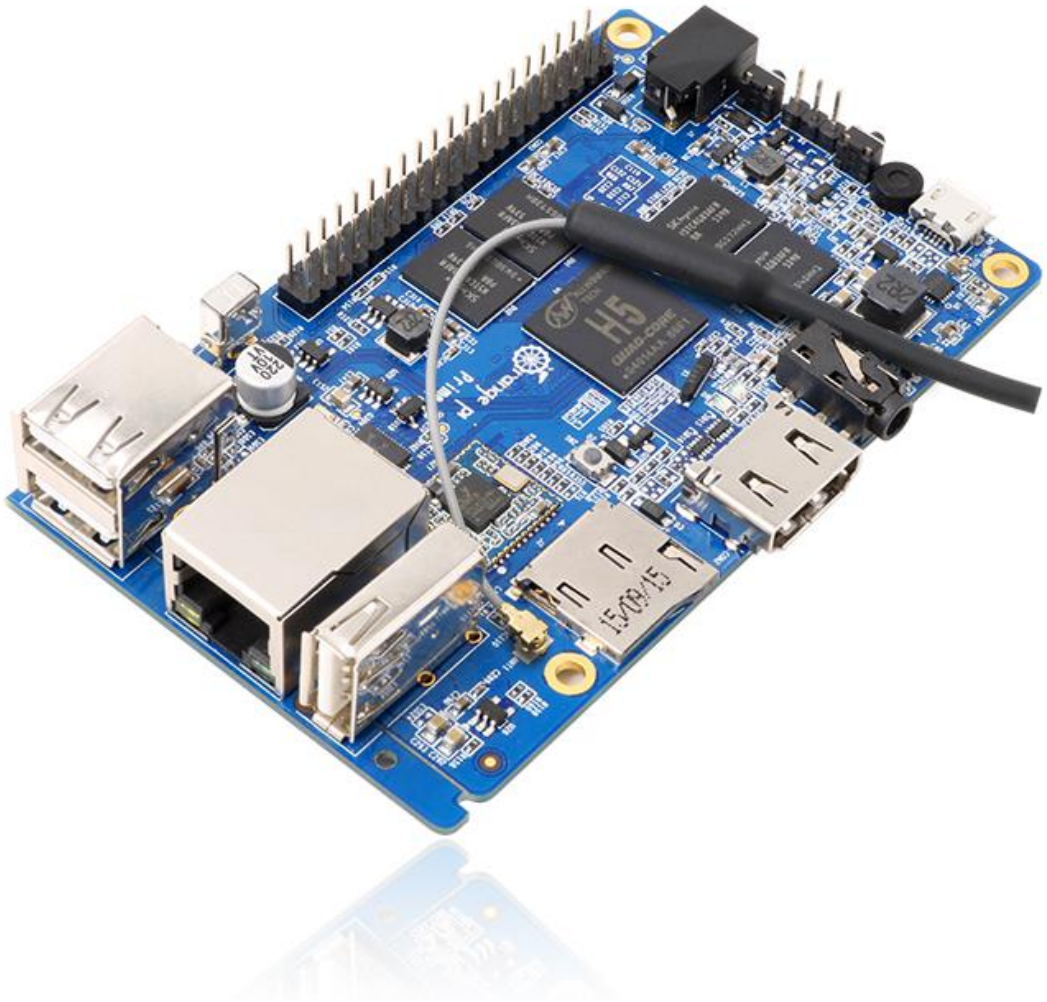
Orange Pi Prime
User Manual



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I. Orange Pi Introduction

1. What is Orange Pi Prime?

It's an open-source single-board computer. It can run Android 5.1, Ubuntu, Debian, Rasberry Pi Image, it uses the AllWinner H5 SoC, and has 2GB DDR3 SDRAM.

2. What can I do with Orange Pi Prime?

You can use it to build…

- A computer
- A wireless server
- Games
- Music and sounds
- HD video
- A speaker
- Android
- Scratch
- .....

Pretty much anything else, because Orange Pi Prime is open source

3. Whom is it for?

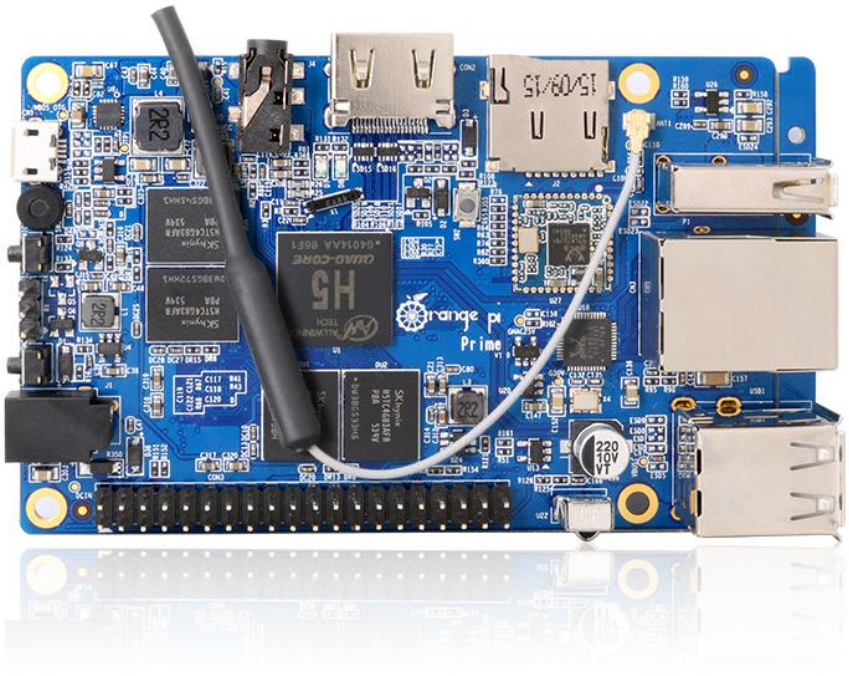
Orange Pi Prime is for anyone who wants to create with technology– not just consuming. It's a simple, fun, useful tool and you can use it to take control of the world around you.

4. Hardware specification of Orange Pi Prime

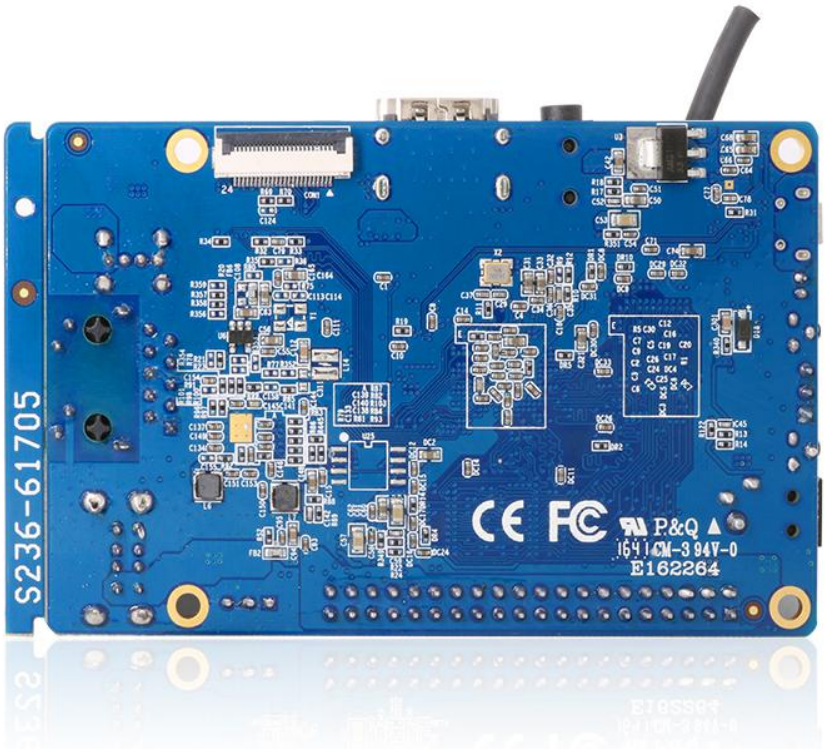
Hardware specification	
CPU	H5 Quad-core Cortex-A53 64bit
GPU	Mali450 GPU including dual Geometry Processors(GP) and quad Pixel Processors Supports OpenGL ES 2.0 and OpenVG1.1 3000Mpix/sec and 163Mtri/sec Full scene over-sampled 4X anti-aliasing engine with

	no additional bandwidth usage
Memory (SDRAM)	2GB DDR3 (shared with GPU)
On-board Storage	TF card (Max. 32GB)/NOR flash(2MB)
On-board Network	1000/100M Ethernet RJ45
Onboard WIFI+BT	8723BS, IEEE 802.11 b/g/n,BT4.0
Video Input	A CSI input connector Camera： Supports 8-bit YUV422 CMOS sensor interface Supports CCIR656 protocol for NTSC and PAL Supports SM pixel camera sensor Supports video capture solution up to 1080p@30fps
Audio Input	MIC
Video Outputs	Supports HDMI output with HDCP Supports HDMI CEC Supports HDMI 30 function
Audio Output	3.5 mm Jack, HDMI
Power Source	DC input can supply power
USB 2.0 Ports	Three USB 2.0 Host, one USB 2.0 OTG
Low-level peripherals	40 Pins Header,compatible with Raspberry Pi B+
GPIO(1x3) pin	UART, ground.
LED	Power led & Status led
Buttons	Power Button(SW2), Reset Button (SW4)
Key	IR Input, Power, Reset
Supported OS	Android Lubuntu, Debian, Raspberry Pi Image
Interface definition	
Product size	98mm × 60mm
Weight	75g
Orange Pi™ is a trademark of the Shenzhen Xunlong Software CO., Limited	

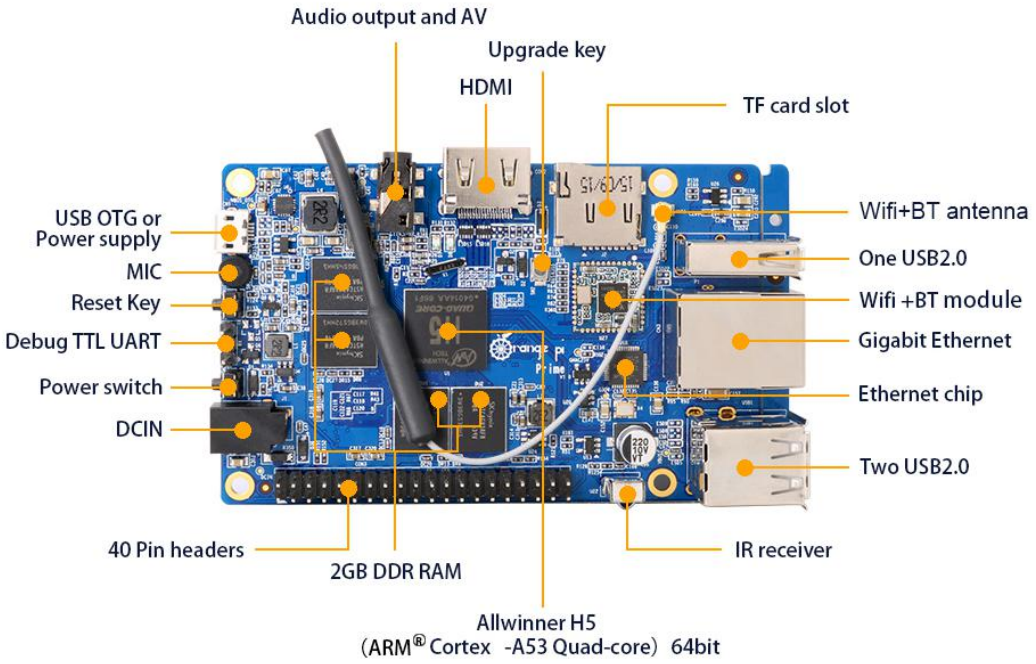
Top view of Orange Pi Prime

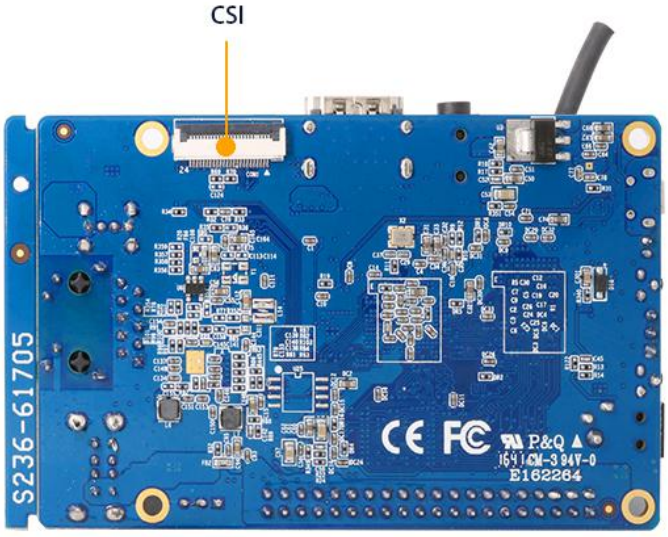


Bottom view of Orange Pi Prime



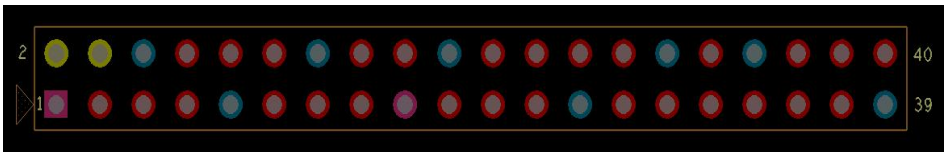
Interface instructions of Orange Pi Prime





5. GPIO Specifications

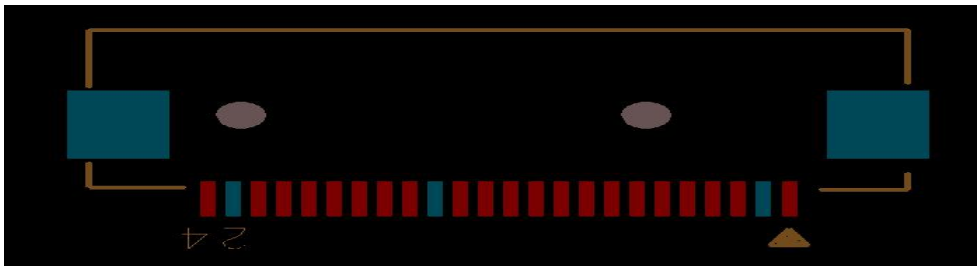
A 40-pin GPIO interface on the Orange Pi Prime is the same as Model A and Model B of Raspberry Pi. The picture below is GPIO pin define of Orange Pi Prime.



