WuKong Pi H3 Zero
User Manual

Contents

I. WuKong Pi Introduction

1. What is WuKong Pi H3 Zero?

It's an open-source single-board computer. It can run Android 4.4, Ubuntu, Debian, Rasberry Pi Image. It uses the AllWinner H3 SoC, and has 256MB/512MB DDR3 SDRAM(256MB version is Standard version).

2. What can I do with WuKong Pi H3 Zero?

You can use it to build …

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

Pretty much anything else, because WuKong Pi H3 Zero is open source

3. Whom is it for?

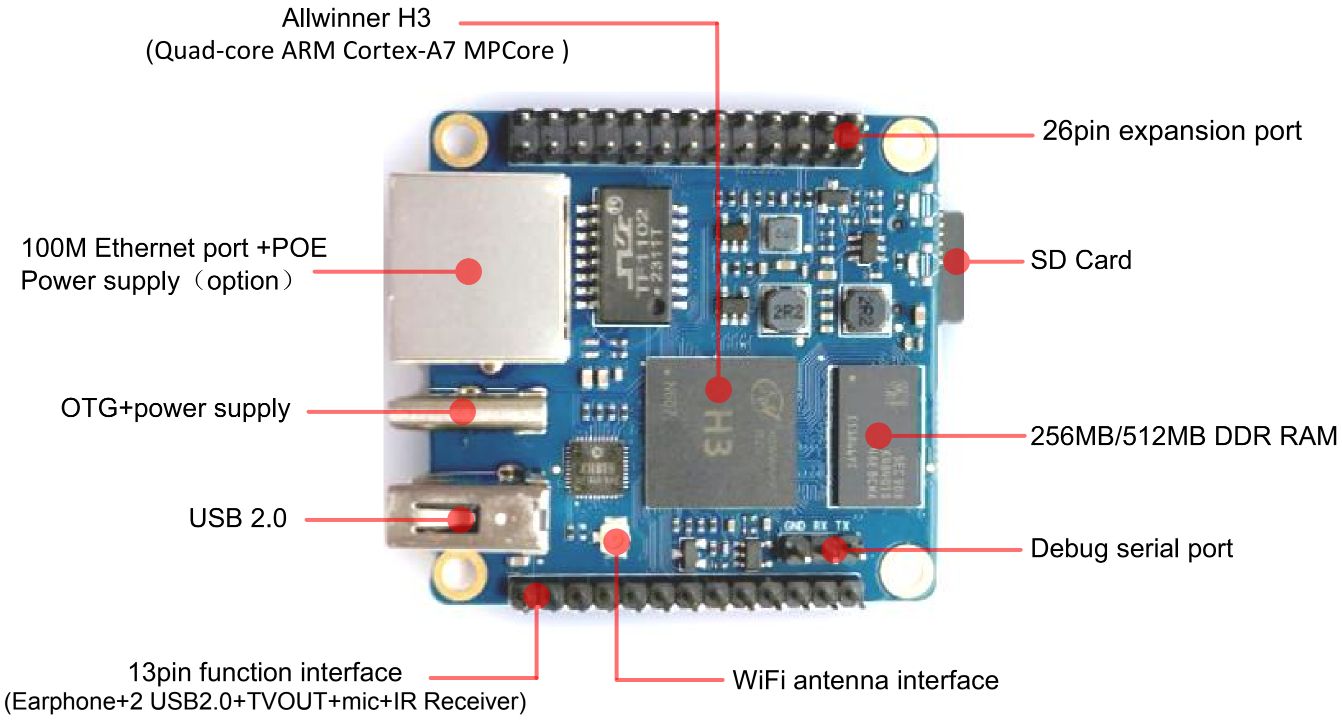
WuKong Pi H3 Zero is for anyone who wants to create with technology– not just consuming. It's a simple, fun, useful tool and you can use it to take control of the world around you.

4. Hardware specification of WuKong Pi H3 Zero

Hardware specification	
CPU	H3 Quad- core Cortex- A7 H 2 6 5 / HEVC 4 K
GPU	Mali400MP2 GPU @600MHz, Supports OpenGL ES 2.0
Memory (SDRAM)	256MB/512MB DDR3 (shared with GPU)(256MB is Standard version)
Onboard Storage	TF card (Max. 32GB) / NOR flash(2MB)
Wifi	Yes

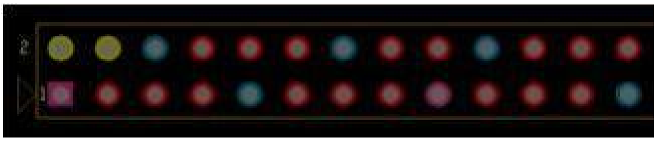
Onboard Network	100M/ 10M Ethernet RJ45 (Integrated POE power supply)
Onboard WIFI	XR819, IEEE 802. 11 b/g/n
Audio Input	No, need to use an expansion board
Video Outputs	Supports external board via 13 pins
Power Source	USB OTG can supply power(Integrated POE power supply)
USB 2.0 Ports	One USB 2.0 HOST, one USB 2.0 OTG
Buttons	Power button
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, Rasberry Pi Image
Interface definition	
Product size	45mm × 48mm
Weight	30g
WuKong Pi is a trademark of the Shenzhen Sincody CO., Limited	

Interface instructions



5. GPIO Specifications

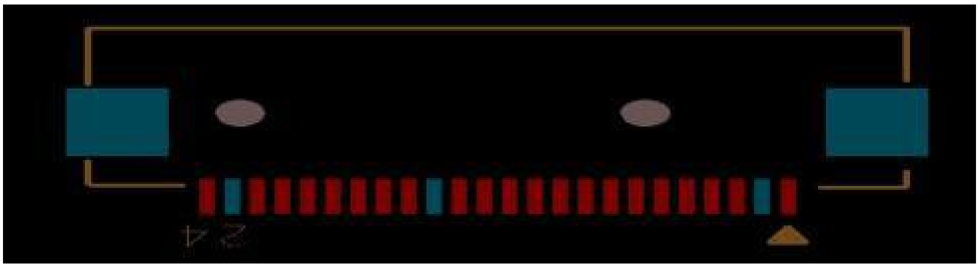
A 26-pin GPIO interface on the WuKong Pi H3 Zero is the same as Model A and Model B of Raspberry Pi. The picture below is GPIO pin define of WuKong Pi H3 Zero.



WuKongPi_zero(H3)		
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 WuKong Pi H3 Zero is camera connector.



WuKong Pi H3 Zero-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 WuKong Pi in a very short period of time. Boot your WuKong 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 WuKong 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	AV video cable	A standard AV video cable can be used to connect stimulated monitor if a HDMI monitor is unavailable.
3	Keyboard and mouse	Any keyboard and mouse with USB port is applicable; Keyboard and mouse are high-power, so a USB concentrator is required.
4	Ethernet cable/ USB WiFi(Optional)	Network is optional, It makes more convenient to mount and upgrade software in your WuKong Pi PC.
5	DC power adapter	5 V/ 2 V min. high qualified power adapter, Type-c can used a power supply
6	Audio cable (Optional)	You can select an audio cable with 3.5mm jack to feel stereo audio.

2. Step 2: Prepare a TF Card

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

1) Write Linux into TF Card Based on Windows Platform

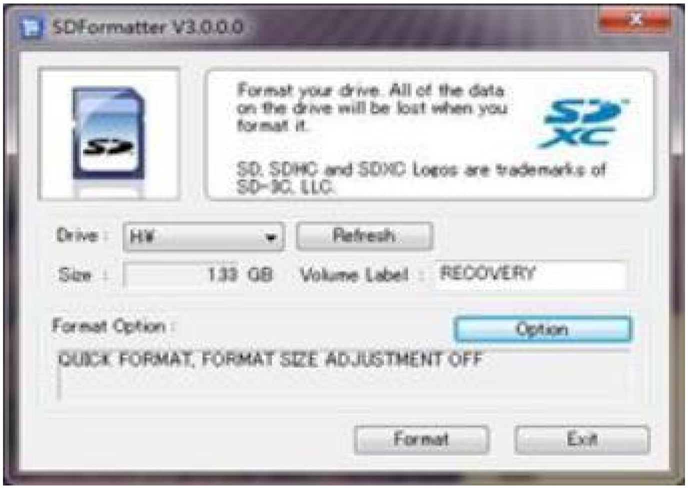
a. Inserting the TF card into the computer, the capacity of the card must be bigger than the operating system, usually requires 8GB or bigger.

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 "*forma*t" button for quick formatting. "*Format size adjustment*" select "(ON)"



SDFormatter V3.0.0.0

Format your drive. All of the data on the drive will be lost when you format it.

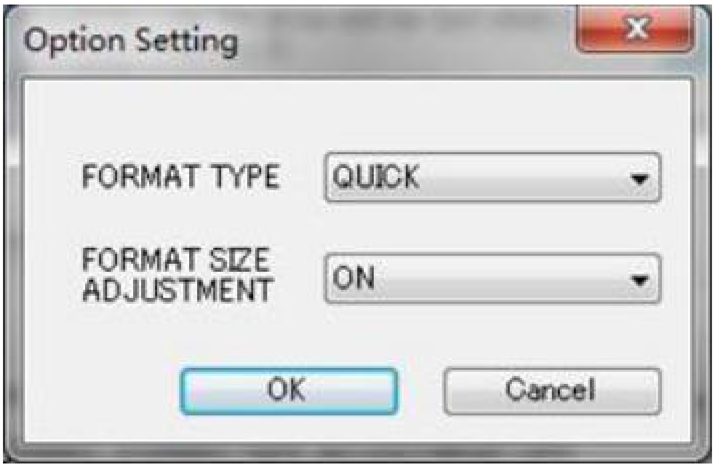
SD, SDHC and SDXC Logos are trademarks of SD-3C, LLC.

Drive : H:\

Size : 1.33 GB Volume Label : RECOVERY

Format Option :

QUICK FORMAT, FORMAT SIZE ADJUSTMENT OFF



Option Setting

FORMAT TYPE QUICK

FORMAT SIZE ADJUSTMENT ON

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

v Click the "*Format*" button.

