

Féidearthachtaí as Cuimse
Infinite Possibilities

Week 8

Raspberry Pi

Fundamentals of IoT
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Lesson Outline

- We're going to introduce the full-size Raspberry Pi this week
- Raspberry Pi programming with gpiozero
- We'll also review MQTT in preparation for this week's lab!
- We should have time to talk a bit about the lab at the end

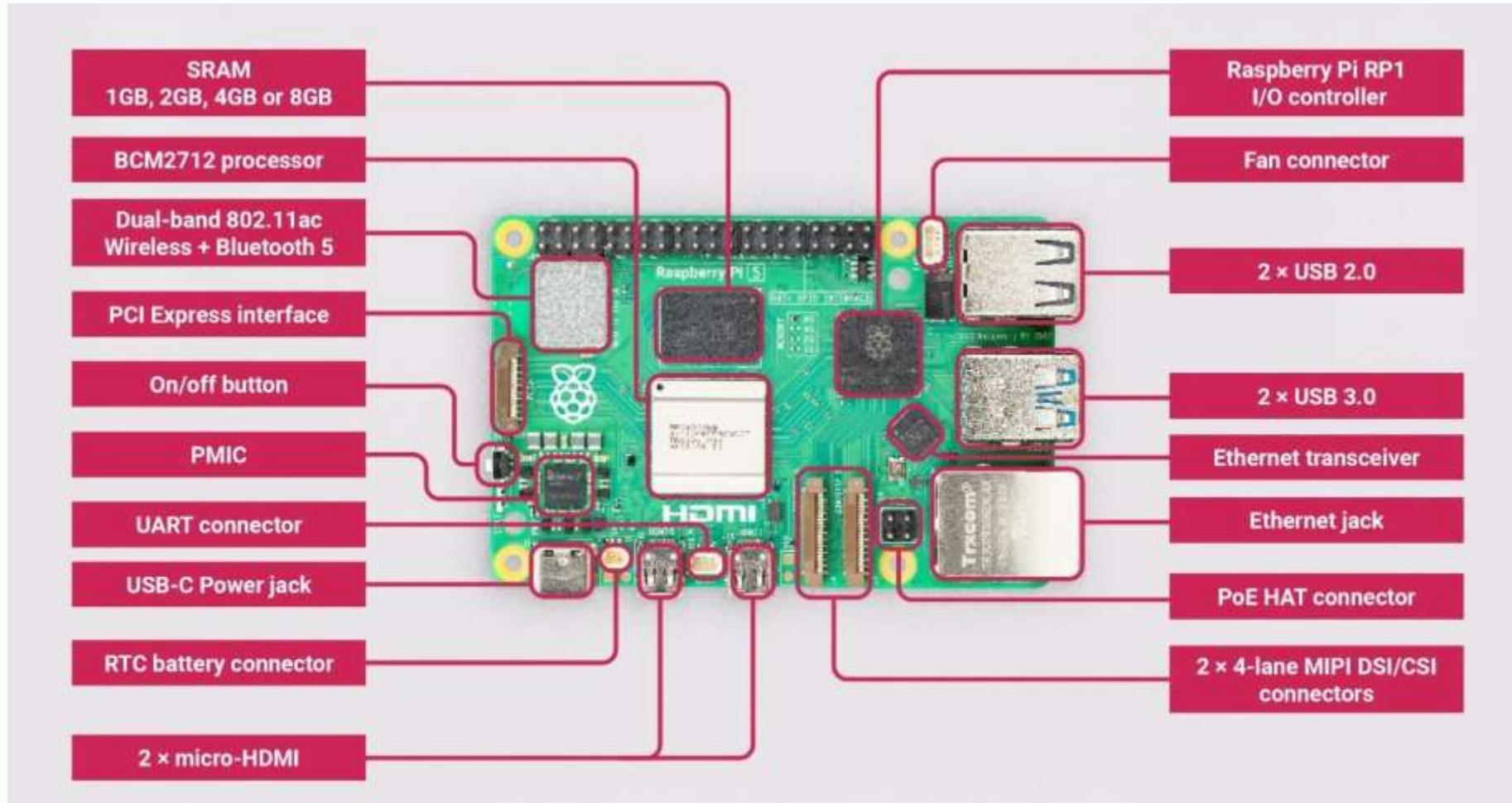
Raspberry Pi

A single-board computer, but very unlike the Pico!