OrangePi(H5)		
CON3-P01	VCC-3V3	
CON3-P02	VCC-5V	
CON3-P03	TWI0-SDA	PA12
CON3-P04	VCC-5V	
CON3-P05	TWI0-SCK	PA11
CON3-P06	GND	
CON3-P07	PWM1	PA6
CON3-P08	UART3_TX	PA13
CON3-P09	GND	
CON3-P10	UART3_RX	PA14
CON3-P11	UART2_RX	PA1
CON3-P12	PD14	PD14
CON3-P13	UART2_TX	PA2
CON3-P14	GND	
CON3-P15	UART2_CTS	PA3
CON3-P16	PC4	PC4
CON3-P17	VCC-3V3	
CON3-P18	CAN_RX	PC7
CON3-P19	SPI0_MOSI	PC0
CON3-P20	GND	
CON3-P21	SPI0_MISO	PC1
CON3-P22	UART2_RTS	PA2
CON3-P23	SPI0_CLK	Prime
CON3-P24	SPI0_CS0	PC3
CON3-P25	GND	
CON3-P26	PA21	PA21
CON3-P27	TWI1-SDA	PA19
CON3-P28	TWI1-SCK	PA18
CON3-P29	PA7	PA7
CON3-P30	GND	
CON3-P31	PA8	PA8
CON3-P32	UART1_RTS	PG8
CON3-P33	PA9	PA9
CON3-P34	GND	
CON3-P35	PA10	PA10
CON3-P36	UART1_CTS	PG9
CON3-P37	PA20	PA20
CON3-P38	UART1_TX	PG6
CON3-P39	GND	
CON3-P40	UART1_RX	PG7

6. Specification of CSI Camera Connector

The CSI Camera Connector is a 24-pin FPC connector which can connect external camera module with proper signal pin mappings. The pin of CIS connector can be defined as follows. The connector marked with "CON 1" on the Orange Pi Prime is camera connector.



Orange Pi Prime-CSI

CON1-P01	NC	
CON1-P02	GND	
CON1-P03	TWI2-SDA	PE13
CON1-P04	VCC-CSI	
CON1-P05	TWI2-SCK	PE12
CON1-P06	CSI-RESET#	PE15
CON1-P07	CSI-VSYNC	PE3
CON1-P08	CSI-STBY-EN	PE15
CON1-P09	CSI-HSYNC	PE2
CON1-P10	VDD1V8-CSI	
CON1-P11	VCC-CSI	
CON1-P12	CSI-D7	PE11
CON1-P13	CSI-MCLK	PE1
CON1-P14	CSI-D6	PE10
CON1-P15	GND	
CON1-P16	CSI-D5	PE9
CON1-P17	CSI-PCLK	PE0
CON1-P18	CSI-D4	PE8
CON1-P19	CSI-D0	PE4
CON1-P20	CSI-D3	PE7
CON1-P21	CSI-D1	PE5
CON1-P22	CSI-D2	PE6
CON1-P23	GND	
CON1-P24	AFVCC-CSI	

II. Using Method Introduction

Follow these steps, you can configure and run your Orange Pi in a very short period of time. Boot your Orange Pi need to complete the following steps.

1. Step 1: Prepare Accessories Needed

You need at least some accessories like the following if it is your first time to use the Orange Pi.

No.	Items	Requirements and Instructions
1	TF card	8GB min.; class 10. Branded TF cards would be reference which are much more reliable.
2	HDMI to HDMI cable or HDMI to DVI cable	HDMI to HDMI cable is used to connect HD TV or HD monitor
3	AV cable	If your screen does not have HDMI port, then you could use AV cable to connect it.
4	Keyboard and mouse	You could use keyboard and mouse with USB por; keyboard and mouse are high-power, so a USB concentrator is required.
5	Ethernet cable/(Optional)	Network is optional, it makes more convenient to mount and upgrade software in your Orange Pi.
6	DC power adapter	5V/2V min. high qualified power adapter
7	Audio cable (Optional)	You can select an audio cable with 3.5mm jack to feel stereo audio.


HDMI to HDMI cable


HDMI to DVI cable


AV cable

TF card

DC power adapter

2. Step 2: Prepare a TF Card or EMMC Image

In order to use Orange Pi normally, you must install the operating system into TF card first.

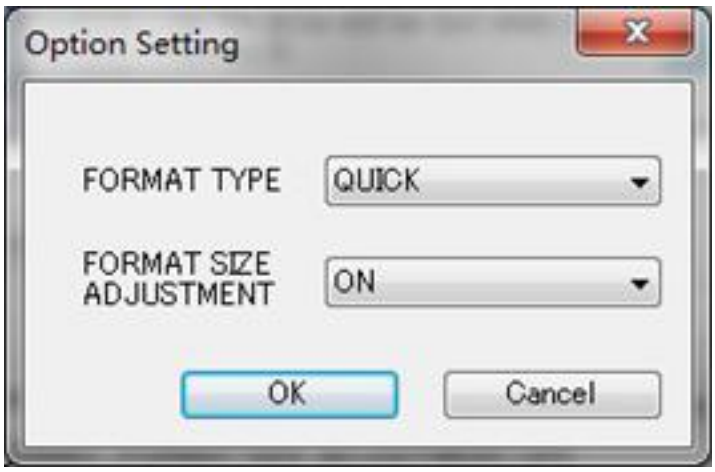
1) Write Linux into TF Card Based on Windows Platform

a. Inserting the TF card into the computer, the capacity of the card must be bigger than the operating system, usually requires 8GB or bigger.
b. Formatting the TF card.

i Download tools for formatting TF card, such as TF Formatter, it could be downloaded from:
https://www.sdcard.org/downloads/formatter_4/eula_windows/

ii Unzip the downloaded files, and run *setup.exe*

iii In the *options settings* select the "*form*at" button for quick formatting. "*Format size adjustment*" select "(ON)"



iv Make sure the inserted TF card disk are in accordance with the chosen disk.

v Click the "*Format*" button.

c. Download the operating system image file from the download page, the page address is as following:

http://www.orangepi.org/downloadresources

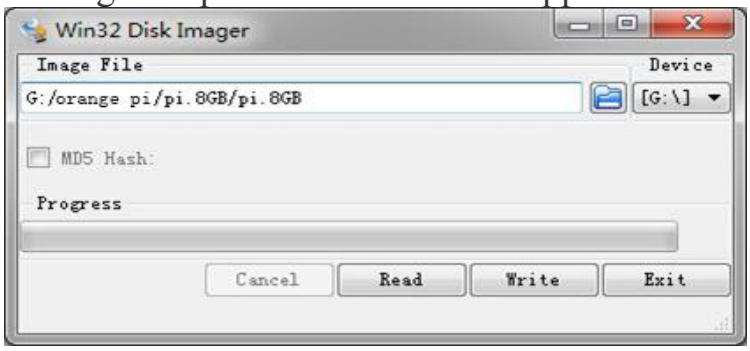
d. Unzip the downloaded file (in addition to the Android system, this method can be used to burn to write, the Android system need another burn, the following will introduce)

e. Right click to download the file, select "*Unzip file*" to write image to TF card

i Download tools to write image,such as *Win32 Diskimager,* here is the download page:

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

ii Select the image file path that has been unzipped.



iii Click "*Write*" button and wait for the image to write.

iv After the image is written, click "*Exit*" button.

2) Write Linux into TF card based on Linux platform?

a. Inserting the TF card into the computer, the capacity of the card must be larger than the operating system image, usually requires 8GB or greater capacity.

b. Formatting the TF card.

i Run ***fdisk –l*** order to make sure TF disk.

ii Run ***umount /dev/sdxx*** to uninstall all partitions of TF Card.

iii Run ***sudo fdisk /dev/sdx*** order. Use ***o*** command to delete all partitions of TF Card, and then us ***n*** order to add a new partition, finally use ***w*** command to save and exit.

iv Run ***sudo mkfs.vfat /dev/sdx1*** command to format the TF card partition set up last step to FAT32 form(according to your TF card disk to replace***x***). Or you could skip this step since command in Linux will format TF card automatic.

c. Download the OS image from download page

http://www.orangepi.org/`downloadresources

d. Unzip and right click the downloaded file, select " *Unzip file*"

e. Write image to TF card

i Run **sudo fdisk –l** order to make sure the TF card disk

ii make sure the image file **hash key** is the same as download page mention(optional). It will output ***sha1sum [path]/[imagename]***, which should be same as the image paye *"SHA-1"*

iii Run ***umount /dev/sdxx*** order to uninstall all partitions in TF Card

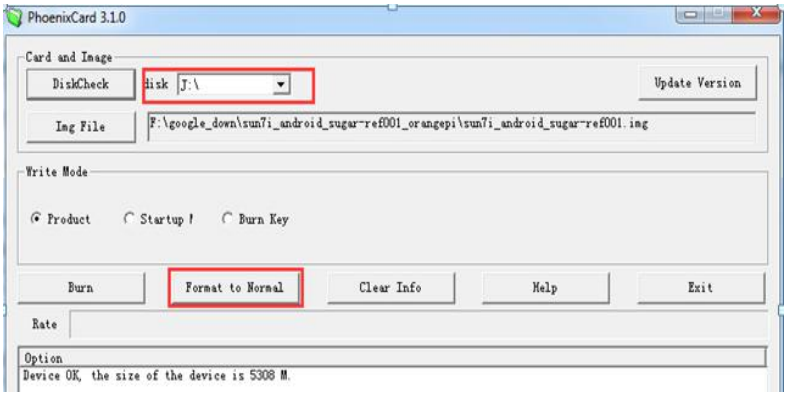
iv Run ***sudo dd bs=4M if=[path]/[imagename] of=/dev/sdx*** to write down image file. Wait for the image to write. If it cannot work at 4M, then replace a 1M which takes more time. You can run ***sudo pkill –USR1 –n –x dd*** order to monitoring procedure.

3) Use PhoenixCard tool to write Android image into TF card

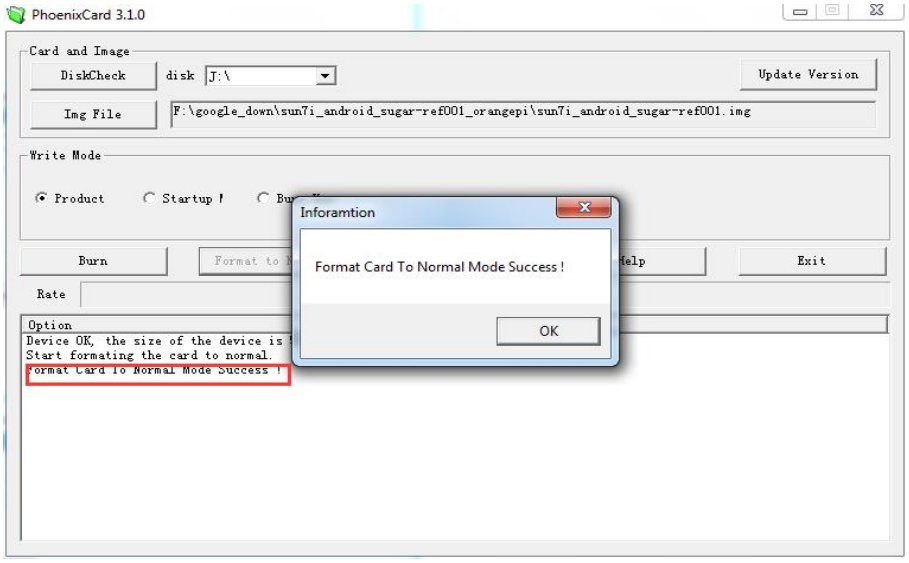
It is impossible for Android image to be written into TF card by using *dd* command under Linux or using *Win32 Diskimager* under Windows. Here PhoenixCard tool is applicable for Android image writing.

a. Download the Android OS image and **PhoenixCard** tool.
Download **PhoenixCard** from here:
https://drive.google.com/file/d/0B_VynIqhAcB7NTg2UkRDdHRWX2s/edit?usp=sharing
Download Android OS image from here:
http://www.orangepi.org/downloadresources/

b. Format the TF card

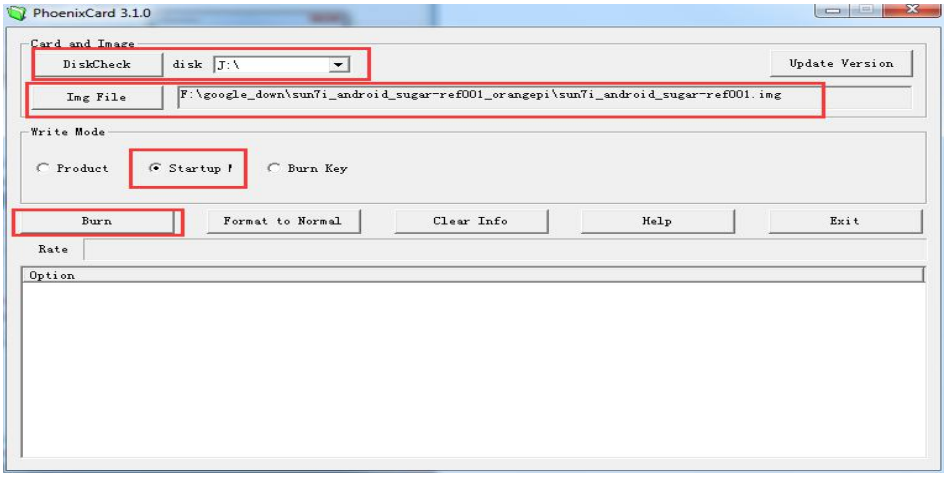


c. Please make sure the inserted TF card is in accordance with the chosen TF card, click "*recovery*" button and then start TF card formatting.

