Orange Pi Zero Plus2(H5)
User Manual

Contents

I. **Orange Pi Introduction**

1. **What is Orange Pi Zero Plus2?**

It's an open-source single-board computer. It can run Android 4.4(H3 version)/Android 5.1(H5 version) , Ubuntu, Debian, Rasberry Pi Image, it uses the AllWinner H3/H5 SoC, and has 512MB DDR3 SDRAM.

2. **What can I do with Orange Pi Zero Plus2?**

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 Zero Plus2 is open source

3. **Whom is it for?**

Orange Pi Zero Plus2 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.

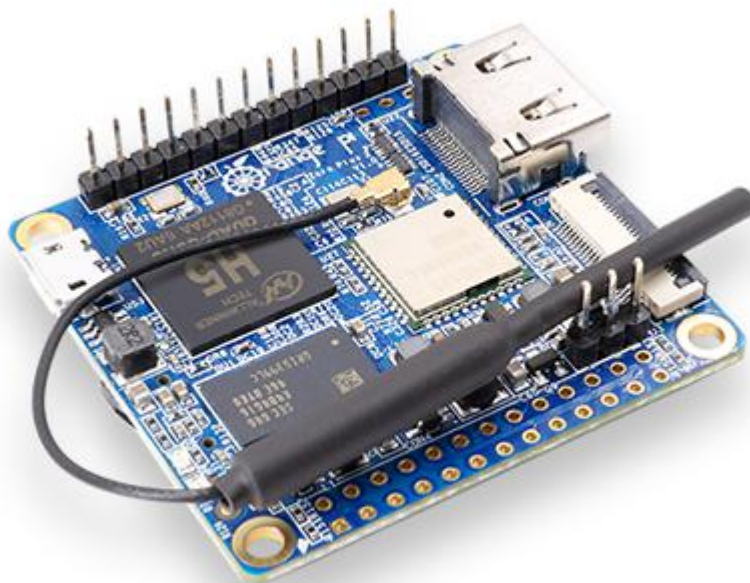## 4. **Hardware specification of Orange Pi Zero Plus2**

Hardware specification	
CPU	Quad-core 64bit Cortex-A53
GPU	Mali450 GPU
Memory (SDRAM)	512MB DDR3 (shared with GPU)
On-board Storage	TF card (Max. 32GB) /eMMC flash(8GB)

| On-board Wifi	AP6212, IEEE 802.11 b/g/n,BT4.2
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
Video Outputs	Supports HDMI output with HDCP Supports HDMI CEC Supports HDMI 30 function
Power Source	USB OTG input can supply power
USB 2.0 Ports	one USB 2.0 OTG
Low-level peripherals	26 Pins Header,compatible with Raspberry Pi B+ 13 Pins Header,with 2x USB, IR pin, AUDIO(MIC, AV)
GPIO(1x3) pin	UART, ground.
LED	Power led & Status led
Supported OS	Android Lubuntu, Debian, Raspberry Pi Image
Interface definition	
Product size	46mm × 48mm
Weight	36g
Orange Pi™ is a trademark of the Shenzhen Xunlong Software CO., Limited	

Top view

Bottom view

Interface instructions
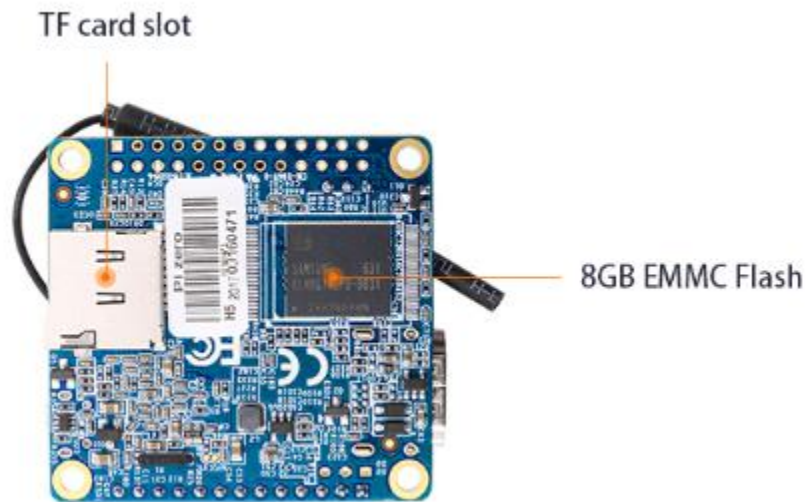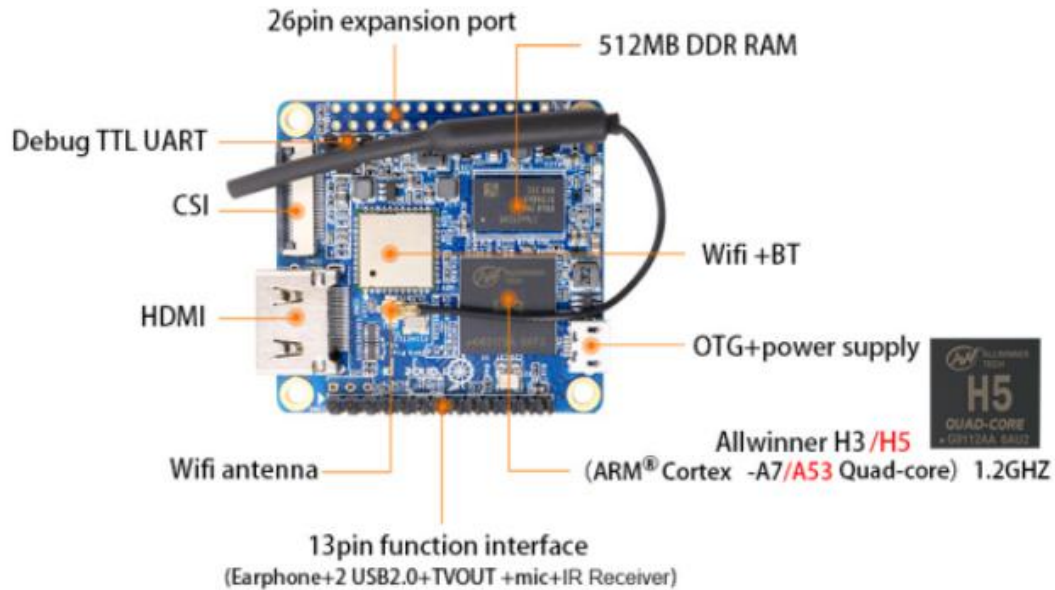
5. GPIO Specifications

