Orange Pi Zero 3 User Manual



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1. Basic features of Orange Pi Zero 3

1.1. What is Orange Pi Zero 3

Orange Pi is an open source single-board card computer, a new generation of arm64 development board, which can run Android TV 12, Ubuntu and Debian and other operating systems. Orange Pi Zero 3 uses Allwinner H618 system-on-a-chip and has 1GB or 1.5GB or 2GB or 4GB LPDDR4 memory.

1.2. Purpose of Orange Pi Zero 3

We can use it to achieve:

- A small Linux desktop computer
- A small Linux web server
- Install the Klipper host computer to control the 3D printer
- Android TV box

Of course, there are more functions. Relying on a powerful ecosystem and a variety of expansion accessories, Orange Pi can help users easily realize the delivery from idea to prototype to mass production. It is a maker, dreamer, hobby The ideal creative platform for readers.

1.3. Who is Orange Pi Zero 3 designed for?

The Orange Pi development board is not just a consumer product, but is designed for anyone who wants to use technology to create and innovate. It's a simple, fun, and useful tool you can use to shape the world around you.

1.4. Hardware Features of Orange Pi Zero 3

Introduction to hardware features		
CDU	Allwinner H618 quad-core 64-bit 1.5GHz high-performance	
CPU	Cortex-A53 processor	
GPU	Mali G31 MP2	
	Supports OpenGL ES 1.0/2.0/3.2、OpenCL 2.0	
Memory	1GB/1.5GB/2GB/4GB LPDDR4 (shared with GPU)	
Onboard storage	micro SD card slot, 16MB SPI Flash	
Ethernet	Support 10/100M/1000M Ethernet	
WIFI+Bluetooth	• AW859A chip, support IEEE 802.11 a/b/g/n/ac, BT5.0	
	Micro HDMI 2.0a	
Video Output	• TV CVBS output, support PAL/NTSC (via 13pin	
	expansion board)	
Audio output	Micro HDMI output	
	• 3.5mm audio port (via 13pin expansion board)	
Power Supply	USB Type C interface input	
USB 2.0 port	3* USB 2.0 HOST (two of them are through 13pin expansion	
	board)	
26pin connector	With I2Cx1, SPIx1, UARTx1 and multiple GPIO ports	
12 nin connector	With USB 2.0 HOSTx2, TV-OUT, LINE OUT, IR-RX, and 3	
	GPIO ports	
Debug serial port	UART-TX, UART-RX and GND	
LED light	Power light and status light	
Infrared receiver	Support infrared remote control (via 13pin expansion board)	
Supported OS	Android12 TV, Ubuntu, Debian, etc.	
Introduction of Appearance Specifications		
Product Size	85mm×56mm	
Weight	30g	

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1.5. Top view and bottom view of Orange Pi Zero 3

Top view:



Bottom view:



1. 6. Interface details of Orange Pi Zero 3







Image: spin spin spin spin spin spin spin spin
The diameters of the four positioning holes are all 3.0mm.

2. Introduction to the use of the development board

2.1. Prepare the required accessories

1) Micro SD card, a high-speed SanDisk card of class 10 or above with a minimum capacity of 8GB



Using other brands of micro SD cards (non-SanDisk micro SD cards), as shown in the picture below (including but not limited to these cards), some friends have reported that there will be problems during the system startup process, such as the system is stuck halfway through startup, Or the reboot command cannot be used normally, and it was finally resolved after changing the SanDisk micro SD card. So if you use a non-SanDisk micro SD card and find that there is a problem with the system startup or use, please replace the SanDisk micro SD card and then test.



Current feedback is that there are some micro SD cards that have problems starting on Orange Pi Zero 3

In addition, the micro SD card that can be used normally on other types of development boards does not guarantee that it can be started normally on Orange Pi Zero 3, please pay special attention to this point.

2) Micro SD card reader, used to read and write micro SD card



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



Note, please do not use the relatively wide Micro HDMI adapter as shown in the figure below, because the distance between the Micro HDMI interface of the development board and the Type-C power interface is relatively small, it may cause that the two cannot be inserted into the development board at the same time. plate.



4) Power supply, if you have a 5V/2A or 5V/3A power head, you only need to prepare a USB-to-Type C interface data cable as shown in the picture on the left below, and you can also use a cable similar to the picture on the right below A 5V/2A or 5V/3A high-quality USB Type C interface power adapter integrated with the power head.





- 5) 13pin expansion board
 - a. The physical object of the expansion board is as follows



b. The way to insert the expansion board into the development board is as follows, remember not to insert it backwards



c. The 13pin pin header on the Orange Pi Zero 3 development board can be connected to the expansion board to expand the functions that are not on the development board. The functions that the expansion board can use are as follows

1	Microphone (Mic)	No support, no support, no support! ! !

		The 13pin expansion board is a general-purpose
		expansion board, which is suitable for various
		development boards of Orange Pi, but the 13pin
		interface of Orange Pi Zero3 has no Mic function, so
		although there is a Mic on the 13pin expansion board,
		it is on the Orange Pi Zero 3. Unusable, the 13pin
		expansion board is mainly used to expand functions
		other than Mic on Orange Pi Zero 3.
2	Analog audio and video	Supported it can be used to connect headphones to
-	Thinking dualo and video	Supported, it can be used to connect nearphones to
2	output interface	play music, or connect to TV through AV cable to
2	output interface	play music, or connect to TV through AV cable to output analog audio and video signals (Android
2	output interface	play music, or connect to TV through AV cable to output analog audio and video signals (Android system only).
3	output interface USB 2.0 Host x 2	play music, or connect to TV through AV cable to output analog audio and video signals (Android system only). Support, used to connect USB keyboard, mouse and
3	USB 2.0 Host x 2	play music, or connect to TV through AV cable to output analog audio and video signals (Android system only). Support, used to connect USB keyboard, mouse and USB storage device.
3	USB 2.0 Host x 2	play music, or connect to TV through AV cable to output analog audio and video signals (Android system only). Support, used to connect USB keyboard, mouse and USB storage device. Support, Android system can be controlled by infrared

d. The schematic diagram of the 13pin header of the Orange Pi Zero 3 development board is shown below



6) The mouse and keyboard of the USB interface, as long as the mouse and keyboard of the standard USB interface are acceptable, the mouse and keyboard can be used to control the Orange Pi development board

7) Infrared remote control, mainly used to control Android TV system



Note that the remote control of the air conditioner or the remote control of the TV cannot control the Orange Pi development board. By default, only the remote control provided by Orange Pi can.

8) 100M or 1000M network cable, used to connect the development board to the Internet

9) AV video cable, if you want to display video through the AV interface instead of the HDMI interface, then you need to connect the development board to the TV through the AV video cable



10) Heat sink, if you are worried that the temperature of the development board is too high, you can add a heat sink, and the heat sink can be pasted on the H618 chip



11) 5V cooling fan, as shown in the figure below, both 5V and GND pins on the 26pin and 13pin interfaces of the development board can be connected to the cooling fan. The spacing between the 26pin and 13pin headers is 2.54mm. Refer to this Specifications can be purchased.

Note that the 5V pin can be used directly after the development board is plugged in without other settings, and the output voltage of the 5V pin cannot be adjusted or turned off by software.



12) Matching shell (pictures to be added)

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





Note that the TTL level used by the development board is 3.3v. In addition to the USB to TTL module shown in the above figure, other similar 3.3v USB to TTL modules are generally available.

14) X64 computer with Ubuntu and Windows operating systems installed

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

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

1) The website for downloading the English version is

http://www.orangepi.org/html/hardWare/computerAndMicrocontrollers/service-and -support/Orange-Pi-Zero-3.html

- 2) The information mainly includes
 - a. Android source code: Save on Google Drive
 - b. Linux source code: Save on Github
 - c. Android source code: Save on Google Drive
 - d. Ubuntu source code: Save on Google Drive
 - e. Debian source code: Save on Google Drive
 - f. User Manual and Schematic: Chip-related data sheets will also be placed here
 - g. **Official tool:** It mainly includes the software that needs to be used during the use of the development board

2. 3. Method of burning Linux image to micro SD card based on Windows PC

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

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

2. 3. 1. How to use balenaEtcher to burn Linux image

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

2) Then use the card reader to insert the micro SD card into the computer

3) Download the Linux operating system image file compression package that you want to burn from the **Orange Pi data download page**, and then use the decompression software to decompress it. Among the decompressed files, the file ending with ".img" is the image file of the operating system. The size is generally more than 1GB

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

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

5) After entering the balenaEtcher download page, click the green download button to jump to the place where the software is downloaded

脊 balena	More Products V Resources V Customers & Partners V Pricing Contact Login Sign Up
	ETCHER
	Flash. Flawless.
	Flash OS images to SD cards & USB drives, safely and easily.
	Select image Select drive Flashd
	Download Etcher

6) Then you can choose to download the Portable version of balenaEtcher software. The Portable version does not need to be installed, and you can use it by double-clicking to open it

DOWNLOAD

Download Etcher

ASSET	os	ARCH	
ETCHER FOR WINDOWS (X86 X64) (INSTALLER)	WINDOWS	X86 X64	Download
ETCHER FOR WINDOWS (X86 X64) (PORTABLE)	WINDOWS	X86 X64	Download
ETCHER FOR WINDOWS (LEGACY 32 BIT) (X86 X64) (PORTABLE	WINDOWS	X86 X64	Download
ETCHER FOR MACOS	MACOS	X64	Download
ETCHER FOR LINUX X64 (64-BIT) (APPIMAGE)	LINUX	X64	Download
ETCHER FOR LINUX (LEGACY 32 BIT) (APPIMAGE)	LINUX	X86	Download
Looking for Debian (.deb) packages or Red Hat (.rpm) packages?		🕻 oss	hosting by doudsmit

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





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



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



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

😂 Etcher – 26% Validating		– 🗆 X
	🌍 balena Etcher	¢ 0
 Orangep170.img 2.71 GB Generic Device 	While you are waiting, check out some pro	jects
7	balena-rpiplay	
Validating 26% Skip	Turn a Raspberry Pi into an Airplay server using RPi mirroring on tvs, monitors and projectors.	Play to enable screen
	Warks with	Get started
	Do you want to list your project here Check out our contribution guidelines i	? here

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



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

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

- 2) Then use the card reader to insert the micro SD card into the computer
- 3) Then format the micro SD card
 - a. **SD Card Formatter** can be used to format the micro SD card. The download link is

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

- b. After downloading, unzip and install directly, and then open the software
- c. If only a micro SD card is inserted into the computer, the drive letter of the micro SD card will be displayed in the " **Select card** " column. If multiple USB storage devices are inserted into the computer, you can select the corresponding drive letter of the micro SD card through the drop-down box

Select card		
F:\		~
		Refresh
Card information		
Туре	SDHC	52
Capacity	14.84 GB	
Formatting optio Quick format	ns	
Overwrite for	mat	
CHS format si	ze adjustment	
Volume label		
1		

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



e. After formatting the micro SD card, the message shown in the figure below will pop up, click OK



4) Download the Linux operating system image file compression package that you want to burn from the **Orange Pi data download page**, and then use the decompression software to decompress it. Among the decompressed files, the file ending with "**.img**" is the image file of the operating system. The size is generally more than 1GB

5) Use **Win32Diskimager** to burn the Linux image to the micro SD card

a. The download page of Win32Diskimager is

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

- b. After downloading, install it directly. The interface of Win32Diskimager is as follows
 - a) First select the path of the image file
 - b) Then confirm that the drive letter of the micro SD card is consistent with that displayed in the "**Device**" column
 - c) Finally click "Write" to start burning

映像文件		设备
		E [7:1] •
fiteria		1
and the second		
无 · 生街 質則	Select	the TF car
え ・ 生貞 原則 Select the image file	e Select	the TF car
 注点 原則 Select the image file (以本取已分配分区 任务通常 	e Select	the TF car
 注 ・ 生点 原則 Select the image file ① 仅体取已分配分区 任务速度 Start burning image 	e Select	/ the TF car
 王 ・ 生点 原則 Select the image file ① 供体取已分配分区 任务速度 Start burning image 	e Select	the TF car

c. After the image writing is completed, click the "**Exit**" button to exit, and then you can pull out the micro SD card and insert it into the development board to start

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

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

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

2) Then use the card reader to insert the micro SD card into the computer

3) Download the balenaEtcher software, the download address is

|--|

4) After entering the balenaEtcher download page, click the green download button to jump to the place where the software is downloaded

🖻 balena	More Products V Resources V Customers & Partners V Pricing Contact Login Sign Up
	ETCHER
	Flash. Flawless.
	Flash OS images to SD cards & USB drives, safely and easily.
	Select image Select drive Flash!
	Download Etcher

5) Then choose to download the Linux version of the software

Download Etcher

DOWNLOAD

ASSET	os	ARCH	
ETCHER FOR WINDOWS (X86 X64) (INSTALLER)	WINDOWS	X86 X64	Download
ETCHER FOR WINDOWS (X86 X64) (PORTABLE)	WINDOWS	X86 X64	Download
ETCHER FOR WINDOWS (LEGACY 32 BIT) (X86 X64) (PORTABLE)	WINDOWS	X86 X64	Download
ETCHER FOR MACOS	MACOS	X64	Download
ETCHER FOR LINUX X64 (64-BIT) (APPIMAGE)	LINUX	X64	Download
ETCHER FOR LINUX (LEGACY 32 BIT) (APPIMAGE)	LINUX	X86	Download

6) Download the image file compression package of the Linux operating system that you want to burn from the **Orange Pi data download page**, and then use the decompression software to decompress it. Among the decompressed files, the file ending with "**.img**" is the image file of the operating system. The size is generally above 1GB. The decompression command for the compressed package ending in 7z is as follows:

test@test:~\$ 7z x orangepizero3_1.0.0_ubuntu_focal_desktop_linux6.1.31.7z

test@test:~\$ ls orangepizero3_1.0.0_ubuntu_focal_desktop_lin	ux6.1.31.*
orangepizero3_1.0.0_ubuntu_focal_desktop_linux6.1.31.7z	
orangepizero3_1.0.0_ubuntu_focal_desktop_linux6.1.31.sha	# checksum file
orangepizero3_1.0.0_ubuntu_focal_desktop_linux6.1.31.img	# mirror file

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

test@test:~\$ sha256sum -c *.sha orangepizero3_1.0.0_ubuntu_focal_desktop_linux6.1.31.img: success

8) Then double-click **balenaEtcher-1.14.3-x64.AppImage** on the graphical interface of Ubuntu PC to open balenaEtcher (no installation required), and the interface after balenaEtcher is opened is displayed as shown in the figure below



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



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

	Etcher – 50% Flashing		00
	🌍 balena Etcher		¢ 0
÷ —		- +	
Orangepiz9.170.img 911 MB	Generic M…rageClass 31.9 GB	Flashing	Cancel ETA 0m13s

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



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

	Etcher	۵ 😣
Flash Com I Successful Effective speet: 47	Dlete! Flash Another	
Thanks	for using 🌍 balena Etcher	
n	ade with 🤎 by 🍞 balena	

2.5. How to burn Android image to micro SD card

The Android image of the development board can only be burned into the micro

SD card under the Windows platform using the PhoenixCard software, and the version of the PhoenixCard software must be PhonixCard-4.2.8.

Please do not use software for burning Linux images, such as Win32Diskimager or balenaEtcher, to burn Android images.

In addition, the PhoenixCard software does not have versions for Linux and Mac platforms, so it is impossible to burn Android images to micro SD cards under Linux and Mac platforms.

First, please make sure that the Windows system has installed Microsoft Visual C++
 2008 Redistrbutable -

命主页	应用和功能	
		2020/6/15
应用	Microsoft Visual C++ 2005 Redistributable (x64)	6.84 MB 2020/6/15
三 应用和功能	Microsoft Visual C++ 2008 Redistributable - x64	8.14 MB 2020/6/15
□→ 默认应用	Microsoft Visual C++ 2008 Redistributable - x86	6.68 MB
印. 离线地图	9.0.21022	2020/6/15
A 可使用网站打开的应用	修改	卸载
口 视频播放	Microsoft Visual C++ 2010 x64 Redistributable	13.7 MB
〒 启动	Microsoft Visual C++ 2010 x86 Redistributable	2020/6/15 9.71 MB
6		2020/6/15

2) If not installed **Microsoft Visual C++ 2008 Redistrbutable - x86**, Using PhoenixCard to format micro SD card or burn Android image will prompt the following error



固件	C:\Users\test\De:	sktop\OrangePi_Zero2_Android1	0_v1.0.img			
別作卡的种类						
○量产卡	◉启动卡	○烷Key卡	烧卡	恢复卡	刷新盘符	
刘表(请确保插)	入需要烧写的卡,并:	拔出其他移动存储设备)				
蜂	盘符	容量		状态	5	
✓ 1	E	29339M				
出信息						
essage						
:正在格式化卡纤 :格式化卡 F 失i 战到盘符:F	创正常状态 败 1844					

3) Microsoft Visual C++ 2008 Redistrbutable - x86 the installation package can be downloaded from the official tool of Orange Pi Zero 3, or you can go to the official website of Microsoft to download



4) Then prepare a micro SD card with 8GB or larger capacity. The transmission speed of the micro SD card must be **class 10 or above**. It is recommended to use a micro SD card of SanDisk and other brands

5) Then use the card reader to insert the micro SD card into the computer

6) Download the Android image and PhoenixCard programming tool from the **Orange Pi data download page**. **Please ensure that the version of the PhonenixCrad tool is PhonixCard-4.2.8**. Please do not use the PhonixCard software version lower than 4.2.8 to burn the Android image. There may be problems with the Android image flashed by this version of the PhonixCard tool

Balena-etcher		â	2020-11-04 13:48
Android测试APP		-	2020-11-04 13:48
win32diskimager-1.0.0-install.exe		12M	2020-11-04 13:48
vcredist_x86.exe		4.3M	2021-04-25 21:25
security.tar.gz	Please download this latest version of the software.	2.3M	2021-06-16 14:07
SDCardFormatterv5_WinEN.zip		6M	2020-11-04 13:48
PhonixCard-4.2.5.zip		4.9M	2021-03-08 18:07
PhoenixCard4.2.8.zip		10.2M	2022-01-05 13:33
MobaXterm_Portable_v20.3.zip		24.9M	2020-11-04 13:48

7) Then use the decompression software to decompress the compressed package of the downloaded Android image. Among the decompressed files, the file ending with ".img" is the Android image file, and the size is more than 1GB.

8) Then use decompression software to decompress **PhonixCard4.2.8.zip**, this software does not need to be installed, just find PhoenixCard in the decompressed folder and open it

li			
Masocketun	2010/4/0 11.33	א עידובותוצו	24 NU
Mbr2Gpt.dll	2019/2/27 13:34	应用程序扩展	9 KB
option.cfg	2019/4/22 15:57	CFG 文件	1 KB
Parsenwanager.on	2019/1/10 14:51	应用程序扩展	81 KB
👼 PhoenixCard	2019/12/31 11:29	应用程序	1,748 KB
	2019/12/31 10:42	LAN 文件	3 KB
TTV			

9) After opening PhoenixCard, if the micro SD card is recognized normally, the drive letter and capacity of the micro SD card will be displayed in the middle list. Please make sure that the displayed drive letter is consistent with the drive letter of the micro SD card you want to burn. If there is no display, you can try to unplug the micro SD card, or click the "Refresh Drive Letter" button in PhoenixCard

训作卡的种类					
○	◎ 启动卡	○烧Key卡	烧卡	恢夏卡	刷新盘符
列表 (插入雲要烧写的卡,并				
列表(请确保 _{先择}	插入需要烧写的卡,并 盘符	拔出其他移动存储设备) 容 畢		1	*

10) After confirming the drive letter, format the micro SD card first, and click the "**Recover Card**" button in PhoenixCard (if the "**Recover Card**" button is gray and cannot be pressed, you can first click the "**Refresh Drive Letter**" button)

制作卡的种类 〇 里产卡	●启动ŧ	- ○焼Key卡	焼卡 恢夏卡 刷新盘符 1. Refresh the drive letter first
列表(请确保指	插入需要烧写的卡,并	并拔出其他移动存储设备)	2. Then tap Recover Card
进择	盘符	容田	<u> </u>
1	E	15193M	
		A green progress	bar will be displayed
		after f	ormatting
输出信息			
Message			
E: 正在格式化- E: 格式化成功 时到盘符: E	卡到正常状态		

If there is a problem with formatting, please try to unplug and insert the micro SD card and then test again. If the problem still exists after re-plugging and inserting the micro SD card, you can restart the Windows computer or try another computer.

- 11) Then start to write the Android image into the micro SD card
 - a. First select the path of the Android image in the "Firmware" column
 - b. Select "Activation Card" in "Card Type"
 - c. Then click the "burn card" button to start burning



固件	Y:\images\Orang	ePi_Zero2_Android10_v1.(D\OrangePi_Zero2_Androidity_v1.0.img
制作卡的种类	● 启动卡	○燒Key卡	城卡 恢复卡 刷新盘符
列表(请确保插	入需要烧写的卡,并	拔出其他移动存储设备) ——	Click Burn Card to start burning the image to the TF card
选择	置符	容里 15103M	状态 74%
			Show the flashing progress of the Android image
 输出信息 Message E: 正在格式化卡 E: 开始烷写 E: [burn 1st part E: [burn 2nd part E: [bootloader]] E: [bootloader]] E: [boot]旗写完印 E: [boot]旗写完印 	······ t: boot0]焼写完成 rt: boot1]焼写完成 成 焼写完成 成		Display the output information of the Android image process
清除消息	帮助		版本更新 关闭

12) After burning, the display of PhoenixCard is as shown in the figure below. At this time, click the "**Close**" button to exit PhoenixCard, and then you can pull out the micro SD card from the computer and insert it into the development board to start

ð	
S	range Pi User Manual

选择	盘符	容里	状态
1	E	15193M	
輸出信息 Message E: [misc]烧写3	完成		^
3: [recovery]) 3: [cache]焼雪 5: [vbmeta]焼 5: [DATA File]	烧写完成 写完成 跨完成])烧写完成		After burning, click close to exit
E: magic完成 E: 烧写结束 找到盘符:E			
0)			· · · · · · · · · · · · · · · · · · ·

After burning the Android system, the micro SD card can only see a 128 MB partition in Windows, and the displayed partition is as shown in the figure below (some computers may pop up more than 20 disk partitions, but only the 128 MB partition can be opened. partition), please note that this is normal, please do not think that the micro SD card is burned out. The reason for this is that the Android system has a total of more than 20 partitions, but most of them cannot be recognized normally in the Windows system. At this point, please safely unplug the micro SD card and insert it into the development board to start it.



After the Android system starts, use the following command to see the twenty or so partitions in the micro SD card:

console:/ # ls /dev/bl	ock/mmcblk0*	
/dev/block/mmcblk0	/dev/block/mmcblk0p17	/dev/block/mmcblk0p25
/dev/block/mmcblk0p1	/dev/block/mmcblk0p18	/dev/block/mmcblk0p3
/dev/block/mmcblk0p10	/dev/block/mmcblk0p19	/dev/block/mmcblk0p4
/dev/block/mmcblk0p11	/dev/block/mmcblk0p2	/dev/block/mmcblk0p5
/dev/block/mmcblk0p12	/dev/block/mmcblk0p20	/dev/block/mmcblk0p6
/dev/block/mmcblk0p13	/dev/block/mmcblk0p21	/dev/block/mmcblk0p7
/dev/block/mmcblk0p14	/dev/block/mmcblk0p22	/dev/block/mmcblk0p8
/dev/block/mmcblk0p15	/dev/block/mmcblk0p23	/dev/block/mmcblk0p9
/dev/block/mmcblk0p16	/dev/block/mmcblk0p24	
console:/ #		
Use the df -h command to see that the 16GB micro SD card has about 11 GB of space available after burning the Android system (more than 20 partitions will not be mounted to the Android system, focus on these to the partition).

ilesystem	Size	Used	Avail	Use%	Mounted on
mpfs	727M	1.1M	726M	1%	/dev
tmpfs	727M	0	727M	0%	/mnt
/dev/block/mmcblk0p19	11M	136K	11M	2%	/metadata
/dev/block/dm-0	782M	779M	2.4M	100%	1
/dev/block/dm-1	104M	103M	332K	100%	/vendor
/dev/block/dm-3	6.5M	6.5M	24K	100%	/vendor_dlkm
/dev/block/dm-2	250M	249M	788K	100%	/product
/dev/block/mmcblk0p23	16M	0	16M	0%	/oem
tmpfs	727M	8.0K	727M	1%	/apex
tmofs	727M	532K	726M	1%	/linkerconfig
/dev/block/mmcblk0p25	11G	904M	11G	8%	/data
tmpfs	727M	0	727M	0%	/data_mirror
/dev/block/mmcblk0p24	16M	0	16M	0%	/Reserve0
/dev/fuse	11G	904M	11G	8%	/mnt/user/0/emulated
/dev/block/vold/public:179,1	128M	5.3M	122M	5%	/mnt/media_rw/0000-0000
/dev/fuse	128M	5.3M	122M	5%	/mnt/user/0/0000-0000
console:/ #				N 11290 1212	

2.6. Instructions for using the micro linux system in the onboard SPI Flash

There is a 16MB SPI Flash on the development board, and its location is shown in the figure below:



There is a tiny linux system programmed into SPI Flash by default, which is mainly used to prove that the development board can start normally. When you get the development board, you don't need to burn the system into the micro SD card, you only need to connect the Type-C power supply to the development board to start the micro linux system in the SPI Flash. The main functions of this system are:

a) During the u-boot start-up phase, the red LED light will be lit, and after entering the kernel, the red LED light will be turned off and the green LED light will be set to flash;

b) If the development board is connected to an HDMI screen, after the system starts up, the command line interface of the micro-linux system can be seen on the HDMI screen;

c) If the development board is connected with a USB keyboard, some simple linux commands can be run on the command line, such as ls, cd, etc.

Due to the limited functions of the tiny linux system in SPI Flash, if you want to use all the functions of the development board normally, please burn the linux image or Android image to the micro SD card, and then use it.

2.7. Start the Orange Pi development board

1) Insert the micro SD card with the burned image into the micro SD card slot of the Orange Pi development board

2) The development board has a Micro HDMI interface, and the development board can be connected to a TV or HDMI display through a Micro HDMI to HDMI cable

3) If you have purchased a 13pin expansion board, you can plug the 13pin expansion board into the 13pin interface of the development board

4) Connect the USB mouse and keyboard to control the Orange Pi development board

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

6) Connect a high-quality power adapter with a 5V/2A (5V/3A is also available) USB Type C interface

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

Many unstable phenomena during the power-on and start-up process of the system are basically caused by power supply problems, so a reliable power adapter is very important. If you find that there is a phenomenon of continuous restart during the startup process, please replace the power supply or Type C data cable and try again.

7) Then turn on the switch of the power adapter, if everything is normal, the HDMI monitor can see the system startup screen at this time

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

2.8. How to use the debugging serial port

2.8.1. Connection instruction of debugging serial port

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



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



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

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

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



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

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

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

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

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

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

test@test:~\$ sudo apt update

test@test:~\$ sudo apt install -y putty

Then run putty, remember to add sudo permission
 test@test:~\$ sudo putty

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

	PuTTY Configuration	- 🗆 🔕
Category: • Session	Basic options for your PuTTY sess Specify the destination you want to connect to —	Ion
Logging	Host Manie (of IP address)	22
Keyboard Bell	Connection type: Raw Ielnet Rlogin SSH	Se <u>r</u> ial
Features Vindow Appearance	Load, save or delete a stored session Saved Sessions	
Translation	Default Settings	Load
Selection		Sa <u>v</u> e
Fonts		Delete
✓ Connection Data		
Telnet Rlogin	Close window on exit: Always Never Only on clea	n exit
H22 4		
About	<u>O</u> pen	<u>C</u> ancel

5) First select the setting interface of the serial port

	PuTTY Configuration		- 🛛 🔇
Category: Logging Terminal Keyboard Bell	Options controll Select a serial line Seria <u>l</u> line to connect to Configure the serial line	ing local serial lines	
Features ♥ Window Appearance Behaviour Translation > Selection Colours Fonts ♥ Connection Data Proxy Telnet Rlogin > 5511 Serial	Speed (baud) Data bits Stop bits Parity Elow control First of the	9600 8 1 None XON/XOF	F v
About	[<u>O</u> pen	Cancel

- 6) Then set the parameters of the serial port
 - a. Set **Serial line to connect to**to as **dev/ttyUSB0** (modify to the corresponding node name, usually /dev/ttyUSB0)
 - b. Set **Speed(baud)** to 115200 (the baud rate of the serial port)
 - c. Set Flow control as None



- 7) After setting the setting interface of the serial port, return to the Session interface
 - a. First select the **Connection type** as Serial
 - b. Then click the **Open** button to connect to the serial port

	PuTTY Configuration	- 0
Category: 🖌 🥢	1. Back to Session Interfac Basic options for your PuTTY sessi	e ion
 Session Logging 	Specify the destination you want to connect to Serial line	Speed
- Terminal	/dev/ttyUSB0	115200
Keyboard Bell	Connection type:	• Se <u>r</u> ial
Features Window Appearance	Load, save or delete a stored session Saved Sessions 2. Select Serial	
Translation Selection	Default Settings	Load
		Save
Fonts		Delete
 Connection Data 		
Proxy Telnet Rlogin	Close window on exit: Always Never Only on clea	n exit
১ ১৩% Finally	click the Open button	
About	Open	<u>C</u> ancel

8) Then start the development board, and you can see the Log information output by the system from the opened serial port terminal



2.8.3. How to use the debugging serial port on Windows platform

There are many serial port debugging software that can be used under Windows, such as SecureCRT, MobaXterm, etc. The following demonstrates how to use

MobaXterm. This software has a free version and can be used without buying a serial number.

- 1) Download MobaXterm
 - a. Download MobaXterm website as follows

https://mobaxterm.mobatek.net/

b. After entering the MobaXterm download page, clickGET XOBATERM NOW!



c. Then choose to download the Home version



d. Then select the Portable version. After downloading, you don't need to install it, just open it and use it

Download	d MobaXterm H	ome Edition	(current versio	n):			
	*	MobaXterm (Portab	Home Edition v le edition)	r20.3			MobaXterm Home Edition v20.3 (Installer edition)
Download	1 previous stab	le version:	MobaXterm Po	ortable v20.2	MobaXterm In	staller v20.2	
You can a	also get early a	ccess to the	latest features	and improve	ments by downline	oading MobaXter Version	m Preview version:
By downk	pading MobaXt	erm softwar	e, you accept M	lobaXterm ter	ms and conditio	ns	
You can o	download Moba	Xterm and	olugins sources	here			
0	If you use Mo subscription v generate pers	baXterm insid ill give you a onalized vers	le your company ccess to profess ions of MobaXter	; you should c ional support : rm including ye	onsider subscribir and to the "Custo our own logo, you	ng to <u>MobaXterm F</u> mizer" software. T r default settings a	Professional Edition: your his customizer will allow you to nd your welcome message.

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

名称	修改日期	类型	大小
CygUtils.plugin	2020/5/21 4:06	PLUGIN 文件	15,570 KB
NobaXterm_Personal_20.3	2020/6/5 4:30	应用程序	14,104 KB

- 3) After opening the software, the steps to set up the serial port connection are as follows
 - a. Open the session settings interface
 - b. Select the serial port type
 - c. Select the port number of the serial port (select the corresponding port number according to the actual situation), if you cannot see the port number, please use 360 Driver Master to scan and install the driver for the USB-to-TTL serial port chip
 - d. Select the baud rate of the serial port as 115200
 - e. Finally click the "**OK**" button to complete the setup

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2. Select the session and open the setting interface of the session Setting interface of the setting Setting interface of the setting Seting interface	Serial port	x

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



2.9. Instructions for using the 5v pin in the 26pin or 13pin interface of the development board to supply power

The power supply method we recommend for the development board is to use the 5V/2A or 5V/3A Type C interface power cord to plug into the Type C power interface of the development board for power supply. If you need to use the 5V pin in the 26pin or 13pin interface to power the development board, please make sure that the power cable used can meet the power supply requirements of the development board. If the use is unstable, please switch back to the Type C power supply.

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



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

2) Use the 5V pin in the 26pin or 13pin interface to supply power to the development board. The connection method of the power line is as follows

- a. The USB A port of the power cord shown in the above figure needs to be plugged into the 5V/2A or 5V/3A power adapter connector (it is not recommended to plug into the USB port of the computer for power supply. If there are too many peripherals connected to the development board, use will be unstable)
- b. The red DuPont wire needs to be plugged into the 5V pin of the 26pin or 13pin interface of the development board
- c. The black Dupont wire needs to be inserted into the GND pin of the 26pin or 13pin interface
- d. The positions of the 5V pin and GND pin of the 26pin and 13pin interfaces in

the development board are shown in the figure below, **remember not to reverse the connection**.



2.10. The method of using the 13pin interface of the development board to expand the USB interface

1) If you have purchased a 13pin expansion board for Orange Pi, insert the expansion board into the 13pin interface of the development board to expand 2 USB interfaces



2) If there is no 13pin expansion board, you can use a 4pin 2.54mm DuPont to USB2.0 female cable to expand the USB interface. The specific method is as follows:

a. First, you need to prepare a 4pin 2.54mm Dupont to USB2.0 female cable (this cable can be bought on Amazon, please search and buy by yourself), as shown in the figure below:



b. The schematic diagram of the 13pin interface is shown below



c. The wiring of USB2 is as follows



d. The wiring of USB3 is as follows



e. If you need to connect two USB devices to the 13pin interface at the same time, you will find that the 5V and GND pins on the 13pin interface are not enough. At

this time, one of the USB devices can use the 5V and GND pins in the 26pin interface. The location is as shown in the figure below Shown:



3. Instructions for use of Debian/Ubuntu Server and Xfce desktop system

3.1. Supported linux image types and kernel versions

Linux image type	kernel version	server version	desktop version
Ubuntu 20.04 - Focal	Linux5.4	Support	Support
Ubuntu 22.04 - Focal	Linux5.4	Support	Support
Debian 11 - Bullseye	Linux5.4	Support	Support
Ubuntu 22.04 - Jammy	Linux6.1	Support	Support
Debian 11 - Bullseye	Linux6.1	Support	Support
Debian 12 - Bookworm	Linux6.1	Support	Support

After entering the download page of the corresponding development board on the **Orange Pi data download page**, you can see the following download options. In the description below, the Ubuntu image and the Debian image are generally referred to as the Linux image.



The naming rules of Linux images are as follows:

Development board model_version number_Linux distribution type_release code name_server or desktop_kernel version

- a. **The model of the development board :** Both are **orangepizero3**. The model names of different development boards are generally different. Before burning the image, please make sure that the model name of the selected image matches the development board.
- b. Version number: For example, 1.x.x, this version number will increase with the update of the image function, and the last number of the version number of the Linux image on the development board is an even number.
- c. **Types of Linux distributions: Ubuntu** and **Debian** are currently supported. Since Ubuntu is derived from Debian, there is not much difference between the two systems in terms of usage. However, there are still some differences in the default configuration of some software and the use of commands. In addition, both Ubuntu and Debian have their own software warehouses supported by maintenance, and there are also some differences in the supported and installable software packages. These need to be experienced in person to have a deeper understanding. For more details, you can refer to the official documentation provided by Ubuntu and Debian.
- d. **Release code name :** Used to distinguish between different versions of a specific Linux distribution such as Ubuntu or Debian. Among them, both **focal** and **jammy** are Ubuntu distributions, focal means Ubuntu20.04, and jammy means Ubuntu22.04. The biggest difference between different versions is that the software in the software warehouse maintained by the new version of Ubuntu system is much better than that of the old version of Ubuntu system. The ones in it should be new, such as Python and GCC compilation tool chains. **bullseye** is the specific version code of Debian, bullseye means Debian11, and bookworm means Debian12.
- e. Server or Desktop: It is used to indicate whether the system has a desktop

environment. If it is server, it means that the system does not have a desktop environment. The storage space and resources occupied by the image are relatively small, and the command line is mainly used to operate and control the system. If it is **desktop_xfce**, it means that the system is installed with the XFCE desktop environment by default. The storage space and resources occupied by the image are relatively large. You can connect the monitor, mouse and keyboard to operate the system through the interface. Of course, the desktop version of the system can also be operated through the command line like the server version of the system.

f. Kernel version : Used to indicate the version number of the linux kernel, currently supports linux5.4 and linux6.1.

Function	Linux5.4	Linux6.1
HDMI video	ОК	ОК
HDMI audio	ОК	ОК
USB2.0 x 3	ОК	ОК
micro SD card start	ОК	ОК
Gigabit Ethernet	ОК	ОК
Infrared receiver	ОК	ОК
WIFI	ОК	ОК
Bluetooth	ОК	ОК
headphone audio	ОК	ОК
usb camera	ОК	ОК
LED light	ОК	ОК
26pin GPIO	ОК	ОК
26pin I2C	ОК	ОК
26pin SPI1	ОК	ОК
26pin UART	ОК	ОК
PWM	ОК	ОК
Temperature Sensor	ОК	ОК
hardware watchdog	ОК	ОК
Mali GPU	NO	NO

3.2. Linux kernel driver adaptation

Video codec	NO	NO
TV-OUT	NO	NO

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

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

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

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

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

- b. root@orangepi:~\$ The prompt indicates that this command is entered in the linux system of the development board. The \$ at the end of the prompt indicates that the current user of the system is a normal user. When executing a privileged command, you need to add sudo
- c. root@orangepi:~# The prompt indicates that this command is entered in the linux system of the development board, and the # at the end of the prompt indicates that the current user of the system is the root user, who can execute any desired command
- d. test@test:~\$ The prompt indicates that this command is entered in the Ubuntu PC or Ubuntu virtual machine, not in the linux system of the development board. The \$ at the end of the prompt indicates that the current user of the system is an ordinary user. When executing privileged commands, sudo needs to be added
- e. root@test:~# The prompt indicates that this command is entered in the Ubuntu PC or Ubuntu virtual machine, not in the linux system of the development board. The # at the end of the prompt indicates that the current user of the system is the

root user and can execute any command you want

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

root@orangepi:~# cat /boot/orangepiEnv.txt

verbosity=7

bootlogo=false

console=serial

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

orangepi@orangepi:~\$ echo \

"deb [arch=\$(dpkg --print-architecture) \

signed-by=/usr/share/keyrings/docker-archive-keyring.gpg] \

https://download.docker.com/linux/debian \

\$(lsb_release -cs) stable" | sudo tee /etc/apt/sources.list.d/docker.list > /dev/null

3.4. Linux system login instructions

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

Account	password
root	orangepi
orangepi	orangepi

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

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



other reasons.

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

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



2) Use the following command to set the root user to automatically log in to the terminal orangepi@orangepi:~\$ sudo auto_login_cli.sh root

3) Use the following command to disable automatic login terminal

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

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

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

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

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



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

orangepi@orangepi:~\$ sudo disable desktop autologin.sh

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



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

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

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

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



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

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

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

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

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

1) First enter the following command on the command line, **Please remember to add sudo permission**

orangepi@orangepi:~\$ sudo systemctl disable lightdm.service

2) Then restart the Linux system and you will find that the desktop will not be displayed orangepi@orangepi:~\$ sudo reboot

3) The command to reopen the desktop is as follows, **Please remember to add sudo** permission

orangepi@orangepi:~\$ sudo systemctl start lightdm.service orangepi@orangepi:~\$ sudo systemctl enable lightdm.service

3.5. Onboard LED Light Test Instructions

1) There are two LED lights on the development board, one is green and the other is red. When the system starts, the default display of the LED lights is as follows:

	Green light	Red light
u-boot startup phase	off	on
The kernel boots into the system	flashing	off
GPIO interface	PC13	PC12

The two LED lights on the development board are controlled by software.

When you get the development board, you may find that even if the micro SD card with the system programmed is not inserted into the development board, the two LED lights will be on after the development board is connected to the power supply. This is because the 16MB on the development board SPI Flash will burn a miniature linux system by default when leaving the factory. This system will light up the red light during the u-boot startup phase. After entering the kernel, it will turn off the red light and set the green light to flash.

