

The above settings will eventually add the configuration of overlays=edp to /boot/orangepiEnv.txt. After setting, you can check it first. If this configuration does not exist, then there is a problem with the settings.

If you find it troublesome to use orangepi-config, you can also use the vim editor to open /boot/orangepiEnv.txt, and then add the configuration of overlays=edp.

orangepi@orangepi:~\$ cat /boot/orangepiEnv.txt | grep "edp" overlays=edp #sample configuration



3) After startup, you can see the display of the eDP screen as follows:

3. 31. Instructions for using the switch logo

- 1) By default, the switch logo will only be displayed in the desktop version of the system
- 2) Set the **bootlogo** variable to **false** in **/boot/orangepiEnv.txt** to turn off the switch logo

orangepi@orangepi:~\$ vim /boot/orangepiEnv.txt verbosity=1 bootlogo=false

3) Set the bootlogo variable to true in /boot/orangepiEnv.txt to enable the switch logo orangepi@orangepi:~\$ vim /boot/orangepiEnv.txt verbosity=1 bootlogo=true

4) The location of the boot logo image in the Linux system is

/usr/share/plymouth/themes/orangepi/watermark.png

5) After replacing the boot logo picture, you need to run the following command to take effect

orangepi@orangepi:~\$ sudo update-initramfs -u

3. 32. How to use the ZFS file system

3. 32. 1. How to install ZFS

Note that linux6.6 is not supported yet.

Before installing zfs, please make sure that the Linux image used is the latest version. In addition, if zfs is already installed in the system, it needs to be installed again.

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 on the method of installing the kernel header file.

In Ubuntu20.04, Ubuntu22.04 and Debian11 systems, zfs cannot be installed directly through apt, because the default apt source zfs version is lower than 2.1.6, and there is a problem of incompatibility with rk Linux5.10 kernel. This problem is fixed in zfs version 2.1.6 and later.

To solve this problem, we provide a zfs deb package that can be installed normally, which can be downloaded from the **official tool** of the development board. Open the **official tool**, and enter the **zfs-related deb package folders 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.

••• >	Official Tool > zfs-related deb packag	•
Туре	People Modified	
Name	¥	
	ubuntu22.04_zfs_2.1.6	
	ubuntu20.04_zfs_2.1.6	
	debian11_zfs_2.1.11	

After downloading the zfs deb packages of the corresponding version, please upload them to the Linux system of the development board. For the upload method, please refer to the description in the section of the method of uploading files to the Linux system of the development board.

After the upload is complete, use the cd command in the command line of the development board Linux system to enter the directory of the deb package, and then use the following command to install the deb package of zfs.

orangepi@orangepi:~\$ sudo apt install ./*.deb

After the installation is complete, use the following command to see the zfs-related kernel modules:

orangepi@orangepi:~\$ ls /lib/modules/5.10.160-rockchip-rk356x/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 to see that the zfs kernel module will be automatically loaded:

orangepi@orangep	oi:~\$ lsmod gre	p "zfs"
zfs	2801664	0
zunicode	327680	1 zfs
zzstd	471040	1 zfs
zlua	139264	1 zfs
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 Debian12, the default version of zfs is 2.1.11, so we can install zfs directly through the following command. 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. 32. 2. Methods of creating ZFS pools

ZFS is based on storage pools, we can add multiple physical storage devices to the pool, and then allocate storage space from this pool.

The following content is demonstrated based on the development board connected to an NVMe SSD and a USB flash drive.

1) First, we can use the **lsblk** command to view all storage devices on the development board. The current development board is connected to an NVMe SSD and a U disk. The output is as follows:

orangepi@or	angepi:~	\$ 1	sblk			
NAME	MAJ:MIN	RM	SIZE	RO	TYPE	MOUNTPOINTS
sda	8:0	1	28.8G	0	disk	
-sda1	8:1	1	28.8G	0	part	
└─sda9	8:9	1	8M	Θ	part	
mtdblock0	31:0	0	16M	0	disk	
mmcblk0	179:0	0	29.7G	0	disk	
-mmcblk0p1	179:1	0	1G	0	part	/boot
L_mmcblk0p2	179:2	0	28.4G	0	part	/var/log.hdd
zram0	254:0	0	7.7G	0	disk	[SWAP]
zram1	254:1	0	200M	0	disk	/var/log
nvme0n1	259:0	0	476.9G	0	disk	
-nvme0n1p1	259:3	0	476.9G	0	part	
└─nvme0n1p9	259:4	0	8M	0	part	
orangepi@ora	angep1:~	\$				

2) Then enter the following command to create a ZFS pool, including two storage devices, NVMe SSD and U disk

orangepi@orangepi:~\$ sudo zpool create -f pool1 /dev/nvme0n1 /dev/sda

3) Then use the **zpool list** command to see that the system has created a ZFS pool named **pool1**, and the size of the ZFS pool pool1 is the size of the NVME SSD plus the size of the U disk

orangep	oi@oran	gepi:~\$	zpool	list							
NAME	SIZE	ALLOC	FREE	CKPOINT	EXPANDSZ	FRAG	CAP	DEDUP	HEALTH	ALTROOT	
pool1	504G	114K	504G		-	0%	0%	1.00x	ONLINE	-	

orangepi@orangepi:~\$ df -h							
Filesystem	Size U	Used Ava	ail Use%	Mounted on			
tmpfs	1.6G	18M	1.6G	2% /run			
/dev/mmcblk0p2	29G	6.0G	22G	22% /			
tmpfs	7.7G	46M	7.7G	1% /dev/shm			
tmpfs	5.0M	4.0K	5.0M	1% /run/lock			
tmpfs	7.7G	944K	7.7G	1% /tmp			
/dev/mmcblk0p1	1022M	115M	908M	12% /boot			
/dev/zram1	188M	4.5M	169M	3% /var/log			
tmpfs	1.6G	80K	1.6G	1% /run/user/1000			
pool1	489G	9.3M	489G	1% / <mark>pool1</mark>			

5) Use the following command to see that the file system type of pool1 is zfs

orangepi@orangepi:~\$ mount | grep pool1 pool1 on /pool1 type zfs (rw,xattr,noacl)

6) Then we can test copying a file to the ZFS pool

orangepi@orangepi:~\$ sudo cp -v /usr/local/test.mp4 /pool1/

'/usr/local/test.mp4' -> '/pool1/test.mp4'

3. 32. 3. Test the data deduplication function of ZFS

1) The data deduplication function of ZFS is disabled by default, we need to execute the following command to enable it

orangepi@orangepi:~\$ sudo zfs set dedup=on pool1

2) Then do a simple test, first enter pool1, and then execute the following command to generate a random file with a size of 1G

orangepi@orangepi:~\$ cd /pool1/

root@orangepi:/pool1\$ sudo dd if=/dev/urandom of=test.1g bs=1M count=1024

1024+0 records in

1024+0 records out

1073741824 bytes (1.1 GB, 1.0 GiB) copied, 5.04367 s, 213 MB/s

3) Then use the following command to copy 1000 random files of size 1G root@orangepi:/pool1\$ for ((i=0; i<1000; i++)); do sudo cp test.1g \$i.test.1g; done 4) Then use **du -lh** to see that there are currently 1002G of data in the pool, but in fact the size of the ZFS pool is only **504GB** (the total capacity of SSD+U disk), which cannot hold such a large amount of data

root@orangepi:/pool1\$ du -lh	
1002G	

5) Then use the **zpool list** command to see that only 1.01G is actually occupied, because these 1001 files are all duplicates, indicating that the data deduplication function is effective.



3. 32. 4. Test the data compression function of ZFS

1) Because the stored data is different, the disk space saved by compression will also be different, so we choose to compress relatively large plain text files for compression testing, and execute the following commands to pack the **/var/log/** and **/etc/** directories into a tarball

orangepi@orangepi:~\$ cd /pool1/ root@orangepi:/pool1\$ sudo tar -cf text.tar /var/log/ /etc/

2) Then the file size that can be seen through the **ls -lh** command and the space occupied in the ZFS pool are both **27M**

orangep total 2	i@oran 7M	gepi:/po	pol1\$ l	s -lh						
- rw-r	r 1	root roo	ot 27M	Jun 1 14	:46 text.ta	ar				
orangep	i@oran	gepi:/po	pol1\$ z	pool list						
NAME	SIZE	ALLOC	FREE	CKPOINT	EXPANDSZ	FRAG	CAP	DEDUP	HEALTH	ALTROOT
pool1	504G	26.7M	504G			0%	0%	1.00x	ONLINE	
orangep	i@oran	gepi:/p	pol1\$							

3) Then we enable compression in the ZFS pool pool1

root@orangepi:/pool1\$ sudo zfs set compression=lz4 pool1

4) Then execute the following command again to package the /var/log/ and /etc/ directories into a tar package

root@orangepi:/pool1\$ sudo tar -cf text.tar /var/log/ /etc/

5) At this time, you can see that the size of the **text.tar** file is still 27M, but it only



occupies 9.47M in the ZFS pool, indicating that the file is compressed

orande	ni@oran	geni:/no	011\$ 1	s -lh						
total	9.2M	geb ci / be		o ch						
-rw-r	-r 1	root roo	ot 27M	Jun 1 14	:54 text.ta	ar				
orange	pi@oran	gepi:/po	ool1\$ z	pool list						
NAME	SIZE	ALLOC	FREE	CKPOINT	EXPANDSZ	FRAG	CAP	DEDUP	HEALTH	ALTROOT
pool1	504G	9.47M	504G			0%	0%	1.00x	ONLINE	

3. 33. How to use RTC

1) An RTC battery interface is reserved on the development board. The location is as follows::

		-
State of the state	ANUONCON A	
	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	/

2) The RTC battery that needs to be purchased is as follows, the interface is 2pin, 1.25mm pitch



- 3) The RTC chip used on the development board is HYM8563TS. The characteristics of this chip are:
 - a. Wide operating voltage range: 1.0~5.5v
 - b. Low sleep current: typical value is $0.25 \ \mu A (VDD = 3.0V, TA = 25^{\circ} C)$
- 4) After connecting the RTC battery to the development board, use the following method to test whether the RTC is working normally:
 - a. First boot into the system, and then record the current time of the system.
 - b. Then use the poweroff command to shut down the system gracefully
- c. Then unplug the power, make sure the development board is not connected to network cables and wireless WIFI, and wait a few more minutes.

d. Then start the system again. If you see that the time has moved forward a few minutes after entering the system, it means

The RTC module and battery are working normally

5) The command to view RTC information through the procfs interface of the Linux system is

orangepi@orange	pi:~\$ cat /proc/driver/rtc
rtc_time	: 10:10:36
rtc_date	: 2023-10-19
alrm_time	: 00:00:00
alrm_date	: 1999-12-16
alarm_IRQ	: no
alrm_pending	: no
update IRQ enabl	ed : no
periodic IRQ enab	bled : no
periodic IRQ freq	uency : 1
max user IRQ free	quency : 64
24hr	: yes

3. 34. Testing method of GPU in Linux6.6 system

Note that the desktop wallpaper may display a black screen after the GPU is turned on, so the GUP is turned off by default.

GPU is only available in Ubuntu22.04 and Debian12.

1) In Linux 6.6 system, the GPU is turned off by default and needs to be turned on manually before it can be used. Detailed steps are as follows:

a. First run **orangepi-config**. Ordinary users remember to add **sudo** permissions orangepi@orangepi:~\$ **sudo orangepi-config**

b. Then select System



c. Then select Hardware



d. Then use the keyboard's arrow keys to locate the location shown in the picture below, and then use the space to select the gpu option



e. Then select <Save> to save

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f. Then select <Back>

[] uart7-m2 [] uart9-m2		
< Save >	< Back >	_

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

2) Open a terminal on the desktop and enter the glmark2 command. If you can see GL_VENDOR followed by **Panfrost**, it means a GPU is used.

oran	ngepi@orangepi:~\$ glmark2
	glmark2 2023.01
	OpenGL Information
	GL_VENDOR: Panfrost
	GL_RENDERER: Mali-G52 r1 (Panfrost)
	GL_VERSION: 3.1 Mesa 22.3.6
	Surface Config: buf=32 r=8 g=8 b=8 a=8 depth=24 stencil=0 samples=0
	Surface Size: 800x600 windowed

3. 35. How to shut down and restart the development board

1) During the running of the Linux system, if you directly unplug the Type-C power supply and 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 cutting off the power. Then unplug the power supply.

orangepi@orangepi:~\$ sudo poweroff

2) In addition, the development board is equipped with a power on/off button, and you can also **short press** the power on/off button on the development board to shut down.



Note that after pressing the power button on the Linux desktop version, the confirmation box shown in the figure below will pop up. You need to click the Shut Down option before Shut Down.



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——orangepi-build instructions

4.1. Compilation system requirements

We can cross-compile the Linux image of the development board on the x64 computer, or compile the Linux image of the development board on 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 Ubuntu22.04 system of the development board, please do a good job of cooling (especially when the SSD starts). If the heat dissipation is not done well, it is prone to the error of file system runaway.

4. 1. 1. Compile with the Ubuntu22.04 system of the development board

1) The Linux SDK, namely **orangepi-build**, supports running on the **Ubuntu 22.04** of the development board (other systems have not been tested), so before downloading orangepi-build, please first ensure 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 replace the system before performing the following operations.

rangepi@orangepi:~\$ lsb_release -a			
No LSB module	No LSB modules are available.		
Distributor ID:	Ubuntu		
Description:	Ubuntu 22.04.1 LTS		
Release:	22.04		
Codename:	jammy		

2) Since the source codes such as the kernel and U-boot are stored on GitHub, it is very important to ensure that the development board can download codes from GitHub normally when compiling the image.

3) The download address of the installation image of Ubuntu 22.04 amd64 version is:

https://mirrors.tuna.tsinghua.edu.cn/ubuntu-releases/22.04/ubuntu-22.04-desktop-amd64.iso or

https://repo.huaweicloud.com/ubuntu-releases/22.04/ubuntu-22.04.1-desktop-amd64.iso

4. 1. 2. Compile with x64 Ubuntu22.04 computer

1) The Linux SDK, **orangepi-build**, supports running on computers with **Ubuntu 22.04** installed, so before downloading orangepi-build, please make sure that the Ubuntu version installed on your computer is Ubuntu 22.04. The command to check the Ubuntu version installed on the computer is as follows. If the Release field does not display **22.04**, it means that the current Ubuntu version does not meet the requirements. Please replace the system before performing the following operations.

test@test:~\$ lsb_release -a No LSB modules are available. Distributor ID: Ubuntu Description: Ubuntu 22.04 LTS Release: 22.04 Codename: jammy

2) If the computer is installed with Windows system and there is no computer with Ubuntu 22.04 installed, you can consider using **VirtualBox** or **VMware** to install an Ubuntu 22.04 virtual machine in the Windows system. But please be careful not to compile orangepi-build on the WSL virtual machine, because orangepi-build has not been tested in the WSL virtual machine, so it cannot be guaranteed that orangepi-build can be used normally in WSL.

3) The download address of the installation image of Ubuntu 22.04 amd64 version is: https://mirrors.tuna.tsinghua.edu.cn/ubuntu-releases/22.04/ubuntu-22.04-desktop-amd64.iso Or

https://repo.huaweicloud.com/ubuntu-releases/22.04/ubuntu-22.04.1-desktop-amd64.iso

4. 2. Get the source code of Linux sdk

4. 2. 1. Download orangepi-build from github

1) The Linux sdk actually refers to the code of orangepi-build. orangepi-build is modified based on the armbian build system. Using orangepi-build, multiple versions of Linux images can be compiled. First download the code of orangepi-build, 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 3B development board needs to download the source code of the next branch of orangepi-build. The above git clone command needs to specify the branch of the orangepi-build source code as next.

🖟 orang	epi-xunlong / orangepi-build Publi	c	🛇 Unpin 💿 Ur
<> Code	⊙ Issues 6 រឺរ Pull requests 1 💭	Discussions 🕑 Actions 🖽 Projects	띠 Wiki ① Security 🗠 Insights 🕸 Sett
	🐉 next 🚽 🐉 2 branches 🚫 0 tags		Go to file Add file - <> Code -
	Switch branches/tegs ×	behind main.	រឹ្ឋ Contribute ◄
	Branches Tags Need to switch t	o next	69dd359 4 days ago 🕚 222 commits
	main	Update for Orange Pi 5 v1.0.2	4 days ago
	✓ next View all branches	Update for Orange Pi 5 v1.0.2	4 days ago
	gitignore	Update for Orange Pi 5 v1.0.2	4 days ago
		First Commit	2 years ago
	README.md	Support orangepi3 next branch	8 months ago
	🕒 build.sh	Bump to next branch	9 months ago

Downloading the orangepi-build code through the git clone command does not require entering the user name and password of the github account (the same is true for downloading other codes in this manual), if the Ubuntu PC prompts the user to enter the github account after entering the git clone command The name and password are usually entered incorrectly in the address of the orangepi-build warehouse behind the git clone. Please check the spelling of the command carefully, instead of thinking that we forgot to provide the username and password of the github account.

2) The u-boot and Linux kernel versions currently used by the development board are as follows

branch	u-boot version	Linux Kernel version
legacy	u-boot 2017.09	Linux5.10
current	u-boot 2017.09	Linux6.6

The branch mentioned here is not the same thing as the branch of orangepi-build source code, please don't get confused. This branch is mainly used to distinguish different kernel source code versions.

We define the Linux5.10 bsp kernel currently provided by RK as the legacy branch. We define the latest Linux6.6 kernel as the current branch.

- 3) orangepi-build will contain the following files and folders after downloading
 - a. **build.sh**: Compile the startup script
 - b. **external**: Contains the configuration files needed to compile the image, specific scripts, and the source code of some programs, etc.
 - c. LICENSE: GPL 2 license file
 - d. **README. md**: orangepi-build documentation
 - e. scripts: General script for compiling Linux images

test@test:~/orangepi-build\$ ls

build.sh external LICENSE README.md scripts

If you downloaded the code of orangepi-build from github, after downloading, you may find that orangepi-build does not contain the source code of u-boot and Linux kernel, nor does u-boot and Linux kernel need to use cross-compilation tools Chain, this is normal, because these things are stored in other separate github warehouses or some servers (the addresses will be detailed below). orangepi-build will specify the address of u-boot, Linux kernel and cross-compilation toolchain in the script and configuration file. When running orangepi-build, when it finds that there are no such things locally, it will automatically go to the corresponding place to download them.

