

# My first Raspberry Pi setup with Sense HAT



Initial hotchpotch

## Introduction

I need to prepare a pilot to send IoT data to a database. I have decided to use a Raspberry Pi and a Sense HAT as sources of data.

Many people are already familiar with Raspberry Pis and its possibilities. In my case, it is the first time I am using it, and I am enjoying my new toy as there is no tomorrow! So I decided to write this post to share my experience setting my Raspi and Sense HAT up.

Just for clarification, a Raspberry Pi is a low-cost computer, credit-card size, which is extensively used to learn programming and electronics. It is also quite popular for some industrial applications.

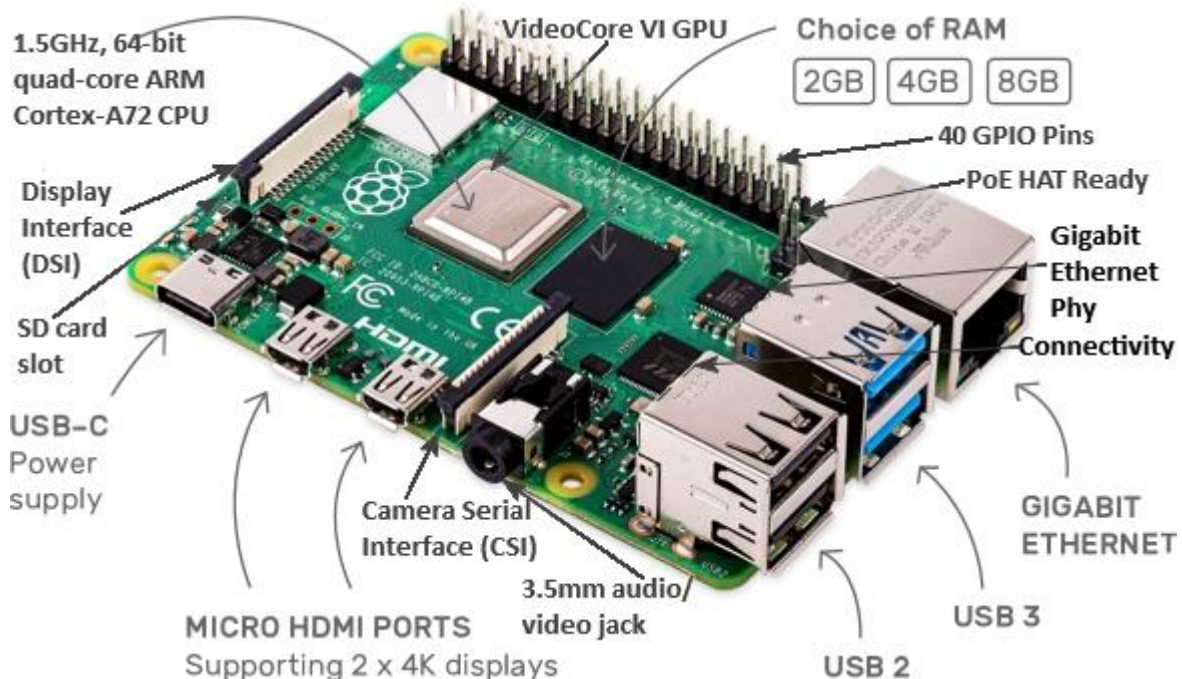
A Sense HAT contains several sensors to measure temperature, humidity, etc. If you just want to make the code to control the Sense HAT and generate the data to send to BigQuery, and you don't need actual measurements, you can replace the Sense HAT with a [web-based](#) or [desktop](#) Sense HAT emulator, which runs natively on [Raspberry Pi OS](#).

## Materials

### Raspberry Pi 4

Raspberry Pi is the name of a series of single-board computers made by the [Raspberry Pi Foundation](https://www.raspberrypi.org/). This UK charity aims to educate people in computing and create more accessible access to computing education.

It also provides a set of GPIO (general purpose input/output) pins. Third-party add-on boards can be attached to the Raspberry Pi and extend its functionality: motor controllers, LEDs, buttons, sensors, microcontrollers, LCDs, ADCs and DACs, etc. So the GPIO pins allow to control of electronic components for physical computing and exploring the Internet of Things (IoT).



My Raspberry Pi 4, model B, 8GB RAM:



To use my Raspberry Pi, I also need:

5-volt USB-C power supply rated at 3 amps,

A keyboard,

A mouse,

A screen (I use my TV),

A cable to connect the Raspberry Pi with the screen (in my case, a micro-HDMI to HDMI cable), and

USB-C Type-C USB Raspberry Pi Power Switch for Raspberry Pi 4 Model B (optional). It helps prevent the USB connector from wear and tear due to frequent pulling and inserting the USB cable.





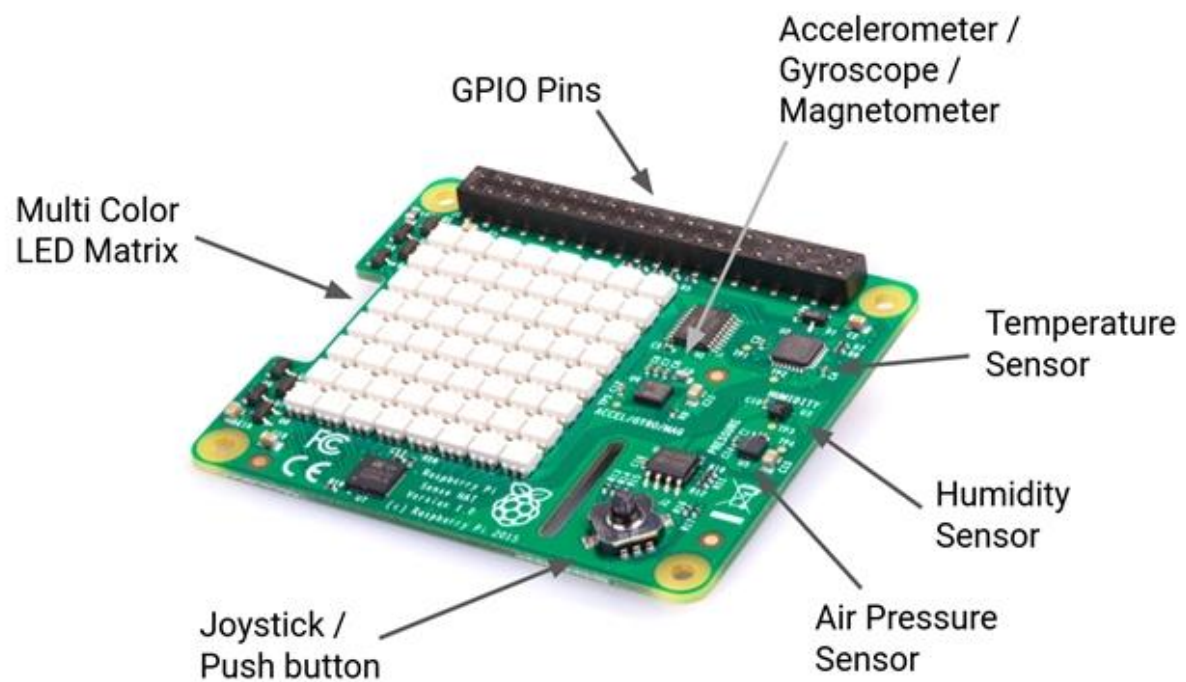
I occasionally use all the items above, except the USB-C power supply, to keep my Raspberry Pi on.

## Sense HAT

On the first Raspberry Pi models, the GPIO connector had 26 pins. Users attaching an add-board to those models usually have to work out which drivers were required for their specific board and then edit the relevant Linux files to make them load at boot time before the board is usable (or load them by hand from the command line). The Raspberry Pi has no knowledge of whether it has a board attached or not, and the various drivers will simply assume that they can make exclusive use of the GPIO interface.

A Hardware Attached on Top (HAT) is an add-on board identified by the Raspberry Pi and automatically configures the GPIOs and drivers for the board.

The Sense HAT is an add-on board for the Raspberry Pi. It is used in the International Space Station for the [Astro Pi Challenge](#). The board allows temperature, humidity, pressure, and orientation measurements and to output information using its built-in LED matrix.



My Sense HAT:



As I have already said in the introduction, if you just want to make the code for the Raspberry Pi to handle the Sense HAT and demonstrate how to ingest the data into BigQuery, but you don't actually need to take real measures, for the time being, you can either use a [web-based Sense HAT emulator](#) or [desktop Sense HAT emulator](#).

### A micro SD card with Raspberry Pi OS operating system

The Raspberry Pi runs a variety of Linux distributions. Its primary supported operating system, [Raspberry Pi OS](#) (previously called Raspbian), is open source and runs a suite of open-source software.



### Pin extender

26 female pin header.





## USB serial cable

The USB serial cable is my backup plan to connect to the Raspberry Pi using the console if SSH does not work for any reason.



## Initial setup

### Raspberry Pi 4

There is detailed information on how to connect and do the initial setup of Raspberry Pi 4, for example, in [The official Raspberry Pi Beginner's Guide](#), chapters 2 and 3.

I show here images of my own setup and configuration process. Remember to handle your Raspberry Pi carefully, bend any connector, and take them from the corners.

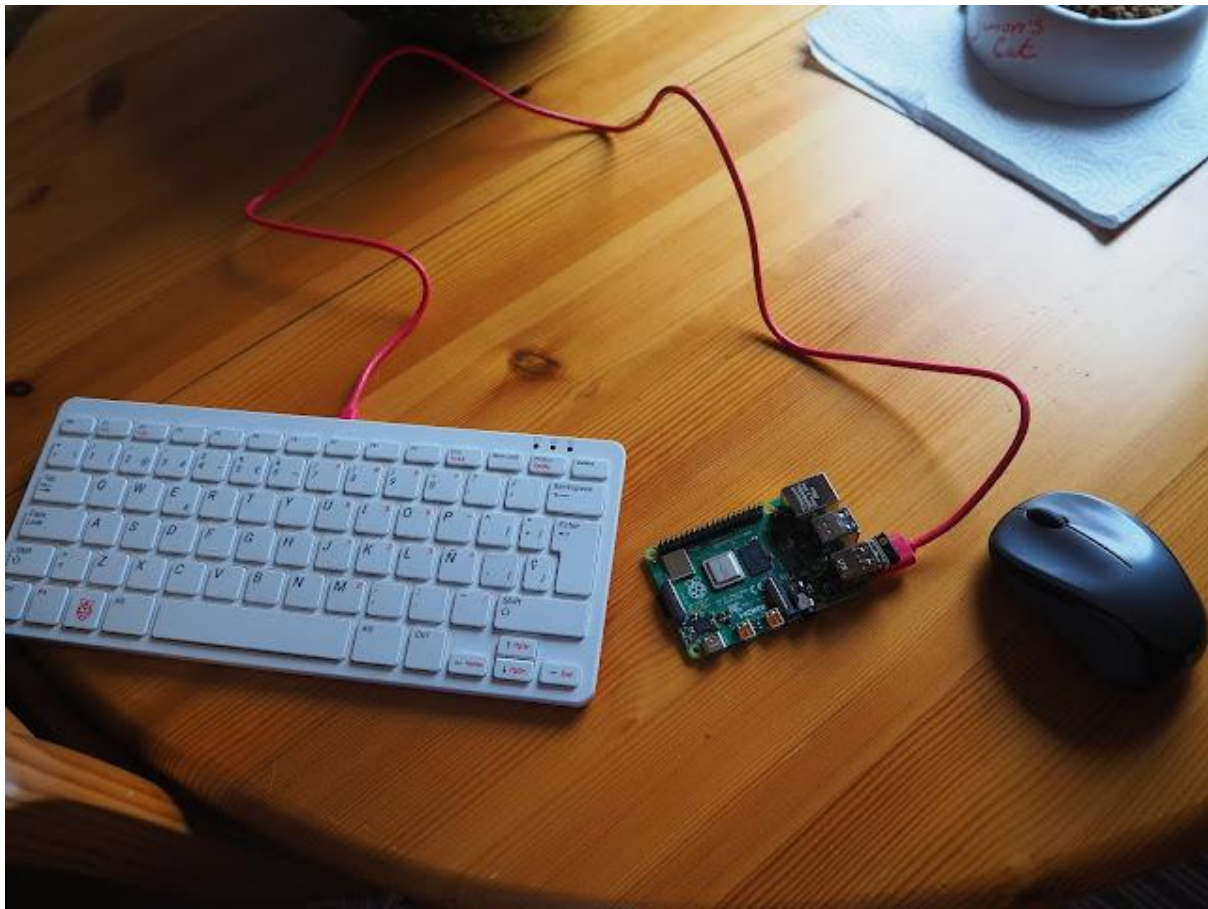
Insert the micro SD card with [NOOBS](#) into the Raspberry Pi.







Connect the keyboard and mouse.

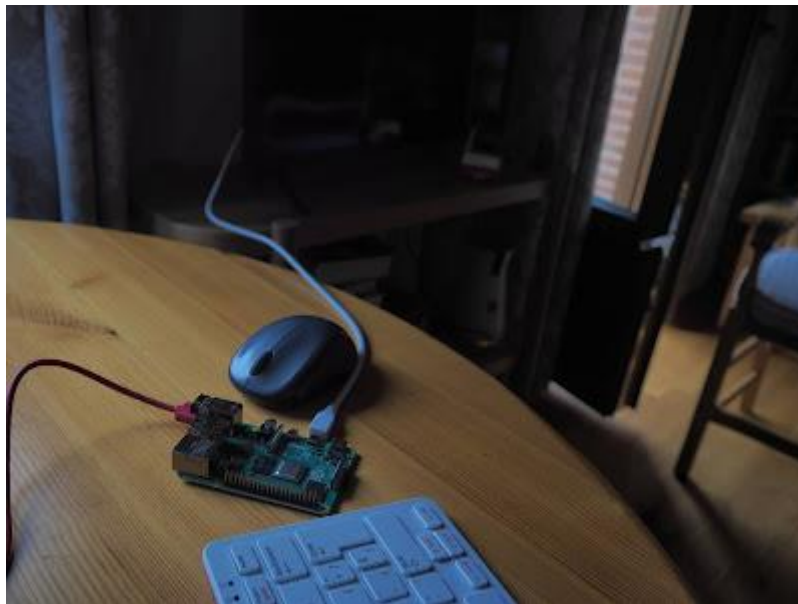


Connect the Raspberry Pi to the TV with the micro-HDMI to HDMI cable.

