



# RASPBERRY PI HACKATHON

1<sup>ST</sup> WORKSHOP

2019.5.6

Funded by  
**STFC**

# AGENDA



Introduction



Installation



Sensors & Scratch



Next Step



hack@uwt - University of Washington Tacoma

# FIRST ANNUAL HACKATON



- A **hackathon** is an event where developers, artists, designers and programmers meet and work together on developing solutions to real-world problems.

# WHO CAN PARTICIPATE IN HACK@UWT?

- All UW students (undergraduate and graduate) are welcome. If you wish to get involved as event volunteers, simply contact us.

# HOW DOES THIS EVENT WORK?

- Students from one or more disciplines will form teams of 3-4 students (graduate or undergraduate). Groups will be given a problem to solve during the hackathon event and you will work with your team to build a prototype or a proof of concept. We will provide:
  - hardware prototyping platforms
  - training workshops
  - lots of food
- At the end of the event, judges will announce the `hack@uwt` winners.

# SIZE OF EACH TEAM

- Teams should be groups of **2-4** students. Although we recommend that you register once you have formed a team, feel free to register individually. In case you submitted an application and wish to switch teams, simply contact us and let us know.

# REGISTER WITHOUT HAVING A TEAM? NO PROBLEM.

- In case you do not have a team yet and wish to participate in the event, feel free to register individually. We will then try to match you with a team.

# ALL MAJORS ARE WELCOMED!

- We encourage students of **all levels** to join, build, innovate and learn!
- We will be holding **training workshops** throughout the first half of the Spring quarter.

The workshops are designed to train students on using hardware resources and to facilitate team formation prior to the event.



# HARDWARE RESOURCES

- We will provide some hardware resources such as Raspberry Pi. Teams will also have access to 3D printers and monitors. In case you need other specific hardware resources, simply contact us and let us know!

# WHAT TO BRING

- A valid student ID when signing in to the hack@uwt event.
- We strongly recommend that you bring a laptop.
- In case you will be bringing other hardware resources not provided by the event, simply let us know in advance.

# COST

- hack@uwt is completely **free**! We will provide participants food and drinks!

# CAN I KEEP WHAT I MAKE AT THIS EVENT?

- Generally, you may keep what you make at this event except any tools or equipment you borrowed. Any components borrowed as part of the hackathon must be returned at the end of the event.

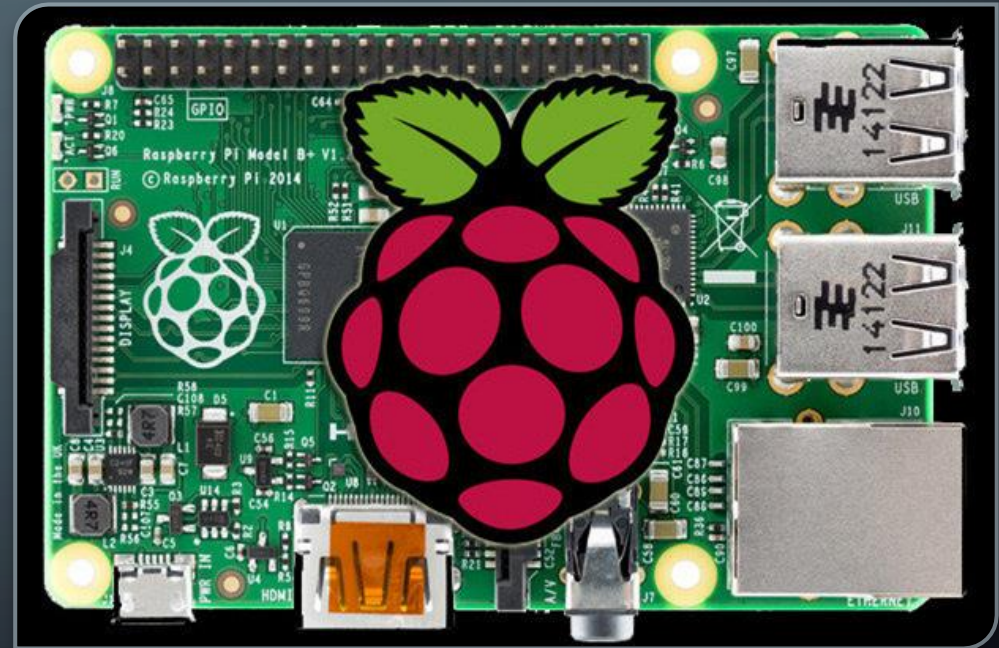


The image features a dark blue background with a subtle gradient. In the four corners, there are decorative white line art elements resembling circuit board traces or neural network connections. These lines are composed of straight segments and small circles, creating a geometric, tech-inspired aesthetic. The central text is white and stands out against the dark background.

Other questions?

# WHAT IS RASPBERRY PI?

- The Raspberry Pi is a low cost, **credit-card sized computer** that plugs into a computer monitor or TV, and uses a standard keyboard and mouse.
- It's capable of doing everything you'd expect a desktop computer to do.



# DIFFERENT MODELS

© raspberrypi org, <https://www.raspberrypi.org/products/>



## Raspberry Pi 3 Model A+

Our third-generation single-board computer, now in the A+ format

[MORE INFO](#)



## Raspberry Pi 3 Model B+

The latest revision of our third-generation single-board computer

[MORE INFO](#)



## Raspberry Pi 3 Model B

Our third-generation single-board computer

[MORE INFO](#)



## Raspberry Pi 2 Model B

The Raspberry Pi 2 Model B is the second-generation Raspberry Pi

[MORE INFO](#)



## Raspberry Pi 1 Model B+

The Model B+ is the final revision of the original Raspberry Pi

[MORE INFO](#)



## Raspberry Pi 1 Model A+

The Model A+ is the low-cost variant of the Raspberry Pi

[MORE INFO](#)



## Raspberry Pi Zero W

Single-board computer with wireless and Bluetooth connectivity

[MORE INFO](#)








## Raspberry Pi Zero

Our lowest-cost single-board computer

[MORE INFO](#)

# DIFFERENT MODELS

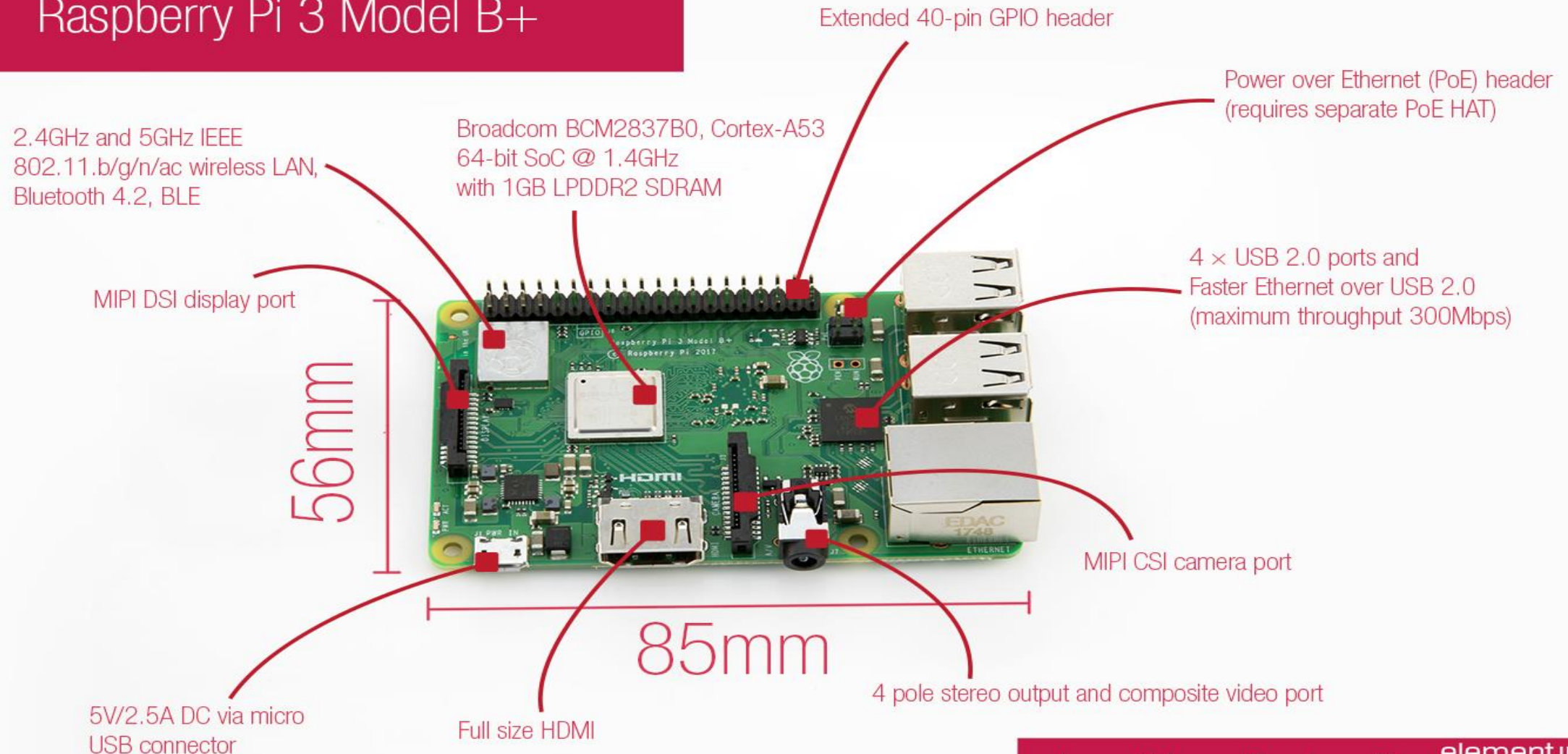
	NEW! Raspberry Pi 3 Model B+	Raspberry Pi 3 Model B	Raspberry Pi 2 Model B v1.2	Raspberry Pi Model B+	Raspberry Pi Model A+
	 Buy Now	 Buy Now	 Buy Now	 SPECIAL ORDER ONLY	 Buy Now
<b>Processor Chipset</b>	Broadcom BCM2837B0, Cortex-A53 64Bit SoC at 1.4GHz	Broadcom BCM2837 64Bit Quad Core Processor powered Single Board Computer running at 1.2GHz	Broadcom BCM2837 64Bit Quad Core Processor powered Single Board Computer running at 900MHz	Broadcom BCM2835 32Bit SoC full HD multimedia applications processor	Broadcom BCM2835 32Bit SoC full HD multimedia applications processor
<b>GPU</b>	Videocore IV	Videocore IV	Videocore IV	Videocore IV	Videocore IV
<b>Processor Speed</b>	QUAD Core @1.4 GHz	QUAD Core @1.2 GHz	QUAD Core @900 MHz	Single Core @700 MHz	Single Core @700 MHz
<b>RAM</b>	1GB LPDDR2 SD RAM	1GB SDRAM @ 400 MHz	1GB SDRAM @ 400 MHz	512 MB SDRAM @ 400 MHz	256 MB SDRAM @ 400 MHz
<b>Storage</b>	MicroSD	MicroSD	MicroSD	MicroSD	MicroSD
<b>USB 2.0</b>	4x USB Ports	4x USB Ports	4x USB Ports	4x USB Ports	1x USB Port
<b>Max Power Draw/voltage</b>	2.5A @ 5V	2.5A @ 5V	1.8A @ 5V	1.8A @ 5V	1.8A @ 5V
<b>GPIO</b>	40 pin	40 pin	40 pin	40 pin	40 pin
<b>Ethernet Port</b>	Gigabit Ethernet over USB 2.0 (max. throughput 300Mbps)	Yes	Yes	Yes	No
<b>WiFi</b>	Dual-band 2.4GHz and 5GHz IEEE 802.11.b/g/n/ac wireless LAN	Built-in	No	No	No
<b>Bluetooth LE</b>	Bluetooth 4.2/BLE	Built-in	No	No	No



