RASPBERRY Pi
Instruction

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Raspberry Pi Basics

1-1. Raspberry Pi Introduction

Raspberry Pi (RPi or RasPi/RPI) [1] is the Linux-based and credit card-sized microcomputer specially designed for computer programming education. [2] With Windows 10 IoT released, the Windows-based Raspberry Pi will also be available.

The Raspberry Pi is developed in the United Kingdom by the Raspberry Pi Foundation. It is an ARM-based microcomputer motherboard. Its memory is SD/MicroSD card. The credit card-sized motherboard has 1/2/4 USB interfaces and 110/100 Ethernet interface (no network interface on type A) to connect the keyboard, mouse and network cable, apart from video analog signal TV output interface and HDMI video output interface. The Raspberry Pi has all basic PC functions. Once connected with the TV and keyboard, it can perform many functions such as spreadsheets, word processing, playing games and high-definition videos. Raspberry Pi B is only provided with computer board without memory, power supply, keyboard, casing or connection cables.

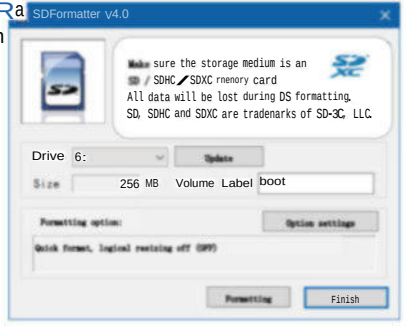
The Raspberry Pi Foundation provides ARM-based Debian and Arch versions. Apart from the Python main programming language, if s also compatible with programming languages such as Java, BBC BASIC ("Brandy Basic" clone via RISC OS images or Linux), C, and Perl.

1-2. Beginner Preparation

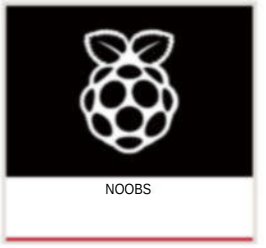
A Raspberry Pi and corresponding powr cable, a Micro SD card with NOOBS, Micro SD card reader, an HDMI cable, a USB mouse, a USB keyboard, anda monitor.

1-3. Burn Raspbian Buster System to Micro SD

1. An SD card above 16G, class 10 high-speed card preferred (card speed directly affects the operating speed of the Raspberry Pi). Format Micro SD with SDFormatter first.



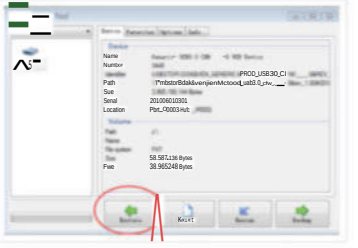
2. Download the official Raspberry Pi system image file:
https://www.raspberrypi.org/downloads/
Choose a suitable version among many Raspberry Pi operating system images in the link.



Raspberry Pi 4b download

Other product lineups and models of Raspberry Pi

3. Install USB Image Tool under WinXP and Win7.
Link USB Image Tool
4. Unzip the downloaded operating system image compressed file and get the img image file.
5. Connect the SD to the computer with the card reader.
6. Unzip and run the USB Image Tool.
7. Select the system image (img file) in the software, select "Restore". Select the corresponding system image img file, and then confirm.
8. The installation process may be a bit slow, depending on the SD card speed. Wait until the dialog box 100% appears, and installation succeeds.



Note: After the system writing completes, if formatting the remaining space of the disc pops out, do not format it!!! The system may not boot when turning on the Raspberry Pi! By default, the Raspberry Pi system only uses the SD card space required by the operating system.

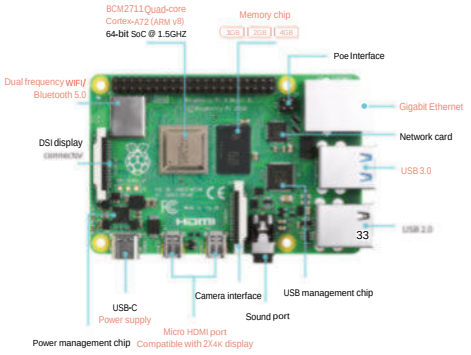
Raspberry Pi Opening Pacckage and Hands-on

If the system starts with an error: end Kernel panic-not syncing: vfs unable to mount root fs on unknown -block (179,2), it may be caused by completing the system formatting of the remaining disk in the SD card. Do not select formatting it. Just plugin the Raspberry Pi and restart.

2-1.How to install, Start and Configure Raspberry Pi for the first time

Mount SD card, connect peripherals

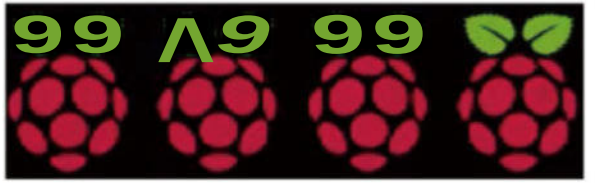
1.Insert the SD card with the installed system into the Raspberry Pi.
2.Connect the keyboard and mouse with USB interface to the Raspberry Pi.
3.Connect the Raspberry Pi to TV or monitor with an HDMI cable. If the monitor adopts the VGA output, an HDMI conversion to VGA cable is required.
4.Connect the Raspberry Pi and the router with the network cable.
5.Connect the power cable and turn on the power.



Note:
If the version is above 3B+, it is recommended to use the power adapter with MicroUsb interface above 3A. Version 4B requires the power cable with the USB Type-c interface.

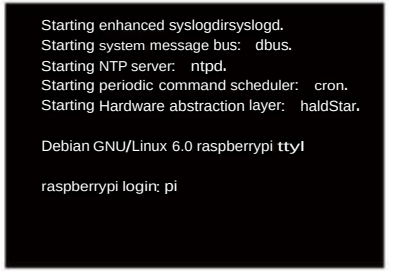
Start Raspberry Pi

When the red power indicator on the Raspberry Pi motherboard is on and the green indicator flashes, the system begins to start. The Raspberry Pi logo will appear on the screen:



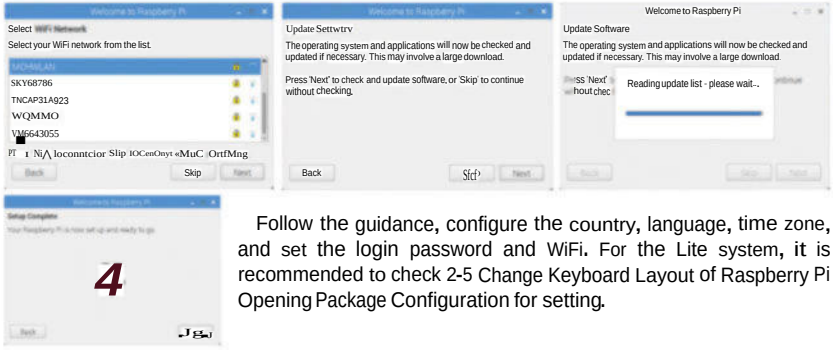
For the Lite system, the login command prompt will appear.

Please enter username: pi, password: raspberry. If the keyboard keys do not respond, it indicates the compatibility issue. Please change the keyboard.



Initial settings

After launching the desktop version, it automatically enters the initializing setup wizard.



