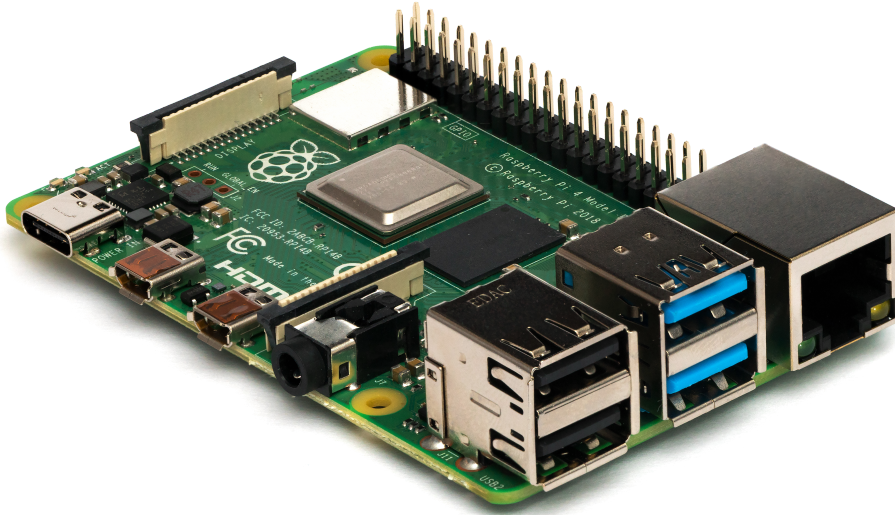


# Intro to the Raspberry Pi

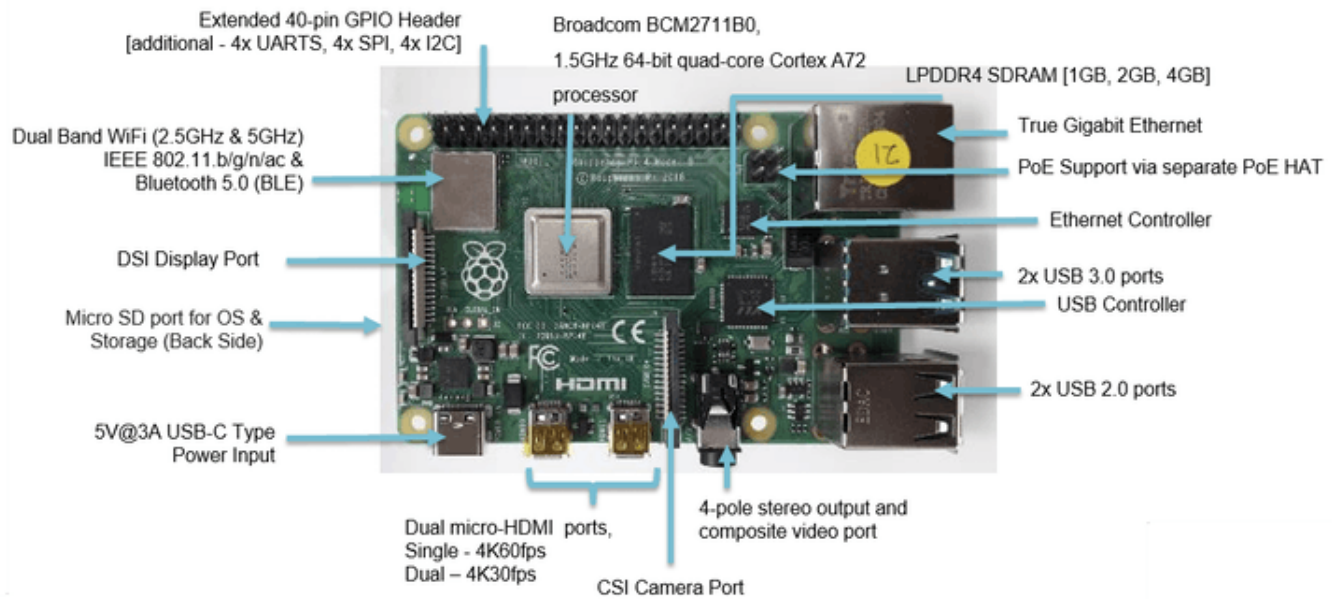


[https://en.m.wikipedia.org/wiki/File:Raspberry\\_Pi\\_4\\_Model\\_B\\_-\\_Side.jpg](https://en.m.wikipedia.org/wiki/File:Raspberry_Pi_4_Model_B_-_Side.jpg)