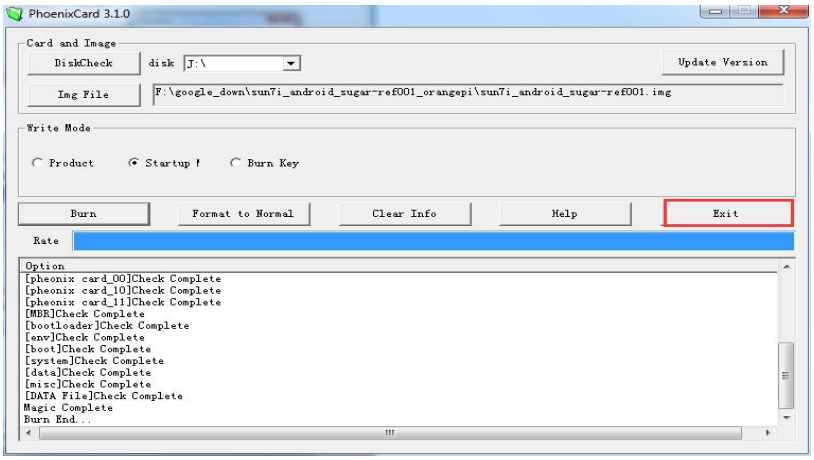


d. Click "*OK*" button after successfully formatted the TF card to normal.

e. Burn the Android OS image into your TF card. Please pay attention to the following with red marks.



f. Click "*Burn*" button for writing to TF card and wait for it finish



g. Click "*Exit*" button after burn Android image to TF card successfully.

4) Write Armbian Image into TF Card

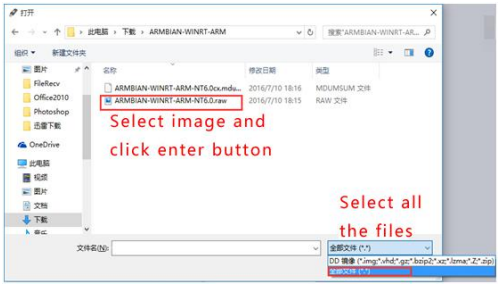
a. Insert TF card into computer, please note that the TF card capacity must bigger than the operating system image, usually need to be 8GB or bigger.

b. Download the OS image file from the download page:
http://www.armbian.com/download/

c. Write the image into TF card.

i Download image writing tool such as *Rufus*, the download page: https://rufus.akeo.ie/

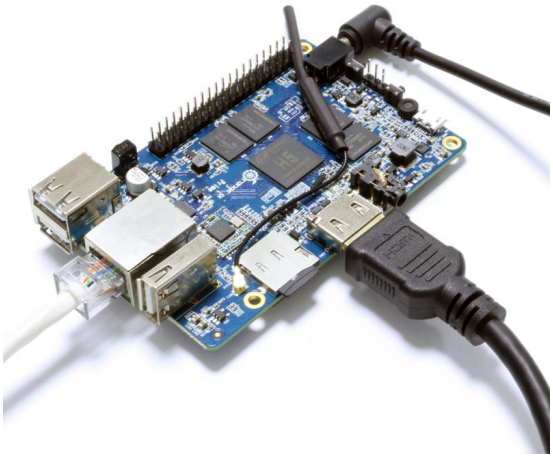
ii Select the image file path that has been unzipped



iii Click "*start*" button and wait for the image to write.
iv After the image is written, click "*close*" button

3. Step 3: Boot your Orange Pi

1) Hardware Connection Sketch Map



Orange Pi Prime runs on Android 5.1 system

Orange Pi Prime runs on Debian system

2) Details of Booting Steps

a. Insert TF card with written image in to TF card slot on Orange Pi.
b. You could use HDMI cable to connect your Orange Pi to HDMI TV or monitor.

You could also use DVI interface to connect TV. If you don't have both HDMI and DVI port, then you could use MIPS to connect LCD.

c. Insert USB keyboard and mouse into USB ports
d. It is the network port in the middle of 3USB interfaces, which you can access Orange Pi to the wired network.
e. It is the power input interface on the right side for connecting a 5V and at least 2A or bigger than 2A power adapter. Avoid using smaller power GSM mobile phone charger, it is unable to output 2A even if it marked "2A 5V".

The Orange Pi will boot in a few minutes If the above steps are successful. There will be graphical interface in he monitor. It may take a long time to start the first time, please wait patiently. The next time will boot very fast.

4. Step 4: Turn off your Orange Pi Correctly

- You can use the shutdown button on the interface to safety close the Orange Pi.
- You can also close the system by entering commands in the shell:

sudo halt
or
sudo shutdown –h

It will be safety to turn off the Orange Pi. If directly use the power button to shut down the system may damage the file system on TF Card. After the system is closed, the power can be cut off by more than 5 seconds' press.

5. Other configuration

1) Connect to the wired network

If Orange pi has already connected to wire cable before powered on, then the system would get the IP address automatically. If it has not

connected to wire cable or other problem of network, then it will fail to get the IP address. The system would take some time to load but it has no influence for the board running.

It should be green LED light on and yellow LED flash. You need to make sure the image you wrote is accordingly to the board you use, since there are some board that is Megabit and some are Gigabit which could not be used mixed .

Megabit is using internal phy, here is the configuration:

2 indicates internal phy

```
[gmac0]
gmac_used           = 2
;gmac_rxd3           = port:PD00<2><default><3><default>
;gmac_rxd2           = port:PD01<2><default><3><default>
;gmac_rxd1           = port:PD02<2><default><3><default>
```

Gigabit is using external phy, here is the configuration:

1 indicates external phy

```
[gmac0]
gmac_used           = 1
gmac_rxd3           = port:PD00<2><default><3><default>
gmac_rxd2           = port:PD01<2><default><3><default>
gmac_rxd1           = port:PD02<2><default><3><default>
gmac_rxd0           = port:PD03<2><default><3><default>
gmac_rxclk          = port:PD04<2><default><3><default>
gmac_rxdv           = port:PD05<2><default><3><default>
```

It is defaulted configured, you could take that as reference.

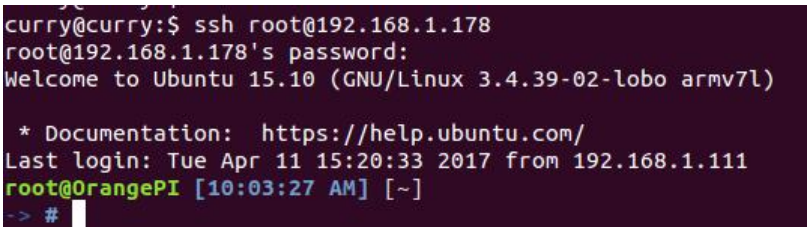
2) Login via vnc and ssh

If there is no condition for connecting HDMI, you could enter the system via vnc or ssh remote login.

- Login via serial port and install ssh
  apt-get install ssh
- Modify ssh configuration file /etc/ssh/sshd_config

```
# Logging
SyslogFacility AUTH
LogLevel INFO

# Authentication:
LoginGraceTime 120
PermitRootLogin yes
StrictModes yes

RSAAuthentication yes
PubkeyAuthentication yes
#AuthorizedKeysFile     %h/.ssh/autho

# Don't read the user's ~/.rhosts and
IgnoreRhosts yes
# For this to work you will also need
RhostsRSAAuthentication no
# similar for protocol version 2
HostbasedAuthentication no
# Uncomment if you don't trust ~/.ssh
#IgnoreUserKnownHosts yes

# To enable empty passwords, change t
PermitEmptyPasswords no

# Change to yes to enable challenge-r
# some PAM modules and threads)
ChallengeResponseAuthentication no
```

- Check the IP with ifconfig, login via ssh of root user



3) HDMI or 3.5mm Sound Output

a. The sound was default to output via HDMI on image, it could check and change via alsamixer.
   ls /etc/asound.conf
   card indicates card number, device indicates device number.
   aplay -l it could check the system to load the sound card number and details
   cat /proc/asound/cards it also could check the sound card and details
   It could be used after use alsamixer to change the sound card.
   alsactl store -f /var/lib/alsa/asound.state used for saving modified parameters
b. Switch to graphical interface
   Open smplayer,select preferences on options, select alsa(audiocodec).
   It could only open one of HDMI or audiocodec in one time.
c. How to use mic sound recording
   arecord -d 5 -f cd -t wav 123.wav
   After recording, use the following to play
   aplay 123.wav

6. Universal Software Configuration

1) Default Account Changing

The default log in account is orangepi. In order to secure, it is recommended to modify the default orangepi accounts to your own account, for example Zhangsan. Steps are as follows:

a. Use root account to login Orange Pi(please note that do not login with the account of orangepi)
b. $ usermod -l zhangsan orangepi Change orangepi account into Zhangsan

c. $ groupmod -n zhangsan orangepi Change group

```
@orangepi:~$ groupmod -n zhangsan orangepi
```

d. $ mv /home/ornagepi /home/zhangsan Change directory of original orangepi

```
@orangepi:~$ mv /home/orangepi /home/zhangsan
```

e. $ usermod -d /home/orangepi orangepi Set this directory to orangepi user's home directory

```
@orangepi:~$ usermod -d /home/zhangsan zhangsan
```

f. $ cat /etc/passwd It should be shown as below:

```
pulse:x:112:121:PulseAudio daemon,,,:/var/run/pulse:/bin/false
zhangsan:x:1001:1001:orangepi,,,,:/home/zhangsan:/bin/bash
```

After the modification of the above iterms, it can be used the new account Zhangsan to land.

2) U Disk Automatic Mounted Configuration

a. sudo apt-get install usbmount

b. sudo vim /etc/udev/rules.d/automount.rules

```
ACTION=="add",KERNEL=="sdb*", RUN+="/usr/bin/pmount --sync
--umask 000 %k"
ACTION=="remove", KERNEL=="sdb*", RUN+="/usr/bin/pumount %k"
ACTION=="add",KERNEL=="sdc*", RUN+="/usr/bin/pmount --sync
--umask 000 %k"
ACTION=="remove", KERNEL=="sdc*", RUN+="/usr/bin/pumount %k"
```

c. udevadm control –reload-rules

It could refer to this:

http://unix.stackexchange.com/questions/134797/how-to-automatically-mount-an-usb-device-on-plugin-time-on-an-already-running-sy

3) System Source Configuration

Take Ubuntu as an example:

a. Open the source file

$ sudo vi /etc/apt/sources.list

```
root@curry:/home/curry# vim /etc/apt/sources.list
root@curry:/home/curry#
```

b. Edit source file

Replace the source file with your favorite source. Take an example of Ubuntu 16.04 on Zhonkeda source:

deb http://mirrors.ustc.edu.cn/ubuntu-ports/ xenial main multiverse restricted universe

deb http://mirrors.ustc.edu.cn/ubuntu-ports/ xenial-backports main multiverse restricted universe

deb http://mirrors.ustc.edu.cn/ubuntu-ports/ xenial-proposed main multiverse restricted universe

deb http://mirrors.ustc.edu.cn/ubuntu-ports/ xenial-security main multiverse restricted universe

deb http://mirrors.ustc.edu.cn/ubuntu-ports/ xenial-updates main multiverse restricted universe

deb-src http://mirrors.ustc.edu.cn/ubuntu-ports/ xenial main multiverse restricted universe

deb-src http://mirrors.ustc.edu.cn/ubuntu-ports/ xenial-backports main multiverse restricted universe

deb-src http://mirrors.ustc.edu.cn/ubuntu-ports/ xenial-proposed main multiverse restricted universe

deb-src http://mirrors.ustc.edu.cn/ubuntu-ports/ xenial-security main multiverse restricted universe

deb-src http://mirrors.ustc.edu.cn/ubuntu-ports/ xenial-updates main multiverse restricted universe

Note: xenial is the version of the code name in this source, if the other version of Ubuntu needs to replace the corresponding version code which can be found on the internet.

4) Remote desktop installation

There are a lot of software, such as VNG, XRDP, X2GO, etc. For X2GO, it has more functions, and desktop color restore is very good which does not need too much configuration. And XRDP is much more safety than VNC.

a. $sudo apt-get install tightvncserver Install VNC

```
apt-get install tightvncserver
```

b. vncpassw Set the password: do not execute this command but executing vncserver directly. It will prompt you to enter the password twice, when prompted whether can be read only to select the *N*.

```
root@curry:/home/curry/tools/minidlna/minidlna-1.1.0# vncpasswd
Using password file /root/.vnc/passwd
VNC directory /root/.vnc does not exist, creating.
Password:
Verify:
```

c. Open one or more of desktops by vncserver or vncserver:1(vncserver:2)… you can also transfer more parameters through the full command as below:

vncserver :1 -geometry 1024x768 -depth 16 -pixelformat rgb565

(*Note:* If it prompted you that cannot find the file or other error when installing, please run sudo apt-get update to update the software source and try installing again.)

5) NAS and DLAN Configuration

a. NAS：

There are many files could be reference from Internet, for example: http://www.geekfan.net/5003/, it detailed descriptions on the operation and the mounted of U disk is very useful.

b. DLNA:

Mainly through the minidlna software to achieve the sharing of media resources within the LAN, such as sharing video, music, etc.. The installation steps are as follows:

i sudo apt-get minidlna

ii Execute the following command to modify the configuration file:

sudo nano /etc/minidlna.conf

Note: you can also use other text editor to modify.

iii Add the following:

media_dir=A,/nas, path: /DLNA/Music

media_dir=V,/nas, path: /DLNA/Video

media_dir=P,/nas, path: DLNA/Picture

db_dir=/nas, path: /DLNA/log

db_dir=/nas, path: /DLNA/db

ctrl +o and enter, ctrl +x to save and exit.

iv Established above folders respectively, noted that path consistency and assigned to read and write permissions.