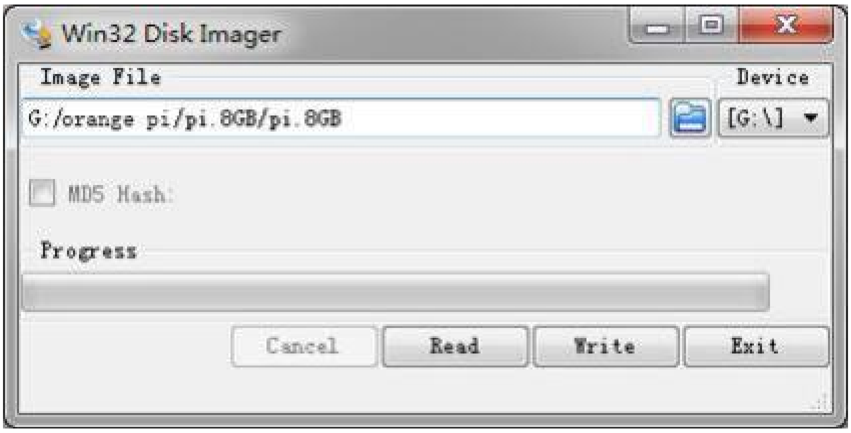
c. Download the operating system image file from the download page, the page address is as following:
https://pan.baidu.com/s/1scMeadmTEeOpsAw2o_tCJg?pwd=abcd
https://github.com/Timfu2019/wukongpi_build

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/ win3 2 diskimager/ 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 ***sudofdisk /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
https://pan.baidu.com/s/1scMeadmTEeOpsAw2o_tCJg?pwd=abcd

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

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

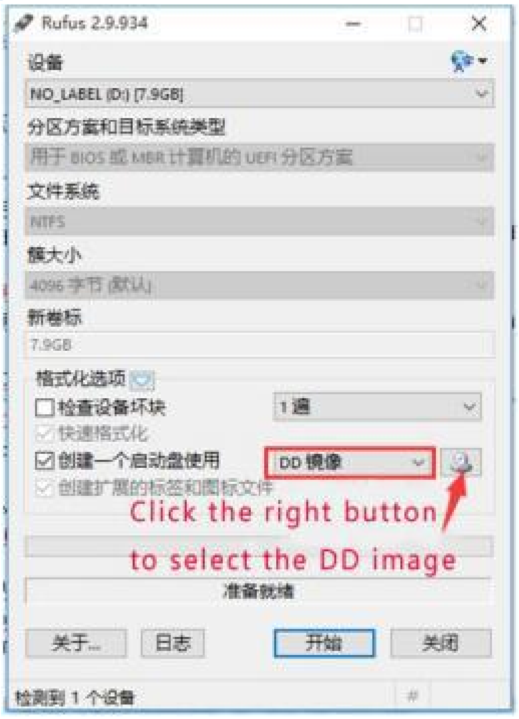
4) Write Armbian Image into TF Card

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.

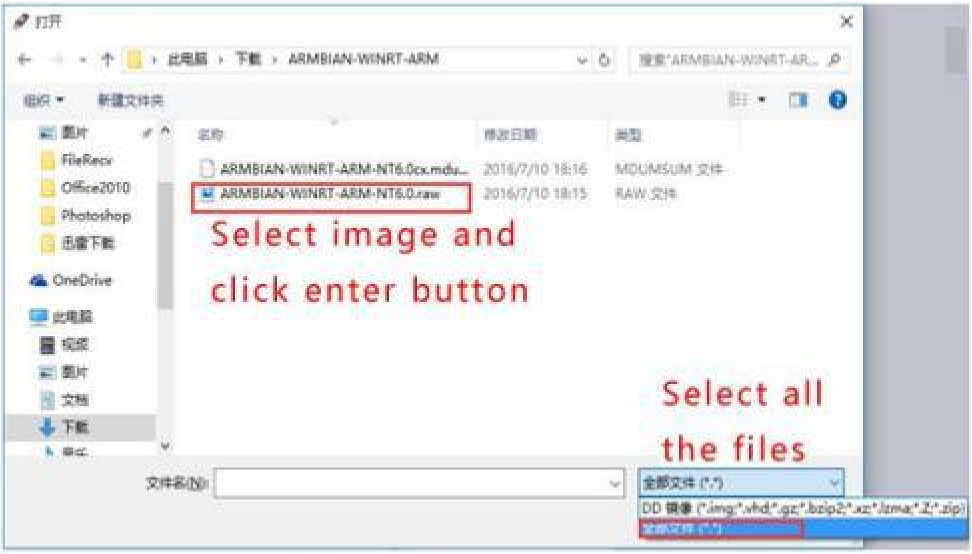
i Download image writing tool such as *Rufus*, the download page: https://rufus.akeo.ie/



设备
NO_LABEL (D:) [7.9GB]
分区方案和目标系统类型
用于 BIOS 或 MBR 计算机的 UEFI 分区方案
文件系统
NTFS
簇大小
4096 字节 (默认)
新卷标
7.9GB
格式化选项
□ 检查设备坏块 1 遍
☑ 快速格式化
☑ 创建一个启动盘使用 DD 镜像
☑ 创建扩展的标签和图标文件
准备就绪
检测到 1 个设备

Click the right button to select the DD image

ii Select the image file path that has been unzipped

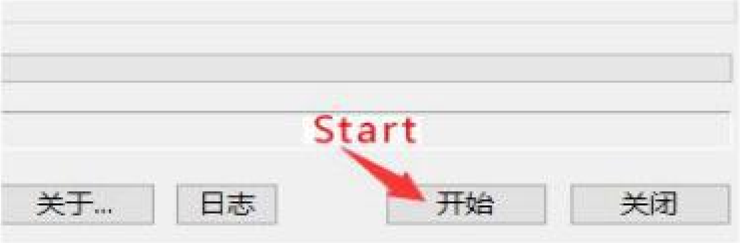


名称	修改日期	类型
ARMBIAN-WINRT-ARM-NT6.0cx.mdu...	2016/7/10 18:16	MDUMSUM 文件
ARMBIAN-WINRT-ARM-NT6.0.raw	2016/7/10 18:15	RAW 文件

Select image and click enter button

Select all the files

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



Start

iv After the image is written, click "*close*" button

3. Step 3: Boot your WuKong Pi

1) Hardware Connection Sketch Map

WuKong Pi H3 Zero runs on Debian system

WuKong Pi H3 Zero 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 WuKong 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 WuKong 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 ".

The WuKong 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 WuKong Pi Correctly

- You can use the shutdown button on the interface to safety close the WuKong 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 WuKong 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 xradio_wlan. ko
```

For example: For xr8 1 9 is xradio_ wlan. 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.

6. Universal Software Configuration

1) Default Account Changing

The default login account is WuKongPi Or this no account. Inorder to secure, it is recommended to modify the default WuKongPi accounts to your own account, for example Zhangsan. Steps are as follows:

a. Use root account to login WuKong Pi (please note that do not login with the account of WuKongPi)

b. $ usermod -l zhangsan WuKongPi Change WuKongPi account into Zhangsan

c. $ groupmod -n zhangsan WuKongPi Change group

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

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

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

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

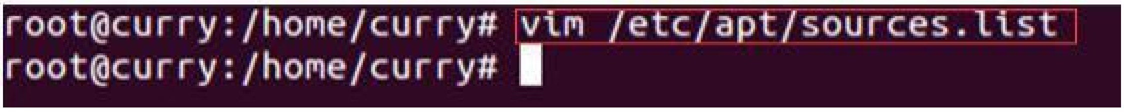
It could refer to this:
http://unix.stackexchange.com/questions/134797/how-to-automatically-mount-an-usb-device-on-plugin-time-on-an-already-running-sy

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
```

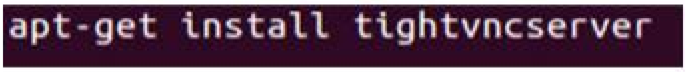
deb-src http://mirrors.ustc.edu.cn/ubuntu-ports/ xenial-proposed main multiverse restricted universe
deb-src http://mirrors.ustc.edu.cn/ubuntu-ports/ xenial-security main multiverse restricted universe
deb-src http://mirrors.ustc.edu.cn/ubuntu-ports/ xenial-updates main multiverse restricted universe

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

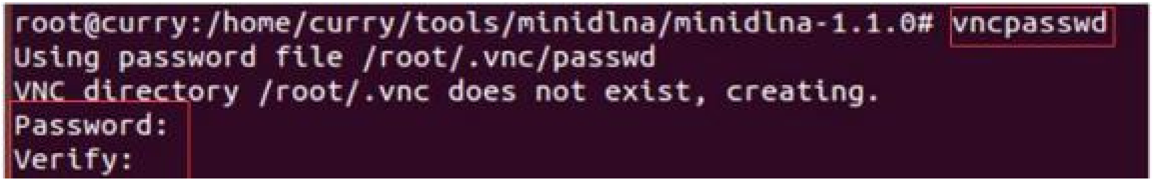
There are a lot of software, such as VNG, XRDP, X2GO, etc. For X2GO, it has more functions, and desktop color restore is very good which does not need too much configuration. And XRDP is much more safety than VNC.

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) 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

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

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) 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  WuKongPi  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.

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.