A 26-pin GPIO interface on the Orange Pi Zero Plus2 is the same as Model A and Model B of Raspberry Pi. The picture below is GPIO pin define of Orange Pi Zero Plus2.
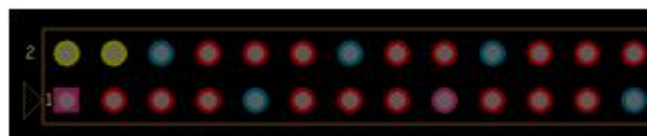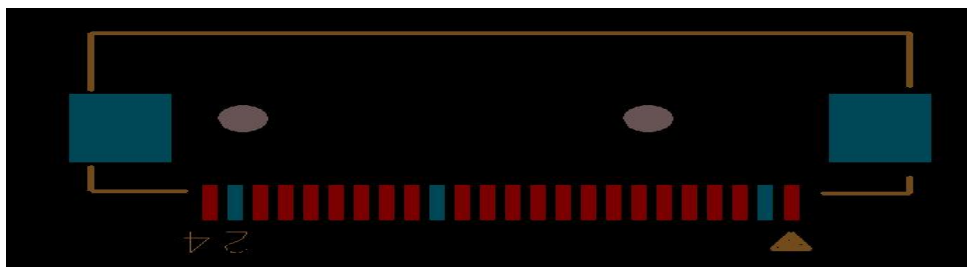
OrangePi_zeroplus2(H5)		
CON3-P01	VCC-3V3	
CON3-P02	VCC-5V	
CON3-P03	TWI0-SDA	PA12
CON3-P04	VCC-5V	
CON3-P05	TWI0-SCK	PA11
CON3-P06	GND	
CON3-P07	PWM1	PA6
CON3-P08	UART2_TX	PA0
CON3-P09	GND	
CON3-P10	UART2_RX	PA1
CON3-P11	S-TWI-SCK	PL0
CON3-P12	PD11	PD11
CON3-P13	S-TWI-SDA	PL1
CON3-P14	GND	
CON3-P15	UART2_CTS	PA3
CON3-P16	TWI1-SDA	PA19
CON3-P17	VCC3V3-EXT	
CON3-P18	TWI1-SCK	PA18
CON3-P19	SPI1_MOSI	PA15
CON3-P20	GND	
CON3-P21	SPI1_MISO	PA16
CON3-P22	UART2_RTS	PA2
CON3-P23	SPI1_CLK	PA14
CON3-P24	SPI1_CS	PA13
CON3-P25	GND	
CON3-P26	PD14	PD14

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 Zero Plus2 is camera connector.

Orange Pi Zero Plus2-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(we would suggest you using the Expansion board at the same time).

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 video cable	A standard AV video cable can be used to connect stimulated monitor if a HDMI monitor is unavailable.
4	Keyboard and mouse	Any keyboard and mouse with USB port is applicable; Keyboard and mouse are high-power, so a USB concentrator is required.
5	Ethernet cable/USB WiFi(Optional)	Network is optional, It makes more convenient to mount and upgrade software in your Orange Pi PC.
6	DC power adapter	5V/2V min. high qualified power adapter, OTG can used a power supply.
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 video cable

TF card   DC power adapter   Expansion Board

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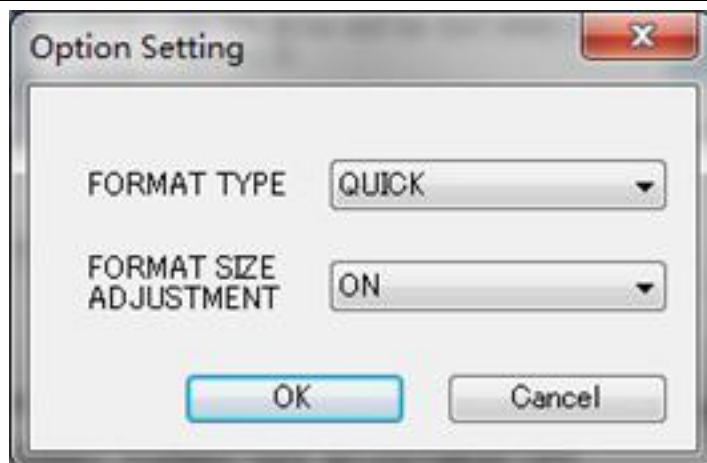b. Formatting the TF card.
   i   Download tools for formatting TF card, such as TF Formatter, it could be downloaded from:
https://www.sdcard.org/downloads/formatter_4/eula_windows/

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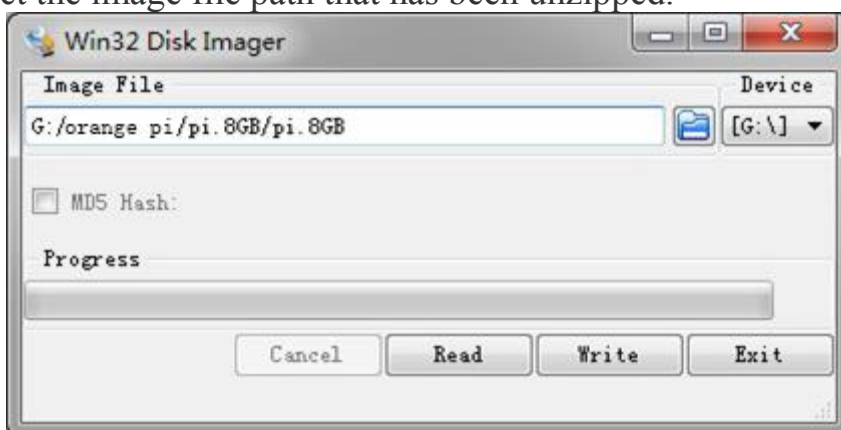
    iii   Click "*Write*" button and wait for the image to write.