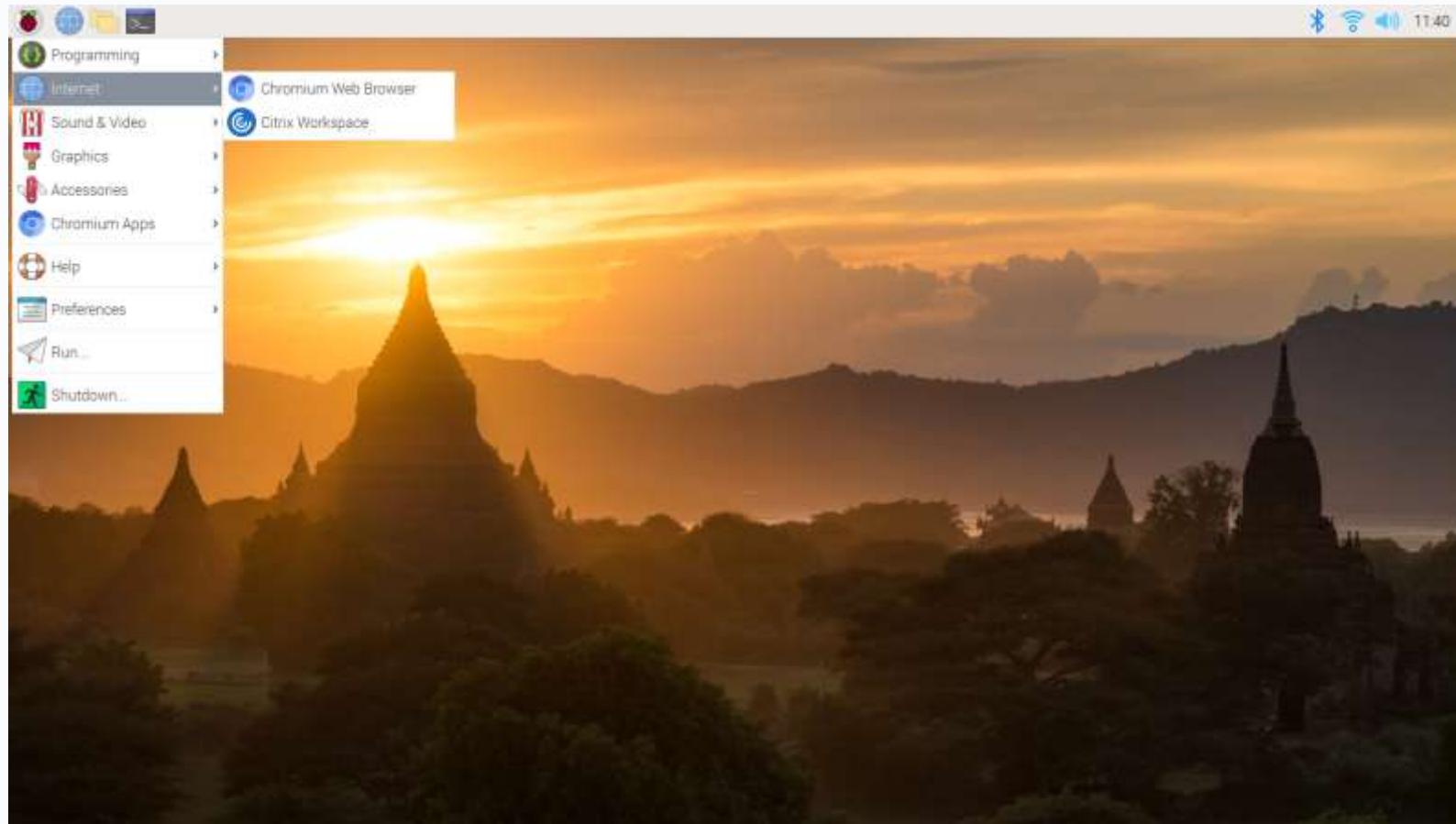
Raspberry Pi 5 specs

- 2.4 GHz 64-bit Arm processor (Broadcom SoC with 4 Cortex-A76 cores)
- 800 MHz GPU
- 4 or 8GB of RAM
- USB, Wifi, Gigabit Ethernet, support for OpenGL and Vulkan
- But no built-in secondary storage (we have SD cards, can also boot over the network or USB)