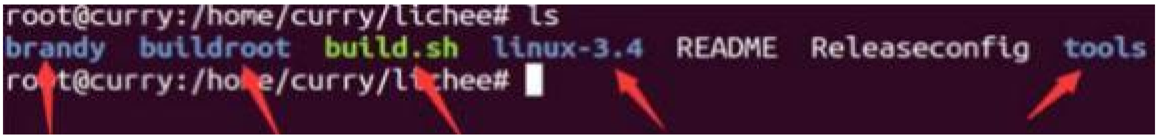
Hardware: WuKong Pi development board* 1 , Card reader* 1 , TF card* 1 , power supply* 1

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: https://github.com/Timfu2019/wukongpi_build

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



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

buildroot: Project compilation script

brandy: gcc- linaro, boot and uboot source code and open source cross compiler tool

linux-3.4: Kernel source code

tools: Tools of project compilation

build.sh: compilation script

2. Update the Kernel Image File and Replace Library

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

libs ： lichee/out/sun8iw7p1/android/common/lib/modules/3.4.39

Download image from official website：
https://pan.baidu.com/s/1scMeadmTEeOpsAw2o_tCJg?pwd=abcd

https://github.com/Timfu2019/wukongpi_build

Wukongpi_build

Basic requirements

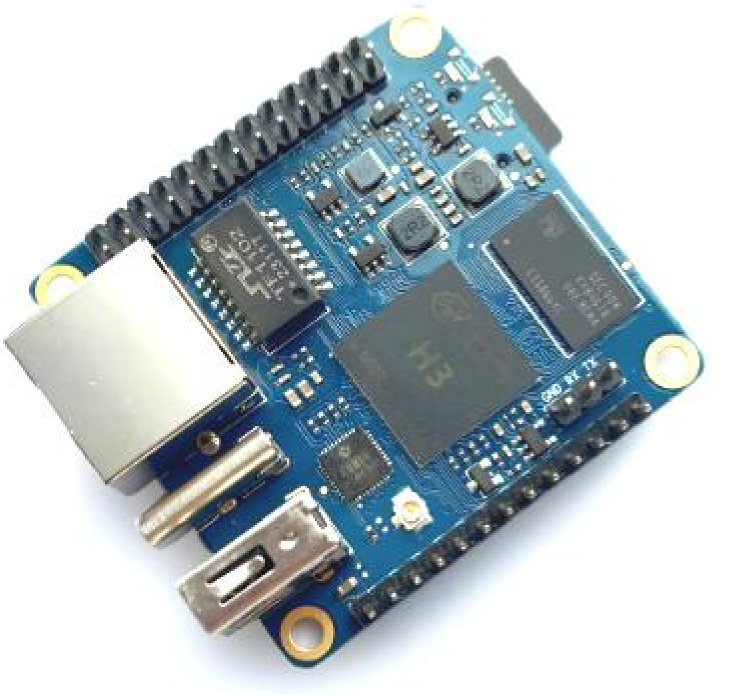
- x86_64 or aarch64 machine with at least 2GB of memory and ~35GB of disk space for a virtual machine, container or bare metal installation
- Ubuntu Jammy 22.04.x amd64 or aarch64 for native building
- Superuser rights (configured sudo or root access).

Simply start with the build script

```
apt-get -y install git

git clone https://github.com/Timfu2019/wukongpi_build.gitcd build

./compile.sh
```

VII. Using Debug tools on WuKongPi

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



TTL to USB cable

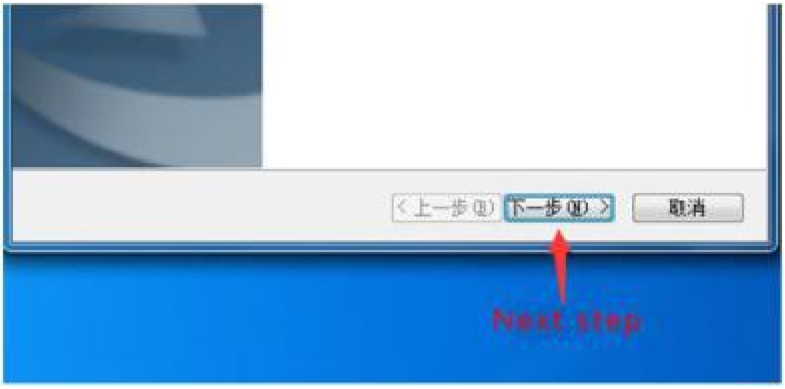
1. Operation Steps on Windows

In order to get more debugging information in the project development process of using WuKongPi, WuKongPi 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.

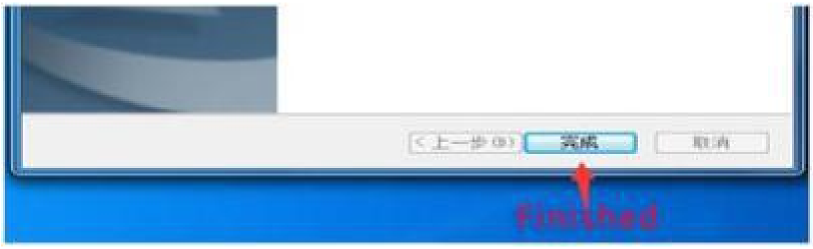
1) Install USB driver on Windows

- Download and unzip the latest version of driver

- Choose application installation as Administrator

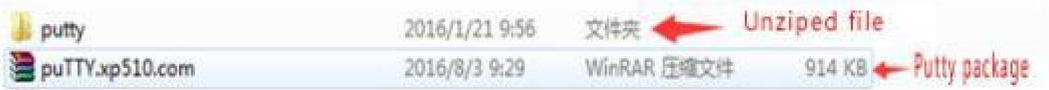


- Wait for completing installation



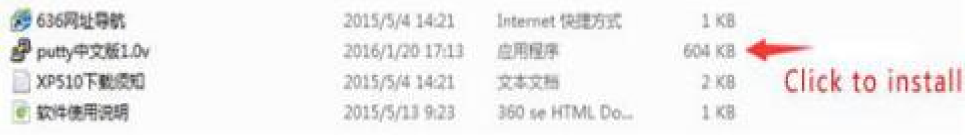
2) Install putty on Windows

- Download putty installation package



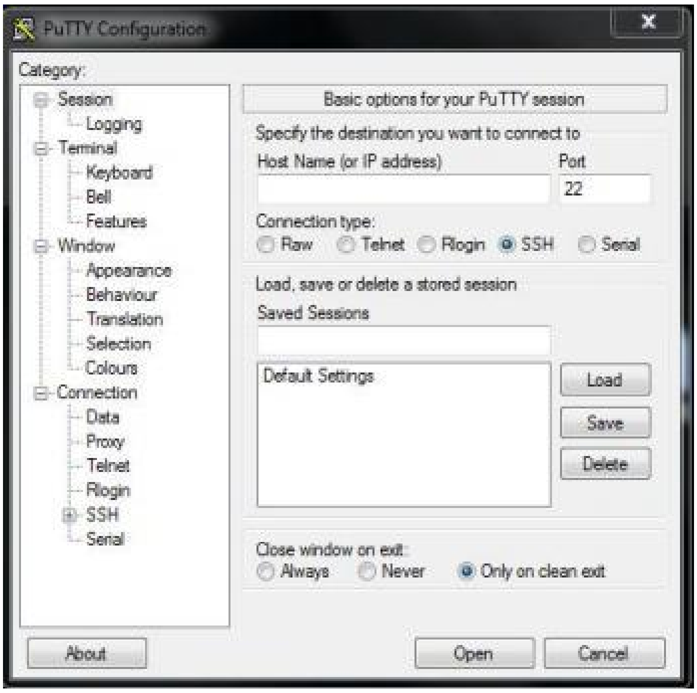
putty	2016/1/21 9:56	文件夹		Unziped file
puTTY.xp510.com	2016/8/3 9:29	WinRAR 压缩文件	914 KB	Putty package

- 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



Basic options for your PuTTY session

Specify the destination you want to connect to

Host Name (or IP address) Port 22

Connection type:
○ Raw ○ Telnet ○ Rlogin ● SSH ○ Serial

Load, save or delete a stored session

Saved Sessions

Default Settings

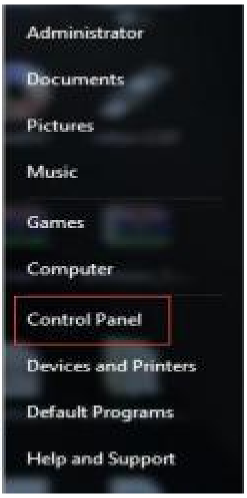
Close window on exit:
○ Always ○ Never ● Only on clean exit