If the linux system in the SPI Flash is cleared, then the two LED lights on the development board will not light up after the power is turned on without inserting the micro SD card with the system programmed

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

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

a. First enter the setting directory of the green light

root@orangepi:~# cd /sys/class/leds/green_led

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

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

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

root@orangepi:/sys/class/leds/green_led# echo default-on > trigger

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

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

3) The method of setting the red light on/off and flashing is as follows:

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

a. First enter the setting directory of the red light

root@orangepi:~# cd /sys/class/leds/red_led

b. The command to set the red light to be on is as follows

root@orangepi:/sys/class/leds/red_led# echo default-on > trigger

c. The command to set the flashing red light is as follows

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

d. The command to set the red light to stop flashing is as follows

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

4) If you do not need the LED light to flash after booting, you can use the following method to turn off the green light flashing

a. First run orangepi-config, common users remember to add sudo permission

orangepi@orangepi:~\$ sudo orangepi-config

b. Then select **System**

D <mark>ebian bul</mark> etween <mark>480</mark>	lseye based OrangePi f	for the OPI Zero3
etween 480	and area with the set	
	and 1512 MHZ USing or	ndemand governor.
tto://www.		
ccp.//www.	n angept.org	
System	System and security s	settings
Network	wired, wireless, Blue	cooth, access point
Software	System and 3rd party	software install
Help	Documentation, suppor	t, sources
	< <mark>0</mark> K >	< Exit >
	ttp://www.c Wsten Network Personal Software Help	ttp://www.orangepi.org System and security s Network Wired, Wireless, Blue Personal Timezone, language, f Software System and 3rd party Help Documentation, suppor

c. Then select **Hardware**



d. Then use the arrow keys on the keyboard to navigate to the position shown in the

e.

f.

figure below, and then use the space to select disable-leds

Then selec

Save>

Save>

Back >

Then select <Back>

	< Save >	< Back >	
--	----------	----------	--

g. Then select **<Reboot>**to restart the system for the configuration to take effect



h. After restarting and fully entering the system, you can see that the two LED lights on the development board will not light up

3. 6. Instructions for operating the rootfs partition capacity of the linux system in the micro SD card

3. 6. 1. The first startup will automatically expand the capacity of the rootfs partition in the micro SD card

1) After burning the Linux image of the development board into the micro SD card, you can check the capacity usage of the micro SD card on the **Ubuntu computer**, the steps are as follows:

Note that this step does not affect the automatic expansion of the Linux system

of the development board. Here I just want to explain how to check the capacity of the micro SD card after burning the Linux image on the micro SD card.

a. First install the gparted software on the Ubuntu computer

test@test:~\$ sudo apt install -y gparted

b. Then open gparted

test@test:~\$ sudo gparted

c. After opening gparted, you can select the micro SD card in the upper right corner, and then you can see the usage of the micro SD card capacity

/dev/sdc - GParted – 🗆								
GParted Edit View Device	Partition Help						_	
	1 🖌 🖌		\rightarrow	/dev/sdc (14.84	GiB)	•	
/dev/sdc1 4.05 GiB			unallocated 10.79 GiB					
Partition File System	Mount Point	Size	Used	Unused	1	Flags		
unallocated unallocated		4.00 MiB			20			
/dev/sdc1 🔍 🔳 🛛 ext4	/media/tes	4.05 GiB	3.28 GiB	785.54 MiE	3			
unallocated 📃 unallocated	ł.	10.79 GiB			-0			

d. The figure above shows the situation of the micro SD card after burning the Linux desktop version system. It can be seen that although the total capacity of the micro SD card is 16GB (displayed as 14.84GiB in GParted), the rootfs partition (/dev/ sdc1) actually allocated only 4.05GiB, leaving 10.79GiB unallocated

2) Then you can insert the micro SD card that has burned the Linux system into the development board to start. When the micro SD card starts the Linux system for the first time, it will call the **orangepi-resize-filesystem** script automatically through the systemd service **orangepi-resize-filesystem.service** The expansion of the rootfs partition, **so there is no need to manually expand the capacity**

3) After logging in to the system, you can use the **df -h** command to check the size of the rootfs. If it is consistent with the actual capacity of the micro SD card, it means that the automatic expansion is running correctly.

orangepi@orangepi:~\$ df -h						
Filesystem	Size Used	Ava	il Use% I	Mounted on		
udev	430M	0	430M	0% /dev		

orange Pi User	Manual		Copyrigh	t reserved by Shenzhen Xunlong Software Co., Ltd
tmpfs	100M	5.6M	95M	6% /run
/dev/mmcblk0p1	15G	915M	14 G	7% /
tmpfs	500M	0	500M	0% /dev/shm

4) After starting the Linux system for the first time, we can also remove the micro SD card from the development board and reinsert it into the **Ubuntu computer**, and then use gparted to check the status of the micro SD card again, as shown in the figure below, the rootfs partition (/dev/ The capacity of sdc1) has been expanded to 14.69GiB

		/dev/sdc	- GParted			8
GParted Edi	t View Device	e Partition Help				
		🛍 🥱 🖌		/dev/sdo	c (14.84 GiB)	•
		/dev 14.6	/sdc1 9 GiB			
Partition	File System	Size	Used	Unused	Flags	
unallocated	unallocated	4.00 MiB				
/dev/sdc1	ext4	14.69 GiB	3.42 GiB	11.26 GiB		_
unallocated	unallocated	151.94 MiB				

It should be noted that the Linux system has only one partition in ext4 format, and does not use a separate BOOT partition to store files such as the kernel image, so there is no problem of expanding the BOOT partition.

3. 6. 2. The method of prohibiting automatic expansion of the capacity of the rootfs partition in the micro SD card

 First burn the linux image of the development board to the micro SD card on the Ubuntu computer (Windows not available), and then re-plug and insert the micro SD card

2) Then the Ubuntu computer will automatically mount the partition of the micro SD card. If the automatic mounting is normal, use the ls command to see the following output

test@	est@test:~\$ ls /media/test/opi_root/											
bin	boot	dev	etc	home	lib	lost+found	media	mnt	opt	proc	root	run
sbin	selin	ux s	rv s	sys tm	o us	sr var						

3) Then switch the current user to the root user on the Ubuntu computer

test@test:~\$ sudo -i

[sudo] password for test:

root@test:~#

4) Then enter the root directory of the linux system in the micro SD card and create a new file named **.no rootfs resize**

root@test:~# cd /media/test/opi_root/ root@test:/media/test/opi_root/# cd root root@test:/media/test/opi_root/root# touch .no_rootfs_resize root@test:/media/test/opi_root/root# ls .no_rootfs* .no rootfs resize

5) Then you can uninstall the micro SD card, and then pull out the micro SD card and insert it into the development board to start. When the linux system starts, when the file.no_rootfs_resize is detected in the /root directory, the rootfs will not be automatically expanded.

6) After entering the Linux system after prohibiting automatic expansion of rootfs, you can see that the total capacity of the rootfs partition is only 4GB (the image of the desktop version is tested here), which is much smaller than the actual capacity of the micro SD card, indicating that the automatic expansion of rootfs is prohibited.

orangepi@orange	pi:~ \$ df	-h		
Filesystem	Size U	sed Ava	uil Use%	Mounted on
udev	925M	0	925M	0% /dev
tmpfs	199M	3.2M	196M	2% /run
/dev/mmcblk0p1	4.0G	3.2G	686M	83% /

7) If you need to re-expand the capacity of the rootfs partition in the micro SD card, just execute the following command, and then restart the Linux system of the development board.

Note, please execute the following commands under the root u	iser.
--	-------

root@orangepi:~# rm /root/.no_rootfs_resize root@orangepi:~# systemctl enable orangepi-resize-filesystem.service root@orangepi:~# sudo reboot

After restarting, enter the Linux system of the development board again, and you can see that the rootfs partition has been expanded to the actual capacity of the micro SD card

ro	root@orangepi:~# df -h									
Fi	lesystem	Size	U	sed Ava	il Use%	Mounted on				
ud	lev	925N	1	0	925M	0% /dev				
tm	npfs	199M	1	3.2M	196M	2% /run				
/d	ev/mmcblk0p1	150	3	3.2G	12G	23% /				

3. 6. 3. The method of manually expanding the capacity of the rootfs partition in the micro SD card

If the total capacity of the micro SD card is large, such as 128GB, you do not want the rootfs partition of the Linux system to use all the capacity of the micro SD card, but only want to allocate a part of the capacity, such as 16GB, to the Linux system, and then the remaining capacity of the micro SD card can be used for other use. Then you can use the content introduced in this section to manually expand the capacity of the rootfs partition in TF.

 First burn the linux image of the development board to the micro SD card on the Ubuntu computer (Windows not available), and then re-plug and insert the micro SD card

2) Then the Ubuntu computer will automatically mount the partition of the micro SD card. If the automatic mounting is normal, use the ls command to see the following output

test@test:~\$ **ls /media/test/opi_root/** bin boot dev etc home lib lost+found media mnt opt proc root run sbin selinux srv sys tmp usr var

3) Then switch the current user to the root user on the Ubuntu computer

test@test:~\$ sudo -i

[sudo] password for test:

root@test:~#

4) Then enter the root directory of the linux system in the micro SD card and create a new file named **.no rootfs resize**

root@test:~# cd /media/test/opi_root/

root@test:/media/test/opi_root/# cd root

root@test:/media/test/opi_root/root# touch .no_rootfs_resize

root@test:/media/test/opi_root/root# ls .no_rootfs*

no_rootfs_resize

5) Then install the gparted software on the Ubuntu computer

test@test:~\$ sudo apt install -y gparted

6) Then open gpartedtest@test:~\$ sudo gparted

7) After opening gparted, you can select the micro SD card in the upper right corner, and then you can see the usage of the micro SD card capacity. The figure below shows the situation of the micro SD card after burning the Linux desktop version system. It can be seen that although the total capacity of the micro SD card is 16GB (displayed as 14.84GiB in GParted), the rootfs partition (/dev/sdc1) Only 4.05GiB were actually allocated, leaving 10.79GiB unallocated

/dev/sdc - GParted – 🗆									
GParted Edit View Dev	ice Partition Help								
	🛍 🥱 🖌		\rightarrow	/dev/sdc (1	4.84 GiB) 🔻				
/dev/sdc1 4.05 GiB			unallocated 10.79 GiB						
Partition File Syste	m Mount Point	Size	Used	Unused	Flags				
unallocated unalloca	ted	4.00 MiB	<u></u>						
/dev/sdc1 🔍 🗖 🤘	ext4 /media/tes	4.05 GiB	3.28 GiB	785.54 MiB					
unallocated 📃 unalloca	ted	10.79 GiB							

8) Then select the rootfs partition (/dev/sdc1)

		/de	v/sdc - GPartec			- 🗆	8
GParted Edit	View Device	Partition Help					
					/dev/sdc (1	4.84 GiB) -
/dev 4.05	/sdc1 GiB			unallocated 10.79 GiB			
Partition	File System	Mount Point	Size	Used	Unused	Flag	s
unallocated	unallocated		4.00 MiB	6 .775 6	_		
/dev/sdc1 🔍	ext4	/media/tes	4.05 GiB	3.28 GiB	785.54 MiB		
unallocated	unallocated		10.79 GiB	-	-		

9) Click the right mouse button again to see the operation options shown in the figure below. If the micro SD card has been mounted, first you need to Umount the rootfs

partition of the micro SD card

		/dev/so	ic - GParteo	l			8
View	Device Partition	Help					
-3		~			/dev/sdc (14.84 GiB)	•
v/sdc1			_	unallocated			
5 GiB	la New	Insert		10.79 GiB			
	🔇 Delete	Delete					
File	Resize/Move		ize	Used	Unused	Flags	é 👘
UN	Сору	Ctrl+C	4.00 MiB	3 2			
٩	🖹 Paste 🧳	Ctrl+V	4.05 GiB	3.28 GiB	785.54 MiE		
UN	Sormat to	÷	10.79 GiB	0.000		52	
3	Open Excryption						
	Unmount						
	Name Partition						
	Manage Flags						
	Check						
	Label File System						
	New UUID						
	View	View Device Partition	View Device Partition Help	/dev/sdc - GParted View Device Partition Help Image: Solution of the second se	/dev/sdc - GParted View Device Partition Help Image: Solution of the second s	/dev/sdc - GParted View Device Partition Help Image: Solution of the system New UID w/sdc1 Image: Solution of the system New UID	/dev/sdc - GParted - View Device Partition Help Image: Solution of the system New UID View Device Partition Help Image: Solution of the system New UID View Device Partition Help Image: Solution of the system New UID View Device Partition Help Image: Solution of the system New UID Image: Solution of the system New UID

10) Then select the rootfs partition again, click the right mouse button, and select**Resize/Move** to start expanding the size of the rootfs partition

				/dev/s	dc - GParteo	1		- 8	8
GParted Edit	View [Device P	artition	Help					
		i i	-	1			/dev/sdc	(1 <mark>4.</mark> 84 GiB	i) 🔻
/dev	//sdc1		1			unallocated			
4.05	GiB	New	/	Insert		10.79 GiB			
		Delete	*	Delete					
Partition	File 📎	Resize/N	Nove		ize	Used	Unused	Flag	S
unallocated	UN	Copy	_	Ctrl+C	4.00 MiB	1	s		
/dev/sdc1 🍳		Paste		Ctrl+V	4.05 GiB	3.28 GiB	785.54 M	iВ	
unallocated	un 👌	Format	to	Þ	10.79 GiB	(200	8 8	-	
		Open En	cryption		-				
		Unmoun	it .						
		Name Pa	artition						
		Manage	Flags						
		Check							
		Label Fil	e System						
		Newilli	ID ID						
		Newoo	10 N		-				
		informa	tion						

11) After the **Resize/Move** option is turned on, the following setting interface will pop up



12) Then you can directly drag the location shown in the figure below to set the size of the capacity, or you can set the size of the rootfs partition by setting the number in **New** size(MiB)

Resize/Move ,	/dev/sdc1			8
Minimum size: 3484 MiB	Maximum si	ze: 15	193 MiE	3
Free space preceding (MiB):	4	-	+	
New size (MiB):	8022	-	+	
Free space following (MiB):	7168	-	+	
Align to:	Мів		•	
	Cancel		NR Re	esize/Move

13) After setting the capacity, click Resize/Move in the lower right corner



14) After confirming that it is correct, click the green button shown in the figure below \checkmark

GParted Edit View Device Partition Help Image: Constraint of the system /dev/sdc1 7.83 GiB Partition File System Size Used Unused Flags unallocated unallocated 4.00 MiB ext4 7.83 GiB 3.40 GiB 4.43 GiB			/dev/sdo	: - GParted		- 🗆 🔕
/dev/sdc1 7.83 GiB Partition File System Size Used Unused Flags unallocated unallocated 4.00 MiB /dev/sdc1 ext4 7.83 GiB 3.40 GiB 4.43 GiB	GParted Edit	View Device F	Partition Help		/dev/s	:dc (14.84 GiB) ▼
Partition File System Size Used Unused Flags unallocated unallocated 4.00 MiB /dev/sdc1 ext4 7.83 GiB 3.40 GiB 4.43 GiB		/dev/sd 7.83 GiB	c1		unallocated 7.00 GiB	
unallocated unallocated 4.00 MiB /dev/sdc1 ext4 7.83 GiB 3.40 GiB 4.43 GiB	Partition	File System	Size	Used	Unused	Flags
/dev/sdc1 ext4 7.83 GiB 3.40 GiB 4.43 GiB	unallocated	unallocated	4.00 MiB	-	-	
	/dev/sdc1	ext4	7.83 GiB	3.40 GiB	4.43 GiB	
unallocated 7.00 GiB — — —	unallocated	unallocated	7.00 GiB	1 .112 7.	1	
	<mark>≫</mark> Grow /dev/s	dc1 from 4.05 GiB to	7.83 GiB			
↓ Grow/dev/sdc1 from 4.05 GiB to 7.83 GiB						
∮ Grow/dev/sdc1 from 4.05 GiB to 7.83 GiB	1 operation p	ending				

15) Then select Apply, it will officially start to expand the capacity of the rootfs partition



16) After the expansion is completed, click Close to close

	Applying pending operations	8
Depending on the number an	d type of operations this might take a long time.	
Completed Operations:		
	All operations successfully completed	
Details		
	Save Details	Close

17) Then you can pull out the micro SD card, insert it into the development board and start it up. After entering the Linux system of the development board, if you can see that the size of the rootfs partition is the same as the size set before, it means manual Expansion succeeded

root@orangepi:~	# df -h	
Filesystem	Size	Used Avail Use% Mounted on

udev	925M	0	925M	0% /dev
tmpfs	199M	3.2M	196M	2% /run
/dev/mmcblk0p1	7.7G	3.2G	4.4G	42% /

3. 6. 4. How to reduce the capacity of the rootfs partition in the micro SD card

After configuring the application program or other development environment in the Linux system of the micro SD card, if you want to back up the Linux system in the micro SD card, you can use the method in this section to reduce the size of the rootfs partition first, and then start the backup.

1) First insert the micro SD card you want to operate in the **Ubuntu computer** (Windows not available)

2) Then install the gparted software on the Ubuntu computer
 test@test:~\$ sudo apt install -y gparted

3) Then open gparted

	~	~	-	-
test(a)test-~	Sen	ido o	narted
LCSL($w_{\mu\nu}$	ψsu	iuu g	partu

4) After opening gparted, you can select the micro SD card in the upper right corner, and then you can see the usage of the micro SD card capacity

		/•	dev/sdc - GParted			- 0	8
GParted Edit	View Device	Partition Hel	p				_
		1 🔦 🗸	-		/dev/sdc (14	.84 GiB)	-
			/dev/sdc1 14.69 GiB				
Partition	File System	Mount Point	Size	Used	Unused	Flags	s
unallocated	unallocated		4.00 MiB				
/dev/sdc1 🍳	ext4	/media/tes	14.69 GiB	3.45 GiB	11.24 GiB		
unallocated	unallocated	1	151.94 MiB				

5) Then select the rootfs partition (/dev/sdc1)

		/de	v/sdc - GParted			_ 0	8
GParted Edit	View Device	Partition Help			-		
		6 1			/dev/sdc (14	1.84 GiB)	•
			/dev/sdc1 14.69 GiB	1			
Partition	File System	Mount Point	Size	Used	Unused	Flags	s
unallocated	unallocated		4.00 MiB	- 1			
/dev/sdc1 🍳	k 📃 🛛 ext4	/media/tes	14.69 GiB	3.45 GiB	11.24 GiB		
unallocated	unallocated		151.94 MiB	-			

6) Click the right mouse button again to see the operation options shown in the figure below. If the micro SD card has been mounted, first you need to Umount the rootfs partition of the micro SD card

Q		1		0 /d	lev/sdc (14	4.84 GiB)
		/dev/sdo	:1			
		14.09 Gr	🔒 New	Insert		
rtition	File System Mount Point	Size	🚫 Delete	Delete	sed	Flags
unallocated	unallocated	4.	Resize/Move			2
/dev/sdc1 🍳	ext4 /media/tes	14	Сору	Ctrl+C	1.24 GiB	
unallocated	unallocated	151.	💼 Paste	Ctrl+V	-	
			Format to	+		
			Open Encryption			
			Name Partition		-	
			Manage Flags			
			Check			
		/	Label File System			
		1	New UUID			
					-	

7) Then select the rootfs partition again, click the right mouse button, and select**Resize/Move** to start setting the size of the rootfs partition



Parted Edit	: View Device F	/dev/sdc - Partition Help	GParted			
3		← ✓		C	/dev/sdc (1	4.84 GiB)
		/dev/ 14.69	sdc1 GiB	New O Delete	Insert Delete	
Partition	File System	Size	Used	➢ Resize/Move		Flags
unallocated	unallocated	4.00 MiB	1	🖷 Сору	Ctrl+C	
/dev/sdc1	ext4	14.69 GiB	3.4	🛍 Paste	Ctrl+V	
unallocated	unallocated	151.94 MiB		Format to	•	
				Open Encryptio Mount	n	
				Name Partition Manage Flags		
				Check		
				Label File Syste	m	
				New OUID		
				U Information		

8) After the **Resize/Move** option is turned on, the following setting interface will pop up

Resize/Move /dev/sdc1				
Minimum size: 3508 MiB	Maximum si	ze: 15	193 MiB	
Free space preceding (MiB):	4	32.55	+	
New size (MiB):	15038	1944	+	
Free space following (MiB):	152	-	+	
Align to:	Мів		•	
	Cancel		> Res	ize

9) Then you can directly drag the location shown in the figure below to set the size of the capacity, or you can set the size of the rootfs partition by setting the number in **New** sieze(MiB)

Resize/Mov	Resize/Move /dev/sdc1					
Minimum size: 3484 MiB	Maximum si	ize: 15	193 MiE	3		
Free space preceding (MiB)	: 4	-	+			
New size (MiB):	8022		+			
Free space following (MiB):	7168		+			
Align to:	Мів		•			
	Cancel		NR Re	esize/Move		

10) After setting the capacity, click **Resize/Move** in the lower right corner



11) After confirming that it is correct, click the green button shown in the figure below \checkmark

		/dev/sdo	: - GParted		- 🛛 🔕		
GParted Edit	View Device	Partition Help					
	-	s 🖌		/dev/s	dc (14.84 GiB) 🔻		
	<mark>/</mark> dev/sd 7.83 Gif	lc1 3		unallocated 7.00 GiB			
Partition	File System	Size	Used	Unused	Flags		
unallocated	unallocated	4.00 MiB					
/dev/sdc1	ext4	7.83 GiB	3.40 GiB	4.43 GiB			
unallocated	unallocated	7.00 GiB					
Srow/dev/s	dc1 from 4.05 GiB t	o 7.83 GiB					
1 operation p	ending						

12) Then select Apply, and the expansion of the rootfs partition will officially start



13) After the expansion is completed, click Close to close


14) Then you can pull out the micro SD card, insert it into the development board and start it up. After entering the Linux system of the development board, if you can use the **df -h** command to see that the size of the rootfs partition is the same as the size set before, it means that the size has been reduced. capacity success

root@orangepi:~#	≠ df -h			
Filesystem	Size U	sed Ava	il Use%	Mounted on
udev	925M	0	925M	0% /dev
tmpfs	199M	3.2M	196M	2% /run
/dev/mmcblk0p1	7.7G	3.2G	4.4G	42% /

3.7. Network connection test

3. 7. 1. Ethernet port test

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

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

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

Please do not copy the following commands. For example, the network node name in debian12 is end0, and the following commands need to be changed to ip a s end0.

orangepi@orangepi:~\$ ip a s eth0

3: eth0: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1500 qdisc pfifo_fast state

UP group default qlen 1000

link/ether 5e:ac:14:a5:93:b3 brd ff:ff:ff:ff:ff:ff

inet **192.168.1.16**/24 brd 192.168.1.255 scope global dynamic noprefixroute eth0 valid_lft 259174sec preferred_lft 259174sec

inet6 240e:3b7:3240:c3a0:e269:8305:dc08:135e/64 scope global dynamic noprefixroute

valid lft 259176sec preferred lft 172776sec

inet6 fe80::957d:bbbd:4928:3604/64 scope link noprefixroute

valid_lft forever preferred_lft forever

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

1. Connect the HDMI monitor, then log in to the system and use the ip a s eth0 command to view the IP address

2. Enter the **ip a s eth0** command in the debugging serial terminal to view the IP address

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

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

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

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

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

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

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

Please do not copy the following commands. For example, the network node name in debian12 is end0, and the following command needs to be changed to ping www.baidu.com -I end0.

orangepi@orangepi:~\$ ping www.baidu.com -I eth0

PING www.a.shifen.com (14.215.177.38) from 192.168.1.12 eth0: 56(84) bytes of data. 64 bytes from 14.215.177.38 (14.215.177.38): icmp_seq=1 ttl=56 time=6.74 ms 64 bytes from 14.215.177.38 (14.215.177.38): icmp_seq=2 ttl=56 time=6.80 ms 64 bytes from 14.215.177.38 (14.215.177.38): icmp_seq=3 ttl=56 time=6.26 ms 64 bytes from 14.215.177.38 (14.215.177.38): icmp_seq=4 ttl=56 time=7.27 ms ^C

--- www.a.shifen.com ping statistics ---

4 packets transmitted, 4 received, 0% packet loss, time 3002ms rtt min/avg/max/mdev = 6.260/6.770/7.275/0.373 ms

3. 7. 2. WIFI connection test

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

3. 7. 2. 1. The server image connects to WIFI through commands

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

1) First log in to the linux system, there are the following three ways

- a. If the development board is connected with a network cable, **SSH remote login** development board under Ubuntu
- a. If the development board is connected to the debugging serial port, you can use

the serial port terminal to log in to the Linux system

b. If the development board is connected to the HDMI display, you can log in to the linux system through the terminal displayed on the HDMI

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

orange	orangepi@orangepi:~\$ nmcli dev wifi							
root@or	angepi:~# nmcli dev	wifi	1.5.61118-00	10.0000000000				
IN-USE	BSSID	SSID	MODE	CHAN	RATE	SIGNAL	BARS	SECURITY
	28:6C:07:6E:87:2E	orangepi	Infra		260 Mbit/s	97		WPA1 WPA2
	D8:D8:66:A5:BD:D1		Infra	10	270 Mbit/s	90		WPA1 WPA2
	A0:40:A0:A1:72:20		Infra		405 Mbit/s	82		WPA2
	28:6C:07:6E:87:2F	orangepi 5G	Infra	149	540 Mbit/s	80		WPA1 WPA2
	CA:50:E9:89:E2:44	Chinalist TC15	Infra	1	130 Mbit/s	79		WPA1 WPA2
	A0:40:A0:A1:72:31	NETOZANIA	Infra	100	405 Mbit/s	67		WPA2
	D4:EE:07:08:A9:E0		Infra		130 Mbit/s	55	_	WPA1 WPA2
	88:C3:97:49:25:13		Infra			52	_	WPA1 WPA2
	00:BD:82:51:53:C2		Infra		130 Mbit/s			WPA1 WPA2
	C0:61:18:FA:49:37		Infra	149	270 Mbit/s	47		WPA1 WPA2
	04:79:70:8D:0C:B8		Infra	153	270 Mbit/s	47	-	WPA2
	04:79:70:FD:0C:B8		Infra	153		47		WPA2
	9C:A6:15:DD:E6:0C		Infra		270 Mbit/s	45		WPA1 WPA2
	B4:0F:3B:45:D1:F5		Infra		270 Mbit/s	45		WPA1 WPA2
	E8:CC:18:4F:7B:44		Infra	157	135 Mbit/s	45	_	WPA1 WPA2
	B0:95:8E:D8:2F:ED		Infra		405 Mbit/s		_	WPA1 WPA2
	C0:61:18:FA:49:36		Infra	11	270 Mbit/s	24	-	WPA1 WPA2
root@or	angepi:~#							

- 3) Then use the **nmcli** command to connect to the scanned WIFI hotspot, where:
 - a. **wifi_name** Need to replace it with the name of the WIFI hotspot you want to connect to
 - b. **wifi_passwd** Need to change to the password of the WIFI hotspot you want to connect to

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

4) You can view the IP address of wifi through the ip addr show wlan0 command orangepi@orangepi:~\$ ip a s wlan0

11: wlan0: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1500 qdisc pfifo_fast state UP group default qlen 1000

link/ether 23:8c:d6:ae:76:bb brd ff:ff:ff:ff:ff:ff

inet **192.168.1.11**/24 brd 192.168.1.255 scope global dynamic noprefixroute wlan0 valid_lft 259192sec preferred_lft 259192sec

inet6 240e:3b7:3240:c3a0:c401:a445:5002:ccdd/64 scope global dynamic noprefixroute

valid_lft 259192sec preferred_lft 172792sec inet6 fe80::42f1:6019:a80e:4c31/64 scope link noprefixroute valid lft forever preferred lft forever

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

```
orangepi@orangepi:~$ ping www.orangepi.org -I wlan0

PING www.orangepi.org (182.92.236.130) from 192.168.1.49 wlan0: 56(84) bytes of

data.

64 bytes from 182.92.236.130 (182.92.236.130): icmp_seq=1 ttl=52 time=43.5 ms

64 bytes from 182.92.236.130 (182.92.236.130): icmp_seq=2 ttl=52 time=41.3 ms

64 bytes from 182.92.236.130 (182.92.236.130): icmp_seq=3 ttl=52 time=44.9 ms

64 bytes from 182.92.236.130 (182.92.236.130): icmp_seq=4 ttl=52 time=45.6 ms

64 bytes from 182.92.236.130 (182.92.236.130): icmp_seq=5 ttl=52 time=48.8 ms

^C

--- www.orangepi.org ping statistics ---

5 packets transmitted, 5 received, 0% packet loss, time 4006ms
```

rtt min/avg/max/mdev = 41.321/44.864/48.834/2.484 ms

3. 7. 2. 2. The server image connects to WIFI in a graphical way

1) First log in to the linux system, there are the following three ways

- a. If the development board is connected with a network cable, SSH remote login development board under Ubuntu
- b. If the development board is connected to the debugging serial port, you can use the serial port terminal to log in to the linux system (please use MobaXterm for the serial port software, and the minicom cannot display the graphical interface)
- c. If the development board is connected to the HDMI display, you can log in to the linux system through the HDMI display terminal

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

orangepi@orangepi:~\$ sudo nmtui

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





4) Select Activate a connect and press Enter

NetworkManager TUI Please select an option Edit a connection Activate a connection Set system hostname Quit	

5) Then you can see all the searched WIFI hotspots

Wired * Wired connection 1	† 	<deactivate></deactivate>	
Wi-Fi orangepi_5G orangepi	*** **** **** *** *** ***	WIFI s	gnal receive
H 7 L E LIN MDM Kadometroorcom	** ** **	<back></back>	

6) Select the WIFI hotspot you want to connect to, then use the Tab key to position the

cursor on Activate and press Enter

2. Use the	Tab key to move the curs	or here an	d press Enter	
	Manual			
	* Wired connection 1	† ***	<activate></activate>	
	* wired connection i			
	Wi-Fi			
	orangepi 5G	***		
	1	****		
	, Jrangepi	****		
	(¹ . (e ¹ . ¹ . ¹ . ¹	****		
	C C VF	***	and the second	A REPORT OF THE PARTY OF
	s 🦸 1. Cho	bose the M	iFi you want to co	nect to
	S Z	***		
	N AR 2	***		
		**		
	E F	**		
	Con Given	**	Deals	
	14	** †	<back></back>	

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

	Wired t <activate> Wired connection 1 Wi-Fi Authentication required by wireless network Passwords or encryption keys are required to access the wireless network 'orangepi'. 1. Enter the WiFi password Password</activate>
-	ETWIFI ** ↓ <back></back>

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



9) You can view the IP address of wifi through the **ip a s wlan0** command

orangepi@orangepi:~\$ ip a s wlan0

11: wlan0: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1500 qdisc pfifo_fast state UP group default qlen 1000

link/ether 24:8c:d3:aa:76:bb brd ff:ff:ff:ff:ff:ff

inet **192.168.1.11**/24 brd 192.168.1.255 scope global dynamic noprefixroute wlan0 valid_lft 259069sec preferred_lft 259069sec

inet6 240e:3b7:3240:c4a0:c401:a445:5002:ccdd/64 scope global dynamic noprefixroute

valid_lft 259071sec preferred_lft 172671sec

inet6 fe80::42f1:6019:a80e:4c31/64 scope link noprefixroute

valid_lft forever preferred_lft forever

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

orangepi@orangepi:~\$ **ping www.orangepi.org -I wlan0** PING www.orangepi.org (182.92.236.130) from 192.168.1.49 wlan0: 56(84) bytes of data.

```
64 bytes from 182.92.236.130 (182.92.236.130): icmp_seq=1 ttl=52 time=43.5 ms
64 bytes from 182.92.236.130 (182.92.236.130): icmp_seq=2 ttl=52 time=41.3 ms
64 bytes from 182.92.236.130 (182.92.236.130): icmp_seq=3 ttl=52 time=44.9 ms
64 bytes from 182.92.236.130 (182.92.236.130): icmp_seq=4 ttl=52 time=45.6 ms
```

64 bytes from 182.92.236.130 (182.92.236.130): icmp seq=5 ttl=52 time=48.8 ms

^C --- www.orangepi.org ping statistics ---5 packets transmitted, 5 received, 0% packet loss, time 4006ms rtt min/avg/max/mdev = 41.321/44.864/48.834/2.484 ms

3. 7. 2. 3. Test method of desktop image

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



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



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

to WIFI



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



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



3. 7. 3. The method of creating WIFI hotspot through create_ap

create_ap is a script that helps quickly create WIFI hotspots on Linux, and supports bridge and NAT modes. It can automatically combine hostapd, dnsmasq and iptables to complete the setting of WIFI hotspots, avoiding complex configuration for users. The github address is as follows:

https://github.com/oblique/create_ap

The Linux image released by OPi has pre-installed the create_ap script. You can create a WIFI hotspot through the create_ap command. The basic command format of create_ap is as follows:

create_ap [options] <wifi-interface> [<interface-with-internet>] [<access-point-name> [<passphrase>]]

* options: You can use this parameter to specify the encryption method, the frequency band of the WIFI hotspot, the bandwidth mode, the network sharing method, etc. You can get the options through create_ap -h
* wifi-interface: The name of the wireless network card
* interface-with-internet: The name of the network card that can be connected to the Internet, generally eth0
* access-point-name: hotspot name
* passphrase: hotspot password

3. 7. 3. 1. create_ap method to create WIFI hotspot in NAT mode

1) Enter the following command to create a WIFI hotspot named **orangepi** and password **orangepi** in NAT mode

Note that in the following commands, Debian12 needs to change eth0 to end0. orangepi@orangepi:~\$ sudo create_ap -m nat wlan0 eth0 orangepi orangepi --no-virt

2) If the following information is output, it means that the WIFI hotspot is created successfully

orangepi@orangepi:~\$ sudo create_ap -m nat wlan0 eth0 orangepi orangepi --no-virt Config dir: /tmp/create_ap.wlan0.conf.TQkJtsz1 PID: 26139 Network Manager found, set wlan0 as unmanaged device... DONE Sharing Internet using method: nat hostapd command-line interface: hostapd_cli -p /tmp/create_ap.wlan0.conf.TQkJtsz1/hostapd_ctrl wlan0: interface state UNINITIALIZED->ENABLED wlan0: AP-ENABLED wlan0: STA ce:bd:9a:dd:a5:86 IEEE 802.11: associated wlan0: AP-STA-CONNECTED ce:bd:9a:dd:a5:86 wlan0: STA ce:bd:9a:dd:a5:86 RADIUS: starting accounting session D4FBF7E5C604F169 wlan0: STA ce:bd:9a:dd:a5:86 WPA: pairwise key handshake completed (RSN) wlan0: EAPOL-4WAY-HS-COMPLETED ce:bd:9a:dd:a5:86

3) Take out the mobile phone at this time, you can find the WIFI hotspot named **orangepi** created by the development board in the searched WIFI list, and then you can click **orangepi** to connect to the hotspot, the password is set above **orangepi**



4) After the connection is successful, the display is as shown in the figure below

Settings	Wi-Fi	
Wi-Fi		
🗸 orangepi		ê 🗢 i

5) In NAT mode, the wireless device connected to the hotspot of the development board requests an IP address from the DHCP service of the development board, so there will be two different network segments, for example, the IP of the development board is 192.168.1.X

Note that in the following commands, Debian12 needs to change eth0 to end0. orangepi@orangepi:~\$ sudo ifconfig eth0 eth0: flags=4163<UP,BROADCAST,RUNNING,MULTICAST> mtu 1500 inet 192.168.1.150 netmask 255.255.255.0 broadcast 192.168.1.255 inet6 fe80::938f:8776:5783:afa2 prefixlen 64 scopeid 0x20<link> ether 4a:a0:c8:25:42:82 txqueuelen 1000 (Ethernet) RX packets 25370 bytes 2709590 (2.7 MB) RX errors 0 dropped 50 overruns 0 frame 0 TX packets 3798 bytes 1519493 (1.5 MB) TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0 device interrupt 83

By default, the DHCP service of the development board will assign an IP address of **192.168.12.0/24** to the device connected to the hotspot. At this time, click on the connected WIFI hotspot **orangepi**, and then you can see that the IP address of the mobile phone is **192.168.12.X**



6) If you want to specify a different network segment for the connected device, you can specify it through the -g parameter, such as specifying the network segment of the access point AP through the -g parameter as 192.168.2.1

Note that in the following commands, Debian12 needs to change eth0 to end0.

At this time, after connecting to the hotspot through the mobile phone, click on the connected WIFI hotspot **orangepi**, and then you can see that the IP address of the mobile phone is **192.168.2.X**.

Settings	Wi-Fi
Wi-Fi	
🗸 orangepi	ê 🤶 🚺
IPV4 ADDRESS	
Configure IP	Automatic >
IP Address	192.168.12.249
Subnet Mask	255.255.255.0
Router	192.168.12.1

7) If the **--freq-band** parameter is not specified, the hotspot created by default is in the 2.4G frequency band. If you want to create a hotspot in the 5G frequency band, you can specify the**--freq-band 5** parameter. The specific command is as follows

Note that in the following commands, Debian12 needs to change eth0 to end0.

orangepi@orangepi:~\$ sudo create_ap -m nat wlan0 eth0 orangepi orangepi --freq-band 5 --no-virt

8) If you need to hide the SSID, you can specify the **--hidden** parameter, the specific command is as follows

Note that in the following commands, Debian12 needs to change eth0 to end0.

orangepi@orangepi:~**\$ sudo create_ap -m nat wlan0 eth0 orangepi orangepi --hidden --no-virt**

At this time, the mobile phone cannot search for the WIFI hotspot. You need to manually specify the name of the WIFI hotspot and enter the password to connect to the WIFI hotspot.

Enter network information		
Other Network	J	oin
orangepi		
	WPA	>
	Other Network	Other Network J orangepi WPA

3. 7. 3. 2. create_ap method to create WIFI hotspot in bridge mode

1) Enter the following command to create a WIFI hotspot named **orangepi** and password **orangepi** in bridge mode

Note that in the following commands, Debian12 needs to change eth0 to end0.

orangepi@orangepi:~\$ sudo create_ap -m bridge wlan0 eth0 orangepi orangepi --no-virt

2) If the following information is output, it means that the WIFI hotspot is created successfully

orangepi@orangepi:~\$ sudo create_ap -m bridge wlan0 eth0 orangepi orangepi --no-virt Config dir: /tmp/create_ap.wlan0.conf.zAcFlYTx PID: 27707 Network Manager found, set wlan0 as unmanaged device... DONE Sharing Internet using method: bridge Create a bridge interface... br0 created. hostapd command-line interface: hostapd_cli -p /tmp/create_ap.wlan0.conf.zAcFlYTx/hostapd_ctrl wlan0: interface state UNINITIALIZED->ENABLED wlan0: AP-ENABLED wlan0: STA ce:bd:9a:dd:a5:86 IEEE 802.11: associated wlan0: STA ce:bd:9a:dd:a5:86 RADIUS: starting accounting session 937BF40E51897A7B wlan0: STA ce:bd:9a:dd:a5:86 WPA: pairwise key handshake completed (RSN)

wlan0: EAPOL-4WAY-HS-COMPLETED ce:bd:9a:dd:a5:86

3) Take out the mobile phone at this time, and you can find the WIFI hotspot named orangepi created by the development board in the searched WIFI list, and then you can click **orangepi** to connect to the hotspot, and the password is the **orangepi** set above

Settings	Wi-Fi	
Wi-Fi		
✓ xunlong_ora	ingepi_5G	🔒 🗢 🚺
MY NETWORKS		
orangepi		🔒 🗢 🚺

4) After the connection is successful, the display is as shown in the figure below



5) In bridge mode, the wireless device connected to the hotspot of the development board also requests an IP address from the DHCP service of the main router (the router connected to the development board), for example, the IP of the development board is

192.168.1.X

orangepi@orangepi:~\$ sudo ifconfig eth0
eth0: flags=4163 <up,broadcast,running,multicast> mtu 1500</up,broadcast,running,multicast>
inet 192.168.1.150 netmask 255.255.255.0 broadcast 192.168.1.255
inet6 fe80::938f:8776:5783:afa2 prefixlen 64 scopeid 0x20 <link/>
ether 4a:a0:c8:25:42:82 txqueuelen 1000 (Ethernet)
RX packets 25370 bytes 2709590 (2.7 MB)
RX errors 0 dropped 50 overruns 0 frame 0
TX packets 3798 bytes 1519493 (1.5 MB)
TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0

🥯 range Pi User Manual

device interrupt 83

The IP of the device connected to the WIFI hotspot is also assigned by the main router, so the mobile phone connected to the WIFI hotspot and the development board are in the same network segment. At this time, click on the connected WIFI hotspot orangepi, and then you can see the IP address of the mobile phone also **192.168.1.X**.

Settings	Wi-Fi
Wi-Fi	
✓ orangepi	ê 🤶 🚺
IPV4 ADDRESS	
Configure IP	Automatic >
IP Address	192.168.12.249
Subnet Mask	255.255.255.0
Router	192.168.12.1

6) If the **--freq-band** y band. If you want to create a hotspot in the 5G frequency band, you can specify the **--freq-band 5** parameter. The specific command is as follows

Note that in the following commands, Debian12 needs to change eth0 to end0.

orangepi@orangepi:~\$ sudo create_ap -m bridge wlan0 eth0 orangepi orangepi --freq-band 5 --no-virt

7) If you need to hide the SSID, you can specify the **--hidden** parameter, the specific command is as follows

Note that in the following commands, Debian12 needs to change eth0 to end0. orangepi@orangepi:~\$ sudo create_ap -m bridge wlan0 eth0 orangepi orangepi --hidden --no-virt

At this time, the mobile phone cannot search for the WIFI hotspot. You need to manually specify the name of the WIFI hotspot and enter the password to connect to the WIFI hotspot.