    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 4GB 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:
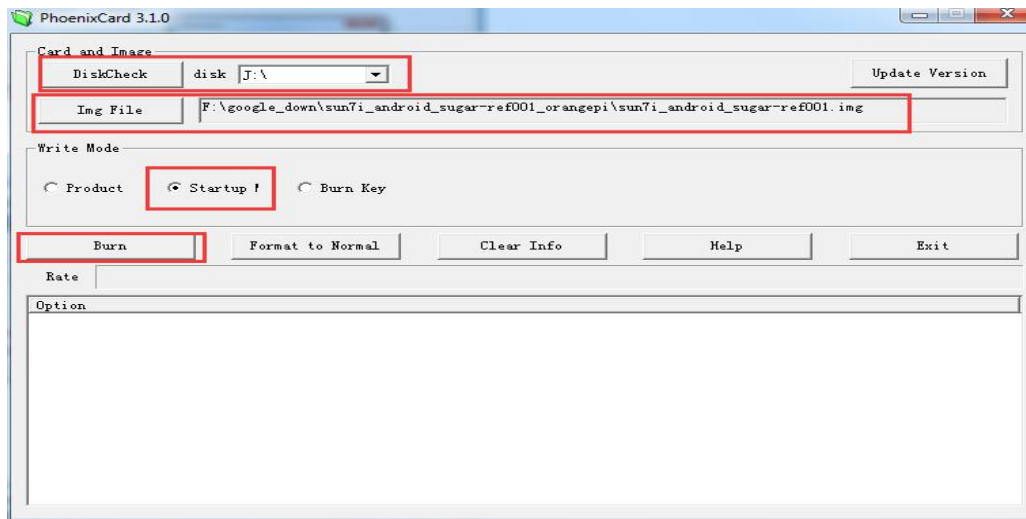   http://www.orangepi.org/downloadresources/
b. Format the TF card
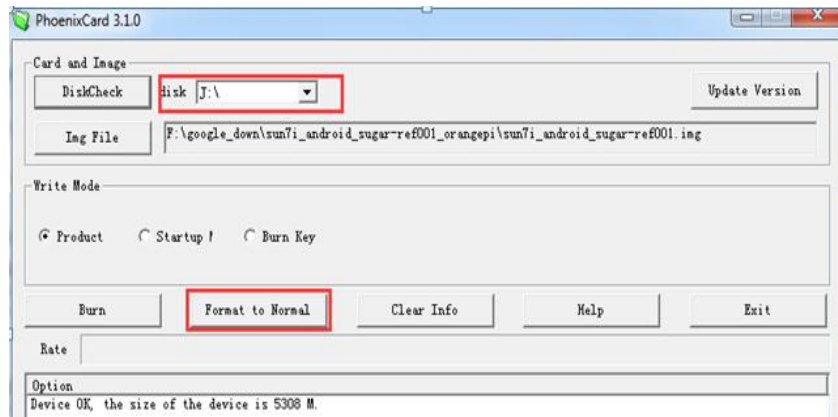
c. Please make sure the inserted TF card is in accordance with the chosen
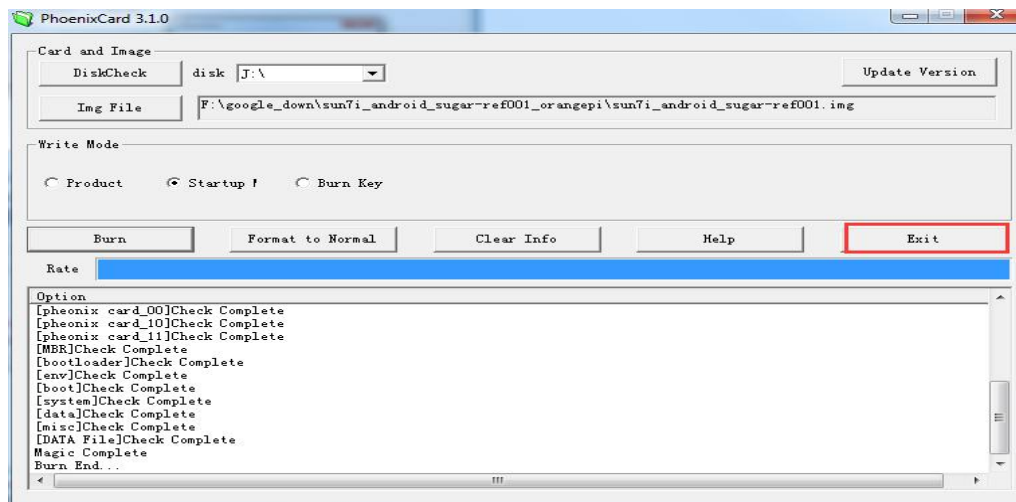   TF card, click "*restore*" button for TF card formatting.
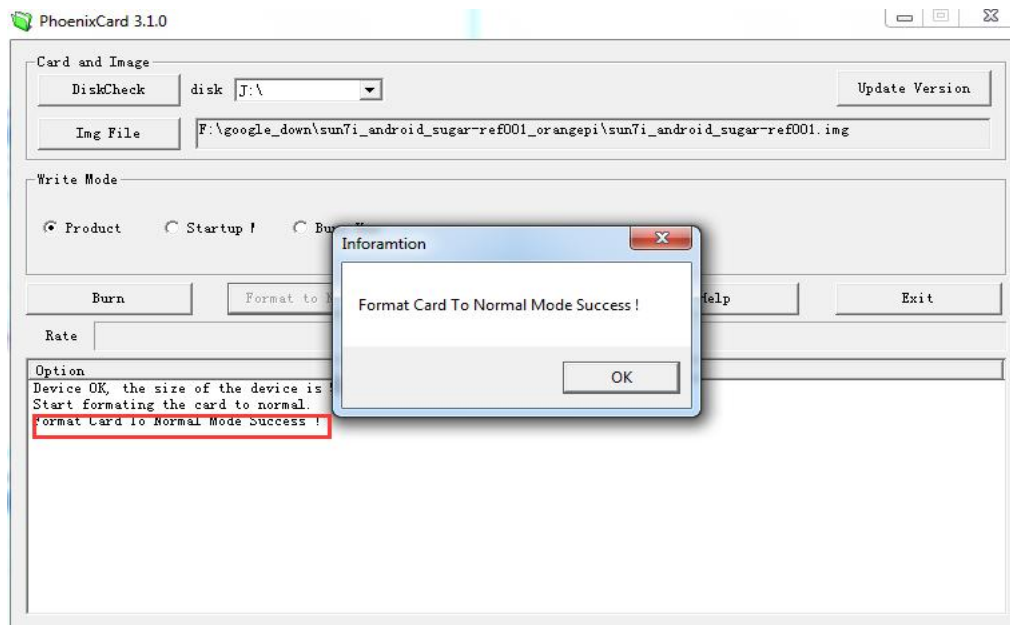
d. Click "*OK*" button after successfully formatted the TF card to normal.

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

5) Write Android image into EMMC

Steps for writing image into EMMC is almost the same with writing into TF card.

a. Download corresponding Android image and Phoenix Card writing tool.
b. Formatting SD card.
c. Make sure the Disk is same as TF card, and start formatting SD card.
d. Write Android into TF card, please note the red mark, which is different from writing into TF card.
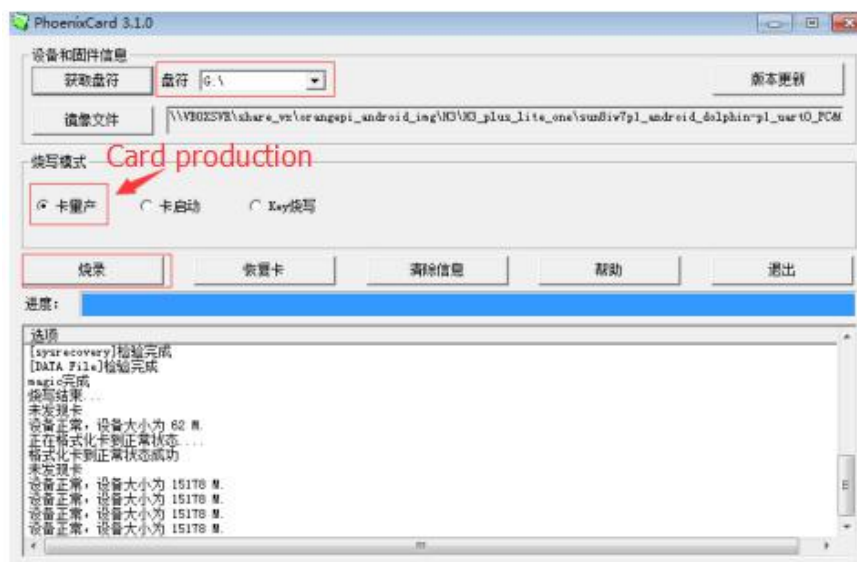
After written image with Card production, then exit.

e. Power it on, you could found that the red LED on board is flashing which means the image is writing. When the LED is off, image written finished. Take off the TF card, then power the board on, it should run.

6) Write Linux image into EMMC

In this section would take image: ubuntu_server_zeroplus2_H5_V0_1.img as an example to illustrate how to write Linux image into EMMC. We would recommend you use the server version image since the RAM of zero plus2 is not too big.

● Method 1:
a. $ sudo OrangePi_FormatEMMC.sh   Formatting EMMC

```
orangepi@Orangepi:~$ sudo OrangePi_FormatEMMC.sh
===============================
          Format EMMC
===============================
Erasing EMMC ...
Creating new filesystem on EMMC ...
  New filesystem created on /dev/mmcblk0.
Partitioning EMMC ...
  Creating boot & linux partitions
  OK.
[  321.903849] EXT4-fs (mmcblk0p2): VFS: Can't find ext4 filesystem
Formating fat partition ...
```

$ sudo OrangePi_Install_OrangePi_2_EMMC.sh   Writ image into EMMC

```
root@Orangepi:/# sudo OrangePi_Install_OrangePi_2_EMMC.sh

WARNING: EMMC WILL BE ERASED !, Continue (y/N)?  y
Erasing EMMC ...
Creating new filesystem on EMMC ...
  New filesystem created on /dev/mmcblk0.
Partitioning EMMC ...
  Creating boot & linux partitions
  OK.
[  560.421320] EXT4-fs (mmcblk0p2): VFS: Can't find ext4 filesystem
Formating fat partition ...
  fat partition formated.
Formating linux partition (ext4), please wait ...
  linux partition formated.

Instaling u-boot to EMMC ...
```

