Raspberry Pi for Beginners

LESSON 1

MAKERHOUSE
EMPOWERING MAKERS

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WHAT IS RASPBERRY PI

1 INTRODUCTION

Small, affordable, and portable "pocket" computers - that's Raspberry Pi always described. Since it small fit on your palm, Raspberry Pi comes with the basics. It is purely targeting to enabling children and adults to learn and experiment with both software (programming) and hardware (electronics).

It may look dull at first glimpse. A printed circuit board with all the small electronics, however, the potential of its achievement is remarkable and only limited by the user imaginations. Raspberry Pi can be used for general purpose computing, learning a program, project platform, product prototyping, media centre, "bare metal" computer hacking, or a retro gaming console.

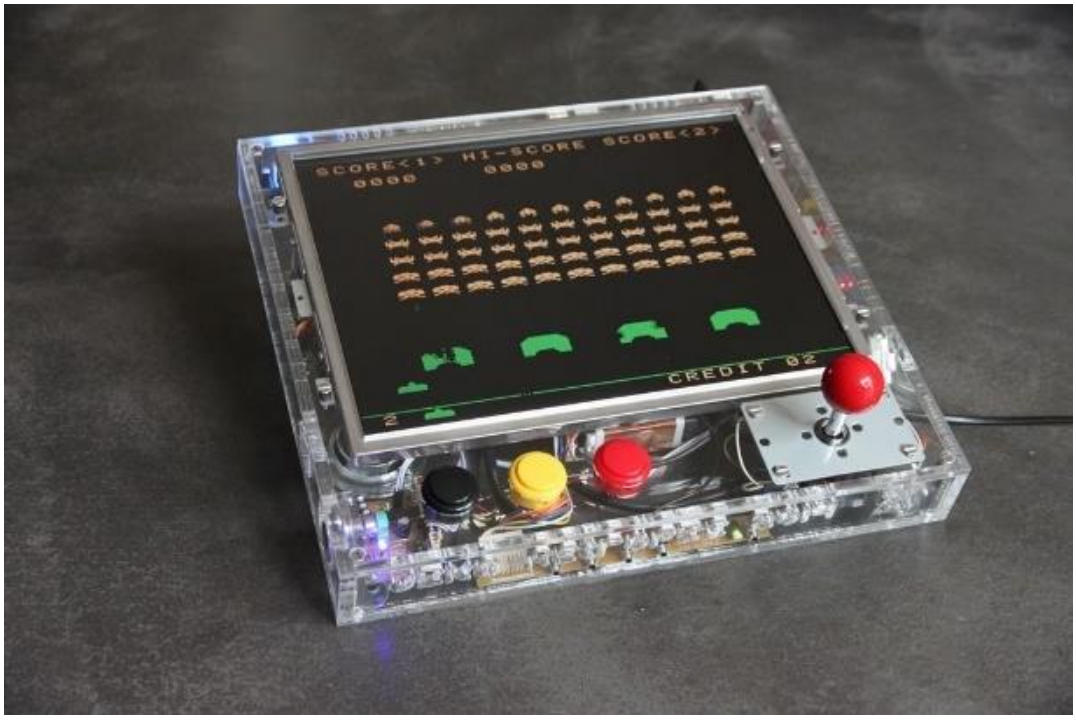


Figure 1: Retro type games created with Raspberry Pi and some electronics.

1.1 RASPBERRY PI HARDWARE

Are you getting excited? So, let's get started and allow our imaginations to soar.

Here is the bare look of Raspberry Pi latest model; Raspberry Pi 3 Model B+ once buy. Palm-sized, simple yet powerful "computer".

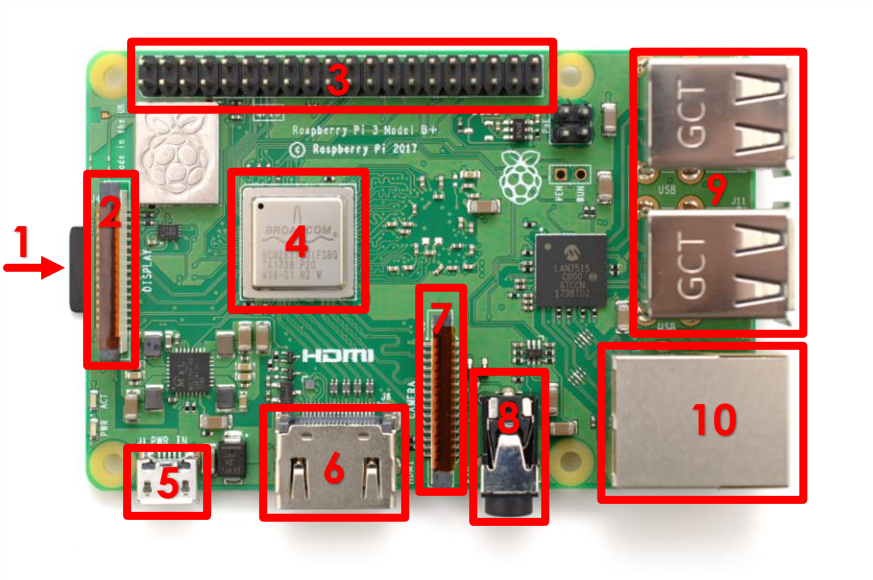


Figure 2: The latest model of Raspberry Pi (Pi 3 Model B+)