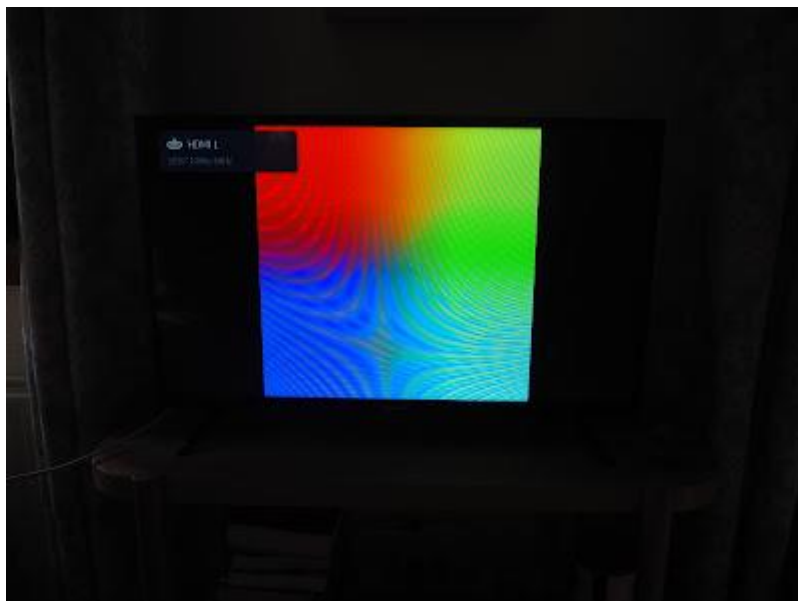




Connect the Raspberry Pi to a socket with the USB-C power supply. The Raspberry Pi doesn't have a power switch. It immediately starts running.



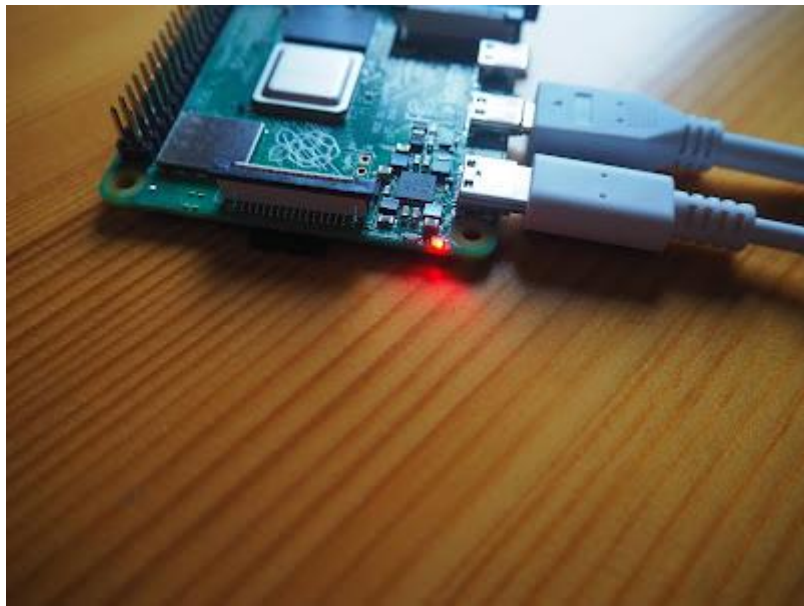
The Raspberry Pi starts.



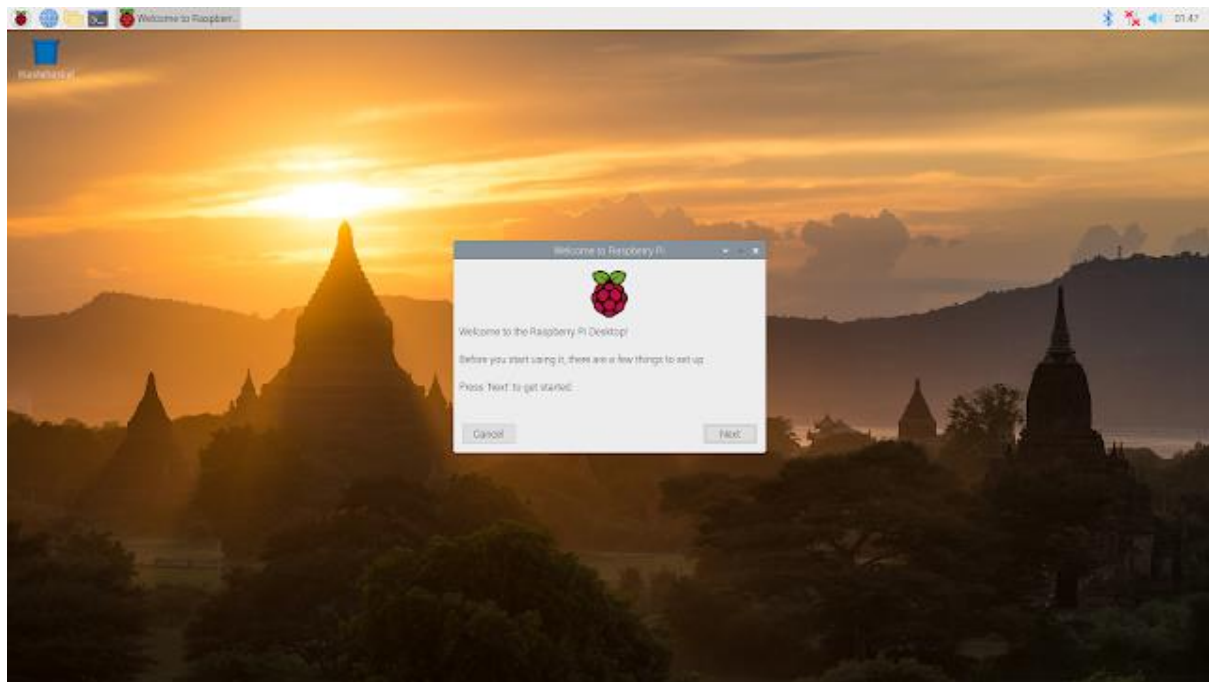


While the [Raspberry Pi OS starts](#), the pilots on the Raspberry Pi board blink.

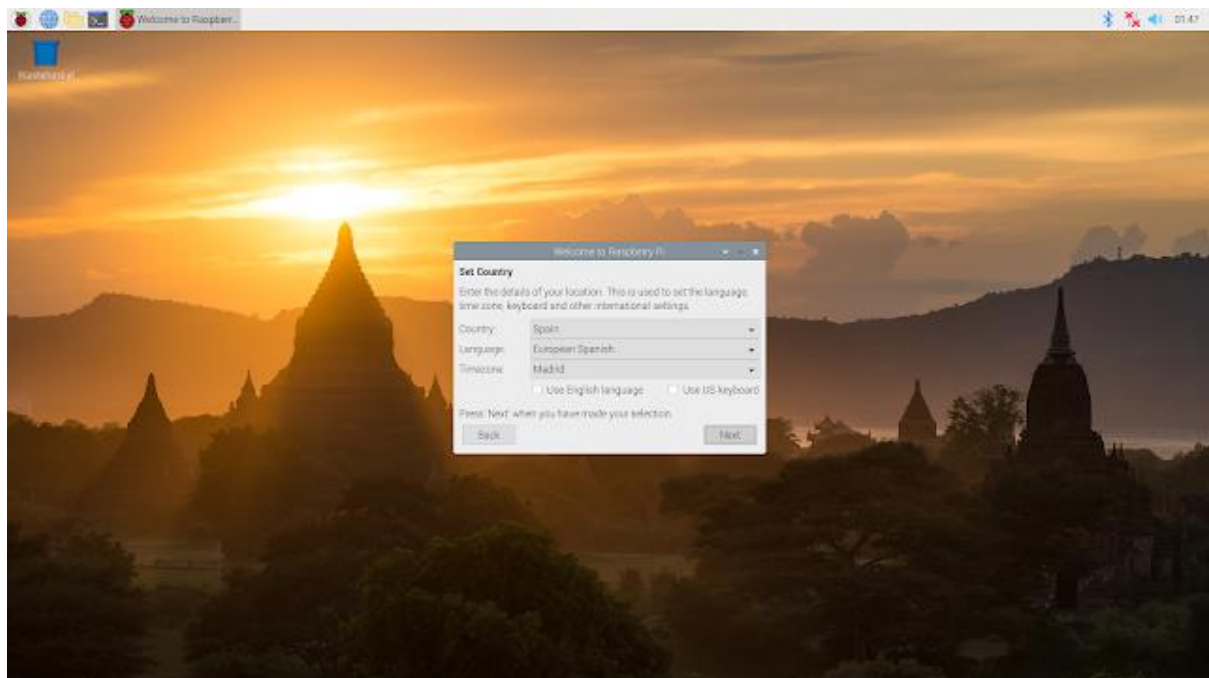


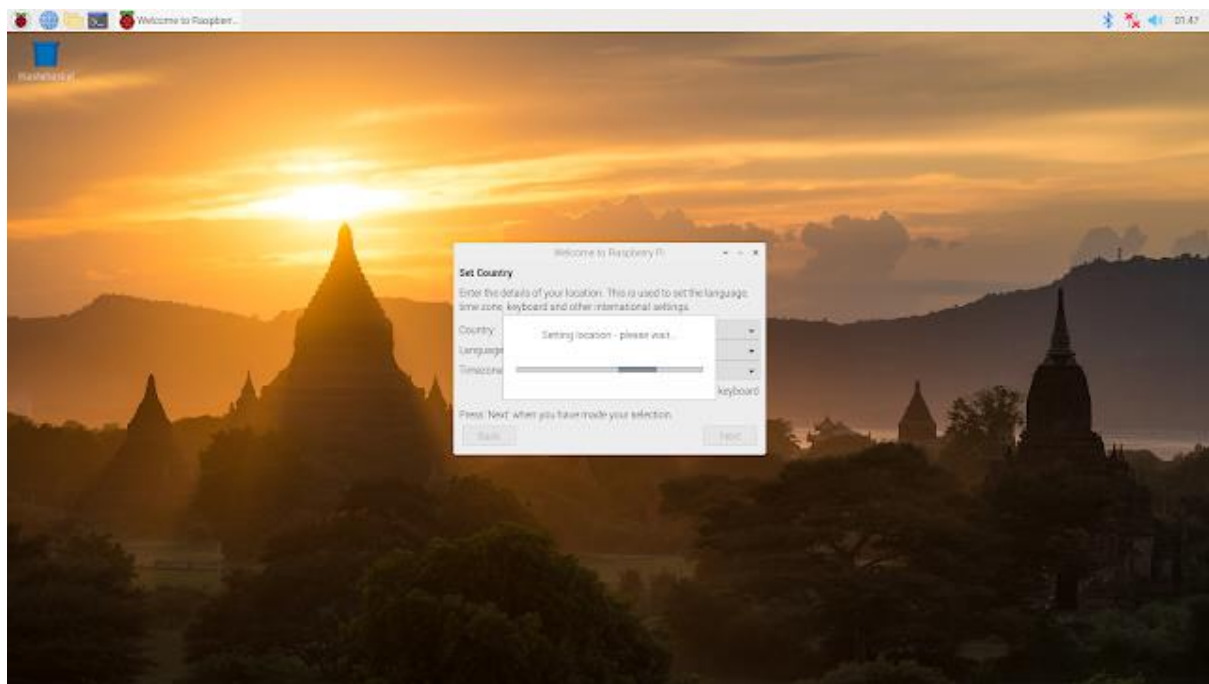


As soon as the Raspberry Pi OS is up and running, the initial setup wizard is launched.