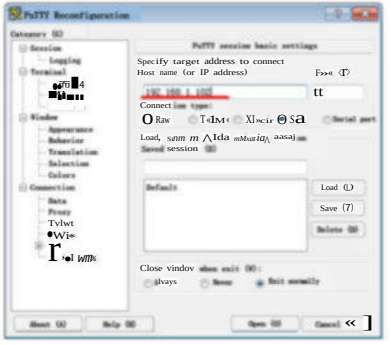
Follow the guidance, configure the country, language, time zone, and set the login password and WiFi. For the Lite system, it is recommended to check 2-5 Change Keyboard Layout of Raspberry Pi Opening Package Configuration for setting.

2-2.Login Raspberry Pi by PuTTY

The Linux-based Raspberry Pi is the same as an ordinary computer. All operations can be done through remote login the computer. Login the Raspberry Pi desktop through VNC, and operate the command line of Raspberry Pi through SSH.

Start SSH

In fact, the latest 2012-10-28 Raspbian has enabled SSH support by default (Since October 2016, the new system needs to enable the SSH service by this method) If for some reason the SSH service is not enabled on the system (upgrade from an old system, turned off, etc.), enable or disable SSH through sudo raspi-config.



Login SSH

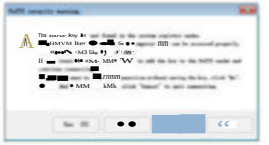
The only recommended tool for login SSH is PuTTY.

PuTTY download: putty.zip Link:

http://pan.baidu.com/share/link?shareid=2217335081&uk=605377859

Open PuTTY and enter the IP address of the Raspberry Pi to login.

Confirm connection key for first login, press "Yes" to confirm. This prompt appears only for first login.



After login, prompt to enter username and password. After entering username and password, login the command line of the Raspberry Pi.

(Prompt: Raspbian's default username and password pi/raspberry)

Login Raspberry Pi by PuTTY
Reasons to recommend PuTTY Chinese version

Two reasons:

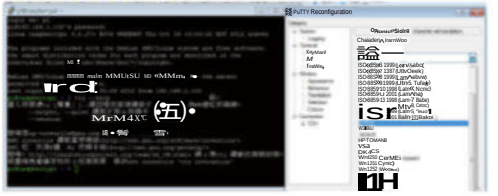
I. Default font is a larger, clearer 12px (small four) NSimSun.

II. Unlike the original English version, the Chinese version has been changed. By default, UTF-8 encoding is used for communication.

Garbled characters (question marks, squares, etc.) in the Chinese command line display can be avoided without any setting.

*When you run across Chinese garbled characters on the command line in PuTTY English version, please adjust the connection option:

Window-> Translation, change the Remote character set to "UTF-8".



SSHRaspberry Pi operation without monitor

To operate the Raspberry Pi without a monitor, you only need to burn the system with an SD card, insert the card and start, and login through SSH.

If you don't know the IP address of the Raspberry Pi after start, please check: 2-10 Login Raspberry Pi Without Monitor and Unknown IP

Reminder: for initial login newly installed SSH through SSH, raspi-config settings program won't appear. Please use the sudo raspi-config command to start it manually.
In addition, in the first screen of PuTTY, use the "Save" button to save the edited connection of various options as an entry in the list box.
Just double click the next time you connect.

2-3.Most Common Raspberry Pi Linux Commands and Descriptions

Common Linux commands and descriptions

Where to enter the command?

Login your Raspberry Pi through the SSH client, or enter the Raspberry Pi desktop to enter the command.

What is the sudo command?

Adding sudo before a command line means that you execute the command as the system administrator. Improper use may cause an accident, so only add it when it is particularly necessary to run it as the system administrator.

sudo reboot

Reboot the Raspberry Pi as the system administrator, so add sudo.

sudo poweroff

Power off as the system administrator.

sudo shutdown -h 03:14

Shut down regularly. For example, the above command will set the shutdown time at 3:14 am.

sudo halt

Halt. Unlike poweroff, this command stops all CPU functions before shutting down. During execution, kill the application process, execute the sync system call, and file system writing before stopping the kernel. This method is recommended to halt.

clear

Clear the text on the terminal.

cd /folderl/folder2

Goto the directory /folderl /folder2.

cd ~

Goto the home directory of the current user.

ls -lha

List files and directories in the current location, displayall information. If you remove the -lha, only the file names are listed.

sudo find /-name file.txt

Find the files named file.txt.

sudo find /-name file.txt -type f

Find the files named file.txt, only find files.

sudo find /-name somedir -type d

Find the files named file.txt, only find directories.

sudo find /-name file.*

Find files named file. *, the asterisk is the wildcard.

sudo mv ~/file /folderl/folder2/

Move ~ /file to /folderl /folder2 /.

man command

View the command manual. Replace any command you want to know.

sudo raspi-config

Open the Raspberry Pi function configuration interface.

sudo ifconfig -a

List the network configuration information of the Raspberry Pi.

ping 192.168.1.1

Ping an IP. Check the connection status of the Raspberry Pi and this IP device.

sudo apt-get update

Update the software list.

sudo apt-get upgrade

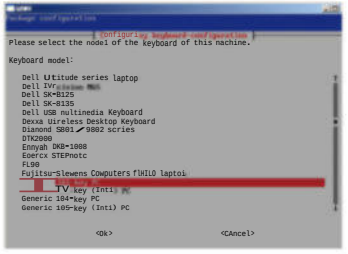
Upgrade the software package.

2-4.Change Keyboard Layout of Raspberry Pi Opening Package Configuration

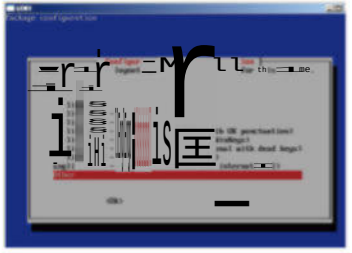
Raspberry Pi is the British product. The default keyboard layout is the United Kingdom (GB) while the common keyboard layout is generally the United States (US).

The command to change the keyboard layout:
sudo dpkg-reconfigure keyboard-configuration

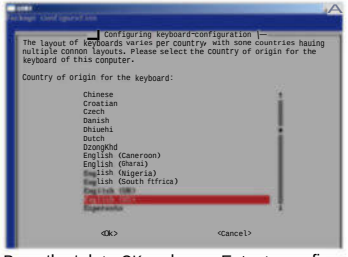
Or enter through raspi-config. udo raspi-config
After entering, select the universal 101-key PC keyboard.



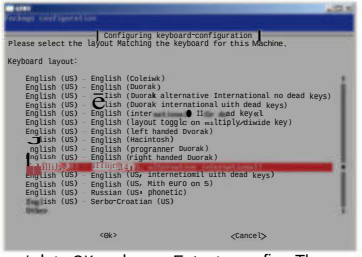
Press the tab to OK and press Enter to confirm.
In the keyboard layout selection, select Other.



Press the tab to OK and press Enter to confirm.
Then in the options, select English (US).



Press the tab to OK and press Enter to confirm.
Then select English (US, alternative international).



Press tab to OK and press Enter to confirm.Then press OK all the way.After exiting, reboot the system.

sudo reboot
During reboot, the keyboard layout is read more slowly than usual due to the changed k eyboard layout.

2-5.Solution for Raspberry Pi New System SSH Connection Refused

The initially installed system cannot connect to the Raspberry Pi through SSH. The SSH connection prompt "connection refused" appears.

The reason is that as of the November 2016 release, Raspbian has the SSH server disabled by default.
Reboot is also very simple. Unplug the SD card, enter the root directory, and create a new blank file named ssh.