Wait for writing finish and re-boot

● Method 2:
$ sudo OrangePi_Settings
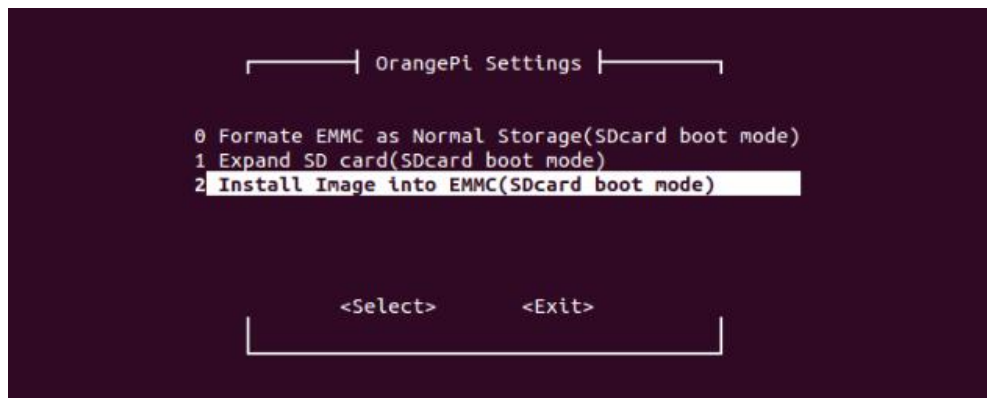
Select the fourth one   Storage Setting

Select the first one, Format EMMC as Normal Storage   First format EMMC

Select fourth one, Install Image into EMMC   Install image into EMMC and re-boot

3. Step 3: Boot your Orange Pi

1) Hardware Connection Sketch Map

Orange Pi Zero Plus2 runs on Android 5.1 system

Orange Pi Zero Plus2 runs on Debian system

Orange Pi Zero Plus2 runs on Ubuntu system

2) **Details of Booting Steps**

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

You could also use AV interface and audio interface to connect output video and audio to analog TV or display.

    c. There is 13pin on board which you could connect to expansion board. For expansion board, 2USB ports, mic and IR receiver are available.

    d. It is the network module on board, which you can access Orange Pi to the wired network.

    e. You could connect to a power adapter on mic USB OTG with a power adapter up to or bigger than 5V/2A. Avoid using smaller power GSM mobile phone charger, it is not able to output 2A even if it marked "5V/2A ".

Note: Micro-USB（OTG）cannot use as power input which may cause the fail boot of the OrangePi. Only the power interface could input power.

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

- Method 1:

a. Enter the following in the command line:
    $ ifconfig
    To check whether there is (wlan*)
b. If no, load the corresponding module according to the wlan model
     $ insmod bcmdhd.ko
      For example: For AP6212 is bcmdhd.ko
c. Enter command ifconfig, you should see wlan0(hypothesis it is wlan0)
d. Configure wired network, first you need to know ssid and psk(account and password), enter corresponding wlan*, ssid, psk
       $ sudo nano /etc/network/interfaces   (add the following contents)
       auto wlan0
       iface wlan0 inet dhcp
       wpa-ssid xxxx
       wpa-psk xxxx
e. Reboot the computer and the wired network will work.
       $ sudo reboot

● Method 2:

a. Build wifi hotspot configuration file of wpa_supplication.conf for on /etc/network/ directory and add the following:

      network={

               ssid="wifi hot spot name"

               psk="wifi hot spot password"

               priority=1

      }

b. Connect wifi, here is the command:
   ifconfig wlan0 up
   sudo wpa_supplicant -i wlan0 -c /etc/network/wpa_supplication.conf &
   dhcpcd wlan0 &

c. Test the condition of wifi connection
Use iwconfig command, you will find the related information of wlan0, use ping command to test.

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

```
curry@curry:$ ssh root@192.168.1.178
root@192.168.1.178's password:
Welcome to Ubuntu 15.10 (GNU/Linux 3.4.39-02-lobo armv7l)

 * Documentation:  https://help.ubuntu.com/
Last login: Tue Apr 11 15:20:33 2017 from 192.168.1.111
root@OrangePI [10:03:27 AM] [~]
-> #
```

3) HDMI or 3.5mm Sound Output(3.5mm sound output would require using an expansion board)

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. It needs to modify configuration on file system for output on 3.5mm of /etc/asound.conf, modify card1 into card0, or use amixer to modify. The default one is configured, or you could use player on graphical interface to switch via sound channel selection.

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

```
@orangepi:~$ usermod -l zhangsan orangepi
```

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. In order for convenient, it could be Chmod 755, such as sudo Chmod 755 /nas path /DLNA/Music

  v   Re-start minidlna to take effect the configuration: /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.

Xware1.0.31_armel_v7a_uclibc.zip (1.84 MB, 下载次数: 3695)

Xware1.0.31_asus_rt_ac56u.zip (1.21 MB, 下载次数: 4889)

Xware1.0.31_cubieboard.zip (1.82 MB, 下载次数: 2549)

Xware1.0.31_iomega_cloud.zip (1.97 MB, 下载次数: 1406)
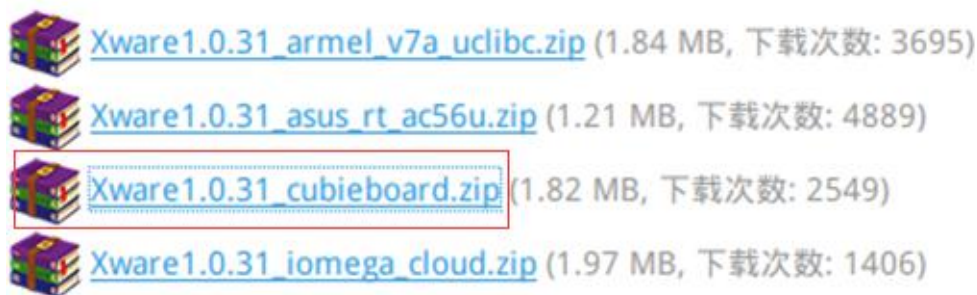
Note: If you want to try the latest version, you can download the latest test version: http://luyou.xunlei.com/thread-15167-1-1.htm.
b. Enter the directory after uploaded the unzip file to OrangePi. It is recommended to rename the file to xunlei
c. Installation method of version 1.0.31:
i $ cd /xxx/xunlei   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:

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.
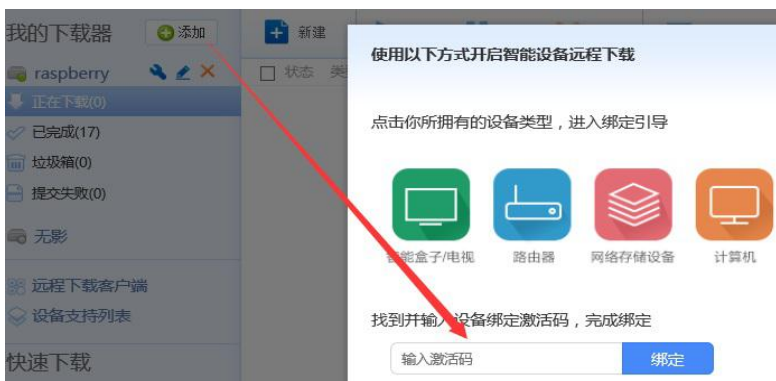
vi Setting start up

　　$ 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 the 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.