## 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

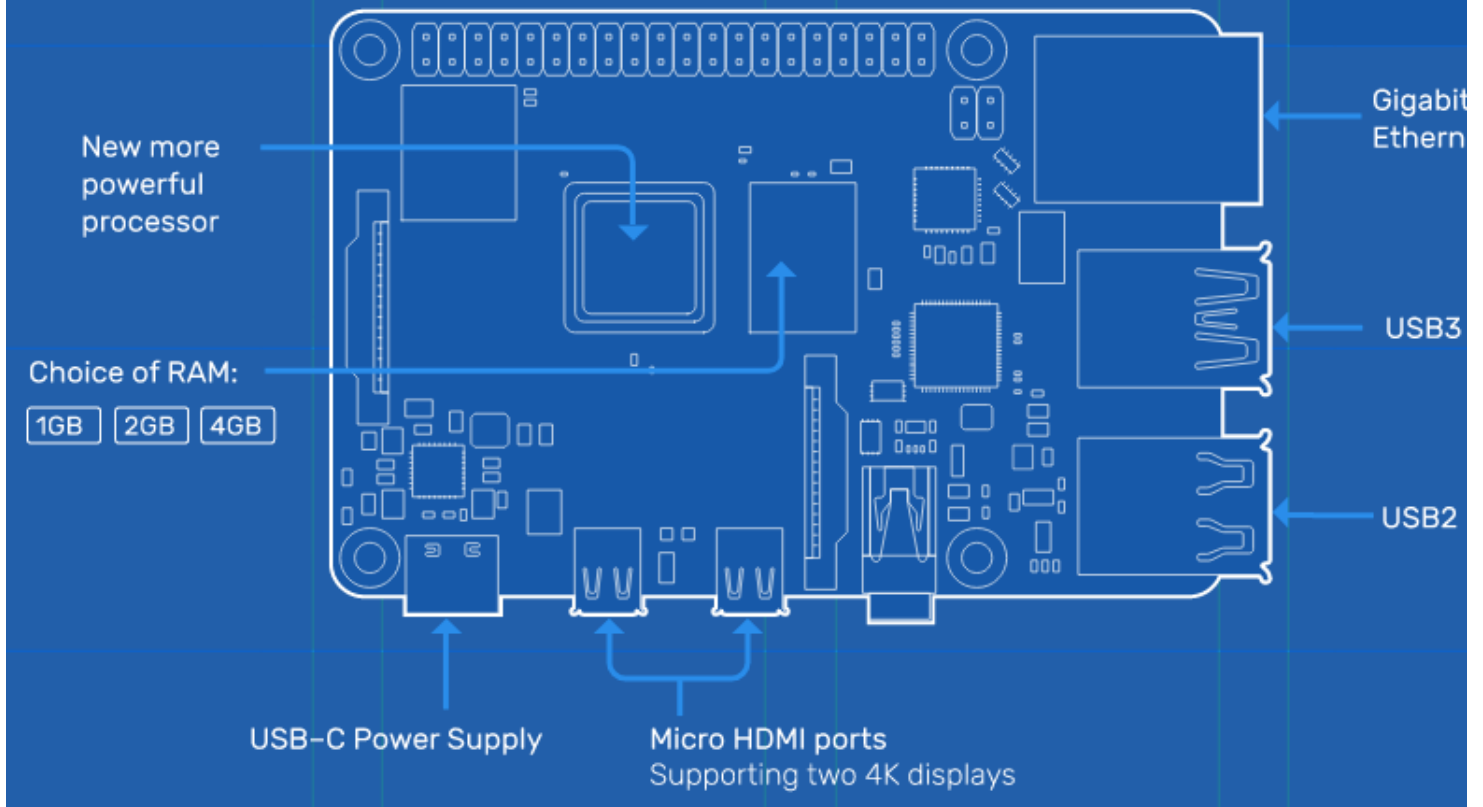


## Pi 4B

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

## Specs

# Raspberry Pi 4 Tech 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\\_apr\\_i\\_4EQTEbPBJS945](https://www.amazon.ca/dp/B014EUQOGK/ref=cm_sw_r_other_apr_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

