



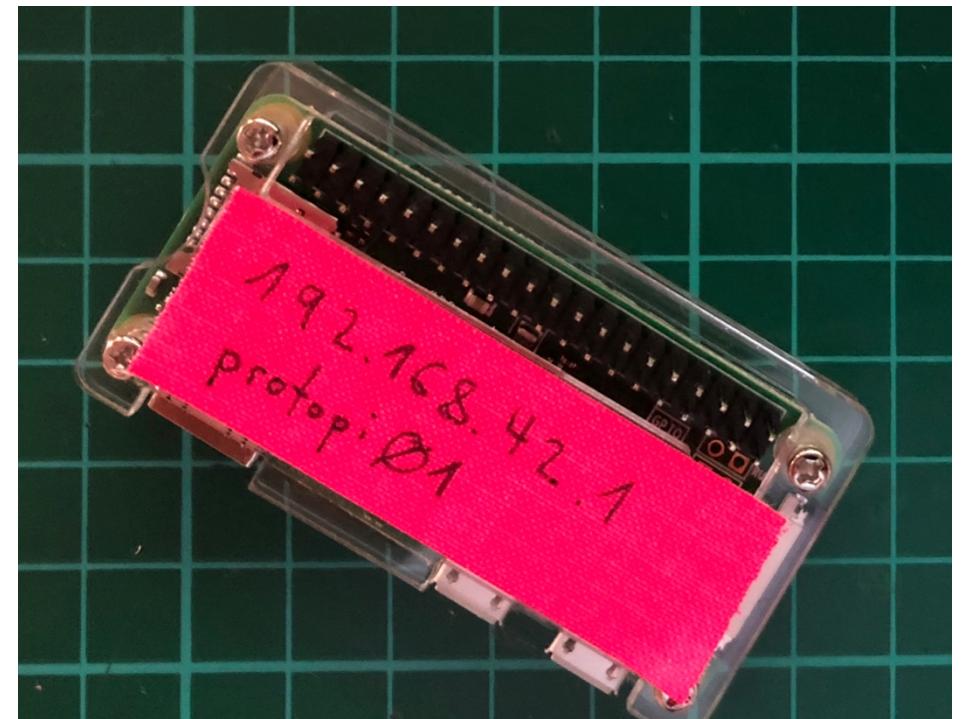
# Let's Get Our Hands Dirty

DIGITAL AND PHYSICAL PROTOTYPING

LENNART HENNIGS

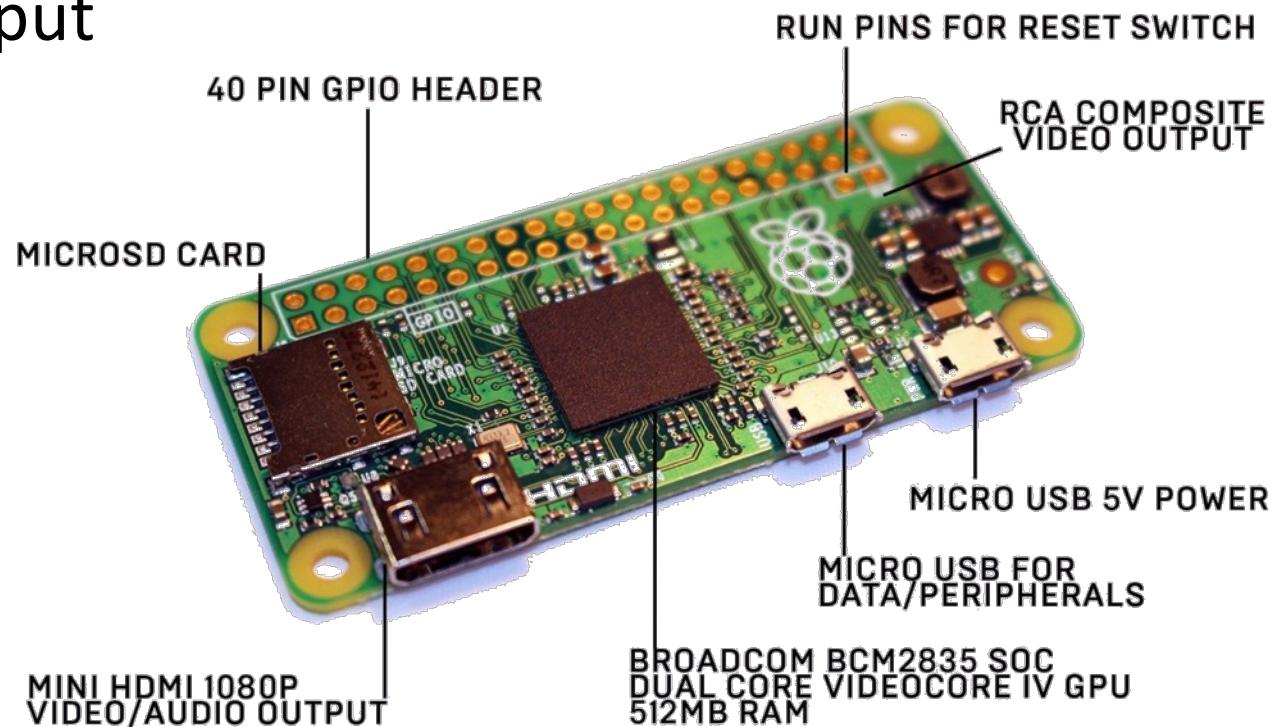
# FINISHING TOUCHES

- Put in your SD card
- Connect your Pi to power
- Put a piece of tape on top
- Let it sit



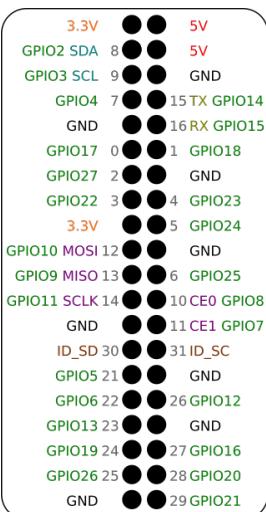
# RASPBERRY PI PINS

- Current Pis offer 40 GPIO pins
- Can be used as input or output
- Pullup / pulldown



# RASPBERRY PI PINS

- Current Pis offer 40 GPIO pins
- Can be used as input or output
- Pullup / pulldown

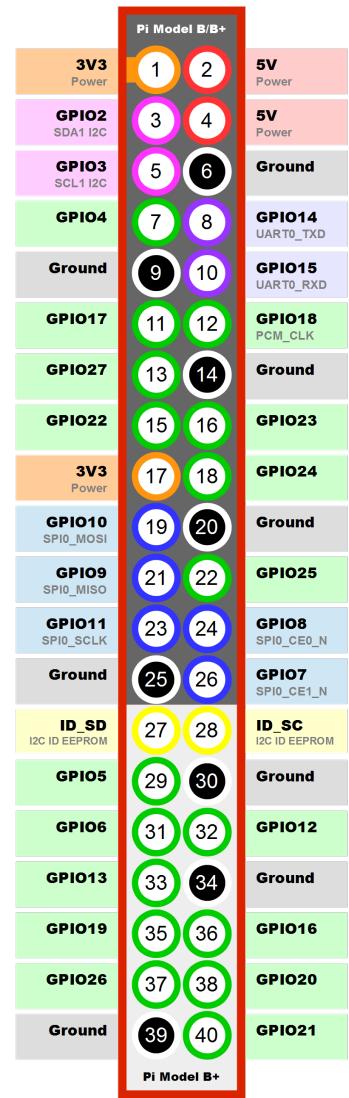


Raspberry Pi B+ Leaf

Power (5 Volts)  
Power (3 Volts)  
Ground  
WiringPi GPIO  
BCM GPIO  
I2C Interface  
UART Interface  
SPI Interface  
ID EEPROM Interface

splitbrain.org

<https://github.com/splitbrain/rpibplusleaf>



[www.raspberrypi-spy.co.uk](http://www.raspberrypi-spy.co.uk)

<https://pinout.xyz/>

# ACCESSING YOUR PI

- USE THE CONSOLE
- FROM THE FILE EXPLORER / FINDER

# THE CONSOLE

```
lennart@242:~\: ssh pi@192.168.2.125
pi@192.168.2.125's password:
Linux protopi01 4.14.34+ #1110 Mon Apr 16 14:51:42 BST 2018 armv6l

The programs included with the Debian GNU/Linux system are free software;
the exact distribution terms for each program are described in the
individual files in /usr/share/doc/*copyright.

Debian GNU/Linux comes with ABSOLUTELY NO WARRANTY, to the extent
permitted by applicable law.
Last login: Sun Jun 10 20:09:18 2018 from 192.168.2.109
pi@protopi01:~ \$ ls
Desktop Documents Downloads Network Trash Folder Temporary Items wpa_supplicant.conf
pi@protopi01:~ \$
```

# THE CONSOLE

- Win: Kitty (<http://www.9bis.net/kitty/>)
- Mac: iTerm (<https://iterm2.com/>)
- iOS: Terminus
- iOS: Cathode

# THE CONSOLE

- Login & Password:

pi pipapo!

