



**FACULTY OF
ENGINEERING**

RL4Eng



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INTRODUCTION TO RASPBERRY PI



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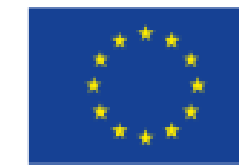
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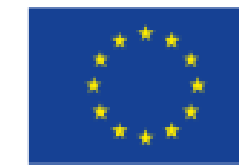


WHY THE NAME RASPBERRY PI?

According to the interview given by RPI founder Eben Upton, they wanted a fruit name for nostalgia and Pi comes from Python programming language.

What is Raspberry Pi?

- 01** A Raspberry Pi is a small, inexpensive computer that's as big as a credit card
- 02** It serves as a platform for individuals to explore programming, and electronics, and engage in DIY projects.
- 03** With its user-friendly interface and connectivity features, the Raspberry Pi finds applications in diverse activities such as web browsing, gaming, and controlling electronic devices.
- 04** Originating in the UK, the Raspberry Pi was developed by the Raspberry Pi Foundation in 2009.



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The idea for Raspberry Pi came from Eben Upton, who works at Broadcom.

06

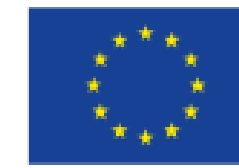
It's a small computer that doesn't cost much, and it's become really popular. More than 3 million of them have been sold.

07

The project is supported by the University of Cambridge Computer Laboratory and Broadcom.

08

Raspberry Pi 5 is the newest, fastest, and easiest to use. We will be using Raspberry Pi 4 model B which comes with 2GB, 4GB, or 8GB of RAM.



Raspbian

- 01 Raspbian is a computer operating system made for Raspberry Pi.
- 02 Since 2015, it's been the main operating system for Raspberry Pi computers, officially supported by the Raspberry Pi Foundation.
- 03 Raspbian was started by Mike Thompson and Peter Green as their own project. They finished the first version in June 2012.
- 04 Raspbian is still being worked on and improved. It's made to work really well with Raspberry Pi's small, not-so-fast processors.

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In the latest update, Raspbian uses PIXEL, which stands for Pi Improved Xwindows Environment, Lightweight, as its main desktop look.

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It's composed of a modified LXDE desktop look and the Openbox window manager, with a fresh design and some small tweaks.

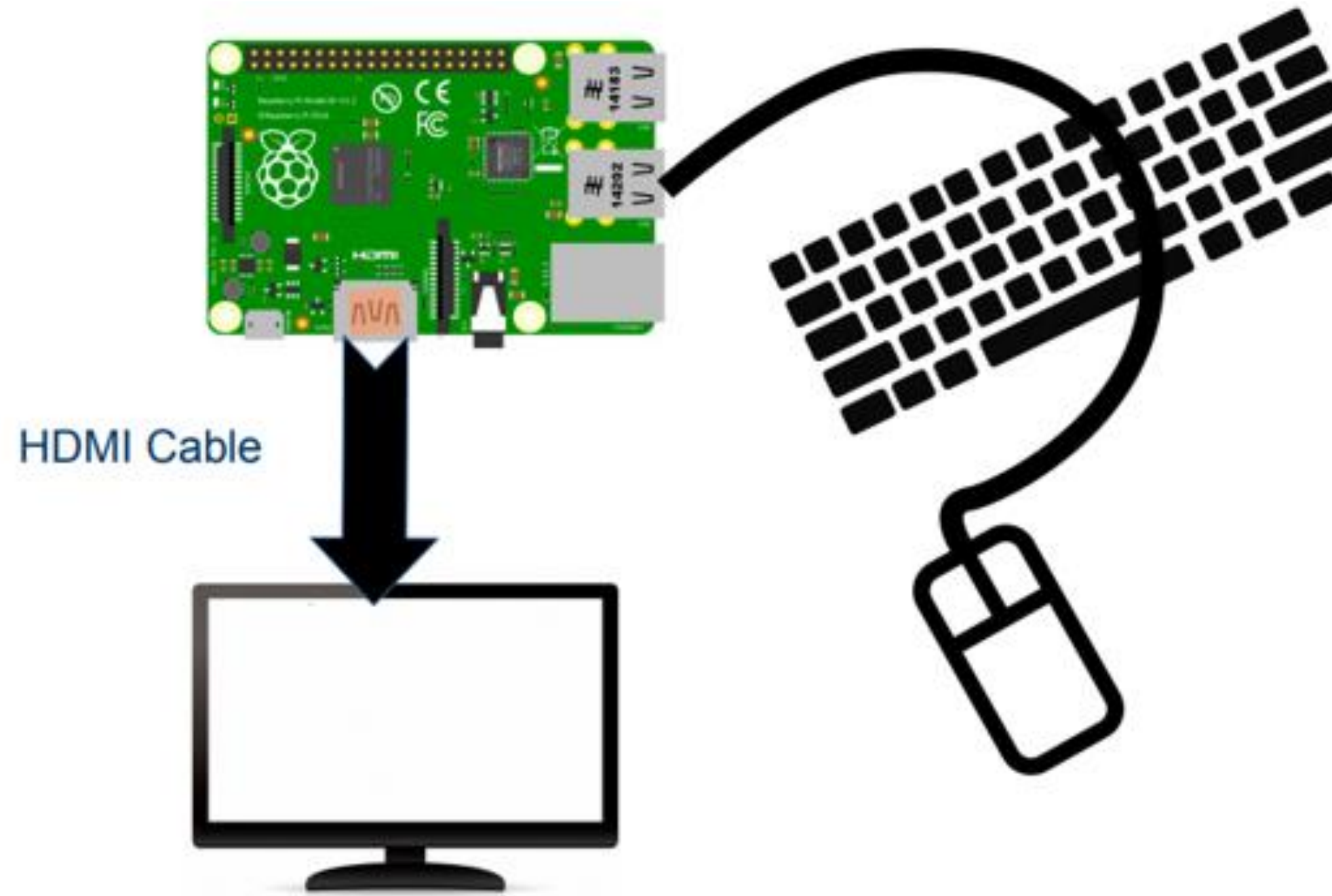
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LXDE provides essential features for a Graphical User Interface (GUI), such as a panel, a file manager, and basic desktop customization options, while consuming minimal system resources.

08

Also, it comes with programs like Mathematica for math and Minecraft Pi for gaming. Plus, there's a simpler version of the web browser Chromium.