Put the card back into the Raspberry Pi, and use SSH.
The command for P.S. Windows users to create new files under PowerShell:
new-item ssh -type file
If you still get "connection refused" after completing the operation above, the SSH service is not enabled. Manually enable SSH service on the Raspberry Pi command line by the command:
service sshd restart

2-6.Raspberry Pi VNC Viewer Remote Desktop Configuration Tutorial

Raspberry Pi Opening Pacckage and Hands-on

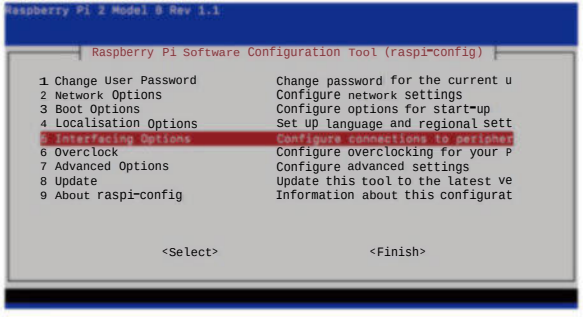
Method to login Raspberry Pi with the certified RealVNC client.

Before start, login Raspberry Pi, enter the Raspberry Pi command window, connect to the monitor, keyboard and mouse, or login through SSH.

Enable Raspberry Pi VNC service

Enter the following command in the terminal to enter the configuration interface.

sudo raspi-config



Method to login Raspberry Pi with the certified RealVNC client.

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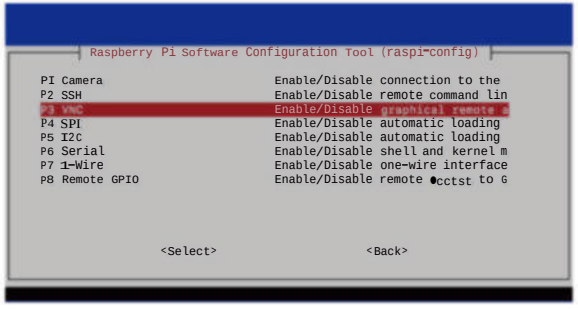
Enter the following command in the terminal to enter the configuration interface.

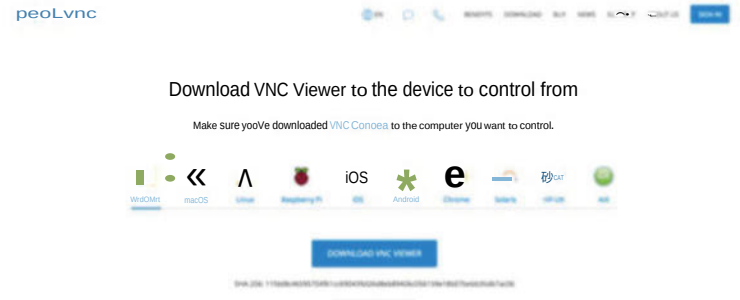
sudo raspi-config




```
  colord-sensor-argyll foomatic-db-compressed-ppds | foomatic-db
  printer-driver-hpcups hplip cups-pdf smbclient antiword docx2txt
  ghostscript-x imagemagick-doc autotrace enscript gimp gnuplot grads graphviz
  hp2xx html2ps libwmf-bin mplayer povray radiance texlive-base-bin transfig
  ufraw-batch gutenprint-locales ooo2dbk rtf2xml inkscape gutenprint-doc
  unpaper
The following packages will be REMOVED:
  tightvncserver
The following NEW packages will be installed:
  acl be colord colord-data cups cups-browsed cups-core-drivers cups-daemon
  cups-filters cups-filters-core-drivers cups-ppdc cups-server-common
  ghostscript imagemagick imagemagick-6-common imagemagick-6.q16 libcolorhug2
  libcupscgil libcupsmimel libcupsppdcl libdjvulibre-text libdjvulibre21
  libfile-copy recursive-perl libfontembedl libgs9 libgs9-common libgusb2
  libgutenprint2 libieeel284-3 libijs-0.35 libjbig2dec0 libjxr-tools libjxr0
  liblouis-data liblouisl2 liblouisutdml-bin liblouisutdml-data liblouisutdml7
  liblqr-1-0 libmagickcore-6.q16-3 libmagickcore-6.q16-3-extra
  libmagickwand-6.q16-3 libnetpbml0 libpaper-utils libpaperl libqpdfl7 libsane
  libsane-common libsane-extras libsane-extras-common libwmf0.2-7 netpbm
  printer-driver-gutenprint qpdf realvnc-vnc-server sane-utils update-inetd
0 upgraded, 57 newly installed, 1 to remove and 0 not upgraded.
Need to [illegible] archives.
  update-alternatives: using /usr/bin/mogrify-im6.q16 to provide /usr/bin/mogrify-
  im6 (mogrify-im6) in auto mode
  Setting up ghostscript (9.20~dfsg-3.2+deb9u2) ...
  Setting up cups-core-drivers (2.2.1-8+deb9u2) ...
  Setting up cups-bsd (2.2.1-8+deb9u2) ...
  locale: Cannot set LC_CTYPE to default locale: No such file or directory
  locale: Cannot set LC_ALL to default locale: No such file or directory
  Setting up libmagickcore-6.q16-3-extra:armhf (8:6.9.7.4+dfsg-11+deb9u5) ...
  Setting up imagemagick (8:6.9.7.4+dfsg-11+deb9u5) ...
  Setting up cups-filters (1.11.6-3+rpil) ...
  .
  Setting up cups (2.2.1-8+deb9u2) ...
  locale: Cannot set LC_CTYPE to default locale: No such file or directory
  locale: Cannot set LC_ALL to default locale: No such file or directory
  Updating PPD files for cups ...
  Updating PPD files for cups-filters ...
  Updating PPD files for gutenprint
  Setting up printer-driver-gutenprint (5.2.11-1+b6) ...
  Processing triggers for libc-bin (2.24-11+deb9u3) ...
  Processing triggers for systemd (232-25+deb9u2) ...
  Processing triggers for dbus (1.10.26-0+deb9u1) ...
  Created ewmlinL /o+r/cwctomH/custom/mi11A[illegible] format wants/uncreserver.v11.service
```

Install VNC client

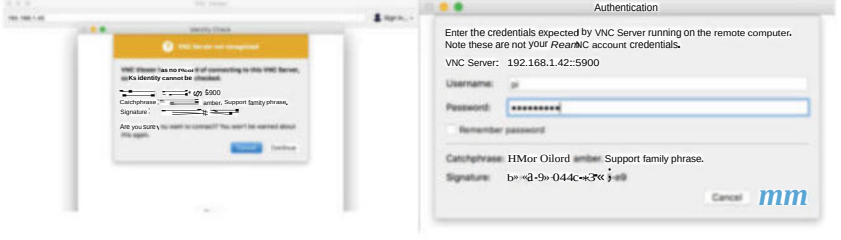
Download RealVNC Viewer from RealVNC official website, link:
https://www.realvnc.com/en/connect/download/viewer/

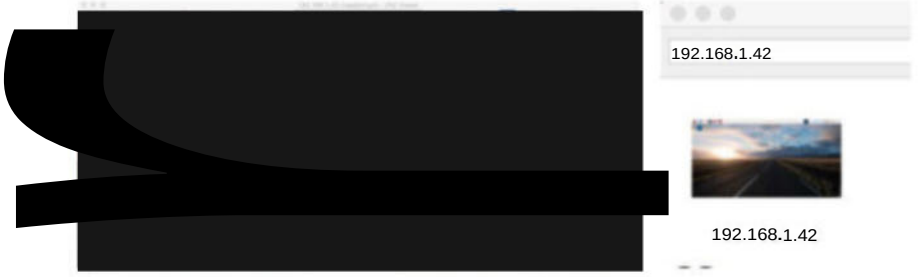


It is the RealVNC client, cross platform. Download the required platform client version.