Raspberry Pi 3 Model B+ provided with necessary hardware as a useful "computer". It comes with the micro SD card slot, display connector, general pin input-output (GPIO), the processor, power connector, HDMI slot, camera connector, audio port, USB port, and an ethernet port.

No	Name	Description
1	Micro SD Card Slot	Holds the operating system (OS)
2	Display Connector	Used to attach LCD panel
3	GPIO	Used to connect electronics devices
4	Processor	The CPU, memory and RAM
5	Power Connector	Used to power Raspberry Pi
6	HDMI Port	Used for connecting monitor or TV
7	Camera Connector	Used to attach Raspberry Pi camera madule
8	Audio Port	Used to connect speaker or earphone
9	USB Ports	Used to connect peripheral; mouse and keyboard
10	Ethernet Port	Used to connect to network

Table 1: Raspberry Pi major parts and description

Apart from the visible hardware mentioned, Raspberry Pi also equipped with built-in Wi-Fi and Bluetooth allow it to connect to the wireless network and Bluetooth devices without a hassle.

1.2 SET UP RASPBERRY PI

Raspberry Pi comes solely with no operating system (OS), no storage, no power supply, and no peripherals.

Wait; what? Then how come it claimable as a small-sized computer?

Calm down. This lesson will guide how to transform these bare-look Raspberry Pi into something fully functioning "computer" as it was. First, let us prepare some material it is required.

For the basic setup, Raspberry Pi requires:

1. MicroSD card with an operating system (OS)
2. A USB mouse and keyboard
3. HDMI display, and
4. 5V micro USB power supply

Now, prepare the items and get ready to assemble it!

1.2.1 PARTS ASSEMBLY

The parts assembly of the Raspberry Pi and the peripherals is as easy as pie. Just follow the graphical representation below, which very informative.

Raspberry Pi, assemble!

1. First, **insert the micro SD card**. MicroSD card pre-installed with NOOBS is the easiest way to start Raspberry Pi exploration.

   Wait! What are NOOBS?

   NOOBS is a smooth operating system installer which contains Raspbian and LibreELEC. Plenty of other alternative operating systems which are then downloaded from the internet and installed -- (https://www.raspberrypi.org/downloads/noobs/). It is suitable for beginners like us, whereas NOOBS provided an easy installation of Raspbian OS. Take the micro SD card, and slot in into Raspberry Pi.

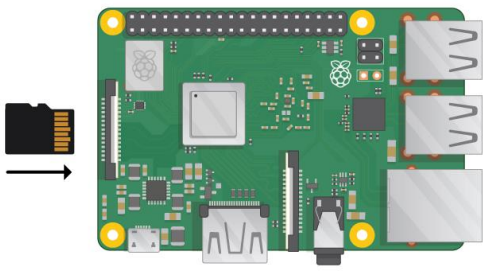
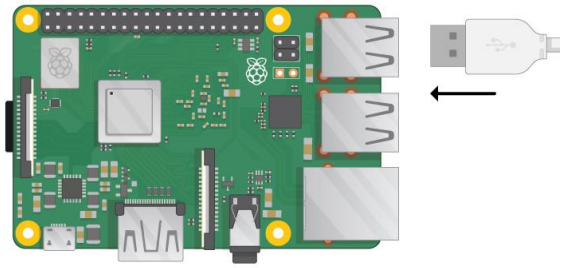
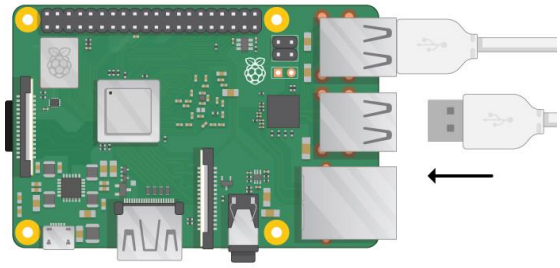


Figure 3: Inserting SD Card into Raspberry Pi SD card slot

2. Next, **insert mouse and keyboard**. Any USB wired or non-wired keyboard and mouse can be used with no restrictions. 4 USB ports are available on the Raspberry Pi, choose any you want.



(a)



(b)

Figure 4: Inserting USB mouse and keyboard

3. Next, **insert the HDMI cable for display**. An HDMI to VGA or HDMI to DVI converter maybe be used, if the monitor used no input for HDMI.

