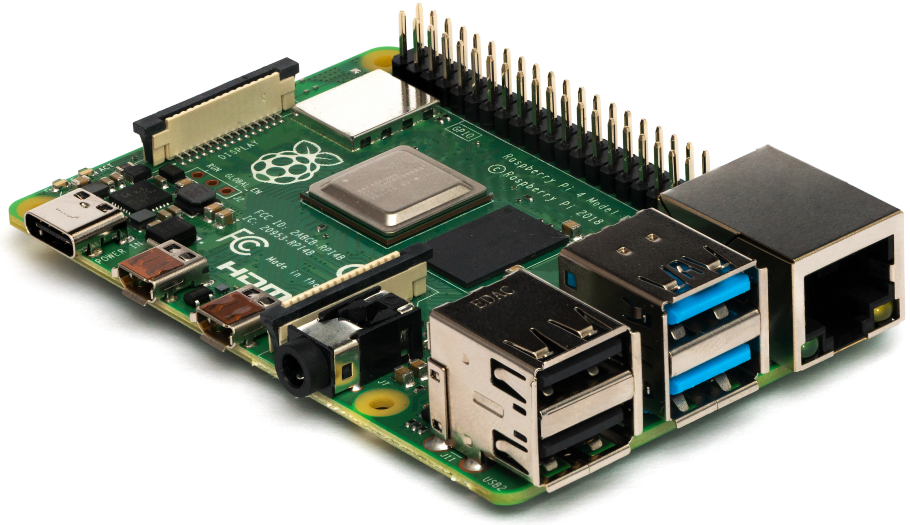
Intro to the Raspberry Pi

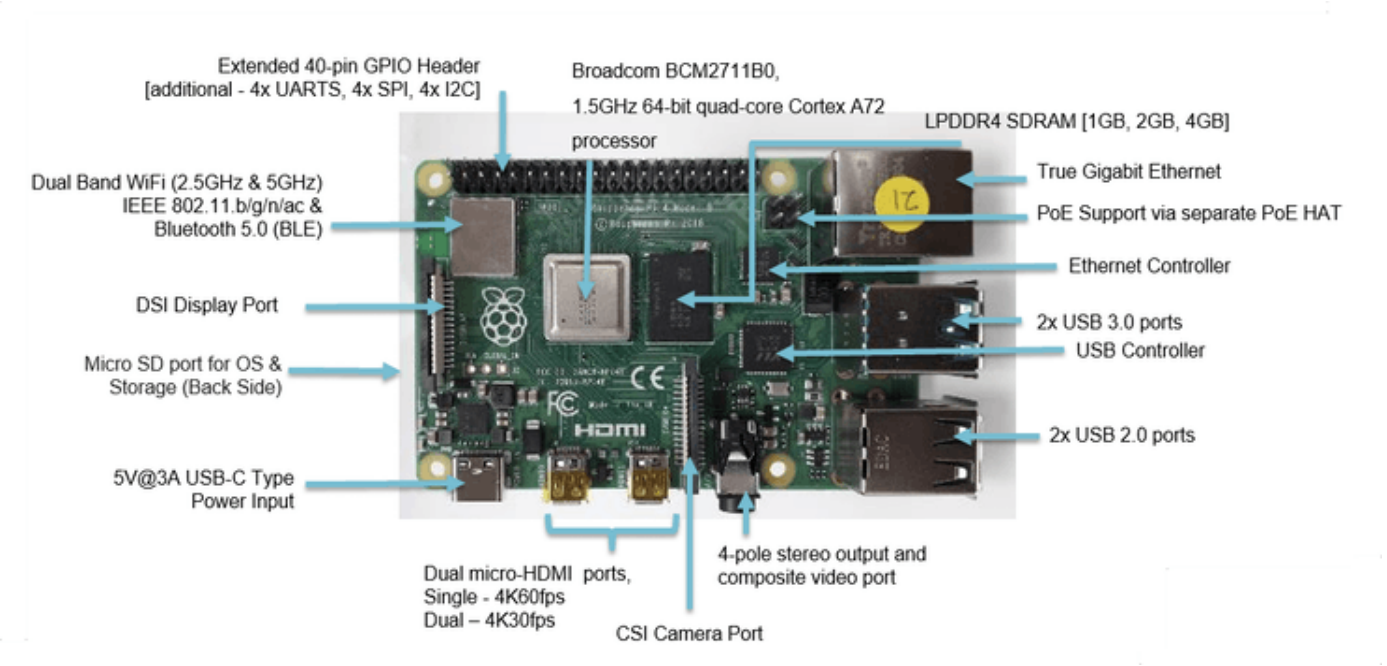


https://en.m.wikipedia.org/wiki/File:Raspberry_Pi_4_Model_B_-_Side.jpg

Why is it so popular

- Inexpensive $35 -$55 US.
- Small about the size of a credit card
- Quiet - mostly does not require a fan
- Exposes gpio allowing us to build electronics and Internet of Things projects
    - A focus on building and learning as opposed to mostly consumption
- Tremendous support
    - By December 2019, a total of 30 million devices had been sold
- Easily swappable "hard drive" e.g. micro SD Card. Which allows changing all the software easily.