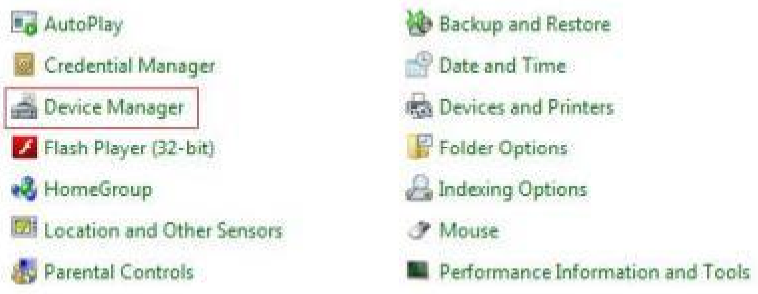
3) Connecting method

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

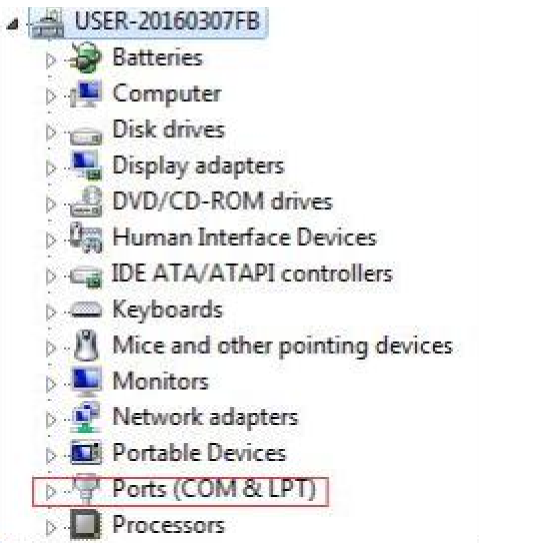
4) Equipment information acquisition

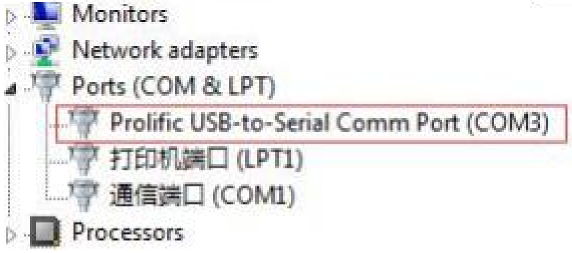
- *Start* menu select *control panel*



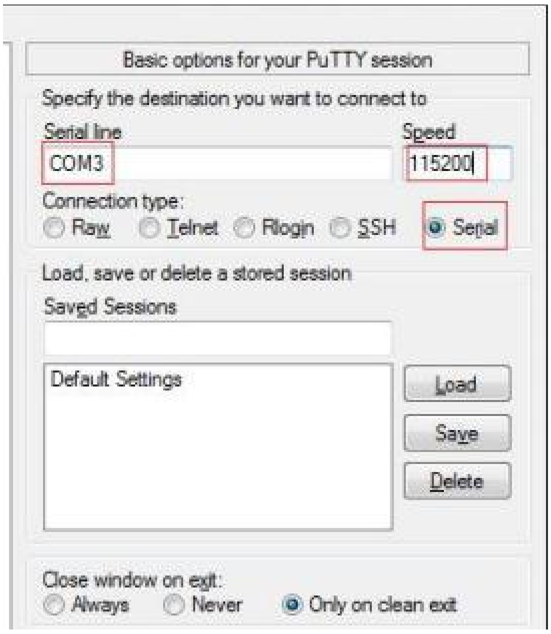


- Click on the *device manager* to check the *port numbe*r





5) Putty Configuration



Basic options for your PuTTY session

Specify the destination you want to connect to

Serial line: COM3

Speed: 115200

Connection type: ○ Raw ○ Telnet ○ Rlogin ○ SSH ● Serial

Load, save or delete a stored session

Saved Sessions

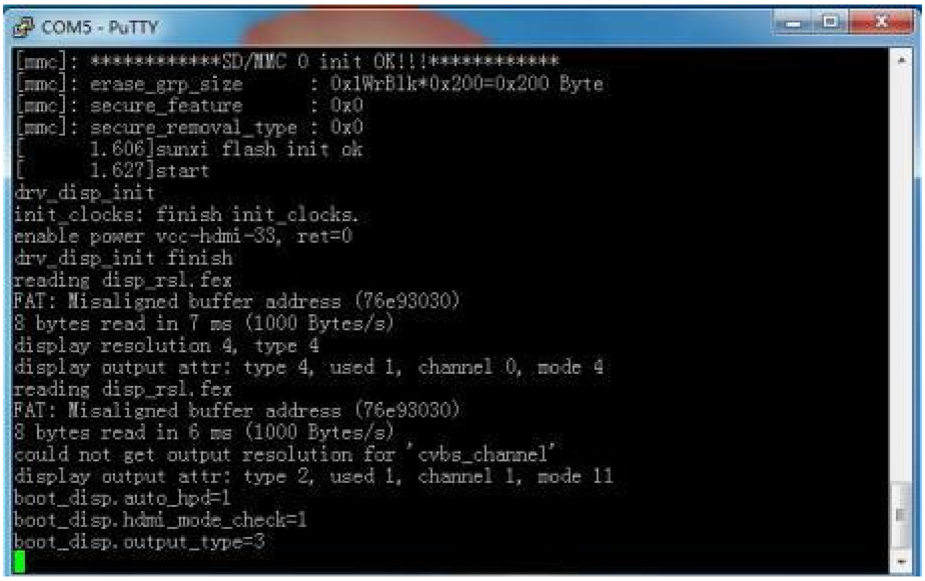
Default Settings

Close window on exit: ○ Always ○ Never ● Only on clean exit

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

6) Serial Debug Port

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



COM5 - PuTTY

```
[mmc]: ************SD/MMC 0 init OK!!!************
[mmc]: erase_grp_size      : 0x1WrBlk*0x200=0x200 Byte
[mmc]: secure_feature      : 0x0
[mmc]: secure_removal_type : 0x0
[      1.606]sunxi flash init ok
[      1.627]start
drv_disp_init
init_clocks: finish init_clocks.
enable power vcc-hdmi-33, ret=0
drv_disp_init finish
reading disp_rsl.fex
FAT: Misaligned buffer address (76e93030)
8 bytes read in 7 ms (1000 Bytes/s)
display resolution 4, type 4
display output attr: type 4, used 1, channel 0, mode 4
reading disp_rsl.fex
FAT: Misaligned buffer address (76e93030)
8 bytes read in 6 ms (1000 Bytes/s)
could not get output resolution for 'cvbs_channel'
display output attr: type 2, used 1, channel 1, mode 11
boot_disp.auto_hpd=1
boot_disp.hdmi_mode_check=1
boot_disp.output_type=3
```

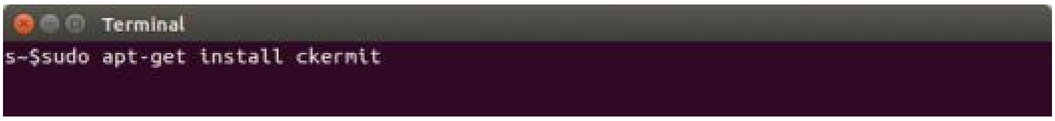
2. Operation Steps on Linux

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:

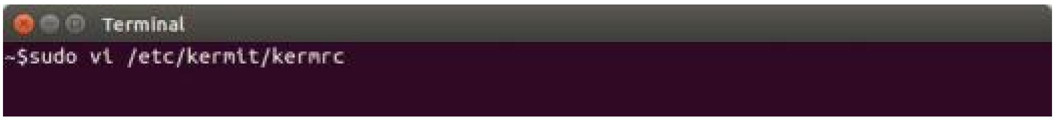
```
$ sudo apt- get install ckermit
```



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

- Configurate Kermit

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



```
~$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 WuKongPi, the other end connected to PC

3) Equipment information acquisitio

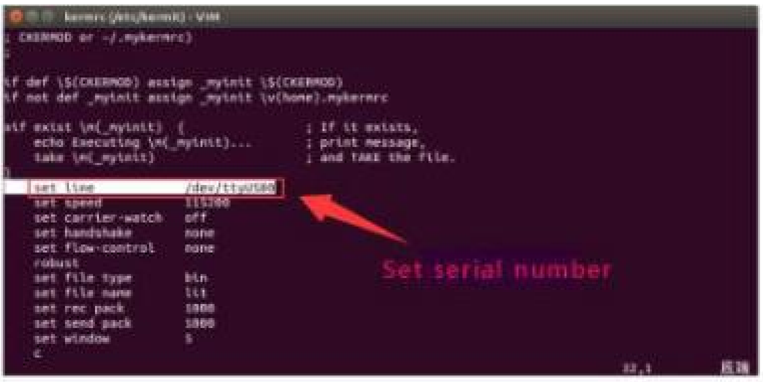
Input command in the PC terminal to check the device number of TTL to the serial cable

```
$ 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
```

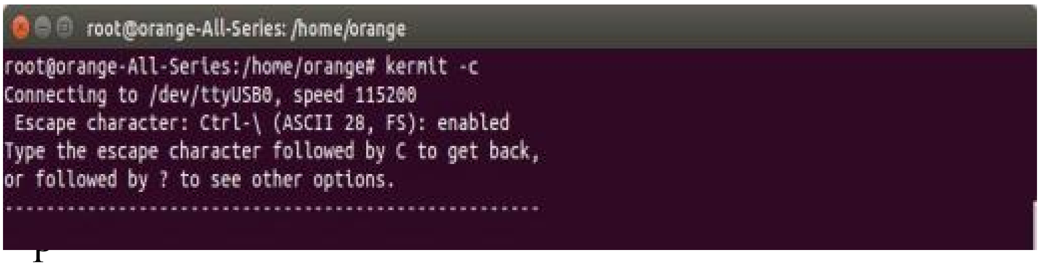
- Set the value of setline into / dev/ ttyUSB0



```
kermrc (/etc/kermit) - VIM
; CKERMOD or ~/.mykermrc)
;

if def \$(CKERMOD) assign _myinit \$(CKERMOD)
if not def _myinit assign _myinit \v(home).mykermrc

