

Lesson 3 Remote Desktop Connection

1. Getting Ready

This section applies to the scenario where the Raspberry Pi 4B does not have a separate display to connect. You need to configure the Wi-Fi network before booting the Raspberry Pi, and then log in remotely via SSH or VNC.

SSH is a network protocol (the default port number is 22), used for encrypted login between computers, and remote control through the command line. VNC remotely controls in the form of a graphical desktop. Users can choose according to their own needs.

Note: The use of VNC must be based on SSH. It can be used by enabling the configuration service (the system turns off the VNC service by default), so SSH cannot be achieved directly (unless there is another screen for the Raspberry Pi 4B). The method in this section is for reference only.

Before starting, please prepare the following tools:

- 1) Smart Phone
- 2) Computer (Laptop is best or a desktop computer with a USB wireless network card)
- 3) Card reader and SD card with Raspberry Pi system image
- 4) Putty tool (for the remote log in tool, please go to the folder "5.Appendix/3.Tools/3. Remote Connect Tool")

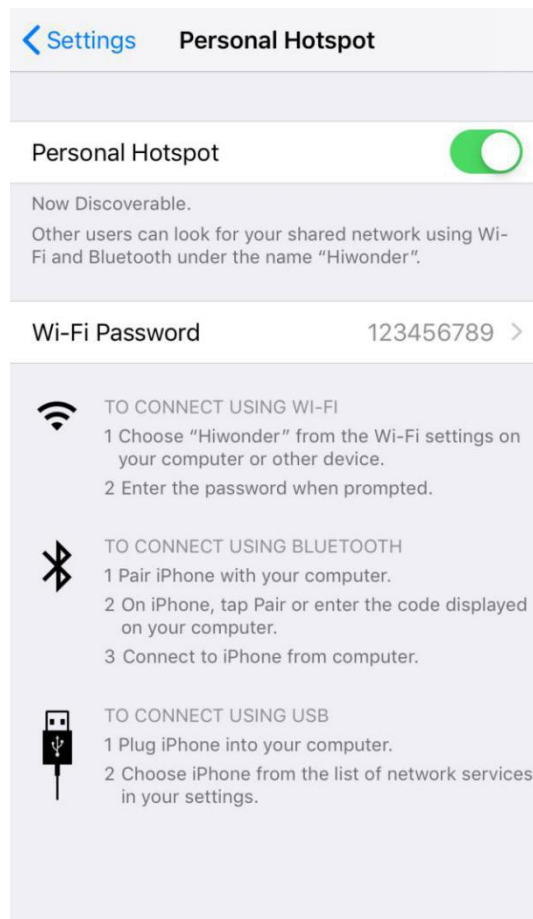


5) VNC Tool (for the remote Desktop connect tool, please go to the folder “5.Appendix/3.Tools/3. Remote Connect Tool”)



2. Operation Steps

1) Establish a hotspot with your smart phone. Hotspot name is Hiwonder and the password is 123456789.



2) Connect the computer to the hotspot established just now. After connecting, enter "CMD" to open the command prompt. Then input “arp -a” command to check the new computer IP.

```

Command Prompt
Microsoft Windows [Version 10.0.19041.450]
(c) 2020 Microsoft Corporation. All rights reserved.

C:\Users\hi>arp -a

```

Computer IP checking

```

Command Prompt
192.168.11.92      40-b0-76-82-39-5d      dynamic
192.168.11.114     00-e0-4c-62-0f-e4      dynamic
192.168.11.130     00-e0-4c-63-0a-82      dynamic
192.168.11.149     00-e0-70-28-77-56      dynamic
192.168.11.150     00-cf-e0-52-f0-5e      dynamic
192.168.11.152     b0-5a-da-c4-5e-72      dynamic
192.168.11.161     00-e0-4c-66-24-36      dynamic
192.168.11.166     00-e0-70-26-bf-b9      dynamic
192.168.11.179     00-e0-70-26-b9-be      dynamic
192.168.11.189     00-e0-4c-0c-5d-bd      dynamic
192.168.11.194     00-cf-e0-43-e6-c2      dynamic
192.168.11.195     00-e0-4c-71-18-2f      dynamic
192.168.11.255     ff-ff-ff-ff-ff-ff      static
224.0.0.22         01-00-5e-00-00-16      static
224.0.0.251        01-00-5e-00-00-fb      static
224.0.0.252        01-00-5e-00-00-fc      static
239.255.255.250    01-00-5e-7f-ff-fa      static
255.255.255.255    ff-ff-ff-ff-ff-ff      static

Interface: 172.20.10.8 --- 0x18
Internet Address  Physical Address  Type
172.20.10.1       ee-44-63-97-07-64  dynamic
172.20.10.15      ff-ff-ff-ff-ff-ff  static
224.0.0.22        01-00-5e-00-00-16  static
224.0.0.251       01-00-5e-00-00-fb  static
224.0.0.252       01-00-5e-00-00-fc  static
239.255.255.250   01-00-5e-7f-ff-fa  static
255.255.255.255   ff-ff-ff-ff-ff-ff  static

C:\Users\hi>