Login Remote Desktop

After running RealVNC Viewer, enter the IP address of the Raspberry Pi, view by ifconfig command. After selecting the connection, enter the Raspberry Pi login username and password. The initial username is pi and the password raspberry. Confirm and enter Raspberry Pi remote desktop!





To change Raspberry Pi resolution, run sudo raspi-config in the terminal to enter the setting interface.

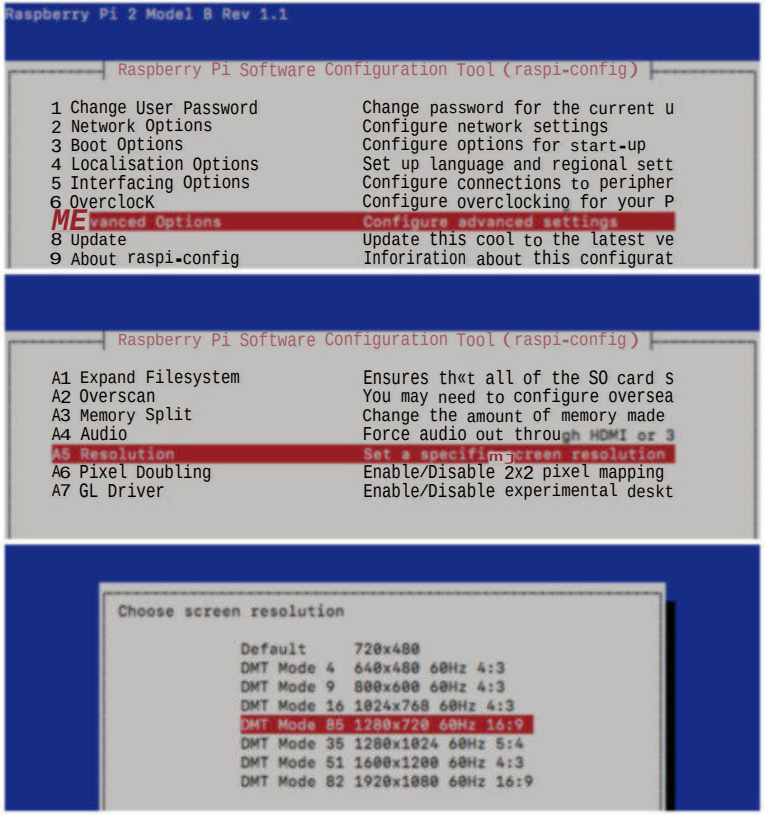
2-7.How to Set Raspberry Pi VNC Resolution

When using VNC to connect to the Raspberry Pi, the default resolution is very low. Even the entire desktop cannot be displayed, so you need to set the resolution.

Setting VNC resolution on the Raspberry Pi is very simple. Run the following command in the terminal to enter the setup interface.

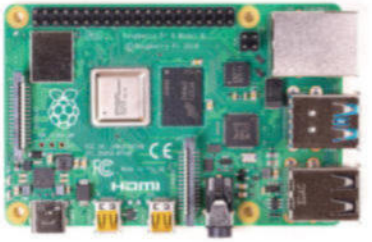
sudo raspi-config

Select Advanced Options> Resolution in the following order, and finally select a more suitable resolution and confirm finish.



It is recommended to reboot the Raspberry Pi or the VNC service for the settings to be effective.

2-8.Configure Raspberry Pi WiFi and SSH Without Screen and Keyboard



Shortly after the Raspberry Pi 4B release, the official Raspbian system of the Raspberry Pi added a mechanism that allows the WiFi network to be configured before start.

Note: This method is only effective if you have not made any Wi-Fi configuration after installing the Raspberry Pi system in the SD card. If you have configured Wi-Fi before, with the same method, the system will use the existing configuration by default and ignore the configuration here. It is therefore recommended to reinstall the system before use.

I. WiFi network configuration

Users can modify the /boot/wpa_supplicant.conf file and configure the SSID and password of the WiFi without starting Raspberry Pi. Then the Raspberry Pi will read the wpa_supplicant.conf file and connect to the WiFi device.

The operation method is simple: read the SD card of the Raspbian system with a computer. Create a new wpa_supplicant.conf file in the boot partition, namely the /boot directory of the Raspberry Pi. Fill in the content according to the following reference format and save the wpa_supplicant.conf file.

```
country=CN
ctrl_interface=DIR=/var/run/wpa_supplicant GROUP=netdev
update_config=1

network={
ssid="WiFi-An
psk="12345678"
key_mgmt=WPA-PSK
priority=1
}
```

```
network={
ssid="WiFi-B"
psk="12345678"

key_mgmt=WPA-PSK
priority=2
scan_ssid=1
}
```

Descriptions and examples of WiFi configurations with different security levels:
#ssid: network ssid
#psk: password
#priority: connection priority, the higher the number, the higher the priority (not a negative number)
#scan_ssid: This value needs to be specified as 1 when connecting to the hidden WiFi

If your WiFi has no password

```
network={
ssid="your wireless network name (ssid)"
key_mgmt=NONE
}
```

If WiFi uses WEP encryption

```
network={
ssid="your wireless network name (ssid)"
key_mgmt=NONE
wep_key0="your wifi password"
}
```

If WiFi uses WPA/WPA2 encryption

```
network={
ssid="your wireless network name (ssid)"
key_mgmt=WPA-PSK
psk="your wifi password"
}
```


If you don't know the encryption mode of WiFi, use root explorer on your Android phone to open /data/misc/wifi/wpa/wpa_supplicant.conf and view WiFi information.

II. Enable SSH service

If you access to Raspberry Pi through ssh and the prompt Access denied appears, ssh service is not enabled. To enable it manually is similar to the WiFi configuration. Also create a new file in the boot partition, leave it blank, and name the file ssh. Use lowercase and do not have any extensions.

When start, Raspberry Pi will automatically enable ssh service after detecting this file. Then find Raspberry Pi IP address by login the router, and connect to Raspberry Pi through ssh. (Detailed method on enabling SSH service)

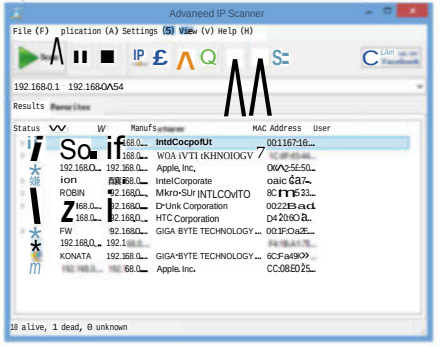
If you need to operate Raspberry Pi remotely, install xrdp through ssh, and connect to Raspberry Pi with the Windows remote desktop client.

2-9.Login Raspberry Pi Without Monitor and Unknown IP

When operating Raspberry Pi without monitor, you may not know the IP address automatically assigned by the Raspberry Pi wired network card. Detailed operation steps are provided below to address this problem.

Network segment scanning method

This is the recommended method. There are many network segment scanning tools. An Advanced IP Scanner is recommended. Download address: ipscan22.exe. Link: http://pan.baidu.com/share/link?shareid=3434443053&uk=605377859



The software will automatically detect the network segment of the computer and determine the scan range. (For example computer IP 192.168.1.101, and scanning range 192.168.1.*)

Press Start to start scanning, the list of all computers in the same network segment can be available.