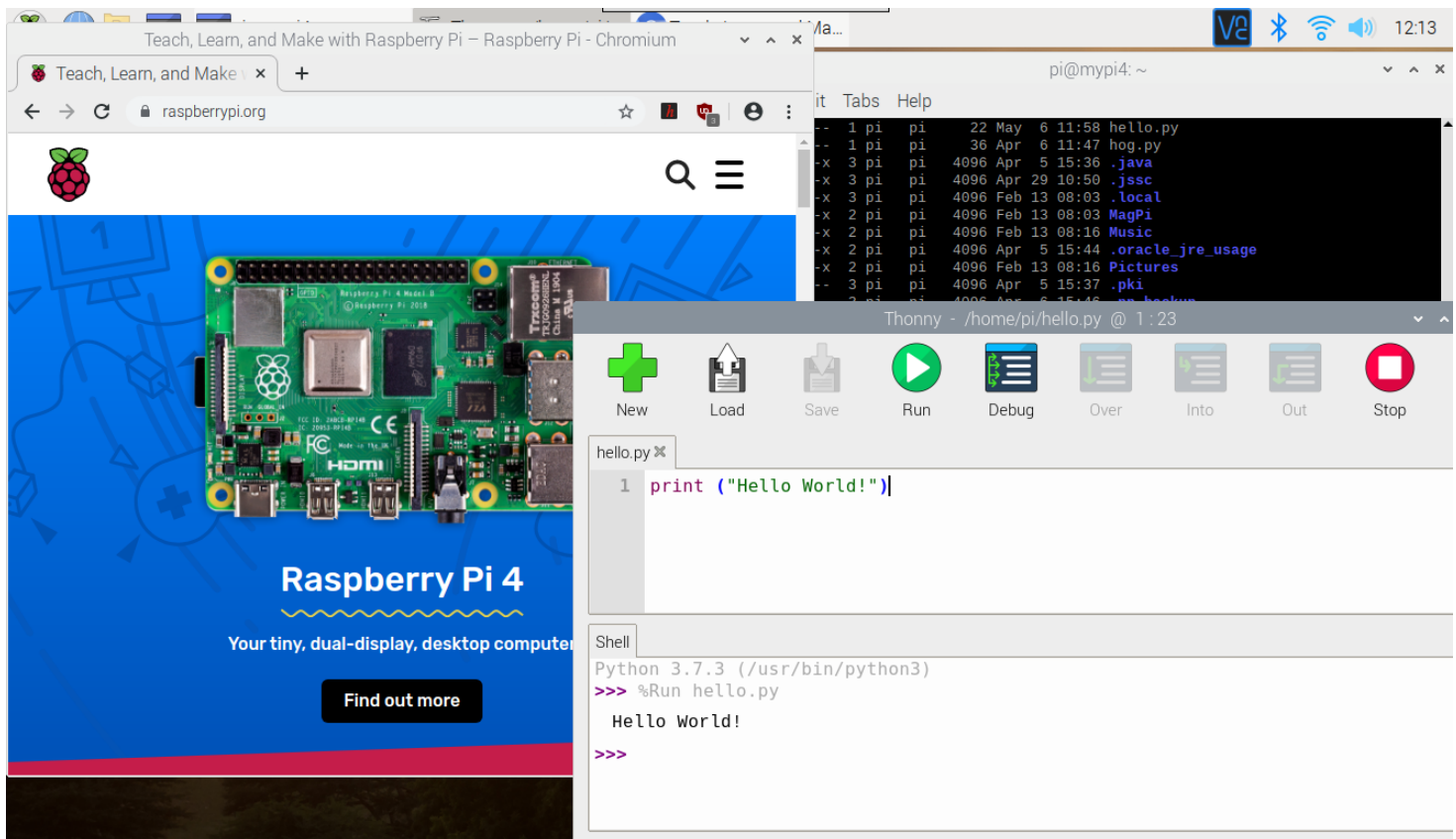


- Answer the questions as they come up

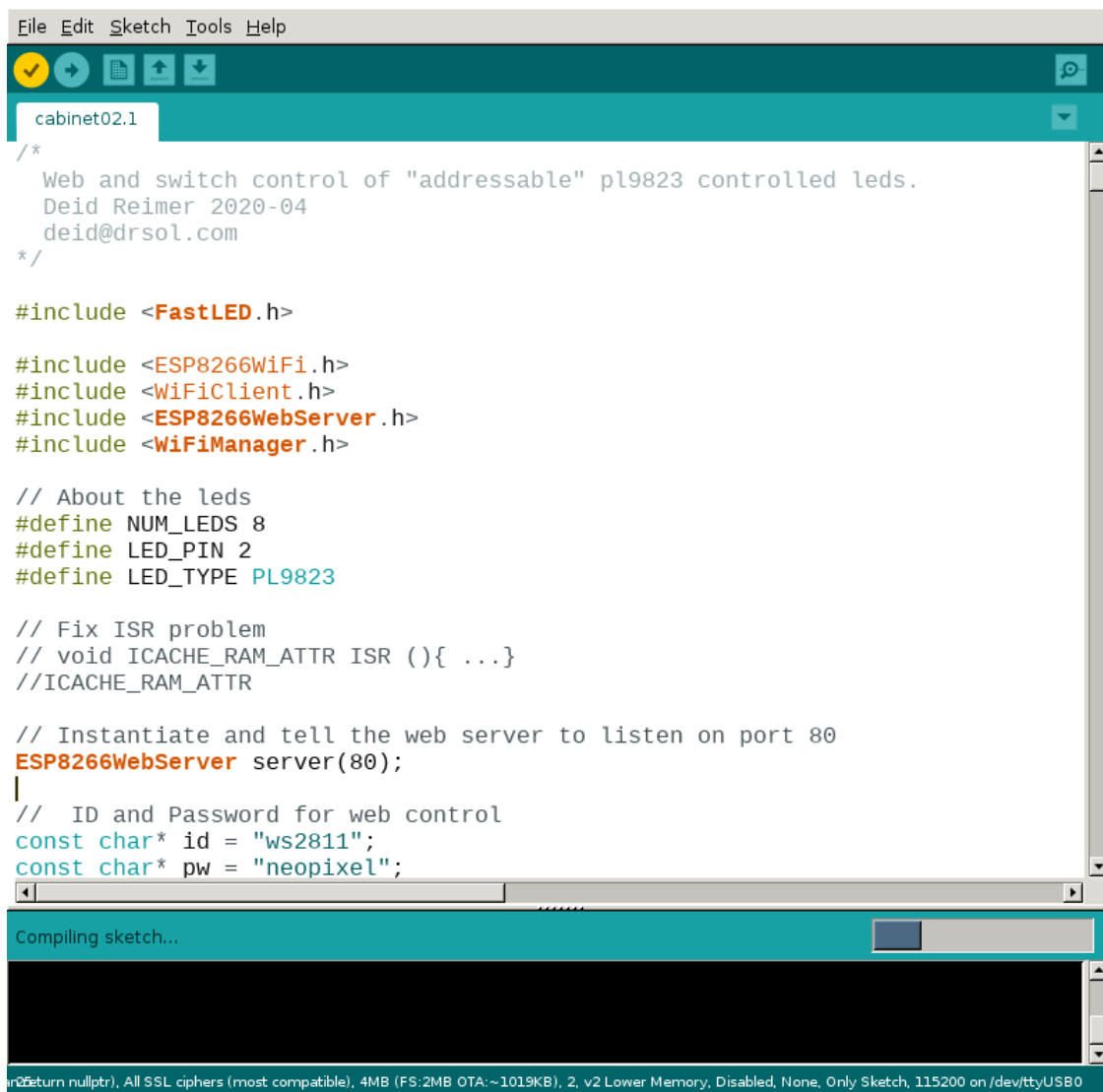
## What to do with it

### 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



The image shows the Arduino IDE interface. The top menu bar includes File, Edit, Sketch, Tools, and Help. Below the menu is a toolbar with icons for opening, saving, and running. The main text area contains the following code:

```
File Edit Sketch Tools Help

cabinet02.1

/*
  Web and switch control of "addressable" pl9823 controlled leds.