3. 7. 4. How to set static IP address

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

3. 7. 4. 1. Use the nmtui command to set a static IP address

1) First run the **nmtui** command

orangepi@orangepi:~\$ sudo nmtui

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

NetworkManager TUI
Please select an option
Edit a connection
Activate a connection Set system hostname
Ouit
Quee
<uk></uk>

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



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



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

Edit Connection	
Profile name Wired connection 1 Device 6E:82:F0:D6:0F:66 (eth0)	
= ETHERNET	<show></show>
<pre>= IPv4 CONFIGURATION <automatic> = IPv6 CONFIGURATION <automatic></automatic></automatic></pre>	<show> <show></show></show>
[X] Automatically connect [X] Available to all users	
	<cancel> <ok></ok></cancel>

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



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

Edit Connection	
Profile name Wired connection 1 Device 6E:82:F0:D6:0F:66 (eth0)	
= ETHERNET	<show></show>
<pre>= IPv4 CONFIGURATION < Manual> = IPv6 CONFIGURATION < Automatic></pre>	<show> <show></show></show>
[X] Automatically connect [X] Available to all users	
	<cancel> <ok></ok></cancel>

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



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

Edit Connection	
Profile name Wired connection 1 Device 6E:82:F0:D6:0F:66 (eth0)	
= ETHERNET	<show></show>
<pre>= IPv4 CONFIGURATION <manual> Addresses <add> Gateway DNS servers <add> Search domains <add> Routing (No custom routes) <edit> [] Never use this network for default route [] Ignore automatically obtained routes [] Ignore automatically obtained DNS parameters </edit></add></add></add></manual></pre>	<hide></hide>
[] Require IPv4 addressing for this connection	
= IPv6 CONFIGURATION <automatic></automatic>	<show></show>
[X] Automatically connect [X] Available to all users	
	<cancel> <ok></ok></cancel>

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

Edit Connection]
Profile name Wired connection 1 Device eth0 (86:F2:85:2C:81:CE)	
= ETHERNET	<show></show>
T IPv4 CONFIGURATION <manual></manual>	<hide></hide>
Addresses 192.168.1.177/24 <remove></remove>	
Gateway 192.168.1.1	
DNS servers 8.8.8.8 <	
<pre><add> Search domains <add></add></add></pre>	

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



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



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



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

Wired * Wired connection 1	↑ <deactivate></deactivate>
Wi-Fi * xunlong_orangepi	

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



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

	NetworkManager TUI
Wired ↑ <activate></activate>	Please select an option
Wi-Fi * xunlong_orangepi	Edit a connection Activate a connection Set system hostname
↓ <mark><back></back></mark>	<ok></ok>

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

Note that in the following commands, Debian12 needs to change eth0 to end0.

orangepi@orangepi:~\$ ip a s eth0

3: eth0: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1500 qdisc pfifo_fast state UP group default qlen 1000

link/ether 5e:ac:14:a5:92:b3 brd ff:ff:ff:ff:ff:ff

inet 192.168.1.177/24 brd 192.168.1.255 scope global noprefixroute eth0

valid_lft forever preferred_lft forever

inet6 241e:3b8:3240:c3a0:e269:8305:dc08:135e/64 scope global dynamic noprefixroute

valid_lft 259149sec preferred_lft 172749sec inet6 fe80::957d:bbbe:4928:3604/64 scope link noprefixroute valid lft forever preferred lft forever

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

Note that in the following commands, I is capital i, Debian12 needs to change eth0 to end0.

orangepi@orangepi:~\$ ping 192.168.1.177 -I eth0 PING 192.168.1.47 (192.168.1.47) from 192.168.1.188 eth0: 56(84) bytes of data. 64 bytes from 192.168.1.47: icmp_seq=1 ttl=64 time=0.233 ms 64 bytes from 192.168.1.47: icmp_seq=2 ttl=64 time=0.263 ms 64 bytes from 192.168.1.47: icmp_seq=3 ttl=64 time=0.273 ms 64 bytes from 192.168.1.47: icmp_seq=4 ttl=64 time=0.269 ms 64 bytes from 192.168.1.47: icmp_seq=5 ttl=64 time=0.275 ms ^C --- 192.168.1.47 ping statistics ---5 packets transmitted, 5 received, 0% packet loss, time 4042ms rtt min/avg/max/mdev = 0.233/0.262/0.275/0.015 ms

3. 7. 4. 2. Use the nmcli command to set a static IP address

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

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

- a. **orangepi** is the name of the WIFI network interface (the name is not necessarily the same)
- b. **Wired connection 1** is the name of the Ethernet interface

orangepi@orangepi:~\$ nmcli con show										
NAME	UUID	TYPE	DEVICE							
orangepi	cfc4f922-ae48-46f1-84e1-2f19e9ec5e2a	wifi	wlan0							

Wired connection 1 9db058b7-7701-37b8-9411-efc2ae8bfa30 ethernet eth0

- 3) Then enter the following command, where
 - a. "Wired connection 1" means to set the static IP address of the Ethernet port. If you need to set the static IP address of the WIFI, please modify it to the corresponding name of the WIFI network interface (you can get it through the nmcli con show command)
 - b. **ipv4.addresses** is followed by the static IP address to be set, which can be modified to the value you want to set
 - c. **ipv4.gateway** represents the address of the gateway

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

4) Then restart the linux system

orangepi@orangepi:~\$ sudo reboot

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

orangepi@orangepi:~\$ ip addr show eth0

3: eth0: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1500 qdisc pfifo_fast state UP group default qlen 1000

link/ether 5e:ae:14:a5:91:b3 brd ff:ff:ff:ff:ff:ff

inet 192.168.1.110/32 brd 192.168.1.110 scope global noprefixroute eth0

valid_lft forever preferred_lft forever

inet6 240e:3b7:3240:c3a0:97de:1d01:b290:fe3a/64 scope global dynamic noprefixroute

valid_lft 259183sec preferred_lft 172783sec

inet6 fe80::3312:861a:a589:d3c/64 scope link noprefixroute

valid_lft forever preferred_lft forever

3. 7. 5. The method of setting the Linux system to automatically connect to the network for the first time

The development board has an Ethernet port. If you want to remotely log in to

the Linux system of the development board through the Ethernet port, you only need to plug in a network cable that can access the Internet normally to the Ethernet port. Assign an IP address, and then we can obtain the IP address of the Ethernet port through the HDMI screen, serial port or view the background of the router, and then we can log in to the Linux system remotely.

The development board also has wireless WIFI. If you want to remotely log in to the Linux system of the development board through WIFI, you need to remotely log in to the Linux system through the IP address of the Ethernet port ssh and then connect to WIFI through commands, or through commands on the HDMI screen or serial port. Connect to WIFI.

But if there is no HDMI screen and serial port module, although there is a network cable, the IP address of the development board cannot be checked through the background of the router. Or there is no HDMI screen, serial port module and network cable, and only WIFI can be connected, then you can use the method introduced in this section to automatically connect to WIFI and also set the static IP address of WIFI or automatically set the static IP address of the Ethernet port.

To use the method in this section, you first need to prepare a Linux system machine. For example, a computer or a virtual machine with Ubuntu system installed.

Why do you need a Linux system machine, because the root file system of the development board Linux system burned in the micro SD card is in ext4 format, and the Linux system machine can mount it normally, and then modify the configuration files in it.

If you want to modify it in the Windows system, you can use the software Paragon ExtFS for Windows. Since this software needs to be paid, and there is no similar free software that is easy to use, I will not demonstrate it here.

In addition, if you have any problems with **Paragon ExtFS for Windows** software, please solve it yourself, we will not answer questions.

1) First burn the Linux image of the development board you want to use into the micro SD card, and then use a card reader to insert the micro SD card that has burned the Linux image of the development board into a machine with a Linux system (such as a machine with an Ubuntu system installed) computer, the following uses Ubuntu computer as an

example to demonstrate)

2) When the micro SD card is inserted into the Ubuntu computer, the Ubuntu computer will generally automatically mount the partition of the Linux root file system in the micro SD card. You can know from the following command that /media/test/opi_root is the Linux root file in the micro SD card The path where the system is mounted

test@test:~\$ df -h | grep "media" /dev/sdd1 1.4G 1.2G 167M 88% /media/test/opi_root test@test:~\$ ls /media/test/opi_root bin boot dev etc home lib lost+found media mnt opt proc root run sbin selinux srv sys tmp usr var

3) Then enter the **/boot** directory of the Linux system burned in the micro SD card test@test:~\$ cd /media/test/opi_root/boot/

4) Then copy the **orangepi_first_run.txt.template** to **orangepi_first_run.txt**. Through the orangepi_first_run.txt configuration file, you can set the Linux system on the development board to automatically connect to a WIFI hotspot when it starts for the first time, and you can also set the WIFI or Ethernet port. static IP address

test@test:/media/test/opi_root/boot\$ sudo cp orangepi_first_run.txt.template orangepi_first_run.txt

5) You can open the orangepi_first_run.txt file with the following command, and then you can view and modify the contents

test@test:/media/test/opi_root/boot\$ sudo vim orangepi_first_run.txt

- 6) Instructions for using variables in the orangepi_first_run.txt file
 - a. **FR_general_delete_this_file_after_completion** variable is used to set whether to delete the orangepi_first_run.txt file after the first startup. The default is 1, that is, delete. If it is set to 0, orangepi_first_run.txt will be renamed to orangepi_first_run.txt after the first startup .old, generally keep the default value
 - b. **FR_net_change_defaults** variable is used to set whether to change the default network settings, this must be set to 1, otherwise all network settings will not take effect
 - c. **FR_net_ethernet_enabled** variable is used to control whether to enable the configuration of the Ethernet port. If you need to set the static IP address of the

Ethernet port, please set it to 1

- d. FR_net_wifi_enabled variable is used to control whether to enable WIFI configuration. If you need to set the development board to automatically connect to WIFI hotspots, you must set it to 1. In addition, please note that if this variable is set to 1, the setting of the Ethernet port will be will fail. That is to say, the WIFI and Ethernet ports cannot be set at the same time (why, because it is not necessary...)
- e. **FR_net_wifi_ssid** variable is used to set the name of the WIFI hotspot you want to connect to
- f. **FR_net_wifi_key** variable is used to set the password of the WIFI hotspot you want to connect to
- g. **FR_net_use_static** variable is used to set whether to set the static IP address of WIFI or Ethernet port
- h. **FR_net_static_ip** variable is used to set static IP address, please set according to your actual situation
- i. **FR_net_static_gateway** variable is used to set the gateway, please set it according to your actual situation
- 7) The following demonstrates several specific setting examples:
 - a. For example, if you want the Linux system of the development board to automatically connect to the WIFI hotspot after the first startup, you can set it like this:
 - a) Set FR_net_change_defaults to 1
 - b) Set **FR_net_wifi_enabled** to **1**
 - c) Set **FR_net_wifi_ssid** to the name of the WIFI hotspot you want to connect to
 - d) Set FR_net_wifi_key to the password of the WIFI hotspot you want to connect to
 - b. For example, if you want the Linux system of the development board to automatically connect to the WIFI hotspot after the first startup, and set the IP address of the WIFI to a specific static IP address (so that when the Linux system is started, you can directly use the set static IP address to ssh remotely Log in to the development board without checking the IP address of the development board through the background of the router), you can set it like this:
 - a) Set **FR_net_change_defaults** to **1**

- b) Set **FR_net_wifi_enabled** to **1**
- c) Set **FR_net_wifi_ssid** to the name of the WIFI hotspot you want to connect to
- d) Set FR_net_wifi_key to the password of the WIFI hotspot you want to connect to
- e) Set FR_net_use_static to 1
- f) Set **FR_net_static_ip** to the desired IP address
- g) Set **FR_net_static_gateway** to the corresponding gateway address
- c. For example, if you want to automatically set the IP address of the Ethernet port to the desired static IP address after the Linux system of the development board starts for the first time, you can set it like this:
 - a) Set FR_net_change_defaults to 1
 - b) Set FR_net_ethernet_enabled to 1
 - c) Set FR_net_use_static to 1
 - d) Set **FR_net_static_ip** to the desired IP address
 - e) Set FR_net_static_gateway to the corresponding gateway address

8) After modifying the orangepi_first_run.txt file, you can exit the /boot directory of the development board Linux system in the micro SD card, uninstall the micro SD card, and then insert the micro SD card into the development board to start

9) If you have not set a static IP address, you still need to check the IP address through the background of the router. If you have set a static IP address, you can ping the set static IP address on the computer. If you can ping, it means that the system has started normally, and The network has also been set correctly, and then you can use the set IP address ssh to remotely log in to the Linux system of the development board

After the Linux system of the development board is started for the first time, orangepi_first_run.txt will be deleted or renamed to orangepi_first_run.txt.old. At this time, the orangepi_first_run.txt configuration file will be reset, and then the Linux system of the development board will be restarted, orangepi_first_run. The configuration in txt will not take effect again, because this configuration will only be effective when the Linux system is started for the first time after burning, please pay special attention to this point.

3.8. SSH remote login development board

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

3. 8. 1. SSH remote login development board under Ubuntu

1) Obtain the IP address of the development board

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

test@test:~\$ ssh orangepi@192.168.1.xxx		(1	Need	to	be	repl	aced	with	the	IP
address of the development board)										
orangepi@192.168.1.xx's password:	(Enter	the	pas	sswc	ord	here,	the	defa	ult
password is orangepi)										

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

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

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

```
test@test:~$ ssh orangepi@192.168.1.121
orangepi@192.168.1.121's password:
Welcome to Orange Pi 1.0.0 Bullseye with Linux 6.1.31-sun50iw9
                                               21 min
System load:
                                Up time:
               39%
                                                        Local users:
                                IP:
Memory usage:
               31% of 1.45G
                                               192.168.1.121
CPU temp:
               54°C
                                Usage of /:
                                               25% of 15G
Last login: Thu Jun 8 08:03:08 2023 from 192.168.1.119
orangepi@orangepi:~$
```

If ssh fails to log in to the linux system normally, first check whether the IP address of the development board can be pinged. If the ping is ok, you can log in to the linux system through the serial port or HDMI display and then enter the following command on the development board and try again. Is it possible to connect:

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

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

3. 8. 2. SSH remote login development board under Windows

1) First obtain the IP address of the development board

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

- a. Open Session
- b. Then select SSH in Session Setting
- c. Then enter the IP address of the development board in the Remote host
- d. Then enter the user name root or orangepi of the linux system in **Specify** username
- e. Finally click **OK**

Modallarm	- 0	×
Terrouze Sension Vew X Lever Tools Games Berling A Moots Hep Mark 2: Karl Karl Karl Karl Karl Karl Karl Karl	X X server	O Ext
C. Select serial port SSH Choose Session C. Select serial port SSH Choose Session Consequence were the life of the development board Consequence were the life of the development board Consequence of the Linux system, Crangepi or root Secure Shell (SSH) session Consequence of the Linux system, Crangepi or root Secure Shell (SSH) session Consequence of the Linux system, Crangepi or root Secure Shell (SSH) session Consequence Cons		\$

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

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



4) The display after successfully logging in to the system is shown in the figure below



💐 192.1	68.1.36 (roc	ot)											
Terminal	Sessions	View	X server	Tools	Games	Settings	Macros	Help					
Session	Servers	Tools	۶ Games	the sessions	View	Split	Y MultiExec	Tunneling	Packages	settings	Help		
Quick	c connect					. 192.168.1.	36 (root)		×				
Stitp Macros Tools Sessions Se	Name .cache .config .gnupg .bash_histo .bashrc .desktop_a .profile .viminfo	bry nutologin		Weld Syst Memo CPU Usag [Ge Last root	<pre>> S ? ? ? ? ? ? ? . F </pre>	SH sess: SSH coi SSH bri X11-fo DISPLA' or more -/ -/ 0range d: 0.: ge: 8 - 47 : 7% system : Tue 0 epi:~#	(SSH cl ion to r mpressic owser rwarding Y info, c Pi Bior 10 0.10 of 967 of 156 configur ct 13 08	? .ient, X root@192 n: / ; X ; 192 .trl+cli .trl+cli 0:05 MB ration (0:15:30	MobaXte -server .168.1. (disabl .168.1. ck on <u>h</u> Linux Up time IP: beta): 2020 fr	rm 20.3 and ne 36 ed or ni 74:0.0 <u>elp</u> or v 5.4.65-: : orangep: om 192.	? tworking t ot support visit our sunxi 3 min 192.168.1 i-config] 168.1.74	eed by server website	ver)

3.9. HDMI test

3. 9. 1. HDMI display test

1) Use a Micro HDMI to HDMI cable to connect the Orange Pi development board and HDMI display



2) After starting the linux system, if the HDMI monitor has image output, it means that the HDMI interface is working normally

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

When you want to connect the HDMI of the development board to the HDMI port of the laptop, please make sure that your laptop supports the HDMI IN function.

When the HDMI is not displayed, please check whether the HDMI cable is plugged in tightly. After confirming that there is no problem with the connection, you can change a different screen and try to see if it is displayed.

3. 9. 2. HDMI to VGA display test

- 1) First you need to prepare the following accessories
 - a. HDMI to VGA converter



b. A VGA cable and a Micro HDMI male to HDMI female conversion cable





- c. A monitor or TV that supports VGA interface
- 2) HDMI to VGA display test as shown below



When using HDMI to VGA display, the development board and the Linux system of the development board do not need to make any settings, only the Micro HDMI interface of the development board can display normally. So if there is a problem with the test, please check whether there is a problem with the HDMI to VGA converter, VGA cable and monitor.

3. 9. 3. How to set HDMI resolution in Linux5.4 system

Note: This method is only applicable to systems with linux5.4 kernel.

1) There is a disp_mode variable in **/boot/orangepiEnv.txt** of the linux system, which can be used to set the resolution of the HDMI output. The default resolution of the linux system is 1080p60

```
orangepi@orangepi:~$ sudo vim /boot/orangepiEnv.txt
verbosity=1
console=both
disp_mode=1080p60
fb0_width=1920
fb0_height=1080
```
Supported values for	HDMI resolution	HDMI refresh rate
disp_mode		
480i	720x480	60
576i	720x480	50
480p	720x480	60
576p	720x576	60
720p50	1280x720	50
720p60	1280x720	60
1080i50	1920x1080	50
1080i60	1920x1080	60
1080p24	1920x1080	24
1080p50	1920x1080	50
1080p60	1920x1080	60

2) The values supported by the disp mode variable are shown in the table below

Note: Linux systems currently do not support 4K resolution.

3) Change the value of the disp_mode variable to the desired output resolution, and then restart the system, HDMI will output the set resolution

4) The method of viewing the HDMI output resolution is as follows. If the displayed resolution is the same as the set resolution, it means that the setting of the development board is correct.



3. 9. 4. How to Modify the Framebuffer Width and Height of Linux5.4 System

Note: This method is only applicable to systems with linux5.4 kernel.

There are two variables fb0_width and fb0_height in the **/boot/orangepiEnv.txt** of the linux system, which can be used to set the width and height of the Framebuffer. The default setting of the linux system is fb0_width=1920 and fb0_height=1080.

orangepi@orangepi:~\$ sudo vim /boot/orangepiEnv.txt verbosity=1 console=both disp_mode=1080p60 fb0_width=1920 fb0_height=1080

The **reference** values corresponding to different resolutions of fb0_width and fb0 height are as follows:

HDMI resolution	fb0_width	fb0_height
480p	720	480
576р	720	576
720p	1280	720
1080p	1920	1080

Under the same HDMI resolution, the larger the value of fb0_width and fb0_height, the smaller the text displayed on the screen, and the smaller the value of fb0_width and fb0_height, the larger the text displayed on the screen.

3. 9. 5. Framebuffer Cursor Setting

1) The softcursor used by Framebuffer, the method of setting the cursor to blink or not is as follows

root@orangepi:~# echo 1 > /sys/class/graphics/fbcon/cursor_blink	#cursor
blinking	
root@orangepi:~# echo 0 > /sys/class/graphics/fbcon/cursor_blink	#cursor not
blinking	

2) If you need to hide the cursor, you can add **vt.global_cursor_default=0** in the **extraargs** variable of **/boot/orangepiEnv.txt** (the value of extraargs will be assigned to the **bootargs** environment variable and finally passed to the kernel) (if **vt.global_cursor_default=1**, the cursor will be displayed), and then restart the system to see that the cursor has disappeared

```
orangepi@orangepi:~$ sudo vim /boot/orangepiEnv.txt
verbosity=1
console=both
```

disp_mode=1080p60 fb0_width=1920 fb0_height=1080 extraargs=vt.global_cursor_default=0

3. 10. How to use Bluetooth

3. 10. 1. Test method of desktop image

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



2) Then select the adapter



3) If there is a prompt on the following interface, please select Yes



4) Then set the **Visibility Setting** to **Always visible** in the Bluetooth adapter setting interface, and then close it





5) Then open the configuration interface of the Bluetooth device



6) Click Search to start scanning the surrounding Bluetooth devices



7) Then select the Bluetooth device you want to connect to, and then click the right button of the mouse to pop up the operation interface for this Bluetooth device, select **Pair** to start pairing, and the demonstration here is to pair with an Android phone



8) When pairing, a pairing confirmation box will pop up in the upper right corner of the desktop, just select **Confirm** to confirm, and the phone also needs to confirm at this time



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



10) The interface for sending pictures is as follows



3. 10. 2. How to use the server image

1) After entering the system, you can first check whether there is a Bluetooth device node through the **hciconfig** command. If it exists, it means that the Bluetooth initialization is normal.

orangepi@orangepi:~\$ sudo apt update && sudo apt install -y bluez orangepi@orangepi:~\$ hciconfig -a Type: Primary Bus: UART hci0: BD Address: 3E:61:3D:19:0E:52 ACL MTU: 1021:8 SCO MTU: 240:3 **UP RUNNING** RX bytes:925 acl:0 sco:0 events:72 errors:0 TX bytes:5498 acl:0 sco:0 commands:72 errors:0 Features: 0xbf 0xff 0x8d 0xfe 0xdb 0x3d 0x7b 0xc7 Packet type: DM1 DM3 DM5 DH1 DH3 DH5 HV1 HV2 HV3 Link policy: RSWITCH SNIFF Link mode: SLAVE ACCEPT Name: 'orangepi' Class: 0x3c0000 Service Classes: Rendering, Capturing, Object Transfer, Audio Device Class: Miscellaneous, HCI Version: 5.0 (0x9) Revision: 0x400 LMP Version: 5.0 (0x9) Subversion: 0x400 Manufacturer: Spreadtrum Communications Shanghai Ltd (492)

2) Use **bluetoothctl** to scan bluetooth devices

orangepi@orangepi:~\$ sudo bluetoothctl

[NEW] Controller 10:11:12:13:14:15 orangepizero3 [default]

Agent registered

[bluetooth]# **power on** #enable controller

Changing power on succeeded

[bluetooth]# discoverable on #Make the controller discoverable

Changing discoverable on succeeded

[CHG] Controller 10:11:12:13:14:15 Discoverable: yes

[bluetooth]# **pairable on** #Set the controller as pairable

Changing pairable on succeeded

[bluetooth]# scan on #Start scanning for nearby Bluetooth devices

Discovery started

[CHG] Controller 10:11:12:13:14:15 Discovering: yes

[NEW] Device 76:60:79:29:B9:31 76-60-79-29-B9-31

[NEW] Device 9C:2E:A1:42:71:11 MiPhone

[NEW] Device DC:72:9B:4C:F4:CF orangepi

[bluetooth]# scan off #After scanning to the Bluetooth device you want to connect, you can close the scan, and then write down the MAC address of the Bluetooth device. The Bluetooth device tested here is an Android phone, the name of the Bluetooth is orangepi, and the corresponding MAC address is DC:72:9B:4C :F4:CF

Discovery stopped

[CHG] Controller 10:11:12:13:14:15 Discovering: no

[CHG] Device DC:72:9B:4C:F4:CF RSSI is nil

3) After scanning to the device you want to pair, you can pair it. You need to use the MAC address of the device for pairing

[bluetooth]# pair DC:72:9B:4C:F4:CF #Use the MAC address of the scanned Bluetooth device for pairing

Attempting to pair with DC:72:9B:4C:F4:CF

[CHG] Device DC:72:9B:4C:F4:CF Connected: yes

Request confirmation

[leeb1m[agent] Confirm passkey 764475 (yes/no): **yes #Enter yes here, and you need** to confirm on the mobile phone

[CHG] Device DC:72:9B:4C:F4:CF Modalias: bluetooth:v010Fp107Ed1436

[CHG] Device DC:72:9B:4C:F4:CF UUIDs: 0000046a-0000-1000-8000-00805f9b34fb

[CHG] Device DC:72:9B:4C:F4:CF ServicesResolved: yes

[CHG] Device DC:72:9B:4C:F4:CF Paired: yesPairing successful#Prompt that the pairing is successful[CHG] Device DC:72:9B:4C:F4:CF ServicesResolved: no[CHG] Device DC:72:9B:4C:F4:CF Connected: no

4) After the pairing is successful, the Bluetooth interface of the mobile phone will be displayed as follows



5) To connect a Bluetooth device, you need to install the **pulseaudio-module-bluetooth** package, and then start the **pulseaudio** service

orangepi@orangepi:~\$ sudo apt update

orangepi@orangepi:~\$ sudo apt -y install pulseaudio-module-bluetooth

orangepi@orangepi:~\$ pulseaudio --start

6) How to connect to a Bluetooth device
orangepi@orangepi:~\$ sudo bluetoothctl
Agent registered
[bluetooth]# paired-devices #View the MAC address of the paired Bluetooth device
Device DC:72:9B:4C:F4:CF orangepi
[bluetooth]# connect DC:72:9B:4C:F4:CF #Connect to bluetooth device using
MAC address
Attempting to connect to DC:72:9B:4C:F4:CF
[CHG] Device DC:72:9B:4C:F4:CF Connected: yes
Connection successful
[CHG] Device DC:72:9B:4C:F4:CF ServicesResolved: yes
[CHG] Controller 10:11:12:13:14:15 Discoverable: no
[orangepi]# #This prompt appears to indicate that the connection is successful

7) After connecting the bluetooth device, the bluetooth configuration interface of the

Android mobile phone can see the prompt that the audio has been connected for calls and media



3. 11. USB interface test

The USB interface can be connected to a USB hub to expand the number of USB interfaces.

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

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

2) Connect the Orange Pi development board to the HDMI display

3) If the mouse or keyboard can operate normally, it means that the USB interface is working normally (the mouse can only be used in the desktop version of the system)

3. 11. 2. Connect USB storage device test

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

2) Execute the following command, if you can see the output of sdX, it means that the U disk is recognized successfully

orangepi@ora	angej	pi:~\$ cat /proc/partitions grep "sd*"
major minor	#bl	ocks name
8	0	30044160 sda
8	1	30043119 sda1

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

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

4) After mounting, you can view the capacity usage and mount point of the U disk through the **df -h** command

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

3. 11. 3. USB Ethernet card test

1) The usable USB Ethernet cards that **have been tested** so far are as follows. Among them, the RTL8153 USB Gigabit network card can be used normally when it is inserted into the USB 2.0 Host interface of the development board, but the speed cannot reach Gigabit. Please note that

serial number	model
1	RTL8152B USB 100M network card
2	RTL8153 USB Gigabit LAN

2) First insert the USB network card into the USB interface of the development board, and then insert the network cable into the USB network card to ensure that the network cable can access the Internet normally. If you can see the following log information through the **dmesg** command, it means that the USB network card is recognized normally.

orangepi@orangepi:~\$ dmesg | tail

121.985016] usb 3-1: USB disconnect, device number 2

126.873772] sunxi-ehci 5311000.ehci3-controller: ehci_irq: highspeed device connect

127.094054] usb 3-1: new high-speed USB device number 3 using sunxi-ehci

127.357472] usb 3-1: reset high-speed USB device number 3 using sunxi-ehci

127.557960] r8152 3-1:1.0 eth1: v1.08.9

127.602642] r8152 3-1:1.0 enx00e04c362017: renamed from eth1

127.731874] IPv6: ADDRCONF(NETDEV_UP): enx00e04c362017: link is not ready

127.763031] IPv6: ADDRCONF(NETDEV_UP): enx00e04c362017: link is not ready

```
    [ 129.892465] r8152 3-1:1.0 enx00e04c362017: carrier on
    [ 129.892583] IPv6: ADDRCONF(NETDEV_CHANGE): enx00e04c362017: link
    becomes ready
```

3) Then you can see the device node of the USB network card and the automatically assigned IP address through the ifconfig command

orangepi@orangepi:~\$ sudo ifconfig enx00e04c362017: flags=4163<UP,BROADCAST,RUNNING,MULTICAST> mtu 1500 inet 192.168.1.177 netmask 255.255.255.0 broadcast 192.168.1.255 inet6 fe80::681f:d293:4bc5:e9fd prefixlen 64 scopeid 0x20<link> ether 00:e0:4c:36:20:17 txqueuelen 1000 (Ethernet) RX packets 1849 bytes 134590 (134.5 KB) RX errors 0 dropped 125 overruns 0 frame 0 TX packets 33 bytes 2834 (2.8 KB) TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0

4) The command to test network connectivity is as follows

```
orangepi@orangepi:~$ ping www.baidu.com -I enx00e04c362017
PING www.a.shifen.com (14.215.177.38) from 192.168.1.12 eth0: 56(84) bytes of data.
64 bytes from 14.215.177.38 (14.215.177.38): icmp_seq=1 ttl=56 time=6.74 ms
64 bytes from 14.215.177.38 (14.215.177.38): icmp_seq=2 ttl=56 time=6.80 ms
64 bytes from 14.215.177.38 (14.215.177.38): icmp_seq=3 ttl=56 time=6.26 ms
64 bytes from 14.215.177.38 (14.215.177.38): icmp_seq=4 ttl=56 time=7.27 ms
^C
```

--- www.a.shifen.com ping statistics ---

4 packets transmitted, 4 received, 0% packet loss, time 3002ms

rtt min/avg/max/mdev = 6.260/6.770/7.275/0.373 ms

3. 11. 4. USB camera test

1) First insert the USB camera into the USB port of the Orange Pi development board

2) Then through the lsmod command, you can see that the kernel has automatically loaded the following modules

orangepi@orangepi:~\$ lsmod

0		
\mathbf{v}	range Pi User Manu	al

Module	Size	Used by
uvcvideo	106496	0

3) 3) Through the v4l2-ctl command, you can see that the device node information of the USB camera is /dev/video0

orangepi@orangepi:~\$ sudo apt update

orangepi@orangepi:~\$ sudo apt install -y v4l-utils

orangepi@orangepi:~\$ v4l2-ctl --list-devices

USB 2.0 Camera (usb-sunxi-ehci-1):

/dev/video0

Note that the l in v4l2 is a lowercase letter l, not the number 1.

In addition, the serial number of the video is not necessarily video0, please refer to what you actually see.

4) Use fswebcam to test the USB camera

a. Install fswebcam

orangepi@orangepi:~\$ sudo apt update

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

- b. After installing fswebcam, you can use the following command to take pictures
 - a) -d option is used to specify the device node of the USB camera
 - b) --no-banner is used to remove the watermark of the photo
 - c) -r option is used to specify the resolution of the photo
 - d) -S option is used to set the number of previous frames to skip
 - e) ./image.jpg is used to set the name and path of the generated photo

orangepi@orangepi:~\$ sudo fswebcam -d /dev/video0 \

--no-banner -r 1280x720 -S 5 ./image.jpg

c. In the server version of the linux system, you can use the scp command to transfer the taken pictures to the Ubuntu PC for mirror viewing after taking pictures

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

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

- 5) Use mjpg-streamer to test USB camera
 - a. Download mjpg-streamer
 - a) Github download address:

orangepi@orangepi:~\$ git clone https://github.com/jacksonliam/mjpg-streamer

b) The image download address of Gitee is:

orangepi@orangepi:~\$ git clone https://gitee.com/leeboby/mjpg-streamer

- b. Install dependent packages
 - a) Ubuntu system

orangepi@orangepi:~\$ sudo apt-get install -y cmake libjpeg8-dev

b) Debian system

orangepi@orangepi:~\$ sudo apt-get install -y cmake libjpeg62-turbo-dev

c. Compile and install mjpg-streamer

orangepi@orangepi:~\$ cd mjpg-streamer/mjpg-streamer-experimental orangepi@orangepi:~/mjpg-streamer/mjpg-streamer-experimental\$ make -j4 orangepi@orangepi:~/mjpg-streamer/mjpg-streamer-experimental\$ sudo make install

d. Then enter the following command to start mjpg_streamer

Note that the serial number of the video is not necessarily video0, please refer to what you actually see.

orangepi@orangepi:~/mjpg-streamer/mjpg-streamer-experimental\$ export LD_LIBRARY_PATH=.

orangepi@orangepi:~/mjpg-streamer/mjpg-streamer-experimental\$ sudo ./mjpg_streamer -i "./input_uvc.so -d \ /dev/video0 -u -f 30" -o "./output_http.so -w ./www"

e. Then enter **[the IP address of the development board: 8080]** in the browser of the Ubuntu PC or Windows PC or mobile phone on the same LAN as the development board to see the video output by the camera



3.12. Audio Test

3. 12. 1. How to play audio using the command line

3. 12. 1. 1. Headphone jack playback audio test

1) First, you need to insert the 13pin expansion board into the 13pin interface of the Orange Pi development board, and then insert the earphone into the audio interface



- 2) Through the **aplay -1** command, you can view the sound card devices supported by the Linux system
 - a. The output of the linux5.4 system is as follows, where **card 0: audiocodec** is the sound card device required for earphone playback

root@orangepi:~# aplay -l

**** List of PLAYBACK Hardware Devices ****

card 0: audiocodec [audiocodec], device 0: SUNXI-CODEC sun50iw9-codec-0 []

Subdevices: 1/1

Subdevice #0: subdevice #0

b. The output of the linux6.1 system is as follows, where **audiocodec** is the sound card device required for earphone playback

root@orangepi:~# aplay -l

**** List of PLAYBACK Hardware Devices ****

card 0: audiocodec [audiocodec], device 0: CDC PCM Codec-0 [CDC PCM Codec-0]

Subdevices: 1/1

Subdevice #0: subdevice #0

3) Then use the aplay command to play the audio, and the headset can hear the sound root@orangepi:~# aplay -D hw:0,0 /usr/share/sounds/alsa/audio.wav
 Playing WAVE 'audio.wav' : Signed 16 bit Little Endian, Rate 44100 Hz, Stereo

If there is noise in the earphone test, please pull out some earphones, do not insert all the earphones.

3. 12. 1. 2. HDMI audio playback test

1) First use the Micro HDMI to HDMI cable to connect the Orange Pi development board to the TV (other HDMI monitors need to ensure that they can play audio)

2) HDMI audio playback does not require other settings, just use the **aplay** command to play directly

root@orangepi:~# aplay -D hw:2,0 /usr/share/sounds/alsa/audio.wav

3. 12. 2. Testing audio methods on desktop systems

1) First open the file manager



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



3) Then select the audio.wav file, right click and select open with vlc to start playing



4) How to switch between different audio devices such as HDMI playback and headphone playback

a. First open the volume control interface



When playing audio, the audio device options that the playback software can use will be displayed in **Playback**, as shown in the figure below, where you can set which audio device to play to



3.13. Infrared receiving test

1) First, you need to insert the 13pin expansion board into the 13pin interface of the Orange Pi development board. After inserting the expansion board, the development board can use the infrared receiving function



2) Install ir-keytable infrared testing software
 orangepi@orangepi:~\$ sudo apt update
 orangepi@orangepi:~\$ sudo apt-get install -y ir-keytable

3) Then execute ir-keytable to view the information of the infrared device

a. linux5.4 system output is as follows

orangepi@orangepi:~\$ ir-keytable

Found /sys/class/rc/rc0/ (/dev/input/event1) with:

Driver: sunxi-rc-recv, table: rc_map_sunxi lirc device: /dev/lirc0 Supported protocols: lirc nec Enabled protocols: lirc nec Name: sunxi_ir_recv bus: 25, vendor/product: 0001:0001, version: 0x0100 Repeat delay = 500 ms, repeat period = 125 ms The output of the linux6.1 system is as follows

orangepi@orangepi:~\$ ir-keytable

Found /sys/class/rc/rc0/ with:

Name: sunxi-ir

b.

Driver: sunxi-ir

Default keymap: rc-empty

Input device: /dev/input/event5

LIRC device: /dev/lirc0

Attached BPF protocols: Operation not permitted

Supported kernel protocols: lirc rc-5 rc-5-sz jvc sony nec sanyo mce_kbd rc-6 sharp xmp imon rc-mm

Enabled kernel protocols: lirc

bus: 25, vendor/product: 0001:0001, version: 0x0100

Repeat delay = 500 ms, repeat period = 125 ms

4) Before testing the infrared receiving function, you need to prepare an infrared remote controller dedicated to Orange Pi, other remote controllers do not support it



5) Then enter the **ir-keytable -t** command in the terminal, and then use the infrared remote control to press the button against the infrared receiver of the Orange Pi development board to see the received key code in the terminal

a. linux5.4 system output is as follows

orangepi@orangepi:~\$ sudo ir-keytable -t Testing events. Please, press CTRL-C to abort. 1598339152.260376: event type EV_MSC(0x04): scancode = 0xfb0413 1598339152.914715: event type EV_SYN(0x00). 1598339152.914715: event type EV_MSC(0x04): scancode = 0xfb0410 b. linux6.1 system output is as follows orangepi@orangepi:~\$ sudo ir-keytable -c -p NEC -t Old keytable cleared Protocols changed to nec Testing events. Please, press CTRL-C to abort. 202.063219: lirc protocol(nec): scancode = 0x45c 202.063249: event type EV_MSC(0x04): scancode = 0x45c 202.063249: event type EV_SYN(0x00).

3. 14. Temperature sensor

1) H618 has a total of 4 temperature sensors, the command to view the temperature is as follows:

The displayed temperature value needs to be divided by 1000, the unit is Celsius.

a. sensor0: CPU temperature sensor, the first command is used to view the type of temperature sensor, and the second command is used to view the value of the temperature sensor

orangepi@orangepi:~\$ cat /sys/class/thermal/thermal_zone0/type cpu_thermal_zone orangepi@orangepi:~\$ cat /sys/class/thermal/thermal_zone0/temp

57734

b. sensor1: DDR temperature sensor, the first command is used to view the type of temperature sensor, and the second command is used to view the value of the temperature sensor

orangepi@orangepi:~\$ cat /sys/class/thermal/thermal_zone1/type ddr_thermal_zone orangepi@orangepi:~\$ cat /sys/class/thermal/thermal_zone1/temp

57410

c. sensor2: GPU temperature sensor, the first command is used to view the type of

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temperature sensor, the second command is used to view the value of the temperature sensor

orangepi@orangepi:~\$ cat /sys/class/thermal/thermal_zone2/type

gpu_thermal_zone

```
orangepi@orangepi:~$ cat /sys/class/thermal/thermal zone2/temp
```

59273

d. sensor3: VE temperature sensor, the first command is used to view the type of temperature sensor, and the second command is used to view the value of the temperature sensor

```
orangepi@orangepi:~$ cat /sys/class/thermal/thermal_zone3/type
ve_thermal_zone
orangepi@orangepi:~$ cat /sys/class/thermal/thermal_zone3/temp
58949
```

2) The system with Linux6.1 kernel can also use the **sensors** command to view the current temperature of the system

orangepi@orangepi:~\$ sensors

cpu thermal-virtual-0

Adapter: Virtual device

```
temp1: +47.4^{\circ}C (crit = +110.0°C)
```

gpu thermal-virtual-0

Adapter: Virtual device

```
temp1: +48.7^{\circ}C (crit = +110.0°C)
```

ddr_thermal-virtual-0 Adapter: Virtual device

temp1: $+47.8^{\circ}C$ (crit = +110.0°C)

ve_thermal-virtual-0 Adapter: Virtual device temp1: +47.2°C (crit = +110.0°C)

3. 15. **13** Pin Description of the Pin Expansion Board Interface

1) Please refer to the figure below for the order of the interface pins of the 13 pin expansion board on the development board



2) The schematic diagram of the 13pin interface of the development board is as follows



3) The function description of the 13 pin expansion board interface pins of the development board is as follows

- a. When the 13pin pin is connected to the expansion board, it can be provided additionally
 - a) 2个USB 2.0 Host
 - b) Audio output of the left and right audio channels of the earphones
 - c) TV-OUT video output
 - d) Infrared receiving function
 - e) After the expansion board is connected, pins 10, 11 and 12 of the 13pin interface cannot be used
 - f) In addition, it should be noted that the MIC on the 13pin expansion board cannot be used on the Orange Pi Zero 3

b. When pin 13 is not connected to the expansion board, pins 10, 11, 12 and 13 can be used as ordinary GPIO ports

GPIO serial number	Function	Pin
	5V	1
	GND	2
	USB2-DM	3
	USB2-DP	4
	USB3-DM	5
	USB3-DP	6
	LINEOUTR	7
	LINEOUTL	8
	TV-OUT	9
65	PC1	10
272	PI16 11	
262	PI6 12	
234	IR-RX/PH10	13

3. 16. 26 Pin Interface Pin Description

1) For the order of the 26-pin interface pins on the Orange Pi Zero 3 development board, please refer to the silkscreen diagram on the development board



2) The functions of the 26 pin interface pins on the development board are shown in the table below

GPIO S/N	GPIO	Function	Pin
		3. 3V	1
229	PH5	TWI3-SDA	3
228	PH4	TWI3-SCK	5

Pin	Function	GPIO	GPIO S/N
2	5V		
4	5V		
6	GND		



73	PC9	PC9	7
		GND	9
70	PC6	PC6	11
69	PC5	PC5	13
72	PC8	PC8	15
		3. 3V	17
231	PH7	SPI1_MOSI	19
232	PH8	SPI1_MISO	21
230	PH6	SPI1_CLK	23
		GND	25

8	UART5_TX	PH2	226
10	UART5_RX	PH3	227
12	PC11	PC11	75
14	GND		
16	PC15	PC15	79
18	PC14	PC14	78
20	GND		
22	PC7	PC7	71
24	SPI1_CS	PH9	233
26	PC10	PC10	74

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

3.17. How to install wiringOP

Note that wiringOP has been pre-installed in the linux image released by Orange Pi. Unless the code of wiringOP is updated, there is no need to re-download, compile and install, just use it directly.