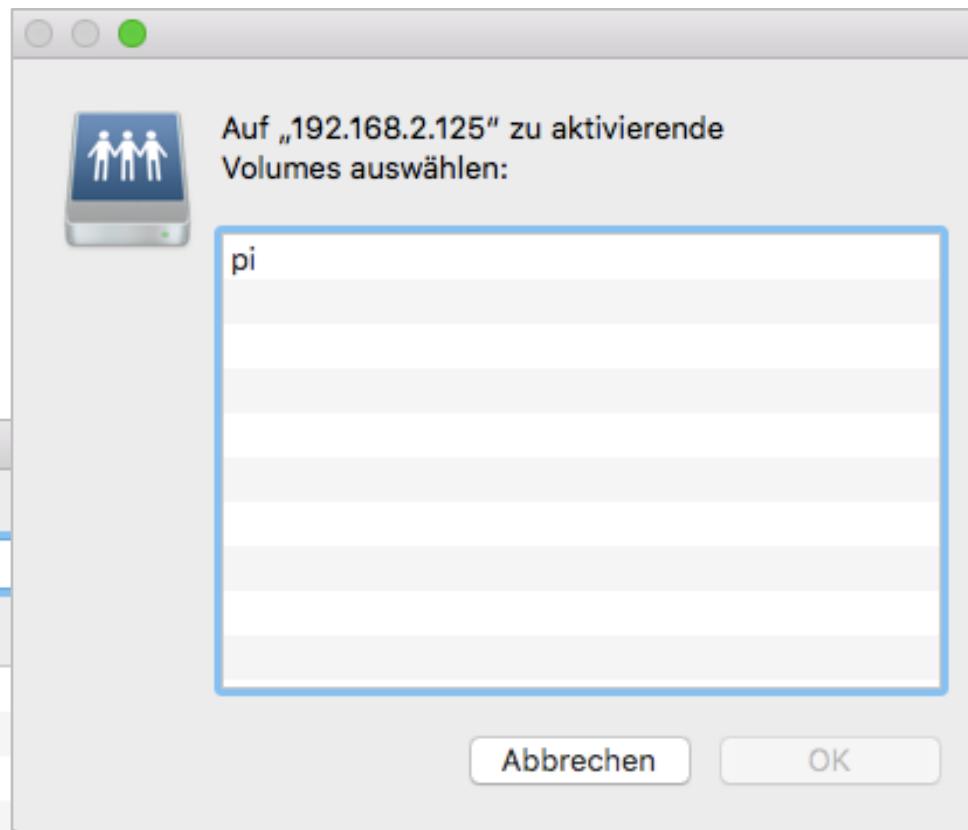
- Connect to the Pi (console)

ssh pi@[IP-Adresse]

oder

ssh pi@[Pi Name].local

# THE FINDER



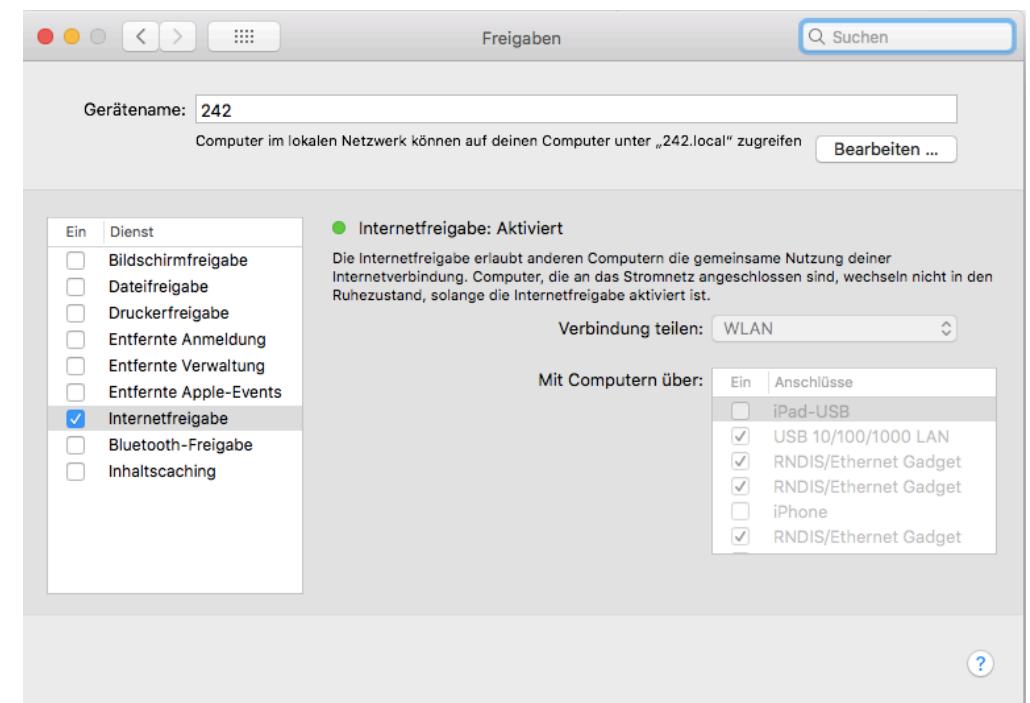
# GET IT ONLINE

- Add your WiFi (console)

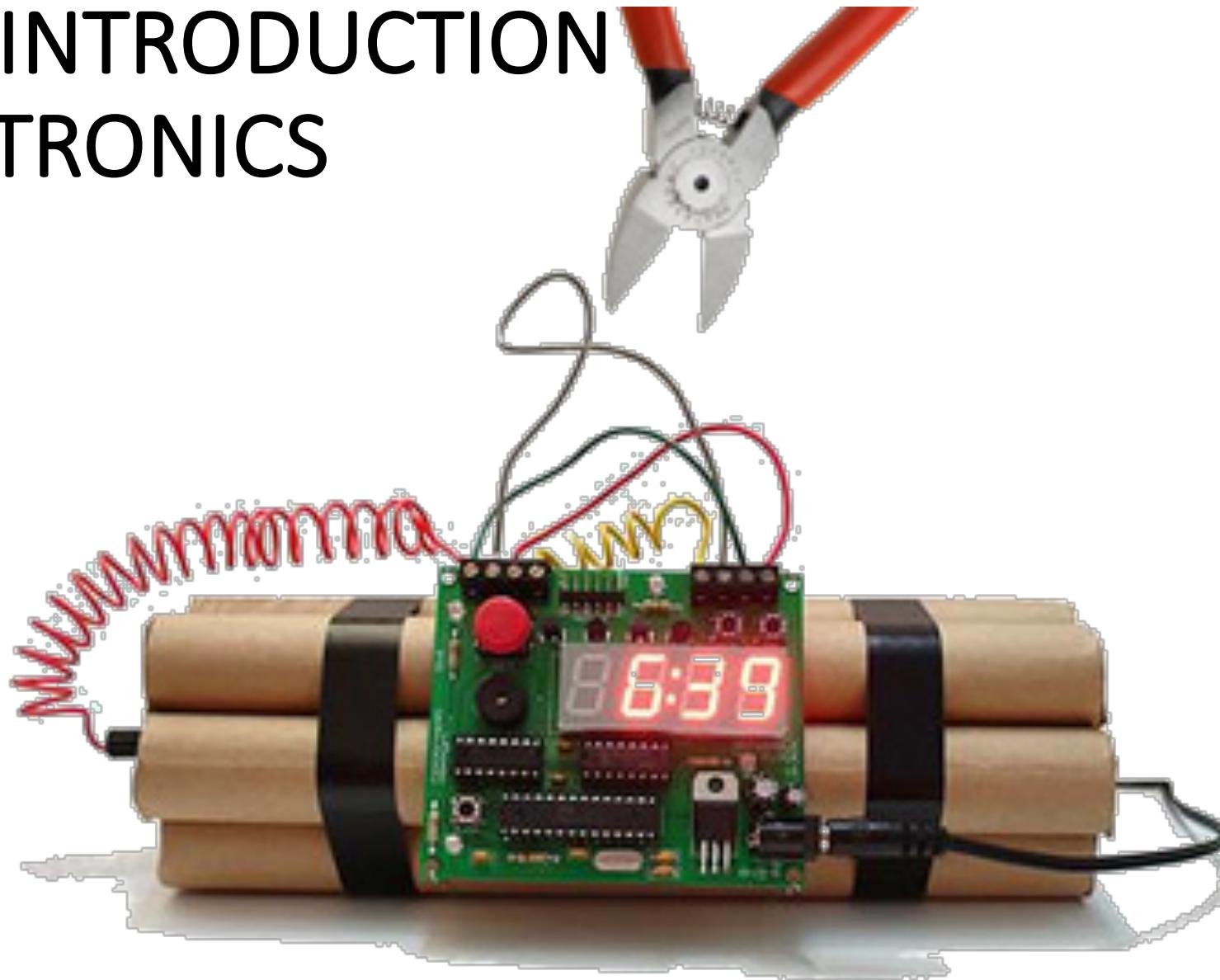
```
sudo nano /etc/wpa_supplicant/wpa_supplicant.conf  
sudo reboot -h now
```