Starting Raspberry Pi



1

A microSD
card with at
least 8GB of
storage

2

A mouse

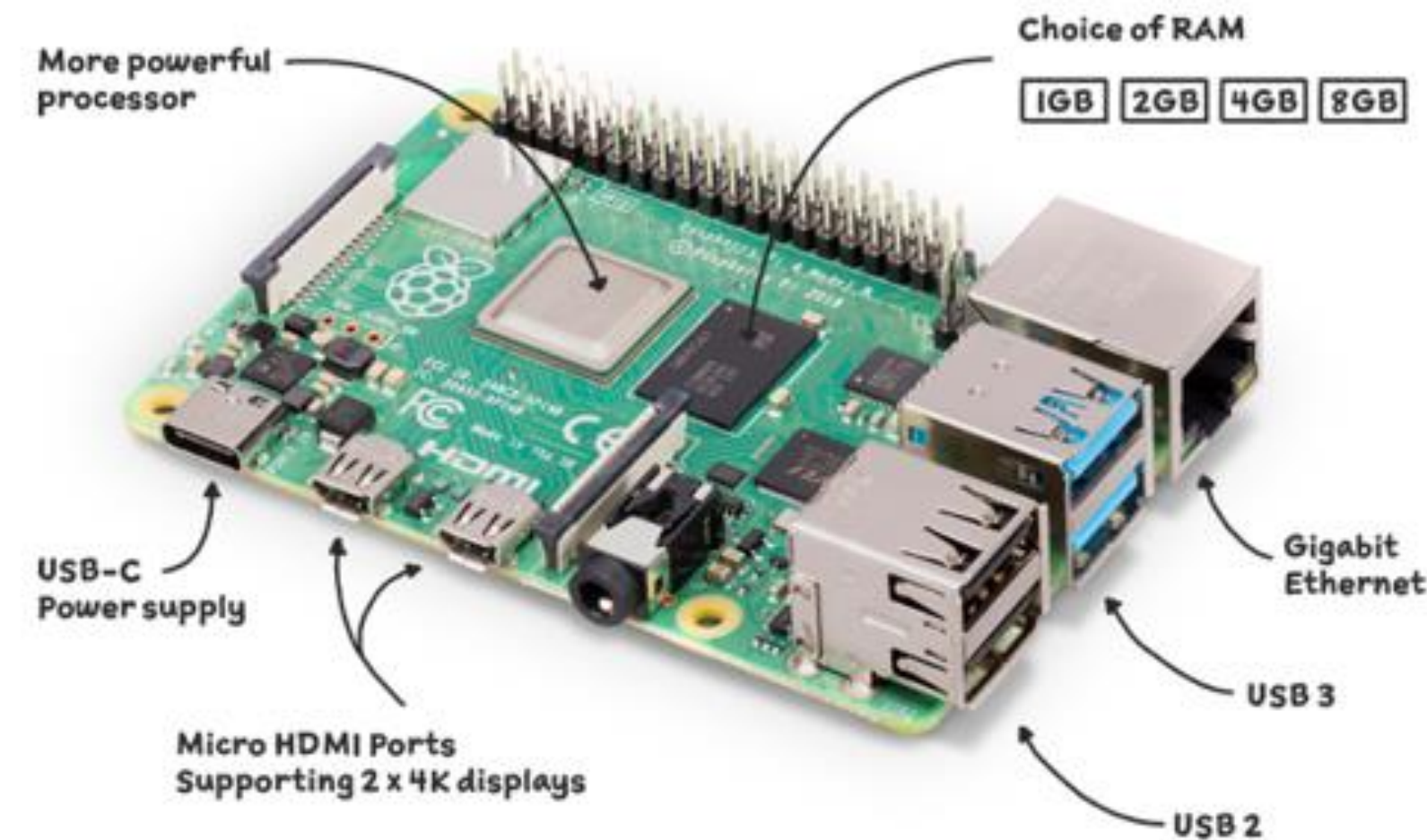
3

A keyboard

4

A screen such as
a TV or
computer
monitor. You'll
need an HDMI
cable to connect
it to your
Raspberry Pi.

- To install an operating system, we recommend using Raspberry Pi Imager, a tool that helps you download and write images.
- Once you've set up your Raspberry Pi, you can use it like a regular computer with a desktop, or you can access it over the network.
- If you want to use it directly, you'll need additional accessories like a display, a cable to connect it to the display, a keyboard, and a mouse. You can also enable SSH to access your Raspberry Pi remotely.



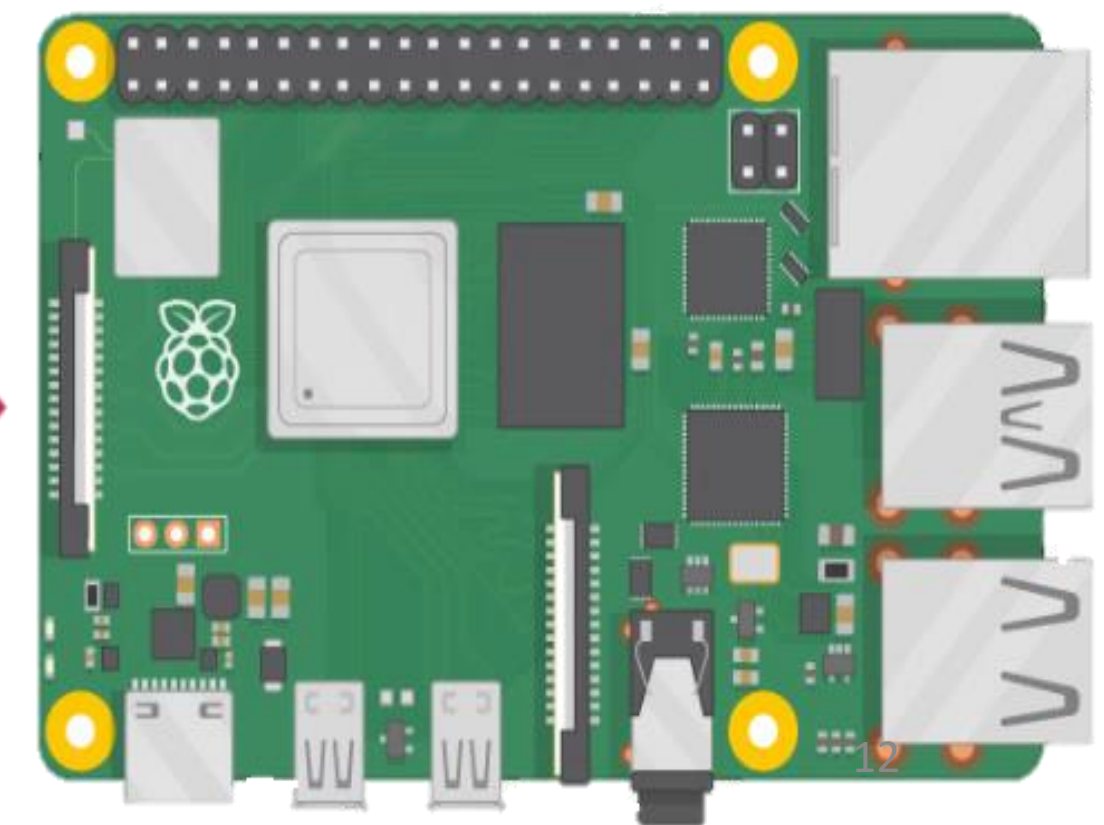
Installing Raspberry Pi OS using Raspberry Pi Imager

To make your Raspberry Pi work, you need an operating system. When you put an SD card into the slot, your Raspberry Pi checks if it has an operating system.

Most people use microSD cards for this. We suggest using Raspberry Pi Imager to install the operating system. It's a tool that helps you get and put images on your SD card.

You can get Imager in a couple of ways:

- download it from raspberrypi.com/software and install it
- or install it manually from your terminal using a command like "sudo apt install rpi-imager"



Step 1. Install the latest version of Raspberry Pi Imager from the website

raspberrypi.com/software/

Install Raspberry Pi OS using Raspberry Pi Imager

Raspberry Pi Imager is the quick and easy way to install Raspberry Pi OS and other operating systems to a microSD card, ready to use with your Raspberry Pi.

Download and install Raspberry Pi Imager to a computer with an SD card reader. Put the SD card you'll use with your Raspberry Pi into the reader and run Raspberry Pi Imager.

[Download for Windows](#)

[Download for macOS](#)

[Download for Ubuntu for x86](#)

Step 2. Insert your SD card using a card reader or a USB reader onto your laptop/computer.



