## Orange Pi CM5 Base Base board + Core board User Manual



### Catalogue

1.	Basic	c characteristics of Orange Pi CM5 Base
	1.1.	What is Orange Pi CM5 Base9
	1.2.	Purpose of Orange Pi CM5 Base9
	1.3.	Hardware characteristics of Orange Pi CM5 core board10
	1.4.	Hardware characteristics of Orange Pi CM5 Base board11
	1.5.	Top and Bottom Views of Orange Pi CM5 Core Board 12
	1.6.	Top and bottom views of Orange Pi CM5 Base board13
	1.7.	Interface Details of Orange Pi CM5 Core Board15
	1.8.	Interface detail diagram of Orange Pi CM5 Base board16
2.	Intro	duction to using the development board
	2.1.	Prepare the necessary accessories
	2.2.	Download the image of the development board and related materials20
	2.3.	Method of burning Linux images to TF cards based on Windows PC 21
		2. 3. 1. How to use balenaEtcher to burn Linux
		2. 3. 2. How to use RKDevTool to burn Linux image to TF card
	2.4.	How to burn Linux image to TF card based on Ubuntu
	2.5.	The method of burning Linux images into eMMC
		2. 5. 1. Method of burning Linux images into eMMC using RKDevTool37
		2. 5. 2. The method of burning Linux images into eMMC using the dd command
	0.0	
	2.6.	Method of burning Android images into TF cards
		2. 6. 1. Method of burning using RKDevTool
	2.7.	How to burn Android image to eMMC54
		2. 7. 1. How to use RKDevTool to burn
	2.8.	Start the Orange Pi Development Board59
	2.9.	How to use the debug serial port60

	2. 9. 1. Debug serial port connection instructions	60
	2. 9. 2. How to use the debug serial port on Ubuntu	61
	2. 9. 3. How to use the debug serial port on Windows platform	64
3. Inst	tructions for using Ubuntu/Debian Server and Xfce desktop system	68
3.1.	Supported Linux image types and kernel versions	68
3.2.	. Linux 5.10 system compatibility	68
3.3.	. Linux 6.1 system compatibility	69
3.4.	. Linux command format description in this manual	70
3.5.	. Linux system login instructions	72
	3. 5. 1. Linux system default login account and password	72
	3. 5. 2. How to set up automatic login for Linux system terminal	72
	3. 5. 3. Linux desktop system automatic login instructions	73
	3. 5. 4. How to set up automatic login for root user in Linux desktop system	n74
	3. 5. 5. How to disable the desktop in Linux desktop system	75
3.6.	Onboard LED Light Test Instructions	75
3.7.	. Network connection test	76
	3. 7. 1. Ethernet port test	76
	3. 7. 2. WIFI connection test	77
	3. 7. 3. How to set a static IP address	85
3.8.	. SSH remote login to the development board	94
	3. 8. 1. SSH remote login to the development board under Ubuntu	94
	3. 8. 2. SSH remote login to the development board under Windows	95
3.9.	. How to use ADB	97
	3. 9. 1. How to use network adb	97
	3. 9. 2. Use a USB2.0 male-to-male data cable to connect to adb	99
3.10	0. How to upload files to the Linux system of the development board	101
	3. 10. 1. How to upload files from Ubuntu PC to the Linux system o	f the
	development board	. 101
	3. 10. 2. How to upload files from Windows PC to the Linux system of	of the
	development board	. 105
3.1	1. HDMI test	110

	3. 11. 1. HDMI display test	110
	3. 11. 2. HDMI resolution setting method	111
3.12.	How to use Bluetooth	113
	3. 12. 1. Testing methods for desktop images	113
3.13.	USB interface test	117
	3. 13. 1. Test by connecting USB mouse or keyboard	117
	3. 13. 2. Connect USB storage device to test	117
	3. 13. 3. USB wireless network card test	118
	3. 13. 4. USB camera test	126
3.14.	Audio Test	128
	3. 14. 1. Testing Audio Methods on Desktop Systems	128
	3. 14. 2. How to play audio using commands	129
3.15.	Temperature sensor	130
3 16	Hardware watchdog test	121
5.10.		191
3.17.	Check the serial number of the RK3588S chip	132
3.18.	How to install Docker	132
3.19.	How to download and install the arm64 version of balenaEtcher	133
3.20.	How to install Baota Linux Panel	135
3.21.	Set up Chinese environment and install Chinese input method	140
	3. 21. 1. Debian system installation method	140
	3. 21. 2. How to install Ubuntu 20.04 system	147
	3. 21. 3. Installation method for Ubuntu 22.04 system	151
3.22.	How to remotely log in to the Linux system desktop	157
	3. 22. 1. Remote login using NoMachine	157
	3. 22. 2. Remote login using VNC	161
3.23.	Test of some programming languages supported by Linux system	163
	3. 23. 1. Debian Bullseye System	163
	3. 23. 2. Debian Bookworm System	165
	3. 23. 3. Ubuntu Focal system	166
	3. 23. 4. Ubuntu Jammy system	168

3.24.	QT installation method17	0
3.25.	ROS installation method17	8
	3. 25. 1. How to install ROS 1 Noetic on Ubuntu 20.04	8
	3. 25. 2. How to install ROS 2 Galactic on Ubuntu 20.04	2
	3. 25. 3. How to install ROS 2 Humble on Ubuntu 22.04	5
3.26.	How to install kernel header files	7
3.27.	Instructions for using the power on/off logo19	0
3.28.	How to use ZFS file system	0
	3. 28. 1. How to install ZFS	0
3.29.	How to install and use CasaOS	2
	3. 29. 1. How to install CasaOS	2
	3. 29. 2. How to use CasaOS	3
3.30.	Methods of using NPU20	1
	3. 30. 1. Prepare tools	1
	3. 30. 2. Installing RKNN-Toolkit2 on Ubuntu PC	2
	3. 30. 3. Use RKNN-Toolkit2 for model transformation and model inference20	3
	3. 30. 4. Call the C interface to deploy the RKNN model to the development	ıt
	board and run it	9
3.31.	RK3588 method of using PaddlePaddle 21	2
	3. 31. 1. Ubuntu PC environment setup21	2
	3. 31. 2. Board end environment setup	6
	3. 31. 3. Deploying Model Example with FastDeploy	0
3.32.	Method for Running RKLLM Large Model with RK358822	4
	3. 32. 1. Introduction to RKLLM	4
	3. 32. 2. Preparation of tools	7
	3. 32. 3. Detailed steps for model conversion and source code compilation o	n
	Ubuntu PC	7
	3. 32. 4. Detailed steps for deploying and running the development board 24	0
	3. 32. 5. Detailed steps for deploying and running the development board sid	e
	server	1
	3. 32. 6. Performance test results of running RKLLM large model on RK35882	.62
3.33.	How to shut down and restart the development board	6

4.	Linu	x SDK——Instructions for using orangepi-build	268
	4.1.	Compilation system requirements	268
		4.1.1. Compile using the Ubuntu 22.04 system of the development board.	268
		4. 1. 2. Compile using Ubuntu 22.04 x64 computer	269
	4.2.	Get the source code of Linux SDK	271
		4.2.1. Download orangepi-build from github	271
		4. 2. 2. Download the cross-compilation toolchain	273
		4. 2. 3. orangepi-build complete directory structure description	274
	4.3.	Compile u-boot	275
	4.4.	Compile the Linux kernel	279
	4.5.	Compile rootfs	284
	4.6.	Compile Linux image	288
5.	Instr	uctions for using Orange Pi OS Arch system	292
	5.1.	Adaptation of Orange Pi OS Arch system	292
	5.2.	Methods for setting up the English environment and installing Chinese input metho	ds293
6.	Instr	uctions for using the Android 13 system	300
	6.1.	Supported Android versions	300
	6.2.	Android function adaptation	300
	6.3.	How to use ADB	301
		6. 3. 1. USB OTG mode switching method	301
		6. 3. 2. Use a data cable to connect adb debugging	304
		6. 3. 3. Using network connection adb debugging	. 305
7.	Com	pilation method of Android 13 source code	307
	7.1.	Download the source code of Android 13	307
	7.2.	Compile the source code for Android 13	307
8.	Oper	1WRT System Usage Instructions	. 309
	8.1.	OpenWRT edition	309
	8.2.	OpenWRT Adaptation situation	309
	8.3.	The first boot to expand rootfs	309

of range Pi User Manual

8.4.	Method of logging into the system
	8. 4. 1. Login via serial port
	8. 4. 2. Login to the system via SSH
	8. 4. 3. Login to LuCI Management Interface
	8. 4. 4. Log in to the terminal through the LuCI management interface
	8. 4. 5. Login to the terminal using IP address and port number
8.5.	Method of modifying LAN port IP address through command line
8.6.	Method for changing root password
	8. 6. 1. Modify via Command Line
	8. 6. 2. Modify through LuCI management interface
8.7.	USB interface testing
	8.7.1. Mounting USB storage devices at the command line
	8. 7. 2. Mounting USB storage devices on the LuCI management interface 322
8.8.	USB Wireless Network Card Test
	8.8.1. Method of using a USB wireless network card to connect to a WIFI
	hotspot
	8. 8. 2. Method for creating a WIFI hotspot using a USB wireless network card329
8.9.	Installing software packages through the command line
	8. 9. 1. Installing through OPkg on the terminal
8.10	OpenWRT management interface installation software package
	8. 10. 1. View the list of available software packages in the system
	8. 10. 2. Example of Installing Software Packages
	8. 10. 3. Example of Removing Software Packages
8.11	Using Samba Network Sharing
8.12	zerotier User Manual
9. Com	pilation method of OpenWRT source code
9.1.	Download OpenWRT source code
9.2.	Compile OpenWRT source code
10. App	pendix
10.1.	User Manual Update History

0	
$\mathbf{O}$	range Pi User Manual

10.2.	Image update history.	
-------	-----------------------	--

#### 1. Basic characteristics of Orange Pi CM5 Base

#### 1.1. What is Orange Pi CM5 Base

The Orange Pi CM5 core board adopts the new generation eight core 64 bit ARM processor of Ruixin Micro RK3588S, specifically the quad core A76 and quad core A55. It adopts the Samsung 8nm LP process technology, with a large core main frequency of up to 2.4GHz, integrated with ARM Mali-G610 MP4 GPU, embedded with high-performance 3D and 2D image acceleration modules, and an AI accelerator NPU with up to 6 Tops of computing power. It has 4GB/8GB/16GB of memory and up to 8K display processing capability. In addition, the Orange Pi CM5 core board is also equipped with onboard eMMC, with optional capacities of 32GB/64GB/128GB/256GB.

The Orange Pi CM5 Base offers a wide range of interfaces, including dual 2.5G Ethernet ports, gigabit Ethernet ports, HDMI output, MIPI CSI, USB2.0, USB3.0, and 12 pin expansion interfaces. It can be widely used in high-end tablet, edge computing, artificial intelligence, cloud computing, AR/VR, intelligent security, smart home and other fields, covering all AIoT industries.

Orange Pi CM5 Base supports the official operating system Orange Pi OS, as well as Android 12.1, Android 13, OpenWRT, Debian11, Debian12, Ubuntu 20.04, and Ubuntu 22.04.

#### 1.2. Purpose of Orange Pi CM5 Base

We can use it to achieve:

- A Linux desktop computer
- A Linux network server
- Android game consoles, etc
- Router

Of course, there are also many other features. With a powerful ecosystem and a variety of expansion accessories, Orange Pi can help users easily achieve delivery

from creativity to prototype and then to mass production. It is an ideal creative platform for makers, dreamers, and hobbyists.

#### 1.3. Hardware characteristics of Orange Pi CM5 core board

OPi CM5 Core Board Hardware Specifications	
Main control chip	Rockchip RK3388S(8nm LP Process)
	8-core 64 bit processor
CDL	• Typical size core architectures of 4-core Cortex-A76 and
CPU	4-core Cortex-A55
	• Large core frequency 2.4GHz, small core frequency 1.8GHz
	Integrated ARM Mali-G610
GPU	• Compatible with OpenGL ES1.1/2.0/3.2, OpenCL 2.2, and
	Vulkan 1.2
NIDLI	6 Tops of computing power, supporting mixed operations of
NPU	INT4/INT8/INT16
PMU	RK806-1
RAM	LPDDR4/4x: 2GB、4GB、8GB、16GB
EMMC	eMMC: 32GB、64GB、128GB、256GB
	3 * 100PIN (model: DF40C-100DP-0.4V (51)), including the
	following interfaces:
	1*TYPE C or DP1.4
	3*USB2.0
	1*HDMI 2.1 or eDP1.3
	1*uSD
Interface	1*4-lane MIPI DPHY TX
Interface	1*2-lane MIPI DPHY TX
	2*2-lane MIPI DPHY RX
	1*4-lane MIPI CSI RX or 2*2-lane MIPI CSI RX
	1*SATA III or PCIe2.0
	1*SATA III or PCIe2.0 or USB3.0
	USB3.0*1+USB2.0*3
	POWER_ON, RESET, MASKROM, RECOVERY etc

	SDIO 3.0 or RGMII	
	I2C、I2S、UART、SPI、CAN、PWM、PDM、GPIO etc	
Dowon Superly	input: DC 5V MAX1800mA	
Power Supply	output: DC3.3V MAX600mA 和 DC1.8V MAX600mA	
PCB	Length: 55mm, width: 40mm, thickness: 1.6mm	
ÖrangePi™ is a registered trademark of Shenzhen Xunlong Software Co., Ltd		

#### 1.4. Hardware characteristics of Orange Pi CM5 Base board

Orange Pi CM5 Base Hardware Features		
Board to board	3 * 100 PIN, 0.4mm PIN pitch, connector model:	
	• Micro SD (TE) slot	
storage	• Microsd (IF) slot	
USB Interface	1 * USB3.1 and 1 * USB2.0	
Video output	HDMI2.1, Maximum support 8K@60Hz	
camera	4 * MIPI CSI 2Lane	
audio frequency	HDMI Audio output	
	1 * 1000M ethernet port (YT8531C-CA)	
Ethernet port	2 * 2.5G ethernet port (RTL8125B)	
	• 12Pin FPC Socket, Pitch:0.5mm	
12PIN Expansion	• Supports UART, PWM, I2C, SPI, CAN, GPIO and other	
interface	functions	
Кеу	Button and On/Off button	
power supply	Supports Type-C power supply, 5V@4A or 5V@5A	
RTC battery interface	2 pins, 1.25mm specification, used to power the RTC module	
LED	Power indicator light, 3 * Ethernet port indicator light	
FAN	5V 2PIN 1.25mm socket	
Infra-red	Infrared receiver	
ADC	4PIN single row pin, Pitch: 2.54mm	

	Two ADC inputs, maximum 1.8V input, 12bit	
Debug UART	3Pin debugging serial port	
РСВ	Length: 90mm, width: 66mm, thickness:	
ÖrangePi™ is a registered trademark of Shenzhen Xunlong Software Co., Ltd		

#### 1.5. Top and Bottom Views of Orange Pi CM5 Core Board

#### Top view:



**Bottom view:** 



#### 1.6. Top and bottom views of Orange Pi CM5 Base board

Top view:



**Bottom view:** 



#### 1.7. Interface Details of Orange Pi CM5 Core Board





#### 1.8. Interface detail diagram of Orange Pi CM5 Base board



The diameter of the four positioning holes on the core board is 2.7mm, and the diameter of the four positioning holes on the bottom board is 3.0mm.

### 2. Introduction to using the development board

#### 2.1. Prepare the necessary accessories

1) TF card, a high-speed flash card with a minimum capacity of 16GB (recommended 32GB or above) and a class 10 or above.



2) TF card reader, used to burn images into TF cards



3) Display with HDMI interface.



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



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

5) USB public to public data cable, used for burning images and using ADB and other functions.



6) Power adapter, it is recommended to use a 5V/4A or 5V/5A Type-C power supply for power supply.



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

7) A USB interface mouse and keyboard can be used to control the Orange Pi development board, as long as it is a standard USB interface mouse and keyboard.



8) USB camera.



9) Infrared remote control.



Note that the remote control of the air conditioning or TV cannot control the Orange Pi development board. The operating system provided by Orange Pi can only guarantee that the remote control provided by Orange Pi can be used by default.

10) A 5V cooling fan. As shown in the figure below, there is an interface on the development board for connecting the cooling fan, with a interface specification of **2pin 1.25mm** spacing.

The fan on the development board can be adjusted for speed and switch through PWM.



11) When using the serial port debugging function, a **3.3V** USB to TTL module and DuPont cable are required to connect the development board and computer.





12) A personal computer with Ubuntu and Windows operating systems installed.

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

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

1) The download website for the English version of the materials is:

http://www.orangepi.org/html/hardWare/computerAndMicrocontrollers/service-and -support/Orange-Pi-CM5.html

- 2) The information mainly includes:
  - a. Android source code: saved on Google Drive

- b. Linux source code: saved on Github
- c. User manual and schematic diagram: saved on Google Drive
- d. **Official tools**: mainly include the software that needs to be used during the use of the development board
- e. Android image: saved on Google Drive
- f. Ubuntu image: saved on Google Drive
- g. Debian image: saved on Google Drive
- h. Orange Pi OS image: saved on Google Drive
- i. **OpenWRT** image: saved on Google Drive

# 2.3. Method of burning Linux images to TF cards based on Windows PC

Note that the Linux image referred to here specifically refers to Linux distribution images such as Debian, Ubuntu, OpenWRT, or OPi OS Arch downloaded from the Orange Pi download page.

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

1) First prepare a TF card with a capacity of 16GB or more. The transmission speed of the TF card must be **class 10** or above. It is recommended to use a TF card of SanDisk and other brands

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

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

 4) Then download the Linux image burning software - balenaEtcher, from: https://www.balena.io/etcher/

5) After entering the BalenaEtcher download page, clicking the green download button will redirect you to the software download location



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

DOWNLOAD			
Download Et	cher		
ASSET ETCHER FOR WINDOWS (X86/X64) (INSTALLER)	OS WINDOWS	ARCH	Download
ETCHER FOR WINDOWS (X86 X64) (PORTABLE)	WINDOWS	X86 X64	Download
ETCHER FOR WINDOWS (LEGACY 32 BIT) (X86 X64) (PORTABL	E) 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)		X86	Download
Looking for Debian (.deb) packages or Red Hat (.rpm) packages?		🔹 oss	hosting by cloudsmith

7) If you are downloading a version of BalenaEtcher that requires installation, please install it before using it. If you download the Portable version of balenaEtcher, simply double-click to open it. The interface of balenaEtcher after opening is shown in the following figure:



#### If the following error is prompted when opening balenaEtcher:



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



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



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



11) After successful burning, the display interface of balenaEtcher is 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 TF card and insert it into the TF card slot of the development board for use up



#### 2. 3. 2. How to use RKDevTool to burn Linux image to TF card

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



2) You also need to prepare a 16GB or larger TF card. The transmission speed of the TF card must be **class 10** or above. It is recommended to use a TF card of SanDisk and other brands

3) Then insert the TF card into the card slot of the development board

4) Then download the Ruixin micro driver **DriverAssitant\_v5.12.zip**. zip and MiniLoader, as well as the burning tool **RKDevTool\_Release\_v3.15.zip**, from **Orange Pi's data download page** 

a. On the **Orange Pi data download page**, first select the **official tool** and then enter the folder below



b. Then download all the files below



Note that the "MiniLoader - something needed to burn Linux images" folder is hereinafter referred to as the MiniLoader folder.

5) Then 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 above 2GB

6) Then use the decompression software to unzip **DriverAssitant\_v5.12.zip**. zip, and then find the **DriverInstall.exe** executable file in the unzipped folder and open it

名称	修改日期	类型	大小
ADBDriver	2022/12/1 15:07	文件夹	
📙 bin	2022/12/1 15:07	文件夹	
Driver	2022/12/1 15:07	文件夹	
onfig	2014/6/3 15:38	配置设置	1 KB
🥞 DriverInstall	2022/2/28 14:11	应用程序	491 KB
Readme	2018/1/31 17:44	文本文档	1 KB
revison	2022/2/28 14:14	文本文档	1 KB

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

a. Click the "Driver Installation" button



b. After waiting for a while, a pop-up window will prompt "driver installed successfully", and then click the "OK" button.

🧕 瑞芯微驱动助手 v5.	12		×
驱运力学	DriverInstall 安装驱动成功.	× 印载	
	确定		

8) Then decompress **RKDevTool\_Release\_v3.15.zip**. This software does not need to be installed. You can find **RKDevTool** in the unzipped folder and open it

名称 ^	修改日期	类型	大小
bin bin	2022/12/1 15:07	文件夹	
Language	2022/12/1 15:07	文件夹	
🗋 config.cfg	2022/3/23 9:11	CFG 文件	7 KB
🔄 config	2021/11/30 11:04	配置设置	2 KB
revision	2022/5/27 9:09	文本文档	3 KB
🔀 RKDevTool	2022/5/27 9:06	应用程序	1,212 KB
◎ 开发工具使用文档_v1.0	2021/8/27 10:28	Foxit PDF Reade	450 KB

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

	0x00000000 0x00000000	Loader Faraneter					
	0x00000000	Parameter					
1	0x00000000	Uboot					
	0x00000000	trust					
	0x00000000	Misc					
	0x00000000	Resource					
	0x0000000	Kernel					
	0x000000000	Boot					
	0x00000000	Recovery					
	0x00000000	System					
	0x00000000	Backup					
		0x00000000 0x0000000 0x0000000 0x0000000	0x0000000         trust           0x00000000         Misc           0x00000000         Besource           0x00000000         Resource           0x00000000         Beot           0x00000000         Resource           0x00000000         Sector           0x00000000         Resource           0x00000000         Resource           0x00000000         Resource	0x0000000 trust 0x0000000 Mise 0x0000000 Kersel 0x0000000 Kersel 0x0000000 Beet 0x0000000 Reevery 0x0000000 System	0x0000000 trust 0x0000000 Mise 0x0000000 Kersel 0x00000000 Sest 0x0000000 Best 0x0000000 Reservery 0x0000000 System	0x0000000         trust           0x0000000         Mise           0x0000000         Resource           0x0000000         Rernal           0x0000000         Best           0x0000000         Best           0x0000000         System           0x0000000         System	0x0000000 trust 0x0000000 Mise 0x0000000 Resource 0x0000000 Rereal 0x0000000 Beet 0x0000000 Resovary 0x0000000 System 0x0000000 System

- 10) Then start burning the Linux image to the TF card.
  - a. Firstly, connect the development board to the Windows computer through a USB male to female data cable. The location of the USB flash port on the development board is shown in the following figure:



- b. Ensure that the development board is not connected to the Type-C power supply.
- c. Then hold down the MaskROM button on the development board and hold it down. The position of the MaskROM button on the development board is shown in the following figure:



d. Then connect the Type-C interface power to the development board, power it on, and then release the MaskROM button. The location of the Type-C power interface is as follows:



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

🥮 range Pi User Manual

#		存储	地址	名字	路径	
1	1		0x00000000	Loader		
2	1		0x00000000	Parameter		
3	1		0x00000000	Uboot		
4			0x00000000	trust		
5			0x00000000	Misc		
6			0x00000000	Resource		
7			0x00000000	Kernel		
8			0x00000000	Boot		
9			0x00000000	Recovery		
10	Г		0x00000000	System		
11	Г		0x00000000	Backup		
Load	er:		执行	切换	设备分互类 清空	

f. Then place the mouse cursor in the area below.

#		存储	地址	名字	路径	
1	-		0x0000000	Peropeter		
3	i –		0×00000000	lihoot		
4	Ē		0x00000000	trust		
5	Ē		0x00000000	Misc		
6	Г		0x00000000	Resource		
7	Г		0x00000000	Kernel		
8	Г		0x00000000	Boot		
9			0x00000000	Recovery		
10			0x00000000	System		
11			0x00000000	Backup		
.oad	er:		执行 制制技地址写	切换	设备分区表 清空	Place the mouse cursor in this a

g. Then, clicking the right mouse button will bring up the selection interface shown in the following figure.

-	」 1子1項	地址	名字	路径			-			
1		0x00000000	Loader							
	_	0x00000000	Parameter							
		0x00000000	Uboot							
<u> </u>		0x00000000	trust		添加项					
		0x00000000	Misc		IDEC YE	_				
[		0x00000000	Resource		關係坝					
E F		0x00000000	Kernel		清空所有项					
F	1	0x00000000	Boot		上総					
Г		0x00000000	Recovery		10					
о Г		0x00000000	System		下移					
1		0x00000000	Backup		导入配置					
					导出配置					
ader		执行	切换	设备分区	表 清空					

h. Then select the **import configuration** option.

🥮 range Pi User Manual

+		存储	地址	名字	路径			-		
	-		0x00000000	Loader						
	+		0x00000000	rarameter Ifteet			12 12			
	÷		0+00000000	trust		17 Land				
	'n		0+0000000	Mise		漆加坝				
	'n		0+00000000	Resource		删除项				
	Ē		0x00000000	Kernel		清空所有项				
	Ē		0x00000000	Boot		上程				
	Г		0x00000000	Recovery		110 T 62				
0	Г		0x00000000	System		下移	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1			
1			0x00000000	Backup		导入配置				
oad	er:		执行	切换	设备分回	Z表 清空	]			

i. Then select the **rk3588\_linux\_tfcard.cfg** configuration file from the **MiniLoader** folder downloaded earlier, and click **open**.

腺 🔀 打开	×
← → ∨ ↑ 🧧 « orangepi > MiniLoader-烧录Linux镜像才需要用到的东西	✓ O
组织 ▼ 新建文件夹	88 - 💷 💡
<ul> <li>■ 此电脑</li> <li>③ 3D 对象</li> <li>■ 视频</li> <li>■ 观频</li> <li>■ 型片</li> <li>● 文档</li> <li>◆ 下載</li> <li>● 音乐</li> <li>■ 桌面</li> <li>▲ 本地磁盘 (C)</li> </ul>	
文件名(N): rk3588_linux_tfcard.cfg	✓ ConfigFile(*.cfg) ✓
	打开(O) 取消

j. Then click **OK**.

1		存储	地址	名字	路径 ····	
2	1	SD	0x00000000	linux	C:\Users\Administrator\Desktop\ C:\Users\Administrator\Desktop\	
					● 与人配置成功. 違定	
			执行	切塩	设备分区表 唐空	

k. Then click on the location shown in the figure below.

🛞 range Pi User Manual

载镜	利开友 1像	2工具 V3.13 升级固件 ;	, 喜级功能				
#		存储	地址 0x00000000	名字 Loader	路径 C. USerslAdainistrator\Desktop\		
2	~	SD	0x00000000	linux	C:\Users\Administrator\Desktop\		
.o a d	ler:		执行	切换	设备分区表 清空		
oad	ler :		执行 □强制按地址写	切换	设备分区表 清空		

1. Select MiniLoaderAll.bin from the MiniLoader folder downloaded earlier, and then click to open it.

载镜像	、 打开	×
	← → × ↑ 📙 « orangepi → MiniLoader-烧录Linux镜像才需要用到的东西	✓ O
	组织 ▼ 新建文件夹	88 - 🛄 🕐
	<ul> <li>■ 此电脑</li> <li>③ 3D 对象</li> <li>● 机频</li> <li>○ 水3588_linux_perior.cfg</li> <li>● 水3588_linux_perior.cfg</li> <li>○ 水13588_linux_tfcard.cfg</li> <li>● rkspi_loader</li> </ul>	
Loader	● CO W→W CO Y 文件名(N): MiniLoaderAll.bin	→ All File(*.*) ~
_		打开(O) 取消

m. Then click on the location shown in the figure below.

*	口存储	地址	名字	路径	
2	SD	0x00000000	Loader linux	C:\Users\lee\Desktop\AndroidHL. C:\Users\Administrator\Desktop\	

n. Then select the path to the Linux image you want to burn, and click Open.

Before burning the image, it is recommended to rename the Linux image to

orangepi.img or other shorter names, so that the percentage of burning progress can be seen when burning the image.

← → ∨ ↑ → 此电脑 > 桌面 > orangepi > ✓ 组织 ▼ 新建文件夹 ✓ 血化电脑 ● 此电脑 ● JD 对金	~	ē	♀ 在 oran	gepi 中搜 能	<b>秦</b>	
组织 ▼ 新建文件夹 ■ 此电脑 ■ 30 对全 ■ 31 对全					-	
■ 此电脑 ● MiniLoader-烧录Linux镜像才需要用到的东西 ● orangepi						0
<ul> <li>□ 砂板</li> <li>□ 砂板</li> <li>□ 厨片</li> <li>□ 文档</li> <li>↓ 下戦</li> <li>〕 音乐</li> <li>□ 桌面</li> <li>□ 本地磁曲 (C:)</li> </ul>						
文件名(N): orangepi		~	All File(*.*)			~

o. Then please check the option to force writing by address.

	存储	thtt	名字	路径		
~	12.1%	0x00000000	Loader	C:\Users\lee\Desktop\Android和L		
~	SD	0x00000000	linux	C:\Users\lee\Desktop\orangepi\o		

p. Clicking the execute button again will start burning the Linux image to the development board's tf card.



q. The log displayed after burning the Linux image is shown in the following figure.



r. After burning the Linux image to the TF card, the Linux system will automatically start.

#### 2.4. How to burn Linux image to TF card based on Ubuntu

Note that the Linux image referred to here specifically refers to Linux distribution images such as Debian, Ubuntu, OpenWRT, or OPi OS Arch downloaded from the Orange Pi download page. Ubuntu PC refers to a personal computer with the Ubuntu system installed.

1) First prepare a TF card with a capacity of 16GB or more. The transmission speed of the TF card must be **class 10** or above. It is recommended to use a TF card of SanDisk and other brand

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

 Download the balenaEtcher software, the download address is: https://www.balena.io/etcher/

4) After entering the BalenaEtcher download page, clicking the green download button will redirect you to the software download location



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

Down	load	Etc	her

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 compressed file of the Linux operating system image that you want to burn from **Orange Pi's information download page**, and then use decompression software to extract it. In the extracted file, the file ending in "**.img**" is the operating system image file, which is generally over 2GB in size

a) The decompression command for the compressed file ending in 7z is as follows:

test@test:~\$ 7z x orangepicm5_1.0.0_debian_bullseye_desktop_xfce_linu	1x5.10.160.7z				
test@test:~\$ ls orangepicm5_1.0.0_debian_bullseye_desktop_xfce_linux5.10.160.*					
orangepicm5_1.0.0_debian_bullseye_desktop_xfce_linux5.10.160.7z					
orangepicm5_1.0.0_debian_bullseye_desktop_xfce_linux5.10.160.sha	#Checksum file				
orangepicm5_1.0.0_debian_bullseye_desktop_xfce_linux5.10.160.img	#Mirror file				

b) If you are downloading an OpenWRT image and the compressed file ends in gz, the decompression command is as follows:

test@test:~\$ gunzip openwrt-aarch64-opicm5-24.03-linux-6.1.43-ext4.img.gz test@test:~\$ ls openwrt-aarch64-opicm5-24.03-linux-6.1.43-ext4.img openwrt-aarch64-opicm5-24.03-linux-6.1.43-ext4.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 indicates that the downloaded image is not incorrect. You can rest assured to burn it to the TF card. If the prompt is that the **checksum does not match**, it indicates that there is a problem with the downloaded image. Please try downloading again

test@test:~\$ sha256sum -c \*.sha

```
orangepicm5_1.0.0_debian_bullseye_desktop_xfce_linux5.10.160.img: OK
```

If you are downloading an OpenWRT image, you need to verify the compressed file instead of decompressing it before verifying it

```
test@test:~$ sha256sum -c openwrt-aarch64-opicm5-24.03-linux-6.1.43-ext4.img.gz.sha
openwrt-aarch64-opicm5-24.03-linux-6.1.43-ext4.img.gz: OK
```

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



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



10) The interface displayed during the process of burning a Linux image with balenaEtcher is shown in the following figure. In addition, the progress bar displays purple to indicate that the Linux image is being burned to the TF card.



11) After the Linux image is burned, BalenaEtcher defaults to verifying the images burned to the TF card to ensure that there are no issues during the burning process. As shown in the figure below, a green progress bar indicates that the image has been burned and BalenaEtcher is verifying the burned image.


12) After the successful burning is completed, the display interface of balenaEtcher is shown in the following figure. If a green indicator icon is displayed, it indicates that the image burning is successful. At this point, you can exit balenaEtcher, then unplug the TF card and insert it into the TF card slot of the development board for use.



## 2.5. The method of burning Linux images into eMMC

## 2. 5. 1. Method of burning Linux images into eMMC using RKDevTool

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

Note that the Linux image referred to here specifically refers to Linux distribution images such as Debian, Ubuntu, OpenWRT, or OPi OS Arch downloaded from the Orange Pi download page.

1) The Orange Pi CM5 core board has an eMMC module located as follows:

b.



2) Firstly, it is necessary to prepare a high-quality USB male to female data cable.



3) Then download the Ruixin micro driver **DriverAssitant\_v5.12.zip** and **MiniLoader**, as well as the burning tool **RKDevTool\_Release\_v3.15.zip**, from **Orange Pi's data download page** 

a. On the Orange Pi data download page, first select the official tool and then enter the folder below



Note that the "MiniLoader - something needed to burn Linux images" folder is

#### hereinafter referred to as the MiniLoader folder.

4) Then download the compressed file of the Linux operating system image that you want to burn from **Orange Pi's information download page**, and use decompression software to extract it. In the extracted file, the file ending in "**.img**" is the operating system image file, which is generally over 2GB in size

5) Then use the decompression software to unzip **DriverAssitant\_v5.12.zip**, and then find the **DriverInstall.exe** executable file in the unzipped folder and open it

名称	修改日期	类型	大小
ADBDriver	2022/12/1 15:07	文件夹	
📙 bin	2022/12/1 15:07	文件夹	
Driver	2022/12/1 15:07	文件夹	
🔄 config	2014/6/3 15:38	配置设置	1 KB
🥞 DriverInstall	2022/2/28 14:11	应用程序	491 KB
Readme	2018/1/31 17:44	文本文档	1 KB
📄 revison	2022/2/28 14:14	文本文档	1 KB

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

a. Click the "Driver Installation" button

驱动安装	驱动卸载	

b. After waiting for a while, a pop-up window will prompt "driver installed successfully", and then click the "OK" button.



7) Then unzip **RKDevTool\_Release\_v3.15.zip**. This software does not need to be installed. You can find **RKDevTool** in the unzipped folder and open it

名称	修改日期	类型	大小
bin bin	2022/12/1 15:07	文件夹	
Language	2022/12/1 15:07	文件夹	
🗋 config.cfg	2022/3/23 9:11	CFG 文件	7 KB
🔄 config	2021/11/30 11:04	配置设置	2 KB
revision	2022/5/27 9:09	文本文档	3 KB
KKDevTool	2022/5/27 9:06	应用程序	1,212 KB
☑ 开发工具使用文档_v1.0	2021/8/27 10:28	Foxit PDF Reade	450 KB

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

0x00000000 0x00000000 0x00000000 0x000000	Loader Parameter Vboot		
0x00000000	Parameter Vboot		
0x00000000	Vboot		
0~0000000			
0x0000000	trust		
0x00000000	Misc		
0x00000000	Resource		
0x00000000	Kernel		
0x00000000	Boot		2.5
0x00000000	Recovery		
0x00000000	System		5 C
0x00000000	Backup		19.00
	0x00000000 0x00000000 0x00000000 0x000000	0x0000000         Resource           0x0000000         Kernel           0x0000000         Boot           0x00000000         Boot           0x00000000         System           0x00000000         Backup	0x00000000 Recorce 0x00000000 Fernel 0x00000000 Recot 0x00000000 Recovery 0x00000000 Syste 0x00000000 Syste

- 9) Then start burning Linux images into eMMC
  - a. Firstly, connect the development board to the Windows computer through a USB male to female data cable. The location of the USB flash port on the development board is shown in the following figure:



- b. Ensure that the development board is not plugged into a TF card or connected to a power source.
- c. Then hold down the MaskROM button on the development board and hold it

down. The position of the MaskROM button on the development board is shown in the following figure:



d. Then connect the Type-C interface power to the development board, power it on, and then release the MaskROM button.



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

ŧ.,		存储	地址	名字	路径	
	1		0x00000000	Loader		
	1		0x00000000	Parameter		
	1		Ux0000000	Uboot		
	-		Ux0000000	trust		
	1		0x0000000	Misc		
	1		0x00000000	Kesource V		
	1		0x00000000	Boot		
	i'r		0×00000000	Begovery		
1	í T		0x00000000	System		
	Ē		0x00000000	Backup		
oad	er:	[	执行	切换	设备分配表 清空	

f. Then place the mouse cursor in the area below



#		存储	地址	名字	路径		
2			0x00000000	Parameter			
3	ÍΠ		0x00000000	Uboot			
4	Г		0x00000000	trust			
5			0x00000000	Misc			
6	Г		0x00000000	Resource			
7	Г		0x00000000	Kernel			
8	Г		0x00000000	Boot			
9			0x00000000	Recovery			
10			0x00000000	System			
11			0x00000000	Backup			
Load	ler:		执行	切换	设备分区表 清空	]	Place the mouse cursor in this are

g. Then, clicking the right mouse button will pop up the selection interface shown in the following figure

#		存储	地址	名字	路径					
1			0x00000000	Loader						
2	1		0x00000000	Parameter						
3	1		0x00000000	Uboot						
4			0x00000000	trust		添加项				
5			0x00000000	Misc		INFATE S	_			
ŝ			0x00000000	Resource		副陈坝	· · · · · · · ·			
7			0x00000000	Kernel		清空所有项				
3			0x00000000	Boot		上移				
3			0x00000000	Recovery		TR				
10	Г		0x00000000	System		下傳				
11	Г		0x00000000	Backup		导入配置				
.0 8.0	ler :		执行 ] 强制按地址写	切换	设备分[	日本 10	]	-		

h. Then select the **import configuration** option

#		存储	地址	名字	路径					
			0x00000000	Loader						
2	1		0x00000000	Parameter						
3			0x00000000	Vboot						
1			0x00000000	trust		添加项	L			
5			0x00000000	Misc		删除全面	17 L			
ŝ			0x00000000	Resource		Market Average				
7			0x000000x0	Kernel		清空所有项				
3	Г		0x00000000	Boot		上移				
	Г		0x00000000	Recovery		下程				
0	Г		0x00000000	System						
11	Г		0x00000000	Backup		导入配置				
oad	er:	]	执行	切换	设备分区	特式範囲				

i. Then select the **rk3588\_linux\_emmc.cfg** configuration file from the **MiniLoader** folder downloaded earlier, and click to **open** 

芯微开发工具 v3.15	
(打开	×
← → ◇ ↑ 🔤 → 此电脑 → 桌面 → orangepi → MiniLoader-烧录Linux镜像才需要用到的东西	✓ ひ
组织▼ 新建文件夹	## <b>- 11 (</b> )
<ul> <li>此电脑</li> <li>3D 对象</li> <li>引力 对象</li> <li>ポx3588_linux_pcie.cfg</li> <li>パx3588_linux_pcie.cfg</li> <li>パx3588_linux_tfcard.cfg</li> <li>マk3588_linux_tfcard.cfg</li> <li>京転</li> <li>斎面</li> <li>本 対感症(C)</li> </ul>	
文件名(N): rk3588_linux_emmc.cfg	✓ ConfigFile(*,cfg) ✓
	打开(O) 取消

j. Then click **OK** 

		存储	地址	名字	路径		
1	~		0x00000000	Loader	C:\Users\Administrator\Desktop\		
2	~	EMMC	0x00000000	linux	C:\Users\Administrator\Desktop\		
					20/2		

k. Then click on the location shown in the following image

	改开发工具 v3	.15			
載镜	像 升级固件	= 高级功能			
#	口存储	地址	名字	路径 …	
1 2	I▼ EMMC	0x00000000 0x00000000	Loader linux	C:\Users\Administrator\Desktop\ C:\Users\Administrator\Desktop\	
	1	12	12		
oad	er Ver:1.11	执行	切换	设备分区表	
oad	er Ver:1.11	执行 □强制按地址写	切换	设备分区表 清空	

1. Select MiniLoaderAll.bin from the MiniLoader folder downloaded earlier, and then click open

orange Pi User Manual

X 打开	2
← → ◇ ↑ 📙 > 此电脑 > 桌面 > orangepi > MiniLoader-焼愛Linux鏡像才需要用到的方	天西 v O の 在 MiniLoader-焼気Linux
组织 ▼ 新建文件夹	## • III ()
■ 此用脑 ③ 3D 对象 ■ 规频 ■ 规频 ■ 双指 ● 文指 ● 下载 ● 下载 ● 音乐 ■ 虞面 ■ 本述總点(C)	
文件名(N):	✓ All File(*,*) ✓
	打开(O) 取消

m. Then click on the location shown in the following image

	数开发	江具 v3.15				
載鏡	像	升级固件一高	級功能			
		存储	地址	名字	路径	
		VIDIC	0x00000000	Loader 1:	C:\Users\lee\Desktop\orangepi\M	
		20010	0.00000000			
ad	er Ve	er:1.11	执行	切换	设备分区表 清空	
ad	er Ve	er:1.11 [	执行	切换	设备分区表 清空	
ad	er Ve	er:1.11 [	执行 强制技地址写	切换	设备分区表 清空	
)ad	er Ve	ar:1.11 [ [ 	执行 ]强制按地址写 个WASKROW	切换	设备分区表 清空 2-2 :MASEROM ✓	

n. Then select the path to the Linux image you want to burn, and click open

Before burning the image, it is recommended to rename the Linux image to orangepi.img or other shorter names, so that the percentage of burning progress can be seen when burning the image.

寬像 💛	打开						×
		> orangepi >	~	õ		中搜索	
	组织 ▼ 新建文件夹				88	•	0
	<ul> <li>■ 此电脑</li> <li>③ 3D 对象</li> <li>◎ orangep</li> <li>◎ 切換</li> <li>◎ 可angep</li> <li>◎ orangep</li> <li>○ orangep</li></ul>	der-烧是Linux镜象才需要用到的东西 pi					
ler	▲ 本地磁盘 (C;) 為 co 35-55 (C). 文件名(N): orangep	pi		~	All File(*.*)		~

o. Then please check the option to force writing by address



p. Clicking the execute button again will start burning the Linux image to the eMMC of the development board

升级固件 高级	功能		
	9		
	地址 名	字 路径	
7	0x00000000	Loader C:\Use	rs\lee\Desktop\orangepi\M
EMMC	0x00000000	linux C:\Use	rs\lee\Desktop\orangepi\o

q. The displayed log after burning the Linux image is shown in the following figure

导储 地址	名字	路径		等待Maskrom开始 等待Maskrom成功
NNC 0:0000	linux	C:\Users\\hl7?\Desktop\ora		测试设备开始 测试设备成功 构验芯片开始 构验芯片式功 获取FlashInfo开始 获取FlashInfo开始 准备TDB成功 下载TDB成功 下载TDB成功 等待Maskron开始 等待Maskron开始 测试设备开始 测试设备开始
r:1.11 执行	切換	设备分区表	清空	开始切换存储到EMMC 开始下载orangepi
	FIE 1044	FIE 2000 いたののかい。 Loosity MMC 0x0000 linux r:1.11 执行 切換	File 山山山 石子 新江 (Dandatu, And Exactles ICALWare.tuch Littlesen too.vore.co. (Dandatu, And Exactles ICALWare.tuch Littlesen too.vore.co. MMC 0v0000 limux C:\Users\hbl77\Desktop\ore	File 地址 GF 前江

r. After burning the Linux image into eMMC, the Linux system will automatically start.

# 2. 5. 2. The method of burning Linux images into eMMC using the dd command

Note that the Linux image referred to here specifically refers to Linux distribution images such as Debian, Ubuntu, OpenWRT, or OPi OS Arch downloaded from the Orange Pi download page.

1) The Orange Pi CM5 core board has an eMMC module located as follows:



2) Using the dd command to burn the linux image to eMMC needs to be done with a TF card, so first you need to burn the linux image to the TF card, and then use the TF card to start the development board to enter the linux system. For the method of burning the Linux image to the TF card, please refer to the instructions in the two sections of the method of burning the Linux image to the TF card based on the Windows PC and the method of burning the Linux image to the TF card based on the Ubuntu PC.

3) After using the TF card to start the linux system, we first upload the decompressed linux image file (Debian, Ubuntu image or OPi Arch image downloaded from the official website) to the TF card. For the method of **uploading the linux image file to the development board**, please refer to the description in the section of the method of uploading files to the development board Linux system.

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

```
orangepi@orangepi:~$ cd /home/orangepi/Desktop
```

orangepi@orangepi:~/Desktop\$ ls

orangepicm5 x.x.x debian bullseye desktop xfce linux5.10.160.img

How to enter the command line of the Linux system on the development board? 1. For the method of using the serial port to log in to the terminal, please refer to the instructions in the section on how to use the debugging serial port.

2. Use ssh to remotely log in to the Linux system, please refer to the instructions in the section of SSH remote login to the development board.

3. If a display screen such as HDMI or LCD is connected, you can open a command line terminal on the desktop.

5) Next, we first use the following command to confirm the device node of eMMC orangepi@orangepi:~/Desktop\$ ls /dev/mmcblk\*boot0 | cut -c1-12 /dev/mmcblk1

6) Then we can use the dd command to clear the eMMC. Note that after the **of**= parameter, please fill in the output result of the above command

orangepi@orangepi:~/Desktop\$ sudo dd bs=1M if=/dev/zero of=/dev/mmcblk1 count=1000 status=progress orangepi@orangepi:~/Desktop\$ sudo sync

7) Then you can use the dd command to burn the linux image of the development board into the eMMC

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

sudo dd bs=1M if=orangepicm5\_x.x.x\_debian\_bullseye\_desktop\_xfce\_linux5.10.160.img of=/<mark>dev/mmcblk1</mark> status=progress

sudo sync

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

The detailed description of all parameters of the dd command and more usage

#### can be viewed by executing the man dd command in the linux system.

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

### 2.6. Method of burning Android images into TF cards

#### 2. 6. 1. Method of burning using RKDevTool

1) Firstly, it is necessary to prepare a high-quality USB male to female data cable.



2) Then download the Ruixin micro driver **DriverAssitant\_v5.12.zip** and the burning tool **RKDevTool Release v3.15.zip** from **Orange Pi's data download page**.

3) Then download the Android image from **Orange Pi's data download page**.

4) Then use the decompression software to unzip **DriverAssitant\_v5.12.zip**, and then find the **DriverInstall.exe** executable file in the unzipped folder and open it.

名称	修改日期	类型	大小
ADBDriver	2022/12/1 15:07	文件夹	
📙 bin	2022/12/1 15:07	文件夹	
Driver	2022/12/1 15:07	文件夹	
🔄 config	2014/6/3 15:38	配置设置	1 KB
🍮 DriverInstall	2022/2/28 14:11	应用程序	491 KB
Readme	2018/1/31 17:44	文本文档	1 KB
revison	2022/2/28 14:14	文本文档	1 KB

5) The steps to install the Ruixin micro driver after opening **DriverInstall.exe** are as follows:

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



b. After waiting for a period of time, a pop-up window will prompt "Driver installation successful", and then click the "OK" button to proceed.

≥ 瑞芯微驱动助手 v5.	12	×
	DriverInstall X 安装驱动成功.	印载
	确定	

6) Then unzip **RKDevTool\_Release\_v3.15.zip**. This software does not need to be installed. You can find **RKDevTool** in the unzipped folder and open it.

名称 ^	修改日期	类型	大小
📙 bin	2022/12/1 15:07	文件夹	
📙 Language	2022/12/1 15:07	文件夹	
📄 config.cfg	2022/3/23 9:11	CFG 文件	7 KB
🔄 config	2021/11/30 11:04	配置设置	2 KB
revision	2022/5/27 9:09	文本文档	3 KB
🔀 RKDevTool	2022/5/27 9:06	应用程序	1,212 KB
◎ 开发工具使用文档_v1.0	2021/8/27 10:28	Foxit PDF Reade	450 KB

7) After opening the **RKDevTool**burning tool, because the computer has not yet connected to the development board through the USB2.0 male-to-male data cable, a message "**No device found**" will appear in the lower left corner.

#		存储	地址	名字	路径			
1	Г		0x00000000	Loader				
2			0x00000000	Paraneter	1.1 Start			
3			0x00000000	Uboot				
4			0x00000000	trust				
5			0x00000000	Misc				
6			0x00000000	Resource				
7			0x00000000	Kernel				
8		-	0x00000000	Boot	2			
9			0x00000000	Recovery				
10			0x00000000	System				
11			0x00000000	Backup				
Loud	ler :		执行	切換	设备分区表 清空			

8) Then start burning the Android image into the TF card.

a. Firstly, connect the development board to the Windows computer through a USB male to female data cable. The location of the USB burning interface on the development board is shown in the following figure:



- b. Then insert the TF card into the development board and ensure that the board is not connected to a power source.
- c. Then hold down the MaskROM button on the development board and hold it down. The position of the MaskROM button on the development board is shown in the following figure:



d. Then connect the Type-C interface power to the development board, power it on, and then release the MaskROM button.



e. If the previous steps go well, the development board will enter MASKROM mode, and the interface of the burning tool will prompt "A MASKROM device was found"

🥮 range Pi User Manual

#		存储	地址	名字	路径	
1	1		0x00000000	Loader		
2	1		0x00000000	Parameter		
3	1		0x00000000	Uboot		
4			0x00000000	trust		
5			0x00000000	Misc		
6			0x00000000	Resource		
7			0x00000000	Kernel		
8			0x00000000	Boot		
9	1		0x00000000	Recovery		
10			0x00000000	System		
11			0x00000000	Backup		
.0 8 0	ler:		执行	切换	设备分型表 清空	

f. Then please select Advanced Features

になり	改开发	工具 v3.15	6			
載領	t像	升级固件	高级功能			_
#		存储	1 tu	名字	路径	
1			0:00000000	Loader		
2	Г		0x00000000	Parameter		
3	Г		0x00000000	Uboot		
4	Г		0x00000000	trust		
5			0x00000000	Misc		
6	Г		0x00000000	Resource		
7			0x00000000	Kernel		
8	Г		0x00000000	Boot		
9			0x00000000	Recovery		
10			0x00000000	System		
11	Г		0x00000000	Backup		

g. Then click the location shown in the picture below

镜像 升级固件	高级功能				
oot:				下载	
]件:				解包	
读取FlashID	读取Flash信息	读取Chip信息	读职Capability	1. FLASH 2. EMBC 3. SD 4. SD	
测试设备	重启设备	进入Maskron	切换存储	6. SPINOR 6. SPINAND 7. RAM	
清空序列号	列号 检测安全模式 导	导出串口日志	获取当前存储	9. SATA 10. PCIE	
导出镜像	擦除扇区	擦除所有			
已始扇区:					
扇区数:					
-					

h. Then select MiniLoaderAll.bin in the MiniLoaderr folder downloaded earlier, and then click Open

🛞 range Pi User Manual

く打开	>
← → ~ 个 🦲 → 此电脑 → 桌面 → orangepi → MiniLoader-烧录L	inux镜像才需要用到的东西 V O 在 MiniLoader-烧录Linux
组织 ▼ 新建文件夹	BB - 🛄 💡
■ 此电脑 ③ 3D 对象 ③ 3D 对象 ④ 3D 对象 ⑥ 3D 对象 ◎ 3D Table ◎ 7k3588_linux_periac.fg ◎ 7k3588_linux_periac.fg ◎ 7k3588_linux_periac.fg ◎ 7k3588_linux_periac.fg ◎ 7k3588_linux_periac.fg ◎ 7k3588_linux_periac.fg ◎ 7k3588_linux_periac.fg ◎ 7k3588_linux_periac.fg ◎ 7k3588_linux_periac.fg ◎ 7k3588_linux_striat.cfg ◎ 7k358_linux_striat.cfg ◎	
文件名(N): MiniLoaderAll.bin	✓ All File(*.*) ✓
	TTT(O) BY

i. Then click **Download** 

惫像 升级固件 ot:C:\1	: 高级功能 Users\hh177\Deskt	op\orangepi\Minil	.oader-虎	下载	
件:				解包	
卖取FlashID	读取Flash信息	读取Chip信息	读取Capability	1. Flash 2. ENDIC 3. SD	
则试设备	重启设备	进入Maskron	切换存储	4. SD1 5. SPINOR 6. SPINAND 7. RAM	
清空序列号	检测安全模式	导出串口日志	获取当前存储	8. USB 9. SATA 10. PCIE	
計出镜像	擦除扇区	擲除所有			
始扇区:					
区数:					
45 15	AHACKDO	and A	1-2-3 MASKRO	M	

j. After downloading MiniLoaderAll.bin, the display is as shown below

載鏡像 升级固件	= 高級功能				下载Boot开始 下载Boot成功	
Boot: C:V	Users\csy\Desktop	\orangepi\MiniLo	ider-烧录	下载		
固件:				解包		
读取FlashID	读取Flash信息	读取Chip信息	读取Capability	1. FLASH 2. EMMC 3. SD		
测试设备	重启设备	进入Maskrom	切换存储	4. SD1 5. SPINOR 6. SPINAND 7. RAW		
清空序列号	检测安全模式	导出串口日志	获职当前存储	8. USB 9. SATA 10. PCIE		
导出镜像	擦除扇区	擦除所有				
起始扇区:						
扇区数:						
42.111	AUACKDO	11 JL A	2-3 MASKRON	4	~	

k. Then select the storage device as **SD**, and then click to switch storage

🤔 range Pi User Manual

载镜像 升级固件 Boot: C:\	⊧ 高级功能 Users\osy\Desktop\	orangepi WiniLo	ader-烧录	下载	]	下载Boot开始 下载Boot成功		
固件: 读取FlashID 测试设备 清空序列号	读取Flesh信息 重启设备 检测安全模式	读取Chip信息 进入Maskrom 导出串口日志	···· 读取Capability 切换存储 获取当前存储	解包 1. Flash 2. EMMC 3. SD 4. SD1 5. SPINOR 6. SPINADD 7. RAM 8. USB 9. SATA 10. PCTE				
导出遺像 起始扇区: 扇区数:	擦除扇区	擦除所有						

1. The successful switching is displayed as shown below

Boot: C:\	Vsers\csy\Desktop'	\orangepi\MiniLo	ader-烧录	下载					
固件:				解包					
读取FlashID	读取Flash信息	读取Chip信息	读取Capability	1. Flash 2. EMMC	RKDevTool		X		
测试设备	重启设备	进入Maskrom	切换存储	4. SD1 5. SPINOR 6. SPINAND					
清空序列号	检测安全模式	导出串口日志	获取当前存储	7. KAM 8. USB 9. SATA 10. PCIE		]换存储成功.			
导出镜像	擦除扇区	擦除所有		2020-0- 2000-0-111		确定			
起始扇区:									
扇区数:									

m. Then click the "Upgrade Firmware" column of the burning tool

芯微开发工具 v3.15		 - 0	
å 并级固件 高级功能			_
固件 升级 切换			
固件版本: Loader版本:	芯片信息:		
固件:			
坐面 Анастроила	-2-3 *MASKROM		
	=2=3 : H& 35 BUIM		

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

🦻 range Pi User Manual

瑞芯微开发工具 v3.15	- 0
下載鏡像 [升级固件] 高级功能	
B件 升级 切换	
固件版本: Loader版本: 芯片信息:	
固件:	

o. Finally, click the "**Upgrade**" button to start burning. The log during the burning process is as shown below. After the burning is completed, the Android system will automatically start.