- Share the Internet connection from your computer
  - Plug in the 2<sup>nd</sup> USB port
  - Enable Internet sharing

- Find your Pi online (console)  
`arp -a | grep "b8:27:eb"`



# NOT AN INTRODUCTION TO ELECTRONICS



# WHAT TO REMEMBER

RED

POSITIVE (+)

POWER

VCC

$5V \neq 3.3V$



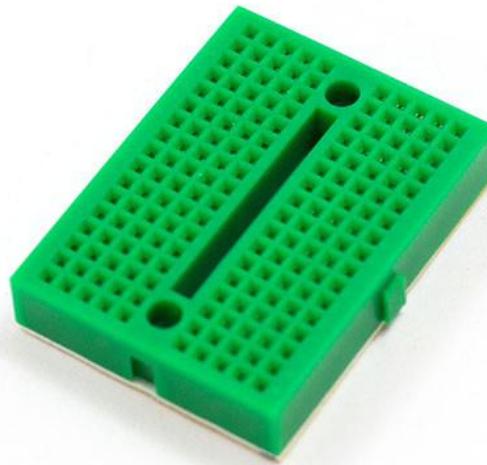
BLACK

MINUS (-)

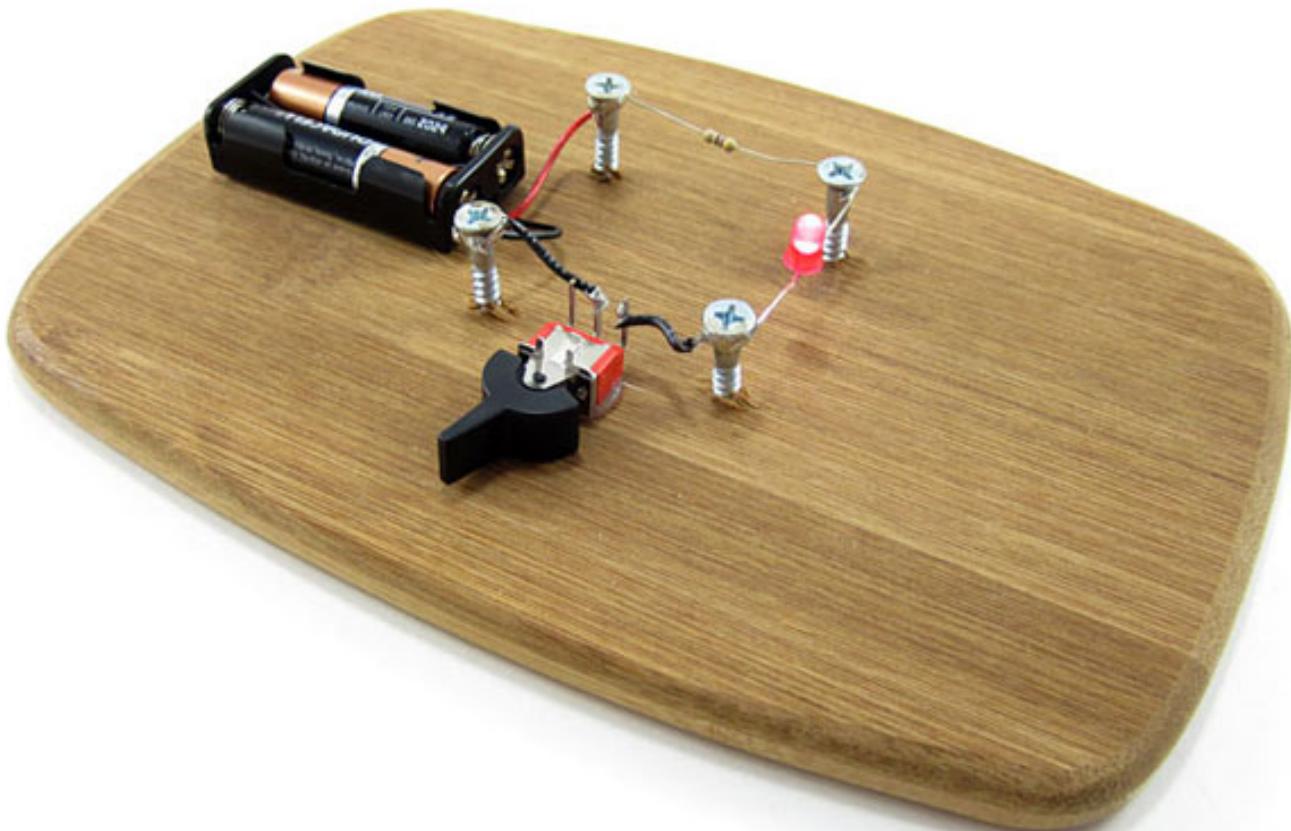
GROUND

GND

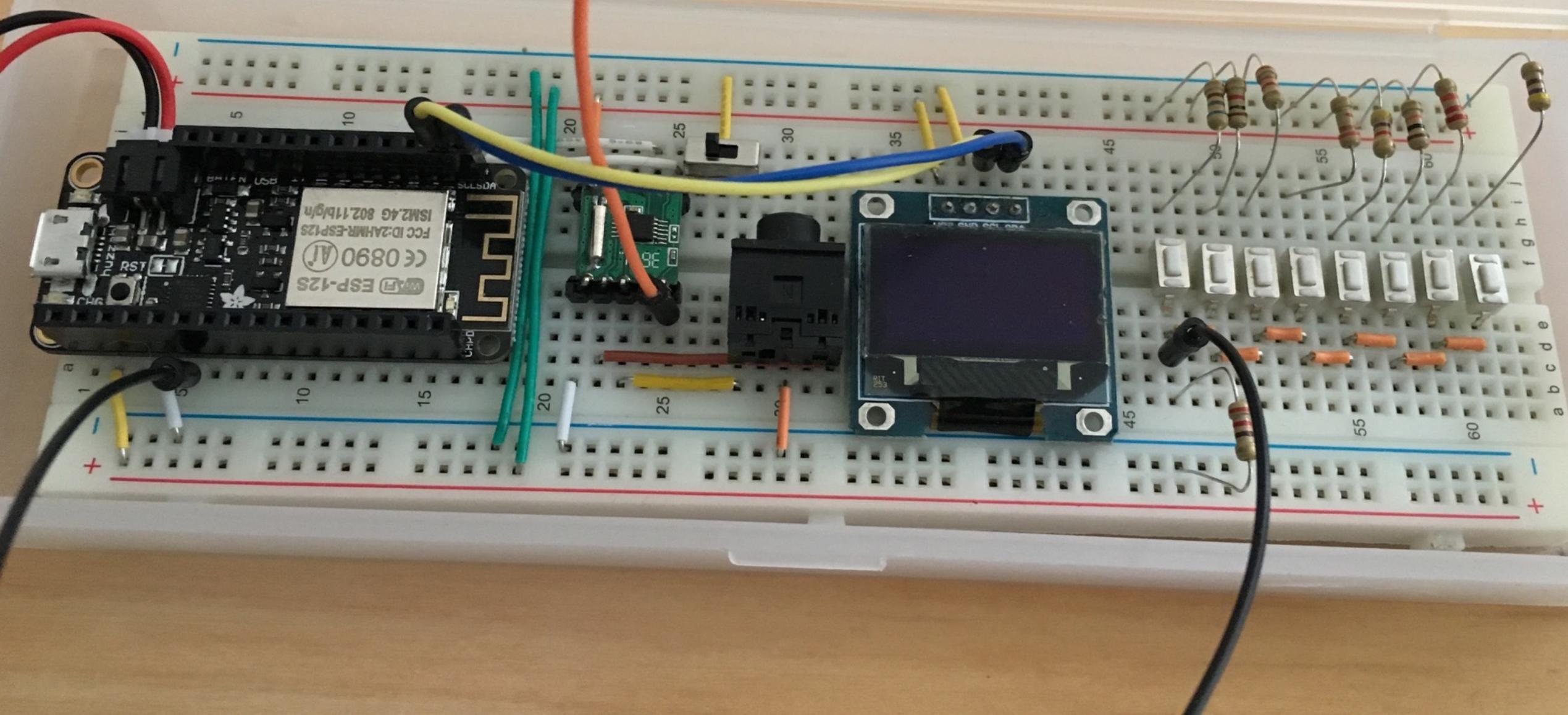
# WHAT IS THIS?