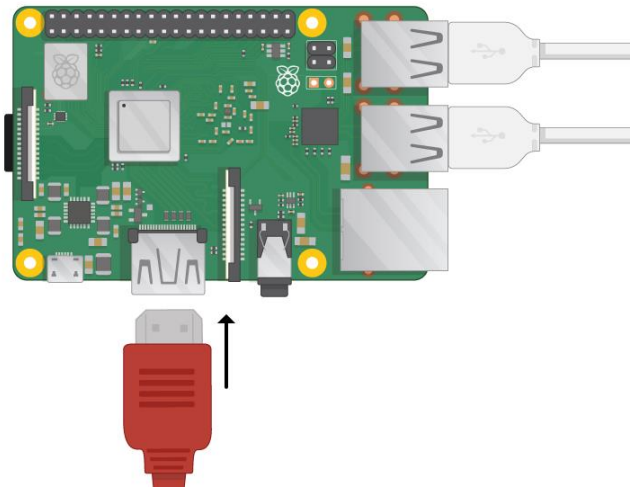


Figure 5: Inserting HDMI cable

4. Finally, **insert the 5V micro USB power supply.** A micro USB power adapter with rated 5V, 2.5A. A standard phone charger with the micro USB cable at least even though the current might be low.

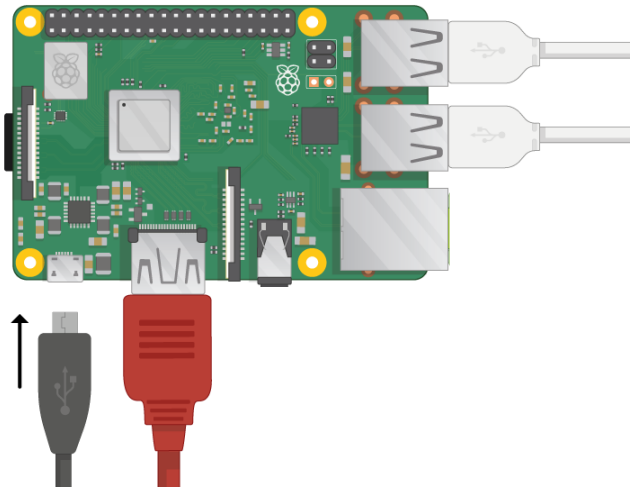


Figure 6: Inserting micro USB 5V power supply

1.3 POWER IT UP

Once finished with the assembly, next is to boot it up.

Hold on!

Raspberry Pi is not come with a case, be careful during the operation. Make sure no conductive material nearby that can interfere with our small cute little micro-computer. It is recommended to have a case for the Raspberry Pi, not only protecting, but also spruce up the appearance.

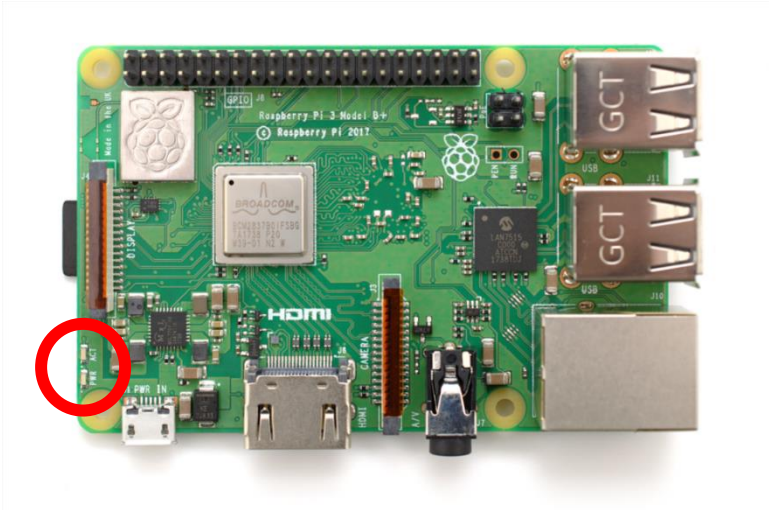


Figure 7: Built-in LED indicator on Raspberry Pi board.

You will notice that the Raspberry Pi board has two built-in LED indication for user to observe, labelled as PWR and ACT.

Label	LED Color	Description
PWR	Red	Power
ACT	Green	SD Card activity

Table 2: Raspberry Pi LED indication

Power it up now and look at the LED. If everything goes right -- the PWR will light up RED and ACT will be blinking GREEN.