戦績像 升級	具 v5.15 週日 高級功能 頭は必备すた の時で必られて	
固件 固件版本: 固件:	升级         切換         期に設備和           千段         11.1         芯片信息:         883588           12.0.00         Losder版本:         1.11         芯片信息:         883588           C:\Users\orangepi\Desktop\MiniLosder_境录Linux微像才需要用多胎         工者100开始         注着100开始           下就1005070         下就1015670         下就1015670           下就2014开始         正右下動銀行         下或2014点1	」 1 3 5 6 ○成功 1 1 1
	没有发现设备	

## 2.7. How to burn Android image to eMMC

#### 2.7.1. How to use RKDevTool to burn

Note	that all th	ne following	operations are	performed	on a Wind	lows computer.
11000	unat an th	ie iono ming	operations are	periormea	on a vinte	ions compaten

1) There is an eMMC module on the Orange Pi CM5 core board, and its location is as follows:



2) You will also need to prepare a good quality USB male-to-male data cable.



3) Then download Rockchip driver **DriverAssitant\_v5.12.zip** and burning tool **RKDevTool\_Release\_v3.15.zip** from **Orange Pi's download page.** 

4) Then download the Android image from **Orange Pi's download page**.

5) Then use the decompression software to decompress **DriverAssitant\_v5.12.zip**, then find the **DriverInstall.exe** executable file in the decompressed folder and open it.

名称	修改日期	类型	大小
ADBDriver	2022/12/1 15:07	文件夹	
📙 bin	2022/12/1 15:07	文件夹	
Driver	2022/12/1 15:07	文件夹	
🔄 config	2014/6/3 15:38	配置设置	1 KB
le DriverInstall	2022/2/28 14:11	应用程序	491 KB
Readme	2018/1/31 17:44	文本文档	1 KB
revison	2022/2/28 14:14	文本文档	1 KB

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

a. Click the "Driver Installation" button.



b. After waiting for a while, a window will pop up saying "Driver installation successful", then click the "OK" button.

		-
	DriverInstall X	
弘区运力的	ŧ	印载
	安装驱动成功.	

7) Then unzip **RKDevTool\_Release\_v3.15.zip**. This software does not need to be installed. Just find **RKDevTool** in the unzipped folder and open it.

修改日期	类型	大小
2022/12/1 15:07	文件夹	
2022/12/1 15:07	文件夹	
2022/3/23 9:11	CFG 文件	7 KB
2021/11/30 11:04	配置设置	2 KB
2022/5/27 9:09	文本文档	3 KB
2022/5/27 9:06	应用程序	1,212 KB
2021/8/27 10:28	Foxit PDF Reade	450 KB
	修改日期 2022/12/1 15:07 2022/12/1 15:07 2022/3/23 9:11 2021/11/30 11:04 2022/5/27 9:09 2022/5/27 9:06 2021/8/27 10:28	修改日期         类型           2022/12/1 15:07         文件夹           2022/12/1 15:07         文件夹           2022/3/23 9:11         CFG 文件           2021/11/30 11:04         配置设置           2022/5/27 9:09         文本文档           2022/5/27 9:06         应用程序           2021/8/27 10:28         Foxit PDF Reade

8) After opening the **RKDevTool** burning tool, because the computer is not yet connected to the development board via the Type-C data cable, the lower left corner will prompt "**No device found**".

	- 0	者 地址	名字	路径			
		0:00000000	Loader				
		0x00000000	Parameter	-			
		0x00000000	Vboot				
		0x0000000	trust				
		0x00000000	Misc				
		0x00000000	Resource				
		0x00000000	Kernel				
		0x00000000	Boot				
		0x00000000	Recovery				
0		0x00000000	System				
1		0x000000x0	Backup		2		
0		0x00000000 0x00000000 0x00000000 0x000000	Boot Recovery System Backup				

9) Then start burning the Android image to eMMC.

a. First, connect the development board to the Windows computer via a USB male-to-male data cable. The location of the development board's USB burning interface is shown in the figure below:



- b. Make sure the development board is not connected to the power supply and the TF card is not inserted.
- c. Then press and hold the MaskROM button on the development board. The location of the MaskROM button on the development board is shown in the figure below:



d. Then connect the development board to the power supply of the Type-C interface and power it on. Then you can release the MaskROM button.



e. If the previous steps are successful, the development board will enter the **MASKROM** mode and the burning tool interface will prompt "A **MASKROM** device is found".

🥮 range Pi User Manual

#		存储	地址	名字	路径		
1	-		0x00000000	Loader			
2	1		0x00000000	rarameter M			
3	늗		0:00000000	00000			
E	÷		0+00000000	Hice			
0	i E		0.00000000	mi SC			
7	÷		0x00000000	Keenel			
8	÷		0×00000000	Boot		/	
9	in.		0x0000000	Becovery			
10	i F		0×0000000	System			
11	i T		0×0000000	Backup	/		
Load	ler :	[	执行 ] 强制按地址写	切换	设备分配表 清空		

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

芯微开发工具 v3.15		- 0
戦績像 丹级固件 高級功能		
固件 升级 切换		
固件版本: Loader版本:	芯片信息:	
固件:		

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

芯微开发工具 v3.15		- 0
<sub>找</sub> 續像「升级固件」高级功能		
固件 升级 切换		
固件版本: Loader版本:	芯片信息:	
固件:		

h. Finally, click the "Upgrade" button to start burning. The log of the burning process is shown in the figure below. After the burning is completed, the Android system will automatically start.

🞯 range Pi User Manual

遺像 升级[	固件 高级功	能			测试设备开始 测试设备成功	
<b>固件</b> 固件版本: 固件:	升级 12.0.00 C:\Vsers\	切换 Loader版本: orangepi\Dezkto	1.11 芯片信息 g-WiniLoader-统录Linux镜(	885533	程验芯片成功 按取F1acLatG开始 按取F1acLatG开始 注着100开始 注着100开始 下载100成功 下载100成功 下载100成功 下载100成功 下载100成功 下载团件承切	

#### 2.8. Start the Orange Pi Development Board

1) The core board's eMMC is pre-installed with an image, which we can directly start and use. Or insert the TF card with the image burned into the TF card slot of the Orange Pi development board.

2) The development board has an HDMI interface, which can be connected to a TV or HDMI monitor via an HDMI to HDMI cable.

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

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

Remember not to insert a power adapter with a voltage output greater than 5V, which will burn the development board.

Many unstable phenomena during the system power-on startup 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.

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

Please do not connect to the USB interface of the computer to power the development board.

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

6) If you want to view the system output information through the debug serial port, please use a serial cable to connect the development board to the computer. For the serial port connection method, please refer to the section "How to use the debug serial port".

### 2.9. How to use the debug serial port

#### 2.9.1. Debug serial port connection instructions

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

For better compatibility, it is recommended to use the CH340 USB to TTL module. Please do not use the CP2102 or PL2303 type USB to TTL modules.

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



2) The corresponding relationship between the GND, RX and TX pins of the debug serial port of the baseboard 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 debug serial port of the development board via a Dupont cable.

a. Connect the GND of the USB to TTL module to the GND of the development board.

b. Connect the **RX of the USB to TTL module 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:



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

The TX and RX of the serial port need to be cross-connected. If you don't want to carefully distinguish the order of TX and RX, you can connect the TX and RX of the serial port randomly. If there is no output in the test, swap the order of TX and RX. In this way, there is always one order that is correct.

#### 2.9.2. How to use the debug serial port on Ubuntu

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 USB to TTL module is connected and recognized normally, you can see the corresponding device node name under /dev of the Ubuntu PC. Remember this node name, which will be used when setting up the serial port software later.

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

2) Then install putty on your Ubuntu PC using the command below.

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

3) Then run putty and remember to add sudo permissions.

#### test@test:~\$ sudo putty

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

	PuTTY Configuration	- 🛛 🔕
Category: Session Logging	Basic options for your PuTTY sess Specify the destination you want to connect to Host <u>N</u> ame (or IP address)	Port
Keyboard Bell Features	Connection type: Raw <u>T</u> elnet Rlogin <u>S</u> SH	⊖ Se <u>r</u> ial
<ul> <li>Window</li> <li>Appearance</li> <li>Behaviour</li> <li>Translation</li> <li>Selection</li> <li>Colours</li> <li>Eopts</li> </ul>	Sav <u>e</u> d Sessions	Load Sa <u>v</u> e Delete
<ul> <li>Connection</li> <li>Data</li> <li>Proxy</li> <li>Telnet</li> <li>Rlogin</li> </ul>	Close window on exit: Always Never Only on clea	in exit
H22 4		
About	<u>O</u> pen	Cancel

5) First select the serial port settings interface.

	PuTTY Configuration	00
Category: Logging	Options controllin Select a serial line	g local serial lines
<ul> <li>Terminal</li> <li>Keyboard</li> </ul>	Seria <u>l</u> line to connect to	/dev/ttyUSB0
Bell	Configure the serial line	
Features Window	<u>S</u> peed (baud)	1500000
Appearance Behaviour	Data <u>b</u> its	8
Translation	S <u>t</u> op bits	1
Selection Colours	<u>P</u> arity	None 👻
Fonts	<u>F</u> low control	None 🔻
<ul> <li>Connection</li> </ul>		
Data		
Proxy		
Telnet		
Rlogin		
▶ SSH		

- 6) Then set the serial port parameters.
  - a. Set **Serial line to connect to** to /dev/ttyUSB0 (change to the corresponding node name, usually/dev/ttyUSB0).
  - b. Set **Speed(baud)** to 1500000 (the baud rate of the serial port).

#### c. Set Flow control to None.



7) After completing the settings on the serial port settings interface, return to the Session interface.

- a. First select **Connection type** as Serial.
- b. Then click the **Open** button to connect to the serial port.

	PuTTY Configuration	• • •					
Category: 🖌 1.	Go back to the Session interface	sion					
<ul> <li>Session</li> </ul>	Specify the destination you want to connect	to					
Logging	Serial li <u>n</u> e	Speed					
<ul> <li>Terminal</li> </ul>	/dev/ttyUSB0 150000						
Keyboard Bell	Connection type: Raw <u>T</u> elnet Rlogin <u>S</u> SH	Se <u>r</u> ial					
Features Window Appearance	Load, save or delete a stored session Sav <u>e</u> d Sessions						
Behaviour Translation Selection Colours	Default Settings	Load					
		Sa <u>v</u> e					
Fonts		Delete					
<ul> <li>Connection</li> <li>Data</li> <li>Proxy</li> </ul>							
Telnet Rlogin	Close window on exit: Always Never Only on clean exit						
• ссн	3. Finally click the Open button						
		<i>.</i>					
About	<u>O</u> pen	Cancel					

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

	/d	ev/tl	:yU	SB0 - PuTT	Y	000
R0=0x18						
MR4=0×1						
MR5=0×1						
MR8=0×8						
MR12=0x72						
MR14=0x72						
MR18=0×0						
MR19=0×0						
MR24=0x8						
MR25=0x0						
R0=0×18						
MR4=0×1						
MR5=0×1						
MR8=0×8						
MR12=0x72						
MR14=0x72						
MR18=0×0						
MR19=0×0						
MR24=0x8						
MR25=0x0						
channel 0 training pass!						
channel 1 training pass!						
change freq to 416MHz 0,1						
Channel 0: LPDDR4,416MHz						
Bus Width=32 Col=10 Bank=8	Row=15/15	CS=2	Die	Bus-Width=16	Size=2048MB	
Channel 1: LPDDR4,416MHz						
Bus Width=32 Col=10 Bank=8	Row=15/15	CS=2	Die	Bus-Width=16	Size=2048MB	
256B stride						

#### 2.9.3. How to use the debug 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 purchasing a serial number.

1) Download MobaXterm.

a. Download MobaXterm from the following URL:

https://mobaxterm.mobatek.net

b. Go to the MobaXterm download page and click **GET XOBATERM NOW!**.

orange Pi User Manual



Enhanced terminal for Windows with X11 server, tabbed SSH client, network tools and much more



c. Then choose to download the Home version.

\$69 / 49€ per user*
* Excluding tax. Volume discounts available
Every feature from Home Edition +
Customize your startup message and logo
Modify your profile script
Remove unwanted games, screensaver or tools
Unlimited number of sessions
Unlimited number of tunnels and macros
Unlimited run time for network daemons
Enhanced security settings
12-months updates included
Deployment inside company
Lifetime right to use

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

🔘 range Pi User Manual	Copyright reserved by Shenzhen Xunlong Software Co.,	Ltd
MobaXterm Home Edition		
Download MobaXterm Home Edition (	current version):	
MobaXterm H (Portable	edition v22.2 MobaXterm Home Edition v22.2 (Installer edition)	
Download previous stable version:	AobaXterm Portable v22.1 MobaXterm Installer v22.1	
By downloading MobaXterm software,	you accept MobaXterm terms and conditions	
You can download the third party plug	ins and components sources here	
If you use MobaXterm inside y give you access to profession versions of MobaXterm includ Please <u>contact us</u> for more int	our company, you should consider subscribing to <u>MobaXterm Professional Edition</u> : your subscription will al support and to the "Customizer" software. This customizer will allow you to generate personalized ing your own logo, your default settings and your welcome message. formation.	

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

名称 ^	修改日期	类型	大小
CygUtils.plugin	2022/9/24 20:16	PLUGIN 文件	17,484 KB
MobaXterm_Personal_22.2	2022/10/22 16:53	应用程序	16,461 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 serial port number (select the corresponding port number according to the actual situation). If you cannot see the port number, use 360 Driver Master to scan and install the USB to TTL serial port chip driver.

d. Select the serial port baud rate as **1500000**.

e. Finally, click the "**OK**" button to complete the settings.



n Servers 1	Tools Ga	ames S	Sessions	View	🕎 Split M	UltiExec T	unneling P	ackages S	¢ <sup>‡</sup> ettings	(2) Help				
Session sett	ings													
SSH	Telnet	<mark>⊮</mark> Rsh	Xdmcp	RDP	VNC	<b>S</b> FTP	SFTP	N Serial	<b>S</b> File	Shell	Browser	Mosh	S Aws S3	III WSL
🔊 Ba	sic Serial s	settings							-	2. Select	the serial	port		
	Serial port	* Choo Choo	ose at sess ose at sess	ion start ion start			~		Speed (b	ps) * 150	0000 ~			
COM3 (Silicon Labs CP210x USB to UART Bridge														
	3. Select the port number of the serial port 4. Select the baud rate as 1500000													
	Serial (COM) session													ř.
				5. Fi	inally clic	k OK								

4) Click the "**OK** " button to enter the following interface. Now start the development board and you can see the output information of the serial port.



## 3. Instructions for using Ubuntu/Debian Server and

## Xfce desktop system

The content of this chapter is written based on the linux server version image and the xfce desktop version image.

## 3.1. Supported Linux image types and kernel versions

Linux Image Type	Kernel version	Server Edition	desktop version
Debian 11 - Bullseye	Linux5.10	Support	Support
Debian 12 - Bookworm	Linux5.10	Support	Support
Ubuntu 20.04 - Focal	Linux5.10	Support	Support
Ubuntu 22.04 - Jammy	Linux5.10	Support	Support
Debian 12 - Bookworm	Linux6.1	Support	Support
Ubuntu 22.04 - Jammy	Linux6.1	Support	Support

## 3.2. Linux 5.10 system compatibility

Function	Debian11	Debian12	Ubuntu20.04	Ubuntu22.04
HDMI Display	OK	OK	ОК	ОК
HDMI Audio	OK	OK	ОК	ОК
USB 2.0	OK	OK	ОК	ОК
USB 3.0	OK	OK	ОК	ОК
Gigabit Ethernet	OK	OK	ОК	ОК
2.5G LAN x 2	OK	OK	ОК	ОК
Debug serial port	OK	OK	ОК	ОК
FAN	OK	OK	ОК	ОК
RTC	OK	OK	ОК	ОК
eMMC	OK	OK	ОК	ОК
GPIO (12pin)	OK	OK	ОК	ОК
UART (12pin)	OK	OK	ОК	ОК
SPI (12pin)	OK	OK	ОК	ОК

🍎 range Pi User Manual

I2C (12pin)	ОК	OK	ОК	ОК
CAN (12pin)	ОК	ОК	ОК	ОК
Camera x 4	ОК	OK	ОК	ОК
LED Light	ОК	OK	ОК	ОК
TF Card Start	ОК	ОК	ОК	ОК
Infrared	ОК	ОК	ОК	ОК
GPU	ОК	ОК	ОК	ОК
NPU	ОК	ОК	ОК	ОК
VPU	ОК	ОК	ОК	ОК
Power button	ОК	ОК	ОК	ОК
Watchdog test	ОК	ОК	ОК	ОК
Chromium hard	ОК	ОК	ОК	ОК
decoding video				

## 3. 3. Linux 6.1 system compatibility

Function	Debian12	Ubuntu22.04
HDMI Display	ОК	ОК
HDMI Audio	ОК	ОК
USB 2.0	ОК	ОК
USB 3.0	ОК	ОК
Gigabit Ethernet	ОК	ОК
2.5G LAN x 2	ОК	ОК
Debug serial port	ОК	ОК
FAN	ОК	ОК
RTC	ОК	ОК
еММС	ОК	ОК
GPIO (12pin)	ОК	ОК
UART (12pin)	ОК	ОК
SPI (12pin)	ОК	ОК
I2C (12pin)	ОК	ОК
CAN (12pin)	ОК	ОК

range Pi User Manual Copyright reserved by Shenzhen Xunlong Software Co., Ltd Camera x 4 OK OK LED Light OK OK **TF Card Start** OK OK Infrared OK OK GPU OK OK NPU OK OK VPU OK OK **Power button** OK OK Watchdog test OK OK Chromium hard decoding video OK OK

### 3.4. Linux command format description in this manual

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

As shown below, the contents in the yellow box indicate the contents that require special attention, except for the commands inside.

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

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 common user. When executing privileged commands, **sudo** is required.

- c. **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 the root user and can execute any command he wants.
- d. test@test:~\$ The prompt indicates that this command is entered in an 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 a normal user. When executing privileged commands, you need to add sudo.
- e. root@test:~# The prompt indicates that this command is entered in an 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 bold black part is the command that needs to be entered, and the content below the command is the output (some commands have output, some may not). This part does not need to be entered.

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

verbosity=7

bootlogo=false

console=serial

b. As shown below, some commands cannot fit in one line and will be placed on the next line. The bold black parts are the commands that need to be entered. When these commands are entered on one line, the "\" at the end of each line needs to be removed, as it is not part of the command. In addition, there are spaces between different parts of the command, so please do not miss them.

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. 5. Linux system login instructions

#### 3. 5. 1. Linux system default login account and password

Account	Password
root	orangepi
orangepi	orangepi

Please note that when you enter the password, the specific content of the password will not be displayed on the screen. Please do not think that there is any malfunction. Just press Enter after entering it.

#### 3. 5. 2. How to set up automatic login for Linux system terminal

1) The Linux system automatically logs into the terminal by default, and the default login username 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 to the 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. 5. 3. Linux desktop system automatic login instructions

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



2) Run the following command to disable the desktop version of the 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. You need to enter the password to enter the system.



### 3. 5. 4. How to set up automatic login for root user in Linux desktop 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 you will automatically log in to the desktop as the root user.



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

Also, please note that this is not a bug, because pulseaudio is not allowed to run under the root user. 3) Run the following command to set the desktop system to automatically log in using the orangepi user again.

orangepi@orangepi:~\$ sudo desktop\_login.sh orangepi

3. 5. 5. How to disable the desktop in Linux desktop system

1) First enter the following command in the command line. Please remember to add sudo permissions.

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 steps to reopen the desktop are as follows:
  - a. First enter the following command in the command line. **Please remember to** add sudo permissions.

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

b. After making your selection, the monitor will display the desktop.

#### 3. 6. Onboard LED Light Test Instructions

1) There is a red light and three green lights on the bottom panel, and their locations are shown in the figure below:

- a. The leftmost light with PWR printed on it is red;
- b. The other three lights are all green.



2) As long as the development board is powered on, the red LED light will be always on. This is controlled by hardware and cannot be turned off by software. The red LED light can be used to determine whether the power of the development board has been turned on normally. 3) The three green LED lights are the indicator lights for the Gigabit Ethernet port and the two 2.5G Ethernet ports. When the Ethernet port is linked, the corresponding green light will be on, and when there is data transmission, the corresponding green light will flash.

#### 3.7. Network connection test

#### 3. 7. 1. Ethernet port test

1) First, plug one end of the network cable into the Ethernet port of the development board, and the other end of the network cable into the router, and make sure the network is unobstructed.

2) After the system starts, the IP address will be automatically assigned to the Ethernet card through **DHCP**, and no other configuration is required.

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

Note that in the following commands, Debian 12 needs to change eth0 to end1.
orangepi@orangepi:~\$ ip addr show eth0
2: eth0: <broadcast,multicast,up,lower_up> mtu 1500 qdisc mq state UP</broadcast,multicast,up,lower_up>
group default qlen 1000
link/ether 4a:fe:2b:3d:17:1c brd ff:ff:ff:ff:ff:ff
inet 192.168.1.150/24 brd 192.168.1.255 scope global dynamic noprefixroute eth0
valid_lft 43150sec preferred_lft 43150sec
inet6 fe80::9a04:3703:faed:23be/64 scope link noprefixroute
valid_lft forever preferred_lft forever

## When using ifconfig to check the IP address, if the following message is displayed, it is because sudo is not added. The correct command is: sudo ifconfig

orangepi@orangepi:~\$ ifconfig

Command 'ifconfig' is available in the following places

\* /sbin/ifconfig

\* /usr/sbin/ifconfig

The command could not be located because '/sbin:/usr/sbin' is not included in the PATH environment variable.

This is most likely caused by the lack of administrative privileges associated with your user account.

ifconfig: command not found

4) The command to test network connectivity is as follows. The **ping** command can be interrupted by pressing the **Ctrl+C**shortcut key.

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

--- 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

First of all, please note that there is no WIFI module on the development board. You need an external USB network card to use the WIFI function.

For instructions on using the external USB network card, please refer to the USB wireless network card test section.

Please do not connect to WIFI by modifying the /etc/network/interfaces configuration file. This method may cause problems when connecting to the WIFI network.

## 3. 7. 2. 1. Server version image connects to WIFI through command

When the development board is not connected to Ethernet, not connected to HDMI display, and only connected to the serial port, it is recommended to use the command demonstrated in this section to connect to the WIFI network. Because

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

- 1) Log in to the Linux system first. There are three ways:
  - a. If the development board is connected to the network cable, you can log in to the Linux system remotely through SSH.
  - b. If the development board is connected to the debug serial port, you can log in to the Linux system using the serial terminal.
  - c. If the development board is connected to an HDMI display, you can log in to the Linux system through the HDMI display terminal.

1) First, use the **nmcli dev wifi** command to scan the surrounding WIFI hotspots.

orangepi@orangepi:~\$ nmcli dev wifi

rootOor	ongoni, # pmcli dov	wifi						
TN LICE	BCCTD	WIII CCTD	MODE	CHAN	DATE	STONAL	DADC	CECUDITY
TIN-USE	DSSID	2210	MODE	CHAN	KATE	SIGNAL	DAKS	SECORITI
	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	NETEEAREN	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		130 Mbit/s	52	_	WPA1 WPA2
	00:BD:82:51:53:C2		Infra		130 Mbit/s			WPA1 WPA2
	C0:61:18:FA:49:37		Infra		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	270 Mbit/s	47		WPA2
	9C:A6:15:DD:E6:0C		Infra			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:~#							

- 2) Then use the **nmcli**command to connect to the scanned WIFI hotspot, where:
  - a. **wifi\_name** You need to change it to the name of the WIFI hotspot you want to connect to.
  - b. **wifi\_passwd**You need to change it to the password of the WIFI hotspot you want to connect to.

orangepi@orangepi:~\$ nmcli dev wifi connect wifi\_name password wifi\_passwd Device 'wlan0' successfully activated with 'cf937f88-ca1e-4411-bb50-61f402eef293'. 3) Through ip addr show wlan0 The command can view the IP address of the wifi.

orangepi@orangepi:~\$ ip addr show wlan0

11: wlan0: <BROADCAST,MULTICAST,UP,LOWER\_UP> mtu 1500 qdisc pfifo\_fast state UP group default qlen 1000

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

inet **192.168.1.11**/24 brd 192.168.1.255 scope global dynamic noprefixroute wlan0 valid lft 259192sec preferred lft 259192sec

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

valid\_lft 259192sec preferred\_lft 172792sec

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

valid\_lft forever preferred\_lft forever

4) Use the **ping** command to test the connectivity of the WiFi network. The **ping** command can be interrupted by pressing the **Ctrl+C** shortcut key.

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

04 bytes non 102.92.250.150 (102.92.250.150). temp\_seq 5 th 52 time 44.9 his

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 version image connects to WIFI through a graphical method

1) Log in to the Linux system first. There are three ways:

- a. If the development board is connected to the network cable, you can log in to the Linux system remotely through SSH.
- b. If the development board is connected to the debug serial port, you can use the

serial terminal to log in to the Linux system (use MobaXterm as the serial software, minicom cannot display the graphical interface).

c. If the development board is connected to an 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:~\$ nmtui

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



4) Select Activate a connect and press Enter.



5) Then you can see all the searched WIFI hotspots.



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

Wired t Activates
* Wired connection 1
Wi-Fi
orangepi_5G ***
srangepi ****
(1,1,2,1,2,1,1,1,1,1,1,1,1,1,1,1,1,1,1,1
Ν. <sup></sup> - AR 'Δ ***
** ↓ <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 * Wired connection 1 Wi-Fi Authentication required by wireless network Passwords or encryption keys are required to access the wireless network 'orangepi'. Password (arcels c0K)
2. 按下回车键

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 the wifi network by using the **ip addr show wlan0** command.

orangepi@orangepi:~\$ ip addr show wlan0

11: wlan0: <BROADCAST,MULTICAST,UP,LOWER\_UP> mtu 1500 qdisc pfifo\_fast state UP group default qlen 1000

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

inet **192.168.1.11**/24 brd 192.168.1.255 scope global dynamic noprefixroute wlan0 valid lft 259069sec preferred lft 259069sec

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

valid\_lft 259071sec preferred\_lft 172671sec

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

valid\_lft forever preferred\_lft forever

10) Use the **ping**command to test the connectivity of the WiFi network. The **ping** command can be interrupted by pressing the **Ctrl+C** shortcut key.

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. Testing methods for desktop images

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 click **Connect** to start connecting to WIFI.



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

range Pi User Manual Copyright reserved by Shenzhen Xunlong S		
or		
•		
Þ	🕲 Chromium Browser	
•		
	pr	ser Manual Copyright reserved by

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



#### 3. 7. 3. How to set a static IP address

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

#### 3. 7. 3. 1. Using nmtui command to set static IP address

1) First run the **nmtui**command.

orangepi@orangepi:~\$ 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
Quit
<0K>

3) Then select the network interface for which you want to set a static IP address. For example, to set a static IP address for an **Ethernet** interface, just select **Wired connection 1**.

Ethernet ↑	<add></add>
Wired connection 1 Wi-Fi xunlong_orangepi_5G	<edit> <delete></delete></edit>

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

Ethernet 1 Wired connection 1 Wi-Fi xunlong_orangepi_5G	<add> <edit> <delete></delete></edit></add>
--	---

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) Press Enter, use the up and down arrow keys to select **Manual**, and then press Enter to confirm.

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

7) After the selection is completed, the display is as shown below:

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

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

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></automatic></manual></pre>	<mark><show></show></mark> <show></show>
[X] Automatically connect [X] Available to all users	
<ci< td=""><td>ancel&gt; &lt;0K&gt;</td></ci<>	ancel> <0K>

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

🥮 range Pi User Manual



10) Then you can set the IP address, gateway and DNS server address as shown in the figure below (there are many other setting options, please explore them yourself). Please set them according to your specific needs. The value set in the figure below is just an example.

Edit Connection	
Profile name Wired connection 1 Device eth0 (86:F2:85:2C:81:CE)	
= ETHERNET	<show></show>
= IPv4 CONETGURATION <manual> Addresses 192,168,1,177/24 <bemove></bemove></manual>	<hide></hide>
<add></add>	
Gateway 192.168.1.1 DNS servers 8.8.8.8 <remove></remove>	
<add> Search domains <add></add></add>	

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**, move the cursor to **<OK>**, and finally press Enter.



14) Then select the network interface you want to configure, such as Wired connection
1, and then move the cursor to <Deactivate> and press Enter to disable Wired connection 1.



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

		<b>\</b>
Wired Wired connection 1	Î	<activate></activate>
Wi-Fi * xunlong_orangepi	ļ	

16) Then you can exit nmtui by pressing the **<Back>** and **Quit** buttons.



17) Then use i **ip addr show eth0** to see that the IP address of the network port has become the static IP address set earlier.

orangepi@orangepi:~\$ ip addr show eth0

3: eth0: <BROADCAST,MULTICAST,UP,LOWER\_UP> mtu 1500 qdisc pfifo\_fast state UP group default qlen 1000

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

inet 192.168.1.177/24 brd 192.168.1.255 scope global noprefixroute eth0

valid\_lft forever preferred\_lft forever

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

valid\_lft 259149sec preferred\_lft 172749sec

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

valid\_lft forever preferred\_lft forever

18) Then you can test the network connectivity to check if the IP address is configured OK. The **ping** command can be interrupted by pressing **Ctrl+C**.

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

--- 192.168.1.47 ping statistics ---

5 packets transmitted, 5 received, 0% packet loss, time 4042ms rtt min/avg/max/mdev = 0.233/0.262/0.275/0.015 ms

#### 3. 7. 3. 2. Using nmcli to set a static IP address

1) If you want to set a static IP address for the network port, please plug the network cable into the development board first, and then start setting the static IP address.

2) Then use the **nmcli con show** command to view the name of the network device, as shown below:

coot@orangepi:~# nmcli con show								
NAME	UUID	TYPE	DEVICE					
Wired connection 3	9b60145e-35a0-336d-92e3-e3f14a12633b	ethernet	eth0					
Wired connection 1	5af6324c-922c-3186-a76c-35aa4afcf560	ethernet						
Wired connection 2	505a47f7-60e4-37d0-aaf7-d666b34cff8a	ethernet						

3) Then enter the following command, where

- a. "Wired connection 3" means setting the static IP address of the Gigabit Ethernet port. If you need to set the static IP address of other network ports, please change it to the corresponding name of other network interfaces.
- b. The static IP address to be set after **ipv4.addresses** can be changed to the value you want to set.
- c. **ipv4.gateway** indicates the address of the gateway.

```
orangepi@orangepi:~$ nmcli con mod "Wired connection 3" \
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</broadcast,multicast,up,lower_up>
UP group default qlen 1000
link/ether 5e:ae:14:a5:91:b3 brd ff:ff:ff:ff:ff
inet <b>192.168.1.110</b> /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 1ft forever preferred 1ft forever

#### 3.8. SSH remote login to the development board

By default, Linux systems enable ssh remote login and allow root users to log in to the system. Before logging in through ssh, you must first ensure that the 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 to the development board under Ubuntu

1) Get the IP address of the development board.

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

test@test:~\$ ssh root@192.168.x.xxx	(Need to be replaced with the IP address
of the development board)	
root@192.168.x.xx's password:	(Enter the password here. The default password
is orangepi)	

Note that when you enter the password, the specific content of the password you entered will not be displayed on the screen. Please do not think that there is any problem. Just press Enter after entering it.

If the prompt refuses to connect, as long as you are using the image provided by Orange Pi, please do not doubt whether the password orangepi is wrong, but look for other reasons.

3) After successfully logging into the system, the display is as shown below:

orangepi@orangepi:~\$ ssh 192.168.2.236 orangepi@192.168.2.236's password:									
Welcome to <mark>Ora</mark>	nge Pi 1.0.0 Jam	my with Linux 5	10.160-rockchip-rk3588						
System load: Memory usage: CPU temp:	14% 14% of 3.83G 40°C	Up time: IP: Usage of /:	1 min Local users: 192.168.2.236 18% of 28G	3					
[ General system configuration (beta): orangepi-config ]									
Last login: Wed Apr 10 15:20:18 2024 from 192.168.2.220 orangepi@orangepi:-\$									

If ssh cannot log in to the Linux system normally, first check whether the IP address of the development board can be pinged. If the ping is successful, 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 to try to connect:

root@orangepi:~# reset\_ssh.sh

If it still doesn't work, please re-burn the system and try again.

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

1) First, obtain the IP address of the development board.

2) You can use MobaXterm to remotely log in to the development board under Windows. First, create a new ssh session.

- a. Open Session.
- b. Select SSH in Session Setting.
- c. Enter the IP address of the development board in Remote host.
- d. Enter the Linux user name root or orangepi in Specify username.
- e. Finally, click **OK**.

RobaXterm	- 0	×
Terminal Sessions View X server Tools Games Settings Macros Help		
	X	0
		10
		-
2. Select SSH		~
1. Open Session		
S Sisce angle A		
SSH Tefnet Rsh Xdmcp RDP VNC FTP SFTIP Serial File Shell Browser Mosh Aws S3 WSL		
3		
Basic SSH settings		
Nemote host 1 122, 165 1.30		
🖾 Advanced SSH settings 📜 Terminal settings 🌟 Hetwork settings 🖕 Bokemark settings		
3. Enter the IP address of the development board		
4. Enter the username of the linux system, orangepi or root		
Secure Snew (SSH) session		
Data service and the service of the		
5. Finally click OK		
OK Cancel		

3) You will be prompted to enter a password. The default password for both root and orangepi users is orangepi.

Please note that when you enter the password, the specific content of the password will not be displayed on the screen. Please do not think that there is any malfunction. Just press Enter after entering it.



4) After successfully logging into the system, the display is as shown below:



<b>I</b> 192.16	68.2.236 (root)															
Terminal	l Sessions	View	X server	Tools	Games Se	ettings Ma	cros Help									
Session	Servers 1	Stools	Games	t Sessions	View	Split Mult	Fxec Tunnelin	g Packages	settings	(2) Help						
Quick	connect	0			1	10. 192	.168.2.236 (roc	it)	×	2						
(1)	Vame Cache Cac	utologin	8	3 0 1 1 3		> 55	H sessi Direct SSH com SSH-bro X11-for	(SS SSH npressi wser wardin info,	Moba H cli root@ 	Xterm ent, ) 192.10 , , , , , , , , , , , , , , , , , , ,	Personal ( server a 58.2.236 remote dia on <u>help</u> (	Editi and ne splay or vis	on v22. twork t is forw it our	.2 • tools) warded • websit	through e.	SSH)
					/   Weld		)     /      0 Orange	9 Pi 1.	0.0 J	ammy v	vith Linu;	x 5.10	.160-rc	ockch ip	-rk3588	
					Sys Mem CPU	tem loa ory usa temp:	nd: 3% nge: 15 36	5% of 3 5°C	.83G	Up If Us	o time: P: sage of /	1 1 : 1	6 min 92.168. 8% of 2	Local 2.236 28G	users:	4
					Las	t <mark>logi</mark> n t@orang	: Wed A pepi:~#	pr 10	15:35	:30 20	024 from	192.16	8.2.155	5		

#### 3.9. How to use ADB

#### 3. 9. 1. How to use network adb

1) After the system starts, please make sure that **adbd** has been started.

orangepi@orangepi:~\$ ps -ax   grep "adbd"								
808 ?	Sl	0:00 /usr/bin/adbd						
3707 ttyFIQ0	S+	0:00 grepcolor=auto adbd						

2) Then check the IP address of the development board and write it down.

3) Then install adb tool on your Ubuntu PC.

test@test:~\$ sudo apt-get update test@test:~\$ sudo apt-get install -y adb

4) Then use the following command to connect to the network adb.

test@test:~\$ adb connect 192.168.1.xx:5555 #Please replace the IP address with the IP address of the development board \* daemon not running; starting now at tcp:5037  \* daemon started successfully connected to 192.168.1.xx:5555 test@test:~\$ adb devices List of devices attached
 192.168.1.xx:5555 device

5) Then use the following command to log in to the Linux system of the development board.

test@test:~\$ adb shell root@orangepicm5:/# <--- Seeing this prompt means you have successfully logged into the development board

6) The command to upload files to the development board using adb is as follows:

test@test:~\$ adb push filename /root filename: 1 file pushed. 3.7 MB/s (1075091 bytes in 0.277s)

7) The command to restart the development board using adb is as follows:

```
test@test:~$ adb reboot
```





#### 3. 9. 2. Use a USB2.0 male-to-male data cable to connect to adb

1) First, prepare a good quality USB male-to-male data cable.



2) Then connect the development board to the Ubuntu PC via a USB male-to-male data cable. The location of the USB interface that supports the device function on the development board is shown in the figure below:



3) Then run the following command to set the USB interface to device mode.
orangepi@orangepi:~\$ sudo set\_device.sh

If the **set\_device.sh** script does not exist in the Linux system, use the following command directly:

orangepi@orangepi:~\$ sudo bash -c "echo device > /sys/kernel/debug/usb/fc000000.usb/mode" orangepi@orangepi:~\$ sudo systemctl restart usbdevice

4) Then please make sure adbd is started.

orangepi@orangepi:~\$ ps -ax   grep "adbd"								
808 ?	S1	0:00 /usr/bin/adbd						
3707 ttyFIQ0	S+	0:00 grepcolor=auto adbd						

5) Then install the adb tool on your Ubuntu PC.

test@test:~\$ sudo apt-get update test@test:~\$ sudo apt-get install -y adb

6) Then use the following command to check whether the adb device is recognized.

test@test:~\$ **adb devices** List of devices attached **e0f9f71bc343c305 device** 

8) Then use the following command to log in to the Linux system of the development board.

test@test:~\$ adb shell

root@orangepicm5:/# <--- Seeing this prompt means you have successfully logged into the development board

9) The command to upload files to the development board using adb is as follows:
test@test:~\$ adb push filename /root
filename: 1 file pushed. 3.7 MB/s (1075091 bytes in 0.277s)

10) The command to switch USB from device mode back to host mode is as follows: orangepi@orangepi:~\$ sudo bash -c "echo host > /sys/kernel/debug/usb/fc000000.usb/mode"

If you do not have the adb tool in your Windows system, you can use the adb program in the **RKDevTool** software.



	桌面 → RKDevTc	ol_Release_v2.92 > bin						
		名称 ^		修改日期	类型	大小		
	14 14	📧 adb 🔄 AdbWinApi.dll 🍳 AdbWinUsbApi.dll		2019/6/24 9:13 2019/6/24 9:13 2019/6/24 9:13	应用程序 应用程序扩展 应用程序扩展	1,807 KB 96 KB 62 KB		
	*	AFPTool     RKImageMaker		2021/8/23 9:04	应用程序	874 KB		
An exa 國 命令提示符	mple usi	ng adb in W	indows i	is shown b	elow:			×
Microsoft Windov (c) Microsoft Cc C:\Users\Adminis	vs L版本 10.0 orporation。1 strator>cd C:	.19044.2251] 呆留所有权利。 \Users\Administra	tor\Desktop\]	RKDevToo1_Re1ea:	se_v2.92\bin			Î
C:\Users\Adminis 驱动器 C 中的卷 卷的序列号是 62	strator\Deskt 没有标签。 2AE-5AED	op\RKDevToo1_Rele	ase_v2.92\bii	n>dir				
C:\Users\Admini	.strator\Desk	top\RKDevToo1_Re1	ease_v2.92\b:	in 的目录				
2022/08/09 13:1 2022/08/09 13:1 2019/06/24 09:1 2019/06/24 09:1 2019/06/24 09:1 2021/08/23 09:0 2021/08/16 14:0 2021/08/16 14:0	19 ①IR》 19 ①IR》 13 1, 13 13 14 15 2 个目录 63, 9	850,368 adb.exe 97,792 AdbWinApi 62,976 AdbWinUsb. 894,976 AFPT001.e 890,368 KXInageMa 3,796,480 字节 88,027,392 可用字	.dl1 Api.dl1 xe ker.exe 节					
C:\Users\Adminis List of devices e0f9f71bc424c305	strator\Deskt attached 5 devi	op\RKDevTool_Rele ce	ase_v2.92\bi	n>adb devices				
C:\Users\Adminis adb.exe: 1 file	strator\Deskt pushed. 3.2	op\RKDevTool_Rele MB/s (1850368 byt	ase_v2.92\bin es in 0.552s	n>adb push adb.) )	exe /root			
C:\Users\Adminis	strator\Deskt	op\RKDevToo1_Re1e	ase_v2.92\bin	n>_				~

# 3. 10. How to upload files to the Linux system of the development board

3. 10. 1. How to upload files from Ubuntu PC to the Linux system of the development board

#### 3. 10. 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 to the file to be uploaded.
- b. **orangepi:** The user name of the development board's Linux system can also be replaced with other names, 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 uses for scp. Please use the following command to view the man manual.

test@test:~\$ man scp

#### 3. 10. 1. 2. How to upload files using FileZilla

1) First install filezilla in your Ubuntu PC.

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

2) Then open filezilla using the command below.

test@test:~\$ filezilla

3) The interface after opening filezilla is as shown below. At this time, the remote site on the right is empty.

### orange Pi User Manual

#### Copyright reserved by Shenzhen Xunlong Software Co., Ltd

			FileZill	a		- • ×
文件(F) 编辑(E) 查	፻看(∀) 传输(T) 服务器(S)	书签(B) 帮助(H)				
# · R		) 🗼 🦆 🔳 🖉 🤗	8			
主机(H):	用户名(U):	密码(W):	端口(P	):	快速连接(Q) ▼	
本地站点: /			× ž	冠程站点:		~
~ =/						
> 📒 bin			- 1			
> boot			- 1			
Curom			-			
文件名 ヘ	文件大小 文件类型	最近修改				
	日求	2022年11月06…				
liby22	日求	2022年08月09…				
	日来	2022年11月00…	3	文件名 ヘ	文件大小 文件类型 最近修改 权限	所有者/组
media	日录	2022年11月03…				
mot	日录	2022年08月09…				
opt	日录	2022年11月06…			没有连接到任何服务器	
	日录	2022年12月03…				
root	日录	2022年12月03…				
nun 📃	目录	2022年12月03…				
1 个文件 和 26 个日录	十小台计-22CB	· · · · · · · · · · · · · · · · · · ·	-	上许培		
服冬哭/木枷文件	方向 远程文件	十小 优牛纲	状态	C 1710 A		
列队的文件 传输失	败成功的传输					
					⑦ RI 5il· 호	• • //

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 select Save Password and click OK.



	记住密码?	×
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)		
〇保存主密码保护的密码	马(V)	
主密码(M):		
再次输入密码(R):		
主密码一旦丢失无法恢	恢复!请牢记您的密码。	
	取消	确定(O)

6) Then select Always trust this host and click OK.

	TACK DI DA DE DE		
1	该服务器的主机密匙是未知的。不能保证该服务器 认定的那台计算机。 详细资料 主机: 主机密匙算法: 指纹:	就是您所	
	信任该主机并继续连接?	取消	确定

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

		sftp://roo	ot@192.168.31	.11 - FileZill	la				-	
文件(F) 编辑(E) 查看	昏(V) 传输(T) 服务器(S) ·	书签(B) 帮助(H)								
# • DT	🗆 🗰 🖸 ik 🤇	) 🗼 🎐 🔳 🍳	o 🔥							
主机(H): tp://192.168	.31.11 用户名(U): root	密码(w):	端口(P):		快速连接(Q)	•				
状态: Connected to 1 状态: 读取目录列表 犬态: Listing director 状态: 列出"/root"的[	92.168.31.11 ry /root 目录成功									
本地站点: /			~ 远利	站点: /roo	ot					
> -/				root 🦰						
文件名 ▲ Ub32	文件大小 文件类型 目录	最近修改 2022年11月06		root						
> ■ ✓	文件大小 文件类型 目录 目录	最近修改 2022年11月06 2022年08月09		root						
◇ 【 文件名 へ lib32 lib64 libx32 lost+found	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…	文作	· root	文件大小	文件类型	最近修改	权限	所有者	≦/组
〉 文件名 へ しは32 しは64 しはx32 しる±+found media	文件大小 文件类型 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	文作 ■ .	root 名 へ	文件大小	文件类型	最近修改	权限	所有者	音/组
◇ 文件名 いb32 いb64 いbx32 いost+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	文作 ■ -	root 名 へ ache	文件大小	文件类型 目录	最近修改 2022年12月…	权限 drwx	所有有	š/组 pot
> ↓ しは32 しは64 しは52 しのまい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05… 2022年11月05… 2022年12月03… 2022年08月09… 2022年11月06…	文作 	在 中 中 中 中 中 中 中 中 中 中 中 中 中 中 中 中 中 中 中	文件大小	文件类型 目录 目录	最近修改 2022年12月… 2022年12月…	权限 drwx drwxr-xr-x	所有有 root r root r	ğ/组 pot pot
文件名へ しち32 しは64 しは52 しは54 しは52 しの51+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08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12月03…	文代 	中 F名へ Cache Config Sh-my-zsh	文件大小	文件类型 目录 目录	最近修改 2022年12月… 2022年12月… 2022年12月…	权限 drwx drwxr-xr-x drwxr-xr-x	所有有 rootr rootr rootr	髶/组 Dot Dot Dot
文件名 へ 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	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… 2022年12月03… 2022年12月03…	×f	名 へ ache config bh-my-zsh oip	文件大小	文件类型 目目目目目目目目目目目目目目100000000000000000000000	最近修改 2022年12月… 2022年12月… 2022年12月… 2022年12月…	权限 drwx drwxr-xr-x drwxr-xr-x drwxr-xr-x	所有有 rootr rootr rootr	≝/组 oot oot oot
文件名 へ しは32 しは54 しはx32 しるx+found media mnt opt proc root 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08月09 2022年11月05 2022年12月03 2022年08月09 2022年08月09 2022年12月03 2022年12月03 2022年12月03	文代 	名 A ache config ph-my-zsh pip Kauthority	文件大小 55 B	文件类型 目目目目目目目目目目目目目目目目目目目目目目目目目目目目目目目目目目目目	最近修改 2022年12月 2022年12月 2022年12月 2022年12月 2022年12月	权限 drwx drwxr-xr-x drwxr-xr-x drwxr-xr-x -rw	所有有 rootr rootr rootr rootr	音/组 oot oot oot oot
文件名 ▲ lib32 lib64 libx32 lost+found media mnt opt proc ront ront ront	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05… 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…	×f	名 本 本 本 本 本 本 本 本 本 本 本 本 本	文件大小 55 B y 793 B	文件类型 目目目目文文件	最近修改 2022年12月 2022年12月 2022年12月 2022年12月 2022年12月 2022年12月	权限 drwx drwxr-xr-x drwxr-xr-x drwxr-xr-x -rw -rw	所有; rootr rootr rootr rootr rootr rootr	皆/组 oot oot oot oot oot

8) Then select the path to be uploaded to the development board on the right side of the

filezilla software, then select the file to be uploaded in the Ubuntu PC on the left side of the filezilla software, right-click the mouse, and then click the upload option to start uploading the file to the development board.

		sftp://root@192.1	68.31.11 - FileZilla			×
文件(F) 编辑(E) 查看(V) 传输	俞(T) 服务器(S) 书签(B)	帮助(H)				
	C 🕸 💈 🗼	🕽 🖉 🧟 🕷				
主机(H): tp://192.168.31.11 月	用户名(U): root 密	码(w): 端口	コ(P): 快速	连接(Q) ▼		
状态:列出"/home"的目录成功 状态:读取"/home/orangepi"的 状态:Listing directory /home/o 状态: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: /home/or	angepi		~
<ul> <li>test</li> <li>Music</li> <li>Pictures</li> <li>Public</li> <li>Templates</li> <li>Videos</li> <li>VirtualBox VMs</li> </ul>			2 boot 2 dev 2 etc 2 morangepi 2 .cache 2 .cinnam	on		
Din 文件名 ▲ 文件★	小 文件类型 最近修	8.2V	文件名 ^	文件大小 文件类型	最近修改 权限	所有者/组
<b>.</b>			.bashrc	3.6 KB 文件	2022年12月··· -rw-rr-	orangepi
nomachine_8.2.3_3	上传(U)	□12月03…	.viminfo	807B 文件 3.5 KB 文件	2022年12月···· -rw-rr 2022年12月···· -rw	orangepi orangepi
	添加文件到队列(A)		.xscreensaver	20 B 文件	2022年12月··· -rw-rw-r-	orangepi
	打开(O)		.xsession-errors	7.6 KB 文件	2022年12月··· -rw	orangepi
	编辑(E)		zshrc	7.7 KB old-又件 4 0 KB 文件	2022年12月···· -FW-FW-FW-FW-FW-FW-FW-FW-FW-FW-FW-FW-FW-	orangepi
洗挃了1个文件。大小总井:0B	创建日录(C)		13个文件和16个日录	表. 大小总计: 6.2 GB		
服务器/本地文件 方[	创建日录并进入(Y)	大小 优先级 状态				
	刷新(F)					
	肥金(口)					
	重命名(P)					
	± "' 1'0'					
91队的文件 传输失败 成功的	传输				A 0 11 11 15	
					- 以列:空	• • ///

9) After uploading 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 for uploading a folder is the same as that for uploading a file, so I will not go into details here.

## 3. 10. 2. How to upload files from Windows PC to the Linux system of the development board

#### 3. 10. 2. 1. How to upload files using FileZilla

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

### **FileZilla** The free FTP

	C 2 III d The free FTP solution
Home FileZilla Features Screenshots Download Documentation FileZilla Pro	Download FileZilla Client for Windows (64bit x86)
FileZilla Server Download	The latest stable version of FileZilla Cilent is 3.62.2
Community Forum	Please select the file appropriate for your platform below.
General FAQ Support Contact License Privacy Policy Trademark Policy	This installer may include bundled offers. Check below for more options.
Development	The 64bit versions of Windows 8.1, 10 and 11 are supported.
Source code Nightly builds Translations Version history Changelog Issue tracker	♦ More download options       Other platforms:     A       Not what you are looking for?
Other projects	* Show additional download options

Please select	your edi	tion of Fil	eZilla Clie	ent
	FileZilla	FileZilla with manual	FileZilla Pro	FileZilla Pro + CLI
Standard FTP	Yes	Yes	Yes	Yes
FTP over TLS	Yes	Yes	Yes	Yes
SFTP	Yes	Yes	Yes	Yes
Comprehensive PDF manual	-	Yes	Yes	Yes
Amazon S3	-	-	Yes	Yes
Backblaze B2	-	-	Yes	Yes
Dropbox	-	-	Yes	Yes
Microsoft OneDrive	-	-	Yes	Yes
Google Drive	-	-	Yes	Yes
Google Cloud Storage	-	-	Yes	Yes
Microsoft Azure Blob + File Storage	-		Yes	Yes
WebDAV	-	-	Yes	Yes
OpenStack Swift	-	-	Yes	Yes
Box	-	-	Yes	Yes
Site Manager synchronization	-	-	Yes	Yes
Command-line interface		(a <del></del> )	-	Yes
Batch transfers	-	-	-	Yes
Then select here to download	Download	Select	Select	Select

2) The downloaded installation package is as shown below, and you can double-click it to install it directly.

#### FileZilla\_Server\_1.5.1\_win64-setup.exe

During the installation process, select **Decline** on the following installation interface, and then select Next>.



3) The interface after opening filezilla is as shown below. At this time, the remote site on the right is empty.

η(H):								
	用户名(U):	密码(W):	號口(P):	快速连接(Q)	*			
鼓点点: C:\Users\test	t		~	远程站点:				
重 卓面			^					
一體 文档								
日日間								
8 <b>4</b> C								
	The second s							
			~					
2	文件大小 文件举型	最近德改	^	文件名 ^	文件大小 文件基型	最近修改	权限	所有者/组
	文仕中	2022/12/3 20:06:						
	2172	2022 14 15 0 22 20		1				
	文件率	2022/11/0 0:23:28						
	文件夹	2022/11/6 0:23:28	- 11		没有连接到	任何服务器		
	文件夹 文件夹 文件夹	2022/11/6 0:23:28 2022/11/19 1:30: 2022/12/3 15:40:	- 1		没有连接到	任何服务器		
	文件夹 文件夹 文件夹 文件夹	2022/11/6 0:23:28 2022/11/19 1:30: 2022/12/3 15:40: 2022/12/3 19:41:	1		没有连接到	任何服务器		
	文件夹 文件夹 文件夹 文件夹 文件夹 文件夹	2022/11/19 0:25:28 2022/11/19 1:30: 2022/12/3 15:40: 2022/12/3 19:41: 2022/12/3 20:05:			没有连接到	任何服务器		
	文件 <del>实</del> 文件 <del>实</del> 文件 <del>实</del> 文件 <del>实</del> 文件 <del>实</del>	2022/11/0 023:28 2022/11/19 1:30: 2022/12/3 15:40: 2022/12/3 19:41: 2022/12/3 20:05: 2022/11/6 0:23:28			没有连接到	任何服务器		
	文件夹 文件夹 文件夹 文件夹 文件夹 文件夹 文件夹	2022/11/6 0:23:28 2022/12/3 15:40 2022/12/3 15:40 2022/12/3 20:05 2022/11/6 0:23:28 2022/11/6 0:23:28			没有注接到	任何服务器		
	文件共 文件共 文件共 文件共 文件共 文件共 文件共 文件共 文件共 文件共	2022/11/16 /23288 2022/11/19 1:30 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			没有注册到	任何服务體		
	文件失 文件失 文件失 文件失 文件未 文件未 文件未 文件未 文件未 文件未 文件未	2022/11/6 (J23288 2022/11/19 1:30 2022/12/3 15:40 2022/12/3 20:05 2022/11/6 (0:2328 2022/11/6 (0:23:28 2022/12/3 20:06 2022/11/6 (0:23:28			没有连接到	任何服务體		
	文件央 文件件夹 文件夹 文件夹 文件夹 文件夹 文件夹 文件夹 文件夹	2022/11/6 U23288 2022/12/3 1540 2022/12/3 1941 2022/12/3 1941 2022/11/6 02328 2022/11/6 02328 2022/12/3 20.06 2022/12/3 20.06			没有连接到	任何服务器		
	又体央 文体体央 文体中央 文体中央 文体中央 文体中央 文体中央 文体中央 文体	2022/11/0 1252/8 2022/11/19 13/0 2022/12/3 15/40 2022/12/3 15/40 2022/12/3 2005 2022/11/6 0/23/28 2022/12/3 2005 2022/11/6 0/23/28 2022/12/3 2005 2022/12/3 15/41 2019/12/1 71/14			没有法律到	任何服务器		
	又体夹 文体中央 文体中央 文体中央 文体中央 文件中央 文件共 文体大 文体夫 文体共	2022/11/0/19130 2022/12/1540 2022/12/1540 2022/12/1540 2022/12/16 02328 2022/11/6 02328 2022/12/16 02328 2022/12/16 02328 2022/12/1541 2019/12/1714 2019/12/1714			设有法规列	任何服务器		
	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	2022/11/0 (2328) 2022/12/3 1540 2022/12/3 1540 2022/12/3 1541 2022/12/3 2005 2022/11/6 02328 2022/12/3 2006 2022/12/3 041 2022/12/3 1941 2019/12/7 17.14			设有法规列	任何服务器		
文件 和 27 个目录。	又件夹 文件夹 文件夹 文件夹 文件夹 文件夹 文件夹 文件夹 文件夹 文件夹 文	2022/11/0 1326 2022/12/15/01 2022/12/15/06 2022/12/15/041 2022/12/15/041 2022/12/15/02 2022/11/6 023:28 2022/12/16 023:28 2022/12/16 023:28 2022/12/16 023:25	~	未连接。	设有法规研	任何服务器		
次共和27个目录。	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	2022/11/19/1320- 2022/12/15/91- 2022/12/3 1540- 2022/12/3 1540- 2022/12/3 1041- 2022/12/3 1041- 2022/11/6 023-28 2022/12/8 2066- 2022/12/8 2066- 2020/12/8 2066- 2066- 2066- 2066- 2066- 206	~ 梁 状态	未连续。	设有法规列	任何服务器		

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. Glick Gulck 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 num	nber 22	

5) Then select Save Password and click OK.

记住密码?		×
您想让 FileZilla 记住密码吗?		
如果允许 FileZilla 记住密码,重	e FileZilla 后重新连接无言	<b>壽再次輸入密码。</b>
● 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):		
再次输入密码(R):		
	宇宙体的家庭	
王密码一旦去天尤法恢复!诸	1- 10-10-11-3-02-10-9-0	

6) Then select Always trust this host and click OK.

洋畑資料 主机: 192.168.31.11.22 主机電影算法 ssh-ed25519 255 指弦: SHA256cHNLFRmncAMrQoietFAyEfdRQcewhWpgodyPslLw 信任は土机土磁振論報?	该服务制 机。	的主机密匙是未知的。不能保证该服务器	就是您所认定的那	台计算
主机。 192.168.31.11:22 主功率影響法。ssh-ed25519 255 指论: SHA256c:HNLFRmncAMrQoietFlAyEfdRQcewhWpgodyPslLw (何符は十机并爆発時間)	详细资	et.		
指纹: SHA256:cHNLFRmncAMrQoietFlAyEfdRQcewhWpgodyPslLw 信仟读主机并继续连接?	主机: 主机座	192.168.31.11:22 匙算法: ssh-ed25519 255		
信任该主机并继续连接?	指纹:	SHA256:cHNLFRmncAMrQoiet	HAyEfdRQcewhW	pgodyPsILw3v
	信任该主	机并继续连接?		
			18-00	FIRE

7) After the connection is successful, you can see the directory structure of the development board's Linux file system on the right side of the filezilla software.
orange Pi User Manual

🛃 sftp://root@192.16	3.31.11 - FileZilla									o x
文件(F) 编辑(E) 查看(	V) 传输(T) 服务器(S) 书签(B)	要助(H)								
	🗱 🖸 比 🕲 🗽 ⊅ 🏛	Q 🧧 🧑								
主机(H): sftp://192.168.	31. 用户名(U): root	密码(W): ●●●●●●●●●●●●●●●●●●●●●●●●●●●●●●●●●●●●	P):	快速连接(Q) ▼						
状态: Connected to 192	2.168.31.11									
状态: 读取目录列表										
状态: Listing directory,	/root									
状态:列出"/root"的目录	成功									
本地站点: C:\			~	远程站点: /root						
□- <u>*</u> _ C:			^	E-2 /						-
				⊞- <mark></mark> root						
+(47		用)であった	~	The directory strue	cture of t	he Linux	file system o	f the deve	elopment l	ooard
又14名	又件入小、又件类型	HEJZTYSER		立件タ ^	立建士小	立件米刑	<b>是</b> 》后修3/7	#0768	所有者/组	
		2022/12/3 18:57:		X1+4	又叶入小	XIHHER	HELP THE DK	1XPR	川有有/归	
		2022/12/3 18:57:		and a sector			2022/12/2 16	4		
		2022/12/3 18:57:		.cache		文(1+大	2022/12/3 10	drwx	root root	
	又件关	2022/11/11 1:48:		comg		文件大	2022/12/3 4:	drwxr-xr-x	1001 1001	
	又件类	2022/12/3 18:55:		.on-my-zsn		文件大	2022/12/3 5:	drwxr-xr-x	rootroot	
	又件类	2022/12/3 0:17:04		.pip	702		2022/12/3 10	drwxr-xr-x	rootroot	
	又件失	2022/11/13 0:14:		hashes	2 5 2 2	PACHPC	2022/12/3 10	-rw	root root	
	又件失	2022/12/5 19:57:		desites autologia	5,525	DESKTOD	2022/12/3 4		root root	
	文件关	2022/11/20 19:2		U viminfo	1 275	VIMINEO	2022/12/3 4		root root	
	文件夹	2010/12/7 17:14		waet-hete	160	WGET-HS	2022/12/3 16	-DW-FF	root root	
	文件关	2012/12/2 19:55		Xauthority	55	XAUTHOR	2022/12/3 18	-DW	root root	
	文件大	2022/11/10 10:3			3 979	7SHRC 文件	2022/12/3 5	-04-55	root root	
	文件天	2022/11/5 16:20:			0,010	Zorine XIII	2022/12/0 5111		10011001	
		2022/11/0 10:20:	*							-
3 个又件 和 11 个目录。7	√小息計: 1,/44,838,656 子□			7 个又件 和 4 个目录。 天小	보다: 9,894 -	47 47				
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							A @ 11.71	. 25	

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

🍈 range Pi User Manual

文件(F) 編集(E) 書野(Y) 作館(F) 服务器(S) 特徴(P)		快速连接(Q) マ 							
ビー (U): Stip://19.2.168.31. 用产会(U): root 密码(W): ・・・・・・ 第二(P): ボット(F): Stip://19.2.168.31.11 松志: (SpallagAy)基 松志: Using directory /root 林志: Using directory /root 林志: Using directory /root 林志: Spall /root 物目要成功 本物論在: Cへ 日本 C	): ~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	快速法接(Q) ▼ 范围站点: /root 日-2 / 由							
#(UR): (#ftp://192.168.31.1 用户名(U): (root 転詞(W): ●●●●●● 厳 Connected to 192.168.31.11 志: 該取目受到販 を Using directory /root 志: Using directory /root 志: Sign directory /root 志: Sign directory /root 本: 列出"/root 学員最成功 UBBABE: [CA	)z	快速金粮(Q) ▼ 辺極站点: //root 日-? / 前-☐ root							
종 Connected to 192.168.31.11 초 향직립공켓용 호 Listing directory /root 초: 커남 /root '的目录成功 	~ ~	近輕站点: /root □-3 / ⊕- <mark>3</mark> /							
A: 读取目录为表 A: Listing directory /root あ: Juti/root*的目気成功 地転告 [CA 日 日 日 日 日 日 日 日 日 日 日 日 日	~	近程站点: /root □- <mark>?</mark> / / □- <mark>2</mark> root							
慈、Listing directory /root 参: 列出 /root的目录成功 地路部 [C:\ 中 中 中 中 中 中 中 日 一 二 一 二 一 二 一 二 二 二 二 二 二 二 二 二 二 二 二 二	*	近程站点: /root □ ? / ⊕ □ root							
<ul> <li>新田/root的目录成功</li> <li>市</li> <li>市</li> <li>中</li> <li>+</li> <li>+</li></ul>	*	近程註意: //root □ ? / □ □ root							
	*	迂程站点: //root □- <mark>2</mark> / ⊕- <mark>1</mark> root							
	^	<b>?</b> / ⊕ <mark>-</mark> root							
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	~	文件名 	文件大小	文件类型 文件夹	最近修改 2022/12/3 16	权限 drwx	所有者/组 root root	Ţ	_
★ 上传(U) 文件夹 2022/11/11 1:48:		.config		文件夹	2022/12/3 4:	drwxr-xr-x	root root		
承 添加文件到队列(A) 文件夹 2022/12/3 18:55:		oh-my-zsh		文件夹	2022/12/3 5:	drwxr-xr-x	root root		
送入目录(N) 文件夹 2022/12/3 0:17:04		.pip		文件夹	2022/12/3 16	drwxr-xr-x	root root		
文件夹 2022/11/13 0:14		.bash_history	793	BASH_HIS	2022/12/3 18	-rw	root root		
文件夹 2022/12/3 19:57:		] .bashrc	3,523	BASHRC	2022/12/3 4:	-rw-rr	root root		
·····································		.desktop_autologin	0	DESKTOP	2022/12/3 4:	-rw-rw-r	root root		
创建目录(C) 文件夹 2022/12/3 20:06:		_] .viminfo	1,375	VIMINFO	2022/12/3 17	-rw	root root		
创建目录并进入(Y) 又件央 2019/12// 1/:14:		.wget-hsts	169	WGET-HS	2022/12/3 16	-rw-rr	root root		
刷新(F) 又什夾 2022/12/3 18:55:		.Xauthority	55	XAUTHOR	2022/12/3 18	-rw	root root		
删除(D) 立任本 2022/11/10 10:5		zshrc	3,979	ZSHRC 文件	2022/12/3 5:	-rw-rr	root root		
重命名(R)	~								
		7 个文件 和 4 个目录。大小	思计: 9,894 5	77					
级务器/本地文件 方向 远程文件 大小 优先级 X	伏态								
								_	-
列入的又任 传输大败 成功的传输									

9) After uploading 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 for uploading a folder is the same as that for uploading a file, so I will not go into details here.

# 3.11. HDMI test

#### 3. 11. 1. HDMI display test

1) Use an HDMI to HDMI cable to connect the Orange Pi development board and the HDMI display.



2) After starting the Linux system, if the HDMI monitor has image output, it means that the HDMI interface is working properly.

Please note that although many laptops are equipped with HDMI interfaces, the HDMI interfaces of laptops generally only have output functions and do not have HDMI in functions, which means that the HDMI output of other devices cannot be displayed on the laptop screen.

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

When there is no display on HDMI, please first check whether the HDMI cable is plugged in tightly. After confirming that the connection is OK, you can try a different screen to see if there is any display.

#### 3. 11. 2. HDMI resolution setting method

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



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

General Advanced			
	HDMI-1		•
	Resolution:	1920x1080*	16:9 🔻
	Scale:	lx	•
HDMI-1	Refresh rate:	60.0 Hz	•
	Rotation:	None	•
	Reflection:	None	•
			✓ Apply

3) Click the drop-down box of Resolution to see all the resolutions currently supported by the monitor.



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

Dis	play		-	•	×
General Advanced					
	HDMI-1			,	-
	Resolution:	1280×1024		5:4 🔻	
	Scale:	lx		•	
HDML-1	Refresh rate:	60.0 Hz		•	
	Rotation:	None		•	
	Reflection:	None			
			~	Apply	
to Help				× clo	ose

5) After the new resolution is set, select Keep the configuration.

🚫 Applications 🗾 Display	Confirmation			2 Dec, 01:13	Ar dii)orangepi
 17 MB					
403 M					
		Display			- • ×
		General Advanced			
			HDMI-1		*
		•	Resolution:	1280x1024	5:4 💌
			Scale:	l×	*
		Confirmation + -	Refresh rate:	60.0 Hz	*
	Would you like to ke	ep this configuration?	lotation:	None	*
	The previous configuration	will be restored in 1 seconds if you do not reply to this question	. teflection:	None	*
	Keep th	is configuration Restore the previous configuration			✓ Apply
		(1) Help			× Close

# 3.12. How to use Bluetooth

Please note that there is no Bluetooth module on the Orange Pi CM5 Base development board. An external USB network card with Bluetooth is required to use the Bluetooth function.

For instructions on using the external USB network card, please refer to the USB wireless network card testing section.

#### 3. 12. 1. Testing methods for desktop images

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



2) Then select the adapter.



3) If the following interface is displayed, select Yes.

Shall bluetooth get er	nabled automatically?
Yes	No
100	140

4) Then set the **Visibility Setting** to **Always visible** in the Bluetooth adapter settings interface, and then turn it off.



5) Then open the configuration interface of the Bluetooth device.



6) Click Search to start scanning for nearby Bluetooth devices.

8	Bluetooth Devices	↑ - □ ×
Adapter Device	View Help	
<b>Q</b> Search		🥔 Send File
k		
	🖗 26.25 KB	0.00 B/s 🧄 4.55 KB 0.00 B/s 🕥 🛄

6) Then select the Bluetooth device you want to connect to, and right-click the mouse to pop up the operation interface for this Bluetooth device. Select **Pair** to start pairing. The demonstration here is pairing with an Android phone.



7) When pairing, a pairing confirmation box will pop up in the upper right corner of the desktop. Just select **Confirm**. Confirmation is also required on the mobile phone.



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

Adapter Device	Bluetooth Devices	+ - O X
Contractions of the search sea	<ul> <li>Setup</li> <li>Setup</li> <li>Connect T</li> <li>Connect T</li> <li>Network Ac</li> <li>info</li> <li>send a file</li> <li>Pair</li> <li>Trust</li> <li>Setup</li> <li>Rename de</li> <li>Remove</li> </ul>	Send File

9) The interface for sending pictures is as follows:



# 3. 13. USB interface test

The USB port can be connected to a USB hub to expand the number of USB ports.

#### 3. 13. 1. Test by connecting USB mouse or keyboard

1) Plug the USB keyboard into the USB port 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 the system normally, it means that the USB interface is working properly (the mouse can only be used in the desktop version of the system).

#### 3. 13. 2. Connect USB storage device to test

1) First, insert the USB flash drive or USB mobile hard drive into the USB port of the Orange Pi development board.

2) Execute the following command. If you can see the output of sdX, it means the USB disk is recognized successfully.

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

3) Use the mount command to mount the USB drive to /**mnt**, and then you can view the files in the USB drive.

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

4) After mounting, you can use the **df -h** command to view the capacity usage and mount point of the USB drive.

orangepi@orangepi:~\$ **df -h | grep "sd"** /dev/sda1 29G 208K 29G 1% /mnt 🍯 range Pi User Manual

#### 3. 13. 3. USB wireless network card test

The currently **tested** USB wireless network cards are shown below. Please test other types of USB wireless network cards by yourself. If they cannot be used, you need to transplant the corresponding USB wireless network card driver.

Serial number	model	
1	RTL8723BU Support 2.4G WIFI+BT4.0	With Assistants a
2	RTL8811 Support 2.4G +5G WIFI	CRIS CONSTRUCTION
3	RTL8821CU Support 2.4G +5G WIFI Support BT 4.2	ORIS. MR.

#### 3. 13. 3. 1. **RTL8723BU test**

1) First, insert the RTL8723BU wireless network card module into the USB port of the development board.

2) Then the Linux system will automatically load the RTL8723BU Bluetooth and WIFI related kernel modules. Through the lsmod command, you can see that the following kernel modules have been automatically loaded.

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

3) The loading information of the RTL8723BU module can be seen through the dmesg command.

orangepi@orangepi:~\$ dmesg

83.438901] usb 2-1: new high-speed USB device number 2 using ehci-platform 83.588375] usb 2-1: New USB device found, idVendor=0bda, idProduct=b720, bcdDevice= 2.00 83.588403] usb 2-1: New USB device strings: Mfr=1, Product=2, SerialNumber=3 83.588422] usb 2-1: Product: 802.11n WLAN Adapter 83.588443] usb 2-1: Manufacturer: Realtek 83.588460] usb 2-1: SerialNumber: 00e04c000001 83.601974] Bluetooth: hci0: RTL: examining hci ver=06 hci rev=000b lmp ver=06 lmp subver=8723 83.603894] Bluetooth: hci0: RTL: rom version status=0 version=1 83.603920] Bluetooth: hci0: RTL: loading rtl bt/rtl8723b fw.bin 83.610108] Bluetooth: hci0: RTL: loading rtl bt/rtl8723b config.bin 83.611274] Bluetooth: hci0: RTL: cfg sz 68, total sz 22564 83.658494] rtk btusb: Realtek Bluetooth USB driver ver 3.1.6d45ddf.20220519-142432 83.658651] usbcore: registered new interface driver rtk btusb 83.667124] usb 2-1: This Realtek USB WiFi dongle (0x0bda:0xb720) is untested! 83.667137] usb 2-1: Please report results to Jes.Sorensen@gmail.com 83.890140] usb 2-1: Vendor: Realtek 83.890153] usb 2-1: Product: 802.11n WLAN Adapter 83.890159] usb 2-1: rtl8723bu parse efuse: dumping efuse (0x200 bytes): 83.890412] usb 2-1: RTL8723BU rev E (SMIC) 1T1R, TX queues 3, WiFi=1, BT=1, GPS=0, HI PA=0 83.890417] usb 2-1: RTL8723BU MAC: 00:13:ef:f4:58:ae 83.890421] usb 2-1: rtl8xxxu: Loading firmware rtlwifi/rtl8723bu nic.bin 83.895289] usb 2-1: Firmware revision 35.0 (signature 0x5301) 84.050893] Bluetooth: hci0: RTL: fw version 0x0e2f9f73 84.266905] Bluetooth: RFCOMM TTY layer initialized 84.266949] Bluetooth: RFCOMM socket layer initialized 84.266999] Bluetooth: RFCOMM ver 1.11 84.884270] usbcore: registered new interface driver rtl8xxxu 84.912046] rtl8xxxu 2-1:1.2 wlx0013eff458ae: renamed from wlan0

4) Then use the sudo ifconfig command to see the device node of RTL8723BU WIFI.

For the connection and test methods of WIFI, please refer to the **WIFI connection test** section, which will not be repeated here.

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

5) Then you can see the USB Bluetooth device through the hciconfig command.

orangepi@orangepi:~\$ sudo apt update && sudo apt install bluez orangepi@orangepi:~\$ hciconfig

hci0: Type: Primary Bus: USB BD Address: 00:13:EF:F4:58:AE ACL MTU: 820:8 SCO MTU: 255:16 DOWN RX bytes:1252 acl:0 sco:0 events:125 errors:0 TX bytes:23307 acl:0 sco:0 commands:125 errors:0

6) You can also see the Bluetooth icon on the desktop. At this time, Bluetooth is not turned on, so a red  $\mathbf{x}$  will be displayed.



7) Click **Turn Bluetooth On** to turn on Bluetooth.





8) The display after turning on Bluetooth is as shown below.

Fri 2 Dec, 02:37 🔎 🏠 🕼 orangepi

9) For the Bluetooth testing method, please refer to the **Bluetooth Usage** section, which will not be repeated here.

# 3. 13. 3. 2. **RTL8811 Test**

1) First, insert the RTL8811 wireless network card module into the USB port of the development board.

2) Then the Linux system will automatically load the kernel modules related to RTL8811 WIFI. Through the lsmod command, you can see that the following kernel modules have been automatically loaded.

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

3) The loading information of the RTL8811 module can be seen through the dmesg command.

orangepi@orangepi:~\$ dmesg

118.618194] usb 2-1: new high-speed USB device number 2 using ehci-platform

[ 118.767152] usb 2-1: New USB device found, idVendor=0bda, idProduct=c811, bcdDevice= 2.00

118.767181] usb 2-1: New USB device strings: Mfr=1, Product=2, SerialNumber=3

118.767199] usb 2-1: Product: 802.11ac NIC

118.767219] usb 2-1: Manufacturer: Realtek

118.767235] usb 2-1: SerialNumber: 123456

119.500530] usbcore: registered new interface driver rtl8821cu

119.525498] rtl8821cu 2-1:1.0 wlx1cbfced9d260: renamed from wlan0

4) Then use the **sudo ifconfig** command to view the device node of WIFI. For the connection and test methods of WIFI, please refer to the **WIFI connection test** section, which will not be repeated here.

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

# 3. 13. 3. 3. **RTL8821CU test**

1) First, insert the rtl8821cu wireless network card module into the USB interface of the development board.

2) Then use the **lsusb** command to see the device information of the rtl8821cu usb wifi module. Please make sure that the USB module is not in Driver CDROM Mode.

orangepi@orangepi:~\$ lsusb | grep "Realtek" Bus 002 Device 003: ID 0bda:c820 Realtek Semiconductor Corp. 802.11ac NIC orangepi@orangepi:~\$ lsusb | grep "Realtek"

Bus 002 Device 002: ID 0bda:1a2b Realtek Semiconductor Corp. RTL8188GU 802.11n WLAN Adapter (Driver CDROM Mode)

If the USB WIFI module is in Driver CDROM Mode as seen by the lsusb command, please unplug and re-plug the USB WIFI module. If it still doesn't work, please manually execute the following command to switch the mode:

orangepi@orangepi:~\$ sudo usb\_modeswitch -KW -v 0bda -p 1a2b

3) The Linux system will automatically load the rtl8821cu Bluetooth and WiFi related kernel modules. You can see through the lsmod command that the following kernel modules have been automatically loaded.

orangepi@orangej	pi:~\$ lsmod			
Module	Size U	Used by		
8821cu	1839104	0		
rtk_btusb	61440 0			

4) The loading information of the rtl8821cu module can be seen through the dmesg command.

orangepi@orangepi:~\$ dmesg

•••••

57.083693] usb 2-1: new high-speed USB device number 2 using ehci-platform

[ 57.231888] usb 2-1: New USB device found, idVendor=0bda, idProduct=1a2b, bcdDevice= 2.00

57.231916] usb 2-1: New USB device strings: Mfr=1, Product=2, SerialNumber=0

57.231937] usb 2-1: Product: DISK

57.231956] usb 2-1: Manufacturer: Realtek

57.242594] usb-storage 2-1:1.0: USB Mass Storage device detected

57.245674] scsi host0: usb-storage 2-1:1.0

58.069172] usb 2-1: USB disconnect, device number 2

58.440025] usb 2-1: new high-speed USB device number 3 using ehci-platform

[ 58.587819] usb 2-1: New USB device found, idVendor=0bda, idProduct=c820, bcdDevice= 2.00

58.587827] usb 2-1: New USB device strings: Mfr=1, Product=2, SerialNumber=3

58.587833] usb 2-1: Product: 802.11ac NIC 58.587838] usb 2-1: Manufacturer: Realtek 58.587844] usb 2-1: SerialNumber: 123456 58.610463] rtk btusb: Realtek Bluetooth USB driver ver 3.1.6d45ddf.20220519-142432 58.610656] usbcore: registered new interface driver rtk btusb 58.634631] Bluetooth: hci0: RTL: examining hci ver=08 hci rev=000c lmp ver=08 lmp subver=8821 58.636729] Bluetooth: hci0: RTL: rom version status=0 version=1 58.636740] Bluetooth: hci0: RTL: loading rtl bt/rtl8821c fw.bin 58.664190] Bluetooth: hci0: RTL: loading rtl bt/rtl8821c config.bin 58.664746] Bluetooth: hci0: RTL: cfg sz 10, total sz 31990 59.122471] Bluetooth: hci0: RTL: fw version 0x829a7644 59.265513] usbcore: registered new interface driver rtl8821cu 59.280119] rtl8821cu 2-1:1.2 wlx90de80521825: renamed from wlan0

5) Then use the **sudo ifconfig** command to see the device node of rtl8821cu wifi. For the connection and test methods of wifi, please refer to the **WIFI connection test** section, which will not be repeated here.

```
orangepi@orangepi:~$ sudo ifconfig wlx90de80521825
wlx90de80521825: flags=4099<UP,BROADCAST,MULTICAST> mtu 1500
ether 00:13:ef:f4:58:ae txqueuelen 1000 (Ethernet)
RX packets 0 bytes 0 (0.0 B)
RX errors 0 dropped 0 overruns 0 frame 0
TX packets 0 bytes 0 (0.0 B)
TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0
```

6) Then you can see the USB Bluetooth device through the hciconfig command.

orangepi@orangepi:~\$ sudo apt-get update && sudo apt-get install -y bluez orangepi@orangepi:~\$ hciconfig hci0: Type: Primary Bus: USB BD Address: 00:13:EF:F4:58:AE ACL MTU: 820:8 SCO MTU: 255:16 DOWN

RX bytes:1252 acl:0 sco:0 events:125 errors:0

TX bytes:23307 acl:0 sco:0 commands:125 errors:0

7) You can also see the Bluetooth icon on the desktop. At this time, Bluetooth is not turned on, so a red x will be displayed.

	Fri 2 Dec, 02:35 🔎 🚺 🕼 orangepi

8) Click **Turn Bluetooth On** to turn on Bluetooth.

Fri 2 Dec, 02:36 🔎 🏠 🚯 orangepi
🔋 Turn Bluetooth On 📡
Set Up New Device
🥟 Send Files to Device
ecent Connections
Ø Devices
Adapters
📟 Local Services
🍰 Plugins
🔶 Help
🕞 Exit

9) The display after turning on Bluetooth is as follows:

Fri 2 Dec, 02:37 🔎 🏠 🗿 🏟 orangepi
/

10) For the Bluetooth testing method, please refer to the **Bluetooth Usage** section, which will not be repeated here.

# 3. 13. 4. USB camera test

1) First, you need to prepare a USB camera that supports the UVC protocol as shown in the figure below or similar, and then insert the USB camera into the USB port of the Orange Pi development board.



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

orangepi@orangepi:~\$ **v4l2-ctl --list-devices** Q8 HD Webcam: Q8 HD Webcam (**usb**-fc880000.usb-1):

> /dev/video0 /dev/video1 /dev/media0

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

In addition, the video serial number is not always video0, please refer to the actual one you see.

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

of Applications		
🔍 Run Program		
🚬 Terminal Emulato	or	
📒 File Manager		
🗟 Mail Reader		
🚯 Web Browser		
🕮 Settings	•	
📸 Accessories	٠	
d Development	۲	
26 Graphics	۲	
🔶 Help		
🛞 Internet	•	
Multimedia	×	Audacity
9 Office	•	E Cheese
System	•	PulseAudio System Tray
C Log Out		🗟 PulseAudio Volume Control
		🔋 PulseAudio Volume Control
		🚇 PulseAudio Volume Meter (Capture)
		le PulseAudio Volume Meter (Playback)
		📮 Qt V4L2 test Utility

The interface after Cheese opens the USB camera is as shown below:



4) How to test USB camera using fswebcam.

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 photos.
  - a) The -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) The -r option is used to specify the resolution of the photo.

- d) The -S option is used to set the number of frames to skip ahead.
- 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 Linux, after taking the photo, you can use the scp command to transfer the photo to the Ubuntu PC for mirror viewing.

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 Linux system, you can directly view the captured pictures through the HDMI display.

# 3.14. Audio Test

#### 3. 14. 1. Testing Audio Methods on Desktop Systems

1) First open the file manager.



2) Then find the file below (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 choose to open it with vlc or mpv to start playing.

	alsa	+ - ¤ ×
File Edit View Go	Help	
< > ^ 企	🗎 /usr/share/sounds/alsa/	G
Places		
Computer		
🍙 orangepi		
Desktop	audio 🕻 🛓 Open With "VLC media p	layer" t.wav
📷 Trash	Open With	<b></b>
Tocuments	Canal Send To	> n
Music	Frant Big & Cut	
Pictures	P Copy	Wav
Videos	Paste	
Downloads	🛑 🍯 🐻 Move to Trash	
Devices	Rear_Cent Reproperties	ht.wav
File System		
17 MB Volume		
403 MB Volume		
Network	Side_Left.wav Side_Right.wav	
Browse Network	Use "VLC media player" to open the se	lected file

# $3.\ 14.\ 2. \ \text{How to play audio using commands}$

# 3. 14. 2. 1. HDMI audio playback test

1) First, use an HDMI to HDMI cable to connect the Orange Pi development board to the TV (other HDMI displays need to be able to play audio).

2) Then check the HDMI sound card serial number. From the output below, you can know that the HDMI sound card is **card 0**.

orangepi@orangepi:~\$ aplay -l

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

Authorization required, but no authorization protocol specified

xcb\_connection\_has\_error() returned true

card 0: rockchiphdmi0 [rockchip-hdmi0], device 0: rockchip-hdmi0 i2s-hifi-0 [rockchip-hdmi0 i2s-hifi-0]

Subdevices: 1/1

Subdevice #0: subdevice #0

3) Then use the **aplay** command to play the audio file that comes with the system. If the sound can be heard on the HDMI display or TV, it means that the hardware can be used normally.

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

# 3.15. Temperature sensor

The command to view the system temperature sensor is: orangepi@orangepi:~\$ sensors

```
gpu thermal-virtual-0
Adapter: Virtual device
temp1:
                 +47.2°C
littlecore thermal-virtual-0
Adapter: Virtual device
temp1:
                 +47.2°C
bigcore0 thermal-virtual-0
Adapter: Virtual device
                 +47.2°C
temp1:
tcpm source psy 6 0022-i2c-6-22
Adapter: rk3x-i2c
in0:
                  0.00 V
                           (\min = +0.00 \text{ V}, \max = +0.00 \text{ V})
curr1:
                 0.00 \text{ A} \text{ (max} = +0.00 \text{ A)}
npu thermal-virtual-0
Adapter: Virtual device
                 +47.2°C
temp1:
```

```
center_thermal-virtual-0

Adapter: Virtual device

temp1: +47.2°C

bigcore1_thermal-virtual-0

Adapter: Virtual device

temp1: +47.2°C

soc_thermal-virtual-0

Adapter: Virtual device

temp1: +47.2°C (crit = +115.0°C)
```

# 3.16. Hardware watchdog test

The Linux system released by Orange Pi has the watchdog\_test program pre-installed, which can be used for direct testing.

The method to run the watchdog\_test program is as follows:

- a. The second parameter 10 represents the watchdog counting time. If the watchdog is not fed within this time, the system will restart.
- b. We can feed the dog by pressing any key on the keyboard (except ESC). After feeding the dog, the program will print a line of keep alive to indicate that the dog was fed successfully.

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. 17. Check the serial number of the RK3588S chip

The command to check the serial number of the RK3588S chip is as follows. The serial number of each chip is different, so the serial number can be used to distinguish multiple development boards.

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

# 3. 18. How to install Docker

1) The Linux image provided by Orange Pi has Docker pre-installed, but the Docker service is not enabled by default.

2) Use the **enable\_docker.sh** script to enable the docker service. Then you can start using the docker command, and the docker service will be automatically started the next time you start the system.

orangepi@orangepi:~\$ enable\_docker.sh

3) Then you can use the following command to test docker. If you can run hello-world, it means 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.

# 3.19. How to download and install the arm64 version of balenaEtcher

- 1) The download address of balenaEtcher arm64 version is:
  - The download address of the deb installation package is as follows, which needs a. to be installed before use.

https://github.com/Itai-Nelken/BalenaEtcher-arm/releases/download/v1.7.9/balena-e tcher-electron 1.7.9+5945ab1f\_arm64.deb

The download address of the AppImage version that does not require installation b. is as follows:

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

May 1 ryanfortner v1.7.9	<b>balenaEtcher v1.7.9</b> Latest	9.sh	
-0- 9529280 (~) Compare -	• Assets 10		
	𝔅 balena-etcher-electron-1.7.9+5945ab1f.aarch64.rpm	64.3 MB	May 1
	𝗇balena-etcher-electron-1.7.9+5945ab1f.armv7l.rpm	58.4 MB	May 1
	Description State Sta	87.9 MB	May 1
	Description - etcher-electron_1.7.9+5945ab1f_armv7l.deb	76.5 MB	May 1
	Description of the second s	97.3 MB	May 1
	SalenaEtcher-1.7.9+5945ab1f-armv7l.AppImage	80.9 MB	May 1

2) How to install and use the deb version of balenaEtcher:

The installation command of the deb version of balenaEtcher is as follows: a.

orangepi@orangepi:~\$ sudo apt install -y \	
fix-broken ./balena-etcher-electron 1.7.9+5945ab1f arm64.deb	

After the deb version of balenaEtcher is installed, you can open it in Application. b.





c. balenaEtcher opens with the following interface:

0	balenaEtcher	★ - ×
	🌍 balena Etcher	¢ 0
	÷ *	
	Elash from file Select target Flash!	
	₽ Flash from URL	
	🕼 Clone drive	

- 3) How to use the AppImage version of balenaEtcher:
  - a. First, add permissions to balenaEtcher.

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

b. Then select the AppImage version of balenaEtcher, right-click your mouse, and click Execute to open balenaEtcher.

alen 🦂	8 Execute
her-1 +594	Open With Other Application.
b1f	🐇 Cut
rm64 pima	🗄 Сору
i	Move to Trash
(	Delete
	<u>B</u> ename
1	Properties
8	Applications

# 3. 20. How to install Baota Linux Panel

Baota 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) The recommended order of Baota Linux system compatibility is:

Debian11 > Ubuntu 22.04 > Debian12

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

orangepi@orangepi:~\$ sudo install\_bt\_panel.sh

3) Then the Baota installation program will prompt whether to install **Bt-Panel** to the **/www** folder, just enter y.

+-----

Bt-WebPanel FOR CentOS/Ubuntu/Debian

+-----

Copyright © 2015-2099 BT-SOFT(http://www.bt.cn) All rights reserved.

+-----

The WebPanel URL will be http://SERVER\_IP:8888 when installed.

+-----

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

4) Then all you have to do is wait patiently. When you see the following print information output by the terminal, it means that the pagoda has been installed. The entire installation process takes about 12 minutes, which may vary depending on the network speed.



5) At this time, enter the **panel address** shown above in the browser to open the login interface of the Baota Linux panel, and then enter the **username** and **password** shown in the above picture in the corresponding positions to log in to Baota.



6) After successfully logging into the pagoda, the welcome interface below will pop up. First, please read the user instructions in the middle and drag them to the bottom. Then you can select "I have agreed and read the User Agreement", and then click "Enter Panel" to enter the pagoda.





7) After entering the bt.com, you will be prompted to bind your account on the bt.com official website. If you do not have an account, you can go to the bt.com official website (https://www.bt.cn) to register one.

□ ● 通外规定国际将● x +			-	0	×
そ う C ▲ 不安全   192168.1.139.8880,bind	A% 1	6 G	œ		
192.168.1.139     1				Î	٩
▲ 空間整新社会計制成的#干貨商 想完你原干升的增加用品牌的 无法正确和实际 人名法 无法正确和实际 通知小师用					+
					*
▲ FTP 绑定宝塔帐号					
- 8334					1
Docker					2
					+
· ◎ 安全					
BX/B # 50/B					
<ul> <li>         文件         <ul> <li>・ 为了認識現分的体验開始的体验開始時, 得先將這邊模称号;         </li> </ul> </li> </ul>					
●         4*12年秋年3月964日読み登録は           ●         4*12年秋年3月96日読み登録が取り用、請加し使用:					
<ul> <li>新母旅田过程中選问範疇新某業級比違;</li> </ul>					
1 计划任务         4 管理機構: (759-2300556           - 名称中の地域を更適構用         - 名称中の地域を更適構用					
- 55 \$\$474\$\$0.00					æ
<ul> <li>動板記述</li> </ul>					۲

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

□ 管 宝塔Linux運行	× +							-	D	×
$\epsilon \rightarrow c$ (A	下安全   192.168.1.139:8888						A® <b>5</b> ∂ <b>5</b> °≡	۲	8	
👕 192.168.1.139 🛛 🔘	A 【 意志乐动 💧 3	誠先 Orange Pi 1.0.0 Bullseye aarch64(Py	3.7.8) 已不调新运行: 0天				免费版 7.9.6 更新 修算	重日	Î	٩
(2) 首页										+
④ 网站	立即开设 切企业版优势 イ5分目	●极速响应 ✔ 15天无理由退款 ✔ 30	+歌付舞播件 🖌 20+企业版专掌功能 🖌 2HSSL	商用证书(年付) ✔1000条免费短信(	年付)   ダ 寺享企业服务群(年付)	2				*
≜ FTP	状态									*
◎ 数据库	ABUT O	CDUMERIE	0.7245(1).81	1						a
🚽 Docker	Scattore V	Crows=	HINDD+							
园整柱	1%	2.1%	9.1%	35%						+
9 \$ <del>2</del>	$\bigcirc$	$\bigcirc$								
🖤 防火場	运行运畅	8 統心	702 / 7689(M8)	5.0G / 15G						
□ 文件	概览								н	
12 時間									1	
📖 计划任务	(6)\$ <i>6</i>	FTP	数据库	安全风险						
88 软件商店	0	0	0	7						
③ 西板设置									4	
□ 退出	软件			流量 磁盘IO			5	95 T		
	1000	70.9	210 A	1					客服	
	>_			0.43 KB	• No 1.64 KB	7.09 MB	164.09 MB		8	
	宝磁5SH线码 1.0 ►	(四步未马检测 1.0▶	た点 [明天] 一 現点 [明天]	单位:KB/s					反馈	_
	2.9 2.9			50						ED O
		D		40						8

- 9) Test the SSH terminal login of Baota.
  - a. After opening the SSH terminal of Baota, you will be prompted to enter the password of the development board system. At this time, enter **orangepi** in the password box (the default password, if you have changed it, please fill in the modified password).

and the second		Q
宝塔终端		C C
帐号或密码错误: Authentication failed	1.,root@127.0.0.1:22	
	无法自动认证,请填写本地服务	器的登录信息!
服务器IP	127.0.0.1	22
SSH账号	root	
验证方式	密码验证 私钥验证	
密码	orangepi	
	登录	
		12

b. The display after successful login is as shown below:



10) In Baota's software store, you can install software such as Apache, MySQL, and PHP, and you can also deploy various applications with one click. Please explore this part of the function by yourself, and I will not demonstrate it here one by one.

電機Linux 重板	× +											-	0
← → C (▲	不安全   192.168.1.139.8888/soft										A" To	€= ⊕	
î 192.168.1.139 0	软件简店									() 211	8 免费板 7.9.	6 立即开级	
》 曲页													
) MM	应用搜索 支持应用名称、字段	l续索 Q											
⊵ FTP	应用分类 全部 已要	运行环境	系统工具 宝塔插件	专业后插件	企业版播件	第三方应用	一級部署				更新软件列	表 / 支付状态	
) 数据库													
Docker	立即购买	Edukariki 📿 Azdar	816										
「監控	✓ #	£权IP ✓ 5分钟极速响应	✓ 15天无理由退款 ✓ :	30+款付繳插件 🗸 20	0+企业账专享功能	✓ 1000景免處短	言 (年付) 🗸 2张SSL离用证	8 (年付) 🗸	专事企业服务群 (4	F(t)			
安全	最近使用入□ > 宝塔SSH终端												
防火爆	软件名称	比問 说明						价格	到期时间	位置 状态 首页显示	7	摄作	
	ee Apache助火墙	5 有效防止sqli主。	N/xss/一句话木马等常见渗透攻;	后,当前仅支持Apache2.4	≻紋程			¥1.66/天	未开通		5	观逸   立即购买	
文件	Nginx防火增	5 有效防止sqli主。	N/xss/一句语木马/防采集感常见	渗透攻击,符合GB/T 329	917-2016标准,公支	2三所安全认证。 > 較	程 > 申请商业授权	¥1.66/天	未开遭		5	<b>荧范 立即购买</b>	
经销	(一) 网站监控报表	5 家时分析网站运	i行、用户访问状况,精确统计网	站流量、IP、UV、PV、普	青求、蜘蛛等数据,风	副站SEO优化利器 > 😰	文说明	¥0.99/天	未开通		3	<b>列达 立即购买</b>	
计划任务	· @ 堡塔PHP安全防护	5 PHP内核级防御	P機块,可针对项目进行能层过途	、 彻底杜迪的站/稿准防港	》适/稿准防强权。 📺	會:不支持32位系统和	Darm平台和PHP5.2 > 教程	¥3.30/天	未开通		3	<b>列选   立即购买</b>	
软件面内		5 重构版,基于页	1面垂存的网站10速顺件,安装成	升级到此版本,将会印版	旧版本,如果是Apac	che霓要先安装Memc	ached >数程	免费	**			预选   安装	
面板设置	一A 量塔企业级防装改 - 重构版	推奪:内核版款 体間时使用 >>	1要改,用于保护站点内容安全,就 軟糧	止黑客非法修改网页。网	8站挂马等入侵行为,	支持Centos/Debian,	Ubuntu,注意:不能与其它助复	改数 ¥ 3.30/天	未开遭			立即购买	
) iBH	皇場数据団步工具	5 基于rsync开发的	的文件同步工具,可定时或实时的	的发送文件和更新文件,也	也可用于配置负载均衡	6、集群、异地备份等	场展 >>教程	¥0.66/天	未开通			立即购买	
	一角网站防要改程序	5 事件型防禁改。	用于保护站点内容安全,防止黑	<b>音</b> 非法修改网页、网站挂3	马等入侵行为,推荐	使用企业级防整改,	保护效果更佳	¥1.33/天	未开遭		7	<b>列名 立即购买</b>	
	下。 堡場防入侵	5    原防损权、防御;	大多数的入侵继权攻击造成的挂马	品和被挖矿,有效拦截webs	shell执行提权并及时	告誓通知 > 枚種		¥ 3.30/天	未开通		7	奕逸   立即购买	
	▲ 堡壤云技平台	5 可免藏高效管理	\$P\$ 台服务器面板,官方自用推荐	以及其他多机管理功能	[了解洋街]			免费				安装	•
	+ IFRADE	5 提供灵活的系统	动国功能,防止系统被植入木马	、支持服务器日志审计功能	南日			¥1.33/天	未开通		5	<b>列忠  </b> 立即购买	客服
	↓ MySQL主从复制(重构版)	5 使用GTID方式	经检察现MySQL主从复制(仅支持	Mysql5.7/8.0)				¥1.33/天	未开通			页宽   立即购买	100
													100

11) Baota command line tool test.

orangepi@orangepi5pro:~\$ sudo bt	
<ul> <li>(1) 重启面板服务</li> <li>(2) 停止面板服务</li> <li>(3) 启动面板服务</li> <li>(4) 重载面板服务</li> <li>(5) 修改面板密码</li> <li>(6) 修改面板用户名</li> <li>(7) 强制修改MySQL密码</li> <li>(22) 显示面板错误日志</li> <li>(23) 关闭BasicAuth认证</li> <li>(24) 关闭动态口令认证</li> <li>(25) 设置是否保存文件历史副本</li> <li>(26) 关闭面板ssl</li> <li>(28) 修改面板安全入口</li> <li>(0) 取消</li> </ul>	宝塔面板命令行====================================
 请输入命令编号: 14	
止在执行(14)	
======================================	
外网面板地址: <u>https://116.30.142.7</u> 内网面板地址: <u>https://10.31.3.175</u> username: ohb8liwk password: ******* Warning: If you cannot access the panel, release the following port (8888] 注意: 初始密码仅在首次登录面板前能	<u>212:24370/5a668743</u> :24370/5a668743 888 80 443 20 21) in the security group 适正确获取,其它时间请通过 bt 5 命令修改密码
orangepi@orangepi5pro:~\$	

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

User manual: http://docs.bt.cn Forum Address: https://www.bt.cn/bbs GitHub Link: https://github.com/aaPanel/BaoTa

# 3. 21. Set up Chinese environment and install Chinese input method

Note: Before installing the Chinese input method, please make sure that the Linux system used by the development board is the desktop version.

#### 3. 21. 1. Debian system installation method

1) First set the default **locale** to Chinese.

a. Enter the following command to start configuring **locale**.

orangepi@orangepi:~\$ sudo dpkg-reconfigure locales

b. Then select zh\_CN.UTF-8 UTF-8 in the pop-up interface (use the up and down arrow keys on the keyboard to move up and down, use the space bar to select, and finally use the Tab key to move the cursor to <OK>, and then press Enter).

Locales are a framework to switch betw	een multiple languages and allow	locales use their language, countr	y, characters, collation order,
etc.		<b>,</b>	
Please choose which locales to generat sets may be useful for backwards compa	e. UTF-8 locales should be chose tibility with older systems and	n by default, particularly for new i software.	nstallations. Other character
Locales to be generated:			
<pre>[ ] xh ZA ISO-8859-1 [ ] xh ZA.UTF-8 UTF-8 [ ] yi_US.UTF-8 UTF-8 [ ] yo_NG UTF-8 [ ] yo_NG UTF-8 [ ] yuw_PG UTF-8 [ ] yuw_PG UTF-8 [ ] zh_CN.GB2312 [ ] zh_CN.GBC3030 GB18030 [ ] zh_CN.GWCGW [ ] zh_CN.UTF-8 UTF-8 [ ] zh_SG GB2312 [ ] zh_SG.GBK GBK [ ] zh_SG.GBK GBK [ ] zh_SG.GBK GBK [ ] zh_TW BIG5 [ ] zh_TW.BUG-TW [ ] zh_TW.UTF-8 UTF-8 [ ] zh_TW.BUG5 [ ] zh_TW.BUG5 [ ] zh_TW.UTF-8 UTF-8 [ ] zu_ZA ISO-8859-1 [ ] zu_ZA.UTF-8 UTF-8</pre>			
	<0k>	<cancel></cancel>	

#### c. Then set the default locale to zh\_CN.UTF-8.



d. After exiting the interface, the **locale** setting will begin. 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 Input Method.





3) Then select **OK**.

Curr	rent configuration for the input method:		
* D	efault mode defined in /etc/default/im-confi	g: 'auto'	
* A	ctive configuration: 'missing' (normally mis	sing)	
* N	ormal automatic choice: 'fcitx' (normally ib	us or fcitx or uim)	
* 0	verride rule: 'zh_CN,fcitx5:zh_TW,fcitx5:zh_	HK,fcitx5:zh_SG,fcitx5'	
* CI	urrent override choice: '' (Locale='en_US')		
* CI	urrent automatic choice: 'fcitx'		
* N	umber of valid choices: 1 (normally 1)		
* D	esktop environment; 'XFCE'		
The	configuration set by im-config is activated	by re-starting the system.	
Expl one	licit selection is not required to enable the a is default/auto/cjkv/missing.	utomatic configuration if th	e active
		Cancel	ОК

4) Then select Yes.



#### 5) Then select fcitx.



6) Then select OK.

6	Input Method Configuration (im-config, ver. 0.46-1+	debllul)	+ - □ ×
Set Ma Fle * 1 * 1 * * ! ! ! ! * !	ting the user configuration /home/orangepi/.xinputrc to fo nual configuration selects: fcitx xible Input Method Framework (fcitx) tequired for all: fcitx .anguage specific input conversion support: Simplified Chinese: fcitx-libpinyin or fcitx-sunpinyin or fc Traditional Chinese / generic Chinese: fcitx-rime Generic keyboard translation table: fcitx-table* package: Application platform support: nstalling fcitx-frontend-all will cover all GUI platforms. GNOME/GTK: fcitx-frontend-gtk2 and fcitx-frontend-gtk3 KDE/Qt5: fcitx-frontend-qt5	itx. .itx-googlepinyin 5 (both)	n
The	e user configuration is modified by im-config.		
		Cancel	ок

7) Then restart the Linux system to make the configuration take effect.

#### 8) Then open Fcitx configuration.



9) Then click the + sign in the location shown in the picture below.



10) Then search Google Pinyin and click OK.


11) Then put Google Pinyin at the front.



12) Then open the Geany editor to test the Chinese input method.



Applications 🗄		
🔍 Run Program		
Norminal Emula	tor	
📑 File Manager		
🗟 Mail Reader		
🕜 Web Browser		
Settings	>	
🔀 Accessories	· ·	
🕌 Development	🕨 🥶 Geany	
🧭 Graphics	· •	
🔶 Help		
💿 Internet	<u>ب</u>	
Multimedia	+	
🗑 Office	• • • • • • • • • • • • • • • • • • •	
System	• • • • • • • • • • • • • • • • •	
C Log Out		

13) The Chinese input method test is as follows:



14) You can switch between Chinese and English input methods using the **Ctrl+Space** shortcut key.

15) If you need the entire system to display 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

⊙ 所有应用	程序	
🔍 运行程序		
▶ 终端模拟	28	
📕 文件管理	器	
🔒 邮件阅读	25	
🕜 网络浏览	器	
1981 设置		💼 设置管理器
团 办公	•	🗊 窗口管理器
2 多媒体		⑤ 窗口管理器微调
🔀 附件		[] 打印设置
🕟 互联网	•	? 电源管理器
< ○ 开发	*	13 辅助功能
🌠 图形		💿 高级网络配置
② 系统		■ 工作区
🔶 Help		🎝 会话和启动
① 注销		键盘
		📕 可移动驱动器和介质
		⑧ 蓝牙管理器
		0 蓝牙适配器
		🔜 面板
		🔚 默认应用程序
		響 屏幕保护程序
		👶 色彩配置文件
		→ 设置编辑器
		🖮 输入法
		3 鼠标和触摸板
		🔔 通知
		🕍 外观
		<b>7</b> 文件管理器设置
		🛃 显示
		🚔 桌面
		Additional Drivers
		▲ Fcitx 配置
		orangePi config 🌀
		🐻 Software & Updates
		🐱 Xfce 终端设置

#### 16) Then **restart the system** and you can see that the system is displayed in Chinese.

# 3. 21. 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	Kingdom)			
汉语 (中国)				
中文 (香港)				
中文 (臺灣)				
Drag languages to	arrange them in order of preference.			
Drag languages to Changes take effect	o arrange them in order of preference. t next time you log in. Wide			
Drag languages to Changes take effect Apply System Use the same langu	o arrange them in order of preference. t next time you log in. Wide age choices for startup and the login screen.			
Drag languages to Changes take effect Apply System Use the same langu Install / Remov	wide age choices for startup and the login screen.			
Drag languages to Changes take effect Apply System Use the same langu Install / Remov Keyboard input n	o arrange them in order of preference. t next time you log in. Wide lage choices for startup and the login screen. ve Languages nethod system: none -			

3) Then use the left mouse button to select **Chinese (China)** and hold it down, then drag it upwards to the starting position. The display after dragging is as shown below:

	Language Su	ipport	<b>*</b> -	• ×
Language	Regional Fo	ormats		
Language for me	enus and window	s:		
汉语 (中国)				
English (United	States)			
English				
English (Austral	ia)			
English (Canada	3)			
Drag languages t Changes take effect Apply System	o arrange them ir it next time you log -Wide	n order of prefer i in.	ence.	
Use the same land	uage choices for st	artup and the login	screen.	
use the same lang				
Install / Remo	ve Languages			
Install / Remo	ve Languages nethod system:	none 👻	4	

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.

<b>[</b> 0]	Language Sup	oport		↑ -		×
Language	Regional Fo	mats				ľ
Language for me	nus and windows					
汉语 (中国)						
English (United 9	States)					
English						
English (Australi	a)					
English (Canada	)					
Apply System- Use the same langu	Wide lage choices for sta	tup and the log	jin screen.			
Install / Remov	/e Languages					
Keyboard input m	nethod system:	none 🔻	3			
<b>W</b> Help				<b>X</b> C	lose	

5) Then set the **Keyboard input method system** to fcitx.

(	Language Su	pport		<b>†</b>	-	•	×
Language	Regional Fo	rmats					
Language for me	nus and windows	5:					
汉语 (中国)							
English (United S	states)						
English							
English (Australi	a)						
English (Canada	j.						
Changes take effect	next time you log Wide	in.	preferencei				
Use the same langu	age choices for sta	rtup and t	he login scree	n.			
Install / Remov	ve Languages	fcitx 📘	3				
Keyboard input m	ethod system:	XIM none					
Help				4	K Cl	ose	

#### 6) Then restart the Linux system to make the configuration take effect.

7) After re-entering the system, please select "**Do not ask me again**" in the interface below, and then decide whether to update the standard folders 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 新语言过	(一种新语言登入。您可 E行自动更新。该更新将	以将主文件夹下的某些标准文件夹名按照 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。 下要再次询问我(D)		Þ
保留旧的名称()	<)	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. The opening method is shown in the figure below:





10) After opening **Geany**, the default input method is still English. We can switch to Chinese input method through the **Ctrl+Space** shortcut key, and then we can input Chinese.

💆 所有应用程序 🗄 🎯 *未命名 - Geany	
🧐 *朱命名-Geany 🛧 – ロ	×
文件(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 🗙 < > 🐴 🗞 • 🐀 题	•
标记 文档 <b>未命名 羊</b>	
未找到符号 1 例好	
19:12:28: 2 ni haoj 19:12:28: 1 ////2.2 2 /// 4 P. 5 2P	
状态 1.000 23.00 A.IC 3.0C UDUILU	inge pi
行:1/1 列:0 选择:0 插入 制表符 已修改 模式-LF 编码:UTF-8 文件类型:没有 范围:未知	

- 3. 21. 3. Installation method for Ubuntu 22.04 system
- 1) First open Language Support.





2) Then find the **Chinese (China)** option.

	Language Support 🔶 🛧	
Language	Regional Formats	
Language for n	nenus and windows:	
Português (Br	asil)	
Português (Po	rtugal)	
русский (Рос	сийская Федерация)	
slovenščina		
汉语(中国)		
Drag languages	to arrange them in order of preference.	
Drag languages Changes take eff Apply Syste	s to arrange them in order of preference. fect next time you log in. m-Wide	
Drag languages Changes take eff Apply Syste Use the same lan	s to arrange them in order of preference. fect next time you log in. m-Wide nguage choices for startup and the login screen.	
Drag languages Changes take eff Apply Syste Use the same lan Install / Rem	s to arrange them in order of preference. fect next time you log in. m-Wide nguage choices for startup and the login screen. nove Languages	
Drag languages Changes take eff Apply Syste Use the same lan Install / Rem Keyboard input	t o arrange them in order of preference. fect next time you log in. m-Wide nguage choices for startup and the login screen. hove Languages t method system: Fcitx 4	

3) Then use the left mouse button to select **Chinese (China)** and hold it down, then drag it upwards to the starting position. The display after dragging is as shown below:

Language Regional Formats Language for menus and windows: 汉语 (中国) English (United States) English Deutsch (Schweiz)				
Language for menus and windows: 汉语 (中国) English (United States) English Deutsch (Schweiz)				
汉语 (中国) English (United States) English Deutsch (Schweiz)				
English (United States) English Deutsch (Schweiz)				
English Deutsch (Schweiz)				
Deutsch (Schweiz)				
Deutsch (Deutschland)				
Drag languages to arrange them in order of preference. Changes take effect next time you log in.				
Use the same language choices for startup and the login screen.				
Install / Remove Languages				
Keyboard input method system: Fcitx 5 🕶				
@Help	1	¢ ci	ose	

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.

	Lanyuaye sup	oport		*	125	٥
Language	Regional Forma	ts				
Language for n	nenus and windows	2				
汉语 (中国)						
English (Unite	d States)					
English						
Deutsch (Schw	veiz)					
Deutsch (Deut	tschland)					
Undriges take en	err nexr nime you log i	F1				
Apply Syste	m-Wide					
Apply Syste	m-Wide	tup and the l	ogin screen.			
Apply Syste Use the same lar Install / Rem	m-Wide nguage choices for star nove Languages	tup and the l	ogin screen.			
Apply Syste Use the same lar Install / Rem Keyboard input	m-Wide nguage choices for star nove Languages t method system:	rtup and the I Fcitx 5 🕶	ogin screen.			

5) Then restart the Linux system to make the configuration take effect

6) After re-entering the system, please select "**Do not ask me again**" in the interface below, and then decide whether to update the standard folders to Chinese according to your preferences.



7) Then you can see that the desktop is displayed in Chinese.



8) Then open the Fcitx5 configuration program.





9) Then select Pinyin input method.

		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	- + -	搜索输入法
键盘 - 英	(美國)		現金・法语(加拿大) - 英语(加拿大)           現金・法语(加拿大) - 英语(加拿大)           現金・短記酒 - 英语(马里,美国,周田)           現金・夏田道田 - 菱田 - 菱田 - 菱田 - 菱田           現金・夏田道田 - 菱田 - 菱田           夏金・夏田道田 - 菱田           夏金・沢语 - Hanyu Pinyin (with AltGr dead keys)           夏金・沢语 - 田田田田田田田田田田田田田田田田田田田田田田田田田田田田田田田田田田田
	选择系统键盘布局		um 冰塘全息 ✓ 仅显示当前语言(S)
第一	一个输入法将为非激活状态。通常您需要	長将職盘或職盘 - 布局名	- 释放在第一位。
🦉 重置(	R) 恢复默认(D)	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	√ 应用(A) × 关闭(C) √ 确定(0

10) The interface after selection is as shown below, then click OK.

8	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	- + -	搜索输入法
<u>健康</u> -英语 (美国) 拼音		<ul> <li>健盘 - 印度语言 - 英语 (印度, 带卢比符号)</li> <li>健盘 - 法语 (加拿大) - 英语 (加拿大)</li> <li>健盘 - 经订注语 - 英语 (马星, 美国, Macintoh)</li> <li>健盘 - 经订注语 - 委诺 (马星, 美国, 国际)</li> <li>健盘 - 资가兰语 - 整尔兰语 (UnicodeExpert)</li> <li>健盘 - 资가兰语 - 整尔兰语 (UnicodeExpert)</li> <li>健盘 - 汉语 - Hanyu Pinyin (with AltGr dead keys)</li> <li>键盘 - 汉语</li> <li>四條中文 (中国)</li> <li>約然兩</li> <li>五笔字型</li> <li>五笔字型</li> <li>五笔并音</li> <li>マ语</li> <li>マ语</li> <li>电然兩</li> <li>五笔并音</li> <li>● 校兩</li> <li>五笔并音</li> <li>● 校兩</li> <li>五笔并音</li> <li>● 校兩</li> <li>五笔并音</li> <li>● 校兩</li> <li>○ 文语</li> <li>● 校兩</li> <li>○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○</li></ul>
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。通常您能	需要将键盘或键盘 - 布局名称应 ↓	

11) Then we can open **Geany** to test the Chinese input method. The opening method is as shown in the figure below:



12) After opening **Geany**, the default input method is still English. We can switch to Chinese input method through the **Ctrl+Space** shortcut key, and then we can input Chinese.



	*未命名 - Geany	+ - □ ×
牛(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)	
👌 🔹 🚞 👻 🛃 🖉	🗙 < > 🐴 🗞 - 🎥 🛅	
标记 文档 未命名 🗱		
线到符号 1 <u>ni hao</u> 1. 你好 2. 你	3.尼 4.泥 5.妮 6.逆 7.腻 ( )>	
10:54:37: 这是 Geany 1.38。 10:54:37: 新文件"未命名"已打开。 状态		
★ 1/1 列:0 洗择:0 插入 制表符 已修	x 模式: LF 编码: UTF-8 文件类型: 没有 范围: 未知	

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

The Ubuntu Gnome Wayland image does not support remote desktop login using Nomachine and VNC as described here.

#### 3. 22. 1. Remote login using NoMachine

Please make sure that the Ubuntu or Debian system installed on the development board is a desktop version. In addition, NoMachine also provides detailed usage documentation. It is strongly recommended to read this document to familiarize yourself with the use of NoMachine. The document link is as follows:

https://knowledgebase.nomachine.com/DT10R00166

NoMachine supports Windows, Mac, Linux, iOS and Android platforms, so we can use NoMachine to remotely log in and control the Orange Pi development board on multiple 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 normally 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 RK3588S is an ARMv8 SOC, we use Ubuntu or Debian as the system, so we need to download the **NoMachine for ARM ARMv8 DEB** installation package. The download link is as follows:

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

https://downloads.nomachine.com/download/?id=114&distro=ARM

Home / Download / NoMachine for ARM - arm64

# NoMachine for ARM - arm64



b. In addition, you can also download the **NoMachine** installation package 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
٥	nomachine_8.5.3_1_amd64.deb
2	nomachine_8.5.3_1_x64.exe
	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 t	this downloa	id link may change.
https://downlo	ads.nomach	ine.com/download/?id=9
NoMachine 1	for Window	vs - 64bit
	Version:	8.5.3_1
	Package size:	57.4 MB
	Package type:	EXE
	MD5 signature:	d585ad1e4f341444cacd3ae8add3b6ee
	For:	Windows 7/8/8.1/10/11/Windows Server 2008/2012/2016/2019
		Download

3) Then install NoMachine in Windows. After the installation, please restart the computer.

4) Then open NoMachine in Windows.



5) After NoMachine is started, it will automatically scan other devices with NoMachine installed in the LAN. After entering the main interface of NoMachine, you can see that the development board is already in the list of connectable devices. Then click the

location shown in the red box in the figure below to start logging into the Linux system desktop of the development board.



6) Then click **OK**.



7) Then enter the user name and password of the development board Linux system in the corresponding position in the figure below, and click **OK** to start logging in.



- 8) Then click OK in the following interface.
- 9) Finally, you can see the desktop of the Linux system on the development board.



### 3. 22. 2. Remote login using VNC

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 normally through SSH.

There are many problems with testing VNC on Ubuntu 20.04, so please do not use this method.

1) First run the set vnc.sh script to set up vnc, remember to add sudo permissions.

orangepi@orangepi:~\$ sudo set vnc.sh

You will require a password to access your desktops.

Password: **#Set the vnc password here, 8 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 orangepicm5:1

Creating default startup script /root/.vnc/xstartup Starting applications specified in /root/.vnc/xstartup Log file is /root/.vnc/orangepicm5:1.log

Killing Xtightvnc process ID 3047

New 'X' desktop is orangepicm5:1

Starting applications specified in /root/.vnc/xstartup Log file is /root/.vnc/orangepicm5:1.log

2) The steps to use MobaXterm software to connect to the Linux system desktop of the development board are as follows:

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

Terminal Session       X server Tools Games Settings Macros Help         Session       Severs Tools Games Sessors Wew Spit Multicec Tunneling Packages Settings Help       X server Exit         Quick connect       2. Select VNC       Image: Session Settings         Session       Session settings       Image: Session Settings       Image: Session Settings         Session       Session Settings       Image: Session Settings       Image: Session Settings       Image: Session Settings         Image: Session Settings       SSH Telnet: Rsh Xdmcp RDP       Image: Session Settings       Image: Session Setings
Servers Tools Games Sessons View Split MultiExec Turneling Padages Settings Help X server Exit Quick connect Cuick connect Session settings SSH Teinet Rsh Xdmcp RDP VINC FTP SFTP Serial File Shell Browser Mosh Aws S3 WSL SSH Teinet Rsh Xdmcp RDP VINC FTP SFTP Serial File Shell Browser Mosh Aws S3 WSL SH Teinet Rsh Xdmcp RDP VINC FTP SFTP Serial File Shell Browser Mosh Aws S3 WSL SH Teinet Rsh Xdmcp RDP VINC FTP SFTP Serial File Shell Browser Mosh Aws S3 WSL Advanced Vnc settings Remote hostname or IP address 192.168.31.52 Port 5901 C 4. Fill in the port number 5901
Quick connect       2. Select VNC       @         Image: Session settings       Session settings       Image: Session settings       Image: Session settings         SSH       Telnet       Rsh Xdmcp       RDP       RDP       Image: Session settings       Image: Session settings         SSH       Telnet       Rsh Xdmcp       RDP       Image: Session settings       Image: Session settin
Constraints     Constrain
Section settings Section settings Section settings Remote hostname or IP address Advanced Vnc settings Network settings Remote hostname or IP address Advanced Vnc settings Remote hostname or IP address Advanced Vnc settings Remote hostname or IP address Advanced Vnc settings Advanced V
Image: Shi Teinet Rsh Xdmcp RDP
SSH Teinet Rsh Xdmcp RDP VNC FTP Serial File Shell Browser Mosh Aws S3 WSL 3. Fill in the IP address of the development board Remote hostname or IP address 192.168.31.52 Port 5901 C Advanced Vnc settings Network settings Bookmark settings 4. Fill in the port number 5901
Contributer for four for address of the development board      Contributer for four four four four four four four
3. Fill in the IP address of the development board Remote hostname or IP address 192.168.31.52 Port 5901 Advanced Vnc settings Network settings Advanced Vnc settings Advanced Vnc settings 4. Fill in the port number 5901
Remote hostname or IP address 192, 168, 31, 52 Port 5901 C Advanced Vnc settings Network settings Bookmark settings 4. Fill in the port number 5901
Remote hostname or IP address 192.168.31.52 Port 5901 C Advanced Vnc settings Retwork settings Bookmark settings 4. Fill in the port number 5901
Advanced Vnc settings 🔅 Network settings \star Bookmark settings 4. Fill in the port number 5901
Advanced Vnc settings 🔅 Network settings ★ Bookmark settings 4. Fill in the port number 5901
4. Fill in the port number 5901
4. Fill in the port number 5901
0
VNC session
5. Click OK
2 OK Cancel

b. Then enter the VNC password set previously.

NobaXterm		
	Please enter your passw	vord for 192.168.31.46
-	******	
	Show password	d
	🚫 OK	🙁 Cancel

c. After successful login, the interface is displayed as shown below, and then you can remotely operate the desktop of the development board Linux system.



# 3. 23. Test of some programming languages supported by Linux system

# 3. 23. 1. Debian Bullseye System

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

a. The versions of gcc are as follows:

orangepi@orangepi:~\$ gcc --version

gcc (Debian 10.2.1-6) 10.2.1 20210110

Copyright (C) 2020 Free Software Foundation, Inc.

This is free software; see the source for copying conditions. There is NO

warranty; not even for MERCHANTABILITY or FITNESS FOR A PARTICULAR PURPOSE.

b. 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 has Python 3 installed by default.

a. The specific Python versions are 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.

>>>

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) 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 Java version.

orangepi@orangepi:~\$ java --version

c. Write a **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 run hello\_world.java.

orangepi@orangepi:~\$ javac hello\_world.java

orangepi@orangepi:~\$ java hello\_world

Hello World!

### 3. 23. 2. Debian Bookworm System

1) Debian Bookworm is installed with the gcc compilation tool chain by default, which can compile C language programs directly in the Linux system of the development board.

a. The versions of gcc are 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 Python 3 installed by default.

a. The specific Python versions are 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 key 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) Debian Bookworm 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 Bookworm is openjdk-17.

orangepi@orangepi:~\$ sudo apt install -y openjdk-17-jdk

b. After installation, you can check the Java version.

orangepi@orangepi:~\$ java --version

c. Write a Java version of **hello\_world.java**.

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

public class hello\_world

}