4. 2. 2. Download the cross-compilation toolchain

The cross-compilation toolchain will only be downloaded when the orangepi-build compilation image is used on an x64 computer. Compiling the Linux image of the development board in the Ubuntu22.04 of the development board will not download the cross-compilation toolchain. At this time, orangepi-build/toolchains will be an empty folder.

1) When orangepi-build runs for the first time, it will automatically download the cross-compilation toolchain and put it in the **toolchains** folder. Every time after running the build.sh script of orangepi-build, it will check whether the cross-compilation toolchain in **toolchains** exists, if it does not exist, the download will be restarted, if it exists, it will be used directly, and the download will not be repeated.

[o.k.]	Checking for external GCC compilers	
[]	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%
i i	downloading using http(s) network [gcc-linaro-arm-none-eabi-4.8-2014.04 linux.tar.xz]	
#e30eec	17MiB/33MiB(50%) CN:1 DL:10MiB ETA:15]	
[o.k.]	Verified [PGP]	
i i	decompressing	
í i	gcc-linaro-arm-none-eabi-4.8-2014.04 linux.tar.xz; 33.9MiB [9.66MiB/s] [>	100%
i i	downloading using http(s) network [gcc-linaro-arm-linux-gnueabihf-4.8-2014.04 linux.tar.xz]	
#041c24	48MIB/48MIB(99%) CN:1 DL:2.7/MB]	
[o.k.]	Verified [PGP]	
i i	decompressing	
i i	gcc-linaro-arm-linux-gnueabihf-4.8-2014.04 linux.tar.xz; 48.8MiB [13.0MiB/s] [====================================	100%
i i	downloading using http(s) network [gcc-linaro-4.9.4-2017.01-x86 64 arm-linux-gnueabi.tar.xz]	
#3dee3e	72MiB/76MiB(93%) CN:1 DL:3.7/liB ETA:1s1	
[o.k.]	Verified [MD5]	
i i	decompressing	
[i	gcc-linaro-4,9.4-2017.01-x86 64 arm-linux-gnueabi.tar.xz: 77.0MiB [14.2MiB/s] [====================================	100%
[]	downloading using http(s) network [gcc-linaro-7.4.1-2019.02-x86 64 arm-linux-gnueabi.tar.xz]	
#42e728	104MiB/104MiB(99%) CN:1 DL:2.8MiB	
[o.k.]	Verified [MD5]	
i i	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]	
#2c065e	108MiB/111MiB(97%) CN:1 DL:3.9MiB]	
[o.k.]	Verified [MD5]	
[]	decompressing	
[]	gcc-linaro-7.4.1-2019.02-x86 64 aarch64-linux-gnu.tar.xz: 111MiB [13.4MiB/s] [====================================	100%
[]	downloading using http(s) network [gcc-arm-9.2-2019.12-x86 64-arm-none-linux-gnueabihf.tar.xz]	
#d232ee	250MiB/251MiB(99%) CN:1 DL:2.0MiB]	
[o.k.]	Verified [MD5]	
[]	decompressing	
[]	gcc-arm-9.2-2019.12-x86 64-arm-none-linux-gnueabihf.tar.xz: 251MiB [13.7MiB/s] [====================================	100%
[]	downloading using http(s) network [gcc-arm-9.2-2019.12-x86 64-aarch64-none-linux-gnu.tar.xz]	
#88b441	268MiB/269MiB(99%) CN:1 DL:0.9MiB]	
[o.k.]	Verified [MD5]	

2) The image URL of the cross-compilation toolchain in China is the open source software image site of Tsinghua University

https://mirrors.tuna.tsinghua.edu.cn/armbian-releases/_toolchain/

3) After **toolchains** is downloaded, it will contain multiple versions of cross-compilation toolchains, and the development board will only use two of them

test@test:~/orangepi-build\$ Is toolchains/

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 toolchain used to compile the Linux kernel source code isa. Linux5.10

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 warehouse does not contain the source code of the Linux kernel, u-boot and cross-compilation tool chain. The source code of the Linux kernel and u-boot is stored in an independent git warehouse.

- a. The git warehouse where the Linux kernel source code is stored is as follows. Please note that the branch of the linux-orangepi warehouse is switched to
 - a) Linux5.10

https://github.com/orangepi-xunlong/linux-orangepi/tree/orange-pi-5.10-rk35xx

b) Linux6.6

https://github.com/orangepi-xunlong/linux-orangepi/tree/orange-pi-6.6-rk35xx

b. The git warehouse where the b.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 runs for the first time, it will download the cross-compilation toolchain, u-boot and Linux kernel source code. After successfully compiling a Linux image, the files and folders that can be seen in orangepi-build are:

a. build.sh: compile startup script

b. external: Contains the configuration files needed to compile the image, scripts with specific functions, and the source code of some programs. The rootfs

compressed package cached during the image compilation process is also stored in external

c. **kernel**: Stores the source code of the Linux kernel. The folder named orange-pi-5.10-rk35xx stores the kernel source code of the legacy branch of the RK3588/RK3588S/RK3566 series development boards. The folder named orange-pi-6.6-rk35xx stores the source code. It is the kernel source code of the current branch of the RK3566 series development board. Please do not modify the name of the folder of the kernel source code manually. If it is 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**: Store compiled deb packages such as u-boot and Linux, compilation logs, and compiled images and other files

g. scripts: general scripts for compiling Linux images

h. toolchains: store cross-compilation toolchain

i. **u-boot**: stores the source code of u-boot, the folder named **v2017.09-rk3588** stores the u-boot source code of the legacy branch of the RK3588/RK3588S/RK3566 series development boards, the name of the folder of the u-boot source code Please do not modify it manually, if it is modified, the u-boot source code will be re-downloaded when the compiling system is running

j. userpatches: Store 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, remember to add sudo permission

test@test:~/orangepi-build\$ sudo ./build.sh

2) Select U-boot package, then enter

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Choose an option Compile image rootfs kernel u-boot	
U-boot package	
Kernel package	
Rootfs and all deb packages	
Full OS image for flashing	

3) Then select the model of the development board

orangepi3-lts orangepizero2 orangepizero3 orangepi4 orangepi4-lts orangepi800 orangepi5 orangepi5b	Allwinner Allwinner Allwinner Rockchip Rockchip Rockchip Rockchip Rockchip	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 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 RK3399 hexa core 4GB RAM GBE eMMC USB3 USB-C WiFi/BT VGA RK3588S octa core 4-16GB RAM GBE USB3 USB-C WiFi/BT eMMC
orangepispius orangepicm4	Rockchip	RK3588 OCTA COFE 4-32UB RAM 2.5UBE USB3 USB-C WIFI/BI NVME EMMC RK3566 quad core 2-8GB RAM GBE eMMC USB3 NVME WiFi/BT
orangepi3b	Rockchip	RK3566 quad core 2-8GB RAM GBE eMMC USB3 NvMe WiFi/BT
	<	Select> <exit></exit>

4) Then select u-boot to select the branch type. Both the current branch and the legacy branch will compile the code of the u-boot v2021.07 version that needs to be used.



5) Then it will start to compile u-boot. Some of the information prompted during compilation is as follows:

a. u-boot source code version

[o.k.]	Compiling u-boot [v2017.09]
b.	The version of the cross-compilation toolchain
[o.k.]	Compiler version [aarch64-linux-gnu-gcc 7.4.1]

c. Path to the generated u-boot deb package

1	range Pi Liser Manijal	Convright reserved by Shenzhen Xunlong Software Co. 1 to
		Copyright reserved by Shenzhen Aumong Sontware Co., Liu
	0	

[o.k.] Target directory [orangepi-build/output/debs/u-boot]

d. The package name of the generated u-boot deb package

[o.k.] File name [linux-u-boot-legacy-orangepi3b_1.0.0_arm64.deb]

e. Compilation time

o.k.] Runtime [1 min]

f. Repeat the command to compile u-boot, use the following command to start compiling u-boot directly without selecting through the graphical interface

[o.k.] Repeat Build Options [**sudo ./build.sh BOARD=orangepi3b BRANCH=legacy** BUILD_OPT=u-boot KERNEL_CONFIGURE=no]

6) View the u-boot deb package generated by compilation

test@test:~/orangepi-build\$ ls output/debs/u-boot/

linux-u-boot-legacy-orangepi3b_1.0.0_arm64.deb

7) 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\$ \$ dpkg -x \

linux-u-boot-legacy-orangepi3b_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-orangepi3b_1.0.0_arm64.deb usr

b. The decompressed file is as follows

test@test:~/orangepi-build/output/debs/u-boot\$ tree usr

usr

└── lib

- —— linux-u-boot-legacy-orangepi3b_1.0.0_arm64
 - idbloader.img
- rkspi_loader.img

u-boot.itb

└── u-boot

- LICENSE
- platform_install.sh

3 directories, 6 files

8) When the orangepi-bulid compilation system compiles the u-boot source code, it will first synchronize the u-boot source code with the u-boot source code of the github server, so if you want to modify the u-boot source code, you first need to turn off the download and update function of the source code (This function needs to be fully compiled once u-boot, otherwise it will prompt that the source code of u-boot cannot be found. If the source code package downloaded from Baidu cloud disk, there is no such problem, because the source code of u-boot is all cached), otherwise the changes made will be reverted, 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"

9) When debugging u-boot code, you can use the following method to update 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-orangepi3b_1.0.0_arm64.deb root@192.168.1.xxx:/root

b. Then log in to the development board and uninstall the deb package of u-boot installed

root@orangepi:~# apt purge -y linux-u-boot-orangepi3b-legacy

c. Install the new u-boot deb package just uploaded

root@orangepi:~# dpkg -i linux-u-boot-legacy-orangepi3b_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/eMMC** to update the u-boot in the TF card or **7 Install/Update the bootloader on SPI Flash** to update the u-boot in the SPI Flash



f. After pressing the Enter key, a Warning will pop up first



g. Press the Enter key again to start updating u-boot, and the following information will be displayed after the update is completed



- h. Then you can restart the development board to test whether the modification of u-boot takes effect
- 10) 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-3b-rk3566 defconfig

b. In the u-boot 2017.09 source code, the dts file used by the development board is orangepi-build/u-boot/v2017.09-rk3588/arch/arm/dts/rk3566-orangepi-3b.dts

4.4. Compile the Linux kernel

1) Run the build.sh script, remember to add sudo permission

test@test:~/orangepi-build\$ sudo ./build.sh

2) Select Kernel package, then enter

Compile image rootfs kernel u-boot	
U-boot package	
Kernel package	
Rootfs and all deb packages	
Full OS image for flashing	

3) Then select the model of the development board

Please choose a Board.
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 orangepi800 Rockchip RK3399 hexa core 4GB RAM GBE eMMC USB3 USB-C WiFi/BT orangepi5 Rockchip RK3588 octa core 4-16GB RAM GBE USB3 USB-C WiFi/BT VGA orangepi5b Rockchip RK3588 octa core 4-16GB RAM GBE USB3 USB-C WiFi/BT eMMC orangepi5plus Rockchip RK3588 octa core 4-32GB RAM 2.5GBE USB3 USB-C WiFi/BT NVMe eMMC orangepi5b Rockchip RK3566 quad core 2-8GB RAM GBE eMMC USB3 NVMe WiFi/BT orangepi3b Rockchip RK3566 quad core 2-8GB RAM GBE eMMC USB3 NVMe WiFi/BT
<select> <exit></exit></select>

4) Then it will prompt whether to display the kernel configuration interface. If you do not need to modify the kernel configuration, select the first one. If you need to modify the kernel configuration, select the second one.

Choose an option	
Select the kernel configuration.	
Do not change the kernel configuration	
Show a kernel configuration menu before compilation	

- 5) Then select the branch type of the kernel source code
 - a. The legacy branch will compile the linux5.10 kernel source code
 - b. The current branch will compile the linux6.6 kernel source code

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6) If you choose 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, save and exit after modification. Yes, after exiting, the kernel source code will be compiled

	Linux/arm64 5.10.110 Kernel Configuration
Arrow keys n are hotkeys For Help, <,	avigate the menu. <enter> selects submenus> (or empty submenus). Highlighted letters . Pressing <y> includes, <n> excludes, <m> modularizes features. Press <esc><esc> to exit, <? > /> for Search. Legend: [*] built-in [] excluded <m> module < > module capable</m></esc></esc></m></n></y></enter>
	General setup>
	[*] Support DMA zone
	[*] Support DMA32 zone
	Platform selection>
	Kernel Features>
	Boot options>
	Power management options>
	CPU Power Management>
	Firmware Drivers>
	[] ACPI (Advanced Configuration and Power Interface) Support
	[*] Virtualization>
	-*- ARM64 Accelerated Cryptographic Algorithms>
	General architecture-dependent options>
	<pre>[*] Enable loadable module support></pre>
	v(+)
	coloct c Evita c Halo c Save a c Load a
	Collects < netb > < Save > < Load >

a. If you do not need to modify the configuration options of the kernel, when running the build.sh script, pass in **KERNEL_CONFIGURE=no** to temporarily block the pop-up kernel configuration interface

test@test:~/orangepi-build\$ sudo ./build.sh KERNEL_CONFIGURE=no

b. You can also set **KERNEL_CONFIGURE=no** in the

orangepi-build/userpatches/config-default.conf configuration file, which can permanently disable this function

c. If the following error is displayed when compiling the kernel, it is because the terminal interface of the Ubuntu PC is too small to display the **make menuconfig** interface. Please maximize the terminal of the Ubuntu PC and run the build.sh script again

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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/kconfig/mconf_Kconfig	
Your display is too small to run Menuconfig!	
It must be at least 19 lines by 80 columns.	
scripts/kconfig/Makefile:28: recipe for target 'menuconfig' failed	
make[1]: *** [menuconfig] Error 1	
Makefile:560: recipe for target 'menuconfig' failed	
make: *** [menuconfig] Error 2	
[#//0] ERROR in function compile_kernel [compilation.sh:376]	
[enum] Error kernel menuconfig failed	
[o.k.] Process terminated	

7) Part of the information prompted when compiling the legacy branch kernel source code is explained 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 configuration file used by the kernel by default and the path where it is stored

[o.k.] Using kernel config file [config/kernel/linux-rockchip-rk356x-legacy.config]

d. The path of the deb package related to the kernel generated by compiling

[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-rk356x_1.0.0_arm64.deb]

f. The time used for compilation

[o.k.] Runtime [**5 min**]

g. Finally, the compilation command to repeatedly compile the kernel selected last time will be displayed. Use the following command to start compiling the kernel source code directly without selecting through the graphical interface

[o.k.] Repeat Build Options [sudo ./build.sh BOARD=orangepi3b BRANCH=legacy BUILD_OPT=kernel KERNEL_CONFIGURE=no]

- 8) View the deb package related to the kernel generated by compilation
 - a. linux-dtb-legacy-rockchip-rk356x_1.0.0_arm64.deb Contains dtb files used by the kernel
 - b. linux-headers-legacy-rockchip-rk356x_1.0.0_arm64.deb Include kernel header files

c. linux-image-legacy-rockchip-rk356x_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-rk356x_1.0.0_arm64.deb output/debs/linux-image-legacy-rockchip-rk356x_1.0.0_arm64.deb output/debs/linux-headers-legacy-rockchip-rk356x_1.0.0_arm64.deb

- 9) 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-rk356x_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-rk356x_1.0.0_arm64.deb .

test@test:~/orangepi build/output/debs/test\$ ls

boot etc lib linux-image-legacy-rockchip-rk356x_1.0.0_arm64.deb usr

b. The decompressed file is as follows



10) The orangepi-bulid compilation system will first synchronize the Linux kernel

source code with the Linux kernel source code of the github server when compiling the Linux kernel source code, so if you want to modify the Linux kernel source code, you first need to turn off the update function of the source code (You need to fully compile the Linux kernel source code before turning off this function. Otherwise, you will be prompted that the source code of the Linux kernel cannot be found. If you download the source code package from Baidu cloud disk, there is no such problem, because the source code of Linux has been cached.), otherwise the The changes made will be reverted 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**"

11) If the kernel has been modified, the following method can be used to update the kernel and kernel modules of the development board Linux system

a. Upload the deb package of the compiled Linux kernel to the Linux system of the development board

test@test:~/orangepi-build\$ cd output/debs

test@test:~/orangepi-build/output/debs\$ scp \

linux-image-legacy-rockchip-rk356x_1.0.0_arm64.deb root@192.168.1.xxx:/root

b. Then log in to the development board and uninstall the deb package of the installed Linux kernel

root@orangepi:~# apt purge -y linux-image-legacy-rockchip-rk356x

c. Install the deb package of the new Linux kernel just uploaded

root@orangepi:~# dpkg -i linux-image-legacy-rockchip-rk356x_1.0.0_arm64.deb

d. Then restart the development board, and then check whether the kernel-related modifications have taken effect

root@orangepi:~# reboot

4.5. **Compile rootfs**

1) Run the build.sh script, remember to add sudo permission

test@test:~/orangepi-build\$ sudo ./build.sh

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2) Select **Rootfs and all deb packages**, then enter

Choose an option Compile image rootfs kernel u-boot	
U-boot package Kernel package	
Rootfs and all deb packages Full OS image for flashing	

3) Then select the model of the development board

orangepicpus Rockchip RK3566 quad core 2-8GB RAM GBE eMMC USB3 NVMe WiFi/BT brangepi3b Rockchip RK3566 quad core 2-8GB RAM GBE eMMC USB3 NVMe WiFi/BT	orangepi3-lts orangepizero2 orangepizero3 orangepizero2w orangepi4 orangepi4-lts orangepi800 orangepi5 orangepi5 orangepi5b	Allwinner Allwinner Allwinner Rockchip Rockchip Rockchip Rockchip Rockchip	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 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 RK3399 hexa core 4GB RAM GBE eMMC USB3 USB-C WiFi/BT VGA RK3588S octa core 4-16GB RAM GBE USB3 USB-C WiFi/BT eMMC RK3588S octa core 4-16GB RAM GBE USB3 USB-C WiFi/BT eMMC
orangepi3b Rockchip RK3566 guad core 2-868 RAM GBE eMMC USB3 NvMe WiFi/BT	orangepicm4	Rockchip	RK3566 guad core 2-8GB RAM GBE eMMC USB3 NVMe WiFi/BT
	orangepi3b	Rockchip	RK3566 quad core 2-8GB RAM GBE eMMC USB3 NvMe WiFi/BT

4) Then select the branch type of the kernel source code. Currently, the rootfs maintained by the kernel source code uses the same set.