2 FIRST TIME CONFIGURATION

For the first-time booting with the NOOBS, it will direct us to the splash screen for the operating system installation process. Here it will look like:

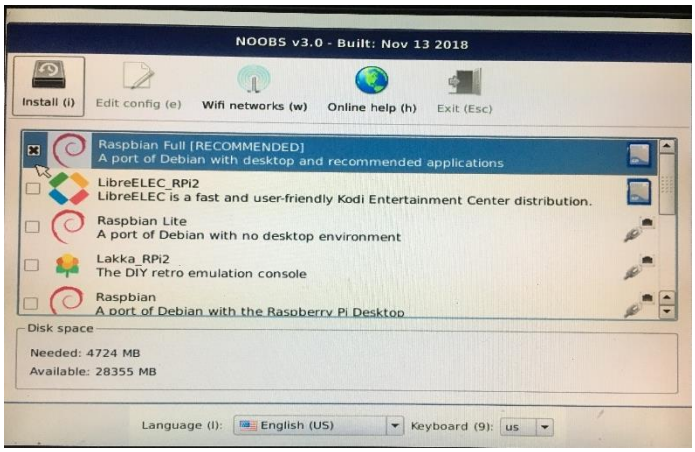


Figure 8: NOOBS first time boot

There is a lot of choice for the operating system. However, we will be using Raspbian for this lesson.

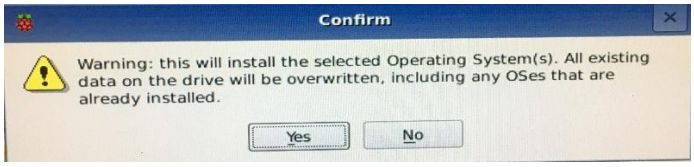


Figure 9: Click on **Raspbian Full (RECOMMENDED)**, and then **INSTALL**. A pop-up **Confirm** windows later will appear, click **Yes.**

2.1 RASPBIAN INSTALLATION

Raspbian is a modified version of Linux which specially made for Raspberry Pi. It contains all essential software required for the beginners to start with Raspberry Pi. The installation process will consume 15-20 minutes to complete. So, let the process finished uninterrupted.

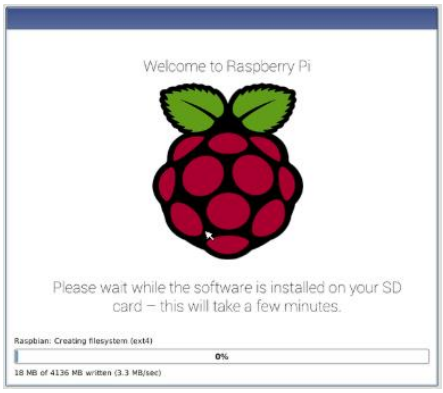


Figure 10: Installation of Raspbian OS – in progress

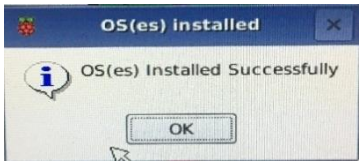


Figure 11: Successful installation only completed as other pop-up windows appear telling the **OS Installed Successfully**. Then, click **OK** and let the Raspberry Pi automatically reboot.

2.2 PERSONALIZED THE PI

Now the Raspberry Pi has everything, the power, the peripherals, the display, and the operating system. It is officially Raspberry Pi Computer.

Hooorayyyyy!

However, the process not yet finished.

It is like an identification process – giving an identity to the new fresh Raspberry Pi.

1. First thing after the reboot, the Raspbian Desktop will greet the new user with **Welcome to Raspberry Pi Desktop**. It is an initial setup for the Raspberry Pi; giving an identity to it. Click **Next**.

Figure 12: Welcoming Raspbian splash out on first boot

2. Next is to set the **Country, Languange, and Timezone**. Once done, click **Next**.

   In this case, set the:
   1. **Country > Malaysia**
   2. **Language > en(US)**, and
   3. **Timezone >> Kuala Lumpur**

Figure 13: Setup on time zone, country and language for the Raspbian OS

3. Set the **new password**. Initially, fresh install Raspberry Pi will have **username: pi** and **password: raspberry**. It is good way to set a new unique password for safety purposes and it is your Pi, not others right?

   Click **Next** when done.

Figure 14: Updating new password

4. **Maximizing the display** appearance. A Raspberry Pi display using the HDMI, suppose the screen will automatically fully span across the monitor with no border. However if has, tix the boxes and let the Raspbian do the adjustment.

   Then, proceed to **Next** for more setup.

Figure 14: Updating new password

5. Set **Wi-Fi connection**. **[OPTIONAL].** As mentioned, the Raspberry Pi 3 Model B+ has built-in Wi-Fi. If there have an available network exists, click on it and key-in the password.

   Click **Next** to proceed.

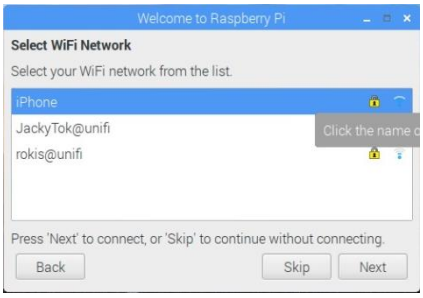


Figure 15: List of available Wi-Fi (example) – ready establish connection

6. **Update the software. [OPTIONAL]**. If the Raspberry Pi connected to the network; it is a good way to updating the software now (recommended) by click **Next** or otherwise just **Skip**.