$ sudo chmod 755 /nas path: /DLNA/Music

v Re-boot minidlna to make the configuration work:

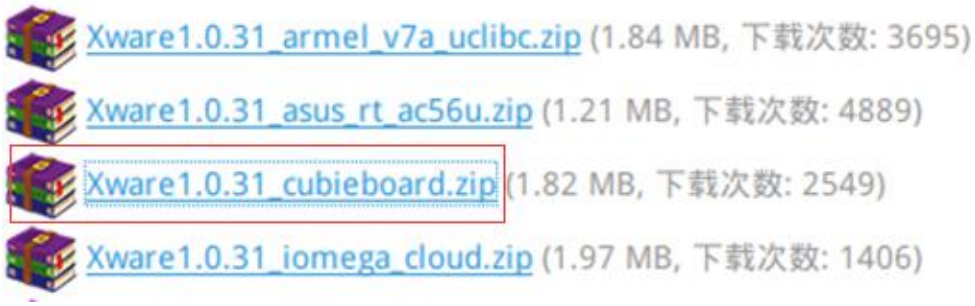
/etc/init.d/minidlna restart.

Transmit the corresponding file on the computer to the corresponding folder through samba.

Note: It is recommended to download MoliPlayer on the mobile device. The effect is good and no blue light pressure on both Android and IOS.

6) Thunder remote download

a. Go to the Thunder routing forum to download the required installation package first. The link for stable version:
http://luyou.xunlei.com/thread-12545-1-1.html.
Download Xware1.0.31_cubieboard zip file.



Note: If you want to try the latest version, you can download the latest test version: http://luyou.xunlei.com/thread-15167-1-1.htm.

b. Enter the directory after uploaded the unzip file to OrangePi. It is recommended to rename the file to xunlei

c. Installation method of version 1.0.31:

i $ cd /xxx/xunlei The xxx is the directory of installation xunlei file

ii $ chmod 755 portal

iii $ ./portal

```
root@curry:/home/curry/Downloads/xunlei# ls
EmbedThunderManager  ETMDaemon  portal  vod_httpserver
root@curry:/home/curry/Downloads/xunlei# chmod 755 portal
root@curry:/home/curry/Downloads/xunlei#
```

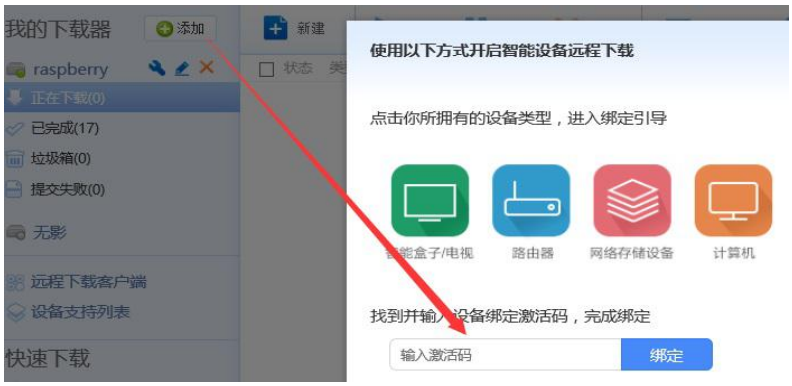
iv You will get an activation code after booting like the following:

```
YOUR CONTROL PORT IS: 9000

starting xunlei service...
etm path: /home/echo/xunlei
execv: /home/echo/xunlei/lib/ETMDaemon.

getting xunlei service info...
Connecting to 127.0.0.1:9000 (127.0.0.1:9000)

THE ACTIVE CODE IS:

go to http://yuancheng.xunlei.com, bind your device with the active code.
finished.
```

Here you will get an activation code

v Copy this activation code to *http://yuancheng.xunlei.com* (Which

required to log in with account of Thunder). Then click the tab on the top right corner to add, fill in the activation code to complete the binding according to the following figure.



vi Setting start up

$ sudo nano /etc/rc.loacl

add the following contents before exit 0

cd /xx/xunlei

./portal &

ctrl +o and enter, ctrl +x to save and exit.

d. Installation of version 3.0.32.253:

i $ cd /xxx/xunlei The xxx is the directory of installation file of xunlei

ii $ sudo nano thunder_mounts.cfg Modify the download path

iii chmod +x etm_monitor

iv Run ./etm_monitor, there will be an activation code page like version 1.0.32. And then binding on the Thunder remote page (above steps 4, 5). There might be one or two errors while running, ignore it (selection type of shell and generation of INI file).

v Setting start up

sudo nano /etc/rc.loacl add the following contents before exit 0

cd /xx/xunlei

./etm_monitor &

ctrl +o and enter, ctrl +x to save and exit.

It could be remote downloading on computer, mobile phone or tablet by login yuancheng.xunlei.com

7) Modify the size of ext4 file system

After made the written image into SD card for booting, enter into rootfs partition's expansion of file system. It could enhance the performance of SD card to avoid limited storage cause problem.

- Method 1

Extend rootfs file partition of TF card on PC:
Select the specified disk, right click and select the corresponding disk, select "change size" and adjust it into your desired size, click "re-size", close the dialog box and click "apply all operations", select "application" to complete the expansion operation

- Method 2

Enter into the system and extend via shell
Before partition

```
root@Orangepi:~# df -lh
Filesystem      Size  Used Avail Use% Mounted on
/dev/mmcblk0p2  2.0G  565M  1.4G  30% /
devtmpfs        482M     0  482M   0% /dev
tmpfs           490M     0  490M   0% /dev/shm
tmpfs           490M   13M  478M   3% /run
tmpfs           5.0M  4.0K  5.0M   1% /run/lock
tmpfs           490M     0  490M   0% /sys/fs/cgroup
/dev/mmcblk0p1   50M   13M   38M  26% /boot
```

Enter into system and expend via resize_rootfs.sh

```
root@Orangepi:/usr/local/sbin# resize_rootfs.sh
+ DEVICE=/dev/mmcblk0
+ PART=2
+ resize
+ fdisk -l /dev/mmcblk0
+ grep /dev/mmcblk0p2
+ awk {print $2}
+ start=143360
+ echo 143360
143360
+ set +e
+ fdisk /dev/mmcblk0

Welcome to fdisk (util-linux 2.27.1).
Changes will remain in memory only, until you decide to write them.
Be careful before using the write command.
```

Enter resize_rootfs.sh on command line, the system will expending automatically,
Reboot the system and use df -lh to check whether expending is successful

```
+ set -e
+ partx -u /dev/mmcblk0
+ resize2fs /dev/mmcblk0p2
resize2fs 1.42.13 (17-May-2015)
Filesystem at /dev/mmcblk0p2 is mounted on /; on-line resizing required
old_desc_blocks = 1, new_desc_blocks = 1
The filesystem on /dev/mmcblk0p2 is now 3871616 (4k) blocks long.

+ echo Done!
Done!
root@Orangepi:/usr/local/sbin# df -lh
Filesystem      Size  Used Avail Use% Mounted on
/dev/mmcblk0p2   15G  566M   14G   4% /
devtmpfs        482M     0  482M   0% /dev
tmpfs           490M     0  490M   0% /dev/shm
tmpfs           490M   13M  478M   3% /run
tmpfs           5.0M  4.0K  5.0M   1% /run/lock
tmpfs           490M     0  490M   0% /sys/fs/cgroup
/dev/mmcblk0p1   50M   13M   38M  26% /boot
```

a. Expand file system

i Boot to Linux, umount /dev/sdb1 and /dev/sdb2, if it prompts disk busy, then use fuser to clean the using disk(we will recommend using another Linux booting disk to lead the system).

ii Use fdisk /dev/sdb to adjust the partition size, after into it, enter p, and keep in mind about the initial position of needed extending size partition.

iii Enter d to delete the partition need to change the size(my file system is /dev/sdb2, which is the 2 partition).

iv Enter n to build a new partition, make sure the initial position is the same as you deleted, and enter the number as you desire.

v Enter w to save the partition data.

vi Use the following command to check the file system(make sure it is a right file system)

e2fsck -f /dev/sdb2

vii Adjust the partition size

resize2fs /dev/sdb2

viii It could mount a disk partition, you could check whether it has changed.

b. Shrink file system

i Boot to Linux, umount /dev/sdb1 and /dev/sdb2, if it prompts disk busy, then use fuser to clean the using disk(we will recommend using another Linux booting disk to lead the system).

ii Use the following command to check the file system(make sure it is a right file system)

e2fsck -f /dev/sdb2

iii Modify the size of file system(Use resize2fs)

resize2fs /dev/sdb2 900M

The "s"after the number represents specifying the size of file system via

the sectors(every sector calculated by 512 bite). You could also specify it into K(KB), M(MB), G(GB), etc.

iv Use fdisk /dev/sdb to adjust the partition size, after into it, enter p, and keep in mind about the initial position of needed extending size partition. You need to first delete the partition then build a new one because the fdisk could not modify the size dynamic(you need to calculate the size, it have to enough to contain the file system adjusted in last step).

v Enter d to delete the partition need to change the size(my file system is /dev/sdb2, which is the 2 partition).

vi Enter n to build a new partition, make sure the initial position is the same as you deleted, and enter the number as you desire. Besides, if it is boot-able partition you want to change, note that need to keep the bootable mark in case cannot boot.

The above illustration is using fdisk and resize2fs to modify partition and file system, you could also use gparted. Gparted has graphical interface and it could help you to re-size file system at the same time of re-sizing partition. Goarted is much easier to use and reduce the change to make mistake. For now our official Lubuntu and Raspbian could not use it.

8) How to use gc2035 on Linux

a. Use find command to find the location of the following files, and load it according to the specified order

```
insmod videobuf-core.ko
insmod videobuf-dma-contig.ko
insmod uvcvideo.ko
insmod cci.ko
insmod vfe_os.ko
insmod vfe_subdev.ko
insmod gc2035.ko
insmod vfe_v4l2.ko
```

There should be generated video0 on /dev/ after loaded. After low-level driver install, then the Andoird could be used directory.

b. Use camera in Linux

i Load up driver

```
sudo modprobe gc2035
sudo modprobe vfe_v4l2
```

ii Install motion

```
sudo apt-get install motion
```

iii Modify configuration

sudo nano /etc/motion/motion.conf
stream_localhost off

iv Create folder for images saving

mkdir ~/motion

v Modify permission

chmod 777 motion

vi Continue modifying configuration

sudo nano /etc/default/motion
start_motion_daemon=yes

vii Boot the server

Sudo /etc/init.d/motion start
Enter the following in browser: localhost:8081
You could check image output from camera.
Besides, you could also refer to this link:

http://www.cnx-software.com/2015/09/26/how-to-use-orange-pi-camera-in-linux-with-motion/

9) eth0 and wlan0 static mac address setting

a. If the system do not use systemd, you could modify rc.local directory and add the following:

```
$ vim /etc/rc.local
MAC=00:e0:4c:a1:2b:d4
ifconfig wlan0 down
ifconfig wlan0 hw ether $MAC
ifconfig wlan0 up
dhclient &
```

After rebooting, you could use ifconfig to check whether mac address has changed.

b. If the system used systemd, you also need to add the following besides the above steps:

$ cd /etc/systemd/system/

$ vim change_mac_address.service (You could name the server, format just like the following)

```
[unit]
Description=Change OrangePi Wifi mac address

[Service]
```

```
ExecStart=/etc/rc.local
RemainAfterExit=yes

[Install]
sWantedBy=multi-user.target
```

$ systemctl enable change_mac_address.service

Modify mac address of eth0 is same as modifying wlan0's, just need to replace wlan0 into eth0.

10) Orange Pi Android root

There is defaulted with root permission on Android pre-installed, but lacking authorization management software. The following is how to add authorization management software.

You need to have UsbModeSwitch.apk and UPDATE-SuperSU-v2.46.zip, install kingroot and make sure OTG on Orange Pi could connect to PC.

a. Open adb debug mode

Use U disk or card reader to install UsbModeSwitch.apk into Orange Pi OS and open it, tick "enable usb device mode" and use debug cable to connect OTG port and PC (make sure it is micro usb-cable in case other cables could not be recognized). Normally PC would search and install adb driver software automatically. If PC failed to install, you could install PC version's Peasecod to install the driver software.

b. After connected Orange PI and PC, open command mode of PC, enter related command of adb(you need to install adb debug command, which Peasecod has adb command). Here is the command:

```
adb remount
adb shell
```

windows(win+r) command line enter into command mode, then enter into kingroot directory and execute the following steps:

```
adb shell
root@rabbit-p1:/ # mkdir /tmp
root@rabbit-p1:/ # cd /system/bin
root@rabbit-p1:/ # mount -o remount, rw /system
root@rabbit-p1:/system/bin # ln -s busybox-smp unzip
```

Logout adb shell Mode

root@rabbit-p1:/exit (Or Ctrl + C)
Unzip UPDATE-SuperSU-v2.46.zip
You will obtain META-INF/com/google/android/update-binary and put it into specific catalog.
adb push /path/UPDATE-SuperSU-v2.46.zip /data/local/tmp path is file's path
adb push /path/ update-binary /data/local/tmp
adb shell
root@rabbit-p1:/ #cd /data/local/tmp
root@rabbit-p1:/ #sh update-binary 0 1 /data/local/tmp/UPDATE-SuperSU-v2.46.zip

.....

.....

After executed scripts, enter reboot command and reboot it, you could use the device authorization management software normally.

After rebooted, there might be no super administrator icon, you need to delete the desk configuration file and reboot the board.