5) Then select the type of rootfs

Choose	a release package base
Select the target OS release package base	
bullseye	Debian 11 Bullseye
jammy	Ubuntu jammy 22.04 LTS

- 6) Then select the type of image
 - a. **Image with console interface (server)** Indicates the image of the server version, which is relatively small

b. **Image with desktop environment** Indicates a image with a desktop, which is relatively large

Select the target image type.	Choose an option	
Ima Ima	<mark>ge with console interface (server)</mark> ge with desktop environment	

7) If you are compiling the image of the server version, you can also choose to compile the Standard version or the Minimal version. The pre-installed software of the Minimal version will be much less than that of the Standard version (please do not choose the Minimal version if there is no special requirement, because many things are not pre-installed by default. Some functions may not be available)



8) If you are compiling the image of the desktop version, you also need to select the type of desktop environment. Currently, Ubuntu Jammy mainly maintains XFCE and Gnome desktops, Ubuntu Focal only maintains XFCE desktops, and Debian Bullseye mainly maintains XFCE and KDE desktops

Choose a desktop environment Select the default desktop environment to bundle with this image Gnome desktop environment Xfce desktop environment	
Choose the desktop environment config Select the configuration for this environment. base configuration	

You can then select additional packages that need to be installed. Please press the Enter key to skip directly here.

Select which kind of s	oftwares 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>

9) Then it will start to compile rootfs, and some of the information prompted during compilation are as follows

a. The type of rootfs

[o.k.]]	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**]

- 10) View the rootfs compressed package generated by compilation
 - a. jammy-xfce-arm64.f930ff6ebbac1a72108a2e100762b18f.tar.lz4 is the rootfs compressed package, the meaning of each field of the name is
 - a) **jammy** indicates the type of Linux distribution of rootfs
 - b) **xfce** means rootfs is the type of desktop version, if it is **cli**, it means the type of server version
 - c) **arm64** represents the architecture type of rootfs
 - d) **f930ff6ebbac1a72108a2e100762b18f** is the MD5 hash value generated by the package names of all software packages installed by rootfs. As long as the list of software packages installed by rootfs is not modified, this value will not change. The compilation script will use this MD5 hash value to

generate Determine whether rootfs needs to be recompiled

b. **jammy-xfce-arm64.f930ff6ebbac1a72108a2e100762b18f.tar.lz4.list** lists the package names of all packages installed by rootfs

test@test:~/orangepi-build\$ **Is external/cache/rootfs/** jammy-xfce-arm64.f930ff6ebbac1a72108a2e100762b18f.tar.lz4 jammy-xfce-arm64.f930ff6ebbac1a72108a2e100762b18f.tar.lz4.current jammy-xfce-arm64.f930ff6ebbac1a72108a2e100762b18f.tar.lz4.list

11) If the required rootfs already exists under **external/cache/rootfs**, then compiling rootfs again will directly skip the compilation process and will not restart the compilation. When compiling the image, it will also go to **external/cache/rootfs** to find out whether it has If there is rootfs available in the cache, use it directly, which can save a lot of download and compilation time.

4.6. **Compile Linux image**

1) Run the build.sh script, remember to add sudo permission

test@test:~/orangepi-build\$ sudo ./build.sh

2) Select Full OS image for flashing, then enter

Compile image rootfs kernel u-boot	
U-boot package Kernel package Rootfs and all deb packages <mark>Full OS image for flashing</mark>	

3) Then select the model of the development board

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Choose an option	
Please choose a Board.	
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/2CB/4GB RAM WiFi/BT GBE SPI orangepizero2w Allwinner H618 quad core 1GB/1.5GB/2CB/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 VGA orangepi5 Rockchip RK3588S octa core 4-16GB RAM GBE USB3 USB-C WiFi/BT VGA orangepi5b Rockchip RK3588S octa core 4-16GB RAM GBE USB3 USB-C WiFi/BT PMMC orangepi5plus Rockchip RK3588 octa core 4-32GB RAM 2.5GBE USB3 USB-C WiFi/BT NVMe eMMC orangepi5plus Rockchip RK3566 quad core 2-8GB RAM GBE eMMC USB3 NVMe WiFi/BT	
<select> <exit></exit></select>	

- 4) Then select the branch type of the kernel source code
 - a. The legacy branch will compile the linux5.10 kernel source code
 - b. The current branch will compile the linux6.6 kernel source code



5) Then select the type of rootfs



- 6) Then select the type of image
 - a. **Image with console interface (server)** Indicates the image of the server version, which is relatively small
 - b. **Image with desktop environment** Indicates a image with a desktop, which is relatively large



7) If you are compiling the image of the server version, you can also choose to compile the Standard version or the Minimal version. The pre-installed software of the Minimal version will be much less than that of the Standard version (please do not choose the Minimal version if there is no special requirement, because many things are not pre-installed by default. Some functions may not be available)

Choose an option
Select the target image type.
Standard image with console interface
Minimal image with console interface

8) If you are compiling the image of the desktop version, you also need to select the type of desktop environment. Currently, Ubuntu Jammy mainly maintains XFCE and Gnome desktops, Ubuntu Focal only maintains XFCE desktops, and Debian Bullseye mainly maintains XFCE and KDE desktops

Select the default desktop	Choose a desktop environment environment to bundle with thi: Gnome desktop environment Xfce desktop environment	s image
Select the configuration for	ose the desktop environment con this environment. base configuration	fig

You can then select additional packages that need to be installed. Please press the Enter key to skip directly here.

Choose desktop softwares to add Select which kind of softwares you'd like to add to your build				
<pre>3dsupport 3dsupport 3 browsers 3 chat 3 desktop_tools 4 desktop_tools 5 deditors 5</pre>	3dsupport Browsers Chat Desktop_tools Editors Internet Multimedia Office Programming Remote_desktop			
	<0k>	<cancel></cancel>		

9) Then it will start to compile the Linux image. The general process of compilation is as follows

a. Initialize the compilation environment of Ubuntu PC and install the software packages required for the compilation process

b. Download the source code of u-boot and Linux kernel (if cached, only update the code)

- c. Compile u-boot source code and generate u-boot deb package
- d. Compile the Linux source code and generate Linux-related deb packages

e. Make the deb package of Linux firmware

f. Make the deb package of the orangepi-config tool

g. Create a deb package supported by the board

h. If you are compiling the desktop image, you will also create desktop-related deb packages

i. Check whether the rootfs has been cached, if not, recreate the rootfs, if it has been cached, directly decompress and use

j. Install the previously generated deb package into rootfs

k. Make some specific settings for different development boards and different types of images, such as pre-installing additional software packages, modifying system configuration, etc.

1. Then make an image file and format the partition, the default type is ext4

m. Then copy the configured rootfs to the mirrored partition

n. Then update initramfs

o. Finally, write the bin file of u-boot into the image through the dd command

- 10) After compiling the image, the following information will be prompted
 - a. The storage path of the compiled image

o.k.] Done building

[output/images/Orangepi3b_1.0.0_debian_bullseye_desktop_xfce_linux5.10.160/Or angepi3b 1.0.0 debian bullseye desktop xfce linux5.10.160.img]

b. Compilation time

[o.k.] Runtime [19 min]

c. Repeat the command to compile the image, and use the following command to start compiling the image directly without selecting through the graphical interface

[o.k.] Repeat Build Options [sudo ./build.sh BOARD=orangepi3b BRANCH=legacy BUILD_OPT=image RELEASE=bullseye BUILD_MINIMAL=no BUILD_DESKTOP=no KERNEL_CONFIGURE=yes]

5. Instructions for using the Orange Pi OS Arch system

5.1. Orange Pi OS Arch system function adaptation

Function	OPi OS Arch
USB2. 0x3	ОК
USB3. 0x1	ОК
SPIFlash+M.2 NVMe SSD Boot	ОК
WIFI	ОК
Bluetooth	ОК
GPIO (40pin)	ОК
UART (40pin)	ОК
SPI (40pin)	ОК

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	1
I2C (40pin)	ОК
PWM (40pin)	ОК
3pin debugging serial port	ОК
eMMC start	ОК
TF card start	ОК
HDMI video	ОК
HDMI audio	ОК
Raspberry Pi 5 inch screen display	ОК
Raspberry Pi 5-inch screen touch	ОК
function	
eDP display	ОК
OV5647 camera	The kernel driver is OK, 3A is not
	adjusted
Gigabit Ethernet port	ОК
Network port status light	ОК
headphone playback	ОК
headphone recording	ОК
LED lights	ОК
GPU	NO
NPU	NO
VPU	NO

range Pi User Manual

5.2. **Orange Pi OS Arch System User Guide Instructions**

First of all, please note that the OPi OS Arch system does not have a default orangepi user and password, so after burning and starting the system, it is impossible to log in remotely through the serial port and ssh directly (not even the root user). This is different from Ubuntu and Debian systems.

When the OPi OS Arch system starts for the first time, it needs to be connected to an HDMI display, and then initialize the system settings through the user wizard (including creating a new user name and setting a password). The setup steps of the User Wizard are as follows:

a) After burning the system for the first time and enter the desktop, you will see the user wizard program shown in the figure below


b) First you need to choose the desired language

W				
1680				
0				
alla syatam				
—	Ō	Orangepi OS Linux Setup Program	^ _ D X	
Homo	Ó	Welcome to Orangepi OS Linux (rolling)	setup	
	Welcome	This program will ask you some questions and set up Orangepi OS Linux on your co	imputer.	
	Location			
	Keyboard			
	Users			
	Summary	_ (`) ≈		
	Set up	× • ∕ /		
	Finish	× 💛		
		American English		
		cpricku srpski	Serbian * Serbian	
	About	svenska точняй	Swedish Tajik incel	
		Inu Türkce (Türkbe)	Thai Turkish (Turkey)	
		yxpaincaxa Tifno Vilit	Ukrainian Vietnamese	
		() () () () () () () () () () () () () (Chinese	
🍯 📔 🙍 🗿 Orangepi OS Linux Setup				• • • • • • • • • • • • • • • • • • •

c) After selecting the language, the user guide will immediately switch to the corresponding language interface, such as the Chinese display as shown below



d) Then select the area

Trado Trado D Hild System				
	び 次迎 健盘 用户 操要 建立 结束	Dranger DS Linux R BHS		
	**	与杨语音将设置为 面/k-中文 (中国)。 含字和日期地域特设置为 副/k-中文 (中国)。	更改(C) 更改(C) 后退(8) 下→参(N) 取消(C)	
	*7			

e) Then select the keyboard model

Trail			
Ala-System			
Jama	资源 2) 2) 2) 2) 2) 2) 2) 2) 2) 2) 2) 2) 2)	Winds 4: Generic 105 key /K* Contain Contain Carech Magdini (Machina) British Befanit Magdini (Machina) Magdini (Machina) British Befanit Magdini (Machina) Magdini (Machina) British Befanit Magdini (Machina) Magdini (Machina) Magdini (Machina) Magdini (Machina)	
	¥Ŧ	后道(0) 下一步(1) 石油	q

f) Then create a new user name and set a password

-				
<u>•</u>				
Δ	6	Orangepi OS Linux 安装程序	A - 0 X	
	 	₩ ₩ ₩		
	关于		后退(B) 下一步(N) 取消(C)	
😑 🔚 💆 💿 Orangepi OS Linux 安装程序				● D > 2023-09-05 oer

g) Then make sure that there is no problem with the selection, and then click the **install** button



h) Then wait for the installation to complete

Taob C Ali System				
	ō	Orangepi OS Linux 安装箱序	* - 0 X	
	()	n		
	位置	\$***		
	键盘 用户			
	摘要	。川韓一〇。		
	建立 结束	Orange Pi QS has multimedia support and supports multi-core Cf command line installation and graphical installation, it is highly c open-source graphics drivers.	PUs. it supports compatible with	
	ži XŦ	33% 在进行未地化配置。	100 T-900 T03KQ	
				2023/2005

i) After the installation is complete, you need to click the **Finish** button to restart the system



j) After restarting, the Orange Pi Hello program will be started automatically. At this time, you need to remove the check status in the lower right corner **when starting up**. Otherwise, you need to manually close the Orange Pi Hello program every time you start it.



At this point, you can use the newly created user name and password to log in to the OPi OS system through the serial port or ssh.

5. 3. How to set DT overlays

LCD MIPI screen, eDP screen, and multiplexing functions such as I2C/SPI/UART/PWM in 40pin are disabled by default in the dts of the kernel, and the corresponding DT overlays need to be manually enabled to use.

The method of opening DT overlays in OPi OS Arch system is as follows:

First open the /boot/extlinux/extlinux.conf configuration file
 [orangepi@orangepi-pc ~]\$ sudo vim /boot/extlinux/extlinux.conf

2) Then open the corresponding configuration by adding FDTOVERLAYS/dtbs/rockchip/overlay/xxx.dtbo in /boot/extlinux/extlinux.conf

Note that xxx.dtbo in FDTOVERLAYS /dtbs/rockchip/overlay/xxx.dtbo needs to be replaced with the specific dtbo configuration, please do not copy it.

[orangepi@orangepi-pc ~]\$ sudo vim /boot/extlinux/extlinux.conf LABEL OPIOS ARM LINUX /Image FDT /dtbs/rockchip/rk3566-orangepi-3b.dtb FDTOVERLAYS /dtbs/rockchip/overlay/xxx.dtbo #Configuration that needs to be added

3) The storage path of xxx.dtbo in the OPi OS Arch image is as follows, please note that not all dtbos under this path can be used.

/boot/dtbs/rockchip/overlay/

4) The DT overlays configuration that can be used by the development board is as follows

Features on the development	Corresponding DT overlays configuration
board	
EDP screen	rk356x-edp.dtbo
Raspberry Pi 5 inch screen	rk356x-raspi-7inch-touchscreen.dtbo
40pin expansion interface -	rk356x-i2c2-m1.dtbo
I2C2	

40pin expansion interface - I2C3	rk356x-i2c3-m0.dtbo
40pin expansion interface - I2C4	rk356x-i2c4-m0.dtbo
40pin extension interface - PWM11	rk356x-pwm11-m1.dtbo
40pin extension interface - PWM15	rk356x-pwm15-m1.dtbo
40pin expansion interface - UART3	rk356x-uart3-m0.dtbo
40pin expansion interface - UART7	rk356x-uart7-m2.dtbo
40pin expansion interface - UART9	rk356x-uart9-m2.dtbo
40pin expansion interface - SPI3	rk356x-spi3-m0-cs0-spidev.dtbo

5) If you need to open multiple configurations at the same time, just add the paths of multiple configurations directly behind **FDTOVERLAYS**. For example, the configurations to open i2c2 and pwm11 at the same time are as follows

[orangepi@orangepi-pc ~]\$ **sudo vim /boot/extlinux/extlinux.conf** LABEL OPIOS ARM LINUX /Image FDT /dtbs/rockchip/rk3566-orangepi-3b.dtb **FDTOVERLAYS /dtbs/rockchip/overlay/rk356x-i2c2-m1.dtbo** /dtbs/rockchip/overlay/rk356x-pwm11-m1.dtbo

6) After setting, you need to restart the system to make the configuration take effect [orangepi@orangepi-pc~]\$ sudo reboot

5. 4. Use of Raspberry Pi 5-inch screen

5. 4. 1. How to assemble the Raspberry Pi 5-inch screen

Please refer to the assembly method of the Raspberry Pi 5-inch screen (click the text in the blue part to jump to the corresponding position).

5. 4. 2. How to open Raspberry Pi 5-inch screen configuration

By default, OPi OS Arch mirroring does not enable the configuration of the Raspberry Pi 5-inch screen. If you need to use the Raspberry Pi 5-inch screen, you need to manually open it. The method to open the configuration is as follows:

a. First add the following configuration in /boot/extlinux/extlinux.conf

[orangepi@orangepi-pc ~]\$ sudo vim /boot/extlinux/extlinux.conf	
LABEL OPIOS ARM	
LINUX /Image	
FDT /dtbs/rockchip/rk3566-orangepi-3b.dtb	
FDTOVERLAYS /dtbs/rockchip/overlay/rk356x-raspi-7inch-touchscreen.dtbo	#Configuration that needs
to be added	
b. Then restart the system	

[orangepi@orangepi-pc ~]\$ sudo reboot

After restarting, you can see the display on the LCD screen as follows:



5.5. How to use the eDP screen

5. 5. 1. Assembly method of eDP screen

Please refer to how to use the eDP screen (click the text in the blue part to jump to

the corresponding position).

5. 5. 2. How to open eDP screen configuration

The OPi OS Arch image does not enable the eDP screen configuration by default. If you want to use the eDP screen, you need to manually open it. The method to open the configuration is as follows:

a. First add the following configuration in /boot/extlinux/extlin	ux.conf	
[orangepi@orangepi-pc ~]\$ sudo vim /boot/extlinux/extlinux.conf		
LABEL OPIOS ARM		
LINUX /Image		
FDT /dtbs/rockchip/rk3566-orangepi-3b.dtb		
FDTOVERLAYS /dtbs/rockchip/overlay/rk356x-edp.dtbo	#Configuration	that
needs to be added		
b. Then restart the system		

[orangepi@orangepi-pc ~]\$ sudo reboot

After restarting, you can see that the display of the eDP screen is as follows:



5.6. How to install the software

Use the pacman package management tool to install software that is not in OPi OS. For example, the command to install the vim editor is as follows. If you want to install other software, you only need to replace vim with the package name of the software you want to install. [orangepi@orangepi-pc ~]\$ sudo pacman -Syy vim

6. Orange Pi OS OH system usage instructions

6.1. Orange Pi OS OH system function adaptation status

功能	OPi OS OH
USB2. 0x3	ОК
USB3. 0x1	ОК
SPIF1ash+M.2 NVMe SSD Boot	NO
WIFI	ОК
Bluetooth	NO
3pin Debug serial port	ОК
eMMC start	ОК
TF card start	ОК
HDMI video	ОК
HDMI audio	NO
Raspberry Pi 5 inch screen display	NO
Raspberry Pi 5-inch screen touch	NO
function	
eDP display	NO
OV5647 camera	NO
Gigabit Ethernet port	OK
Network port status light	ОК
Network port status light	ОК
headphone recording	NO
LED lights	ОК
GPU	ОК
NPU	NO
VPU	NO

Currently, the 8GB memory version of the development board can only use 4GB

of memory in the OPi OS OH system. Please pay special attention to this.