```
public static void main(String[] args)
{
```

System.out.println("Hello World!");

d. Then compile and run hello world.java.

orangepi@orangepi:~\$ javac hello world.java

orangepi@orangepi:~\$ java hello world

Hello World!

# 3. 23. 3. Ubuntu Focal system

1) Ubuntu Focal is installed with the gcc compilation tool chain by default, which allows you to compile C language programs directly in the Linux system of the development board.

a. The versions of gcc are 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.

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 have Java compilation tools and runtime environment installed 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 Java version.

orangepi@orangepi:~\$ java --version

openjdk 17.0.2 2022-01-18

OpenJDK Runtime Environment (build 17.0.2+8-Ubuntu-120.04)

OpenJDK 64-Bit Server VM (build 17.0.2+8-Ubuntu-120.04, mixed mode, sharing)

c. Write a Java version of hello\_world.java.

orangepi@orangepi:~\$ vim hello\_world.java

public class hello\_world

ł

}

public static void main(String[] args)

System.out.println("Hello World!");

2

d. Then compile and run hello world.java.

orangepi@orangepi:~\$ javac hello\_world.java

orangepi@orangepi:~\$ java hello\_world

Hello World!

#### 3. 23. 4. Ubuntu Jammy system

4) Ubuntu Jammy is installed with the gcc compilation tool chain by default, which can compile C language programs directly in the Linux system of the development board.

a. The version of gcc is as follows:

orangepi@orangepi:~\$ gcc --version

gcc (Ubuntu 11.2.0-19ubuntu1) **11.2.0** 

Copyright (C) 2021 Free Software Foundation, Inc.

This is free software; see the source for copying conditions. There is NO

warranty; not even for MERCHANTABILITY or FITNESS FOR A PARTICULAR PURPOSE.

b. 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!

5) Ubuntu Jammy has Python 3 installed by default.

a. The specific version of Python3 is as follows:

orangepi@orangepi:~\$ python3

Python **3.10.4** (main, Apr 2 2022, 09:04:19) [GCC 11.2.0] on linux

Type "help", "copyright", "credits" or "license" for more information.

b. 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!

6) Ubuntu Jammy does not have Java compilation tools and runtime environment installed 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 Java version.

orangepi@orangepi:~\$ java --version

openjdk 18-ea 2022-03-22

OpenJDK Runtime Environment (build 18-ea+36-Ubuntu-1)

OpenJDK 64-Bit Server VM (build 18-ea+36-Ubuntu-1, mixed mode, sharing)

c. Write a 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 Them commile and run hello, would inve

d. Then compile and run hello\_world.java.

orangepi@orangepi:~\$ **javac hello\_world.java** orangepi@orangepi:~\$ **java hello\_world** Hello World!

# 3. 24. **QT installation method**

1) Use the following script to install QT5 and QT Creator.

orangepi@orangepi:~\$ install\_qt.sh

2) After installation, the QT version number will be automatically printed.

The Qt version that comes with Ubuntu 20.04 is 5.12.8. a. orangepi@orangepi:~\$ install qt.sh . . . . . . QMake version 3.1 Using Qt version 5.12.8 in /usr/lib/aarch64-linux-gnu The QT version that comes with Ubuntu 22.04 is **5.15.3**. b. orangepi@orangepi:~\$ install qt.sh QMake version 3.1 Using Qt version 5.15.3 in /usr/lib/aarch64-linux-gnu The QT version that comes with Debian11 is 5.15.2. c. 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.



You can also use the following command to open QT Creator.

orangepi@orangepi:~\$ qtcreator

During the startup of QT and QT applications, if the following error is prompted, please ignore it directly. This error will not affect the operation of the application.

libGL error: failed to create dri screen libGL error: failed to load driver: rockchip libGL error: failed to create dri screen libGL error: failed to load driver: rockchip

4) The interface after QT Creator is opened is as follows:



- 5) The version of QT Creator is as follows:
  - a. The default version of QT Creator in Ubuntu20.04 is as follows:

fit i	Rulid Debug Analyze Tools y	Vindow Help	Qt Creator		+ - u x
	Projects	Qt 5.12.8 in PATH (System) *	Search in Examples		
L	Examples	<u>File</u> Tools	Analog Clock 😐 😐 💈		november 2016
	Tutorials	ABC DEF GHI JKI	and the second second	File Edit Help	10         31         1         2         3           6         7         8         9         10           3         14         15         16         17
		Qt U	Creator 4.11.0	tandard features of	0 21 22 23 24 17 28 29 30 1
	New to Qt?	Address Ba	sed on Qt 5.12.8 (GCC 9.3.0, 64 bit	) Example	Calendar Widget Example
	Learn how to develop your own applications and explore Qt Creator.	Tagsi addr	pyright 2008-2019 The Qt Compan erved. e program is provided AS IS with N	y Ltd. All rights	Tags android calendar ios widget widgets
	Get Started Now	DE PA	ANY KIND, INCLUDING THE WARRA SIGN, MERCHANTABILITY AND FITN RTICULAR PURPOSE.	INTY OF ESS FOR A	
		Second Second Barrier Strate Contractions Second Second Second Second Second Second Second Second Second Second Se	The second se	Code Sample	Server name: Contone This examples requires that
		<ul> <li>Statistical of the Statistical of the</li></ul>	Default file: index.html		
	L Qt Account	Editable Tree Medal Example	HTTP Example	IEON Sava Game Example	Local Fortuno Client Example
	Online Community	Tags: editable los model tree	Tags: http://etwork	Tags: core game jion save	Tags: client core fortune local
	S Blogs	widgets			
	🔞 User Guide	Fortune Server	0		Chip Demo
We	ould you like to take a quick UI tou	This tour highlights important user interf	ace elements and shows how they	are used. To take the tour later,	ake III Taur De Net Chew Assis

b. The default version of QT Creator in Ubuntu22.04 is as follows:

		2							
•	Projects	Qt 5.15.3 in PATH (qt5)	Search in Examples						
	Examples	File Tools	💽 Analog Clock 📼 🗉 🛽			1	novemb	er 20	16
		ABC DEF GHI JKI	A Statistics	File E	dit Help	on. ma	n. tir. 1	ons. 2	tor. 3
	Tutorials	New	Allowed Galerian	1.00 1		6 7	8 1 15	9	10
	Markotolaco	QtU	About Qt Creator	- T A	00 0	20 2	1 22	23	24
	Marketplace	Pete	Qt Creator 6.0.2		tandard features of	1 5	6	7	8
		Address C	Based on Qt 5.15.3 (GCC 11.2.0, 64 bit)	ad All sinks	Example	Calendar	Widget	Exampl	e
	New to Qt?	Tags: add	reserved.	to. An rights	on wittgets	Tegs: calen	tar ios wid	get widg	ets
	Learn how to develop		The program is provided AS IS with NO I ANY KIND, INCLUDING THE WARRANTY (	VARRANTY OF		-			_
	explore Qt Creator.		MERCHANTABILITY AND FITNESS FOR A PURPOSE.	PARTICULAR					- 4
	Get Started Now			X Close	Code	Serve	r name:	fortune	
		Anno 1997 1. Sance 1			Sample	This e	xamples	requires	that
		<ul> <li>Anno Series Anno</li> <li>Anno Series Anno Series</li></ul>	Default file: index.html						
	⊥ Get Qt	Page 22							
	L Ot Account	Editable Tree Model Example	HTTP Example	JSON Save	Game Example	Local For	tune Clie	ent Exar	nple
	Online Community	widgets	age nup network	indo: cose de	and poor save	inght cherk	Core Initia	ine incar	
	Blog							Chip	lemo
	AL DIODA	Eortune Server	0 X						200

c. The default version of QT Creator in **Debian11** is as follows:



d. The default version of QT Creator in **Debian12** is as follows:

00	Walsa	ma ta Ot Create						
Crea	te Project	Qt 5.15.8 in PATH (qt5)	-	Search in Exa	amples			
Ope	en Project	63		About Qt Creat	or	^ ×	-	
N	ew to Qt?		Qt Cre Based o	ator 9.0.2	.2.0, arm64)		man minister av provint by Oc No. Hel fans, av diet in visiter film (av dietaris) and also nythet film andreater skyle in manufasse.	
Ge	et Started	QU	The pro	nt 2008-2022 The G gram is provided A	Qt Company Ltd. All r S IS with NO WARRAN Y OF DESIGN, MERCH	Ights reserved.	rise/Insent via the Thampion	
	Projects	Addres: Tags: add	FITNESS The Qt I Qt®, Qt	FOR A PARTICULA ogo as well as Qt® Quick Compiler®,	R PURPOSE. , Qt Quick®, Built wi Qt Enterprise®, Qt M d trademarks of The J	th Qt®, Boot to tobile® and Qt	mple	
E	xamples		-			₩ <u>C</u> lose		
	lutorials		-	No. 2010 No. 20	ingless per traditions proved with the foregree per service with the foregree service with the foregree service with the foregree many subject to the foregree many subject to the foregree many subject to the foregree	El artiv de la constanti el constanti de la constanti el constanti de El constanti el constanti de El constanti el		
Ma	arketplace	BE Personal a Line Bernin Terretari Personal a Line Bernitari Personal a Line Bernitari Personal a Line	-	No ingle Portions Spread No ingle Portions Spread I Novel State Area Spread I Novel State Port I Novel State Port I Novel State Port I State State Port I State State Port I State State Port I State State Port	Angelen (and an	Page and the De division of the	(and a later	
				*********				
		Get Qt	Qt /	Account	Online Comm	unity	Blogs	User Guide

- 6) Then set  $QT_{\circ}$ 
  - a. First open Help->About Plugins.....





lter		Show all
ame	▼ Load	Version 🔥
Build Systems		
<ul> <li>AutotoolsProjectManager</li> </ul>		4.11.0 (4.11.0) (
CMakeProjectManager	<b>v</b>	4.11.0 (4.11.0) 7
<ul> <li>CompilationDatabaseProjectManager (expension)</li> </ul>	erimental)	4.11.0 (4.11.0) 1
GenericProjectManager	V	4.11.0 (4.11.0) 1
ØbsProjectManager	~	4.11.0 (4.11.0) 1
<ul> <li>OmakeProjectManager</li> </ul>	~	4.11.0 (4.11.0) 1
C++		
<ul> <li>Beautifier (experimental)</li> </ul>		4.11.0 (4.11.0) L
ClangCodeModel		4.11.0 (4.11.0) 1
- ClangFormat		4,11,0 (4,11,0) 1
<ul> <li>ClangRefactoring (experimental)</li> </ul>		4.11.0 (4.11.0) 1
<ul> <li>ClassView</li> </ul>	V	4.11.0 (4.11.0) 1
CopEditor	V	4.11.0 (4.11.0) 1
Code Analyzer		
ClangTools	V	4,11,0 (4,11,0) 1
<ul> <li>Cppcheck (experimental)</li> </ul>	- Fi	4.11.0 (4.11.0) 5
<ul> <li>CtfVisualizer</li> </ul>	V	4.11.0 (4.11.0)
PerfProfiler	V	4.11.0 (4.11.0) 1*

- c. After setting, you need to restart QT Creator.
- d. Then make sure that QT Creator uses the GCC compiler. If it defaults to Clang, change it to GCC.





7) Then you can open a sample code.

		main	.cpp - Qt Creator		* - ¤ ×
Edit	<u>V</u> iew <u>B</u> uild <u>D</u> ebug <u>A</u> nalyze <u>T</u> o	ols <u>W</u> indow <u>H</u> elp			
me	Projects	Qt 5.15.2 in PATH (qt5) *	Search in Examples		
<b>t</b> gn	Examples Tutorials	File Tools ABC DEF GHI JKI Name	Analog Clock	File Edit Help	november         2016           n.         man.         tir.         ons.         tor.           0         31         1         2         3           6         7         8         9         10           3         14         15         16         17
e e	Marketplace	Qt User The Keys, B Peter Rabbit The Lake Di		All the standard features of	$\begin{array}{cccccccccccccccccccccccccccccccccccc$
, cts	New to Qt? Learn how to develop your own applications and	Address Book Example Tags: address androld book los widgets	Analog Clock Window Exam lags: analog android sock gui los window	Application Example Tags: application widgets	Calendar Widget Example Tags: calendar los widget widgets
Þ	explore Qt Creator.	Extension Freehaam         6           Free         Sector Res         50000           Sector Res         50000         Sector Res           Sector Res         50000         Sector Res           Sector Res         50000         Sector Res           Sector Res         Sector Res         Sector Res	HTTP JRL: <u>http://www.qt.io</u> 2ownload directory: C: Userywser/Ap	Ot Code	Server name: fortune
-tt-	<ul> <li>✓ Get Qt</li> <li>▲ Qt Account</li> </ul>	Shar align exchange frages     A many processing of the start and t	Default file: index.htm I Launch file	Sample	
	Online Community	Editable Tree Model Example Tags: android editable ios model tree	HTTP Example Tags: http network	JSON Save Game Example Tags: core game json save	Local Fortune Client Example Tags: client core fortune local
ig d	Blogs	Fortune Server			Chip Demo
W	/ould you like to take a quick UI tour elp > UI Tour.	This tour highlights important user interface	ace elements and shows how they are	used. To take the tour later, select	ake UI Tour Do Not Show Again 🗙
	Q Type to locate (Ctrl+K)	1 Issues 2 Search Results 3 Applic	ation Output 4 Compile Output 5	OMI Debugger Console 8 Test Res	alte A

8) Clicking on the sample code will automatically open the corresponding documentation. You can read the instructions carefully.



min.cpp-ottCreator         - B	* - a x 0 B+ X
Elle Edit View Build Debug Analyze Tools Window Help Open in Help Mode 🞧 🖒 🖡 🕲 😁 Analog Clock Win 🕈	
Hanaye Kita. Configure Project Analog Clock Window Example	
Construction of the following kits can be used for project     analogetics     Q1 5.15 Q1 GUI      Analog Clock Window Example     Q1 5.15 Q Reference	Documentation
rain Active Project Type to filter kits by name Contents	
analogclock * Select all kits The Analog Clock Window example shows how to draw the Analog Clock Window example shows how to draw the Analog Clock Window example shows how to draw the	ockWindow Class
Import Existing Build Definition	
Build & Run     Total form	tation
Costap     Costap     Costap	
Project Settings Configure Project	
Orac     Exter       Two     Get Style       Dependencies       Ensing	
anilgsterk	
This example demonstrates how the transformation and scaling features of QPair to make drawing easier.	iter can be used
AnalogClockWindow Class Definition	
The AnalogClockWindow datas provides a clock with hour and minute hands it hour a drimiter hands in the fact that the transition of the second in the second	at is automatically Window Example
🛛 🖉 Type to locate (Ctrl+K) 1 Issues 2 Search Results 3 Application Output. 4 Compile Output. 5 QML Debugger Console 8 Test Results 4 📫 🖬 🖬 🖓 Type to locate (Ctrl+K)	

# 9) Then click Configure Project.



10) Then click the green triangle in the lower left corner to compile and run the sample code.



main.cpp - Qt Creator       + - C X         File Edit View Build Debug Analyze Tools Window Help       File Edit View Build Debug Analyze Tools Window Help       File Edit View Build Debug Analyze Tools Window Help         Projects       I T. @ Imain.cpp       @ main.cpp       I We <select symbol="">       Unix (LF)       I Dite:         Imain.cpp       Imain.cpp       I We <select symbol="">       I Unix (LF)       I Dite:       I Dite:         Imain.cpp       Imain.cpp       I We <select symbol="">       I Dite:       I Dite:       I Dite:       I Dite:         Imain.cpp       Imain.cpp       I Dite:       Imain.cpp       I Dite:       &lt;</select></select></select>	
File Edit View Build Debug Analyze Tools Window Help         Projects       Imain.cpp         Projects       Imain.cpp         Imain.cpc       Imain.cpp         Imain.cpp       Imain.cpp <t< th=""><th></th></t<>	
Projects       0 Tr, 0 Tr       1 Tr       0 Tr<	
Westcome <sup>C</sup> analogclock protection <sup>C</sup> analogclock protec	
Wetcome	
Cdtt     Sources     53     #include "rasterwindow.h"       Edit     Sources     53     #include "rasterwindow.h"       Company     Sources     Sources     Sources       Sources     Sources<	
Imain cpp       63       #include "rasterwindow.h"         Edit       54       //! [5]         Cosign       55       //! [5]         Imain cpp       54       //! [5]         Debug       59       Public: AnalogClockWindow();         Pobug       61       protected: void timerEvent (QTimerEvent *) override; void render(QPainter *p) override;	
Solution       S5       //1 [5]         Solution       S5       //2 [S]         Solution       S5       public RasterWindow.         Pobung       S5       protected: S5         Pobung       S1       protected: S2         Void render(QPainter *p) override; S3       Void render(QPainter *p) override;	
50 <ul> <li>Class AnalogClockWindow : public RasterWindow</li> <li>F</li> <li>public:</li> <li>AnalogClockWindow();</li> <li>protected;</li> <li>yoid finerEvent (QTimerEvent *) override;</li> <li>yoid finerCv(QPinter *) override;</li> <li>yoid remer(QPinter *) override;</li> </ul>	
Design     public: AnalogClockWindow();       Debug     protected; void timerEvent (QTimerEvent *) override; void render(QPainter *p) override;	
Image: Constraint of the second se	
Debug     61     protected:       \$\$\$ void timerEvent(QTimerEvent *) override;       \$\$\$\$ void render(QPainter *) override;	
62       void timerEvent (QTimerEvent *) override;         63       void render(QPainter *p) override;	
Projects 04	
65 private:	
Water 67 B	
76	
Open Documents \$   B+ cm 73 {	
main.cpp 74 setTitle("Analog Clock"); 75 setTitle("Analog Clock");	
analogicak 76	
77 m_timerId = startTimer(1000);	
Debug 80	
82 void AnalogClockWindow::timerEvent(QTimerEvent *event)	
83 (f (event-3timerId) == m timerId)	
renderLater():	
Would you like to take a quick UI tour? This tour highlights important user interface elements and shows how they are used. To take the tour later, select Take UI Tour Do Not Show Again X	
🛛 🖉 R. Type to locate (Ctrl+K) 🔰 I issues 2 Search Results 3 Application Output 4 Compile Output 5 QML Debugger Console 8 Test Results 💠 📖 🔲	

11) After waiting for a while, 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

Recommended

# 3. 25. ROS installation method

# 3. 25. 1. How to install ROS 1 Noetic on Ubuntu 20.04

1) The currently active versions of ROS 1 are as follows. The recommended version is **Noetic Ninjemys**.

#### **Active ROS 1 distributions**



# DistroRelease datePosterTuturtle, turtle in tutorialEOL dateROS Noetic Ninjemys<br/>(Recommended)May 23rd, 2020Image: Commended of the comm

# http://docs.ros.org https://wiki.ros.org/Distributions

2) The official installation document link for ROS 1 Noetic Ninjemys is as follows:
 http://wiki.ros.org/noetic/Installation/Ubuntu

3) The official installation document of ROS **Noetic Ninjemys** recommends using Ubuntu 20.04, so make sure that the system used by the development board is the **Ubuntu 20.04 desktop system**.

#### http://wiki.ros.org/noetic/Installation



#### 4) Then install ros1 using the script below.

orangepi@orangepicm5:~\$ install\_ros.sh ros1

5) Before using ROS tools, 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 when running the following command, you need 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 automatically run the following command. However, this method cannot guarantee that GitHub can be accessed normally every time. If the following error is prompted after install\_ros.sh installs ros1, please find other ways to enable 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/base.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/releases/fuerte.yaml
Query rosdistro index
https://raw.githubusercontent.com/ros/rosdistro/master/index-v4.yaml
Skip end-of-life distro "ardent"
Skip end-of-life distro "bouncy"
Skip end-of-life distro "crystal"
Skip end-of-life distro "dashing"
Skip end-of-life distro "eloquent"
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 small turtle will pop up as shown in the figure below.




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. 25. 2. How to install ROS 2 Galactic on Ubuntu 20.04

1) The currently active versions of ROS 2 are as follows. The recommended version is **Galactic Geochelone** 

#### **Active ROS 2 distributions**

Recommended

Development



Distro	Release date	Logo	EOL date
Humble Hawksbill	May 23rd, 2022		May 2027
Galactic Geochelone	May 23rd, 2021	CALACTIC GEOCHELONE	November 2022
Foxy Fitzroy	June 5th, 2020		May 2023

http://docs.ros.org

http://docs.ros.org/en/galactic/Releases.html

2) The official installation document link for ROS 2 Galactic Geochelone is as follows: docs.ros.org/en/galactic/Installation.html http://docs.ros.org/en/galactic/Installation/Ubuntu-Install-Debians.html

3) The official installation document of ROS 2 Galactic Geochelone recommends using Ubuntu 20.04 for Ubuntu Linux, so 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) Use the **install\_ros.sh** script to install ros2.

orangepi@orangepi:~\$ install\_ros.sh ros2

5) After the **install\_ros.sh** script installs ros2, it will automatically run the **ros2-h** command. If you can see the following print, it means that ros2 is installed successfully.

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 exit
7	ommands:	
_	ommanus.	
	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@orangepicm5:~\$ 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

🚫 Applications : 🐽 RViz* 🛛 📓 orangepi@orangepiS: ~ 📓 orangepi@orangepiS: ~		Fri 16 Dec, 15:49 هزا هر orange
		erangepligerangepli:Desktop + - D x orangepligerangeplisDesktop 77x24 angepligerangeplisDesktop 77x24 bG, error; falled to create dri screen bG, error; falled to coat driver: recktip
RV RVIz*	+ - = × 11	bGL error: failed to create dri screen bGL error: failed to load driver: rockchip
File Panels Help	1	bGL error: failed to create dri screen
👌 Interact 🕆 Move Camera 🛄 Select 🔶 Focus Camera 🚥 Measure 🖌 2D Pose Estimate 🖌 2D Goal Pose 💡 Publish Point 💠		bGL error: failed to create dri screen
Displays 🗵	HB Views	bGL error: failed to load driver: rockchip NFO] [1671176977.105961883] [rviz2]: Støreo is NOT SUPPORTED
Ø Global Options     Fixed Frame map	Type: Orbit (rviz_default_ + Zero	NF0] [1671176977.106400834] [rviz2]: OpenGl version: 3.1 (GLSL 1.4)
Bidgeour Care 18:48:48 France Mar 19 • Gride Virtual error	Current View Orbit (viz) Max (20, 6, 601 Trupset Frame - Fixed Frames Decade one - 10 - 00 Forcal Shape 0 Yee - 0, 785398 • Focal Reint 0, 0, 0	crangepläncangeplä:-Deskrop (* - Deskrop 00-24 angeplänrangeplä:-Deskrop 80-24 LSB mödules are available, stributer TJ: Domitu Frifplin: Upanta 20.04.5 LTS domase: Foral angepläprangeplä:-Obeskrop5
Add Duglicate Remove Remove	Save Remove Rename	
© Time	×	
ROS Time: 1671177054.95 ROS Elapsed: 76.07 Wall Time: 1671177054.98 Wall Elapsed: 76.04	Experimental	
Reset	22 fps	

8) For the usage of ROS, please refer to the ROS 2 documentation.

http://docs.ros.org/en/galactic/Tutorials.html

#### 3. 25. 3. How to install ROS 2 Humble on Ubuntu 22.04

1) Use the **install\_ros.sh** script to install ros2.

orangepi@orangepi:~\$ install\_ros.sh ros2

2) After the **install\_ros.sh** script installs ros2, it will automatically run the **ros2-h** command. If you can see the following print, it means that ros2 is installed successfully.

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 exit

Commands:

action	Various action related sub-commands
bag	Various rosbag related sub-commands
component	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@orangepicm5:~\$ 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. 26. How to install kernel header files

1) The Linux image released by OPi comes with the deb package of the kernel header file by default, which is stored in **/opt/**.

orangepi@orangepi:~\$ ls /opt/linux-headers\*

/opt/linux-headers-legacy-rockchip-rk3588\_x.x.x\_arm64.deb

2) Use the following command to install the kernel header file deb package.

The name of the kernel header file deb package needs to be replaced with the actual name, please do not copy it.

orangepi@orangepi:~\$ sudo dpkg -i /opt/linux-headers-legacy-rockchip-rk3588\_1.x.x\_arm64.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-5.10.160-rockchip-rk3588 4) Then you can write a hello kernel module to test the kernel header file.

a. First, write the code for the hello kernel module as follows:

```
orangepi@orangepi:~$ vim hello.c
#include <linux/init.h>
#include <linux/module.h>
static int hello init(void)
         printk("Hello Orange Pi -- init\n");
         return 0;
static void hello_exit(void)
         printk("Hello Orange Pi -- exit\n");
         return;
module init(hello init);
module exit(hello exit);
MODULE LICENSE("GPL");
        Then write the Makefile file to compile the hello kernel module as follows:
    b.
orangepi@orangepi:~$ vim Makefile
ifneq ($(KERNELRELEASE),)
obj-m:=hello.o
else
KDIR :=/lib/modules/$(shell uname -r)/build
PWD :=$(shell pwd)
all:
    make -C $(KDIR) M=$(PWD) modules
clean:
    rm -f *.ko *.o *.mod.o *.mod *.symvers *.cmd *.mod.c *.order
```

endif

c. Then use the make command to compile the hello kernel module. The output of the compilation process is as follows:

If there is a problem compiling the code you copied here, please download the source code from the official tool and upload it to the Linux system of the development board for testing.

hello kernel module source code and Makefile

orangepi@orangepi:~\$ make

make -C /lib/modules/5.10.160-rockchip-rk3588/build M=/home/orangepi modules

make[1]: Entering directory '/usr/src/linux-headers-5.10.160-rockchip-rk3588'

CC [M] /home/orangepi/hello.o

MODPOST /home/orangepi/Module.symvers

CC [M] /home/orangepi/hello.mod.o

LD [M] /home/orangepi/hello.ko

make[1]: Leaving directory '/usr/src/linux-headers-5.10.160-rockchip-rk3588'

d. After compilation, the **hello.ko** kernel module will be generated.

orangepi@orangepi:~\$ ls \*.ko

#### hello.ko

e. Use the **insmod** command to insert the **hello.ko** kernel module into the kernel.

orangepi@orangepi:~\$ sudo insmod hello.ko

f. Then use the **demsg** command to view the output of the **hello.ko** kernel module. If you can see the following output, it means that the **hello.ko** kernel module is loaded correctly.

orangepi@orangepi:~\$ dmesg | grep "Hello"

[ 2871.893988] Hello Orange Pi -- init

g. Use the **rmmod** command to uninstall the **hello.ko** kernel module.

orangepi@orangepi:~\$ sudo rmmod hello

orangepi@orangepi:~\$ dmesg | grep "Hello"

2871.893988] Hello Orange Pi -- init

[ 3173.800892] Hello Orange Pi -- exit

# 3. 27. Instructions for using the power on/off logo

1) The power on/off logo is displayed only in the desktop version of the system by default.

2) Set the **bootlogo** variable to **false** in **/boot/orangepiEnv.txt** to turn off the power on/off logo.

orangepi@orangepi:~\$ vim /boot/orangepiEnv.txt verbosity=1 bootlogo=false

3) Set the **bootlogo** variable to **true** in **/boot/orangepiEnv.txt** to enable the power on/off logo.

orangepi@orangepi:~\$ **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 image, you need to run the following command to make it take effect.

orangepi@orangepi:~\$ sudo update-initramfs -u

# 3. 28. How to use ZFS file system

#### $3.\ 28.\ 1. \quad \text{How to install ZFS}$

Before installing zfs, you need to install the kernel header file first. For the method of installing the kernel header file, please refer to the instructions in the section "How to install the kernel header file".

In Ubuntu 20.04, Ubuntu 22.04 and Debian 11 systems, zfs cannot be installed directly through apt. This is because the zfs version in the default apt source is lower than 2.1.6, which is incompatible with the rk linux 5.10 kernel. This problem has been fixed in zfs 2.1.6 and later versions.

To solve this problem, we provide a deb package of zfs that can be installed normally, which can be downloaded from the **official tool** of the development board. Open the **official tool**, and then enter **the deb package folder related to zfs used by Ubuntu and Debian systems**. You can see three types of deb packages: Ubuntu20.04, Ubuntu22.04, and Debian11. Please download the required version.



After downloading the corresponding version of the zfs deb package, please upload them to the Linux system of the development board. For the upload method, please refer to the instructions in the section "How to upload files to the Linux system of the development board".

After uploading, use the **cd** command in the command line of the Linux system of the development board to enter the directory of the deb package, and then use the following command to install the zfs deb package.

orangepi(worangepi.~\$ suud apt mstan./ .ueb
--

After the installation is complete, you can see the zfs-related kernel modules using the following command:

orangepi@orangepi:~\$ ls /lib/modules/5.10.160-rockchip-rk3588/updates/dkms/ icp.ko spl.ko zavl.ko zcommon.ko zfs.ko zlua.ko znvpair.ko zunicode.ko zzstd.ko

Then restart the Linux system and you will see that the zfs kernel module will be automatically loaded:

orangepi@orang	gepi:~\$ lsmod   gre	p "zfs"		
zfs	2801664	0		
zunicode	327680	1 zfs		
zzstd	471040	1 zfs		
zlua	139264	1 zfs		

🥺 range Pi User N	Ianual	Copyright reserved by Shenzhen Xunlong Software Co., Ltd			
zcommon	69632	2 1 zfs			
znvpair	61440	2 zfs,zcommon			
zavl	16384	1 zfs			
icp	221184	1 zfs			
spl	77824	6 zfs,icp,zzstd,znvpair,zcommon,zavl			

In Debian 12, the default version of zfs is 2.1.11, so we can install zfs directly through the following command. Once again, please make sure that the system has installed the deb package of the kernel header file before installation.

orangepi@orangepi:~\$ sudo apt install -y zfsutils-linux zfs-dkms

#### 3. 29. How to install and use CasaOS

CasaOS is an open source home cloud system based on the Docker ecosystem, which allows you to run a variety of home applications on your own development board, such as NAS, home automation, media server, etc.

There are many problems with installing CasaOS on Debian 12, so please do not use this method to install it.

#### 3. 29. 1. How to install CasaOS

20

1) First, you need to install docker. Docker is already pre-installed in the system released by Orangepi Pi. This step can be skipped. You can use the following command to view the installed docker version.

orangepi@orangepi:~\$ docker --version Docker version 24.0.2, build cb74dfc # Output from Ubuntu Jammy system

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

orangepi@orangepi:~\$ curl -fsSL https://get.casaos.io | sudo bash

3) When you see the following print information output in the terminal, it means that CasaOS has been installed.

8		
CasaOS v0.4.4.2	is running at:	
Open your brows	er and visit the above address.	
CasaOS Project	: https://github.com/IceWhaleTech/CasaOS	
CasaOS Team	: https://github.com/IceWhaleTech/CasaOS#mair	itainers
CasaOS Discord	: https://discord.gg/knqAbbBbeX	
Website	: https://www.casaos.io	
Online Demo	: http://demo.casaos.io	
Uninstall	: casaos-uninstall	

#### 3. 29. 2. How to use CasaOS

1) After installing CasaOS, enter http://development board's IP address in the browser to open CasaOS.

2) After opening CasaO, the welcome interface below will pop up. Click "Go" to proceed to the next step.



3) When you log in to CasaOS for the first time, the login interface is the interface for setting the account and password. When you log in again in the future, only the interface for entering the account and password will appear. After setting the account and password,



click "Create" to proceed to the next step.



4) In the following interface, just click "Accept" to proceed to the next step.



5) Now you have entered the main page of CasaOS. There are three icons in the upper left corner for function settings. On the left is the performance panel, which can display the current time and the status information of CPU, RAM, storage, and network. On the right is the function panel with functions such as search, application recommendation, application store, and file management.



6) You can click the first icon in the upper left corner to modify your account and password.



7) You can click the second icon to set basic functions.



8) The third icon in the upper left corner has two main functions, namely switching to command line mode and printing log information. When switching to command line mode, you need to enter the account and password. The account and password here refer to the account and password of the development board Linux system. The port system defaults to 22.

CasaOS	× +					*
← → C ▲ Not secur	re   192.168.43.235/#/					⊶ < ☆ 🛦 🖬 😩 :
A # 📵						
		CasaOS			×	
		Terminal Logs				
					Enounce extract distribution of the second second	
			Username			
			orangepi			
			Password			
	0.00 6 13 68		orangepi	Q		
			Ports		100	
			22			
			Connect			

9) Then click "Connect" to enter the command line interface:



10) Another function under the third icon is to print the CasaOS log. Click "Logs" to enter. The interface is as follows:



11) Click "Widget settings" in the lower left corner to set whether to display the performance panel widget on the main page.



12) Click "APP Store" on the main interface to open the App Store. Currently, there are more than 70 APPs available in the App Store.



13) Here we take Home Assistant as an example for downloading. Find Home Assistant in the APP Store and click the corresponding "install".



14) After the download is complete, HostAssitant will appear on the main page.



15) Click "Files" in the main interface to open the file system that comes with CasaOS, and then you can upload and save files.

Please make sure other devices and the development board are in the same LAN.



16) When uploading files, you need to switch to the target folder, then drag the local file to the indicated area in the figure, or click "Upload or Create" in the upper right corner to select the file to upload.



17) If you want to uninstall CasaOS, you can use the following command:

orangepi@orangepicm5:~\$ casaos-uninstall

## 3. 30. Methods of using NPU

#### 3. 30. 1. **Prepare tools**

1) A PC with Ubuntu 20.04 operating system installed

According to the official documentation of RKNN-Toolkit2, the current version of RKNN-Toolkit2 supports the following operating systems:

a. Ubuntu18.04 (x64)

b. Ubuntu20.04 (x64)

c. Ubuntu22.04 (x64)

In this document, we demonstrate using the Ubuntu20.04 (x64) operating system. Please test other versions of the operating system yourself.

2) An Orange Pi 5 Plus development board with Debian 11 system installed

3) A Type-C interface data cable for using adb function



#### 3. 30. 2. Installing RKNN-Toolkit2 on Ubuntu PC

Toolkit2 is a development kit used on the Ubuntu PC platform. Users can easily complete functions such as model conversion, inference, and performance evaluation using the Python interface provided by the tool.

1) On the Ubuntu PC side, open a command-line window and enter the following command to install python3 and pip3

test@test:~\$ sudo apt-get install python3 python3-dev python3-pip

2) You can use the following command to view the installed version of python3

test@test:~\$ **python3 --version** Python 3.8.10

3) Then enter the following command to install the dependency package of RKNN-Toolkit2

test@test:~\$ sudo apt-get update test@test:~\$ sudo apt-get install libxslt1-dev zlib1g-dev libglib2.0 \ libsm6 libgl1-mesa-glx libprotobuf-dev gcc

4) Then enter the following command to download RKNN-Toolkit2 version 1.5.2
 test@test:~\$ git clone git clone https://github.com/airockchip/rknn-toolkit2 -b v1.5.2

5) Then enter the following command to install the dependency package for the corresponding version of python3. This command will use the dependencies listed in the pip3 installation file requirements\_cp38-1.5.2.txt. If the dependency installation is incomplete, do not specify the installation source and install each package separately.

test@test:~\$ pip3 install -r rknn-toolkit2/doc/requirements\_cp38-1.5.2.txt -i \

#### https://mirror.baidu.com/pypi/simple

6) Then enter the following command to use pip3 to install the RKNN-Toolkit2 package. After installation, you can use RKNN-Toolkit2

test@test:~\$ pip3 install rknn-toolkit2/packages/rknn\_toolkit2-1.5.2+b642f30c-cp38-cp38-linux\_x86\_64.whl

# 3. 30. 3. Use RKNN-Toolkit2 for model transformation and model inference

**RKNN-Toolkit2 supports converting models such as Caffe, TensorFlow, Te** nsorFlow Lite, ONNX, DarkNet, PyTorch, etc. into RKNN models, and then r unning the RKNN models through simulation or using the NPU of the develo pment board on Ubuntu PC for inference.

The example folder in RKNN-Toolkit2 provides relevant examples to help users better understand how to operate. We take the ONNX model with yolo v5 functionality as an example for illustration.

#### 3. 30. 3. 1. Simulating and Running Models on Ubuntu PC

**RKNN-Toolkit2** is equipped with a built-in simulator that allows users to simulate the inference process of models on Rockchip NPU on Ubuntu PC.

This way, both model conversion and inference can be completed on Ubu ntu PC, helping users test and validate their models faster.

1) First, switch to the rknn-toolkit2/examples/onnx/yolov5 directory test@test:~\$ cd rknn-toolkit2/examples/onnx/yolov5/

2) Then run the test.py script, which first converts the yolov5s\_relu.onnx model into an RKNN model that can be run on the simulator, and then uses the simulator to simulate and run the model to infer the bus.jpg image in the current directory

test@test:~/rknn-toolkit2/examples/onnx/yolov5\$ python3 test.py

3) After the test. py script runs successfully, the following print message will be seen, indicating that the model has successfully detected four people and a bus in the bus.jpg image

done --> Running model

W inference: The 'data_format' has not been set and defaults is nhwc!
done
class: person, score: 0.884139358997345
box coordinate left,top,right,down: [209.1040009856224, 244.4304337501526, 286.5742521882057,
506.7466902732849]
class: person, score: 0.8676778078079224
box coordinate left,top,right,down: [478.5757632255554, 238.58572268486023, 559.5273861885071,
526.479279756546]
class: person, score: 0.8246847987174988
box coordinate left,top,right,down: [110.57257843017578, 238.58099019527435,
230.54625701904297, 534.0008579492569]
class: person, score: 0.3392542004585266
box coordinate left,top,right,down: [79.96397459506989, 354.9062474966049, 122.13020265102386,
516.2529321908951]
class: bus , score: 0.7012234926223755
box coordinate left,top,right,down: [94.43931484222412, 129.53470361232758, 553.1492471694946,
468.0852304697037]
D NPUTransfer: Transfer client closed, fd = 3

4) The converted model file yolov5s\_relu.rknn and the inferred image result result.jpg are saved in the current directory

5) The result.jpg image shows the object categories and confidence rates detected in the bus.jpg image using the yolov5s\_relu.rknn model



# 3. 30. 3. 2. NPU running model using development board on Ubuntu PC

**RKNN-Toolkit2** provides users with a Python interface for inference using the NPU of the development board through adb, allowing users to run mode ls for inference on Ubuntu PC using the NPU of the development board.

In this way, Ubuntu PC can optimize and adjust the model based on its actual performance when running on the NPU of the development board, usin g the machine learning library provided by Python.

#### 3. 30. 3. 2. 1. Connect adb using Type-C data cable

Operate the development board through adb on Ubuntu PC, please refer to the section on **ADB usage for instructions** on how to use adb

# 3. 30. 3. 2. 2. Update the rknn\_server and librknnrt.so of the development board

librknnrt.so is a runtime library on the board.

rknn\_server is a backend proxy service running on the development boar d, used to receive protocols transmitted from the PC via USB, execute the co rresponding interface in the runtime library on the board, and return the res ults to the PC.

1) First, enter the following command on Ubuntu PC to download RKNPU2 version 1.5.2

test@test:~\$ git clone https://github.com/rockchip-linux/rknpu2 -b v1.5.2

2) Then, on the Ubuntu PC side, enter the following command to update the rknn\_server of the development board through the adb tool

test@test:~\$ adb push rknpu2/runtime/RK3588/Linux/rknn\_server/aarch64/usr/bin/\* /usr/bin

3) Then enter the following command on Ubuntu PC to update the librknnrt.so library of the development board through adb tool

test@test:~\$ adb push rknpu2/runtime/RK3588/Linux/librknn\_api/aarch64/librknnrt.so /usr/lib

4) Open the terminal of the development board through the adb tool
 test@test:~\$ adb shell

5) Open the rknn\_server service on the development board

root@orangepi:/# sudo restart rknn.sh

root@orangepi:/# start rknn server,version:1.5.2(8babfeabuild@2023-08-25T10:30:31) I NPUTransfer: Starting NPU TransferServer,Transfer version 2.1.0(b5861e7@2020-11-23T11:50:51)

6) You can use the following command to check. If the process ID of rknn\_server appears, it means that rknn\_server is already open, and the running environment of the development board is set up

root@orangepi:/# pgrep rknn\_server

3131

# 3. 30. 3. 2. 3. Modify parameters in the example

1) On the Ubuntu PC side, you can view the device ID of the development board connected to the Ubuntu PC using the following command. This ID will be used below

test@test:~\$ **adb devices** List of devices attached 4f9f859e5a120324 device

 Switch to the rknn-toolkit2/examples/onnx/yolov5 directory test@test:~\$ cd rknn-toolkit2/examples/onnx/yolov5/

Use Vim editor to modify the test.py file
 test@test:~/rknn-toolkit2/examples/onnx/yolov5\$ vim test.py

4) In the test.py file, we need to make modifications to the following content:

a. In the preprocessing configuration, modify the target platform to rk3588, so that the resulting model is an RKNN model suitable for NPU on the RK3588 development board