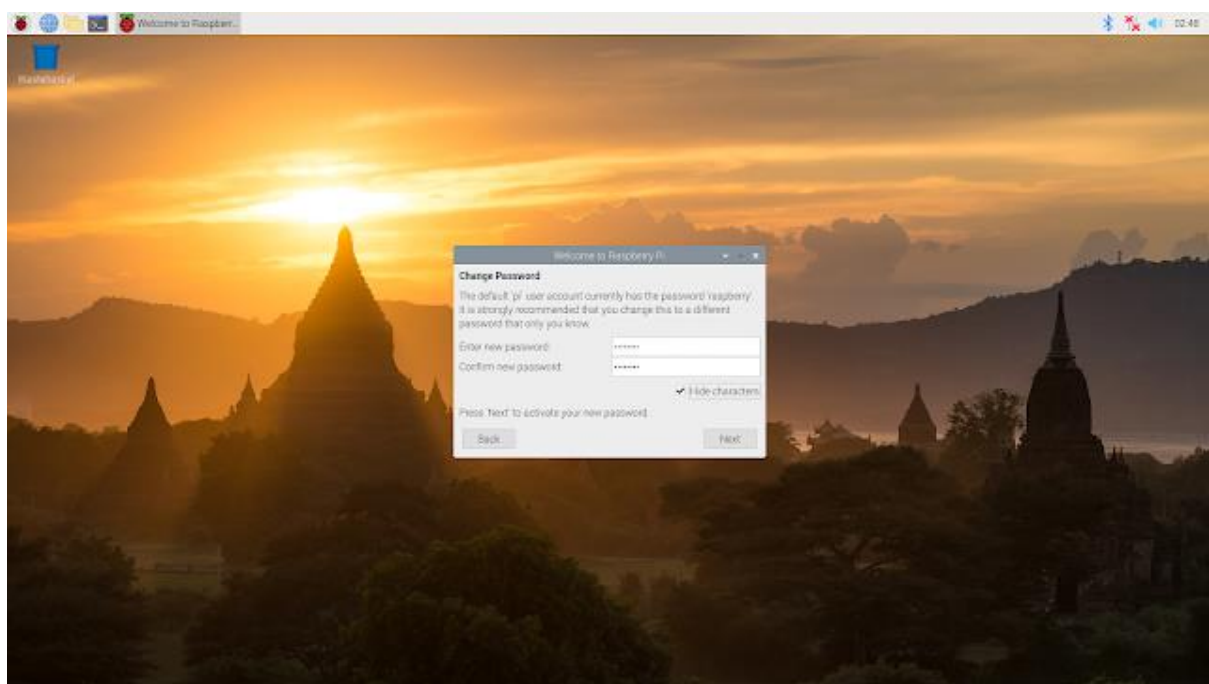


My image is configured for Spanish users. I use a Spanish keyboard, and I like seeing my computer in English. However, the only languages I can choose in the initial wizard are the official languages in Spain. If I check the "Use English language", the keyboard is configured in English. I leave this screen as it is now, and I'll change the language configuration later on.



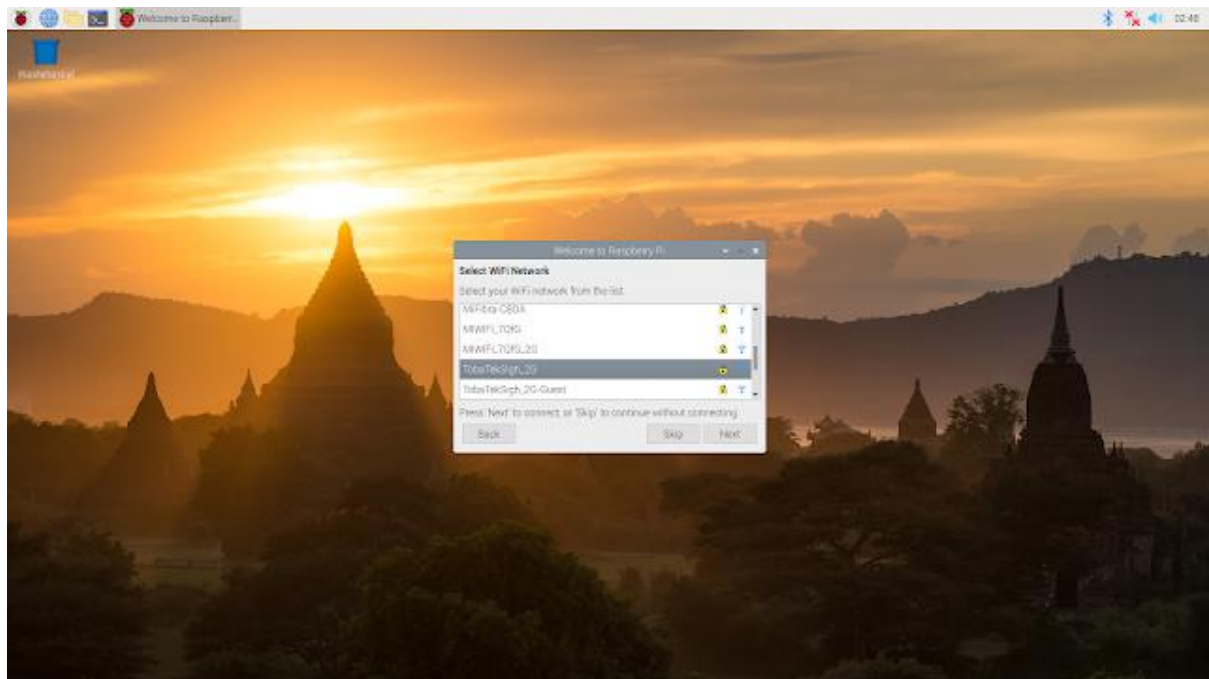
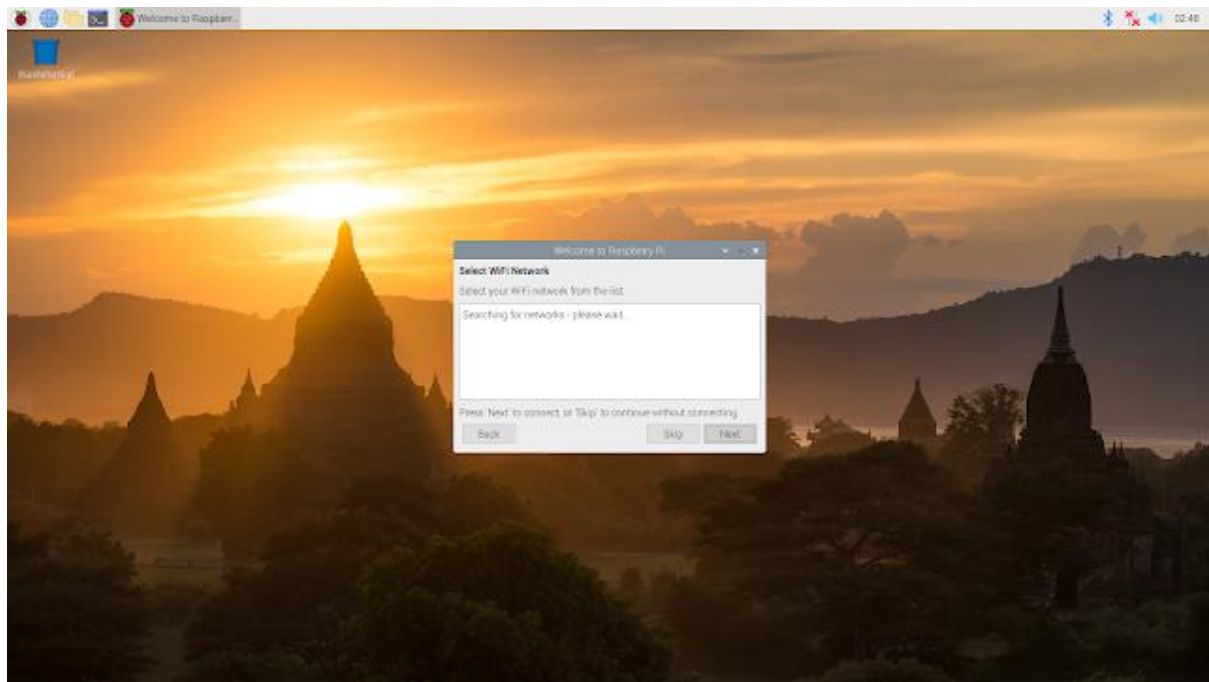


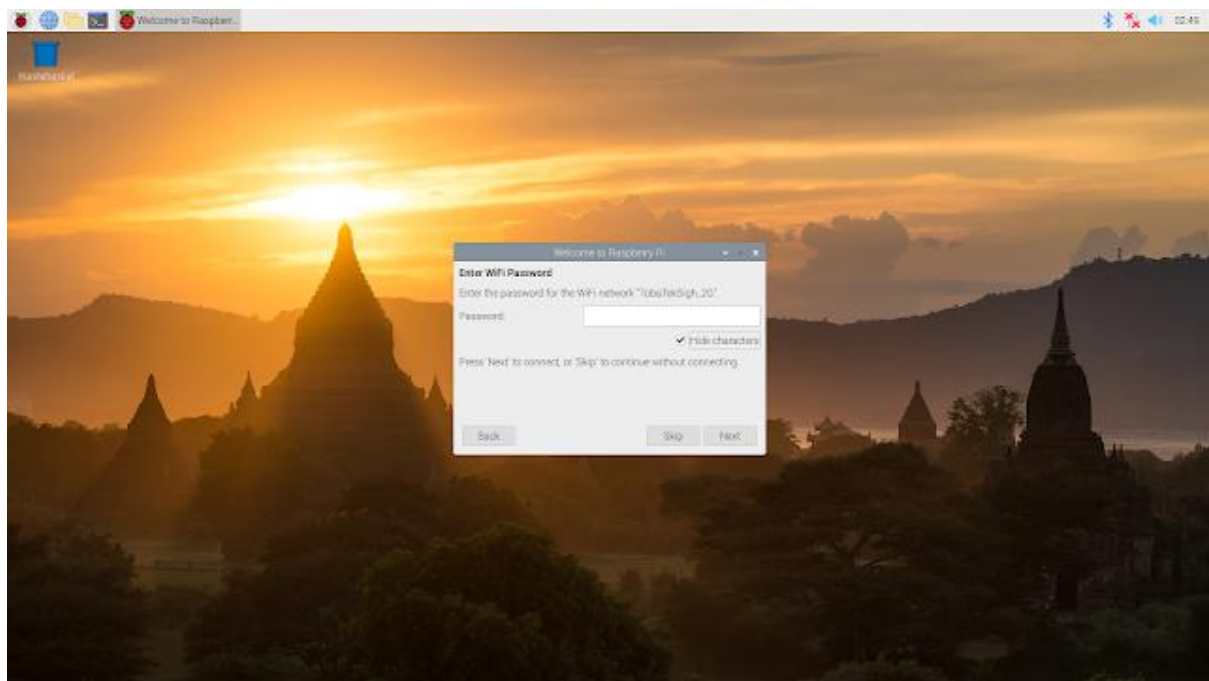
Change user pi's password.



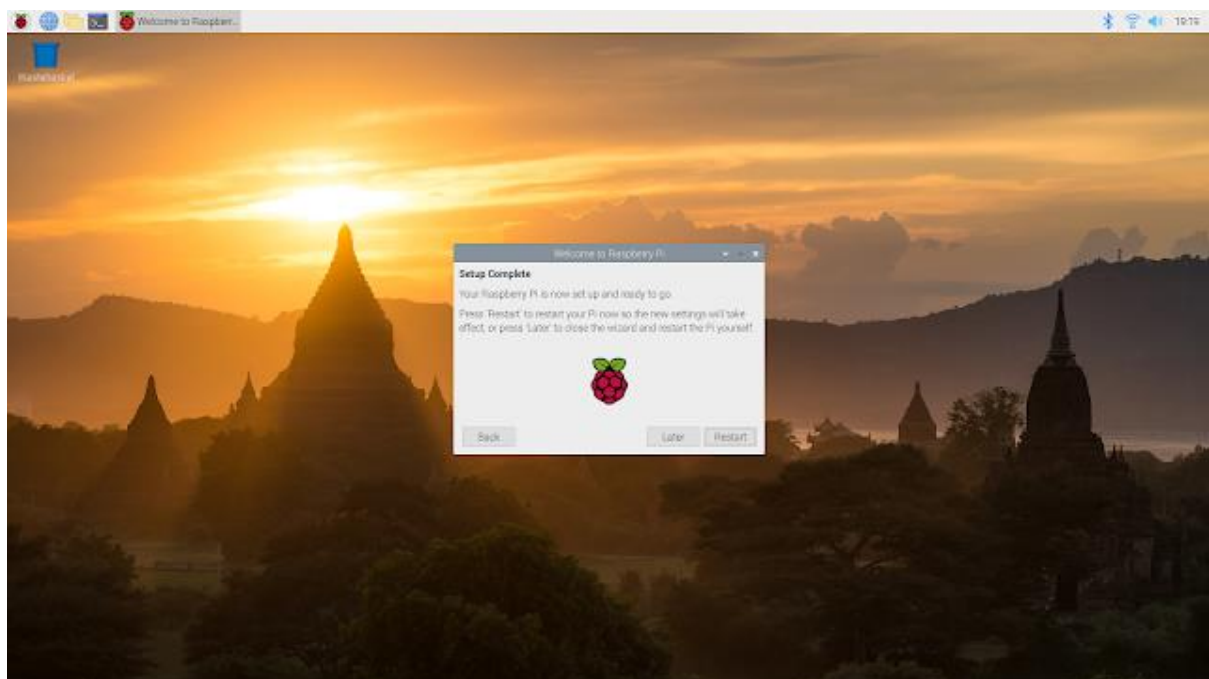
Connect the Raspberry Pi to the WiFi.