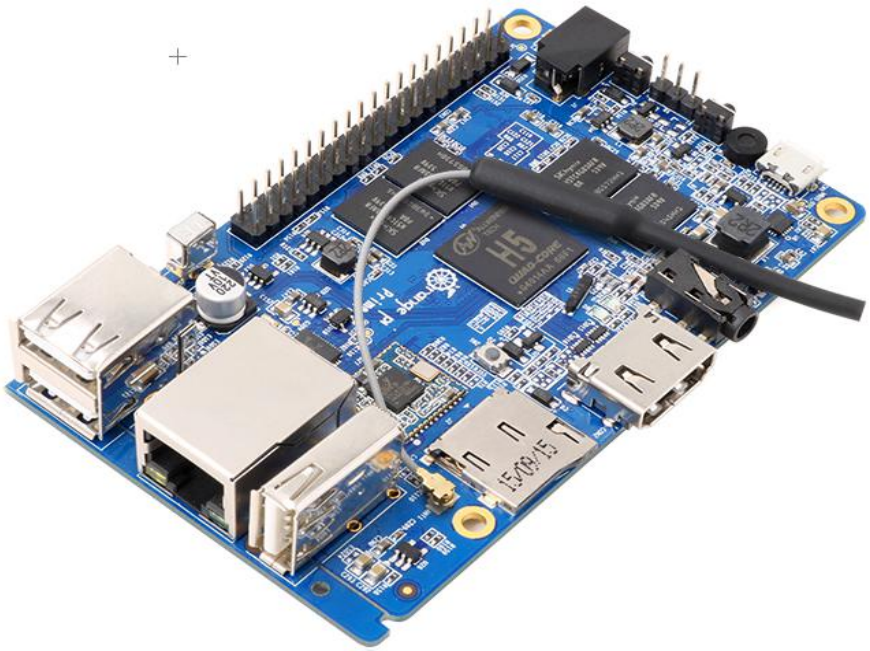
III. Linux Kernel Source Code Compilation

In order to support the rapid development of the project, we are writing this sections for project configuration options to the binary file. When the system is running, it can get the information of the system running by reading the binary file, which can greatly simplify the time of project development.

This manual describes how to use the binary file to speed up the development of the project.

Note: In the following sections, * indicates wild-cards, you need to fill in the actual values according to their file storage path.

Hardware: Orange Pi development board*1, Card reader*1, TF card*1, power supply*1



1. Download Linux Source Code

You could download the source code from the official website(Source code for AH5 chip are the same), and you could find the tools of lichee and android for file compilation.

http://www.orangepi.org/downloadresources/

Subsection and compress the file, then unzip it after finish downloaded:

```
curry@curry:$ ls
android  lichee  Patch
curry@curry:$ cd lichee/
curry@curry:$ ls
brandy  buildroot  build.sh  linux-3.10  out  README  tools
curry@curry:$
```

buildroot: Project compilation script
brandy: gcc-linaro, boot and uboot source code and open source cross compiler tool
linux-3.10: Kernel source code
tools: Tools of project compilation
build.sh: compilation script

2. Compile Project Source Code

You need to compile the entire project while it is your first time to use the source code. You can use the following commands in the /lichee directory to complete the project:

- Enter into content of lichee, command

  $ ll -a

Check if there is an executable permission on build.sh, if not, modify the permissions

  $ chmod 755 build.sh

- If there is .buildconfig after commanded ll –a, delete it

  $ rm –rf .buildconfig

```
curry@curry:$ ls -la
总用量 40
drwxrwxr-x  7 curry curry 4096  4月  1 18:27 .
drwxr-xr-x  6 curry curry 4096  4月 10 16:18 ..
drwxrwxr-x 11 curry curry 4096  3月 22 10:02 brandy
-rw-rw-r--  1 curry curry  165  4月  1 18:27 .buildconfig
drwxrwxr-x 14 curry curry 4096  3月 22 10:02 buildroot
-r-xr-xr-x  1 curry curry   55  7月  8  2016 build.sh
drwxrwxr-x 28 curry curry 4096  4月  5 20:10 linux-3.10
drwxrwxr-x  3 curry curry 4096  3月 21 18:02 out
-r--r--r--  1 curry curry  232  7月  8  2016 README
drwxrwxr-x  8 curry curry 4096  3月 22 10:02 tools
```

- Use the following command to compile the entire project

  $ ./build.sh config

```
root@curry:/home/curry/lichee# ls
brandy  buildroot  build.sh  linux-3.4  README  Releaseconfig  tools
root@curry:/home/curry/lichee# ./build.sh config
```

Use this command to compile the entire project

At this point the system will prompt the choice of the chip, for OrangePi, select sun50iw2p1

At this point, the system will be prompted to select the platform, as shown below, for OrangePi, select Android

```
curry@curry:$ ./build.sh config

Welcome to mkscript setup progress
All available chips:
   0. sun50iw1p1
   1. sun50iw2p1
   2. sun8iw11p1
   3. sun8iw6p1
   4. sun8iw7p1
   5. sun8iw8p1
   6. sun9iw1p1
Choice: 1
All available platforms:
   0. android
   1. dragonboard
   2. linux
   3. eyeseelinux
Choice: 0
not set business, to use default!
LICHEE_BUSINESS=
using kernel 'linux-3.10':
select arch by kernel version and chip
```

Appear this interface indicates waiting for the compiler.

```
select arch by kernel version and chip
==========================================
INFO: ------------------------------------------
INFO: build lichee ...
INFO: chip: sun50iw2p1
INFO: platform: android
INFO: business:
INFO: kernel: linux-3.10
INFO: arch: arm64
INFO: board:
INFO: output: out/sun50iw2p1/android/
INFO: ------------------------------------------
INFO: build buildroot ...
external toolchain has been installed
external toolchain_32 has been installed
```

Wait fifteen minutes or so, compile complete.

```
regenerate rootfs cpio
15756 块
17028 块
build_ramfs
Copy boot.img to output directory ...
Copy modules to target ...

sun50iw2p1 compile Kernel successful


INFO: build kernel OK.
INFO: build rootfs ...
INFO: skip make rootfs for android
INFO: build rootfs OK.
------------------------------------------
build sun50iw2p1 android  lichee OK
------------------------------------------
```

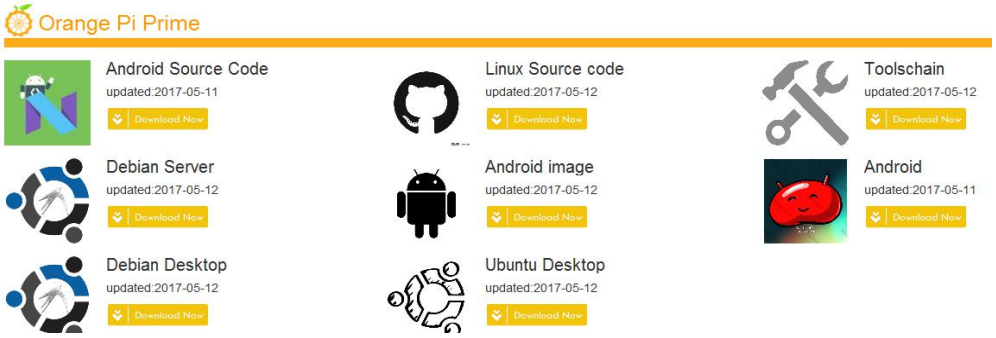
3. Update the Kernel Image File and Replace Library

- After compilation is finished, the following files will be generated in the directory：

libs： lichee/out/sun50iw2p1/android/common/lib/modules/3.10.65

Download image from official website：

http://www.orangepi.org/downloadresources/



- Write the image：

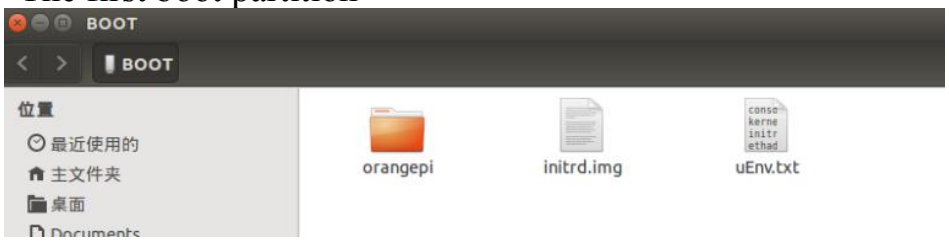
  $ sudo dd bs=4M if=*.img of=/dev/sd*

```
curry@curry:$ sudo dd bs=4M if=Ubuntu_Server_Xenial_PC2_V0_9_0.img of=/dev/sdc
[sudo] password for curry:
记录了555+1 的读入
记录了555+1 的写出
2329935872字节(2.3 GB)已复制，230.669 秒，10.1 MB/秒
```

- Pull out the card reader, and then insert it again.

At this time, the SD card is inserted into PC, view the SD card mount point (if you don't know how to get a mount point for the SD card, please refer to the diagram below).

The first boot partition



The second rootfs partition

Copy the kernel image file generated by the compiler to the first partition (boot partition)

Copy the lib library which generated after compilation to the second partition (rootfs partition)

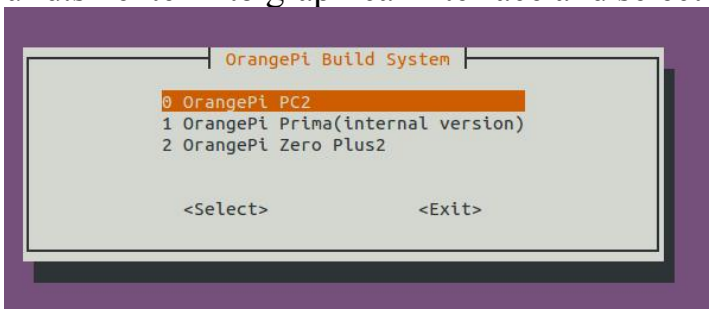
We would suggest using compilation system on github of official website.

```
curry@curry:$ ls
build.sh  external  kernel  output  scripts  toolchain  uboot
```

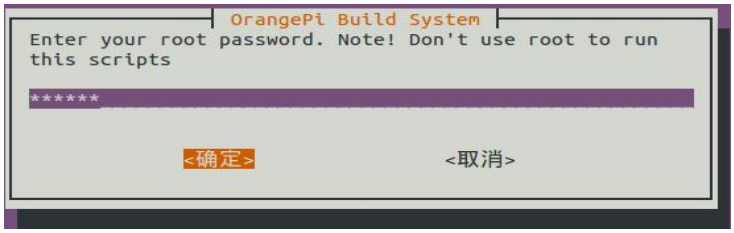
build.sh Execute script into the graphical interface of compilation

extenal Inside are patch and some configuration kernel file

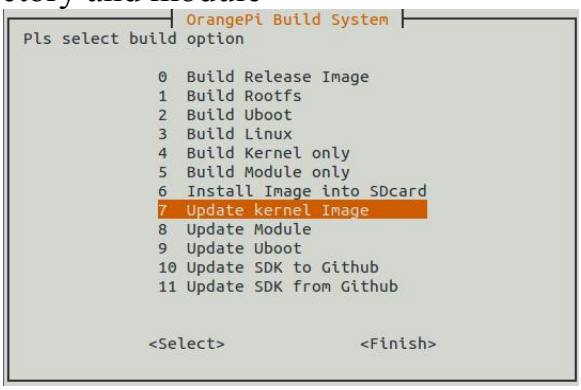
output File generated
script Script compiled
toolchain Cross compiler location
uboot uboot source code
Execute./build.sh enter into graphical interface and select Prime



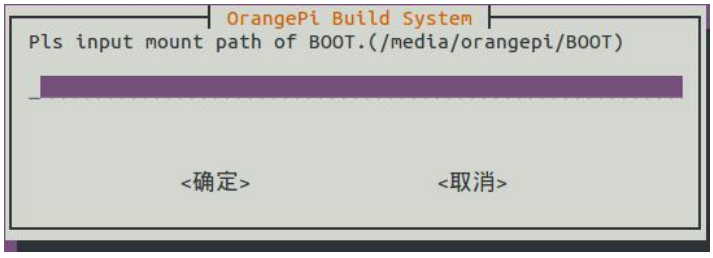
Enter password of root



Update Kernel directory and module

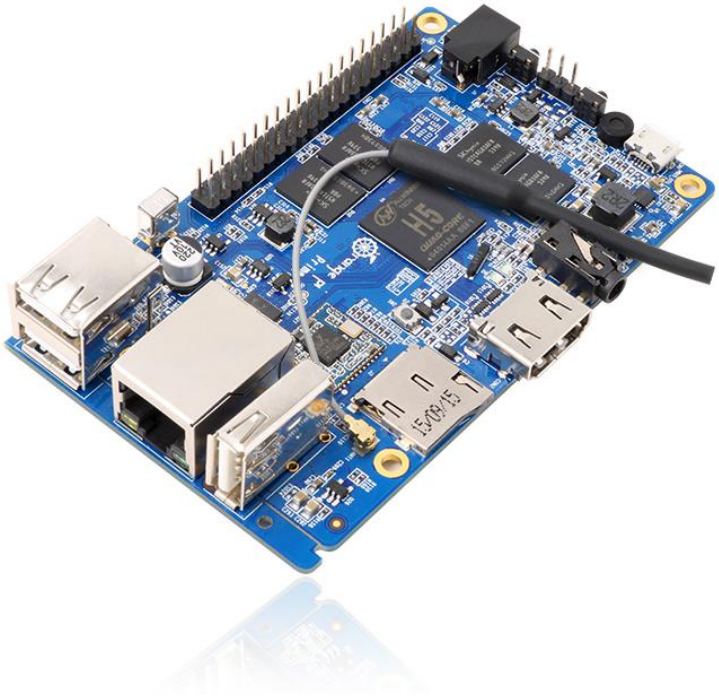


Select corresponding file directory and update uImage and modules



IV. Android Kernel Source Code Compilation

Hardware: Orange Pi development board*1, Card reader*1, TF card*1, power supply*1



Software

Linux host computer, which hard disk space at least 50G (to meet a fully compiled need)

Linux host computer needs:

Version 2.7.3 of Python;

Version 3.81-3.82 of GNU Make;

Version 1.7 or higher version of Git.