Hardware: Orange Pi development board*1, Card reader*1, TF card*1, power supply*1
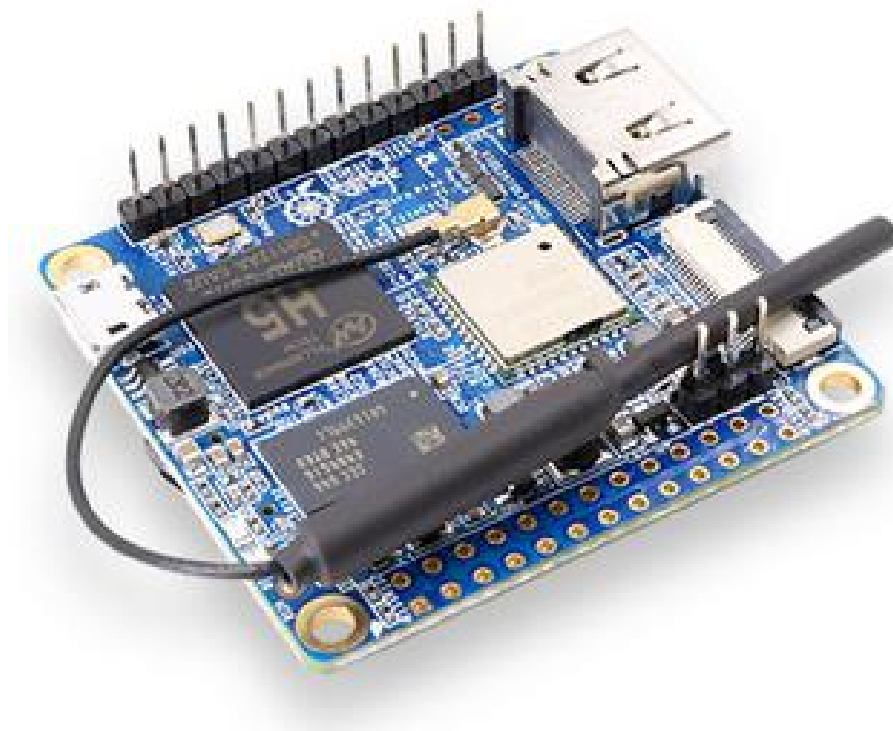
Note: In the following sections, * indicates wild-cards, you need to fill in the actual values according to their file storage path.

1. **Download Linux Source Code**

You could download the source code from the official website(Source code for H5 chip are the same):

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

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

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

- Use the following command to compile the entire project
  $ ./build.sh   config

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

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

At this point, the system will be prompted the choice of the board, as shown below, for the OrangePi, select dolphin-p1

Appear this interface indicates waiting for the compiler.

Wait fifteen minutes or so, compile complete.

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/sdb

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
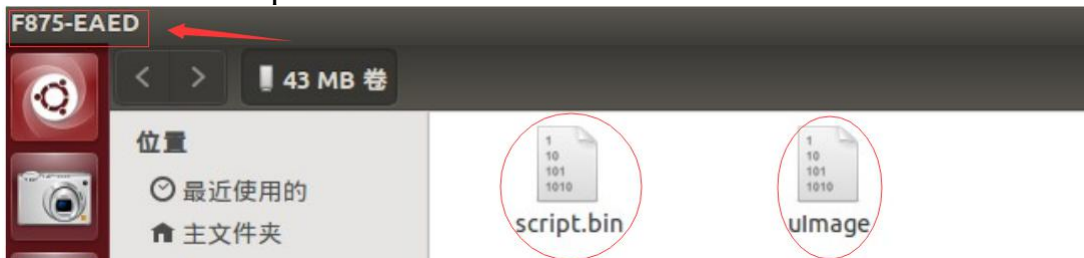
The second rootfs partition

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.

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 Zero Plus2
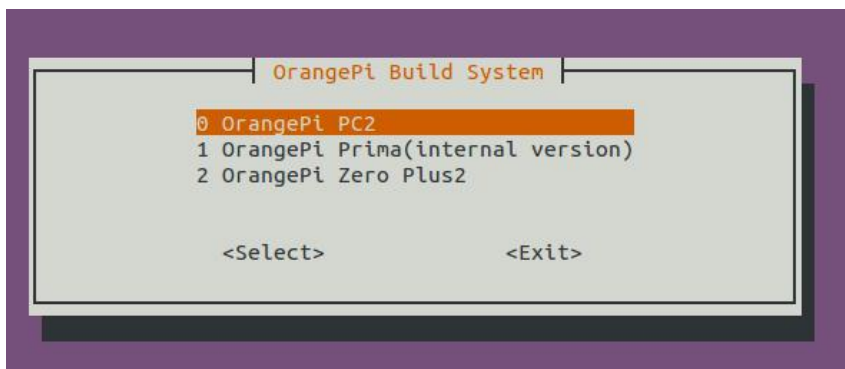
Enter password of root
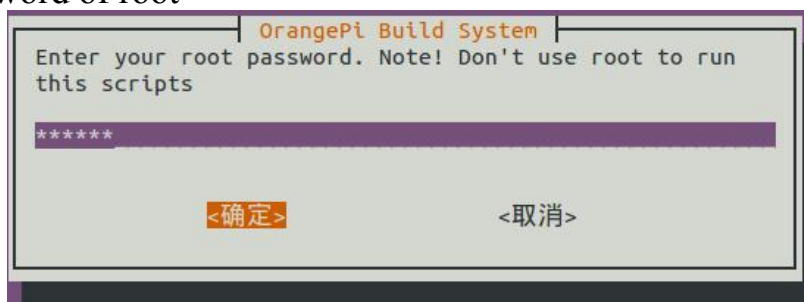
Update Kernel directory and module
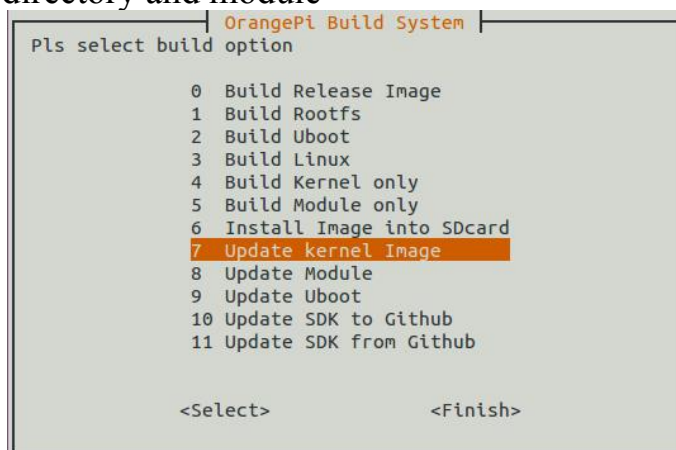
Select corresponding file directory and update uImage and modules
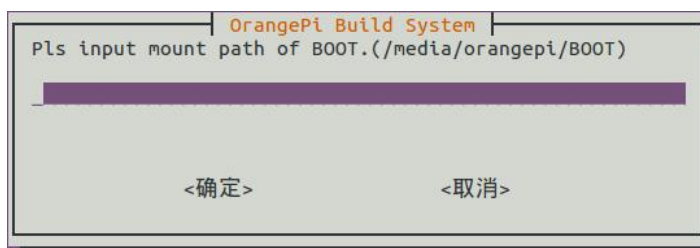
IV.   **Android Kernel Source Code Compilation**

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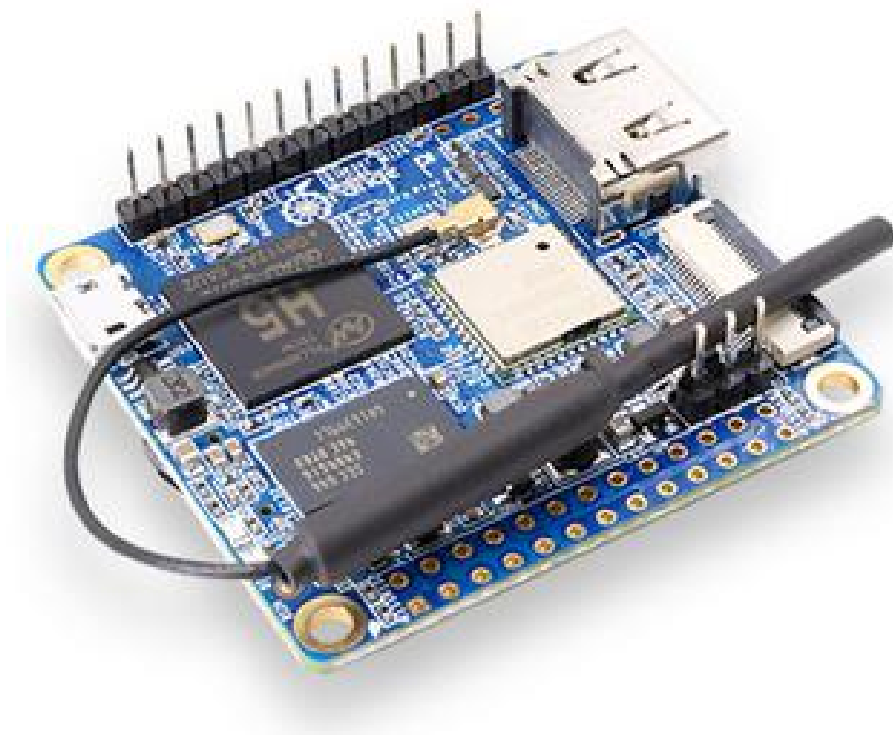
Software

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;

JDK 6;

Version 1.7 or higher version of Git.