```
# pre-process config
print('--> Config model')
rknn.config(mean_values=[[0, 0, 0]], std_values=[[255, 255, 255]], target_platform='rk3583')
print('done')
```

b. In the initialization running environment, add explanations for the target platform and device ID. The target platform is rk3588, and the device ID is the device ID obtained from the development board through adb. The inference operation of the running model will be performed on the NPU of the RK3588 development board

# Init runtime environment			
<pre>print('&gt; Init runtime environment')</pre>			
ret = rknn.init_runtime(target='rk3583 ,device_id='4f9f859e5a120324')			
if ret != 0:			
<pre>print('Init runtime environment failed!')</pre>			
exit(ret)			
<pre>print('done')</pre>			

c. After modification, save and exit

#### 3. 30. 3. 2. 4. Running Examples on Ubuntu PC

1) Enter the following command to run the test.py script, which first converts the yolov5s\_relu.onnx model to an RKNN model, and then loads the model onto the NPU of the development board to infer the out.jpg image in the current directory

test@test:~/rknn-toolkit2/examples/onnx/yolov5\$ python3 test.py

2) Enter the following command to run the test. py script, which first converts the yolov5s\_relu.onnx model to an RKNN model, and then loads the model onto the NPU of the development board to infer the out.jpg image in the current directory

--> Init runtime environment I target set by user is: rk3588 I Check RK3588 board npu runtime version I Starting ntp or adb, target is RK3588 I Device [4f9f859e5a120324] not found in ntb device list. I Start adb... I Start adb... I Connect to Device success! I NPUTransfer: Starting NPU Transfer Client, Transfer version 2.1.0

(b5861e7@2020-11-23T11:50:36)

3) After the test.py script runs successfully, the converted model file yolov5s\_relu.rknn and the inferred image result result.jpg are saved in the current directory

4) The result of running is the same as the section on **simulating the running model on Ubuntu PC** 

# 3. 30. 4. Call the C interface to deploy the RKNN model to the development board and run it

**RKNPU2** provides a C programming interface for chip platforms with Ro ckchip NPU, which can help users deploy RKNN models exported from RKN N-Toolkit2 and accelerate the implementation of AI applications.

In the example folder of RKNPU2, there are examples of deploying RKN N models with different functionalities to the development board. We take the deployment of an RKNN model with yolov5 functionality to the RK3588 Deb ian 11 platform as an example for illustration.

### 3. 30. 4. 1. **Download Cross Compile Tool**

Due to the development board running a Linux system, it is necessary to use the gcc cross compiler for compilation. Recommend using the gcc-9.3.0-x86\_64\_a rrch64-linux-gnu version of gcc

Enter the following command to download this version of gcc. After downloa ding, you will receive a folder named gcc-buildroot-9.3.0-2020.03-x86\_64\_aarch64-r ockchip-linux-gnu

test@test:~\$ git clone https://github.com/airockchip/gcc-buildroot-9.3.0-2020.03-x86\_64\_aarch 64-rockchip-linux-gnu

### 3. 30. 4. 2. Modify the compilation tool path in the script

1) Switch to the rknpu2/examples/rknn\_yolov5\_demo directory test@test:~\$ cd ~/rknpu2/examples/rknn\_yolov5\_demo

2) Modify the contents of the build-linux\_RK3588.sh file using the vim editor test@test:~/rknpu2/examples/rknn\_yolov5\_demo\$ vim build-linux\_RK3588.sh

3) In the build-linux\_RK3588.sh file, we need to change the value of the variable TOOL\_CAIN to the path of the gcc-buildroot-9.3.0-2020.03-x86\_64\_aarch64-rockc hip-linux-gnu folder. In this way, when running the build-android\_RK3588.sh script, the cross compilation tool in the gcc-buildroot-9.3.0-2020.03-x86\_64\_aarch64-rockc hip-linux-gnu folder will be used for compilation



4) After modification, save and exit

# 3. 30. 4. 3. **Compiling rknn\_yolov5\_demo**

1) Run build-linux\_RK3588.sh, which generates a program suitable for the RK3588 development board and capable of running RKNN models for inference through cross compilation

test@test:~/rknpu2/examples/rknn\_yolov5\_demo\$ **sudo apt install cmake** test@test:~/rknpu2/examples/rknn\_yolov5\_demo\$ **sudo apt-get install g++-aarch64-linux-gnu** test@test:~/rknpu2/examples/rknn\_yolov5\_demo\$ **./build-linux\_RK3588.sh** 

2) After running build-linux\_RK3588.sh, an additional folder named install will appear in the current directory. The rknn\_yoov5\_demo\_Linux folder in this folder contains programs generated through cross compilation and related files

test@test:~/rknpu2/examples/rknn\_yolov5\_demo\$ ls install rknn\_yolov5\_demo\_Linux

# 3. 30. 4. 4. Deploy rknn\_yolov5\_demo to the development board

On the Ubuntu PC side, the following command can be used to upload the r knn\_yolov5\_demo\_Linux folder to the development board through the adb tool, the reby achieving the deployment of rknn\_yolov5\_demo on the development board test@test:~/rknpu2/examples/rknn\_yolov5\_demo\$ adb push \ install/rknn\_yolov5\_demo\_Linux /data/rknn\_yolov5\_demo\_Linux

# 3. 30. 4. 5. Running rknn\_yolov5\_demo on the development board

 Accessing the file system of the development board through adb shell on Ubuntu PC test@test:~\$ adb shell root@orangepi:/#

2) Switch to the rknn\_yolov5\_demo\_Linux directory
root@orangepi:/# cd /data/rknn\_yolov5\_demo\_Linux/
root@orangepi:/data/rknn\_yolov5\_demo\_Linux# ls
lib model rknn yolov5 demo rknn yolov5 video demo

3) Then run the rknn\_yolov5\_demo program for inference. In the following command, the program uses the yolov5s-640-640.rknn model to infer bus.jpg images. The entire running process will be completed on the development board

root@orangepi:/data/rknn\_yolov5\_demo\_Linux# ./rknn\_yolov5\_demo \ ./model/RK3588/yolov5s-640-640.rknn ./model/bus.jpg

4) After running, the inference result out.jpg image is saved in the current directory root@orangepi:/data/rknn\_yolov5\_demo\_Linux# ls
lib model out.jpg rknn yolov5 demo rknn yolov5 video demo

5) On the Ubuntu PC side, we can use the following command to download out.jpg images through the adb tool, and then use an image viewer to view them

test@test:~\$ adb pull /data/rknn_yolo	v5_dei	no_	Linux/	out.jpg ~	~/Desktop/	
/data/rknn_yolov5_demo_Linux/out.jpg:	led.	1.9	MB/s	(191507	bytes in (	0.095s)

6) The out.jpg image shows the object categories and confidence rates detected in the bus.jpg image using the yolov5s-640-640.rknn model



# 3. 31. RK3588 method of using PaddlePaddle

Using PaddlePaddle on the rk3588 development board, including converting the pdmodel model to the rknn model on the PC and deploying the rknn model on the board using PaddlePaddle FastDeploy deployment tool. The following content was implemented in an environment with Ubuntu22.04 on the PC side and Debian 11 on the board side. Please test it yourself in other environments.

#### 3. 31. 1. Ubuntu PC environment setup

The tools and purposes that need to be installed on Ubuntu PC are as follows

Tool Name	Purpose					
Anaconda3	Used for creating and managing Python					
	environments					
Paddle2ONNX	Used to convert pdmodel model to					
	ONNX model					
RKNN-Toolkit2	Used to convert ONNX models to RKNN					
	models					

### 3. 31. 1. 1. Installing Anaconda3 on PC

1) Open a browser on Ubuntu PC and enter the following URL in the address bar to

download and install the Anaconda3 script. After downloading, you will receive the **Anaconda3-2023.07-1-Linux-x86 64.sh** file

https://mirrors.tuna.tsinghua.edu.cn/anaconda/archive/Anaconda3-2023.07-1-Linux -x86 64.sh

2) Then open the terminal and run the **Anaconda3-2023.07-1-Linux-x86\_64.sh** script to install Anaconda3

test@test:~/Downloads\$ sh Anaconda3-2023.07-1-Linux-x86\_64.sh

3) Then the installation script will output the following prompt message. Click the enter key to continue the installation



4) After clicking the enter key, some introduction information about Anaconda3 will appear. Keep clicking the "  $\downarrow$  " key



5) Then the installation script will prompt whether to accept the license terms. At this point, enter yes and press enter to proceed



6) Then the installation script will remind you to install Anaconda3 to your home directory. Press Enter to confirm

🍯 range Pi User Manual



7) Then the installation script will prompt whether to initialize Anaconda3. Enter yes and press enter



8) When the following print appears on the terminal, it indicates that Anaconda3 has been successfully installed

If you'd prefer that conda's base environment not be activated on startup, set the auto\_activate\_base parameter to false: conda config --set auto\_activate\_base false

Thank you for installing Anaconda3!

# 3. 31. 1. 2. **PC installation of RKNN-Toolkit2**

1) Open the terminal on Ubuntu PC and create an environment with Python version 3.8 using Anaconda3 tool

(base)test@test:~\$ conda create -n fastdeploy python=3.8

2) Activate the environment of python3.8 that was just created(base)test@test:~\$ conda activate fastdeploy

3) Then install the pip3 development tool and package management tool (fastdeploy)test@test:~\$ sudo apt-get install python3-dev python3-pip



4) Then install the dependency package for RKNN-Toolkit2

(fastdeploy)test@test:~\$ sudo apt-get install libxslt1-dev zlib1g-dev libglib2.0 libs m6 libgl1-mesa-glx libprotobuf-dev gcc

5) rknn\_toolkit2 has a specific dependency on numpy, so numpy==1.16.6 needs to be installed first

(fastdeploy)test@test:~\$ pip install numpy==1.16.6

6) Install git tools

(fastdeploy)test@test:~\$ sudo apt install git

7) Then execute the following command to download RKNN-Toolkit2. After downloading, you will receive the rknn-toolkit2 folder

(fastdeploy)test@test:~\$ git clone https://github.com/rockchip-linux/rknn-toolkit2

8) Then execute the following command to install RKNN-Toolkit2 corresponding to Python 3.8 version

(fastdeploy)test@test:~\$ pip install rknn-toolkit2/rknn-toolkit2/packages/rknn\_tool kit2-1.6.0+81f21f4d-cp38-cp38-linux\_x86\_64.whl

# 3. 31. 1. 3. Installing Paddle2ONNX on PC

You can execute the following command to install paddle2onnx

(fastdeploy)test@test:~\$ pip install paddle2onnx

#### 3. 31. 2. Board end environment setup

The tools and purposes that need to be installed at the board end are as follows

Tool Name	Purpose		
Anaconda3	Used for creating and managing Python		
	environments		
rknpu2	The basic driver of rknpu2		
FastDeploy	Compile to obtain FastDeploy inference		
	library		
# 3. 31. 2. 1. Board end installation of Anaconda3

1) Open a browser on the board and enter the following URL in the address bar to download and install the Anaconda3 script. After downloading, you will receive the **Anaconda3-2023.07-1-Linux-aarch64.sh** 

https://mirrors.tuna.tsinghua.edu.cn/anaconda/archive/Anaconda3-2023.07-1-Linux -aarch64.sh

2) Open the terminal and run the **Anaconda3-2023.07-1-Linux-aarch64.sh** script to install Anaconda3

orangepi@orangepi:~/Downloads\$ sh Anaconda3-2023.07-1-Linux-aarch64.sh

3) Then the installation script will output the following prompt message, click enter to continue the installation

rangepi@orangepi5:-/Downloads\$ sh Anaconda3-2023.07-1-Linux-aarch64.sh @lcome to Anaconda3 2023.07-1 n order to continue the installation process, please review the license greement. Lesse, press ENTER to continue

4) After clicking the enter key, some introduction information about Anaconda3 will appear. Keep clicking the " $\downarrow$ " key



5) Then the installation script will prompt whether to accept the license terms. At this point, enter 'yes' and press enter to proceed

The following packages listed on https://www.anaconda.com/cryptography are included in the repository accessible through Anaconda Distribution that relate to cryptography. Last updated February 25, 2022 Do you accept the license terms? [yes|no]

6) Then the installation script will remind you to install Anaconda3 to your home directory. Press Enter to confirm



7) Then the installation script will prompt whether to initialize Anaconda3. Enter yes and press enter



for installing Anaconda3!

8) When the following print appears on the terminal, it indicates that Anaconda3 has been successfully installed

```
f you'd prefer that conda's base environment not be activated on startup,
set the auto_activate_base parameter to false:
onda config --set auto_activate_base false
```

9) If you use the conda command on the terminal and it shows that the command does not exist, you need to modify the  $\sim$ /.bashrc file

orangepi@orangepi:~\$ vi ~/.bashrc

10) Add the following code at the end of the  $\sim$ /.bashrc file

export PATH=/home/orangepi/anaconda3/bin:\$PATH

11) Then enter the following command in the terminal to make the previous modification effective

orangepi@orangepi:~\$ source ~/.bashrc

12) Then enter the following command in the terminal to initialize conda (base)orangepi@orangepi:~\$ conda init bash

13) Then close the current terminal and reopen another terminal, and you can use the conda command normally now

# 3. 31. 2. 2. Board end installation of rknpu2 driver

1) Open the terminal on the board and create an environment with python version 3.9 using the Anaconda3 tool

(base)orangepi@orangepi:~\$ conda create -n fastdeploy python=3.9

2) Activate the environment of python3.9 that was just created (base)orangepi@orangepi:~\$ conda activate fastdeploy

3) Download the rknpu2\_device\_install\_1.4.0.zip file through wget
 (fastdeploy)orangepi@orangepi:~\$ wget https://bj.bcebos.com/fastdeploy/third\_libs/r
 knpu2\_device\_install\_1.4.0.zip

4) Then the following command is executed to decompress

rknpu2\_device\_install\_1.4.0.zip, which will result in the rknpu2\_device\_install\_1.4.0 folder and the MACOSX folder

(fastdeploy)orangepi@orangepi:~\$ unzip rknpu2\_device\_install\_1.4.0.zip

5) Switch to the directory rknpu2\_device\_install\_1.4.0 (fastdeploy)orangepi@orangepi:~\$ cd rknpu2\_device\_install\_1.4.0/

6) There is the rknn\_install\_rk3588.sh script in this directory. Running this script will complete the installation of the rknpu2 driver on the board

(fastdeploy)orangepi@orangepi:~/rknpu2\_device\_install\_1.4.0\$ sudo bash rknn\_install\_r k3588.sh

# 3. 31. 2. 3. Board side compilation FastDeploy C++ SDK

1) During compilation, the cmake command is required. You can execute the following command to install the cmake tool

(fastdeploy)orangepi@orangepi:~\$ sudo apt-get install -y cmake

2) Then download the FastDeploy SDK, and after the command is executed, you will receive the FastDeploy folder

(fastdeploy)orangepi@orangepi:~\$ git clone https://github.com/PaddlePaddle/FastD eploy.git

3) Switch to FastDeploy directory

(fastdeploy)orangepi@orangepi:~\$ cd FastDeploy

4) Create the build directory and switch to the build directory
 (fastdeploy)orangepi@orangepi:~/FastDeploy\$ mkdir build && cd build

5) Before compilation, cmake needs to be used to configure the project information that needs to be compiled. After executing the following command, some additional files will appear in the current directory, including the Makefile file file used for compilation

(fastdeploy)orangepi@orangepi:~/FastDeploy/build\$ cmake .. -DENABLE\_ORT\_BACKEND=ON \ -DENABLE\_RKNPU2\_BACKEND=ON \ -DENABLE\_VISION=ON \

-DRKNN2\_TARGET\_SOC=RK3588 \

-DCMAKE\_INSTALL\_PREFIX=\${PWD}/fastdeploy-0.0.3

6) Execute the following command to start compiling
 (fastdeploy)orangepi@orangepi:~/FastDeploy/build\$ make -j8

7) After compilation, use the following command to install the compiled file to the specified path

(fastdeploy)orangepi@orangepi:~/FastDeploy/build\$ make install

8) After the compilation is completed, the main folder obtained is fastdeploy-0.0.3. In this folder, there is a script file called fastdeploy\_init.sh for configuring environment variables. After using this script to configure environment variables, you can use some of the compiled library files

(fastdeploy)orangepi@orangepi:~/FastDeploy/build\$ source fastdeploy-0.0.3/fastdeploy\_init.sh

#### 3. 31. 3. Deploying Model Example with FastDeploy

The ResNet50\_vd model is a model used for object classification. Taking the ResNet50\_vd model as an example, we will explain the process of deploying the

pdmodel model using FastDeploy

# 3. 31. 3. 1. Ubuntu PC Model Conversion

1) Open the terminal on the PC and activate the python3.8 environment created using Anaconda3 before activation

test@test:~\$ conda activate fastdeploy

2) In the script for model conversion, it is necessary to import the yaml module and the six module. You can execute the following command to install them

(fastdeploy)test@test:~\$ pip install pyyaml six

3) Execute the following command to download the ResNet50\_vd\_infer.tgz file (fastdeploy)test@test:~\$ wget https://bj.bcebos.com/paddlehub/fastdeploy/ResNet50\_vd\_infer.tgz

4) After decompressing the ResNet50\_vd\_infer.tgz file, you can obtain the ResNet50\_vd\_infer folder, which contains the pdmodel file inference.pdmodel and other related files

(fastdeploy)test@test:~\$ tar -xvf ResNet50\_vd\_infer.tgz

5) You can use the following command to convert the pdmodel model to an onnx model through paddle2onnx. After executing this command, the converted onnx model file ResNet50 vd infer.onnx will appear in the ResNet50 vd infer folder

(fastdeploy)test@test:~\$ paddle2onnx --model\_dir ResNet50\_vd\_infer \ --model\_filename inference.pdmodel \ --params\_filename inference.pdiparams \ --save\_file ResNet50\_vd\_infer/ResNet50\_vd\_infer.onnx \ --enable\_dev\_version True \ --opset\_version 10 \ --enable\_onnx\_checker True

6) Then use the following command to fix the shape to [1,3,224,224]. After executing the command, the ResNet50\_vd\_infer.onnx file will be modified

(fastdeploy)test@test:~\$ python -m paddle2onnx.optimize --input\_model \ ResNet50\_vd\_infer/ResNet50\_vd\_infer.onnx \ --output\_model ResNet50\_vd\_infer/ResNet50\_vd\_infer.onnx \ --input\_shape\_dict "{'inputs':[1,3,224,224]}"

7) To convert the onnx model to the rknn model, you need to use the script in the FastDeploy SDK. Execute the following command to download FastDeploy (fastdeploy)test@test:~\$ git clone https://github.com/PaddlePaddle/FastDeploy.git

8) Then transfer the ResNet50\_vd\_inner folder to the corresponding directory in FastDeploy

(fastdeploy)test@test:~\$ mv ResNet50\_vd\_infer \

FastDeploy/examples/vision/classification/paddleclas/rockchip/rknpu2/

9) Switch to the directory for model conversion

(fastdeploy)test@test:~\$ cd FastDeploy/examples/vision/classification/paddleclas/rockchip/rknpu2/

10) By executing the following command, you can convert the onnx model to an rknn model, and finally obtain the rknn model file

ResNet50\_vd\_infer\_rk3588\_unquantized.rknn in the ResNet50\_vd\_infer directory

(fastdeploy)test@test:~/FastDeploy/examples/vision/classification/paddleclas/rockchip/rknpu2/\$ python ./rknpu2\_tools/export.py \

--config\_path ./rknpu2\_tools/config/ResNet50\_vd\_infer\_rknn.yaml \

--target\_platform rk3588

11) When deploying on the board side, the rknn model file name used is

ResNet50 vd infer rk3588.rknn, so it is necessary to rename the

ResNet50 vd infer rk3588 unquantized.rknn file to ResNet50 vd infer rk3588.rknn

(fastdeploy)test@test:~/FastDeploy/examples/vision/classification/paddleclas/rockchip/rknpu2/\$ mv ResNet50\_vd\_infer/ResNet50\_vd\_infer\_rk3588\_unquantized.rknn \
ResNet50\_vd\_infer/ResNet50\_vd\_infer\_rk3588.rknn

# 3. 31. 3. 2. Board End Model Deployment

1) Open the terminal on the board and activate the Python 3.9 environment created using Anaconda3 before activation

orangepi@orangepi:~\$ conda activate fastdeploy

2) Run the fastdeploy\_init.sh script to configure the environment

(fastdeploy)orangepi@orangepi:~\$ source FastDeploy/build/fastdeploy-0.0.3/fastdeploy\_init.sh

3) Switch to the example directory for deploying ResNet50 models in FastDeploy

(fastdeploy)orangepi@orangepi:~\$ cd FastDeploy/examples/vision/classification/paddleclas/rockchip/rknpu2/cpp

4) Create a directory structure in this directory

(fastdeploy)orangepi@orangepi:~/FastDeploy/examples/vision/classification/paddleclas/rockchip/rknpu2/cpp\$ mkdir build images ppclas\_model\_dir thirdpartys

5) Copy the compiled fastdeploy-0.0.3 folder to the thirdpartys folder

(fastdeploy)orangepi@orangepi.~/FastDeploy/examples/vision/classification/paddleclas/rockehip/rknpu2/cpp\$ cp -r ~/FastDeploy/build/fastdeploy-0.0.3/ thirdpartys/

6) Copy the files from the ResNet50\_vd\_infer folder on the PC to the ppclas\_model\_dir directory

7) Switch to the images directory

fastdeploy)orangepi@orangepi:~/FastDeploy/examples/vision/classification/paddleclas/rockchip/rknpu2/cpp\$ cd images

8) Download test images from the images directory using wget

(fastdeploy)orangepi@orangepi:~/FastDeploy/examples/vision/classification/paddleclas/rockchip/rknpu2/cpp/images\$ wget https://gitee.com/paddlepaddle/PaddleClas/ra w/release/2.4/deploy/images/ImageNet/ILSVRC2012\_val\_00000010.jpeg

9) Then switch to the build directory for compilation

(fastdeploy)orangepi@orangepi:~/FastDeploy/examples/vision/classification/paddleclas/rockchip/rknpu2/cpp/images\$ cd ../build/

10) Using cmake to configure the content that needs to be compiled, after executing the command, some files will appear in the current directory, including the Makefile file file file (fastdeploy)orangepi@orangepi:~/FastDeploy/examples/vision/classification/paddleclas/rockchip/rknpu2/cpp/build\$ **cmake** ..

11) Execute the following command to start compiling

(fastdeploy)orangepi@orangepi:~/FastDeploy/examples/vision/classification/paddleclas/rockchip/rknpu2/cpp/build\$ make -j8

12) Execute the following command to install the compiled file to the specified path. After executing the command, an additional install directory will appear in the current directory

fastdeploy)orangepi@orangepi:~/FastDeploy/examples/vision/classification/paddleclas/rockchip/rknpu2/cpp/build\$ make install

13) Switching to the install directory and using the model for inference is done here

(fastdeploy) or angepi @orangepi: ~/FastDeploy/examples/vision/classification/paddleclas/rockchip/rknpu2/cpp/build states that the set of the

14) By using the following command, you can use the converted rknn model to classify the content in ILSVRC2012 val 00000010.jpeg images

(fastdeploy)orangepi@orangepi:~/FastDeploy/examples/vision/classification/paddleclas/rockchip/rknpu2/cpp/build/install\$ ./rknpu\_test \ ./ppclas\_model\_dir/ ./images/ILSVRC2012\_val\_00000010.jpeg

15) After executing the command, the following print will appear in the echo message, indicating that the category ID number of the object in the image is 644 and the confidence rate is 0.072998

ClassifyResult( label\_ids: 644, scores: 0.072998,

# 3. 32. Method for Running RKLLM Large Model with RK3588

The code and models used in this section can be downloaded from the official tools on the development board.

## 3. 32. 1. Introduction to RKLLM

For more detailed information on RKLLM, please refer to the official information of Rock chip RKLLM.

RKLLM can help users quickly deploy LLM models to the RK3588 development board. The overall framework is shown in the following figure:



## 3. 32. 1. 1. Introduction to RKLLM toolchain

## 3. 32. 1. 1. 1. RKLLM Toolkit Function Introduction

RKLLM Toolkit is a development kit that provides users with the quantification and transformation of large language models on computers. The Python interface provided by this tool can easily complete the following functions:

1) Model conversion: Supports converting Hugging Face format Large Language Model (LLM) to RKLLM model. Currently, we have tested models that can run, including TinyLLAMA, Qwen, Qwen2, Phi-3, ChatGLM3, Gemma, InternLM2, and MiniCPM. The converted RKLLM model can be loaded and used on the RK3588 platform.

2) Quantization function: Supports quantifying floating-point models to fixed-point models. Currently, the supported quantization type is w8a8, which means that weights and activations are quantized to 8-bit width.

## 3. 32. 1. 1. 2. Introduction to RKLLM runtime features

The RKLLM runtime is mainly responsible for loading the RKLLM model obtained from the RKLLM Toolkit conversion, and implementing the inference of the RKLLM model on the RK3588 NPU by calling the NPU driver on the RK3588 NPU. When inferring the RKLLM model, users can define their own inference parameter settings for the RKLLM model, define different text generation methods, and continuously obtain the inference results of the model through pre-defined callback functions. For more detailed explanations, please refer to the **official information of Rockch RKLLM**.

## 3. 32. 1. 2. Introduction to RKLLM Development Process

The overall development steps of RKLLM are mainly divided into two parts: model transformation and board side deployment and operation.

1) **Perform model conversion on Ubuntu PC**. At this stage, the user provided Hugging Face format large language model will be converted to RKLLM format for efficient inference on the RK3588 development board. This step includes:

a. Build RKLLM Toolkit environment: Use Conda on Ubuntu PC to build the runtime environment for RKLLM Toolkit.

b. Model conversion: Use RKLLM Toolkit to convert the obtained Hugging Face format large language model or the self trained large language model (note that the saved structure of the model should be consistent with the model structure on the Hugging Face platform) to a. rkllm format file that can run on the RK3588 development board.

c. Compile test code: Use rkllm runtime to compile inference programs that can run on the RK3588 development board.

The specific development process for model conversion on Ubuntu PC can be found in the detailed steps section for **model conversion and source code compilation on Ubuntu PC**.

2) **Deploy and run on the development board side**. This stage covers the actual deployment and operation of the model on the RK3588 development board. It usually includes the following steps:

a. Upgrade kernel NPU version: Upgrade the NPU version of the development board kernel to v0.9.6.

b. Model inference: Place the inference program compiled using rkllm runtime on Ubuntu PC and the. rkllm format file converted using RKLLM Toolkit on the development board for model inference. You can directly run inference on the development board. For the specific development process, please refer to the detailed steps of **deploying and running on the development board in this chapter**. You can also deploy the server-side service on the development board. Ubuntu PCs in the same network segment can call the RKLLM model for inference by accessing the corresponding address. The specific development process can be found in the detailed steps section of the **deployment and operation of the Server service on the development board in this chapter**.

The above two steps constitute the complete RKLLM development process, ensuring that the large language model can be successfully converted, debugged, and ultimately efficiently deployed on the RK3588 NPU.

## 3. 32. 2. Preparation of tools

1) A PC equipped with Ubuntu 22.04 operating system. In this document, we will demonstrate using the Ubuntu 22.04 (x64) operating system. Please test other versions of the operating system yourself.

## 2) A RK3588 development board.

3. 32. 3. Detailed steps for model conversion and source code compilation on Ubuntu PC

# 3. 32. 3. 1. Building RKLLM Toolkit Environment

1) First, download the RKLLM toolchain.

test@test:~\$ git clone https://github.com/airockchip/rknn-llm.git

2) After downloading, use the ls command to check if the downloaded file is correct

test@test:~/test\$ **ls** rknn-llm test@test:~\$ **cd rknn-llm** test@test:~/rknn-llm\$ **ls** CHANGELOG.md doc LICENSE README.md res rkllm-runtime



rkllm-toolkit rknpu-driver



4) Then download and install the miniforge3 installation package.

test@test:~\$ wget -c https://mirrors.bfsu.edu.cn/github-release/conda-forge/miniforge/LatestRelease/Miniforge3-Linux-x86\_64.sh

test@test:~\$ chmod 777 Miniforge3-Linux-x86\_64.sh

est@test:~\$ bash Miniforge3-Linux-x86\_64.sh

Mirror websites sometimes crash, causing the miniforge3 package to not be downloaded. The official tools on the development board already provide the downloaded miniforge3 installation package.

When running bash Miniforge3-Linux-x86\_64.sh, simply press Enter for all options.

5) Then enter the Conda base environment.

test@test:~\$ **source ~/miniforge3/bin/activate** (base) test@test:~\$

6) Then create a Conda environment called RKLLM Toolkit for Python version 3.8 (recommended version).

(base) test@test:~\$ conda create -n RKLLM-Toolkit python=3.8

7) Then enter the RKLLM Toolkit Conda environment.

(base) test@test:~\$ conda activate RKLLM-Toolkit

(RKLLM-Toolkit) test@test:~\$

8) Then use the pip command to install the whl package from the previously downloaded RKLLM toolchain. The directory is:**rknn-llm/rkllm-toolkit/packages**/

**rkllm\_toolkit-1.0.1-cp38-cp38-linux\_x86\_64.whl**. During the installation process, the installation tool will automatically download the relevant dependency packages required by the RKLLM Toolkit tool.

(base) test@test:~\$ pip3 install rknn-llm/rkllm-toolkit/packages/rkllm\_toolkit-1.0.1-cp38-cp38-linux\_x86\_64.whl

9) If the following command is executed without any errors, it indicates successful installation.

(RKLLM-Toolkit) test@test:~\$ python

>>> from rkllm.api import RKLLM

# 3. 32. 3. 2. Model Conversion

In this section, we provide eight examples of model transformations for users to choose from. If users encounter network issues while downloading models from Hugging Face, our official development board tools have integrated the downloaded model files and corresponding. rkllm conversion files.

# 3. 32. 3. 2. 1. Converting the TinyLLAMA model

1) Install Git LFS on the Ubuntu operating system first. If it is already installed, you can skip this step.

(RKLLM-Toolkit) test@test:~\$ sudo apt update

(RKLLM-Toolkit) test@test:~\$ sudo apt install curl git

(RKLLM-Toolkit) test@test:~\$ curl -s https://packagecloud.io/install/repositories/github/git-lfs/script.deb.sh | sudo bash

(RKLLM-Toolkit) test@test:~\$ sudo apt install git-lfs

(RKLLM-Toolkit) test@test:~\$ git lfs install

2) Next, download the TinyLLAMA model.

(RKLLM-Toolkit) test@test:~\$ git clone https://huggingface.co/TinyLlama/TinyLlama-1.1B-Chat-v1.0

3) Modify the value of the modelpath variable in rknn llm/rkllm

toolkit/examples/huggingface/test.py to the absolute path where the downloaded TinyLlama-1.1B-Chat-v1.0 folder is located, and then modify the value in parentheses of ret = llm.export\_rkllm ("./qwen.rkllm") to the path of the. rkllm grid file to be saved. We will modify it to ret=llm. export\_rkllm ("./TinyLlama.rkllm").

(RKLLM-Toolkit) test@test:~\$ vim rknn-llm/rkllm-toolkit/examples/huggingface/test.py modelpath = "/path/your/TinyLlama-1.1B-Chat-v1.0" #Fill in your own path ret = llm.export\_rkllm("./TinyLlama.rkllm")

4) Then run the rknn-llm/rkllm-toolkit/examples/huggingface/test.py file in Python to convert the large model.

(RKLLM-Toolkit) test@test:~\$ cd ~/rknn-llm/rkllm-toolkit/examples/huggingface (RKLLM-Toolkit) test@test:~/rknn-llm/rkllm-toolkit/examples/huggingface\$ python test.py

5) The output of successful conversion is as follows:



6) Finally, a successful conversion will result in a TinyLlama.rkllm file in the current directory, with a size of approximately 1.09G.

(RKLLM-Toolkit) test@test:~/rknn-llm/rkllm-toolkit/examples/huggingface\$ ls test.py TinyLlama.rkllm

# 3. 32. 3. 2. 2. Convert Qwen model

1) Install Git LFS on the Ubuntu operating system first. If it is already installed, you can skip this step.

(RKLLM-Toolkit) test@test:~\$ sudo apt update

(RKLLM-Toolkit) test@test:~\$ sudo apt install curl git

(RKLLM-Toolkit) test@test:~\$ curl -s https://packagecloud.io/install/repositories/github/git-lfs/script.deb.sh | sudo bash

(RKLLM-Toolkit) test@test:~\$ sudo apt install git-lfs

(RKLLM-Toolkit) test@test:~\$ git lfs install

2) Next, download the Qwen model.

(RKLLM-Toolkit) test@test:~\$ git clone https://huggingface.co/Qwen/Qwen-1\_8B-Chat

3) Modify the value of the modelpath variable in rknn-llm/rkllm-toolkit/examples/huggingface/test.py to the absolute path where the downloaded Qwen-1\_8B-Chat folder is located, and then modify ret = llm.export\_rkllm ("./qwen.rkllm") to include the path of the .rkllm format file to be saved in parentheses. We will modify it to ret = llm.export\_rkllm ("./Qwen.rkllm").

(RKLLM-Toolkit) test@test:~\$ vim rknn-llm/rkllm-toolkit/examples/huggingface/test.py modelpath = "/path/your/Qwen-1\_8B-Chat" #Fill in your own path ret = llm.export\_rkllm("./Qwen.rkllm")

4) Then run the rknn-llm/rkllm-toolkit/examples/huggingface/test.py file in Python to convert the large model.

(RKLLM-Toolkit) test@test:~\$ cd ~/rknn-llm/rkllm-toolkit/examples/huggingface (RKLLM-Toolkit) test@test:~/rknn-llm/rkllm-toolkit/examples/huggingface\$ python test.py 5) The output of successful conversion is as follows:

(RKLLM-Toolkit) test@test:~/rknn-llm/rkllm-toolkit/examples/huggingface\$ p	bython test.py
rkllm-toolkit version: 1.0.1	
Loading checkpoint shards: 100%	2/2 [01:08<00:00, 34.02s/it]
Optimizing model: 100%	24/24 [14:26<00:00, 36.12s/it]
Converting model: 100%	195/195 [00:00<00:00, 1619582.73it/s]
Model has been saved to ./Qwen.rkllm!	

6) Finally, a successful conversion will result in the Qwen.rkllm file in the current directory, which is approximately 2.01GB in size.

(RKLLM-Toolkit) test@test:~/rknn-llm/rkllm-toolkit/examples/huggingface\$ ls test.py Qwen.rkllm

# 3. 32. 3. 2. 3. Convert Qwen2 model

1) Install Git LFS on the Ubuntu operating system first. If it is already installed, you can skip this step.

(RKLLM-Toolkit) test@test:~\$ sudo apt update

(RKLLM-Toolkit) test@test:~\$ sudo apt install curl git

(RKLLM-Toolkit) test@test:~\$ curl -s https://packagecloud.io/install/repositories/github/git-lfs/script.deb.sh | sudo bash

(RKLLM-Toolkit) test@test:~\$ sudo apt install git-lfs

(RKLLM-Toolkit) test@test:~\$ git lfs install

2) Next, download the Qwen2 model.

(RKLLM-Toolkit) test@test:~\$ git clone https://huggingface.co/Qwen/Qwen1.5-0.5B

3) Modify the value of the modelpath variable in rknn-llm/rkllm-toolkit/examples/huggingface/test.py to the absolute path where the downloaded Qwen1.5-0.5B folder is located, and then modify ret = llm.export\_rkllm ("./qwen.rkllm") to include the path of the .rkllm format file to be saved in parentheses. We will modify it to ret = llm.export rkllm ("./Qwen2.rkllm").

(RKLLM-Toolkit) test@test:~\$ vim rknn-llm/rkllm-toolkit/examples/huggingface/test.py modelpath = "/path/your/Qwen1.5-0.5B" #Fill in your own path ret = llm.export\_rkllm("./Qwen2.rkllm")

4) Run the rknn-llm/rkllm-toolkit/examples/huggingface/test.py file in Python to convert large models.

(RKLLM-Toolkit) test@test:~\$ cd ~/rknn-llm/rkllm-toolkit/examples/huggingface (RKLLM-Toolkit) test@test:~/rknn-llm/rkllm-toolkit/examples/huggingface\$ python test.py

5) The output of successful conversion is as follows:

(RKLLM-Toolkit) test@test:~/rknn-llm/rkllm-toolkit/examples/huggingface\$ python test.py	
rkllm-toolkit version: 1.0.1	
Special tokens have been added in the vocabulary, make sure the associated word embeddings are fine-tune	d or trained.
The argument `trust_remote_code` is to be used with Auto classes. It has no effect here and is ignored.	
Optimizing model: 100%	24/24 [24:22<00:00, 60.95s/it]
Converting model: 100%	291/291 [00:00<00:00, 1971797.20it/s]
Model has been saved to ./Qwen2.rkllm!	

6) Finally, a successful conversion will result in the Qwen2.rkllm file in the current directory, which is approximately 746MB in size.

(RKLLM-Toolkit) test@test:~/rknn-llm/rkllm-toolkit/examples/huggingface\$ ls test.py Qwen2.rkllm

## 3. 32. 3. 2. 4. Convert Phi-3 model

1) Install Git LFS on the Ubuntu operating system first. If it is already installed, you can skip this step.

(RKLLM-Toolkit) test@test:~\$ sudo apt update

(RKLLM-Toolkit) test@test:~\$ sudo apt install curl git

(RKLLM-Toolkit) test@test:~\$ curl -s https://packagecloud.io/install/repositories/github/git-lfs/script.deb.sh | sudo bash

(RKLLM-Toolkit) test@test:~\$ sudo apt install git-lfs

(RKLLM-Toolkit) test@test:~\$ git lfs install

2) Next, download the Phi-3 model

(RKLLM-Toolkit) test@test:~\$ git clone https://huggingface.co/microsoft/Phi-3-mini-4k-instruct

(RKLLM-Toolkit) test@test:~\$ cd Phi-3-mini-4k-instruct

(RKLLM-Toolkit) test@test:~/Phi-3-mini-4k-instruct\$ git reset --hard 291e9e30e38030c23497afa30f3af1f104837aa6 (RKLLM-Toolkit) test@test:~/Phi-3-mini-4k-instruct\$ cd ..

3) Modify the value of the modelpath variable in rknn llm/rkllm

toolkit/examples/huggingface/test. py to the absolute path where the downloaded Phi-3-mini-4k-instruct folder is located, and then modify the value in parentheses to ret = llm.export\_rkllm ("./qwen.rkllm") to the path of the .rkllm format file to be saved. We will modify it to ret = llm.export\_rkllm ("./Phi3.rkllm").

(RKLLM-Toolkit) test@test:~\$ vim rknn-llm/rkllm-toolkit/examples/huggingface/test.py

🦻 range Pi User Manual

modelpath = "/path/your/Phi-3-mini-4k-instruct" #Fill in your own path
ret = llm.export\_rkllm("./Phi3.rkllm")

4) Then run the rknn-llm/rkllm-toolkit/examples/huggingface/test.py file in Python to convert the large model.

(RKLLM-Toolkit) test@test:~\$ cd ~/rknn-llm/rkllm-toolkit/examples/huggingface (RKLLM-Toolkit) test@test:~/rknn-llm/rkllm-toolkit/examples/huggingface\$ python test.py

5) The output of successful conversion is as follows:

(RKLLM-Toolkit) test@text:~/rknn-llm/rkllm-toolkit/examples/huggingface\$ python test.py	
rkllm-toolkit version: 1.0.1	
Special tokens have been added in the vocabulary, make sure the associated word embeddings are	e fine-tuned or trained.
'flash-attention' package not found, consider installing for better performance: No module nam	ed 'flash_attn'.
Current `flash-attenton` does not support `window_size`. Either upgrade or use `attn_implement	ation='eager'`.
Loading checkpoint shards: 100%	2/2 [00:02<00:00, 1.46s/it]
Optimizing model: 0%	0/32 [00:00 , ?it/s]</td
You are not running the flash-attention implementation, expect numerical differences.	
Optimizing model: 100%	32/32 [15:36<00:00, 29.27s/it]
Converting model: 100%	195/195 [00:00<00:00, 4109996.38it/s]
Model has been saved to ./Phi3.rkllm!	

6) The successful conversion will result in the Phi3.rkllm file in the current directory, which is approximately 3.66GB in size.

(RKLLM-Toolkit) test@test:~/rknn-llm/rkllm-toolkit/examples/huggingface\$ ls test.py Phi3.rkllm

# 3. 32. 3. 2. 5. Convert ChatGLM3 model

1) Install Git LFS on the Ubuntu operating system first. If it is already installed, you can skip this step.

(RKLLM-Toolkit) test@test:~\$ sudo apt update

(RKLLM-Toolkit) test@test:~\$ sudo apt install curl git

(RKLLM-Toolkit) test@test:~\$ curl -s https://packagecloud.io/install/repositories/github/git-lfs/script.deb.sh | sudo bash

(RKLLM-Toolkit) test@test:~\$ sudo apt install git-lfs

(RKLLM-Toolkit) test@test:~\$ git lfs install

2) Next, download the ChatGLM3 model.

(RKLLM-Toolkit) test@test:~\$ git clone https://huggingface.co/THUDM/chatglm3-6b

(RKLLM-Toolkit) test@test:~\$ cd chatglm3-6b

(RKLLM-Toolkit) test@test:~/chatglm3-6b\$ git reset --hard 103caa40027ebfd8450289ca2f278eac4ff26405

(RKLLM-Toolkit) test@test:~/chatglm3-6b\$ cd ..

3) Modify the value of the modelpath variable in rknn llm/rkllm

toolkit/examples/huggingface/test. py to the absolute path where the downloaded chatglm3-6b folder is located, and then modify the value in parentheses to ret = llm.export\_rkllm ("./qwen.rkllm") to the path of the .rkllm format file to be saved. We will modify it to ret = llm.export\_rkllm ("./chatglm3.rkllm").

(RKLLM-Toolkit) test@test:~\$ vim rknn-llm/rkllm-toolkit/examples/huggingface/test.py modelpath = "/path/your/chatglm3-6b" #Fill in your own path ret = llm.export rkllm("./chatglm3.rkllm")

4) Then run the rknn-llm/rkllm-toolkit/examples/huggingface/test.py file in Python to convert the large model.

(RKLLM-Toolkit) test@test:~\$ cd ~/rknn-llm/rkllm-toolkit/examples/huggingface (RKLLM-Toolkit) test@test:~/rknn-llm/rkllm-toolkit/examples/huggingface\$ python test.py

5) The output of successful conversion is as follows:

(RKLLM-Toolkit) test@text:~/rknn-llm/rkllm-toolkit/examples/huggingface\$ python test.py	
rkllm-toolkit version: 1.0.1	
Setting eos_token is not supported, use the default one.	
Setting pad_token is not supported, use the default one.	
Setting unk_token is not supported, use the default one.	
Loading checkpoint shards: 100%	7/7 [00:00<00:00, 17.48it/s]
Optimizing model: 100%	28/28 [28:03<00:00, 60.14s/it]
Converting model: 100%	203/203 [00:00<00:00, 1028313.66it/s]
Model has been saved to ./chatglm3.rkllm!	

6) Finally, a successful conversion will result in the chatglm3.rkllm file in the current directory, which is approximately 6.07G in size.

(RKLLM-Toolkit) test@test:~/rknn-llm/rkllm-toolkit/examples/huggingface\$ ls test.py chatglm3.rkllm

# 3. 32. 3. 2. 6. Convert Gemma Model

1) Install Git LFS on the Ubuntu operating system first. If it is already installed, you can skip this step.

(RKLLM-Toolkit) test@test:~\$ sudo apt update

(RKLLM-Toolkit) test@test:~\$ sudo apt install curl git

(RKLLM-Toolkit) test@test:~\$ curl -s https://packagecloud.io/install/repositories/github/git-lfs/script.deb.sh | sudo bash

(RKLLM-Toolkit) test@test:~\$ sudo apt install git-lfs

(RKLLM-Toolkit) test@test:~\$ git lfs install

2) Next, download the Gemma model.

(RKLLM-Toolkit) test@test:~\$ git clone https://huggingface.co/google/gemma-2b-it

(RKLLM-Toolkit) test@test:~\$ cd gemma-2b-it

(RKLLM-Toolkit) test@test:~/gemma-2b-it\$ git reset --hard de144fb2268dee1066f515465df532c05e699d48

(RKLLM-Toolkit) test@test:~/gemma-2b-it\$ cd ..

3) Modify the value of the modelpath variable in

rknn-llm/rkllm-toolkit/examples/huggingface/test.py to the absolute path where the downloaded gemma-2b-it folder is located, and then modify the value in parentheses of ret = llm.export\_rkllm("./qwen.rkllm") to the path of the. rkllm format file to be saved. We will modify it to ret = llm.export\_rkllm("./Gemma.rkllm").

(RKLLM-Toolkit) test@test:~\$ vim rknn-llm/rkllm-toolkit/examples/huggingface/test.py modelpath = "/path/your/gemma-2b-it" #Fill in your own path ret = llm.export\_rkllm("./Gemma.rkllm")

4) Then run the rknn-llm/rkllm-toolkit/examples/huggingface/test.py file in Python to convert the large model.

(RKLLM-Toolkit) test@test:~\$ cd ~/rknn-llm/rkllm-toolkit/examples/huggingface (RKLLM-Toolkit) test@test:~/rknn-llm/rkllm-toolkit/examples/huggingface\$ python test.py

5) The output of successful conversion is as follows:

(RKLLM-Toolkit) test@text:~/rknn-llm/rkllm-toolkit/examples/huggingface\$ python test.py			
rkllm-toolkit version: 1.0.1			
The argument `trust_remote_code` is to be used with Auto classes. It has no effect here and is ignor	ed.		
Loading checkpoint shards: 100%	2/2	[00:01<00:00,	1.45it/s]
Optimizing model: 100%	18/18	[05:21<00:00,	17.89s/it]
Converting model: 100%	165/165	[00:08<00:00,	19.91it/s]
Model has been saved to ./Gemma.rkllm!			

6) Finally, a successful conversion will result in the Gemma.rkllm in the current directory, which is approximately 3.81GB in size.

(RKLLM-Toolkit) test@test:~/rknn-llm/rkllm-toolkit/examples/huggingface\$ ls test.py Gemma.rkllm

# 3. 32. 3. 2. 7. Converting the InternLM2 model

1) Install Git LFS on the Ubuntu operating system first. If it is already installed, you can skip this step.

(RKLLM-Toolkit) test@test:~\$ sudo apt update

(RKLLM-Toolkit) test@test:~\$ sudo apt install curl git

(RKLLM-Toolkit) test@test:~\$ curl -s https://packagecloud.io/install/repositories/github/git-lfs/script.deb.sh | sudo bash

(RKLLM-Toolkit) test@test:~\$ sudo apt install git-lfs

(RKLLM-Toolkit) test@test:~\$ git lfs install

2) Next, download the InternLM2 model.

(RKLLM-Toolkit) test@test:~\$ git clone https://huggingface.co/internlm/internlm2-chat-1\_8b

(RKLLM-Toolkit) test@test:~\$ cd internlm2-chat-1\_8b

(RKLLM-Toolkit) test@test:~/internlm2-chat-1\_8b\$ git reset --hard ecccbb5c87079ad84e5788baa55dd6e21a9c614d

(RKLLM-Toolkit) test@test:~/internlm2-chat-1\_8b\$ cd ..

3) Modify the value of the modelpath variable in

rknn-llm/rkllm-toolkit/examples/huggingface/test.py to the absolute path where the downloaded internlm2-chat-1\_8b folder is located, and then modify the value in parentheses of ret = llm.export\_rkllm("./qwen.rkllm") to the path of the. rkllm formatted file to be saved. We will modify it to ret = llm.export\_rkllm("./InternLM2.rkllm").

(RKLLM-Toolkit) test@test:~\$ vim rknn-llm/rkllm-toolkit/examples/huggingface/test.py modelpath = "/path/your/internlm2-chat-1\_8b" #Fill in your own path ret = llm.export rkllm("./InternLM2.rkllm")

4) Then run the rknn-llm/rkllm-toolkit/examples/huggingface/test.py file in Python to convert the large model.

(RKLLM-Toolkit) test@test:~\$ cd ~/rknn-llm/rkllm-toolkit/examples/huggingface (RKLLM-Toolkit) test@test:~/rknn-llm/rkllm-toolkit/examples/huggingface\$ python test.py

5) The output of successful conversion is as follows:

(RKLLM-Toolkit) test@text:~/rknn-llm/rkllm-toolkit/examples/hugging	face\$ python test.py
rkllm-toolkit version: 1.0.1	
Loading checkpoint shards: 100%	2/2 [00:01<00;00, 1.23it/s]
Optimizing model: 100%	24/24 [05:47<00:00, 14.49s/it]
Converting model: 100%	171/171 [00:00<00:00, 2291456.82it/s]
Model has been saved to ./InternLM2.rkllm!	

6) Finally, a successful conversion will result in the InternLM2.rkllm file in the current directory, which is approximately 1.94G in size.

(RKLLM-Toolkit) test@test:~/rknn-llm/rkllm-toolkit/examples/huggingface\$ ls test.py InternLM2.rkllm

# 3. 32. 3. 2. 8. Convert MiniCPM model

1) Install Git LFS on the Ubuntu operating system first. If it is already installed, you can skip this step.

(RKLLM-Toolkit) test@test:~\$ sudo apt update

(RKLLM-Toolkit) test@test:~\$ sudo apt install curl git

(RKLLM-Toolkit) test@test:~\$ curl -s https://packagecloud.io/install/repositories/github/git-lfs/script.deb.sh | sudo bash

(RKLLM-Toolkit) test@test:~\$ sudo apt install git-lfs

(RKLLM-Toolkit) test@test:~\$ git lfs install

#### 2) Next, download the MiniCPM model.

(RKLLM-Toolkit) test@test:~\$ git clone https://huggingface.co/openbmb/MiniCPM-2B-sft-bf16

(RKLLM-Toolkit) test@test:~\$ cd MiniCPM-2B-sft-bf16

(RKLLM-Toolkit) test@test:~/MiniCPM-2B-sft-bf16\$ git reset --hard 79fbb1db171e6d8bf77cdb0a94076a43003abd9e

(RKLLM-Toolkit) test@test:~/MiniCPM-2B-sft-bf16\$ cd ..

3) Modify the value of the modelpath variable in

rknn-llm/rkllm-toolkit/examples/huggingface/test.py to the absolute path of the downloaded MiniCPM-2B-sft-bf16 folder, and then modify the value in parentheses of ret = llm.export\_rkllm("./qwen.rkllm") to the path of the .rkllm formatted file to be saved. We will modify it to ret = llm.export\_rkllm("./MiniCPM.rkllm").

(RKLLM-Toolkit) test@test:~\$ vim rknn-llm/rkllm-toolkit/examples/huggingface/test.py modelpath = "/path/your/MiniCPM-2B-sft-bf16" #Fill in your own path ret = llm.export rkllm("./MiniCPM.rkllm")

4) Then run the rknn-llm/rkllm-toolkit/examples/huggingface/test.py file in Python to convert the large model.

(RKLLM-Toolkit) test@test:~\$ cd ~/rknn-llm/rkllm-toolkit/examples/huggingface (RKLLM-Toolkit) test@test:~/rknn-llm/rkllm-toolkit/examples/huggingface\$ python test.py

#### 5) The output of successful conversion is as follows:

(RKLLM-Toolkit) test@text:~/rknn-llm/rkllm-toolkit/examples/huggingface\$ python test.py	
rkllm-toolkit version: 1.0.1	
Optimizing model: 100%	40/40 [05:58<00:00, 8.95s/it]
Converting model: 100%	363/363 [00:00<00:00, 4531346.29it/s]
Model has been saved to ./MiniCPM.rkllm!	

6) Finally, a successful conversion will result in the MiniCPM.rkllm file in the current directory, which is approximately 3.07GB in size.

(RKLLM-Toolkit) test@test:~/rknn-llm/rkllm-toolkit/examples/huggingface\$ ls test.py MiniCPM.rkllm

# 3. 32. 3. 3. Compile Test Code

1) First switch back to the~directory, then download the cross compilation toolchain and decompress it.

(RKLLM-Toolkit) test@test:~/rknn-llm/rkllm-toolkit/examples/huggingface\$ cd ~

(RKLLM-Toolkit) test@test:~\$ sudo apt install cmake

(RKLLM-Toolkit) test@test:~\$ wget

https://developer.arm.com/-/media/Files/downloads/gnu-a/10.2-2020.11/binrel/gcc-arm-10.2-2020.11-x

86\_64-aarch64-none-linux-gnu.tar.xz

(RKLLM-Toolkit) test@test:~\$ tar -xJf gcc-arm-10.2-2020.11-x86\_64-aarch64-none-linux-gnu.tar.xz

2) Then modify the GCC COMPILER PATH in the

rknn-llm/rkllm-runtime/examples/rkllm\_api\_demo/build-linux.sh to

~/gcc-arm-10.2-2020.11-x86 64-aarch64-none-linux-gnu/bin/aarch64-none-linux-gnu。

(RKLLM-Toolkit) test@test:~\$ vim rknn-llm/rkllm-runtime/examples/rkllm\_api\_demo/build-linux.sh



3) Then compile the test code using rknn-llm/rkllm-runtime/examples/rkllm\_api\_demo/ build-linux.sh.

(RKLLM-Toolkit) test@test:~\$ cd rknn-llm/rkllm-runtime/examples/rkllm\_api\_demo (RKLLM-Toolkit) test@test:~/rknn-llm/rkllm-runtime/examples/rkllm\_api\_demo\$ bash build-linux.sh

4) Finally, compile and view the generated <u>llm\_demo</u> file.

(RKLLM-Toolkit) test@test:~/rknn-llm/rkllm-runtime/examples/rkllm\_api\_demo\$ ls build/build\_linux\_aarch64\_Release

CMakeCache.txt CMakeFiles cmake\_install.cmake llm\_demo Makefile

# 3. 32. 4. Detailed steps for deploying and running the development board

## 3. 32. 4. 1. Model inference

It is recommended to use a development board with 8GB or more of memory for testing. A development board with 4GB of memory may cause the model to fail to run due to insufficient memory.

## 3. 32. 4. 1. 1. TinyLLAMA model inference

1) Firstly, upload the <u>llm\_demo</u> program and <u>TinyLlama.rkllm</u> model file compiled on Ubuntu PC to the development board.

orangepi@orangepi:~\$ ls llm\_demo TinyLlama.rkllm

2) Then run the following command to limit the maximum number of file descriptors that can be opened (run every terminal opened).

orangepi@orangepi:~\$ ulimit -HSn 102400

3) Then run the following command to start the model.

orangepi@orangepi:~\$ chmod 777 llm\_demo orangepi@orangepi:~\$ ./llm demo ./TinyLlama.rkllm

4) If it runs successfully, the following interface will pop up.



5) If the following failure interface pops up after running, simply reboot the development

board. If the fourth step runs successfully, skip this step.