The storage path of the compiled wiringOP deb package in orangepi-build is: orangepi-build/external/cache/debs/arm64/wiringpi x.xx.deb

After entering the system, you can run the gpio readall command. If you can see the following output, it means that wiringOP has been pre-installed and can be used normally.

orangepi(dorange	pi:~\$ gpio	readall								
+	+	+		+	+ H6	516	+	+	+	-+	++
GPIO	wPi	Name	Mode		Phys	ical	I V	Mode	Name	wPi	GPIO
+		3 31/ 1			1	1 2	+ I		+		++
1 220	٥		OFF	I ∩	1 2				1 51		• •
1 229	1				5			÷			ł ł
1 73					7					1 3	226
	2		ULL								220
70	5		AL T5	I ∩	11	1 12					75
	7		ALTS		13	1 1/					13
			ALIS		15	1 14					70
1 12	0		UFF	0	17					1 10	79
1 224	11	J. JV	OFF		10	81	0		I PC14	1 10	/8
231	11	MICO 1	OFF	0	19	20				1 12	74
232	12	MISU.1	OFF	0	21	22	0			1 13	
230	14	SCLK.1	OFF	U	23	24	0		CE.1	15	233
		GND			25	26	0		PC10	16	/4
65	17	PC1	OFF	0	27	28				, l	ļ
272	18	PI16	ALT2	0	29	30		4	Ļ		
262	19	PI6	OFF	0	31	32					
234	20	PH10	ALT3	0	33	34					
+	++	+		+	+4	+	+	+	+	-+	++
GPIO	wPi	Name	Mode	V	Phys	sical	V	Mode	Name	wPi	GPIO
+	++	+		H	F Hé	5 1 6 ·	+	+	+	+	++
orangepi(dorange	epi:~\$									

wiringOP is currently mainly adapted to the functions of setting GPIO port input and output, setting GPIO port output high and low levels, and setting up and down pull-down resistors. Functions such as hardware PWM are not available.

1) Download the code of wiringOP

orangepi@orangepi:~\$ sudo apt update

orangepi@orangepi:~\$ sudo apt install -y git

orangepi@orangepi:~\$ git clone https://github.com/orangepi-xunlong/wiringOP.git -b next

Note that the source code needs to download the code of the wiringOP next branch, please don't miss the -b next parameter.

If you have problems downloading the code from GitHub, you can directly use the wiringOP source code that comes with the Linux image, and the storage location is: /usr/src/wiringOP.

Compile and install wiringOP
 orangepi@orangepi:~\$ cd wiringOP
 orangepi@orangepi:~/wiringOP\$ sudo ./build clean

orangepi@orangepi:~/wiringOP\$ sudo ./build

- 3) Test the output of the gpio readall command as follows
 - a. There is a one-to-one correspondence between pins 1 to 26 and 26 Pins on the development board
 - b. Pin 27 corresponds to pin 10 of 13pin on the development board
 - c. Pin 29 corresponds to pin 11 of 13pin on the development board
 - d. Pin 31 corresponds to pin 12 of 13pin on the development board
 - e. Pin 33 corresponds to pin 13 of 13pin on the development board
 - f. Pins 28, 30, 32, and 34 are empty, please ignore them

or	angepi(orange	<mark>epi:∼</mark> \$ gpio	readall			616	(1	ē			
	GPI0	wPi	Name	Mode	V	Phy	sical	I V	Mode	Name	wPi	GPIO
l			3.3V			1	1 2	ī		5V		
Ì	229	0	SDA.3	OFF	0	3	i 4	Ì		5V	i i	i i
ĺ	228	1	SCL.3	OFF	0	5	6	Í		GND		İ İ
	73	2	PC9	OFF	0	7	8	0	OFF	TXD.5	3	226
			GND			9	10	0	OFF	RXD.5	4	227
	70	5	PC6	ALT5	0	11	12	0	OFF	PC11	6	75
	69	7	PC5	ALT5	0	13	14	1		GND		
	72	8	PC8	OFF	0	15	16	0	OFF	PC15	9	79
			3.3V			17	18	0	OFF	PC14	10	78
	231	11	MOSI.1	OFF	0	19	20	I		GND		
	232	12	MISO.1	OFF	0	21	22	0	OFF	PC7	13	71
	230	14	SCLK.1	OFF	0	23	24	0	OFF	CE.1	15	233
			GND			25	26	0	OFF	PC10	16	74
	65	17	PC1	OFF	0	27	28	I				
	272	18	PI16	ALT2	0	29	30	I				
	262	19	PI6	OFF	0	31	32	1				
	234	20	PH10	ALT3	0	33	34					
+			++		++	+	++	+	+	+	++	+
	GPI0	wPi	Name	Mode		Phy	sical	I V	Mode	Name	wPi	GPIO
+ or	angepi(orange	epi:~\$		++	H	616	+	+	+	• - + +	+

3. 18. 26pin interface GPIO, I2C, UART, SPI and PWM test

3. 18. 1. **26pin GPIO port test**

1) The following takes pin 7—corresponding to GPIO as PC9—corresponding to wPi number 2—as an example to demonstrate how to set the high and low levels of the GPIO port



	angepi(dorangep	i:~\$ gpio n	readall		LI616	5					
Ì	GPIO	wPi	Name	Mode	I V I	Physic	cal	I V I	Mode	Name	wPi	GPIO
+			3.3V		++	1	2	1 1		5V		+
Ť	229	0	SDA.3	OFF	0	3	4	1 1		5V	Î	í l
T	228	1	SCL.3	OFF	0	5	6	i i		GND		í i
T	73	2	PC9	OFF	0	7	8	0	OFF	TXD.5	3	226
T			GND			9	10	0	OFF	RXD.5	4	227

2) First set the GPIO port to output mode, where the third parameter requires the serial number of the wPi corresponding to the input pin

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

3) Then set the GPIO port to output a low level. After setting, you can use a multimeter to measure the voltage value of the pin. If it is 0v, it means that the low level is set successfully

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

rangepi@orangepi:~\$ gpio readall H616 GPIO wPi Mode Physical V Mode Name wPi 1 GPIO Name V 3.3V **5**V 2 1 229 0 SDA.3 5V **OFF** 3 0

5

6

8

0

0

OFF

OFF

GND

TXD.5

RXD.5

3

Δ

226

227

Use gpio readall to see that the value (V) of pin 7 has changed to 0

0

OFF

OUT

4) Then set the GPIO port to output a high level. After setting, you can use a multimeter to measure the voltage value of the pin. If it is 3.3v, it means that the high level is set successfully.

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

SCL.3

PC9

GND

Use gpio readall to see that the value (V) of pin 7 has changed to 1

ог +	angepi	dorange	e <mark>pi:~</mark> \$ gpio r	-eadall	+	H616	++		+	-+	++
1	GPIO	wPi	Name	Mode	VI	Physical	I V I	Mode	Name	wPi	GPI0
i			3.3V			1 2	1		5V		
Ĩ	229	0	SDA.3	OFF	0	3 4	1 1		5V	1	1 1
1	228	1	SCL.3	OFF	0	5 6	1 1		GND	1	l l
I	73	2	PC9	OUT	1	7 8	0	OFF	TXD.5	3	226
1			GND			9 10	0	OFF	RXD.5	4	227

228

73

1

2

5) The setting method of other pins is similar, just modify the serial number of wPi to the corresponding serial number of the pin

3. 18. 2. How to set pull-up and pull-down resistors on 26 pin GPIO

ports

1) The following takes pin 7—the corresponding GPIO is PC9—the corresponding wPi number is 2—as an example to demonstrate how to set the pull-up and pull-down resistors of the GPIO port

ог +	angepi(goranger	oi:∼\$ gpio r	eadall	++	H616	4+-		.	-+	++
İ	GPIO	wPi	Name	Mode	V	Physical	I V I	Mode	Name	wPi	GPIO
			3.3V		++ 	1 2	1 1		5V	1	
Ĩ	229	0	SDA.3	OFF	0	3 4	1		5V	1	i i
Ĩ	228	1	SCL.3	OFF	0	5 6	ÍÍ		GND	T.	Í Í
	73	2	PC9	OFF	0	7 8	0	OFF	TXD.5	3	226
			GND			9 10	0	OFF	RXD.5	4	227

2) First, you need to set the GPIO port to the input mode, and the third parameter needs to be the serial number of the wPi corresponding to the input pin

root@orangepi:~/wiringOP# **gpio mode 2 in**

3) After setting to input mode, execute the following command to set the GPIO port to pull-up mode

root@orangepi:~/wiringOP# **gpio mode 2 up**

4) Then enter the following command to read the level of the GPIO port, if the level is 1, it means that the pull-up mode is set successfully

root@orangepi:~/wiringOP# **gpio read 2**

1

5) Then execute the following command to set the GPIO port to pull-down mode root@orangepi:~/wiringOP# **gpio mode 2 down**

6) Then enter the following command to read the level of the GPIO port, if the level is 0, the pull-down mode is set successfully

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

3. 18. 3. **26pin SPI test**

1) According to the schematic diagram of the 26pin interface, the available spi is spi1



2) The spi1 is disabled by default in the Linux system and needs to be manually enabled before it can be used. The steps to open are as follows:

a. First run **orangepi-config**, normal users remember to add **sudo** permission orangepi@orangepi:~\$ **sudo orangepi-config**

b. Then select System



c. Then select Hardware





d. Then use the arrow keys on the keyboard to navigate to the position shown in the figure below, and then use the **space** to select **spi1-cs1-spidev**

	spi1-cs0-spidev	
[*]	spi1-cs1-spidev	
	zero2w-disable-led	

e. Then select **<Save>** to save



f. Then select **<Back>**



g. Then select **<Reboot>** to restart the system to make the configuration take effect

Applying	g changes	
Reboot to enal	ble new features?	
	-	
<reboot></reboot>	<cancel></cancel>	

3) Then check whether there is a **spidev1.1** device node in the Linux system. If it exists, it means that the configuration of SPI1 has taken effect

orangepi@orangepi:~\$ ls /dev/spidev1* /dev/spidev1.1

4) Do not short-circuit the mosi and miso pins of SPI1 first, the output result of running spidev_test is as follows, you can see that the data of TX and RX are inconsistent

5) Then short the two pins of mosi (the 19th pin in the 26pin interface) and miso (the 21st pin in the 26pin interface) of SPI1, and then run the output of spidev_test as follows, you can see the sending and receiving same data

3. 18. 4. **26pin I2C test**

1) According to the schematic diagram of 26pin, the available i2c is i2c3



2) i2c3 is disabled by default in the Linux system, and it needs to be manually enabled before it can be used. The steps to open are as follows:

a. First run orangepi-config, normal users remember to add sudo permission

orangepi@orangepi:~\$ sudo orangepi-config

b. Then select **System**

	orangepi-config	
onfigure <mark>Debian</mark>	bullseye based OrangePi for the OPI Zero3	
oC runs between	480 and 1512 MHz using ondemand governor.	
upport: http://		
upport. http://	www.oraligept.org	
Syste	System and security settings	
Syste	System and security settings	
Syste Netwo Perso	System and security settings rk wired, wireless, Bluetooth, access point nal Timezone, language, hostname	
Syste Netwo Perso Softw	System and security settings rk wired, wiretess, Bluetooth, access point nal Timezone, language, hostname are System and 3rd party software install	
Syste Netwo Perso Softw Help	System and security settings rk wired, wireless, Bluetooth, access point nal Timezone, language, hostname are System and 3rd party software install Documentation, support, sources	
Netwo Perso Softw Help	System and security settings rk wired, wireless, Bluetooth, access point nal Timezone, language, hostname are System and 3rd party software install Documentation, support, sources	
Softw Help	System and security settings rk wired, wireless, Bluetooth, access point nal Timezone, language, hostname are System and 3rd party software install Documentation, support, sources	

c. Then select **Hardware**



d. d. Then use the arrow keys on the keyboard to navigate to the position shown in the figure below, and then use the **space** to select **ph-i2c3**



e. Then select <Save> to save



f. Then select **<Back>**

< Save >	< Back >

g. Then select **<Reboot>** to restart the system to make the configuration take effect

Applying	g changes
Reboot to enal	ble new features?
<r<mark>eboot></r<mark>	<cancel></cancel>

3) After starting the linux system, first confirm that there is an i2c3 device node under /dev

orangepi@orangepi:~\$ ls /dev/i2c-3 /dev/i2c-3

4) Then start testing i2c, first install i2c-tools

orangepi@orangepi:~\$ sudo apt-get update

orangepi@orangepi:~\$ sudo apt-get install -y i2c-tools

5) Then connect an i2c device to the i2c3 pin of the 26pin connector

Please select the 5V and 3.3V pins according to the specific i2c device, and the voltage value required by different i2c devices may be different.

sda pin	Corresponding to pin 3 in 26pin
sck pin	Corresponding to pin 5 in 26pin
5v pin	Corresponding to pin 2 in 26pin
3.3v pin	Corresponding to pin 1 in 26pin
gnd pin	Corresponding to pin 6 in 26pin

6) Then use the **i2cdetect -y 3** command, if the address of the connected i2c device can be detected, it means that i2c can be used normally

Different i2c device addresses are different, the address 0x50 in the figure below is just an example. Please refer to what you actually see.

	0	1	2	2	4		C	7	0	0		L.	100		225	
	0	1	2	- 3	- 4	D	ю	/	ð	9	a	D	С	a	e	I
90:																
10:																
20:																
30:																10280
40:																<u></u>
50:	50															
60 :																
70:																

3. 18. 5. **26pin UART test**

1) According to the schematic diagram of the 26pin interface, the available uart is uart5



2) Uart5 is disabled by default in the Linux system, and it needs to be opened manually to use it. The steps to open are as follows:

a. First run **orangepi-config**, normal users remember to add **sudo** permission orangepi@orangepi:~**\$ sudo orangepi-config**

b. Then select System



c. Then select Hardware



d. Then use the arrow keys on the keyboard to navigate to the position shown in the figure below, and then use the space to select ph-uart5



e. Then select **<Save>** to save



f. Then select **<Back>**



g. Then select **<Reboot>** to restart the system to make the configuration take effect



3) After entering the linux system, first confirm whether there is a uart5 device node under /dev

Note that the linux5.4 system is /dev/ttyAS5.
orangepi@orangepi:~\$ ls /dev/ttyS5
/dev/ttyS5

4) Then start to test the uart5 interface, first use the DuPont line to short the rx and tx of the uart5 interface to be tested

	uart5
tx pin	Corresponding to pin 8 of 26pin
rx pin	Corresponding to pin 10 of 26pin

5) Use the **gpio** command in wiringOP to test the loopback function of the serial port as shown below. If you can see the following print, it means that the serial port communication is normal

orange	epi@	orang	epi:~\$ gpio serial /dev/ttyS5	# linux-6.1 test command
orange	epi@	orang	epi:~\$ gpio serial /dev/ttyAS5	# linux-5.4 test command
Out:	0:	->	0	
Out:	1:	->	1	
Out:	2:	->	2	
Out:	3:	->	3^C	

3. 18. 6. **PWM test method**

The development board can use up to 4 channels of PWM, and the positions of their pins are shown in the figure below:





1) In the Linux system, the pwm is closed by default, and it needs to be opened manually to use it. The steps to open are as follows:

a. First run orangepi-config, normal users remember to add sudo permission

orangepi@orangepi:~\$ sudo orangepi-config

b. Then select System



c. Then select Hardware

Install Install to/update boot loader Bootenv Edit boot environment CPU Set CPU speed and governor Avabi Appounce system in the network						
Toggle hardware configuration: UART, I2C, etc.						
Reconfigure SSH daemon						
Run apt update & apt upgrade Install ZSH with plugins and tmux Disable desktop or change login type						
< OK > < Back >						
d. Then use the arrow keys on the keyboard to navigate to the position shown in the figure below, and then use the space to select the configuration corresponding to pwm

Since the RX and TX pins of UART5 in the PWM1, PWM2 and 26pin interfaces are multiplexed, please make sure that the UART5 configuration is not selected (do not check ph-uart5) when turning on PWM1 and PWM2 (you need to select ph-pwm12).

PWM3, PWM4 and the TX and RX pins in the debug serial port are multiplexed, so when using PWM3 and PWM4 (need to select ph-pwm34), please turn off the configuration of UART0 (need to select disable-uart0), after turning off UART0 The debug serial port cannot be used.



e. Then select **<Save>** to save



f. Then select **<Back>**

< Save >	< Back >	-

g. Then select **<Reboot>** to restart the system to make the configuration take effect



2) After restarting, the PWM test can be started

Please execute the following commands under the root user.

a. Enter the following command on the command line to make pwm1 output a 50Hz square wave

root@orangepi:~# echo 1 > /sys/class/pwm/pwmchip0/export

root@orangepi:~# echo 20000000 > /sys/class/pwm/pwmchip0/pwm1/period

root@orangepi:~# echo 1000000 > /sys/class/pwm/pwmchip0/pwm1/duty_cycle

root@orangepi:~# echo 1 > /sys/class/pwm/pwmchip0/pwm1/enable

b. Enter the following command on the command line to make pwm2 output a 50Hz square wave

root@orangepi:~# echo 2 > /sys/class/pwm/pwmchip0/export

root@orangepi:~# echo 20000000 > /sys/class/pwm/pwmchip0/pwm2/period root@orangepi:~# echo 1000000 > /sys/class/pwm/pwmchip0/pwm2/duty_cycle root@orangepi:~# echo 1 > /sys/class/pwm/pwmchip0/pwm2/enable

c. Enter the following command on the command line to make pwm3 output a 50Hz square wave

root@orangepi:~# echo 3 > /sys/class/pwm/pwmchip0/export

root@orangepi:~# echo 20000000 > /sys/class/pwm/pwmchip0/pwm3/period

root@orangepi:~# echo 1000000 > /sys/class/pwm/pwmchip0/pwm3/duty cycle

root@orangepi:~# echo 1 > /sys/class/pwm/pwmchip0/pwm3/enable

d. Enter the following command on the command line to make pwm4 output a 50Hz square wave

root@orangepi:~# echo 4 > /sys/class/pwm/pwmchip0/export

root@orangepi:~# echo 20000000 > /sys/class/pwm/pwmchip0/pwm4/period

root@orangepi:~# echo 1000000 > /sys/class/pwm/pwmchip0/pwm4/duty_cycle

root@orangepi:~# echo 1 > /sys/class/pwm/pwmchip0/pwm4/enable



D no conjenio II je	I .		, 	
		· · · · · · · · · · · · · · · · · · ·		~

3. 19. How to install and use wiringOP-Python

wiringOP-Python is the Python language version of wiringOP, which is used to operate the hardware resources of the development board, such as GPIO, I2C, SPI and UART, in the Python program.

In addition, please note that all the following commands are operated under the root user.

3. 19. 1. How to install wiringOP-Python

1) First install the dependency package

root@orangepi:~# sudo apt-get update

root@orangepi:~# sudo apt-get -y install git swig python3-dev python3-setuptools

2) Then use the following command to download the source code of wiringOP-Python

Note that the following git clone --recursive command will automatically download the source code of wiringOP, because wiringOP-Python depends on wiringOP. Please make sure that the download process does not report errors due to network problems.

If you have problems downloading the code from GitHub, you can directly use the wiringOP-Python source code that comes with the Linux image, and the storage location is: /usr/src/wiringOP-Python

root@orangepi:~# git clone --recursive https://github.com/orangepi-xunlong/wiringOP-Python -b next

root@orangepi:~# cd wiringOP-Python

root@orangepi:~/wiringOP-Python# git submodule update --init --remote

3) Then use the following command to compile wiringOP-Python and install it into the Linux system of the development board

root@orangepi:~# cd wiringOP-Python

root@orangepi:~/wiringOP-Python# **python3 generate-bindings.py > bindings.i** root@orangepi:~/wiringOP-Python# **sudo python3 setup.py install**

4) Then enter the following command, if there is help information output, it means that wiring OP-Python is installed successfully, press the \mathbf{q} key to exit the help information interface

root@orangepi:~/wiringOP-Python# **python3 -c "import wiringpi; help(wiringpi)"** Help on module wiringpi:

NAME

wiringpi

DESCRIPTION

This file was automatically generated by SWIG (http://www.swig.org).

Version 4.0.2

#

Do not make changes to this file unless you know what you are doing--modify # the SWIG interface file instead.

5) The steps to test whether wiringOP-Python is successfully installed under the python command line are as follows:

a. First use the python3 command to enter the command line mode of python3 root@orangepi:~# python3

b. Then import the python module of wiringpi



>>> import wiringpi;

c. Finally, enter the following command to view the help information of wiringOP-Python, and press the q key to exit the help information interface

>>> help(wiringpi)

Help on module wiringpi:

NAME

wiringpi

DESCRIPTION

This file was automatically generated by SWIG (http://www.swig.org).

```
# Version 4.0.2
```

#

Do not make changes to this file unless you know what you are doing--modify # the SWIG interface file instead.

CLASSES

```
builtins.object

GPIO

I2C

Serial

nes

class GPIO(builtins.object)

| GPIO(pinmode=0)

|
```

>>>

3. 19. 2. **26pin GPIO port test**

wiringOP-Python is the same as wiringOP, you can also determine which GPIO pin to operate by specifying the wPi number, because there is no command to check the wPi number in wiringOP-Python, so you can only check the board wPi number and physical Correspondence between pins.

or	angeni	lorange	eni:~\$ anio	readall									
+		+	++		+	+ H	616		+	+	+	+	+
I	GPIO	wPi	Name	Mode	V	Phy	sica	al	V	Mode	Name	wPi	GPIO
+	+	+	++		+	+	++-		+	+	+	++	++
1			3.3V			1		2			5V		
	229	0	SDA.3	OFF	0	3	11 4	4			5V		
	228	1	SCL.3	OFF	0	5	(6			GND		
	73	2	PC9	OFF	0	7	1 8	8	0	OFF	TXD.5	3	226
			GND			9	11 :	10	0	OFF	RXD.5	4	227
	70	5	PC6	ALT5	0	11	11 :	12	0	OFF	PC11	6	75
	69	7	PC5	ALT5	0	13	11 :	14			GND		Î Î
	72	8	PC8	OFF	0	15	11 :	16	0	OFF	PC15	9	79
1			3.3V			17	11 :	18	0	OFF	PC14	10	78
Ì	231	11	MOSI.1	OFF	0	19		20			GND	1	
Í	232	12	MISO.1	OFF	0	21	11 :	22	0	OFF	PC7	13	71
l	230	14	SCLK.1	OFF	0	23	11 :	24	0	OFF	CE.1	15	233
Ì			GND			25	11 2	26	0	OFF	PC10	16	74
İ	65	17	PC1	0FF	0	27	11 :	28				1	
I	272	18	PI16	ALT2	0	29	ii :	30	i i				i i
İ	262	19	PI6	OFF	0	31	11 :	32					
İ	234	20	PH10	ALT3	0	33	ii :	34	Ì		i	Ĩ.	1
+		+	++		+	+	++-		+	+	+	+	+
	GPIO	wPi	Name	Mode	V	Phy	sica	al	V	Mode	Name	WPi	GPIO
+			++		+	+ H	616		+		+	+	++
ог	angepi(dorange	epi:~\$										
	and the second second												

1) The following takes pin 7—the corresponding GPIO is PC9—the corresponding wPi number is 2—as an example to demonstrate how to set the high and low levels of the GPIO port

ог	angepi(dorange	pi:~\$ gpio	readall		lica	_		25	ж.		
1	GPIO	wPi	Name	Mode	V	Physi	.6 .cal	V	Mode	+ Name	wPi	++ GPIO
+		+4	+		+4	++		++	+	+	-+	++
1			3.3V			1	2			5V		1 [
1	229	0	SDA.3	OFF	0	3	4	1		5V	1	i i
I	228	1	SCL.3	OFF	0	5	6			GND		i i
İ	73	2	PC9	OFF	0	7	8	0	OFF	TXD.5	3	226
1			GND			9	10	0	OFF	RXD.5	4	227

2) The steps to test directly with the command are as follows:

a. First set the GPIO port to output mode, where the first parameter of the **pinMode** function is the serial number of the wPi corresponding to the pin, and the second parameter is the GPIO mode

root@orangepi:~/wiringOP-Python# python3 -c "import wiringpi; \ from wiringpi import GPIO; wiringpi.wiringPiSetup(); \ wiringpi.pinMode(2, GPIO.OUTPUT); "

b. Then set the GPIO port to output low level. After setting, you can use a

🤌 range Pi User Manual

multimeter to measure the voltage value of the pin. If it is 0v, it means that the low level is set successfully.

root@orangepi:~/wiringOP-Python# python3 -c "import wiringpi; \ from wiringpi import GPIO; wiringpi.wiringPiSetup() ;\ wiringpi.digitalWrite(2, GPIO.LOW)"

c. Then set the GPIO port to output a high level. After setting, you can use a multimeter to measure the voltage value of the pin. If it is 3.3v, it means that the high level is set successfully.

root@orangepi:~/wiringOP-Python# python3 -c "import wiringpi; \ from wiringpi import GPIO; wiringpi.wiringPiSetup() ;\ wiringpi.digitalWrite(2, GPIO.HIGH)"

- 3) The steps to test in the command line of python3 are as follows:
 - a. First use the python3 command to enter the command line mode of python3

root@orangepi:~# python3

b. Then import the python module of wiringpi

>>> import wiringpi

>>> from wiringpi import GPIO

c. Then set the GPIO port to output mode, where the first parameter of the **pinMode** function is the serial number of the wPi corresponding to the pin, and the second parameter is the GPIO mode

>>> wiringpi.wiringPiSetup()

>>> wiringpi.pinMode(<mark>2, GPIO.OUTPUT</mark>)

d. Then set the GPIO port to output low level. After setting, you can use a multimeter to measure the voltage value of the pin. If it is 0v, it means that the low level is set successfully.

>>> wiringpi.digitalWrite(2, GPIO.LOW)

e. Then set the GPIO port to output a high level. After setting, you can use a multimeter to measure the voltage value of the pin. If it is 3.3v, it means that the high level is set successfully.

>>> wiringpi.digitalWrite(2, GPIO.HIGH)

4) The method of wiringOP-Python to set GPIO high and low levels in python code can refer to the **blink.py** test program in the examples below. The **blink.py** test program will



set the voltage of all GPIO ports in the 26 pins of the development board to change continuously.

```
root@orangepi:~/wiringOP-Python# cd examples
```

root@orangepi:~/wiringOP-Python/examples# ls blink.py

blink.py

root@orangepi:~/wiringOP-Python/examples# python3 blink.py

3. 19. 3. **26pin SPI test**

1) According to the schematic diagram of the 26pin interface, the available spi is spi1



2) The spi1 is disabled by default in the Linux system and needs to be manually enabled before it can be used. The steps to open are as follows:

a. First run orangepi-config, normal users remember to add sudo permission

orangepi@orangepi:~\$ sudo orangepi-config

b. Then select **System**



c. Then select Hardware





d. Then use the arrow keys on the keyboard to navigate to the position shown in the figure below, and then use the **space** to select **spi1-cs1-spidev**

	spi1-cs0-spidev	
[*]	spi1-cs1-spidev	
	zero2w-disable-led	

e. Then select **<Save>** to save



f. Then select <Back>然后选择<Back>



g. Then select **<Reboot>** to restart the system to make the configuration take effect

Applying changes	
Reboot to enable new features?	
<pre><reboot> <cancel></cancel></reboot></pre>	

3) Then check whether there is a **spidev1.1** device node in the Linux system. If it exists, it means that the configuration of SPI1 has taken effect

```
orangepi@orangepi:~$ ls /dev/spidev1*
/dev/spidev1.1
```

4) Then you can use the **spidev_test.py** program in the examples to test the loopback function of the SPI. The **spidev_test.py** program needs to specify the following two parameters:

- a. --channel: Specify the channel number of SPI
- b. --port: Specify the port number of SPI

5) Do not short-circuit the mosi and miso pins of SPI1, the output result of running spidev_test.py is as follows, you can see that the data of TX and RX are inconsistent

6) Then use the Dupont wire to short-circuit the two pins of txd (pin 19 in the 26pin interface) and rxd (pin 21 in the 26pin interface) of SPI1 and then run the output of spidev_test.py as follows, you can see The data sent and received are the same, indicating that the SPI1 loopback test is normal

 FF FF FF FF FF F0 0D |......@..........

3. 19. 4. **26pin I2C test**

1) According to the schematic diagram of 26pin, the available i2c is i2c3



2) i2c3 is disabled by default in the Linux system, and it needs to be manually enabled before it can be used. The steps to open are as follows:

a. First run orangepi-config, normal users remember to add sudo permission

orangepi@orangepi:~\$ sudo orangepi-config

b. Then select System



c. Then select Hardware





d. Then use the arrow keys on the keyboard to navigate to the position shown in the figure below, and then use the space to select ph-i2c3



e. Then select **<Save>** to save



f. Then select **<Back>**



g. Then select **<Reboot>** to restart the system to make the configuration take effect

Applying	g changes
Reboot to enat	ole new features?
<reboot></reboot>	<cancel></cancel>

3) After starting the linux system, first confirm that there is an i2c3 device node under /dev

orangepi@orangepi:~\$ ls /dev/i2c-3 /dev/i2c-3

4) Then start testing i2c, first install i2c-tools
 orangepi@orangepi:~\$ sudo apt-get update
 orangepi@orangepi:~\$ sudo apt-get install -y i2c-tools

5) Then connect an i2c device to the i2c3 pin of the 26pin connector, here we take the DS1307 RTC module as an example



Pins of the RTC module	The pin corresponding to the 26pin of				
	the development board				
5V	Pin 2				
GND	Pin 6				
SDA	Pin 3				
SCL	Pin 5				

6) Then use the **i2cdetect -y 3** command, if the address of the connected i2c device can be detected, it means that the i2c device is connected correctly

Lau	100	Pe	33	me	10	10		0	- 0	in F	1-h												
	0	1		2	3	4		5		6	7	1	8		9	а	D	С	1	d	e		f
00:																						-	-
10:				-				-														-	-
20:				÷					-	÷				-		÷			-			-	
30:				-			6. 7	-									7					÷	
40:				-				-				1											
50:				-					-											-£.		-	-
60:				=								6	8									-	
70:				-																			



7) Then you can run the ds1307.py test program in the examples to read the RTC time

```
root@orangepi:~/wiringOP-Python# cd examples
root@orangepi:~/wiringOP-Python/examples# python3 ds1307.py --device \
"/dev/i2c-3"
Thu 2022-06-16 04:35:46
Thu 2022-06-16 04:35:47
Thu 2022-06-16 04:35:48
^C
exit
```

3. 19. 5. **26pin UART test**

1) According to the schematic diagram of the 26pin interface, the available uart is uart5



2) uart5 is disabled by default in the Linux system, and it needs to be opened manually to use it. The steps to open are as follows:

a. First run **orangepi-config**, normal users remember to add **sudo** permission orangepi@orangepi:~\$ **sudo orangepi-config**

b. Then select System

	orangepi-config							
Configure Debian bul	lseye based OrangePi for the OPI Zero3							
SoC runs between 480 and 1512 MHz using ondemand governor.								
Support: http://www.	orangepi.org							
System	System and security settings wired, wireless, Bluetooth, access point							
Personal	Timezone, language, hostname							
Help	Documentation, support, sources							
L	-							
	< 0K > < Exit >							

c. Then select **Hardware**

	System settings
Install Bootenv CPU Avabi	Install to/update boot loader Edit boot environment Set CPU speed and governor Announce system in the network
Hardwar SSH Firmwar ZSH Desktop	 Toggle hardware configuration: UART, I2C, etc. Reconfigure SSH daemon Run apt update & apt upgrade Install ZSH with plugins and tmux Disable desktop or change login type
	<mark>< OK ></mark> < Back >

d. Then use the arrow keys on the keyboard to navigate to the position shown in the figure below, and then use the space to select ph-uart5

[]	ph-uart2	
[*]	ph-uart5	
	pi-12c0	

e. Then select **<Save>** to save

< <mark>S</mark> ave >	< Back >	-

f. Then select **<Back>**



g. Then select **<Reboot>** to restart the system to make the configuration take effect

Applying changes	
Reboot to enable new features?	
<pre><reboot> <cancel></cancel></reboot></pre>	

3) After entering the linux system, first confirm whether there is a uart5 device node

under /dev

Note that the linux5.4 system is /dev/ttyAS5.

orangepi@orangepi:~\$ ls /dev/tty85

/dev/ttyS5

4) Then start to test the uart5 interface, first use the DuPont line to short the rx and tx of the uart5 interface to be tested

	uart5
tx pin	Corresponding to pin 8 in 26pin
rx pin	Corresponding to pin 10 in 26pin

5) Finally, you can run the **serialTest.py** program in the examples to test the loopback function of the serial port. If you can see the following print, it means that the loopback test of the serial port is normal

root@	orangepi	:~/wiringOP-Python# cd examples	
root@	orangepi	:~/wiringOP-Python/examples# python3 serialTest.pydevice "/dev/ttyS5"	# linux6.1 使用
root@	orangepi	:~/wiringOP-Python/examples# python3 serialTest.pydevice "/dev/ttyAS5"	# linux5.4 使用
Out:	0: ->	0	
Out:	1: ->	1	
Out:	2: ->	2	
Out:	3: ->	3	
Out:	4:^C		
exit			

3. 20. Hardware Watchdog Test

The watchdog_test program is pre-installed in the linux system released by Orange PI, which can be tested directly.

The method of running the watchdog_test program is shown below:

- a. The second parameter 10 indicates the counting of the door dog. If the dog is not fed in this time, the system will restart
- b. We can feed the dog by pressing any key (except ESC) on the keyboard. After the dog is fed, the program will print a line of Keep Alive to indicate that the dog

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

3. 21. Check the chipid of the H618 chip

The command of the H618 chip Chipid is shown below. The chipid of each chip is different, so you can use Chipid to distinguish multiple development boards.

orangepi@orangepi:~\$ cat /sys/class/sunxi_info/sys_info | grep "chipid" sunxi_chipid : 338020004c0048080147478824681ed1

3. 22. Python related instructions

3. 22. 1. Python source code compilation and installation method

If the Python version in the Ubuntu or Debian system software warehouse does not meet the requirements of development, if you want to use the latest version of Python, you can use the following method to download the source code package of Python to compile and install the latest version of Python.

The following demonstration is the latest version of the compilation and installation of Python3.9. If you want to compile and install other versions of Python, the method is the same (need to download the source code corresponding to the Python you want to install).

1) First install the dependency package required to compile Python

orangepi@orangepi:~\$ sudo apt-get update orangepi@orangepi:~\$ sudo apt-get install -y build-essential zlib1g-dev \ libncurses5-dev libgdbm-dev libnss3-dev libssl-dev libsqlite3-dev \ libreadline-dev libffi-dev curl libbz2-dev

2) Then download the latest version of the Python3.9 source code and decompress it orangepi@orangepi:~\$ wget \
https://www.python.org/ftp/python/3.9.10/Python-3.9.10.tgz
orangepi@orangepi:~\$ tar xvf Python-3.9.10.tgz

3) Then run the configuration command
 orangepi@orangepi:~\$ cd Python-3.9.10
 orangepi@orangepi:~\$./configure --enable-optimizations

4) Then compile and install python3.9, the compilation time takes about half an hour orangepi@orangepi:~\$ make -j4 orangepi@orangepi:~\$ sudo make altinstall

5) After installation, you can use the following command to view the Python version number just installed

orangepi@orangepi:~\$ python3.9 --version Python 3.9.10

6) Then update pip

orangepi@orangepi:~\$ /usr/local/bin/python3.9 -m pip install --upgrade pip

3. 22. 2. Python to replace the pip source method

The Linux system PIP's default source is the official source of Python, but the source of the official Python official visits is very slow, and the Python software packaging failure is often caused by network reasons. So when installing the Python library with PIP, remember to replace the pip source

1) First install **python3-pip**

orangepi@orangepi:~\$ sudo apt-get update orangepi@orangepi:~\$ sudo apt-get install -y python3-pip 2) Method of permanent replacement of pip source under Linux

a. Create a new~/.pip directory first, then add the **pip.conf** configuration file, and set the source of the pip as Tsinghua source

orangepi@orangepi:~\$ mkdir -p ~/.pip orangepi@orangepi:~\$ cat <<EOF > ~/.pip/pip.conf [global] timeout = 6000 index-url = https://pypi.tuna.tsinghua.edu.cn/simple trusted-host = pypi.tuna.tsinghua.edu.cn EOF

b. Then install the Python library with pip3, it will be fast

3) The method of temporarily replacing the pip source under Linux, the **<packagename>** needs to be replaced with a specific package name

orangepi@orangepi:~\$ pip3 install <packagename> -i \ https://pypi.tuna.tsinghua.edu.cn/simple --trusted-host pypi.tuna.tsinghua.edu.cn

3. 23. The Method Of Installing The Docker

Orange Pi's Linux image has been pre-installed with Docker, but the Docker service has not been opened by default. Use **enable_docker.sh** script to enable the docker service, and then you can start using the docker command, and the docker service will be automatically activated at the next start of the system.

orangepi@orangepi:~\$ enable_docker.sh

You can use the following command to test the docker, If you can run **hello-world** to indicate that docker can be used normally.

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

Hello from Docker!

This message shows that your installation appears to be working correctly.

When using the docker command, if it prompts **permission denied**, please add the current user to the docker user group, so that the docker command can be run without sudo $_{\circ}$

orangepi@orangepi:~\$ sudo usermod -aG docker \$USER

Note: You need to log out of the system and log in again to take effect, and restarting the system is also OK.

3. 24. How to install Home Assistant

Note that only the method of installing Home Assistant in Ubuntu or Debian system will be provided here. For detailed usage of Home Assistant, please refer to official documents or corresponding books.

3. 24. 1. Install via docker

1) First of all, please install docker and make sure that docker can run normally. The Method Of Installing The Docker, please refer to the instructions in the section on how to install Docker.

2) Then you can search for the docker image of Home Assistant orangepi@orangepi:~\$ docker search homeassistant

3) Then use the following command to download the docker image of Home Assistant to the local. The size of the image is about 1GB, and the download time will be relatively long. Please wait patiently for the download to complete

orangepi@orangepi:~\$ docker pull homeassistant/home-assistant

Using default tag: latest

latest: Pulling from homeassistant/home-assistant

be307f383ecc: Downloading

5fbc4c07ac88: Download complete

..... (omit some output)

3cc6a1510c9f: Pull complete

7a4e4d5b979f: Pull complete Digest: sha256:81d381f5008c082a37da97d8b08dd8b358dae7ecf49e62ce3ef1eeaefc4381bb Status: Downloaded newer image for homeassistant/home-assistant:latest docker.io/homeassistant/home-assistant:latest

4) Then you can use the following command to view the docker image of Home Assistant just downloaded

orangepi@orangepi:~\$ docker	r images h	omeassistant/hon	ne-assistant	
REPOSITORY T	AG	IMAGE ID	CREATED	SIZE
homeassistant/home-assistant	latest	bfa0ab9e1cf5	2 months ago	1.17GB

5) Now you can run the docker container of Home Assistant

```
orangepi@orangepi:~$ docker run -d \
--name homeassistant \
--privileged \
--restart=unless-stopped \
-e TZ=Asia/Shanghai \
-v /home/orangepi/home-assistant:/config \
--network=host \
homeassistant/home-assistant:latest
```

6) Then enter **(**IP address of the development board: 8123 **)** in the browser to see the Home Assistant interface

It takes a while for the Home Assistant container to start. If the following interface is not displayed normally, please wait for a few seconds and then refresh. If the following interface is not displayed normally after waiting for more than one minute, it means that there is a problem with the installation of Home Assistant. At this time, you need to check whether there is a problem with the previous installation and setting process.



7) Then enter your name, user name and password and click Create Account

Home Assistant
Are you ready to awaken your home, reclaim your privacy and join a worldwide community of tinkerers?
Let's get started by creating a user account.
Name
Username
Password O
Confirm Password
CREATE ACCOUNT Alternatively you can restore from a previous backup.

8) Then follow the interface prompts to set according to your preferences, and then click Next



← → C () 🖄 ↔ 192.168.1.15:8123/onboarding.html		談合 な ち ※ 目
👩 orangepi		
	Home Assistant Helio Berry, welcome to Home Assistant. How would you like to mane your home Assistant and assistant.	
	We would like to know where you live. This information will help with displaying information and setting up sur-based automations. This data is never shared outside dryour network.	
	one-time request to an external service.	
4	Country* Language*	
	Time Zone Binution	
	Unit System Unit System Us customary Fahrenbeit, pounds	
	Currency Find my value	
	NEXT	\sim

9) Then click Next



10) Then click Finish

← → C orangepi	○ A 0~ 192.168.1.15/8123/onboarding.html		羅 合	t, +, ≫ ≡
		Image: Weight of the second		
•	$\leq \langle \rangle$	Reacon Tracker MSStack Atom Roomba Coho a61920 (192:168.1.167		

11) The final main interface displayed by Home Assistant is shown in the figure below



Ξ¢	Home Assista	nt
-	Overview	
4	Energy	
₽	Мар	
Ξ	Logbook	
1	History	
	ESPHome	
۵	Media	
>_	Terminal	
7	Developer Tools	
2	Pattings	
4	settings	8
	Notifications	0
0	orange	

12) How to stop the Home Assistant container

a. The command to view the docker container is as follows

orangepi@orangepi:~\$ docker ps -a

b. The command to stop the Home Assistant container is as follows

orangepi@orangepi:~\$ docker stop homeassistant

c. The command to delete the Home Assistant container is as follows

orangepi@orangepi:~\$ docker rm homeassistant

3. 24. 2. Install via python

Before installation, please replace the source of pip with a domestic source to speed up the installation of the Python package. For the configuration method, see the instructions in the section on Python to replace the pip source method.