6.2. How to use the Gigabit Ethernet port

- 1) First use a network cable to connect the development board and router
- 2) Then use the ifconfig command in the debugging serial port to see the IP address assigned by the router to the development board network port.

# ifconfig	g eth0
eth0	Link encap:Ethernet HWaddr 4e:fc:9d:f3:67:26 Driver rk_gmac-dwmac
	inet addr: 192.168.1.189 Bcast: 192.168.1.255 Mask: 255.255.255.0
	inet6 addr: fe80::4cfc:9dff:fef3:6726/64 Scope: Link
	UP BROADCAST RUNNING MULTICAST MTU:1500 Metric:1
	RX packets:378 errors:0 dropped:0 overruns:0 frame:0
	TX packets:24 errors:0 dropped:0 overruns:0 carrier:0
	collisions:0 txqueuelen:1000
	RX bytes:30663 TX bytes:2904
	Interrupt:45
#	

3) Then use the ping command to test whether the network can be used normally

ping www.orangepi.cn

Ping www.orangepi.cn (123.57.147.237): 56(84) bytes. 64 bytes from 123.57.147.237: icmp_seq=1 ttl=0 time=42 ms 64 bytes from 123.57.147.237: icmp_seq=2 ttl=0 time=43 ms 64 bytes from 123.57.147.237: icmp_seq=3 ttl=0 time=44 ms --- 123.57.147.237 ping statistics ---3 packets transmitted, 3 received, 0% packet loss round-trip min/avg/max = 0/0/43 ms

#

4) In addition to checking the IP address of the network port in the command line, you can also check the IP address of the network port in the OH settings. The method is

as follows

a. First click on the **application list**



b. Then open settings



c. Then select wired network

设置	
Q 搜索设置项	
🛜 WLAN	已关闭
* 蓝牙	已关闭
1 移动网络	
Ø 有线网络 ▲	

d. Then you can see the IP address of the network port and other information.

How to use WIFI

1) First click on the **application list**



2) Then open settings



3) Then select WLAN

设置	
Q 搜索设置项	
🛜 WLAN	已关闭
* 蓝牙	已关闭

4) Then turn on WLAN

\leftarrow wlan	
WLAN	

5) Then connect to the searched WIFI hotspot

\leftarrow wlan		
WLAN		•
可用WLAN		ं
xunlong_orangepi 加密		
NETGEAR24-5G 加密	*	A
HUAWEI 加密		1
DIRECT-E9-HP Laser 136nw 加密		
xunlong_orangepi_5G 加密		1

7. Android 11 operating system instructions

7.1. Supported Android versions

Android version	Kernel version
Android 11	Linux4.19

7.2. Android Function Adaptation

Functions	Android 11
USB2.0x3	ОК
USB3.0x1	ОК
M.2 NVMe SSD boot	ОК
WIFI	ОК
Bluetooth	ОК
GPIO (40pin)	ОК
UART (40pin)	ОК
SPI (40pin)	ОК
I2C (40pin)	ОК
PWM (40pin)	ОК
PWM fan interface	ОК
3pin Debugging serial port	ОК
ЕММС	ОК
TF card boot	ОК
HDMI video	ОК
HDMI Audio	ОК
LCD	ОК
eDP display	ОК
OV5647 Camera	The kernel driver is OK, 3A is not
	adjusted
Gigabit network port	ОК
Network port status indicator	ОК

Headphone playback	ОК
Headphone recording	ОК
LED Light	ОК
GPU	ОК
NPU	ОК
VPU	ОК
RTC	ОК

7.3. WIFI connection test method

1) First click enter Setting



2) Then select Network & internet



3) Then select Wi-Fi

8:01 AM 🕜 🖞 🚱	1
← Network & int	ernet Q
œ Wi-Fi Off	() ()
Airplane mode	() ()

4) Then turn on the **Wi-Fi** switch

÷	Wi-Fi	۹
	Use Wi-Fi	
(i)	To see available networks, turn WI-Fi on. To improve location accuracy, turn on WI-Fi scanning in <u>scanning settings</u> .	/
	Wi-Fi preferences Wi-Fi doesn't turn back on automatically	
	Wi-Fi data usage 0 8 used Jun 20 – Jul 18	,

0

5) After turning on Wi-Fi, if everything is normal, you can scan for nearby Wi-Fi

hotspots

8:03 AM	0 4 O		\Diamond 0
÷	Wi-Fi		۹
	Use Wi-Fi		•
•			6
•	The second se		Ð
•		*	Đ
-	and the second se		£

6) Then select the Wi-Fi you want to connect to, and the password input interface shown in the figure below will pop up

kunlor	ig_ora	ngepi_	5G												
browsee															
		1													
] Show pass	word														
dimension entire															
q	w	е	r	4	t	5	y "	u	7	i	1	0	9	р	Ø
а		s	d	f		g	h		j		k		Ē.		0
+	z	х	С		v		b	n		m		!		?	+
7123															0

7) Then use the keyboard to enter the password corresponding to Wi-Fi, and then use the mouse to click the Enter button in the virtual keyboard to start connecting to Wi-Fi

	ig_oran	gepi_50	6							
Show pass	word									
Adventual color										
1	2	3	4	5	б	7	8	9	0	Ø
@	#	s	%	&	-	+	()	[•
$\sim <$	١	=	*		32	:	;	1	?	~[<
ABC		-						7		۲

8) After the Wi-Fi connection is successful, the display is as shown in the figure below:

8:05 AM	л ф		€ 9
÷	Wi-Fi		۹
	Use Wi-Fi	•	
•	xunlong_orangepi_5G Connected		۲

7.4. How to use Wi-Fi hotspot

1) First, please make sure that the Ethernet port is connected to the network cable and can access the Internet normally

2) Then select Settings

7:58 AM 🛈 🖞 🛈 • Q Search apps Ó + = 122 0 -Calculator Calendar Clock Camera Contacts 9 9 06 0 Explorer Gallery Files Lightning Music \$ Q (Ø Search Video Settings Sound Recorder WebView Browser Tester Ŏ, wiringOP

3) Then select Network & internet

8:00 AM	0 + 0	•
٩	Search settings]
?	Network & internet Wi-Fi, data usage, and hotspot	
60	Connected devices Bluetooth	

4) Then select Hotspot & tethering



5) Then select Wi-Fi hotspot

range Pi User Manual	Copyright reserved by Shenzhen Xunlong Software Co., Ltd
range Pi User Manual Copyright reserved by Shenzhen Xunlong Software Co., Ltd 8:08 AM * * ← Hotspot & tethering Q Wi-Fi hotspot Not sharing internet or content with other devices USB tethering Share tablet's internet connection via USB	
← Hotspot & tethering	٩
Wi-Fi hotspot Not sharing internet or content with other devices	
USB tethering Share tablet's internet connection via USB	()

6) Then turn on the **Wi-Fi hotspot**, you can also see the name and password of the generated hotspot in the figure below, remember them, and use them when connecting to the hotspot (If you need to modify the name and password of the hotspot, you need to turn off the **Wi-Fi hotspot** first, and then you can modify it)

8:11 AM	ι ψ	®
÷	Wi-Fi hotspot	۹
	Off	
	Hotspot name AndroidAP_6953	
	Security WPA2-Personal	
	Hotspot password	

7) At this time, you can take out your mobile phone. If everything is normal, you can find the WIFI hotspot with the same name (here AndroidAP_6953) displayed under the **Hotspot name** in the above picture in the WI-FI list searched by the mobile phone. Then you can click AndroidAP_6953 to connect to the hotspot, and the password can be seen under the **Hotspot password** in the above picture



8) After the connection is successful, it will be displayed as shown in the figure below (the interface of different mobile phones will be different, the specific interface is subject

to the display of your mobile phone). At this point, you can open a webpage on your mobile phone to see if you can access the Internet. If you can open the webpage normally, it means that the **WI-FI Hotspot** of the development board can be used normally.



7.5. Bluetooth test method

1) First click enter Setting

7:58 AM 🕒 🖞 🛈				Q
		Q Search apps		
*		۵	•	2
Calculator	Calendar	Camera	Clock	Contacts
6			\bigcirc	۲
Explorer	Files	Gallery	Lightning	Music
	\$			@
Search	Settings	Sound Recorder	Video	WebView Browser Tester
Ŏ,				
wiringOP				

2) Then select Connected devices

8:12 AM	¢	0
٩	Search settings	J
Ŷ	Network & internet Wi-Fi, data usage, and hotspot	
60	Connected devices Bluetooth	

3) Then click **Pair new device** to turn on Bluetooth and start scanning the surrounding Bluetooth devices

range Pi User Manual	Copyright reserved by Shenzhen Xunlong Software Co., Ltd
8:13 AM \$\P\$	8

÷	Connected devices	٩
ψ	OTHER DEVICES USB Charging this device	
+	Pair new device Bluetooth will turn on to pair	

4) The searched Bluetooth devices will be displayed under Available devices

8:18 AM	÷	0
÷	Pair new device	۹
	Device name rk3566	
	Available devices	•
5	And and a second s	
5		
*		
*		
r.		
٤.	test	
	ETERATIVE CONTRACTOR OF CONTRACT	

5) Then click the Bluetooth device you want to connect to start pairing. When the following interface pops up, please use the mouse to select the **Pair** option



6) The test here is the configuration process of the development board and the Bluetooth of the Android mobile phone. At this time, the following confirmation interface will pop up on the mobile phone. After clicking the pairing button on the mobile phone, the

pairing process will start



7) After the pairing is completed, you can see the paired Bluetooth device as shown in the figure below



8) At this time, you can use the Bluetooth of your mobile phone to send a picture to the development board. After sending, you can see the following confirmation interface in the Android system of the development board, and then click **Accept** to start receiving the picture sent by the mobile phone.

	range Pi User Mar	nual	Copyright re	served by Shenz	hen Xunlo	ong Software Co., Lt	td
8:26 AM	彩 中	_	_	_	_		0
÷	Connected devices					م	
	OTHER DEVICES						
ψ	USB Charging this device						
Ľ.	test	Accept incoming f	le?				
+	Pair new device	From test					
	PREVIOUSLY CONNECTED DEVICES	Filename 1689731722436.jpg					
>	See all	Size 226 kB					
	Connection preferences Bluetooth	En del sen en en	*	DECLINE	ACCEPT		
()	Visible as "rk3566" to other devices						

9) You can open the **Download** directory in the file manager to view the pictures received by the Android system Bluetooth of the development board



7.6. How to use Raspberry Pi 5-inch screen

Please make sure that the image used is the following two versions of the image: OrangePi3B_RK3566_Android11_lcd_v1.x.x.img OrangePi3B_RK3566_Android11_spi-nvme_lcd_v1.x.x.img

1) The screen needs to be assembled first, please refer to the assembly method of the Raspberry Pi 5-inch screen

2) Connect the Type-C power supply to the board and power it on. After the system starts, you can see the screen display as shown in the figure below

Both the display and touch of the Raspberry Pi 5-inch screen can be used. If you have problems with the screen test, please make sure that the screen you purchased is exactly the same as the screen that the Orange Pi is compatible with.

The Orange Pi compatible screen is described in the assembly method of the Raspberry Pi 5-inch screen.



7.7. How to use the eDP screen

Please make sure that the image used is the following two versions of the image: OrangePi3B_RK3566_Android11_lcd_v1.x.x.img OrangePi3B_RK3566_Android11_spi-nvme_lcd_v1.x.x.img

The eDP screen has no touch function.

- 1) Currently only one eDP screen is compatible, including the following accessories:
 - a. 0.5 pitch 30pin single-head cable in the same direction



15.6-inch eDP display with a resolution of 1920x1080 b.



30pins EDP interface

2) Connect the FPC end of the 30pin single-head codirectional cable to the eDP interface of the development board, and connect the other end to the eDP interface of the screen



3) Then connect the Type-C power supply to the board and power it on. After the system starts, you can see the screen display as shown in the figure below



7.8. 40pin interface GPIO, UART, SPI and PWM test

7.8.1. **40pin GPIO port test**

1) First click on the wiringOP icon to open the wiringOP APP

		Q Search apps		
*			ø	•
Calculator	Calendar	Camera	Clock	Contacts
6			\bigcirc	۲
Explorer	Files	Gallery	Lightning	Music
	\$	٩		P
Search	Settings	Sound Recorder	Video	WebView Browser Tes
wiringOP				

2) The main interface of wiringOP APP is displayed as shown in the figure below, and then click the **GPIO_TEST** button to open the GPIO test interface

ам О Ф	0
viringOP	
GPI0_TEST	
UART_TEST	
I2C_TEST	
SPL_TEST	
PWM_TEST	

3) The GPIO test interface is shown in the figure below. The two rows of **CheckBox** buttons on the left are in one-to-one correspondence with the 40pin pins. When the **CheckBox** button is checked, the corresponding GPIO pin will be set to **OUT** mode, and the pin level will be set to high level; when the checkbox is unchecked, the GPIO pin level will be set to low level; When the **GPIO READALL** button is pressed, information such as wPi number, GPIO mode, and pin level can be obtained; when the **BLINK ALL GPIO** button is clicked, the program will control the 28 GPIO ports to continuously switch between high and low levels

8:03 AM 🕐 🜵			
wiringOP			
3.3V 🗌 🔲 5V		1	
SDA.2 🔲 🗍 5V	GPIO READALL	BLINK ALL GPIO	
SCL.2 GND			
GPIO4_A4 🗌 🗌 RXD.2			
GND 🗌 🔲 TXD.2			
GPI03_C6 🗌 🗌 GPI03_C7			
GPIO4_A0 🔲 🔲 GND			
GPI04_A2 🗌 🗌 GPI04_A3			
3.3V 🗌 🔲 GPI04_A1			
SPI3_TXD 🔲 🗌 GND			
SPI3_RXD 🗌 🔲 GPIO4_B1			
SPI3_CLK 🗌 🔲 SPI3_CS1			
GND GPI04_A7			
SDA.3 🗌 🗌 SCL.3			
GPIO4_A5 🔲 🔲 GND			
GPI03_D4 🗌 🔲 GPI04_C0			
GPIO3_D7 🔲 🗌 GND			
GPI03_D0 🗌 🗌 GPI03_D5			

4) Then click the **GPIO READALL** button, the output information is as shown in the figure below:

range Pi User Manual			Copyr	ight re	eser	ved	by	Sh	enzhe	n Xunlo	ng S	Software Co., L
wiringOP												
3.3V . 5V SDA.2 . 5V			GPIO REAL	DALL					BLIN	ALL GPIO		
SCL.2 . GND PWM15 . RXD.2	GPIO	+ wPi	Name	Mode	+ V	PI3 Physi	BB - ical	V	 Mode	+ Name	+ wPi	++ GPIO
GND CTXD.2 GPI03_C6 GPI03_C7 GPI04_A0 GND TXD.7 RXD.7 3.3V GPI04_A1 SPI2 TXD GPI04_A1	140 141 147 118 128 130 138	0 1 2 5 7 8 11	3.3V SDA.2 SCL.2 PWM15 GPI03_C6 GPI04_A0 TXD.7 3.3V SPI3_TXD	ALT1 ALT1 IN IN ALT4 ALT4	1 1 0 0 1 1	1 3 7 9 11 13 15 17 17	2 4 8 10 12 14 16 18 20	1 1 0 1	ALT1 ALT1 IN ALT4 IN	5V 5V GND RXD.2 TXD.2 GPI03_C7 GND RXD.7 GPI04_A1 GND	 3 4 6 9 10	25 24 119 131 129
SPI3_RXD TXD.9 SPI3_CLK SPI3_CS1 GND GPI04_A7 SDA.3 SCL.3 RXD.9 GND	139 139 32 133 124 127 120 123	14 17 19 20 22 23 25	SPI3_CLK GND SDA.3 RXD.9 GPI03_D4 GPI03_D7 GPI03_D0 GPI03_D3 GND	ALT4 ALT4 ALT4 IN IN IN IN	0	23 25 27 29 31 33 35 37 39	24 26 28 30 32 34 36 38 40	1 0 0 0 0	ALT4 IN ALT1 IN IN IN IN IN IN	SPI3_CS1 GPI03_D6 SCL.3 GND PWM11 GND GPI03_D5 GPI03_D1 GPI03_D1	15 16 18 21 24 26 27	134 126 33 144 125 122 122
GPIO3_D4	GPIO	wPi	Name	Mode	IV	Physi	ical	I V	Mode	Name	wPi	GPIO

5) There are a total of 28 GPIO ports in the 40pins of the development board that can be used. The following uses pin 7 — the corresponding GPIO is GPIO4_A4 — the corresponding wPi serial number is 2—as an example to demonstrate how to set the high and low levels of the GPIO port. First click the **CheckBox** button corresponding to pin 7. When the button is selected, pin 7 will be set to high level. After setting, you can use a multimeter to measure the voltage value of the pin. If it is 3.3v, it means setting high level success



6) Then click the GPIO READALL button, you can see that the current pin 7 mode is

OUT, and the pin level is high

iringOP												
3.3V 🔲 🛄 5V												
DA.2 🔲 🗍 5V			GPIO REAL	DALL					BLIN	K ALL GPIO		
CL.2 GND	_											
M15 RXD.2	+	wPi	Name	Mode	++	PI Phys	3B · ical	+ V	+ Mode	+ Name	+ wPi	++ GPI0
	+		3 31/				+	++ 	+ I	+	+ I	++
	140	0	SDA.2	ALT1	1		4		i	5V	i i	i i
3_C6 🗹 📋 GPI03_C7	141	1	SCL.2	ALT1		5	6	1		GND		1 25
4_A0 🔲 🦳 GND	147		GND	TIN		9	1 10	1	I ALTI	TXD.2	4	24
	118	5	GPI03_C6	OUT	1	11	12	0	IN	GPI03_C7	6	119
XD.7 📋 📋 RXD.7	128	7	GPI04_A0	IN	U	13	14			GND		
	130	8	TXD.7	ALT4	1	15	16		ALT4	RXD.7	9	131
	138	11		AI T4	0	19	20		I IN	I GND	110	129
TXD 🔲 🔲 GND	136	12	SPI3 RXD	ALT4	ŏ	21	22	1	ALT4	TXD.9	13	132
	139	14	SPI3_CLK	ALT4	0	23	24	1	ALT4	SPI3_CS1	15	134
RXD 📋 📋 TXD.9	1 E	i 1	GND		1 1	25	26	0	IN	GPI03_D6	16	126
	32	17	SDA.3	ALT1		27	28	1	ALT1	SCL.3	18	33
	133	19	RXD.9	AL14		29	30			GND DUAL1.1	21	144
	124	20	GP103_04			33	34	0	1 10		21	144
	120	23	GPI03 D0	IN	ŏ	35	36	0	IN	GPI03 D5	24	125
DA.3 🗌 🔲 SCL.3	123	25	GPI03_D3	IN	0	37	38	0	IN	GPI03_D2	26	122
	1		GND		i i	39	į 40	0	IN	GPI03_D1	27	121
	+		Nomo	Hodo	++	Dhuc	+	+	+	+	+	+
_D4 🗍 🗍 PWM11	GP10	WP1	Nalle	Mode	v	PIIVS	ICGI	v	Mode	I Nalle	WP1	I GPIU
3_D0 🗌 🔲 GPIO3_D5												
									-10			
									- 2			

7) Click the **CheckBox** button in the figure below again to cancel the check status. Pin 7 will be set to low level. After setting, you can use a multimeter to measure the voltage value of the pin. If it is **0v**, it means that the low level is set successfully.