xif exist \m(_myinit) {                  ; If it exists,
    echo Executing \m(_myinit)...        ; print message,
    take \m(_myinit)                     ; and TAKE the file.
}
    set line            /dev/ttyUSB0
    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
    c
```

4) Start debug

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



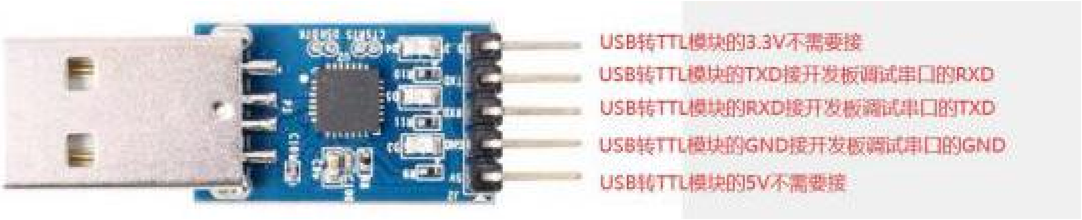
```
root@orange-All-Series: /home/orange
root@orange-All-Series:/home/orange# kermit -c
Connecting to /dev/ttyUSB0, speed 115200
 Escape character: Ctrl-\ (ASCII 28, FS): enabled
Type the escape character followed by C to get back,
or followed by ? to see other options.
----------------------------------------------------
```

- power on and boot WuKongPi, the serial port will automatic print debug log

2.7. method of debugging the serial port

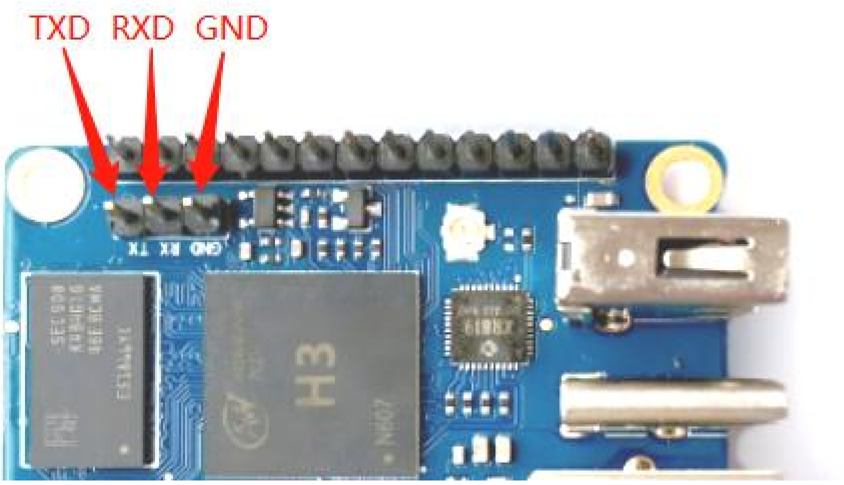
2.7.1. Connection instructions of debugging the serial port

1) First, you need to prepare a USB to TTL module, which can be purchased in WuKong Pi stores. If there are other similar USB to TTL module, then transfer USB to TTL. The USB end of the module is inserted into the USB and interface of the computer



USB转TTL模块的3.3V不需要接
USB转TTL模块的TXD接开发板调试串口的RXD
USB转TTL模块的RXD接开发板调试串口的TXD
USB转TTL模块的GND接开发板调试串口的GND
USB转TTL模块的5V不需要接

2) The corresponding relationships of the debugging serial ports of the GND, TX and RX pins of the development board are shown in the following figure



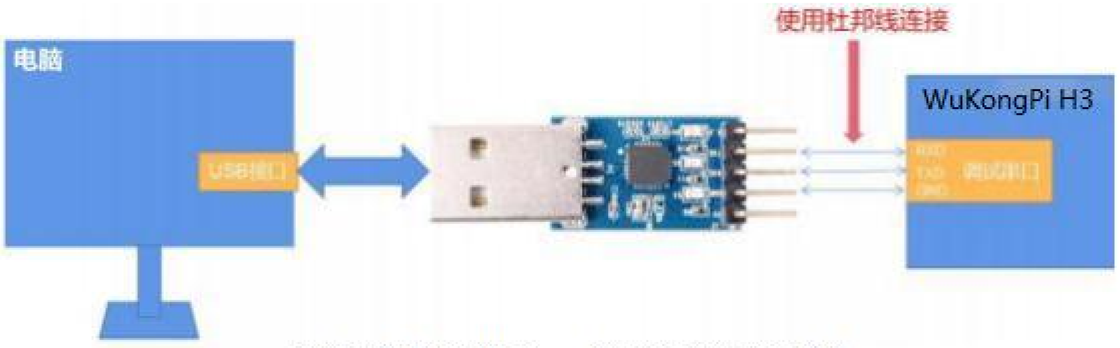
3) The USB to TTL module GND, TXD, and RXD pins need to be connected to the debugging serial port of the development board through the DuPont line

A. USB to TTL and the GND of the module to the GND of the development board

B. USB to TTL and the RXD of the module is connected to the TXD of the development board

C. USB to TTL connects the TXD of the module to the RXD of the development board

4) The schematic diagram of USB to TTL module connecting the computer and WuKong Pi development board is shown below



USB TTL模块和WuKong Pi开发板的连接示意图

2.7.2. Ubuntu The method of the platform debugging serial interface

1) If the connection of USB to TTL module is normal, you can see the corresponding device node name under the Ubuntu PC / dev. Remember this node name, and the serial port software will be used later

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

2) Linux. There are many serial port debugging tools that can be used under linux, such as putty, minicom, etc. Here is the use of putty

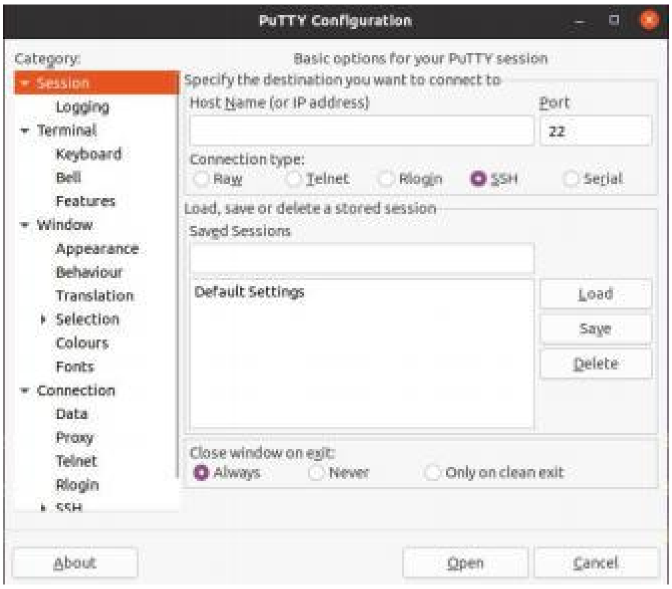
3) First, install the putty on the Ubuntu PC

```
test@test:~$ sudo apt update
test@test:~$ sudo apt install putty
```

4)Then run putty and remember to add sudo permission