Card Reader

- USB Micro SD Card Reader
- High-Speed Transmission
- Quick Identification, Plug and Play
- Compatible with Multiple Systems

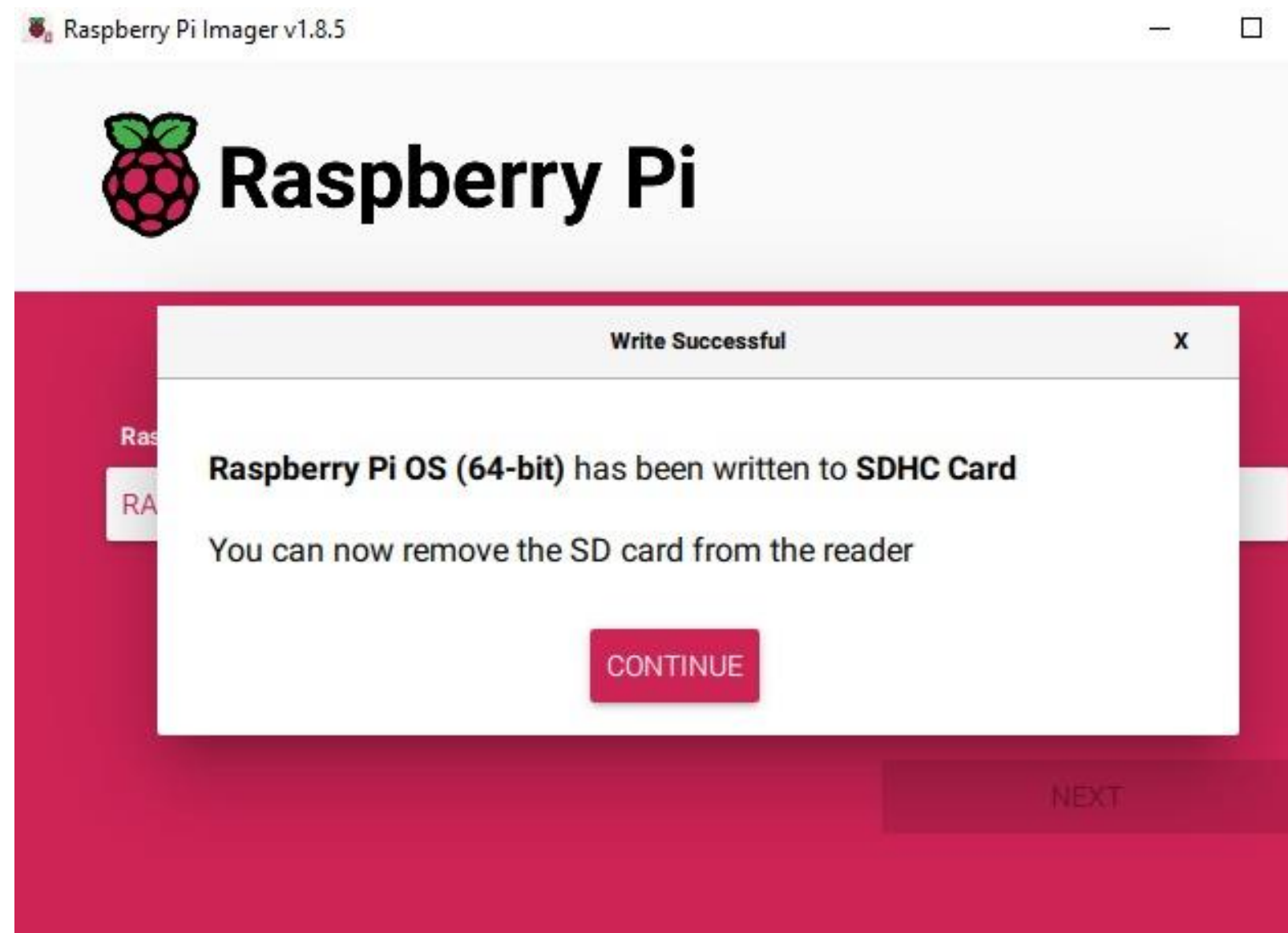


Step 3. Launch the Raspberry Pi Imager



Step 4. Make sure to choose the Raspberry Pi Device , the recommended Operating System and the Storage path of our SD Card

Step 5 . Once all is done, the raspberry Pi operating system was successfully written on your SD Card .



Connecting your Raspberry Pi

01

If your Raspberry Pi has more than one HDMI port, connect your main monitor to the port labeled HDMIO.

02

Many screens don't have micro or mini HDMI ports. But you can use a micro-HDMI-to-HDMI cable or a mini-HDMI-to-HDMI cable to link those ports on your Raspberry Pi to any HDMI screen. If your display doesn't use HDMI, you can try an adapter that changes the HDMI output to a port your screen supports.



03

The Raspberry Pi gets its power from either a Micro USB or USB-C connector, depending on which model you have. If you're using the Raspberry Pi 4 Model B, it's best to use a USB-C power supply.

04

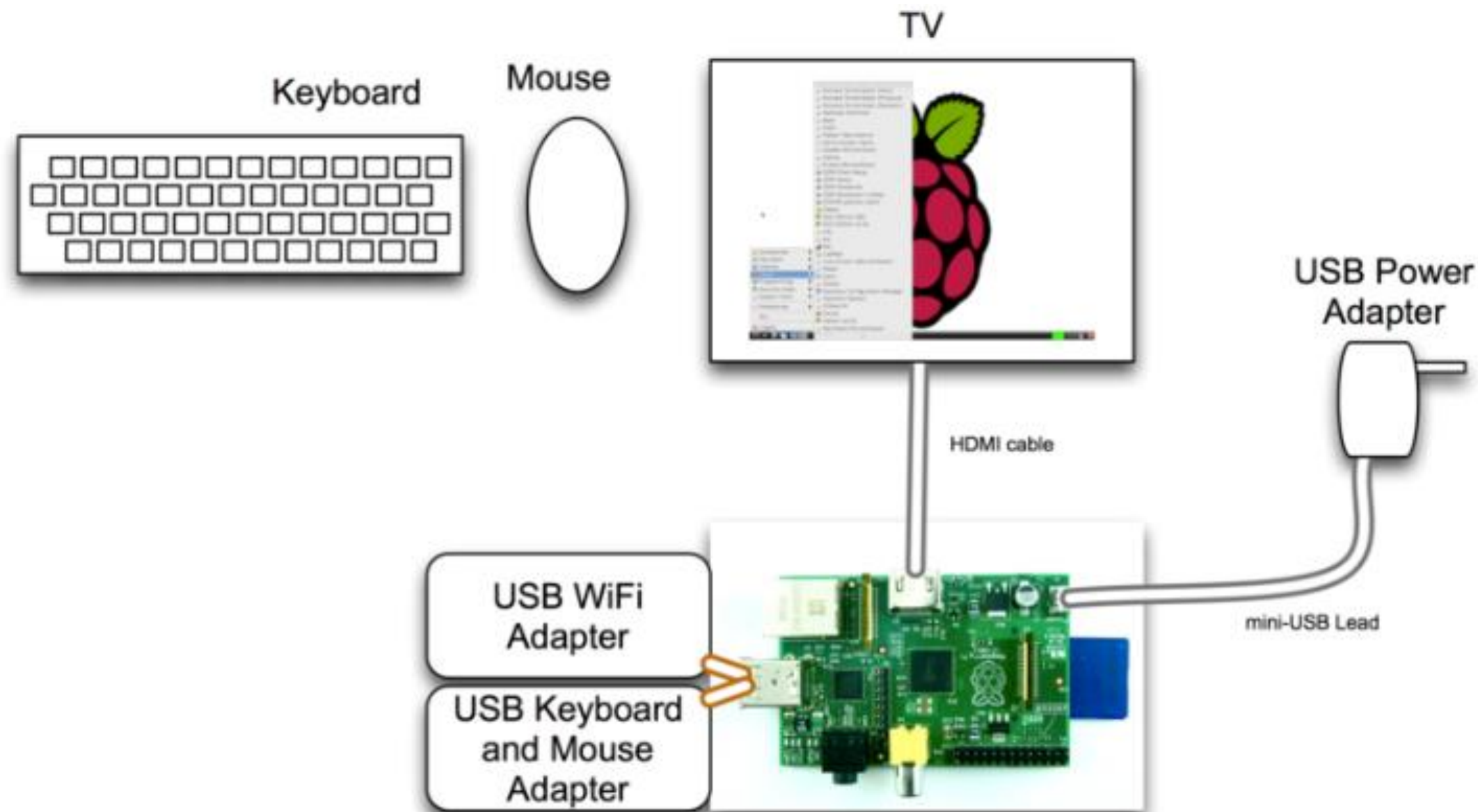
This supply gives out 5 volts with a current rating of at least 3 amps, which equals 15 watts. This makes sure the Raspberry Pi gets a steady supply of power, especially when it's working hard or has lots of things connected to it.