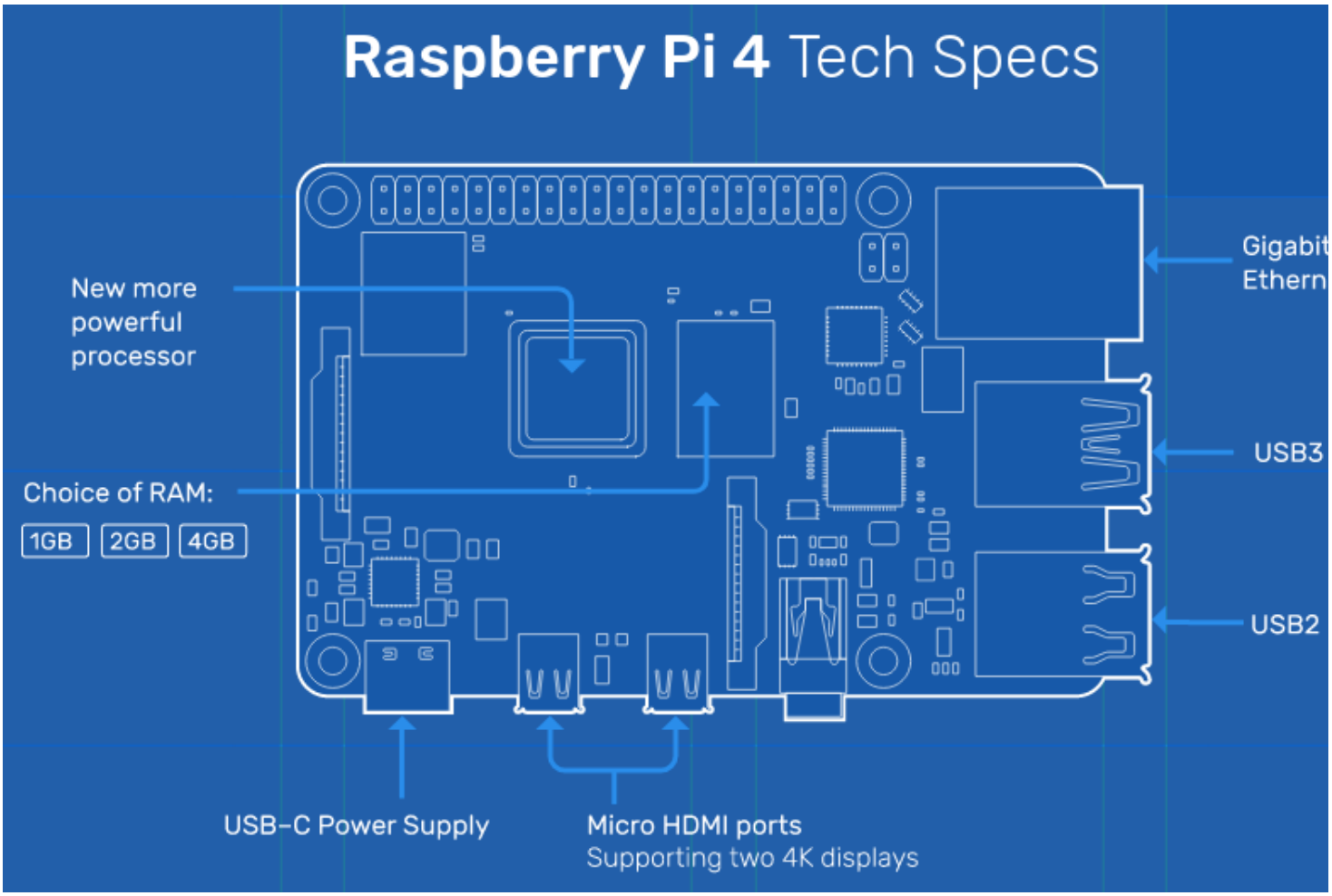
What it is



Pi 4B

https://www.hackster.io/news/meet-the-new-raspberry-pi-4-model-b-9b4698c284

Specs



https://www.raspberrypi.org/products/raspberry-pi-4-model-b/specifications/

- Broadcom BCM2711, Quad core Cortex-A72 (ARM v8) 64-bit SoC @ 1.5GHz
- 1GB, 2GB or 4GB LPDDR4-3200 SDRAM
- 2.4 GHz and 5.0 GHz IEEE 802.11ac wireless, Bluetooth 5.0, BLE
- Gigabit Ethernet
- 2 USB 3.0 ports; 2 USB 2.0 ports.
- Raspberry Pi standard 40 pin GPIO header (fully backwards compatible with previous boards)
- 2 × micro-HDMI ports (up to 4kp60 supported)
- 2-lane MIPI DSI display port
- 2-lane MIPI CSI camera port
- 4-pole stereo audio and composite video port
- H.265 (4kp60 decode), H264 (1080p60 decode, 1080p30 encode)
- Power over Ethernet (PoE) enabled (requires separate PoE HAT)

- ...

What you need to make it run

- Headless - running without a monitor, keyboard or mouse. Control is via the network - VNC or SSH.
  - A micro SD card with an operating system on it. I recommend you start with Raspbian - either the image or NOOBS. NOOBS is easy. Copy all the files to an empty micro SD card and boot it. Copying the image requires extra software for Windows. The end result is the same.
  - A power supply 5V 3Amps USB C connection
- With a Keyboard and Monitor - the above and

See: https://www.amazon.ca/dp/B014EUQOGK/ref=cm_sw_r_other_apa_i_4EQTEbPBJS945

I find it easier to get the software installed and finding the IP address - then go headless if you want. Other Opinions?

  - A USB keyboard and mouse
  - An HDMI monitor or TV.
  - An HDMI to micro HDMI cable
- A case is nice, but not required if you have a secure location for your pi.

Getting Started

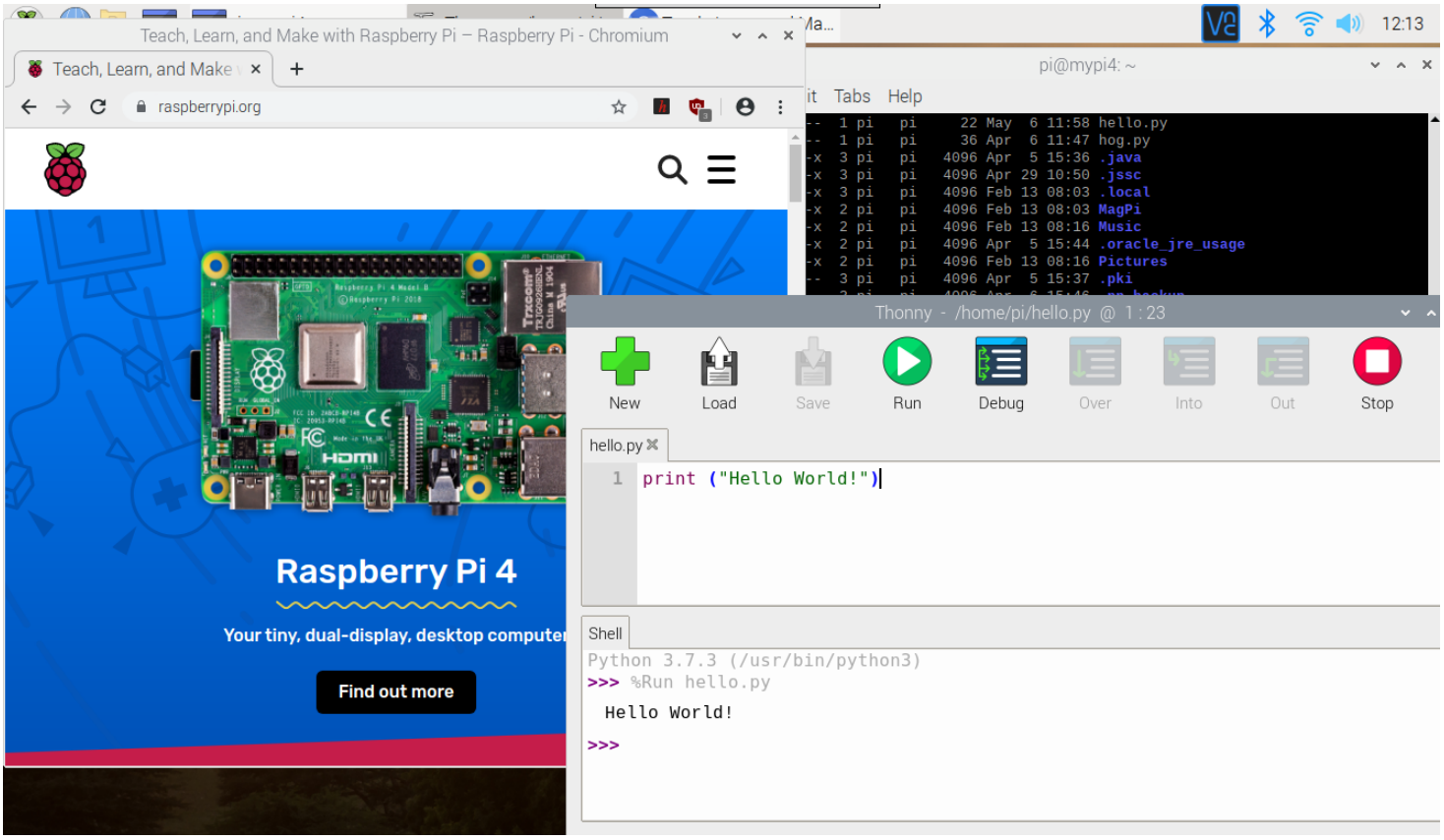
- Install and Configure the OS
  - Untar and copy NOOBS to the micro SD card
  - Insert the SD card into the Pi