Figure 16: Update the Raspbian as the latest distribution

7. Restart. The setup process almost finished. The Raspberry will required to restart in order the settings has been done take effect on the next start. Just click **Restart**.

Figure 17: Finished the first setup and configuration

3 EXPLORING RASPBIAN DESKTOP

There are two ways to exploring the Raspbian OS; Graphical User Interface (GUI) or Terminal.

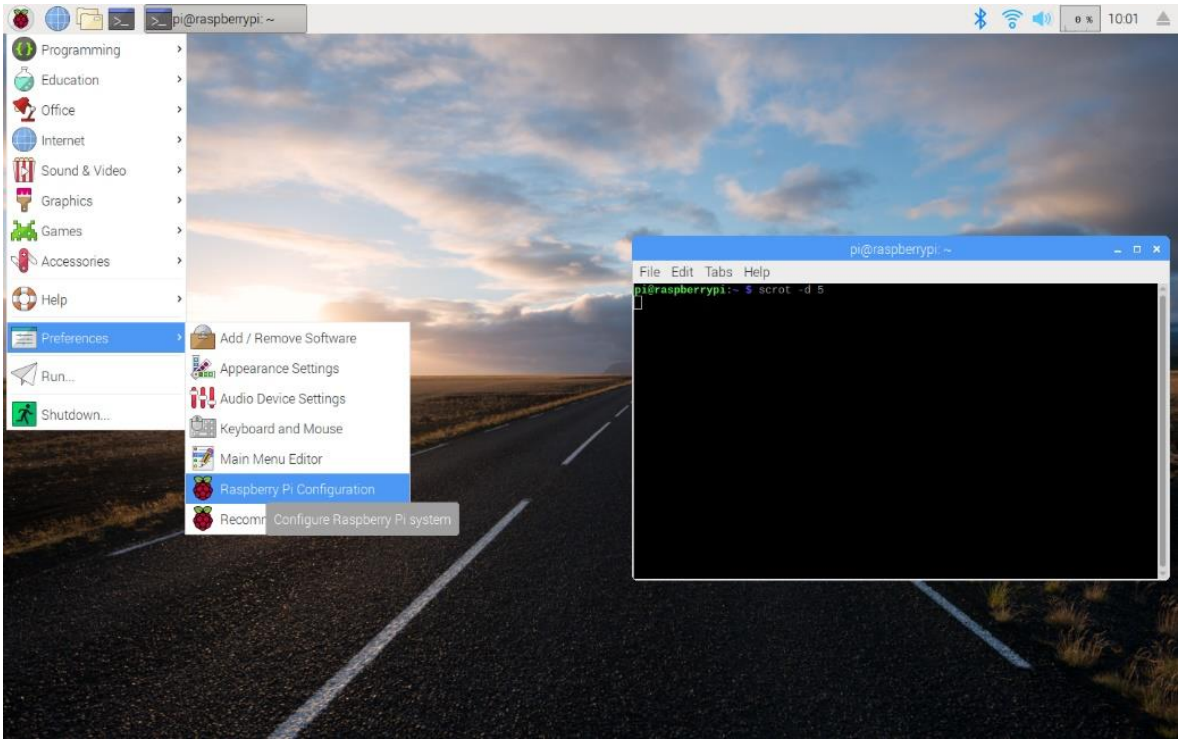


Figure 18: Raspbian Desktop

3.1 GUI DESKTOP

Familiar with Window OS? – Browse freely with mouse and click on the folder/option to execute anything; folder, programs, games, surf the internet, etc. Easy right?

Ok, now we will do some setup and setting while exploring the Raspbian Desktop in GUI mode.

Setting again?

Yes, of course whereas Raspbian OS is new for us. Let us explore it more by doing something.

3.1.1 RASPBERRY PI CONFIGURATION

Even though the setup process of the Raspberry Pi is completed, suddenly we decided to want to do some changes. How do we do use GUI?