05

It's really important to use a good power supply to avoid problems like the Raspberry Pi acting strange or turning off unexpectedly.

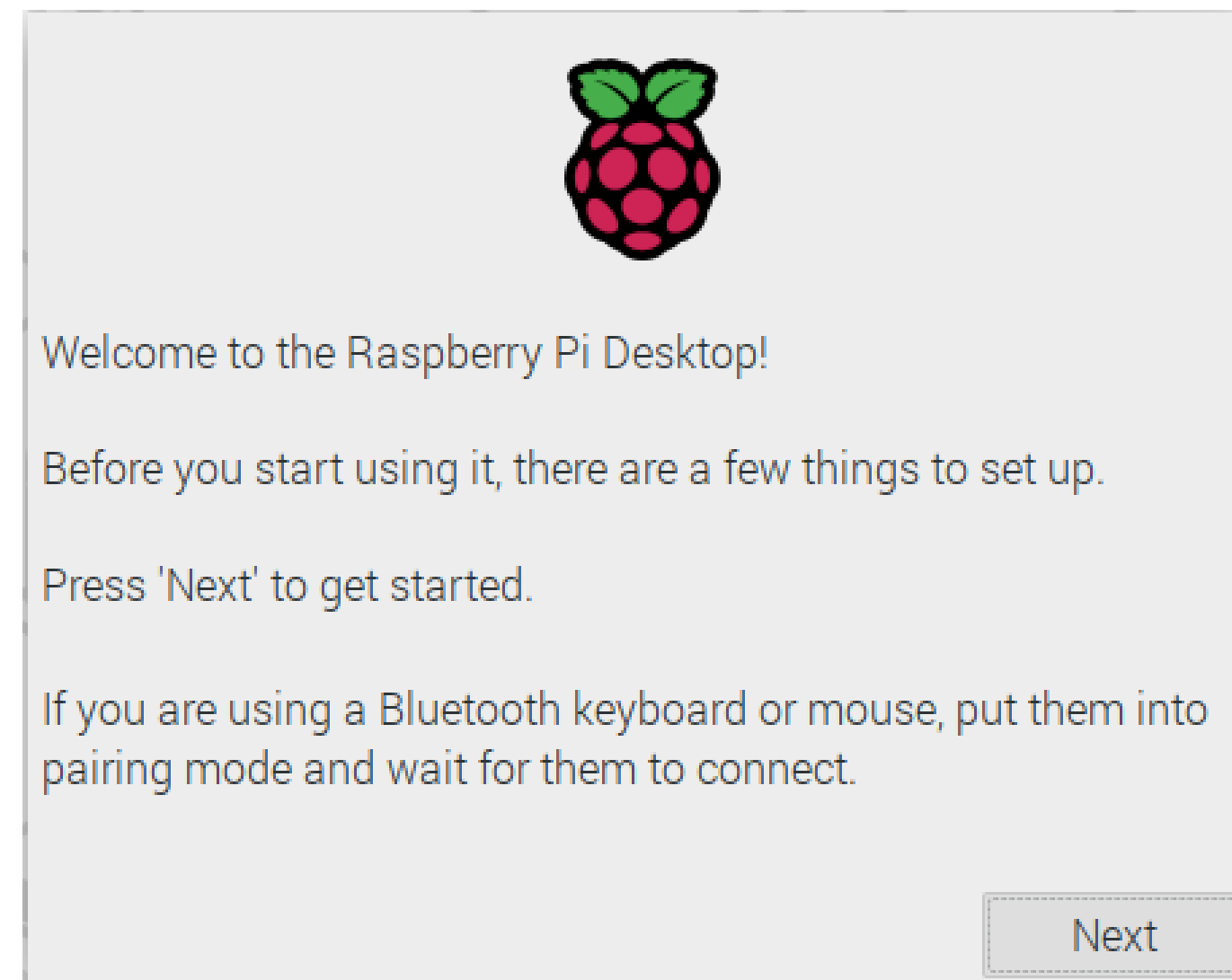


Once you've installed the Raspberry Pi OS on your SD Card, simply insert the SD Card into the SD card slot. The Raspberry Pi will then automatically start up with the installed OS



Finalizing the setup

When you power on your Raspberry Pi for the first time, you'll see the Welcome to Raspberry Pi application appear, which will walk you through the initial setup process





Set your Country, Language, and Timezone

Set Country

Enter the details of your location. This is used to set the language, time zone, keyboard and other international settings.

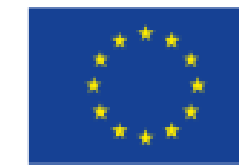
Country:

Language:

Timezone:

Use English language Use US keyboard

Press 'Next' when you have made your selection.



Enter a new username and password for your Raspberry Pi

Create User

You need to create a user account to log in to your Raspberry Pi.

The username can only contain lower-case letters, digits and hyphens, and must start with a letter.

Enter username:

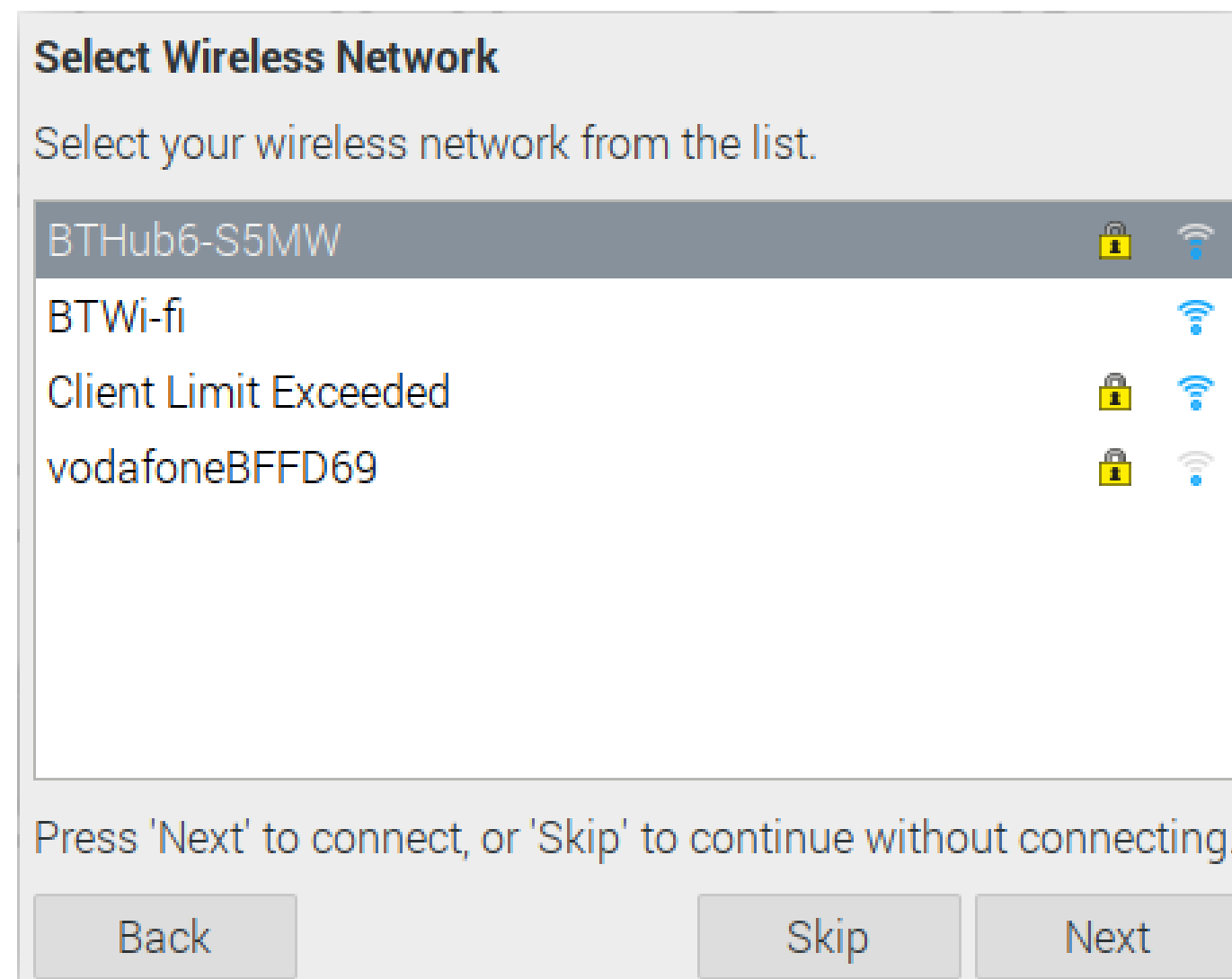
Enter password:

Confirm password:

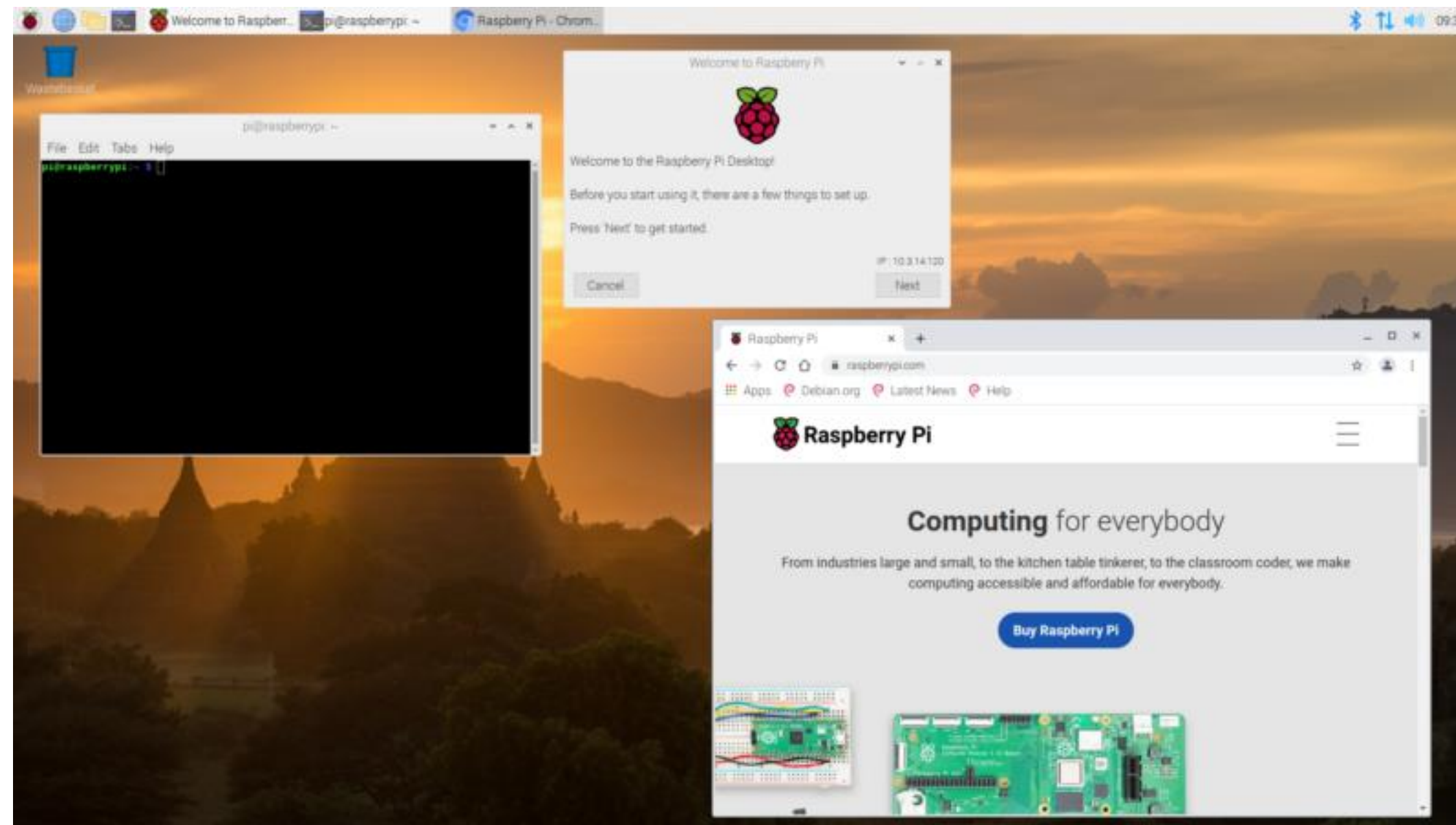
Hide characters

Press 'Next' to create your account.

Connect to your wireless network by selecting its name and entering the password or you can choose skip if you wish to connect via ethernet cable