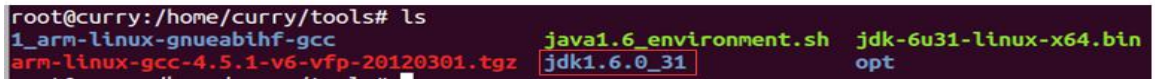
Version 1.7 of Java

1. Install JDK

The following will illustrate jdk1.6 installation, it would be same for jdk1.7 installation.

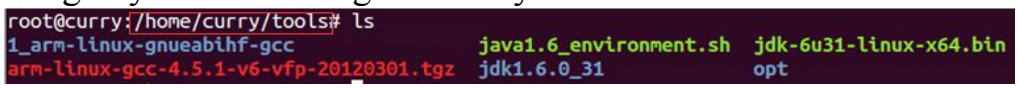
- Download and install JDK, you will obtain jdk-6u31-linux-x64.bin
- Modify the permission of jdk-6u31-linux-x64.bin, which has no prior permission
- $./jdk-6u31-linux-x64.bin

It will generate a folder:



- Input at terminal

Note that JAVA_HOME is the name of the current directory, you need to fill in according to your own storage directory.




```
$ export  JAVA_HOME=*/jdk1.6.0_31
$ export  PATH=$PATH:/$JAVA_HOME/bin
$ export  CLASSPATH=.:$JAVA_HOME/lib
$ export  JRE_HOME=$JAVA_HOME/jre
```

- Command line input Jav and press tab to see whether it auto completion (Java), which indicates it can successfully installed version 1.7.

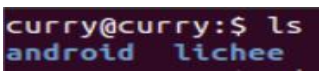
2. Install Platform Supported Software

```
$ sudo apt-get install git gnupg flex bison gperf build-essential \
  zip curl libc6-dev libncurses5-dev:i386 x11proto-core-dev \
  libx11-dev:i386 libreadline6-dev:i386 libgl1-mesa-glx:i386 \
  libgl1-mesa-dev g++-multilib mingw32 tofrodos \
  python-markdown libxml2-utils xsltproc zlib1g-dev:i386
$ sudo ln -s /usr/lib/i386-linux-gnu/mesa/libGL.so.1
  /usr/lib/i386-linux-gnu/libGL.so
```

3. Download Android Source Package

Download website(source code is same for all boards of H3 chip):
http://www.orangepi.org/downloadresources/

Unzip the download file you will obtain the following directories:



4. Install Compiler Tool Chain

The compiler tool chain has been integrated in Android SDK. Tool chain is on: lichee/brandy/gcc-linaro/ of Android SDK(already exist)

```
brandy  buildroot  build.sh  linux-3.4  README  tools
root@curry:/home/curry/OrangePi/android/lichee# cd brandy/gcc-linaro/bin/
root@curry:/home/curry/OrangePi/android/lichee/brandy/gcc-linaro/bin# ls
arm-linux-gnueabi-addr2line     arm-linux-gnueabi-gprof
arm-linux-gnueabi-ar            arm-linux-gnueabi-ld
arm-linux-gnueabi-as            arm-linux-gnueabi-ld.bfd
arm-linux-gnueabi-c++           arm-linux-gnueabi-ldd
arm-linux-gnueabi-c++filt       arm-linux-gnueabi-ld.gold
arm-linux-gnueabi-cpp           arm-linux-gnueabi-nm
```

5. Compile Lichee Source Code

There are Android and Lichee after unzipped the package, enter the directory of Lichee:

$ cd lichee

$ ./build.sh lunch

Select sun50iw2p1

Print information of successful compilation

```
INFO: build kernel OK.
INFO: build rootfs ...
INFO: skip make rootfs for android
INFO: build rootfs OK.
----------------------------------------
build sun50iw2p1 android  lichee OK
----------------------------------------
```

6. Android Source Code Compilation

Input the command:

$ cd android

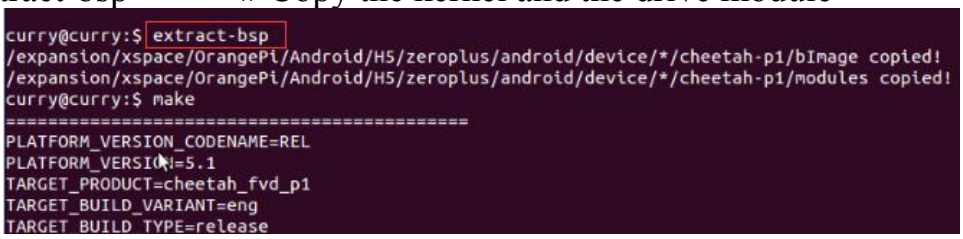
$ source ./build/envsetup.sh

```
root@curry:/home/curry/OrangePi/android/android# source ./build/envsetup.sh
including device/generic/armv7-a-neon/vendorsetup.sh
including device/generic/x86/vendorsetup.sh
including device/generic/mips/vendorsetup.sh
including device/asus/tilapia/vendorsetup.sh
including device/asus/grouper/vendorsetup.sh
including device/asus/deb/vendorsetup.sh
including device/asus/flo/vendorsetup.sh
```

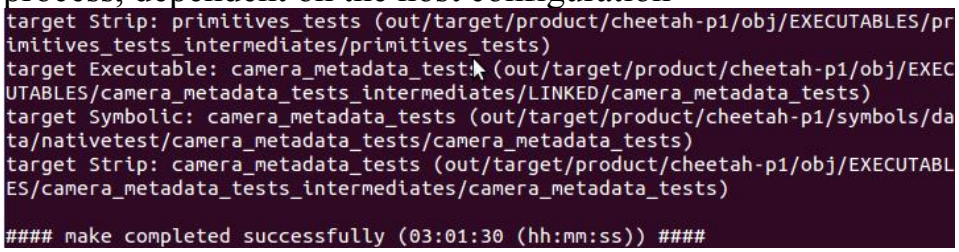
$ lunch dolphin_fvd_p1-eng # Select the scheme number

```
curry@curry:$ lunch

You're building on Linux

Lunch menu... pick a combo:
     1. rabbit_cmccwasu_p1-eng
     2. rabbit_gms_p1-eng
     3. rabbit_fvd_p1-eng
     4. rabbit_aosp_p1-eng
     5. rabbit_aosp_p1-user
     6. rabbit_fvd_p1-user
     7. rabbit_fvd_p1-userdebug
     8. rabbit_aosp_perf-eng
     9. jaws_optimus-eng
     10. cheetah_fvd_p1-eng
     11. cheetah_fvd_p1-user
     12. cheetah_cts_p1-eng
     13. cheetah_cts_p1-user
     14. cheetah_cmcc_p1-eng
     15. cheetah_cmcc_p1-user
     16. molly-eng
     17. jaws_tvd_p1-eng
     18. rabbit_32bit_fvd_p1-eng
     19. cheetah_perf-eng
     20. eagle_fvd_p1_normal-eng
     21. eagle_fvd_p1_secure-eng
     22. dolphin_fvd_p1-eng
     23. dolphin_fvd_p1-user

Which would you like? [aosp_arm-eng] 10
```

$ extract-bsp # Copy the kernel and the drive module



$ make The rear values of # is for the simultaneous compilation process, dependent on the host configuration



$ pack #Packaged into firmware

$ cd */lichee/tools/pack/

V. Use Project Configuration Files

1. sys_config.fex Introduction

Configure hardware: sys_config.fe

The sys_config.fex is a binary configuration file that used by the SOC kernel driver or LiveSuit for a particular target board, including how to set up a variety of peripherals, ports, and I/O which based on the target version.

For OrangePi, the location of the project configuration document is：
lichee/tools/pack/chips/sun50iw2p1/configs/dolphin-p1/sys_config.fex

Copy the file to the directory of /lichee, use command:

```
$ cd ./lichee
$ cp ./tools/pack/chips/sun50iw2p1/configs/dolphin-p1/sys_config.fex ./
```

You could personalized configuration of sys_config.fex according to sysconfig1.fex_manul_linux_BSP_v0.4.doc.
Direcotory of sysconfig1.fex_manul_linux_BSP_v0.4.doc is /lichee/buildroot/docs.

2. Examples

1) Modify the output mode into tv

- tv-out out, the output type of tv0 is invalid, you need to set the output type of tv1 into pal.

  Modify defaulted enable display output configuration into tv

```
[tv0]
used                            = 1
tv_dac_used                     = 1
dac_src0                        = 0
dac_type0= 0
interface= 1
[tvout_para]
tvout_used= 1
tvout_channel_num= 1

[disp]
disp_init_enable= 1
disp_mode= 1
screen0_output_type= 2
```

screen0_output_mode= 11
screen1_output_type= 2
screen1_output_mode= 11
dev0_output_type = 4
dev0_output_mode = 4
dev0_screen_id = 0
dev0_do_hpd = 1
dev1_output_type = 2
dev1_output_mode = 11

Modify sys_confi and replace it when it generated script.bin. If would be faster if use compilation system on githug. About compilation you could refer to the charter of Linux Compilation.

2) Loading tv.ko module automatically after booted

Enter /lib/ directory, enter command:
depmod -a
Add one more line on /etc/modules
tv
It would be tv out after booted

- Capacitance touch panel (capacitor tp)

Configuration Item	Configuration Meaning
ctp_used=xx	Whether turn on capacitance touch panel, if so set the value as 1, and vice verso 0.
ctp_name =xx	Indicates the control scheme used in the specified scheme, for now there are: "ft5x_ts" or "Goodix-TS".
ctp_twi_id=xx	Used for selecting i2c adapter, there are 0 and 2.
ctp_twi_addr =xx	Indicates the device address of i2c, it is related to the specific hardware.
ctp_screen_max_x＝xx	Maximum coordinates of the X axis of the touch panel
ctp_screen_max_y=xx	Maximum coordinates of the Y axis o the touch panel
ctp_revert_x_flag=xx	Whether needed to flip the X coordinates, if so then set 1, and vice verso 0.
ctp_revert_y_flag=xx	Whether needed to flip the Y coordinates, if so then set 1, and vice verso 0.

ctp_int_port=xx	GPIO configuration of the interrupt signal of capacitive touch panel
ctp_wakeup=xx	GPIO configuration of the wake-up signal of capacitive touch panel
ctp_io_port=xx	Capacitive screen IO signal, currently share with interrupt signal common pin

Configuration samples:

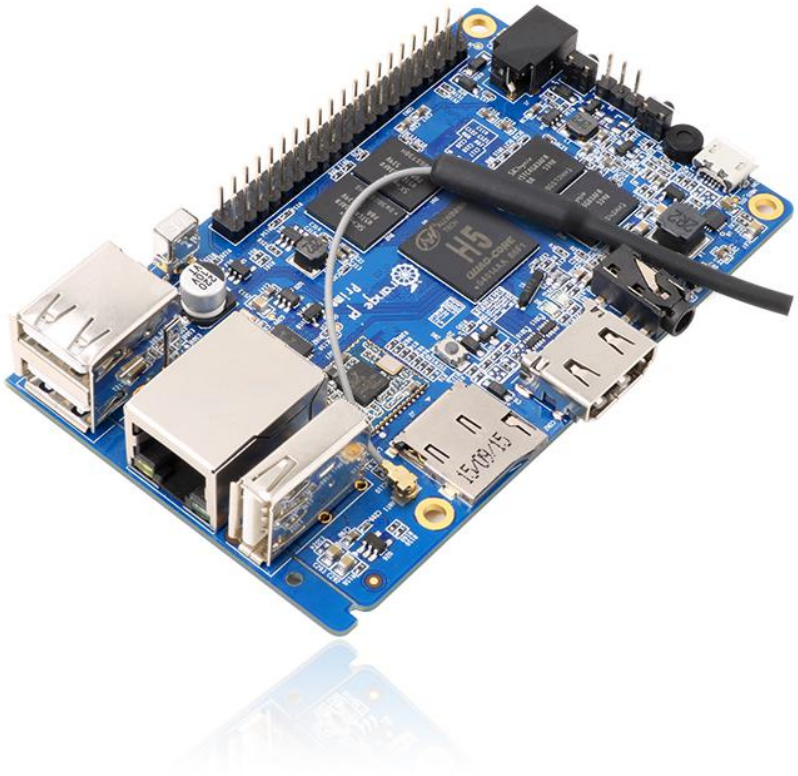
```
ctp_used        = 1
ctp_name        = "ft5x_ts"
ctp_twi_id      = 2
ctp_twi_addr    = 0x70
ctp_screen_max_x    = 800
ctp_screen_max_y    = 480
ctp_revert_x_flag   = 0
ctp_revert_y_flag   = 0
ctp_int_port        = port:PH21<6><default>
ctp_wakeup          = port:PB13<1><default><default><1>
ctp_io_port         = port:PH21<0><default>
```

Note: If you want to support the new capacitive touch IC, you need to combine the configuration of the BSP A10 layer, which should be based on the original capacitive touch IC code, to make the appropriate changes. Specifically, 1) ctp_twi_id should be consistent with the hardware connection in sys_config; 2) In the drive part of the code: the use of twi from the device name + address should be consistent with the ctp_name and ctp_twi_addr in sys_config configuration. At the same time, the other sub configuration in sysconfig should also be properly configured, these configurations should be corresponding processing in the program.

VI. OrangePi Driver development

In order to help developers become more familiar with OrangePi, this manual describes how to use simple device driver modules and applications on the development board.