- Answer the questions as they come up

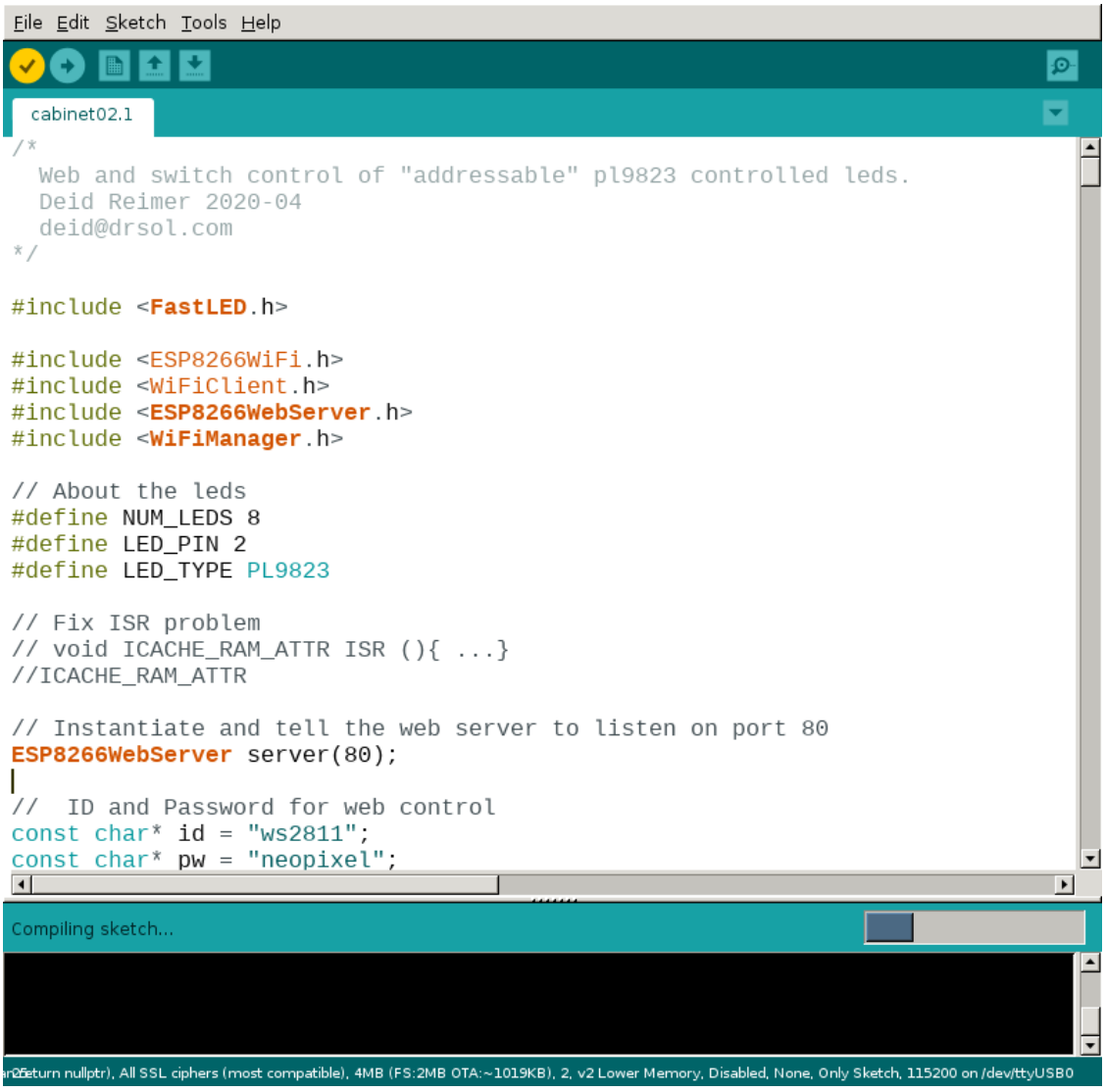
What to do with it

Simply Use it as a PC.

Of course as soon as you say this - infinite possibilities arise ...