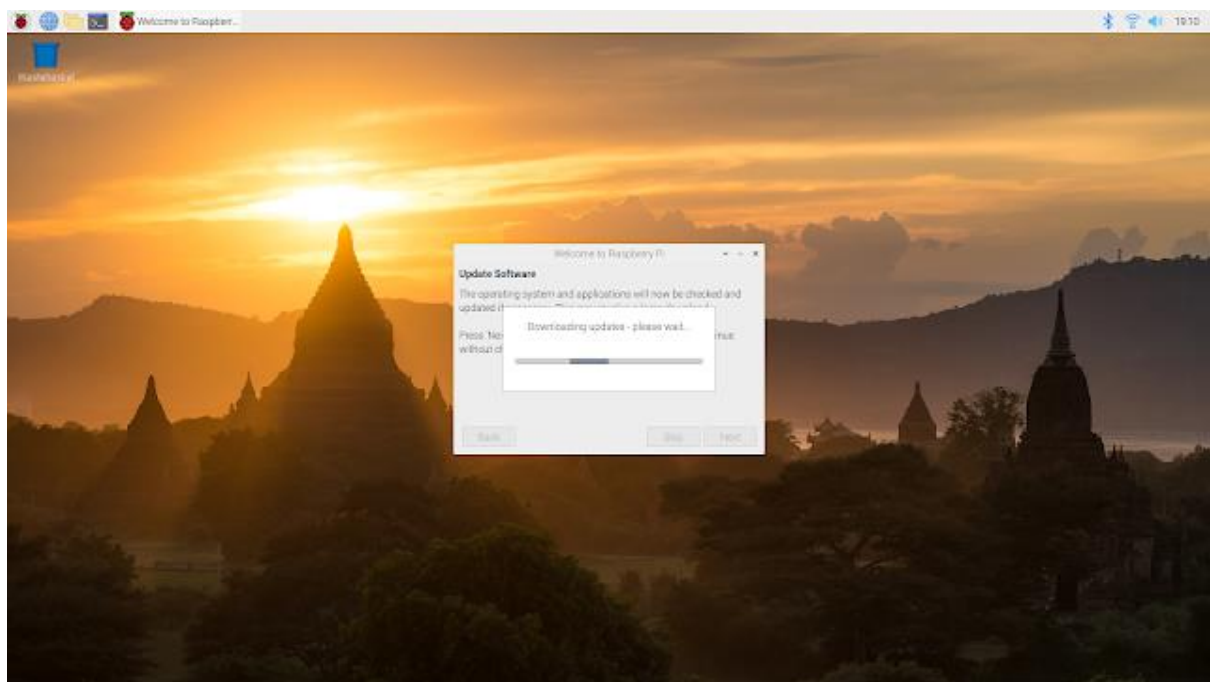
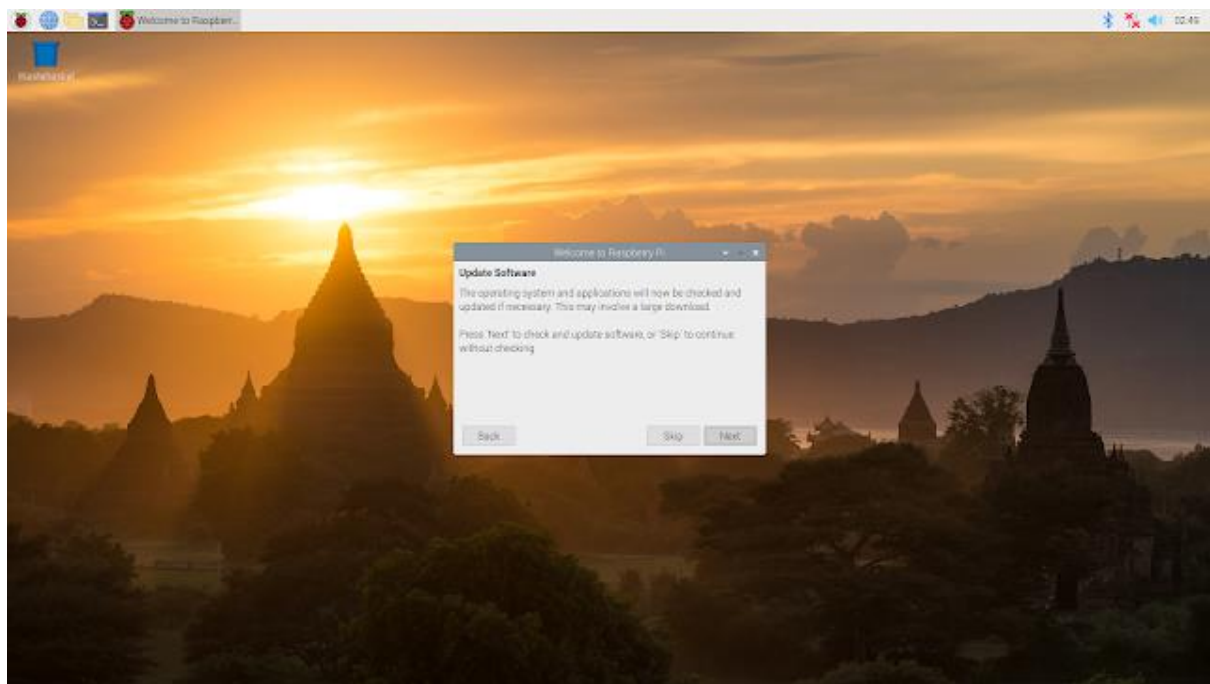




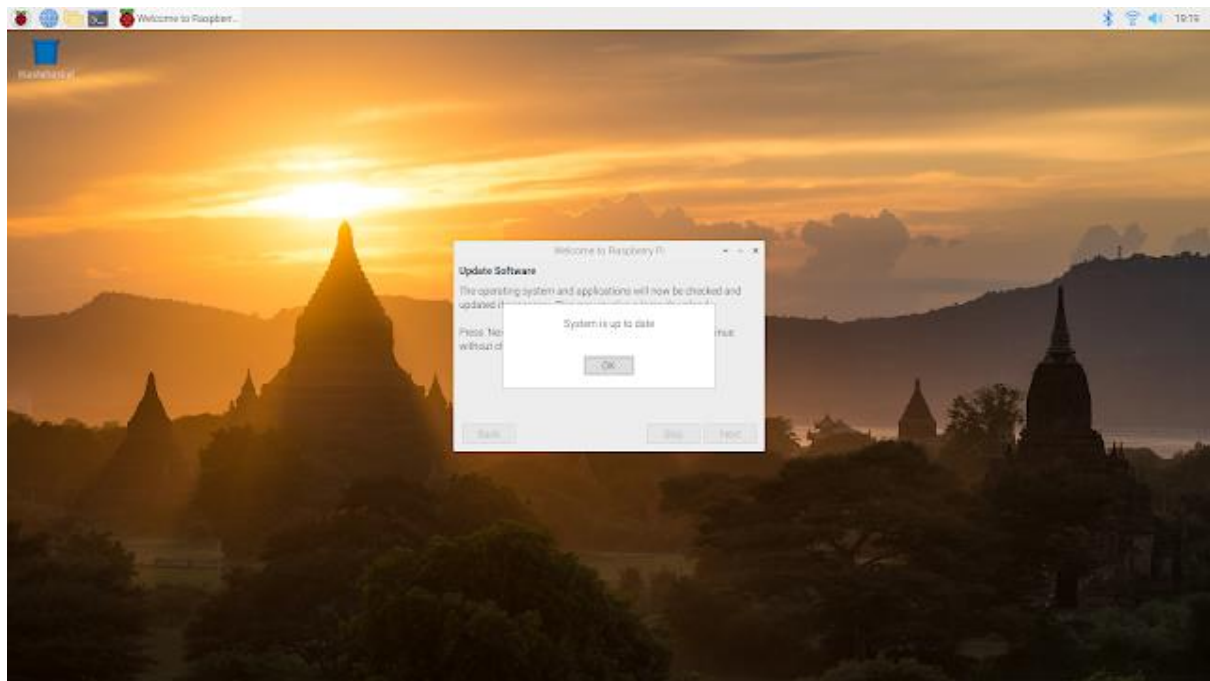
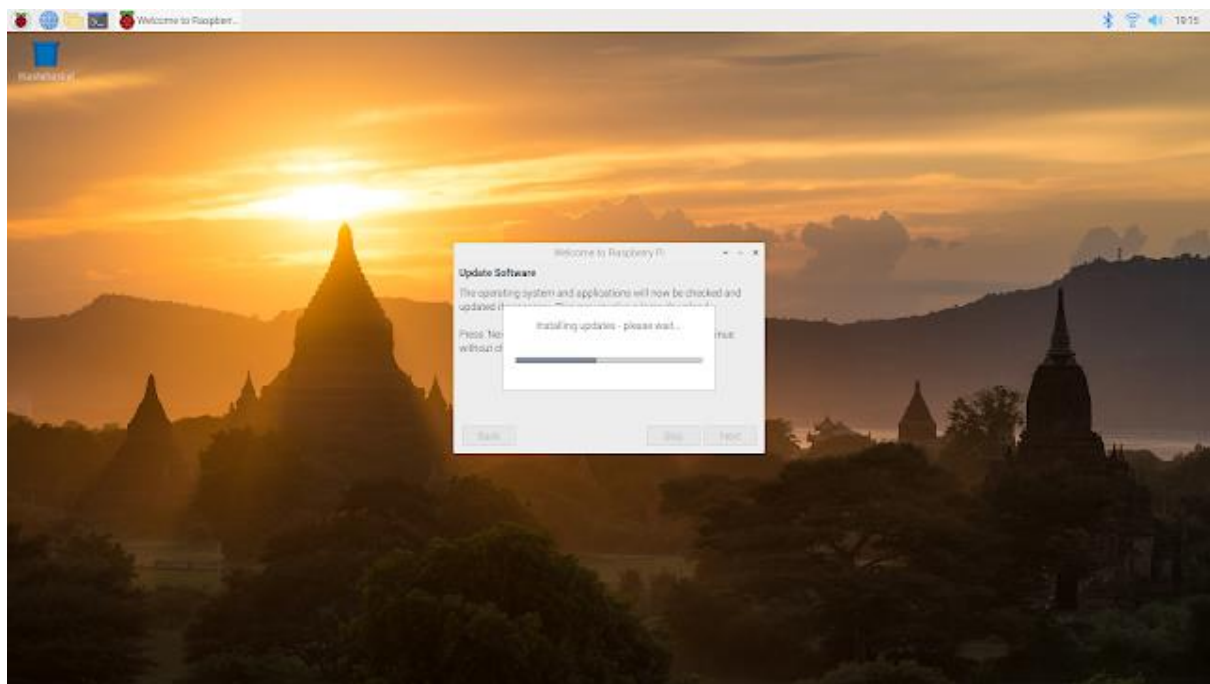


Then I am prompted to update the operating system and all packages. I choose to update it now. It takes a long time.