Hardware: Orange Pi development board*1, Card reader*1, TF card*1, power supply*1



1. Device Driver and Application Programming

1) Application Program (app.c)

```
#include <stdio.h>
#include <sys/types.h>
#include <sys/stat.h>
#include <fcntl.h>
#include <string.h>

int main(int argc, char *argv[])
{
	int cnt, fd;
	char buf[32] = {0};
	if(argc != 2)
	{
		printf("Usage : %s </dev/xxx>\r\n", argv[0]);
		return -1;
	}

	fd = open(argv[1], O_RDWR);
	if(fd < 0)
	{
		printf("APP Error : open device is Failed!\r\n");
		return -1;
	}
	read(fd, buf, sizeof(buf));
	printf("buf = %s\r\n", buf);
	close(fd);
	return 0;
}
```

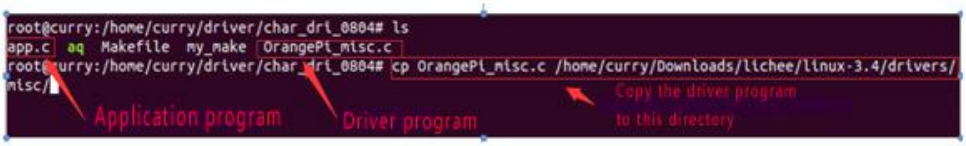
2) Driver Program (OrangePi_misc.c)

```
#include <linux/kernel.h>
#include <linux/module.h>
#include <linux/fs.h>
#include <linux/miscdevice.h>
#include <linux/init.h>
#include <asm-generic/uaccess.h>

static int orangepi_open(struct inode *inodp, struct file *filp)
{
	return 0;
}

static ssize_t orangepi_read(struct file *filp, char __user *buf, size_t
count, loff_t *offset)
{
	char str[] = "Hello World";
	copy_to_user(buf, str, count);
	return 0;
}

static struct file_operations tOrangePiFops = {
	.owner = THIS_MODULE,
	.open  = orangepi_open,
	.read  = orangepi_read,
};

static struct miscdevice OrangePi_Misc = {
	.minor = 255,
	.name  = "orangepimisc",
	.fops  = &tOrangePiFops,
};
```

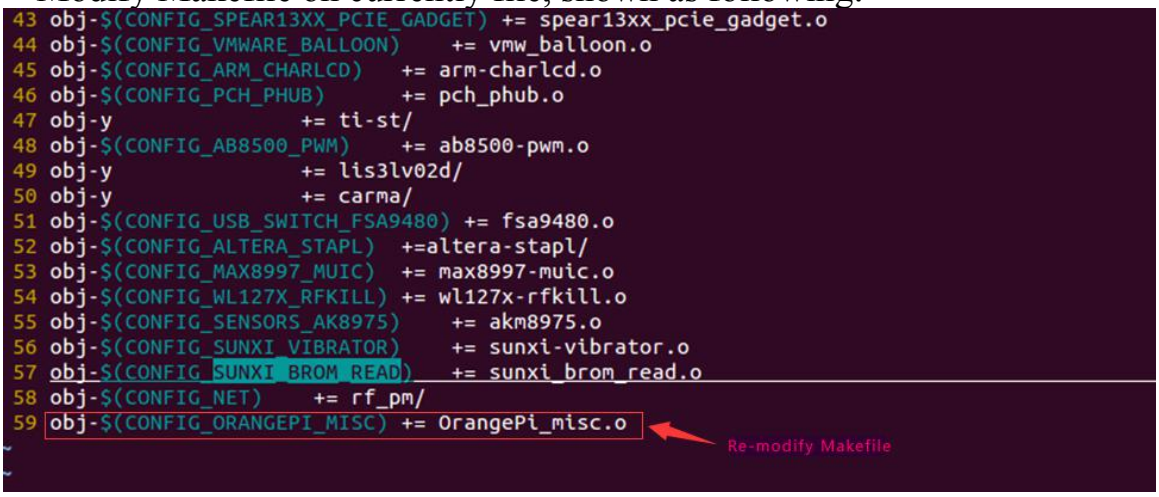
```
static int __init OrangePi_misc_init(void)
{
	int ret;
	printk("func : %s, line : %d\r\n", __func__, __LINE__);

	ret = misc_register(&OrangePi_Misc);
	if(ret < 0){
		printk("Driver Error : misc_register is Failed!\r\n");
		return -1;
	}
	return 0;
}

static void __exit OrangePi_misc_exit(void)
{
	int ret;
	printk("func : %s, line : %d\r\n", __func__, __LINE__);
	ret = misc_deregister(&OrangePi_Misc);
	if(ret < 0){

		printk("Driver Error : misc_register is Failed\r\n");
	}
}

module_init(OrangePi_misc_init);
module_exit(OrangePi_misc_exit);
```

2. Compile device driver

Copy the OrangePi_misc.c to the directory of :
*/lichee/linux-3.10/driver/misc

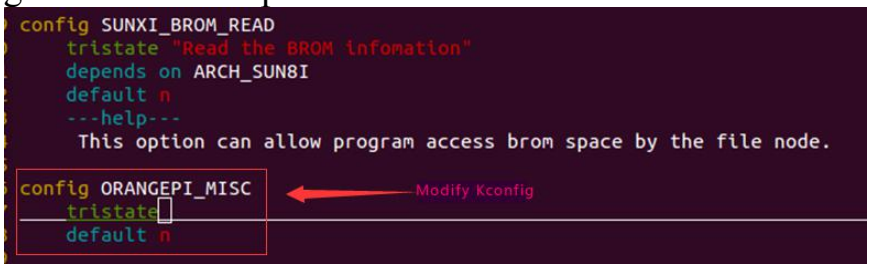


Enter to */lichee/linux-3.10/drivers/misc/, and modify makefile
Modify Makefile on currently file, shown as following:



There is Kconfig on the same sibling folders with Makefile. Each Kconfig respectively describes the the source directory file related kernel configuration menu. In the kernel configuration making menuconfig, it read from the Kconfig config menu and the user configuration saved to the config. In the kernel compile, the main Makefile by calling this.Config could know the user's configuration of the kernel.

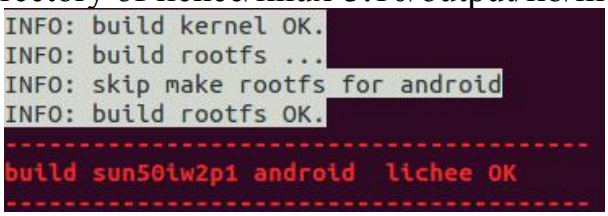
Kconfig is corresponding to the kernel configuration menu. Add a new driver to the kernel source code, you can modify the Kconfig to increase the configuration menu for your drive, so you can choose whether the menuconfig driver was compiled or not.



Back to the source code directory:

$ ./build.sh

After compiled the kernel, there will be an orangepi_misc.ko file generated on the directory of lichee/linux-3.10/output/lib/modules/3.10.65



There will be a .ko file on the directory of:

*/lichee/linux-3.10/output/lib/modules/3.10.65/

It is generated after OrangePi_misc.c compilation.

Insert U disk (please note the SD card should have been written image) if the SD card system is mounted to the directory / dev/ sdb, SD card will have two sub mount points, respectively are / dev / sdb1 and /dev/sdb2. Two partition of SD card will automatically mount to the PC /media/ directory, the first partition is the boot partition and the second partition is the rootfs partition.

Copy OrangePi_misc.ko file to /media/*/lib/modules/3.10.65.

$ cp OrangePi_misc.ko /media/*/lib/modules/3.10.65

3. Cross compiler Application Program

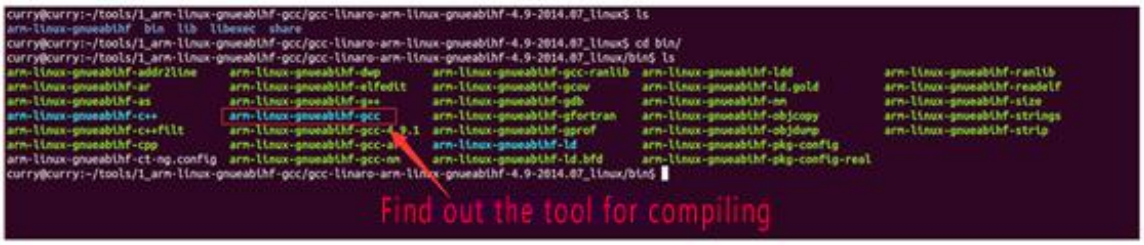
Here will take arm-linux-gnueabihf-gcc as an example. Check whether there is the cross compiler, if not, then download and install it.

$ arm-linux-gnueabihf-gcc -v

While compiling the application, you will fill that you need the cross compiler arm-linux-gnueabihf-gcc, download and install it.

Unzip the downloaded file and enter the the directory

Check the information after entering bin directory



pwd hows the path and export it into the whole project

$ ll /etc/environment shows that the file can only read, need to modify permissions
$ chmod 755 /etc/environment
Modify permission

Add the path to the whole environment variable

Compile the application with cross compiler

$ arm-linux-gnueabihf-gcc app.c –o aq

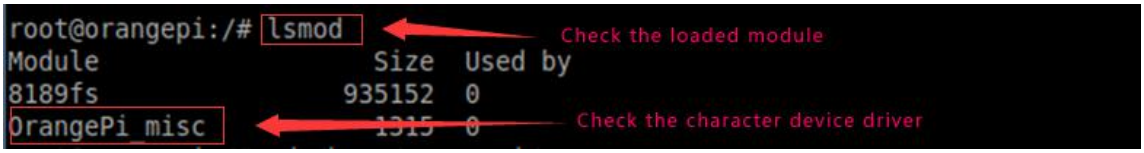
There will be an ap application generated in the directory, copy it to the board file system(on the rootfs directory of /home/orangepi/)
$ cp aq /media/*/home/orangepi/

4. Running Driver and Application

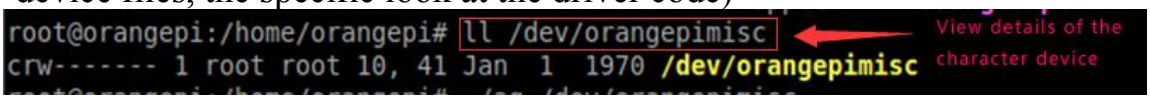
Removed the SD card and inserted it into the development board and power on.

You need to switch to root users and load module driver module to the development board first.

$ insmod /lib/modules/orangepi.ko
$ lsmod To check whether it is loaded



$ ll /dev/orangepimisc(Miscellaneous equipment automatically generated device files, the specific look at the driver code)

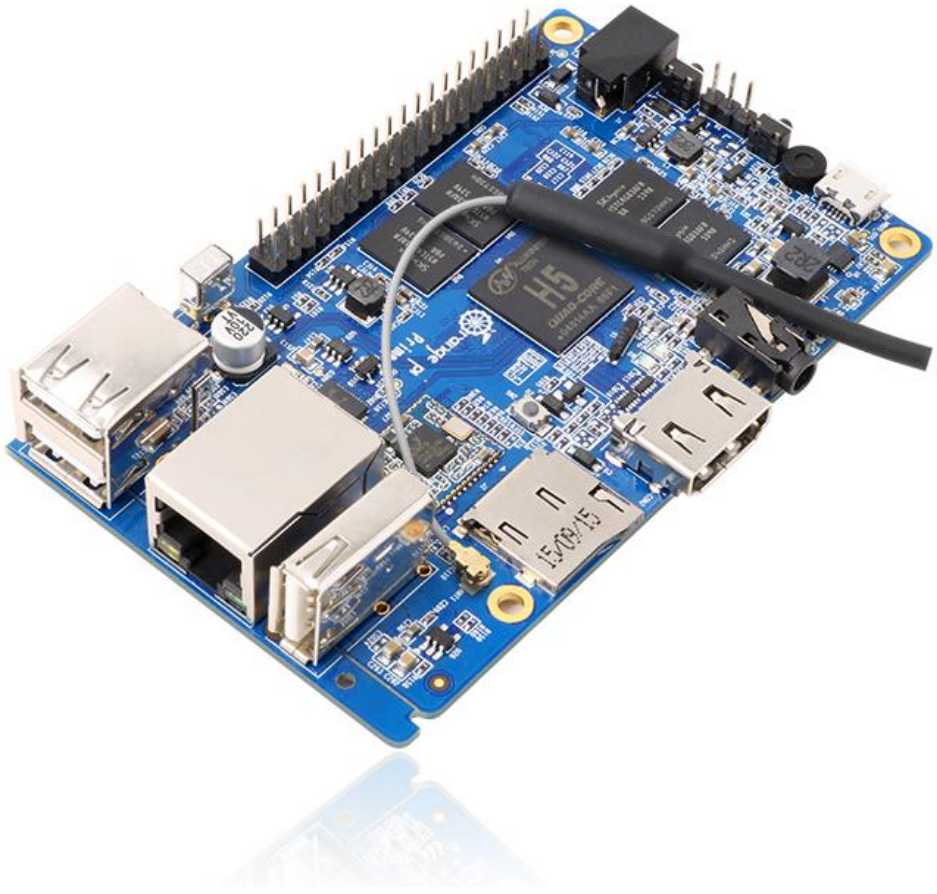


Executive application (note the use of the application, the specific check at the code)

$ ./aq /dev/orangepimisc

VII. Using Debug tools on Orange Pi

Hardware: Orange Pi development board*1, Card reader*1, TF card*1, power supply*1



TTL to USB cable

1. Operation Steps on Windows

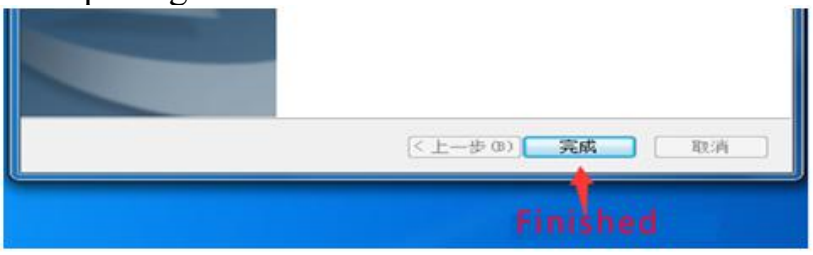
In order to get more debugging information in the project development process of using OrangePi, OrangePi default support for serial information debugging. For developers, you can simply get the serial port debugging information with the materials mentioned above. The host computer using different serial debugging tools are similar, basically can reference with the following manual for deployment. There are a lot of debugging tools for Windows platform, the most commonly used tool is putty. This section takes putty as an example to explain the deployment.