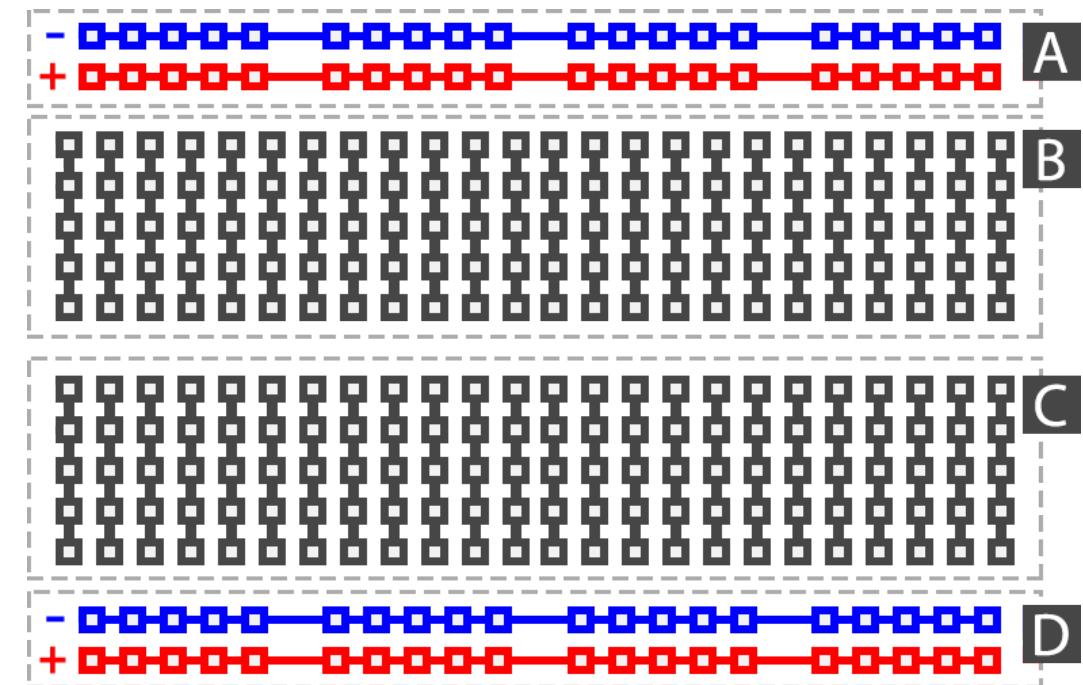
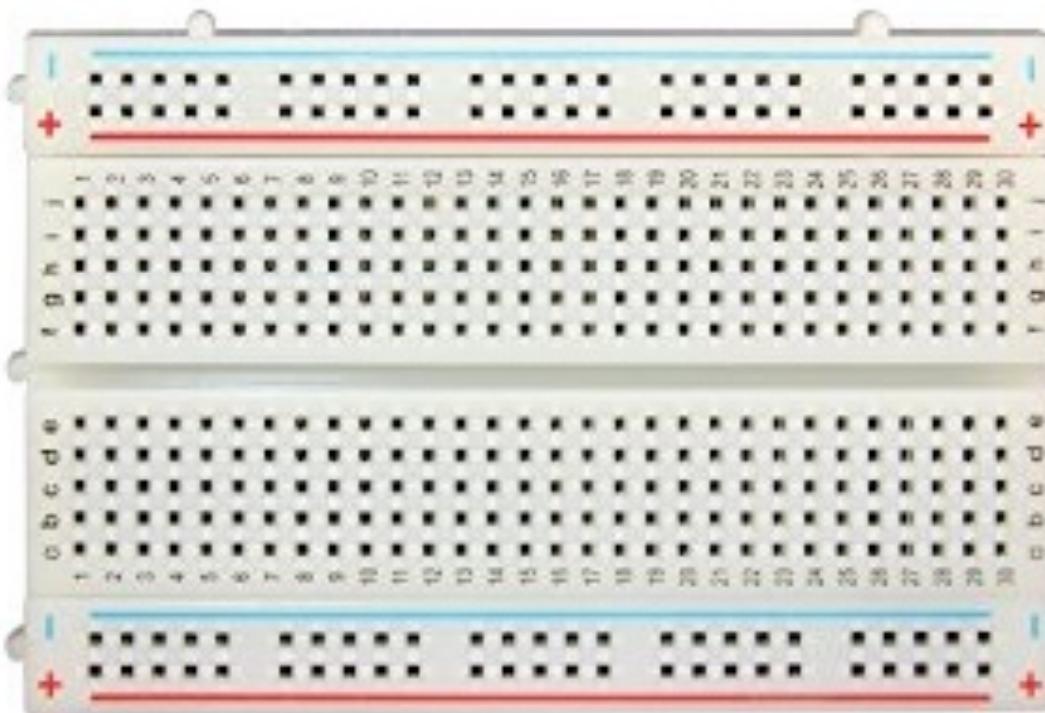
# ...A BREADBOARD