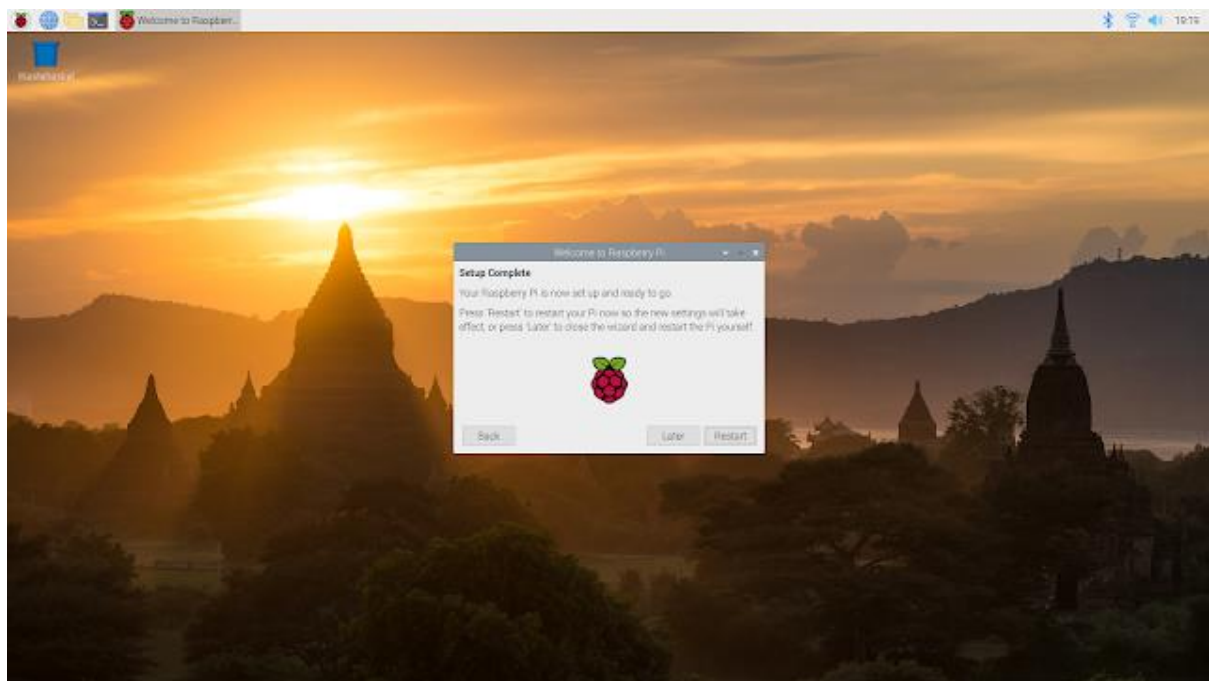




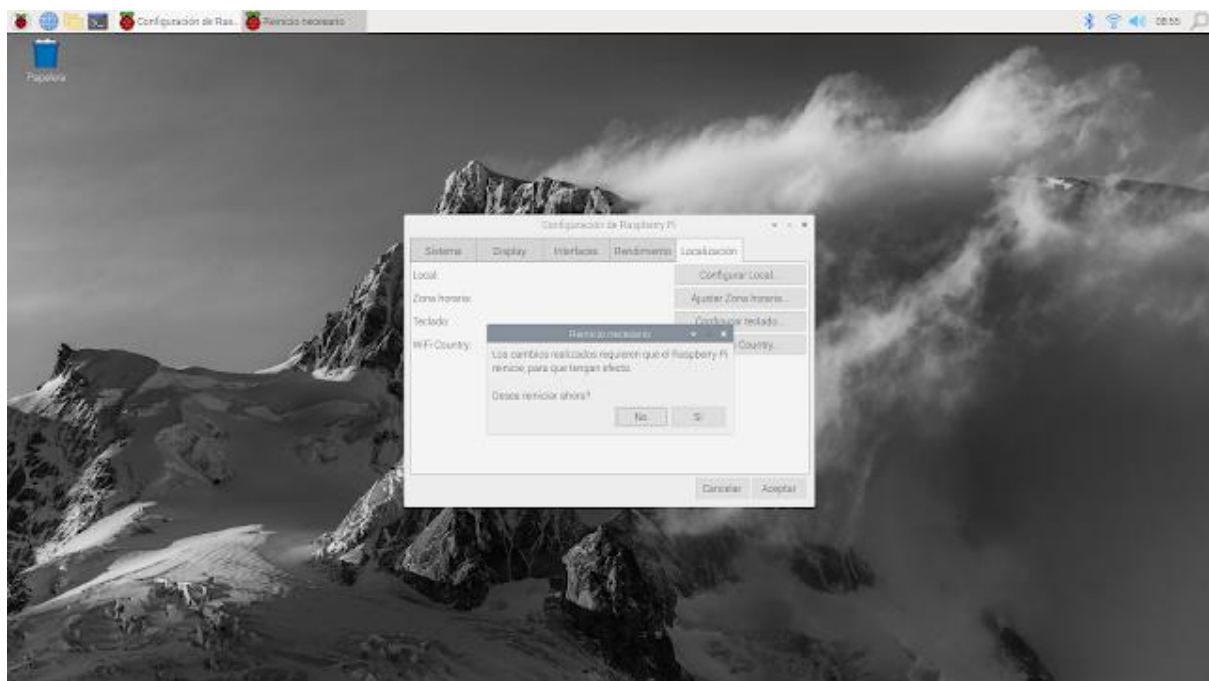


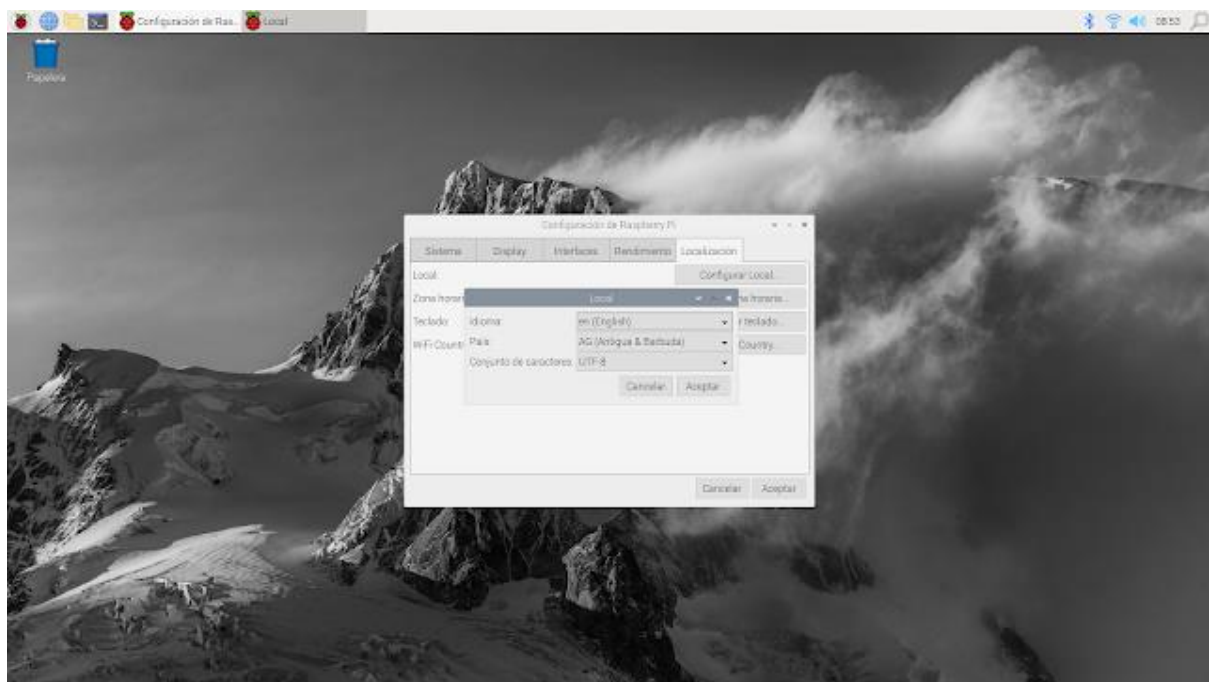
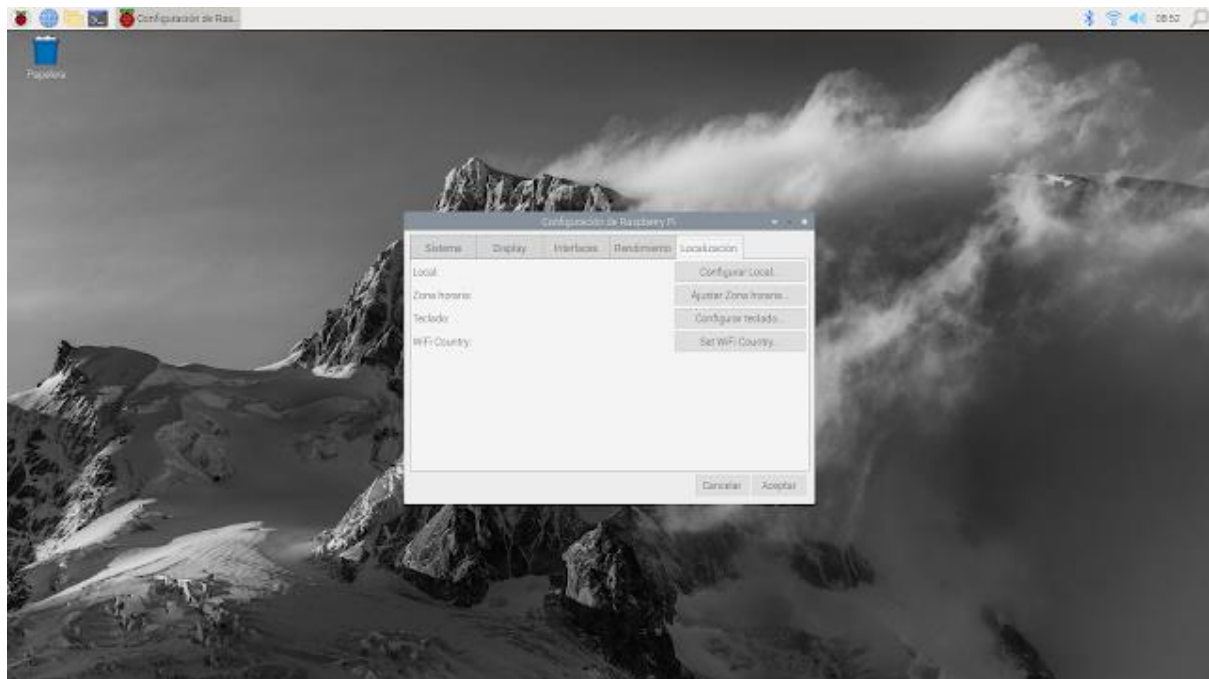


Restart the Raspberry Pi.

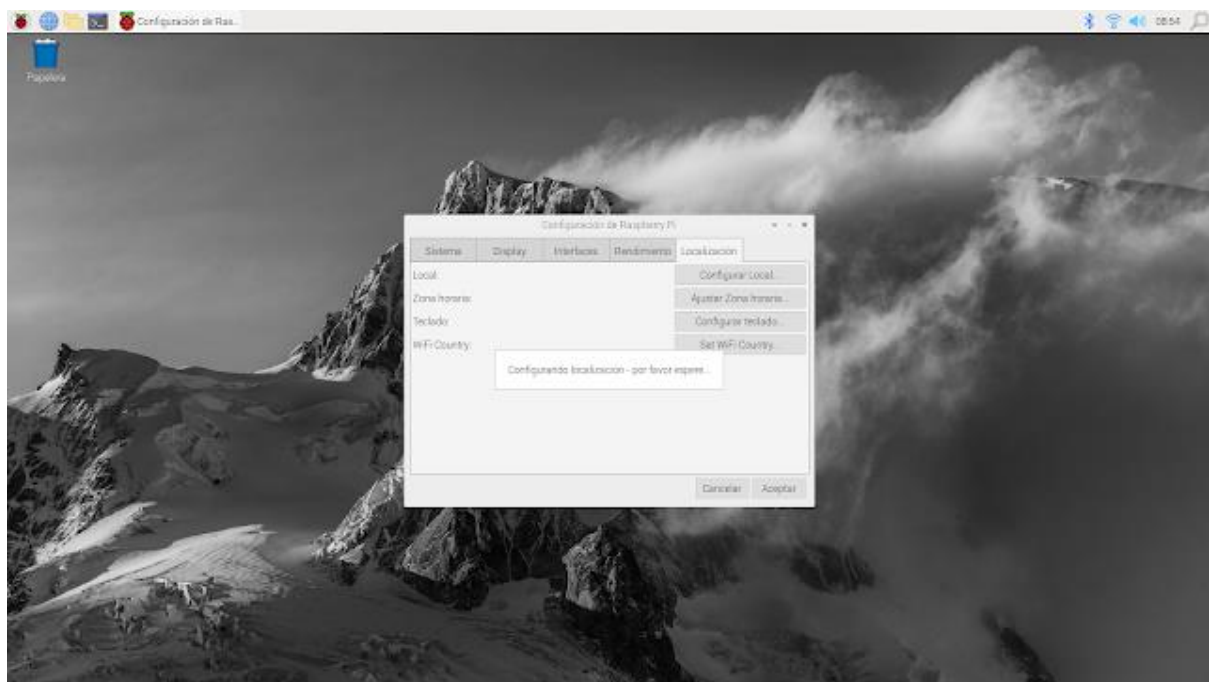
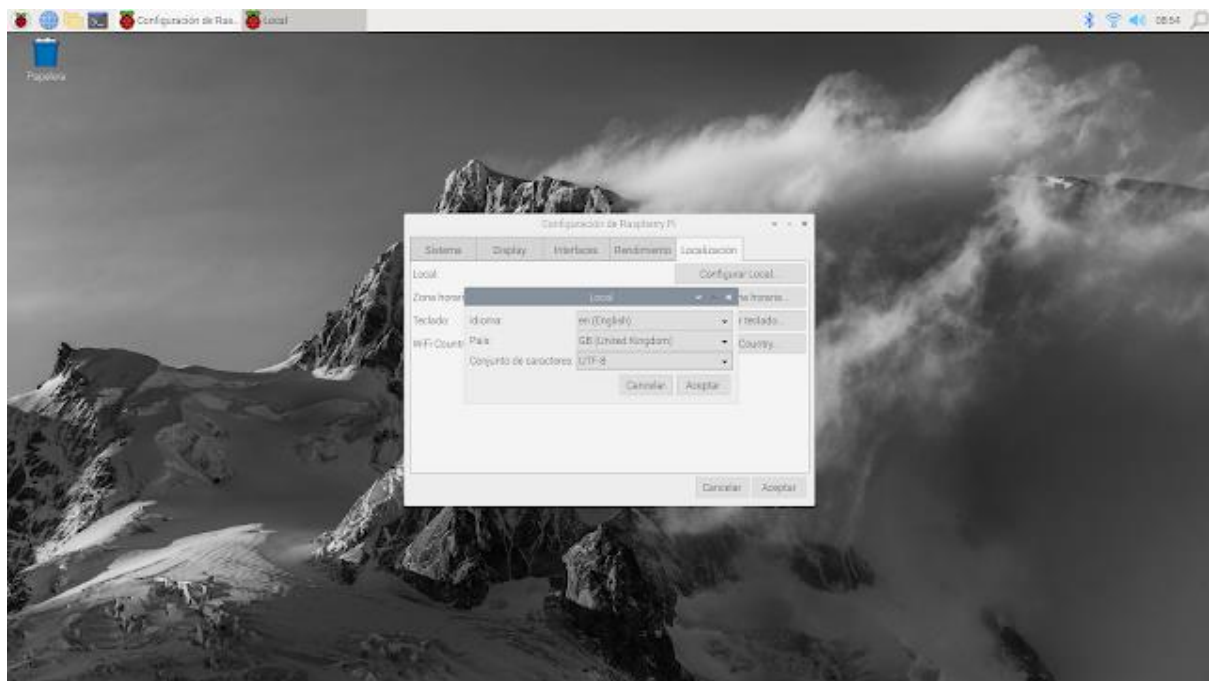