3.3V 🗌 🔲	5V
SDA.2	5V
SCL.2	GND
GPI04_A4	RXD.2
GND	TXD.2
GPI03_C6	GPI03_C7
GPI04_A0	GND
GPI04_A2	GPIO4_A3
3.3V 🗌 🔲	GPI04_A1

8) Then click the GPIO READALL button, you can see that the current pin 7 mode is

OUT, and the pin level is low

wiringOP												
3.3V 🔲 🔲 5V	_					_						_
SDA.2 🔲 🗍 5V			GPIO REAL	DALL					BLINE	ALL GPIO		
SCL.2 GND												
PWM15 🗌 🗌 RXD.2	GPI0	wPi	++ Name	Mode	++ V	- PI Phys	3B ⊣ ical∣	V	⊦ Mode	+ Name	+ wPi	++ GPIO
GND TXD.2	+ 		++ 3.3V		++ 	1	++			+ 5V	+ 	++
GPI03_C6 GPI03_C7	140 141	0 1	SDA.2 SCL.2	ALT1 ALT1		3	4			5V GND		
	147	2	PWM15 GND	IN	0	7	8	1	ALT1	RXD.2 TXD.2	3	25 24
	118	5	GPI03_C6	OUT		11	12	Ó	IN	GPI03_C7	6	119
	130	8	TXD.7	ALT4	1	15	16	1	ALT4	RXD.7	9	131
	138	11	SPI3_TXD	ALT4	0	19	20	1		GND		
	136	14	SPI3_KKD	ALT4 ALT4	0	21	22	1	ALT4	SPI3_CS1	13	132
	32	17	GND SDA.3	ALT1	1	25 27	26	0	IN ALT1	GP103_D6 SCL.3	16 18	126 33
	133 124	19 20	RXD.9 GPI03_D4	ALT4 IN	1	29 31	30 32	0	IN	GND PWM11	 21	144
GND GPI04_A7	127	22 23	GPI03_D7 GPI03_D0	IN TN		33	34	0	I I TN	GND	24	125
SDA.3 SCL.3	123	25	GPI03_D3	ÎN	0	37	38	0	IN IN	GPI03_D2	26	122
RXD.9 🔲 GND +-	+		++	Nodo	++	+	++		+	+	+	++
PI03_D4 PWM11	GPI0 I	WPI	Name	Mode	V	Phys	ICAL	V	Mode	Name	-WP1	GPI0
PIO3_D7												
PIO3_D0 🗌 🔲 GPIO3_D5												
	-1								-0			
									-V			

7. 8. 2. **40pin UART test**

1) UART7 and UART9 are enabled by default in Android. The position of the 40pin is shown in the figure below, and the corresponding device nodes are /dev/ttyS7 and /dev/ttyS9 respectively



2) First click on the wiringOP icon to open the wiringOP APP

		Q. Search apps		
	132	۵	•	
Calculator	Calendar	Camera	Clock	Contacts
6			\bigcirc	۲
Explorer	Files	Gallery	Lightning	Music
	\$	٩		.
Search	Settings	Sound Recorder	Video	WebView Browser Tes
wiringOP				

3) The main interface of wiringOP APP is displayed as shown in the figure below, and then click the **UART TEST** button to open the UART test interface

8:02 AM 🗿 🖞 🛈	0
wiringOP	
	GPIO_TEST
	UART_TEST
	12C_TEST
	SPI_TEST
	PWM_TEST

4) The serial port test interface of the APP is shown in the figure below

8:03 AM 🕐 🌵 🤇	•							0
wiringOP								
/dev/ttyS1	÷	115200	OPEN	CLOSE				
neno world:						SEND		
				()	•	•		

5) Take the test of **UART7** as an example below, select the /dev/ttyS7 node in the selection box, enter the baud rate you want to set in the edit box, and then click the **OPEN** button to open the /dev/ttyS7 node. After the opening is successful, the **OPEN** button becomes unselectable, and the **CLOSE** button and **SEND** button become selectable

	range Pi User Manual						al	Copyright reserved by Shenzhen Xunlong Software Co., Ltd
8:06 AM	0	ψ	0					0
wirin	gO	Ρ						
/dev/ttyS	7			*	115200	OPEN	CLOSE	
hello wor	rld!							
								SEND

6) Then use Dupont wire to short the RXD and TXD pins of uart7



7) Then you can enter a character in the send edit box below, and click the **SEND** button to start sending

8:11 AM 🕒 🖞 🕼									0
wiringOP									
/dev/ttyS7	*	115200	OPEN	CLOSE					
hello world!									
					SI	END			

8) If everything is normal, the received string will be displayed in the receiving box

8:10 AM 🛈 🖞 🛈	۵
wiring0P	
/dev/ttyS7 v 115200 OPEN CLOSE	
hello world!	
neno worta:	
SEND	

7.8.3. **40pin SPI test**

1) According to the table below, the spi available for Orange Pi 3B is spi3

range Pi User Manual

复用功能	复用功能	GPIO	GPIO序号	引脚序号	引脚序号	GPIO序号	GPIO	复用功能	复用功能
		3.37		1	2		57		
	I2C2_SDA_W1	GPIO4_B4	140	3	4		5V		
	I2C2_SCL_H1	GPIO4_B5	141	5	6		GND		
	PWM15_IR_W1(fe700030)	GPI04_C3	147	7	8	25	GPIO0_D1	UART2_TX_MO	
		GND		9	10	24	GPIO0_D0	UART2_RX_MO	
		GP103_C6	118	11	12	119	GP103_C7		
		GPIO4_A0	128	13	14		GND		
	UART7_TX_M2	GPI04_A2	130	15	16	131	GPIO4_A3	UART7_RX_M2	
		3.37		17	18	129	GPIO4_A1		
I2C4_SDA_MO	SPI3_MOSI_MO	GPI04_B2	138	19	20		GND		
	SPI3_MISO_MO	GPIO4_B0	136	21	22	132	GPIO4_A4	UART9_TX_M2	
I2C4_SCL_M0	SPI3_CLK_MO	GPIO4_B3	139	23	24	134	GPIO4_A6	SPI3_CSO_MO	
		GND		25	26	126	GPIO3_D6		
UART3_RX_MO	I2C3_SDA_HO	GPI01_A0	32	27	28	33	GPIO1_A1	I2C3_SCL_MO	UART3_TX_MO
	UART9_RX_M2	GPIO4_A5	133	29	30		GND		
		GPI03_D4	124	31	32	144	GPIO4_CO	PWM11_IR_M1(fe6f0030)	
		GP103_D7	127	33	34		GND		
		GPI03_D0	120	35	36	125	GPIO3_D5		
		GP103_D3	123	37	38	122	GPIO3_D2		
		GND		39	40	121	GPIO3 D1		

2) Here, the SPI interface is tested through the w25q64 module. First, the w25q64 device is connected to the SPI3 interface



3) Then click the wiringOP icon to open the wiringOP APP



4) The main interface of wiringOP APP is displayed as shown in the figure below, click the SPI_TEST button to open the SPI test interface

7:56 AM 😗 🕆 😗		0
wiringOP		
	GPI0_TEST	
	UART_TEST	
	I2C_TEST	
	SPL_TEST	
	PWM_TEST	

5) Then click the **OPEN** button to initialize the SPI

7:57 AM 🛈 🖞 🛈
wiringOP
/dev/spidev3.0 SPI Channel: <u>3</u> SPI Port: <u>0</u> SPI Speed: <u>2000000</u>
OPEN
$data[0]: \underbrace{0x9f}_{0x09} data[1]: \underbrace{0x09}_{0x09}$
TRANSFER
SPI Open Success, channel: 3, port: 0, speed:2000000

6) Then fill in the bytes that need to be sent, such as reading the ID information of w25q64, fill in the address 0x9f in data[0], and then click the **TRANSFER** button



7) Finally, the APP will display the read ID information

range Pi User Manual

7:59 AM 🛈 🜵 🗘
wiringOP
/dev/spidev3.0 SPI Channel: <u>3</u> SPI Port: <u>0</u> SPI Speed: <u>2000000</u>
OPEN
data[0]: 0x9f data[1]: 0x09
data[2]: 0x09 data[3]: 0x09
TRANSFER
SPI Transfer success ret:4 data[0]:9f data[1]:ef data[2]:40 data[3]:17

8) The MANUFACTURER ID of the w25q64 module is EFh, and the Device ID is 4017h, corresponding to the value read above (h stands for hexadecimal)

MANUFACTURER ID	(MF7 - MF0)		
Winbond Serial Flash	EFh	_	
Device ID	(ID7 - ID0)	(ID15 - ID0)	
Instruction	ABh, 90h, 92h, 94h	9Fh	
W25Q64FV (SPI)	16h	4017h	
W25Q64FV (QPI)	16h	6017h	

7. 8. 4. **40pin PWM test**

1) Android enables **PWM11** by default, and the corresponding pin is located at 40pin as shown in the figure below



2) First click on the wiringOP icon to open the wiringOP APP
| range Pi User I | Manual | Copyright reserved by | / Shenzhen Xunlo | ong Software Co., Ltd |
|-----------------|-----------|-----------------------|------------------|------------------------|
| | | Q Search apps | | |
| []
 + = | | ۵ | • | |
| Calculator | Calendar | Camera | Clock | Contacts |
| 6 | | | \bigcirc | ۲ |
| Explorer | Files | Gallery | Lightning | Music |
| | \$ | ٩ | | - (|
| Search | Settings | Sound Recorder | Video | WebView Browser Tester |
| wiringOP | | | | |

3) Then click the **PWM_TEST** button on the main interface of wiringOP to enter the PWM test interface

7:56 AM 🕐 🜵 🕐	0
wiringOP	
GPI0_TEST	
UART_TEST	
I2C_TEST	
SPI_TEST	
PWM_TEST	

4) The base address corresponding to PWM11 is **fe6f0030**, here pwmchip0 shows **fdd70020.pwm** on the right, then you need to click the drop-down option to select other pwmchips until **fe6f0030.pwm** is displayed on the right

8:03 AM 🛈 🕂 🛈
wiringOP
Controller: pwmchip0 - fdd70020.pwm
Channel: 0
Period: 50000 ns
EXPORT
Enable pwmchip0 Duty

5) When the drop-down option selects **pwmchip3**, the corresponding base address of PWM11 is **fe6f0030** on the right

range Pi User Manual	Copyright reserved by Shenzhen Xunlong Software Co., Ltd
8:07 AM OP + OP	
wiringOP	
Controller: pwmchip3 - fe6f0030.pwm	
Channel: 0	
Period: 50000 ns	
EXPORT	
Enable pwmchip3 Duty	

6) Then confirm the PWM channel, the default is channel 0, and confirm the PWM cycle, the default configuration is **50000ns**, converted to PWM frequency is **20KHz**, you can modify it yourself, click the **EXPORT** button to export **PWM11**

:07 АМ 🕒 🖞 🛈	Ø
wiringOP	
iontroller: pwmchip3 - fe6f0030.pwm	
hannel: 0	
eriod: 50000 ns	
EXPORT	
Enable pwmchip3 Duty	

7) Then drag the drag bar below to change the PWM duty cycle, and then check Enable to output the PWM waveform

в:то ам 🚱 🕸 😳	6
wiringOP	
Controller: pwmchip3 - fe6f0030.pwm	
Channel: 0	
Period: 50000 ns	
UNEXPORT	
Enable pwmchip3 Duty	

8) Then use an oscilloscope to measure the No. 32 pin in the 40pin of the development board, and you can see the following waveform



7.9. How to use ADB

7.9.1. The method of USB OTG mode switching

The development board has 4 USB interfaces, among which the USB interface marked in red box in the figure below can support both Host mode and Device mode, and the other 3 USB interfaces only support Host mode.



The USB OTG interface defaults to Host mode, which 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

range Pi User	Manual	Copyright reserved b	y Shenzhen Xunl	ong Software Co., Ltd
7:58 AM 🕒 🜵 🕒				0
		Q Search apps		
	1000	۵	•	8
Calculator	Calendar	Camera	Clock	Contacts
6			\bigcirc	۲
Explorer	Files	Gallery	Lightning	Music
	\$	٩		·
Search	Settings	Sound Recorder	Video	WebView Browser Tester
Ŏ,				
wiringOP				

2) Then select About tablet

9:48 AM	0 G	0
	Storage 5% used - 243 GB free	
ଦ୍ଧ	Privacy Permissions, account activity, personal data	
0	Location On - 1 app has access to location	
۵	Security Screen lock	
	Accounts No accounts added	
Ť	Accessibility Screen readers, display, interaction controls	
۵	Screenshot Screenshot	
6	System Languages, gestures, time, backup	
	About tablet orangepi3b	
	•• • • • •)	

3) Then click the **Build number** menu bar several times with the mouse until the promptYou are now a developer! appears

10:07 AM	©	\leftrightarrow
÷	About tablet	۹
	Model orangepi3b	
	Android version	
	IP address fe80:a18e:3b41:a563:4574 192.168.1.222	
	Wi-Fi MAC address To view, choose saved network	
	Device Wi-Fi MAC address Unavailable	
	Bluetooth address Unavailable	
	Up time 01:24	
	Build number You are now a developer! rk3566_r-userdebug 11 RD2A.211001.002 eng.orange.20230824.173248 eieease keys	
	♦	

4) Then click to return to the previous menu

÷	About tablet	۹
	Model orangepi3b	
	Android version	
	IP address fe80::a18e:3b41:a563:4574 192.168.1.222	
	Wi-Fi MAC address To view, choose saved network	
	Device Wi-Fi MAC address Unavailable	
	Bluetooth address Unavailable	
	Up time 15:39	
	Build number rk3566_r-userdebug 11 RD2A.211001.002 eng.orange.20230824.173248 release-keys	

5) Then select System

	range Pi User Manual	Copyright reserved by Shenzhen Xunlong Software Co., Ltd
10:22 AM	0	() ↔
	Storage	
	5% used - 243 GB free	
©.	Privacy	
	Permissions, account activity, personal data	
	Location	
	On - 1 app has access to location	
	Security	
	Screen lock	
la	Accounts	
Ø	No accounts added	
÷	Accessibility	
	Screen readers, display, interaction controls	
	Screenshot	
	Screenshot	
	System	
	Languages, gestures, time, backup	
	About tablet	
Ľ۳.	orangepi3b	

6) Then select Advanced

10:24 AM	0	\leftrightarrow 0
÷	System	۹
	Languages & input Android Keyboard (AOSP)	
Ľ.	Gestures	
0	Date & time GMT+00:00	
٢	Backup Off	
~	Advanced Reset options, Multiple users, Developer options	

7) Then select **Developer options** in the expanded column

	range Pi User Manua	l Copyright reserved by Shenzhen Xunlong Software Co., Ltd
10:25 AM	0	⇔ 0
÷	System	٩
	Languages & input Android Keyboard (AOSP)	
Ŀ	Gestures	
0	Date & time GMT+00:00	
٢	Backup Off	
Ð	Reset options Network, apps, or device can be reset	
Do	Multiple users Signed in as Owner	
{}	Developer options	

8) Finally find the **USB OTG Mode Switch** switch, **turn on the switch to switch to Device mode**, **turn off the switch to switch to Host mode**

10:28 AM	G G	⇔ ß
÷	Developer options	٩
	On	•
	Quick settings developer tiles	
	DEBUGGING	
	USB debugging Debug mode when USB is connected	•
	USB OTG Mode Switch Open: Device mode; Close: Host mode	
	Wireless debugging Debug mode when Wi-Fi is connected	

7. 9. 2. Use the data cable to connect to adb debugging

1) First prepare a good quality USB2.0 male-to-male data cable



2) Then refer to the method of USB OTG mode switching to switch USB OTG to Device mode

3) Then connect the development board to the Ubuntu PC through the USB2.0 male-to-male data cable. The position of the USB OTG interface on the development board is shown in the figure below:



4) Then install the adb tool on the Ubuntu PC test@test:~\$ sudo apt update test@test:~\$ sudo apt -y install adb

5) You can view the identified ADB devices through the following command

test@test:~\$ **adb devices** List of devices attached S63QCF54CJ device test@test:~\$ **lsusb** Bus 003 Device 006: ID 2207:0006

6) Then you can log in to the android system through the adb shell on the Ubuntu PC test@test:~\$ adb shell console:/\$

7) Execute the following command to remount the Android system

test@test:~\$ adb root test@test:~\$ adb remount

8) Then you can transfer files to the Android system

test@test:~\$ adb push example.txt /system/

7.9.3. Use network connection adb debugging

Using the network adb does not require a data cable to connect the computer and the development board, but to communicate through the network, so first make sure that the wired or wireless network of the development board is connected, and then obtain the IP address of the development board, which will be used later.