```
test@test:~$ sudo putty
```

5)The following interface pop up after the putty command



Basic options for your PuTTY session

Specify the destination you want to connect to

Host Name (or IP address)

Port: 22

Connection type: ○ Raw ○ Telnet ○ Rlogin ● SSH ○ Serial

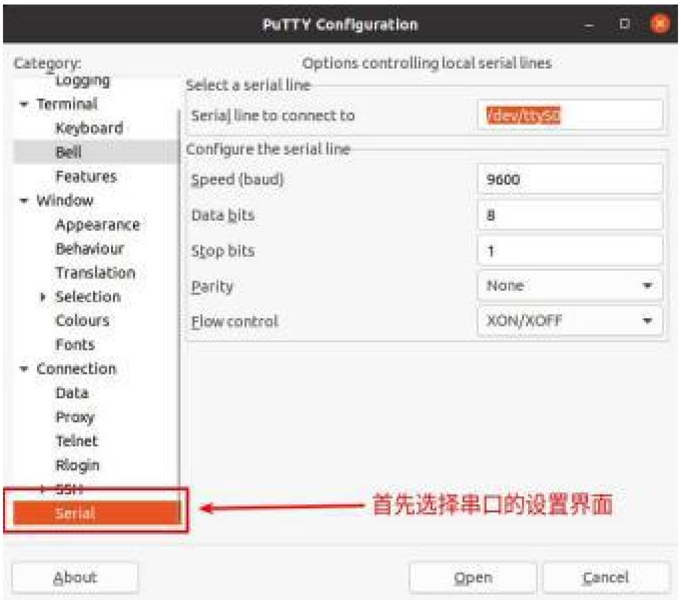
Load, save or delete a stored session

Saved Sessions

Default Settings

Close window on exit: ● Always ○ Never ○ Only on clean exit

6) First, select the setting interface of the serial port



Options controlling local serial lines

Select a serial line

Serial line to connect to: /dev/ttyS0

Configure the serial line

Speed (baud): 9600

Data bits: 8

Stop bits: 1

Parity: None

Flow control: XON/XOFF

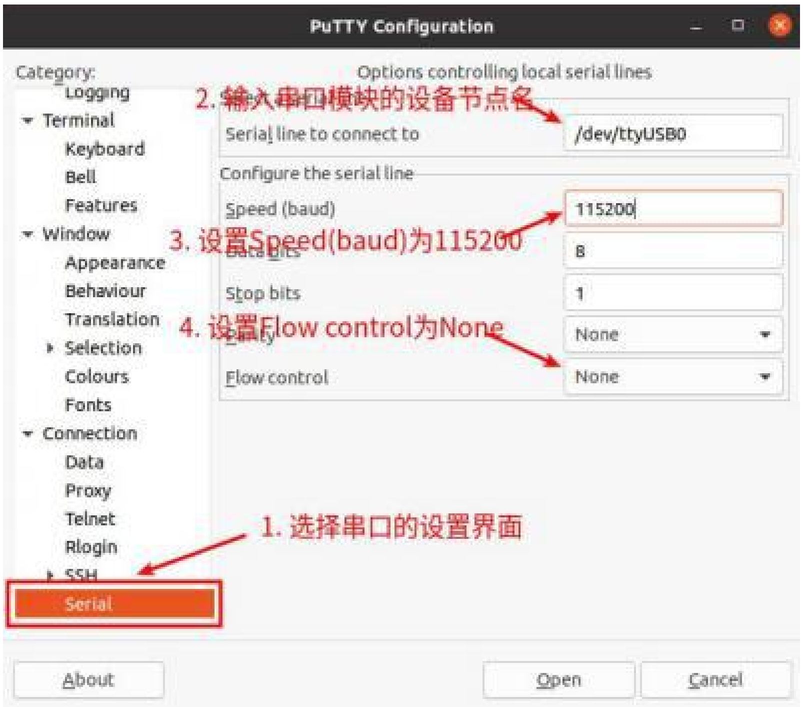
首先选择串口的设置界面

7) Then,set the parameters of the serial port

a. Set: Serial_line to connect_to /dev/ttyUSB0 (Modified to the corresponding node name, generally as / dev / ttyUSB0)

b. set: Speed(baud): 115200

c. Set: Flow control :None



2. 输入串口模块的设备节点名

Serial line to connect to: /dev/ttyUSB0

3. 设置Speed(baud)为115200

Speed (baud): 115200

Data bits: 8

Stop bits: 1

4. 设置Flow control为None

Parity: None

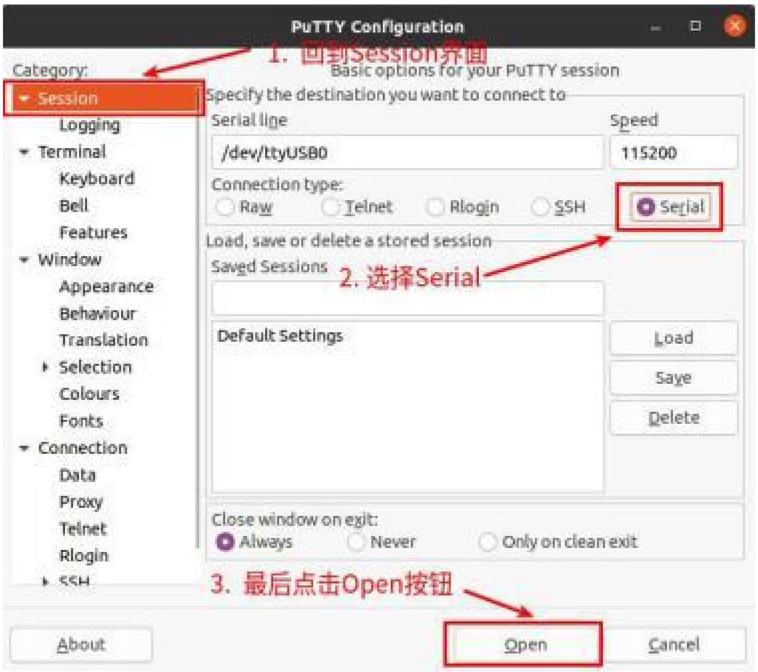
Flow control: None

1. 选择串口的设置界面

8) After the serial port setting interface is set up, go back to the Session interface

a. First choose Connection type to Serial

b. Then click Open button to connect the serial port



1. 回到Session界面

Serial line: /dev/ttyUSB0

Speed: 115200

Connection type: ○ Raw ○ Telnet ○ Rlogin ○ SSH ● Serial

2. 选择Serial

Saved Sessions: Default Settings

Close window on exit: ● Always ○ Never ○ Only on clean exit

3. 最后点击Open按钮

9) After starting the development board, you can see the Log output of the system from the open serial port terminal

2. 7. 3. Windows platform .The method of debug serial interface

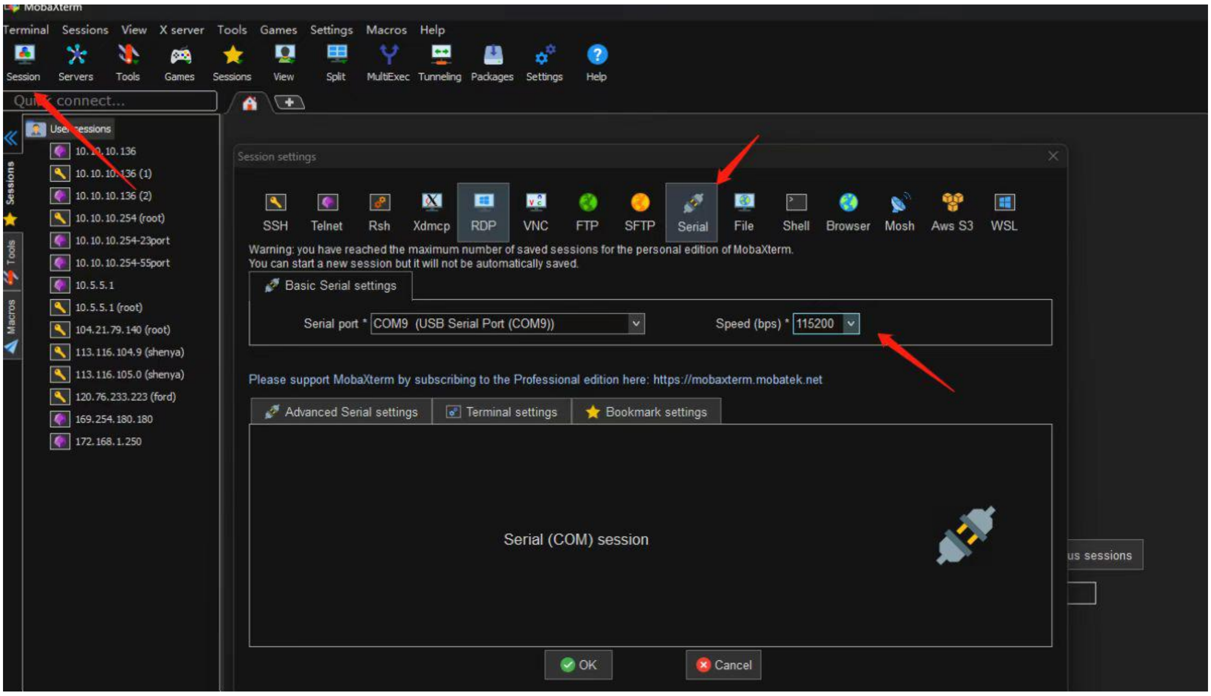
1)There are many serial port debugging tools that can be used, such as SecureCRT, MobaXterm, etc. Next, you can demonstrate the use method of MobaXterm. This software is free, and can be made without purchasing a serial number

2) download MobaXterm

a. You can down MobaXterm from this page:

https://mobaxterm.mobatek.net/

1) The use method of the MobaXterm. Select Session-> Serial-> Speed (bps): 115200. Select a second serial port. Point OK



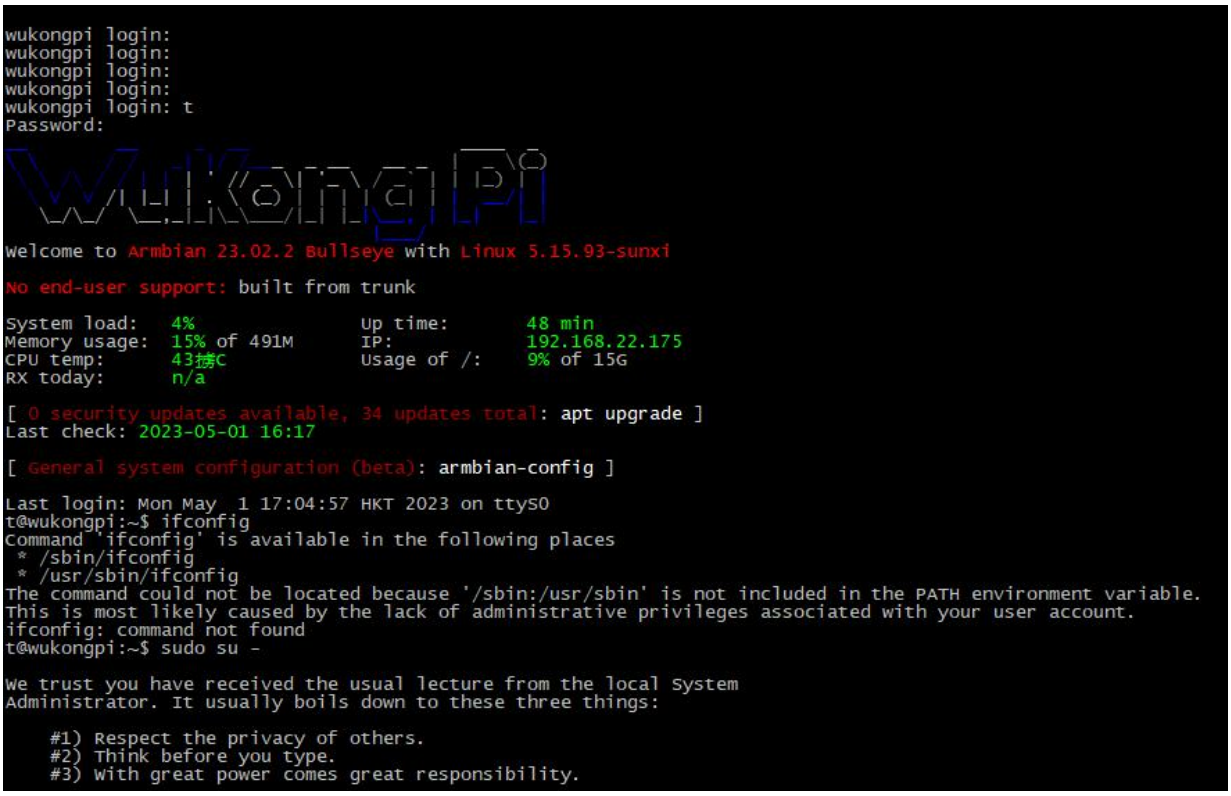
Warning: you have reached the maximum number of saved sessions for the personal edition of MobaXterm.
You can start a new session but it will not be automatically saved.

Serial port * COM9 (USB Serial Port (COM9))

Speed (bps) * 115200

Please support MobaXterm by subscribing to the Professional edition here: https://mobaxterm.mobatek.net

3)After starting the development board, you can see the Log output of the system from the open serial port terminal



```
wukongpi login:
wukongpi login:
wukongpi login:
wukongpi login:
wukongpi login: t
Password:

Welcome to Armbian 23.02.2 Bullseye with Linux 5.15.93-sunxi

No end-user support: built from trunk

System load:   4%               Up time:       48 min
Memory usage:  15% of 491M      IP:            192.168.22.175
CPU temp:      43摚C             Usage of /:    9% of 15G
RX today:      n/a

[ 0 security updates available, 34 updates total: apt upgrade ]
Last check: 2023-05-01 16:17

[ General system configuration (beta): armbian-config ]

Last login: Mon May  1 17:04:57 HKT 2023 on ttyS0
t@wukongpi:~$ ifconfig
Command 'ifconfig' is available in the following places
 * /sbin/ifconfig
 * /usr/sbin/ifconfig
The command could not be located because '/sbin:/usr/sbin' is not included in the PATH environment variable.
This is most likely caused by the lack of administrative privileges associated with your user account.
ifconfig: command not found
t@wukongpi:~$ sudo su -

We trust you have received the usual lecture from the local System
Administrator. It usually boils down to these three things:

    #1) Respect the privacy of others.
    #2) Think before you type.
    #3) With great power comes great responsibility.
```

3.11. WIFI, connection test

Do not connect to WIFI by modifying the / etc / network / interfaces profile, causing problems with the WIFI network connection

3. 11. 1. Server version mirror connects to WIFI through command

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

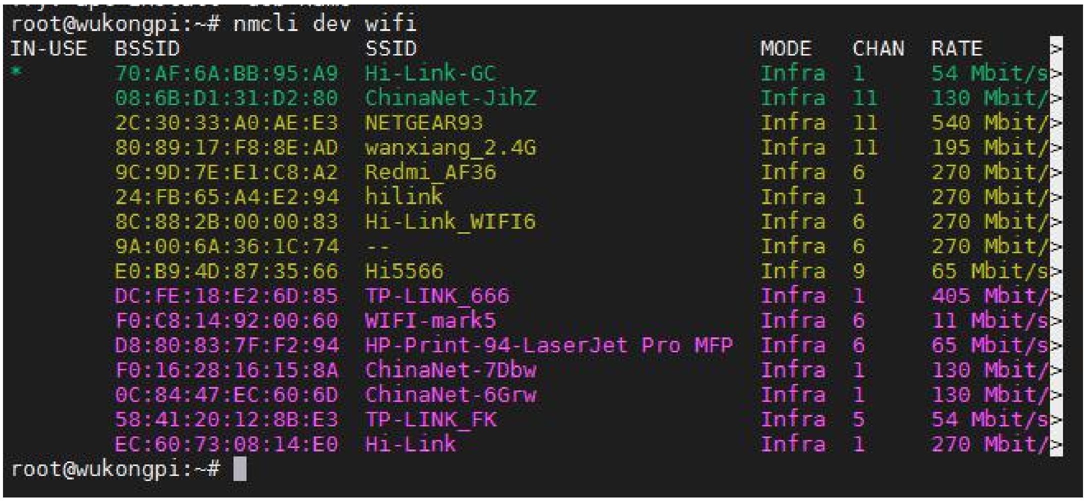
1) There are three ways to log in to the linux system first

a. If the development board is connected to the network cable, you can log into the linux system remotely via ssh

b. If the development board is connected to the debugging serial port, you can use the serial port terminal to log in to the linux system

2) first scanned WIFI hotspot use the nmcli dev wifi command

```
root@wukongpi:~# nmcli dev wifi
```



```
root@wukongpi:~# nmcli dev wifi
IN-USE  BSSID              SSID                        MODE   CHAN  RATE      >
*       70:AF:6A:BB:95:A9  Hi-Link-GC                  Infra  1     54 Mbit/s>
        08:6B:D1:31:D2:80  ChinaNet-JihZ               Infra  11    130 Mbit/>
        2C:30:33:A0:AE:E3  NETGEAR93                   Infra  11    540 Mbit/>
        80:89:17:F8:8E:AD  wanxiang_2.4G               Infra  11    195 Mbit/>
        9C:9D:7E:E1:C8:A2  Redmi_AF36                  Infra  6     270 Mbit/>
        24:FB:65:A4:E2:94  hilink                      Infra  1     270 Mbit/>
        8C:88:2B:00:00:83  Hi-Link_WIFI6               Infra  6     270 Mbit/>
        9A:00:6A:36:1C:74  --                          Infra  6     270 Mbit/>
        E0:B9:4D:87:35:66  Hi5566                      Infra  9     65 Mbit/s>
        DC:FE:18:E2:6D:85  TP-LINK_666                 Infra  1     405 Mbit/>
        F0:C8:14:92:00:60  WIFI-mark5                  Infra  6     11 Mbit/s>
        D8:80:83:7F:F2:94  HP-Print-94-LaserJet Pro MFP  Infra  6   65 Mbit/s>
        F0:16:28:16:15:8A  ChinaNet-7Dbw               Infra  1     130 Mbit/>
        0C:84:47:EC:60:6D  ChinaNet-6Grw               Infra  1     130 Mbit/>
        58:41:20:12:8B:E3  TP-LINK_FK                  Infra  5     54 Mbit/s>
        EC:60:73:08:14:E0  Hi-Link                     Infra  1     270 Mbit/>
root@wukongpi:~#
```

3) Then use the nmcli command to connect the scanned WIFI hotspot,:

a. **wifi_name** You need to replace the name of the WIFI hotspot that you want to connect with

b. **wifi_passwd** You need to change to the password for the WIFI hotspot that you want to connect to

```
root@wukongpi:~# nmcli dev wifi connect wifi_name password wifi_passwd
Error: No network with SSID 'wifi_name' found.

For example:
root@wukongpi:~# nmcli dev wifi connect Hi-Link-GC password 12345678
Device 'wlan0' successfully activated with '559ee6d8-90d3-4f12-905e-a1cb2f9afd06'.
```

4) The IP address of the wifi can be viewed with the **ifconfig** command

```
root@wukongpi:~# ifconfig wlan0
wlan0: flags=4163<UP,BROADCAST,RUNNING,MULTICAST>   mtu 1500
        inet 192.168.100.12   netmask 255.255.255.0   broadcast 192.168.100.255
        inet6 fe80::d2a8:27ee:1701:a174   prefixlen 64   scopeid 0x20<link>
        ether 12:81:aa:6e:dc:8c   txqueuelen 1000   (Ethernet)
        RX packets 1908   bytes 761938 (744.0 KiB)
        RX errors 0   dropped 0   overruns 0   frame 0
        TX packets 22   bytes 3170 (3.0 KiB)
        TX errors 0   dropped 0 overruns 0   carrier 0   collisions 0
```

5) Test the connectivity of the wifi network by using the **ping** command

```
root@wukongpi:~# ping www.baidu.com -I wlan0
PING www.a.shifen.com (14.119.104.189) from 192.168.100.12 wlan0: 56(84) bytes of data.
64 bytes from 14.119.104.189 (14.119.104.189): icmp_seq=1 ttl=55 time=11.9 ms
64 bytes from 14.119.104.189 (14.119.104.189): icmp_seq=2 ttl=55 time=14.2 ms
64 bytes from 14.119.104.189 (14.119.104.189): icmp_seq=3 ttl=55 time=12.2 ms
64 bytes from 14.119.104.189 (14.119.104.189): icmp_seq=4 ttl=55 time=23.2 ms
64 bytes from 14.119.104.189 (14.119.104.189): icmp_seq=5 ttl=55 time=16.0 ms
^C
--- www.a.shifen.com ping statistics ---
5 packets transmitted, 5 received, 0% packet loss, time 4043ms
rtt min/avg/max/mdev = 11.910/15.498/23.209/4.133 ms
```

3. 11. 2. graphically connects to WIFI

There are three ways to log in to the linux system first

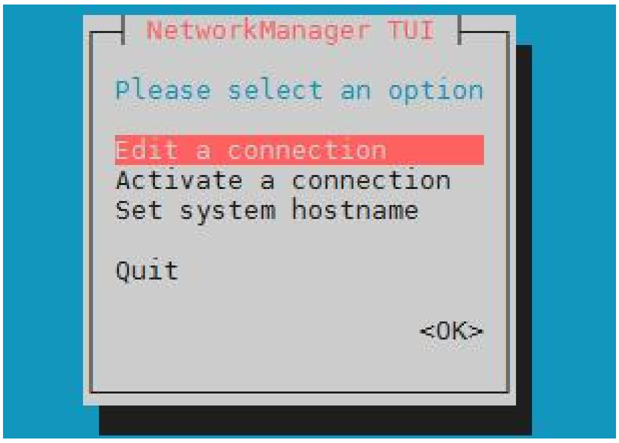
A. If the development board is connected to the network cable, you can log into the linux system remotely via the ssh

B. If the development board is connected to the debugging serial port, you can use the serial port terminal to log in to the linux system (the serial port is soft, please use MobaXterm, and the graphical interface cannot be displayed with minicom)

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

```
root@wukongpi:~# nmtui
```

3)The interface opened by the input **nmtui** command is shown below



NetworkManager TUI

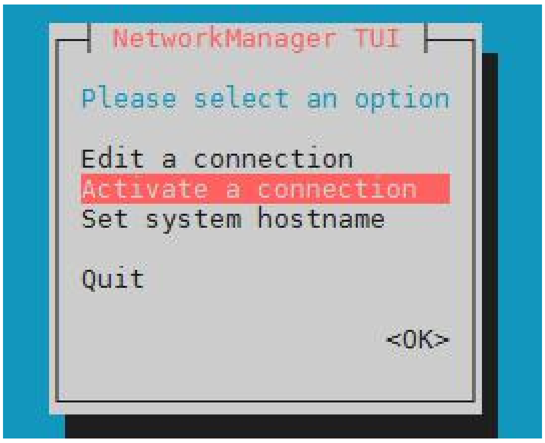
Please select an option

Edit a connection
Activate a connection
Set system hostname

Quit

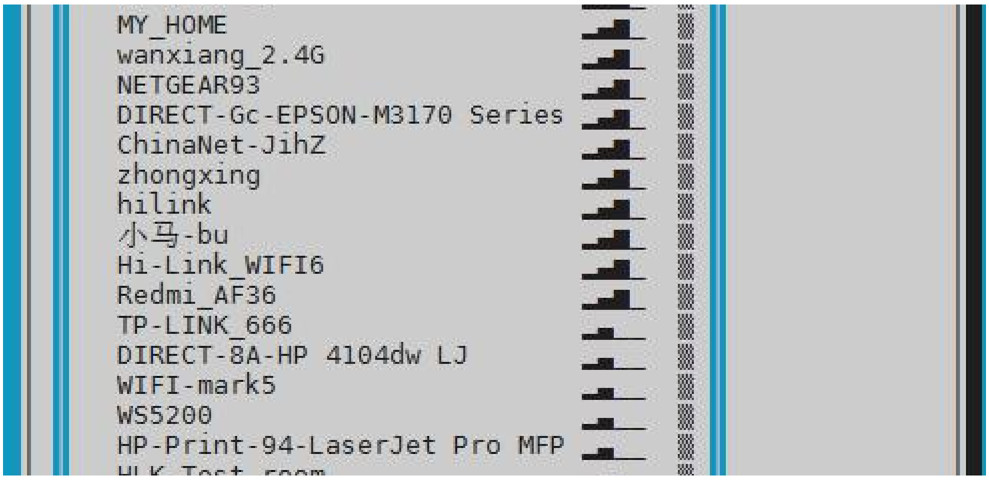
<OK>

4) Select **Activate a connect** after return



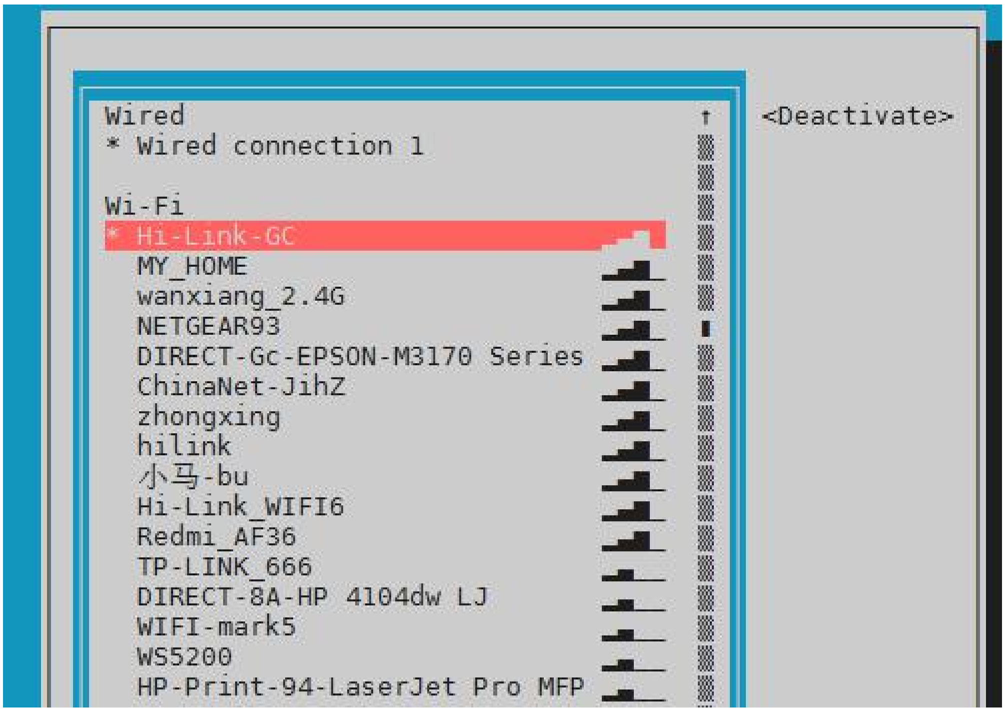
```
NetworkManager TUI