```

Computer IP after connecting

3) Insert the card reader into the computer and click "boot" drive letter, which is the "/boot" directory of the Raspberry Pi.



4) Use the Notepad tool to fill in the content according to the following reference format, and then name it "wpa_supplicant.conf " (Tip: Enter the content, save and exit the file first, then rename the file name. You need to

replace all file names including txt with the name above. If there is a pop-up prompt, select "Yes"), and then save it to the "boot" drive letter.

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

network={
    ssid="Hiwonder"
    psk="123456789"
    key_mgmt=WPA-PSK
    priority=1
}
```

#ssid: Wi-Fi name, take "Hiwonder" as example.

#psk: Wi-Fi password, take "123456789" as example.

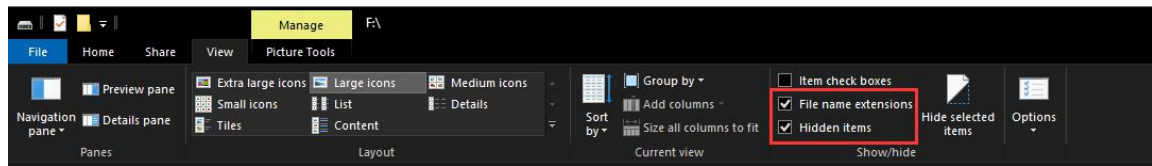
Most Wi-Fi generally uses WPA encryption. If your Wi-Fi with WEP encryption, please modify the code to:

```
network={
    ssid="Your Wi-Fi name"
    (ssid) "
    key_mgmt=NONE
    wep_key0="Your Wi-Fi
password"
}
```

5) Raspberry Pi disables the ssh service by default, so you need to create a file to start this service. Please follow the method in the previous steps to create another new file named "ssh" (lower case and no txt as the suffix). The content can be empty.

6) We can click "File name extensions" and "Hidden items" to check whether

the suffix name meets the requirements



7) Start the Raspberry Pi and wait for the boot to complete. If the phone receives a new device connection, it proves that the Raspberry Pi is successfully connected. Then use the CMD command line to check the IP of the Raspberry Pi. Enter the "arp -a" command again, you can find that there is a dynamic IP address "172.20.10.9" (example IP), which is the IP address of the Raspberry Pi.

```

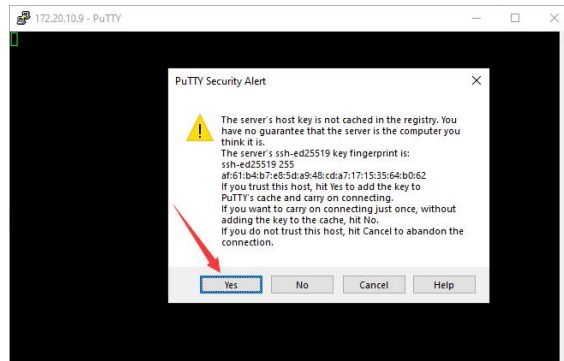
C:\> Command Prompt

239.255.255.250      01-00-5e-7f-ff-fa      static
255.255.255.255      ff-ff-ff-ff-ff-ff      static