1) First install the dependency package

orangepi@orangepi:~\$ sudo apt-get update

orangepi@orangepi:~\$ sudo apt-get install -y python3 python3-dev python3-venv \ python3-pip libffi-dev libssl-dev libjpeg-dev zlib1g-dev autoconf build-essential \ libopenjp2-7 libtiff5 libturbojpeg0-dev tzdata

If it is debian12, please use the following command:

orangepi@orangepi:~\$ sudo apt-get update

orangepi@orangepi:~\$ sudo apt-get install -y python3 python3-dev python3-venv \ python3-pip libffi-dev libssl-dev libjpeg-dev zlib1g-dev autoconf build-essential \

libopenjp2-7 libturbojpeg0-dev tzdata

2) Then you need to compile and install Python3.9. For the method, please refer to the section on how to compile and install Python source code

The default Python version of Debian Bullseye is Python3.9, so there is no need to compile and install.

The default Python version of Ubuntu Jammy is Python3.10, so there is no need to compile and install.

The default Python version of Debian Bookworm is Python3.11, so there is no need to compile and install.

3) Then create a Python virtual environment

Debian Bookworm is python3.11, please remember to replace the corresponding command.

orangepi@orangepi:~\$ sudo mkdir /srv/homeassistant

orangepi@orangepi:~\$ sudo chown orangepi:orangepi /srv/homeassistant

orangepi@orangepi:~\$ cd /srv/homeassistant

orangepi@orangepi:~\$ python3.9 -m venv .

orangepi@orangepi:~\$ source bin/activate

(homeassistant) orangepi@orangepi:/srv/homeassistant\$

4) Then install the required Python package

(homeassistant) orangepi@orangepi:/srv/homeassistant\$ python3 -m pip install wheel

5) Then you can install Home Assistant Core

(homeassistant) orangepi@orangepi:/srv/homeassistant\$ pip3 install homeassistant

6) Then enter the following command to run Home Assistant Core

(homeassistant) orangepi@orangepi:/srv/homeassistant\$ hass

7) Then enter **[IP address of the development board: 8123]** in the browser to see the interface of Home Assistant

When running the hass command for the first time, you will download and install and cache some necessary libraries and dependencies to run. This process may take a few minutes. Note that at this time, the interface of Home Assistant cannot be seen in the browser. Please wait for a while before refreshing.

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🌀 orangepi			· · · · · · · · · · · · · · · · · · ·	6
		Home Assistant		
		Are you ready to awaken your home, reclaim your privacy and join a worldwide community of tinkerers? Let's get started by creating a user account.		
		Name		
		Username		
		Password		
		Confirm Password		
		CITEATE ACCOUNT Alternatively you can restore from a revious backue.		

3. 25. **OpenCV installation method**

3. 25. 1. Use apt to install OpenCV

1) The installation command is shown below

orangepi@orangepi:~\$ sudo apt-get update

orangepi@orangepi:~\$ sudo apt-get install -y libopencv-dev python3-opencv

2) Then use the following command to print the output of the version number of OpenCV, indicating that the installation of OpenCV is successful

a. The version of OpenCV in ubuntu22.04 is shown below:

orangepi@orangepi:~\$ python3 -c "import cv2; print(cv2.__version__)" 4.5.4

b. The version of OpenCV in Ubuntu 20.04 is shown below:

orangepi@orangepi:~\$ python3 -c "import cv2; print(cv2.__version__)" 4.2.0

c. The version of OpenCV in Debian11 is shown below:

orangepi@orangepi:~\$ python3 -c "import cv2; print(cv2.__version__)" 4.5.1

d. The version of OpenCV in Debian12 is shown below:

orangepi@orangepi:~\$ python3 -c "import cv2; print(cv2.__version__)" 4.6.0

3. 26. The installation method of the aapanel Linux panel

aapanel Linux panel is a server management software that improves operation and maintenance efficiency. It supports more than 100 server management functions such as one -click LAMP/LNMP/cluster/monitoring/website/FTP/database/Java (excerpted from Baota official website)

1) First of all, you need to expand the/tmp memory. After setting, you need to restart the linux system of the development board, and the command is shown below:

orangepi@orangepi:~\$ sudo sed -i 's/nosuid/&,size=2G/' /etc/fstab orangepi@orangepi:~\$ sudo reboot

2) After restarting, you can see that the size of the/tmp space has become 2G orangepi@orangepi:~\$ df -h | grep "/tmp" tmpfs
2.0G 12K 2.0G 1% /tmp

3) Then enter the following command in the Linux system to start the installation of the aapanel

orangepi@orangepi:~\$ sudo install_bt_panel.sh

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

+-----

Bt-WebPanel FOR CentOS/Ubuntu/Debian

+-----

Copyright © 2015-2099 BT-SOFT(http://www.bt.cn) All rights reserved.

+-----

The WebPanel URL will be http://SERVER_IP:8888 when installed.

+-----

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

5) Then you have to wait patiently. When you see the printing information below the terminal output, it means that the pagoda has been installed. The entire installation



process takes about 34 minutes. There may be some differences according to the difference in network speed

 外网面板地址: 内网面板地址:	<u>https://183.15.204.194:29920/52024d5</u> 9 https://192.168.1.166:29920/52024d59
username: 4qha	gfrc
password: 27b2	d026
If you cannot	access the panel,
release the fo 若无法访问面板 因已开启面板自	llowing panel port [29920] in the security group ,请检查防火墙/安全组是否有放行面板[29920]端口 签证书,访问面板会提示不匹配证书,请参考以下链接配置证书 /bbs/thread_105443-1-1_html

6) At this time, enter the **panel address** displayed above in the browser to open the login interface of the aapanel Linux panel, and then enter the **username** and **password** displayed in the corresponding position to log in to the aapanel

← → C 心 ▲ 不安全 https://192.168.1.166.29920/52024d59
宝玉····································
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图(2013)

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



8) After entering the aapanel, you will first prompt that you need to bind the account of the aapanel official website. If you do n't have an account, you can go to the aapanel 's official website (https://www.bt.cn) to register one

← → C △ ▲ 不安全 https://192.168.1.	.166/29920/bind	lê t	2 🗆 🛎
192.168.1.166 0			
☆ 首页			
	主体者にはアダルにながれたなが、加速になり入りませんのコンスをなかが完美、からなどのなが正づきないになったので、 のないなから、		
🏚 FTP	绑定宝塔帐号		
	THE .		
圆 监控	כעורים		
☑ 安全	党府		
🖤 WAF	登录		
□ 文件	·朱冉熙唱,免雷注册		
- 日本	• 为了您相距好的体验票嘅功制,请先哪边坚体账号;		
□ 终端	 单个性型等等性多型能分離構成; - 螺定常与注意就会指的功能反映,请给心使用; 		
🗇 计划任务	 林母師定过程中遇到问题清晰或解散处理; 本編曲語: 0769-23030556 		
器 软件商店	 客器内询: 查案二约码 		
🖗 面板设置			
□ 退出			
	宝塔Linux画板 © 2014-2023 广东建塔安全技术有限公司 (bt.cn) 论坛求助 使用手册 微価公众号 正版查询 毎局QQ課: 907340327		

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

<i>o</i> range	e Pi User Manual	C	opyright reserv	ed by Sher	zhen Xun	long Softw	are Co., L	td
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192.168.1.166 0	○ 157****4643 2 激減認知 ▲ 系	統: Orange Pi 1.0.0 Bullseye aarch64(P	y3.7.16) 已不间断运行: 0天			企业版 免费版	7.9.10 更新 修复 重启	Ĵ
	状态							
 FTP ● 数据库 国 监控 	负载状态 ⑦	CPU使用率 2%	内存使用率 33%	35%	/va	r/log		
ジ 安全 ● WAF	运行流畅	4 核心	490 / 1483(MB)	4.916 / 14.386	0.03G	/ 0.05G		
▷ 文件 昆 日志	概览	FTP	約提库	*	全风险			
 2 终端 11 11 11 11 11 11 11 11 11 11 11 11 11 11 11 11 11 11 11 11 11 11 11 11 11 11 11 11 11 11 11 11 11 11 11 11 11 11 11 11 11 11 11 11 11 11 11 11 11 11 11 11 11 11 11 11 11 11 11 11 11 11 11 11 11 11 11 11 11 11 11 11 11 11 11 11 11 11 11 11 11 11 11 11 11 11 11 11 11 11 11 11 11 11 11 11 11 11 11 11 11 11 11 11 11 11 11 11 11 11 11 11 11 11 11 11 11 11 11 11 11 11 11 11 11 11 <l< th=""><td>0</td><td>0</td><td>0</td><td></td><td>12</td><td></td><td></td><td></td></l<>	0	0	0		12			
器 软件商店 ◎ 面板设置	软件			流量 磁盘IC			全部	客服
日退出	上 宝塔SSH终装 1.0 ▶ (現今日)	▲ 約2週 1.0 ►		●上行 0.44 KB 单位:KB/s	●下行 0.90 KB	意源道 5.24 MB	总接收 381.04 MB	四 评价

10) For more functions of the aapanel, please refer to the following information to explore by yourself

Use manual: http://docs.bt.cn Forum website: https://www.bt.cn/bbs GitHub Link: https://github.com/aaPanel/BaoTa

3. 27. "face_recognition" The installation and testing method of the face recognition library

Note that the contents of this section are tested in the Linux system of the **desktop version**, so please make sure that the system used by the development board is a desktop version system.

In addition, the installation test below is performed under OrangePi users. Please keep the environment consistent.

Debian12 is currently not adapted.

The address of the source code warehouse of Face_recognition is: https://github.com/ageitgey/face_recognition

Face_recognition Chinese version of the explanation document is: https://github.com/ageitgey/face_recognition/blob/master/README_Simplified_Chi

nese.md

3. 27. 1. The method of using script to automatically install face_recognition

First open a terminal on the desktop, then download face_recognition_install.sh
 orangepi@orangepi:~/Desktop\$ wget \

https://gitee.com/leeboby/face_recognition_install/raw/master/face_recognition_install.sh

2) Then execute the following command to start the installation face_recognition orangepi@orangepi:~/Desktop\$ bash face_recognition_install.sh

3) After face_recognition is installed, it will automatically download the source code of face_recognition, and then automatically run some examples in face_recognition. If you can finally see the following pictures popping up on the desktop, it means that the face_recognition installation test is successful.



3. 27. 2. Manually install face_recognition

1) First create a new ~/.pip directory, then add the pip.conf configuration file, and set the mirror source of pip to Tsinghua source in it, the commands to be executed are as follows:

orangepi@orangepi:~\$ mkdir -p ~/.pip orangepi@orangepi:~\$ cat <<EOF > ~/.pip/pip.conf [global] timeout = 6000

index-url = https://pypi.tuna.tsinghua.edu.cn/simple trusted-host = pypi.tuna.tsinghua.edu.cn EOF

2) Then install dependencies

orangepi@orangepi:~\$ sudo apt update orangepi@orangepi:~\$ sudo apt install -y python3-pip libopencv-dev \ python3-opencv imagemagick python3-scipy python3-setuptools python3-wheel \ python3-dev cmake python3-testresources

3) Then update pip3

orangepi@orangepi:~**\$ python3 -m pip install -U pip setuptools wheel**

4) Before installing **face_recognition**, you first need to install the **dlib** library. Since the compilation and installation of the dlib library on the development board is relatively slow, I saved a compiled dlib whl file on **gitee**, and you can install it directly after downloading. The download address of the dlib whl file is as follows:

ittps://gitee.com/leeboby/python_whl											
a.	First	download	the	python_whl	warehouse	to	the	Linux	system	of t	he
	devel	opment boa	ırd								
	$\cdot \circ$	• • •		1 4 4	1			/	41		

orangepi@orangepi:~\$ git clone --depth=1 https://gitee.com/leeboby/python_whl

b. In the python_whl folder, you can see that there are multiple versions of dlib installation packages. The Linux systems corresponding to different versions of dlib are as follows:

Ubuntu20.04	dlib-19.24.0-cp38-cp38-linux_aarch64.whl
Ubuntu22.04	dlib-19.24.0-cp310-cp310-linux_aarch64.whl
Debian11	dlib-19.24.0-cp39-cp39-linux_aarch64.whl

- c. Then you can start installing dlib, the command is as follows
 - a) Ubuntu20.04

orangepi@orangepi:~\$ cd python_whl

orangepi@orangepi:~/python_whl\$ python3 -m pip install dlib-19.24.0-cp38-cp38-linux_aarch64.whl

b) Ubuntu22.04

orangepi@orangepi:~\$ cd python_whl

orangepi@orangepi:~/python_whl\$ python3 -m pip install dlib-19.24.0-cp310-cp310-linux_aarch64.whl

c) Debian11

orangepi@orangepi:~\$ cd python_whl

orangepi@orangepi:~/python_whl\$ python3 -m pip install dlib-19.24.0-cp39-cp39-linux_aarch64.whl

d. After installation, if the version number of dlib can be printed normally by using the following command, it means that dlib is installed correctly

orangepi@orangepi:~/python_whl\$ python3 -c "import dlib; print(dlib.__version__)" 19.24.0

5) Then install face_recognition_models-0.3.0-py2.py3-none-any.whl

orangepi@orangepi:~/python_whl\$ python3 -m pip install face_recognition_models-0.3.0-py2.py3-none-any.whl

6) Then install **face_recognition**

orangepi@orangepi:~**\$ python3 -m pip install face_recognition**

7) Then you need to **reopen a terminal** to find and run the two commands **face detection** and **face recognition**

- a. The face_recognition command is used to recognize whose face is in a single image or a folder of images.
- b. The face_detection command is used to locate the face in a single picture or a picture folder

orangepi@orangepi:~\$ which face_detection
/usr/local/bin/face_detection
orangepi@orangepi:~\$ which face_recognition
/usr/local/bin/face_recognition

If you can't find the above two commands after reopening the terminal, please try to manually import environment variables, and then test again

orangepi@orangepi:~\$ export PATH=/home/orangepi/.local/bin:\$PATH

3. 27. 3. The test method of face_recognition

Note that the following operations are demonstrated on the desktop, so please connect the HDMI monitor first, or use NoMachine/VNC to remotely log in to the Linux desktop to test.

1) There are some sample codes in the source code of **face_recognition**, which we can use directly for testing. The download address of the source code of face_recognition is

as follows:

a. GitHub official download address

orangepi@orangepi:~\$ git clone https://github.com/ageitgey/face_recognition.git

b. Gitee image download address

orangepi@orangepi:~\$ git clone https://gitee.com/leeboby/face_recognition.git

2) The path to the face_recognition sample code is as follows

face_recognition/examples

3) The Chinese description document link of face_recognition is as follows, please read it carefully before using face recognition

https://github.com/ageitgey/face_recognition/blob/master/README_Simplified_Chinese.md

4) **find_faces_in_picture.py** is used to locate the position of the face in the picture, the test steps are as follows

a. Open a terminal on the desktop, then enter the **face_recognition/examples** directory, and then execute the following command

orangepi@orangepi:~\$ cd face_recognition/examples

orangepi@orangepi:~/face_recognition/examples\$ python3 find_faces_in_picture.py I found 1 face(s) in this photograph.

A face is located at pixel location Top: 241, Left: 419, Bottom: 562, Right: 740

b. Wait for a while and the following picture will pop up, which is the face located in the test picture



5) **find_facial_features_in_picture.py** is used to identify the key points of the face in a single picture, and the test steps are as follows

a. Open a terminal on the desktop, then enter the **face_recognition/examples** directory, and then execute the following command

orangepi@orangepi:~\$ cd face_recognition/examples

orangepi@orangepi:~/face_recognition/examples\$ python3 find_facial_features_in_picture.py

b. After waiting for a while, the following picture will pop up, and you can see that the outline of the face is marked



6) **identify_and_draw_boxes_on_faces.py** is used to identify faces and mark them with boxes. The test steps are as follows

a. Open a terminal on the desktop, then enter the **face_recognition/examples** directory, and then execute the following command

orangepi@orangepi:~\$ cd face_recognition/examples

orangepi@orangepi:~/face_recognition/examples\$ python3 identify_and_draw_boxes_on_faces.py

b. After waiting for a while, the following picture will pop up. You can see that the faces in the picture are marked with boxes, and the names of the characters are displayed correctly



7) **face_distance.py** is used to compare whether two faces belong to the same person at different precisions. First open a terminal, then enter the **face_recognition/examples** directory, and then execute the following command to see the output of the test

orangepi@orangepi:~\$ cd face recognition/examples

orangepi@orangepi:~/face_recognition/examples\$ python3 face_distance.py

The test image has a distance of 0.35 from known image #0

- With a normal cutoff of 0.6, would the test image match the known image? True

- With a very strict cutoff of 0.5, would the test image match the known image? True

The test image has a distance of 0.82 from known image #1 - With a normal cutoff of 0.6, would the test image match the known image? False - With a very strict cutoff of 0.5, would the test image match the known image? False

8) **recognize_faces_in_pictures.py** is used to identify who the face in the unknown
picture is. First open a terminal, then enter the **face_recognition/examples** directory, and then execute the following command, and you can see the test results after waiting for a while

orangepi@orangepi:~\$ cd face_recognition/examples

orangepi@orangepi:~/face_recognition/examples\$ python3 recognize_faces_in_pictures.py

Is the unknown face a picture of Biden? False

Is the unknown face a picture of Obama? True

Is the unknown face a new person that we've never seen before? False

9) facerec_from_webcam_faster.py is used to recognize the face in the USB camera,

the test steps are as follows:

a. First, please insert the USB camera into the USB interface of the development board, and then use the v4l2-ctl (note that l in v4l2 is a lowercase letter l, not the number 1) command to check the serial number of the device node of the USB camera

orangepi@orangepi:~\$ sudo apt update orangepi@orangepi:~\$ sudo apt install -y v4l-utils orangepi@orangepi:~\$ v4l2-ctl --list-devices cedrus (platform:cedrus):

/dev/video0

USB2.0 UVC PC Camera: USB2.0 UV (usb-5311000.usb-1):

/dev/video1 /dev/video2

orangepi@orangepi:~\$ cd face recognition/examples

orangepi@orangepi:~/face_recognition/examples\$ vim facerec_from_webcam_faster.py

video_capture = cv2.VideoCapture(1)

c. Then execute the following command to run facerec_from_webcam_faster.py orangepi@orangepi:~/face_recognition/examples\$ python3 facerec_from_webcam_faster.py

d. Wait for a while and the camera display screen will pop up

^{b. Then open a terminal on the desktop, enter the face_recognition/examples directory, and first modify the device serial number of the camera used in facerec_from_webcam_faster.py. For example, through the v4l2-ctl --list-devices command above, you can see that the USB camera is /dev/video1, then modify the 0 in cv2.VideoCapture(0) to 1}



- e. At this point, you can point the camera at yourself. When the camera detects a face, it will frame the detected face with a square. Note that when detecting a face, the image displayed by the camera will be relatively slow, please do not move too fast
- f. You can also open a picture of Obama, and then use the camera to point at the opened picture. You can see that not only the face can be marked, but also the name of the detected face can be displayed correctly. Note that when detecting a face, the image displayed by the camera will be relatively slow, please do not move too fast



10) **web_service_example.py** is a very simple case of using a web service to upload a picture to run face recognition. The backend server will identify whether the picture is Obama, and output the recognition result as a json key-value pair. The test steps are as

follows:

a. Open a terminal on the desktop, then enter the face_recognition/examples directory, and then execute the following command (if face_recognition is automatically installed using a script, then there is no need to install flask)

orangepi@orangepi:~\$ python3 -m pip install flask

orangepi@orangepi:~\$ cd face_recognition/examples

root@orangepi:~/face_recognition/examples\$ python3 web_service_example.py

- * Serving Flask app 'web_service_example' (lazy loading)
- * Environment: production

WARNING: This is a development server. Do not use it in a production deployment. Use a production WSGI server instead.

- * Debug mode: on
- * Running on all addresses (0.0.0.0)

WARNING: This is a development server. Do not use it in a production deployment.

- * Running on http://127.0.0.1:5001
- * Running on http://192.168.1.79:5001 (Press CTRL+C to quit)
- * Restarting with stat
- * Debugger is active!
- * Debugger PIN: 500-161-390
 - b. Then open another terminal and run the following command to return the result of image recognition (note that the execution path of the following command is **face recognition/examples**)

orangepi@orangepi:~/face_recognition/examples\$ curl -XPOST -F \ "file=@obama2.jpg" http://127.0.0.1:5001

"face_found_in_image": true, "is_picture_of_obama": true

}

c. We can also copy the picture **face_recognition/examples/obama2.jpg** to other Linux computers. Of course, we can also prepare a picture named **obama2.jpg** by ourselves, and then use the following command on the Linux computer to remotely Use the service running on the development board to recognize faces (note that the IP address in the command needs to be replaced with the IP address of the development board, and the file name after file needs to be replaced with the name of the picture you want to test). test@test:~\$ curl -XPOST -F "file=@obama2.jpg" http://192.168.1.79:5001

"face_found_in_image": true, "is_picture_of_obama": true

- d. The method to test using the browser is as follows:
 - a) First open the browser, then enter the IP address of the development board:
 5001 in the address bar of the browser, and then you can see the following page

Applications	🕝 Is this a picture	of Oba	OrangePi - root@orange
Is this a pict	ture of Obama? x	+	
← → C (Not secure	192.168	3.1.79:5001
🔢 Apps 🧔 D	ebian.org 🧔 Lates	t News	🥺 Help

Upload a picture and see if it's a picture of Obama!

Choose File No file chosen Upload

b) Then copy obama2.jpg to the desktop

orangepi@orangepi:~/face_recognition/examples\$ cp obama2.jpg /home/orangepi/Desktop/

c) Then select the picture you just copied in your browser



d) Then click **Upload** to upload the picture you just selected for face recognition

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S Is this a picture of Obama? x	+
← → C ☆ ▲ Not secure	192.168.1.79 :5001
Apps @ Debian.org @ Lates	st News 🔞 Help

Upload a picture and see if it's a picture of Obama!

Choose File	obama2.jpg	Upload	
	,	Construction of the local division of the lo	

e) After waiting for a while, the detection result will be displayed



- 11) **face_detection** command test example
 - a. The face_detection command-line tool can locate the face position (output pixel coordinates) in a single picture or a picture folder. Use **face_detection --help** to view the help information of the face_detection command

orangepi@orangepi:~\$ face_detection --help

Usage: face_detection [OPTIONS] IMAGE_TO_CHECK

Options:

cpus INTEGER	number of CPU cores to use in parallel1 means "use all in
	system"
model TEXT	Which face detection model to use. Options are "hog" or
	"enn".
help	Show this message and exit.

b. An example of detecting a single image is shown below:

orangepi@orangepi:~**\$ cd face_recognition/examples** orangepi@orangepi:~/face_recognition/examples**\$ face_detection obama2.jpg**

obama2.jpg,302,474,611,164

- c. An example of using multiple cores to detect multiple images in parallel is shown below:
 - a) First enter the **face_recognition/examples** folder

- b) Then create a new test folder
- c) Then copy the jpg images to the test folder
- d) Then use all cpus to run face_detection in parallel to check the pictures in the test folder, where --cpus -1 means to use all cpus

orangepi@orangepi:~\$ cd face_recognition/examples orangepi@orangepi:~/face_recognition/examples\$ mkdir test orangepi@orangepi:~/face_recognition/examples\$ cp *.jpg test orangepi@orangepi:~/face_recognition/examples\$ face_detection --cpus -1 test test/obama-240p.jpg,29,261,101,189 test/obama_small.jpg,65,215,169,112 test/obama2.jpg,302,474,611,164 test/two_people.jpg,62,394,211,244 test/two_people.jpg,95,941,244,792 test/obama.jpg,136,624,394,366 test/obama-480p.jpg,65,507,189,383 test/obama-720p.jpg,94,751,273,572 test/obama-1080p.jpg,136,1140,394,882 test/biden.jpg,233,749,542,439

12) face_recognition command test example

a. **face_recognition** command-line tool can recognize whose face is in a single picture or a picture folder. Use **face_recognition --help** to view the help information of the face_recognition command

orangepi@orangepi:~\$ face_recognition --help

Usage: face_recognition [OPTIONS] KNOWN_PEOPLE_FOLDER IMAGE_TO_CHECK

Options:

cpus INTEGER	number of CPU cores to use in parallel (can speed
	up processing lots of images)1 means "use all in
	system"
tolerance FLOAT	Folerance for face comparisons. Default is 0.6.
	Lower this if you get multiple matches for the same
	person.
show-distance BOOLEAN	Output face distance. Useful for tweaking tolerance
	setting.

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--help

Show this message and exit.

b. First create a new face picture folder known_people with a known name, then copy two pictures to known_people, and then copy obama2.jpg to unknown.jpg, which is the picture we want to identify

orangepi@orangepi~\$ cd face recognition/examples

orangepi@orangepi:~/face recognition/examples\$ mkdir known people

orangepi@orangepi:~/face_recognition/examples\$ cp biden.jpg obama.jpg known_people

orangepi@orangepi:~/face_recognition/examples\$ cp obama2.jpg unkown.jpg

c. Then you can use the following command to identify the name of the person in the **unknown.jpg** picture, and you can see that the unknown.jpg picture is recognized as obama

orangepi@orangepi:~/face_recognition/examples\$ face_recognition known_people \

unkown.jpg

unkown.jpg,obama

d. If we identify an irrelevant image, unknown_person will be displayed

root@orangepi:~/face_recognition/examples\$ face_recognition known_people \

alex-lacamoire.png

alex-lacamoire.png,unknown_person

e. We can also create a new test folder and put multiple pictures in it, and then we can use all the CPUs to recognize all the pictures in parallel

orangepi@orangepi:~/face_recognition/examples\$ mkdir test

orangepi@orangepi:~/face_recognition/examples\$ cp *.jpg *.png test

orangepi@orangepi:~/face_recognition/examples\$ face_recognition --cpus -1 \

known_people test

test/obama-240p.jpg,obama

test/alex-lacamoire.png,unknown_person

test/obama_small.jpg,obama

test/unkown.jpg,obama

test/obama2.jpg,obama

test/lin-manuel-miranda.png,unknown_person

test/two_people.jpg,biden

test/two_people.jpg,obama

test/obama-720p.jpg,obama

test/obama.jpg,obama

test/obama-480p.jpg,obama

test/biden.jpg,biden test/obama-1080p.jpg,obama

3. 28. Setting Chinese environment and installing Chinese input method

Note, please make sure that the Linux system used by the development board is a desktop system before installing the Chinese input method.

3. 28. 1. How to install Debian system

- 1) First set the default locale to Chinese
 - a. Enter the following command to start configuring the locale

orangepi@orangepi:~\$ sudo dpkg-reconfigure locales

b. Then select zh_CN.UTF-8 UTF-8 in the pop-up interface (move up and down through the up and down direction keys on the keyboard, select through the space bar, and finally move the cursor to <OK>through the Tab key, and then press Enter.)

Locales are a framework to switch between multiple languages and allow users to use their language, country, characters etc.	, collation order,
Please choose which locales to generate. UTF-8 locales should be chosen by default, particularly for new installations. sets may be useful for backwards compatibility with older systems and software.	Other character
Locales to be generated:	
<pre>[] xh_ZA ISO-8859-1] xh_ZA.UTF-8 UTF-8 [] yi_US CP1255 [] yi_US UTF-8 UTF-8 [] yw_HK UTF-8 [] yw_HK UTF-8 [] yw_HK UTF-8 [] zh_CN G62312 [] zh_CN G62312 [] zh_CN G618030 GB18030 [] zh_CH GBK GFK [] zh_SG (GK GK [] zh_SG (GK GK [] zh_SG (GK GK [] zh_SG (GK GK [] zh_TW.EUC-TW EUC-TW [] zh_TW.EUC-TW EUC-TW [] zh_TW.EUC-TW EUC-TW [] zh_TW.EUC-TW EUC-TW [] zh_ZA.UTF-8 UTF-8</pre>	
<ok> <cancel></cancel></ok>	

c. Then set the default locale to zh_CN.UTF-8



d. After exiting the interface, the **locale** setting will start, and the output displayed on the command line is as follows

orangepi@orangepi:~\$ sudo dpkg-reconfigure locales Generating locales (this might take a while)... en_US.UTF-8... done

zh_CN.UTF-8... done

Generation complete.

2) Then open the Input Method



3) Then choose **OK**



Current configuration for the input me	thod:				
* Default mode defined in /etc/default	t/im-config: 'auto'				
* Active configuration: 'missing' (norr	nally missing)				
* Normal automatic choice: 'fcitx' (no	mally ibus or fci	tx or uim)			
* Override rule: 'zh_CN,fcitx5:zh_TW,	fcitx5:zh_HK,fcitx	5:zh_SG,fcitx5'			
* Current override choice: " (Locale=	'en_US')				
* Current automatic choice: 'fcitx'					
* Number of valid choices: 1 (normall	y 1)				
* Desktop environment: 'XFCE'					
The configuration set by im-config is a	ctivated by re-sta	arting the system.			
Explicit selection is not required to en one is default/auto/cjkv/missing.	able the automat	ic configuration if t	ne ac	tive	3
				_	

4) Then choose Yes



5) Then choose fcitx



6) Then chooseOK



•	Input Method Configuration (im-config, ver. 0.46-1+deb1lu1) 🔹 🛧 – 🗖 🗙
Se	tting the user configuration /home/orangepi/.xinputrc to fcitx.
Ma	nual configuration selects: fcitx
Fle	exible Input Method Framework (fcitx)
*1	Required for all: fcitx
*1	Language specific input conversion support:
	Simplified Chinese: fcitx-libpinyin or fcitx-sunpinyin or fcitx-googlepinyin
	Traditional Chinese / generic Chinese: fcitx-rime
	Generic keyboard translation table: fcitx-table* packages
*;	Application platform support:
1	nstalling fcitx-frontend-all will cover all GUI platforms.
	GNOME/GTK: fcitx-frontend-gtk2 and fcitx-frontend-gtk3 (both)
	KDE/Qt5: fcitx-frontend-qt5
Th	e user configuration is modified by im-config.
Re	start the session to activate the new user configuration.
	Cancel OK

7) Then restart the Linux system to make the configuration take effect



8) Then open **Fcitx configuration**

9) Then click the + sign in the position shown in the figure below





10) Then search Google Pinyin and click OK

*		Input Meth	od Configuration		*	-		×
Input Method								
Keyboard - Englis	h (US)						Engli	ish
		Add	input method		+	•	×	
Google Piny	/in			Chinese	(China)			
🔽 Only Sh	ow Current Languag	ge					-	
goog	search go	ogle here				-	ן	
				Cancel	(ок	٦	
↓ ↓ ↓ ↓ ↓		-			-	-	-	NCG.
T	· /6 B							

11) Then bring Google Pinyin to the front





12) Then open the Geany editor to test the Chinese input method



13) The Chinese input method test is as follows



14) The Chinese and English input methods can be switched through the **Ctrl+Space** shortcut key

15) If the entire system needs to be displayed in Chinese, you can set the variables in /etc/default/locale to zh CN.UTF-8

orangepi@orangepi:~\$ sudo vim /etc/default/locale # File generated by update-locale LC_MESSAGES=zh_CN.UTF-8 LANG=zh_CN.UTF-8 LANGUAGE=zh_CN.UTF-8

16) Then **restart the system** and you can see that the system is displayed in Chinese



3. 28. 2. How to install Ubuntu 20.04 system

1) First open Language Support





2) Then find the **Chinese (China)** option

	Language Support	+ - □ ×
Language	Regional Formats	
Language for me	nus and windows: /	
English (United	(ingdom)	
汉语 (中国)		
中文 (香港)		
中文(臺灣)		
Drag languages t	arrange them in order of pre	ference.
Drag languages t Changes take effect Apply System	arrange them in order of pre	ference.
Drag languages t Changes take effec Apply System Use the same lang	arrange them in order of pre mext time you log in. Wide lage choices for startup and the lo	ference. ogin screen.
Drag languages t Changes take effect Apply System Use the same lang Install / Remo	o arrange them in order of pre next time you log in. Wide age choices for startup and the lo re Languages	ference. ogin screen.
Drag languages t Changes take effect Apply System Use the same lang Install / Remo Keyboard input r	o arrange them in order of present time you log in. Wide age choices for startup and the log re Languages hethod system: none -	ference. ogin screen.

3) Then please use the left mouse button to select **Chinese (China)** and hold it down, then drag it up to the initial position, the display after dragging is as shown in the figure below:

	Language Su	pport		*	-	•
Language	Regional Fo	ormats				
Language for me	nus and window	s:				
汉语 (中国)						
English (United	States)					
English						
English (Australi	a)					
e. U.L. fermals	1					
English (Canada)					
Drag languages to Changes take effect	y o arrange them ir t next time you log Wide	n order of p in.	reference.			
Drag languages to Changes take effect Apply System- Use the same langu	o arrange them ir t next time you log Wide uage choices for sta	n order of p in. artup and the	reference. e login screen.			
English (Canada Drag languages to Changes take effec Apply System- Use the same langu Install / Remov) o arrange them ir t next time you log Wide Jage choices for sta ve Languages	n order of p in. artup and the	reference. e login screen.			
English (Canada Drag languages to Changes take effec Apply System- Use the same langu Install / Remov Keyboard input n	y o arrange them ir t next time you log Wide uage choices for str ve Languages nethod system:	n order of p in. artup and the none -	reference. e login screen.	22		

Note that this step is not easy to drag, please be patient and try a few more times.

4) Then select **Apply System-Wide** to apply the Chinese settings to the entire system

(in		Language Sup	oport		*			×
	Language	Regional Fo	mats					-
	Language for mer	nus and windows	:					
	汉语 (中国)							
	English (United S	tates)						
	English							
	English (Australia	a)						
	English (Canada)							
	Apply System-V	Wide age choices for sta	tup and the	login screen.				
	Install / Remov	e Languages)					
	Keyboard input m	ethod system:	none 🔻		\$			
	Help				1	¢ cl	ose	Ĵ

5) Then setKeyboard input method system to fcitx

	Language Su	pport		*	-		×
Language	Regional Fo	rmats					
Language for me	nus and windows	:					
汉语 (中国)							
English (United S	states)						
English							
English (Australi	a)						
English (Canada)	1						
Changes take effect	next time you log Wide	in.	preferencer				
Use the same langu	age choices for sta	rtup and t	ne login screen.				
Install / Remov	e Languages	fcitx					
Keyboard input m	ethod system:	none					
W Help				1	K Cl	ose	

6) Then restart the Linux system to make the configuration take effect

7) After re-entering the system, **please choose not to ask me again** in the following interface, and then please decide whether the standard folder should also be updated to Chinese according to your preferences

	* ×
Δ	将标准文件夹更新到当前语言吗?
您已经以前语言》	(一种新语言登入。您可以将主文件夹下的某些标准文件夹名按照 行自动更新。该更新将会更改以下文件夹:
当前文件夹名称	新的文件夹名称
/home/orangepi/Desktop	/home/orangepi/桌面
/home/orangepi/Downloads	/home/orangepi/下载
/home/orangepi/Templates	/home/orangepi/模板
/home/orangepi/Public	/home/orangepi/公共的
/home/orangepi/Documents	/home/orangepi/文档
/home/orangepi/Music	/home/orangepi/音乐
/home/orangepi/Pictures	/home/orangepi/图片
/home/orangepi/Videos	/home/orangepi/视频
请注意,现有内容不会被移动。	
下不要再次询问我(D)	\$
保留旧的名称(K) 更新名称(U)

8) Then you can see that the desktop is displayed in Chinese





9) Then we can open **Geany** to test the Chinese input method, as shown in the figure below



10) After opening **Geany**, the default is English input method, we can switch to Chinese input method through **Ctrl+Space** shortcut key, and then we can input Chinese





3. 28. 3. How to install Ubuntu 22.04 system

1) First open Language Support



2) Then find the Chinese (China) option

	Language Support	+ - D >
Language	Regional Formats	
Language for m	enus and windows:	
Portugués (Bra	isil)	
Português (Por	tugal)	
русский (Росс	ийская Федерация)	
slovenšćina		
汉语 (中国)		
Changes take effe	ect next time you log in. n-Wide	
Use the same lan	guage choices for startup and the login	screen.
Use the same lan	guage choices for startup and the login ove Languages	screen.
Use the same lan Install / Rem Keyboard input	guage choices for startup and the login ove Languages method system: Fcitx 4 🕶	screen.

3) Then please use the left mouse button to select **Chinese (China)** and hold it down, then drag it up to the initial position, the display after dragging is as shown in the figure below:

	Language St	apport		* -	٥
Language	Regional Form	ats			
Language for m	enus and window	/S:			
汉语 (中国)					
English (United	d States)				
English					
Deutsch (Schw	eiz)				
Deutsch (Deut	schland)				
Drag languages Changes take effe	to arrange them i ect next time you log	n order of progin.	eference.		
Apply System	n-Wide				
Use the same lan	guage choices for st	artup and the	login screen.		
Install / Rem	ove Languages				
instan / Kenn					
Keyboard input	method system:	Fcitx 5 🕶			

Note that this step is not easy to drag, please be patient and try a few more times.

4) Then select **Apply System-Wide** to apply the Chinese settings to the entire system

	age Support 🔶 → I	
Language Regiona	al Formats	
Language for menus and v	vindows:	
汉语 (中国)		
English (United States)		
English		
Deutsch (Schweiz)		
Deutsch (Deutschland)		
Drag languages to arrange	them in order of preference.	
Drag languages to arrange Changes take effect next time Apply System-Wide	them in order of preference. you log in.	
Drag languages to arrange Changes take effect next time Apply System-Wide Use the same language choice	them in order of preference. you log in. es for startup and the login screen.	
Drag languages to arrange Changes take effect next time Apply System-Wide Use the same language choice Install / Remove Langua	them in order of preference. you log in. es for startup and the login screen. ages	
Drag languages to arrange Changes take effect next time Apply System-Wide Use the same language choice Install / Remove Langua Keyboard input method sy	them in order of preference. you log in. es for startup and the login screen. ages stem: Fcitx 5	

5) Then restart the Linux system to make the configuration take effect

6) After re-entering the system, please choose **not to ask me again** in the following interface, and then please decide whether the standard folder should also be updated to Chinese according to your preferences

	*	×
Δ	将标准文件夹更新到当前语言吗?	
(加) 恋已经に 新语言は	从一种新语言登入。您可以将主文件夹下的某些标准文件夹名按照 进行自动更新。该更新将会更改以下文件夹:	
当前文件夹名称	新的文件夹名称	
/home/orangepi/Desktop	/home/orangepi/桌面	
/home/orangepi/Downloads	/home/orangepi/下载	
/home/orangepi/Templates	/home/orangepi/模板	
/home/orangepi/Public	/home/orangepi/公共的	
/home/orangepi/Documents	/home/orangepi/文档	
/home/orangepi/Music	/home/orangepi/音乐	
/home/orangepi/Pictures	/home/orangepi/图片	
/home/orangepi/Videos	/home/orangepi/视频	
请注意,现有内容不会被移动。		
下不要再次询问我(D)	\$	
保留旧的名称(K) 更新名称(U)	

7) Then you can see that the desktop is displayed in Chinese





8) Then open the Fcitx5 configuration program



9) Then choose to use Pinyin input method

相八/4	主向AGA9 PD/AGAIT		
当前输入	法:		可用输入法:
分组:	Default	- + -	搜索输入法
键盘 - 英	598 (美国)		全語 法语 (加拿大) - 英语 (加拿大) 強語 近世沿语 - 英语 (元素)、美語、Macintosh) 健語 - 近世记语 - 石道 (元素)、美語、Macintosh) 健語 - 近世记语 - 石道 (元素)、美語、開作) 健語 - 近方记语 - 君(元素)、美語、開作) 健語 - 近方记语 - 2.then click here - 2.then click here - 健語 - 辺语 - Hanyu Pinyin (with AltGr dead keys) 健語 - 辺语 - 辺语 - 辺语 - 辺语 - 辺语 - 辺语 - 辺语 - 辺语 - 辺语 - 辺语 - 近语 - 近音 - 辺 - 辺 - 近 - 辺 - 辺 - 辺 - 辺 - 辺 - 辺 - 辺 - 辺
	选择系统键盘布局		✓ 仅显示当前语言(S)

10) The interface after selection is as shown below, and then click OK

Ł	Fcitx 配置	×
输入法 全局选项 附加组件		
当前输入法:	可用输入法:	
分组: Default	 	
<u> </u>	 (銀盘・印度语言 - 英语 (印度, 帶戶比符号) (銀盘・法语 (加拿大) - 英语 (加拿大) (銀盘・昭尼拉雪 - 英语 (马里, 美國, Macintosh) (銀盘・昭尼拉雪 - 英语 (马里, 美國, 國际) (銀盘・愛尔兰语 - 愛尔兰语 (UnicodeExpert) (銀金, 愛尔兰语 - 愛尔兰语 (UnicodeExpert) 	4
	汉语 健豊 - 汉语 - Hanyu Pinyin (with AltGr dead keys) 健豊 - 汉语	
	(前体中文(中国)) 自然码 五零天世 東京秋音 晩风 双川 二笔 电振码 右道 水塘会息	*
选择系统键盘布局	✔ 仅显示当前语言(S)	
第一个输入法将为非激活状态。通常您的	£将键盘或键盘-布局各称放在第一位。 ↓ ↓ ↓ ↓ ↓ ↓ ↓ ↓ ↓ ↓ ↓ ↓ ↓ ↓ ↓ ↓ ↓ ↓ ↓	:(0)

11) Then we can open **Geany** to test the Chinese input method, the opening method is shown in the figure below





12) After opening **Geany**, the default is English input method, we can switch to Chinese input method through **Ctrl+Space** shortcut key, and then we can input Chinese

	*未命名 - Geany	+ - □ ×
件(F) 编辑(E) 搜索(S)	查看(V) 文档(D) 项目(P) 生成(B) 工具(T) 帮助(H)	
🧯 🕶 🔛 👻 .	🚨 🗗 省 🗙 < > 🦓 🦘 - 🐎 🛅	-
标记 文档	未命名 🕱	
找到符号 1	ni hao	1
	1. 你好 2. 你 3. 尼 4. 泥 5. 妮 6. 逆 7. 臧	
	I	
▲ 10:54:37: 这是	Geany 1.38	
10:54:37: 新文	件"未命名"已打开。	
状态		
-		

3. 29. How to Remotely Log In to the Desktop of Linux System

3. 29. 1. Remote login using NoMachine

Make sure the Ubuntu or Debian system installed on the development board is a desktop system version. In addition, NoMachine also provides detailed documents.