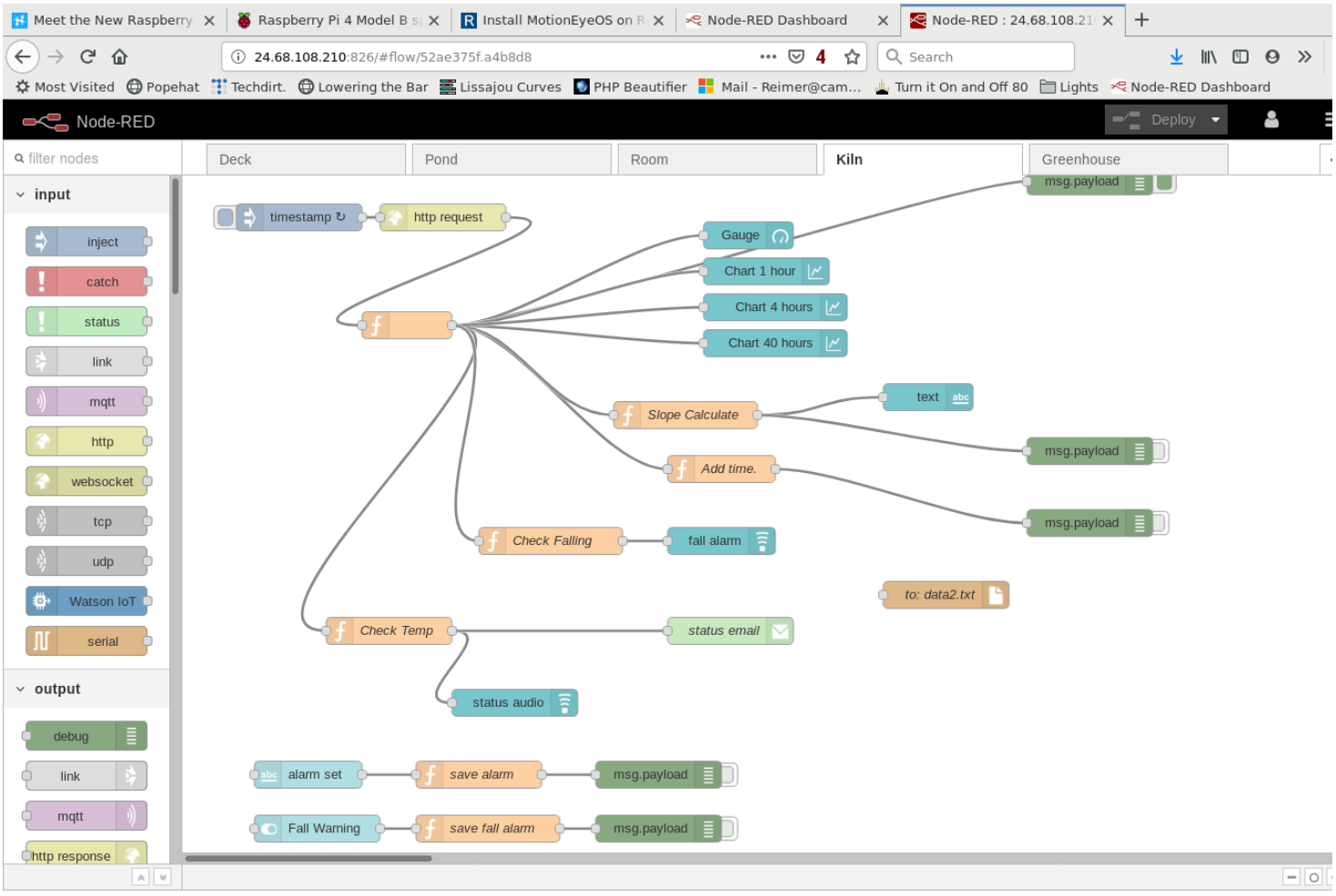


Program an Arduino or an ESP8266 or ESP32

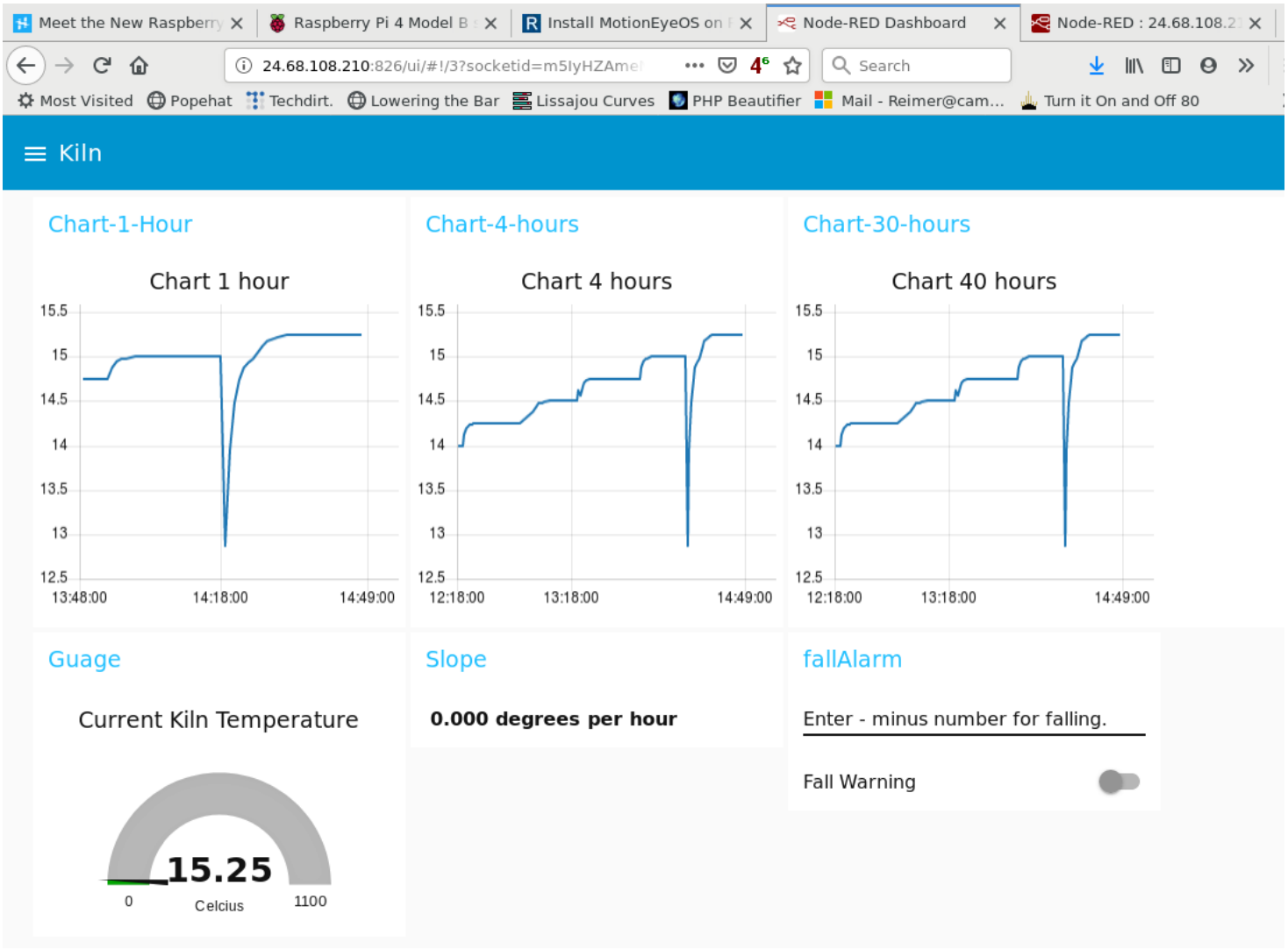


See: http://drsol.com/~deid/pi/leds/index.html

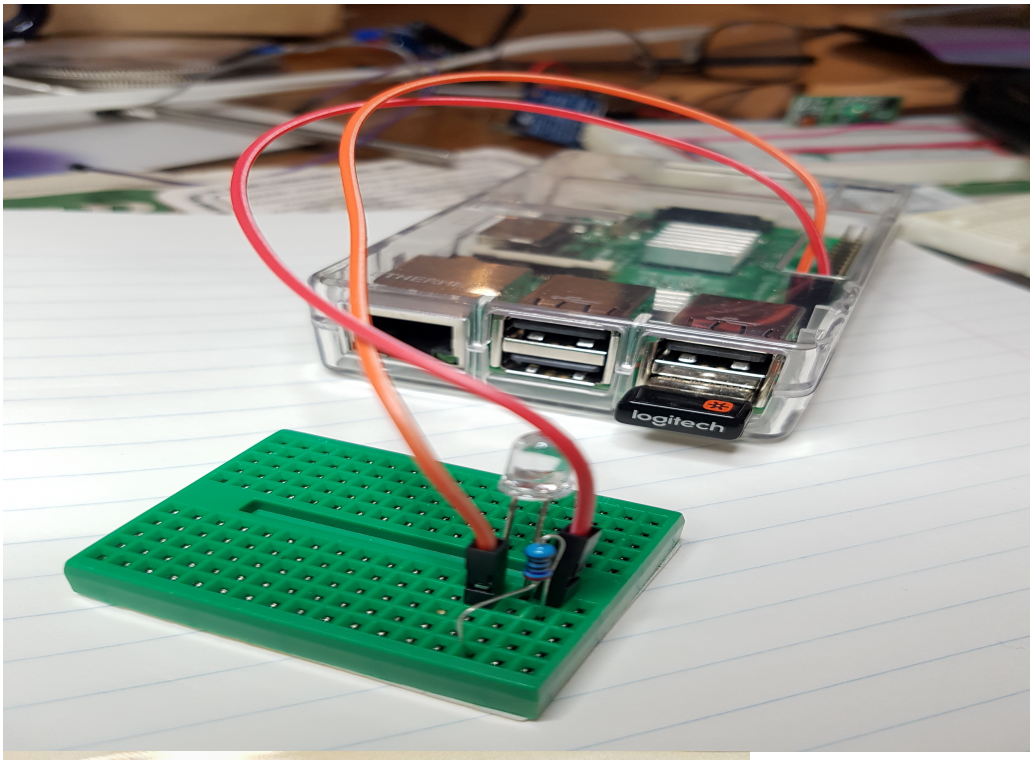
Run Node Red to capture data



- See: http://drsol.com/~deid/pi/Node-RED/index.html
- See: http://drsol.com/~deid/pi/Node-REDII/index.html