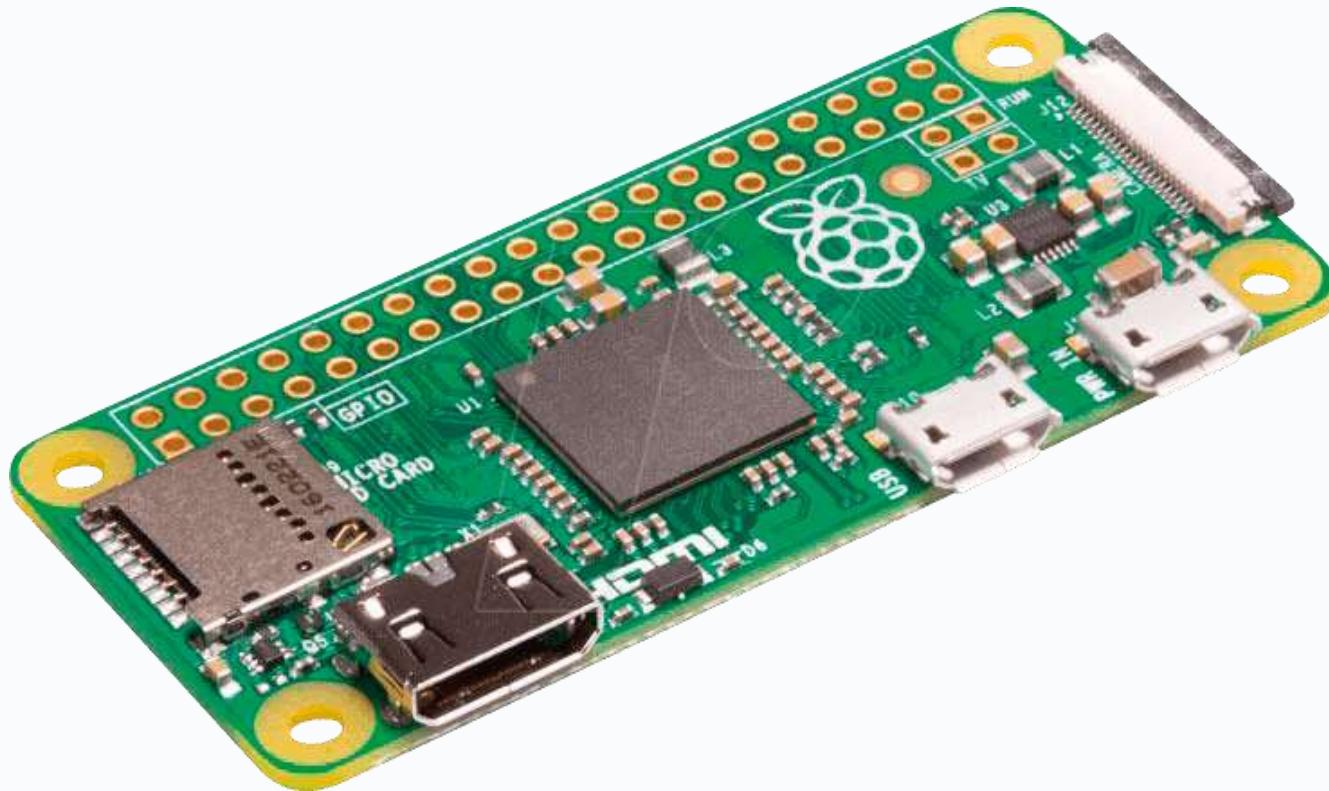
Raspberry Pi 5 diagram



It runs Linux!