  Deid Reimer 2020-04
  deid@drsol.com
*/

#include <FastLED.h>

#include <ESP8266WiFi.h>
#include <WiFiClient.h>
#include <ESP8266WebServer.h>
#include <WiFiManager.h>

// About the leds
#define NUM_LEDS 8
#define LED_PIN 2
#define LED_TYPE PL9823

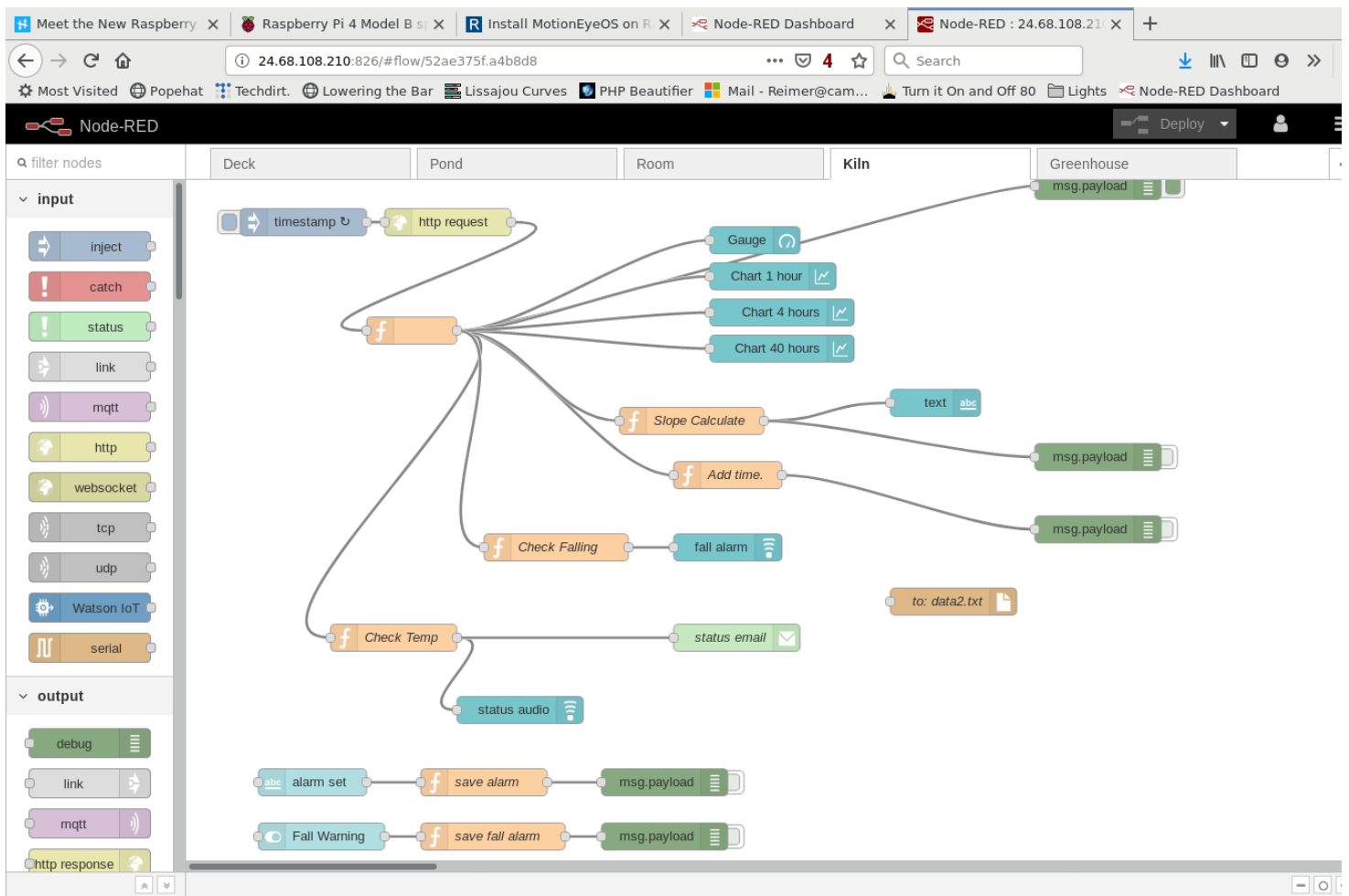
// Fix ISR problem
// void ICACHE_RAM_ATTR ISR (){ ...}
//ICACHE_RAM_ATTR

// Instantiate and tell the web server to listen on port 80
ESP8266WebServer server(80);
|
// ID and Password for web control
const char* id = "ws2811";
const char* pw = "neopixel";
```