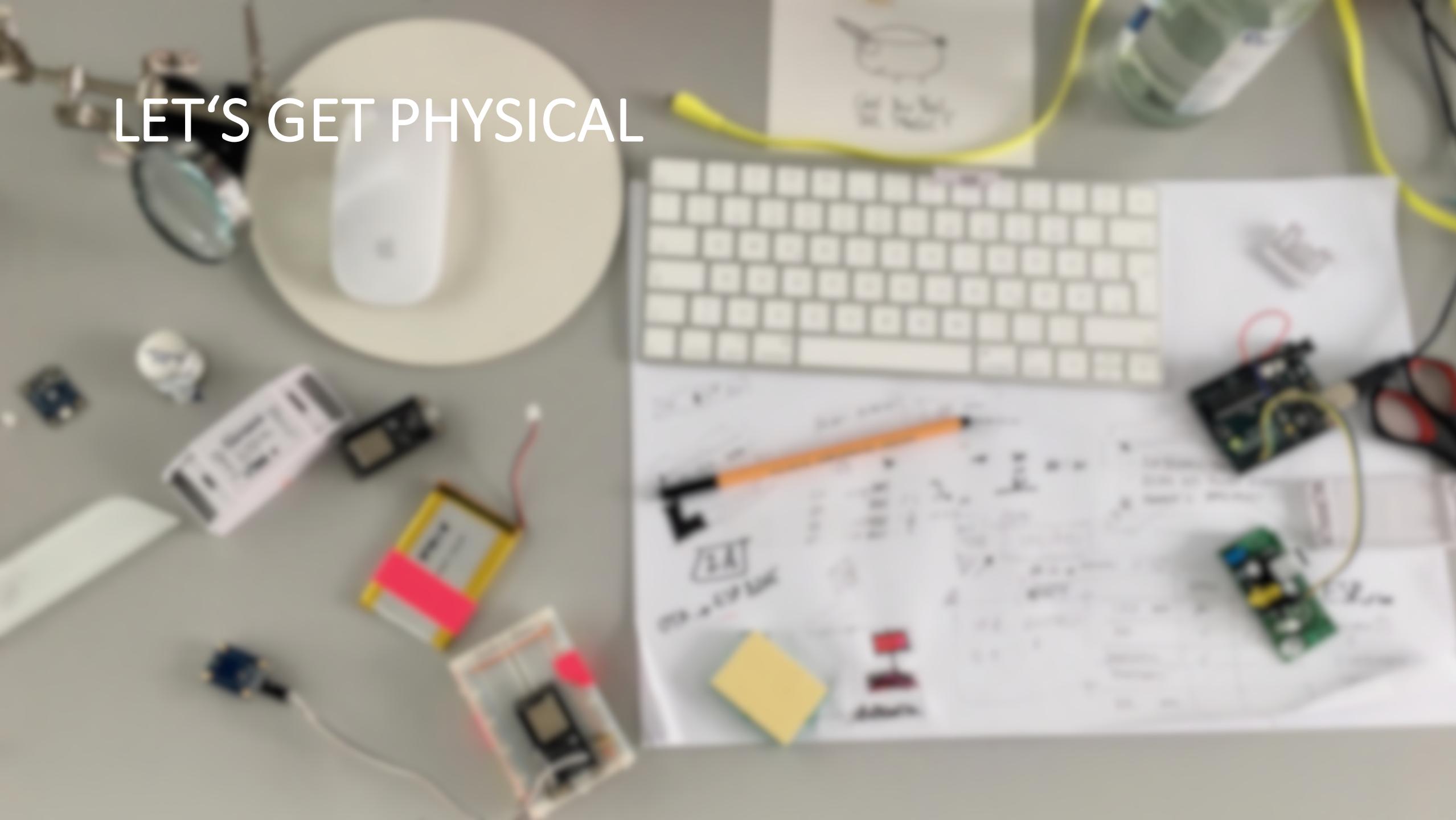
# BUILD CIRCUITS WITHOUT SOLDERING



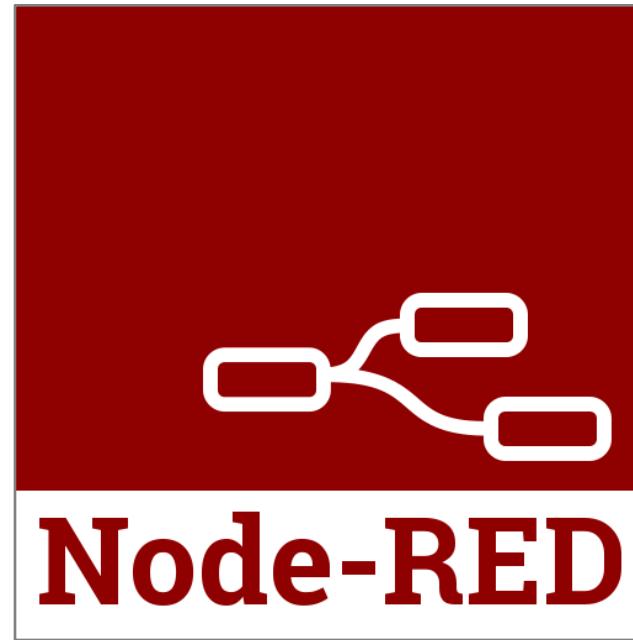
# BREADBOARD LAYOUT



# LET'S GET PHYSICAL



Hpi-academy C20ydwdX



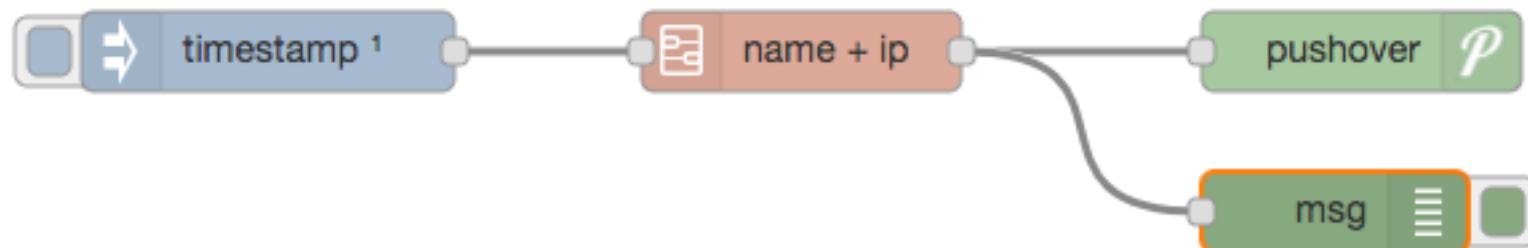
[http://protopi\[Nummer\].local:1880](http://protopi[Nummer].local:1880)

# OUR FIRST FLOW

# Pushover

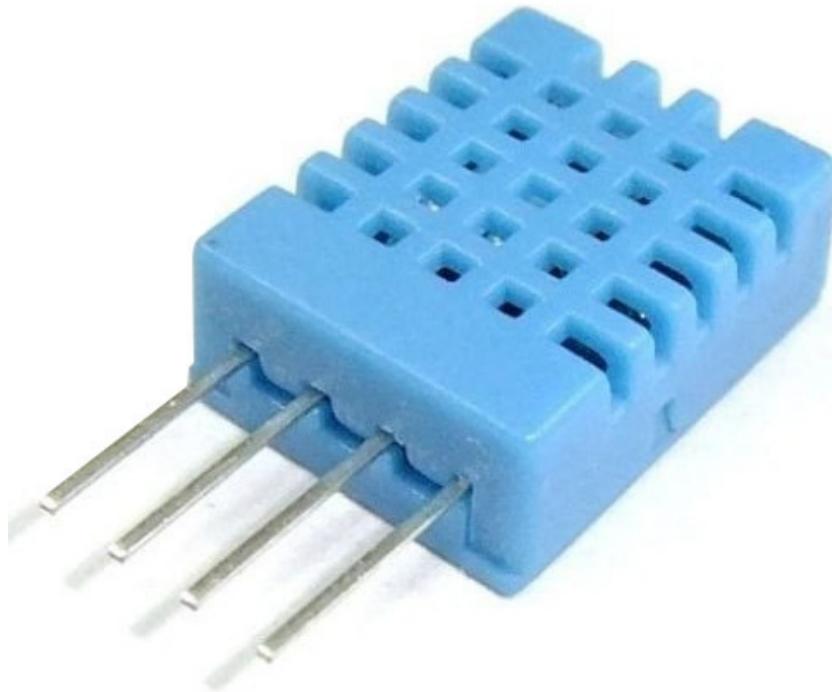
## Simple Notifications

Pushover makes it easy to get real-time notifications on your Android, iPhone, iPad, and Desktop (Android Wear and Apple Watch, too!)

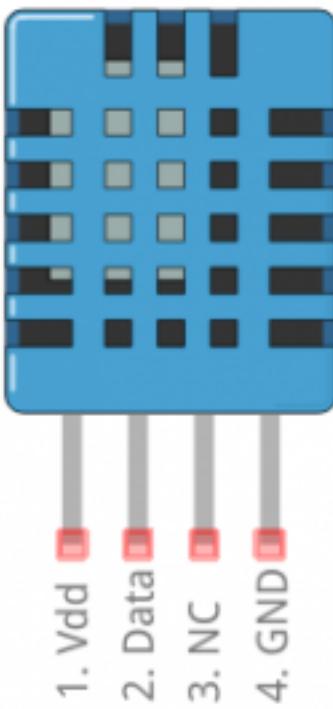


```
protopi07 : msg : Object
  ↳ object
    topic: "protopi07"
    _msgid: "81ca9f9e.ef0e2"
    payload: "192.168.2.125"
```

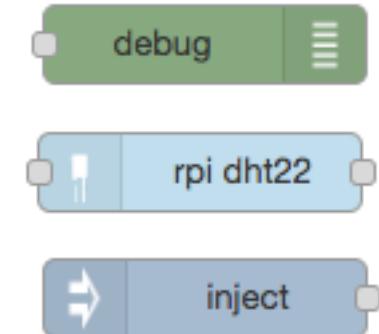
# READ TEMPERATURE & HUMIDITY



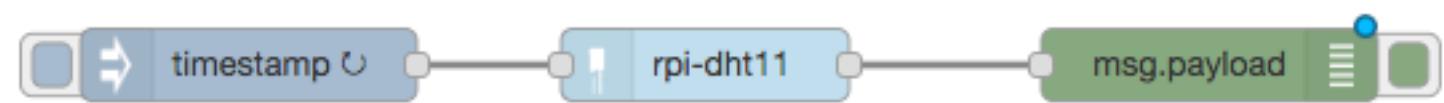
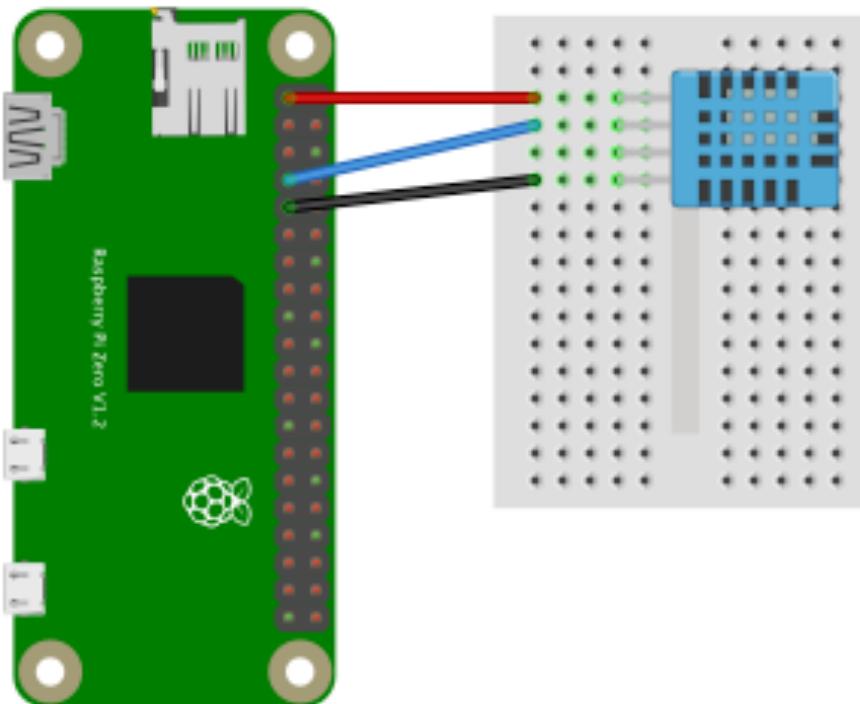
# READ TEMPERATURE & HUMIDITY



- DHT11
  - A family of temp / humidity sensors
  - Reads temperature and humidity values
  - VCC <= 5V
- 
- Use the pins: 1, 7 & 9  
(see [pinout.xyz](http://pinout.xyz))