Control outputs and read input - first step to taking over the world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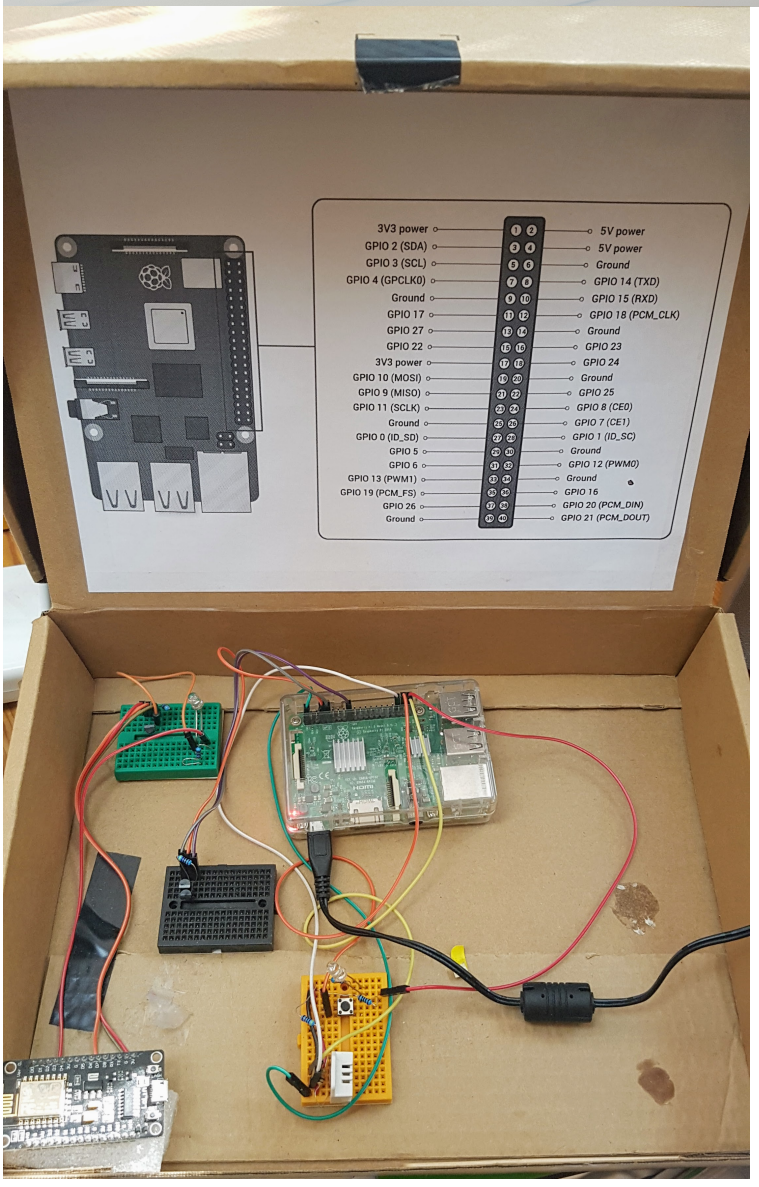
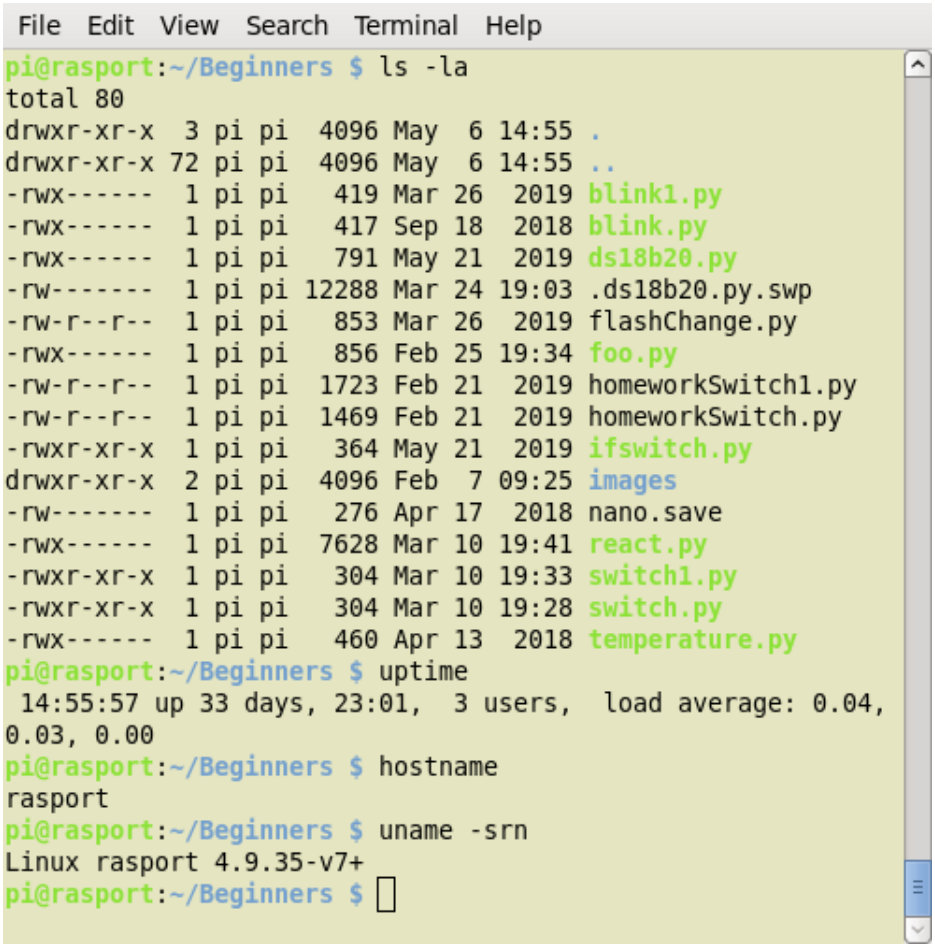