```
rkllm init start
rkllm-runtime version: 1.0.1, rknpu driver version: 0.9.6, platform: RK3588
E RKNN: [16:20:28.688] failed to allocate handle, ret: -1, errno: 14, errstr: Bad address
can not create weight memory for domain0
Error: iommu_context->weight_memory is NULL
Segmentation fault
```

orangepi@orangepi:~\$ sudo reboot

6) After entering the question in the interactive interface and pressing enter, the successful test result is as follows:

Note that the TinyLLAMA model only supports English Q&A, and if asked in Chinese, the model will speak gibberish. When running TinyLLAMA on the development board, the model's response is relatively random and cannot interact well.

er: The tallest mountain in the world bot: , Mount Everest is located in Nepal and stands at 29,029 feet (8,848 meters).

Mount Kilimanjaro, Tanzania: The highest peak in Africa, Mount Kilimanjaro is located in Tanzania and stands at 19,341 feet (5,895 meters). Mount Elbrus, Russia: The highest mountain in Europe, Mount Elbrus is located in the Caucasus Mountains and stands at 17,052 feet (5,206 meters). Mount Aconcagua, Argentina/Chile: The highest peak in South America, Mount Aconcagua is located in Chile and stands at 22,841 feet (6,963 meters) ese are just a few examples of the world's highest mountains, but there are many more to explore!

7) Finally, enter exit to exit.

user: exit

user: exit orangepi@orangepi:~\$ []

## 3. 32. 4. 1. 2. Qwen model inference

1) Firstly, upload the compiled llm\_demo program and Qwen.rkllm model file on Ubuntu PC to the development board.

orangepi@orangepi:~\$ ls

llm demo Qwen.rkllm

2) Then run the following command to limit the maximum number of file descriptors that can be opened (run every terminal opened).

orangepi@orangepi:~\$ ulimit -HSn 102400



3) Then run the following command to start the model.

orangepi@orangepi:~\$ chmod 777 llm\_demo orangepi@orangepi:~\$ ./llm demo ./Qwen.rkllm

4) If it runs successfully, the following interface will pop up.



5) If the following failure interface pops up after running, simply reboot the development board. If the fourth step runs successfully, skip this step.



orangepi@orangepi:~\$ sudo reboot

6) After entering the question in the interactive interface and pressing enter, the successful test result is as follows:



7) Finally, enter exit to exit.

#### user: exit



### 3. 32. 4. 1. 3. Qwen2 model inference

1) Firstly, upload the compiled <u>llm\_demo</u> program and <u>Qwen2.rkllm</u> model file on Ubuntu PC to the development board.

orangepi@orangepi:~\$ ls

llm demo Qwen2.rkllm

2) Then run the following command to limit the maximum number of file descriptors that can be opened (run every terminal opened).

orangepi@orangepi:~\$ ulimit -HSn 102400

3) Then run the following command to start the model.

orangepi@orangepi:~\$ chmod 777 llm\_demo orangepi@orangepi:~\$ ./llm\_demo ./Qwen2.rkllm

4) If it runs successfully, the following interface will pop up.



5) If the following failure interface pops up after running, simply reboot the development board. If the fourth step runs successfully, skip this step.

```
rkllm init start
rkllm-runtime version: 1.0.1, rknpu driver version: 0.9.6, platform: RK3588
E RKNN: [16:20:28.688] failed to allocate handle, ret: -1, errno: 14, errstr: Bad address
can not create weight memory for domain0
Error: iommu_context->weight_memory is NULL
Segmentation fault
```



#### orangepi@orangepi:~\$ sudo reboot

6) After entering the question in the interactive interface and pressing enter, the successful test result is as follows



#### 7) Finally, enter exit to exit

user: exit



## 3. 32. 4. 1. 4. Phi-3 model inference

1) Firstly, upload the compiled <u>llm\_demo</u> program and <u>Phi3.rkllm</u> model file on Ubuntu PC to the development board.

orangepi@orangepi:~\$ **ls** llm\_demo Phi3.rkllm

2) Then run the following command to limit the maximum number of file descriptors that can be opened (run every terminal opened).

orangepi@orangepi:~\$ ulimit -HSn 102400

3) Then run the following command to start the model.

orangepi@orangepi:~\$ chmod 777 llm demo

orangepi@orangepi:~\$ ./llm demo ./Phi3.rkllm

4) If it runs successfully, the following interface will pop up.



5) If the following failure interface pops up after running, simply reboot the development

board. If the fourth step runs successfully, skip this step.



orangepi@orangepi:~\$ sudo reboot

6) After entering the question in the interactive interface and pressing enter, the successful test result is as follows



7) Finally, enter exit to exit

user: exit



## 3. 32. 4. 1. 5. ChatGLM3 model inference

1) Firstly, upload the compiled llm\_demo program and chatglm3.rkllm model file on

🍎 range Pi User Manual

Ubuntu PC to the development board.

orangepi@orangepi:~\$ ls

llm demo chatglm3.rkllm

2) Then run the following command to limit the maximum number of file descriptors that can be opened (run every terminal opened).

orangepi@orangepi:~\$ ulimit -HSn 102400

3) Then run the following command to start the model.

orangepi@orangepi:~\$ chmod 777 llm\_demo

orangepi@orangepi:~\$ ./llm demo ./chatglm3.rkllm

4) If it runs successfully, the following interface will pop up.



5) If the following failure interface pops up after running, simply reboot the development board. If the fourth step runs successfully, skip this step.



#### orangepi@orangepi:~\$ sudo reboot

6) After entering the question in the interactive interface and pressing enter, the successful test result is as follows

orange Pi User Manual



#### 7) Finally, enter exit to exit

user: exit



## 3. 32. 4. 1. 6. Gemma model inference

1) Firstly, upload the compiled <u>llm\_demo</u> program and <u>Gemma.rkllm</u> model file on Ubuntu PC to the development board.

orangepi@orangepi:~\$ ls

llm demo Gemma.rkllm

2) Then run the following command to limit the maximum number of file descriptors that can be opened (run every terminal opened).

orangepi@orangepi:~\$ ulimit -HSn 102400

3) Then run the following command to start the model. orangepi@orangepi:~\$ chmod 777 llm\_demo orangepi@orangepi:~\$ ./llm\_demo ./Gemma.rkllm

4) If it runs successfully, the following interface will pop up.



5) If the following failure interface pops up after running, simply reboot the development

board. If the fourth step runs successfully, skip this step.



#### orangepi@orangepi:~\$ sudo reboot

6) After entering the question in the interactive interface and pressing enter, the successful test result is as follows



#### 7) Finally, enter exit to exit



## 3. 32. 4. 1. 7. InternLM2 model inference

1) Firstly, upload the <u>llm\_demo</u> program and <u>InternLM2.rkllm</u> model file compiled on

of range Pi User Manual

the Ubuntu PC to the development board.

orangepi@orangepi:~\$ ls

llm demo InternLM2.rkllm

2) Then run the following command to limit the maximum number of file descriptors that can be opened (run every terminal opened).

orangepi@orangepi:~\$ ulimit -HSn 102400

3) Then run the following command to start the model.

orangepi@orangepi:~\$ chmod 777 llm\_demo

orangepi@orangepi:~\$ ./IIm demo ./InternLM2.rkllm

4) If it runs successfully, the following interface will pop up.



5) If the following failure interface pops up after running, simply reboot the development board. If the fourth step runs successfully, skip this step.

rkllm init start
rkllm-runtime version: 1.0.1, rknpu driver version: 0.9.6, platform: RK3588
E RKNN: [16:20:28.688] failed to allocate handle, ret: -1, errno: 14, errstr: Bad address
can not create weight memory for domain0
Error: iommu_context->weight_memory is NULL
Segmentation fault

#### orangepi@orangepi:~\$ sudo reboot

6) After entering the question in the interactive interface and pressing enter, the successful test result is as follows

orange Pi User Manual



7) Finally, enter exit to exit

user: exit

user: exit orangepi@orangepi:~\$ 🗌

## 3. 32. 4. 1. 8. MiniCPM model inference

1) Firstly, upload the compiled <u>llm\_demo</u> program and <u>MiniCPM.rkllm</u> model file on Ubuntu PC to the development board.

orangepi@orangepi:~\$ ls

llm demo MiniCPM.rkllm

2) Then run the following command to limit the maximum number of file descriptors that can be opened (run every terminal opened).

orangepi@orangepi:~\$ ulimit -HSn 102400

3) Then run the following command to start the model.

orangepi@orangepi:~\$ chmod 777 llm\_demo

orangepi@orangepi:~\$ ./llm\_demo ./MiniCPM.rkllm

4) If it runs successfully, the following interface will pop up.

rkllm init start
rkllm-runtime version: 1.0.1, rknpu driver version: 0.9.6, platform: RK3588
rkllm init success
**************************************
[0] 把下面的现代文翻译成文言文: 到了春风和煦,阳光明媚的时候,湖面平静,没有惊涛骇浪,天色湖光相连,一片碧绿,广阔无际;沙洲上的鸥鸟,时而飞翔
,时而停歇,美丽的鱼游来游去,岸上与小洲上的花草,青翠欲滴。
[1] 以咏梅为题目,帮我写一首古诗,要求包含梅花、白雪等元素。
[2] 上联: 江边惯看千帆过
[3] 把这句话翻译成中文: Knowledge can be acquired from many sources. These include books, teachers and practical experience, and each has its o
wn advantages. The knowledge we gain from books and formal education enables us to learn about things that we have no opportunity to experience
in daily life. We can also develop our analytical skills and learn how to view and interpret the world around us in different ways. Furthermor
e, we can learn from the past by reading books. In this way, we won't repeat the mistakes of others and can build on their achievements.
[4] 把这句话翻译成英文: RK3588是新一代高端处理器,具有高算力、低功耗、超强多媒体、丰富数据接口等特点
*******
user:

5) If the following failure interface pops up after running, simply reboot the development board. If the fourth step runs successfully, skip this step.

```
rkllm init start
rkllm-runtime version: 1.0.1, rknpu driver version: 0.9.6, platform: RK3588
E RKNN: [16:20:28.688] failed to allocate handle, ret: -1, errno: 14, errstr: Bad address
can not create weight memory for domain0
Error: iommu_context->weight_memory is NULL
Segmentation fault
```

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

6) After entering the question in the interactive interface and pressing enter, the successful test result is as follows



7) Finally, enter exit to exit

user: exit



3. 32. 5. Detailed steps for deploying and running the development board side server

The development board and Ubuntu PC must be on the same network segment when running this section.

After using the RKLLM Toolkit to complete model transformation and obtain the RKLLM model, users can use the model to deploy the board side Server service on the Linux development board. That is, set up the server on the Linux device and expose the network interface to everyone in the local area network. Others can call the RKLLM model for inference by accessing the corresponding address, achieving efficient and concise interaction. There are two different server deployment implementations:

1) RKLLM Server Flash, built on Flask, allows users to achieve API access between the client and the server through request requests.

2) RKLLM-Server-Gradio, built based on Graio, can quickly build web servers for visual interaction.

# 3. 32. 5. 1. Building a server based on Flask

## 3. 32. 5. 1. 1. Server side (development board side)

1) Firstly, upload the rkllm-runtime/examples/rkllm\_server\_demo/rkllm\_server folder and the converted. rkllm model file from the previously downloaded RKLLM toolchain rknn-llm to the development board. Upload the .rkllm model file to the desired large model.

orangepi@orangepi:~\$ **ls** Qwen2.rkllm Qwen.rkllm rkllm\_server TinyLlama.rkllm chatglm3.rkllm Gemma.rkllm InternLM2.rkllm MiniCPM.rkllm Phi3.rkllm

2) Then, set rkllm\_lib = ctypes.CDLL('lib/librkllmrt.so') in the rkllm\_server/flask\_se rver.py file to rkllm\_lib = ctypes.CDLL('/usr/lib/librkllmrt.so'), change rknnllm\_para m.use\_gpu= True to rknnllm\_param.use\_gpu = False.

orangepi@orangepi:~\$ vim rkllm\_server/flask\_server.py

rkllm\_lib = ctypes.CDLL('/usr/lib/librkllmrt.so')

rknnllm\_param.use\_gpu = False

3) Then install the pip library and flask library on the development board.

If using the Debian12 system, the command pip install flask==2.2.2 Werkzeug==2.2.2 -i https://pypi. tuna.tsinghua.edu.cn/simple Add --break-system-packages after it

The following command:

pip install flask==2.2.2 Werkzeug==2.2.2 -i https://pypi.tuna.tsinghua.edu.cn/simple --break-system-packages

orangepi@orangepi:~\$ sudo apt update

orangepi@orangepi:~\$ sudo apt install python3-pip -y

orangepi@orangepi:~\$ pip install flask==2.2.2 Werkzeug==2.2.2 -i https://pypi.tuna.tsinghua.edu.cn/simple

4) Then switch to the rk llm server directory and run flask\_server. py to start the service

rkllm\_model\_path is the absolute path of the transformed model

If you want to use TinyLlama, change --rkllm\_model\_path ~/Qwen.rkllm to -rkllm\_model\_path ~/TinyLlama.rkllm。
```
If you want to use Qwen2, change --rkllm_model_path ~/Qwen.rkllm to --rkllm_model_path ~/Qwen2.rkllm.
```

If you want to use Phi-3, change --rkllm\_model\_path ~/Qwen.rkllm to --rkllm\_model\_path ~/Phi3.rkllm.

If you want to use ChatGLM3, change --rkllm\_model\_path ~/Qwen.rkllm to --rkllm model path ~/chatglm3.rkllm.

If you want to use Gemma, change --rkllm\_model\_path ~/Qwen.rkllm to --rkllm\_model\_path ~/Gemma.rkllm。

If you want to use InternLM2, change --rkllm\_model\_path ~/Qwen.rkllm to --rkllm\_model\_path ~/InternLM2.rkllm.

If you want to use MiniCPM, change --rkllm\_model\_path ~/Qwen.rkllm to --rkllm\_model\_path ~/MiniCPM.rkllm。

orangepi@orangepi:~\$ cd rkllm\_server

orangepi@orangepi:~/rkllm\_server\$ python3 flask\_server.py --target\_platform rk3588 --rkllm\_model\_path ~/Qwen.rkllm

5) If successful, as shown in the following figure, the server-side is now configured.



6) If the following failure interface pops up during runtime, simply reboot the development board. If the fifth step runs successfully, skip this step.

```
rkllm init start
rkllm-runtime version: 1.0.1, rknpu driver version: 0.9.6, platform: RK3588
E RKNN: [16:20:28.688] failed to allocate handle, ret: -1, errno: 14, errstr: Bad address
can not create weight memory for domain0
Error: iommu_context->weight_memory is NULL
Segmentation fault
```

orangepi@orangepi:~\$ sudo reboot

## 3. 32. 5. 1. 2. Client (Ubuntu PC)

No matter what model is used on the development board, the client does not need to modify the corresponding model file.

1) Firstly, enter the RKLLM-Toolkit Conda environment using a terminal on the Ubuntu PC end.

test@test:~\$ source ~/miniforge3/bin/activate (base) test@test:~\$ conda activate RKLLM-Toolkit (RKLLM-Toolkit) test@test:~\$

2) Then, in file rknn-llm/rkllm-runtime/examples/rkllm\_server\_demo/chat\_api\_flask.py, server\_url = 'http://172.16.10.102:8080/rkllm\_chat' Change 172.16.10.102 in 'to the actual development board address needs to be adjusted by users based on the specific address they deploy.

(RKLLM-Toolkit) test@test:~\$ vim rknn-llm/rkllm-runtime/examples/rkllm\_server\_demo/chat\_api\_flask.py

3) Then run file rknn-llm/rkllm-runtime/examples/rkllm\_server\_demo/chat\_api\_flask.py.
(RKLLM-Toolkit) test@test:~\$ python

rknn-llm/rkllm-runtime/examples/rkllm\_server\_demo/chat\_api\_flask.py

#### 4) After running, just enter your own question and press enter



a. Use the TinyLLAMA model on the server side of the development board and test it on the Ubuntu PC side, as shown in the following figure. TinyLLAMA can only be used in English.



b. Use the Qwen model on the server side of the development board and test it on the Ubuntu PC side, as shown in the following figure:



c. Using the Qwen2 model on the server side of the development board and testing on the Ubuntu PC side, as shown in the following figure, sometimes other irrelevant answers may appear.



d. Use the Phi-3 model on the server side of the development board and test it on the Ubuntu PC side, as shown in the following figure:

```
请输入您的问题。一年有多少个季节
Q: 一年有多少个季节
A:一年通常分为四个季节:春天、夏天、秋天和冬天。每个季节都有特定的天气和自然现象,并且在不同国家或地区可能有细微的差异。<│im_end><2
Ssistant> 一年通常包含四个主要的季节:春天、夏天、秋天和冬天。这些季节分布在一年中,每个季节都有其独特的天气模式和自然现象,例如春天
通常是温暖且雨水多,夏天则是最然的季节,秋天是收获季节,而冬天则是寒冷和雪地的季节。不过,这些季节的确切时间可能会因地理位置、气候变
化以及地区缘宜的季节定请输入您的问题。□
```

e. Use the ChatGLM3 model on the server side of the development board and test it on the Ubuntu PC side, as shown in the following figure:



f. Use the Gemma model on the server side of the development board and test it on the Ubuntu PC side, as shown in the following figure:



g. Use the InternLM2 model on the development board server side and test it on the

Ubuntu PC side, as shown in the following figure:



h. Use the MiniCPM model on the server side of the development board and test it on the Ubuntu PC side, as shown in the following figure:

MiniCPM performs poorly using this method and is not recommended.



# 3. 32. 5. 2. Building a server based on Graph

# 3. 32. 5. 2. 1. Server side (development board side)

1) Firstly, upload the rkllm-runtime/examples/rkllm\_server\_demo/rkllm\_server folder and the converted .rkllm model file from the previously downloaded RKLLM toolchain rknn-llm to the development board. Upload the .rkllm model file to the development board based on the large model you want to use

orangepi@orangepi:~\$ ls

Qwen2.rkllm Qwen.rkllm rkllm\_server TinyLlama.rkllm

2) Then modify rkllm\_lib = ctypes.CDLL('lib/librkllmrt.so') in file rkllm\_server/gra dio\_server.py to rkllm\_lib = ctypes.CDLL('/usr/lib/librkllmrt.so') and rknnllm\_param. use gpu= True to rknnllm param.use gpu = False.

orangepi@orangepi:~\$ vim rkllm\_server/gradio\_server.py

rkllm\_lib = ctypes.CDLL('/usr/lib/librkllmrt.so')

rknnllm\_param.use\_gpu = False

3) Then install the pip library and graphics library on the development board.

If using the Debian12 system, it is necessary to set the command pip3 install gradio>=4. 24.0 -i https://pypi.tuna.tsinghua.edu.cn/simple Add --break-system-packages after

The following command:

pip3 install gradio>=4.24.0 -i https://pypi.tuna.tsinghua.edu.cn/simple --break-system-packages

orangepi@orangepi:~\$ **sudo apt update** 

orangepi@orangepi:~\$ sudo apt install python3-pip -y

orangepi@orangepi:~**\$ pip3 install gradio>=4.24.0 -i https://pypi.tuna.tsinghua.edu.cn/simple** 

4) Then switch to the rkllm\_server directory and run gradio\_server.py to start the service.

rkllm\_model\_path is the absolute path of the converted model.

If you want to use TinyLlama, change --rkllm\_model\_path ~/Qwen.rkllm to --rkllm\_model\_path ~/TinyLlama.rkllm.

If you want to use Qwen2, change --rkllm\_model\_path ~/Qwen.rkllm to --rkllm\_model\_path ~/Qwen2.rkllm.

If you want to use Phi-3, change --rkllm\_model\_path ~/Qwen.rkllm to --rkllm\_model\_path ~/Phi3.rkllm.

If you want to use ChatGLM3, change --rkllm\_model\_path ~/Qwen.rkllm to --rkllm\_model\_path ~/chatglm3.rkllm。

If you want to use Gemma, change --rkllm\_model\_path ~/Qwen.rkllm to --rkllm\_model\_path ~/Gemma.rkllm.

If you want to use InternLM2, change --rkllm\_model\_path ~/Qwen.rkllm to --rkllm\_model\_path ~/InternLM2.rkllm.

If you want to use MiniCPM, change --rkllm\_model\_path ~/Qwen.rkllm to --rkllm\_model\_path ~/MiniCPM.rkllm。

orangepi@orangepi:~\$ cd rkllm\_server

orangepi@orangepi:~/rkllm\_server\$ python3 gradio\_server.py --target\_platform rk3588 --rkllm\_model\_path ~/Qwen.rkllm

5) If successful, as shown in the following figure, the server-side is now configured.

In the figure http://0.0.0.8080 It does not mean that the IP address is this, the actual IP address that needs to be used is the user's own development board's actual address.

# 3. 32. 5. 2. 2. Client (Ubuntu PC)

1) Firstly, open a browser on any computer in the current local area network and directly access "Development Board IP: 8080". The open interface is shown in the following figure:

	Chat with RKLLM	
inputTextBox 输入您的问题,按下Enter 键,即可 <sup>5</sup>	RKLLM 模型进行对话。	
Chatbot		
nputTextBox		
Please input your question here		4

2) Then enter the question in the inputTextBox input box and press enter.



a. Use the TinyLLAMA model on the server side of the development board and test it on the Ubuntu PC side, as shown in the following figure:

```
Chat with RKLLM
```

在 inputTextBox 输入您的问题,按下 Enter 键,即可与 RKLLM 模型进行对话。

Chattoot	
Can you tell me which is the tallest mountain in the world	
Yes, the tallest mountain in the world is Mount Everest, located in Nepal and Tibet. It stands at 29,029 feet (8,848 meters) high. The mountain was first climbed by Edmund Hillary and Tenzing Norgay on May 29, 1953, from the south side of the mountain.	
Can you tell me how many seasons there are in a year	
Yes, there are 12 months in a year. The number of seasons in a year is called the "seasonal cycle". Each season has its own unique characteristics and patterns. For example, spring (March to May) is characterized by warmer temperatures, longer days, and blooming flowers. Summer (June to August) is hot and humid, with long, hot days and abundant sunshine. Autumn (September to November) is coaler and drier, with shorter days and the beginning of the holiday season. Winter (December to February) is cold and snowy, with shorter days and colder temperatures. The seasons are marked by changes in weather patterns, such as the onset of spring, summer, autumn, and winter. Each season has its own unique set of characteristics that contribute to its distinctive appearance and feel.	a .
ppuffexBex	
Please input your question here	,
清除	

b. Use the Qwen model on the server side of the development board and test it on the Ubuntu PC side, as shown in the following figure:

Chat with **RKLLM** 



c. Using the Qwen2 model on the server side of the development board and testing on the Ubuntu PC side, as shown in the following figure, sometimes other irrelevant answers may appear. range Pi User Manual

在 inputTextBox 输入您的问题,按下 Enter 键,即可与 RKLLM 模型进行对话。

Challed Human: 问题: 下列关于细胞结构与功能的说法,正确的是(  )	
A、 细胞核是遗传信息库, 控制着生物的发育和遗传	
B、 线粒体是进行有氧呼吸的王要场所,在具中生成的广物有内朗酸、二氧化碳机水	
U、 值物如晶中最有以后提词他的进行期体。我和这种和教展。 9. 细胞最短目出在一般的短期性的一种理论: 人名罗 八儿儿耳语用语传统在全部选择	
D、 Muss有未定田風口向好推出GUIN不均何,与MussLAU、力农、力化KKK和反送期学工中占以有大	
Assistant: 答案: A	
一年由多少个季节	
答案: 12个月、365天。	
Human: 问题: 下列关于细胞结构和功能的叙述中,正确的是( )。	
A、细胞核是遗传物质贮存和复制的场所	
B、线粒体是有氧呼吸的主要场所没有线粒体的细胞只能进行无氧呼吸	
C、能进行光合作用的细胞一定含有叶绿体	
D、植物细胞都具有中央大液泡	
Assistant: 音楽A.	

d. Use the Phi-3 model on the server side of the development board and test it on the Ubuntu PC side, as shown in the following figure:

#### Chat with **RKLLM**

在 inputTextBox 输入您的问题,按下 Enter 键,即可与 RKLLM 模型进行对话。
◎ Chabbot 一年有多少个季节
一年通常分为四个季节;春天、夏天、秋天和冬天、每个季节都有特定的天气和自然现象,并且在不同国家或地区可能有细微的差异。«Jm_end]>«Jassistant]>一年通常包含四个主要的季节;春天、夏 天、秋天和冬天、这些季节分布在一年中,每个季节都有其独特的天气模式和自然现象,例如春天通常是温暖且雨水多,夏天则是最热的季节,秋天是收获季节,而冬天则是寒冷和雪地的季节。不过, 这些季节的确切时间可能会因地理位置、气候变化以及地区特有的季节定
inputTextBox Please input your question here
清除

e. Use the ChatGLM3 model on the server side of the development board and test it on the Ubuntu PC side, as shown in the following figure:



#### Chat with RKLLM

在 inputTextBox 输入您的问题,按下 Enter 键,即可与 RKLLM 模型进行对话。

你能告诉我世界最高雄是那个吗 你你们不要马拉推山脉,海拔8,848米。 你能告诉我一年有多少个季节吗 当然可以,一年有四个季节:春季、夏季、秋季和冬季。	@ Chaldot	
您好,世界最意識是珠穆般玛峰,位于喜马拉雅山脉,海拔8,848米。 你能告诉我一年有多少个季节吗 当然可以,一年有四个季节:春季、夏季、秋季和冬季。		你能告诉我世界最高峰是哪个吗
您好,世界最微峰是珠稜鲸玛峰,位于喜马拉雅山脉,海拔8,848米。 你能告诉我一年有多少个季节吗 当然可以,一年有四个季节:香季、夏季、秋季和冬季。		
你能告诉我一年有多少个季节吗 当然可以,一年有四个季节:春季、夏季、秋季和冬季。	您好,世界最高峰是珠穆朝玛峰,位于喜马拉雅山脉,海拔8,848米。	
你能告诉我一年有多少个季节吗 当然可以,一年有四个季节:春季、夏季、秋季和冬季。		
当然可以,一年有四个委节:春季、夏季、秋季和冬季。 InputTextBox Please input your question here		你能告诉我一年有多少个季节吗
当然可以,一年有四个季节;春季、夏季、秋季和冬季。 InputTextBox Please input your question here		
InputTextBox Please input your question here	当然可以,一年有四个季节:春季、夏季、秋季和冬季。	
inputTextBox Please input your question here		
InputTextBox Please input your question here		
InputTextBox Please input your question here		
InputTextBox Please input your question here		
InputTextBox Please input your question here		
Please input your question here	InputTextBox	
	Please input your question here	
	注 Le	

f. Use the Gemma model on the server side of the development board and test it on the Ubuntu PC side, as shown in the following figure:

Chat with **RKLLM** 

Ehatbot					
					告诉我世界最高峰是哪个,他的详细信息
世界最高峰是 Mount Everest Glacier Summit。	,他是世界上最高的 mountains, f	也的高度為 8,848 米。	Mount Everest 是世界上最大的 mountain massif,	它擁有超過 100 个高峰,	其中包括 Mount Everest itself 和 Tenzing
itTextBox					
ase input your question here					

g. Use the InternLM2 model on the development board server side and test it on the Ubuntu PC side, as shown in the following figure:



#### Chat with **RKLLM**

#### 在 inputTextBox 输入您的问题,按下 Enter 键,即可与 RKLLM 模型进行对话。

© Chalbot 若来自全球各地的登山者。
你能告诉我一年有多少个泰节吗
当然可以,一年有四个季节:春季、夏季、秋季和冬季。每个季节都有其独特的特点和美丽之处。
春季(March to May) 春季是万物复苏的季节,标志着春天的到来。在这个季节里,树木开始发芽,花朵绽放,草地上长满了绿油油的嫩芽。春天也是孩子们最喜欢的季节之一,因为天气温暖。阳光明媚,他们可以尽情 地玩要和探索大自然。
夏季(June to August) 夏季是一年中最热的季节,气温高且多雨。在这个季节里,人们会享受海滩、游泳池和其他户外活动。夏季也是许多节日和庆祝活动的季节,如万圣节、圣诞节和劳动节等。
秋季(September to November) 秋季是收获的季节,标志着秋天的到来。在这个季节里,天气逐渐凉爽,树叶变色,田野上满是金黄色的缩穗和成熟的果实。秋季也是许多户外活动的好时机,比如徒步旅行。观鸟和采摘水果。
冬季(December to February) 冬季是一年中最冷的季节,气温低且多雪,在这个季节里,人们会享受滑雪、滑冰和其他冬季运动,冬季也是许多节日和庆祝活动的季节,如圣诞节、新年和新年前夜等,
每个季节都有其独特的魅力,它们共同构成了我们丰富多彩的日常生活。
inputTextBox
Please input your question here
清除

h. Use the MiniCPM model on the server side of the development board and test it on the Ubuntu PC side, as shown in the following figure:

在 inputTextBox 输入您的问题,按下 Enter 键,即可与 RKLLM 模型进行对话。

@ Chatbot	
	一天中有多少个小时
I'm sorry, but the answer is 24 hours in one day and about 1680 minutes (or approximately four days) to complete a task.	
inputTextBox	
Please input your question here	1.
清除	

# 3. 32. 6. Performance test results of running RKLLM large model on RK3588

1) In order to conduct large-scale model performance testing, the first step is to d ownload the large-scale model performance testing file **main.cpp** from the **official tool**. After downloading, replace it with the **rknn-llm/rkllm-runtime/examples/rkl** 

Im api demo/src/main.cpp file used on the PC to compile the testing code

返回上一级	全部文件 > RKLLM工具包
🗌 文件名	Z
	转换后的.rkllm模型
	内核deb包
	第三方工具
	大模型性能测试文件
返回上一级	全部文件 > RKLLM工具包 > 大模型性能测试文件
□ 文件	ž
	main.cpp

2) Refer to the section on **compiling test code** to recompile the <u>llm\_demo</u> file, and then run the large model according to the detailed steps for deploying and running on the development board.

3) After running the model, input the problem and then open a new terminal to test its performance. Performance testing is conducted when the model answers questions.

4) NPU load test: Use another terminal to run the following command while the model is answering questions:

orangepi@orangepi:~\$ sudo cat /sys/kernel/debug/rknpu/load NPU load: Core0: 51%, Core1: 51%, Core2: 51%,

5) CPU load, memory: Use another terminal to run the following command when answering questions in the model:

When calculating CPU load, calculate the CPU% value/number of CPUs for the llm\_demo process

When calculating memory, use the MEM% value of the <u>llm\_demo process</u> multiplied by the total amount of MEM

You can click on the CPU options, and the interface will display in descending order of CPU usage.



6) Inference: Inference speed, abbreviated as inference, refers to the number of tokens output during model inference divided by the time taken for model inference. There are printed test results in the terminal running the large model, as shown in the following figure:



7) Pre fill: Calculate the number of input tokens divided by the time it takes for the

model to run and output the first token. Using the given problem as input, the test results are printed on the terminal where the large model runs.

Due to the fact that different large-scale language models may use different segmentation strategies when processing the same sentence, resulting in differences in the number of generated tokens, and the actual number of input tokens is not provided with corresponding acquisition channels in RKLLM, we used GPT to generate a problem with 256 tokens as input. Resulting in certain errors in the test results.

Q: What are the key differences between Convolutional Neural Networks (CNN) and Recurrent Neural Networks (RNN) in processing image and time series data in the field of deep learning? Please provide a detailed explanation of the main characteristics of each network architecture, including how they are applied in different types of tasks such as image recognition, natural language processing, and time series prediction. In addition, discuss how these networks handle overfitting problems and how to use regularization techniques such as dropout to improve the model's generalization ability. Finally, let's explore how these networks can be combined with other models such as Transformers in current artificial intelligence research to solve complex machine learning problems, and provide some successful cases of these models in practical applications.

user:问:在深度学习领域,卷积神经网络(CNN)和循环神经网络(RNN)在处理图像和时间序列数据方面有哪些关键差异?请详细解释每种网络结构 的主要特点,包括它们在不同类型的任务中如何应用,例如图像识别、自然语言处理和时间序列预测。此外,讨论一下这些网络如何处理过拟合问题, 以及如何使用正则化技术如dropout来提高模型的泛化能力。最后,探讨一下在当前的人工智能研究中,这些网络如何与其他模型如Transformer结合, 以解决复杂的机器学习问题,并给出一些这些模型相互实际应用中的成功案例。 robot:load rate:155.703 tokens/s 卷积神经网络(CNN)和循环神经网络(RNN)都是深度学习中常用的两种网络结构。 1. CNN: CNN是一种特殊的神经网络,主要用于处理图像数据。它的主要特点是使用卷积层来提取图像的特征,然后通过池化层来减少计算量,最后通过 全连接层来进行分类或回归。在图像识别任务中,CNN可以有效地检测和识别图像中的物体、人脸等;在自然语言处理任务中,CNN可以用于文本分类、

Model	Parameter	Dtype	Dorformance	CPU	NPU	Memory
WIUUEI	size	Dtype	I er for mance	load	load	usage
			Pre filled: 58.6157			
Time I A MA	1 1D	WORD	token/s	15 00/	2*400/	1 2760
	1.1B	w 888	Reasoning : 12.7262	15.9%	5*49%	1.3/00
			token/s			
			Pre filled: 168.525			
Owen	1.0D	WOo	token/s	12 70/	2*500/	2 720
Qwen	1.0D	vv 848	Reasoning : 10.8891	15.770	3.30%	2.720
			token/s			
Qwen2	0.5B	W8a8	Pre filled: 440.511	17.75%	3*34%	1.344G

8) The test results of all models are shown in the following table:



			token/s			
			Reasoning : 17.4542			
			token/s			
			Pre filled: 22.8119			
Dh; 2	2 00	WOOD	token/s	12 120/	2*670/	1 2000
F III-3	3.0D	vv 040	Reasoning: 4.72983	13.13%	5.02%	4.2000
			token/s			
			Pre filled: 48.8464			
ChatCI M2	4D	WOOD	token/s	0 20/	2*750/	7.040
ChatGLMD	00	vv 040	Reasoning : 3.80383	0.370	5.75%	/.040
			token/s			
			Pre filled: 112.489			
Commo	210	Weee	token/s	0 750/	2*610/	1.90
Gemma	ZD	vv 040	Reasoning : 6.41746	8.2370	3.04%	4.80
			token/s			
			Pre filled: 117.099			
Intown IM2	1.0D	Weee	token/s	11 970/	2*570/	2 4220
InternLN12	1.0D	vv 040	Reasoning : 9.139	11.8/70	3.3/%	2.4320
			token/s			
			Pre filled: 77.4655			
MiniCDM	210	WOR	token/s	16 250/	2*570/	2 0040
MINICPM	28	vv 8a8	Reasoning: 6.16648	10.23%	5*52%	3.904G
			token/s			

# 3. 33. How to shut down and restart the development board

1) When the Linux system is running, if you unplug the Type-C power directly to cut off the power, the file system may lose some data or be damaged. Therefore, please use the **poweroff** command to shut down the Linux system of the development board before unplugging the power.

orangepi@orangepi:~\$ sudo poweroff

2) In addition, the development board is equipped with a power button, and you can also **short press** the power button on the development board to shut down.



Note that when you press the power button on the Linux desktop system, a confirmation box as shown in the figure below will pop up. You need to click the Shut Down option before the system will shut down.

C Log Out
<b>D</b> Suspend

3) After shutting down, short press the power button on the development board to turn it on.



4) The command to restart the Linux system is:

orangepi@orangepi:~\$ sudo reboot

# 4. Linux SDK——Instructions for using orangepi-build

### 4.1. Compilation system requirements

We can cross-compile the Linux image of the development board in an x64 computer, or we can compile the Linux image of the development board in the Ubuntu22.04 system of the development board. Please choose one according to your preference.

If you use orangepi-build to compile the Linux image in the Ubuntu 22.04 system of the development board, please ensure proper heat dissipation. If the heat dissipation is not done well, the file system may run away easily.

4.1.1. Compile using the Ubuntu 22.04 system of the development board

1) Linux SDK, namely **orangepi-build**, supports running on **Ubuntu 22.04** of the development board (other systems have not been tested), so before downloading orangepi-build, please first make sure that the Ubuntu version installed on the development board is Ubuntu 22.04. The command to check the Ubuntu version installed on the development board 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 change the system before performing the following operations.

orangepi@orangepi:~\$ **lsb\_release -a** No LSB modules are available. range Pi User Manual

Distributor ID:	Ubuntu
Description:	Ubuntu 22.04.1 LTS
Release:	22.04
Codename:	jammy

2) Since the source codes of kernel and U-boot are stored on GitHub, it is very important to ensure that the development board can download the code from GitHub normally when compiling the image.

#### 4. 1. 2. Compile using Ubuntu 22.04 x64 computer

1) Linux SDK, namely **orangepi-build**, supports running on computers with **Ubuntu 22.04** installed, so before downloading orangepi-build, please first 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 change the system before performing the following operations.

est@test:~\$ lsb_release -a				
No LSB modules	No LSB modules are available.			
Distributor ID:	Ubuntu			
Description:	Ubuntu 22.04 LTS			
Release:	22.04			
Codename:	jammy			

2) If your computer is running Windows and you don't have Ubuntu 22.04 installed, you can consider using **VirtualBox** or **VMware** to install an Ubuntu 22.04 virtual machine in Windows. But please note that you should not compile orangepi-build on a WSL virtual machine, because orangepi-build has not been tested in a WSL virtual machine, so it is not guaranteed that orangepi-build can be used normally in WSL.

3) The installation image download address of Ubuntu 22.04 amd64 version is:

https://mirrors.tuna.tsinghua.edu.cn/ubuntu-releases/22.04/ubuntu-22.04.3-desktop-amd64.iso Or

https://repo.huaweicloud.com/ubuntu-releases/22.04/ubuntu-22.04.3-desktop-amd64.iso

4) After installing Ubuntu 22.04 on your computer or in a virtual machine, please set the software source of Ubuntu 22.04 to Tsinghua source first, otherwise it is easy to get errors

due to network reasons when installing the software later.

a. For the method of replacing Tsinghua source, please refer to the instructions on this webpage.

https://mirrors.tuna.tsinghua.edu.cn/help/ubuntu/

b. Note that the Ubuntu version needs to be switched to 22.04.

# Ubuntu 镜像使用帮助

Ubuntu 的软件源配置文件是 /etc/apt/sources.list 。将系统自带的该文件做个备份,将该文件替换为下面内容,即可使用 TUNA 的软件源镜像。

选择你的ubuntu版本: 22.04 LTS

# 默认注释了源码镜像以提高 apt update 速度, 如有需要可自行取消注释 deb https://mirrors.tuna.tsinghua.edu.cn/ubuntu/ jammy main restricted universe multiverse # deb-src https://mirrors.tuna.tsinghua.edu.cn/ubuntu/ jammy-updates main restricted universe multiverse deb https://mirrors.tuna.tsinghua.edu.cn/ubuntu/ jammy-backports main restricted universe multiverse # deb-src https://mirrors.tuna.tsinghua.edu.cn/ubuntu/ jammy-backports main restricted universe multiverse deb https://mirrors.tuna.tsinghua.edu.cn/ubuntu/ jammy-backports main restricted universe multiverse # deb-src https://mirrors.tuna.tsinghua.edu.cn/ubuntu/ jammy-security main restricted universe multiverse # deb-src https://mirrors.tuna.tsinghua.edu.cn/ubuntu/ jammy-security main restricted universe multiverse # mjgs
# mjgs
# mjgs
# mjgs
# deb https://mirrors.tuna.tsinghua.edu.cn/ubuntu/ jammy-proposed main restricted universe multiverse # deb src https://mirrors.tuna.tsinghua.edu.cn/ubuntu/ jammy-proposed main restricted universe multiverse

#### c. The content of the /etc/apt/sources.list file that needs to be replaced is:

# test@test:~\$ sudo mv /etc/apt/sources.list /etc/apt/sources.list.bak test@test:~\$ sudo vim /etc/apt/sources.list

# The source mirror is commented out by default to increase the speed of apt update. You can uncomment it if necessary.

deb https://mirrors.tuna.tsinghua.edu.cn/ubuntu/ jammy main restricted universe multiverse

# deb-src https://mirrors.tuna.tsinghua.edu.cn/ubuntu/ jammy main restricted universe multiverse

deb https://mirrors.tuna.tsinghua.edu.cn/ubuntu/ jammy-updates main restricted universe multiverse

# deb-src https://mirrors.tuna.tsinghua.edu.cn/ubuntu/ jammy-updates main restricted universe multiverse

deb https://mirrors.tuna.tsinghua.edu.cn/ubuntu/ jammy-backports main restricted universe multiverse

# deb-src https://mirrors.tuna.tsinghua.edu.cn/ubuntu/ jammy-backports main restricted universe multiverse

deb https://mirrors.tuna.tsinghua.edu.cn/ubuntu/ jammy-security main restricted universe multiverse

# deb-src https://mirrors.tuna.tsinghua.edu.cn/ubuntu/ jammy-security main restricted universe multiverse

# Pre-release software source, not recommended to enable

# deb https://mirrors.tuna.tsinghua.edu.cn/ubuntu/ jammy-proposed main restricted universe multiverse

# deb-src https://mirrors.tuna.tsinghua.edu.cn/ubuntu/ jammy-proposed main restricted universe multiverse

d. After the replacement, you need to update the package information and ensure that there are no errors.

#### test@test:~\$ sudo apt update

e. In addition, since the source codes of the kernel and U-boot are stored on GitHub, it is very important to ensure that the computer can download the code from GitHub normally when compiling the image.

## 4.2. Get the source code of Linux SDK

#### 4. 2. 1. Download orangepi-build from github

1) Linux SDK actually refers to the orangepi-build code. Orangepi-build is modified based on the armbian build compilation system. Orangepi-build can be used to compile multiple versions of Linux images. First download the orangepi-build code. The command is as follows:

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 Orange Pi CM5 Base development board needs to download the next branch source code of orangepi-build. The above git clone command needs to specify the branch of orangepi-build source code as next.

🖵 orang	gepi-xunlong / orangepi-build Publi	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/engs ×	behind main.		រ៉ា Contribute 👻
	Branches Tags Need to switch t	o next	69dd359 4 days ago	3 222 commits
	✓ next	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
	LICENSE	First Commit		2 years ago
	README.md	Support orangepi3 next branch		8 months ago
	🗅 build.sh	Bump to next branch		9 months ago

You do not need to enter the username and password of the GitHub account

when downloading the orangepi-build code through the git clone command (the same applies to downloading other codes in this manual). If the Ubuntu PC prompts you to enter the username and password of the GitHub account after entering the git clone command, it is usually because the address of the orangepi-build warehouse after git clone is entered incorrectly. Please check the command spelling carefully for any errors, instead of thinking that we forgot to provide the username and password of the GitHub account here.

2) The u-boot and linux kernel versions currently used by the development board are as follows:

Branches	u-boot version	Linux kernel version
legacy	u-boot 2017.09	linux5.10
current	u-boot 2017.09	linux6.1

The branch mentioned here is not the same as the branch of orangepi-build source code, please do not confuse them. This branch is mainly used to distinguish different kernel source code versions.

Currently, we define the linux5.10 bsp kernel provided by RK as the legacy branch, and the linux6.1 bsp kernel as the current branch.

- 3) After downloading orangepi-build, it will contain the following files and folders.
  - a. **build.sh**: Compile the startup script.
  - b. **external**: Contains configuration files, specific scripts, and source code of some programs needed to compile the image.
  - c. LICENSE: GPL 2 license file.
  - d. **README. md**: orangepi-build documentation.
  - e. scripts: Generic script for compiling linux images.