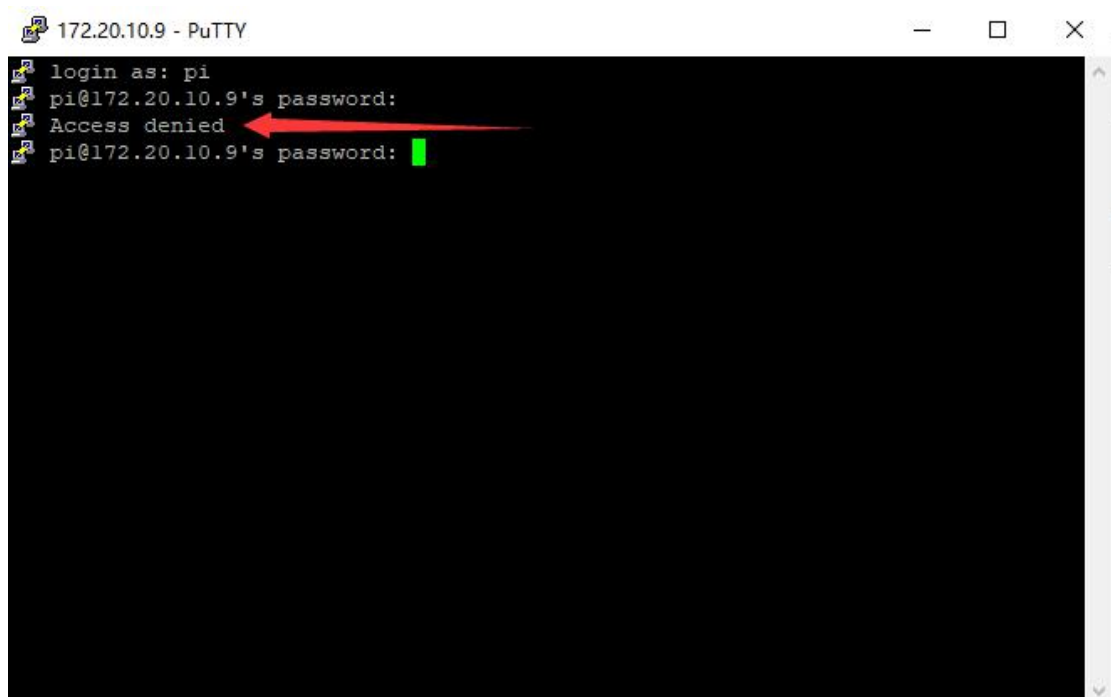
Interface: 172.20.10.7 --- 0x1b
Internet Address      Physical Address      Type
172.20.10.1           ee-44-63-97-07-64     dynamic
172.20.10.9           dc-a6-32-b7-46-2a     dynamic
172.20.10.15          ff-ff-ff-ff-ff-ff     static
224.0.0.22            01-00-5e-00-00-16     static
224.0.0.251           01-00-5e-00-00-fb     static
224.0.0.252           01-00-5e-00-00-fc     static
239.255.255.250      01-00-5e-7f-ff-fa     static
255.255.255.255      ff-ff-ff-ff-ff-ff     static
  
```

3. SSH Operation

1) Open the Putty software, enter the recorded Raspberry Pi IP "172.20.10.9", and remain the computer and Raspberry Pi under the same network. A security pop-up warning will appear when logging in for the first time, just click the "Yes".

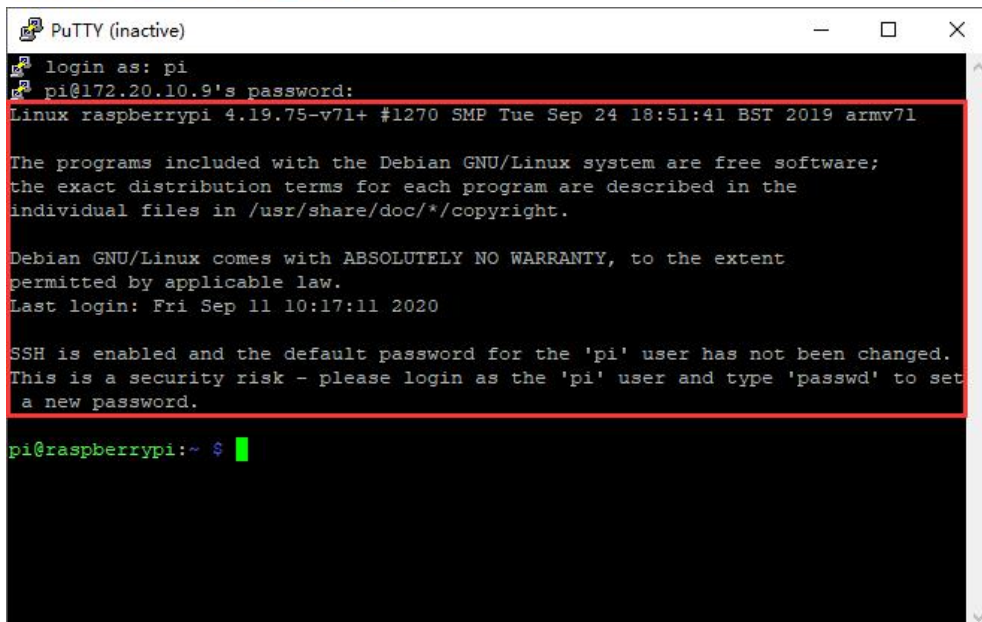


2) Enter account name and password in the pop-up window and then press "Enter". The default name is pi and the password is raspberry. Please note that there will be no visual display when you enter the password. If the password is wrong, the prompt shown below will appear.



Fail to log in

3) After entering the password successfully, the system interface is shown in the figure below:



```
login as: pi
pi@172.20.10.9's password:
Linux raspberrypi 4.19.75-v71+ #1270 SMP Tue Sep 24 18:51:41 BST 2019 armv7l

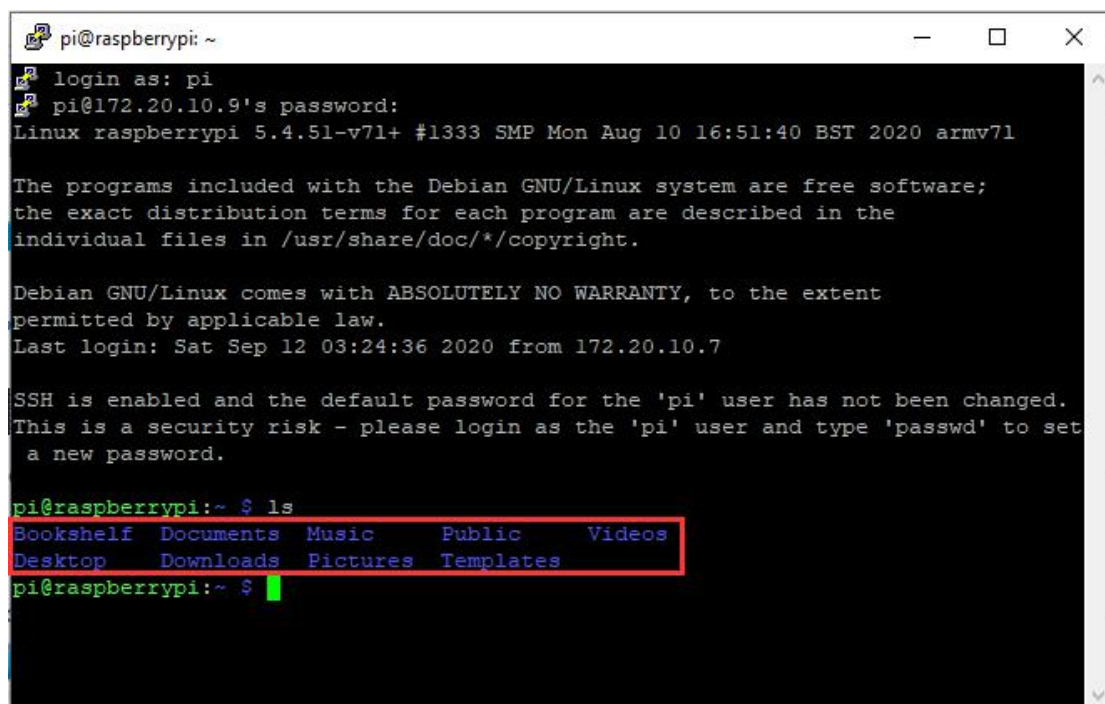
The programs included with the Debian GNU/Linux system are free software;
the exact distribution terms for each program are described in the
individual files in /usr/share/doc/*/copyright.