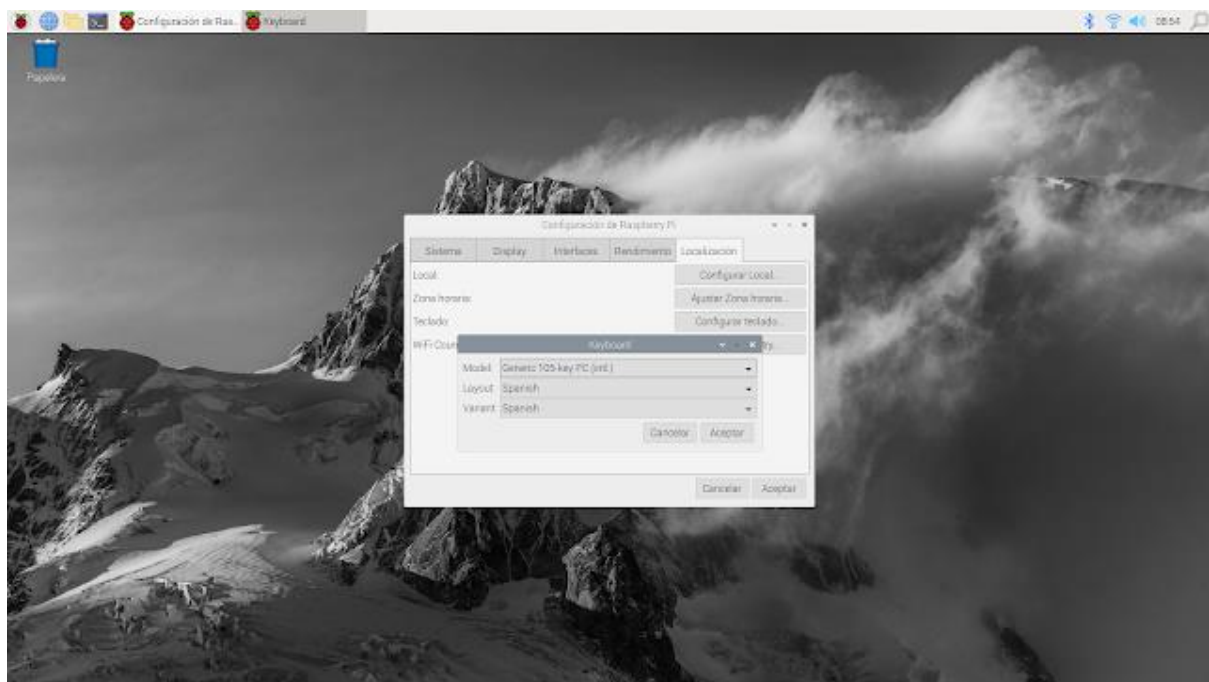
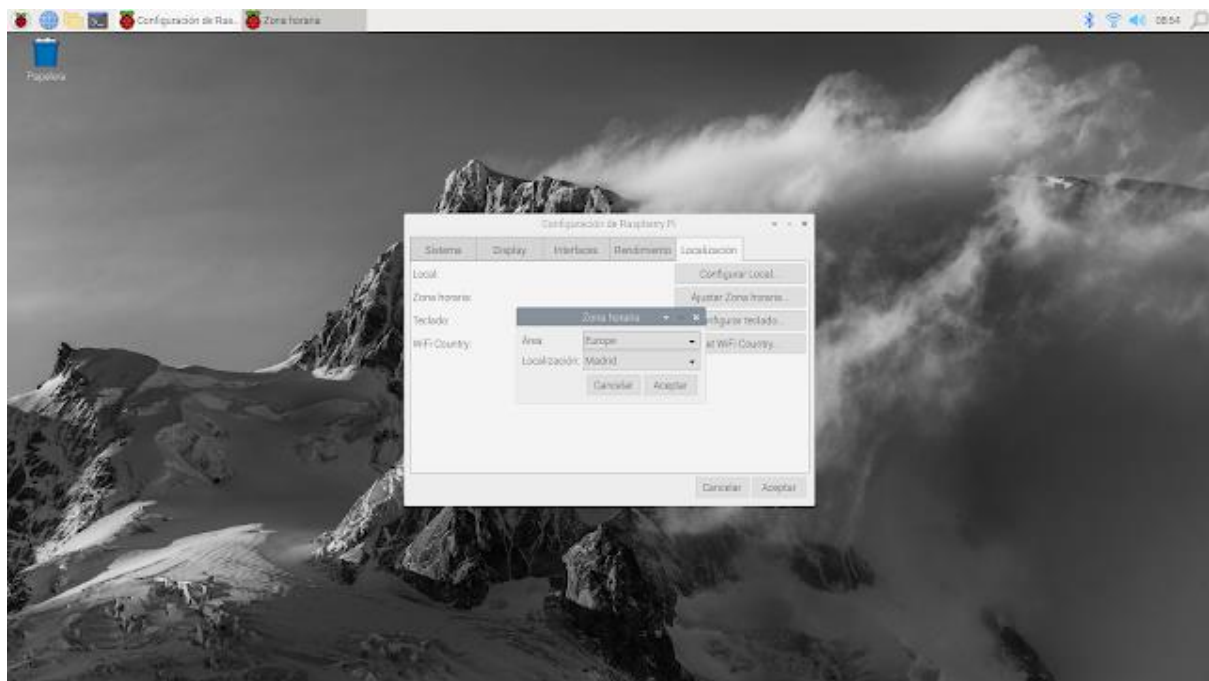
I change the language configuration, and I keep the keyboard in Spanish. So I click on the Raspberry Pi on the top left corner, and I click on Preferences → Raspberry Pi Configuration → "Localisation" tab. I changed the language and checked the other localisation settings.

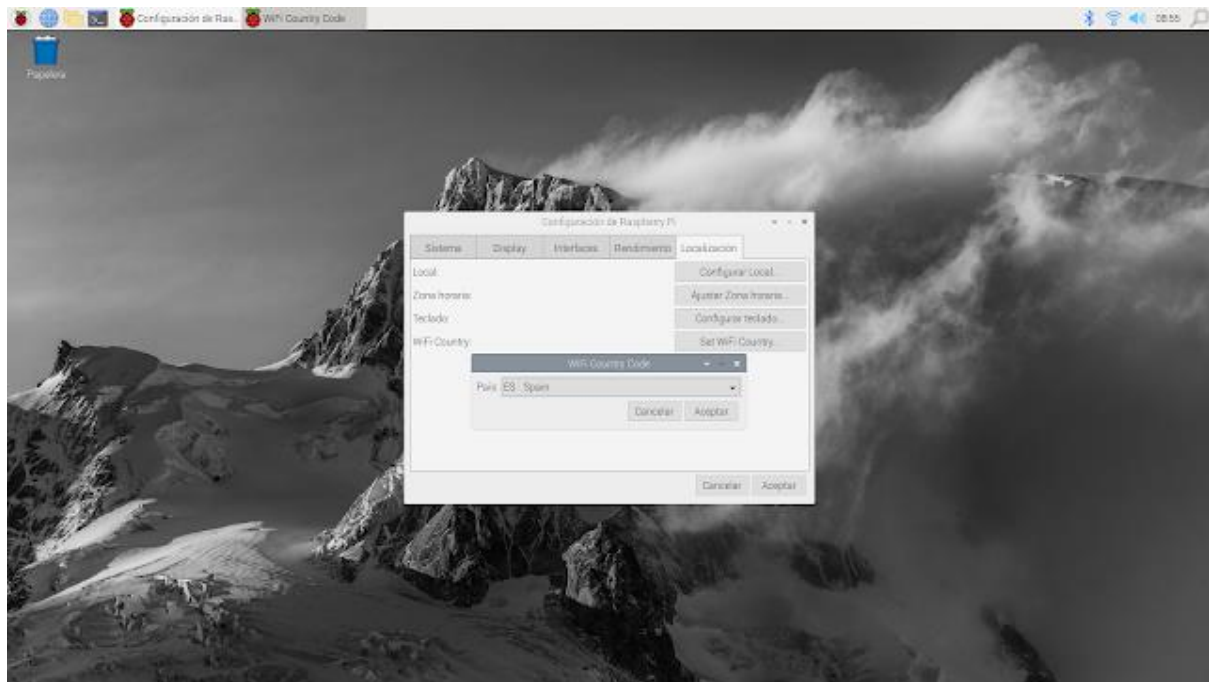










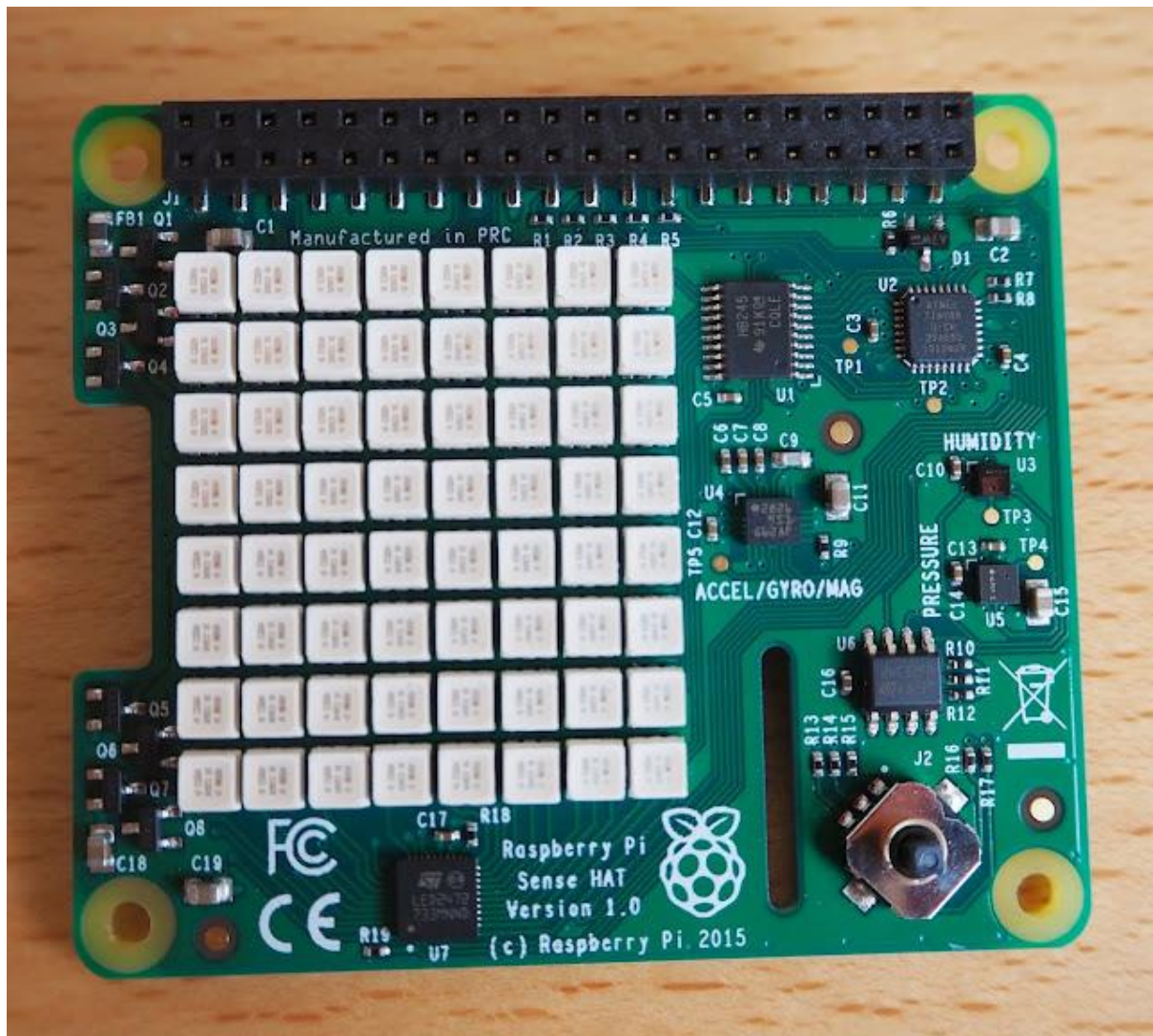


## Sense HAT

There is detailed information on installing the Sense HAT on Raspberry Pi and programming it, for example, in [The official Raspberry Pi Beginner's Guide](#), chapters 7.

My Sense HAT:







Four spacers and eight screws. They come with the Sense HAT. The spacers are meant to prevent the Sense HAT from bending and flexing when using the joystick.



*Warning: HAT modules should only be plugged into and removed from the GPIO header while the Raspberry Pi is switched off and disconnected from its power supply.*