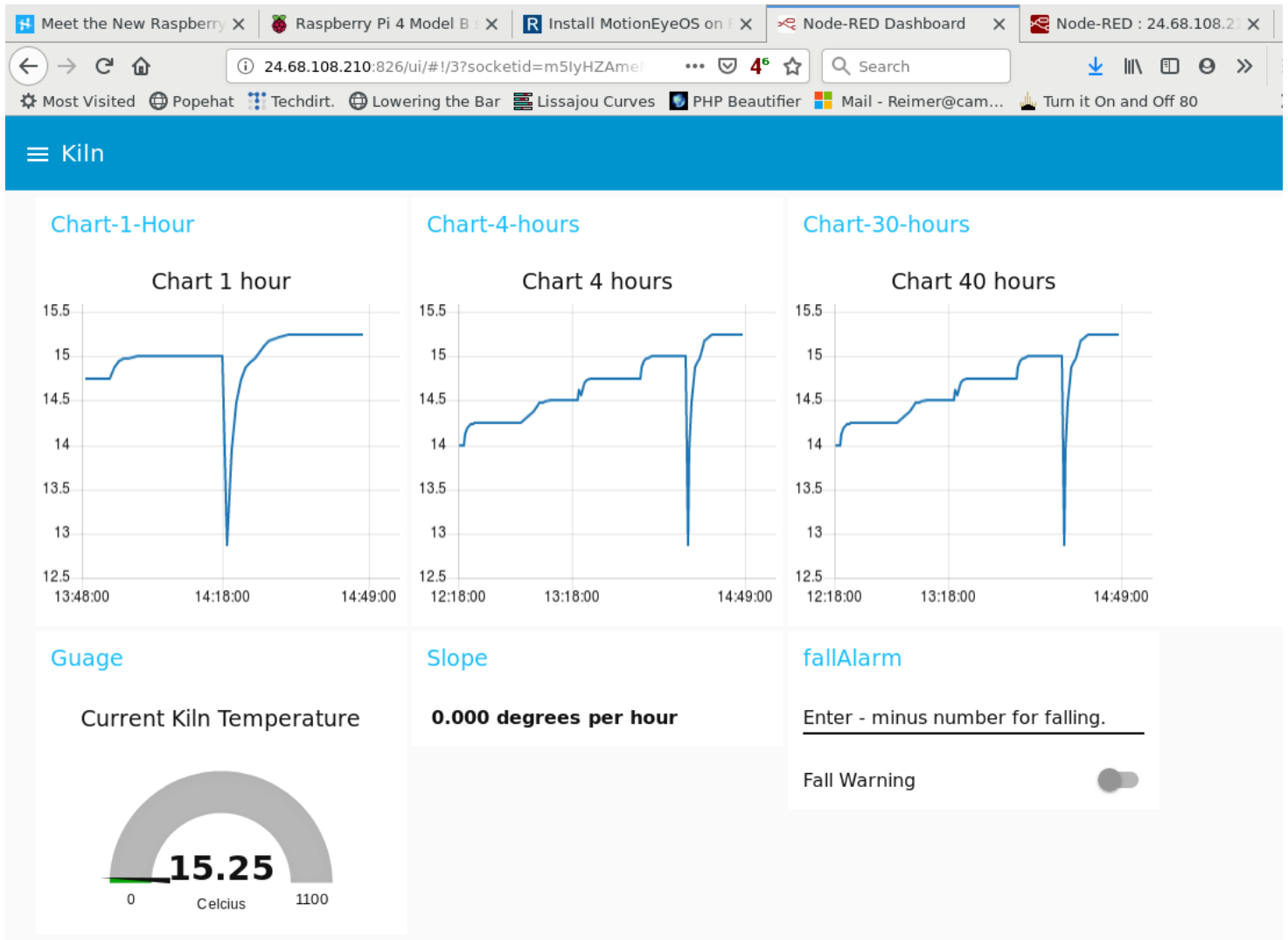
Below the code editor, there is a status bar that says "Compiling sketch..." with a progress bar. At the very bottom, a small status line reads: "Return nullptr, All SSL ciphers (most compatible), 4MB (FS:2MB OTA:~1019KB), 2, v2 Lower Memory, Disabled, None, Only Sketch, 115200 on /dev/ttyUSB0".

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

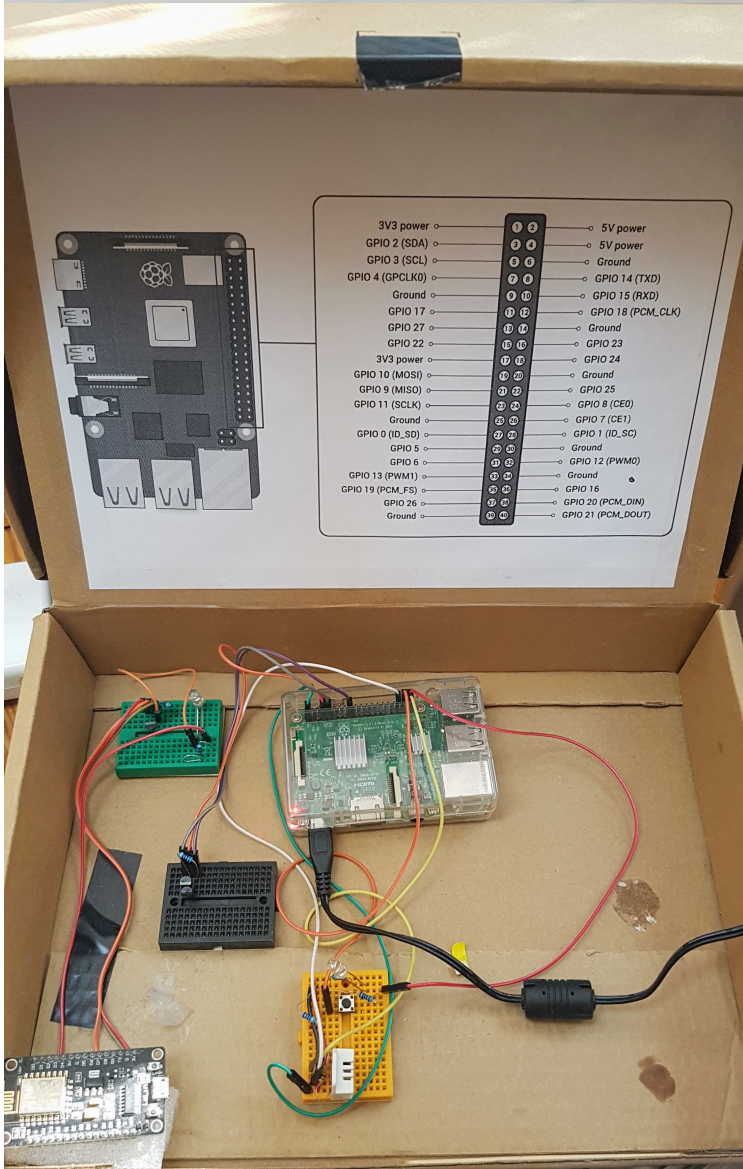
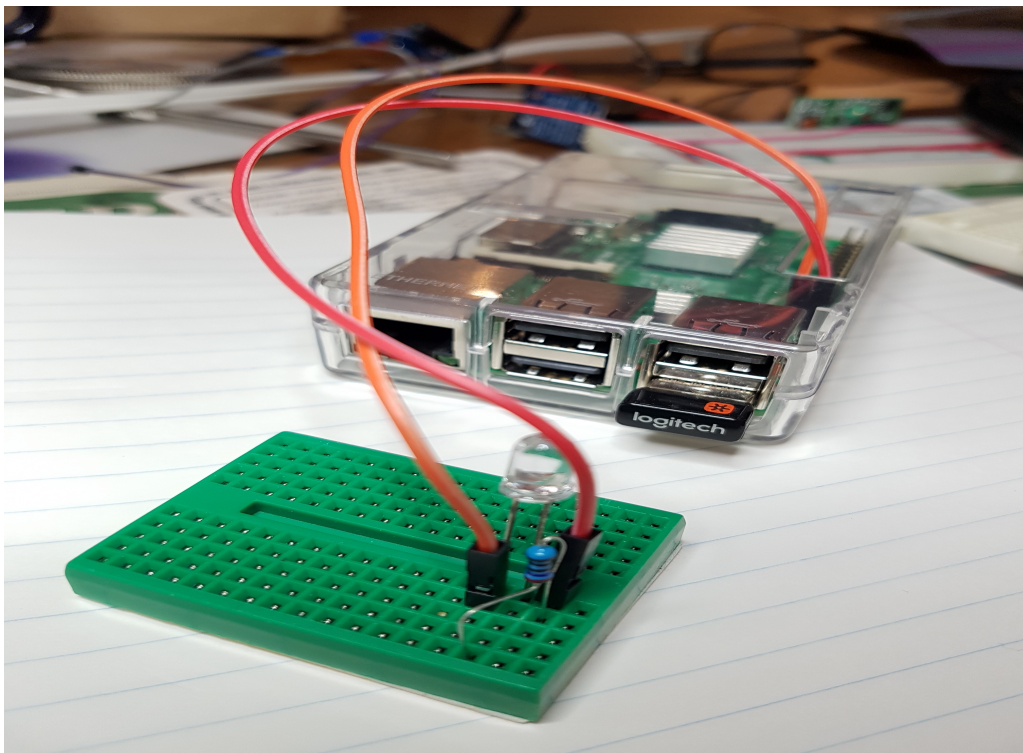
## Run Node Red to capture data