It is strongly recommended to read this document to be familiar with the use of NoMachine. The document link is shown below:

https://knowledgebase.nomachine.com/DT10R00166

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

Before operation, please make sure that the Windows computer and the development board are in the same LAN, and can log in to the Ubuntu or Debian system of the development board through ssh

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

a. Since H618 is a SOC of the ARMV8 architecture, the system we use is Ubuntu or Debian, so you need to download the **NoMachine for ARM ARMv8 DEB** installation package. The download link is shown below:

Note that this download link may change, please look for the deb package of the Armv8/Arm64 version。

https://downloads.nomachine.com/download/?id=118&distro=ARM

Home / Download / NoMachine for ARM - arm64

NoMachine for ARM - arm64

ihilbi	Version:	8.5.3_1
ARM	Package size:	48.34 MB
	Package type:	DEB
	MD5 signature:	2291f8d8ec76f0a914285acaaa93e34d
	For:	Ubuntu 14.04/16.04/18.04/20.04, Debian 8/9/10
	Although y	our ARMv8 device may not be listed here, we encourage you to try the packages. Please consult the installation and configuration

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

Download



First enter the remote login software-NoMachine folder

Remote Login Software-NoMachine

Then download the arm64 version of the deb installation package

	nomachine_8.5.3_2.dmg
۵	nomachine_8.5.3_1_amd64.deb
-	nomachine_8.5.3_1_x64.exe
D	nomachine_8.5.3_1_arm64.deb

- c. Then upload the downloaded **nomachine_x.x.x_arm64.deb** to the Linux system of the development board
- d. Then use the following command to install **NoMachine** in the Linux system of the development board

orangepi@orangepi:~\$ sudo dpkg -i nomachine_x.x.x_x_arm64_arm64.deb

2) Then download the installation package of the Windows version of the NoMachine software, the download address is as follows

Note that this download link may change.

https://downloads.nomachine.com/download/?id=9

NoMachine for Windows - 64bit

4f341444cacd3ae8add3b6ee
/8/8.1/10/11/Windows Server 2008/2012/2016/2019

- 3) Then install NoMachine in Windows, please restart the computer after installation
- 4) Then open NoMachine in Window



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

loMachine		- 0
Machines	NE	MACHINE
😋 Add 🛛 📮 Edit 🍞 Connect 🔍 Search	🔛 View 🔗 Orde	s Settings
orangeni		
Liburatu 22.04.2 ITC		

6) Then click **OK**



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





- 8) Then click OK in the next interface
- 9) Finally, you can see the desktop of the development board Linux system



3. 29. 2. Log in remotely using VNC

Before operation, please make sure that the Windows computer and the development board are in the same local area network, and can log in to the Ubuntu or Debian system of the development board normally with ssh.

Ubuntu20.04 has many problems testing VNC, please do not use this method

1) First run the set vnc.sh script to set up vnc, remember to add sudo permission

orangepi@orangepi:~\$ sudo set_vnc.sh

You will require a password to access your desktops.



 Password:
 #Set the vnc password here, 8 -bit characters

 Verify:
 #Set the vnc password here, 8 characters

 Would you like to enter a view-only password (y/n)? n

 xauth:
 file /root/.Xauthority does not exist

 New 'X' desktop is orangepi:1

 Creating default startup script /root/.vnc/xstartup

 Starting applications specified in /root/.vnc/xstartup

 Log file is /root/.vnc/orangepi:1.log

 Killing Xtightvnc process ID 3047

 New 'X' desktop is orangepi:1

 Starting applications specified in /root/.vnc/xstartup

 Log file is /root/.vnc/orangepi:1.log

2) The steps to use the MobaXterm software to connect to the desktop of the Linux system of the development board are as follows:

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

KobaXterm	1. Click Session	- 0	×
Session Servers Tools	* X server Tools Games Settings Watcros Help 参愛 🌟 🖳 🖳 👯 Y 💬 🧰 🍰 20 Games Sessions View Solt MultExec Tunneling Packages Settings Help	X X server	(U) Exit
Quick connect	2. Select VNC		Ű
User sessions	ession settings SSH Telnet Rsh Xdmcp RDP VNC FTP SFTP Serial File Shell Browser Mosh Aws S3 WSL 3. Fill in the IP address of the development board	×	\$
	Basic Vnc settings Remote hostname or IP address 192.168.31.52 Port 5901 Advanced Vnc settings Network settings Pock settings]	
	4. Fill in the port number 5901		
	5. Click OK		
	Cancel		

b. Then enter the VNC password set earlier

Please enter your passv	vord for 192.168.31.46

Show passwor	d
OK 📀	🙁 Cancel

c. After successful login, the interface is displayed as shown in the figure below, and then you can remotely operate the desktop of the development board linux system





3. 30. How to install QT

1) Use the script below to install QT5 and QT Creator

orangepi@orangepi:~\$ install_qt.sh

2) After installation, the version number of QT will be automatically printed

a. The qt version that comes with Ubuntu 20.04 is **5.12.8**

orangepi@orangepi:~\$ install_qt.sh

.....

QMake version 3.1

Using Qt version **5.12.8** in /usr/lib/aarch64-linux-gnu

b. The QT version that comes with Ubuntu 22.04 is 5.15.3

orangepi@orangepi:~\$ install_qt.sh

.....

QMake version 3.1

Using Qt version **5.15.3** in /usr/lib/aarch64-linux-gnu

c. The QT version that comes with Debian11 is **5.15.2**

orangepi@orangepi:~\$ install_qt.sh

.....

QMake version 3.1

Using Qt version **5.15.2** in /usr/lib/aarch64-linux-gnu



d. The QT version that comes with Debian12 is **5.15.8**

orangepi@orangepi:~\$ install_qt.sh QMake version 3.1 Using Qt version 5.15.8 in /usr/lib/aarch64-linux-gnu

3) Then you can see the QT Creator startup icon in Applications

Applications 🗄					
🐀 Run Program					
🔤 Terminal Emula	itor				
🐻 File Manager					
🙆 Mail Reader					
🚯 Web Browser					
🔄 Settings	•				
La Accessories	•				
🥜 Development	🕨 🌝 Geany				
A Graphics	🕨 🖾 Qt 5 Assistant				
Internet	Qt 5 Designer				
🚺 Multimedia	🕨 💕 Qt 5 Linguist				
G Office	Qt Creator				
System	,				
🚖 Help					
🎄 Log Out					

You can also use the following command to open QT Creator orangepi@orangepi:~\$ qtcreator

- 4) The interface after QT Creator is opened is as follows



			Qt Creator		*
File Edit	View Build Debug Analyze Too	ls <u>W</u> indow <u>H</u> elp			
Welcome	Projects	Qt 5.15.2 in PATH (qt5) *	Search in Examples		
Edit	Examples	File Tools	Analog Clock		november 2016
1	Tidadala	ABC DEF GHI JKI	Sale of the second seco	<u>File Edit Help</u>	0 31 1 2 6 7 8 9
Design	Tutonais	Name *	3	I 🕒 🚨 🕌 I 😹 🖷	3 14 15 16
Debug	Marketplace	Qt User The Keys, E Peter Rabbit The Lake Dis		All the standard features of	21 22 23 24 27 28 29 30 4 5 6 7
1	New to Ot?	Address Book Example	Analog Clock Window Example	Application Example	Calendar Widget Example
	Learn how to develop your	Tags: address android book ins widgets	Tags: analog android clock gui ios window	Tags: application widgets	Tags: calendar ios widgets
Help	own applications and explore Of Creator	Sitila TerMat. 8	HTTP.		
		The Team Name Disks Control of the second secon			
	Get Started Now	¹⁰ Die Basser Calanie (2014), C. Wang with the year authorities your calanie and provide and provide and and provide and	URL: http://www.qt.io	Code	Server name: fortune
		Ber Freid Parkensen B	Default file: index.html	Sample	This examples requires the
	<u>₩</u> Get Qt	Constantides from Constantides from Constantides	☑ Launch file		
_	L Qt Account	Editable Tree Model Example	HTTP Example	JSON Save Game Example	Local Fortune Client Example
- T	Online Community	Tags: android editable los model tree	Tags: http://www.ck	Tags: core game json save	Tags: client core fortune local
	S Blogs	widgets			
	User Guide	Fortune Server	0 _ D X		Chip Derr
- In-		The server is running.	Progressing using 1 thread(s)		ntialiasing OpenGL
~	Would you like to take a quick UI tour?	This tour highlights important user interface eleme	ents and shows how they are used. To take	e the tour later, select Help > UI Tour.	Take UI Tour Do Not Show
	P. Type to locate (Ctrl+K)	1 Issues 2 Search Results 3 Applica	stion Output 4 Compile Output 5 QN	1L Debugger Console 8 Test Results 💠	

- 5) The version of QT Creator is as follows
 - a. The default version of QT Creator in **Ubuntu20.04** is as follows

Edit Build Debug Analyze Tool:	Window Help					
me Projects	Qt 5.12.8 in PATH (System) * Sea	rch in Examples,				
Examples	File Tools ABC DEF GHI JKI	Inalog Clock = 0 2 State of the state of th	Edit Help	nover n. man. ti 0 31 1 6 7 8 3 14 1	nber 2016 r. ons. tor. 2 3 9 10 5 16 17	-
New to Qt?	Address Tags: add	r 4.11.0 5.12.8 (GCC 9.3.0, 64 bit) 08-2019 The Qt Company Ltd. All rights	tandard features of n Example	10 21 2 17 28 2 3 5 0 Calendar Widge Tags android calen	2 23 24 9 30 1 7 8 et Example dar los widget	
your own applications and explore Qt Creator.	The program OF ANY NIND. DESIGN, MEN PARTICULAR	IS provided AS IS with NO WARRANTY . INCLUDING THE WARRANTY OF ICHANTABILITY AND FITNESS FOR A PURPOSE. X Close	+ Code	Server name	i fortune	
1 Qt Account	Editable Tree Model Example	file: index.html indi file xample ISON Savi	e Game Example	Local Fortune 0	lient Example	
Blogs	Tags: editable ios model tree Tags: http widgets	p network Tago core g	pame json säve	Tags: client core fo	rtune local	
🕑 User Guide	Eortime Server	- 10 (x)		ntulasine Coent	Chip Demo	

b. The default version of QT Creator in Ubuntu22.04 is as follows



c. The default version of QT Creator in **Debian11** is as follows

- Andrewski		-			1
Projects	Qt 5.15.2 in PATH (qt5)	Search in Examples			
Examples	<u>File</u> Tools	Analog Clock	Σ	november 2016 m. man. tir. ons. tor.	Î
Tutorials	ABC DEF GHI JKI	and the second s	<u>File Edit H</u> elp	0 31 1 2 3 6 7 8 9 10	
latorials	N 🚥	About Qt Creator	🗕 🔺 🔁 🔮 🖌 🕾	3 14 15 16 17	
Marketplace	Pete	Qt Creator 4.14.1	tandard features of	10 21 22 23 24 17 28 29 30 1 4 5 6 7 8	
New to Ot2	Address C	Based on Qt 5.15.2 (GCC 10.2.1 2021	0110, 64 bit) Example	Calendar Widget Example	
New to Qtr	Togs: add	opyright 2008-2020 The Qt Compan eserved.	on widgets	Tags: calendar ios widget widgets	
your own applications and explore Ot Creator		The program is provided AS IS with N NY KIND, INCLUDING THE WARRANT	O WARRANTY OF Y OF DESIGN.		
comme de arcatan	878 B	RENCHANTABILITY AND FITNESS FOR URPOSE.	A PARTICULAR		
Get Started Now			× close Code	Server name: Cortune	
2		Data & file: Judex html	Sample	This examples requires that	
<u>↓</u> Get Qt	 Statute Anno Anno Anno Anno Anno Anno Anno Ann	☑ Launch file			
L Qt Account	Editable Tree Model Example	HTTP Example	ISON Save Game Example	Local Fortune Client Example	1
Online Community	Tags: android editable los model tree	Tags: http://etwork	Tags: core game ison save	Tags: client core fortune local	
a Blogs	widgets				
User Guide	-			Chip Demo	
	Fortune Server	0 - C ×		management of the second secon	1.00

d. The default version of QT Creator in **Debian12** is as follows



6) Then set up QT



a. First open Help->About Plugins....

of Applications E	🔞 Qt Creator				
20			Qt Creator		↑ - □ ×
File Edit Build	Debug Analyze Tools Window	Help	All Constants		
		Contents			
-		Index			
		Context Help	E1		
Welcome	Projects	UI Tour	Search in Examples		
		Table 16			-
Edit	Examples	Technical Support	P Analog Clock	X	november 2016
22.5		Report Bug	A CALLER OF	et etc. tota	
/	Tutorials	System Information		File Edit Help	6 7 8 9 10
Design		About <u>Q</u> t Creator		2 📑 🛄 🔛	3 14 15 16 17
- ME		About Plugins			20 21 22 23 24
Debug		Peter Rabbit The Lake Div		All the standard features of	28 29 30 1
o N	ew to Ot?	ddross Book Example	Applog Clock Window Exam	Application Example	Calendar Widget Example
Projects		duress book Example	Analog Clock Window Exam.	Application example	
Le	our own applications and	ags: address book ios widgets	Tags: analog android clock gui ios window	Tags: application widgets	lags: android calendar los widget widgets
h	Then remove the	tick of Clan	oCodeModel		
υ.	Then remove the		gCouchiouci		
	00	Installe	d Plugins — Ot Creator		A X
		mstane	a riagins - Qi ci cator		
	Filter				and all
	Filler				iow all
	Name		▼ Lo	ad Version	V-
	 Build Systems 				
	- Autoto	olsProjectManager		4.11.0 (4.11	.0) (
	CMake	ProjectManager	×	4.11.0 (4.11	.0) 7
	- Compil	ationDatabaseProjectM	anager (experimental)	4.11.0 (4.11	.0) 1
	🗸 Generi	cProjectManager	~	4.11.0 (4.11	.0) 1
	 QbsPro 	jectManager	~	4.11.0 (4.11	.0) 1
	V Qmake	ProjectManager	<u><</u>	4.11.0 (4.11	.0) 1
	* C++	line (averaging and a P			0) 1
	- Beaufi	ier (experimental)		4.11.0 (4.11	.0) 1
	Clange	odeModel		4.11.0 (4.11	.0) 1
	- Clange	ofmat	-1)	4.11.0 (4.11	.0) 1
	- Clarige	eractoring (experiment		4.11.0 (4.11	.0) 1
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c. After setting, you need to restart QT Creator

d. Then make sure the GCC compiler used by QT Creator, if the default is Clang, please modify it to GCC

Debian12 please skip this step.





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7) Then you can open a sample code


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P Type to locate (Ctrl+K)	1 Issues 2 Search Results 3 Applic	ation Output 4 Compile Output 5	OML Debugger Console 8 Test Res	ults 🗢 🛋

8) After clicking the sample code, the corresponding instruction document will be opened automatically, you can read the instructions carefully

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Edit	Active Project		Type to filter kits by name			The Apalon Clock Window example shows how to draw the	Contents
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Design	Import Existing Build		🗸 🖵 Desktop	Details *			AnalogClock Class
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analogclock						Clock Window example	
Unconfigure						This example demonstrates how the transformation and scaling to make drawing easier.	eatures of QPainter can be used
ured						AnalogClockWindow Class Definition	
2 22 4	Would you like to take a quick UI tour? This to Help > UI Tour.	ur highlight:	s important user interface elements	and shows how they a	re used. To take the tour later, select Take UI Tour Do Not Show Again X	The AnalogClockNindow class provides a clock with hour and updated every few seconds. We make use of the RasterWindow and reimplement the render function to draw the clock face:	minute hands that is automatically from the Raster Window Example
	P. Type to locate (Ctrl+K) 1 Iss	Jes 2 Sea	rch Results 3 Application Output	4 Compile Output	5 QML Debugger Console 8 Test Results 🗢 🛁 💷 .	P. Type to locate (Ctrl+K)	X

9) Then click Configure Project



10) Then click the green triangle in the lower left corner to compile and run the sample code



11) After waiting for a period of time, the interface shown in the figure below will pop up, which means that QT can compile and run normally





12) References

https://wiki.qt.io/Install_Qt_5_on_Ubuntu https://download.qt.io/archive/qtcreator https://download.qt.io/archive/qt

3.31. How to install ROS

3. 31. 1. How to install ROS 1 Noetic on Ubuntu 20.04

1) The currently active version of ROS 1 is shown below, and the recommended version

is Noetic Ninjemys

Active ROS 1 distributions

Recommended



of range Pi User Manual

Distro	Release date	Poster	<i>Tuturtle</i> , turtle in tutorial	EOL date
ROS Noetic Ninjemys (Recommended)	May 23rd, 2020	* MOETIC- MINJEMYS	\$	May, 2025 (Focal EOL)
ROS Melodic Morenia	May 23rd, 2018	Melodic Molensa Molensa Molensa Melodic	1	May, 2023 (Bionic EOL)

http://docs.ros.org https://wiki.ros.org/Distributions

2) ROS 1 Noetic Ninjemys official installation documentation link is as follows: http://wiki.ros.org/noetic/Installation/Ubuntu

3) In the ROS **Noetic Ninjemys** official installation document, Ubuntu recommends using Ubuntu20.04, so please make sure that the system used by the development board is the **Ubuntu20.04 desktop system**

http://wiki.ros.org/noetic/Installation



4) Then use the script below to install ros1

orangepi@orangepi:~\$ install_ros.sh ros1

5) Before using the ROS tool, you first need to initialize rosdep, and then you can quickly install some system dependencies and some core components in ROS when compiling the source code Note that running the following command needs to ensure that the development board can access github normally, otherwise an error will be reported due to network problems

The install_ros.sh script will try to modify /etc/hosts and run the following commands automatically. However, this method cannot guarantee that github can be accessed normally every time. If install_ros.sh prompts the following error after installing ros1, please find other ways to allow the linux system of the development board to access github normally, and then manually run the following command.

https://raw.githubusercontent.com/ros/rosdistro/master/rosdep/osx-homebrew.yaml Hit https://raw.githubusercontent.com/ros/rosdistro/master/rosdep/base.yaml ERROR: error loading sources list:

The read operation timed out

orangepi@orangepi:~\$ source /opt/ros/noetic/setup.bash orangepi@orangepi:~\$ sudo rosdep init Wrote /etc/ros/rosdep/sources.list.d/20-default.list Recommended: please run

rosdep update

orangepi@orangepi:~\$ rosdep update

reading in sources list data from /etc/ros/rosdep/sources.list.d Hit https://raw.githubusercontent.com/ros/rosdistro/master/rosdep/osx-homebrew.yaml Hit https://raw.githubusercontent.com/ros/rosdistro/master/rosdep/python.yaml Hit https://raw.githubusercontent.com/ros/rosdistro/master/rosdep/ruby.yaml Hit https://raw.githubusercontent.com/ros/rosdistro/master/rosdep/ruby.yaml Query rosdistro index https://raw.githubusercontent.com/ros/rosdistro/master/releases/fuerte.yaml Skip end-of-life distro "ardent" Skip end-of-life distro "crystal" Skip end-of-life distro "crystal" Skip end-of-life distro "dashing"

Add distro "foxy"

Add distro "galactic" Skip end-of-life distro "groovy" Add distro "humble" Skip end-of-life distro "hydro" Skip end-of-life distro "indigo" Skip end-of-life distro "jade" Skip end-of-life distro "kinetic" Skip end-of-life distro "lunar" Add distro "melodic" Add distro "noetic" Add distro "rolling" updated cache in /home/orangepi/.ros/rosdep/sources.cache

6) Then open a command line terminal window on the **desktop**, and use the **test_ros.sh** script to start a small turtle routine to test whether ROS can be used normally

orangepi@orangepi:~\$ test_ros.sh

7) After running the **test_ros.sh** script, a little turtle as shown in the figure below will pop up



8) Then please keep the terminal window you just opened on top





9) At this time, press the direction keys on the keyboard to control the little turtle to move up, down, left, and right



3. 31. 2. How to install ROS 2 Galactic on Ubuntu 20.04

1) The currently active version of ROS 2 is shown below, and the recommended version

is Galactic Geochelone

Active ROS 2 distributions

<image>

Distro	Release date	Logo	EOL date
Humble Hawksbill	May 23rd, 2022		May 2027
Galactic Geochelone	May 23rd, 2021	GEOCHELONE	November 2022
Foxy Fitzroy	June 5th, 2020		May 2023

http://docs.ros.org

http://docs.ros.org/en/galactic/Releases.html

2) The link to the official ROS 2 **Galactic Geochelone** installation documentation is as follows:

docs.ros.org/en/galactic/Installation.html http://docs.ros.org/en/galactic/Installation/Ubuntu-Install-Debians.html

3) In the official ROS 2 **Galactic Geochelone** installation document, Ubuntu Linux recommends using Ubuntu 20.04, so please make sure that the system used by the development board is the **Ubuntu 20.04 desktop system**. There are several ways to install ROS 2. The following demonstrates how to install ROS 2 **Galactic Geochelone**

through **Debian packages**.

4) Ros2 can be installed using the **install_ros.sh** script

orangepi@orangepi:~\$ install_ros.sh ros2

5) The **install_ros.sh** script will automatically run the **ros2 -h** command after installing ros2. If you can see the following print, it means that the ros2 installation is complete usage: ros2 [-h] Call `ros2 <command> -h` for more detailed usage. ...

ros2 is an extensible command-line tool for ROS 2.

optional arguments:

-hhelp	show this help mes	sage and exit
n, noip	show this help mes	Suge and exit

Commands:

action	Various action related sub-commands
bag	Various rosbag related sub-commands
componen	t Various component related sub-commands
daemon	Various daemon related sub-commands
doctor	Check ROS setup and other potential issues
interface	Show information about ROS interfaces
launch	Run a launch file
lifecycle	Various lifecycle related sub-commands
multicast	Various multicast related sub-commands
node	Various node related sub-commands
param	Various param related sub-commands
pkg	Various package related sub-commands
run	Run a package specific executable
security	Various security related sub-commands
service	Various service related sub-commands
topic	Various topic related sub-commands
wtf	Use `wtf` as alias to `doctor`

Call `ros2 <command> -h` for more detailed usage.

6) Then you can use the **test_ros.sh** script to test whether ROS 2 is installed successfully.

If you can see the following print, it means that ROS 2 can run normally

orangepi@orangepi:~\$ test_ros.sh
[INFO] [1671174101.200091527] [talker]: Publishing: 'Hello World: 1'
[INFO] [1671174101.235661048] [listener]: I heard: [Hello World: 1]
[INFO] [1671174102.199572327] [talker]: Publishing: 'Hello World: 2'
[INFO] [1671174102.204196299] [listener]: I heard: [Hello World: 2]
[INFO] [1671174103.199580322] [talker]: Publishing: 'Hello World: 3'
[INFO] [1671174103.204019965] [listener]: I heard: [Hello World: 3]

7) Run the following command to open rviz2

orangepi@orangepi:~\$ source /opt/ros/galactic/setup.bash orangepi@orangepi:~\$ ros2 run rviz2 rviz2



8) For how to use ROS, please refer to the documentation of ROS 2

http://docs.ros.org/en/galactic/Tutorials.html

3. 31. 3. How to install ROS 2 Humble on Ubuntu 22.04

1) Ros2 can be installed using the **install_ros.sh** script

orangepi@orangepi:~\$ install_ros.sh ros2

2) The **install_ros.sh** script will automatically run the **ros2 -h** command after installing ros2. If you can see the following print, it means that the ros2 installation is complete

usage: ros2 [-h] Call `ros2 <command> -h` for more detailed usage. ...

ros2 is an extensible command-line tool for ROS 2.

optional arguments:

-h,help show this help message and ex-	now this help message and exit
--	--------------------------------

Commands:

action	Various action related sub-commands
bag	Various rosbag related sub-commands
componer	t Various component related sub-commands
daemon	Various daemon related sub-commands
doctor	Check ROS setup and other potential issues
interface	Show information about ROS interfaces
launch	Run a launch file
lifecycle	Various lifecycle related sub-commands
multicast	Various multicast related sub-commands
node	Various node related sub-commands
param	Various param related sub-commands
pkg	Various package related sub-commands
run	Run a package specific executable
security	Various security related sub-commands
service	Various service related sub-commands
topic	Various topic related sub-commands
wtf	Use `wtf` as alias to `doctor`

Call `ros2 <command> -h` for more detailed usage.

3) Then you can use the **test_ros.sh** script to test whether ROS 2 is installed successfully. If you can see the following print, it means that ROS 2 can run normally

orangepi@orangepi:~\$ test_ros.sh
[INFO] [1671174101.200091527] [talker]: Publishing: 'Hello World: 1'
[INFO] [1671174101.235661048] [listener]: I heard: [Hello World: 1]
[INFO] [1671174102.199572327] [talker]: Publishing: 'Hello World: 2'
[INFO] [1671174102.204196299] [listener]: I heard: [Hello World: 2]
[INFO] [1671174103.199580322] [talker]: Publishing: 'Hello World: 3'

[INFO] [1671174103.204019965] [listener]: I heard: [Hello World: 3]

4) Run the following command to open rviz2

orangepi@orangepi:~\$ source /opt/ros/humble/setup.bash orangepi@orangepi:~\$ ros2 run rviz2 rviz2



5) Reference documents

http://docs.ros.org/en/humble/index.html http://docs.ros.org/en/humble/Installation/Ubuntu-Install-Debians.html

3. 32. How to install the kernel header file

The Debian 11 system with the Linux6.1 kernel will report a GCC error when compiling the kernel module. So if you want to compile the kernel module, please use Debian12 or Ubuntu22.04

1) The Linux image released by OPi comes with the deb package of the kernel header file by default, and the storage location is **/opt/**

orangepi@orangepi:~\$ ls /opt/linux-headers*

/opt/linux-headers-xxx-sun50iw9_x.x.x_arm64.deb

2) Use the following command to install the deb package of the kernel header file orangepi@orangepi:~\$ sudo dpkg -i /opt/linux-headers*.deb

3) After installation, you can see the folder where the kernel header files are located under /usr/src

orangepi@orangepi:~\$ ls /usr/src

linux-headers-x.x.x

4) Then you can compile the source code of the hello kernel module that comes with the Linux image. The source code of the hello module is in /usr/src/hello. After entering this directory, use the make command to compile.

orangepi@orangepi:~\$ cd /usr/src/hello/

orangepi@orangepi:/usr/src/hello\$ sudo make

make -C /lib/modules/5.4.125/build M=/usr/src/hello modules

make[1]: Entering directory '/usr/src/linux-headers-5.4.125'

CC [M] /usr/src/hello/hello.o

Building modules, stage 2.

MODPOST 1 modules

CC [M] /usr/src/hello/hello.mod.o

LD [M] /usr/src/hello/hello.ko

make[1]: Leaving directory '/usr/src/linux-headers-5.4.125'

5) After compiling, the **hello.ko** kernel module will be generated

orangepi@orangepi:/usr/src/hello\$ **ls *.ko** hello.ko

6) Using the **insmod** command, you can insert the **hello.ko** kernel module into the kernel orangepi@orangepi:/usr/src/hello\$ **sudo insmod hello.ko**

7) Then use the **demsg** command to view the output of the **hello.ko** kernel module. If you can see the output instructions below, the **hello.ko** kernel module is loaded correctly

orangepi@orangepi:/usr/src/hello\$ dmesg | grep "Hello"

[2871.893988] Hello Orange Pi -- init

8) Use the **rmmod** command to uninstall the **hello.ko** kernel module

orangepi@orangepi:/usr/src/hello\$ **sudo rmmod hello** orangepi@orangepi:/usr/src/hello\$ **dmesg | grep "Hello"** [2871.893988] Hello Orange Pi -- init [3173.800892] **Hello Orange Pi -- exit**

3. 33. Some programming language tests supported by Linux system

3. 33. 1. Debian Bullseye System

1) Debian Bullseye has a gcc compilation tool chain installed by default, which can directly compile C language programs in the Linux system of the development board

a. The version of gcc is as follows

orangepi@orangepi:~\$ gcc --version

gcc (Debian 10.2.1-6) 10.2.1 20210110

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warranty; not even for MERCHANTABILITY or FITNESS FOR A PARTICULAR PURPOSE.

b. Write the **hello_world.c** program in C language

```
orangepi@orangepi:~$ vim hello_world.c
#include <stdio.h>
```

```
int main(void)
```

printf("Hello World!\n");

return 0;

c. Then compile and run hello_world.c

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

2) Debian Bullseye comes with Python3 installed by default

a. The specific version of Python is as follows

orangepi@orangepi:~\$ python3

Python 3.9.2 (default, Feb 28 2021, 17:03:44)

[GCC 10.2.1 20210110] on linux

Type "help", "copyright", "credits" or "license" for more information.

>>>

Use the Ctrl+D shortcut to exit python's interactive mode.

b. Write **hello_world.py** program in Python language

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

c. The result of running **hello_world.py** is as follows

orangepi@orangepi:~\$ python3 hello_world.py

Hello World!

3) Debian Bullseye does not install Java compilation tools and runtime environment by default

a. You can use the following command to install openjdk, the latest version in Debian Bullseye is openjdk-17

orangepi@orangepi:~\$ sudo apt install -y openjdk-17-jdk

b. After installation, you can check the version of Java

orangepi@orangepi:~\$ java --version

c. Edit hello_world.java of java version

orangepi@orangepi:~\$ vim hello_world.java

public class hello_world

}

public static void main(String[] args)

System.out.println("Hello World!");

d. Then compile and runhello_world.java

orangepi@orangepi:~\$ javac hello_world.java

orangepi@orangepi:~\$ java hello_world

Hello World!

3. 33. 2. Debian Bookworm System

1) Debian Bookworm is installed with a gcc compilation tool chain by default, which can

directly compile C language programs in the Linux system of the development board

a. The version of gcc is as follows

orangepi@orangepi:~\$ gcc --version

gcc (Debian 12.2.0-14) 12.2.0

Copyright (C) 2022 Free Software Foundation, Inc.

This is free software; see the source for copying conditions. There is NO

```
warranty; not even for MERCHANTABILITY or FITNESS FOR A PARTICULAR PURPOSE.
```

b. Write the **hello_world.c** program in C language

orangepi@orangepi:~\$ **vim hello_world.c** #include <stdio.h>

int main(void)

```
printf("Hello World!\n");
```

return 0;

}

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

orangepi@orangepi:~\$ gcc -o hello_world hello_world.c orangepi@orangepi:~\$./hello_world

Hello World!

2) Debian Bookworm has Python3 installed by default

a. The specific version of Python is as follows

orangepi@orangepi:~\$ python3

Python 3.11.2 (main, Mar 13 2023, 12:18:29) [GCC 12.2.0] on linux

Type "help", "copyright", "credits" or "license" for more information.

>>>

Use the Ctrl+D shortcut to exit python's interactive mode.

b. Write **hello_world.py** program in Python language

orangepi@orangepi:~\$ vim hello_world.py

print('Hello World!')

c. The result of running **hello_world.py** is as follows

orangepi@orangepi:~\$ python3 hello_world.py

Hello World!

3) Debian Bookworm does not install Java compilation tools and operating environment by default

a. You can use the following command to install openjdk, the latest version in Debian Bookworm is openjdk-17

orangepi@orangepi:~\$ sudo apt install -y openjdk-17-jdk

b. After installation, you can check the version of Java

orangepi@orangepi:~\$ java --version

```
c. Edit the Javaverison's hello_world.java
```

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

public class hello_world

{

}

```
public static void main(String[] args)
```

```
System.out.println("Hello World!");
```

,

d. Then compile and run**hello_world.java**

orangepi@orangepi:~\$ javac hello_world.java

orangepi@orangepi:~\$ java hello_world

Hello World!

3. 33. 3. Ubuntu Focal System

1) Ubuntu Focal has a gcc compilation tool chain installed by default, which can directly compile C language programs in the Linux system of the development board

a. The version of a.gcc is as follows

orangepi@orangepi:~\$ gcc --version

gcc (Ubuntu 9.4.0-1ubuntu1~20.04.1) 9.4.0

Copyright (C) 2019 Free Software Foundation, Inc.

This is free software; see the source for copying conditions. There is NO

warranty; not even for MERCHANTABILITY or FITNESS FOR A PARTICULAR PURPOSE.

b. Write the **hello_world.c** program in C language

orangepi@orangepi:~\$ vim hello_world.c

#include <stdio.h>

```
int main(void)
```

printf("Hello World!\n");

return 0;

c. Then compile and run hello_world.c

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

2) Ubuntu Focal has Python3 installed by default

a. The specific version of Python3 is as follows

orangepi@orangepi:~\$ python3

Python 3.8.10 (default, Nov 14 2022, 12:59:47)

[GCC 9.4.0] on linux

Type "help", "copyright", "credits" or "license" for more information.

>>>

Use the Ctrl+D shortcut to exit python's interactive mode.

b. Write the **hello_world.py** program in Python language

orangepi@orangepi:~\$ vim hello_world.py

print('Hello World!')

c. The result of running **hello_world.py** is as follows

orangepi@orangepi:~\$ python3 hello_world.py

Hello World!

3) Ubuntu Focal does not install Java compilation tools and operating environment by default

a. You can use the following command to install openjdk-17

orangepi@orangepi:~\$ sudo apt install -y openjdk-17-jdk

b. After installation, you can check the version of Java

orangepi@orangepi:~\$ java --version

openjdk 17.0.2 2022-01-18

OpenJDK Runtime Environment (build 17.0.2+8-Ubuntu-120.04)

orange Pi User Manual

{

ł

OpenJDK 64-Bit Server VM (build 17.0.2+8-Ubuntu-120.04, mixed mode, sharing)

```
c. Write the Java version of hello_world.java
```

orangepi@orangepi:~\$ **vim hello_world.java** public class hello_world

```
public static void main(String[] args)
```

```
System.out.println("Hello World!");
```

-

d. Then compile and run hello_world.java

orangepi@orangepi:~\$ javac hello_world.java

orangepi@orangepi:~\$ java hello world

Hello World!

3. 33. 4. Ubuntu Jammy System

1) Ubuntu Jammy is installed with a gcc compilation tool chain by default, which can directly compile C language programs in the Linux system of the development board

a. The version of a.gcc is as follows

orangepi@orangepi:~\$ gcc --version

gcc (Ubuntu 11.3.0-1ubuntu1~22.04.1) 11.3.0

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This is free software; see the source for copying conditions. There is NO

warranty; not even for MERCHANTABILITY or FITNESS FOR A PARTICULAR PURPOSE.

b. Write the **hello_world.c** program in C language

```
orangepi@orangepi:~$ vim hello_world.c
#include <stdio.h>
```

int main(void)

{

printf("Hello World!\n");

return 0;

c. Then compile and run hello_world.c

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

2) Ubuntu Jammy has Python3 installed by default

a. The specific version of Python3 is as follows

orangepi@orangepi:~\$ python3

Python 3.10.6 (main, May 29 2023, 11:10:38) [GCC 11.3.0] on linux

Type "help", "copyright", "credits" or "license" for more information.

>>>

Use the Ctrl+D shortcut to exit python's interactive mode.

b. Write the **hello_world.py** program in Python language

orangepi@orangepi:~\$ vim hello_world.py

print('Hello World!')

c. The result of running **hello_world.py** is as follows

orangepi@orangepi:~**\$ python3 hello_world.py** Hello World!

3) Ubuntu Jammy does not install Java compilation tools and operating environment by default

a. You can use the following command to install openjdk-18

orangepi@orangepi:~\$ sudo apt install -y openjdk-18-jdk

b. After installation, you can check the version of Java

orangepi@orangepi:~\$ java --version

openjdk 18.0.2-ea 2022-07-19

OpenJDK Runtime Environment (build 18.0.2-ea+9-Ubuntu-222.04)

OpenJDK 64-Bit Server VM (build 18.0.2-ea+9-Ubuntu-222.04, mixed mode, sharing)

c. Write the Java version of hello_world.java

```
orangepi@orangepi:~$ vim hello_world.java
public class hello_world
{
    public static void main(String[] args)
    {
        System.out.println("Hello World!");
```

}

d. Then compile and run hello_world.java
 orangepi@orangepi:~\$ javac hello_world.java
 orangepi@orangepi:~\$ java hello_world
 Hello World!