Debian GNU/Linux comes with ABSOLUTELY NO WARRANTY, to the extent
permitted by applicable law.
Last login: Fri Sep 11 10:17:11 2020

SSH is enabled and the default password for the 'pi' user has not been changed.
This is a security risk - please login as the 'pi' user and type 'passwd' to set
a new password.

pi@raspberrypi:~ $
```

4) In the Raspberry Pi system, we can control with the command line. Check the file with the “ls” command.



```
login as: pi
pi@172.20.10.9's password:
Linux raspberrypi 5.4.51-v71+ #1333 SMP Mon Aug 10 16:51:40 BST 2020 armv7l

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.
Last login: Sat Sep 12 03:24:36 2020 from 172.20.10.7

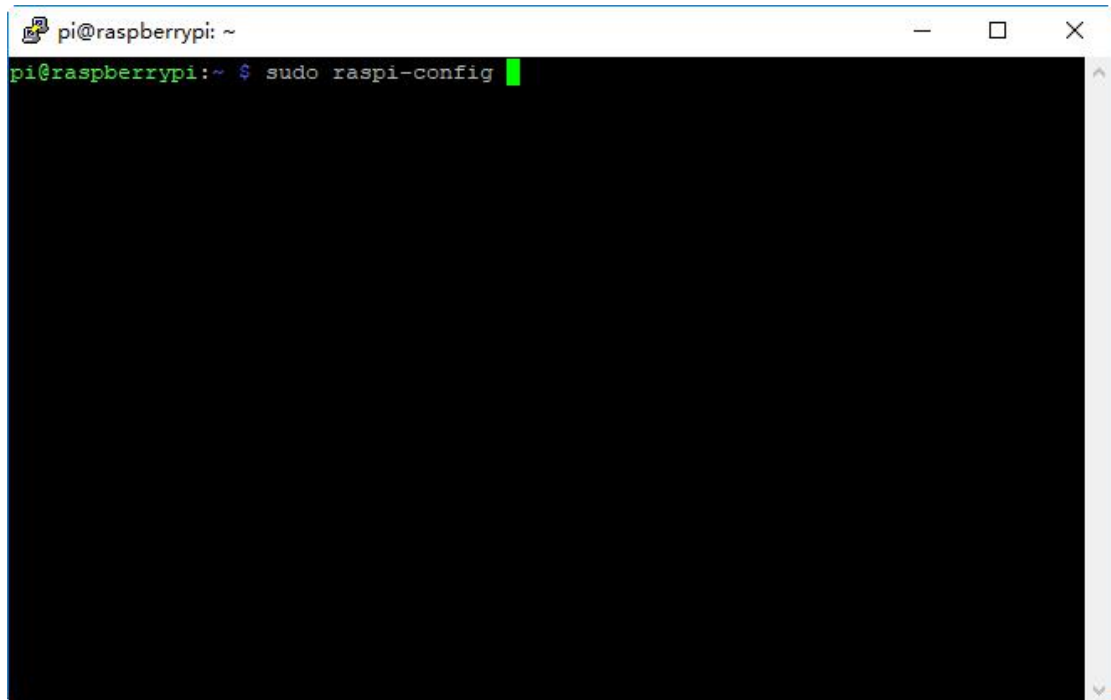
SSH is enabled and the default password for the 'pi' user has not been changed.
This is a security risk - please login as the 'pi' user and type 'passwd' to set
a new password.