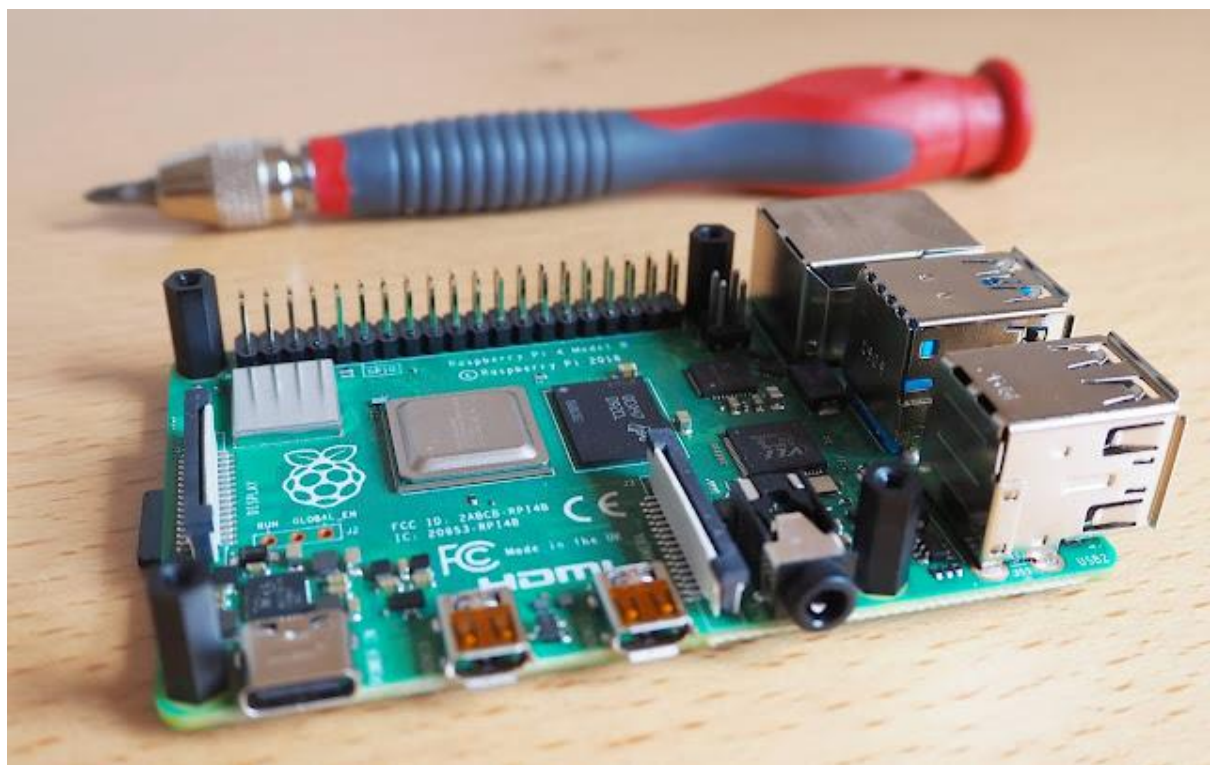
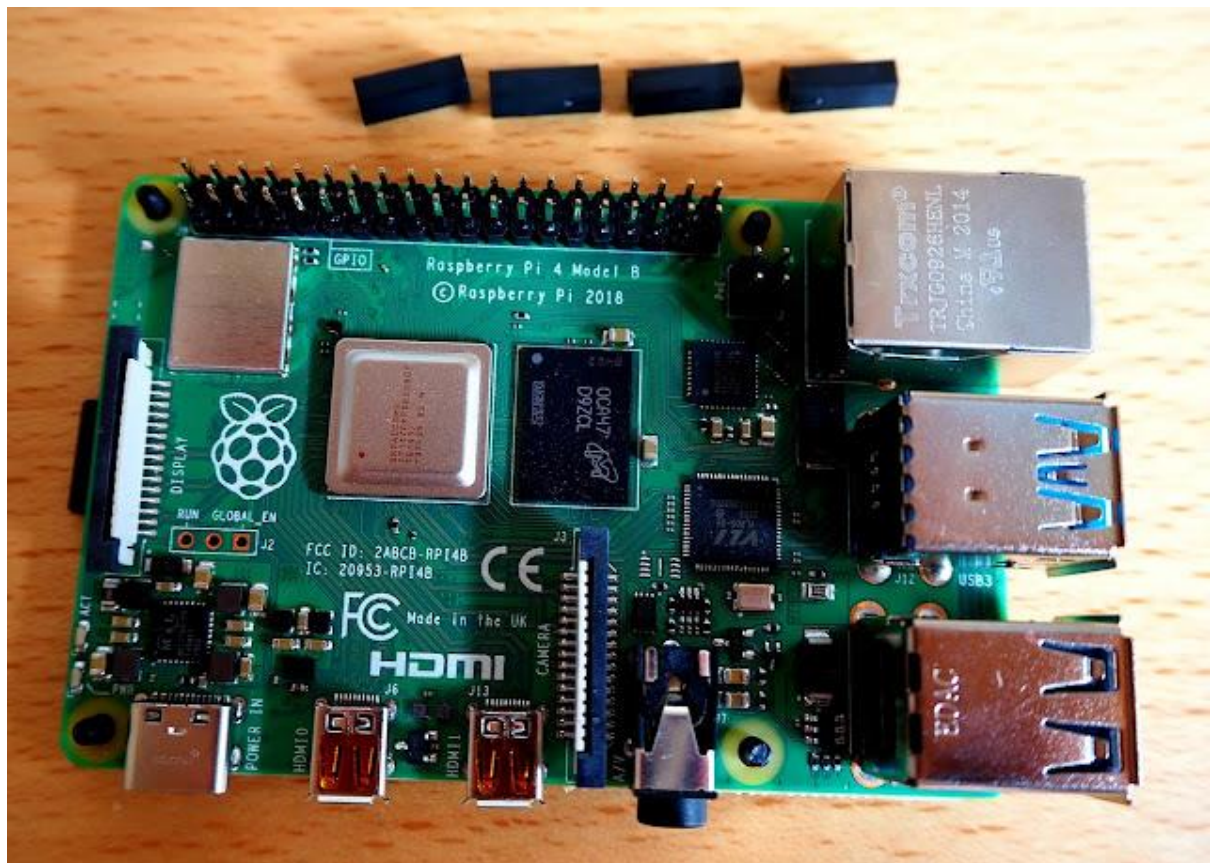
After switching my Raspberry Pi off and removing the gadgets attached, I push four screws up from underneath the bottom of my Raspberry Pi through the four mounting holes at each corner (yellow).



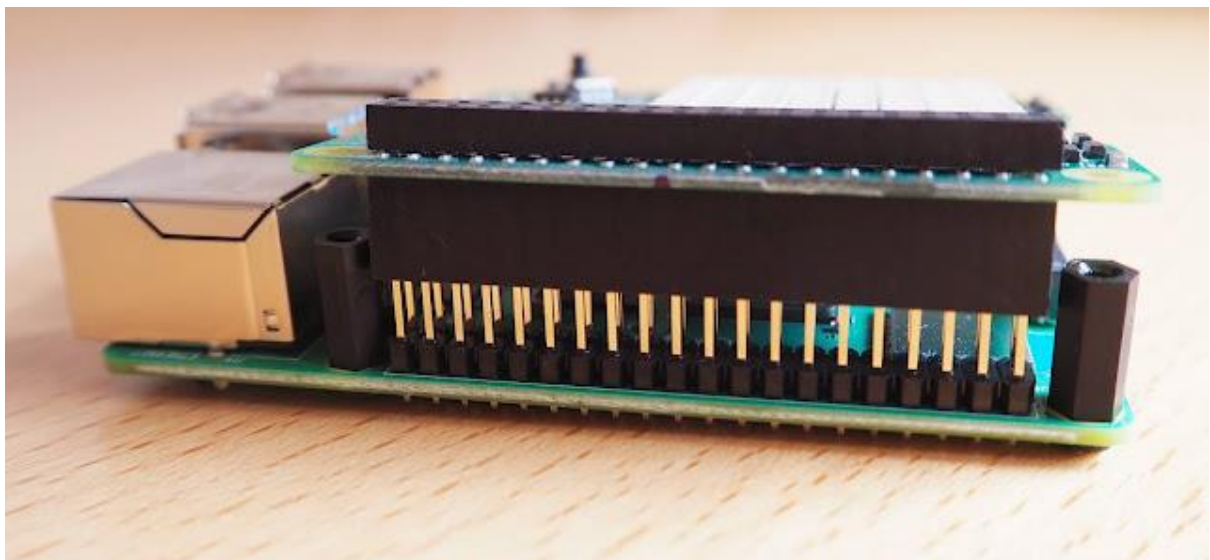
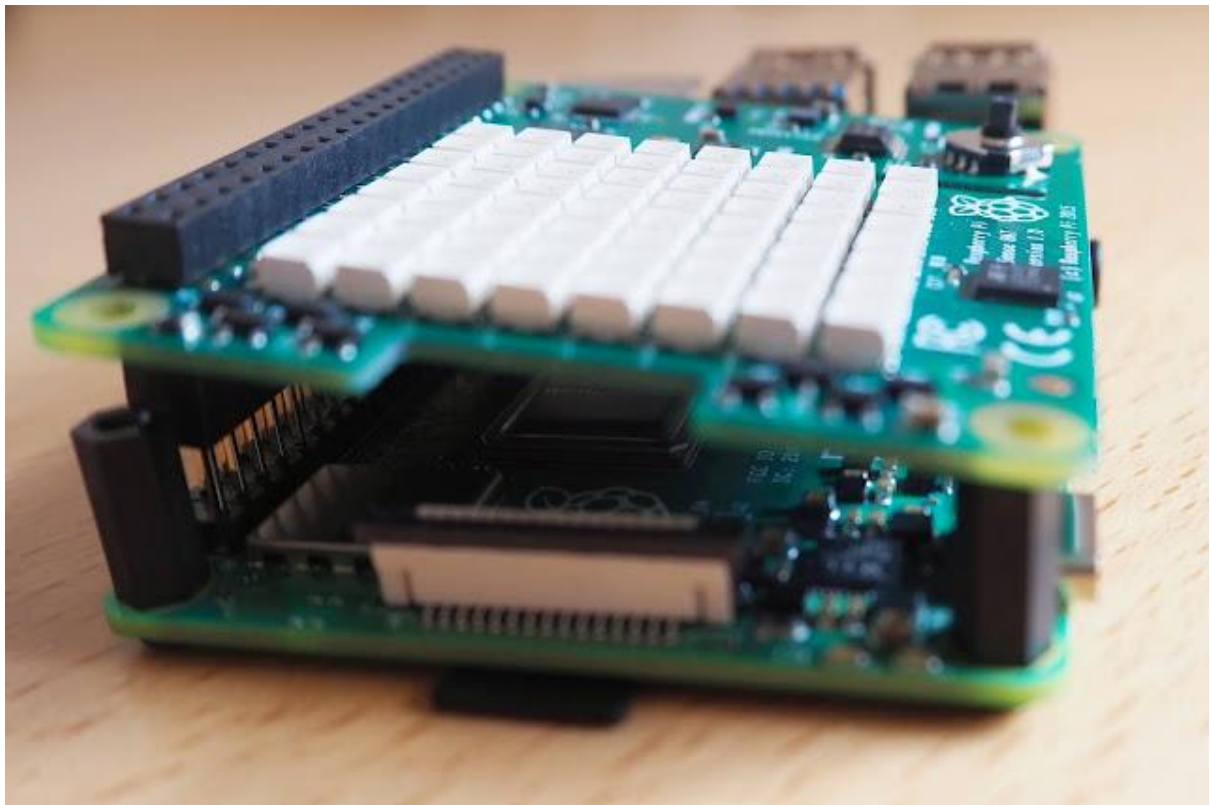


Then I twist the spacers on the screws. I use a screwdriver to tighten the screws.

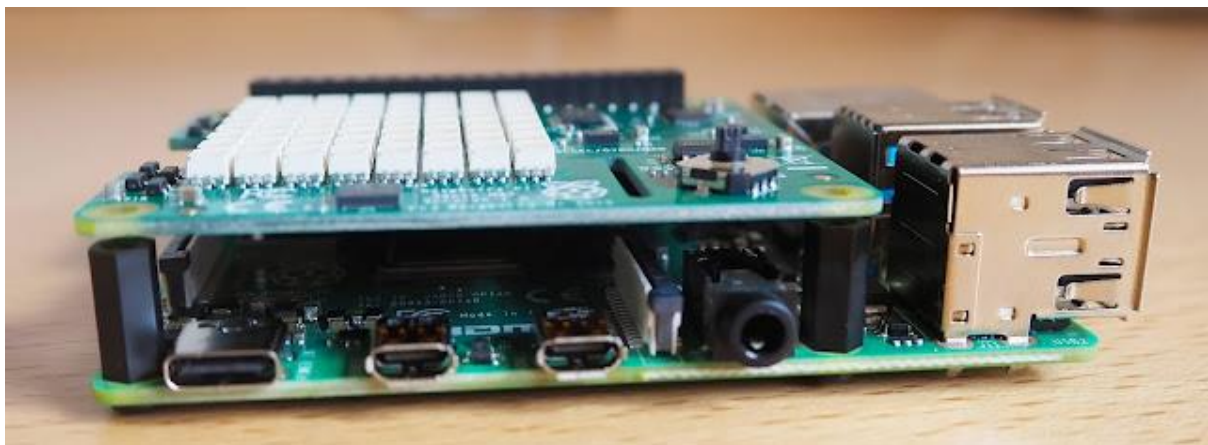




Next, I push the Sense HAT down onto Raspberry Pi's GPIO header. I line it up with the pins underneath, trying to keep it as flat as possible.