1) Make sure that the **service.adb.tcp.port** of the Android system is set to port number 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 port number of network adb

console:/ # setprop service.adb.tcp.port 5555

console:/ # stop adbd

console:/ # start adbd

3) Install adb tool on Ubuntu PC

test@test:~\$ sudo apt update

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

4) Then connect to the network adb on the Ubuntu PC

test@test:~\$ adb connect 192.168.1.xxx (IP 地址需要修改为开发板的 IP 地址) * daemon not running; starting now at tcp:5037 * daemon started successfully connected to 192.168.1.xxx:5555 test@test:~\$ adb devices List of devices attached 192.168.1.xxx:5555 device

5) Then you can log in to the android system through the adb shell on the Ubuntu PC test@test:~\$ adb shell console:/ #

8. Instructions for using the OpenWRT system

8.1. **OpenWRT Version**

OpenWRT Version	Kernel version
snapshot	Linux6.1

8.2. OpenWRT adaptation situation

Function	OpenWRT
USB2.0x3	ОК
USB3.0x1	ОК
3pin debugging serial port	ОК
TF card startup	ОК
UWE5622 WIFI	NO
M.2 NVMe SSD boot	ОК
Network port	ОК
Network port status light	ОК
RTL8811 USB network card	ОК
USB to wired network card	ОК
LED light	ОК
FAN interface	ОК
eMMC expansion interface	ОК

8.3. Start expanding rootfs for the first time

1) When the OpenWRT system is started for the first time, the resize-rootfs.sh script will be executed to expand the rootfs, and it will automatically restart after the expansion is completed.

2) After logging in to the system, you can use the **df -h** command to check the size of rootfs. If it is consistent with the actual capacity of the storage device (TF card, eMMC or NVME SSD), it means that the automatic expansion is running correctly.

range Pi User Manual	Cop	yright reserve	d by Shenzhen Xunlong Software Co., Ltd
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

8.4. How to log in to the system

8. 4. 1. Log in through serial port

1) First, for the use of the debugging serial port, please refer to the chapter on **how to use the debugging serial port**.

2) The OpenWrt system will automatically log in as the root user by default, and the display interface is as follows

OpenWrt login: root
BusyBox v1.36.1 (2023-11-23 13:47:57 UTC) built-in shell (ash)
OpenWrt SNAPSHOT, r24453+3-a39a49e323
=== WARNING! ====================================
There is no root password defined on this device! Use the "passwd" command to set up a new password in order to prevent unauthorized SSH logins.
root@OpenWrt:~# []

8. 4. 2. Log in to the system via SSH

Please note that in the OpenWrt system of Orange Pi 3B, the onboard network port is configured as a LAN port function by default.

1) First use a network cable to connect the LAN port of the board to the network port of the computer so that the computer's network port can obtain the IP address through DHCP.

2) The default LAN port IP of the board is set to **192.168.2.1**, so at this time the computer can obtain an IP address starting with **192.168.2**

3) If the Ubuntu system is installed on the computer, 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) After successfully logging into the system, the display is as shown below



5) If the computer is installed with Windows system, you can refer to the method of **SSH** remote login to the development board under Windows in the Linux system instruction manual to log in.

8. 4. 3. Log in to the LuCI management interface

Please note that in the OpenWrt system of Orange Pi 3B, the onboard network port is configured as a LAN port function by default.

1) First use a network cable to connect the LAN port of the board to the network port of the computer so that the computer's network port can obtain the IP address through DHCP.

2) The default LAN port IP of the board is set to **192.168.2.1**, so at this time the computer can obtain an IP address starting with **192.168.2**

3) Enter the IP address **192.168.2.1** in the browser on your computer to log in to the LuCI interface

$\leftarrow \ \rightarrow \ C$	🔘 🗟 192.168.2.1/cgi-bin/luci/		☆
		· · · · · · · · · · · · · · · · · · ·	
		用户名 root	
		密码	
		77	

4) The OpenWrt system does not set a password by default, so just click the login button. After successful login, the interface will be displayed as shown below.

192.168.2.1/cgi-bin/luci/			
	OpenWrt 状态 → 系统 → Docker →	服务 → 网络 → 统计 → 退出	刷新
	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	1并愈用。	創練到密码配置页
	状态		
	主机名	OpenWrt	
	型号	Rockchip RK3566 OPi 3B	
	架构	ARMv8 Processor rev 0	
	目标平台	rockchip/armv8	
	固件版本	OpenWrt SNAPSHOT r24453+3-a39a49e323 / LuCl Master git-23.326.65612-8a	01448
	内核版本	6.1.62	
	本地时间	2023-11-24 01:21:21	
	运行时间	0h 15m 16s	
	平均负载	0.00, 0.06, 0.09	
	内存		
	可用数	1.77 GiB / 1.94 GiB (91%)	
	已使用	300.71 MiB / 1.94 GiB (15%)	
	已缓冲	3.71 MiB / 1.94 GiB (0%)	
	已缓存	166.27 MiB / 1.94 GiB (8%)	

8. 4. 4. Log in to the terminal through the LuCI management interface

Please note that in the OpenWrt system of Orange Pi 3B, the onboard network port is configured as a LAN port function by default.

1) First use a network cable to connect the LAN port of the board to the network port of the computer so that the computer's network port can obtain the IP address through

DHCP.

2) The default LAN port IP of the board is set to **192.168.2.1**, so at this time the computer can obtain an IP address starting with **192.168.2**

3) Enter the IP address **192.168.2.1** in the browser on your computer to log in to the LuCI interface

$\leftarrow \ \rightarrow \ C$	O 192.168.2.1/cgi-bin/luci/				\$
		需要授权			
		用户名	root		
		密码			
			왕킃		

4) Select "Terminal" in the "Service" column of the navigation bar and click to enter



5) At this time, the terminal display interface is as shown below

range Pi User Manual	Copyright reserved by Shenzhen Xunlong Software Co., Ltd
OpenWrt 状态 → 系统 → Docker → 服务 →	网络 - 统计 - 退出
未设置宓码!	
尚未设置密码。请为 root 用户设置密码以保护主机并启用。	
终端 配置	
OpenWrt login:	<u>م</u>
	· · · · · · · · · · · · · · · · · · ·

6) Enter the username **root** to log in



8. 4. 5. Log in to the terminal using IP address + port number.

Please note that in the OpenWrt system of Orange Pi 3B, the onboard network port is configured as a LAN port function by default.

1) First use a network cable to connect the LAN port of the board to the network port of the computer so that the computer's network port can obtain the IP address through DHCP.

2) The default LAN port IP of the board is set to **192.168.2.1**, so at this time the computer can obtain an IP address starting with **192.168.2**

3) Then enter **192.168.2.1:7681** in the browser to log in to the OpenWRT terminal



8.5. How to modify the LAN port IP address through the command line

1) In the OpenWrt system, a command line tool uci is provided, which can easily modify, add, delete and read the contents in the configuration file. For detailed instructions, please refer to the **official documentation**

First use the following command to obtain the network configuration. The corresponding configuration file is /etc/config/network. 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 item root@OpenWrt:~# uci set network.lan.ipaddr='192.168.100.1'

4) Then enter the following command to complete the submission, that is, write it to the configuration file

root@OpenWrt:~# uci commit

If the IP address in red font is consistent with the one to be set, the modification is 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 ubus. For instructions on using ubus, please refer to the **official documentation**.

root@OpenWrt:~# ubus call network restart

6) At this time, enter the command and you can see that the IP of the LAN port is already192.168.100.1

root@OpenWrt:~# 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. How to change the root password

8. 6. 1. Modification through command line

1) First enter passwd root on the system command line. The following prompt message will appear. At this time, you can enter the password you want to set and press the Enter key to confirm.

root@OpenWrt:/# **passwd root**

Enter new UNIX password:

2) You will then be prompted to re-enter your password. At this time, enter your password again to confirm and press Enter.

Retype password:

3) The successful modification is displayed as follows

passwd: password for root changed by root

8. 6. 2. Modify through LuCl management interface

1) First refer to **logging in to the 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
- b. In the vertical column options below the system, select "Management Rights" and click

未设置密码 , 请为 root f	系统 管理权		NS3AT.
	软件包 启动项		跳转到密码配置页
状态	计划任务		
系统			
主机名	LED 配置	OpenWrt	
型号		Rockchip RK3566 OPi 3B	
架构	目定义命令	ARMv8 Processor rev 0	
目标平台		rockchip/armv8	
固件版本		OpenWrt SNAPSHOT r24453+3-a39a49e323 / LuCI Master git-2	23.326.65612-8a01448
内核版本		6.1.62	
. Select the	"Router P	assword" option on the Tab page	
OpenWrt #**-	至您 - Docker -	服务 -	

路由器密码		
<u>受快的时候</u> 面的自建风面的 密码	8	
确认密码	*	
		保存

- 3) Modify and save the router password
 - a. Enter the password you set in the "**Password**" and "**Confirm Password**" dialog boxes (if you are not sure whether the password is entered correctly, you can click the "*" icon behind the dialog box to display the input characters)
 - b. Click "Save" to save the newly modified password.

OpenWrt 状态 - 系统	š + Docker + 服务 + 网络	各 - 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			
路由器密码 更改访问设备的管理员密码				
确认密码			0	
				保存

Note: In the "Password" and "Confirm Password" dialog boxes, the passwords entered twice must be consistent.

4) After the password is successfully changed, a pop-up box showing "System password has been changed successfully" will pop up. At this time, you will need a password to log in to OpenWRT.

*	系统密码已更改成功。		关闭
*	未设置密码! 尚未设置密码。请为 root 用户设置密码以保护	机并启用。	
*	路由器密码 SSH 访问 SSH 密钥 HTTP)访问	
•	路由器密码 ^{更改访问设备的管理员密码}		
•	密码	*	
	确认密码		
	商认密码	*	

8.7. USB interface test

8.7.1. Mount USB storage device from command line

1) First insert the USB disk into the USB interface of the Orange Pi development board

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

root@OpenW	′rt:∼#	cat /proc/pa	artitions grep "sd*"	
major minor	#ble	cks name		
8	0	15126528 se	da	

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

root@OpenWrt:~# mount /dev/sda /mnt/ root@OpenWrt:~# ls /mnt/ range Pi User Manual

test.txt

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

root@OpenWrt:~#	t df -h gre	ep "sd"		
/dev/sda	14.4G	187.2M	14.2G	1% /mnt

8. 7. 2. Mount USB storage device in LuCI management interface

1) First connect the U disk (or other storage device) to the development board through USB2.0

2) Then log in to **the LuCI management interface** to enter the LuCI management interface.

3) Then in the LuCI management interface, click "System->Mount Point" to enter the mount point configuration interface

OpenWrt 状态 -	系统 + Docker +)	服务→ 网络→ 统计→ 退出	刷新
未设置密码! 尚未设置密码。请为 root,	系统 管理权 软件包 启动项	目用。	转到密码配置页
<mark>状态</mark> ^{系统}	计划任务 挂载点 时间同步		
主机名	LED 配置	OpenWrt	
型号	备份与升级 自定义命令	Rockchip RK3566 OPi 3B	
架构	重启	ARMv8 Processor rev 0	
目标平台		rockchip/armv8	
固件版本		OpenWrt SNAPSHOT r24453+3-a39a49e323 / LuCl Master git-23.326.65612-8a0144	.8
内核版本		6.1.62	

- 4) Then follow the steps below to add a mount point
 - a. Find "Mount Point" at the bottom of the mount point global settings interface.
 - b. Below the mount point, select the "Add" button and click to enter

range Pi User Manual Copyright reserved by Shenzhen Xunlong Software Co., Ltd 挂载点 配置存储设备挂载到文件系统中的位置和参数 挂载点 挂载选 文件系统 已启 设备 文件系统 用 项 检查 UUID: 84173db5-fa99-e35a-95c6-28613cc7 auto Ξ /mnt/mmcblk1p1 defaults 否 编辑 删除 (/dev/mmcblk1p1, 64.00 MiB) (ext4) UUID: ff313567-e9f1-5a5d-989 3ba130b4a864 auto defaults 否 = 编辑 删除 (/dev/mmcblk1p2, 29.61 (ext4) 添加

c. The following pop-up window interface will pop up.

常规设置	高级设置				
	已启				
	UUI	D 根据 UUID 匹配	•		
		⑦ 如果指定,则通过 UUID i	而不是固定的设备文件来挂载设备	Z H	
	卷	示 根据标签匹配	•		
		②如果指定,则通过分区卷	际而不是固定的设备文件来挂载i	受备	
	设计	备 未指定	-		
		⑦存储器或分区的设备文件	(例如:/dev/sda1)		
	挂载	点 - 请选择	•		
		❷指定设备的挂载目录			
					关闭

- d. Then you can start mounting the storage device
 - a) Check "Enabled"
 - b) Select the actual connected device /dev/sda in the General Settings UUID column (select according to your own device)
 - c) Select "Custom" in the mount point column and fill in the target directory to be mounted. Here, the /mnt directory is used as an example. After filling in, press Enter to confirm.
 - d) Then click the "Save" button in the lower right corner



5) Then you will return to the mount point global settings page. Click "Save and Apply" in the lower left corner of the page to make the mount point effective.

已启 用	设备	挂截点	文件系统	挂载选 项	文件系统 检查			
	UUID: 84173db5-fa99-e35a-95c6-28613cc79ea9 (/dev/mmcblk1p1, 64.00 MiB)	/mnt/mmcblk1p1	auto (ext4)	defaults	否	Ξ	编辑	
	UUID: ff313567-e9f1-5a5d-9895-3ba130b4a864 (/dev/mmcblk1p2, 29.61 GiB)	I	auto (ext4)	defaults	Кп	≡	编辑	
☑ 添加 を换分	UUID: ce4b-c491 (/dev/sda, 59.48 GiB)	/mnt	auto (vfat)	defaults 非堂慢 因为	否	E RAM	编辑	
✓ 添加 ∑換分 以果物理 已启用	UUID: ce4b-c491 (/dev/sda, 59.48 GiB)	/mnt 胎9 <u>RAM</u> 。请注意:数据交	auto (vfat)	defaults 非常慢,因为	否	E RAM	编辑	東地び
✓ 添加 泛换分 □果物理 已启用	UUID: ce4b-c491 (/dev/sda, 59.48 GiB)	/mnt 500 <u>RAM</u> 。请注意:数据交 <i>尚无任何配置</i>	auto (vfat)	defaults 非常慢,因为	否 交换设备无法	E RAM	编辑	慧地议

6) After saving, you can see that the storage device has been mounted successfully in "Mounted File Systems"

文件系统	挂载点	可用	已使用	卸载分区
dev/root	T	28.93 GiB / 29.25 GiB	1.04% (310.21 MiB)	2
npfs	/tmp	7.67 GiB / 7.68 GiB	0.06% (4.69 MiB)	÷
npfs	/dev	512.00 KiB / 512.00 KiB	0.00% (0 B)	n.
dev/root	/opt/docker	28.93 GiB / 29.25 GiB	1.04% (310.21 MiB)	卸载分区
dev/sda	/mnt	59.46 GiB / 59.46 GiB	0.00% (640.00 KiB)	印教公区

挂载点

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 usable USB wireless network cards that **have been tested** so far are as follows. Please test other models of USB wireless network cards by yourself. If it cannot be used, you need to transplant the corresponding USB wireless network card driver.

serial number	model	
1	RTL8811	GRIS
	Support 2.4G +5G WIFI	S to sub

8.8.1. Method to create WIFI hotspot using 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 up the development board.

2) After the system starts, click **Network -> Wireless** to enter the wireless WiFi configuration interface. If there is no **wireless** option, it means that the USB wireless network card model is not supported by the system.

192.168.2.1/cgi-bin/luci/			
OpenWr	rt 状态 - 系统 - Docker - I	服务 - 网络 - 统计 - 退出 	M¥6
未设置密高大设置密	码! 码。请为 root 用户设置密码以保护主机	接口 并启用 <mark> </mark>	
状态		ーーー DHCPiDNS 网络沙斯 防火海	
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 the OpenWRT system is **Master** mode. We can directly click to **enable** to create an open WIFI hotspot.

OpenWrt 状态 -	系统 + Docker + 服务 + 网络 + 统计 + 退出	刷新
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。	跳转到密码配置页
无线概况		
in adio0	Generic MAC80211 802.11ac/d/g/n 设备未激活 SSID: OpenWrt 模式: Master	重启扫描添加
10 日祭用	无线未开启	后用 编辑 移除

4) The display interface of successfully creating a WIFI hotspot is as shown below

OpenWrt 状态 -	系统 - Docker - 服务 - 网络 - 统计 - 退出	刷新
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。	跳转到密码配置页
无线概况		
👳 radio0	Generic MAC80211 802.11ac/b/g/n 信道: 36 (5.180 GHz) 比特率: ? Mbit/s	重启 扫描 添加
di dBm	SSID: OpenWrt 模式: Master BSSID: 1C:BF:CE:D9:D2:60 加密: None	禁用编辑移除

5) At this point, you can connect to the WIFI hotspot named **OpenWrt** through your mobile phone



6) If you want to create a WIFI hotspot with a password, click the Edit option

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OpenWrt 状态 - 3	系统 → Docker → 服务 → 网络 → 统计 → 退出	刷新
未设置密码! 尚未设置密码。请为 root 用F	9设置密码以保护主机并启用。	就转到密码配置页
无线概况		
🙊 radio0	Generic MAC80211 802.11ac/b/g/n 信道: 36 (5.180 GHz) 比特率: 433.3 Mbit/s	重启 扫描 添加
48 dBm	SSID: OpenWrt 模式: Master BSSID: 1C:BF:CE:D9:D2:60 加密: None	禁用 編輯 移除

7) In the pop-up tab, we click on the Wireless Security column.