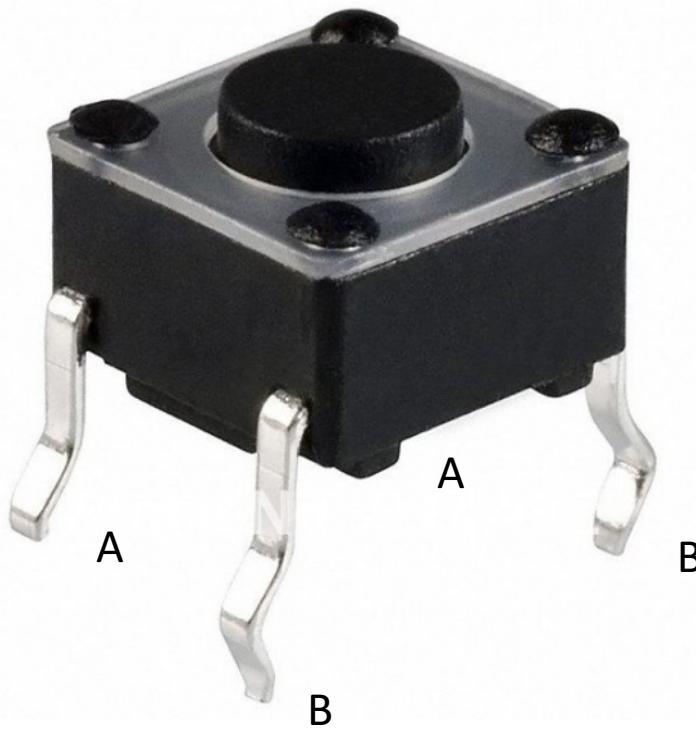
# READ TEMPERATURE & HUMIDITY



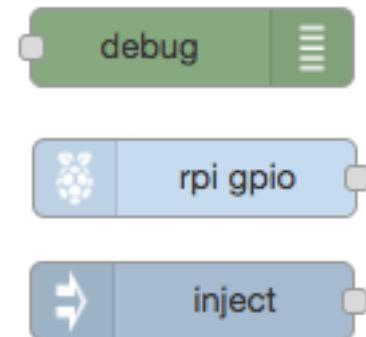
# DETECT A BUTTON PRESS



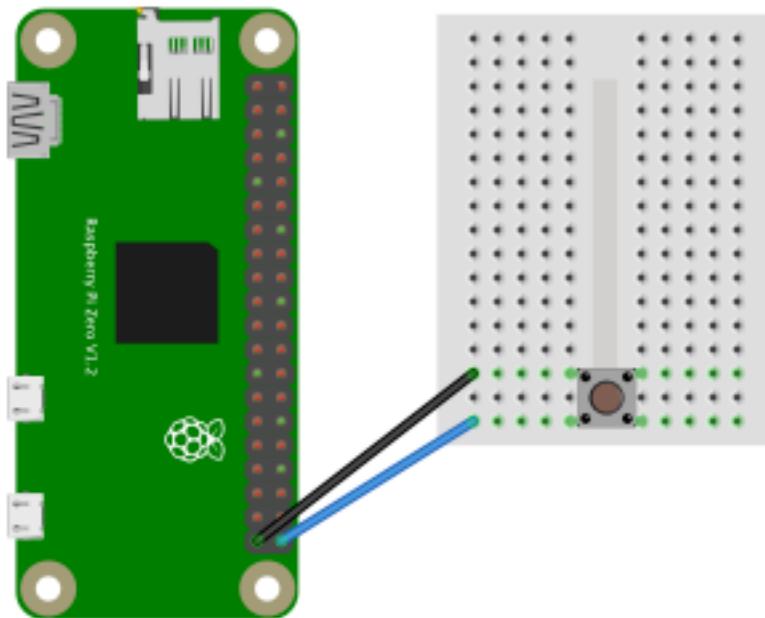
# DETECT A BUTTON PRESS



- Connect the pins that are on the same side of the dashboard
- Push = connection established
- Debouncing
- Pull up / pull down
- Use pins 39 and 40
- The button should return a „0“ when pressed

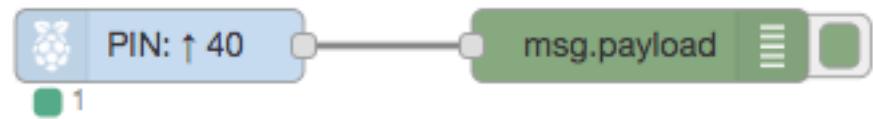


# DETECT A BUTTON PRESS

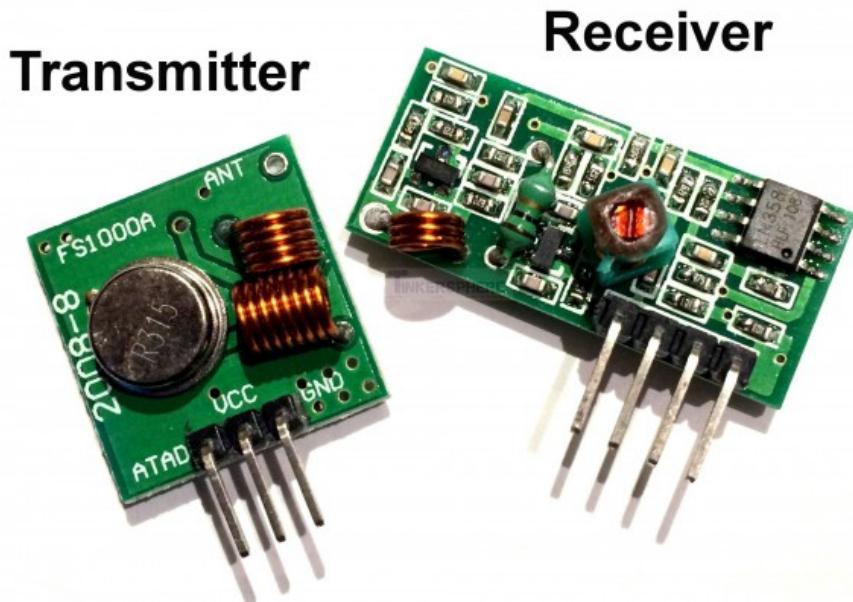


Note: You need to set the pin to pullup, so it will have a default value of '1'. When you press the button the current will flow to the ground pin and the value will be '0'.

To reverse the effect, use a 3.3V or 5V power pin instead of a ground pin and set the pin to pulldown. Now the value will be '0' by default and '1' when pressed



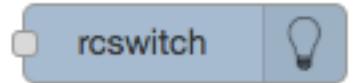
# CONTROL A REMOTE POWER PLUG



# CONTROL A REMOTE POWER PLUG



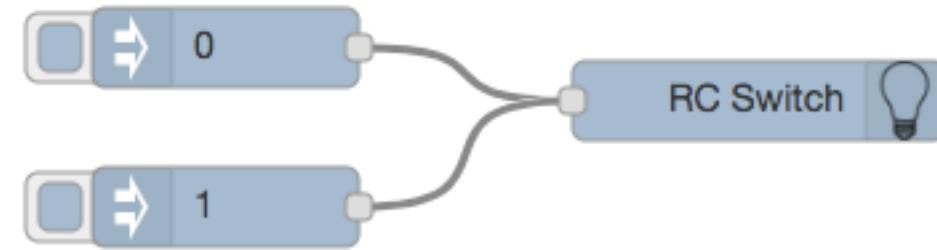
- 433.92MHz sender
- Frequency used for **power plugs**, weather stations
- VCC: 3V - 12V (the more the better)
- Group: 5-bit
- Device: A-D
- The node uses the wiring pin numbering:  
use pins 17, 18 (wiring pin #5) & 20.



# CONTROL A REMOTE POWER PLUG

node properties

Name	Name
PIN	5
Mode	Group code + Device
Group	11111x
Device	Device A
Switch Position	msg.payload

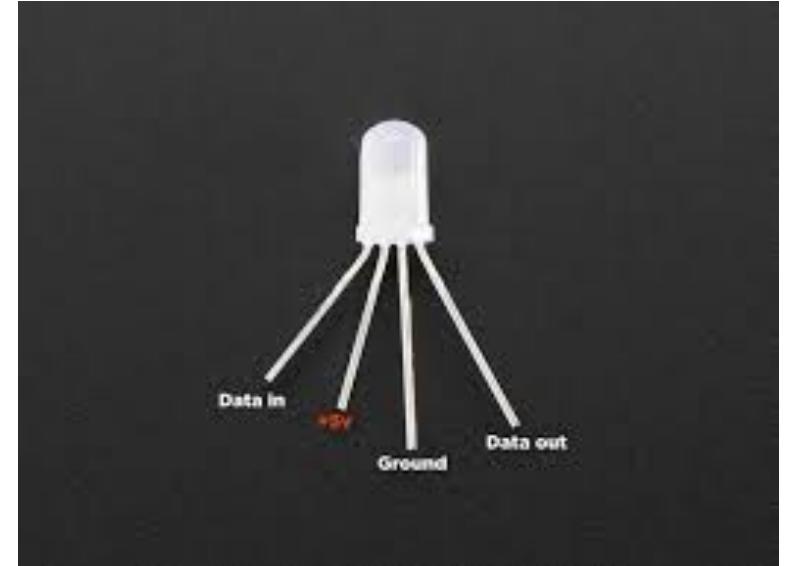


# CONTROL A LED



# CONTROL A LED

- This a NeoPixel (clone, WS2811),
  - It's RGB LED (well, the 2811 is a GRB LED)
  - Digital adressable
- 
- VCC = 5V