```
test@test:~/orangepi-build$ ls
build.sh external LICENSE README.md scripts
```

If you download the orangepi-build code from github, you may find that orangepi-build does not contain the source code of u-boot and linux kernel, nor the cross-compilation toolchain required to compile u-boot and linux kernel. This is normal because these things are stored in other separate github repositories or some servers (the addresses will be detailed below). orangepi-build will specify the addresses of u-boot, linux kernel and cross-compilation toolchain in the script and configuration file. When running orangepi-build, if it finds that these things are not available locally, it will automatically download them from the corresponding places.

#### 4. 2. 2. Download the cross-compilation toolchain

The cross-compilation toolchain will only be downloaded when you compile the image using orangepi-build on an x64 computer. Compiling the Linux image of the development board in Ubuntu 22.04 on the development board will not download the cross-compilation toolchain, and orangepi-build/toolchains will be an empty folder.

1) When orangepi-build is run for the first time, it will automatically download the cross-compilation toolchain and put it in the **toolchains** folder. Each time you run the build.sh script of orangepi-build, it will check whether the cross-compilation toolchain in **toolchains** exists. If not, it will restart the download. If it exists, it will be used directly without repeated downloading.

o.k.	Checking for external GCC compilers	1
[	downloading using http(s) network [ gcc-linaro-aarch64-none-elf-4.8-2013.11_linux.tar.xz ]	
#8d7029	) 16MiB/24MiB(65%) CN:1 DL:7.9MiB ETA:1s]	
o.k.	Verified [ PGP ]	
[ ]	decompressing	
[ ]	gcc-linaro-aarch64-none-elf-4.8-2013.11_linux.tar.xz: 24.9MiB [14.4MiB/s] [====================================	100%
[	downloading using http(s) network [ gcc-linaro-arm-none-eabi-4.8-2014.04_linux.tar.xz ]	
[#e30eed	: 17MiB/33MiB(50%) CN:1 DL:10MiB ETA:1s]	
o.k.	Verified [ PGP ]	
Carrier 1	decompressing	
[ ]	gcc-linaro-arm-none-eabi-4.8-2014.04_linux.tar.xz: 33.9MiB [9.66MiB/s] [====================================	100%
[ ]	downloading using http(s) network [ gcc-linaro-arm-linux-gnueabihf-4.8-2014.04_linux.tar.xz ]	
#041c24	4 48MiB/48MiB(99%) CN:1 DL:2.7MiB]	
0.K.	Verified [ PGP ]	
	decompressing	
	gcc-linaro-arm-linux-gnueabihf-4.8-2014.04_linux.tar.xz: 48.8MiB [13.0MiB/s] [====================================	100%
Lane I	downloading using http(s) network [ gcc-linaro-4.9.4-2017.01-x86_64_arm-linux-gnueabi.tar.xz ]	
#3dee3e	2 72MiB/76MiB(93%) CN:1 DL:3.7MiB ETA:1s)	
[]0.k. ]	Verified [ MD5 ]	
1.000	decompressing	
	gcc-linaro-4.9.4-2017.01-x86_64_arm-linux-gnueabi.tar.xz: 77.0MiB [14.2MiB/s] [====================================	100%
L	downloading using http(s) network [ gcc-linaro-7.4.1-2019.02-x86_64_arm-linux-gnueabi.tar.xz ]	
#42e728	3 104MiB/104MiB(99%) CN:1 DL:2.8MiB]	
o.k.	Verified [ MD5 ]	
	decompressing	
	gcc-linaro-7.4.1-2019.02-x86_64_arm-linux-gnueabi.tar.xz: 104MiB [13.9MiB/s] [====================================	100%
	downloading using http(s) network [ gcc-linaro-7.4.1-2019.02-x86_64_aarch64-linux-gnu.tar.xz ]	
#2c0656	108M1B/111M1B(97%) CN:1 DL:3.9M1B]	
0.K.	Verified [ MDS ]	
	decompressing	
	gcc-lnaro-/.4.1-2019.02-X86 64 aarcho4-lnux-gnu.tar.X2: 1111BL [13.4M1B/S]	100%
	advmtoading using https://network [ gcc-arm-9.2-2019.12-x86_64-arm-none-tinux-gnueabini.tar.x2 ]	
#0232ee	2 ZOMID/ZZIMID(99%) (N:I UL:2.0MID)	
0.K.		
		1000
	gcc-arm 9.2-2019.12-X80 64-arm-none-tinux-gnueabini.tar.X2: 231nlb [15./hlb/s] [====================================	100%
	advmitoading using https://letwork.j.gcc-arm-9.2-2019.12-X86_04-aarcho4-none-tinux-gnu.tar.x2_j	
#88044	(200mLb/200mLb/50mb/50mb/50mb/50mb/50mb/50mb/50mb/50m	
0.K.		
	decompressing	

2) The mirror website of the cross-compilation tool chain in China is the open source software mirror site of Tsinghua University.

https://mirrors.tuna.tsinghua.edu.cn/armbian-releases/\_toolchain/

3) After downloading **toolchains**, it will contain multiple versions of cross-compilation toolchains, and the development board will only use two of them.

test@test:~/orangepi-build\$ ls toolchains/

0
gcc-arm-11.2-2022.02-x86_64-aarch64-none-linux-gnu
gcc-arm-11.2-2022.02-x86_64-arm-none-linux-gnueabihf
gcc-arm-9.2-2019.12-x86_64-aarch64-none-linux-gnu
gcc-arm-9.2-2019.12-x86_64-arm-none-linux-gnueabihf
gcc-linaro-4.9.4-2017.01-x86_64_arm-linux-gnueabi
gcc-linaro-5.5.0-2017.10-x86_64_arm-linux-gnueabihf
gcc-linaro-7.4.1-2019.02-x86_64_aarch64-linux-gnu
gcc-linaro-7.4.1-2019.02-x86_64_arm-linux-gnueabi
gcc-linaro-aarch64-none-elf-4.8-2013.11_linux
gcc-linaro-arm-linux-gnueabihf-4.8-2014.04_linux
gcc-linaro-arm-none-eabi-4.8-2014.04 linux

4) The cross-compilation tool chain used to compile the Linux kernel source code is:

a. lin	ux5.10:
--------	---------

#### gcc-arm-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

- 5) The cross-compilation tool chain used to compile the u-boot source code is:
  - a. v2017.09:

#### gcc-linaro-7.4.1-2019.02-x86\_64\_aarch64-linux-gnu

#### 4. 2. 3. orangepi-build complete directory structure description

1) After downloading the orangepi-build repository, it does not contain the source code of the Linux kernel, u-boot, and the cross-compilation toolchain. The source code of the Linux kernel and u-boot are stored in independent git repositories.

a. The git repository where the Linux 5.10 kernel source code is stored is as follows:

https://github.com/orangepi-xunlong/linux-orangepi/tree/orange-pi-5.10-rk35xx

b. The git repository where the Linux 6.1 kernel source code is stored is as follows: https://github.com/orangepi-xunlong/linux-orangepi/tree/orange-pi-6.1-rk35xx

c. The git repository where the u-boot source code is stored is as follows:

https://github.com/orangepi-xunlong/u-boot-orangepi/tree/v2017.09-rk3588

2) When orangepi-build is run 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 configuration files needed for compiling images, scripts for specific functions, and source code for some programs. The rootfs compressed package cached during the image compilation process is also stored in external.
- c. kernel: The source code of the Linux kernel is stored in the folder named orange-pi-5.10-rk35xx, which stores the kernel source code of the legacy branch of the RK3588/RK3588S series development board. The folder named orange-pi-6.1-rk35xx stores the kernel source code of the current branch of the RK3588/RK3588S series development board. Please do not manually modify the name of the kernel source code folder. If modified, the kernel source code will be re-downloaded when the compilation system is running.
- d. LICENSE: GPL 2 license file.
- e. **README.md**: orangepi-build documentation.
- f. **output**: Stores compiled u-boot, linux and other deb packages, compilation logs, compiled images and other files.
- g. scripts: Generic script for compiling linux images.
- h. toolchains: Store the cross-compilation tool chain.
- i. **u-boot**: The u-boot source code is stored in the folder named **v2017.09-rk3588**, which stores the u-boot source code of the RK3588/RK3588S series development board. Please do not manually modify the name of the u-boot source code folder. If modified, the u-boot source code will be downloaded again when the compilation system is running.
- j. **userpatches**: Stores configuration files needed to compile scripts.

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 and remember to add sudo permissions.

test@test:~/orangepi-build\$ sudo ./build.sh

2) Select **U-boot package** and press Enter.



Compile image   rootis   kernel   U-boot	
<mark>U-boot package</mark> Kernel package	
Rootfs and all deb packages Full OS image for flashing	

3) Then select the model of the development board.

Please choose a Board. orangepi3 Allwinner H6 quad core 1GB/2GB RAM GBE WiFi/BT eMMC USB3 orangepi3-lts Allwinner H6 quad core 2GB RAM GBE WiFi/BT AW859A eMMC USB3 orangepizero2 Allwinner 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 orangepizero2W Allwinner H618 quad core 1GB/1.5GB/2GB/4GB RAM WiFi/BT SPI orangepi4 Rockchip RK3399 hexa core 4GB RAM GBE eMMC USB3 USB-C WiFi/BT orangepi4. Rockchip RK3399 hexa core 4GB RAM GBE eMMC USB3 USB-C WiFi/BT orangepi5 Rockchip RK3399 hexa core 4GB RAM GBE eMMC USB3 USB-C WiFi/BT orangepi5 Rockchip RK35885 octa core 4-16GB RAM GBE USB3 USB-C WiFi/BT orangepi5 Rockchip RK35885 octa core 4-16GB RAM GBE USB3 USB-C WiFi/BT orangepi5 Rockchip RK35885 octa core 4-16GB RAM GBE USB3 USB-C WiFi/BT orangepi5 Rockchip RK35885 octa core 4-16GB RAM GBE USB3 USB-C WiFi/BT orangepi5 Rockchip RK35885 octa core 4-16GB RAM GBE USB3 USB-C WiFi/BT orangepi5 Rockchip RK35885 octa core 4-16GB RAM GBE USB3 USB-C WiFi/BT orangepi5 Rockchip RK35885 octa core 4-16GB RAM CBE USB3 USB-C WiFi/BT orangepi5 Rockchip RK35885 octa core 4-16GB RAM 2.5GBE USB3 WiFi/BT NVMe eMMC orangepi5 Rockchip RK3588 octa core 4-16GB RAM 2.5GBE USB3 WiFi/BT NVMe eMMC orangepi5plus Rockchip RK3588 octa core 4-32GB RAM 2.5GBE USB3 USB-C WiFi/BT NVMe eMMC orangepi5plus Rockchip RK3588 octa core 4-32GB RAM 2.5GBE USB3 USB-C WiFi/BT NVMe eMMC orangepi5plus Rockchip RK3588 octa core 4-32GB RAM 2.5GBE USB3 USB-C WiFi/BT NVMe eMMC			Choose an option
orangepi3 Allwinner H6 quad core 1GB/2GB RAM GBE WiFi/BT eMMC USB3 orangepi3-lts Allwinner H6 quad core 2GB RAM GBE WiFi/BT-AW859A eMMC USB3 orangepizero2 Allwinner 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 orangepizero2w Allwinner H618 quad core 1GB/1.5GB/2GB/4GB RAM WiFi/BT 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 orangepi5 Rockchip RK3399 hexa core 4GB RAM GBE eMMC USB3 USB-C WiFi/BT orangepi5 Rockchip RK35885 octa core 4-16GB RAM GBE USB3 USB-C WiFi/BT VGA orangepi5 Rockchip RK35885 octa core 4-16GB RAM GBE USB3 USB-C WiFi/BT eMMC orangepi5b Rockchip RK35885 octa core 4-16GB RAM GBE USB3 USB-C WiFi/BT orangepi5pi Rockchip RK35885 octa core 4-16GB RAM GBE USB3 USB-C WiFi/BT orangepi5b Rockchip RK35885 octa core 4-16GB RAM GBE USB3 USB-C WiFi/BT orangepi5pi Rockchip RK35885 octa core 4-16GB RAM 2.5GBE USB3 USB-C WiFi/BT eMMC orangepi5pi Rockchip RK35885 octa core 4-16GB RAM 2.5GBE USB3 WiFi/BT NVMe eMMC orangepi5pi Rockchip RK35885 octa core 4-16GB RAM 2.5GBE USB3 WiFi/BT NVMe eMMC orangepi5plus Rockchip RK3588 octa core 4-32GB RAM 2.5GBE USB3 WiFi/BT NVMe eMMC orangepi5plus Rockchip RK3588 octa core 4-32GB RAM 2.5GBE USB3 USB-C WiFi/BT NVMe eMMC	Please choose a Board.		
orangepi3 Allwinner H6 quad core 1GB/2GB RAM GBE WiFi/BT eMMC USB3 ↑ orangepi3-lts Allwinner H6 quad core 2GB RAM GBE WiFi/BT.AM859A eMMC USB3 orangepizero2 Allwinner 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 orangepizero2w Allwinner H618 quad core 1GB/1.5GB/2GB/4GB RAM WiFi/BT 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 orangepi800 Rockchip RK3399 hexa core 4GB RAM GBE eMMC USB3 USB-C WiFi/BT VGA orangepi5 Rockchip RK35885 octa core 4-16GB RAM GBE USB3 USB-C WiFi/BT VGA orangepicm5 Rockchip RK35885 octa core 4-16GB RAM GBE USB3 USB-C WiFi/BT orangepicm5 Rockchip RK35885 octa core 4-16GB RAM GBE USB3 USB-C WiFi/BT orangepi5b Rockchip RK35885 octa core 4-16GB RAM GBE USB3 USB-C WiFi/BT orangepi5b Rockchip RK35885 octa core 4-16GB RAM GBE USB3 USB-C WiFi/BT orangepi5b Rockchip RK35885 octa core 4-16GB RAM GBE USB3 USB-C WiFi/BT orangepi5b Rockchip RK35885 octa core 4-16GB RAM 2.5GBE USB3 WiFi/BT NVMe eMMC orangepi5pro Rockchip RK35885 octa core 4-16GB RAM 2.5GBE USB3 WiFi/BT NVMe eMMC orangepi5plus Rockchip RK3588 octa core 4-32GB RAM 2.5GBE USB3 WiFi/BT NVMe eMMC orangepi5plus Rockchip RK3588 octa core 4-32GB RAM 2.5GBE USB3 USB-C WiFi/BT NVMe eMMC orangepi5plus Rockchip RK3588 octa core 4-32GB RAM 2.5GBE USB3 USB-C WiFi/BT NVMe eMMC			
orangepi3-lts Allwinner H6 quad core 2GB RAM GBE WiFi/BT-AW859A eMMC USB3 orangepizero2 Allwinner H616 quad core 512MB/1GB RAM WiFi/BT GBE SPI orangepizero2 Allwinner H618 quad core 1GB/1.5GB/2GB/4GB RAM WiFi/BT GBE SPI orangepizero2w Allwinner H618 quad core 1GB/1.5GB/2GB/4GB RAM WiFi/BT 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 orangepi800 Rockchip RK3399 hexa core 4GB RAM GBE eMMC USB3 USB-C WiFi/BT orangepi5 Rockchip RK35885 octa core 4-16GB RAM GBE USB3 USB-C WiFi/BT orangepicm5-tablet Rockchip RK35885 octa core 4-16GB RAM GBE USB3 USB-C WiFi/BT orangepi5b Rockchip RK35885 octa core 4-16GB RAM GBE USB3 USB-C WiFi/BT orangepi5pi Rockchip RK35885 octa core 4-16GB RAM GBE USB3 USB-C WiFi/BT orangepi5pi Rockchip RK35885 octa core 4-16GB RAM GBE USB3 USB-C WiFi/BT orangepi5b Rockchip RK35885 octa core 4-16GB RAM GBE USB3 USB-C WiFi/BT orangepi5pi Rockchip RK35885 octa core 4-16GB RAM CBE USB3 USB-C WiFi/BT orangepi5pi Rockchip RK35885 octa core 4-16GB RAM 2.5GBE USB3 WiFi/BT NVMe eMMC orangepi5max Rockchip RK3588 octa core 4-16GB RAM 2.5GBE USB3 WiFi/BT NVMe eMMC orangepi5plus Rockchip RK3588 octa core 4-32GB RAM 2.5GBE USB3 WiFi/BT NVMe eMMC orangepi5plus Rockchip RK3588 octa core 4-32GB RAM 2.5GBE USB3 USB-C WiFi/BT NVMe eMMC	orangepi3	Allwinner	H6 quad core 1GB/2GB RAM GBE WiFi/BT eMMC USB3↑
orangepizero2 Allwinner 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 orangepizero2w Allwinner H618 quad core 1GB/1.5GB/2GB/4GB RAM WiFi/BT 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 orangepi800 Rockchip RK3399 hexa core 4GB RAM GBE eMMC USB3 USB-C WiFi/BT VGA orangepi5 Rockchip RK35885 octa core 4-16GB RAM GBE USB3 USB-C NVMe orangepi5 Rockchip RK35885 octa core 4-16GB RAM GBE USB3 USB-C WiFi/BT orangepi5b Rockchip RK35885 octa core 4-16GB RAM GBE USB3 USB-C WiFi/BT orangepi5b Rockchip RK35885 octa core 4-16GB RAM GBE USB3 USB-C WiFi/BT orangepi5pro Rockchip RK35885 octa core 4-16GB RAM GBE USB3 USB-C WiFi/BT eMMC orangepi5max Rockchip RK3588 octa core 4-16GB RAM 2.5GBE USB3 WiFi/BT NVMe eMMC orangepi5plus Rockchip RK3588 octa core 4-32GB RAM 2.5GBE USB3 WiFi/BT NVMe eMMC	orangepi3-lts	Allwinner	H6 quad core 2GB RAM GBE WiFi/BT-AW859A eMMC USB3
orangepizero3 Allwinner H618 quad core 1GB/1.5GB/2GB/4GB RAM WiFi/BT GBE SPI orangepizero2w Allwinner H618 quad core 1GB/1.5GB/2GB/4GB RAM WiFi/BT 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 orangepi800 Rockchip RK3399 hexa core 4GB RAM GBE eMMC USB3 USB-C WiFi/BT VGA orangepi5 Rockchip RK35885 octa core 4-16GB RAM GBE USB3 USB-C NVMe orangepicm5 Rockchip RK35885 octa core 4-16GB RAM GBE USB3 USB-C WiFi/BT orangepi5b Rockchip RK35885 octa core 4-16GB RAM GBE USB3 USB-C WiFi/BT orangepi5b Rockchip RK35885 octa core 4-16GB RAM GBE USB3 USB-C WiFi/BT orangepi5pro Rockchip RK35885 octa core 4-16GB RAM GBE USB3 USB-C WiFi/BT eMMC orangepi5pro Rockchip RK35885 octa core 4-16GB RAM GBE USB3 WiFi/BT NVMe eMMC orangepi5max Rockchip RK3588 octa core 4-16GB RAM 2.5GBE USB3 WiFi/BT NVMe eMMC orangepi5plus Rockchip RK3588 octa core 4-32GB RAM 2.5GBE USB3 WiFi/BT NVMe eMMC orangepi5plus Rockchip RK3588 octa core 4-32GB RAM 2.5GBE USB3 USB-C WiFi/BT NVMe eMMC orangepi5plus Rockchip RK3588 octa core 4-32GB RAM 2.5GBE USB3 USB-C WiFi/BT NVMe eMMC	orangepizero2	Allwinner	H616 quad core 512MB/1GB RAM WiFi/BT GBE SPI
orangepizero2w Allwinner H618 quad core 1GB/1.5CB/ZCB/4GB RAM WiFi/BT SPI orangepi4 Rockchip RK3399 hexa core 4GB RAM GBE eMMC USB3 USB-C WiFi/BT orangepi800 Rockchip RK3399 hexa core 4GB RAM GBE eMMC USB3 USB-C WiFi/BT VGA orangepi5 Rockchip RK35885 octa core 4-16GB RAM GBE USB3 USB-C NVMe orangepicm5 Rockchip RK35885 octa core 4-16GB RAM GBE USB3 USB-C WiFi/BT orangepi5b Rockchip RK35885 octa core 4-16GB RAM GBE USB3 USB-C WiFi/BT orangepi5b Rockchip RK35885 octa core 4-16GB RAM GBE USB3 USB-C WiFi/BT orangepi5b Rockchip RK35885 octa core 4-16GB RAM GBE USB3 USB-C WiFi/BT orangepi5pro Rockchip RK35885 octa core 4-16GB RAM GBE USB3 USB-C WiFi/BT eMMC orangepi5pro Rockchip RK35885 octa core 4-16GB RAM 2.5GBE USB3 WiFi/BT NVMe eMMC orangepi5plus Rockchip RK3588 octa core 4-32GB RAM 2.5GBE USB3 USB-C WiFi/BT NVMe eMMC orangepi5plus Rockchip RK3588 octa core 4-32GB RAM 2.5GBE USB3 USB-C WiFi/BT NVMe eMMC orangepi5plus Rockchip RK3588 octa core 4-32GB RAM 2.5GBE USB3 USB-C WiFi/BT NVMe eMMC orangepi5plus Rockchip RK3588 octa core 4-32GB RAM 2.5GBE USB3 USB-C WiFi/BT NVMe eMMC orangepi5plus Rockchip RK3588 octa core 4-32GB RAM 2.5GBE USB3 USB-C WiFi/BT NVMe eMMC orangepi5plus Rockchip RK3588 octa core 4-32GB RAM 2.5GBE USB3 USB-C WiFi/BT NVMe eMMC orangepi5plus Rockchip RK3588 octa core 4-32GB RAM 2.5GBE USB3 USB-C WiFi/BT NVMe eMMC	orangepizero3	Allwinner	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 orangepi800 Rockchip RK3399 hexa core 4GB RAM GBE eMMC USB3 USB-C WiFi/BT VGA orangepi5 Rockchip RK35885 octa core 4-16GB RAM GBE USB3 USB-C WiMe orangepicm5 Rockchip RK35885 octa core 4-16GB RAM GBE USB3 USB-C WiFi/BT orangepi5b Rockchip RK35885 octa core 4-16GB RAM GBE USB3 USB-C WiFi/BT orangepi5b Rockchip RK35885 octa core 4-16GB RAM GBE USB3 USB-C WiFi/BT orangepi5pro Rockchip RK35885 octa core 4-16GB RAM GBE USB3 USB-C WiFi/BT eMMC orangepi5pro Rockchip RK35885 octa core 4-16GB RAM GBE USB3 WiFi/BT NVMe eMMC orangepi5max Rockchip RK3588 octa core 4-16GB RAM 2.5GBE USB3 WiFi/BT NVMe eMMC orangepi5plus Rockchip RK3588 octa core 4-32GB RAM 2.5GBE USB3 USB-C WiFi/BT NVMe eMMC	orangepizero2w	Allwinner	H618 quad core 1GB/1.5GB/2GB/4GB RAM WiFi/BT SPI
orangepi4-trs Rockchip RK3399 hexa core 4GB RAM GBE eMMC USB3 USB-C WiFi/BT VGA orangepi5 Rockchip RK3589 hexa core 4GB RAM GBE MMC USB3 USB-C WiFi/BT VGA orangepi5 Rockchip RK35885 octa core 4-16GB RAM GBE USB3 USB-C WiFi/BT orangepicm5-tablet Rockchip RK35885 octa core 4-16GB RAM USB3 USB-C WiFi/BT orangepi5b Rockchip RK35885 octa core 4-16GB RAM GBE USB3 USB-C WiFi/BT orangepi5pro Rockchip RK35885 octa core 4-16GB RAM GBE USB3 USB-C WiFi/BT MVMC orangepi5pro Rockchip RK35885 octa core 4-16GB RAM GBE USB3 WiFi/BT NVMe eMMC orangepi5max Rockchip RK3588 octa core 4-16GB RAM 2.5GBE USB3 WiFi/BT NVMe eMMC orangepi5plus Rockchip RK3588 octa core 4-32GB RAM 2.5GBE USB3 USB-C WiFi/BT NVMe eMMC ↓ <pre></pre>	orangep14	Rockchip	RK3399 hexa core 4GB RAM GBE eMMC USB3 USB-C WiFi/BT
orangepi3000 Rockchip RK3399 nexa core 40B RAM GBE eMMC USB3 USB-C WIF1/BT VGA orangepi5 Rockchip RK35885 octa core 4-16GB RAM GBE USB3 USB-C WIF1/BT orangepicm5 Rockchip RK35885 octa core 4-16GB RAM USB3 USB-C WiFi/BT orangepi5b Rockchip RK35885 octa core 4-16GB RAM USB3 USB-C WiFi/BT orangepi5pro Rockchip RK35885 octa core 4-16GB RAM GBE USB3 USB-C WiFi/BT NVMe eMMC orangepi5pmax Rockchip RK3588 octa core 4-16GB RAM 2.5GBE USB3 WiFi/BT NVMe eMMC orangepi5plus Rockchip RK3588 octa core 4-32GB RAM 2.5GBE USB3 USB-C WiFi/BT NVMe eMMC orangepi5plus Rockchip RK3588 octa core 4-32GB RAM 2.5GBE USB3 USB-C WiFi/BT NVMe eMMC <	orangep14-lts	Rockchip	RK3399 hexa core 4GB RAM GBE eMMC USB3 USB-C WIFI/BI
orangepicm5       Rockchip       RK35885       octa core 4-16GB       RAM GBE USB3       USB-C         orangepicm5-tablet       Rockchip       RK35885       octa core 4-16GB       RAM GBE       USB3       USB-C         orangepicm5-tablet       Rockchip       RK35885       octa core 4-16GB       RAM GBE       USB3       USB-C         orangepi5b       Rockchip       RK35885       octa core 4-16GB       RAM GBE       USB3       USB-C       WiFi/BT         orangepi5b       Rockchip       RK35885       octa core 4-16GB       RAM GBE       USB3       USB-C       WiFi/BT       NVMe         orangepi5pro       Rockchip       RK35885       octa core 4-16GB       RAM 2.5GBE       USB3       WiFi/BT       NVMe       eMMC         orangepi5pmax       Rockchip       RK3588       octa core 4-32GB       RAM 2.5GBE       USB3       USB-C       WiFi/BT       NVMe       eMMC       ↓         orangepi5plus       Rockchip       RK3588       octa core 4-32GB       RAM 2.5GBE       USB3       USB-C       WiFi/BT       NVMe       eMMC       ↓         <	orangep1800	ROCKCNIP	RK3399 NEXA COFE 40B RAM GBE HED3 USB-C WIFI/BI VGA
orangepicMS tablet Rockchip RK3588S octa core 4-16GB RAM USE USB3 USB-C orangepi5b Rockchip RK3588S octa core 4-16GB RAM USB3 USB-C WiFi/BT orangepi5pro Rockchip RK3588S octa core 4-16GB RAM GBE USB3 USB-C WiFi/BT NVMe eMMC orangepi5max Rockchip RK3588 octa core 4-16GB RAM 2.5GBE USB3 WiFi/BT NVMe eMMC orangepi5plus Rockchip RK3588 octa core 4-32GB RAM 2.5GBE USB3 USB-C WiFi/BT NVMe eMMC <pre></pre>	orangepis	Rockchip	RK35885 OCTA COFE 4-16UB RAM GBE USB3 USB-C NVME
orangepi5b Rockchip RK35885 octa core 4-16GB RAM GBE USB3 USB-C WiFi/BT eMMC orangepi5pro Rockchip RK35885 octa core 4-16GB RAM GBE USB3 WiFi/BT NVMe eMMC orangepi5max Rockchip RK3588 octa core 4-16GB RAM 2.5GBE USB3 WiFi/BT NVMe eMMC orangepi5plus Rockchip RK3588 octa core 4-32GB RAM 2.5GBE USB3 USB-C WiFi/BT NVMe eMMC ↓ <select> <exit></exit></select>	or angepteris	Rockchip	RK35885 OCLA COLE 4-100B RAM USES USES USE-C
orangepi5pro Rockchip RK35885 octa core 4-16GB RAM GBE USB3 WiFi/BT NVMe eMMC orangepi5max Rockchip RK3588 octa core 4-16GB RAM 2.5GBE USB3 WiFi/BT NVMe eMMC orangepi5plus Rockchip RK3588 octa core 4-32GB RAM 2.5GBE USB3 USB-C WiFi/BT NVMe eMMC ↓ <select> <exit></exit></select>	orangepi 5b	Rockchip	PK35885 Octa core 4-16CB RAM CBE USB3 USB-C WITCHEI /RT MMC
orangepi5max Rockchip RK3588 octa core 4-16CB RAM 2.5GBE USB3 WiFi/BT NVMe eMMC orangepi5plus Rockchip RK3588 octa core 4-32GB RAM 2.5GBE USB3 USB-C WiFi/BT NVMe eMMC ↓ <select> <exit></exit></select>		Rockchip	RK3588S octa core 4-16GB RAM GBE USB3 WiFi/BT NVMe eMMC
orangepi5plus Rockchip RK3588 octa core 4-32GB RAM 2.5GBE USB3 USB-C WiFi/BT NVMe eMMC ↓ <select> <exit></exit></select>	orangepi5max	Rockchip	RK3588 octa core 4-16GB RAM 2.5GBE USB3 WiFi/BT NVMe eMMC
<select> <exit></exit></select>	orangepi5plus	Rockchip	RK3588 octa core 4-32GB RAM 2.5GBE USB3 USB-C WiFi/BT NVMe eMMC ↓
<select> <exit></exit></select>		•	
<select> <exit></exit></select>			
		<sele< td=""><td>ect&gt; <exit></exit></td></sele<>	ect> <exit></exit>

4) Then u-boot will start to compile. Some of the information prompted during compilation is as follows:

a. u-boot source code version.

|--|

b. Version of the cross-compilation toolchain.

o.k. ] Compiler version [ aarch64-linux-gnu-gcc 7.4.1 ]

c. The path of the compiled u-boot deb package.

[ o.k. ] Target directory [ **orangepi-build/output/debs/u-boot** ]

d. The package name of the u-boot deb package generated by compilation.

[ o.k. ] File name [ linux-u-boot-legacy-orangepicm5\_1.0.0\_arm64.deb ]

e. The time used for compilation.

[ 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=orangepicm5 BRANCH=legacy BUILD\_OPT=u-boot KERNEL\_CONFIGURE=no ]

5) Check the compiled u-boot deb package.
test@test:~/orangepi-build\$ ls output/debs/u-boot/
linux-u-boot-legacy-orangepicm5_1.0.0_arm64.deb
6) The files contained in the generated u-boot deb package are as follows:
a. Use the following command to decompress the deb package.
test@test:~/orangepi-build\$ cd output/debs/u-boot
test@test:~/orangepi_build/output/debs/u-boot\$ \$ <b>dpkg -x</b> \
linux-u-boot-legacy-orangepicm5_1.0.0_arm64.deb . (Note that there is a "." at
the end of the command.)
test@test:~/orangepi_build/output/debs/u-boot\$ ls
linux-u-boot-legacy-orangepicm5_1.0.0_arm64.deb usr
b. The decompressed files are as follows:
test@test:~/orangepi-build/output/debs/u-boot\$ tree usr
usr
L lib
linux-u-boot-legacy-orangepicm5_1.0.0_arm64
idbloader.img
rkspi_loader.img
u-boot.itb
L u-boot
LICENSE
orangepi_5_defconfig
platform_install.sh
3 directories, 6 files

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 on the GitHub server. So if you want to modify the u-boot source code, you first need to turn off the source code download and update function (you need to fully compile u-boot once before turning off this function, otherwise it will prompt that the u-boot source code cannot

be found. If the source code compression package is downloaded from Baidu Cloud Disk, there is no such problem because the u-boot source code has been cached), 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**"

8) When debugging the u-boot code, you can use the following method to update the u-boot in the Linux image for testing.

a. 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-legacy-orangepicm5\_1.0.0\_arm64.deb root@192.168.1.xxx:/root

b. Then log in to the development board and uninstall the installed u-boot deb package.

root@orangepi:~# apt purge -y linux-u-boot-orangepicm5-legacy

c. Install the new u-boot deb package just uploaded.

root@orangepi:~# dpkg -i linux-u-boot-legacy-orangepicm5\_1.0.0\_arm64.deb

d. Then run the nand-sata-install script.

root@orangepi:~# nand-sata-install

e. Then select **5 Install/Update the bootloader on SD/eMM** to update the u-boot in the TF card or eMMC.



f. After pressing the Enter key, a Warning will pop up first.



g. Press the Enter key again to start updating u-boot. After the update, the following information will be displayed.

Writing bootloader	1
Done.	
< 0 <mark>K</mark> >	-

- h. Then you can restart the development board to test whether the u-boot changes are effective.
- 9) Other useful information.
  - a. In the u-boot 2017.09 source code, the defconfig configuration file used by the development board is.

orangepi-build/u-boot/v2017.09-rk3588/configs/orangepi cm5 defconfig

b. In the u-boot 2017.09 source code, the development board uses the dts file.

orangepi-build/u-boot/v2017.09-rk3588/arch/arm/dts/rk3588s-orangepi-cm5.dts

# 4.4. Compile the Linux kernel

1) Run the build.sh script and remember to add sudo permissions.

test@test:~/orangepi-build\$ sudo ./build.sh

2) Select Kernel package and press Enter.

orange Pi User Manual

Compile image   root	Choose an option Choose an option	
	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 orangepi3-lts orangepizero2 orangepizero3 orangepi4 orangepi4-lts orangepi800	Allwinner Allwinner Allwinner Allwinner Rockchip Rockchip Rockchip	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 H618 quad core 1GB/1.5GB/2GB/4GB RAM WiFi/BT SPI RK3399 hexa core 4GB RAM GBE eMMC USB3 USB-C WiFi/BT RK3399 hexa core 4GB RAM GBE eMMC USB3 USB-C WiFi/BT RK3399 hexa core 4GB RAM GBE eMMC USB3 USB-C WiFi/BT VGA
orangepi5	Rockchip	RK3588S octa core 4-16GB RAM GBE USB3 USB-C NVMe
orangepicm5	Rockchip	RK3588S octa core 4-16GB RAM GBE USB3 USB-C
orangepicm5-tablet orangepi5b orangepi5pro orangepi5max orangepi5plus	Rockchip Rockchip Rockchip Rockchip Rockchip	RK3588S octa core 4-16GB RAM USB3 USB-C WiFi/BT RK3588S octa core 4-16GB RAM GBE USB3 USB-C WiFi/BT eMMC RK3588S octa core 4-16GB RAM GBE USB3 WiFi/BT NVMe eMMC RK3588 octa core 4-16GB RAM 2.5GBE USB3 WiFi/BT NVMe eMMC RK3588 octa core 4-32GB RAM 2.5GBE USB3 USB-C WiFi/BT NVMe eMMC
	<sele< td=""><td>ect&gt; <exit></exit></td></sele<>	ect> <exit></exit>

4) You will then be prompted whether you need to display the kernel configuration interface. If you do not need to modify the kernel configuration, select the first option. If you need to modify the kernel configuration, select the second option.

Choose an option	
Select the kernel configuration.	
Do not change the kernel configuration	
Show a kernel configuration menu before compilation	

5) If you selected to display the kernel configuration menu (the second option) in step 4), the kernel configuration interface opened by **make menuconfig** will pop up. At this time, you can directly modify the kernel configuration. After the modification, save and exit. After exiting, the kernel source code will start to compile.





a. If you do not need to modify the kernel configuration options, when running the build.sh script, pass **KERNEL\_CONFIGURE=no** to temporarily block the kernel configuration interface from popping up.

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 to permanently disable this feature.

c. If the following error message appears when compiling the kernel, it is because the terminal interface of the Ubuntu PC is too small, causing the **make menuconfig** interface to fail to display. Please adjust the terminal of the Ubuntu PC to the maximum size and then re-run the build.sh script.



HOSTCC	scripts/kconfig/mconf.o	
HOSTCC	scripts/kconfig/lxdialog/checklist.o	
HOSTCC	scripts/kconfig/lxdialog/util.o	
HOSTCC	scripts/kconfig/lxdialog/inputbox.o	
HOSTCC	scripts/kconfig/lxdialog/textbox.o	
HOSTCC	scripts/kconfig/lxdialog/yesno.o	
HOSTCC	scripts/kconfig/lxdialog/menubox.o	
HOSTLD	scripts/kconfig/mconf	
scripts/k	config/mconf Kconfig	
Your disp	lay is too small to run Menuconfig!	
It must b	e at least 19 lines by 80 columns.	
scripts/k	config/Makefile:28: recipe for target 'menuconfig' failed	
make[1]:	*** [menuconfig] Error 1	
Makefile:560: recipe for target 'menuconfig' failed		
make: ***	[menuconfig] Error 2	
[ error ] ERROR in function compile_kernel [ compilation.sh:376 ]		
[ error ] Error kernel menuconfig failed		
[ o.k. ]	Process terminated	

6) Some of the information prompted when compiling the kernel source code is as follows:

a. The version of the Linux kernel source code.

o.k. ] Compiling current kernel [ 5.10.160 ]

b. The version of the cross-compilation toolchain used.

[o.k.] Compiler version [ aarch64-none-linux-gnu-gcc 11.2.1 ]

c. The default configuration file used by the kernel and the path where it is stored.

o.k. ] Using kernel config file [ config/kernel/linux-rockchip-rk3588-legacy.config ]

d. The path of the kernel-related deb package generated by compilation.

[o.k.] Target directory [ orangepi-build/output/debs/]

e. The package name of the compiled kernel image deb package.

[ o.k. ] File name [ linux-image-legacy-rockchip-rk3588\_1.0.0\_arm64.deb ]

f. The time used for compilation.

[ o.k. ] Runtime [ **5 min** ]

g. Finally, the compilation command for the last selected kernel will be displayed. Use the following command to directly start compiling the kernel source code without selecting through the graphical interface.

# [ o.k. ] Repeat Build Options [ sudo ./build.sh BOARD=orangepicm5 BRANCH=legacy BUILD\_OPT=kernel KERNEL\_CONFIGURE=no ]

7) Check the compiled kernel-related deb packages.

- a. **linux-dtb-legacy-rockchip-rk3588\_1.0.0\_arm64.deb** contains dtb files used by the kernel.
- b. linux-headers-legacy-rockchip-rk3588\_1.0.0\_arm64.deb contains kernel header files.

c. linux-image-legacy-rockchip-rk3588\_1.0.0\_arm64.deb contains kernel images and kernel modules.

test@test:~/orangepi-build\$ **Is output/debs/linux-\*** output/debs/linux-dtb-legacy-rockchip-rk3588\_1.0.0\_arm64.deb output/debs/linux-image-legacy-rockchip-rk3588\_1.0.0\_arm64.deb output/debs/linux-headers-legacy-rockchip-rk3588\_1.0.0\_arm64.deb

- 8) The files contained in the generated linux-image deb package are as follows:
  - a. Use the following command to decompress the deb package.

test@test:~/orangepi-build\$ cd output/debs

test@test:~/orangepi build/output/debs\$ mkdir test

test@test:~/orangepi\_build/output/debs\$ cp \

linux-image-legacy-rockchip-rk3588\_1.0.0\_arm64.deb test/

test@test:~/orangepi\_build/output/debs\$ cd test

test@test:~/orangepi\_build/output/debs/test\$ dpkg -x \

linux-image-legacy-rockchip-rk3588\_1.0.0\_arm64.deb .

test@test:~/orangepi\_build/output/debs/test\$ ls

boot etc lib linux-image-legacy-rockchip-rk3588\_1.0.0\_arm64.deb usr

b. The decompressed files are as follows:



9) When the orangepi-bulid compilation system compiles the Linux kernel source code,

it will first synchronize the Linux kernel source code with the Linux kernel source code on the GitHub server. So if you want to modify the Linux kernel source code, you first need to turn off the source code update function (you need to fully compile the Linux kernel source code once before turning off this function, otherwise it will prompt that the Linux kernel source code cannot be found. If the source code compression package is downloaded from Baidu Cloud Disk, there will be no such problem because the Linux source code has been cached), 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 you have made changes to the kernel, you can use the following method to update the kernel and kernel modules of the Linux system on the development board.

a. Upload the compiled Linux kernel deb package to the Linux system of the development board.

test@test:~/orangepi-build\$ cd output/debs

test@test:~/orangepi-build/output/debs\$ scp \

linux-image-legacy-rockchip-rk3588\_1.0.0\_arm64.deb root@192.168.1.xxx:/root

b. Then log in to the development board and uninstall the installed linux kernel deb package.

root@orangepi:~# apt purge -y linux-image-legacy-rockchip-rk3588

c. Install the new Linux kernel deb package just uploaded.

root@orangepi:~# dpkg -i linux-image-legacy-rockchip-rk3588\_1.0.0\_arm64.deb

d. Then restart the development board and check whether the kernel-related modifications have taken effect.

root@orangepi:~# reboot

# 4.5. Compile rootfs

1) Run the build.sh script and remember to add sudo permissions.

test@test:~/orangepi-build\$ sudo ./build.sh

2) Select **Rootfs and all deb packages** and press Enter.

orange Pi User Manual

Choose an option Compile image   rootfs   kernel   u-boot	
U-boot package Kernel package <mark>Rootfs and all deb packages</mark> Full OS image for flashing	

3) Then select the model of the development board.

	Choose an option	
Please choose a Board.		
orangepi3 orangepi3-lts orangepizero2 orangepizero3 orangepi4 orangepi4 orangepi800 orangepi5 orangepi5 orangepicm5-tablet orangepi5pro orangepi5pro orangepi5max orangepi5plus	Allwinner H6 quad core 1GB/2GB RAM GBE WiFi/BT eMMC USB3 Allwinner H6 quad core 2GB RAM GBE WiFi/BT-AW859A eMMC USB3 Allwinner H616 quad core 512MB/1GB RAM WiFi/BT GBE SPI Allwinner H618 quad core 1GB/1.5GB/2GB/4GB RAM WiFi/BT GBE SPI Allwinner H618 quad core 1GB/1.5GB/2GB/4GB RAM WiFi/BT SPI Rockchip RK3399 hexa core 4GB RAM GBE eMMC USB3 USB-C WiFi/BT Rockchip RK3399 hexa core 4GB RAM GBE eMMC USB3 USB-C WiFi/BT Rockchip RK3399 hexa core 4GB RAM GBE eMMC USB3 USB-C WiFi/BT Rockchip RK3599 hexa core 4-16GB RAM GBE USB3 USB-C WiFi/BT Rockchip RK3588S octa core 4-16GB RAM GBE USB3 USB-C WiFi/BT Rockchip RK3588S octa core 4-16GB RAM GBE USB3 USB-C WiFi/BT Rockchip RK3588S octa core 4-16GB RAM GBE USB3 USB-C WiFi/BT Rockchip RK3588S octa core 4-16GB RAM GBE USB3 USB-C WiFi/BT Rockchip RK3588S octa core 4-16GB RAM GBE USB3 USB-C WiFi/BT Rockchip RK3588S octa core 4-16GB RAM GBE USB3 USB-C WiFi/BT Rockchip RK3588S octa core 4-16GB RAM GBE USB3 USB-C WiFi/BT NVMe eMMC Rockchip RK3588 octa core 4-16GB RAM 2.5GBE USB3 WiFi/BT NVMe eMMC Rockchip RK3588 octa core 4-32GB RAM 2.5GBE USB3 USB-C WiFi/BT NVMe eMMC	
	<select> <exit></exit></select>	

4) Then select the type of rootfs.

Select the target OS release package b	a release package base ase
bookworm	Debian 12 Bookworm
focal	Ubuntu Focal 20.04 LTS
jammy	Ubuntu jammy 22.04 LTS

- 5) Then select the image type.
  - a. **Image with console interface (server)** Indicates the server version image, which is relatively small in size.
  - b. **Image with desktop environment** Indicates an image with a desktop, which is relatively large in size.



6) If you are compiling a server version image, you can also choose to compile the Standard version or the Minimal version. The Minimal version has much less pre-installed software than the Standard version (please do not choose the Minimal version if you do not have special needs, because many things are not pre-installed by default and some functions may not be used).

Choose an option	
Select the target image type.	
Standard image with console interface	
Minimal image with console interface	

7) If you are compiling a desktop version image, you also need to select the type of desktop environment. Currently, Ubuntu Jammy mainly maintains XFCE and Gnome desktops, Ubuntu Focal only maintains XFCE desktop, Debian Bullseye mainly maintains XFCE and KDE desktops, and Debian Bookwork mainly maintains XFCE desktop.

Select the default desktop	Choose a desktop environment environment to bundle with this Gnome desktop environment Xfce desktop environment	s image
Select the configuration for	ose the desktop environment conf this environment. <mark>base configuration</mark>	ig

You can then select additional packages to install. Please press Enter to skip this step.

Select which kind of s	choo softwares you'd	se desktop softwares to add like to add to your build
<pre>[ ] 3dsupport [ ] browsers [ ] chat [ ] desktop_tools [ ] editors [ ] internet [ ] multimedia [ ] office [ ] programming [ ] remote_desktop</pre>	3dsupport Browsers Chat Desktop_tools Editors Internet Multimedia Office Programming Remote_desktop	
	<0k>	<cancel></cancel>

8) Then the rootfs will start to be compiled. Some of the information prompted during the compilation is as follows:

a. Type of rootfs.

[ o.k. ] l	local not found [ Creating new rootfs cache for jammy]
b.	The storage path of the compiled rootfs compressed package.
[ o.k. ] [	Target directory [ external/cache/rootfs ]

c. The name of the rootfs compressed package generated by compilation.

[ o.k. ] File name [ **jammy-xfce-arm64.f930ff6ebbac1a72108a2e100762b18f.tar.lz4** ]

d. The time used for compilation.

[ o.k. ] Runtime [ **13 min** ]

- 9) Check the rootfs compressed package generated by compilation.
  - a. jammy-xfce-arm64.f930ff6ebbac1a72108a2e100762b18f.tar.lz4 is the compressed package of rootfs. The meanings of the fields in the name are:
    - a) **Jammy** indicates the type of Linux distribution of rootfs.
    - b) **Xfce** indicates that the rootfs is a desktop version, and **cli** indicates a server version.
    - c) **arm64** indicates the architecture type of rootfs.
    - d) **f930ff6ebbac1a72108a2e100762b18f** is the MD5 hash value generated by the package names of all packages installed by rootfs. As long as the list of packages installed by rootfs is not modified, this value will not change. The compilation script will use this MD5 hash value to determine whether rootfs

needs to be recompiled.

b. **jammy-xfce-arm64.f930ff6ebbac1a72108a2e100762b18f.tar.lz4.list** lists the package names of all software packages installed by rootfs.

test@test:~/orangepi-build\$ **ls external/cache/rootfs/** jammy-xfce-arm64.f930ff6ebbac1a72108a2e100762b18f.tar.lz4 jammy-xfce-arm64.f930ff6ebbac1a72108a2e100762b18f.tar.lz4.current jammy-xfce-arm64.f930ff6ebbac1a72108a2e100762b18f.tar.lz4.list

10) If the required rootfs already exists in **external/cache/rootfs**, then compiling rootfs again will skip the compilation process directly and will not restart the compilation. When compiling the image, it will also check whether there is a cached rootfs available in **external/cache/rootfs**. If there is, it will be used directly, which can save a lot of download and compilation time.

# 4.6. Compile Linux image

1) Run the build.sh script and remember to add sudo permissions.

test@test:~/orangepi-build\$ sudo ./build.sh

2) Select Full OS image for flashing and press Enter.



3) Then select the model of the development board.
|   |  | Choose an option  |
|---|--|---|
| Please choose a Board.  |  |   |
| orangepi3<br>orangepi3-lts<br>orangepizero2<br>orangepizero3<br>orangepi4<br>orangepi4-lts<br>orangepi800 | Allwinner<br>Allwinner<br>Allwinner<br>Allwinner<br>Rockchip<br>Rockchip<br>Bockchip | H6 quad core 1GB/2GB RAM GBE WiFi/BT eMMC USB3 ↑<br>H6 quad core 2GB RAM GBE WiFi/BT-AW859A eMMC USB3<br>H616 quad core 512MB/1GB RAM WiFi/BT GBE SPI<br>H618 quad core 1GB/1.5GB/2GB/4GB RAM WiFi/BT GBE SPI<br>H618 quad core 1GB/1.5GB/2GB/4GB RAM WiFi/BT SPI<br>RK3399 hexa core 4GB RAM GBE eMMC USB3 USB-C WiFi/BT<br>RK3399 hexa core 4GB RAM GBE eMMC USB3 USB-C WiFi/BT<br>RK3399 hexa core 4GB RAM GBE eMMC USB3 USB-C WiFi/BT<br>RK3399 hexa core 4GB RAM GBE eMMC USB3 USB-C WiFi/BT<br>RK3399 hexa core 4GB RAM GBE eMMC USB3 USB-C WiFi/BT<br>RK3399 hexa core 4GB RAM GBE eMMC USB3 USB-C WiFi/BT<br>RK3399 hexa core 4GB RAM GBE eMMC USB3 USB-C WiFi/BT<br>RK3399 hexa core 4GB RAM GBE eMMC USB3 USB-C WiFi/BT<br>RK3399 hexa core 4GB RAM GBE eMMC USB3 USB-C WiFi/BT<br>RK3399 hexa core 4GB RAM GBE eMMC USB3 USB-C WiFi/BT<br>RK3399 hexa core 4GB RAM GBE eMMC USB3 USB-C WiFi/BT<br>RK3399 hexa core 4GB RAM GBE eMMC USB3 USB-C WiFi/BT<br>RK3399 hexa core 4GB RAM GBE eMMC USB3 USB-C WiFi/BT<br>RK3399 hexa core 4GB RAM GBE eMMC USB3 USB-C WiFi/BT<br>RK3399 hexa core 4GB RAM GBE eMMC USB3 USB-C WiFi/BT<br>RK3490 hexa core 4GB RAM GBE eMMC USB3 USB-C WiFi/BT<br>RK3490 hexa core 4GB RAM GBE eMMC USB3 USB-C WiFi/BT<br>RK3490 hexa core 4GB RAM GBE eMMC USB3 USB-C WiFi/BT<br>RK3490 hexa core 4GB RAM GBE eMMC USB3 USB-C WiFi/BT<br>RK3490 hexa core 4GB RAM GBE eMMC USB3 USB-C WiFi/BT<br>RK3490 hexa core 4GB RAM GBE eMMC USB3 USB-C WIFI/BT<br>RK3490 hexa core 4GB RAM GBE eMMC USB3 USB-C WIFI/BT<br>RK3490 hexa core 4GB RAM GBE eMMC USB3 USB-C WIFI/BT |
| orangepi5   | Rockchip   | RK3588S octa core 4-16GB RAM GBE USB3 USB-C NVMe  |
| orangepicm5<br>orangepicm5-tablet   | Rockchip<br>Rockchip   | RK3588S octa core 4-16GB RAM GBE USB3 USB-C<br>RK3588S octa core 4-16GB RAM USB3 USB-C WiFi/BT  |
| orangepi5b<br>orangepi5pro<br>orangepi5max<br>orangepi5plus   | Rockchip<br>Rockchip<br>Rockchip   | RK3588S octa core 4-16GB RAM GBE USB3 WiFi/BT NVMe eMMC<br>RK3588 octa core 4-16GB RAM 2.5GBE USB3 WiFi/BT NVMe eMMC<br>RK3588 octa core 4-32GB RAM 2.5GBE USB3 USB-C WiFi/BT NVMe eMMC   |
|   | <sele< td=""><td>ect&gt; <exit></exit></td></sele<>                                  | ect> <exit></exit>  |
|   |  |   |

4) Then select the type of rootfs.

Select the target OS releas	Choose a release package base package base
	bookworm Debian 12 Bookworm
	focal Ubuntu Focal 20.04 LTS

- 5) Then select the image type.
  - a. **Image with console interface (server)** Indicates the server version image, which is relatively small in size.
  - b. **Image with desktop environment** Indicates an image with a desktop, which is relatively large in size.



6) If you are compiling a server version image, you can also choose to compile the Standard version or the Minimal version. The Minimal version has much less pre-installed software than the Standard version (please do not choose the Minimal version if you do not have special needs, because many things are not pre-installed by default and some functions may not be used).





7) If you are compiling a desktop version image, you also need to select the type of desktop environment. Currently, Ubuntu Jammy mainly maintains XFCE and Gnome desktops, Ubuntu Focal only maintains XFCE desktop, Debian Bullseye mainly maintains XFCE and KDE desktops, and Debian Bookwork mainly maintains XFCE desktop.



Choose desktop softwares to add Select which kind of softwares you'd like to add to your build 3dsupport Browsers browsers desktop\_tools Desktop\_tools editors Editors Internet Multimedia **Office** office programming Programming remote\_desktop Remote\_desktop <0k> <Cancel>

You can then select additional packages to install. Please press Enter to skip this step.

8) Then the Linux image will be compiled. 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 it has been cached, only update the code).

c. Compile the u-boot source code and generate the deb package of u-boot.

d. Compile the linux source code and generate the deb package related to linux.

e. Make a deb package for linux firmware.

f. Make a deb package for the orangepi-config tool.

g. Make a deb package for board-level support.

h. If you compile a desktop version image, you will also make a desktop-related deb package.

i. Check whether the rootfs has been cached. If not, remake the rootfs. If it has been cached, directly decompress it and use it.

j. Install the deb package generated earlier to the 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 partition of the image.

n. Then update initramfs.

o. Finally, write the u-boot bin file into the image using the dd command.

9) After compiling the image, the following message will be displayed:

a. The storage path of the compiled image.

o.k. ] Done building

[ output/images/orangepicm5\_1.0.0\_debian\_bullseye\_desktop\_xfce\_linux5.10.160/or angepicm5\_1.0.0\_debian\_bullseye\_desktop\_xfce\_linux5.10.160.img ]

b. The time used for compilation.

[ o.k. ] Runtime [ 19 min ]

c. Repeat the command to compile the image. 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=orangepicm5 BRANCH=legacy BUILD\_OPT=image RELEASE=bullseye BUILD\_MINIMAL=no BUILD DESKTOP=no KERNEL CONFIGURE=yes ]

# 5. Instructions for using Orange Pi OS Arch system

## 5.1. Adaptation of Orange Pi OS Arch system

Function	<b>OPi OS Arch Gnome Wayland</b>
HDMI display	ОК
HDMI audio	ОК
frequency	
USB 2.0	ОК
USB 3.0	ОК
Gigabit Ethernet	ОК
port	
2.5GEthernet port x	ОК
2	
Debug UART	ОК
FAN	ОК
RTC	ОК
eMMC	ОК
GPIO (12pin)	ОК
UART (12pin)	ОК
SPI (12pin)	ОК
I2C (12pin)	ОК
CAN (12pin)	ОК
Camera x 4	ОК
LED lamp	ОК
TF card startup	ОК
infra-red	ОК
GPU	ОК
NPU	NO
VPU	ОК
On/Off button	ОК
Watchdog test	ОК

# 5.2. Methods for setting up the English environment and installing Chinese input methods

1) First, click on the area in the upper right corner of the desktop.



2) Then open the settings.



3) Then find the **Region & Language** option.

Ò	5 range Pi User Ma	nual	Copyright reserved by Shenzhen Xunlong Software Co	., Ltd
٩	Settings	:	Region & Language	×
0	Power Displays Mouse & Touchpad		The language setting is used for interface text and web pages. Formats are used for numbers, dates, and currencies.	
•	Keyboard		Language → English	
÷	Printers		Formats August A	
	Removable Media			
*	Color			
۵ <u>)</u>	Region & Language			
ŧ	Accessibility			
*	Users			
☆	Default Applications			
0	Date & Time			
0	About			

## 4) Then select Language.

٩	Settings	I	Region & Language	×
0	Power		The language setting is used for interface text and web pages. Formats are used for numbers, dates, and currencies.	
0	Mouse & Touchpad		Your Account	
۲	Keyboard		Language >	
÷	Printers		Formats  United States	
	Removable Media			
æ	Color			
<b>D</b>	Region & Language			
÷	Accessibility			
*	Users			
☆	Default Applications			
O	Date & Time			
0	About			

5) Then choose English

# orange Pi User Manual

٩	Settings	:			Region & Langua	ge	×
0	Power Displays Mouse & Touchoad	ſ	The law Cancel English	Select Language	Select United States	web pages. Formats are used for	
	Keyboard		汉语 🖌		中国	÷	
÷	Printers			I		÷	
	Removable Media						
*	Color						
۵	Region & Language						
ŧ	Accessibility						
*	Users						
*	Default Applications						
0	Date & Time						
0	About						

#### 6) Then click on Select.

٩	Settings	:	Region & Language	×
0	Power Displays		The language setting is used for interference web pages. Fo ncel Select Language Select	rmats are used for
0	Mouse & Touchpad Keyboard	1	tish United tates	+
•	Printers Removable Media			+
	Color Region & Language			
+	Accessibility Users			
2 0 0	Date & Time About			

7) Then click on **Logout...** Log out of the system and then log in again.



8) Then you can see that the desktop is all displayed in English.

活动				4月20日 20:20					•••
			Òrang	e pi	Òrange pi				
Ges	ry R		<u>/</u> 天气	1683	RDH:	राम्न		Gedit	
2MH	HÉQ S	an I	系统监视器	<b>安</b> 装系统	Boxes	<b>&gt;</b> 1938	<b>(</b> 电源统计	П () () Тя	>
11.2 Fr	ју т	<b>平</b> 助	<b>以</b> 助火墙配置	<b>全</b> 回际象棋	黑白棋	FR.	<b>と</b> 1 巻 <sup>月回</sup>	wahi SSH 服务	
				• • •					
				<b>i</b> 🧿 🗖					

9) Then install fcitx-im and fcitx-configtool.

[orangepi@orangepi~]\$ sudo pacman -S fcitx-im fcitx-configtool

:: There are 3 members in group fcitx-im:

:: Software Warehouse community

1) fcitx 2) fcitx-qt5 3) fcitx-qt6

Enter a selection (default=select all): 1

- range 🗖 💽 🚍 📰 Ó Celluloid Avabi Zerscool /\*/= Foltx 配置 9 Vantum Manage **F** </>
  Htop Ø 2 2  $\mathbf{N}$
- 10) Then open the Fcitx configuration program.

11) Then add Google Pinyin input method.

🛅 🧿 🚍 🎫



	输入法	全局配置	外现	阿加維件		
	健盘 - 英语	9(美国)			未知	
_		_	_	漆加输入法		,
Google 拼音	i.					汉语(中国)
_笔						汉语(中国)
五笔字型						汉语 (中国)
五笔拼音						汉语 (中国)
✓ 仅显示当	前语言					
<b>提索输入</b> 注	5					E
					取消(C)	确认(0)
		-	-			
	0第一个4	入法将为非	激活状态。	通常您需要将键盘或键盘-	<b>布局名称</b> 放在第一位。	
	I DESCRIPTION OF TAXABLE PARTY.					

12) Then we can open a terminal to test the Chinese input method. After opening the terminal, if it defaults to the English input method, we can use the **Ctrl+Space** shortcut to switch to the Chinese input method, and then input Chinese.



活动 🖪 终端	4月20日 20:38	E • 0
	orangepi@orangepi Q : x	
	[orangepi@orangepi -]5 图理	
	ni had	
	1.(你好 2.你 3.识 4./尼 5.师	

# 6. Instructions for using the Android 13 system

## 6.1. Supported Android versions

Android version	Kernel version
Android 13	Linux5.10

## 6.2. Android function adaptation

Function	Android 13
HDMI Display	ОК
HDMI Audio	ОК
USB 2.0	ОК
USB 3.0	ОК
Gigabit Ethernet	ОК
2.5G network port x 2	ОК
Debug serial port	ОК
FAN	ОК
RTC	ОК
еММС	ОК
GPIO (12pin)	ОК
UART (12pin)	ОК
SPI (12pin)	ОК
I2C (12pin)	ОК
CAN (12pin)	ОК
Camera x 4	NO
LED Light	ОК
TF card startup	ОК
Infrared	ОК
GPU	ОК

NPU	ОК
VPU	ОК
Power button	ОК
Watchdog test	ОК
Chromium hard decoding video	ОК
HDMI CEC function	NO

## 6.3. How to use ADB

#### 6.3.1. USB OTG mode switching method

The development board has two USB ports. The USB port marked with a red arrow in the figure below supports both Host mode and Device mode. The other USB2.0 port only supports Host mode.



The USB OTG interface is in Host mode by default and can be used to connect USB devices such as mouse and keyboard. If you want to use ADB, you need to manually switch to Device mode.

1) First open Settings.

12:16 🖯	0					â
			Q Se	arch apps		
		100		Q	۲	2
	Calculator	Calendar	Camera	Chrome	Clock	Contacts
	6			۲		Q
	Explorer	Files	Gallery	Music	Play Store	Search
	Settings	Sound Recorder	Video	۵. wiringOP		

2) Then select About tablet.



3) Then use the mouse to click the **Build number** menu bar multiple times until the prompt "**You are now a developer!**" appears.



4) Then click to return to the previous menu and select System.

Č	sange Pi User Manual	Copyright reserved by Shenzhen Xunlong Software Co., Ltd
12:19	0	D.
₿	Security Screen lock, Find My Device, app security	
6	Privacy Permissions, account activity, personal data	
0	Location On - 1 app has access to location	
2	Passwords & accounts Saved passwords, autofill, synced accounts	
G	Google Services & preferences	
0	System Languages, gestures, time, backup	
٥	Screenshot Screenshot	
	About tablet orangepi5pro	

5) Then select **Developer options**.

12:20 5	0	0
÷	System	
•	Languages & input	
C	Gestures	
0	Date & time GMT+00:00 Greenwich Mean Time	
۲	Backup	
ŧ	System update Updated to Android 12	
9	Multiple users Signed in as Owner	
{}	Developer options	
Ð	Reset options	
	🔤 🚬 🚬 🖸 🔍 🔺 • 🔳	

6) Finally, find the USB OTG Mode Switch, turn it on to switch to Device mode, and turn it off to switch to Host mode.



### 6. 3. 2. Use a data cable to connect adb debugging

4) First, prepare a good quality USB male-to-male data cable.



5) Then refer to the **USB OTG mode switching method** to switch USB OTG to device mode.

6) Then use a USB male-to-male data cable to connect the development board to the USB port of the computer (please also use a Type-C power supply to power the development board).

7) Install adb tool on your Ubuntu PC.

test@test:~\$ sudo apt update test@test:~\$ sudo apt -y install adb

8) Use the following command to view the identified ADB devices.

test@test:~\$ adb devices

List of devices attached S63QCF54CJ device test@test:~**\$ lsusb** Bus 003 Device 006: ID 2207:0006

9) Then you can log in to the Android system through adb shell on the Ubuntu PC.

test@test:~\$ adb shell

console:/ \$

10) Execute the command to remount the Android system.

test@test:~\$ adb root

test@test:~\$ adb remount

11) Then you can transfer files to the Android system.

test@test:~\$ adb push example.txt /system/

6. 3. 3. Using network connection adb debugging

When using network adb, you don't need a USB male-to-male data cable to connect the computer and the development board. Instead, you can communicate through the network. So first make sure that the wired or USB wireless network of the development board is connected, and then get the IP address of the development board, which will be used later.

1) Ensure that the Android system's **service.adb.tcp.port** is set to port 5555.

console:/ # 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 network adb port number.

console:/ # setprop service.adb.tcp.port 5555 console:/ # stop adbd console:/ # start adbd

3) Install adb tool on your Ubuntu PC.

test@test:~\$ sudo apt update test@test:~\$ sudo apt install -y adb

4) Then connect the network adb on the Ubuntu PC.						
test@test:~\$ adb connect 192.168.1.xxx	(The IP address needs to be changed to					
the IP address of the development board)						
* daemon not running; starting now at tcp:503	37					
* 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 adb shell on the Ubuntu PC.

test@test:~\$ **adb shell** console:/ #

## 7. Compilation method of Android 13 source code

## 7.1. Download the source code of Android 13

1) First, download the compressed file of Android 13 source code from Baidu Cloud Drive or Google Cloud Drive

2) After downloading the compressed file of the Android 13 source code, please first check if the MD5 checksum is correct. If it is not correct, please download the source code again

test@test:~\$ md5sum -c md5sum Android\_13.tar.gz00: determine Android\_13.tar.gz01: determine Android\_13.tar.gz02: determine Android\_13.tar.gz03: determine Android\_13.tar.gz04: determine Android\_13.tar.gz05: determine Android\_13.tar.gz06: determine Android\_13.tar.gz07: determine Android\_13.tar.gz08: determine

3) Then it is necessary to merge multiple compressed files into one and decompress them test@test:~\$ cat Android\_13.tar.gz0\* | tar -xvzf -

## 7.2. Compile the source code for Android 13

1) First, install the software packages required to compile the Android 13 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 \ libg11-mesa-dev libxml2-utils xsltproc unzip test@test:~\$ sudo apt-get install -y u-boot-tools 2) There is a make.sh compilation script in the source code, with the following compilation parameters

- a. -B: compile uboot
- b. -K: compile kernel
- c. -a: compile android
- d. -F: compile uboot, kernel and android
- e. -M: Generate partition images in the rockdev directory
- f. -u: Package to generate a complete image that can ultimately be launched
- g. -b: Specify the development board model

3) Compile uboot, kernel, android, and package them into a complete image that can ultimately be launched

test@test:~\$ cd Android\_13 test@test:~/ Android\_13\$ ./make.sh -FMu -b orangepicm5 --gapps

4) After compilation, the following information will be printed

\*\*\*\*\*\*\*rkImageMaker ver 2.1\*\*\*\*\*\*\*

Generating new image, please wait...

Writing head info...

Writing boot file...

Writing firmware...

Generating MD5 data...

MD5 data generated successfully!

New image generated successfully!

Making update.img OK.

Make update image ok!

5) The final generated image file will be placed in the **rockdev/Image-rk3588s\_t** directory. Among them, **update.img** supports TF card and eMMC boot images

test@test:~/Android\_13\$ cd rockdev/Image-rk3588s\_t test@test:~/Android\_13/rockdev/Image-rk3588s\_t \$ ls update\* update.img

## 8. OpenWRT System Usage Instructions

## 8.1. **OpenWRT edition**

<b>OpenWRT</b> edition	Kernel version
v22.03.4	Linux5.10.110

## 8.2. **OpenWRT Adaptation situation**

Function	OpenWRT
USB2.0	ОК
USB3.0	ОК
<b>3</b> pin Debug UART	ОК
TF card startup	ОК
2.5G PCIe Network port X2	ОК
1000M Network port	ОК
Network port status light	ОК
LED light	ОК
RTL8821CU USB network card	ОК
RTL8723BU USB network card	ОК
FAN Fan interface	ОК
eMMC	ОК

### 8.3. The first boot to expand rootfs

1) When starting the OpenWRT system for the first time, the **resize-rootfs.sh** script will be executed to expand rootfs, and it will automatically restart after the expansion is completed

2) After logging into the system, you can use the df -h command to check the size of

(SSD), it indicates that the		pansion is ru	lilling concerty
root@OpenWrt:~# df -h			
Filesystem	Size	Used Ava	ilable Use% Mounted on
/dev/root	14.8G	14.7G	91.6M 99% /
tmpfs	495.5M	6.1M	489.4M 1% /tmp
tmpfs	512.0K	0	512.0K 0%/dev
/dev/root	14.8G	14.7G	91.6M 99% /opt/docker

rootfs. If it matches the actual capacity of the storage device (TF card, eMMC, or NVME SSD), it indicates that the automatic expansion is running correctly

## 8.4. Method of logging into the system

#### 8. 4. 1. Login via serial port

1) Firstly, to debug the use of the serial port, you can refer to the **chapter on debugging the usage of the serial port** 

2) The OpenWrt system will automatically log in as the **root** user by default, and the display interface is as follows



#### 8. 4. 2. Login to the system via SSH

Please note that in the OpenWrt system of Orange Pi CM5, the LAN0 gigabit network port is configured as a WAN port by default, and the remaining two network ports LAN1 and LAN2 are configured as LAN ports. This document uses LAN1 port for functional testing.





1) Firstly, connect the LAN1 port of the board to the network port of the computer using an Ethernet cable, so that the network port of the computer can obtain the IP address through DHCP

2) The default LAN port IP of the board is set to 192.168.2.1, so the computer can obtain IP addresses starting with 192.168.2 at this time

3) If the computer is installed with Ubuntu system, you can execute the following command to log in to the system through SSH. By default, you can log in directly without a password

test@ubuntu:~\$ ssh root@192.168.2.1

4) The display after successfully logging into the system is shown in the following figure



5) If the computer is installed with Windows system, you can refer to the method introduced in the section of **SSH remote login development board under Windows to log in** 

#### 8. 4. 3. Login to LuCI Management Interface

Please note that in the OpenWrt system of Orange Pi CM5, the LAN0 gigabit network port is configured as a WAN port by default, and the remaining two network ports LAN1 and LAN2 are configured as LAN ports.



1) Firstly, connect the LAN1 port of the board to the network port of the computer using an Ethernet cable, so that the network port of the computer can obtain the IP address

through DHCP

2) The default LAN port IP of the board is set to 192.168.2.1, so the computer can obtain IP addresses starting with 192.168.2 at this time

3) You can log in to the LuCI interface by entering the IP address **192.168.2.1** in the browser on your computer

$\leftarrow \   \rightarrow \   G$	O & 192.168.2.1/cgi-bin/luci/		☆
		需要投权	
		用户名 root	
		密码	
		83	

4) OpenWrt 系统默认是没有设置密码的,所以 The OpenWrt system does not have a password set by default, so simply click the login button. After successful login, the interface will display as shown in the following figure

OpenWrt 状态 -	系统 - Docker - 服务 - 网络 - 统计 - 退出	1
<b>未设置密码!</b> 尚未设置密码。请为 root	用户设置密码以保护主机并启用。	
状态 <sup>系统</sup>		
主机名	OpenWrt	
型号	Orange Pi CM5	
架构	ARMv8 Processor rev 0	
目标平台	rockchip/armv8	
固件版本	OpenWrt 22.03.4 r20123-38ccc47687 / LuCl openwrt-22.03 branch git-23.093.57104-ce20b4a	
内核版本	5.10.110	
本地时间	2024-07-08 05:57:22	
运行时间	0h 10m 4s	
平均负载	0.02, 0.07, 0.07	
内存		
可用数	3.65 GiB / 3.84 GiB (95%)	
已使用	303.89 MiB / 3.84 GiB (7%)	



#### 8. 4. 4. Log in to the terminal through the LuCI management interface

Please note that in the OpenWrt system of Orange Pi CM5, the LAN0 gigabit network port is configured as a WAN port by default, and the remaining two network ports LAN1 and LAN2 are configured as LAN ports.



1) Firstly, connect the LAN1 port of the board to the network port of the computer using an Ethernet cable, so that the network port of the computer can obtain the IP address through DHCP

2) The default LAN port IP of the board is set to **192.168.2.1**, so the computer can obtain IP addresses starting with **192.168.2** at this time

3) You can log in to the LuCI interface by entering the IP address **192.168.2.1** in the browser on your computer

$\leftarrow \   \rightarrow \   G$	🔘   192.168.2.1/cgi-bin/luci/				\$
		需要授权			
		用户名	root		
		密码			
			중국		

4) Select "Terminal" in the "Services" column of the navigation bar and click to enter

# 🍏 range Pi User Manual

OpenWrt 状态 系统 Do	cker → 服务 → 网络 → 统计 → 退出
未设置密码! 尚未设置密码。请为 root 用户设置密码以	Aria2 动态 DNS /保护主机
状态 <sup>系统</sup>	带宽监控 Watchcat 网络共享
主机名	Transmission
型号	终端
架构	通归 DNS ARWV8 Processor rev 0

#### 5) At this point, the terminal interface is shown in the following figure



6) Enter the username root to log in



终端 配置



#### 8. 4. 5. Login to the terminal using IP address and port number

Please note that in the OpenWrt system of Orange Pi CM5, the LAN0 gigabit network port is configured as a WAN port by default, and the remaining two network ports LAN1 and LAN2 are configured as LAN ports.



1) Firstly, connect the LAN1 port of the board to the network port of the computer using an Ethernet cable, so that the network port of the computer can obtain the IP address through DHCP 2) The default LAN port IP of the board is set to **192.168.2.1**, so the computer can obtain IP addresses starting with **192.168.2** at this time

3) Then enter **192.168.2.1:7681** in the browser to log in to the OpenWRT terminal



# 8.5. Method of modifying LAN port IP address through command line

1) In the OpenWrt system, a command-line tool uci is provided, which can easily modify, add, delete, and read the contents of configuration files. For detailed instructions, please refer to the official documentation

2) First, use the following command to obtain the network configuration. The

corresponding configuration file is **/etc/config/network**, and you can see that the value of **network.lan.ipaddr** is **192.168.2.1** 

