

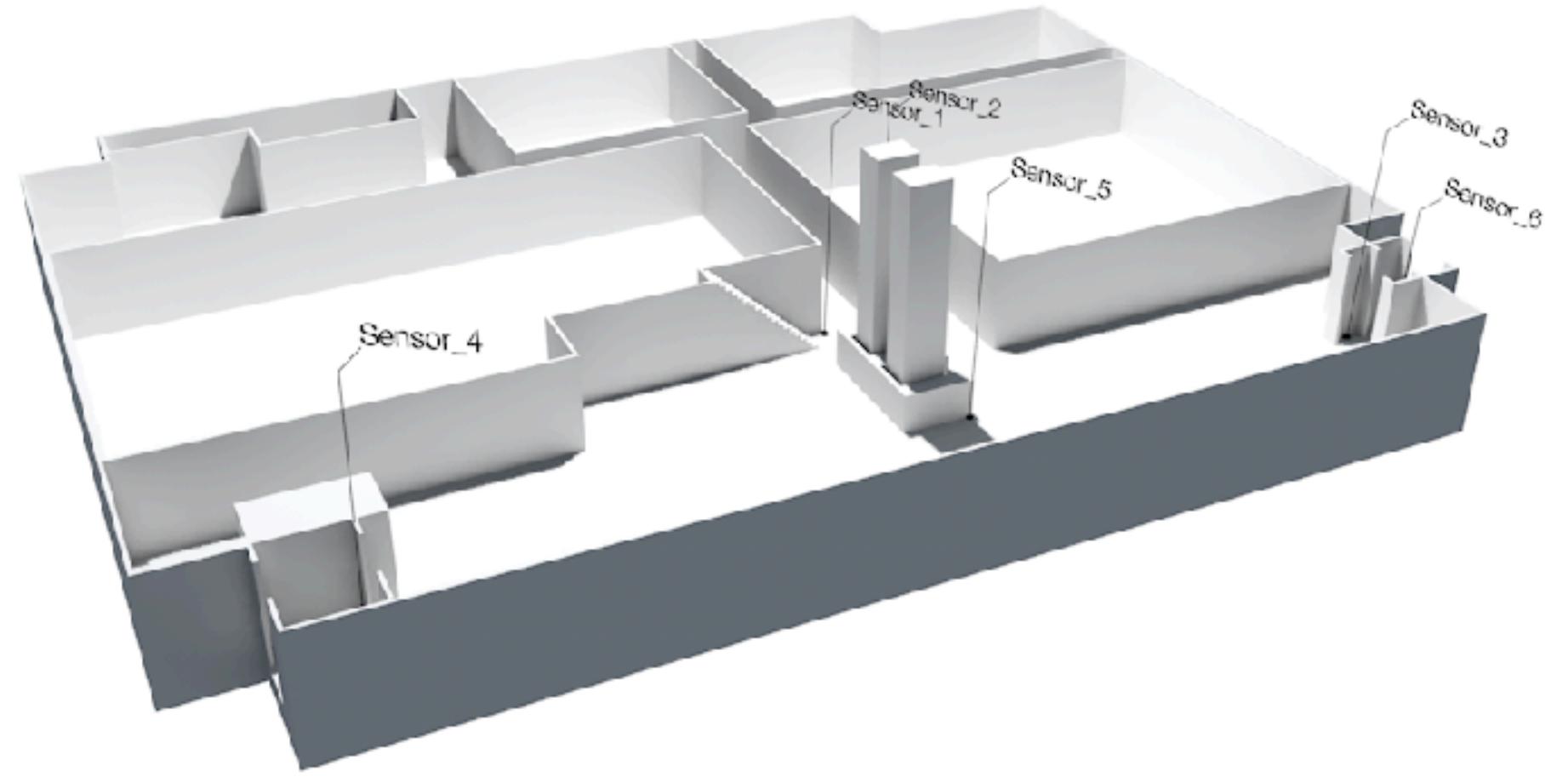
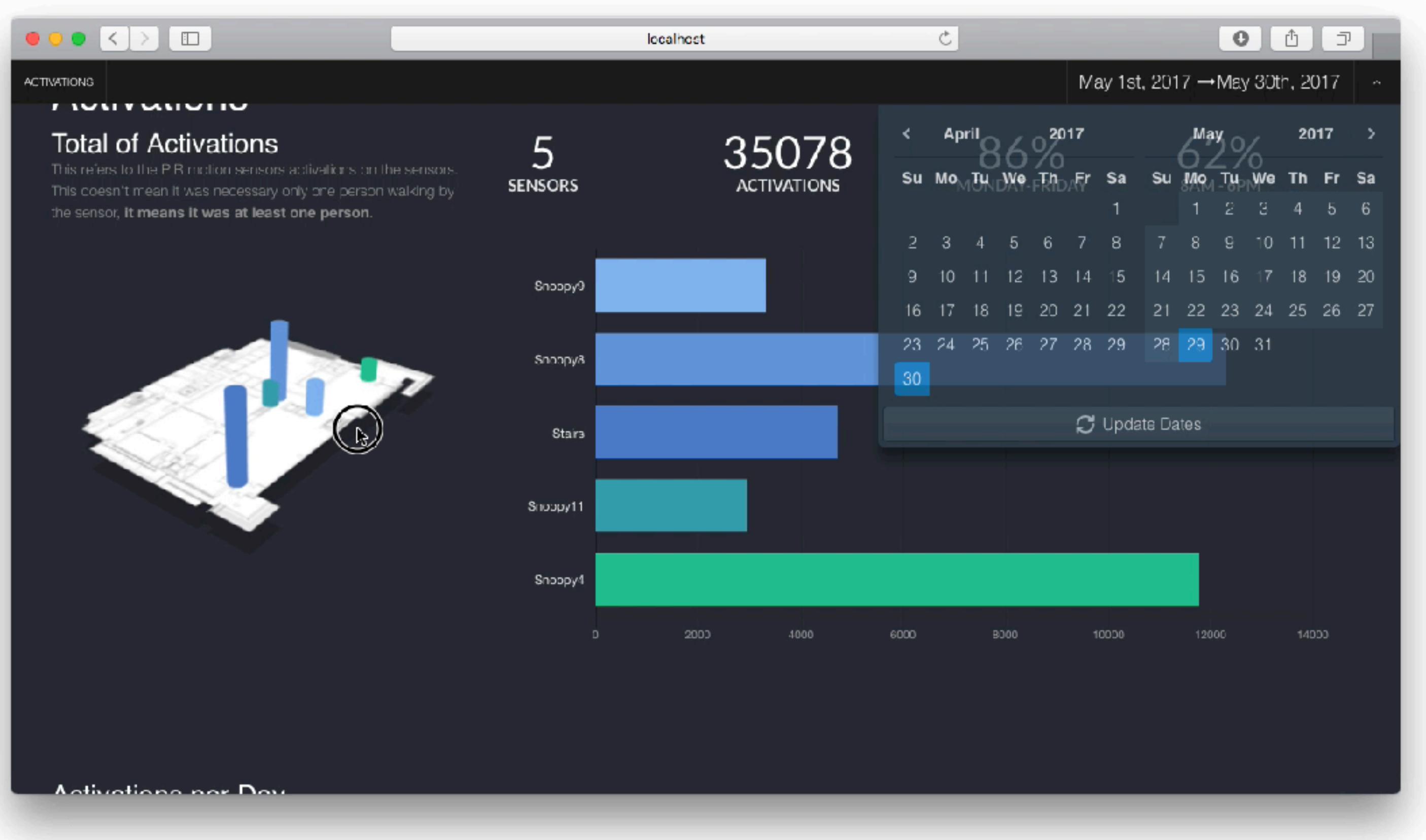