<https://learn.adafruit.com/adafruit-neopixel-uberguide/the-magic-of-neopixels>

# BUILD YOUR OWN REMOTE CONTROL



# BUILD YOUR OWN REMOTE CONTROL



- ...using Blynk
- Blynk allows you to connect „virtual“ sensors and actuators to your pi

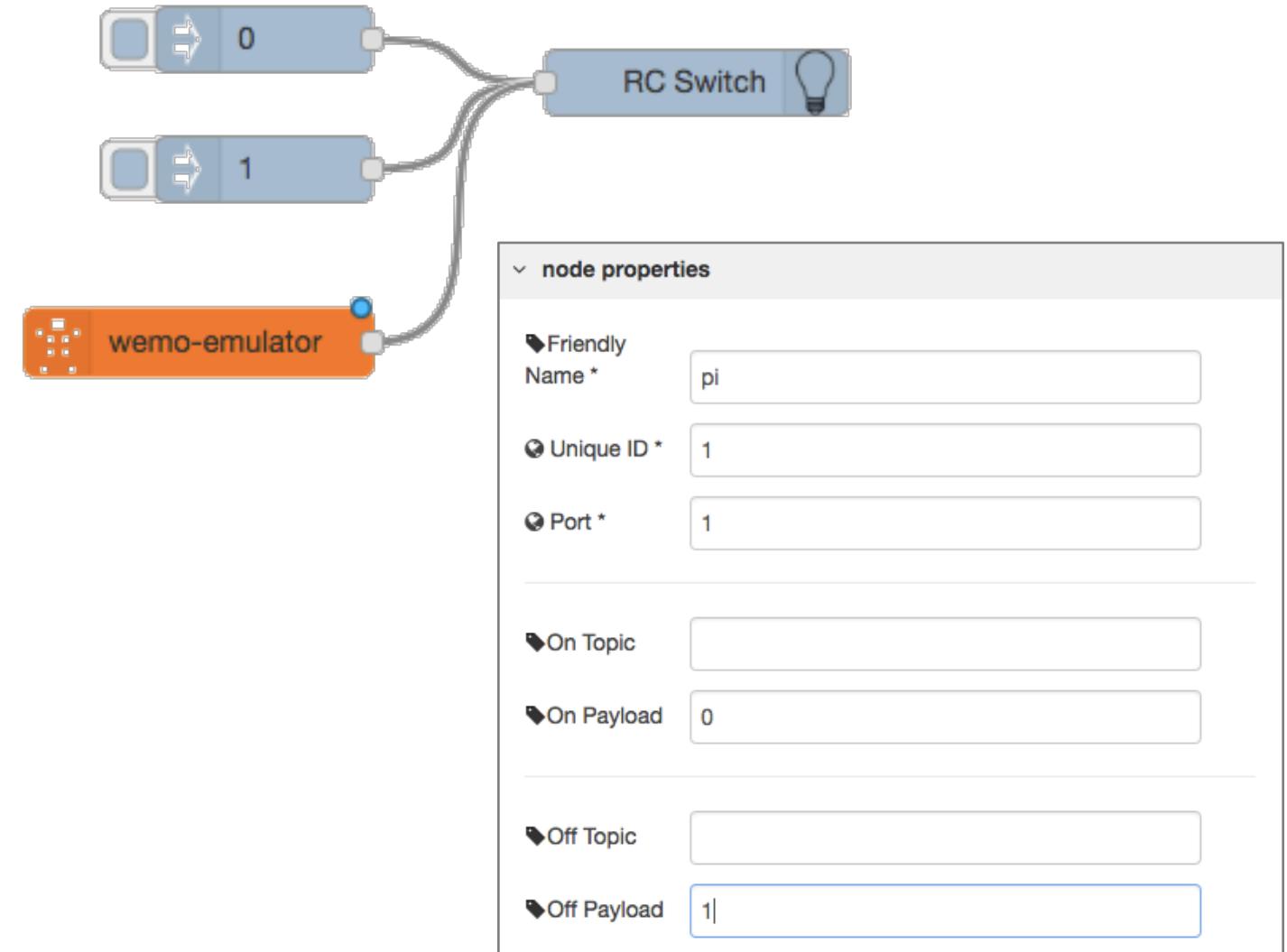
# TALK TO THE PI



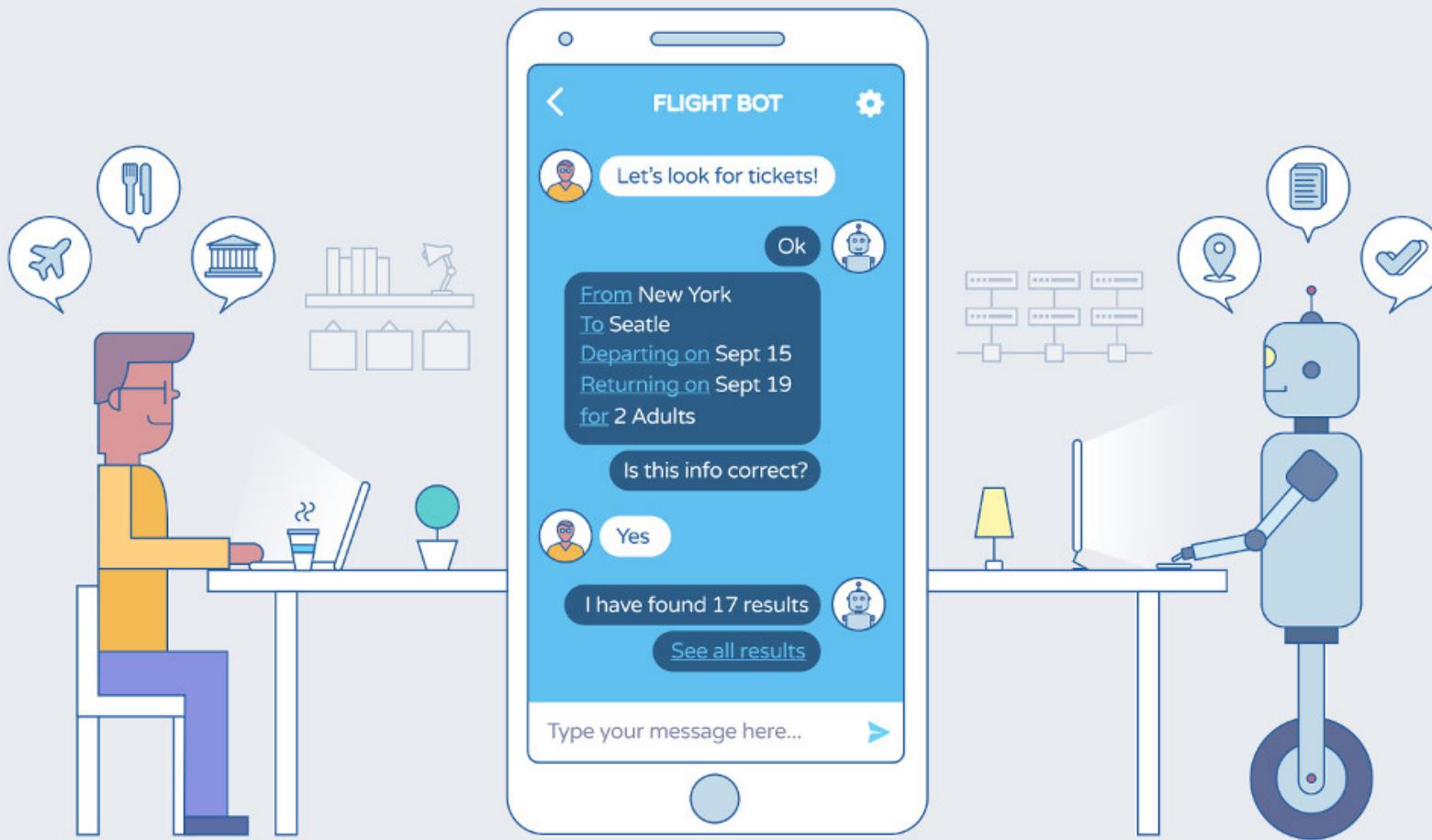
# TALK TO THE PI



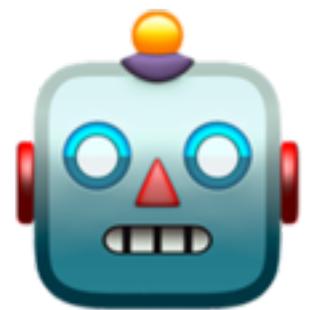
... by faking a WeMo switch.