# RASPBERRY PI 3 MODEL B+

© Element 14, <https://www.element14.com/community/docs/DOC-88853/1/raspberry-pi-3-model-b-plus-b-technical-specifications>

## Raspberry Pi 3 Model B+



The Raspberry Pi logo, featuring a stylized raspberry with a black outline, red body, and two green leaves, is centered in the background. The background is a blurred image of a green circuit board with various components.

# INSTALL RASPBIAN OS

# OBJECTIVE: INSTALL RASPBERRY PI OPERATING SYSTEM— RASPBIAN OS WITH NOOBS

## Parts:

- Raspberry pi 3 model B+
- Any computer with a USB port
- MicroSD card(at least above 8GB in size)
- MicroSD card reader





- **Step 1.** Insert MicroSD card into your MicroSD card reader and plug the reader into an USB adapter. Then insert it into the USB port on your computer.



**Raspbian** is the Foundation's official supported Operating System. Download it here, or use **NOOBS**, our easy installer for Raspbian and more.



NOOBS



RASPBIAN

- **Step 2.** Visit <https://www.raspberrypi.org/downloads/>. It will display a box with a link to the NOOBS files. Click the icon to go to that link.

**NOOBS Lite** contains the same operating system installer without Raspbian pre-loaded. It provides the same operating system selection menu allowing Raspbian and other images to be downloaded and installed.



### NOOBS

Offline and network install

Version: 2.4.0

Release date: 2017-09-07


[Download Torrent](#)

[Download ZIP](#)



SHA-256: affd54ab863330c03e64398d5ae38b0ea6c9e22e10374e714e94707f3380ea34 SHA-256: fcac10f83dab2769b

- **Step 3.** The simplest option is to download the zip archive of the files.



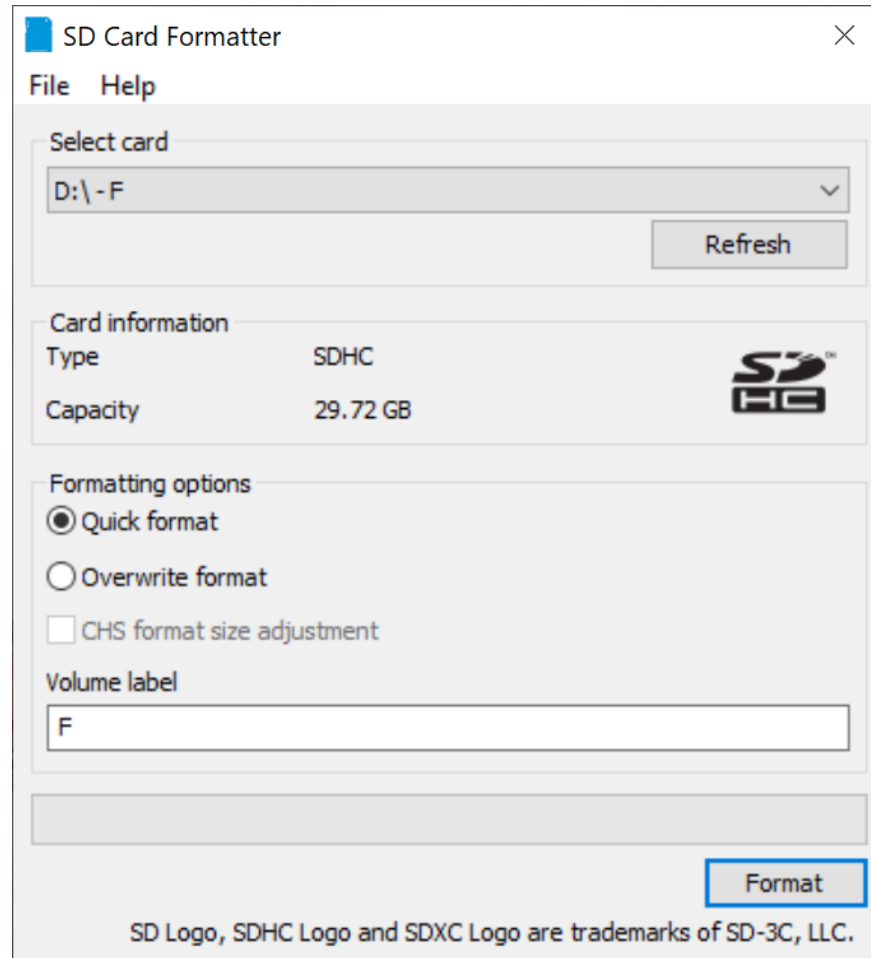
- **Step 4.** Format the MicroSD card.

- Visit SD Association's website:

[https://www.sdcard.org/downloads/formatter\\_4/index.html](https://www.sdcard.org/downloads/formatter_4/index.html)

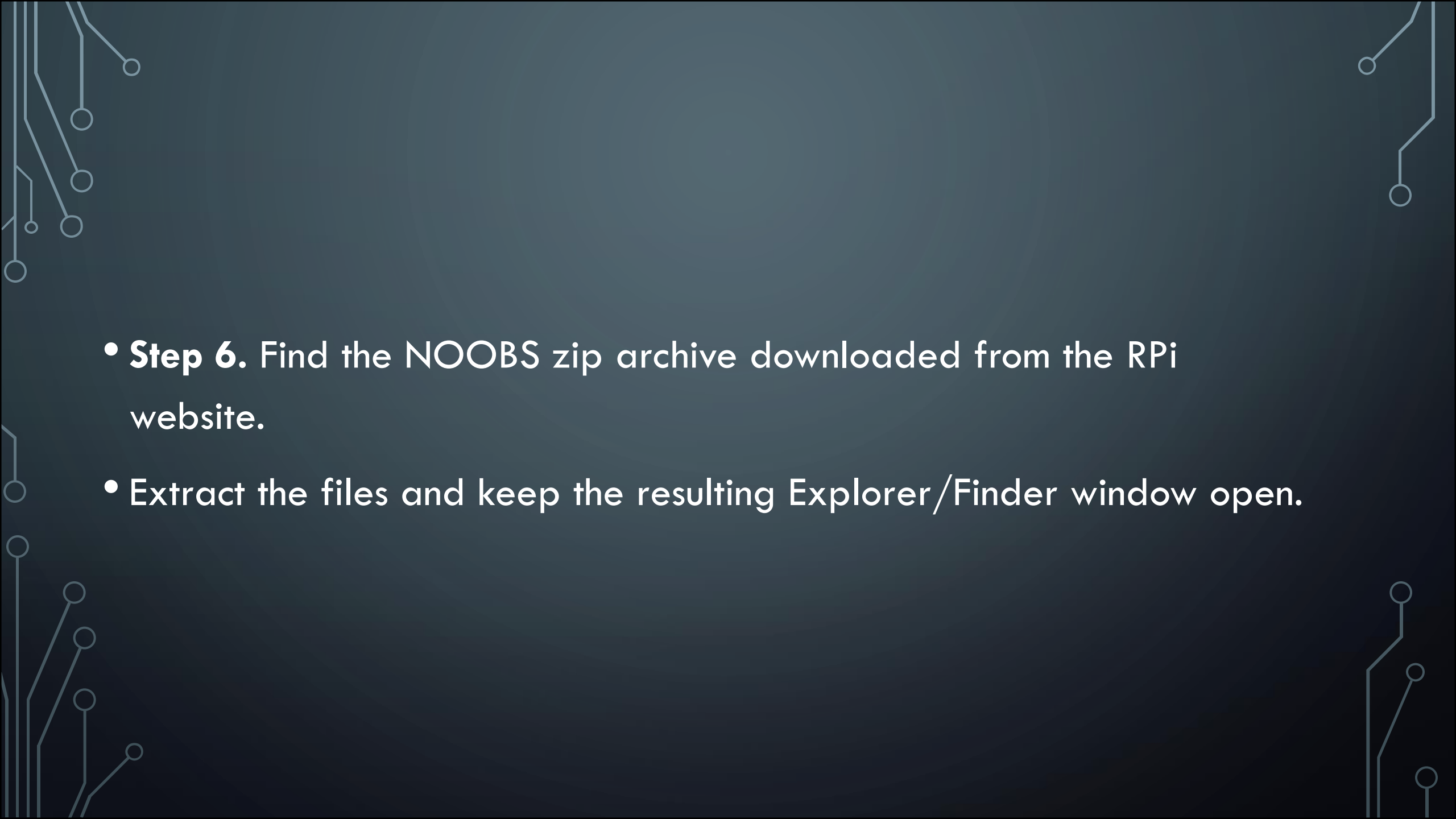
Download the latest version of SD Formatter for Windows or Mac.