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

3. 34. 1. How to upload files to the development board Linux system in Ubuntu PC

3. 34. 1. 1. How to upload files using the scp command

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

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

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

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

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

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

test@test:~\$ man scp

3. 34. 1. 2. How to upload files using filezilla

1) First install filezilla in Ubuntu PC

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

2) Then use the following command to open filezilla

test@test:~\$ filezilla

3) The interface after filezilla is opened is as follows, at this time, the display under the remote site on the right is empty

			FileZilla				- • ×
文件(F) 编辑(E) 查	看(V) 传输(T) 服务器(S)	书签(B) 帮助(H)					
# · D.) 🗽 🎐 🏛 🍳 🧕	- *				
主机(H):	用户名(U):	密码(w):	端口(P):	快速连接(Q)	•		
本地站点: // ~ ■/ > ■ bin			✓ 远程站点				~
> 📒 boot 📒 cdrom							
文件名 ^	文件大小 文件类型	最近修改					
📒 lib32	目录	2022年11月06…					
📒 lib64	目录	2022年08月09…					
ibx32	目录	2022年11月06…					
ost+found	目录	2022年11月05…	文件名	• 文件大小	文件类型 最近修改	权限	所有者/组
📒 media	目录	2022年12月03…					
📒 mnt	目录	2022年08月09…		X	设有连接到任何服务器		
📒 opt	目录	2022年11月06…					
proc	目录	2022年12月03…					
root	目录	2022年12月03…					
nun 🔁	目录	2022年12月03…					
1个文件和26个日录。	大小总计: 2.2 GB		未连接。				
服务器/本地文件	方向 远程文件	大小 优先级	状态				
列队的文件 传输失	败 成功的传输						
					0 P	同・空	🔵 🚇 //:

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



	Filezilla 3.Password: orangepi	5 Click Quick Connect	- • ×
文件(F) 编辑(E) 查看(V) 传输(T) 服务器(S) 书签(B)	帮助(H)	S. Onex Guiler Connect	
🖽 🗸 📳 🗂 🗰 🔕 🖡	🏂 🏛 🖉 🤌 🦚		
主机(H): 192.168.1.100 用户名(U): root	密码(W): 端口(P): 22	快速连接(Q) ▼	
1.IP address 2.Username	4.Port nur	mber 22	

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

您想让 FileZilla 记住密码	吗?	
如果允许 FileZilla 记住密	码,重启 FileZilla 后重新连接无	需再次输入密码。
●保存密码(E)		
〇 不要保存密码(O)		
○ 保存主密码保护的密	码(V)	
主密码(M):		
主密码(M): 再次输入密码(R):		
主密码(M): 再次输入密码(R): 主密码一旦丢失无法(恢复!请牢记您的密码。	

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

	未定义的快捷键		×
1	该服务器的主机密匙是未知的。不能保证该服务部 认定的那台计算机。 详细资料 主机: 主机密匙算法:	器就是您所	
	指纹: 信任该主机并继续连接? 2019是信任该主机,并将该密钥加入缓存(A)		
		取消	确定

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

🛞 range Pi User Manual

		sftp://roo	ot@192.1	68.31.11 - FileZilla			- 0 (
文件(F) 编辑(E) 查	:看(V) 传输(T) 服务器(S) =	书签(B) 帮助(H)					
# · D		1 1 1 E Q	o 🔥				
主机(H): tp://192.16	i8.31.11 用户名(U): root	密码(W):	端口	コ(P): 快速	ἑ连接(Q) ▼		
 犬态: Connected to 犬态: 读取目录列表. 犬态: Listing directo 犬态: 列出"/root"的 	192.168.31.11 ory /root l目录成功						
本地站点: /			~	远程站点: /root			```
立件 夕 ▲				1			
lib32	文件大小 文件类型 目录	最近修改 2022年11月06…					
Lib64	文件大小 文件类型 目录 日录	最近修改 2022年11月06··· 2022年08月09···					
Lib32 lib64 libx32	文件大小 文件类型 目录 目录 目录 目录	最近修改 2022年11月06… 2022年08月09… 2022年11月06… 2022年11月05…		文件名 ^	文件大小 文件类型	最近修改 权限	所有者/组
lib32 lib64 libx32 lost+found media	文件大小 文件类型 目录 目录 目录 目录 目录 目录	最近修改 2022年11月06… 2022年08月09… 2022年11月06… 2022年11月05… 2022年12月03…		· 文件名 ▲	文件大小 文件类型	最近修改 权限	所有者/组
lib32 lib64 libx32 lost+found media mnt	文件大小 文件类型 目录 目录 目录 目录 目录 目录	最近修改 2022年11月06 2022年08月09 2022年11月06 2022年11月05 2022年12月03 2022年08月09		文件名 ^ 	文件大小 文件类型	最近修改 权限 2022年12月… drwx	所有者/组 root root
lib32 lib64 libx32 lost+found media mnt opt	文件大小 文件类型 目录 目录 目录 目录 目录 目录 目录 目录	最近修改 2022年11月06… 2022年11月06… 2022年11月06… 2022年11月05… 2022年12月03… 2022年18月09… 2022年11月06…		文件名 A ··· ··· ···· ·······················	文件大小 文件类型 目录 目录	最近修改 权限 2022年12月 drwx 2022年12月 drwxr-xr-x	所有者/组 root root root root
lib32 lib64 libx32 lost+found media mnt opt proc	文件大小 文件类型 目录 目录 目录 目录 目录 目录 目录 目录 目录 目录	最近修改 2022年11月06 2022年0月09 2022年11月06 2022年11月05 2022年12月03 2022年08月09 2022年11月06 2022年11月06 2022年11月03		文件名 A ··· ·cache ·config ·oh-my-zsh	文件大小 文件类型 目录 目录 日录	最近修改 权限 2022年12月・・・ drwx 2022年12月・・・ drwxr-xr-x 2022年12月・・・ drwxr-xr-x	所有者/组 root root root root root root
kitta co lib32 lib64 libx32 lost+found media mnt opt proc root	文件大小 文件类型 目录 目录 目录 目录 目录 目录 目录 目录 目录 目录 目录 目录 目录	最近修改 2022年11月06 2022年0月09 2022年11月06 2022年11月05 2022年12月03 2022年12月03 2022年12月03 2022年12月03		文件名 < .coche .config .oh-my-zsh .pip	文件大小 文件类型 目录 目录 目录 目录	最近修改 权限 2022年12月・・・ drwx 2022年12月・・・ drwxr-xr-x 2022年12月・・・ drwxr-xr-x 2022年12月・・・ drwxr-xr-x	所有者/组 root root root root root root root root
lib32 lib64 lib64 libx32 lost+found media mnt opt proc root run	文件大小 文件类型 目录 目录 目录 目录 目录 目录 目录 目录 目录 目录 目录 目录 目录	最近修改 2022年11月06 2022年0月09 2022年11月06 2022年11月05 2022年12月03 2022年12月03 2022年12月03 2022年12月03 2022年12月03		文件名 ^ 	文件大小 文件类型 目录 目录 目录 目录 目录	最近修改 权限 2022年12月・・・ drwx 2022年12月・・・ drwxr-xr-x 2022年12月・・・ drwxr-xr-x 2022年12月・・・ drwxr-xr-x 2022年12月・・・ drwxr-xr-x	所有者/组 root root root root root root root root root root
Virta r lib32 lib64 libx32 lost+found media mnt opt proc root run chin	文件大小 文件类型 目录 目录 目录 目录 目录 目录 目录 目录 目录 目录 目录	最近修改 2022年11月06 2022年08月09 2022年11月06 2022年11月06 2022年12月03 2022年12月03 2022年12月03 2022年12月03 2022年12月03 2022年12月03		文件名 ^ .cache .config .oh-my-zsh .pip .Xauthority .bash history	文件大小 文件类型 目录 目录 目录 目录 55B 文件 793B 文件	 最近修改 权限 2022年12月・ drwx 2022年12月・ drwxrxx 2022年12月・ drwxrxxx 2022年12月・ drwxrxxx 2022年12月・ rw 2022年12月・ rw 	所有者/组 root root root root root root root root root root root root

8) Then select the path to be uploaded to the development board on the right side of the filezilla software, and then select the file to be uploaded on the Ubuntu PC on the left side of the filezilla software, then click the right mouse button, and then click the upload option to start uploading the file to the development board.

		sftp://r	oot@1	192.168	B.31.11 - FileZilla	3			-	
文件(F) 编辑(E) 查看(V) 传轴	俞(T) 服务器(S) 书签(B)	帮助(H)								
# · [] *	C 🕸 🕉	O 😫 O 🗽 🍺 🄳 R 🔗 🚸								
主机(H): tp://192.168.31.11 月	用户名(U): root 图	密码(W):		端口(P):	快速连接(Q)	•			
 · 列出"/home"的目录成功 / 大态: · 读取"/home/orangepi"的 / 大态: Listing directory /home/o / 大态: 列出"/home/orangepi"的 // // //	目录列表 orangepi 目录成功									
本地站点: /home/test/Downloa	ds/test/			~	远程站点: /hom	ne/orangepi				
Music > Pictures Public Templates Videos > VirtualBox VMs bin	- 小	修改			?) dev ?) etc ~ home ~ oran ? .ca ? .ci	gepi iche nnamon - <'- 文件大小	◇ 文件类型	最近修改 权限	所有者	香/组
文件名 へ 文件大					-	2610	3 ++++	2022/T 42 E		
文件名 〈 文件大 nomachine_8.2.3_3	上传(U) 添加文件到队列(A) 打开(Q) 编辑(r)	年12月03···			.bashrc .profile .viminfo .xscreensaver .xsession-erro .xsession-erro	3.5 KE 3.5 KE 20 E 9rs 7.6 KE 9rs 7.7 KE	3 文件 3 文件 3 文件 3 文件 3 文件 3 文件 3 old-文件	2022#12月···· +W+++- 2022#12月···· +W+-+- 2022#12月···· +W 2022#12月···· +W 2022#12月···· +W 2022#12月···· +W 2022#12月···· +W	orang orang orang orang orang orang	epi epi epi epi epi
文件名 文 件大 nomachine_8.2.3_3	上传(U) 添加文件到队列(A) 打开(Q) 编辑(E)	年12月03… 】			.bashrc .profile .viminfo .xscreensaver .xsession-erro .xsession-erro .zshrc 13 个文件 和 16 /	3.0 Kt 807 E 3.5 KE 20 E 9rs 7.6 KE 9rs 7.7 KE 4.0 KE 个日录。大小总	3 文件 3 文件 3 文件 3 文件 3 文件 3 文件 3 old-文件 3 文件 计: 6.2 GB	2022#12月····· rw-r-r 2022#12月···· rw-r-r 2022#12月···· rw 2022#12月···· rw	orang orang orang orang orang orang orang	ері ері ері ері ері ері

9) After the upload is complete, you can go to the corresponding path in the Linux system of the development board to view the uploaded files

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

3. 34. 2. How to upload files to the development board Linux system in Windows PC

3. 34. 2. 1. How to upload files using filezilla

WebDAV

OpenStack Swift

Box

Site Manager synchronization

Command-line interface

Batch transfers

Then select here to download.

1) First download the installation file of the Windows version of the filezilla software, the download link is as follows

https://filezilla-project.org/download.php?type=client **E**FileZilla FileZilla®Pro ileZilla GET IN NOW > Features Screensho Download Document FileZilla P Download FileZilla Client for Windows (64bit x86) ileZilla S Please select the file appropriate for your platform b ndows (64bit x86) 👫 Download FileZilla Client click here to down-This installer may include bundled offers. Check below for The 64bit versions of Windows 8.1, 10 and 11 are sup ♦ More download options Other platforms: ^A × ∆ ∆ Not what you are lo nal do o beo Please select your edition of FileZilla Client FileZilla Pro FileZilla FileZilla Pro FileZilla with manual + CLI Standard FTP Yes Yes Yes Yes FTP over TLS Yes Yes Yes Yes SETP Yes Yes Yes Yes Comprehensive PDF manual Yes Yes Yes Amazon S3 --Yes Yes Backblaze B2 -Yes Yes 12 Dropbox Yes Yes Microsoft OneDrive Yes Yes Google Drive Yes Yes Google Cloud Storage Yes Yes Microsoft Azure Blob + File Storage Yes Yes

Yes

Yes

Yes

Yes

-

Select

Select

Yes

Yes

Yes

Yes

Yes

Yes

Select

Download

2) The downloaded installation package is as follows, and then double-click to install directly

FileZilla_Server_1.5.1_win64-setup.exe

During the installation process, please select Decline on the following installation interface, and then select Next>



3) The interface after filezilla is opened is as follows, and the display under the remote site on the right is empty

		Q 9 💏							
机(H):	用户名(U):	密码(W):	3佛口(P):	快速连接(Q)	•				
電站点: C:\Users\te	st		~	远限站点					
重直 二			^						
一體 文档									
白 🔜 此电脑									
🛛 🏪 C:									
	and the second se								
			~						
+2 ^	文件十小 文件采用	县:5体3 7	^		立建士小 立建新期	単にに体力	\$778	新有素/印	
-	文 件入小 文件架里	RECTIFICK		XIHA	X1+X1-X1+962	ARXLIP DX	DOPR	//190100/101	
	又件关	2022/12/3 20:06:							
	XHX	2022/11/0 0:25:20	- 11		没有连接到	王何服务器			
	×1+天	2022/11/19 1:30:							
100 million 100 million 100 million 100 million 100 million 100 million 100 million 100 million 100 million 100	where the sales	2022 112 12 15 10							
	文件夹	2022/12/3 15:40:							
	文件夹 文件夹	2022/12/3 15:40: 2022/12/3 19:41:							
	文件夹 文件夹 文件夹	2022/12/3 15:40: 2022/12/3 19:41: 2022/12/3 20:05:							
	文件夹 文件夹 文件夹 文件夹	2022/12/3 15:40: 2022/12/3 19:41: 2022/12/3 20:05: 2022/11/6 0:23:28							
	文件夹 文件夹 文件夹 文件夹 文件夹	2022/12/3 15:40: 2022/12/3 19:41: 2022/12/3 20:05: 2022/11/6 0:23:28 2022/11/6 0:23:28							
	交件夹 文件夹 文件夹 文件夹 文件夹 文件夹 文件夹	2022/12/3 15:40: 2022/12/3 19:41: 2022/12/3 20:05: 2022/11/6 0:23:28 2022/11/6 0:23:28 2022/12/3 20:06:	1						
	文件夹 文件夹 文件夹 文件夹 文件夹 文件夹 文件夹	2022/12/3 15:40 2022/12/3 19:41 2022/12/3 20:05 2022/11/6 0:23:28 2022/11/6 0:23:28 2022/11/6 0:23:28							
Ē	文件夹 文件夹 文件夹 文件夹 文件夹 文件夹 文件夹 文件夹 文件夹	2022/12/3 15:40 2022/12/3 19:41 2022/12/3 20:05 2022/11/6 0:23:28 2022/11/6 0:23:28 2022/12/3 20:06 2022/11/6 0:23:28 2022/12/3 19:41							
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文件和27个目录	交纬央 文纬史 文纬史 文纬史 文纬夫 文纬夫 文纬夫 文纬夫 文纬夫 文纬夫 文纬夫 文纬夫 文纬夫 文纬夫	2022/12/3 1540 2022/12/3 1540 2022/11/8 2005 2022/11/8 023:28 2022/14/8 023:28 2022/12/3 2006 2022/12/3 2006 2022/12/3 1941 2019/12/7 17:14 2019/12/7 17:14	v	未连接。					
个文件和 27 个目录。	交件失 文件失 文件失 文件失 文件失 文件失 文件失 文件失 文件失 文件失 文	2022/12/3 15-60 2022/12/3 15-61 2022/12/3 19-61 2022/11/8 023-28 2022/11/8 023-28 2022/12/3 20.06 2022/12/3 20.06 2022/12/3 19-61 2019/12/7 17-14 2019/12/7 17-14 2019/12/7 17-14	~ 先级 状态	未连接。					
个文件 和 27 个目录 器/本地文件	文件央 文件央 文件央 文件央 文件央 文件央 文件央 文件央 文件央 文件央 文件央 文件央 文件央 文件央 文件央 文件央 文件央 文件央 文件央 文件央 文件央 文件央 文件会 方件 方向 諾優文件	2022/12/3 15:40 2022/12/3 15:40 2022/12/3 20:05 2022/11/8 02:32:8 2022/11/8 02:32:8 2022/12/8 20:06 2022/12/3 10:41 2019/12/7 17:14 2019/12/7 17:14 2022/11/8 02:557	~ モ疫 状态	未连接。					
內(本地文件)	文件夹 方用 古用	2022/12/3 15-40 2022/12/3 15-40 2022/12/3 20:05 2022/11/6 023-28 2022/11/6 023-28 2022/12/3 20:06 2022/12/3 20:06 2022/12/3 19-41 2019/12/7 17:14 2022/11/6 025-57	*	未连接。					
文件 和 27 个目录 截/本地文件	文件夹 文件 大 方向 近間文件 方向 近間文件	2022/12/3 15:40 2022/12/3 15:40 2022/11/8 0:45: 2022/11/8 0:23:28 2022/11/8 0:23:28 2022/12/3 20:06 2022/12/3 19:41 2019/12/7 17:14 2022/11/8 0:25:57 ステム 使5	~ 七段 秋本	未连接。					

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

3.Password: orangepi 5. Click Quick Connect	- • ×
文件(F) 编辑(E) 查看(V) 传输(T) 服务器(S) 书签(B) 帮助(H)	
主机(H): 192.168.1.100 用户名(U): root 密码(W): 端口(P): 22 快速连接(Q) -	
1.IP address 2.Username 4.Port number 22	

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

您想让 FileZilla 记住密码吗?	
如果允许 FileZilla 记住密码,重 ● 保存密码(E) ○ 不要保存密码(O)	記 FileZilla 后重新连接无需再次输入密码。
○保存主密码保护的密码(V)	
主密码(M):	
and the second s	
再次输入密码(R):	
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6) Then select Always trust this host, and click OK



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

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8) Then select the path to be uploaded to the development board on the right side of the filezilla software, and then select the file to be uploaded on the Windows PC on the left side of the filezilla software, then click the right mouse button, and then click the upload option to start uploading the file to the development board.

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9) After the upload is complete, you can go to the corresponding path in the Linux system of the development board to view the uploaded files

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

3. 35. Instructions for using the switch logo

1) By default, the switch logo will only be displayed in the desktop version of the system

2) Set the bootlogo variable to false in /boot/orangepiEnv.txt to turn off the switch logo
orangepi@orangepi:~\$ sudo vim /boot/orangepiEnv.txt
verbosity=1
bootlogo=false

3) Set the bootlogo variable to true in /boot/orangepiEnv.txt to enable the switch logo orangepi@orangepi:~\$ sudo vim /boot/orangepiEnv.txt verbosity=1 bootlogo=true

4) The location of the boot logo image in the Linux system is

/usr/share/plymouth/themes/orangepi/watermark.png

5) After replacing the boot logo picture, you need to run the following command to take effect

orangepi@orangepi:~\$ sudo update-initramfs -u

3. 36. How to shut down and restart the development board

1) During the running of the Linux system, if the power is directly unplugged, the file system may lose some data. It is recommended to use the **poweroff** command to shut down the Linux system of the development board before power off, and then unplug the power

orangepi@orangepi:~\$ sudo poweroff

Note that after the development board is turned off, the power supply needs to be re-plugged to turn it on.

2) Use the **reboot** command to restart the Linux system on the development board orangepi@orangepi:~\$ sudo reboot

4. Linux SDK——orangepi-build instruction

4.1. Compilation system requirements

The Linux SDK, **orangepi-build**, only supports running on X64 computers with **Ubuntu 22.04** installed, so before downloading orangepi-build, please make sure that the Ubuntu version installed on your computer is Ubuntu 22.04. The command to check the Ubuntu version installed on the computer is as follows. If the Release field does not display **22.04**, it means that the current Ubuntu version does not meet the requirements. Please replace the system before performing the following operations.

test@test:~\$ lsb	_release -a	
No LSB module	s are available.	
Distributor ID: U	Jbuntu	
Description:	Ubuntu 22.04 LTS	
Release:	22.04	
Codename:	jammy	

If the computer is installed with a Windows system and there is no computer with Ubuntu 22.04 installed, you can consider using **VirtualBox** or **VMware** to install an Ubuntu 22.04 virtual machine in the Windows system. But please note, do not compile orangepi-build on the WSL virtual machine, because orangepi-build has not been tested in the WSL virtual machine, so it cannot be guaranteed that orangepi-build can be used normally in WSL, and please do not compile it on the Linux system of the development

board Use orangepi-build in. The download address of the installation image of Ubuntu 22.04 **amd64** version is:

https://mirrors.tuna.tsinghua.edu.cn/ubuntu-releases/22.04/ubuntu-22.04-desktop-amd64.iso

4.2. Get the source code of linux sdk

4. 2. 1. Download orangepi-build from github

The linux sdk refers to the code of orangepi-build. orangepi-build is modified based on the armbian build system. Using orangepi-build, multiple versions of linux images can be compiled. Use the following command to download the orangepi-build code:

test@test:~\$ sudo apt-get update

test@test:~\$ sudo apt-get install -y git

test@test:~\$ git clone https://github.com/orangepi-xunlong/orangepi-build.git -b next

Note that the development board using the H618 Soc needs to download the source code of the next branch of orangepi-build. The above git clone command needs to specify the branch of the orangepi-build source code as next.

🛱 orang	epi-xunlong / orangepi-build Public	c		🛇 Unpin 💿 Ur
<> Code	⊙ Issues 6 \$ Pull requests 1 ₽	Discussions 🕑 Actions 🗄 Projects	🛱 Wiki 🛈 Security 占	⊻ Insights 🕸 Seti
	💡 next 🗸 🧚 2 branches 📀 0 tags		Go to file Add file	<> Code -
	Switch branches/eqs ×	behind main.		រឿ Contribute 👻
	Branches Tags Need to switch t	o next	69dd359 4 days ago	3 222 commits
	main default ∕	Update for Orange Pi 5 v1.0.2		4 days ago
	View all branches	Update for Orange Pi 5 v1.0.2		4 days ago
	.gitignore	Update for Orange Pi 5 v1.0.2		4 days ago
		First Commit		2 years ago
	C README.md	Support orangepi3 next branch		8 months ago
	🗋 build.sh	Bump to next branch		9 months ago

Downloading the orangepi-build code through the git clone command does not require entering the user name and password of the github account (the same is true for downloading other codes in this manual), if the Ubuntu PC prompts the user to enter the github account after entering the git clone command The name and password are usually entered incorrectly in the address of the orangepi-build warehouse behind the git clone. Please check the spelling of the command carefully, instead of thinking that we forgot to provide the username and password of the github account.

The u-boot and linux kernel versions currently used by the H618 series development boards are as follows:

branch	u-boot version	Linux kernel version
current	u-boot v2018.05	linux5.4
next	u-boot v2021.07	linux6.1

The branch mentioned here is not the same thing as the branch of the orangepi-build source code, please do not confuse it. This branch is mainly used to distinguish different kernel source code versions.

We currently define the linux5.4 bsp kernel provided by Allwinner as the current branch. The latest linux6.1 LTS kernel is defined as the next branch.

After orangepi-build is downloaded, it will contain the following files and folders:

- a. **build.sh**: Compile the startup script
- b. **external**: Contains the configuration files needed to compile the image, specific scripts, and the source code of some programs, etc.
- c. LICENSE: GPL 2 license file
- d. **README. md**: orangepi-build documentation
- e. scripts: General script for compiling linux images

```
test@test:~/orangepi-build$ ls
```

build.sh external LICENSE README.md scripts

If you downloaded the code of orangepi-build from github, after downloading, you may find that orangepi-build does not contain the source code of u-boot and linux kernel, nor does u-boot and linux kernel need to use cross-compilation tools Chain, this is normal, because these things are stored in other separate github warehouses or some servers (the addresses will be detailed below). orangepi-build will specify the address of u-boot, linux kernel and cross-compilation toolchain in the script and configuration file. When running orangepi-build, when it finds that

there are no such things locally, it will automatically go to the corresponding place to download them.

4. 2. 2. Download the cross-compilation toolchain

When orangepi-build runs for the first time, it will automatically download the cross-compilation toolchain and put it in the **toolchains** folder. Every time you run the build.sh script of orangepi-build, it will check whether the cross-compilation toolchain in **toolchains** exists. If If it does not exist, the download will be restarted, if it exists, it will be used directly, and the download will not be repeated.



The mirror URL of the cross-compilation toolchain in China is the open source software mirror site of armbian University:

https://imola.armbian.com/dl/ toolchain/

After the **toolchains** are downloaded, it will contain multiple versions of the cross-compilation toolchain:

test@test:~/orangepi-build\$ ls toolchains/
gcc-arm-11.2-2022.02-x86_64-aarch64-none-linux-gnu
gcc-linaro-4.9.4-2017.01-x86_64_aarch64-linux-gnu
gcc-linaro-7.4.1-2019.02-x86_64_arm-linux-gnueabi
gcc-arm-11.2-2022.02-x86_64-arm-none-linux-gnueabihf
gcc-linaro-4.9.4-2017.01-x86_64_arm-linux-gnueabi
gcc-linaro-aarch64-none-elf-4.8-2013.11_linux
gcc-arm-9.2-2019.12-x86_64-aarch64-none-linux-gnu

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gcc-linaro-5.5.0-2017.10-x86_64_arm-linux-gnueabihf gcc-linaro-arm-linux-gnueabihf-4.8-2014.04_linux gcc-arm-9.2-2019.12-x86_64-arm-none-linux-gnueabihf gcc-linaro-7.4.1-2019.02-x86_64_aarch64-linux-gnu gcc-linaro-arm-none-eabi-4.8-2014.04_linux

The cross-compilation toolchain used to compile the H618 Linux kernel source code is:

a. linux5.4

gcc-arn	n-11.2-2022.02-x86_64-aarch64-none-linux-gnu	
b.	linux6.1	

gcc-arm-11.2-2022.02-x86 64-aarch64-none-linux-gnu

The cross-compilation toolchain used to compile the H618 u-boot source code is:

a. v2018.05

gcc-linaro-7.4.1-2019.02-x86_64_arm-linux-gnueabi

b. v2021.07

gcc-arm-11.2-2022.02-x86_64-aarch64-none-linux-gnu

4. 2. 3. orangepi-build complete directory structure description

1) The orangepi-build repository does not contain the source code of the linux kernel, u-boot, and cross-compilation toolchain after downloading. The source code of the linux kernel and u-boot is stored in an independent git repository

- a. The git warehouse where the linux kernel source code is stored is as follows, pay attention to switch the branch of the linux-orangepi warehouse to
 - a) Linux5.4

https://github.com/orangepi-xunlong/linux-orangepi/tree/orange-pi-5.4-sun50iw9

b) Linux6.1

https://github.com/orangepi-xunlong/linux-orangepi/tree/orange-pi-6.1-sun50iw9

- b. The git warehouse where the u-boot source code is stored is as follows, pay attention to switch the branch of the u-boot-orangepi warehouse to
 - a) v2018.05

https://github.com/orangepi-xunlong/u-boot-orangepi/tree/v2018.05-h618

b) v2021.07

https://github.com/orangepi-xunlong/u-boot-orangepi/tree/v2021.07-sunxi

2) When orangepi-build runs for the first time, it will download the cross-compilation toolchain, u-boot and linux kernel source code. After successfully compiling a linux image, the files and folders that can be seen in orangepi-build are:

- a. **build.sh**: Compile the startup script
- b. **external**: Contains the configuration files needed for compiling the image, scripts for specific functions, and the source code of some programs. The rootfs compressed package cached during the compiling process is also stored in external
- c. **kernel**: Store the source code of the linux kernel
- d. LICENSE: GPL 2 license file
- e. **README.md**: orangepi-build documentation
- f. **output**: Store compiled u-boot, linux and other deb packages, compilation logs, and compiled images and other files
- g. scripts: General script for compiling linux images
- h. toolchains: Store the cross-compilation toolchain
- i. **u-boot**: Store the source code of u-boot
- j. userpatches: Store the configuration files needed to compile the script

test@test:~/orangepi-build\$ ls

build.sh external kernel LICENSE output README.md scripts toolchains u-boot userpatches

4. 3. Compile u-boot

1) Run the build.sh script, remember to add sudo permission

test@test:~/orangepi-build\$ sudo ./build.sh

2) Select U-boot package, then press Enter

U-boot package	Compile image rootfs
Kernel package	U
Rootfs and all deb packages	R

3) Then select the model of the development board
| | Choose an option |
|---|---|
| Please choose a Board. | |
| orangepi3 Allwinner
orangepi3-lts Allwinner
orangepizero2 Allwinner | H6 quad core 1GB/2GB RAM GBE WiFi/BT eMMC USB3
H6 quad core 2GB RAM GBE WiFi/BT-AW859A eMMC USB3
H616 quad core 512MB/1GB RAM WiFi/BT GBE SPI |
| orangepizero3 Allwinner | H618 quad core 1GB/1.5GB/2GB/4GB RAM WiFi/BT GBE SPI |
| orangepi4 Rockchip
orangepi4-lts Rockchip | RK3399 hexa core 4GB RAM GBE eMMC USB3 USB-C WiFi/BT
RK3399 hexa core 4GB RAM GBE eMMC USB3 USB-C WiFi/BT |

- 4) Then select the branch type of u-boot
 - a. The current branch will compile the u-boot v2018.05 code that needs to be used in the linux5.4 image
 - b. The next branch will compile the u-boot v2021.07 version code that needs to be used in the linux6.1 image

Select the target kernel branch	٦
current Recommended. Come with best support next Use the latest kernel	

5) Then it will start to compile u-boot, and part of the information prompted when compiling the next branch is as follows:

a. u-boot source code version

o.k.] Compiling u-boot [v2021.07]

b. The version of the cross-compilation toolchain

[o.k.] Compiler version [aarch64-linux-gnu-gcc 11]

c. Path to the generated u-boot deb package

[o.k.] Target directory [orangepi-build/output/debs/u-boot]

d. The package name of the generated u-boot deb package

- [o.k.] File name [linux-u-boot-next-orangepizero3_x.x.x_arm64.deb]
 - e. Compilation time

[o.k.] Runtime [**1 min**]

f. Repeat the command to compile u-boot, use the following command to start compiling u-boot directly without selecting through the graphical interface

[o.k.] Repeat Build Options [sudo ./build.sh BOARD=orangepizero3 BRANCH=next BUILD_OPT=u-boot]

6) View the u-boot deb package generated by compilation

test@test:~/orangepi-build\$ ls output/debs/u-boot/ linux-u-boot-next-orangepizero3_x.x.x_arm64.deb

7) When the orangepi-bulid compilation system compiles the u-boot source code, it will first synchronize the u-boot source code with the u-boot source code of the github server, so if you want to modify the u-boot source code, you first need to turn off the download and update function of the source code (This function needs to be fully compiled once u-boot, otherwise it will prompt that the source code of u-boot cannot be found), otherwise the changes made will be restored, the method is as follows:

Set the IGNORE UPDATES variable in **userpatches/config-default.conf** to "yes"

test@test:~/orangepi-build\$ **vim userpatches/config-default.conf** IGNORE_UPDATES="<mark>yes</mark>"

8) When debugging u-boot code, you can use the following method to update u-boot in the linux image for testing

a. First upload the compiled u-boot deb package to the linux system of the development board

test@test:~/orangepi-build\$ cd output/debs/u-boot

test@test:~/orangepi_build/output/debs/u-boot\$ scp \

linux-u-boot-next-orangepizero3_x.x.x_arm64.deb root@192.168.1.xxx:/root

b. Install the new u-boot deb package just uploaded

orangepi@orangepi:~\$ sudo dpkg -i linux-u-boot-next-orangepizero3 x.x.x arm64.deb

c. Then run the nand-sata-install script

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

d. Then select 5 Install/Update the bootloader on SD/eMMC

	Choose an option:
Curre	nt root: UUID=f212e173-cd34-4610-868f-150eca7af979
	Install/Update the bootloader on SD/eMMC
L	
-	< <mark>CK ></mark> <cancel></cancel>

e. After pressing the Enter key, a Warning will pop up first



f. Press the Enter key again to start updating u-boot, and the following information will be displayed after the update

Writing bootloader]
Done.	
< 0 <mark>K ></mark>	-
	¹ 8

g. Then you can restart the development board to test whether the modification of u-boot takes effect

4.4. Compile the linux kernel

1) Run the **build.sh** script, remember to add sudo permission

test@test:~/orangepi-build\$ sudo ./build.sh

2) Select Kernel package, then press Enter

U-boot package	
Rootfs and all deb packages	

3) Then you will be prompted whether you need to display the kernel configuration interface. If you do not need to modify the kernel configuration, select the first one. If



you need to modify the kernel configuration, select the second one.



4) Then select the model of the development board

	0000	Choose an	option 🚽			1
Please choose a Bo	ard.					
orangepi3 orangepi3-lts orangepizero2	Allwinner H6 Allwinner H6 Allwinner H61	quad core 1GB/2 quad core 2GB R 16 quad core 512	GB RAM GBE AM GBE WiFi MB/1GB RAM	WiFi/BT eM ./BT-AW859A WiFi/BT GBI	MC USB3 eMMC USB3 E SPI	
orangepizero3 /	Allwinner H61	18 quad core 1GB	/1.5GB/2GB/	4GB RAM Wil	Fi/BT GBE SPI	
orangepi4 orangepi4-lts	Rockchip RK3 Rockchip RK3	3399 hexa core 4 3399 hexa core 4	GB RAM GBE GB RAM GBE	eMMC USB3 U eMMC USB3 U	JSB-C WiFi/BT JSB-C WiFi/BT	

- 5) Then select the branch type of the kernel source code
 - a. current branch will compile linux5.4 kernel source code
 - b. The next branch will compile the linux6.1 kernel source code



6) If you choose to display the kernel configuration menu (the second option) in step 3), the kernel configuration interface opened by **make menuconfig** will pop up. At this time, you can directly modify the kernel configuration, save and exit after modification. Yes, after exiting, it will start compiling the kernel source code.





a. If you do not need to modify the configuration options of the kernel, when running the build.sh script, pass in **KERNEL_CONFIGURE=no** to temporarily block the pop-up kernel configuration interface

test@test:~/orangepi-build\$ sudo ./build.sh KERNEL CONFIGURE=no

b. You can also set **KERNEL_CONFIGURE=no** in the

orangepi-build/userpatches/config-default.conf configuration file, which can permanently disable this function

c. If the following error is displayed when compiling the kernel, it is because the terminal interface of the Ubuntu PC is too small to display the make menuconfig interface. Please maximize the terminal of the Ubuntu PC and run the build.sh script

```
again
```



7) Part of the information prompted when compiling the next branch kernel source code is as follows:

- a. The version of the linux kernel source code
- o.k.] Compiling current kernel [6.1.31]
 - b. The version of the cross-compilation toolchain used
- [o.k.] Compiler version [aarch64-linux-gnu-gcc 11]
 - c. The configuration file used by the kernel by default and the path where it is stored are as follows

[o.k.] Using kernel config file

[orangepi-build/external/config/kernel/linux-6.1-sun50iw9-next.config]

- d. The path of the deb package related to the kernel generated by compiling
- [o.k.] Target directory [output/debs/]
 - e. The package name of the compiled kernel image deb package
- [o.k.] File name [linux-image-next-sun50iw9_x.x.x_arm64.deb]
 - f. The time used for compilation

[o.k.] Runtime [**10 min**]

g. Finally, the compilation command to repeatedly compile the kernel selected last time will be displayed. Use the following command to start compiling the kernel source code directly without selecting through the graphical interface

[o.k.] Repeat Build Options [sudo ./build.sh BOARD=orangepizero3 BRANCH=next BUILD_OPT=kernel KERNEL_CONFIGURE=no]

- 8) View the deb package related to the kernel generated by compilation
 - a. linux-dtb-next-sun50iw9_x.x.x_arm64.deb Contains dtb files used by the kernel
 - b. linux-headers-next-sun50iw9_x.x.x_arm64.deb Include kernel headers
 - c. **linux-image-next-sun50iw9_x.x.x_arm64.deb** Contains kernel images and kernel modules

test@test:~/orangepi-build\$ **ls output/debs/linux-*** output/debs/linux-dtb-next-sun50iw9_x.x.x_arm64.deb output/debs/linux-headers-next-sun50iw9_x.x.x_arm64.deb output/debs/linux-image-next-sun50iw9_x.x.x_arm64.deb

9) When the orangepi-bulid compilation system compiles the linux kernel source code, it

first synchronizes the linux kernel source code with the linux kernel source code of the github server, so if you want to modify the linux kernel source code, you first need to turn off the update function of the source code (the linux kernel needs to be fully compiled once This function can only be turned off after the source code, otherwise it will prompt that the source code of the linux kernel cannot be found), otherwise the changes made will be restored, the method is as follows:

Set the IGNORE_UPDATES variable in **userpatches/config-default.conf** to "yes" test@test:~/orangepi-build\$ **vim userpatches/config-default.conf** IGNORE_UPDATES="**yes**"

10) If the kernel has been modified, the following method can be used to update the kernel and kernel modules of the development board linux system

a. Upload the deb package of the compiled linux kernel to the linux system of the development board

test@test:~/orangepi-build\$ cd output/debs

test@test:~/orangepi-build/output/debs\$ scp \

linux-image-next-sun50iw9_x.x.x_arm64.deb root@192.168.1.xxx:/root

b. Install the deb package of the new linux kernel just uploaded

orangepi@orangepi:~\$ sudo dpkg -i linux-image-next-sun50iw9_x.x.x_arm64.deb

c. Then restart the development board, and then check whether the kernel-related modifications have taken effect

orangepi@orangepi:~\$ sudo reboot

4.5. **Compile rootfs**

1) Run the build.sh script, remember to add sudo permission

test@test:~/orangepi-build\$ sudo ./build.sh

2) Select Rootfs and all deb packages, then press Enter

```
Choose an option
Compile image | rootfs | kernel | u-boot
U-boot package
Kernel package
Rootfs and all deb packages
Full OS image for flashing
```

3) Then select the model of the development board

	Choose an option
Please choose a Board.	
orangepi3 Allwinne	r H6 quad core 1GB/2GB RAM GBE WiFi/BT eMMC USB3
orangepi3-lts Allwinne	r H6 quad core 2GB RAM GBE WiFi/BT-AW859A eMMC USB3
orangepizero2 Allwinne	r H616 quad core 512MB/1GB RAM WiFi/BT GBE SPI
orangepizero3 Allwinne	r H618 quad core 1GB/1.5GB/2GB/4GB RAM WiFi/BT GBE SPI
orangepi4 Rockchip	RK3399 hexa core 4GB RAM GBE eMMC USB3 USB-C WiFi/BT
orangepi4-lts Rockchip	RK3399 hexa core 4GB RAM GBE eMMC USB3 USB-C WiFi/BT

4) Then select the branch type of the kernel source code, the type of rootfs maintained by different versions of the kernel source code is different

- a. The current branch can see debian11, ubuntu20.04, ubuntu22.04 three options
- b. The next branch can see debian11, debian12, ubuntu22.04 three options

Choose an o	ption
Select the target kernel branch	
current Recommended. Com	e with best support
next Use the latest k	ernel

5) Then select the type of rootfs

seccer the target os recease package base	
bookworm Debiar	12 Bookworm
bullseye Debiar	11 Bullseye

- 6) Then select the type of image
 - a. **Image with console interface (server)** Indicates the image of the server version, which is relatively small
 - b. **Image with desktop environment** Indicates a mirror image with a desktop, which is relatively large

Select the target image type.	
Image with console interface (server)	
Image with desktop environment	

7) If you are compiling the image of the server version, you can also choose to compile the Standard version or the Minimal version. The pre-installed software of the Minimal version will be much less than that of the Standard version (please do not choose the

Minimal version if there is no special requirement, because many things are not pre-installed by default. Some functions may not be available)

Select the target image type.	٦
Standard image with console interface Minimal image with console interface	

8) If you are compiling the image of the desktop version, you also need to select the type of desktop environment. Currently only XFCE is maintained, so please choose the XFCE type desktop

Choose a desktop environment Select the default desktop environment to bundle with this image Xfce desktop environment
Choose the desktop environment config Select the configuration for this environment. base configuration

You can then select additional packages that need to be installed. Please press the Enter key to skip directly here.

Choose desktop softwares to add Select which kind of softwares you'd like to add to your build			
<pre>[] 3dsupport [] browsers [] cbat</pre>	3dsupport Browsers Chat		
[] desktop_tools [] editors [] internet [] multimedia [] office [] programming [] remote_desktop	Desktop_tools Editors Internet Multimedia Office Programming Remote_desktop		
	<0k>	<cancel></cancel>	

9) Then it will start to compile rootfs, and some information prompted during compilation is explained as follows

🧐 range Pi User Manual

a. The type of rootfs

[o.k.] local not found [Creating new rootfs cache for **bullseye**]

b. The storage path of the compiled rootfs compressed package

- [o.k.] Target directory [**orangepi-build/external/cache/rootfs**]
 - c. The name of the rootfs compressed package generated by compilation

[o.k.] File name [bullseye-xfce-arm64.5250ec7002de9e81a41de169f1f89721.tar.lz4]

10) View the rootfs compressed package generated by compilation

- a. **bullseye-xfce-arm64.5250ec7002de9e81a41de169f1f89721.tar.lz4** is the rootfs compressed package, the meaning of each field of the name is
 - a) **bullseye** indicates the type of linux distribution of rootfs
 - b) **xfce** means rootfs is the type of desktop version, if it is **cli**, it means the type of server version
 - c) **arm64** represents the architecture type of rootfs
 - d) **25250ec7002de9e81a41de169f1f89721** is the MD5 hash value generated by the package names of all software packages installed by rootfs. As long as the list of software packages installed by rootfs is not modified, this value will not change. The compilation script will use this MD5 hash value to generate Determine whether rootfs needs to be recompiled
- b. **bullseye-xfce-arm64.5250ec7002de9e81a41de169f1f89721.tar.lz4.list** lists the package names of all packages installed by rootfs

test@test:~/orangepi-build\$ **ls external/cache/rootfs**/ bullseye-xfce-arm64.5250ec7002de9e81a41de169f1f89721.tar.lz4 bullseye-xfce-arm64.5250ec7002de9e81a41de169f1f89721.tar.lz4.current bullseye-xfce-arm64.5250ec7002de9e81a41de169f1f89721.tar.lz4.list

11) If the required rootfs already exists under **external/cache/rootfs**, then compiling rootfs again will directly skip the compilation process and will not restart the compilation. When compiling the image, it will also go to **external/cache/rootfs** to find out whether it has If there is rootfs available in the cache, use it directly, which can save a lot of download and compilation time

4. 6. **Compile linux image**

1) Run the **build.sh** script, remember to add sudo permission

test@test:~/orangepi-build\$ sudo ./build.sh

2) Select **Full OS image for flashing**, then press Enter

Choose an option Compile image rootfs kernel u-boot	
U-boot package Kernel package Rootfs and all deb packages <mark>Full OS image for flashing</mark>	

3) Then select the model of the development board



4) Then select the branch type of the kernel source code, the type of rootfs maintained by different versions of the kernel source code is different

- a. The current branch can see debian11, ubuntu20.04, ubuntu22.04 three options
- b. The next branch can see debian11, debian12, ubuntu22.04 three options

Choose an option		
Select the target kernel branch		
current Recommended. Come with best support		
next Use the latest kernel		

5) Then select the type of rootfs

	Choose a release package base	
Select the target OS release pack	kage base	
	1 million and the second second second second second second second second second second second second second se	
	bookworm Debian 12 Bookworm	
	bullseye Debian 11 Bullseye	
	jammy Ubuntu jammy 22.04 LTS	

- 6) Then select the type of image
 - c. **Image with console interface (server)** Indicates the image of the server version, which is relatively small

d. **Image with desktop environment** Indicates a mirror image with a desktop, which is relatively large



7) If you are compiling the image of the server version, you can also choose to compile the Standard version or the Minimal version. The pre-installed software of the Minimal version will be much less than that of the Standard version (please do not choose the Minimal version if there is no special requirement, because many things are not pre-installed by default. Some functions may not be available)

Select the target image type.	٦
Standard image with console interface Minimal image with console interface	

8) If you are compiling the image of the desktop version, you also need to select the type of desktop environment. Currently only XFCE is maintained, so please select the XFCE type desktop

Choose a desktop environment Select the default desktop environment to bundle with this image Xfce desktop environment
Choose the desktop environment config Select the configuration for this environment.
base configuration

You can then select additional packages that need to be installed. Please press the Enter key to skip directly here.