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:

```
root@curry:/home/curry/tools# ls
1_arm-linux-gnueabihf-gcc                java1.6_environment.sh   jdk-6u31-linux-x64.bin
arm-linux-gcc-4.5.1-v6-vfp-20120301.tgz  jdk1.6.0_31              opt
```

- 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.

```
root@curry:/home/curry/tools# ls
1_arm-linux-gnueabihf-gcc                java1.6_environment.sh   jdk-6u31-linux-x64.bin
arm-linux-gcc-4.5.1-v6-vfp-20120301.tgz  jdk1.6.0_31              opt
```

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

```
root@curry:/home/curry/tools# export JAVA_HOME=/home/curry/tools/jdk1.6.0_31
root@curry:/home/curry/tools# export PATH=$PATH:.$JAVA_HOME/bin
root@curry:/home/curry/tools# export CLASSPATH=.:$JAVA_HOME/lib
root@curry:/home/curry/tools# export JRE_HOME=$JAVA_HOME/jre
```

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

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

Then you will obtain the following directories:

```
curry@curry:$ ls
android  lichee
```

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

```
sun8iw7p1 compile Kernel successful

INFO: build kernel OK.
INFO: build rootfs ...
INFO: skip make rootfs for android
INFO: build rootfs OK.
---------------------------------------------
build sun8iw7p1 android dolphin lichee OK
```

6. Compile Command of Android Code

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 cheetah_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

```
curry@curry:$ extract-bsp
/expansion/xspace/OrangePi/Android/H5/zeroplus/android/device/*/cheetah-p1/bImage copied!
/expansion/xspace/OrangePi/Android/H5/zeroplus/android/device/*/cheetah-p1/modules copied!
curry@curry:$ make
===========================================
PLATFORM_VERSION_CODENAME=REL
PLATFORM_VERSION=5.1
TARGET_PRODUCT=cheetah_fvd_p1
TARGET_BUILD_VARIANT=eng
TARGET_BUILD_TYPE=release
```

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

```
target Strip: primitives_tests (out/target/product/cheetah-p1/obj/EXECUTABLES/pr
imitives_tests_intermediates/primitives_tests)
target Executable: camera_metadata_tests (out/target/product/cheetah-p1/obj/EXEC
UTABLES/camera_metadata_tests_intermediates/LINKED/camera_metadata_tests)
target Symbolic: camera_metadata_tests (out/target/product/cheetah-p1/symbols/da
ta/nativetest/camera_metadata_tests/camera_metadata_tests)
target Strip: camera_metadata_tests (out/target/product/cheetah-p1/obj/EXECUTABL
ES/camera_metadata_tests_intermediates/camera_metadata_tests)

#### make completed successfully (03:01:30 (hh:mm:ss)) ####
```

$ pack   #Packaged into firmware

```
verity_block.fex Len: 0xc6ea4
Vverity_block.fex Len: 0x4
recovery.fex Len: 0xece800
Vrecovery.fex Len: 0x4
sysrecovery.fex Len: 0xb
diskfs.fex Len: 0x200
BuildImg 0
Dragon execute image.cfg SUCCESS !
----------image is at----------

/expansion/xspace/OrangePi/Android/H5/zeroplus/lichee/tools/pack/sun50iw2p1_andr
oid_cheetah-p1_uart0.img

pack finish
```

$ cd */lichee/tools/pack/

```
curry@curry:$ ls
chips    createkeys  pack       pctools
common   out         parser.sh  sun50iw2p1_android_cheetah-p1_uart0.img
curry@curry:$ pwd
/expansion/xspace/OrangePi/Android/H5/prime/lichee/tools/pack
```

Write image:

Copy the generated image file i to the SD card, switch to the windows operating system. Programming software download website：

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

Download the compressed package, unzip and get the folder

Enter the folder, open the program to run as Administrator

Write Android image on Windows with this tool:
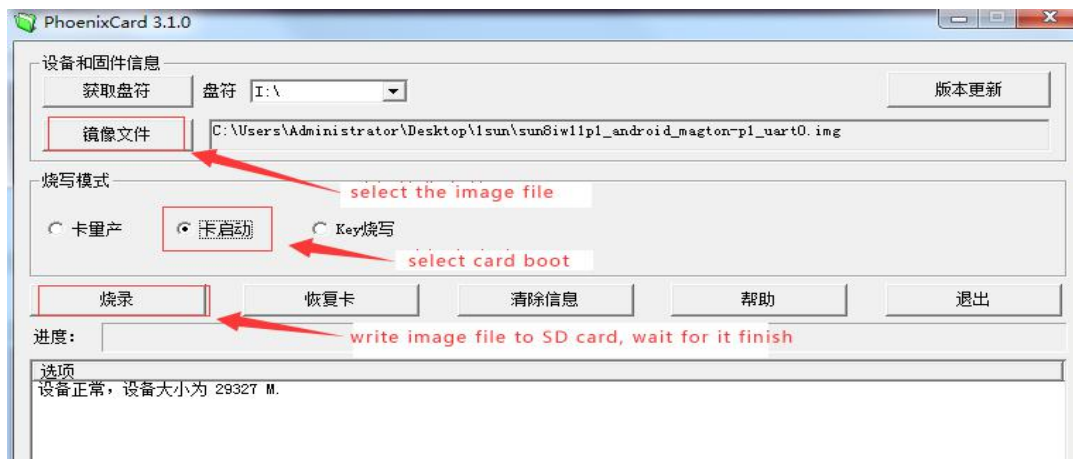
Insert the TF card with written image to OrangePi, turn on the computer then you could enter to Android system.