pi@raspberrypi:~ $ ls
Bookshelf  Documents  Music      Public     Videos
Desktop   Downloads  Pictures   Templates
pi@raspberrypi:~ $
```

4. VNC Operation

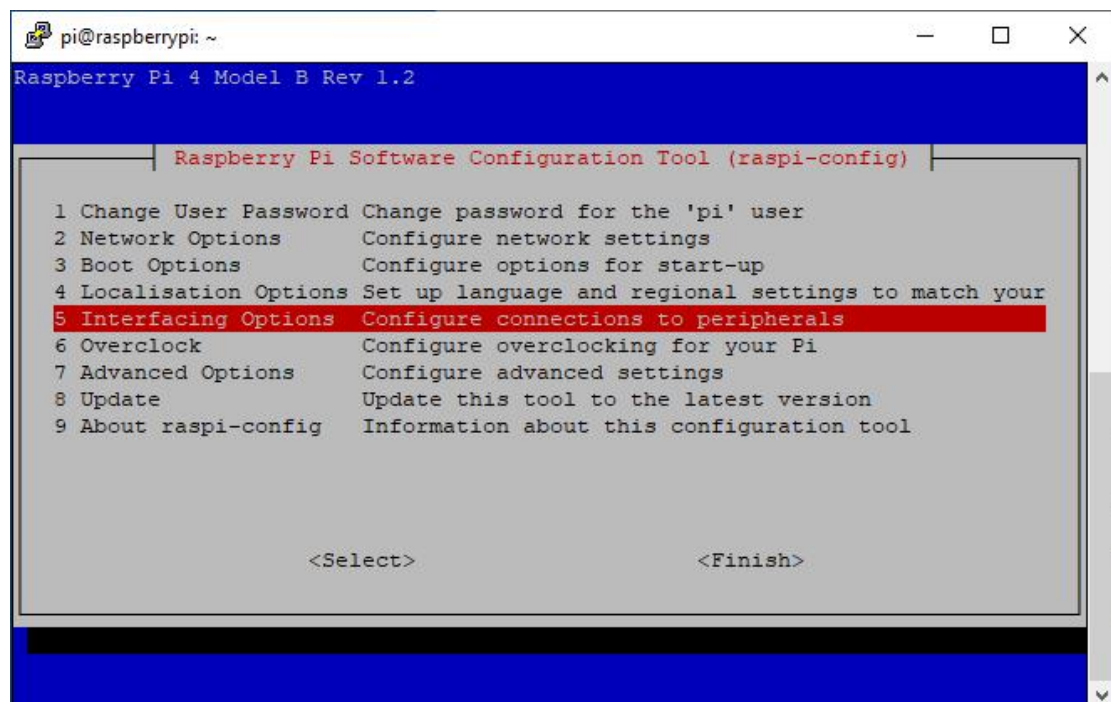
If you are unfamiliar or unaccustomed to command line control, you can remotely control the Raspberry Pi through another screen (your computer), which likes the Windows operation interface through a graphical desktop.

1) Enter “sudo raspi-config” in the SSH interface to go into the configuration interface.

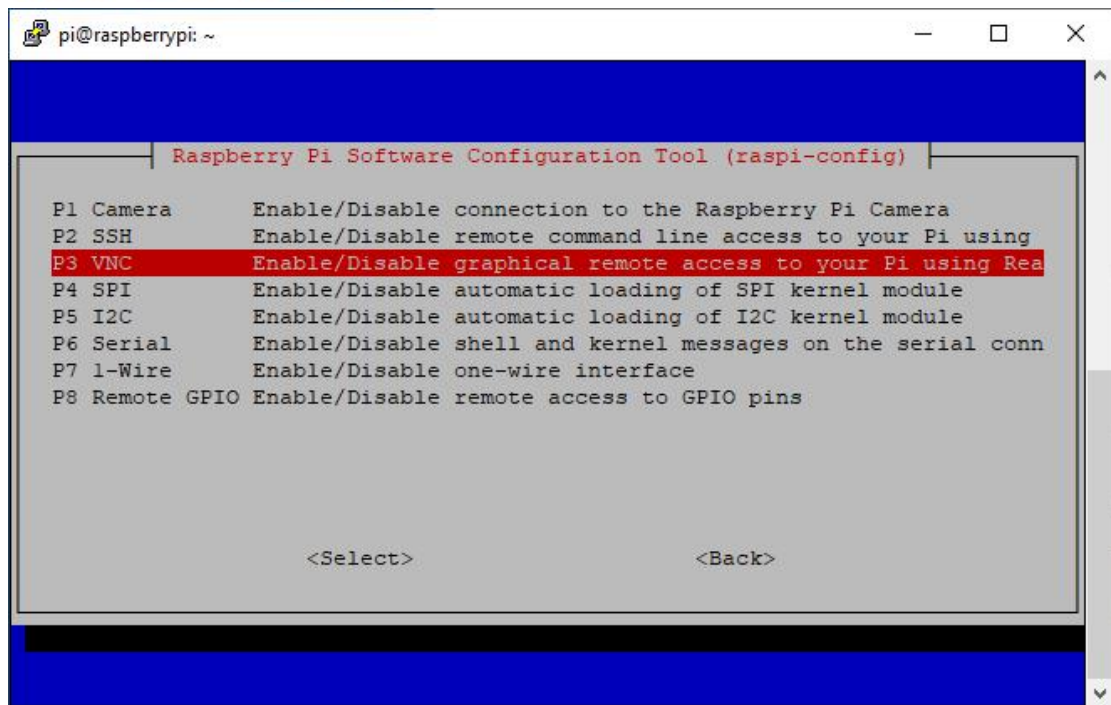