If the router has login permission (such as home network), directly view the IP address assigned to the Raspberry Pi on the router's management interface.

The default hostname of Raspbian Pi Raspbian system is raspberrypi.

(Find alarmpi with ArchLinuxARM, if you change the hostname yourself)

Attached: enable Raspberry Pi to be dynamically assigned to the same IP address every time

Dynamic IP is leased. When the lease expires, the reassigned IP address may change and sometimes cause inconvenience.

You can instruct the router, if manageable, to remember the MAC hardware address of the Raspberry Pi network card.

As long as it is the same Raspberry Pi, no matter how the operating system changes, the router will automatically assign the same IP address and remain unchanged.

This method is recommended because it keeps the automatically assigned IP address fixed and facilitates SSH, VNC and other connections.

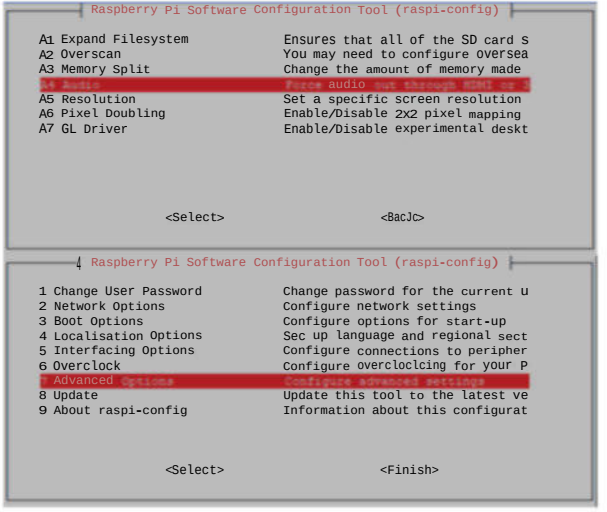
The method for binding the static IP address to the MAC address is the same for different routers. Refer to the Router User Guidelines for details.

2-10.Configure Raspberry Pi Audio Output: 3.5MM /HDMI

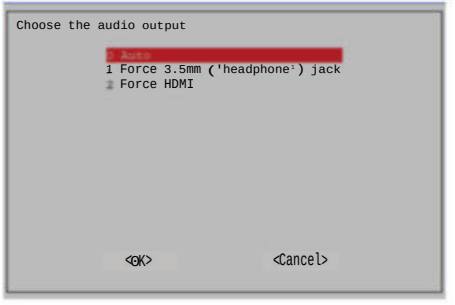
By default, the Raspberry Pi automatically selects the audio output port. When simultaneously connecting the HDMI display and 3.5MM headphone or speaker, sometimes you want to manually specify one of them as the audio output device. Configure it by the following method. When connecting an external DAC expansion board, select the DAC output with this method after configuring the driver.

Enter Raspberry Pi configuration tool:
sudo raspi-config

Select Advanced Options-> Audio.



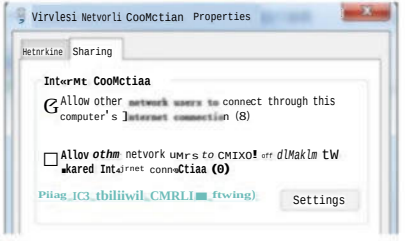
List the audio output devices here. Select Force 3.5mm or Force HDMI.



2-11.Raspberry Pi + One Network Cable Directly Connected to the Laptop

Connect the computer directly with a network cable without going through the router.

I. Materials: One Raspberry Pi, one network cable, one laptop.
1. Raspberry Pi: SD card with power supply system and burned Raspbian system;
2. Network cable: cross or direct connection;
3. Laptop: dual network card.
II. Operation steps.

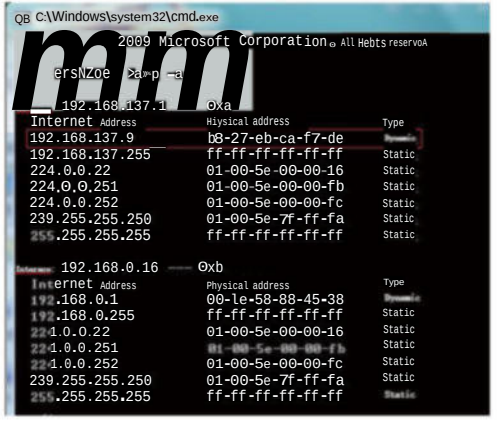


1. Wiring.

Connect the Raspberry Pi with the power cable;
Connect one end of the network cable to the Raspberry Pi and the other end to the laptop.

2. Internet sharing.

If the current laptop is connected to the Internet through WIFI, the Internet resources of the wireless network card can be shared to the local connection. Take win7 system as an example, Start-Control Panel-Network and Internet-Network and Sharing Center-View Network Status and Tasks-Change Adapter Settings, find the wireless network connection, right-click "Properties", select on the sharing tab "Allow other network users to connect through this computer's Internet connection (N)" option, click OK.



3. Find Raspberry Pi IP address.

Run the DOS window and enter arp -a. The dynamic IP address under the interface 192.168.137.1 is Raspberry Pi address.

Why is the interface 192.168.137.1? Because during the upper Internet sharing, the "local connection" IP address is automatically set to the static IP 192.168.137.1. This IP address can also be set to other static IP addresses commonly used by you. Because the Raspberry Pi IP address is dynamic, you can only find it with this method. Set the Raspberry Pi to a static IP address by modifying the cmdline.txt file in the SD card (add the statement ip = ***. ***. ***. ***). To secure successful connection, set the static IP address of the computer's "Local Connection" at the same segment as the static IP address of Raspberry Pi.

4. Use PuTTY software to connect Raspberry Pi.

Connect to the Raspberry Pi by entering the dynamic IP address or static IP address. Perform operations such as initializing because of the initial connection.

5. Graphical interface connection.

According to the descriptions of VNC remote login Raspberry Pi graphic interface, connect to Raspberry Pi through VNC software for graphical interface operation, or use the "Remote Desktop Connection" that comes with Windows for graphical operation. Find related tutorials on specific settings online.

2-12.Set Raspberry Pi Wireless Internet

I. Check if the network card status is normal

Plug the wireless network card into the Raspberry Pi, and enter the command ifconfig -a to see if there is any information about wlan0. If so, it means that the network card is normal. Skip the second step and directly configure the wireless network. If the information about wlan0 is not available, you need to install the wireless network card driver.

II. View the information of the wireless network card

Enter the command dmesg | grep usb and view the information of the wireless network card, solely the manufacturer. For example, the network card information
usb 1-1.3: Manufacturer: Realtek

Take Realtek as an example, install the wireless network card driver.
If the current Raspberry Pi is online, enter the installation command to install the Realtek driver.
First search the Realtek driver:
apt-cache search Realtek

See the following message:
firmware-realtek – Binary firmware for Realtek wired and wireless network adapters
Install Realtek driver:
sudo apt-get install firmware-realtek

If the Raspberry Pi is not online, go to the mirror image site and download the relevant driver.