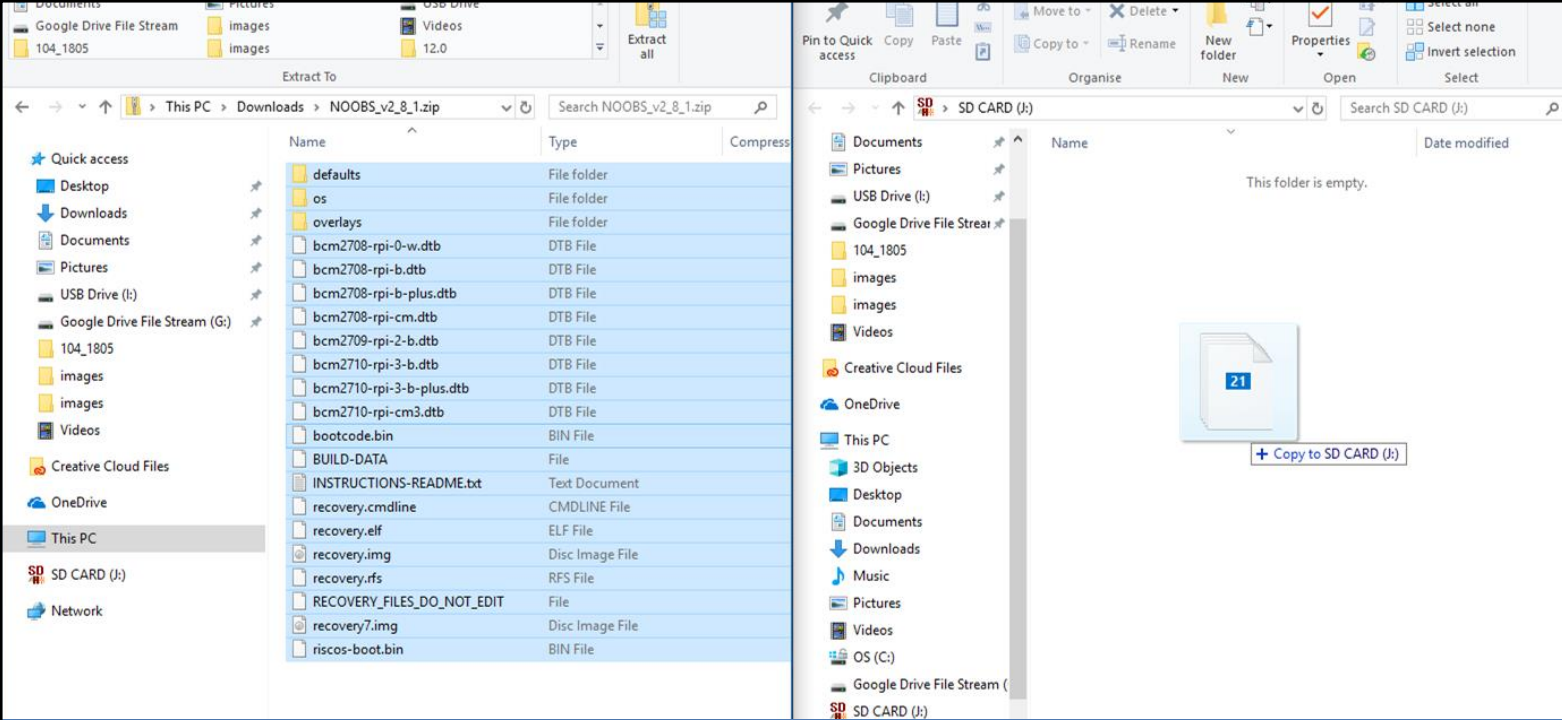




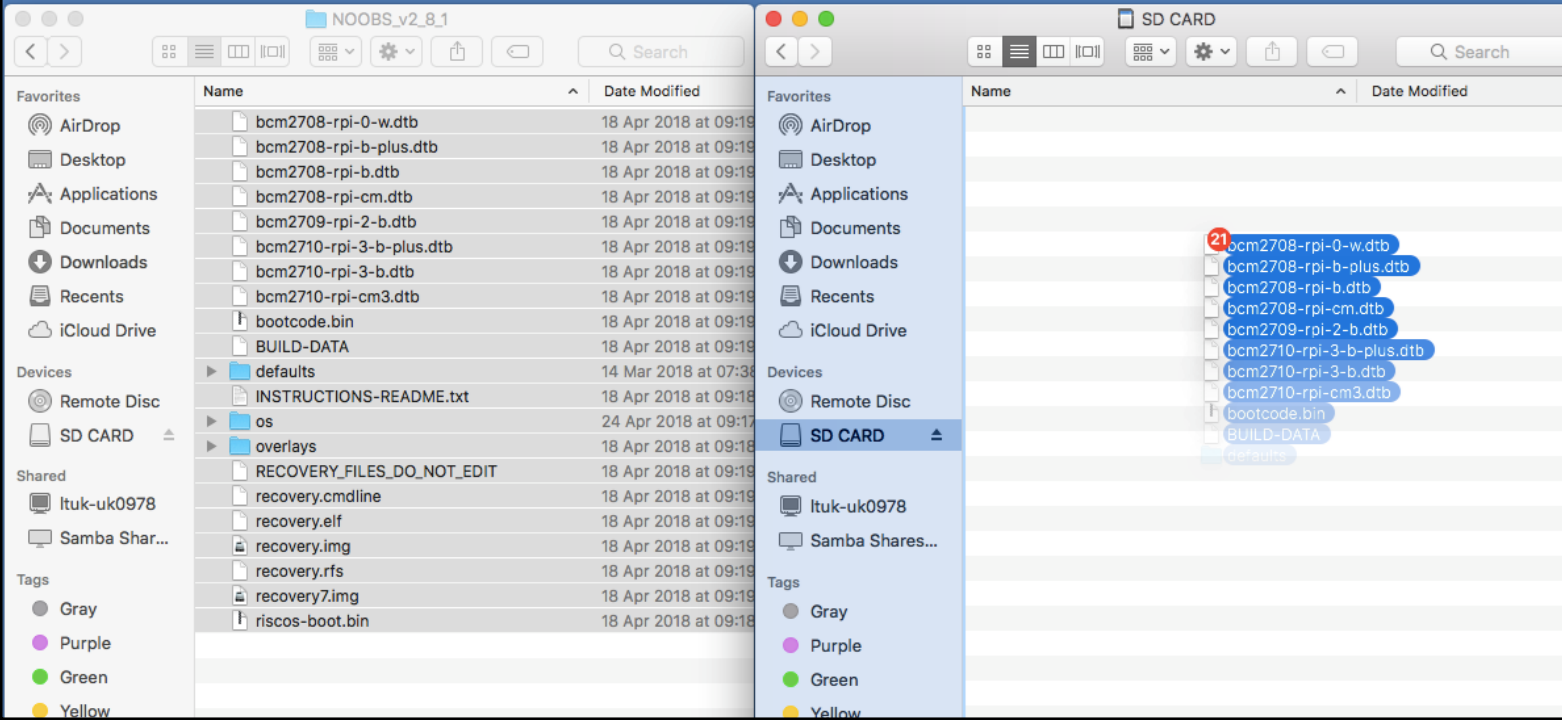
- **Step 5.** In SD Formatter, select the driver letter for your SD card, and format it.



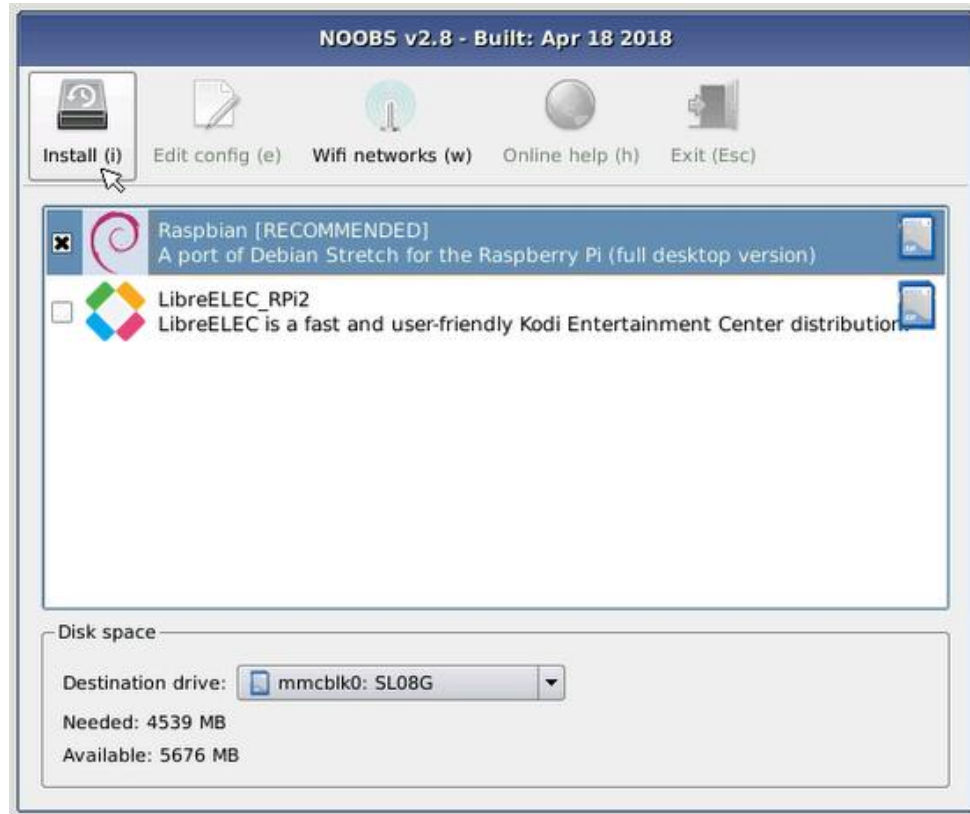
- 
- The background is a dark blue gradient. In the corners, there are decorative white line art elements resembling circuit boards or neural networks, with lines and small circles connecting them.
- **Step 6.** Find the NOOBS zip archive downloaded from the RPi website.
  - Extract the files and keep the resulting Explorer/Finder window open.