无线网络: 主设备 "OpenW 设备配置	/rt" (phy0-ap0)
常规设置高级设置	
状态	
无线网络已启用	禁用
工作频率	模式 信道 通道宽度 AC V 36 (5180 Mhz) V 80 MHz V
最大传输功率	驱动默认 🖌 - 当前功率: 20 dBm
接口配置 常规设置 无线安全 MAC 近	●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。 1
模式	接入点 AP V
ESSID	OpenWrt
网络	
隐藏 <u>ESSID</u>	 ● 选择指派到此无线接口的网络,或者填与创建栏来新建网络。

8) Then in **Interface Configuration -> Wireless Security**, select **WPA2-PSK** as the encryption algorithm; set the key (wireless password) to **password**

接口配置	1					
常规设置	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 the above settings are completed, click **Save** in the lower right corner of the page, and then exit the tab page

接口配置	1											
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)	~							
		算法	自动		~							
		密钥	password		*							
8	302.11w 管理	里帧保护	已禁用)注音·右些	无线驱动程序不	▼	802 11w	個bo · mw	lwifi ⊡€5⊖≢	三——此问题			
启用密钥重	ī新安装(KF	RACK) [对策	通过禁用用 导致互操作	于安装密钥的 E 性问题,并降低	APOL-Key 密钥协商的	/ 帧的重 的可靠性	新传输,来增 ,特别是在》	普加客户端密 充量负载较重	新重安装攻 的环境中。	前复杂度。	此解决方法	法可能会
启用 WPS - WPA(—键加密按钥 (2)-PSK/WP/	日,需要 [A3-SAE										
											关闭	保存

10) Then click **Save and Apply** in the lower right corner of the page and wait for the configuration to be applied.

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OpenWrt 状态 - 豸	統 - Docker - Ma	谤 - 网络 - 统计 - 退	Ш	刷新 未保存的配置: 3
未设置密码! 尚未设置密码。请为 root 用户	可设置密码以保护主机并	信用.		跳转到密码配置页
无线概况				
🙊 radio0	Generic MAC 信道: 36 (5.180	80211 802.11ac/b/g/n GHz) 比特率: 433.3 Mbit/s		重启 扫描 添加
▲ -46 dBm	SSID: OpenWrt 接□有 2 个未应	模式: Master 用的更改		禁用 编辑 修除
网络	MAC 地址	主机	信号/噪声	接收速率/发送速率
● 主设备 "OpenWrt" (phy0- ap0)	26:0D:25:46:1C:9D	192.168.2.229	-44 dBm	263.3 Mbit/s, 80 MHz, VHT-MCS 6, VHT-NSS 1 433.3 Mbit/s, 80 MHz, VHT-MCS 9, VHT-NSS 1, Short GI
				保存并应用 • 保存

11) The display interface of successfully creating a hotspot is as shown below. At this time, you can see that the WIFI hotspot has been encrypted.

OpenWrt	状态 ▼ 系统 ▼ Dock	er + 服务 + 网络 +	统计 👻 退出		Relati
未设置密码 尚未设置密码]! 過. 请为 root 用户设置密码以保	护主机并启用。			就转到密码配置页
无线概况					
👷 ra	adio0 Generic MA 信道: 36 (5.18)	C80211 802.11ac/b) GHz) 比特率: ? Mbit/s	/g/n		重启 扫描 添加
(dBm SSID: OpenW BSSID: 1C:BF	t 模式: Master :CE:D9:D2:60 <mark>加密:</mark> W	PA2 PSK (CCMP)		禁用 编辑 移除
已连接站点	5				
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

12) Then use your mobile phone or computer to search for the WiFi corresponding to the SSID and connect. After the connection is successful, as shown in the figure below



8. 8. 2. How to use USB wireless network card to connect to 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 up the development board.

2) After the system startup is completed, click "Network > Wireless" to enter the wireless WiFi configuration interface.

192.168.2.1/cgi-bin/luci/			
	OpenWrt 状态 - 系统 - Docker -)	服务→ 网络→ 统计→ 退出	Ritti
	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	^{按□} ^并 2用, <mark>无线</mark>	
	状态 ^{系统}	mini DHCP/DNS 网络诊断 BCV 満	
	主机名	Ope: MultiWAN 管理器	
	型号	服务质量(QoS)	
	架构	ARMv8 Processor rev 0	
	目标平台	rockchip/armv8	

3) First, you need to remove the default wireless configuration, click the **"Remove"** button as shown below

OpenWrt 状态 -	系统 - Docker - 服务 - 网络 - 统计 - 退出	Rissi
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。	跳转到密码配置页
无线概况	Generic MAC80211 802.11ac/b/g/n 设备未激活	重自 扫描 添加
100 已禁用	SSID: OpenWrt 模式 : Master <i>无线未开启</i>	启用 编辑 移除

4) Then click the **"Scan"** button to scan the surrounding WiFi hotspots

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未设置密	码! 码。请为 root 用户词	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
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)

5) Then the following window will pop up to display the available WiFi hotspots. Click the **"Join Network"** button to the right of the WiFi hotspot you want to connect to.

加入网络:搜索无线	加入网络:搜索无线							
信号	SSID	信道	模式	BSSID	7回路:			
📶 -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	1004 1004 100 10 10 1	149	Master	A0:40:A0:A1:72:31	WPA2 PSK (CCMP)	加入网络		
📶 -67 dBm	THE FORE THE FOUND	60	Master	50:6A:03:AB:90:1A	WPA2 PSK (CCMP)	加入网络		

6) Then enter the password as shown in the picture below, and then click "Submit"





7) Then the following interface will pop up, click Save

range I	Pi User Manual	Copyright reserved by Shenzhen Xunlong Software Co., Ltd
无线网络: 客户端 "xunlong 殳 备配置 ^{常规设置} 高级设置	j_orangepi_5G'' (radio0.network1)	
状态	載式: Client SSID: xunlong_orangepi_5G dBm 无线末关联	
无线网络已启用	業用	
工作频率	模式 信道 带宽 AC V 36 (5180 Mhz) V 80 MHz V	
最大传输功率	驱动默认 🗸 - 当前功率: 未知	
专 口配置 18规设置 无线安全 高级设置	WLAN 濃游	
模式	春戸第	
ESSID	xunlong_orangepi_5G	
BSSID		
网络	wwan: 🗶	
	♥ 选择指派到此无线接口的网络,或者填写创建栏来新建网络。	
		关闭 保 存

8) Finally, you will return to the main interface of wireless configuration, click "Save and Apply"

未设置密 尚未设置密	码! 码。请为 root 用户词	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		重启日描添加
	2 已禁用	SSID: xunlong_orangepi_5G 接口有 7 个未应用的更改	摸式: Client		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

9) After successfully connecting to the WiFi hotspot, the interface displays as shown below

线概况					
🧟 radio0	Generic M 信道: 48 (5.2	AC80211 802.11ac 40 GHz) 速率: 292.5 I	t bgn Mbit/s		重启 扫描 添加
📕 -60 dBm	SSID: xunlor BSSID: 1C:E	g_orangepi_5G 模式: F:CE:D9:D2:60 加密:	Client WPA2 PSK (CCMP)		禁用 编辑 移除
连接站点					
<mark>连接站点</mark> ^赂		MAC 地址	主机	信号/噪声	接收速率/发送速率

8.9. Installing packages via the command line

8.9.1. Install through opkg in the terminal

1) Update the list of available software packages

root@OpenWrt:/# opkg update

2) Get the 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 the software

root@OpenWrt:/# opkg remove <package name>

8. 10. OpenWRT management interface installation package

If you need to add a new software package, you can install it through the OpenWRT management interface.

8. 10. 1. View the list of available software packages on the system 系

- 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 column 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	刷新
未设置密码!	系统 管理权	1H	
间不设里运识。 肩刃 1001)	软件包	9/12· 왜쇼크피하지지하고	洒
	启动项		<u>.</u>
状态	计划任务		
77/+			
杀玧			
主机名	LED 配置	OpenWrt 🔨	
刑户		Dockshin DK3566 ODi 3B	
25	自定义命令	RURLIN RASSOU OFI SD	
架构		ARMv8 Processor rev 0	
目标平台		rockchip/armv8	
固件版本		OpenWrt SNAPSHOT r24453+3-a39a49e323 / LuCl Master git-23.326.65612-8a01448	
内核版本		6.1.62	

2) Then the main page of the software package will appear, as shown in the figure below, to obtain the list of available software

- a. In the "Action" option of the software package, click "Update List" to obtain the list of available software packages.
- b. In the Tab page, click "Available" to view the currently available software packages.
- c. View the number of currently available software packages

软件包 ^{空闲空间:} 98% (28.94 GiB)			0			
筛选器:		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
可用已安装	更新		正在显示 1-100, 共 717	1		»
软件包名称	版本	大小 (.ipk)	描述			

8. 10. 2. Installation package example

- 1) Take the installation of the software package "luci-app-acl" as an example
 - a. In the OpenWRT package management interface, click the filter dialog box and enter "luci-app-acl"
 - b. In the list of software packages, you can see the version, package size and description information of the "**luci-app-acl**" software package, and then click the "**Instal**l" button

软件包

空闲空间: 98% (28.94 GiB)							
ににいる。	۲	载并安装软件包		操作:			
luci-app-ac	清除 新	次件包名称或 URL	确认	更新列表	上传软件包	配置 opkg	
显示 LuCI 翻译包: ● 已过滤 ○ 全部 (可用 已安装 更新	ОÆ f						
	(x)		正在显示 1-3 , 共 3			3	
软件包名称	版本	大小(.ipk)	描述				
luci-app-acl	git-21.194.67617-f74b06	c 4.14 KiB	LuCI account ma	nagement module		安装	
luci-i18n-acl-en	git-23.090.61754-f7f34d4	1.25 KiB	Translation for luc	<u>ii-app-acl</u> - English		安装	
luci-i18n-acl-zh-cn	git-23.090.61754-f7f34d4	1.90 KiB	Translation for luc	<u>:i-app-acl</u> - 简体中文	(Chinese Simplifie	d) 安装…	

c. Then the following pop-up window will appear, click "Install"