III. Configure the wireless network

Open the interfaces file with editor nano
sudo nano /etc /network /interfaces
Interfaces file:

```
auto lo

iface lo inet loopback
iface eth0 inet dhcp

allow-hotplug wlan0
iface wlan0 inet manual
wpa-roam /etc/wpa_supplicant/wpa_supplicant.conf
iface default inet dhcp
```

Comment out all the wireless network card parts with #, and then add your own configuration information. The final result:

```
auto lo

iface lo inet loopback
iface eth0 inet dhcp

auto wlan0
# allow-hotplug wlan0
#iface wlan0 inet manual
iface wlan0 inet dhcp
wpa-conf /etc/wpa.conf
# wpa-roam /etc/wpa_supplicant/wpa_supplicant.conf
iface default inet dhcp
```


Use nano editor, ctrl + o to save, ctrl + x to exit.
Create the /etc/wpa.conf file with the editor nano:
sudo nano /etc/wpa.conf

If wifi has no password

```
network = {
[Tab] ssid = "your wireless network name (ssid)"
[Tab] key_mgmt = NONE
}
```

If wifi uses WEP encryption

```
network = {
[Tab] ssid = "your wireless network name (ssid)"

[Tab] key_mgmt = NONE
[Tab] wep_key0 = "your wifi password"
}
```

If wifi uses WPA /WPA2 encryption

```
network = {
[Tab] ssid = "your wireless network name (ssid)"
[Tab] key_mgmt = WPA-PSK
[Tab] psk = "your wifi password"
}
```

Note 1:
All symbols are half-width (symbols in English status), "[Tab]" means press the Tab key once
N
ote 2:
If you are not sure about the wifi encryption mode, open /data/misc/wifi/wpa/wpa_supplicant.-conf with root explorer on your Android phone and view the wifi information.

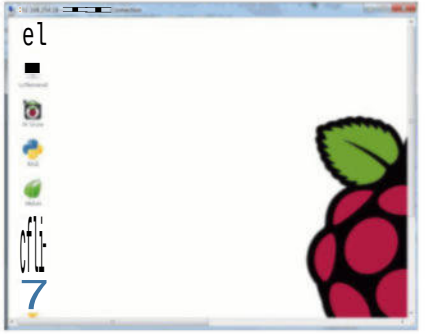
2-13.Method to Connect Raspberry Pi with Windows Remote Desktop

How to connect to Raspberry Pi with VNC has been described in the Raspberry Pi DIY notes. Under Windows, the built-in remote desktop is more convenient. How to connect to Raspberry Pi with remote desktop (mstsc.exe) rather than VNC?

Just need to install a service xdrp under raspbian. Enter the following command to install:

sudo apt-get install xrdp

Then it is Ok.



If an error-problem connecting occurs, the root cause is tightvnc. The version with the problem conflicts with the X font, leading to connection to the Xserver error.

Solution:

sudo apt-get purge tightvnc xrdp

sudo apt-get install tightvncserver xrdp

Finally, start the xrdp service and sudo /etc/init.d/xrdp restart. Enable the corresponding port and default configuration.

Through command: netstat -tnl

View 3350 3389 5910, it' s OK when these three ports are in LISTEN.

dpkg -L + name of the package, you can know which files this package contains.

via http://rpi.linux48.com/remote-rpi.html

http://www.linuxidc.com/Linux/2015-05/117835.htm

2-14.Summary of Software Installation and Uninstallation Commands on Raspberry Pi

Basic commands

Install software apt-get install softname1 softname2 softname3 ...

Uninstall software apt-get remove softname1 softname2 softname3 ...

Uninstall and purge configuration apt-get remove –purge softname1

Update software information database apt-get update

System upgrade apt-get upgrade

Search package apt-cache search softname1 softname2 softname3 ...

If you come across errors such as slow response or non-existent sources when using apt-get, you may need to replace the sources.

Install deb package dpkg -i xxx.deb

Delete package dpkg -r xxx.deb

Delete with the configuration file dpkg -r –purge xxx.deb

View package information dpkg -info xxx.deb

View file copy details dpkg -L xxx.deb

View information about installed packages in the system dpkg -l

Reconfigure package dpkg-reconfigure xxx

Purge residual configuration files for all deleted packages

dpkg -l | grep ^rc | awk '{print $ 2}' | sudoxargs dpkg -P

If the following error is reported, it means that there are no residual configuration files in your system. Don't worry.

dpkg: –purge needs at least one package name argument

The dpkg installation can be uninstalled with apt, and vice versa.

aptitude command

aptitude, like apt-get, is an extremely powerful package management tool in Debian and its derivatives. Unlike apt-get, aptitude is better at handling dependencies. For example, when aptitude deletes a package, it also deletes the packages it depends on. In this way, no unnecessary packages remain in the system, and the entire system is cleaner. The following are some of the

commonly used aptitude commands summarized by the author for reference only.
aptitude update update the list of available packages
aptitude upgrade upgrade available packages
aptitude dist-upgrade upgrade the system to a new release
aptitude install pkgname install package
aptitude remove pkgname delete package
aptitude purge pkgname delete the package and its configuration file
aptitude search string search package
aptitude show pkgname show detailed information of the package
aptitude clean delete downloaded package files
aptitude autoclean delete only expired package files
Of course, you can also use aptitude in text interface mode.
List of common apt commands
apt-cache search # ------ (package search package)
apt-cache show # ------ (package get information about the package, such as description, size, version, etc.)
sudo apt-get install # ------ (package installation package)
sudo apt-get install # ----- (package--reinstall package)
sudo apt-get -f install # ----- (force installation? # "-f = --fix-missing" when it is repair installation ...)
sudo apt-get remove # ----- (package delete package)
sudo apt-get remove--purge # ------ (package delete package, including deleting configuration files, etc.)
sudo apt-get autoremove --purge # ---- (package delete the package and its dependent packages + configuration files, etc. (only valid for 6.10, highly recommended))
sudo apt-get update # ------ update source
sudo apt-get upgrade # ------ update installed packages
sudo apt-get dist-upgrade # --------- upgrade system
sudo apt-get dselect-upgrade # ------ upgrade with dselect
apt-cache depends # ------- (package understand use dependency)
apt-cache rdepends # ------ (package know a specific dependency? # view which packages are dependent on this package ...)
sudo apt-get build-dep # ------ (package installation-related compilation environment)

apt-get source # ------ (package download the source code of the package)
sudo apt-get clean && sudo apt-get autoclean # -------- clean the archive of downloaded files && clean only outdated packages
sudo apt-get check # ------- check for broken dependencies

2-15.Linux Vi (vim) Editor Tutorial

vi (vim) is a very common Linux editor. Many Linux releases have vi (vim) installed by default. There are many vi (vim) commands. When used flexibly, they will greatly improve efficiency. vi is short for "visual interface", vim is vi IMproved. Vi is sufficient for general system management and maintenance. You can use vim to highlight code. Vi tutorial is given below: including vi introduction, use mode, file open, close and save, inserting text or creating new lines, moving the cursor, deleting, restoring characters or lines, searching, and so on. Such vi tutorial is very suitable for beginners.

vi has 3 modes: insert, command, and low line.

Insert: In this mode, enter characters. Press ESC to return to the command mode.
Command: Move the cursor, delete characters, etc.
Low line: Save files, exit vi, set vi, find (low line mode can also be regarded as in command mode).

I. Open, save, close the file (used in vi command mode)
vi filename //Open the filename file
: w //Save the file
: w vpser.net //Save to vpser.net file
: q //Quit the editor, if the file has been modified, please use the following command
: q! //Exit the editor without saving
: wq //Exit the editor and save the file

II. Insert text or line (used in vi command mode, execute the following command and enter insert mode, press ESC key to exit insert mode)
a //Add text to the right of the current cursor position
i //Add text to the left of the current cursor position
A //Add text at the end of the current line

I //Add text at the beginning of the current line (at the beginning of the line of non-empty character)
O //Create a new line above the current line
o //Create a new line below the current line
R //Replace (overwrite) the current cursor position and subsequent text
J //Merge the cursor line and the next line (still in command mode)

III. Move the cursor (used in vi command mode)
1.Use the up, down, left, and right arrow keys
2. In command mode: h left, j down, k up, l right.
Spacebar right, Backspace left, Enter move to the beginning of the next line,- move to the beginning of the previous line.