1) Install USB driver on Windows

- Download and unzip the latest version of driver PL2303_Prolific_DriverInstaller_v130.zip

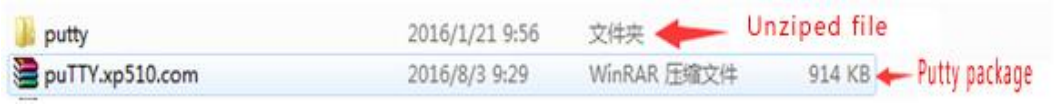
- Choose application installation as Administrator

- Wait for completing installation



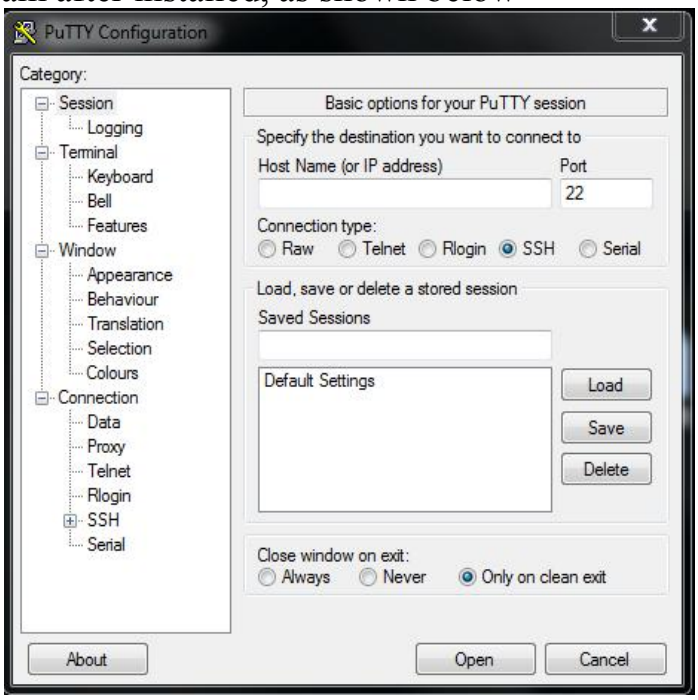
2) Install putty on Windows

- Download putty installation package



- Unzip and install

- Open program after installed, as shown below

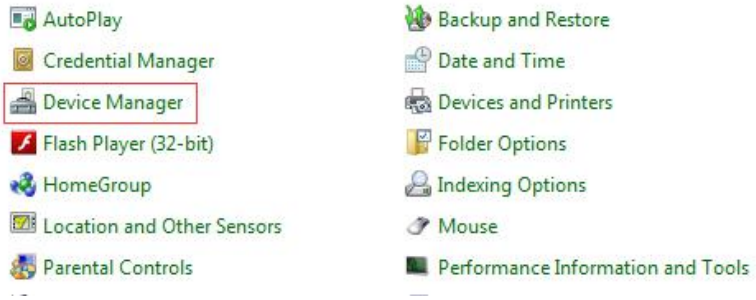


3) Connecting method

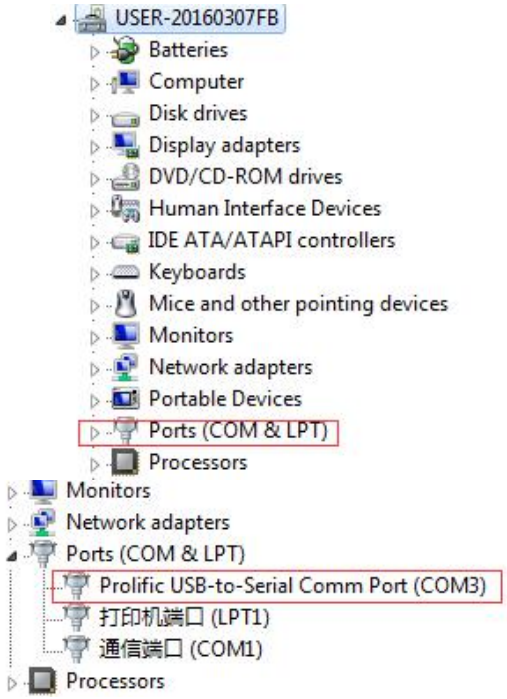
Use the TTL to the serial port cable, one end connected to OrangePi, the other end connected to PC

4) Equipment information acquisition

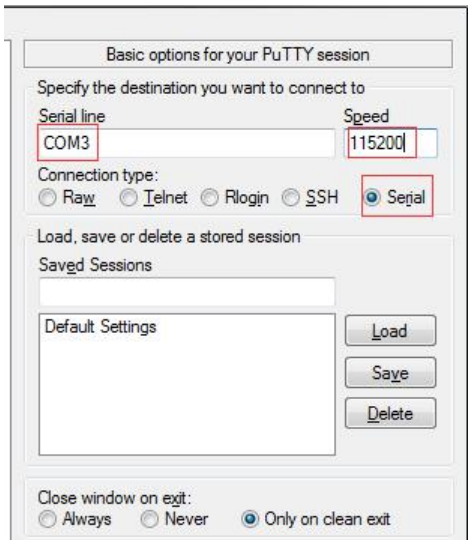
- *Start* menu select *control panel*



- Click on the *device manager* to check the *port numbe*r



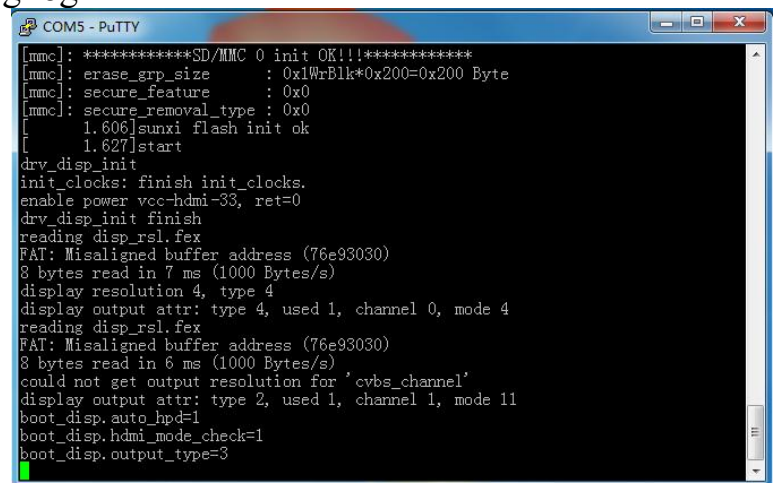
5) Putty Configuration



Serial port should set to the corresponding port number (COM5), the speed should set to 115200

6) Serial Debug Port

Power on and boot OrangePi, the serial port will automatic print debug log



2. Operation Steps on Linux

There are Minicom and Kermit serial debugging tools for Linux, this section will take Kermit as an example to have an illustrate.

1) Install Kermit

- Install the Kermit by execute command:
  $ sudo apt-get install ckermit

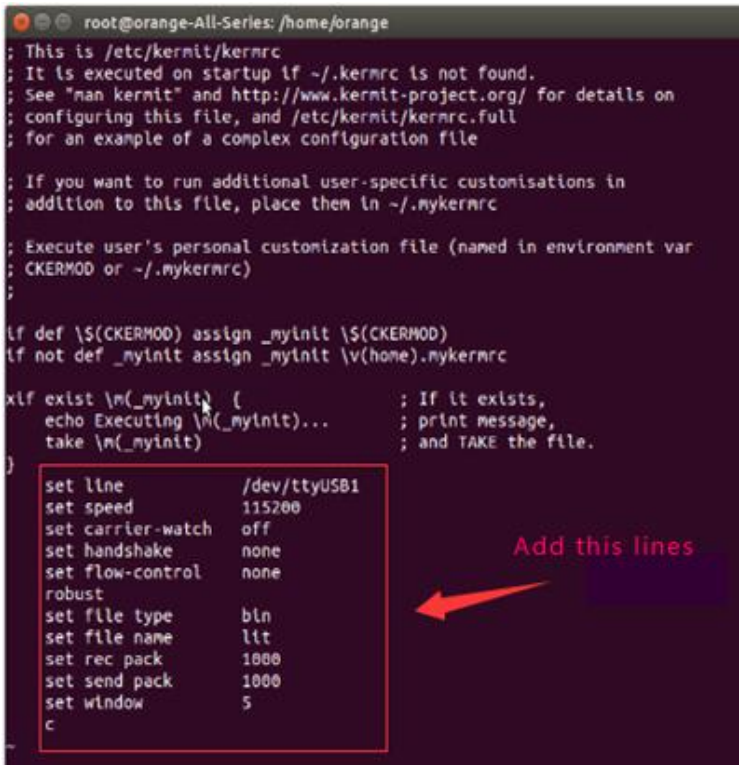
```
Terminal
s~$sudo apt-get install ckermit
```

- Configure Kermit
  $ sudo vi /etc/kermit/kermrc

```
Terminal
~$sudo vi /etc/kermit/kermrc
```

- Add lines：

```
set line          /dev/ttyUSB1
set speed             115200
set carrier-watch    off
set handshake   none
set flow-control      none
robust
set file type       bin
set file name          lit
set rec pack           1000
set send pack         1000
set window            5
```



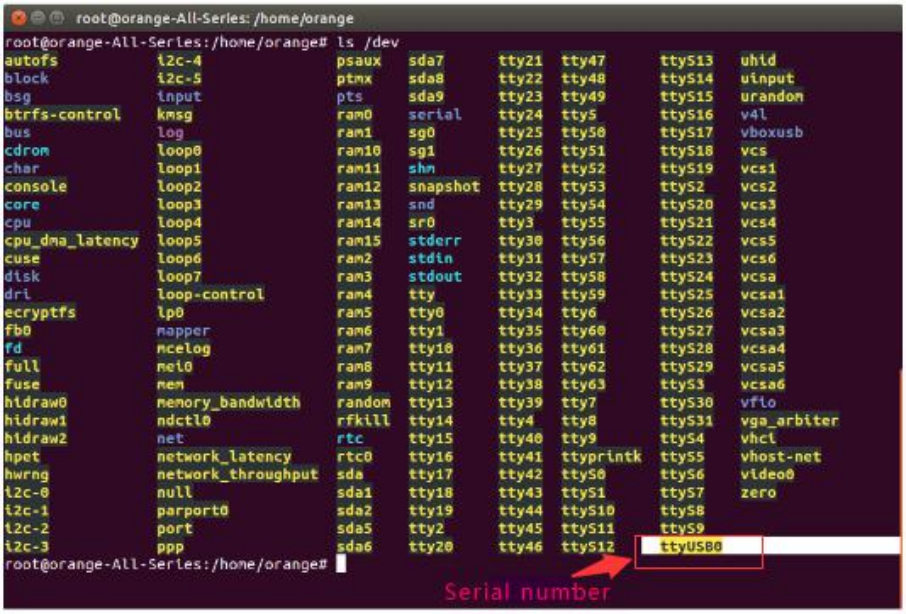
2) Connecting method

Use the TTL to the serial port cable, one end connected to OrangePi, the other end connected to PC

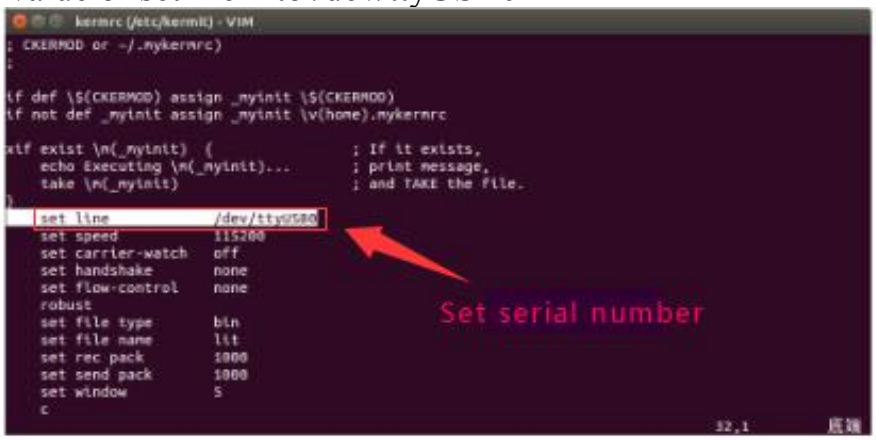
3) Equipment information acquisitio

Input command in the PC terminal to check the device number of TTL to the serial cable

$ ls /dev/

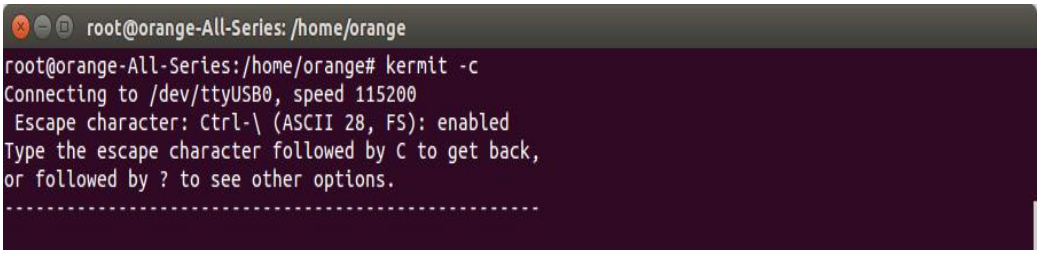


- It can be seen from the figure that TTL to the serial port cable is identified as ttyUSB0, configure the /ect/kermit/kermitc file, update the serial port information.
  $ sudo vi /etc/kermit/kermitc
- Set the value of setline into /dev/ttyUSB0



4) Start debug

- Input command in the host computer terminal, enter the Kermit mode:
  $ sudo kermit –c



- Power on and boot OrangePi, the serial port will print debug log automatically