- **Step 7.** Open another Explorer/Finder window and navigate to the SD card. Select all the files from the NOOBS folder and drag them onto the SD card.



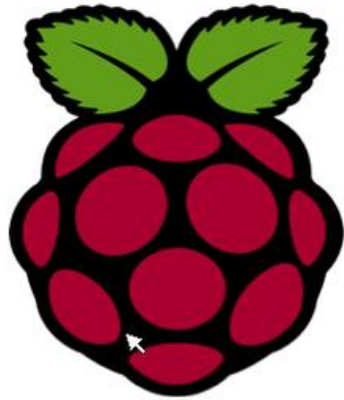
- **Step 8.** Eject the SD card from computer. Insert the microSD card into RPi and plug the Pi into a power source. The RPi should be booting up right after plugging into a power source.



- **Step 9.** A window will prompt when the installer has loaded automatically. Check the box for Raspbian and then click Install on the top left-hand side of the window.



Welcome to Raspberry Pi



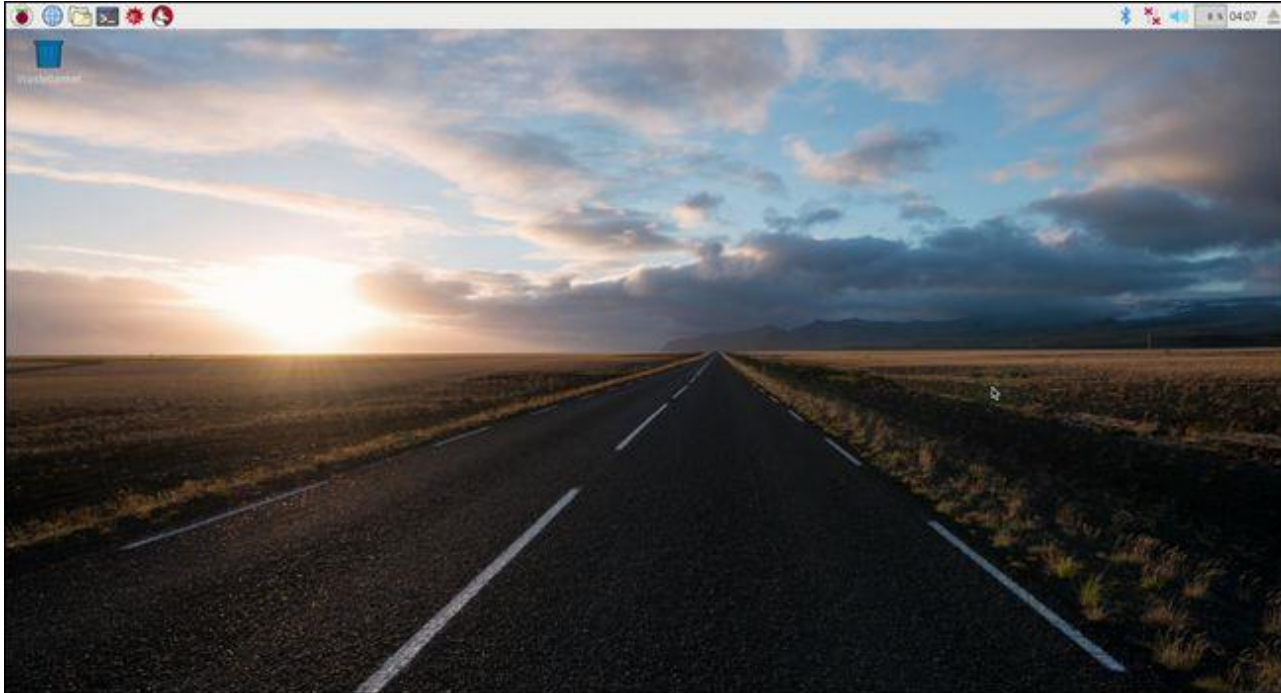
Please wait while the software is installed on your SD card – this will take a few minutes.

Raspbian: Creating filesystem (ext4)



18 MB of 4136 MB written (3.3 MB/sec)

- **Step 10.** Click **Yes** at the warning dialog, and then sit back and relax. It will take a while depends on what kind of SD card you have.



- **Step 11.** When Raspbian has been installed, click **OK** and your RPi will restart and Raspbian OS will boot up.
- Now, Raspbian OS on the Rpi has been installed.

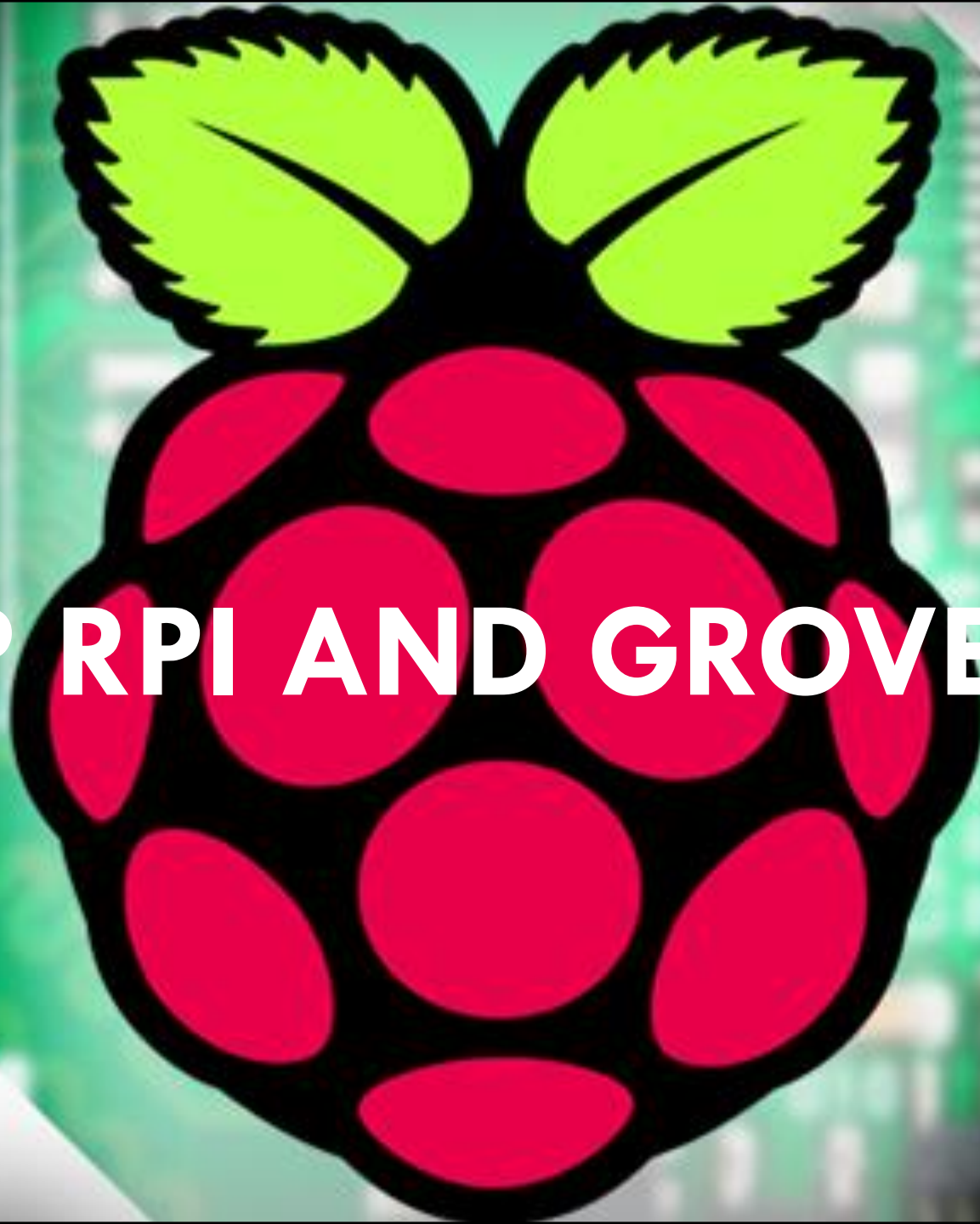
- **Step 12.** Finish the follow-up tutorial in the “Getting Started with the RPi.docx”.