Raspberry Pi Zero



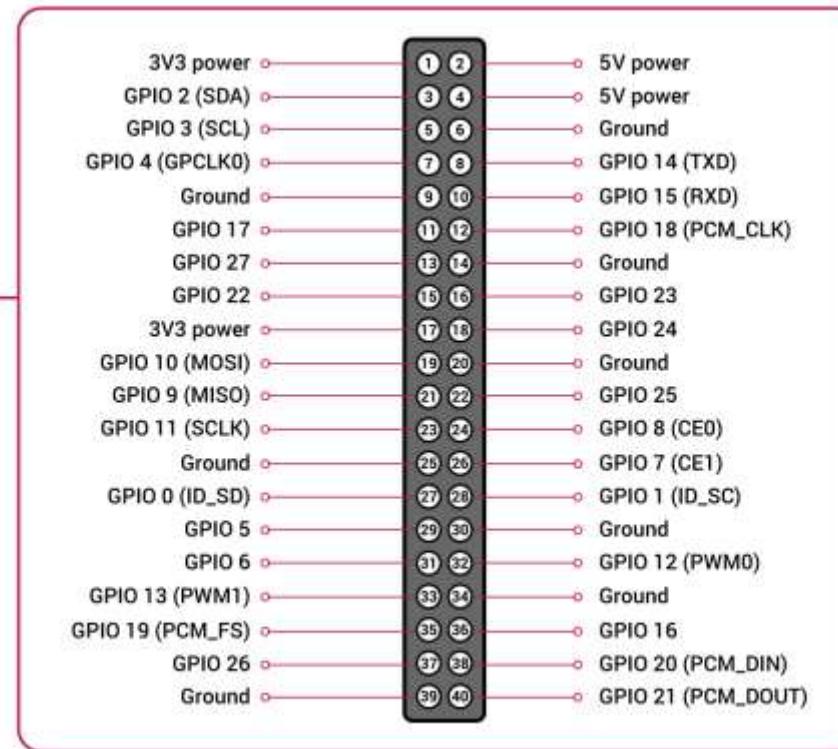
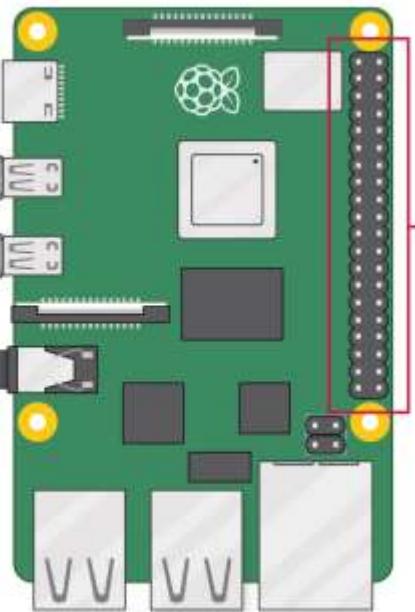
Raspberry Pi 400



GPIO on the Raspberry Pi

The Pi's GPIO facilities are similar to the Pico's

Raspberry Pi GPIO pinout



Note the distinction
between the
Broadcom and Board
naming schemes –
this is important!

Libraries

- A number of GPIO libraries exist for the Pi, and support a wide range of languages
- The actual GPIO is controlled from userspace via ioctls into a kernel module
- Both low-level and high-level APIs have been implemented on top of this for a range of languages

gpiozero

Very easy to use Python GPIO library

Controlling an LED

```
import gpiozero  
  
my_led = gpiozero.LED(17)  
  
my_led.on()  
my_led.off()
```

Blinking an LED

```
import gpiozero, time

my_led = gpiozero.LED(17)

while True:
    my_led.on()
    time.sleep(1)
    my_led.off()
    time.sleep(1)
```

PWM LED control

```
import gpiozero  
  
led = gpiozero.PWMLED(12)  
  
led.value = 0.5
```

Toggle an LED with a button

```
import gpiozero

button = gpiozero.Button(17)
led = gpiozero.LED(2)

while True:
    button.wait_for_press()
    led.toggle()
```