# CHAT WITH THE PI



A **Chatbot** is a computer program that simulates human conversation through voice commands or text chats or both.



# CHAT WITH THE PI



- Telegram is a messenger app
- It offers a Chatbot API
- Contact the **@BotFather** to create a new one

# CHAT WITH THE PI



## The Botfather

Telegram

BotFather  
bot

Lennart  
`/newbot`

BotFather  
Alright, a new bot. How are we going to call it? Please choose a name for your bot.

Lennart  
ProtoPi01

BotFather  
Good. Now let's choose a username for your bot. It must end in `bot`. Like this, for example: TetrisBot or tetris\_bot.

Lennart  
ProtoPiBot

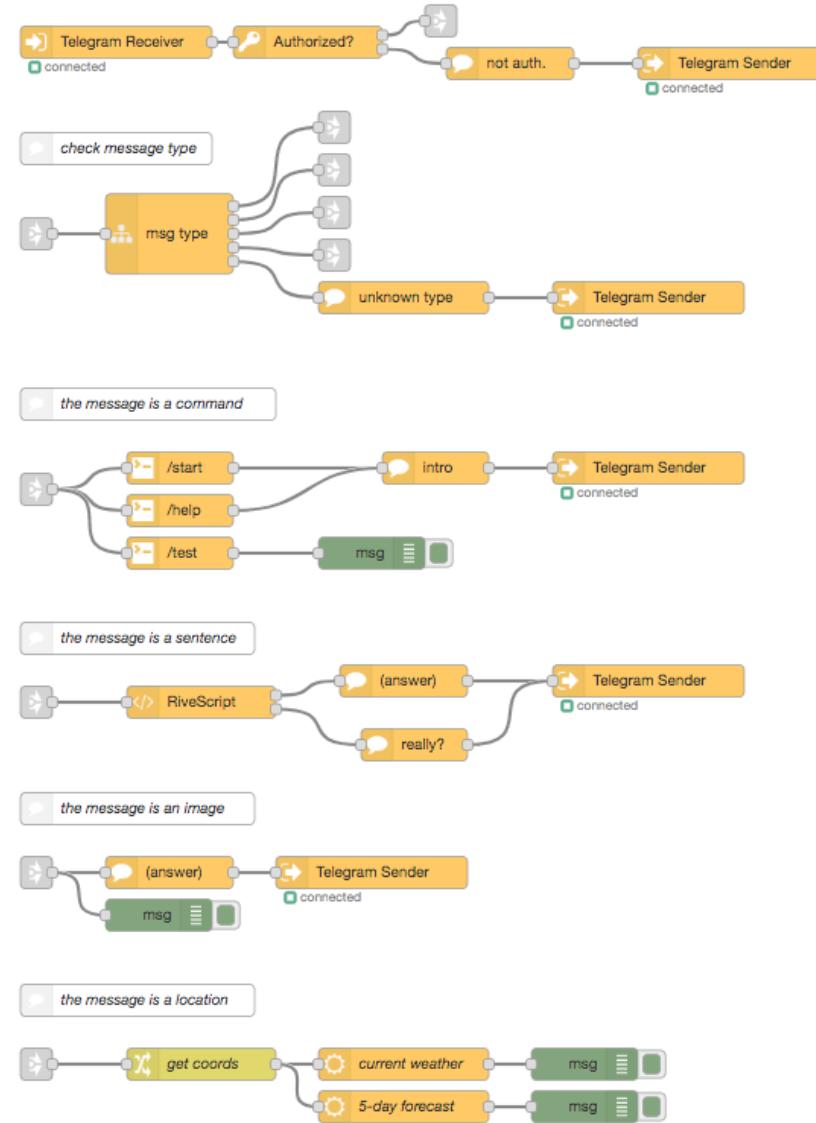
BotFather  
Done! Congratulations on your new bot. You will find it at [t.me/ProtoPiBot](https://t.me/ProtoPiBot). You can now add a description, about section and profile picture for your bot, see [/help](#) for a list of commands. By the way, when you've finished creating your cool bot, ping our Bot Support if you want a better username for it. Just make sure the bot is fully operational before you do this.

Use this token to access the HTTP API:  
**562273079:AAFuSAQ5\_1oP5ffhBIcEjBkC1tmkdYdi00**

For a description of the Bot API, see this page: <https://core.telegram.org/bots/api>

Write a message...  

# CHAT WITH THE PI



# GET WEATHER DATA

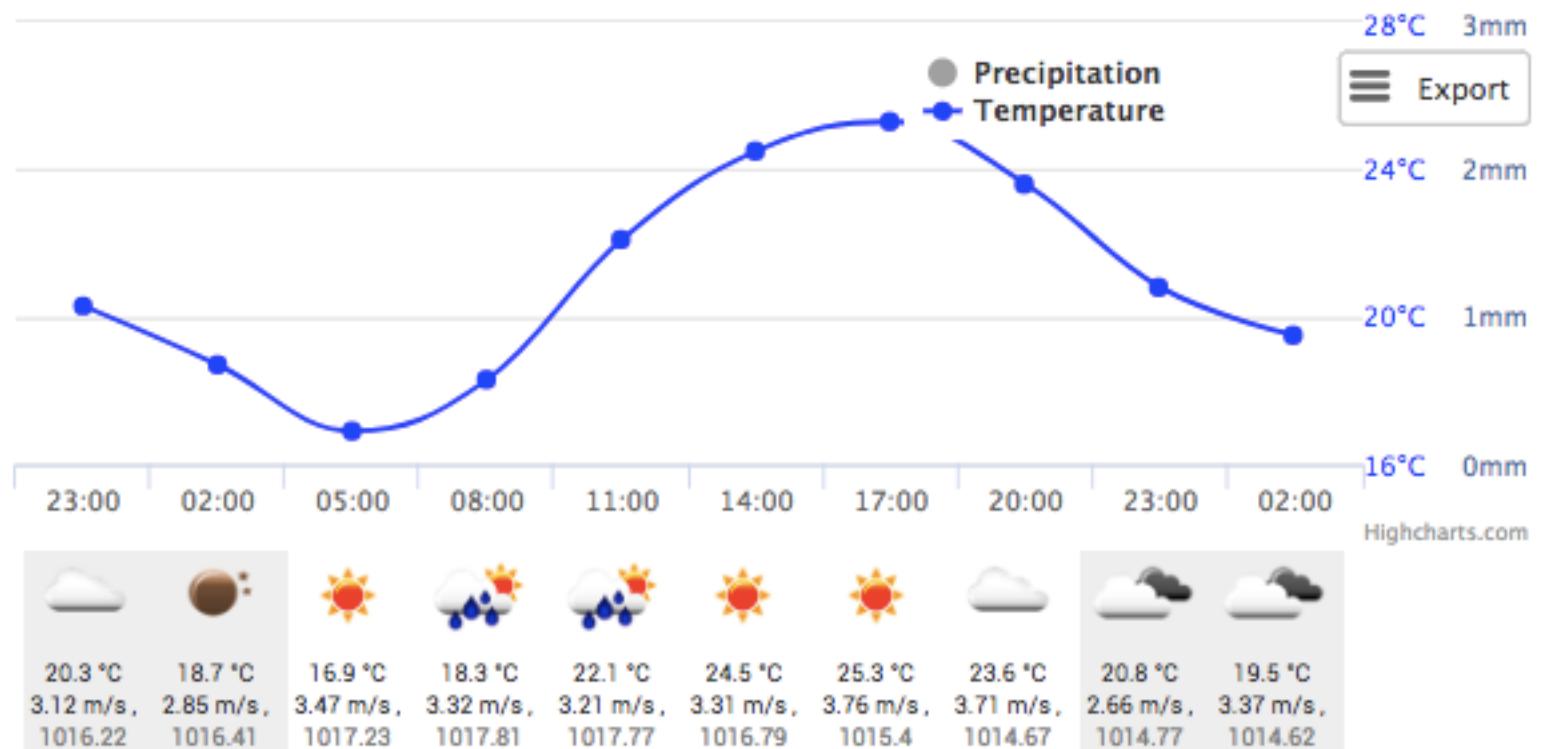


Light intensity shower rain

21:26 Jun 10 Wrong data?

Wind	Light breeze, 2.1 m/s, North-northwest ( 330 )
Cloudiness	Broken clouds
Pressure	1009 hpa
Humidity	88 %
Sunrise	04:45
Sunset	21:29
Geo coords	[52.4, 13.07]

## Weather and forecasts in Potsdam, DE



<https://www.openweathermap.org>

MARIO  
005400

0 x 22

WORLD  
1-1

TIME  
367

RESET & SHUTDOWN BUTTON



# RESET & SHUTDOWN

- The Pi Zero is missing a shutdown button
- Connect GPIO 13 & 14 with a button
- Short click = reboot
- Long click (<5 sec) shutdown
- Nothing needs to be done in Node-RED