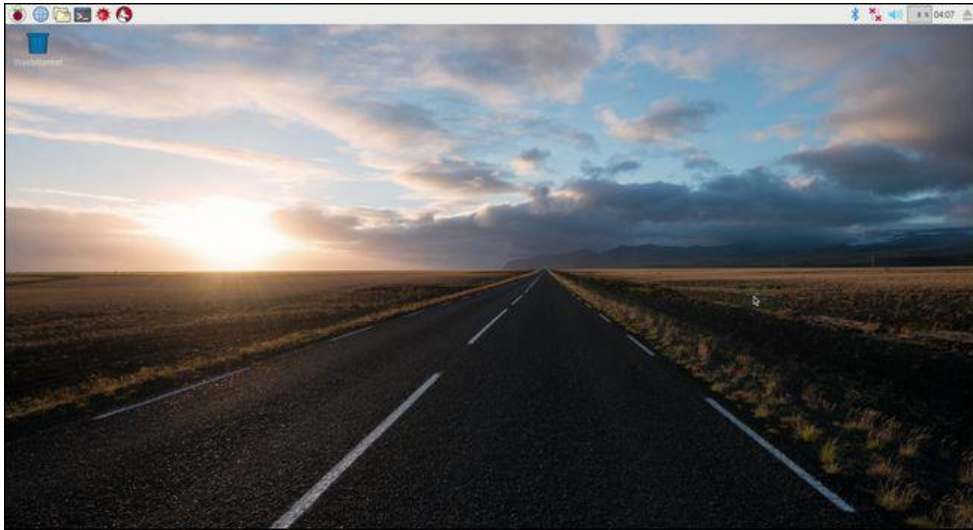


**Congratulations, you have now successfully completed this tutorial.**

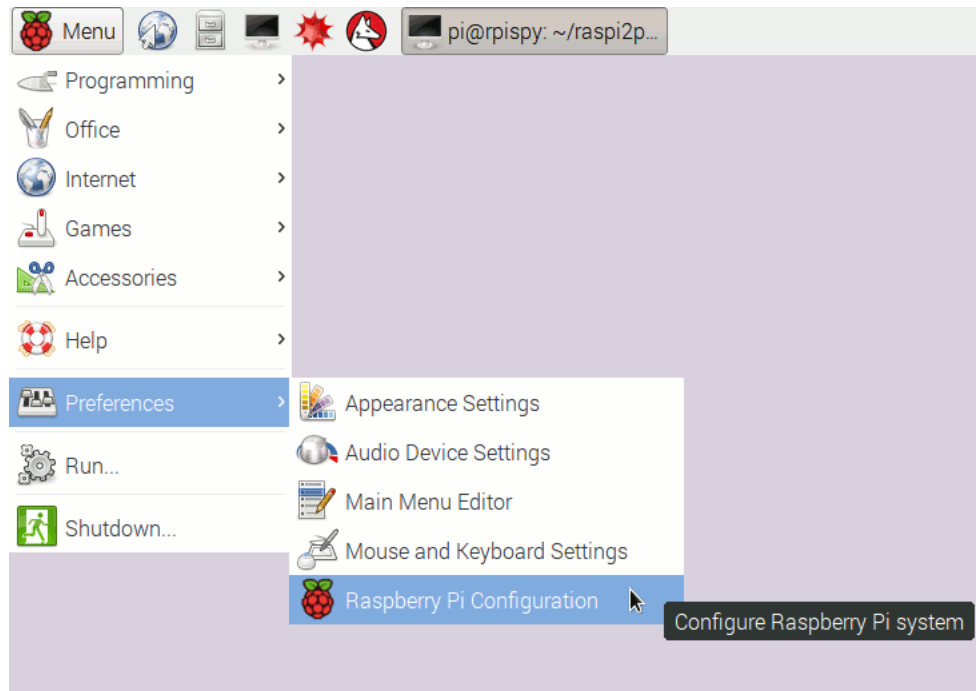


# SETUP RPI AND GROVEPI+

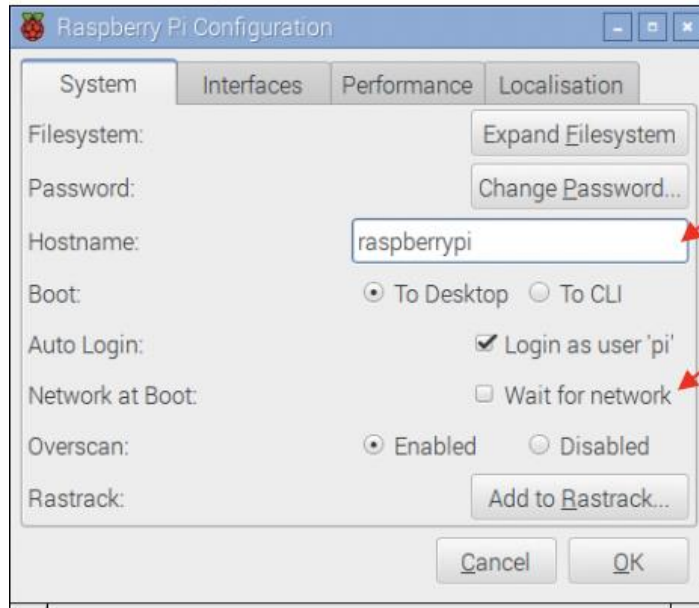




- **Step 1.** Connect the RPi and run it.  
Follow desktop environment



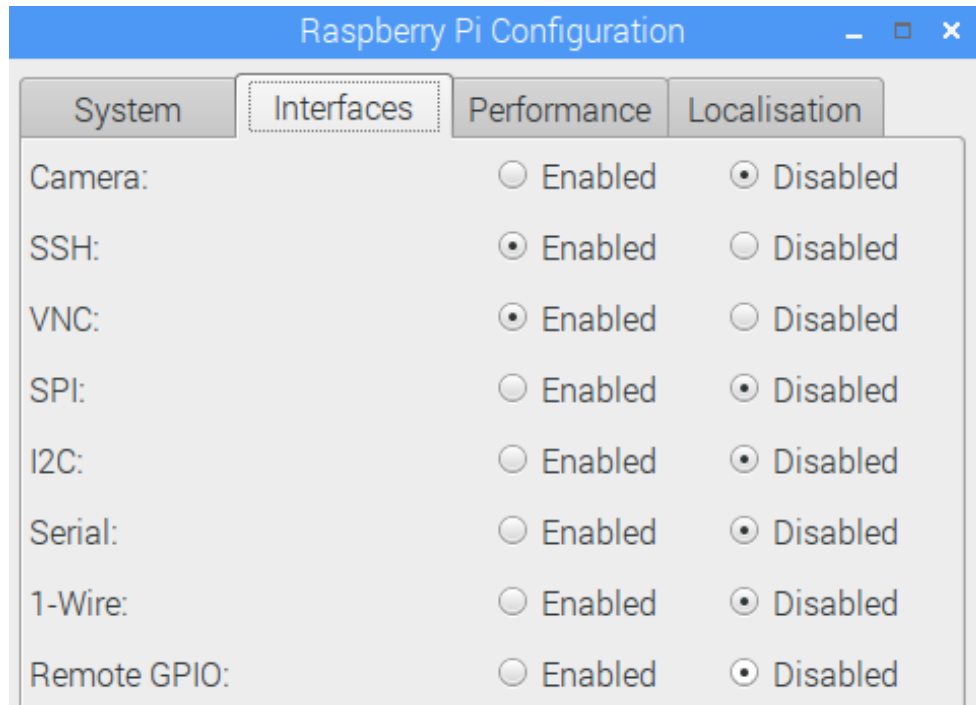
- **Step 2.** Once logged in, access the Raspberry Pi Configuration.



hostname

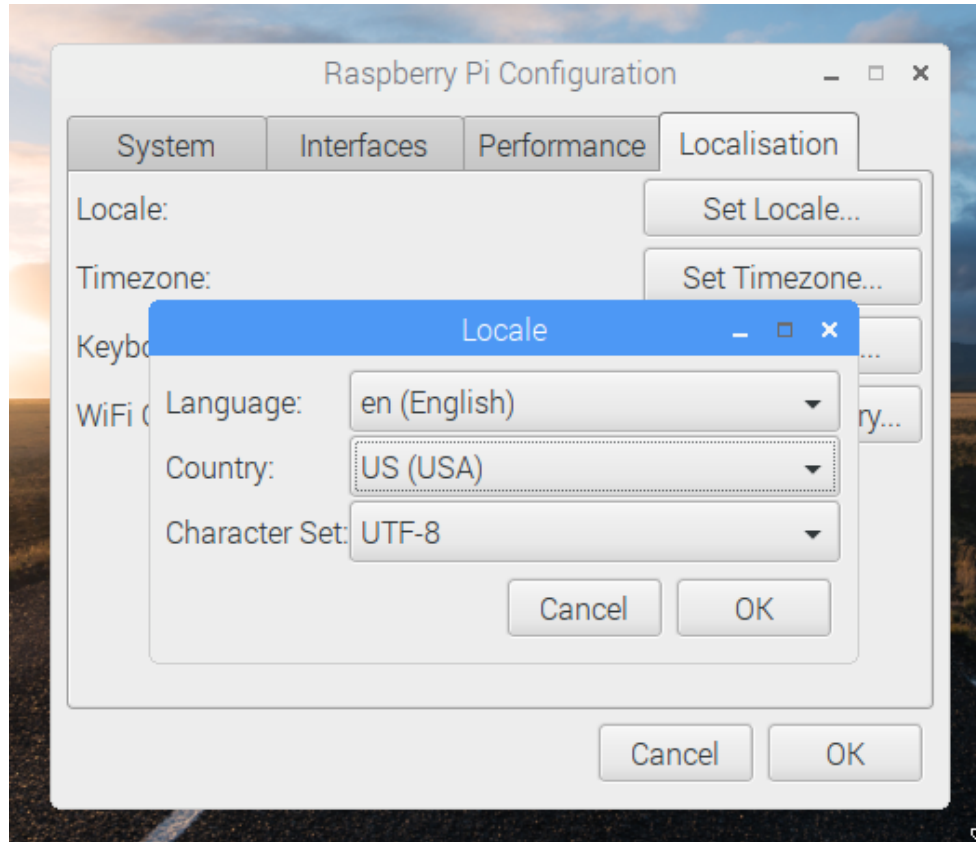
network

- **Step 3.** Change the following parameters/options:
  - **hostname:** tc5573-gr## where ## represent a two digit number of your group (e.g. 05, 15, etc.)
  - **Network at Boot:** check this option
  - **password:** change the password (choose a challenging password)
    - see the following link on how to create a strong password <https://support.google.com/accounts/answer/32040?hl=en>

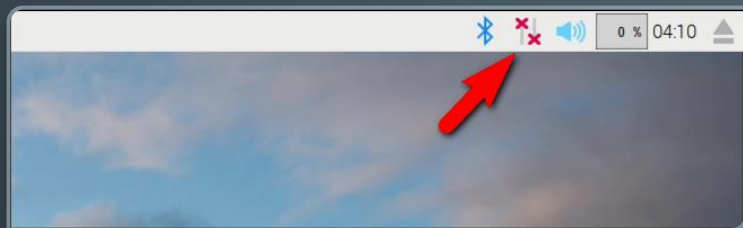


- **Step 4.** Under the **Interfaces** tab, enable the following options/features (for remote connectivity)
- **SSH**
- **VNC**

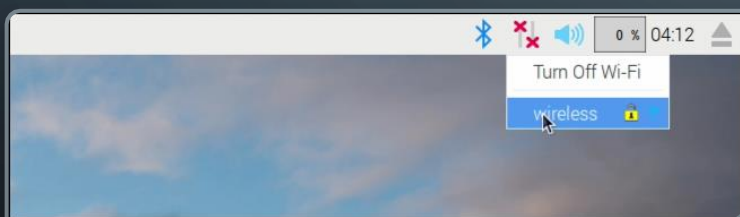




- **Step 5.** Under the **Localisation** tab, enable the following options.
- **Set Locale** (choose any preferred Locale), example:
  - Language: **en (English)**
  - Country **US (USA)**
  - Character Set **UTF-8**
- **Set Timezone.**
  - Area **USA**
  - Location **Pacific**
- **Set Keyboard.**
  - Keyboard **English United States**



- **Step 7. Setup WiFi.**
- Click on the WiFi icon on the taskbar and setup the appropriate WiFi connection.