软件包 luci-app-acl 详情



d. Then wait for the installation to complete



e. The installation completion display is as follows

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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.
                                                                         关闭
```

- 2) Check whether the software package is installed successfully
 - a. In the OpenWRT package management interface, click the filter dialog box and enter "**luci-app-acl**"
 - b. Select and click "Available" on the Tab page

c. The "luci-app-acl" software package will be displayed in the software package list, and the status will be updated to "Installed""

			95% (7.4 GB)			
訪选器: uci-app-ac∥	津	下载并安装软件包: 软件包名称或 URL	确认	操作: 更新列表…	上传软件包	配置 opkg
可用 已安装	更新					
× 0	۹C	I	在显示 1-36,共 36			2
2 软件包名称	« 版本	正 大小(.ipk)	在显示 1-36,共 36 描述			3

8. 10. 3. Example of removing software packages

- 1) Take removing the software package "luci-app-acl" as an example
 - a. In the OpenWRT package management interface, click the filter dialog box and enter "**luci-app-acl**"
 - b. Select "**Installed**" on the Tab page to display the list of installed software packages.
移除软件包 luci-app-acl

c. Click "**Remove**" on the right to remove the corresponding software package

软件包

选器		下载并安装软件包:		操作:		
uci-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					
~		<u>`1</u>				
	` ② ≪	1 正在显示	: <mark>1-1</mark> ,共1			3 2
物件句名称	2 «	① 正在显示	i1-1,共1		8	×
软件包名称	2 《 版本	1 正在显示 大小 (.ipk)	〔1-1,共1) 描述		8	25

a. Then the pop-up window below will be displayed, click "Remove"

大小: ~3.4 KB 已安装		
描述		
LuCI account management module		
✓ 自动移除未使用的依赖	取消	移除
b. 移除成功后,显示界面如下		
b. 移除成功后,显示界面如下 正在执行软件包管理器		
b. 移除成功后,显示界面如下 正在执行软件包管理器 Removing package luci-app-acl from root		

- 2) Check whether the software package was successfully removed
 - a. In the OpenWRT package management interface, click the filter dialog box and enter "luci-app-acl"
 - b. Select and click "Installed" on the Tab page
 - c. The "luci-app-acl" software package will not be displayed in the software package list. At this time, the "luci-app-acl" software package has been successfully removed.

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软件包

筛洗器 :		下载并安装软件包:		操作:	wa	
uci-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		-01				
40		В	是有软件包			э
		后本	+	() (ink)	描述	

8.11. Using Samba network sharing

There are two main software options for OpenWRT LAN file sharing implementation, Samba and NFS. The Samba system has good compatibility, and NFS has superior performance. For users who need to use Windows devices, it is recommended to choose Samba.

- 1) Enter the management page of Samba network share
 - a. Find the "Service" 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 the Samba service needs to monitor
 - 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 through the "wan port", set it to "**wan**"

网络共享	
Samba Version 4.14.7	
常规设置 编辑模板	
接口	未間定(・)
工作组	docker: g# lan: g# wan: g#
启用扩展调整	 ● 自定义 <l< th=""></l<>
强制同步 I/O	□ ● 在低端设备上,可以通过强制使用同步1/0而不是默认的异步来提高速度。

- 3) Set up a shared directory for network sharing
 - a. Click "Add" shared directory address in "Shared Directory" of "General Settings" of network sharing.
 - b. Enter the name of the shared folder as "**mmt**" under the name.
 - c. Under the path of the shared directory, select "/mnt" to set the shared directory location.
 - d. Check "Browsable" and "Run anonymous user"
 - e. Click "Save and Apply" to save the configuration

共享目录 请添加要判	录 共享的目录。	每个目	录指到	已挂载设	备上的文件	夹。								
^{名称} 2.输入共	路径→ 享文件3	可 英 約:	只 名称 3.设	强制 Root 置共享	^{允许用} 户	允许 匿名 用户	仅来宾用户	继承所有者	创建权 限掩码	目录权 限掩码	VFS 对象	Apple Time- machine 共享	Time- machine 大 小(GB)	
mmt	/mnt	0	0	0					0777	0777		0		删除
新增											4.点击	告"保存并	应用",保存	記置
		` 1.	点击"	新增"								保存并加	应用 ▼ 保存	复位

4) Windows 10 starts network discovery and sharing

Note: When accessing Samba and sharing under Windows 10 system, you need

to first confirm whether Windows 10 has enabled network discovery and sharing. If not, perform the following settings first.

- a. Enable Samba v1/v2 access
 - a) Enter the "Control Panel" of Windows 10
 - b) Click "Programs" on the left navigation bar of the control panel
 - c) Select "Turn Windows features on or off" in Programs and Features
 - d) Check "SMB 1.0/CIFS file sharing support" in the pop-up box to enable or disable Windows features.
 - e) Click "OK" to configure the application



- b. Turn on network discovery in Windows 10
 - a) Enter the "Control Panel" of Windows 10
 - b) Select "Network and Internet" in the Control Panel
 - c) Then open "Network and Sharing Center"
 - d) Click | "Advanced Sharing Settings"
 - e) Turn on "Enable network discovery" and "Enable file and printer sharing"
 - f) Click "Save Changes" to save the network discovery configuration of Windows 10

4 高级共享设置		-	
← → ◇ ↑ 📢 > 控制面板 > 网络和 Internet > 网络和共享中心 > 高级共享设置	~ Ō	搜索控制面板	Q
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) (2010年1月11日) (2010年11月11日) (2010年1月11日) (2010年1月111日) (2010年11月11日) (2010年11月11日) (2010年1月11日) (2010年1月11日) (2)		
网络发现			
如果已启用网络发现,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。			
 ● 启用网络发现 ☑ 启用网络连接设备的自动设置。 ○ 关闭网络发现 			
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。			
● 启用文件和打印机共享 ○关闭文件和打印机共享			
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 〇)		
●保存更改 取消			

5) After the setting is completed, enter \\OpenWrt in the address bar of the resource manager to access the shared directory. The user name is root, and the password is the password set by the development board host.

个 🚽 - 网	缗 > OpenWrt > mmt			
≱ 快速访问	名称	修改日期	类型	大小
	System Volume Information	2020/9/7 18:26	文件夹	
	wiringOP	2020/11/28 5:12	文件夹	
△ WPS网盘	audio.wav	2020/8/17 18:10	WAV 文件	1,936 KB
- 世由時	openwrt-sunxi-cortexa7-sun8i-h2-plu	2019/1/9 9:14	MD5SUM 文件	1 KB
	orangepi.txt	2020/9/25 17:29	文本文档	1 KB
■ 视频	📄 usbcamera.apk	2020/11/13 21:55	APK 文件	20,451 KB
🔮 文档				
➡ 下载				
▶ 音乐				
重 桌面				
🏪 本地磁盘 (C:)				
🛫 temp (\\vboxsrv)				
📄 网络				

8.12. Zerotier usage instructions

The OpenWRT system has been pre-installed with 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 operations are as follows.

1) Log in to zerotier official website https://my.zerotier.com/network, register and click Network->Create A Network to create a virtual LAN

$\overline{\Phi}$ ZEROTIER		Downlo	ad Knowledge B	ase Accoui	nt Network	s System	API	Community	Logout
		Cre	eate A Network						
		Create a Ne	etwork to Get	Started					
$\overline{\Phi}$ ZEROTIER		Download	Knowledge Base	Account	Networks	System	API	Community	Logout
		Cre	ate A Network						
	Your Networks	SEARCH 1 networks							
	Networks: 1 Authorized Members: 0 / 50	NETWORK ID	NAME †	DESCRI	PTION SUE	BNET I	NODES		
	Online Members: 0	8286ac0e47d53bb5	happy_metcal	fe	172.	27.0.0/16	0/0		

2) Click to enter the network console page and set the privacy option to public, so that the added network nodes 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) Next, you can choose the network segment for automatically assigning the address. The selected network segment here is 172.27.*.*

	nange			
Easy		Advanced		
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.*	
192.168.193.*	192.168.194.*	192.168.195.*	192.168.196.*	

4) Enter the following command in 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 zerotier client
root@OpenWrt:/# zerotier-cli join 8286ac0e47d53bb5	#Join the network

5) Enter if config in the terminal and you can see that there is a new **ztks54inm2** device with an IP address of **172.27.214.213**

6) Install the zerotier client on another device (Ubuntu 18.04 is used as an example here), execute the following command to install. After the installation is completed, you need to restart the computer.

test@ubuntu:~\$ curl -s https://install.zerotier.com | sudo bash

7) After restarting, join the virtual LAN according to the Network ID. You can also see that the IP address assigned by zerotier has been obtained. At this time, the Ubuntu PC and the development board are in the same LAN, and the two can communicate freely.

test@ubuntu:~\$ sudo zerotier-cli join 8286ac0e47d53bb5
test@ubuntu:~\$ ifconfig
ztks54inm2: flags=4163 <up,broadcast,running,multicast> mtu 2800</up,broadcast,running,multicast>
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 (以太网)
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 the 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 ^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) If the computer cannot ping the development board, please log in to the LuCI interface and change the inbound data in the firewall configuration to accept

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。	接口 无线 路由 DHCP/DNS	跳转到密码配置页
常规设置	网络诊断	
防火墙 - 区域设置 防火墙通过在网络接口上创建区域来控制网络流量。	M3文唱 MultiWAN 管理器 服务质量(QoS)	
常规设置		
启用 SYN-flood 防御 🔽		
丢弃无效数据包 🗌		
入站数据接受	✓	
出站数据 接受	~	
转发 拒绝	v	

10) Other common commands of zerotier

root@OpenWrt:/# zerotier-one -d	#Start zerotier client
root@OpenWrt:/# zerotier-cli status	#Get address and service status
root@OpenWrt:/# zerotier-cli join # Network ID	#Join the network
root@OpenWrt:/# zerotier-cli leave # Network ID	#Leave the network
root@OpenWrt:/# zerotier-cli listnetworks	#list networks
OPENWRT_DEVICE_REVISION="v0"	
OPENWRT_RELEASE="OpenWrt 22.03.4 r20123-3	8ccc47687"

9. How to compile Android11 source code

9.1. Download the source code of Android 11

1) First download the Android 11 source code sub-volume compressed package from the

Google network disk

a. Google Drive

K356X_Android11.tar.gz06 🎎	OrangePi							
		19:55 OrangePi	962.1 MB	8+	₹	0-	☆	:
K356X_Android11.tar.gz05 🚢	OrangePi	19:31 OrangePi	4 GB					:
K356X_Android11.tar.gz04 🚢	OrangePi	19:31 OrangePi	4 GB					:
K356X_Android11.tar.gz03 🎎	OrangePi	19:32 OrangePi	4 GB					:
K356X_Android11.tar.gz02 🚢	OrangePi	16:37 OrangePi	4 GB					:
K356X_Android11.tar.gz01 🚢	OrangePi	16:37 OrangePi	4 GB					:
K356X_Android11.tar.gz00 🚢	CrangePi	16:37 OrangePi	4 GB					:
K356X_Android11.tar.gz.md5sum 🚢	CrangePi	16:37 OrangePi	420 个字节					:
	K356K_Android11.tar.gz04 11. K356K_Android11.tar.gz03 11. K356K_Android11.tar.gz02 11. K356K_Android11.tar.gz01 11. K356K_Android11.tar.gz00 11. K356K_Android11.tar.gz00 11. K356K_Android11.tar.gz00 11. K356K_Android11.tar.gz00 11. K356K_Android11.tar.gz00 11.	K356X_Android11.tar.gz05 ±t Firef OrangePi K356X_Android11.tar.gz03 ±t Firef OrangePi K356X_Android11.tar.gz03 ±t Firef OrangePi K356X_Android11.tar.gz02 ±t Firef OrangePi K356X_Android11.tar.gz02 ±t Firef OrangePi K356X_Android11.tar.gz00 ±t Firef OrangePi K356X_Android11.tar.gz00 ±t Firef OrangePi K356X_Android11.tar.gz00 ±t Firef OrangePi	K356X_Android11.tar.gz05 ±t + OrangePi 19:31 OrangePi K356X_Android11.tar.gz03 ±t + OrangePi 19:32 OrangePi K356X_Android11.tar.gz03 ±t + OrangePi 19:32 OrangePi K356X_Android11.tar.gz03 ±t + OrangePi 19:32 OrangePi K356X_Android11.tar.gz02 ±t + OrangePi 16:37 OrangePi K356X_Android11.tar.gz00 ±t + OrangePi 16:37 OrangePi K356X_Android11.tar.gz00 ±t + OrangePi 16:37 OrangePi K356X_Android11.tar.gz00 ±t + OrangePi 16:37 OrangePi K356X_Android11.tar.gz.md5sum ±t + OrangePi 16:37 OrangePi	K356X_Android11.tar.g205 五 ImagePi 19:31 OrangePi 4 GB K356X_Android11.tar.g203 五 ImagePi 19:32 OrangePi 4 GB K356X_Android11.tar.g203 五 ImagePi 19:32 OrangePi 4 GB K356X_Android11.tar.g203 五 ImagePi 19:32 OrangePi 4 GB K356X_Android11.tar.g202 五 ImagePi 16:37 OrangePi 4 GB K356X_Android11.tar.g202 五 ImagePi 16:37 OrangePi 4 GB K356X_Android11.tar.g200 五 ImagePi 16:37 OrangePi 4 GB	K356X_Android11.tar.g205 五 ImagePi 19:31 OrangePi 4 GB K356X_Android11.tar.g203 五 ImagePi 19:32 OrangePi 4 GB K356X_Android11.tar.g203 五 ImagePi 19:32 OrangePi 4 GB K356X_Android11.tar.g203 五 ImagePi 19:32 OrangePi 4 GB K356X_Android11.tar.g202 五 ImagePi 16:37 OrangePi 4 GB K356X_Android11.tar.g202 五 ImagePi 16:37 OrangePi 4 GB K356X_Android11.tar.g201 五 ImagePi 16:37 OrangePi 4 GB K356X_Android11.tar.g200 五 ImagePi 16:37 OrangePi 4 GB K356X_Android11.tar.g200 五 ImagePi 16:37 OrangePi 4 GB K356X_Android11.tar.g200 五 ImagePi 16:37 OrangePi 4 GB	K356X_Android11.tar.gz05 五 ImagePi 19:31 OrangePi 4 GB K356X_Android11.tar.gz03 五 ImagePi 19:32 OrangePi 4 GB K356X_Android11.tar.gz03 五 ImagePi 19:32 OrangePi 4 GB K356X_Android11.tar.gz03 五 ImagePi 19:32 OrangePi 4 GB K356X_Android11.tar.gz02 五 ImagePi 19:32 OrangePi 4 GB K356X_Android11.tar.gz02 五 ImagePi 16:37 OrangePi 4 GB K356X_Android11.tar.gz00 五 ImagePi 16:37 OrangePi 4 GB K356X_Android11.tar.gz00 五 ImagePi 16:37 OrangePi 4 GB K356X_Android11.tar.gz00 五 ImagePi 16:37 OrangePi 4 GB K356X_Android11.tar.gz.md5sum 五 ImagePi 16:37 OrangePi 4 GB	K356X_Android11.tar.g205 エム GrangePi 19:31 OrangePi 4 GB K356X_Android11.tar.g203 エム GrangePi 19:32 OrangePi 4 GB K356X_Android11.tar.g203 エム GrangePi 19:32 OrangePi 4 GB K356X_Android11.tar.g203 エム GrangePi 19:32 OrangePi 4 GB K356X_Android11.tar.g202 エム GrangePi 16:37 OrangePi 4 GB K356X_Android11.tar.g202 エム GrangePi 16:37 OrangePi 4 GB K356X_Android11.tar.g200 エム GrangePi 16:37 OrangePi 4 GB	K356X_Android11.tar.g205 エム GrangePi 19:31 OrangePi 4 GB K356X_Android11.tar.g203 エム GrangePi 19:32 OrangePi 4 GB K356X_Android11.tar.g203 エム GrangePi 19:32 OrangePi 4 GB K356X_Android11.tar.g203 エム GrangePi 19:32 OrangePi 4 GB K356X_Android11.tar.g202 エム GrangePi 16:37 OrangePi 4 GB K356X_Android11.tar.g202 エム GrangePi 16:37 OrangePi 4 GB K356X_Android11.tar.g200 エム GrangePi 16:37 OrangePi 4 GB

2) After downloading the sub-volume compression package of the Android 11 source code, please check whether the MD5 checksum is correct, if not, please download the source code again

test@test:~\$ md5sum -c RK356X_Android11.tar.gz.md5sum	
RK356X_Android11.tar.gz00: OK	
RK356X_Android11.tar.gz01: OK	
RK356X_Android11.tar.gz02: OK	
RK356X_Android11.tar.gz03: OK	
RK356X_Android11.tar.gz04: OK	
RK356X_Android11.tar.gz05: OK	
RK356X_Android11.tar.gz06: OK	

3) Then you need to merge multiple compressed files for decompression

```
test@test:~$ cat RK356X_Android11.tar.gz0* | tar -xvzf -
```

9.2. Compile the source code of Android 11

1) First install the software packages required to compile the Android11 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 libncurses5 \ lib32ncurses5-dev x11proto-core-dev libx11-dev lib32z1-dev ccache \ libgl1-mesa-dev libxml2-utils xsltproc unzip liblz4-tool 2) There is a build.sh compilation script in the source code, and the compilation parameters are as follows

- a. -U: Compile uboot
- b. -K: Compile kernel
- c. -A: compile android
- d. -u: Package and generate update.img and update_spi_nvme.img
- e. -o: Compile OTA package
- f. -d: Specify kernel dts
- 3) Compile uboot, kernel, android and package them into update.img
 - a. The command to compile and support HDMI 4K display mirroring (LCD is turned off by default) is as follows:

test@test:~/ RK356X_Android11 test@test:~/ RK356X_Android11\$ export BOARD=orangepi3b test@test:~/ RK356X_Android11\$ source build/envsetup.sh test@test:~/ RK356X_Android11\$ lunch rk3566_r-userdebug test@test:~/ RK356X_Android11\$./build.sh -AUKu

b. The command to compile and support LCD display mirroring (HDMI is disabled by default) is as follows:

test@test:~\$ cd RK356X_Android11
test@test:~/ RK356X_Android11\$ export BOARD=orangepi3b
test@test:~/ RK356X_Android11\$ export DUAL_LCD=true
test@test:~/ RK356X_Android11\$ source build/envsetup.sh
test@test:~/ RK356X_Android11\$ lunch rk3566_r-userdebug
test@test:~/ RK356X_Android11\$./build.sh -AUKu

4) After the compilation is complete, the following information will be printed

********rkImageMaker ver 2.1*******

Generating new image, please wait...

storage is spinor

Writing head info...

Writing boot file...

Writing firmware...

Generating MD5 data... MD5 data generated successfully! New image generated successfully! *******rkImageMaker ver 2.1****** Merging storage firmware, please wait... storage count = 2 adding spinor_update.img...ok adding pcie_update.img...ok Merging firmware success. Making update_spi_nvme.img OK. Make update image ok! /wspace3/RK3566/RK356X_Android11

5) The final image file will be placed in the **rockdev/Image-rk3566_r**/ directory. Among them, **update.img** is the boot image that supports TF card and eMMC, and **update spi nvme.img** is the boot image of NVME SSD

test@test:~/RK356X_Android11\$ **cd rockdev/Image-rk3566_r** test@test:~/RK356X_Android11/rockdev/Image-rk3566_r \$ **ls update*** update.img update_spi_nvme.img

10. Compilation method of OpenWRT source code

10.1. Download OpenWRT source code

1) First execute the following command to download the source 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 main

2) After the OpenWRT code is downloaded, it will contain the following files and folders test@test:~/openwrt\$ ls
 BSDmakefile Config.in include Makefile README.md scripts toolchain Config feeds.conf.default LICENSE package rules.mk target tools

10.2. Compile OpenWRT source code

1) First install the following dependent software (currently only tested on Ubuntu22.04, you need to install the following software. If you compile on other versions of the system, please install the dependent software yourself according to the error message)

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 to download dependency packages

test@test:~/openwrt\$./scripts/feeds update -a test@test:~/openwrt\$./scripts/feeds install -a

3) Then choose to use the configuration file of OrangePi 3B test@test:~/openwrt\$ cp configs/orangepi-3b-rk3566_defconfig .config

4) Then execute the following command to make the configuration take effect 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 is completed, 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-3b-ext4-sysupgrade.img.gz
- ----- openwrt-rockchip-armv8-xunlong_orangepi-3b.manifest
- openwrt-rockchip-armv8-xunlong_orangepi-3b-squashfs-sysupgrade.img.gz
- packages
- profiles.json
- ------ sha256sums
- └─── version.buildinfo

1 directory, 9 files

11. Appendix

11. 1. User Manual Update History

Version	Date	Update Notes
v1.0	2023-08-17	initial version
v1.1	2023-08-24	1. Compilation method of Android11 source code
		2. Android11: The method of USB OTG mode switching
		3. Android11: The method of using the data cable to connect to adb
		debugging
v1.2	2023-08-25	1. Added instructions for purchasing PCIe NVMe SSDs
v1.3	2023-09-05	1. Instructions for using the Orange Pi OS Arch system
v1.4	2023-09-21	1. Linux: How to create a WIFI hotspot through create_ap
v1.5	2023-11-08	1. How to burn Orange Pi OS (OH) image to TF card
		2. How to burn Orange Pi OS (OH) image into eMMC
		3. Orange Pi OS OH system usage instructions

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		4. Added instructions for Linux 6.6 system
v1.6	2023-11-24	1. How to use wiringOP hardware PWM
		2. Instructions for using the OpenWRT system
		3. How to compile OpenWRT source code
v1.7	2024-09-24	1. v2.1 Hardware Version Manual Image Update

11.2. Image Update History

Date	Update Notes
2023-08-17	Orangepi3b_1.0.0_ubuntu_focal_server_linux5.10.160.7z
	Orangepi3b_1.0.0_ubuntu_jammy_server_linux5.10.160.7z
	Orangepi3b_1.0.0_debian_bullseye_server_linux5.10.160.7z
	Orangepi3b_1.0.0_debian_bookworm_server_linux5.10.160.7z
	Orangepi3b_1.0.0_ubuntu_focal_desktop_xfce_linux5.10.160.7z
	Orangepi3b_1.0.0_ubuntu_jammy_desktop_xfce_linux5.10.160.7z
	Orangepi3b_1.0.0_debian_bullseye_desktop_xfce_linux5.10.160.7z
	Orangepi3b_1.0.0_debian_bookworm_desktop_xfce_linux5.10.160.7z
	OrangePi3B_RK3566_Android11_v1.0.0.tar.gz
	OrangePi3B_RK3566_Android11_lcd_v1.0.0.tar.gz
	OrangePi3B_RK3566_Android11_spi-nvme_v1.0.0.tar.gz
	OrangePi3B_RK3566_Android11_lcd_spi-nvme_v1.0.0.tar.gz
	* initial version
2023-08-23	Opios-arch-aarch64-xfce-opi3b-23.08-linux5.10.160.img.xz
	* initial version
2023-08-24	OrangePi3B_RK3566_Android11_v1.0.1.tar.gz
	OrangePi3B_RK3566_Android11_lcd_v1.0.1.tar.gz
	OrangePi3B_RK3566_Android11_spi-nvme_v1.0.1.tar.gz
	OrangePi3B_RK3566_Android11_lcd_spi-nvme_v1.0.1.tar.gz
	* Support USB OTG mode switching function
2023-08-25	Opios-arch-aarch64-xfce-opi3b-23.08.1-linux5.10.160.img.xz

	* Solve the problem that the app store cannot be used
2023-09-21	Orangepi3b_1.0.2_ubuntu_focal_server_linux5.10.160.7z
	Orangepi3b_1.0.2_ubuntu_jammy_server_linux5.10.160.7z
	Orangepi3b_1.0.2_debian_bullseye_server_linux5.10.160.7z
	Orangepi3b_1.0.2_debian_bookworm_server_linux5.10.160.7z
	Orangepi3b_1.0.2_ubuntu_focal_desktop_xfce_linux5.10.160.7z
	Orangepi3b_1.0.2_ubuntu_jammy_desktop_xfce_linux5.10.160.7z
	Orangepi3b_1.0.2_debian_bullseye_desktop_xfce_linux5.10.160.7z
	Orangepi3b_1.0.2_debian_bookworm_desktop_xfce_linux5.10.160.7z
	* Solve the problem of CPU frequency being limited to 1.2GHz
	* Add rk356x-uart2-m0.dtbo
2023-11-06	Opios-openharmony-4.0-beta1-aarch64-opi3b-23.11-linux5.10.img.tar.gz
	* initial version
2023-11-08	Orangepi3b_1.0.0_ubuntu_jammy_desktop_xfce_linux6.6.0-rc50.7z
	Orangepi3b_1.0.0_debian_bullseye_desktop_xfce_linux6.6.0-rc5.7z
	Orangepi3b_1.0.0_debian_bookworm_desktop_xfce_linux6.6.0-rc5.7z
	* initial version
2023-11-08	Opios-oh-4.0-beta1-aarch64-opi3b-23.11.1-linux5.10.img.tar.gz
	* Support TF card boot
2023-11-24	openwrt-aarch64-opi3b-23.05-linux6.1.62-ext4.img.gz
	* initial version

FCC WARNING

This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) this device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

Any changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

NOTE: This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation.

If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

-- Reorient or relocate the receiving antenna.

-- Increase the separation between the equipment and receiver.

-- Connect the equipment into an outlet on a circuit different

from that to which the receiver is connected.

-- Consult the dealer or an experienced radio/TV technician for help.

To maintain compliance with FCC's RF Exposure guidelines, This equipment should be installed and operated with minimum distance between 20cm the radiator your body: Use only the supplied antenna.