Please select an option

Edit a connection
Activate a connection
Set system hostname

Quit

                    <OK>
```

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



```
MY_HOME
wanxiang_2.4G
NETGEAR93
DIRECT-Gc-EPSON-M3170 Series
ChinaNet-JihZ
zhongxing
hilink
小马-bu
Hi-Link_WIFI6
Redmi_AF36
TP-LINK_666
DIRECT-8A-HP 4104dw LJ
WIFI-mark5
WS5200
HP-Print-94-LaserJet Pro MFP
HLK_Test_room
```

6) Select the WIFI hotspot you want to connect and then use the Tab key to locate the cursor to the Activate

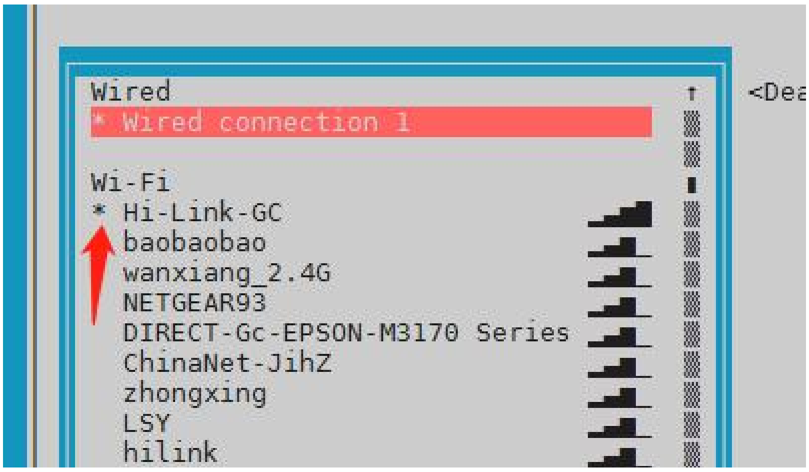


```
Wired                                      <Deactivate>
* Wired connection 1

Wi-Fi
* Hi-Link-GC
  MY_HOME
  wanxiang_2.4G
  NETGEAR93
  DIRECT-Gc-EPSON-M3170 Series
  ChinaNet-JihZ
  zhongxing
  hilink
  小马-bu
  Hi-Link_WIFI6
  Redmi_AF36
  TP-LINK_666
  DIRECT-8A-HP 4104dw LJ
  WIFI-mark5
  WS5200
  HP-Print-94-LaserJet Pro MFP
```

7) Then a dialog box for entering the password will pop up, enter the corresponding password in the Pssword and then the return will start

Link the WIFI

8) Successful WIFI connection displays a "*" before the connected WIFI name



```
Wired                                   <Dea
* Wired connection 1

Wi-Fi
* Hi-Link-GC
  baobaobao
  wanxiang_2.4G
  NETGEAR93
  DIRECT-Gc-EPSON-M3170 Series
  ChinaNet-JihZ
  zhongxing
  LSY
  hilink
```

9) The IP address of the wifi can be viewed with the **ifconfig** command

```
root@wukongpi:~# ifconfig wlan0
wlan0: flags=4163<UP,BROADCAST,RUNNING,MULTICAST>  mtu 1500
        inet 192.168.100.12  netmask 255.255.255.0  broadcast 192.168.100.255
        inet6 fe80::d2a8:27ee:1701:a174  prefixlen 64  scopeid 0x20<link>
        ether 12:81:aa:6e:dc:8c  txqueuelen 1000  (Ethernet)
        RX packets 1908  bytes 761938 (744.0 KiB)
        RX errors 0  dropped 0  overruns 0  frame 0
        TX packets 22  bytes 3170 (3.0 KiB)
                TX errors 0  dropped 0 overruns 0  carrier 0  collisions 0
```

3. 12. USB interface testing

1) Format the U disk first, and then put some files in the U disk

2) Then insert the U disk into the USB interface of Wukong Pi H3

4)After Wukong Pi H3 Zero is connected to the transfer board, there are 3 USB interfaces that can be used. Before linux5.4 system uses the two USB interfaces on the transfer board, it needs to ensure that overlays in / boot/armbianEnv.txt has usbhost2 and usbhost3 to be used normally. linux5.4 system opens usbhost2 and usbhost3 by default. If there is no configuration, the two USB interfaces on the adapter board are not work normally, and you need to restart after the configuration. In addition, the linux3.4 system does not need to check, and the default 3 USB interfaces are open

```
root@wukongpi:~# cat /boot/armbianEnv.txt
overlays=usbhost2  usbhost3
```

5)execute the following command if you can see the output of sdX U disk recognized successfully

```
root@wukongpi:~# cat /proc/partitions | grep "sd*"
major minor       #blocks       name
    8                        0          30044160 sda
    8                         1          30043119 sda1
```

6)With mount, the command can mount the U disk to / mnt, and then view the files in the U disk

```
root@wukongpi:~# mount /dev/sda1  /mnt/
root@wukongpi:~# ls /mnt/
test.txt
```

7) After mounting, you can view the capacity usage and mount point of the U disk through the df command

```
root@wukongpi:~# df -h | grep "sd"
/dev/sda1                          29G       208K            29G            1% /mnt
```

3. 13. The USB Ethernet card test

1) The USB Ethernet cards that have been tested so far are as follows. The RTL8153 USB Gigabit network card is inserted into the USB 2.0 Host interface of the development board and the test can be used normally, but the rate is less than gigabit. Please note this

number	PN
1	RTL8152B USB 100Mcard
2	RTL8153 USB 1000Mcard

2)First, the USB network card is inserted into the USB interface of the development board, and then the network cable is inserted in the USB network card to ensure that the network cable can access the Internet normally. If you can see the following log information through the dmesg command, the USB network card identification is normal

```
root@wukongpi:~# dmesg | tail
[       121.985016] usb 3- 1: USB disconnect, device number 2
[       126.873772] sunxi-ehci 5311000.ehci3-controller: ehci_irq: highspeed device
connect [       127.094054] usb 3- 1: new high-speed USB device number 3 using
sunxi-ehci                        [       127.357472] usb 3- 1: reset high-speed USB device
number 3 using sunxi-ehci                        [       127.557960] r8152 3- 1:1.0 eth1:
v1.08.9
[       127.602642] r8152 3- 1:1.0 enx00e04c362017: renamed from eth1
[       127.731874] IPv6: ADDRCONF(NETDEV_UP): enx00e04c362017: link is not ready
[       127.763031] IPv6: ADDRCONF(NETDEV_UP): enx00e04c362017: link is not ready [
129.892465] r8152 3- 1:1.0 enx00e04c362017: carrier on
[           129.892583]    IPv6:    ADDRCONF(NETDEV_CHANGE):    enx00e04c362017:
link becomes ready
```

3) The ifconfig command then lets you see the device nodes of the USB network card, as well as the automatically assigned IP addresses

4) Commands to test network connectivity reference before.

3.14. On-board LED light display control instructions

1) There are two LED lights on the development board, one green light and one red light. The default LED lights are displayed when the system starts as shown below

	GreenLed	RedLed
u-boot Start stage	Off	On
ernel starts up to enter the system	On	Off or flash
GPIO	PL10	PA17

2) The green light and flashing are set as follows (take linux3.4 system as an example)

a. First enter the green light setting directory

```
root@wukongpi:/sys/class/leds# cd wukongpi\:green\:pwr
```

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

```
root@wukongpi:/sys/class/leds/wukongpi:green:pwr# echo 0 >brightness
```

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

```
root@wukongpi:/sys/class/leds/wukongpi:green:pwr# echo 1 >brightness
```

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

```
root@wukongpi:/sys/class/leds/wukongpi:green:pwr# echo heartbeat > trigger
```

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

```
root@wukongpi:/sys/class/leds/wukongpi:green:pwr# echo none > trigger
```

3) The method for setting red lights and flashing is as follows (take linux3.4 system for example)

a. First go to the red light setting directory

```
root@wukongpi:~# cd /sys/class/leds/wukongpi\:red\:status
```

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

```
root@wukongpi:/sys/class/leds/wukongpi:red:status# echo 0 > brightness
```

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

```
root@wukongpi:/sys/class/leds/wukongpi:red:status# echo 1 > brightness
```

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

```
root@wukongpi:/sys/class/leds/wukongpi:red:status# echo heartbeat > trigger
```

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

```
root@wukongpi:/sys/class/leds/wukongpi:red:status# echo none > trigger
```