- Choose wireless network to connect to the Internet from the drop down menu.



### Your connection is not private

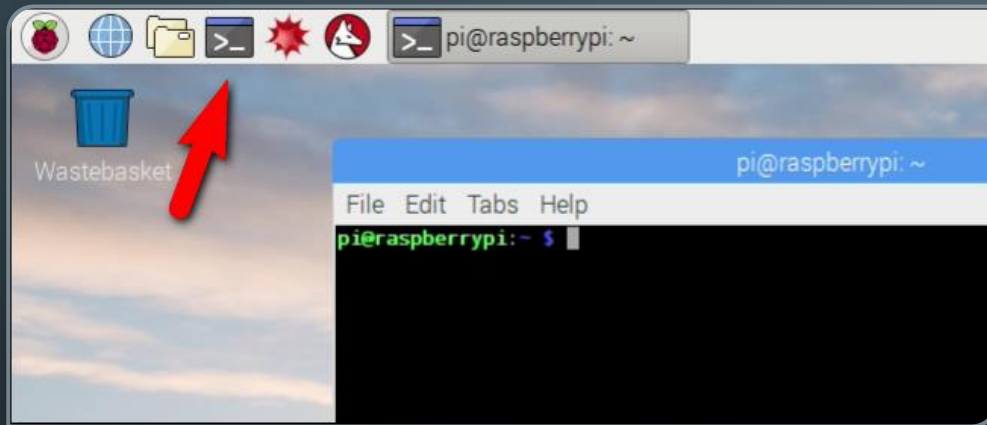
Chrome can't establish a private connection to **www.google.com**. This is probably because your computer's date is set incorrectly. You should refresh this page after [you update your computer's date and time](#).

[Advanced](#)

Reload

- Some WiFi connections require authentication (e.g. UW). Once enter the password, open the browser and then attempt to see if there is an Internet connection (e.g. type yahoo.com).
- *Fix Connection is Not Private Error*

- **Step 8.** Setup **Avahi**, a free zero-configuration networking.
- Access the Terminal:



- Type the following lines (one at a time)
  - `sudo apt-get install avahi-daemon`
  - `sudo apt-get install insserv`
  - `sudo insserv avahi-daemon`
  - `sudo /etc/init.d/avahi-daemon restart`

- **Step 9.** Setup a Python email script that will automatically send an email to your Gmail account with the IP address in order to connect remotely.



- **Step 10.** Copy/Download the Python script send\_ip.py Python will Email Script to desktop.

- Double click on the script. This will open an editor. Modify the following

- Recipient email address → should be your Gmail address
- Sender email address → should be your Gmail address
- Gmail Password → Gmail account password

```
# *****  
# Email Account Information  
# Change to your own account information  
# *****  
Recipient = '????@gmail.com'  
Sender    = '????@gmail.com'  
Password  = '????'
```

- Save the file and then copy the code into the clipboard by pressing **Ctrl + A** (select all) and then **Ctrl + C** (to copy code into the clipboard).

- **Step 11.** setup the script, access the **terminal**, then type the following:
  - `mkdir code` → this will create a new folder called code
  - `cd code` → this will change the path to the new code folder
  - type the following line
- `sudo nano send_ip.py`
- this will open an editor in the terminal window where you can edit the file. Press the following keys together to paste: **Shift + insert**



Press **Ctrl + X** to exit from the terminal nano editor, then press the letter Y to accept the changes and press the Enter key to exit from the nano editor and save the changes.

For more information on how to use the nano editor, visit the following YouTube tutorial

<https://www.youtube.com/watch?v=cLyUZAabf40>

Set the permissions for the script to be executable **sudo chmod +x send\_ip.py**

- **Step 12:** test the `send_ip.py` script to check if it send an email.

Type the following command in the terminal window

- `sudo python send_ip.py`

- **Step 13.** call the script every time the RPi boots (at startup): Type the following command in the terminal window

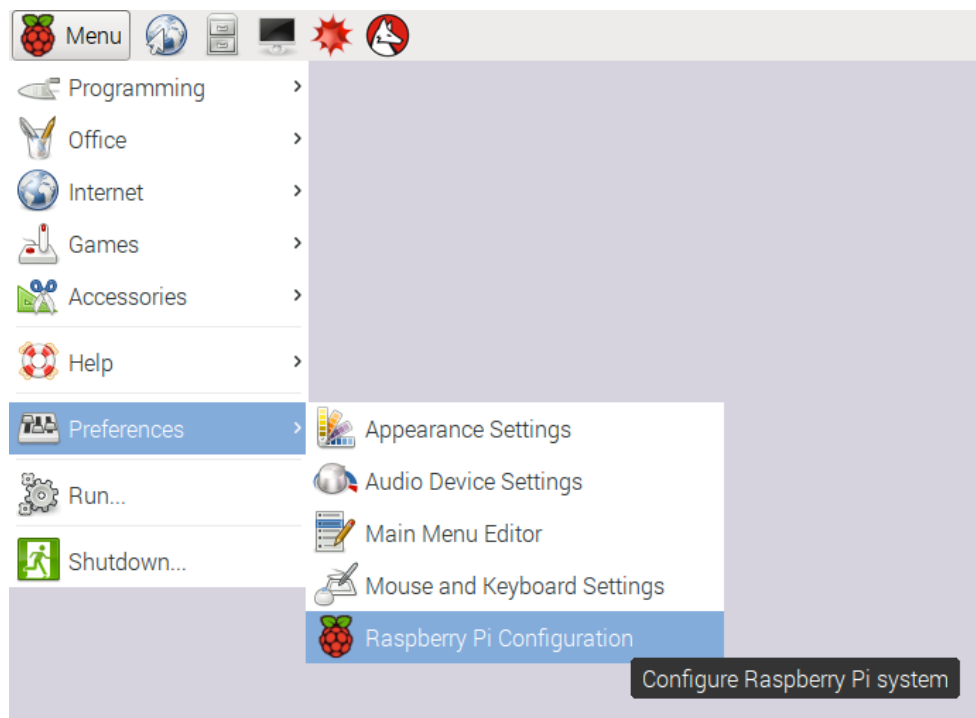
```
crontab -e
```

- scroll all the way down the file and then enter the following line

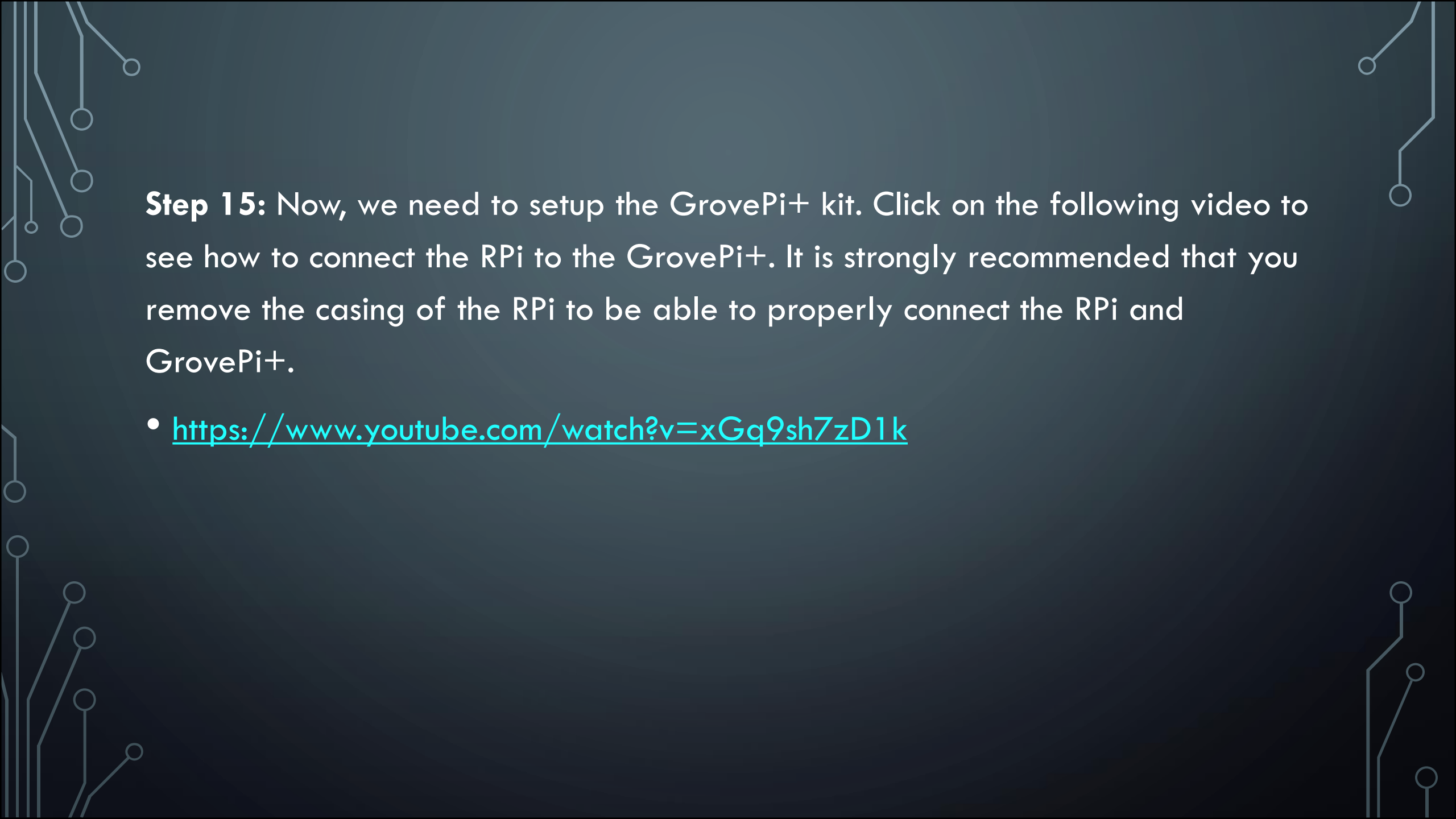
```
@reboot python /home/pi/code/send_ip.py
```

Press Ctrl + X -> Y ->press enter to exit and save the file.