- 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

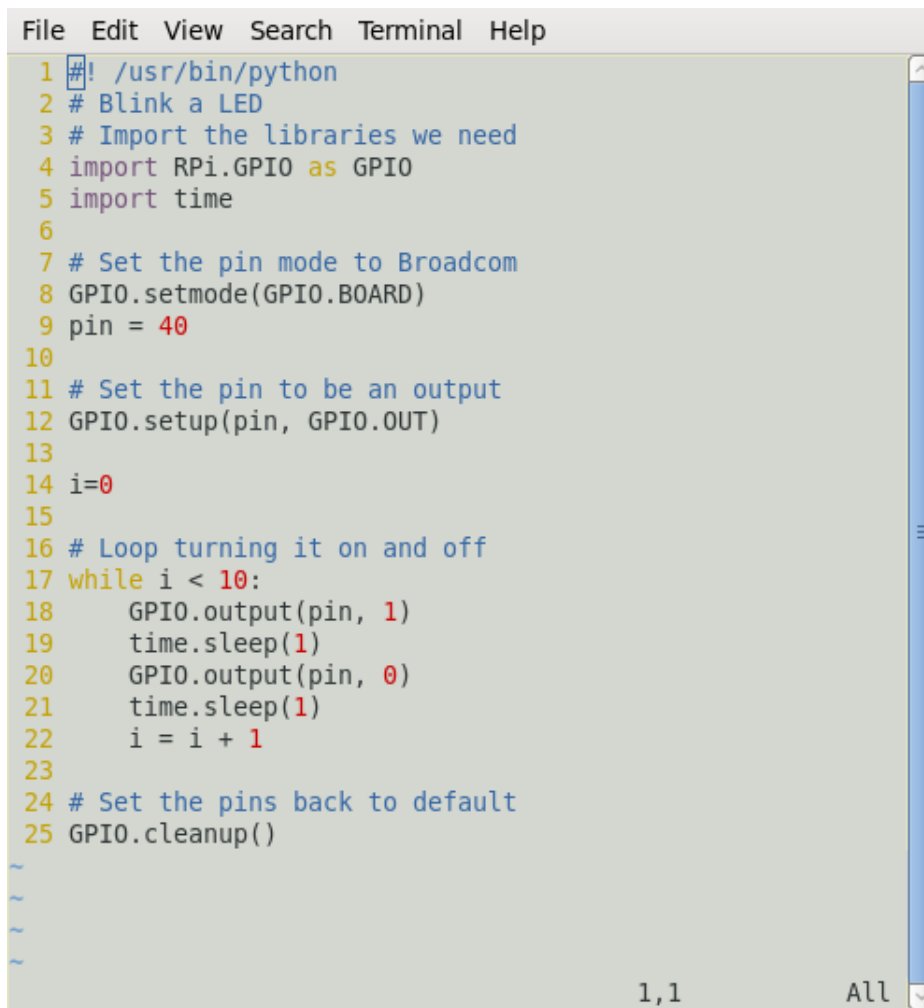


See: <http://drsol.com/~deid/pi/Beginners>

## Learn Linux and programming

```
File Edit View Search Terminal Help
pi@rasport:~/Beginners $ ls -la
total 80
drwxr-xr-x  3 pi pi  4096 May  6 14:55 .
drwxr-xr-x 72 pi pi  4096 May  6 14:55 ..
-rwx----- 1 pi pi   419 Mar 26  2019 blink1.py
-rwx----- 1 pi pi   417 Sep 18  2018 blink.py
-rwx----- 1 pi pi   791 May 21  2019 ds18b20.py
-rw----- 1 pi pi 12288 Mar 24 19:03 .ds18b20.py.swp
-rw-r--r-- 1 pi pi   853 Mar 26  2019 flashChange.py
-rwx----- 1 pi pi   856 Feb 25 19:34 foo.py
-rw-r--r-- 1 pi pi  1723 Feb 21  2019 homeworkSwitch1.py
-rw-r--r-- 1 pi pi  1469 Feb 21  2019 homeworkSwitch.py
-rwxr-xr-x 1 pi pi   364 May 21  2019 ifswitch.py
drwxr-xr-x 2 pi pi  4096 Feb  7 09:25 images
-rw----- 1 pi pi   276 Apr 17  2018 nano.save
-rwx----- 1 pi pi  7628 Mar 10 19:41 react.py
-rwxr-xr-x 1 pi pi   304 Mar 10 19:33 switch1.py
-rwxr-xr-x 1 pi pi   304 Mar 10 19:28 switch.py
-rwx----- 1 pi pi   460 Apr 13  2018 temperature.py
pi@rasport:~/Beginners $ uptime
 14:55:57 up 33 days, 23:01,  3 users,  load average: 0.04,
0.03, 0.00
pi@rasport:~/Beginners $ hostname
rasport
pi@rasport:~/Beginners $ uname -srn
Linux rasport 4.9.35-v7+
pi@rasport:~/Beginners $
```





```