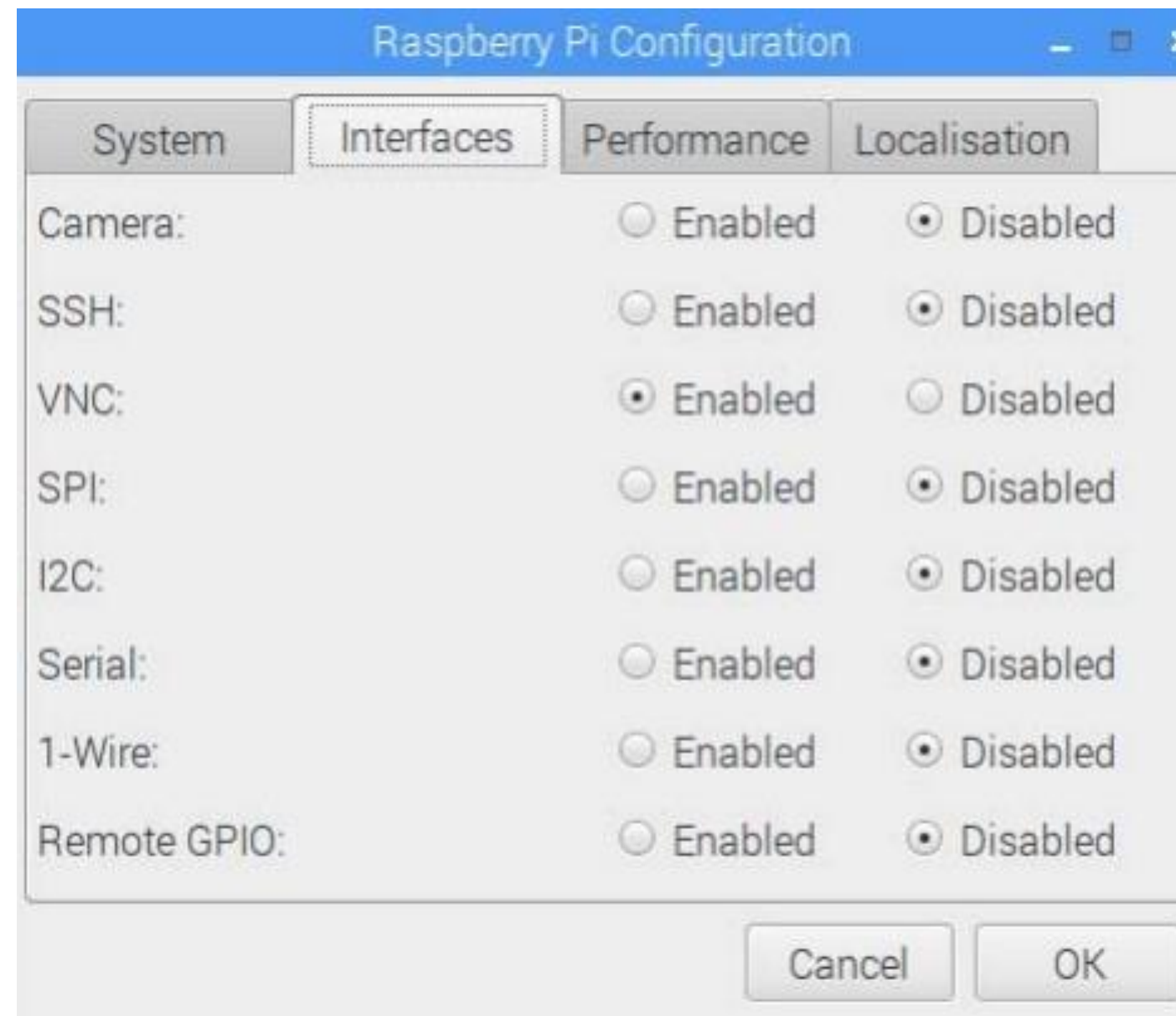


Raspberry environment includes essential features such as a taskbar, menu system, and application launcher. This desktop environment makes it easy for users to interact with their Raspberry Pi, whether they're browsing the web, programming, or working on DIY projects.



Raspberry Pi interfaces

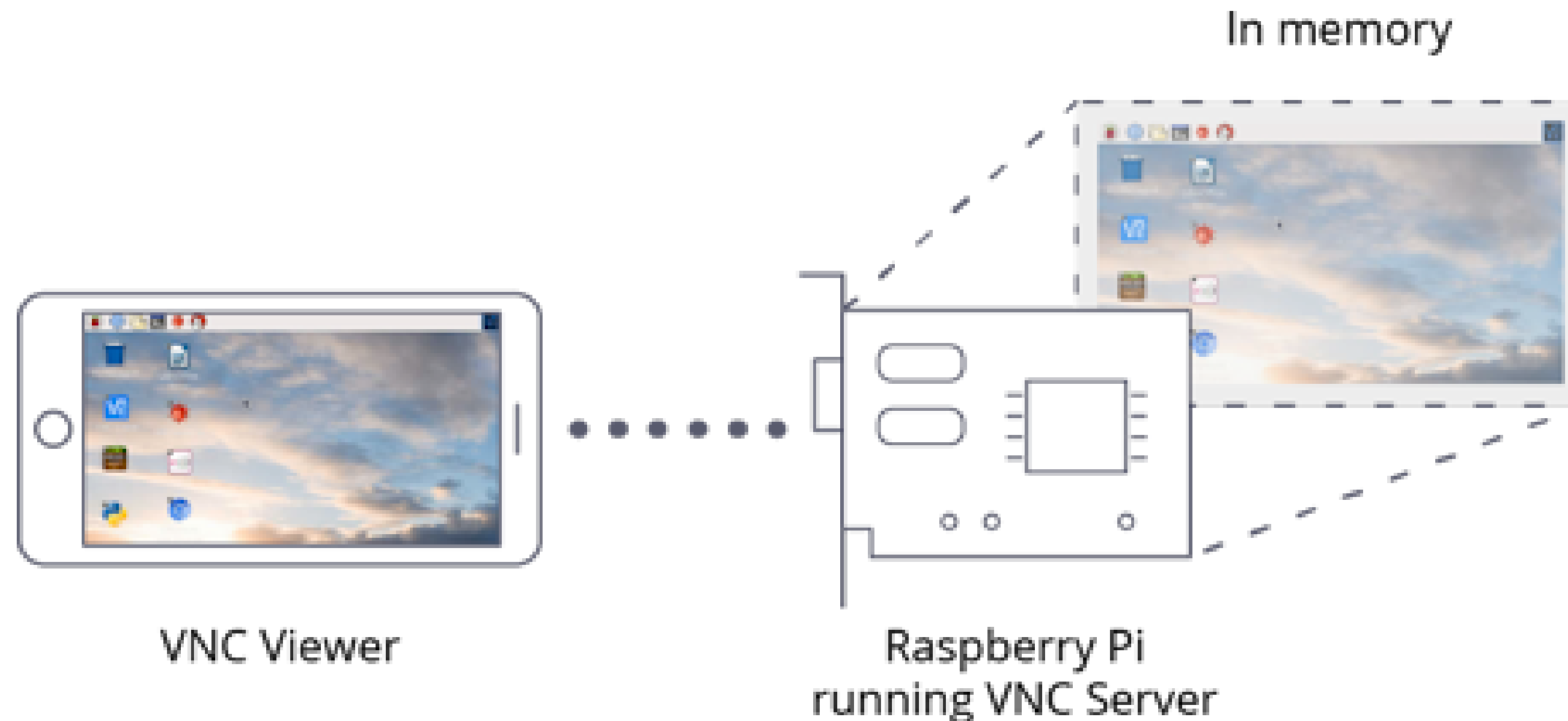
Raspberry interfaces let you do all sorts of projects, whether you need to control things remotely, use a camera, connect electronic stuff, or add more devices to your Raspberry Pi.



Different ways to connect and use your Raspberry Pi

1. VNC (Virtual Network Computing):

With VNC, you can control your Raspberry Pi's desktop from another device over the internet. This means you can manage it from a computer, phone, or tablet, even if they use a different system. It's handy for fixing problems or managing your Pi without needing to plug in a screen, keyboard, or mouse.



2. SSH (Secure Shell):

SSH gives you a secure way to control your Raspberry Pi from another device. You can use it to run commands on your Pi from a different computer. This is helpful for tasks like managing files, running programs, or changing settings without needing to be right next to your Pi.