IV. Delete or restore characters or lines (used in vi command mode)
x //Delete the current character
nx //Delete n characters from the cursor
dd //Delete the current line
ndd //Delete downward n lines including the current line
u //Undo the previous operation
U //Undo all operations on the current line

V. Search (used in vi command mode)
/vpser //Search vpser string under the cursor
? vpser //Search the vpser string above the cursor
n //Search downward the previous search action
N //search upward the previous search action

VI. Jump to the specified line (used in vi command mode)
n + //n lines down
n- //n lines up
nG //Jump to line with line number n

G //Skip to the bottom of the file

VII. Setting the line number (used in vi command mode)
: set nu //Display line number
: set nonu //Cancel displaying line number

VIII. Copy and paste (used in vi command mode)
yy //Copy the current line to the buffer area. Use "ayy copy," a buffer, and a can also be replaced with any letter from a to z, which can complete multiple copy tasks.
nyy //Copy the current line downward n lines to the buffer, or use "anyy copy," a buffer, a can also be replaced with any letter from a to z, which can complete multiple copy tasks.
yw //Copy the characters from the cursor to the end of the word.
nyw //Copy n words starting from the cursor.
y ^ //Copy the content from the cursor to the beginning of the line. VPS detective
y $ //Copy the content from the cursor to the end of the line.
p //Paste the contents of the clipboard after the cursor. If the previous custom buffer is used, it is recommended to use "ap to paste.
P //Paste the contents of the clipboard in front of the cursor. If the previous custom buffer is used, it is recommended to use "aP" to paste

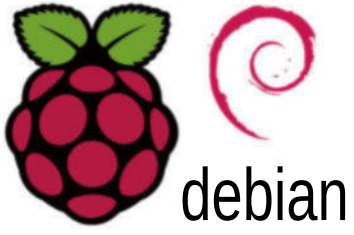
IX. Replace (used in vi command mode)

: s/old/new//Replace the first old in the line with new
: s/old/new/g//Replace all old in the line with new
: n, m s/old/new/g//Replace all old lines from n to m with new
:% s/old/new/g//Replace all old in the current file with new

X Edit other files
: e otherfilename //Edit the file named otherfilename.

XI. Modify file format
: set fileformat = unix //Modify the file to unix format. For example, the text file under win will appear ^ M under linux.

2-16.Descriptions of Purpose of Each Linux/Raspbian Directory



Many students who are new to Raspberry Pi /Linux will wonder where the software and configuration files are stored when installing, uninstalling, and configuring software for the Raspberry Pi. They may also come across issues with directory paths such as "disk partition" and U disk mount. However, Linux directories rules are very clear.

Difference between Linux and Windows

One of the significant differences between Linux and Windows is their different directory structure. Apart from the format, the things stored in different locations are very different.

On Windows, a typical path may be D: \ Folder \ subfolder \ file.txt, while on Linux, the path would be /Folder/subfolder/file.txt.

The direction of the slash is different. Linux has no concept of the C drive and D drive. After the Linux system starts, the root partition is "mounted" at the /position, and all files, folders, devices, as well as different hard disk drives are also mounted on /.

Although it may not be obvious in the following example, the Linux system is sensitive to uppercase and lowercase characters in file or file path names.

For example, /Folder/subfolder/file.txt and /folder/subfolder/file.txt are not the same file.

Linux system directory description

The directory structure of Unix and Linux is unified. All directories and files are finally unified under the "/" root file system. Whether the file system is mounted, the file system is finally arranged hierarchically under the file system starting with "/".

The Linux directory structure adopts the "Filesystem Hierarchy Structure (FHS)." This standard is maintained by the "Free Standards Group." However, most LINUX releases intentionally or unintentionally deviates from this Norm.

"/" root path

This is the "root" directory of the Linux system and the lowest level of any directory structure. On UNIX and compatible systems, "/" is a separate directory.

/boot

This directory contains boot loader, such as Grub, Lilo or Kernel, and configuration files such as initrd and system.map.

Initrd ramdisk or "" initrd "" refers to a temporary file system called by the Linux kernel during the startup phase. initrd is mainly used for preparation before the "root" file system is mounted.

/sys

This directory contains the kernel, firmware, and system related files.

/sbi

Contain the binary files and management tools necessary for system operation, mainly executable files and similarto EXE files under Windows.

/bin

Contain binary files and utility programs in single-user mode, such as commands cat, ls, cp.

/lib

Contain the library files needed to run binary files in the /sbin and /bin directories.

/dev

Contain the necessary system files and drives.

/etc

Contain system configuration files, directories underneath, such as /etc/hosts, /etc/resolv.conf, nsswitch.conf, and system default settings, network configuration files, and configuration files for some systems and applications.

/home

Under this directory, each user will have a separate directory commanded by the username, where the user's personal settings files are stored, especially files ending with profile. However, there are exceptions. The data of the root user is not in this directory, but is in the root path and

stored in a separate /root folder.

/media
A conventional mount point for all removable devices such as optical drives, USB external disks, and floppy disks.
/mnt
Temporary file system mount point. For example, if you don't want to mount a drive for a long time, but just temporarily mount a USB flash drive to copy an MP3 or the like, then you should mount it in this location.

/opt
In Linux systems, this directory is not used much. opt is short for Optional Software Packages. This directory on UNIX system is much more versatile such as Sun Solaris.

/usr
The user data directory contains utilities and applications that belong to the user. There area lot of important but not critical file system mounted under this path. Here you will find a new bin, sbin, and lib directory that contains non-critical user and system binary files, related libraries and shared directories, and some library files.

/usr /sbin
Contain unnecessary and not particularly important system binary files and network application tools in the system.
/usr /bin
Contain unnecessary and not particularly important binary files for users.

/usr /lib
Store the library files needed by the binary files in /usr/sbin and /usr/bin.

/usr /share
A "platform independent" shared data directory.

/usr /local
It is a secondary directory under /usr. It mainly stores local system data including system binary files and runtime libraries.

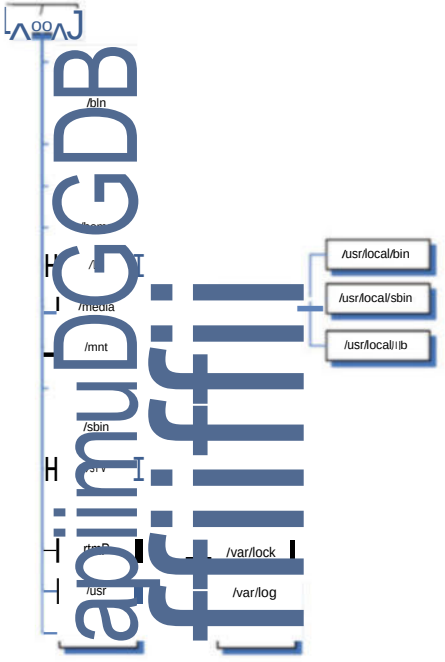
/var

This path usually contains system logs, printer spool files, crontabs, mails, running processes, process lock files, and so on. We should emphasize daily inspection and maintenance on this directory, because the file size in this directory may grow quickly. It may quickly fill up the hard disk, and then the system will have various strange problems.