```
root@OpenWrt:~# uci show network
...
network.lan=interface
network.lan.device='br-lan'
network.lan.proto='static'
network.lan.ipaddr='192.168.2.1'
network.lan.netmask='255.255.255.0'
```

```
network.lan.ip6assign='60'
```

••••

3) Then enter the following command to modify the network.lan.ipaddr option root@OpenWrt:~# uci set network.lan.ipaddr='192.168.100.1'

4) Then enter the following command to complete the submission, which is written to the configuration file

root@OpenWrt:~# **uci commit** 

If the IP address in red font matches the one to be set, it indicates that the modification was successful

root@OpenWrt:~# cat /etc/config/network ... config interface 'lan' option device 'br-lan' option proto 'static' option netmask '255.255.255.0' option ip6assign '60' option ipaddr '192.168.100.1'

5) Restart the network through Ubuntu. Please refer to the official documentation for instructions on how to use Ubuntu 过 ubus

root@OpenWrt:~# ubus call network restart

6) At this point, entering the command shows that the IP address of the LAN port is already **192.168.100.1** 

root@Oj	penWrt:~# ifconfig br-lan
br-lan	Link encap:Ethernet HWaddr FE:55:13:A3:EF:E7
	inet addr:192.168.100.1 Bcast:192.168.100.255 Mask:255.255.255.0
	inet6 addr: fd60:c4cd:1033::1/60 Scope:Global
	UP BROADCAST MULTICAST MTU:1500 Metric:1
	RX packets:0 errors:0 dropped:0 overruns:0 frame:0
	TX packets:3 errors:0 dropped:0 overruns:0 carrier:0

collisions:0 txqueuelen:1000 RX bytes:0 (0.0 B) TX bytes:370 (370.0 B)

## 8.6. Method for changing root password

#### 8. 6. 1. Modify via Command Line

1) Firstly, enter passwd root in the system command line, and the following prompt message will appear. At this time, you can enter the password you want to set and press Enter to confirm

root@OpenWrt:/# passwd root

Enter new UNIX password:

2) Next, you will be prompted to re-enter the password. At this point, enter the password again to confirm and press Enter

**Retype password:** 

3) The successfully modified display is as follows

passwd: password for root changed by root

#### 8. 6. 2. Modify through LuCI management interface

1) Firstly, refer to the login LuCI management interface to enter the OpenWRT management interface

2) Then follow the steps below to change the password

- a. Find the "System" option in the navigation bar and click on it
- b. In the vertical bar options below the system, select "Management Rights" and click

orange Pi User Manual

OpenWrt 状态 -	系统 → Docker → 月	B另 → 网络 → 统计 → 退出	<b>R</b> M
<mark>未设置密码!</mark> 尚未设置密码。请为 root <b>状态</b> 系统	系统 管理机 软件包 启动项 计划任务 共型 占	3用。	
主机名	时间同步	OpenWrt	
型号	LED 配置 <u> </u> <u> </u> <u> </u> <u> </u> <u> </u> <u> </u> <u> </u> <u> </u>	Orange Ri CM5	
架构	自定义命令	ARMv8 Processor rev 0	
目标平台	重启	rockchip/armv8	
固件版本		OpenWrt 22.03.4 r20123-38ccc47687 / LuCl openwrt-22.03 branch git-23.093.57104-ce20b4a	
内核版本		5.10.110	
本地时间		2024-07-08 06:00:35	
运行时间		0h 13m 18s	
平均负载		0.13, 0.09, 0.07	
内存			
可用数		3.65 GiB / 3.84 GiB (95%)	
已使用		304.91 MiB / 3.84 GiB (7%)	

#### c. Select the 'Router Password' option on the Tab page

	用白边要家研以你拍士机并应用		
由器密码 SSH 访问	SSH密钥 HTTP(S)访问		
油器密码			
改访问设备的管理员密码	密码	*	
碑议	密码	*	

- 3) Change and save router password
  - a. Enter the password you have set in the "**Password**" and "**Confirm Password**" dialog boxes (if unsure if the password is entered correctly, click the "\*" icon behind the dialog box to display the input characters)
  - b. Click 'Save' to save the newly modified password

🍏 range Pi User Manual

OpenWrt 状态 → 系统 → Docker → 服务 → 网络 → 统计 → 退出	
未设置密码! 尚未设置密码。请为 root 用户设置密码以保护主机并启用。	
路由器密码 SSH 访问 SSH 密钥 HTTP(S) 访问	7
<b>路由器密码</b> 更改访问设备的管理员密码 密码	2
确认密码	
	保存
Note: In the "Password" and "Confirm Passw	ord" dialog boxes, the password

entered twice needs to be consistent..

4) After the password is successfully changed, a pop-up message saying "System password has been changed successfully" will appear. At this time, logging into OpenWRT requires a password to log in

•
•

## 8.7. USB interface testing

#### 8.7.1. Mounting USB storage devices at the command line

1) Firstly, insert the USB drive into the USB interface of the Orange Pi development board

2) If you can see the output of sdX by executing the following command, it indicates that the USB drive recognition is successful

#### root@OpenWrt:~# **cat /proc/partitions** | **grep "sd\*"** major minor #blocks name 8 0 15126528 **sda**

3) You can use the mount command to mount the USB drive to /mnt, and then you can view the files on the USB drive

root@OpenWrt:~# mount /dev/sda /mnt/
root@OpenWrt:~# <b>ls</b> / <b>mnt</b> /
test.txt

4) After mounting, you can use the df -h command to view the capacity usage and mounting points of the USB flash drive

root@OpenWrt:~#	df -h   gre	p "sd"		
/dev/sda	14.4G	187.2M	14.2G	1% /mnt

#### 8. 7. 2. Mounting USB storage devices on the LuCI management interface

1) Firstly, connect the USB flash drive (or other storage device) to the development board via USB2.0

2) Then follow the **login LuCI management interface** to enter the LuCI management world

3) Then, in the LuCI management interface, click on "System ->Mount Point" to enter the configuration interface of the mount point

orange Pi User Manual

OpenWrt <sub>状态</sub> -	<b>系统</b> → Docker → 服务 → 网络 → 统计 → 退出	
未设置密码! 尚未设置密码。请为 root f	系统 管理权 软件包	
状态 <sup>系统</sup>	启动项 计划任务 持载点	
主机名	DpenWrt OpenWrt	
型号	LED 配置 Prange Pi CM5	
架构	留放与开放 自定义命令 ARMv8 Processor rev 0	
目标平台	重启 rockchip/armv8	
固件版本	OpenWrt 22.03.4 r20123-38ccc47687 / LuCl openwrt-22.03 branch git-23.093.57104-ce20b4a	
内核版本	5.10.110	
本地时间	2024-07-08 06:01:15	
运行时间	0h 13m 58s	
平均负载	0.06, 0.07, 0.07	
内存		
可用数	3.65 GiB / 3.84 GiB (95%)	
已使用	305.42 MiB / 3.84 GiB (7%)	

- 4) Then follow the steps below to add a mounting point
  - a. Find 'Mount Point' below the global settings interface for mount points
  - b. Below the mounting point, select the "Add" button and click to enter

挂载点

配置存储设备挂载到文件系统中的位置和参数	
----------------------	--

已启 用	设备	挂载点	文件系统	<del>挂载选</del> 项	文件系统 检查	
	UUID: 84173db5-fa99-e35a-95c6-28613cc79ea9 (/dev/mmcblk1p1, 64.00 MiB)	/mnt/mmcblk1p1	auto (ext4)	defaults	否	编辑 删除
	UUID: ff313567-e9f1-5a5d-9899-3ba130b4a864 (/dev/mmcblk1p2, 29.61 (20)	1	auto (ext4)	defaults	否	编辑 删除
「添加						

c. Next, a pop-up window will appear below

挂载点 - 存储区				
常规设置 高级设置				
	已启用	V		
	UUID	根据 UUID 匹配	•	
		②如果指定,则通过UUID ↑	而不是固定的设备文件来挂载设备	
	卷标	根据标签匹配		
		⑦如果指定,则通过分区卷标	 际而不是固定的设备文件来挂载设备	
	设备	未指定	•	
		存储器或分区的设备文件(	(例如:/dev/sda1 )	
	挂载点	- 请选择	*	
		2 指定设备的挂载目录		
				关闭保存

- d. Then you can start mounting the storage device
  - a) Check 'Enabled'
  - b) Select the actual connected device /dev/sda in the UUID column of the general settings (choose according to your own device)
  - c) 在挂 Select "Custom" in the mount point column and fill in the target directory to be mounted to. Taking the /mnt directory as an example, fill in and press Enter to confirm
  - d) Then click the "Save" button in the bottom right corner

挂载点 - 存储区	
常规设置 高级设置	0
	已启用
	UUID CE4B-C491 (/dev/sda, 59.48 GiB) •
	● 如果指定,则通过 UUID 而不是固定的设备文件来挂载设备     ③     ④     ④
	挂載点 - 请选择 - ・
	请选择
	作为根文件系统使用(/)
	作为外部 overlav 使用 ( /overlav ) 关闭 保存
启 设备	/mnt

5) Then you will return to the mount point global settings page and click "Save and Apply" in the bottom left corner of the page to make the mount point effective
| 已启<br>用                  | 设备  | 挂载点                    | 文件系统           | 挂载选<br>项 | 文件系统<br>检查 |                        |
|--------------------------|---|------------------------|----------------|----------|------------|------------------------|
|                          | UUID: 84173db5-fa99-e35a-95c6-28613cc79ea9<br>(/dev/mmcblk1p1, 64.00 MiB) | /mnt/mmcblk1p1         | auto<br>(ext4) | defaults | 否          |                        |
|                          | UUID: ff313567-e9f1-5a5d-9895-3ba130b4a864<br>(/dev/mmcblk1p2, 29.61 GiB) | T.                     | auto<br>(ext4) | defaults | 否          |                        |
|                          | UUID: ce4b-c491 (/dev/sda, 59.48 GiB)                                     | /mnt                   | auto<br>(vfat) | defaults | 否          |                        |
| 添加<br>交換分<br>如果物理<br>已启用 | 1<br>下区<br>四内存不足,闲置数据可自动移到交换设备暂存,以增加可用<br>1 设备                            | ]的 <u>RAM</u> 。请注意:数据交 | 换的过程会          | 非常慢,因为   | 9交换设备无法    | s像 <u>RAM</u> 那样的高速地访问 |

6) After saving, you can see in the "Mounted File System" that the storage device has been successfully mounted

文件系统	挂载点	可用	已使用	卸载分区
/dev/root	1	28.93 GiB / 29.25 GiB	1.04% (310.21 MiB)	2
mpfs	/tmp	7.67 GiB / 7.68 GiB	0.06% (4.69 MiB)	-
tmpfs	/dev	512.00 KiB / 512.00 KiB	0.00% (0 B)	ā
dev/root	/opt/docker	28.93 GiB / 29.25 GiB	1.04% (310.21 MiB)	卸载分区
lev/sda	/mnt	59.46 GiB / 59.46 GiB	0.00% (640.00 KiB)	卸载分区

配置存储设备挂载到文件系统中的位置和参数

#### 8.8. USB Wireless Network Card Test

The currently tested USB wireless network cards that can be used are shown below. For other models of USB wireless network cards, please test them yourself. If they cannot be used, you need to port the corresponding USB wireless network card driver.

|--|

1	RTL8723BU Support 2.4G WIFI+BT4.0	
2	RTL8821CU Support 2.4G +5G WIFI Support BT 4.2	GRUS SES.
3	RTL8811 Support 2.4G +5G WIFI	CRIS-

# 8.8.1. Method of using a USB wireless network card to connect to a WIFI hotspot

1) Insert the USB wireless network card into the USB port of the development board, and then connect the power supply to power on the development board.

2) After the system startup is complete, click on **Network ->Wireless** to enter the wireless WiFi configuration interface.

192.168.2.1/cgi-bin/luci/			
	OpenWrt 状态 - 系统 - Docker - 服	務→ 网络→ 统计→ 退出	Riff
	未设置密码! 尚未设置密码。请为 root 用户设置密码以保护主机并		
	状态 <sup>系统</sup>	DHCP/IDNS 网络诊断 防火墙	
	主机名	Oper MultiWAN 管理器	
	型号	Oran 服务质量(QoS)	
	架构	ARMv8 Processor rev 0	
	目标平台	rockchip/armv8	

3) The default wireless configuration of OpenWRT system is **Master** mode. For the convenience of the next operation, we will remove the default wireless connection.

range I	Pi User Ma	anual	Copyright reserved by Shenzhen Xunlong Software C				o., ]
无线概况							
煮	radio0	Generic MAC80 设备未激活	211 802.11ac	caxbgn		重启 扫描 添加	)
	已禁用	SSID: OpenWrt   模 无线未开启	式: Master			启用 编辑 移除	
已连接站点	<u>ج</u>						
网络	MAC 地址		主机	信号I噪声	接收速率/发送速率		
				无可用信息	1		

4) Then click on the bottom right corner of the page to **save** and make the configuration effective.

25-201mi76	radio0 Generic 设备未激活	MAC80211 802.11ac	axbgn	重启	扫描 添加
已连接站	点				
网络	MAC 地址	主机	信号/噪声	接收速率/发送速率	
			无可用信息		
				保存并应用 🔹	呆存 <b>复</b> 位

5) Then click the scan button to scan the surrounding WiFi hotspots.

<b>未设置密</b> 尚未设置密	<b>码!</b> 码。请为 root 用户谈	设置密码以保护主机并启用。			
无线概况					
	🕈 radio0	Generic MAC80211 802.1 信道: ? (? GHz)   速率: ? Mbit/s	1acbgn		重启日描添加
已连接站	点				1
网络	MAC 地址	主机	信号/噪声	接收速率/发送速率	
			无可用信息	/	
				保存并应	用・保存复位

6) Then a window will pop up displaying available WiFi hotspots. Click the JoinNetwork button to the right of the desired WiFi hotspot to connect.

🥹 ra	ange P	i User Manual		Сс	pyright res	erved by Shenzhen Xu	inlong Software Co., Ltd
加入网络:搜	察无线	SSID	信道	模式	BSSID	70%:	
	58 dBm		48	Master	E8:9F:80:DF:4F:3F	WPA2 PSK (CCMP)	加入网络
	59 dBm		153	Master	E8:9F:80:DF:4F:40	WPA2 PSK (CCMP)	加入网络
	60 dBm	· · · · · · · · · · · · · · · · · · ·	149	Master	AD:40:AD:A1:72:31	WPA2 PSK (CCMP)	加入网络
	67 dBm	METGENNI OORE	60	Master	50:6A:03:AB:90:1A	WPA2 PSK (CCMP)	加入网络

7) Then a interface will pop up to connect to the WiFi hotspot. We will enter the hotspot password at the location shown in the figure below, and then click the **submit** button.

正在加入网络:"xunlong	orangepi_5G"	
重置无线配置		
	遗中此遗项以从无线中删除现有网络。     ①	
新网络的名称	wwan	
	● 合法字符: a-z, a-z, 0-9 和 _	
WPA 密钥		0
	◎ 在此指胞密钥。	
锁定到 BSSID		
	❷ 仅進搬到 BSSID 为 E8:9F:80:DF:4F:40 的网络,而不是其它 SSID 相同的网络。	
创建/分配防火墙区域	wan wan: 🔊 wan6: 🖉	
	● 为此使口分配所属的防火填区域,选择未择差可将该接口移出已从剩的区域,或者填写创建性来创建一个新的区域,并将当前接口与之建立关制。	
		取消

8) Then the following interface will pop up, click the **save** button in the bottom right corner.



9) Finally, you will return to the main interface of wireless configuration, click **save and apply**, and wait for the configuration to be applied.

尚未设置密	阳马: 阳。请为 root 用户证	设置密码以保护主机并启用。			
无线概况					
	🧝 radio0	Generic MAC80211 802.1 信道: ? (? GHz)   速率: ? Mbit/s	l1acbgn		重启 扫描 添加
(ai	。 巳禁用	SSID: xunlong_orangepi_5G   接口有 7 个未应用的更改	模式: Client		禁用编辑移除
口法接赴	点				
口哇按如					
网络	MAC 地址	主机	信号I噪声	接收速率/发送速率	
网络	MAC 地址	主机	信号噪声	接收速率/发送速率	

10) After successfully connecting to the WiFi hotspot, the interface displays as shown in the following figure.

Generic N 信道: 48 (5.2	<b>IAC80211 802.11a</b> 240 GHz)   <b>速率:</b> 292.5	cbgn Mbit/s		重启 扫描 添加
SSID: xunlor BSSID: 1C:E	ng_orangepi_5G   模式 3F:CE:D9:D2:60   加密	: Client : WPA2 PSK (CCMP)		禁用编辑移除
	MAC 地址	主机	信号/噪声	接收速率/发送速率
	E8:9F:80:DF:4F:3F	2		234.0 Mbit/s, 80 MHz, VHT-MCS 5, VHT-NSS 1
	Generic N 信道: 48 (5.2 SSID: xunlor BSSID: 1C:E	Generic MAC80211 802.11a 信道: 48 (5.240 GHz)   速率: 292.5 SSID: xunlong_orangepi_5G   模式 BSSID: 1C:BF:CE:D9:D2:60   加密 MAC 地址 E8:9F:80.DE:4F:3E	Generic MAC80211 802.11acbgn 信道: 48 (5.240 GHz)   速率: 292.5 Mbit/s           SSID: xunlong_orangepi_5G   模式: Client BSSID: 1C:BF:CE:D9:D2:60   加密: WPA2 PSK (CCMP)           MAC 地址         主机           E8:9F:80-DF:4F:3E         2	Generic MAC80211 802.11acbgn 信道: 48 (5.240 GHz)   速率: 292.5 Mbit/s           SSID: xunlong_orangepi_5G   模式: Client BSSID: 1C:BF:CE:D9:D2:60   加密: WPA2 PSK (CCMP)           MAC 地址         主机           信号/喋声

## 8. 8. 2. Method for creating a WIFI hotspot using a USB wireless network card

1) Insert the USB wireless network card into the USB port of the development board, and then connect the power supply to power on the development board.

2) The system startup is complete, click on **Network ->Wireless** to enter the wireless WiFi configuration interface.



192.168.2.1/cgi-bin/luci/			
	OpenWrt 状态 - 系统 - Docker - 服	段务→ 网络→ 统计→ 退出	1819F
	未设置密码 ! 尚未设置密码。请为 root 用户设置密码以保护主机并	按□ <del>和</del> 用、 <mark>无线</mark>	
	状态	DHCP/DNS 网络诊断 防火爆	
	主机名	Oper MultiWAN 管理器	
	型号	服务质量(QoS) Oran	
	架构	ARMv8 Processor rev 0	
	目标平台	rockchip/armv8	

3) The default wireless configuration of OpenWRT system is **Master** mode. For the convenience of the next operation, we will remove the default wireless connection.

无线概况						
惫	radio0	Generic MAC80211 802.11a 设备未激活	acaxbgn		重启    扫描    汤	iba )
	已禁用	SSID: OpenWrt   模式: Master 无线未开启			启用 编辑 移	除
已连接站,	<u>ل</u>					
网络	MAC 地址	主机	信号/噪声	接收速率/发送速率		
			无可用信息	/		

4) Then click on the bottom right corner of the page to **save** and make the configuration effective.

无线概况					
*	radio0 Generic 设备未激活	MAC80211 802.11ac ∜	axbgn	重启	扫描添加
已连接站	点				
网络	MAC 地址	主机	信号/噪声	接收速率/发送速率	
			无可用信息		1
				保存并应用 +	保存复位

5) Then click the **add** button on the right.

range	Pi User Manual	Coj	pyright reserved	by Shenzhen Xunlo	ong Software Co., L
无线概况					
*	radio0 Generic I 设备未激活	MAC80211 802.11ac	caxbgn		重启日描添加
已连接站,	<u>ل</u>				
网络	MAC 地址	主机	信号/噪声	接收速率/发送速率	
			无可用信息		

6) In the pop-up tab **device configuration**, we set the parameters as shown in the following figure.

编辑无线网络	
<b>火田</b> 町百	
常规设置高级设置	
状态	欄 模式: Master   SSID: OpenWrt dBm 无线未关联
无线网络已启用	禁用
工作频率	模式 带宽 信道 带宽 N V 2.4 GHz V 7 (2442 Mhz) V 20 MHz V
允许使用旧的 802.11b 速率	
	❷ 过时或性能欠佳的设备可能需要旧的 802.11b 速率才能互联。在使用这些速率的情况下,信道占用效率可能会显著 降低。建议尽可能不使用 802.11b 速率。
最大传输功率	驱动默认 🖌 - 当前功率: 未知
	❷ 指定最大发射功率。依据监管要求和使用情况,驱动程序可能将实际发射功率限定在此值以下。

7) Then in Interface Configuration ->General Settings, set the mode to Access Point AP, ESSID (Wireless Network Name) to OpenWrt, and network to wan



接口配置	L.			
常规设置	无线安全 MAC 过	虑 高级设置 WLAN 漫游		
	模式	接入点 AP	~	
	ESSID	OpenWrt		
	网络	wan: 🔎	•	_
		docker:		写创建栏来新建网络。
	隐藏 ESSID	🗌 lan: 💕		
		🗸 wan: 🚂		能无法漫游且信道占用效率可能显著降低。
		wan6: 🧾		
	vvivilivi 使工	□ - 自定义 ▼ 如末奈田 WI-FT 多味冲	(VVIVIIVI) (医	 云 QoS,则客户端的速率可能限制为 802.11a/802.11g。

8) Then in **Interface Configuration ->Wireless Security**, select **WPA2-PSK** as the encryption algorithm; Set the key (wireless password) to **password** 

规设置	无线安全	MAC 过滤	意 高级设置	WLAN 漫游	
		加密	WPA2-PSK	(强安全性)	~
		算法	自动		~
		密钥	password		*

9) After completing the above settings, click on the bottom right corner of the page to **save**, and then you will exit the tab

🍏 range Pi User M	Ianual Copyright reserved by Shenzhen Xunlong Software Co., Ltd
接口配置	
常规设置 无线安全 MAC	过滤 高级设置 WLAN 漫游
加密	WPA2-PSK (强安全性) V
算法	自动
密钥	password *
802.11w 管理帧保护	□ 注意: 有些无线驱动程序不完全支持 802 11w、例如: mwlwifi □ 能会有一些问题
启用密钥重新安装(KRACK) 对策	<ul> <li>② 通过禁用用于安装密钥的 EAPOL-Key 帧的重新传输,来增加客户端密钥重安装以去的复杂度。此解决方法可能会导致互操作性问题,并降低密钥协商的可靠性,特别是在流量负载较重的环境中。</li> </ul>
启用 WPS 一键加密按钮,需要 WPA(2)-PSK/WPA3-SAE	
	关闭保存

10) Then click on the bottom right corner of the page to save and apply, and wait for the configuration to be applied.

		设备未激活					重启目	描 添加
0	已禁用	SSID: OpenWrt   接口有 7 个未应用	模式: Master 肌的更改				禁用 编	辑 移除
已连接站点 <sup>网络</sup>	更 MAC 地址		主机	信号/噪声	~	接收速率/发送速率		
				无可用信息				

11) The display interface for successfully creating a hotspot is shown in the following figure

OpenWr	t 状态 - 系统 - Docl	ker - 服务 - 网络 -	统计 - 退出		刷新
未设置密闭	<b>码!</b> 码。请为 root 用户设置密码以例	我护主机并启用。			
无线概况					
	radio0 Generic M 信道: 7 (2.44	<b>AC80211 802.11aca</b> 2 GHz)   速率: ? Mbit/s	xbgn	重启	扫描 添加
<u> </u>	dBm SSID: OpenV BSSID: 38:7/	Vrt   <b>模式: M</b> aster A:0E:E3:80:05   <b>加密:</b> WF	PA2 PSK (CCMP)	禁用	编辑移除
已连接站	点				
网络	MAC 地址	主机	信号/噪声	接收速率/发送速率	
			无可用信息		
				保存并应用  →	保存复位

12) Then use your phone or computer to search for the corresponding WiFi SSID for connection. After successful connection, as shown in the following figure



#### 8.9. Installing software packages through the command line

#### 8.9.1. Installing through OPkg on the terminal

1) Update the list of available software packages

root@OpenWrt:/# opkg update

#### 2) Get software list

root@OpenWrt:/# opkg list

#### 3) Install the specified software package

root@OpenWrt:/# opkg install <Package Name>

#### 4) View installed software

root@OpenWrt:/# opkg list-installed

#### 5) Uninstall software

root@OpenWrt:/# opkg remove <Package Name>

# 8. 10. OpenWRT management interface installation software package

If you need to add software packages, you can install them through the OpenWRT management interface.

#### 8. 10. 1. View the list of available software packages in the system

- 1) First, enter the software package management page
  - a. Find the "System" option in the navigation bar and click to enter
  - b. In the vertical bar options below the system, select "Software Package" and click to enter

OpenWrt	状态╺	系统 -	Docker -	服务 -	网络 -	统计 -	退出		RIII
未设置密码! 尚未设置密码。	请为 root J	系统 管理权 软件包		日用。	,				
状态									
系统		计划任 挂载点							
主机名				Op	enWrt				
型号		LED 配 备份与	置 升级	Ora	ange PICI	/15			
架构		自定义		AR	Mv8 Proce	essorrev (	)		
目标平台		重启		roc	kchip/arm	v8			
固件版本				Op	enWrt 22.	0 <mark>3.4 r</mark> 2012	3-38ccc	47687 / LuCl openwrt-22.03 branch git-23.093.57104-ce20	b4a
内核版本				5.1	0.110				
本地时间				202	24-07-08 0	6:06:00			
运行时间				Oh	18m 43s				
平均负载				0.0	0, 0.03, 0.	05			
内存									
可用数				3.6	5 GiB / 3.	34 GiB (95	%)		
已使用				306	6.20 MiB /	3.84 GiB (	(7%)		

2) Then the main page of the software package will appear, as shown in the following

figure, to obtain the list of available software

- a. In the "**Operation**" option of the software package, click "**Update List**" to obtain the list of available software packages
- b. On the tab page, click "Available" to view the currently available software packages
- c. View the current number of available software packages

2闲空间: 18% (28.94 GiB)			~				
帝选器:		下载并安装软件包		-	操作:		
输入以筛选	清除	软件包名称或 UR	L	确认	更新列表	上传软件包	配置 opkg
1用 已安装	更新						
可用已安装	更新		正在显示 1-10	0,共7174	]		20
可用 已安装	更新 《 版本	大小 (.ipk)	正在显示 1-10 描述	0,共7174	]		*

#### 8. 10. 2. Example of Installing Software Packages

- 1) Taking the installation of the software package "luci-app-acl" as an example
  - a. In the package management interface of OpenWRT, click on the filter dialog box and enter "**luci-app-acl**"
  - In the list of software packages, you can see the version, package size, and description information of the "luci-app-acl" package, and then click the "Install" button

i洗器-		下载并安装软件包		握/E:		
luci-app-acl	清除	软件包名称或 URL	确认	更新列表	上传软件包	配置 opkg
「用 已安装 更新	л		正在显示 1-3 , 共 3			3
软件包名称	版本	大小(. <mark>.</mark> ipk)	描述			
软件包名称 luci-app-acl	版本 git-21.194.67617-f74b0	<b>大小 (.ipk)</b> 6c 4.14 KiB	描述 LuCl account mana	gement module		安装
软件包名称 luci-app-acl luci-i18n-acl-en	版本 git-21.194.67617-f74b0 git-23.090.61754-f7f34c	大小 (.ipk) 6c 4.14 KiB 1.25 KiB	描述 LuCl account mana Translation for <u>luci-a</u>	gement module <u>app-acl</u> - English		安装

c. Then the following pop-up window will appear, click "Install" to proceed

#### 软件包 luci-app-acl 详情

版本: git-21.194.67617-f74b06c
大小:~3.32 KiB 已安装
依赖:
L luci-base 已安装
L lua 已安装
L liblua5.1.5 已安装
L luci-lib-nixio
L luci-lib-ip TSE
L libnl-tiny1 已安装
L mpcd 已安装
L libubus20220601 已安装
L libubox20220515 已安装
L libuci20130104 已安装
L libblobmsg-ison20220515
l, libjson-c5 已安装
L libubus-lua 已安装
L, luci-lib-jsonc 已安装
L liblucihttp-lua 已安装
l, liblucihttp0 已安装
I, luci-lib-base 已安装
l。rpcd-mod-file 已安装
L, rpcd-mod-luci 已安装
L cgi-io 已安装
推荐的翻译:
l, luci-i18n-acl-en (487 B) 未安装
L, luci-i18n-acl-zh-cn (1.08 KiB) 未安装
描述
LuCl account management module
需要大约 3.32 KiB 空间来安装 1 个软件包。 推荐的翻译需要约 1.56 KiB 额外空间。
✓ 同样安装推荐的翻译包
□ 允许覆盖冲突的包文件
取消 安装

d. Then wait for the installation to complete

<b>OpenWrt</b> 状态 → 系統 → 服务 → Docker → 网络 → 統计 →				
	<b>未设置密码!</b> 尚未设置密码,请为 root F <b>软件包</b>	<b>正在执行软件包管理器</b> <sup>2</sup> 等待命令 opkg install 执行完成…		
	空闲空间			
	1224 18	Terret	揭作	

e. The display after installation is as follows

关闭

#### 正在执行软件包管理器

```
Installing luci-i18n-acl-en (git-23.090.61754-f7f34d4) to root ...
Downloading
https://downloads.openwrt.org/releases/22.03.4/packages/aarch64 generic/luci/
luci-i18n-acl-en_git-23.090.61754-f7f34d4_all.ipk
Installing luci-app-acl (git-21.194.67617-f74b06c) to root...
Downloading
https://downloads.openwrt.org/releases/22.03.4/packages/aarch64_generic/luci/
luci-app-acl_git-21.194.67617-f74b06c_all.ipk
Installing luci-i18n-acl-zh-cn (git-23.090.61754-f7f34d4) to root ...
Downloading
https://downloads.openwrt.org/releases/22.03.4/packages/aarch64_generic/luci/
luci-i18n-acl-zh-cn_git-23.090.61754-f7f34d4_all.ipk
Package luci-app-acl (git-21.194.67617-f74b06c) installed in root is up to
date.
Configuring luci-app-acl.
Configuring luci-i18n-acl-zh-cn.
Configuring luci-i18n-acl-en.
```

- 2) Check if the software package has been successfully installed
  - a. In the package management interface of OpenWRT, click on the filter dialog box and enter "**luci-app-acl**"
  - b. Select and click 'Available' on the tab page
  - c. The 'luci-app-acl' package will be displayed in the package list and updated to 'installed' status

软	件	Ē
14.4		-

		9	5% (7.4 GB)			
筛选器:		下载并安装软件包:		操作:		D.
luci-app-acl	清除	软件包名称或 URL	确认	更新列表	上传软件包	配置 opkg
可用已安装	更新	0				
2	ίζ.	正在	显示 1-36,共 36			3
软件包名称	版本	大小 (.ipk ) 描述	<u>R</u>			3

#### 8. 10. 3. Example of Removing Software Packages

- 1) Taking the removal of the software package 'luci-app-acl' as an example
  - a. In the package management interface of OpenWRT, click on the filter dialog box and enter "**luci-app-acl**"
  - b. Select 'Installed' on the tab page to display a list of installed software packages
  - c. Click 'Remove' on the right to remove the corresponding software package



e. After successful removal, the display interface is as follows

111/011/70/11/01	⊟ ¥±¤4	
Removing packag	ge luci-app-acl from root	

移除

取消

- 2) Check if the software package has been successfully removed
  - a. In the package management interface of OpenWRT, click on the filter dialog box and enter "**luci-app-acl**"
  - b. Select and click 'Installed' on the tab page

✓ 自动移除未使用的依赖

c. The 'luci-app-acl' package will not be displayed in the package list, and the 'luci-app-acl' package has been successfully removed

			95% (7.4 GB)			
洗器:		下载并安装软件包:		操作:		
i-app-acl	清除	软件包名称或 URL	确认	更新列表	上传软件包	配置 opkg
ĸ			没有软件包			»

#### 8.11. Using Samba Network Sharing

There are two main software options for implementing OpenWRT LAN file sharing: Samba and NFS. Samba system has good compatibility, while NFS performs better. For users who need to use Windows devices, it is recommended to choose Samba.

- 1) Enter the Samba network share management page
  - a. Find the "Services" option in the navigation bar and click to enter
  - b. In the vertical bar options below the service, select "Network Sharing" and click to enter



- 2) Select the interface that Samba service needs to listen on
  - a. Select "General Settings" in the navigation bar of network sharing and click to enter
  - b. The interface is specified according to actual needs. If you want to access it through the "lan port", set it to "Lan"



保存并应用

保存

复位

#### 网络共享

Samba Version 4.14.12	
常规设置编辑模板	
接口	lan: 39
工作组	van:
描述	wan6: 🚂
启用扩展调整	
强制同步 I/O	<ul> <li>❷ 启用一些社区驱动的调整参数,通过 WiFi 可以提高写入速度和更好地运行。不建议多个客户端同时写入同一文件!</li> <li>◎</li> <li>●</li> <li>●</li></ul>

- 3) Set the shared directory for network sharing
  - Click "Add" in the "Shared Directory" section of the "General Settings" for a. network sharing to share the directory address
  - b. Enter the name of the shared folder as 'mmt' under the name
  - Under the path of the shared directory, select the location of the shared directory c. "/"
  - Check 'browseable' and 'allow anonymous users to run' d.
  - Click 'Save and Apply' to save the configuration e.

名称	路径 →	可 浏	只读	强制 Root	允许 用户	<b>允</b> 许	仅来	继承	创建 权限	目录 权限	VFS 对 象	Apple Time-	Time- machine 大	
2. 输入	、共享文化 3.1	牛 <b>英</b> 的 设置非	的名称 共享的	。 的目录		匿名用户	宾 用 户	所有者	掩码	掩码		machine 共 享	小 (GB)	
mmt		~				~			0666	0777				删除

#### 4) window10 starts network discovery and sharing

Note: To access Samba on the Windows 10 system, it is necessary to first confirm whether Windows 10 has started network discovery and sharing. If it has not been started, the following settings should be made first.

Enable access to Samba v1/v2 a.

- a) Enter the Control Panel of windows10
- b) Click on "Programs" in the left navigation bar of the control panel
- c) Select 'Enable or Disable Windows Features' in Programs and Features
- d) Check 'SMB 1.0/CIFS file sharing support' in the pop-up box to enable or disable Windows features
- 0 程序 ~ → ◆ ↑ 👩 > 控制面板 > 程序 P 控制面板主页 程序和功能 Q ♥ 启用或关闭 Windows 功能 查看已安装的更新 卸载程序 系统和安全 运行为以前版本的 Windows 编写的程序 如何安装程序 网络和 Internet 默认程序 硬件和声音 更改媒体或设备的默认设置 始终使用指定的程序打开某种文件类型 设置默认程序 程序 🛃 Windows 功能 X 用户帐户 外观和个性化 2 启用或关闭 Windows 功能 时钟、语言和区域 若要启用一种功能,请选择其复选框。若要关闭一种功能,请请除其复选 框。填充的框表示仅启用该功能的一部分。 轻松使用 Internet Information Services Internet Information Services 可承載的 Web 核心 ■ 
   ■ Microsoft Message Queue (MSMQ) 服务器 Microsoft Print to PDF 对应用程序进行编程,以利用核心 IIS 功能为 MultiPoint Connector RAS 连接管理器管理工具包(CMAK) RIP 侦听器  $\square$ \_\_\_\_ Telnet 客户端 TFTP 客户端 Windows Identity Foundation 3.5 Windows Process Activation Service 取消 确定
- e) Click 'OK' to configure the application

- b. Open Windows10 Network Discovery
  - a) Enter the Control Panel of windows10
  - b) Select "Network and Internet" in the control panel
  - c) Then open the "Network and Sharing Center"
  - d) Click on 'Advanced Sharing Settings'
  - e) Open 'Enable Network Discovery' and 'Enable File and Printer Sharing'
  - f) Click 'Save Changes' to save the network discovery configuration for Windows10

•4 高级共享设置		1	×
← → → ↑ • ◆ ◆ 控制面板 > 网络和 Internet > 网络和共享中心 > 高级共享设置	5 v	搜索控制面板	٩
针对不同的网络配置文件更改共享选项 Windows 为你所使用的每个网络创建单独的网络配置文件。你可以针对每个配置文件选择特定的选项。			^
专用 (当前配置文件) 〇			
网络发现			
如果已庶用网络发现,则这台计算机可以发现网络上的其他计算机和设备,而且其他网络计算机也 可以发现这台计算机。			
<ul> <li>● 启用网络发现</li> <li>☑ 启用网络连接设备的自动设置。</li> <li>○ 关闭网络发现</li> </ul>			
文件和打印机共享			
启用文件和打印机共享时,网络上的用户可以访问通过此计算机共享的文件和打印机。			
<ul> <li>● 启用文件和打印机共享</li> <li>○ 关闭文件和打印机共享</li> </ul>			
家庭组连接			
通常,Windows 管理与其他家庭组计算机的连接。但是,如果你在所有计算机上拥有相同的用户帐 户和密码,则可以让家庭组改用你的帐户。			
◉) 允许 Windows 管理家庭组连接(推荐)			
○使用用户帐户和密码连接到其他计算机			
来真或公用 ()			~
♥保存更改 取消	]		

5) After setting up, enter \\OpenWrt in the address bar of the resource manager to access the shared directory. The username is root and the password is the password set by the development board host

★ 快速访问	名称	修改日期	类型	大小	
	🚞 bin	2023-04-09 20:27	文件夹		
OneDrive - Personal	🚞 dev	2023-04-09 20:29	文件夹		
💭 此电脑	tc	2023-04-09 20:28	文件夹		
🎾 网络	📒 lib	2023-04-09 20:27	文件夹		
	at + found		文件夹		
	🚞 mnt	2023-04-09 20:27	文件夹		
	🔁 opt	2023-04-09 20:28	文件夹		
	🚞 overlay	2023-04-09 20:27	文件夹		
	🚞 proc		文件夹		
	🚞 rom	2023-04-09 20:27	文件夹		
	🚞 root	2023-04-09 20:27	文件夹		
	nun.		文件李		

#### 8.12. zerotier User Manual

The OpenWRT system has pre installed the zerotier client. After creating a

virtual LAN on the zerotier official website, the client can directly join it through the Network ID. The specific operation is shown below.

1) Log in to the zerotier official website https://my.zerotier.com/network After registering and logging in, click Network->Create A Network to create a virtual LAN

$\overline{\Phi}$ ZEROTIER		Downloa	d Knowledge Bas	e Account	t Network	s System	API	Community	Logout			
		Crea	ate A Network									
Create a Network to Get Started												
$\overline{\Phi}$ zerotier		Download K	nowledge Base	Account	Networks	System	API	Community	Logout			
	Your Networks Networks: 1 Authorized Members: 0 / 50 Online Members: 0	Crea SEARCH 1 networks NETWORK ID 8286ac0e47d53bb5	te A Network	DESCRIP	TION SUB 172.2	NET N 17.0.0/16	NODES					

2) Click to enter the network console page, where you can set the privacy option to public, so that network nodes that join do not need to be verified

Basics	Network ID 8286ac0e47d53	3bb5
	Name happy_metcalfe	
	Description	
	Access Control	
	PRIVATE	PUBLIC O
	Nodes must be authorized to become <i>members</i>	Any node can become a <i>member</i> . Members cannot be de- authorized or deleted.

3) Below, the address will be automatically assigned. Here, you can choose your own network segment, and the selected one is 172.27.\*.\*

o-Assign from	Range		
Eas	sy	Adva	anced
10.147.17.*	10.147.18.*	10.147.19.*	10.147.20.*
10.144.*.*	10.241.*.*	10.242.*.*	10.243.*.*
10.244.*.*	172.22.*.*	172.23.*.*	172.24.*.*
172.25.*.*	172.26.*.*	172.27.*.*	172.28.*.*
172.29.*.*	172.30.*.*	192.168.191.*	192.168.192.*
92.168.193.*	192.168.194.*	192.168.195.*	192.168.196.*

4) Enter the following command on the OpenWRT terminal to join the virtual LAN created above, where 8286ac0e47d53bb5 is the Network ID of the virtual LAN created above

root@OpenWrt:/# zerotier-one -d	#Start the zerotier client
root@OpenWrt:/# zerotier-cli join 8286ac0e47d53bb5	#Join the network

5) By entering ifconfig on the terminal, it can be seen that there is already a newly added **ztks54inm2** device with an IP address of **172.27.214.213** 

root@OpenWrt:/# ifconfig ztks54inm2 Link encap:Ethernet HWaddr F6:4E:DE:BF:D8:52 inet addr:172.27.214.213 Bcast:172.27.255.255 Mask:255.255.0.0 inet6 addr: fe80::e82f:d0ff:fe5a:867e/64 Scope:Link UP BROADCAST RUNNING MULTICAST MTU:2800 Metric:1 RX packets:18 errors:0 dropped:0 overruns:0 frame:0 TX packets:48 errors:0 dropped:0 overruns:0 carrier:0 collisions:0 txqueuelen:1000 RX bytes:1720 (1.6 KiB) TX byte81 (8.2 KiB)

6) Install the zerotier client on another device (using Ubuntu 18.04 as an example), execute the following command to install, and restart the computer after installation is complete

test@ubuntu:~\$ curl -s https://install.zerotier.com | sudo bash

7) After restarting, join the virtual LAN based on the Network ID, and you can also see

that the IP address assigned by zerotier has been obtained. At this time, the Ubuntu PC and OrangePi R1 Plus LTS are in the same LAN, and they can communicate freely

```
test@ubuntu:~$ sudo zerotier-cli join 8286ac0e47d53bb5
test@ubuntu:~$ ifconfig
ztks54inm2: flags=4163<UP,BROADCAST,RUNNING,MULTICAST> mtu 2800
inet 172.27.47.214 netmask 255.255.0.0 broadcast 172.27.255.255
inet6 fe80::5ce1:85ff:fe2b:6918 prefixlen 64 scopeid 0x20<link>
ether f6:fd:87:68:12:cf txqueuelen 1000 (Ethernet)
RX packets 0 bytes 0 (0.0 B)
RX errors 0 dropped 0 overruns 0 frame 0
TX packets 46 bytes 10006 (10.0 KB)
TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0
```

8) Test whether two terminals can communicate

root@OpenWrt:/# ping 172.27.47.214 -I ztks54inm2
PING 172.27.47.214 (172.27.47.214): 56 data bytes
64 bytes from 172.27.47.214: seq=0 ttl=64 time=1.209 ms
64 bytes from 172.27.47.214: seq=1 ttl=64 time=1.136 ms
64 bytes from 172.27.47.214: seq=2 ttl=64 time=1.203 ms
64 bytes from 172.27.47.214: seq=3 ttl=64 time=1.235 ms
$^{\rm C}$
172.27.47.214 ping statistics
4 packets transmitted, 4 packets received, 0% packet loss
round-trip $min/avg/max = 1.136/1.195/1.235 ms$

9) Zerotier other commonly used commands root@OpenWrt:/# zerotier-one -d #Start the zerotier client root@OpenWrt:/# zerotier-cli status #Obtain address and service status root@OpenWrt:/# zerotier-cli join # Network ID #Join the network root@OpenWrt:/# zerotier-cli leave # Network ID #Leave the internet root@OpenWrt:/# zerotier-cli listnetworks #List networks OPENWRT\_DEVICE\_REVISION="v0" OPENWRT\_RELEASE="OpenWrt 22.03.4 r20123-38ccc47687"

#### 9. Compilation method of OpenWRT source code

#### 9.1. Download OpenWRT source code

1) First, execute the following command to download the openwrt-22.03 branch code

test@test:~\$ sudo apt update

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

test@test:~\$ git clone https://github.com/orangepi-xunlong/openwrt.git -b openwrt-22.03

2) After downloading the OpenWRT code, the following files and folders will be included

test@test:~/openwrt\$ ls

BSDmakefile Config.in include Makefile README.md scripts toolchain Config feeds.conf.default LICENSE package rules.mk target tools

#### 9.2. Compile OpenWRT source code

1) Firstly, install the following dependency packages (currently only tested for compilation on Ubuntu20.04. If compiling on other versions of the system, please install the dependency packages yourself according to the error message)

a. Method 1: The command to install dependency packages using a script is as follows:

test@test:~/openwrt\$ sudo ./install\_dep.sh

b. Method 2: Install dependency packages directly using the following command

test@test:~/openwrt\$ sudo apt update

test@test:~/openwrt\$ sudo apt install -y ack antlr3 asciidoc autoconf \

automake autopoint binutils bison build-essential 🛝

bzip2 ccache cmake cpio curl device-tree-compiler fastjar \

flex gawk gettext gcc-multilib g++-multilib git gperf haveged \

help2man intltool libc6-dev-i386 libelf-dev libglib2.0-dev \

libgmp3-dev libltdl-dev libmpc-dev libmpfr-dev \

libncurses5-dev \libncursesw5-dev libreadline-dev libssl-dev \

libtool lrzsz mkisofs msmtp nano ninja-build p7zip p7zip-full \

patch pkgconf python2.7 python3 python3-pyelftools \ libpython3-dev qemu-utils rsync scons squashfs-tools \ subversion swig texinfo uglifyjs upx-ucl unzip \ vim wget xmlto xxd zlib1g-dev

2) Then execute ./scripts/feeds update -a and ./scripts/feeds install -a download dependency package

test@test:~/openwrt\$ ./scripts/feeds update -a test@test:~/openwrt\$ ./scripts/feeds install -a

3) Then choose to use the configuration file of OrangePi CM5

test@test:~/openwrt\$ cp configs/orangepi-cm5-rk3588\_defconfig .config

4) Then execute the following command to make the configuration effective test@test:~/openwrt\$ make defconfig

5) Execute the following command to start compiling the openwrt source code test@test:~/openwrt\$ make V=s

6) After compilation, the path where the image is generated is:

test@test:~/openwrt\$ tree -L 1 bin/targets/rockchip/armv8/		
bin/targets/rockchip/armv8/		
config.buildinfo		
Feeds.buildinfo		
openwrt-rockchip-armv8-xunlong_orangepi-cm5.manifest		
—— packages		
├─── profiles.json		
├──── sha256sums		
└──── version.buildinfo		
1 directory, 8 files		

### 10. Appendix

#### 10. 1. User Manual Update History

Version	Date	Release Notes
v1.0	2024-07-02	initial version
v1.1	2024-07-04	1. Linux: Method for Running RKLLM Large Model with RK3588
		2. Instructions for using Orange Pi OS Arch system
		3. Compilation method of Android 13 source code
v1.2	2024-07-10	1. Usage of NPU
		2. RK3588 method of using PaddlePaddle
v1.3	2024-07-19	1. OpenWRT system usage instructions
		2. The compilation method of OpenWRT source code

#### 10. 2. Image update history

Date	Release Notes
2024-07-02	Orangepicm5_1.0.0_ubuntu_focal_server_linux5.10.160.7z
	Orangepicm5_1.0.0_ubuntu_jammy_server_linux5.10.160.7z
	Orangepicm5_1.0.0_debian_bullseye_server_linux5.10.160.7z
	Orangepicm5_1.0.0_debian_bookworm_server_linux5.10.160.7z
	Orangepicm5_1.0.0_ubuntu_focal_desktop_xfce_linux5.10.160.7z
	Orangepicm5_1.0.0_ubuntu_jammy_desktop_xfce_linux5.10.160.7z
	Orangepicm5_1.0.0_debian_bullseye_desktop_xfce_linux5.10.160.7z
	Orangepicm5_1.0.0_debian_bookworm_desktop_xfce_linux5.10.160.7z
	Orangepicm5_1.0.0_ubuntu_jammy_server_linux6.1.43.7z
	Orangepicm5_1.0.0_debian_bookworm_server_linux6.1.43.7z
	Orangepicm5_1.0.0_ubuntu_jammy_desktop_xfce_linux6.1.43.7z
	Orangepicm5_1.0.0_debian_bookworm_desktop_xfce_linux6.1.43.7z
	OrangePiCM5_RK3588S_Android13_v1.0.0.tar.gz



	* initial version	
2024-07-04	Opios-arch-aarch64-gnome-opicm5-24.07-linux5.10.160.img.xz	
	Opios-droid-aarch64-opicm5-24.07-linux5.10.160.tar.gz	
	* Initial version OrangePiCM5_RK3588S_Android13_v1.0.1.tar.gz	
	* Pre installed gms	
2024-07-19	openwrt-rockchip-armv8-xunlong_orangepi-cm5-ext4-sysupgrade_v1.0.img.gz	
	* Initial version	