3V3 power
GPIO 2 (SDA)
GPIO 3 (SCL)
GPIO 4 (GPCLK0)
Ground
GPIO 17
GPIO 27
GPIO 22
3V3 power
GPIO 10 (MOSI)
GPIO 9 (MISO)
GPIO 11 (SCLK)
Ground
GPIO 0 (ID_SD)
GPIO 5
GPIO 6
GPIO 13 (PWM1)
GPIO 19 (PCM_FS)
GPIO 26
Ground
5V power
5V power
Ground
GPIO 14 (TXD)
GPIO 15 (RXD)
GPIO 18 (PCM_CLK)
Ground
GPIO 23
GPIO 24
Ground
GPIO 25
GPIO 8 (CE0)
GPIO 7 (CE1)
GPIO 1 (ID_SC)
Ground
GPIO 12 (PWM0)
Ground
GPIO 16
GPIO 20 (PCM_DIN)
GPIO 21 (PCM_DOUT)

See: http://drsol.com/~deid/pi/Beginners

Learn Linux and programming



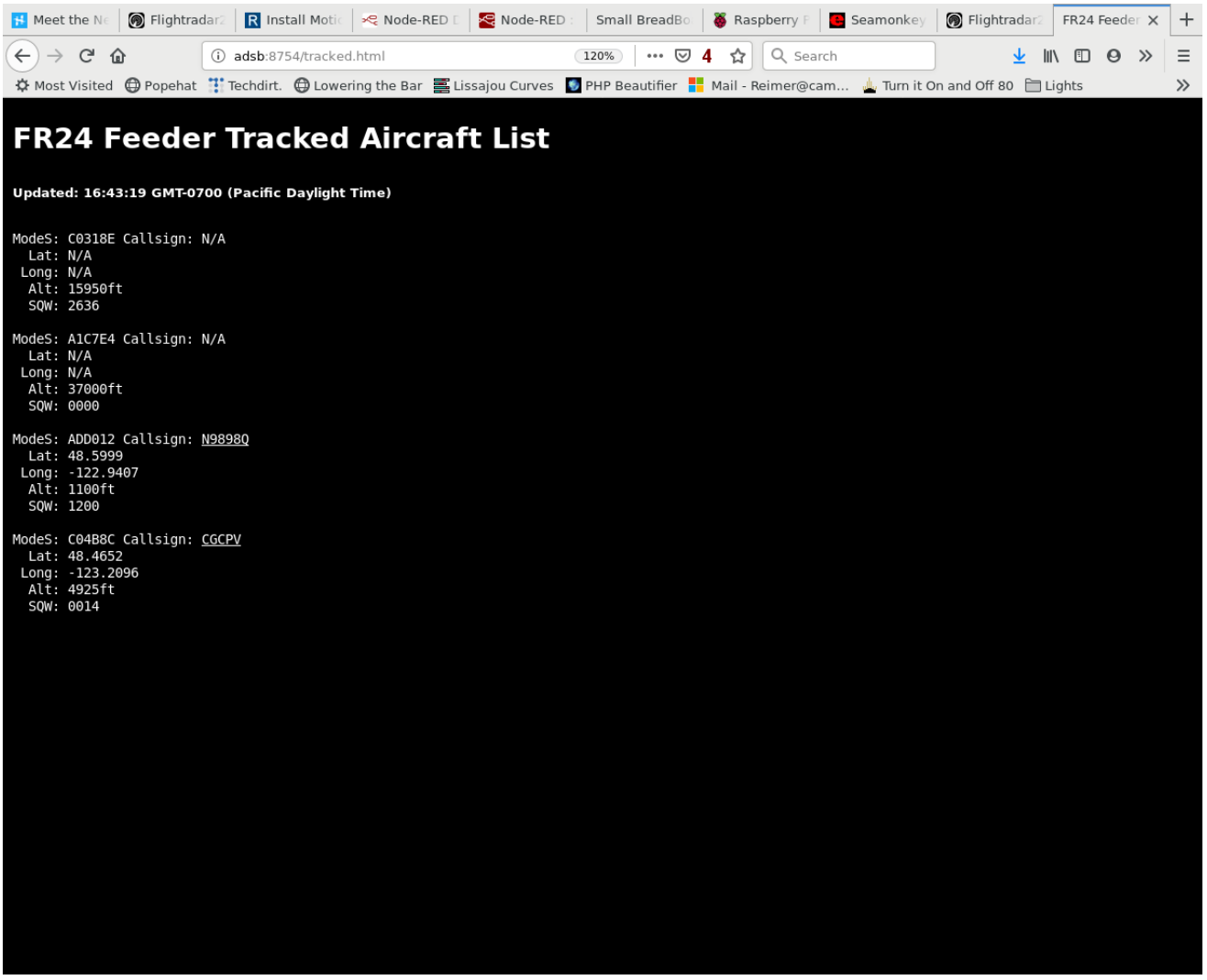
File Edit View Search Terminal Help

```
#! /usr/bin/python
# Blink a LED
# Import the libraries we need
import RPi.GPIO as GPIO
import time

# Set the pin mode to Broadcom
GPIO.setmode(GPIO.BOARD)
pin = 40

# Set the pin to be an output
GPIO.setup(pin, GPIO.OUT)

i=0

# Loop turning it on and off
while i < 10:
    GPIO.output(pin, 1)
    time.sleep(1)
    GPIO.output(pin, 0)
    time.sleep(1)
    i = i + 1

# Set the pins back to default
GPIO.cleanup()
~
~
~
~
                                    1,1           All
```