/tmp

It is a temporary folder that is used to store temporary files. During system reboot, the "temporary" files in this directory will be emptied. Likewise, /var/tmp also holds temporary files. The only difference between the two is that the files stored in the /var /tmp directory of the latter will be protected by the system, and the files in this directory will not be emptied after system reboot.
/proc

This directory is a pseudo file system residing in system memory, which holds the system kernel and process information in text format.
Linux Directory Structure in Visual View It should be noted that there are some differences in the directory structure of different Linux releases.



2-17.How to Safely Shutdown and Reboot Raspberry Pi?

Many shutdown options, one option in one line.
sudo shutdown -h now
sudo halt
sudo poweroff
sudo initO

Reboot method
sudo reboot
shutdown -r now
shutdown -r 18:23:52 # timed reboot shutdown at 18:2

2-18.Connect Raspberry Pi with USB Serial Cable on Mac OS X

There is no HDMI monitor while RPi has TXD and RXD plus a usb to ttl.
Mac OS Usb TTL driver.
Driver download address: PL2303 Mac OS X Driver Download, link: http://www.prolific.com.tw/US/ShowProduct.aspx?p_id=229&pcid=41

Restart the system after installation and find the serial device:
cd /dev
ls tty.usbserial *

mac os install screen
The port used here is screen
brew install screen

or
sudo port install screen

Then connect Raspberry Pi

Raspberry PI serial communication
In our TTL board
GND-> Groud
RXD-> GPIO14 (TXD)
TXD-> GPIO15 (RXD)
! Note: TXD is connected to RXD. Don't make the same connection.

Mac OSttl setting raspberry pi
Serial communication
screen /dev/tty.usbserial 115200

During system reboot, input username and password
Raspbian GNU/Linux 7 raspberrypi ttyAMAO

raspberrypi login: pi
Password:
Last login: Sat Apr 26 05:58:07 UTC 2014 on ttyAMAO
Linux raspberrypi 3.10.25+ #622 PREEMPT Fri Jan 3 18:41:00 GMT 2014 armv6l

The programs included with the Debian GNU/Linux system are free software;
the exact distribution terms for each program are described in the
individual files in /usr/share/doc/*/copyright.

Debian GNU/Linux comes with ABSOLUTELY NO WARRANTY, to the extent
permitted by applicable law.
ls

NOTICE: the software on this Raspberry Pi has not been fully configured. Please run 'sudo raspi-config'

Then
sudo raspi-config

Select the first one and proceed
Expand Filesystem Ensures that all of the SD cards
After reboot, it seems that the new raspberry pi comes with openssh-server.
By the way provide a way to uninstall the driver
rm -rf /System/Library/Extensions/XXXX.kext
rm -rf /System/Library/Extensions.kextcache
rm -rf /System/Library/Extensions.mkext
kextcache -k /System/Library/Extensions

These commands may be issued when you are an administrator. It is recommended to use the root user or sudo -s. XXXX.kext is the name of the driver. For example, the two USB-Serial drivers here start with Prolific and FDTI.

2-19.Install Raspbian on Raspberry Pi under Mac OSX

First download the system image in the official website of Raspberry Pi, it is recommended to download Raspbian.
After download, get an img image:
[usiful_ @mac: pi] $ ls -lh
total 3788800
-rw-r--r-- 1 landzo staff 1.8G 2 9 03:44 2013-02-09-wheezy-raspbian.img

Insert the SD card and use the df command to view the currently mounted volume:
[usiful_@mac: pi] $ df -h
Filesystem Size Used Avail Capacity Mounted on
/dev /disk0s2 112Gi 96Gi 15Gi 87% /
devfs 183Ki 183Ki 0Bi 100% /dev
map -hosts 0Bi 0Bi 0Bi 100% /net
map auto_home 0Bi 0Bi 0Bi 100% /home
/dev /disk1s1 15Gi 2.3Mi 15Gi 1% /Volumes /unnamed

Compare Size and Name, find the device file corresponding to the SD card partition in the

system (here /dev/disk1s1). If you have multiple partitions, there may be disk1s2 and the like. Use diskutil unmount to unmount these partitions:
[usiful_ @mac: pi] $ diskutil unmount /dev /disk1s1
2
Volume unnamed on disk1s1 unmounted

Confirm the device with diskutil list:
[usiful_ @mac: pi] $ diskutil list
/dev/disk0
#: TYPE NAME SIZE IDENTIFIER
0: GUID_partition_scheme * 121.3 GB disk0
1: EFI 209.7 MB disk0s1
2: Apple_HFS Macintosh HD 120.5 GB disk0s2
3: Apple_Boot Recovery HD 650.0 MB disk0s3
/dev /disk1
#: TYPE

NAME SIZE IDENTIFIER
0: FDisk_partition_scheme
* 15.8 GB disk1
1: Windows_NTFS unnamed
15.8 GB disk1s1

Use the dd command to write the system image. Pay special attention to the number after the disk.
(Note: /dev/disk1s1 is the partition, /dev/disk1 is the block device, and /dev/rdisk1 is the original character device)
[usiful_ @mac: pi] $ dd bs = 4m if = 2013-02-09-wheezy-raspbian.img of =/dev/rdisk1

After waiting for a few minutes, the following prompt appears, indicating that the SD card has been swiped:
462 + 1 records in
462 + 1 records out
1939865600 bytes transferred in 163.133220 secs (11891297 bytes /sec)

Uninstall the device with diskutil unmountDisk:
[usiful_@mac: pi] $ diskutil unmountDisk /dev/disk1
Unmount of all volumes on disk1 was successful

Now you can remove the SD card and plug it into the Raspberry Pi to start the system. During first startup, enter Raspi-config. The latter configuration method is the same as other platforms. For details, please refer to the part Configure Raspberry Pi with raspi-config.

Precautions

caveat

- This product can only be connected to the 5V external DC power supply. Any external power supply used with Raspberry-P should comply with the relevant regulations and standards applicable in the country/region of use.
- This product should not be beyond frequency, as it will increase the temperature of some components.
- The product cannot be covered, and the operating environment should be ventilated.
- The product should be placed on a stable, non-conductive surface during use and should not come in contact with any conductive items.

Instructions for use safet

To avoid malfunction or damage to the Raspberry Pi, please follow the following requirements:

1. Do not contact with water and moisture or place it on conductive surface during operation.
2. Do not allow the Raspberry P to come into contact with any heat source. The product will operate reliably under normal room temperature.
3. Be careful not to cause mechanical or electrical damage to the printed circuit board and connectors during operation.
4. Don' t operate Raspberry Pi when it' s energized. Operate by only the edges and avoid electrostatic discharge damage.
5. All peripheral devices used with the Raspberry Pi should comply with the relevant standards of the country/region of use and be marked accordingly to ensure compliance with relevant safety and performance requirements. These devices include, but are not limited to, keyboard, monitor, and mouse used with the Raspberry Pi.
6. If you use different software to write microSD cards or use different cards, you need to use Pi4B compatible software. If you see a rainbow boot screen with a lightning bolt symbol, it means that you are not using compatible software.
7. Before the circuit board is completely assembled, do not install the heat sink or insert a microSD card into the board; the board must be installed on a flat base under the two grooves;
8. Do not insert a micro card into the USB card reader. Don' t start Raspberry Pi from the USB card reader. USB card reader only works on your PC or Mac, if you need to rewrite.