Callbacks for hardware events

```
import gpiozero

def pressed():
    print('You pressed the button')

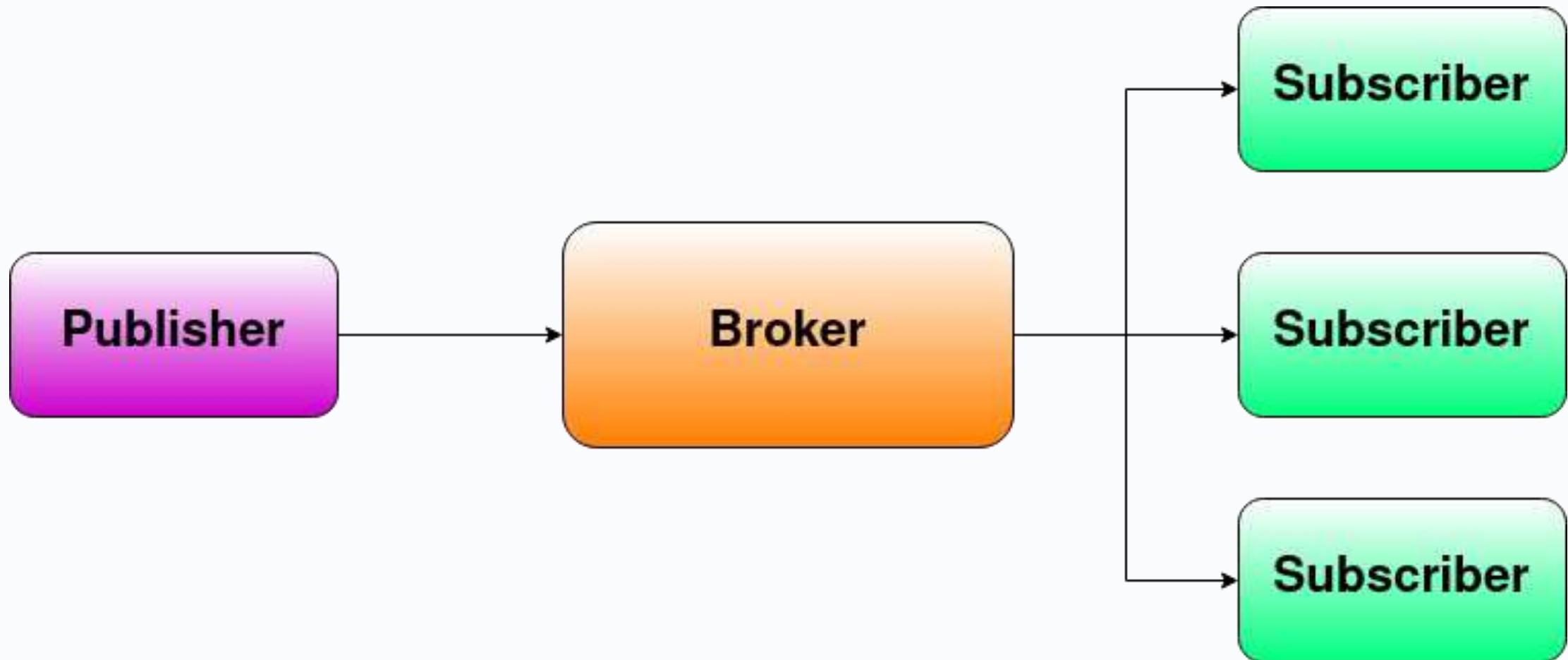
def released():
    print('You released the button')

button = gpiozero.Button(10)
button.when_pressed = pressed
button.when_released = released
```

MQTT overview

You'll need to understand MQTT for the lab, so let's review it!

MQTT



Motor controller

A device used to control an electric motor

Motor controller



A device to control an electric motor. For example, the one shown to the left is used to control the lens of a digital camera. Why might we need such a device? Why not wire the motor directly to the GPIO pins? Where have we seen a motor controller before?

Summary

- Introduced the Raspberry Pi
- Gave you a taste of programming the GPIO facilities. All other types of programming are the same as on a normal PC or laptop: it is just an ordinary computer running Linux!
- Reviewed about MQTT
- Introduced motor controllers, a new type of component, which is a device that controls one or more electric motors

That's all for this week

Thanks for your attention!