File Edit View Search Terminal Help
1 #!/usr/bin/python
2 # Blink a LED
3 # Import the libraries we need
4 import RPi.GPIO as GPIO
5 import time
6
7 # Set the pin mode to Broadcom
8 GPIO.setmode(GPIO.BOARD)
9 pin = 40
10
11 # Set the pin to be an output
12 GPIO.setup(pin, GPIO.OUT)
13
14 i=0
15
16 # Loop turning it on and off
17 while i < 10:
18     GPIO.output(pin, 1)
19     time.sleep(1)
20     GPIO.output(pin, 0)
21     time.sleep(1)
22     i = i + 1
23
24 # Set the pins back to default
25 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



Browser tabs: Meet the N..., Flightradar..., Install Moti..., Node-RED, Node-RED, Small BreadBo..., Raspberry F..., Seamonkey, Flightradar..., FR24 Feeder X

Address bar: adsb:8754/tracked.html 120% Search

Most Visited: Popehat, Techdirt, Lowering the Bar, Lissajou Curves, PHP Beautifier, Mail - Reimer@cam..., Turn it On and Off 80, Lights

## FR24 Feeder Tracked Aircraft List

Updated: 16:43:19 GMT-0700 (Pacific Daylight Time)

ModeS: C0318E Callsign: N/A  
Lat: N/A  
Long: N/A  
Alt: 15950ft  
SQW: 2636

ModeS: A1C7E4 Callsign: N/A  
Lat: N/A  
Long: N/A  
Alt: 37000ft  
SQW: 0000

ModeS: ADD012 Callsign: N9898Q  
Lat: 48.5999  
Long: -122.9407  
Alt: 1100ft  
SQW: 1200

ModeS: C04B8C Callsign: CGCPV  
Lat: 48.4652  
Long: -123.2096  
Alt: 4925ft  
SQW: 0014