- **Step 14.** Now you are ready to reboot the RPi.

The background is a dark blue gradient. In the corners, there are decorative white line art elements resembling circuit traces or a stylized city skyline. These lines connect to small white circles, some of which are arranged in a grid-like pattern.

**Step 15:** Now, we need to setup the GrovePi+ kit. Click on the following video to see how to connect the RPi to the GrovePi+. It is strongly recommended that you remove the casing of the RPi to be able to properly connect the RPi and GrovePi+.

- <https://www.youtube.com/watch?v=xGq9sh7zD1k>

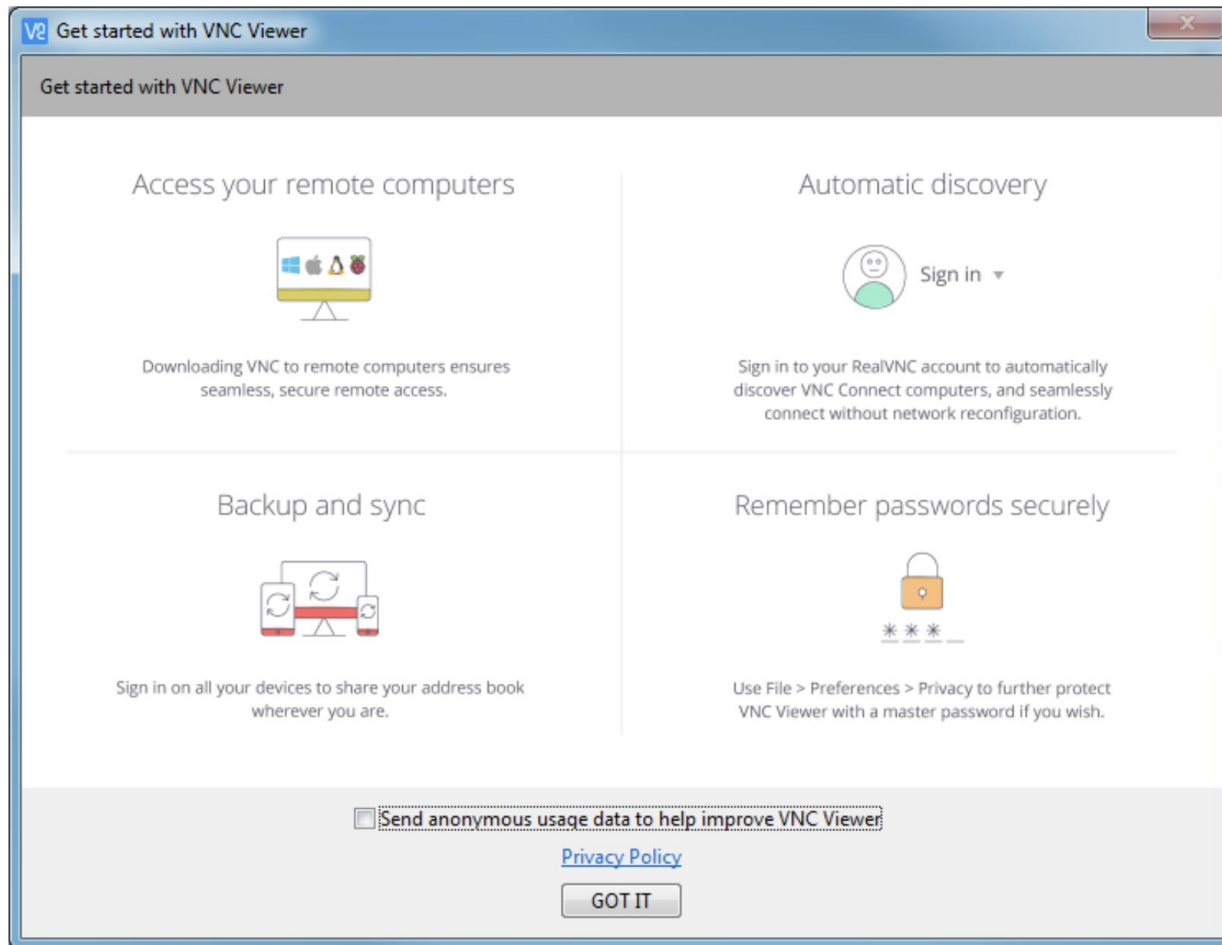
- **Step 16.** Go to the following address and setup GrovePi+ (click on Detailed instructions), then follow the instructions on how to setup the GrovePi+.
- <https://www.dexterindustries.com/GrovePi/get-started-with-the-grovepi/setting-software/>
- Once installed the GrovePi+ software modules, you are now ready to run sample applications that come with the kit. In the green booklet that comes with the kit, you can go through the sample applications and how to connect them (e.g. HelloWorld).

- **Step 17.** Once completed adding the GrovePi+, update the RPi by executing the following commands in the terminal window (this may take 10-20 minutes to complete).
- `sudo apt-get update`
- `sudo apt-get upgrade`

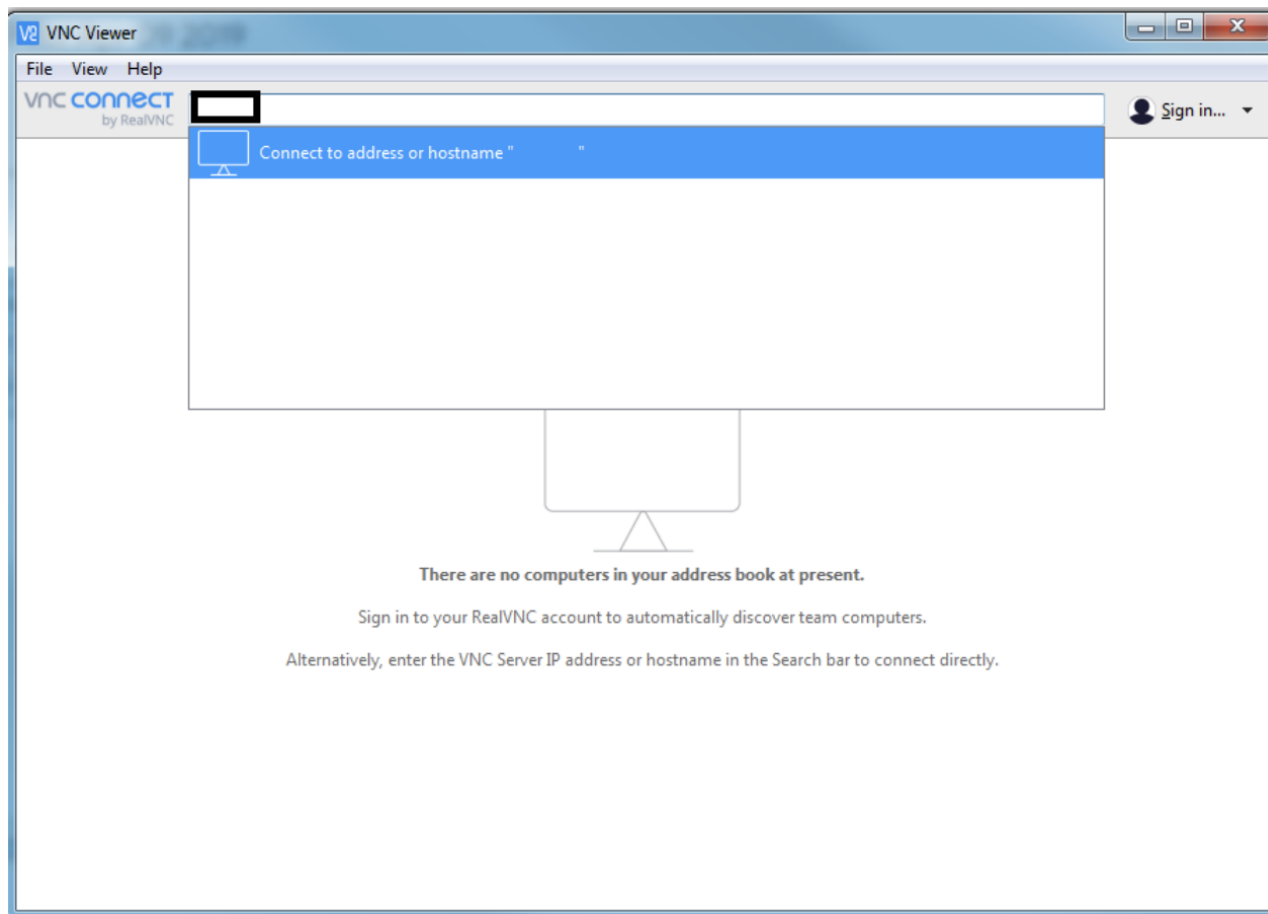


- **Step 18. Connecting remotely to the RPi using VNC**
- VNC viewer is installed in the Raspbian OS by default . We need to install VNC viewer on the computing device that you wish to use to access the RPi remotely (e.g. laptop).
- Follow the below link to download VNC Viewer.  
<https://www.realvnc.com/en/connect/download/viewer/>  
select OS of your computing device (e.g. laptop) and click **Download VNC Viewer** button.