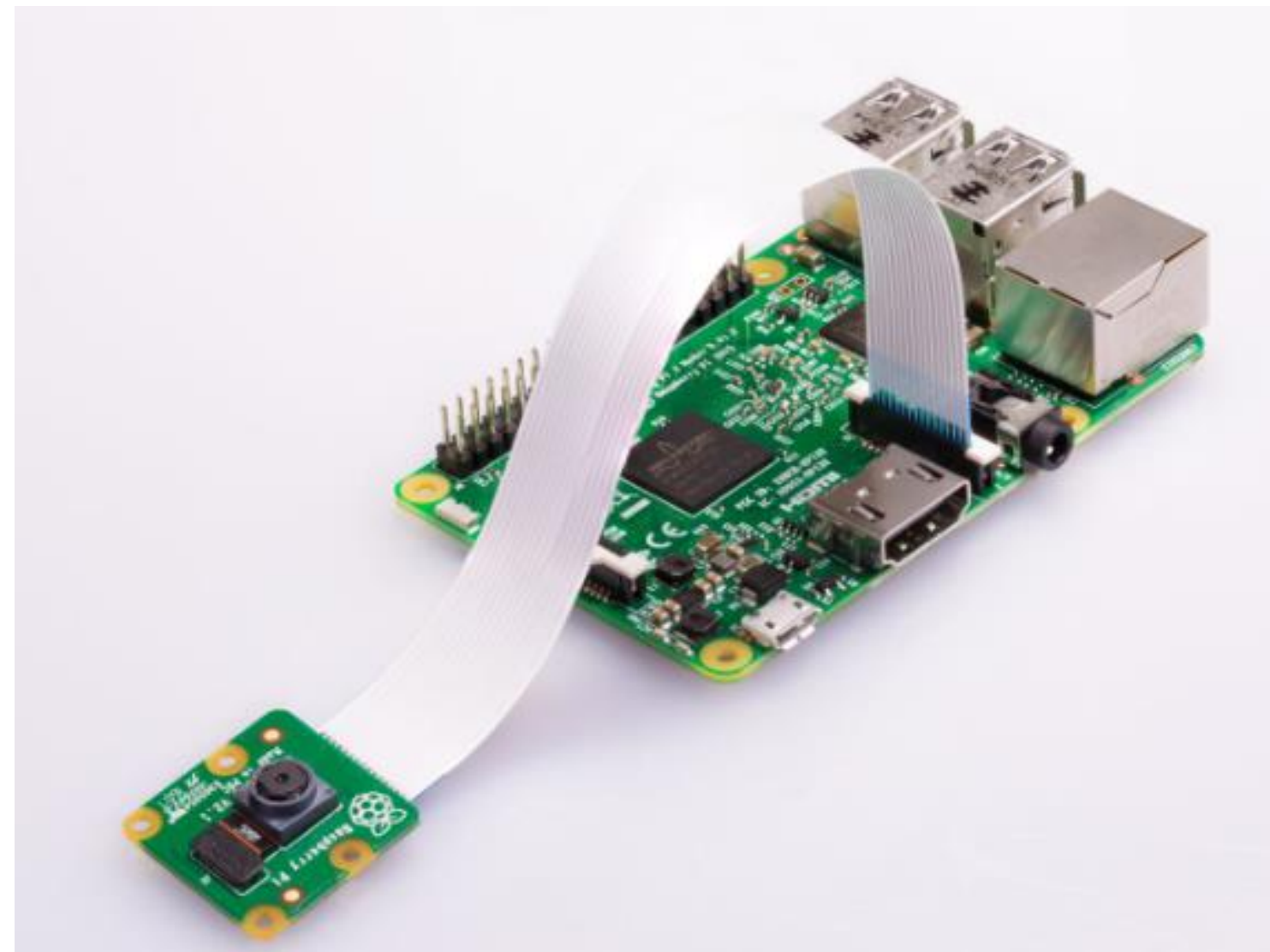
- When you've found the IP address, you can connect to your Raspberry Pi from your computer.
- Windows users can use an SSH client like [PuTTY](#).
- Linux and macOS user have an [SSH](#) client installed by default, and can SSH into the Pi by typing:

```
ssh pi@[IP Address of your Pi board]
```

If you have not changed the "pi" user password, the default one is raspberry.