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/sun8iw7p1/configs/dolphin-p1/sys_config.fex

Copy the file to the directory of /lichee, use command:
$ cd ./lichee
$ cp ./tools/pack/chips/sun8iw7p1/configs/dolphin-p1/sys_config.fex ./

You could personalized configuration of sys_config.fex according to sysconfig1.fex_manul_linux_BSP_v0.4.pdf.
Direcotory of sysconfig1.fex_manul_linux_BSP_v0.4.pdf 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 OrangePiH5.dtb. 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
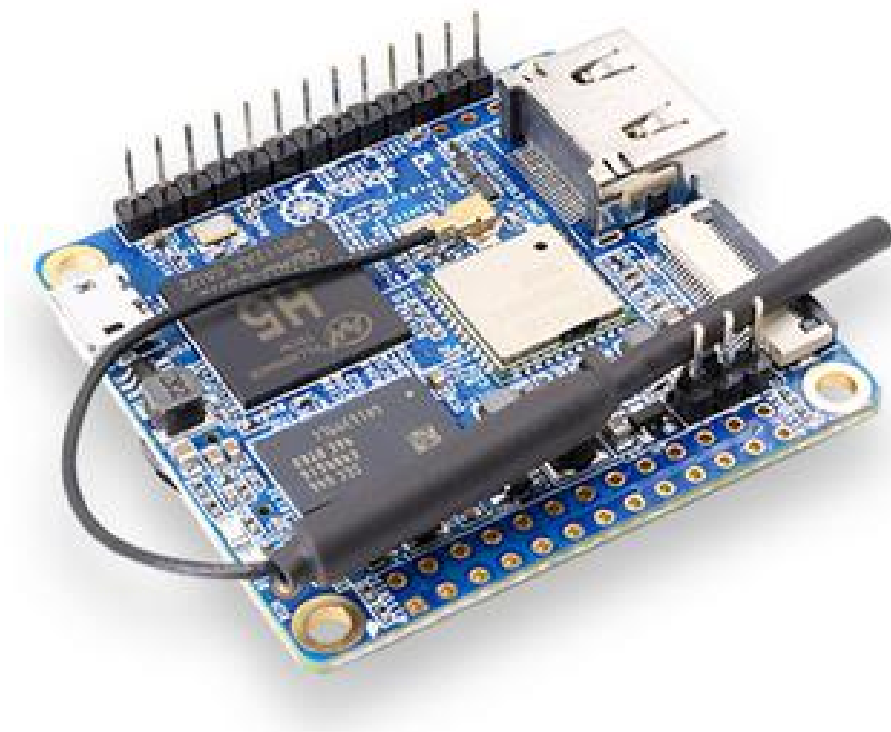
1. Device Driver and Application Programming