Follow this guide:

1. Click on the **Raspberry Pi icon > Preferences > Raspberry Pi Configuration**.

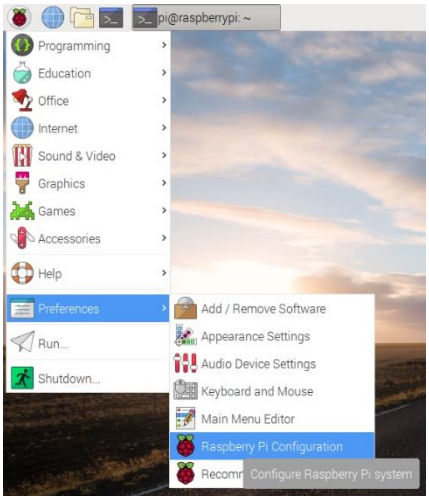


Figure 19: Opening Apps – Raspberry Pi configuration

2. Click on **System** tabs.

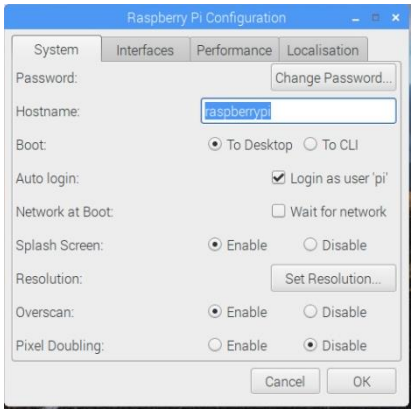


Figure 20: Original Hostname is **raspberry**, but you can change it to any name you like.

3. Click on **Interfaces** tabs.

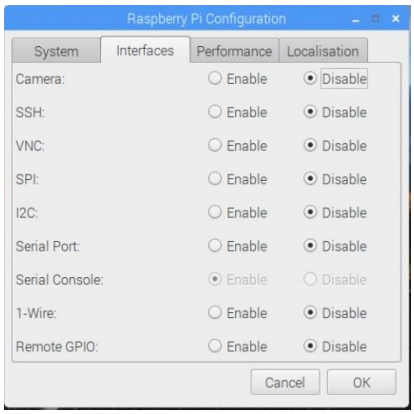


Figure 21: If we want to use Raspberry Pi Camera Module, we need to enable it here. For the moment, don't need to enable anyhing.

4. Click on **Performance** tabs. **Note**: overclocking will shorten the life of Raspberry Pi.

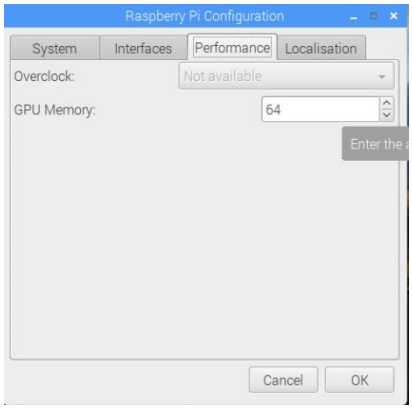


Figure 22: If we tend to make it the Raspberry more responsive, we can overclocking it by increasing the amount of GPU memory.

5. Click on **Localisation** tabs.

Figure 23: Here is the setting if we need to change the Raspberry Pi Country, Language, Timezone, Keyboard Layout, etc.

3.2 TERMINAL

Another way for browsing in Raspbian OS (Linux) is through terminal.

Hold on. What is terminal?

This is terminal

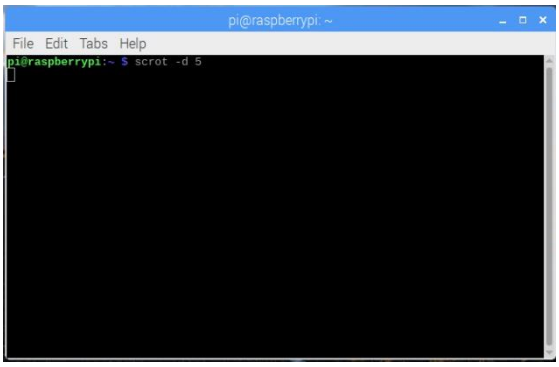


Figure 24: Terminal in Raspbian OS.

To open **New Terminal**, hit **ctrl+alt+t.** Try it.

The terminal is an interface in which you can type and execute text-based commands using keyboard only. You might ask,

Why using Terminal if we already can used GUI?

It can be much faster to complete some tasks using a Terminal than with graphical applications and menus. Another benefit is allowing access to many more commands and scripts. A common terminal task of installing an application can be achieved within a single command, compared to navigating through the GUI.

OK. Let us try navigating to configure the Raspberry Pi to allow it using total space of micro SD card.