```
pi@raspberrypi: ~  
pi@raspberrypi:~ $ sudo raspi-config
```

2) In this interface, you can select with “↑↓” key, confirm with “Enter” and back to last step with “Esc”.

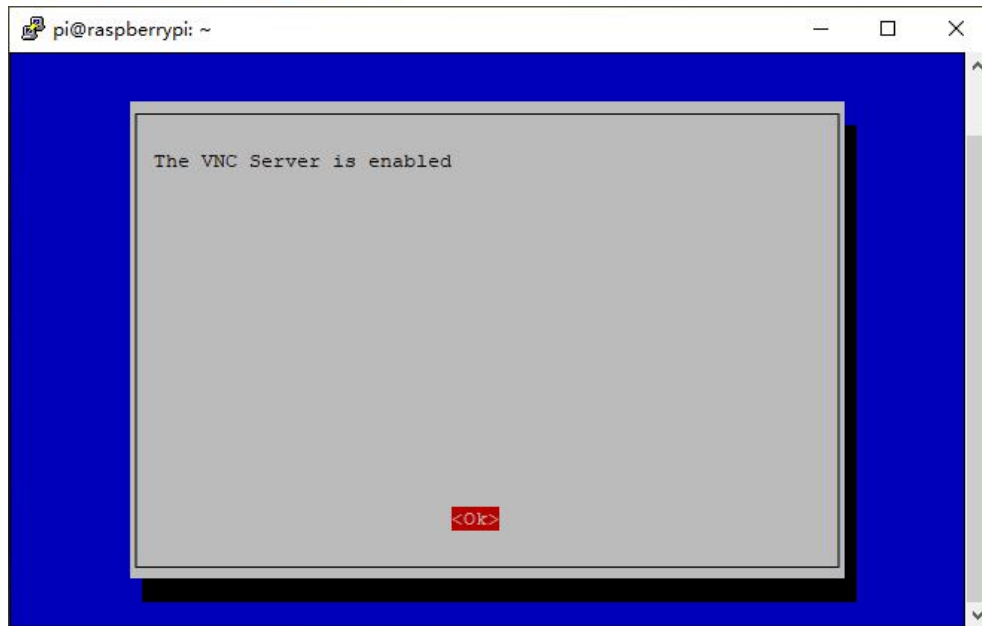


```
Raspberry Pi 4 Model B Rev 1.2  
Raspberry Pi Software Configuration Tool (raspi-config)  
1 Change User Password Change password for the 'pi' user  
2 Network Options Configure network settings  
3 Boot Options Configure options for start-up  
4 Localisation Options Set up language and regional settings to match your  
5 Interfacing Options Configure connections to peripherals  
6 Overclock Configure overclocking for your Pi  
7 Advanced Options Configure advanced settings  
8 Update Update this tool to the latest version  
9 About raspi-config Information about this configuration tool  
  