Select which kind of softwares you'd	bese desktop softwares to add like to add to your build
[] 3dsupport 3dsupport [] browsers Browsers [] chat Chat [] desktop_tools Desktop_tools [] editors Editors [] internet Internet [] multimedia Multimedia [] office Office [] programming Programming [] remote_desktop Remote_desktop	
<0k>	<cancel></cancel>

9) Then it will start to compile the linux image. The general process of compilation is as follows

a. Initialize the compilation environment of Ubuntu PC and install the software packages required for the compilation process

b. Download the source code of u-boot and linux kernel (if cached, only update the code)

- c. Compile u-boot source code and generate u-boot deb package
- d. Compile the linux source code and generate linux-related deb packages
- e. Make the deb package of linux firmware
- f. Make the deb package of the orangepi-config tool
- g. Create a deb package supported by the board

h. If you are compiling the desktop image, you will also create desktop-related deb packages

i. Check whether the rootfs has been cached, if not, recreate the rootfs, if it has been cached, directly decompress and use

j. Install the previously generated deb package into rootfs

k. Make some specific settings for different development boards and different types of images, such as pre-installing additional software packages, modifying system configuration, etc.

1. Then make an image file and format the partition, the default type is ext4

- m. Then copy the configured rootfs to the mirrored partition
- n. Then update initramfs
- o. Finally, write the bin file of u-boot into the image through the dd command

10) After compiling the image, the following information will be prompted

a. The storage path of the compiled image

o.k.] Done building

[output/images/orangepizero3_x.x.x_debian_bullseye_linux6.1.xx_xfce_desktop/ora ngepizero3_x.x.x_debian_bullseye_linux6.1.xx_xfce_desktop.img]

b. Compilation time

[o.k.] Runtime [19 min]

c. Repeat the command to compile the image, and use the following command to start compiling the image directly without selecting through the graphical interface

[o.k.] Repeat Build Options [sudo ./build.sh BOARD=orangepizero3 BRANCH=next BUILD_OPT=image RELEASE=bullseye BUILD_MINIMAL=no BUILD_DESKTOP=no KERNEL_CONFIGURE=yes]

5. Android 12 TV system instructions

5.1. Supported Android versions

Android version	kernel version
Android 12 TV version	linux5.4

5.2. Android 12 TV function adaptation

Function	Android12
HDMI Video	OK
HDMI Audio	OK
USB2.0 x 3	OK
TFcard boot	OK
network card	OK
infrared	OK
WIFI	OK
WIFI hotsport	OK
Bluetooth	OK
BLE Bluetooth	OK
headphone audio	OK
TV-OUT	OK
USB camera	OK
LED light	OK
Temperature Sensor	OK
Mali GPU	OK
video codec	OK

5.3. **Onboard LED light display instructions**

	Green Light	Red Light
u-boot startup phase	Off	Bright



The kernel boots into the	Bright	Off
system		

5.4. Android method to return to the previous interface

1) We generally use the mouse and keyboard to control the Android system of the development board. When entering certain interfaces and need to return to the previous interface or desktop, we can only return through the **right mouse button**, and the keyboard cannot return.

2) If you have purchased the infrared remote control (other remote control does not work) and the expansion board that match the development board, after inserting the expansion board into the development board, you can return to the previous menu through the return key in the remote control. The position of the return key is shown in the figure below shown:



5.5. How to use ADB

5. 5. 1. Use network connection adb debugging

Using the network adb does not require a USB Type C interface data cable to connect the computer and the development board, but to communicate through the network, so first make sure that the wired or wireless network of the development board has been connected, and then obtain the IP address of the development board, and then to use.

1) Make sure that the **service.adb.tcp.port** of the Android system is set to port number 5555

apollo-p2:/ # getprop | grep "adb.tcp" [service.adb.tcp.port]: [5555]

2) If **service.adb.tcp.port** is not set, you can use the following command to set the port number of network adb in the serial port

apollo-p2:/ # setprop service.adb.tcp.port 5555 apollo-p2:/ # stop adbd apollo-p2:/ # start adbd

3) Install adb tool on Ubuntu PC

test@test:~\$ sudo apt-get update

test@test:~\$ sudo apt-get install -y adb

4) Then connect network adb on Ubuntu PC

test@test:~\$ adb connect 192.168.1.xxx:5555	(It needs to be modified to the IP
address of the development board)	
* daemon not running; starting now at tcp:5037	
* daemon started successfully	
connected to 192.168.1.xxx:5555	
test@test:~\$ adb devices	
List of devices attached	
192.168.1.xxx:5555 device	

5) Then you can log in to the android system through the adb shell on the Ubuntu PC

test@test:~\$ adb shell	
apollo-p2:/#	

5. 5. 2. Use the data cable to connect to adb debugging

1) Prepare a data cable with USB Type C interface, plug one end of the USB interface into the USB interface of the computer, and insert one end of the USB Type C interface into the power interface of the development board. In this case, the development board is powered by the USB interface of the computer, so please make sure that the USB interface of the computer can provide the most power to drive the development board



Install adb tool on Ubuntu PC
 test@test:~\$ sudo apt-get update
 test@test:~\$ sudo apt-get install -y adb

3) View the identified ADB device

test@test:~\$ **adb devices** List of devices attached 4c00146473c28651dd0 device

4) Then you can log in to the android system through the adb shell on the Ubuntu PC test@test:~\$ adb shell apollo-p2:/\$

5. 6. View the method of setting HDMI display resolution

1) First enter Settings



2) Then select **Device Preferences**



3) Then select **Display & Sound**

FileManager	Gallery	MiracustReceiver	Music		Device Preferences	
Device					🕀 Language	
Device					Keyboard Android Keyboard (AOSP)	
•				1	Inputs	
Settings					Display & Sound	R
					Storage	

4) Then select **Advanced display settings**

FileManager		Display & Sound
		Display
Device		Text scaling
0		Match content frame rate
		Advanced display settings

5) Then select **HDMI outpu mode**



6) Then you can see the list of resolutions supported by the display. At this time, click the corresponding option to switch to the corresponding resolution. Please note that the resolutions supported by different monitors may be different. If you connect to a TV, you will generally see more resolution options than the picture below.



7) The HDMI output of the development board supports 4K display. When connected to a 4K TV, you can see the option of 4K resolution



5.7. HDMI to VGA display test

- 1) First, you need to prepare the following accessories
 - a. HDMI to VGA Converter



b. A VGA cable and a Micro HDMI male to HDMI female conversion cable



- c. A monitor or TV that supports VGA interface
- 2) HDMI to VGA display test as shown below



When using HDMI to VGA display, the development board and the Android system of the development board do not need to make any settings, only the Micro HDMI interface of the development board can display normally. So if there is a problem with the test, please check whether there is a problem with the HDMI to VGA converter, VGA cable and monitor.

5.8. WI-FI connection method

1) First select Settings



2) Then select Network & Internet



3) Then open WI-FI



4) After turning on WI-FI, you can see the searched signal under Available networks



5) After selecting the WI-FI you want to connect to, the password input interface shown in the figure below will pop up



6) Then use the keyboard to enter the password corresponding to the WI-FI, and then use the **mouse** to click the Enter button in the virtual keyboard to start connecting to the WI-FI



7) After the WI-FI connection is successful, the display is as shown in the figure below



5.9. How to use WI-FI hotspot

1) First, please make sure that the Ethernet port is connected to the network cable and can access the Internet normally

2) Then select Settings



3) Then select Network & Internet



4) Then select WIFI hotspot



5) Then turn on **Hotspot Enable**, you can also see the name and password of the generated hotspot in the figure below, remember them and use them when connecting to the hotspot (if you need to modify the name and password of the hotspot, you need to turn off **Hotspot Enable** first, before modifying)



6) At this point, you can take out your mobile phone. If everything is normal, you can find the WIFI hotspot with the same name (here AndroidAP_7132) displayed under the **Hotspot name** in the above picture in the WI-FI list searched by the mobile phone. Then you can click AndroidAP_7132 to connect to the hotspot, and the password can be seen

under the **Hotspot password** in the above picture

〈 设置 Wi	-Fi
Wi-Fi	
✓ xunlong_orangepi	€ 중 (j)
网络	
AndroidAP_7132	🔒 🗢 i

7) After the connection is successful, it will be displayed as shown in the figure below (the interface of different mobile phones will be different, the specific interface is subject to the display of your mobile phone). At this point, you can open a webpage on your mobile phone to see if you can access the Internet. If you can open the webpage normally, it means that the **WI-FI Hotspot** of the development board can be used normally.

〈 设	🖺 Wi-Fi	
	Wi-Fi	
~	AndroidAP_7132	🔒 🗢 i

5. 10. How to check the IP address of the Ethernet port

1) First, please make sure that the Gigabit Ethernet port of the development board is connected to a router or switch



2) Then open Settings

3) Then select Network & Internet



4) Then you can see the IP address of the development board's wired network port at the position shown in the figure below



5. 11. Bluetooth connection method

1) First select Settings



2) Then select **Bluetooth**



3) Then open **Bluetooth Enable**

Gallery	MiracastReceiver	Music	Bluetooth
			🗴 Bluetooth Enable
			Visible as "orangepizero3" to other devices
			Paired devices
			+ Pair new device
			Paired device management
			Device name orangepizero3
			Received files

4) Then click **Pair new device** to start scanning the surrounding Bluetooth devices



5) The searched Bluetooth devices will be displayed under Available devices



6) Then click the Bluetooth device you want to connect to start pairing. When the following interface pops up, please use the mouse to select the **Pair** option



7) The test here is the configuration process of the development board and the Bluetooth of the **Android mobile phone**. At this time, the following confirmation interface will pop up on the mobile phone. After clicking the pairing button on the mobile phone, the pairing process will start



8) After the pairing is complete, open **Paired devices** and you can see the paired Bluetooth devices



9) At this time, you can use the Bluetooth of your mobile phone to send a picture to the development board. After sending, you can see the following confirmation interface in the Android system of the development board, and then click **Accept** to start receiving the picture sent by the mobile phone.



10) The pictures received by the Android system Bluetooth of the development board can be viewed in **Received files**



5. 12. How to use the USB camera

1) First insert the USB (UVC protocol) camera into the USB interface of the development board

2) If the USB camera is recognized normally, a corresponding video device node will be generated under /dev

console:/ # ls /dev/video0	
/dev/video0	

3) Then make sure that the adb connection between the Ubuntu PC and the development board is normal. For how to use adb, please refer to the instructions in the section on how to use ADB

4) Download the USB camera test APP in the official tool on the development board data download page

of range Pi User Manual	Copyrig	ht reserved by S	henzhen Xunlong	g Software Co., Ltd
•	0	1		
Ubuntu Image	Debian Image	Android Image	Android Source Code	
	p	COMPARENT L	Dewnoads	
Linux Source coo	de User Manual	Official Tools		
官方工具				日本 保存到网盘
① 2020-11-03 14:09 失效时间:永久有效				
返回上一級 全部文件 > 官方工具 > Android测试APP				
」 文件名			大小 20M	修政日期 2020-11-04 13:56
rootcheck.apk			204	2020-11-04 13:48
REFile.apk			4.4M	2020-11-04 13:48
bledemo.apk			4.1M	2020-11-04 13:48

5) Then use the adb command to install the USB camera test APP to the Android system, of course, you can also use the U disk to copy the installation

test@test:~\$ adb install usbcamera.apk

6) After installation, you can see the startup icon of the USB camera on the Android desktop



7) Then double-click to open the USB camera APP and you can see the output video of the USB camera

5.13. Android system ROOT instructions

The Android system released by Orange Pi has been ROOT, you can use the



following method to test.

1) Download **rootcheck.apk** from the official tool on the development board data download page

	ubuntu镜像 下载	debian镜像 下载	android镜像 下载	android源码	
	に Linux源码	官方工具			
官方工具 ① 2020-11-03 14:09 失效时间: 永久有效					€年代的
返回上一级 全部文件 > 官方工具 > Android测试	CAPP				
文件名				大小	修改日期
🗌 💼 usbcamera.apk				20M	2020-11-04 13:56
🗆 🔒 rootcheck.apk				2M	2020-11-04 13:48
REFile.apk				4.4M	2020-11-04 13:48

2) Then make sure that the adb connection between the Ubuntu PC and the development board is normal. For how to use adb, please refer to the instructions in the section on how to use ADB

3) Then use the adb command to install rootcheck.apk to the Android system, of course, you can also use the U disk to copy the installation

4) After installation, you can see the startup icon of the ROOT test tool on the Android desktop



5) The display interface after opening the **ROOT test tool** for the first time is shown in the figure below

Root Chee	Root Checker		
Root Statu	S		
Device OS	Allwinner orangepizero3 12 2022-02-05 (API 31)	NOT CHECKED	CHECK NOW

6) Then you can click **CHECK NOW** to start checking the ROOT status of the Android system. After the check, the display is as follows, and you can see that the Android system has obtained the ROOT permission

Root Cheo	ker	
Root Statu	3	
Device OS	Allwinner orangepizero3 12 2022-02-05 (API 31)	ROOTED
		CHECK NOW

5. 14. The method of using MiracastReceiver to cast the mobile phone screen to the development board

1) First, please make sure that the development board and the mobile phone are connected to the same WIFI hotspot. For the method of connecting the development board to WIFI, please refer to the description in the section of **WI-FI connection method**

2) Then open the **MiracastReceiver** application in the Android system of the development board



3) The interface after MiracastReceiver is opened is as follows

Miracast WiFiDisplay	
orangepizero3 waiting for connection	Ŗ
Help Failed to rename device	

4) Then find the screen projection function in the mobile phone settings. Here we take the Mi 12S Pro mobile phone as an example. Please research other brands of mobile phones by yourself. As shown in the figure below, click the button in the red box to open the screen projection function of the mobile phone

				-	_
Cast					
Cest s	creen co	ntents to a	an external	C.	
monito	Dif.			-	-
Dem	os			1	
Castin	g docum	ents, gam	es, photos, i	nd deos	
SPECU	N. FEATU	RES	6		
	1				
Minir	nize w	indow			
Miriumia other fi	e the wire estures of	low that's b your phone	eing cast to b	e able to use	
	1000				

5) After waiting for a while, you can see the searched and connectable devices on the mobile phone, and then we can select the device corresponding to the development board to connect

←
Cast
Cast Cast screen contents to an external monitor
Demos > Casting documents, games, photos, and videos
SPECIAL FEATURES
Select device (1)
 客厅的Redmi电视 orangepizero3
Cancel Help

6) Then the selection box shown in the figure below will pop up on the **MiracastReceiver** application interface of the development board, here we can select **Accept**

Miracast WiFiDisplay	
Invitation to connect From: Xiaomi 12S Pro OCC Accept Decline	ion
Help	13

7) Then you can see the content of the mobile phone screen on the HDMI screen connected to the development board



5. 15. 26pin interface GPIO, UART, SPI test

5. 15. 1. **26pin GPIO port test method**

1) First open the wiringOP APP on the desktop



2) Then click the **GPIO_TEST** button to open the GPIO test interface



3) The GPIO test interface is shown in the figure below. There is a one-to-one correspondence between the two rows of **CheckBox** buttons on the left and the 26pin pins (PC1/PI16/PI6/PH10 in the lower left corner are GPIO ports in the 13pin pins). When the **CheckBox** button is checked, the corresponding GPIO pin will be set to **OUT** mode, and the pin level will be set to high level; when the checkbox is unchecked, the GPIO pin level will be set to low level; When the **GPIO READALL** button is pressed, information such as the wPi number, GPIO mode, and pin level can be obtained.

wiringO	þ	
3.3V 🗌	5V	GPIO READALL
SDA.3	🗌 5V	
SCL.3	GND	
РС9 🗌	TXD.5	
GND	RXD.5	
PC6 🗌	D PC11	
PC5	GND	
PC8	PC15	
3.3V 🗌	PC14	
MOSI.1	GND	
MISO.1	PC7	
SCLK.1	CE.1	
GND	PC10	*
PC1		
PI16 🗌		
P16		
РН10		

4) Then click the **GPIO READALL** button, the output information is as shown in the figure below:

3V 🗌 🔲 5V	GPIO READALL											
A.3 🔲 🗌 5V	+++++++++											
L.3 🔲 🗌 GND	GPIO	wPi	Name	Mode	V	Phys	ical	I V	Mode	Name	wPi	GPIO
С9 🗌 🗍 ТХД.5	1		3.3V			1	2			5V		
	229	0	SDA.3	IN	11	3	4	Į.		5V		
ID I RXD.5	1 73		DCG	066			0	1	AI T 2		1 3	226
26 🔲 🗍 PC11	1 1		GND			i ĝ i	1 10	ŏ	ALT2	RXD.5	4	227
	j 70		PC6	ALT5	j o	11		j 0	OFF	PC11	6	
C5 🔲 🗌 GND	69	7	PC5	ALT5	0	13	14	I _		GND		
	/2	8	2 21/	OFF	0		1 10			PC15	9	1 79
	231	11	MOSI.1	ALT4	0	19	20	ľ				
V 🗌 🔲 PC14	232	12	MISO.1	ALT4	0	21	22	0	OFF	PC7		
	230	14	SCLK.1	ALT4	0	23	24	0	ALT4	CE.1		233
	65	47	GND	055		25	26	0	OFF	PC10	16	74
1 🗌 🗌 PC7	272	18	PUT PT16	OFF		2/	1 30					
	262	19	PI6	OFF	Ö	31	32	i –				
.1 📋 📋 CE.1	234	20	PH10	ALT3		j 33 j	34		É.			
D 🗌 🔲 PC10	+	++ wPi	Name	Mode	+ V	++ Phys	ical	+ i v	Hode	+	-+	+
n 🗆 🗆	+	+			+	+ H6	16	+	+	+	-+	+
6 🗖 🗖												
5) There are a total of 17 GPIO ports in the 26pin of the development board that can be used (if you add 4 GPIO ports in the 13pin, then there are 21 in total), and the following pin No. 7 - corresponding to GPIO is PC9 - corresponding to wPi The serial number is 2——as an example to demonstrate how to set the high and low levels of the GPIO port. First click the **CheckBox** button corresponding to pin 7. When the button is selected, pin 7 will be set to high level. After setting, you can use a multimeter to measure the voltage value of the pin. If it is **3.3v**, it means setting high level success

wiringOP												
3.3V 🗌 🔲 5V	GPIO READALL											
SDA.3 🔲 🗌 5V						- H6	16	*	+			
SCL.3	GPIO	wPi	Name	Mode	V	Phys	ical	V	Mode	Name	wPi	GPIO
PC9 🔽 🗂 TXD.5	229		3.3V		1	1	2			5V 5V		
GND 🔲 🔲 RXD.5	228		SCL.3	IN	1	5	6	0		GND	3	226
PC6 🗌 🗌 PC11	70		GND	AL T5	0	9	10	0	ALT2	RXD.5	4	227
PC5 🔲 🗌 GND	69		PC5	ALT5	0	13	14			GND		
PC8 🗌 🗌 PC15	2		3.3V	0FF		17	18	0	OFF	PC14	10	78
3.3V 🗌 🔲 PC14	232	12	MISO.1	ALT4	0	21	22	0	OFF		13	71
MOSI.1 🗌 🗌 GND	1 230	17	GND	055	0	25	26	0	OFF	PC10	16	74
MISO.1 🗌 🗌 PC7	272	18	PI16	OFF	0	29	30					į i
SCLK.1	262	20	PH10	ALT3	0	33	34					ļ
GND 🗌 🔲 PC10	GPI0	wPi	Name	Mode	V	Phys	ical	V	Mode	Name	wPi	GPIO
PC1 🔲 🗌	+	++-	+		+	- н6	10	+	+	+	-+	++

6) Then click the **GPIO READALL** button, you can see that the current pin 7 mode is **OUT**, and the pin level is high

wiringOP												
3.3V 🔲	🗌 5V	1				(SPIO READAL	.L				
SDA.3	🗌 5V						1616					_
SCL.3	GND	GPIO	wPi	Name	Mode	V	Physical	Į V	Mode	Name	wPi	GPIO
PC9 🔽	TXD.5	229	0	3.3V	TN		1 2			5V 5V		
GND	RXD.5	228	1	SCL.3	IN	Li,	5 6			GND		
PC6 🗌	PC11	73	2	PC9 GND	OUT	1	7 8 9 10	0	ALT2	TXD.5 RXD.5	3	226
PC5	GND	69	5	PC5	ALT5 ALT5	0	13 14			GND	6	75
PC8 🗌	PC15	221	11	3.3V		0		0	0FF	PC14	10	78
3.3V 🗌	PC14	232	12	MISO.1	ALT4	0	21 22	0	OFF	PC7	13	71
MOSI.1	GND	230	14	SCLK.1 GND	ALT4	0	23 24		ALT4	CE.1 PC10	15	233
MISO.1	PC7	65 272	17	PC1 PI16	0FF 0FF	0	27 28 29 30					
SCLK.1	CE.1	262 234	19 20	PI6 PH10	OFF ALT3	0	31 32 33 34					
GND	PC10	+	wPi	Name	Mode		Physical		+ Mode	-+ Name	wPi	GPIO
PC1		+	++	4			+ H616		+			

7) Click the **CheckBox** button in the figure below again to cancel the check status. Pin 7 will be set to low level. After setting, you can use a multimeter to measure the voltage value of the pin. If it is **0v**, it means that the low level is set successfully.



wiringOP												
3.3V 🗌 🗌 5V		/			(GPIO RE	ADALL	1				
SDA.3 🔲 🗌 5V						+ NC	16	****				
SCL.3	GPIO	wPi	Name	Mode	V	Phys	ical		Mode	Name	wPi	GPI0
PC9 🔲 🗂 TXD.5	229	0	3.3V SDA.3	IN	1	1 3	2 4		+ 	5V 5V		
GND 🔲 🔲 RXD.5	228		SCL.3 PC9	IN OUT	1	5	6		ALT2	GND TXD.5		226
PC6 🗌 🗌 PC11	70		GND PC6	ALT5	0	9	10 12	0	ALT2	RXD.5 PC11	4 6	227
PC5 🔲 🗌 GND	69 72	7 8	PC5 PC8	ALT5 OFF	0	13	14	0	OFF	GND PC15		79
PC8 _ PC15	231		3.3V MOSI.1	ALT4	0	17 19	18		0FF 	PC14 GND	10	78
3.3V PC14	232	12	MISO.1 SCLK.1	ALT4 ALT4	0	21 23	22	0	OFF	PC7 CE.1	13 15	71
	65	17	GND PC1	OFF	0	25	26		OFF	PC10	16	74
/ISO.1 _ PC7	272	18 19	PI16 PI6	OFF OFF	0	29	30					
SCLK.1 [] [] CE.1	234	20	PH10	ALT3	Ő	33	34	į +	i +			
GND C PC10	GPI0	wPi	Name	Mode	V	Phys + H6	ical	V	Mode	Name	wPi	GPI0
PC1 🔲 🛄						110						

8) Then click the **GPIO READALL** button, you can see that the current pin 7 mode is OUT, and the pin level is low

wiringOP		
3.3V 🗌 🔲 5V	GPIO READALL	
SDA.3 🔲 🗍 5V	4	
SCL.3	GPIO wPi Name Mode V Physical V Mode Name	wPi GPIO
PC9 🗌 🗌 TXD.5		
GND 🔲 🔲 RXD.5	228 1 SCL.3 IIIII 6 GND	
PC6 🗌 🗌 PC11	73 2 PC9 OUT 0 7 8 0 ALT2 TXD. GND 9 10 0 ALT2 RXD.	5 3 226 5 4 227
	70 5 PC6 ALT5 0 11 12 0 OFF PC11 69 7 PC5 ALT5 0 13 14 GND	6 75
	72 8 PC8 OFF 0 15 16 0 OFF PC15	9 79
	231 11 MOSI.1 ALT4 0 19 20 GND	12 71
	230 14 SCLK.1 ALT4 0 23 24 0 ALT4 CE.1	15 233
	GND 25 26 0 0FF PC10	16 /4
MISO.1 🗌 📋 PC7	272 18 PI16 OFF 0 29 30	
SCLK.1 🗌 🗌 CE.1	262 19 PI6 OFF 0 31 32 234 20 PH10 ALT3 0 33 34	
GND 🗌 🔲 PC10	+++++++++++++++++	+++ wPi GPIO
PC1 🔲 🗌	++ H616 +++	

5. 15. 2. 26pin UART test method

1) **UART5** is enabled by default in Android, and the corresponding device node is /dev/ttyAS5

apollo-p2:/ # ls /dev/ttyAS5 /dev/ttyAS5

2) First open the wiringOP APP on the desktop

Apps				
P	**	ē		Ő,
FileManager	Gallery	MiracastReceiver	Music	wiringOP

3) Then click the **UART TEST** button to open the UART test interface

wiringOP
GPI0_TEST
UART_TEST
12C_TEST
SPI_TEST

4) The serial port test interface of wiringOP is shown in the figure below

wiringOP							
/dev/ttyS3	8 115200	OPEN	CLOSE				
hello world!							
				SEND			

5) Then select the /dev/ttyAS5 node in the selection box

wiringOP							
/dev/ttyAS0	*	115200	OPEN	CLOSE			
/dev/ttyAS1							
/dev/ttyAS5							
/dev/ttyS0							
/dev/ttyS1					SEND		
/dev/ttyS2							
/dev/ttyS3							

6) Enter the baud rate you want to set in the edit box, and then click the **OPEN** button to open the /dev/ttyAS5 node. After the opening is successful, the **OPEN** button becomes unselectable, and the **CLOSE** button and **SEND** button become selectable.

wiringOP				/	
/dev/ttyAS5	Ŧ	115200	OPEN	CLOSE	

7) Then use Dupont wire to short the rx and tx pins of uart5

	uart5			
Tx pin	Corresponding to pin 8 of			
	26pin			
Rx pin	Corresponding to pin 10 of			
	26pin			

8) Then you can enter a character in the send edit box below, click the **SEND** button to start sending

wiringOP					
/dev/ttyAS5	*	115200	OPEN	CLOSE	
hello world 🛹					
					SEND

9) If everything is normal, the received string will be displayed in the receiving box

wiringOP					
/dev/ttyAS5	*	115200	OPEN	CLOSE	
hello world!	Į.				
hello world!					
					SEND

5. 15. 3. **26pin SPI test method**

1) The SPI that can be used in 26pin is SPI1, and the corresponding device node is /dev/spidev1.1

🤍 range Pi User M	anual	Copyright reserved by	Shenzhen Xunlong So	ftware Co., Ltd
Apps				
-				1
E I	<u> </u>			Ca.
				101
FileManager	Gallerv	MiracastReceiver	Music	wiringOD
				winnigor

2) Here is a demonstration to test the SPI1 interface through the w25q64 module, first connect the w25q64 module to the SPI1 interface

It doesn't matter if there is no w25q64 module, because there is a SPIFlash connected to SPI0 on the development board, and the configuration of SPI0 is also enabled by default in Android, so we can also directly use the onboard SPIFlash test.

3) Then open the wiringOP APP on the desktop

X

4) Then click the **SPI_TEST** button to open the SPI test interface

wiringOP	
OPIO_TES	т
UART_TES	т
I2C_TEST	
SPI_TEST	

5) Then select the spi device node in the upper left corner. If you directly test the onboard SPIFlash, then keep the default /dev/spidev0.0. If you connect the w25q64 module to the 26pin spi1, then please select /dev /dev/spidev1.1



6) Then click the **OPEN** button to initialize the SPI



7) Then fill in the bytes that need to be sent, such as reading the ID information of the onboard SPIFlash, fill in the address 0x9f in data[0], and then click the **TRANSFER** button



8) Finally, the APP will display the read ID information of the onboard SPI Flash



9) If it is to read the w25q64 module connected to 26pin SPI1, then the read ID information is shown in the figure below



10) The MANUFACTURER ID of the w25q64 module is EFh, and the Device ID is 4017h, corresponding to the value read above (h stands for hexadecimal)

MANUFACTURER ID	(MF7 - MF0)		
Winbond Serial Flash	EFh		
Device ID	(ID7 - ID0)	(ID15 - ID0)	
Instruction	ABh, 90h, 92h, 94h	9Fh	
W25Q64FV (SPI)	16h	4017h	
W25Q64FV (QPI)	16h	6017h	

5. 15. 4. **26pin I2C test method**

1) The i2c3 in 26pin is enabled by default in Android, and the corresponding device node is /dev/i2c-3

apollo-p2:/ # **ls** /**dev**/**i2c-3** /dev/i2c-3

2) First open the wiringOP APP on the desktop



3) Then click the **I2C_TEST** button to open the i2c test interface



wiringOP	
GP	10_TEST
UA	RT_TEST
12	C_TEST
Si	PL_TEST

4) The i2c test interface of wiringOP is shown in the figure below. You can see that the default i2c is /dev/i2c-3, so we don' t need to re-select

wiringO	P		
/dev/i2c-3	Ŧ	0x38	OPEN
Reg: 0x10			
READ BYTE			
WRITE BYTE		x10	

5) Then connect an i2c device to the 26pin i2c3 pin, here we take the ds1307 rtc module as an example



Pins of the RTC	The pin corresponding to the
module	26pin of the development board
5V	pin 2
GND	pin 6
SDA	pin 3
SCL	pin 5

6) The i2c address of the ds1307 rtc module is 0x68. After connecting the wires, we can use the **i2cdetect -y 3** command in the serial port command line to check whether the i2c address of the ds1307 rtc module can be scanned. As shown in the figure below, if you can see the address 0x68, it means that the wiring of the ds1307 rtc module is correct.

apollo-p2:/ # i2cdetect -y 3

apollo-p2:/ # i2cdetect -y 3																
	0	1	2	3	4	5	6	7	8	9	а	b	С	d	e	f
00:												-				
10:																
20:		-	-	=						-	-		$(\rightarrow (\rightarrow)$		-	
30:								-								
40:											-					
50:	>															
60:		-					-		68						-	
70:	-		-				-									
apol	llo-	•p2:	:/ #													

7) Then set the address of i2c to 0x68 in wiringOP, and then click the **OPEN** button to open i2c3

wiringOF	Þ
/dev/i2c-3	Ox68 OPEN
Reg: 0x10	
READ BYTE	
WRITE BYTE	<u>0x10</u>

8) The display after clicking the **OPEN** button to open i2c3 is as follows:

wiringOF	
/dev/i2c-3	- 0x68 OPEN
Reg: 0x10	
READ BYTE	
WRITE BYTE	0x10
open succe	ess; i2c channel: /dev/i2c-3, addr: 0x68

9) Then we test to write a value into the register of the rtc module, for example, write 0x55 to the 0x1c address

a. We first set the address of the register to be written to 0x1c

wiringOP			
/dev/i2c-3 🔻	0x68	OPEN	
Reg: 0x1c			
READ BYTE			
WRITE BYTE	0x10		

open success; i2c channel: /dev/i2c-3, addr: 0x68

b. Then set the value to be written to 0x55

wiringOP			
/dev/i2c-3 🔻	0x68	OPEN	
Reg: 0x1c			
READ BYTE		/	
WRITE BYTE	0x55 🛩		
open succes	ss; i2c cl	nannel:	/dev/i2c-3, addr: 0x68

c. Then click the **WRITE BYTE** button to execute the write action

wiringOP	
/dev/i2c-3 ▼ 0x68	OPEN
Reg: Ox1c	
READ BYTE	
WRITE BYTE 0x55	
open success; i2c	channel: /dev/i2c-3, addr: 0x68

10) Then click the **READ BYTE** button to read the value of the 0x1c register, if it is displayed as 0x55, it means that the i2c read and write test has passed

wiringOF				
/dev/i2c-3 🔻	0x68	OPEN		
Reg: 0x1c				
READ BYTE	Dx55			
WRITE BYTE	0x55 write	success		
open succe	ss; i2c ch	nannel:	/dev/i2c-3, addr: 0x68	

6. How to compile Android 12 source code

Download the source code of Android 12 6.1.

1) First download the Android 12 source code sub-volume compressed package from Baidu or Google Disk

a. Baidu Netdisk

■ H618_Android122課時 17周時時		
① 2023-07-05 14:38 过期时间: 永久有效		
<u>道面上一眼(全部文件</u> → H618_Android12振网		
文件名	大小	作改日期
🗋 🧕 H618-Android12-Src.targtar	212.8M	2023-07-14 09:18
🖸 🚺 H518-Android12-Src.tar.graq	1.866	2023-07-14 09:18
🗌 🔼 H518-Android12-Src.tar.grap	1.865	2023-07-14 09:18
🗌 🧕 H518-Android12-Src.targzao	1.866	2023-07-14 09:18
🗌 🔼 H518-Android12-Src.targran	1.86G	2023-07-14 09:18
🗌 🔄 H518-Android12-Src.tar.gram	1.86G	2023-07-14 09:18
C 2 H618-Android12-Sic:Langeal	1.865	2023-07-14 09:18
Bill-Android12-Sic.Largask	1.866	2023-07-14 09:18
E Kill-Android12-Src.targaaj	1.866	2023-07-14 09:18
E 1618-Android12-Sirc.targaai	1.86G	2023-07-14 09:18
Kill-Antroid12-Sirc targath	1.86G	2023-07-14 09:18
H518-Android12-Src.targaag	1.86G	2023-07-14 09:18
🗌 🤷 H518-Android12-Src.targzaf	1.866	2023-07-14 09:18
C O H618-Android12-Sic.targae	1.866	2023-07-14 09:18
E 618-Android12-Src.targrad	1.86G	2023-07-14 09:18
C 2 H618-Android12-Sirc tanganc	1.86G	2023-07-14 09:18
K018-Vendroid12-Sire: Langeab	1.86G	2023-07-14 09:18
🗌 🔯 H618-Android12-Sire.targeaa	1.865	2023-07-14 09:18
🗌 🔁 H618-Android12-Src.targz.mdSsum	1KB	2023-07-14 09:18

b. Google Disk

of range Pi User Manual

🛆 云端硬盘

H618_Android_Source_Code

名称	^	所有著	上次修改日期 🕶	文件大小
	H618-Android12-Sro.tar.gz.md5sum 41	◎ 所有者已隐藏	09:20	1 KB
u	H618-Android12-Src.tar.gzaa 11	◎ 所有者已隐藏	09:20	1.86 GB
	H618-Android12-Src.tar.gzab 41	◎ 所有者已隐藏	09:20	1.86 GB
	H618-Android12-Src.tar.gzac 41	🕒 所有者已隐藏	09:20	1.86 GB
	H618-Android12-Src.tar.gzad 41	◎ 所有者已隐藏	09:20	1.86 GB
	H618-Android12-Src.tar.gzae _1.	🕒 所有者已隐藏	09:20	1.86 GB
	H618-Android12-Src.tar.gzaf #	◎ 所有者已隐藏	09:21	1.86 GB
	H618-Android12-Src.tar.gzag 11	◎ 所有者已隐藏	09:21	1.86 GB
	H618-Android12-Src.tar.gzah 11	所有者已隐藏	09:21	1.86 GB
	H618-Android12-Src tar.gzai 4%	◎ 所有者已隐藏	09:21	1.86 GB
	H618-Android12-Src.tar.gzaj 45	◎ 所有者已除蔵	09:21	1.86 GB
	H618-Android12-Src.tar.gzak 41	所有者已隐藏	09:21	1.86 GB
	H618-Android12-Src.tar.gzal 45	◎ 所有者已隐藏	09:21	1.86 GB
	H618-Android12-Src.tar.gzam 41	◎ 所有者已隐藏	09:21	1.86 GB
	H618-Android12-Src tar.gzan 11	🕒 所有者已隐藏	09:21	1.86 GB
	H618-Android12-Src.tar.gzao 41	◎ 所有者已隐藏	09:22	1.86 GB
	H618-Android12-Src.tar.gzap 11	⊖ 所有者已隐藏	09:22	1.86 GB
	H618-Android12-Src.tar.gzaq 41	所有者已隐藏	09:22	1.86 GB
	H618-Android12-Src.tar.gzar 😃	所有者已隐藏	09:22	212.8 MB

2) After downloading the sub-volume compression package of the Android 12 source code, please check whether the MD5 checksum is correct. If not, please download the source code again. The way to check the MD5 checksum is as follows:

test@test:~\$ md5sum -c H618-Android12-Src.tar.gz.md5sum H618-Android12-Src.tar.gzaa: OK H618-Android12-Src.tar.gzab: OK

3) Then you need to combine multiple compressed files into one, and then extract the Android source code. The command looks like this:

test@test:~\$ cat H618-Android12-Src.tar.gza* > H618-Android12-Src.tar.gz test@test:~\$ tar -xvf H618-Android12-Src.tar.gz

6.2. Compile the source code of Android 12

The compilation of Android12 is carried out on an x86_64 computer with Ubuntu 22.04 installed. Other versions of Ubuntu may have some differences in system package dependencies. The mirror download address of Ubuntu 22.04 amd64 version is as follows:

https://repo.huaweicloud.com/ubuntu-releases/22.04/ubuntu-22.04.2-desktop-amd64. iso

The x86_64 computer hardware configuration for compiling the Android12

source code is recommended to have 16GB or more memory, and 200GB or more hard disk space is recommended. The more CPU cores, the better.

1) First install the software packages required to compile the Android12 source code test@test:~\$ sudo apt-get update test@test:~\$ sudo apt-get install -y git gnupg flex bison gperf build-essential \ zip curl zlib1g-dev gcc-multilib g++-multilib libc6-dev-i386 \ lib32ncurses5-dev x11proto-core-dev libx11-dev lib32z1-dev ccache \ libgl1-mesa-dev libxml2-utils xsltproc unzip u-boot-tools python-is-python3 \ libssl-dev libncurses5 clang gawk

2) Then compile the code in the **longan** folder, which mainly contains u-boot and linux kernel

a. First run ./build.sh config to set compliation options		
test@test:~\$ cd H618-Android12-Src/longan		
test@test:~/H618-Android12-Src/longan\$./build.sh config		
Welcome to mkscript setup progress		
All available platform:		
0. android		
1. linux		
Choice [android]: 0		
All available ic:		
0. h618		
Choice [h618]: 0		
All available board:		
0. ft		
1. p1		
2. p2		
3. p7		
4. p7l		
5. perfl		
6. perf2		
7. perf3		
8. qa		

a. First run ./build.sh config to set compilation options

Choice [p2]: 2		
All available flash:		
0. default		
1. nor		
Choice [default]: 0		
All available kern_ver:		
0. linux-5.4		
Choice [linux-5.4]: 0		
All available arch:		
0. arm		
1. arm64		
Choice [arm64]: 1		
*** Default configuration is based on 'sun50iw9p1smp_h618_android_defconfig'		
#		
# configuration written to .config		
#		
make[1]: Leaving directory '/home/test/H618-Android12-Src/longan/out/kernel/build'		
make: Leaving directory '/home/test/H618-Android12-Src/longan/kernel/linux-5.4'		
INFO: clean buildserver		
INFO: prepare_buildserver		
b. Then run the ./build.sh script to start compiling		
test@test:~/H618-Android12-Src/longan\$./build.sh		
c. After the compilation is complete, you will see the following output		
sun50iw9p1 compile Kernel successful		
INFO: Prepare toolchain		
INFO: build kernel OK.		
INFO: build rootfs		
INFO: skip make rootfs for android		
INFO:		
INFO: build lichee OK.		
INFO:		

3) Then use the following command to compile the Android source code and generate the final Android image

test@test:~\$ cd H618-Android12-Src test@test:~/H618-Android12-Src\$ source build/envsetup.sh test@test:~/H618-Android12-Src\$ lunch apollo_p2-userdebug test@test:~/H618-Android12-Src\$ make -j8 test@test:~/H618-Android12-Src\$ pack

4) The storage path of the compiled and generated Android image is: longan/out/h618 android12 p2 uart0.img

7. Appendix

7.1. User Manual Update History

Version	Date	Update Notes
v1.0	2023-07-05	initial version
v1.1	2023-07-14	Add the compilation method of Android 12 source code

7.2. Image update history

Date	Update Notes
2023-07-05	Orangepizero3_1.0.0_ubuntu_jammy_server_linux5.4.125.7z
	Orangepizero3_1.0.0_debian_bullseye_server_linux5.4.125.7z
	Orangepizero3_1.0.0_ubuntu_focal_desktop_xfce_linux5.4.125.7z
	Orangepizero3_1.0.0_ubuntu_jammy_desktop_xfce_linux5.4.125.7z
	Orangepizero3_1.0.0_debian_bullseye_desktop_xfce_linux5.4.125.7z
	Orangepizero3_1.0.0_ubuntu_jammy_server_linux6.1.31.7z
	Orangepizero3_1.0.0_debian_bookworm_server_linux6.1.31.7z
	Orangepizero3_1.0.0_debian_bullseye_server_linux6.1.31.7z
	Orangepizero3_1.0.0_ubuntu_jammy_desktop_xfce_linux6.1.31.7z



	Orangepizero3_1.0.0_debian_bookworm_desktop_xfce_linux6.1.31.7z
	Orangepizero3_1.0.0_debian_bullseye_desktop_xfce_linux6.1.31.7z
	OrangePi_Zero3_Android12_v1.0.tar.gz
	*initial version
2023-07-13	Opios-arch-aarch64-xfce-opizero3-23.07-linux6.1.31.img.xz
	* initial version