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


Meet the Ne Flightradar24 Install Moti Node-RED : Small BreadBo Raspberry F Seamonkey Flightradar24 FR24 Feeder Tr

https://www.flightradar24.com/UAL2864/2474cc1b Search

Most Visited Popehat Techdirt. Lowering the Bar Lissajou Curves PHP Beautifier Mail - Reimer@cam... Turn it On and Off 80 Lights

flightradar24 LIVE AIR TRAFFIC Apps Add coverage Data / History Social Press About Commercial services Business UTC 23:4

**UA2864 / UAL2864**  
United Airlines



© Morris Biondi

**HKG**  
HONG KONG  
HKT (UTC +08:00)

**ORD**  
CHICAGO  
CDT (UTC -05:00)


SCHEDULED 8:30 PM SCHEDULED 10:30 PM  
ACTUAL 8:40 PM ESTIMATED 9:46 PM

10,312 km, 11:07 ago 2,848 km, in 02:57

More UA2864 information

AIRCRAFT TYPE (B77W)  
Boeing 777-322(ER)

REGISTRATION  
N2136U

COUNTRY OF REG.  


SERIAL NUMBER (MSN)  
62648

AGE (MAR 2017)  
3 years

Recent N2136U flights

CALIBRATED ALTITUDE  
37,000 ft

VERTICAL SPEED  
0 fpm

GPS ALTITUDE  
N/A

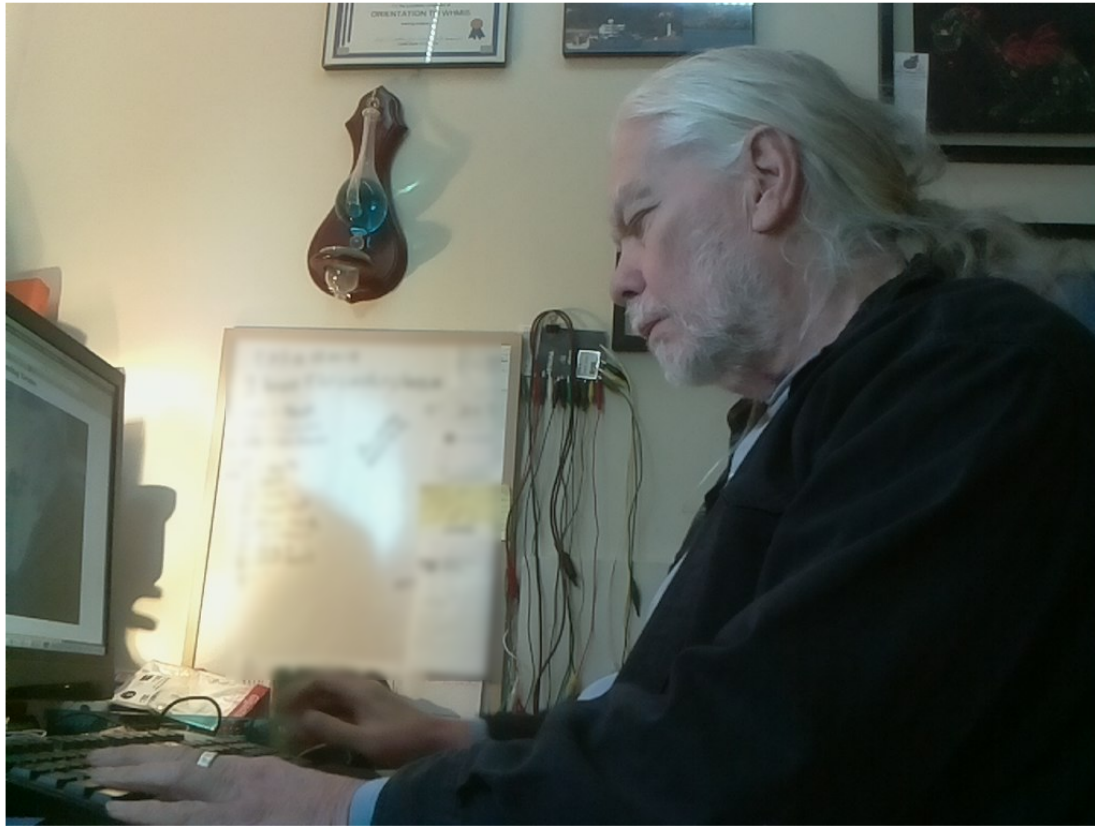
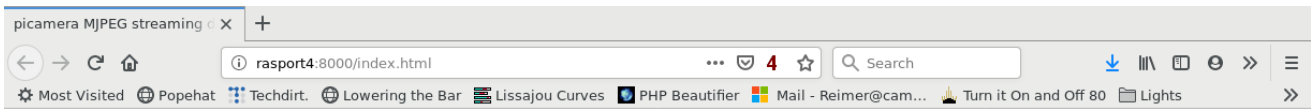
TRACK  
100°

3D view Route Follow Share More

Map view (default)

Map data ©2020 Google 20 km Terms of Use Report a map

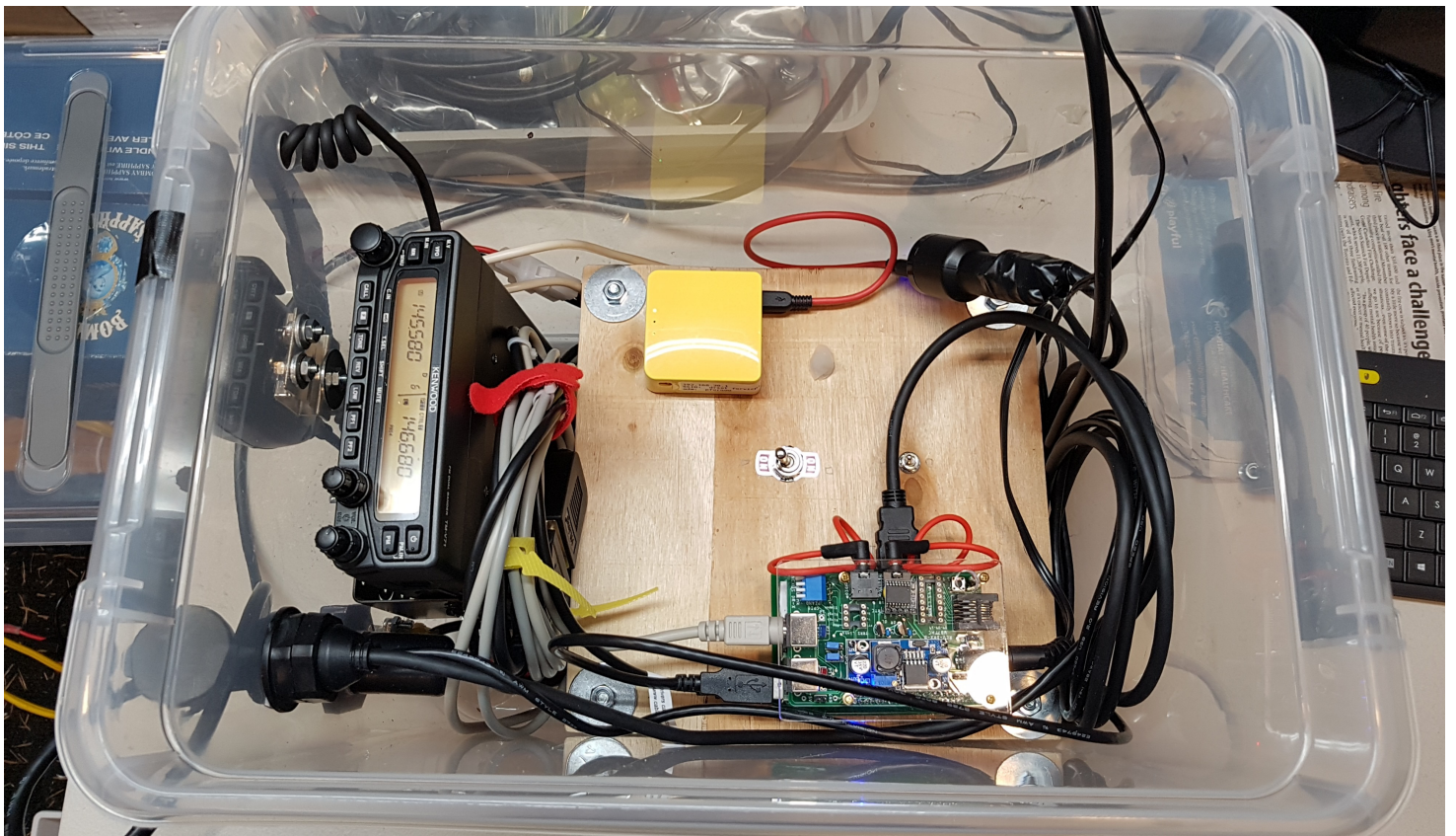
## Take pictures with a Pi Camera



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 ...