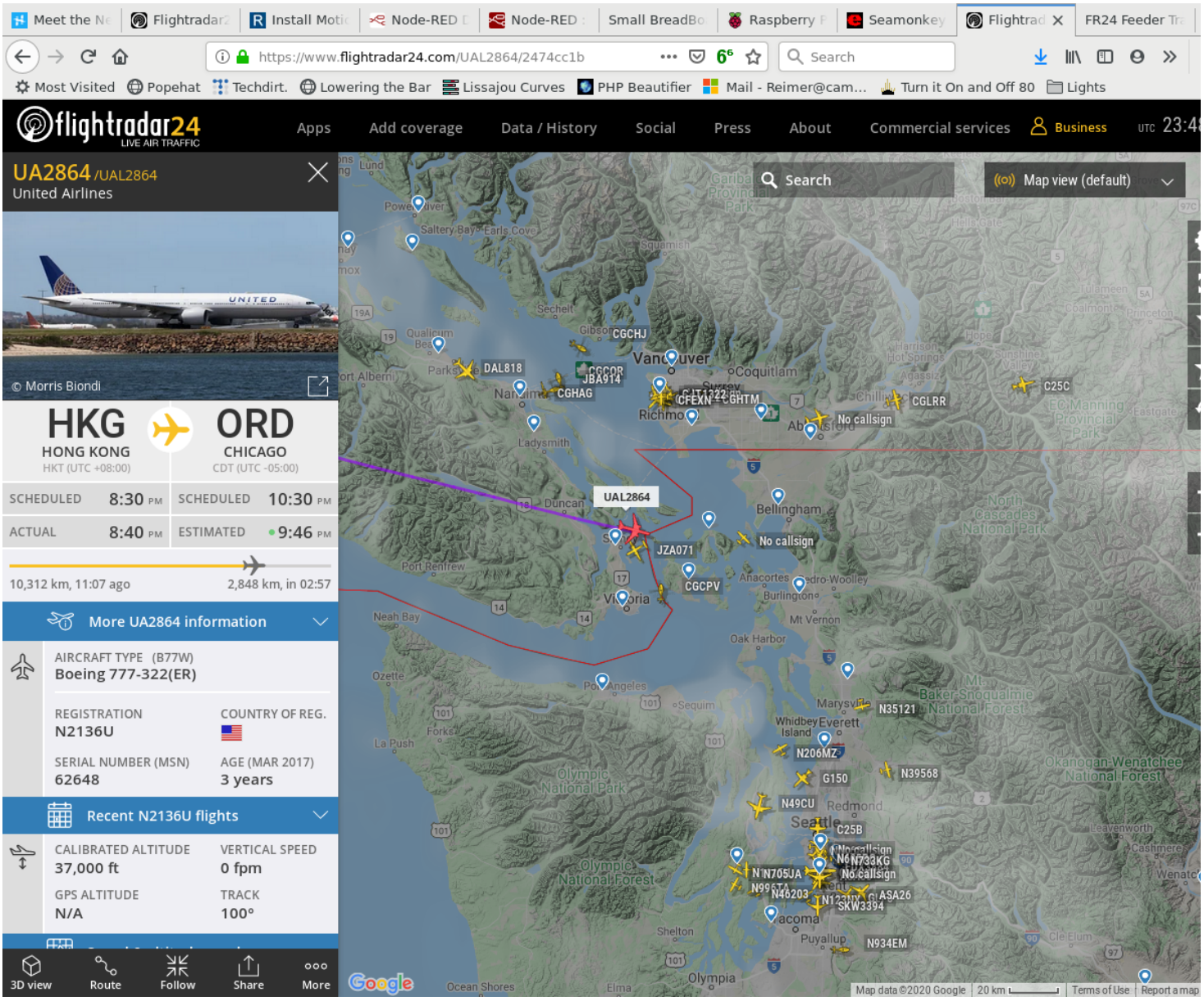
See: https://vicpimakers.ca/january-23-2016-python-introduction/

and: http://drsol.com/~deid/pi/programmingSessions/index.html

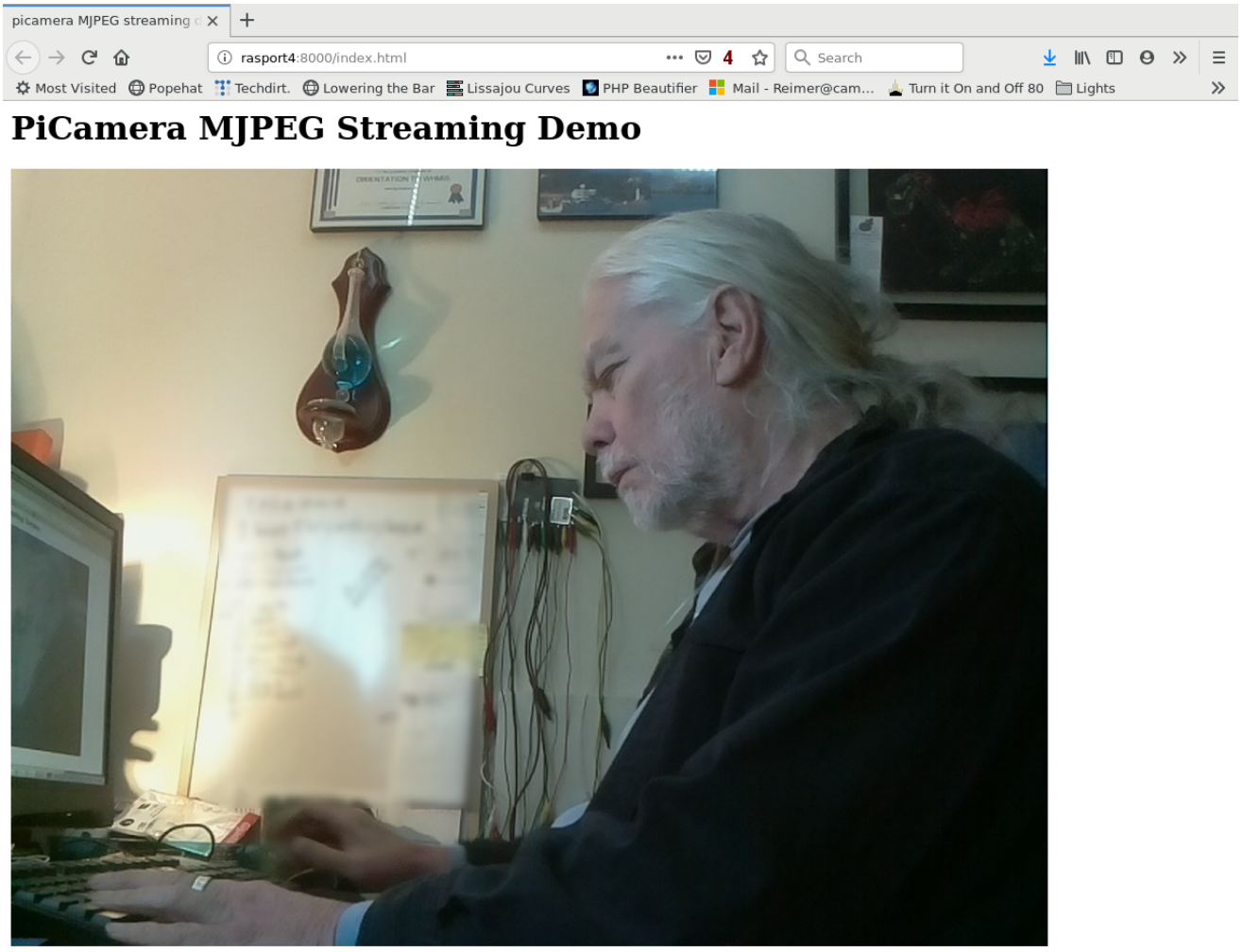
Add a Software Defined Radio and track aircraft