<Select> <Finish>
```

Start VNC service

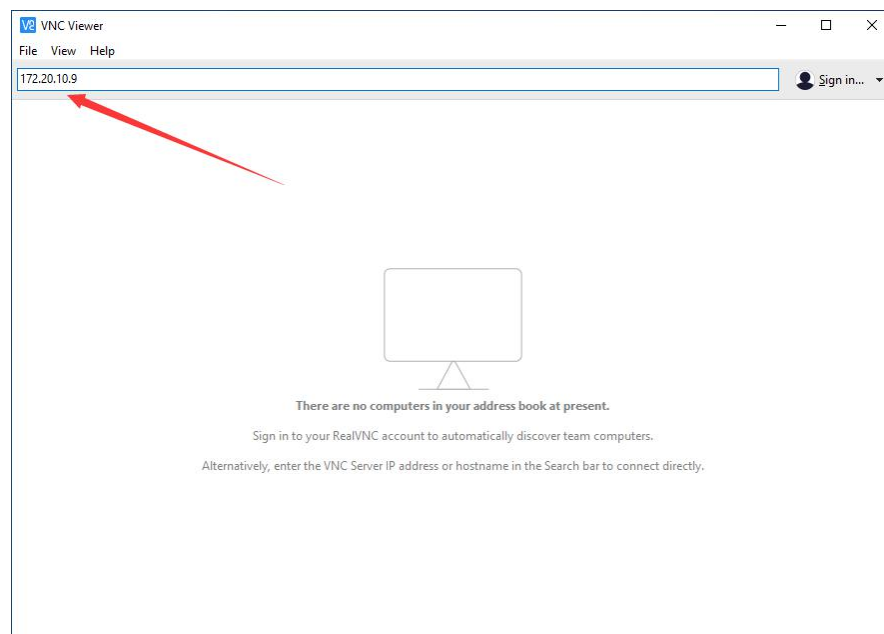




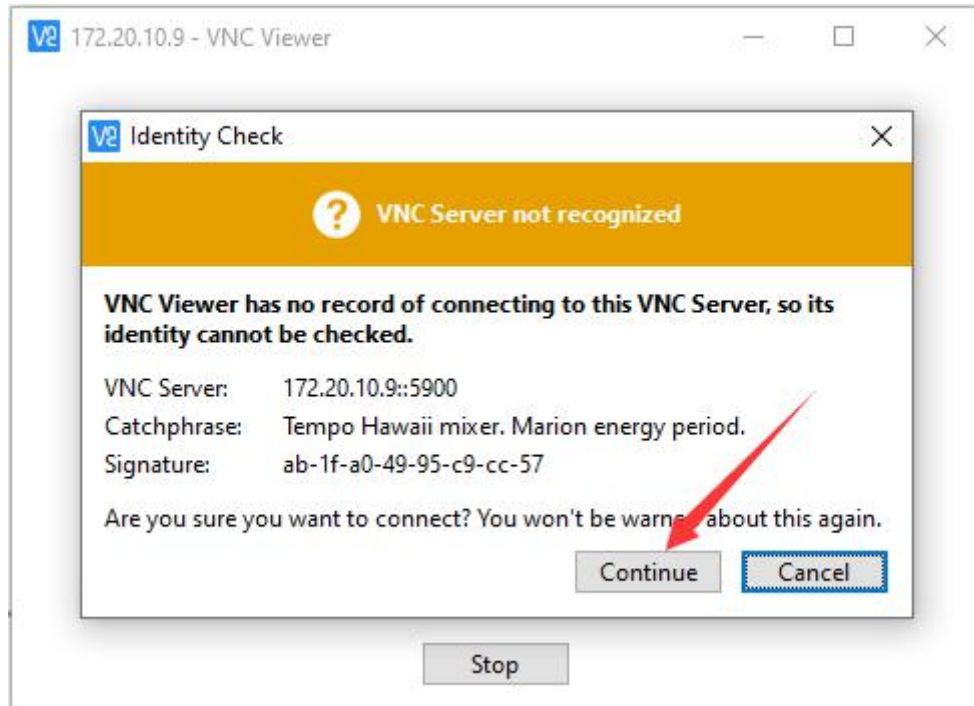
3) As shown in above figure, the VNC service prompt is successfully started. Press the “Enter” key to click "OK", and then the screen will automatically return to the main configuration interface/ Press the "Esc" key to exit.

4) Exit Putty and open the installed VNC.

5) Enter Raspberry Pi IP “172.20.10.9” in the VNV Viewer and press “Enter”. Click "Continue" if prompted that it is not a secure connection.



Enter IP in VNC



6) Enter password "raspberr" in the prompt window. If you're required to fill the account, please enter "pi". Check the remember password box, and then click "OK" to remotely open the desktop of Raspberry Pi. (If it is a black screen with only a mouse pointer, you can try to repeat the above operation after restarting the Raspberry Pi.)