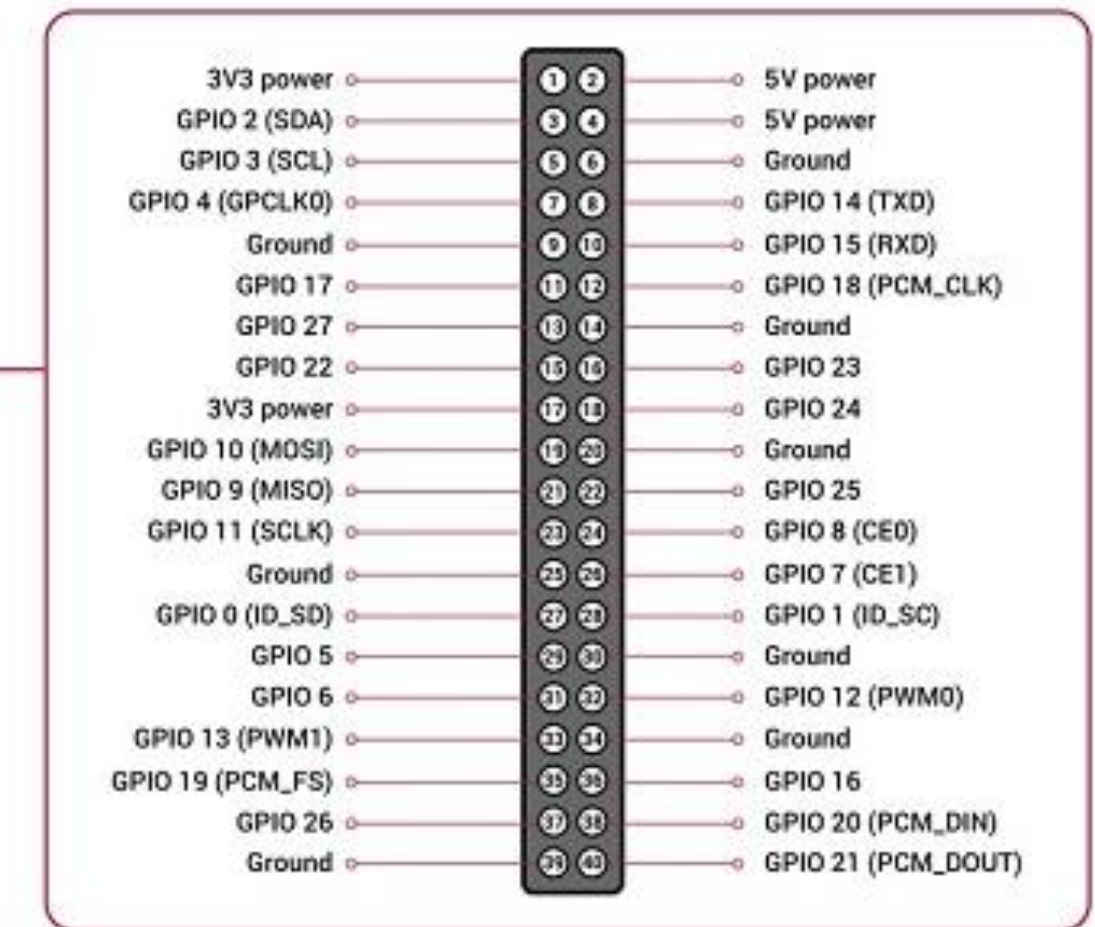
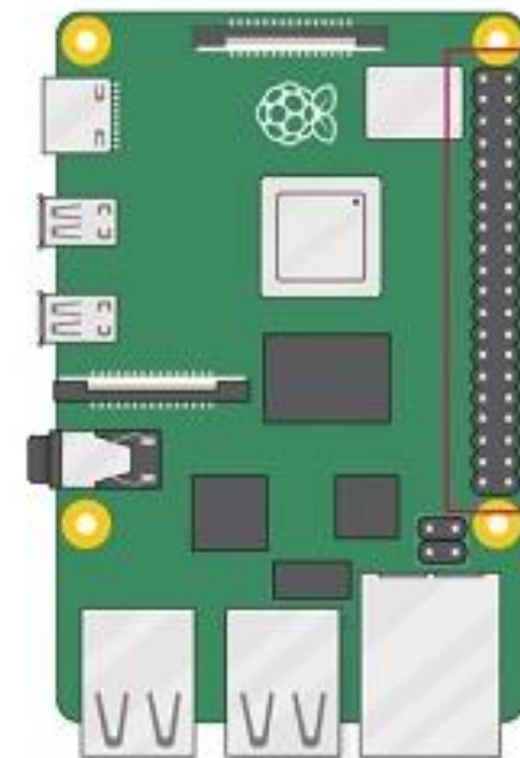
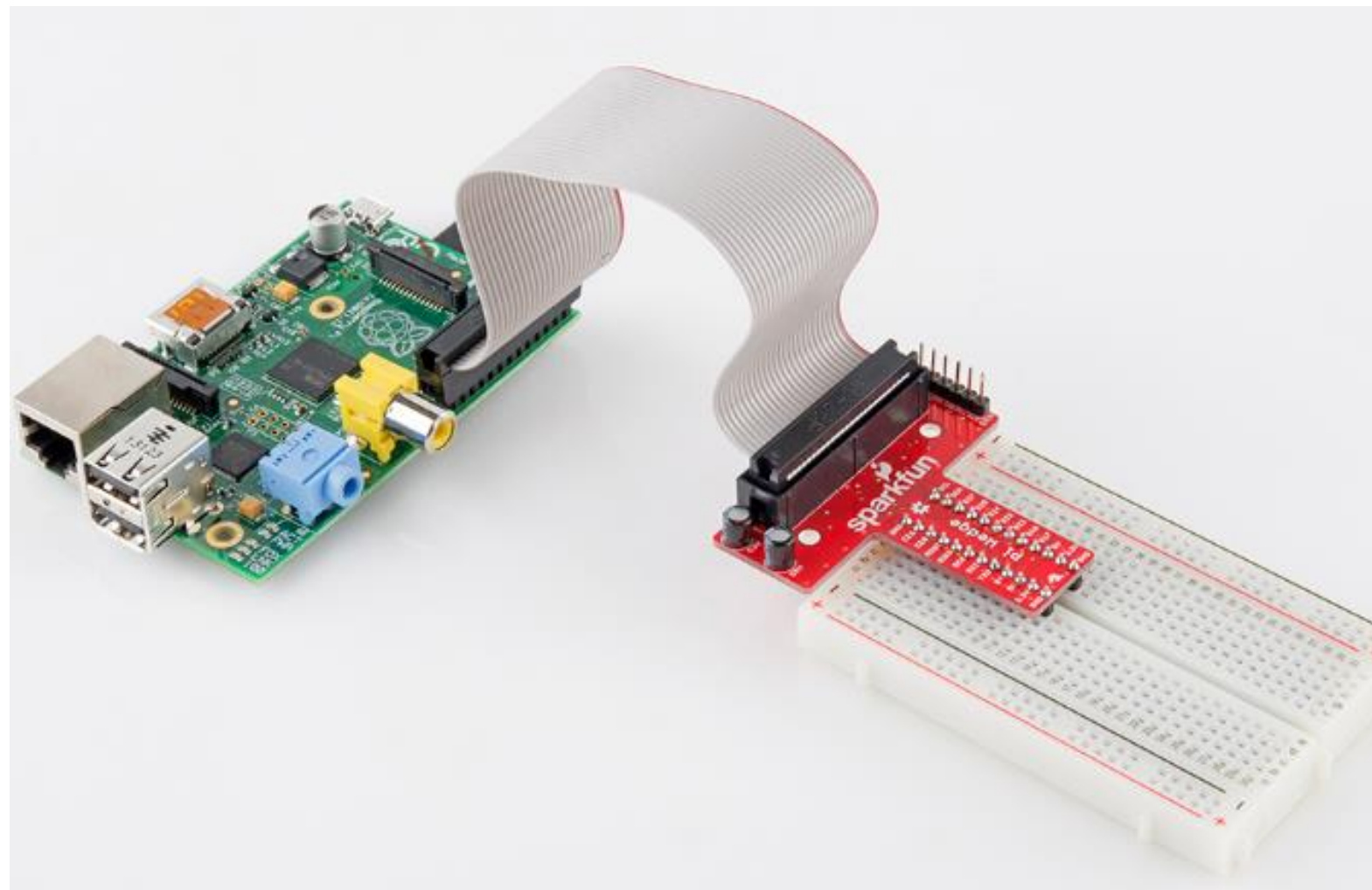
3. Camera Interface:

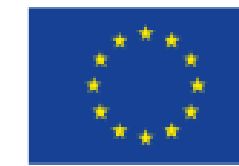
The Raspberry Pi has a special way to connect cameras. You can attach a camera module to it and use software to take pictures, record videos, or do other things with the camera. This is great for projects like photography, security cameras, or anything else that needs a camera.



4. GPIO (General Purpose Input/Output):

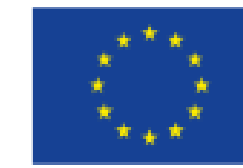
GPIO pins let you connect electronic things to your Raspberry Pi, like sensors, lights, or motors. You can control these things with software, so you can make your Raspberry Pi do all kinds of interactive stuff, like measuring things, turning lights on and off, or making things move.





Programming Languages

- Python [Recommended for coding]
- C
- C++
- Java
- Scratch



- Python is now one of the most favored programming languages in the open source community. It's included in all major Linux distributions, making it easily accessible. When you install Raspbian on your Raspberry Pi, you'll find an app named Thonny.
- Thonny is a Python integrated development environment (IDE) designed for beginners.

```
test.py x
1 def hello(name):
2     print ('Hi', name)
3
4 hello('Reader!')
```

```
Shell
>>> %Run test.py
Hi Reader!
>>>
```



Software Management on Pi

These are some important commands you might use when you're managing software on your Raspberry Pi, which runs on the Raspbian operating system

Checks for any new software available for your Raspberry Pi. It just makes sure your Pi knows about all the latest software that's out there.

`sudo apt-get update`

Installs any updates that are available. It makes sure all the software on your Pi is the newest version.

`sudo apt-get upgrade`

`sudo apt-get install`

Takes care of downloading and installing a package

Downloads a software without actually installing it right away.

`sudo apt-get download`

`sudo apt-get remove`

Removes a software from your Pi

`sudo apt-get purge`

It not only removes the software but also deletes any settings or preferences associated with it

Helps you install those updates. It's like upgrading to a newer version of your whole operating system..

`sudo apt-get dist-upgrade`

Keeping your Raspberry Pi updated is crucial for two main reasons:

01

Firstly, it enhances security by addressing vulnerabilities found in the software over time, making your Pi less susceptible to attacks.

02

Secondly, updating also helps in resolving bugs that may affect the performance and functionality of your Pi, ensuring smooth operation of the system.



Resources

1. **McManus, Sean, and Mike Cook. *Raspberry Pi For Dummies*. Wiley, 2022.**
2. **Monk, Simon. *Raspberry Pi Cookbook*. O'Reilly Media, 2020.**
3. **Raspberry Pi Foundation Official Website (<https://www.raspberrypi.org/>)**



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