See: https://vicpimakers.ca/april-14-2018-flightradar24-for-the-pi/

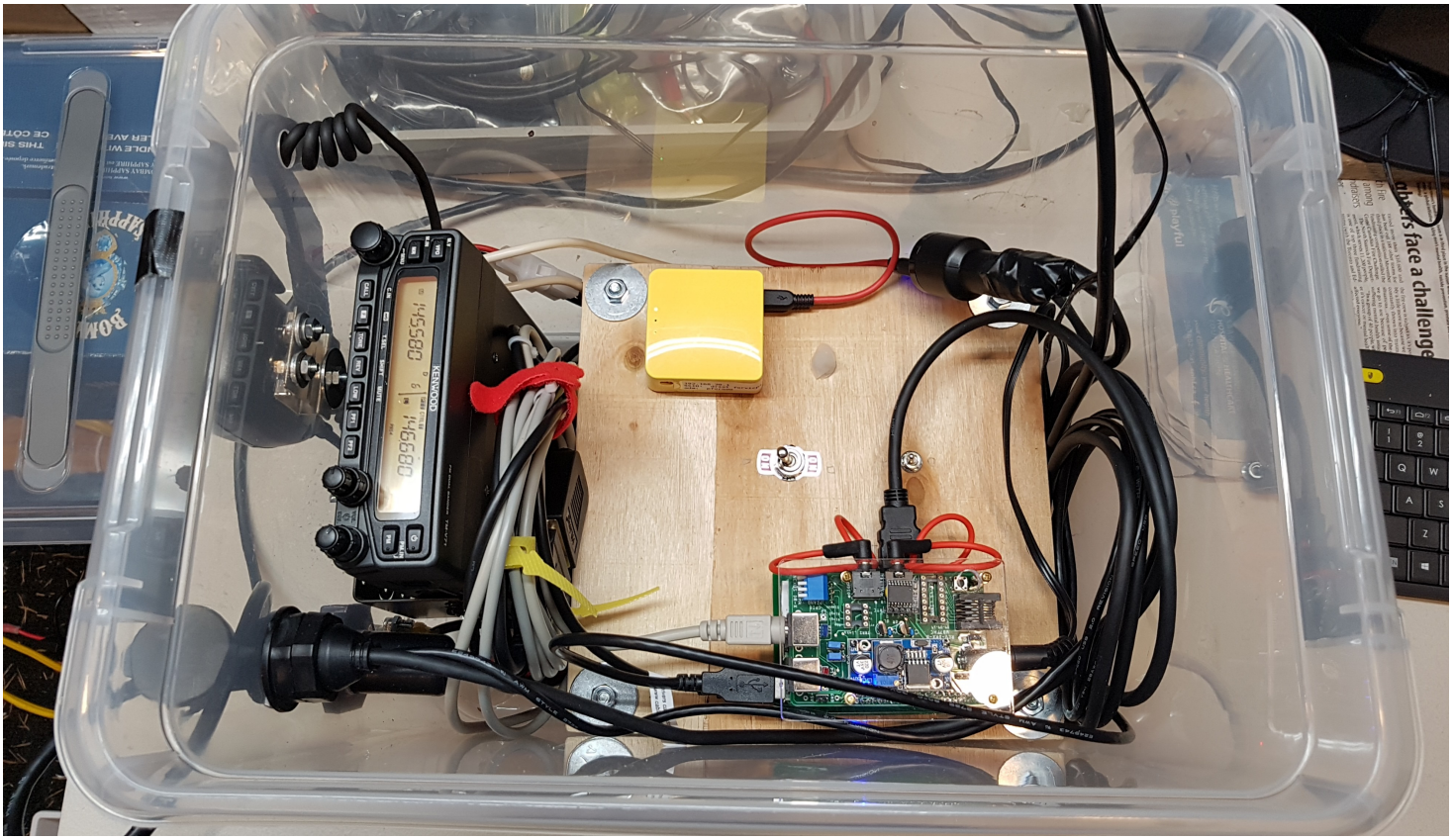


Take pictures with a Pi Camera



See: http://drsol.com/%7Edeid/pi/camera/index.html

Attach it to a Ham Radio

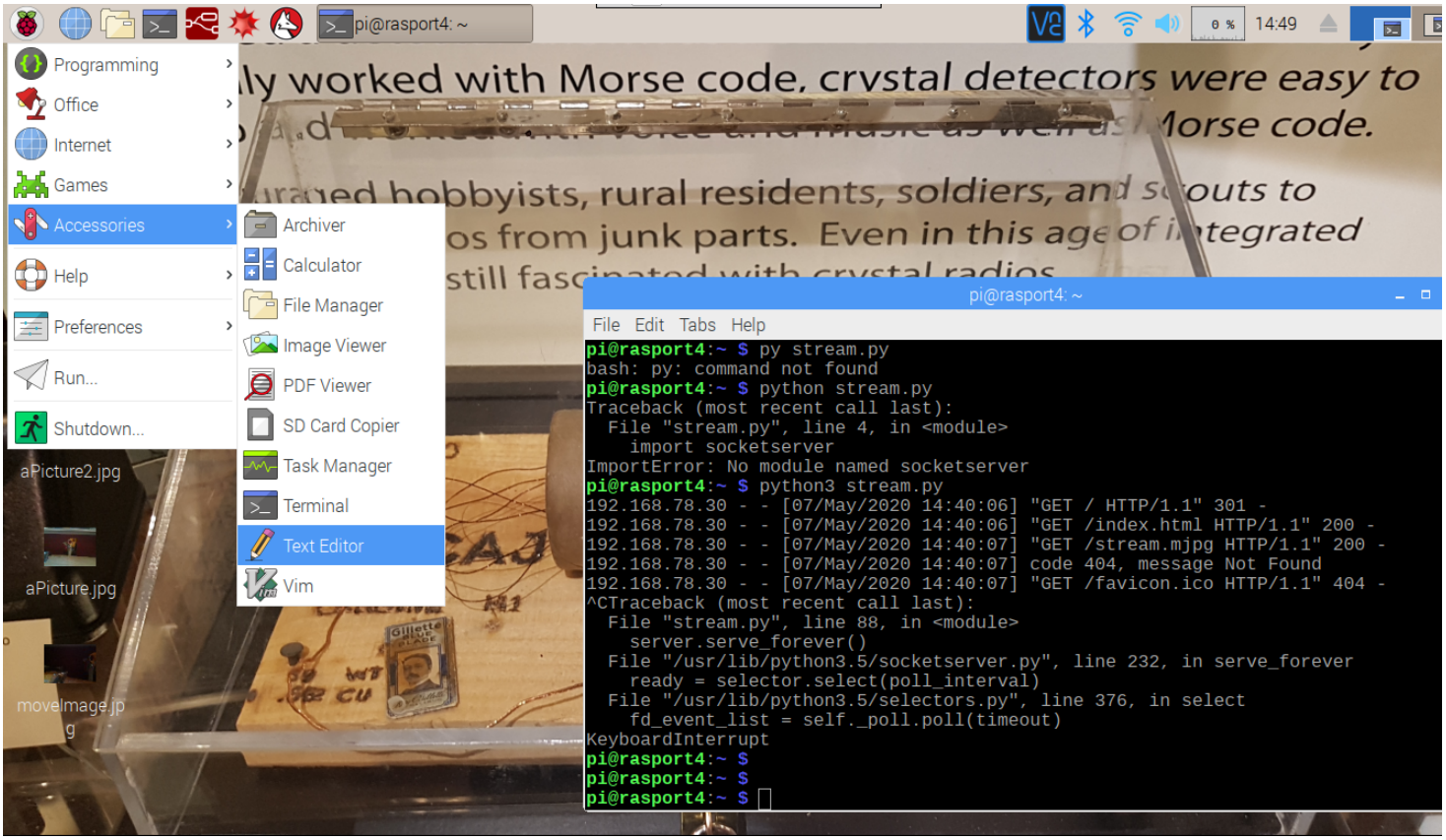


See: http://drsol.com/%7Edeid/pi/nexusdrx/index.html

Add LXC containers and introduce programming languages

See: https://vicpimakers.ca/test2/

How to do it - the CLI and the GUI

- CLI
  - http://drsol.com/%7Edeid/pi/Beginners/OS/

- GUI
  - Really - it's just like Windows with a different picture ...