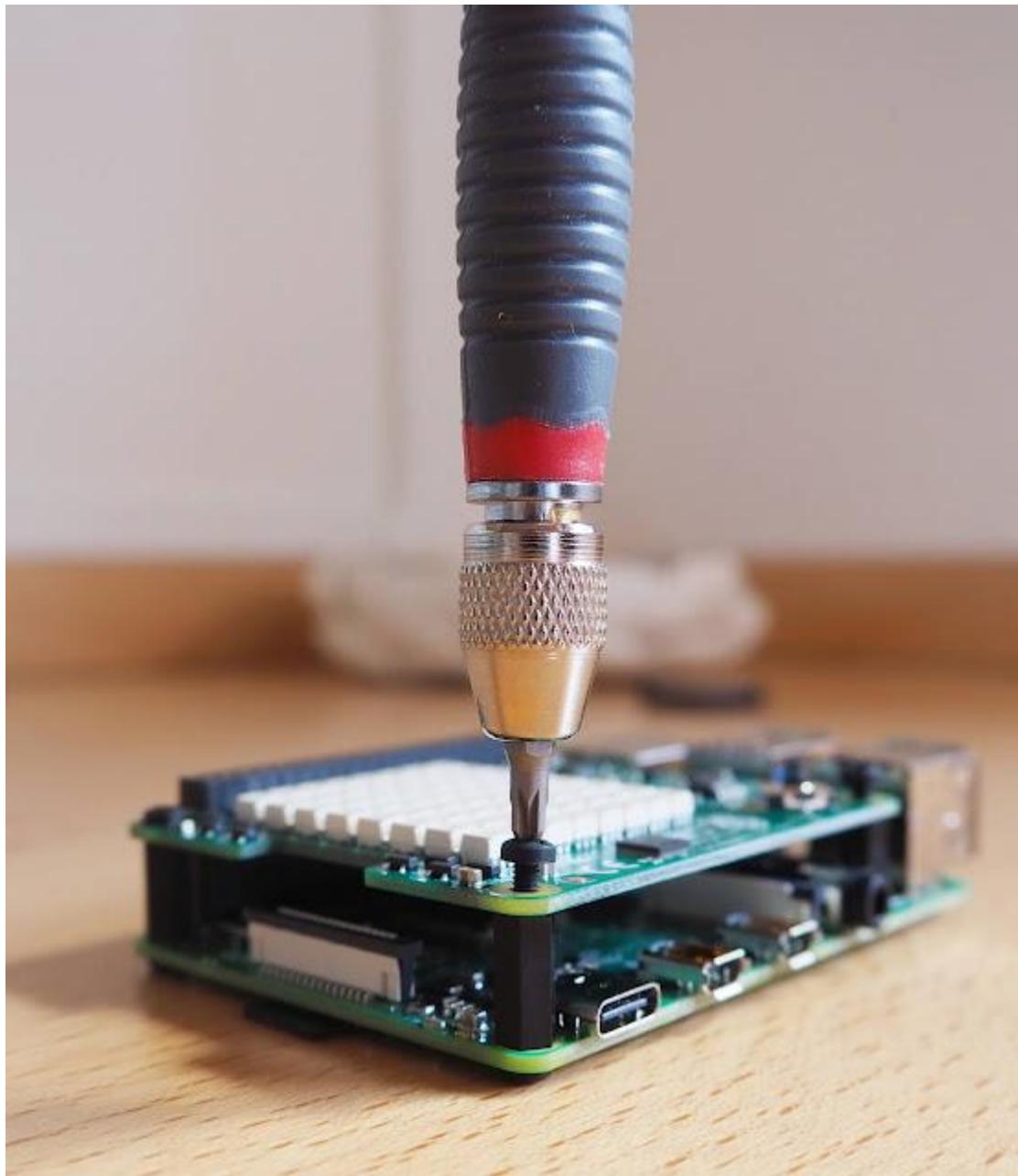


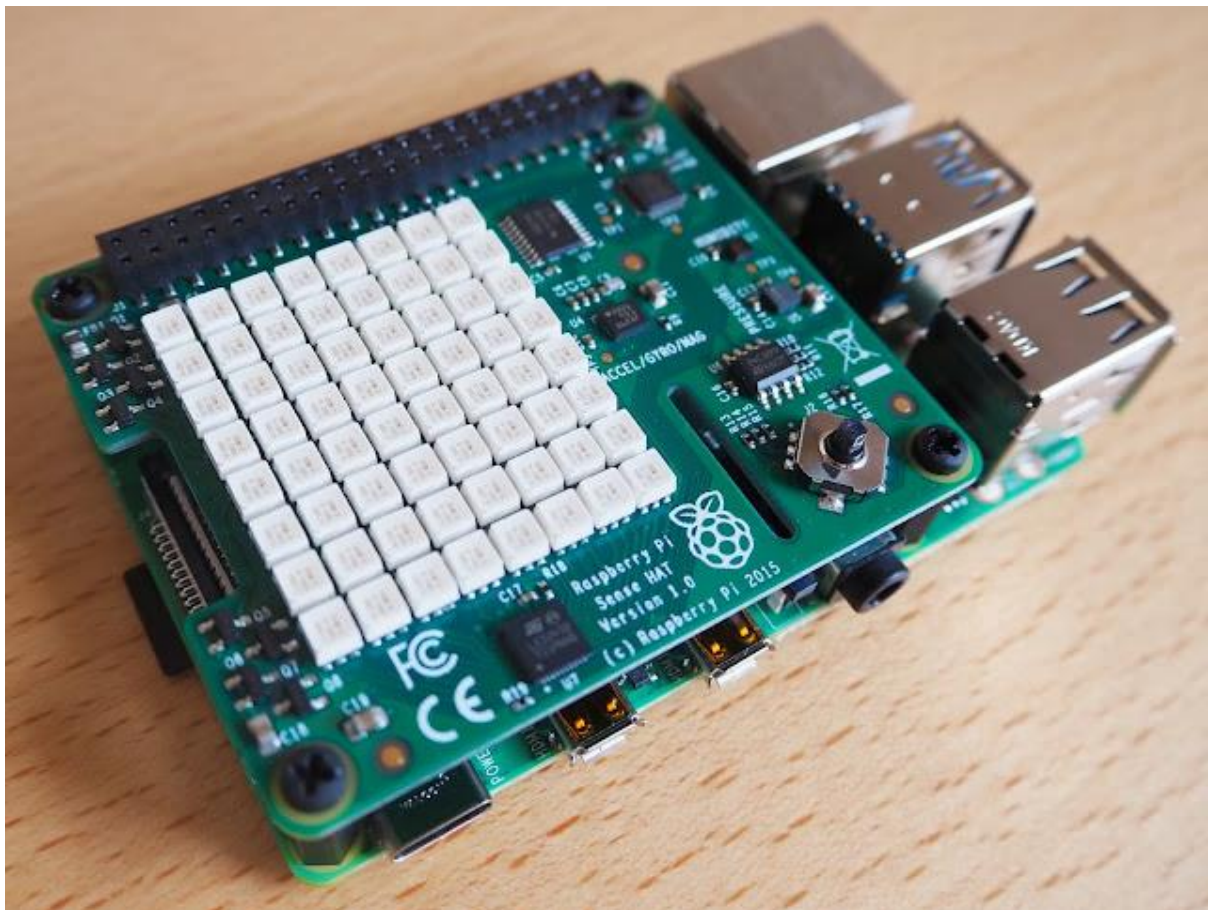
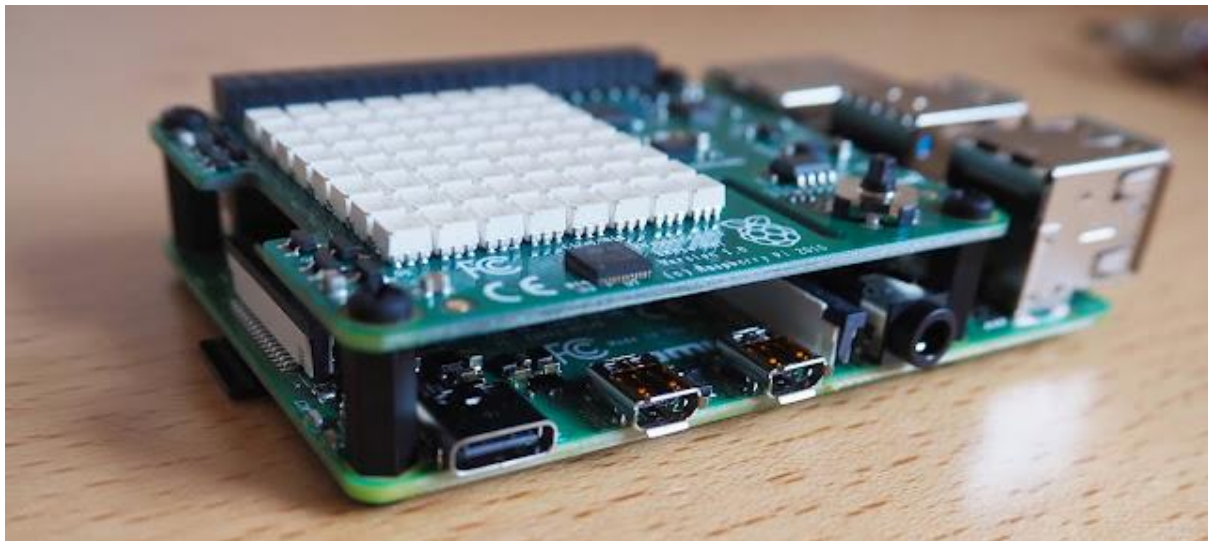




Later I screw the final four screws through the mounting holes in the Sense HAT (yellow) and into the spacers.

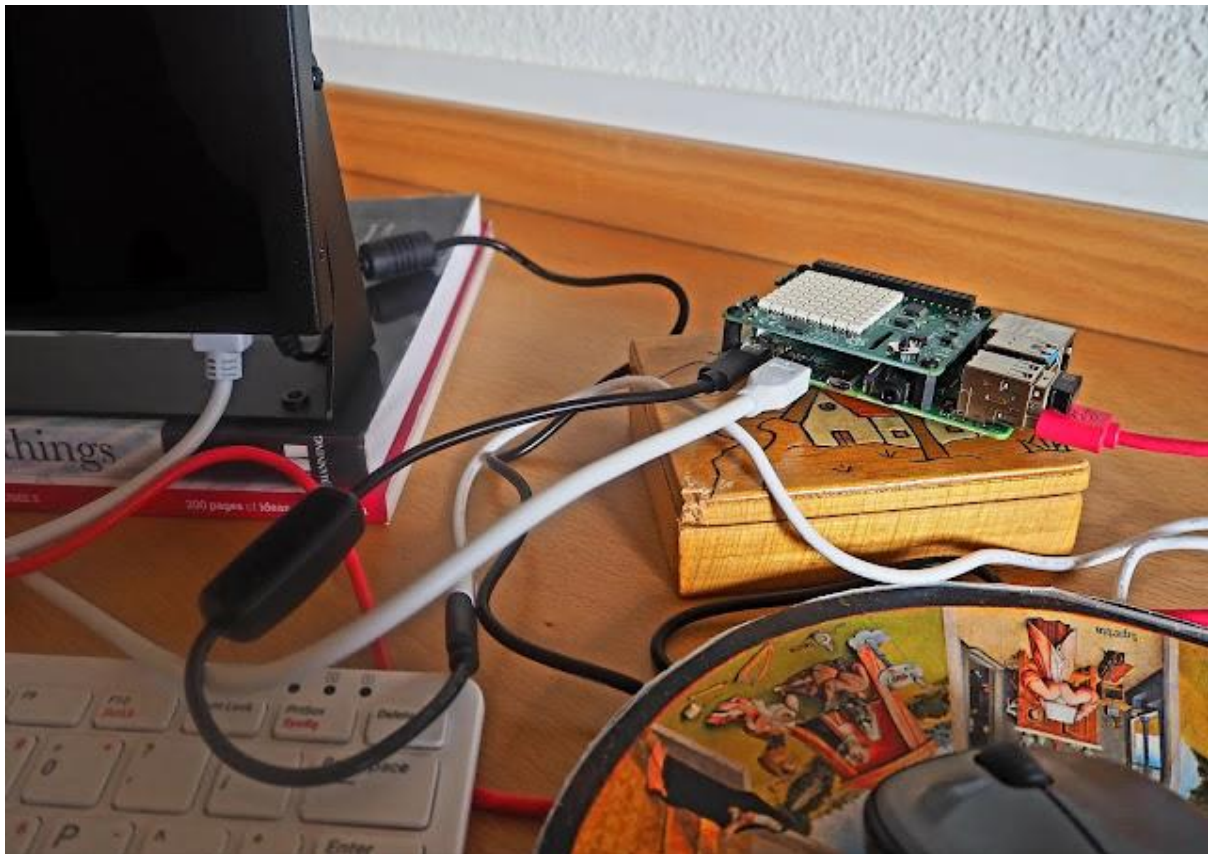




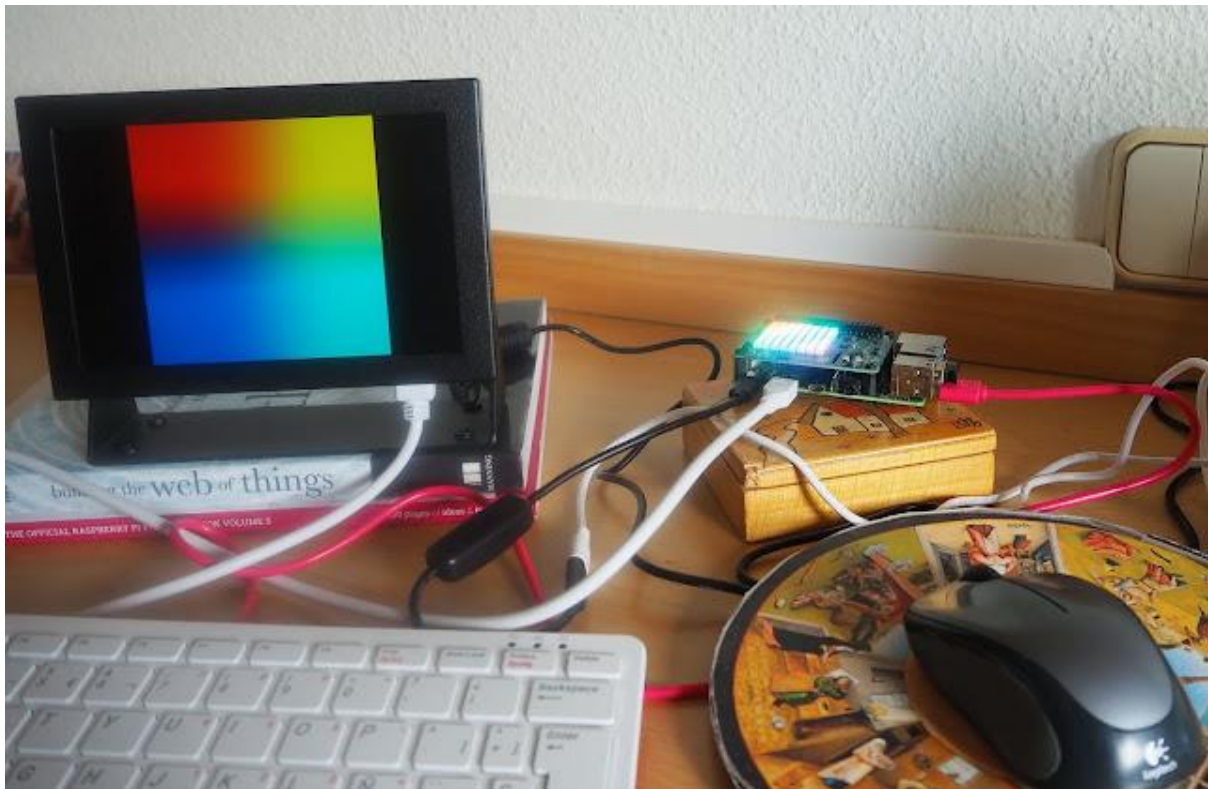


Finally, as shown in the previous section, I plug all the gadgets back to Raspberry Pi (mouse, keyboard, screen and the power supply) and plug the power back in.









**Tah-dah!**

## References

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