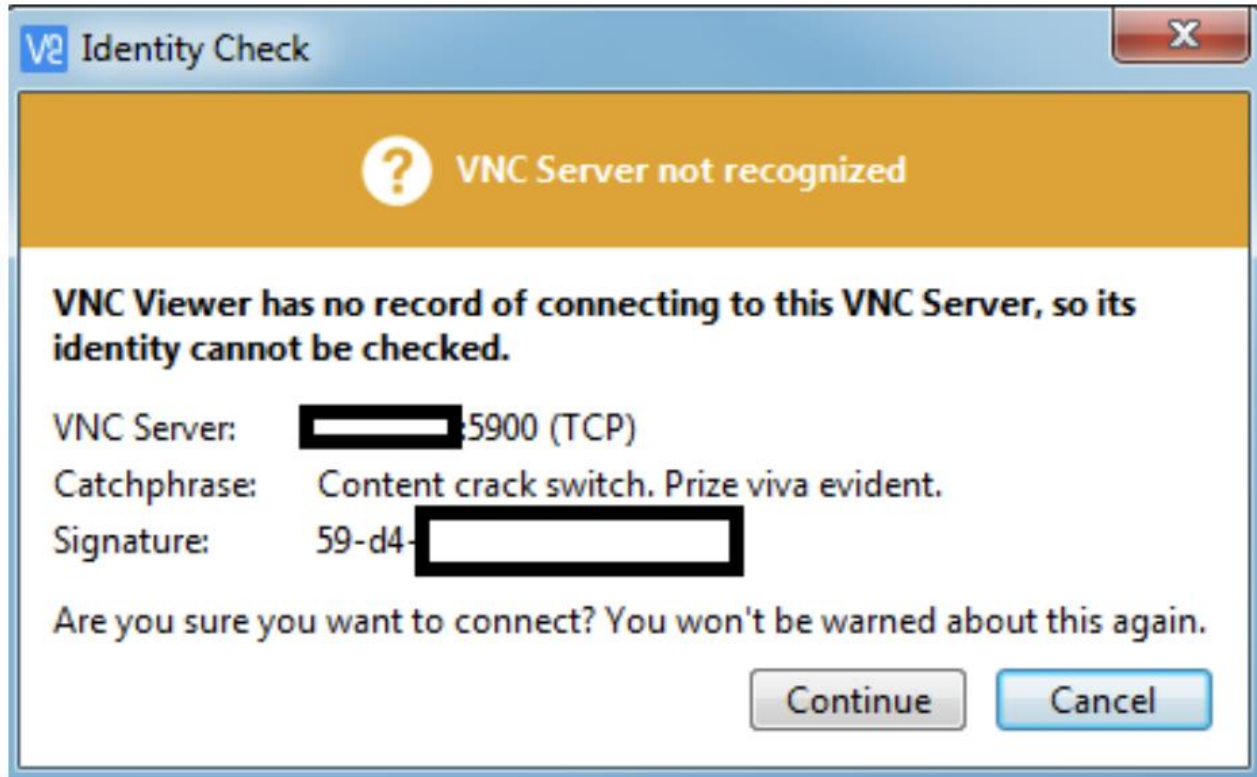




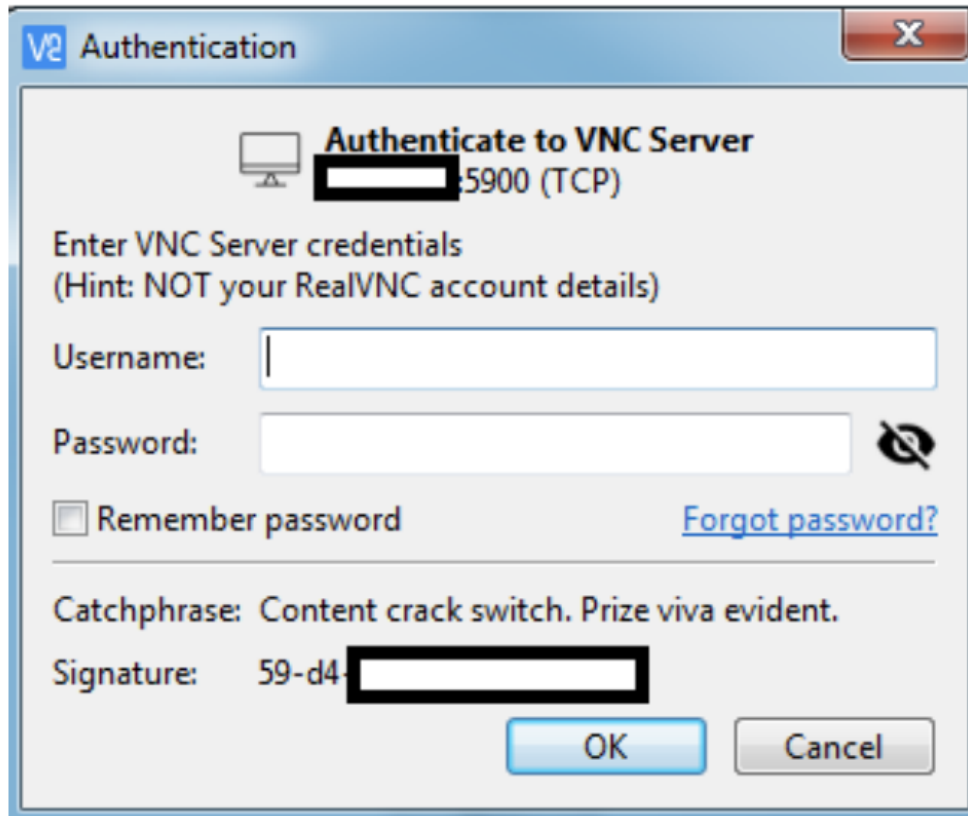
- **Step 19.** Launch VNC Viewer. It will display a startup window.
- Uncheck the option "Send anonymous usage ..." and click "Got it"




- **Step 20.** From the VNC interface, enter the IP address of the RPi that was sent via email. Then, select "Connect to address or hostname ..."



- **Step 21.** A pop-up window titled "Identity Check" will display.
- Click **Continue**.




V2 Authentication

 **Authenticate to VNC Server**  
[Redacted] :5900 (TCP)

Enter VNC Server credentials  
(Hint: NOT your RealVNC account details)

Username:

Password:  

☐ Remember password [Forgot password?](#)

Catchphrase: Content crack switch. Prize viva evident.

Signature: 59-d4-[Redacted]

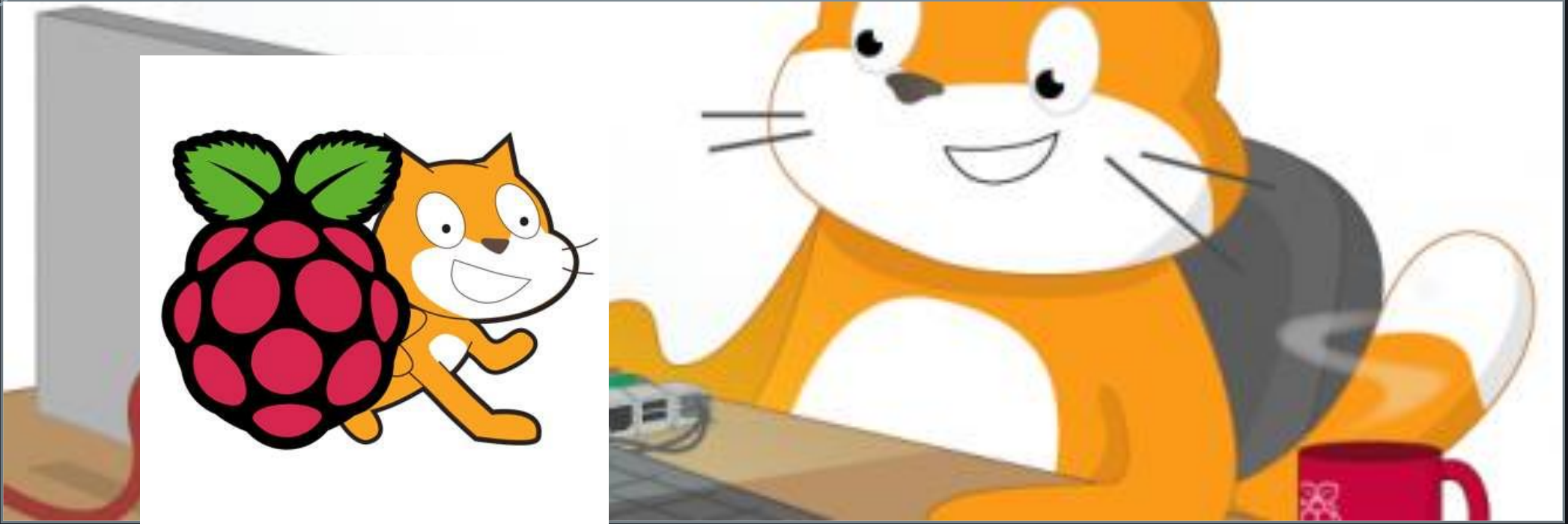
OK Cancel

- **Step 22.** A new pop-up window will appear requesting the username (default is 'pi' without the quotes) and password. Use the username and password that you have set/created when configuring the RPi.
- You will now be able to control the RPi via VNC remotely.



**Congratulations, you have now successfully completed this tutorial.**





# SCRATCH SURFACE WITH SENSORS



## **Demo1: Control LED using GrovePi & Scratch**

<https://youtu.be/oUUfFgoPqIE>

## **Demo2: Detect Temperature using GrovePi & Scratch**

<https://youtu.be/6Z0NbZojE4Q>





# What's next?

1. Python

2. SQL Database

3. Microsoft Azure Basics