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);
```
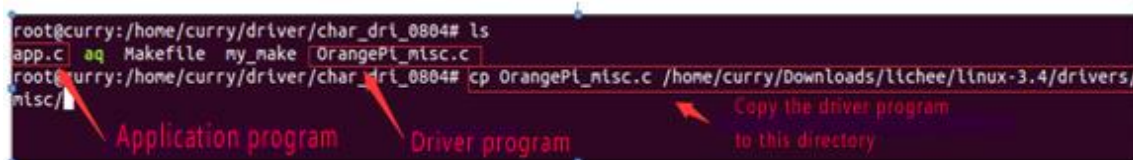
2. Compile device driver

Copy the OrangePi_misc.c to the */lichee/linux-3.4/driver/misc directory:

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 is a .ko module which generated after compiled of OrangePi_misc.c on */lichee/linux-3.4/output/lib/modules/3.4.39/

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 the OrangePi_misc.ko file to /media/*/lib/modules/3.4.39.
$ cp OrangePi_misc.ko   /media/*/lib/modules/3.4.39

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 development 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 OrangePi

Hardware: Orange Pi development board*1, Card reader*1, TF card*1, power supply*1
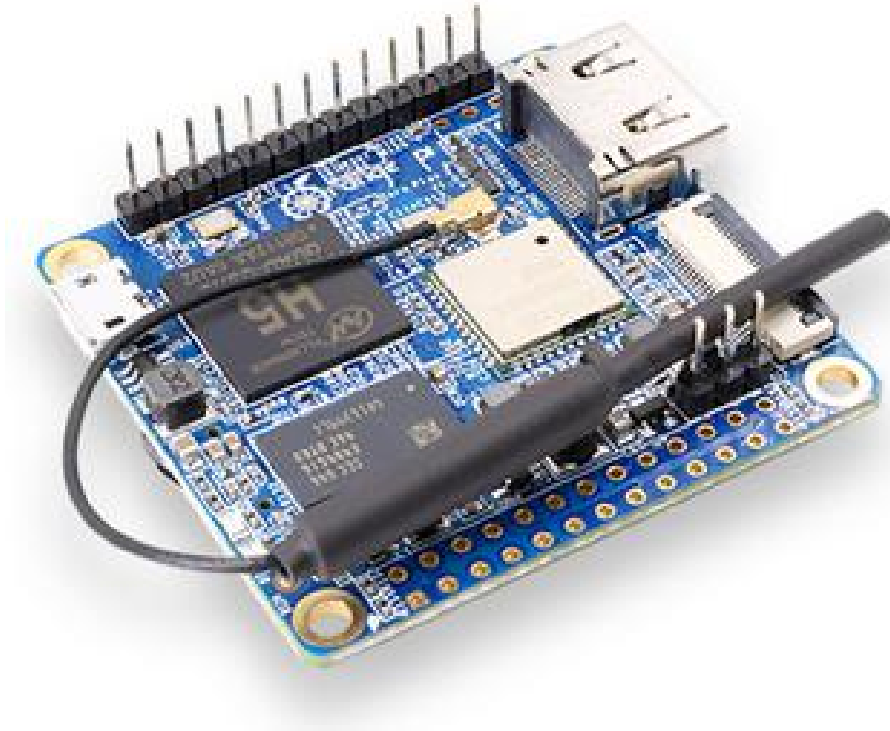
TTL to USB cable

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
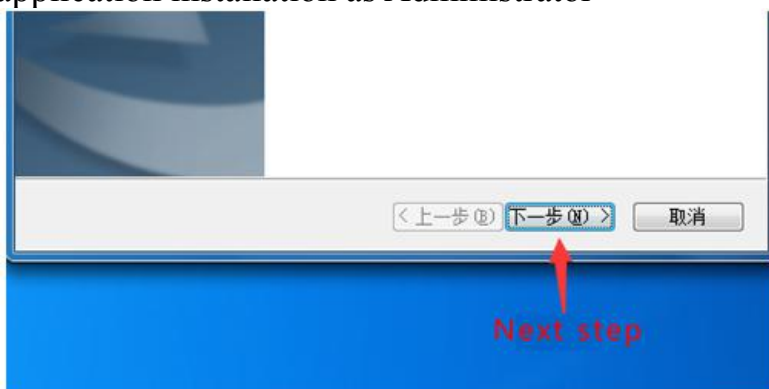
● Wait for completing installation

2) Install putty on Windows

● Download putty installation package

● Unzip and install

636网址导航	2015/5/4 14:21	Internet 快捷方式	1 KB	
putty中文版1.0v	2016/1/20 17:13	应用程序	604 KB	← Click to install
XP510下载须知	2015/5/4 14:21	文本文档	2 KB	
软件使用说明	2015/5/13 9:23	360 se HTML Do...	1 KB	
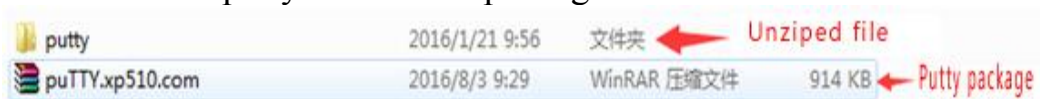
● Open program after installed, as shown below
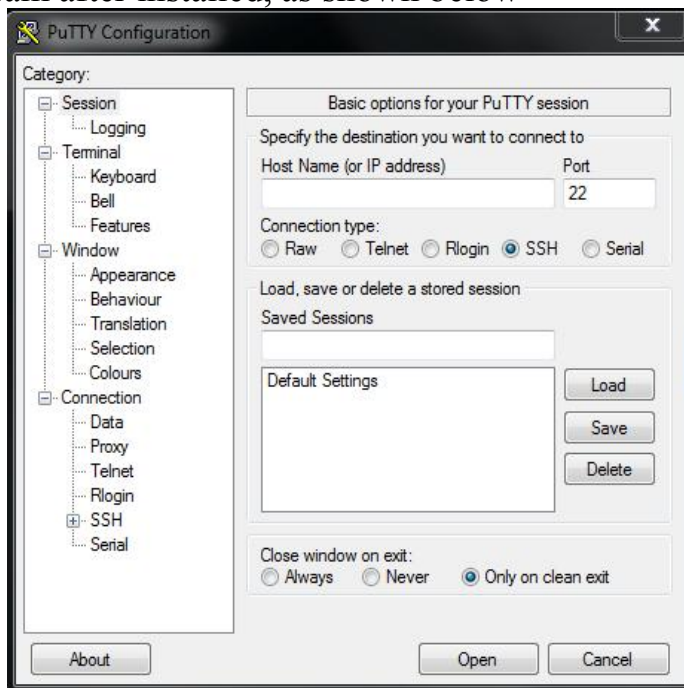
3) **Connecting method**

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*

Administrator
Documents
Pictures
Music
Games
Computer
Control Panel
Devices and Printers
Default Programs
Help and Support

AutoPlay   Backup and Restore
Credential Manager   Date and Time
Device Manager   Devices and Printers
Flash Player (32-bit)   Folder Options
HomeGroup   Indexing Options
Location and Other Sensors   Mouse
Parental Controls   Performance Information and Tools

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

USER-20160307FB
  Batteries
  Computer
  Disk drives
  Display adapters
  DVD/CD-ROM drives
  Human Interface Devices
  IDE ATA/ATAPI controllers
  Keyboards
  Mice and other pointing devices
  Monitors
  Network adapters
  Portable Devices
  Ports (COM & LPT)
  Processors
Monitors
Network adapters
Ports (COM & LPT)
  Prolific USB-to-Serial Comm Port (COM3)
  打印机端口 (LPT1)
  通信端口 (COM1)
Processors
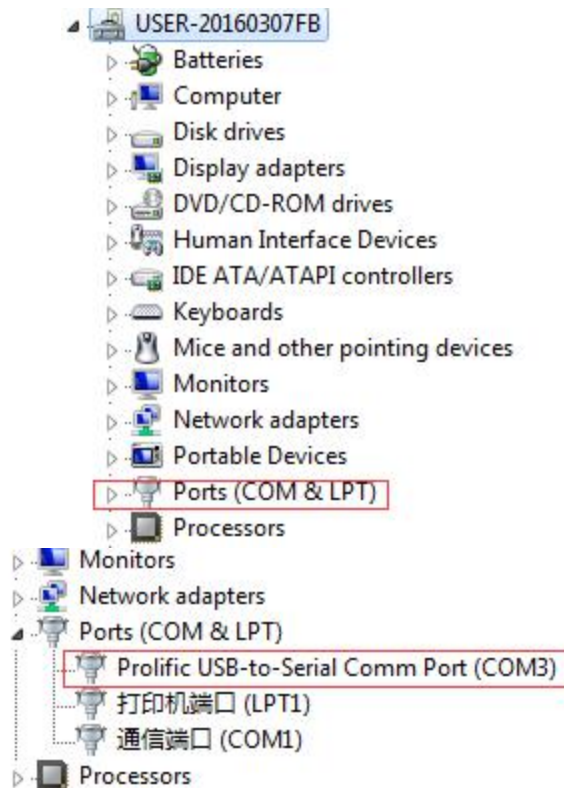
5) Putty Configuration
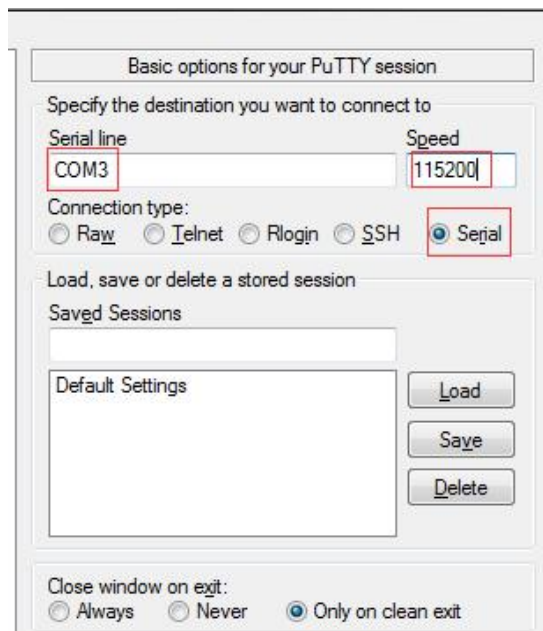
Serial port should set to the corresponding port number (COM5), the speed should set to 115200

6) Serial Debug Port

Power on and boot OrangePi, the serial port will automatic print debug log
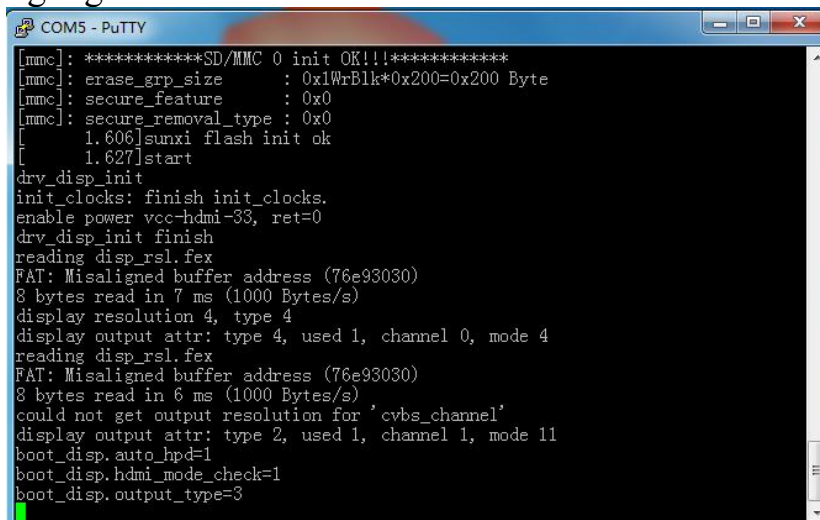
2. Operation Steps on Linux

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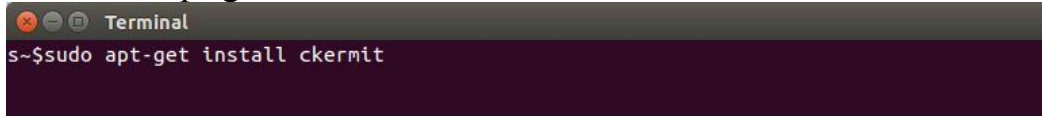
1) Install Kermit

- Install the Kermit by execute command:
    $ sudo apt-get install ckermit
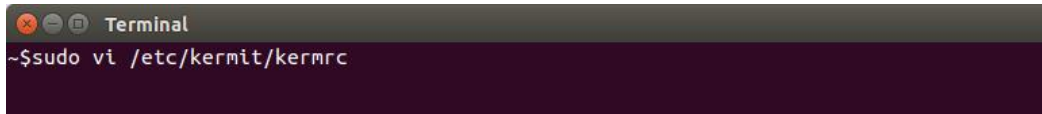
```
Terminal
s~$sudo apt-get install ckermit
```

- 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 automatic print debug log

```
root@orange-All-Series: /home/orange
Connecting to /dev/ttyUSB0, speed 115200
 Escape character: Ctrl-\ (ASCII 28, FS): enabled
Type the escape character followed by C to get back,
or followed by ? to see other options.
--------------------------------------------------
HELLO! BOOT0 is starting!
boot0 commit : 8
boot0 version : 4.0
set pll start
set pll end
rtc[0] value = 0x00000000
rtc[1] value = 0x00000000
rtc[2] value = 0x00000000
rtc[3] value = 0x00000000
rtc[4] value = 0x00000000
rtc[5] value = 0x00000000
DRAMC IS FOUR
DRAM BOOT DRIVE INFO: V1.1
the chip id is 0x00000001
the chip id is 0x00000001
the chip id is 0x00000001
the chip id is 0x00000001
the chip id is 0x00000001
```