3.2.1 USING ALL THE STORAGE ON THE SD CARD

1. Hit **ctrl+al+t**. A New Terminal will appear.
2. Type **sudo raspi-config** and hit **Enter**.

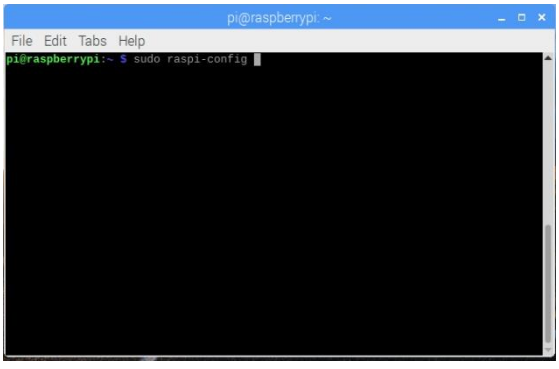


Figure 25: Raspberry Pi configuration – **sudo raspi-config**

3. Go into **Advanced Options** and hit **Enter**.

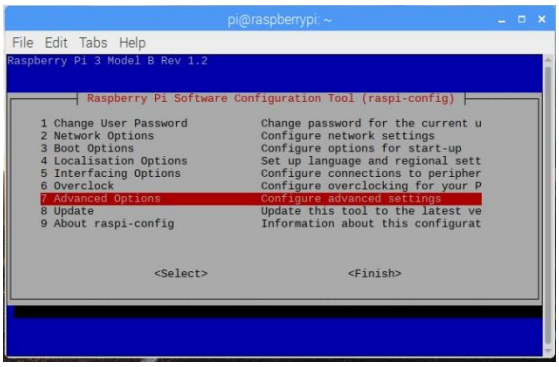


Figure 26: Tools inside raspi-config

4. Go into **Expand Filesystem** and hit **Enter**.

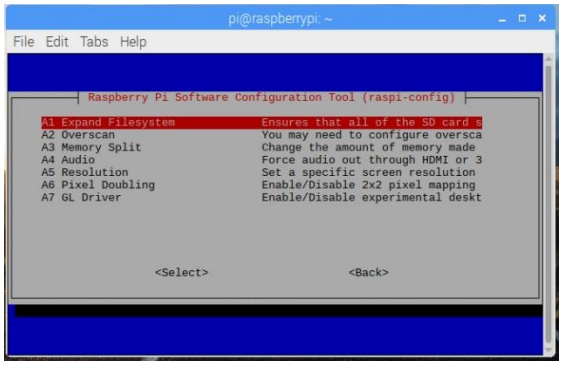


Figure 27: Expanding filesystem – maximize the size of SD Card can be used

5. Select **OK** and Hit **Enter**.

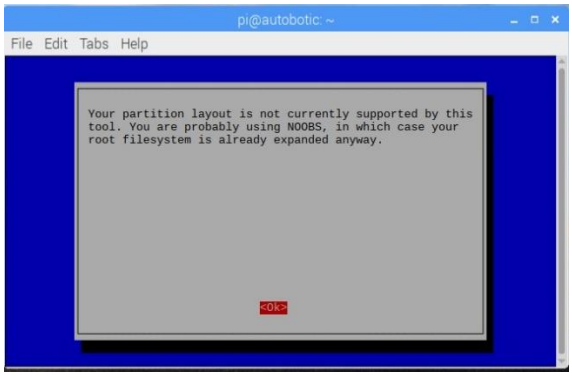


Figure 28: Re-confirmation of expanding filesystem

6. Go to **Finish** and hit **Enter**.

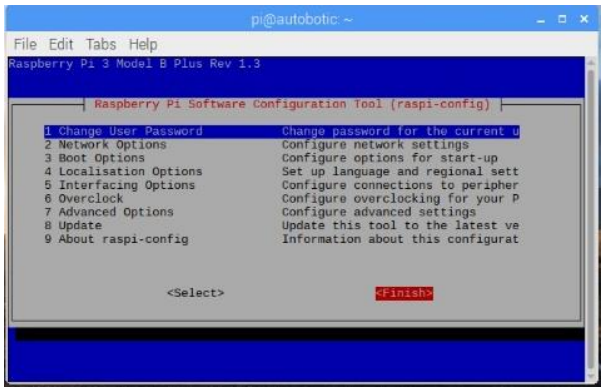


Figure 29: Finish and reboot required after configuration

4 SETUP WIRELESS CONNECTION

Setup the wireless connection or Wi-Fi in Raspberry Pi in simple.

Simple?

Yes, very simple. Here how you can do it by following the instruction.

1. Go to the top of the Raspbian Desktop and click on **network** icon.

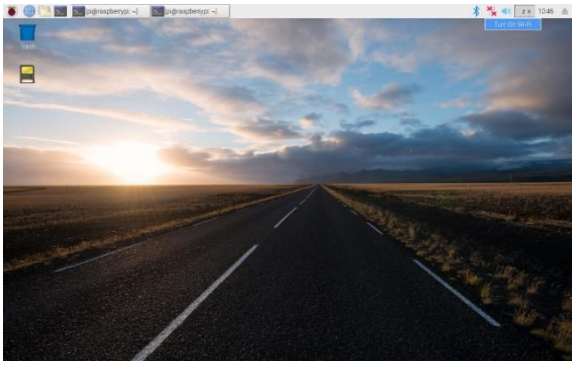


Figure 30: Turn ON the Wi-Fi

2. Select the **available network** and click.

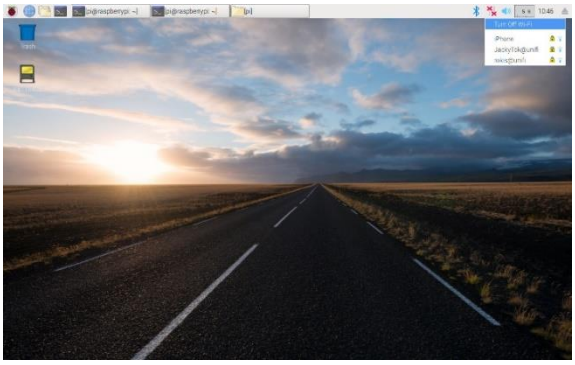


Figure 31: Available Wi-Fi selection

3. Key-in the **password** and click **OK**. Done.

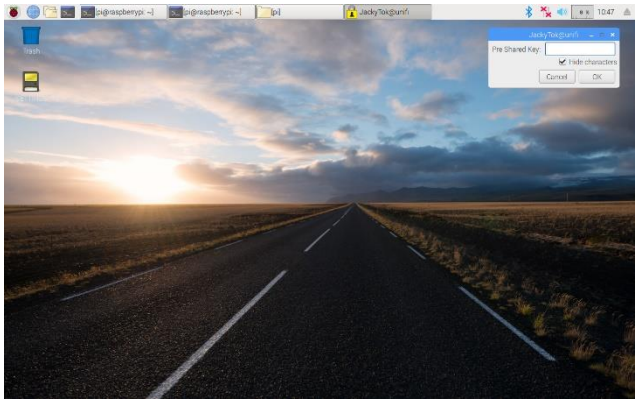


Figure 31: Password required in establish Wi-Fi connection

5 SHUTDOWN THE RASPBERRY PI

Raspberry don't have any shutdown button – remember that.

How to turn it off safely?

Two option available

1. GUI
2. Terminal

5.1 USING GUI

Shutting down the Raspberry Pi using GUI approach.

1. Browse and find the Raspberry icon. Click on it.
2. Scroll and find the Shutdown. Click on it.

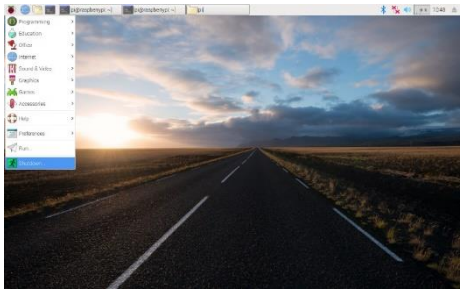


Figure 32: Shutdown option available in main menu (Raspberry Pi icon)

3. Two option available for shutdown or reboot. Choose accordingly.

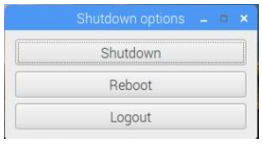


Figure 33: Pop-up selection during shutdown

5.2 USING TERMINAL

Shutting down Raspberry Pi using Terminal approach also have two option. Just open the new terminal and type:

1. **sudo reboot** and hit **Enter**

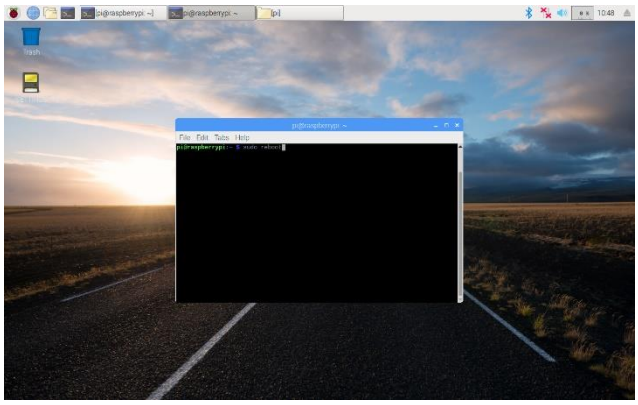


Figure 34: sudo reboot -- restart

2. **sudo shutdown -h now** and hit **Enter.**

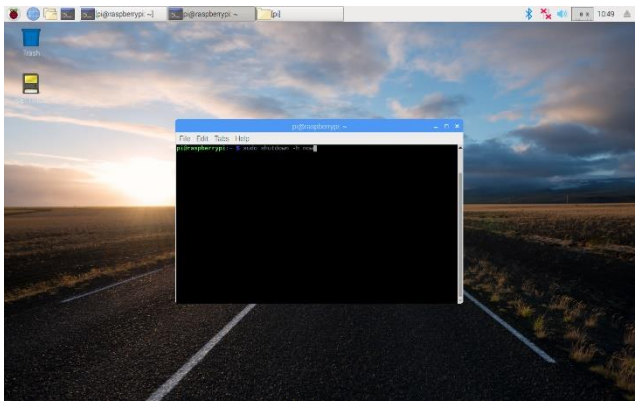


Figure 35: sudo shutdown -h now – fast shutdown