# IoT 101

SandBox : Internet of Things for data collection

# IoT - Data Collection



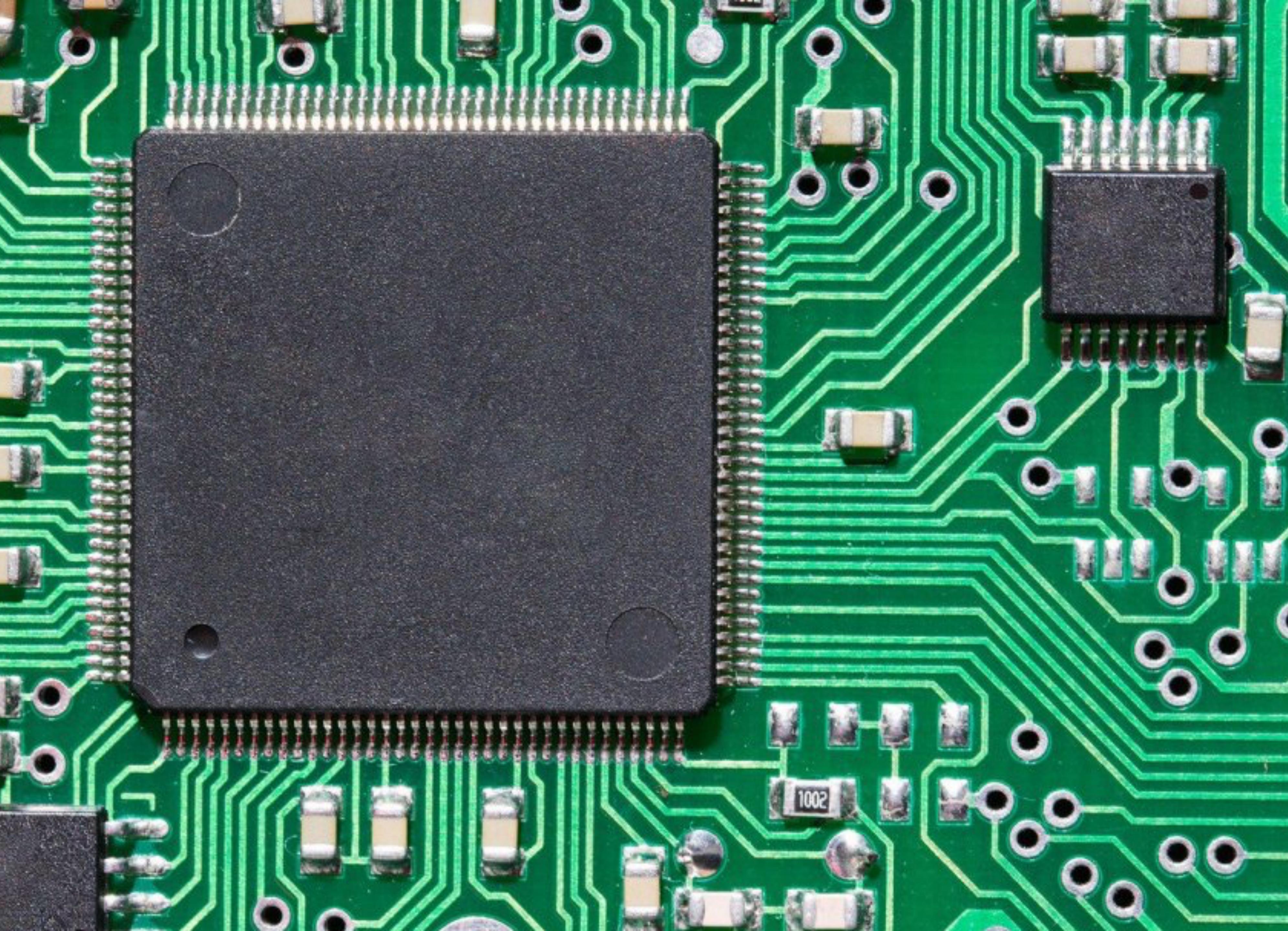
# IoT - Data Collection

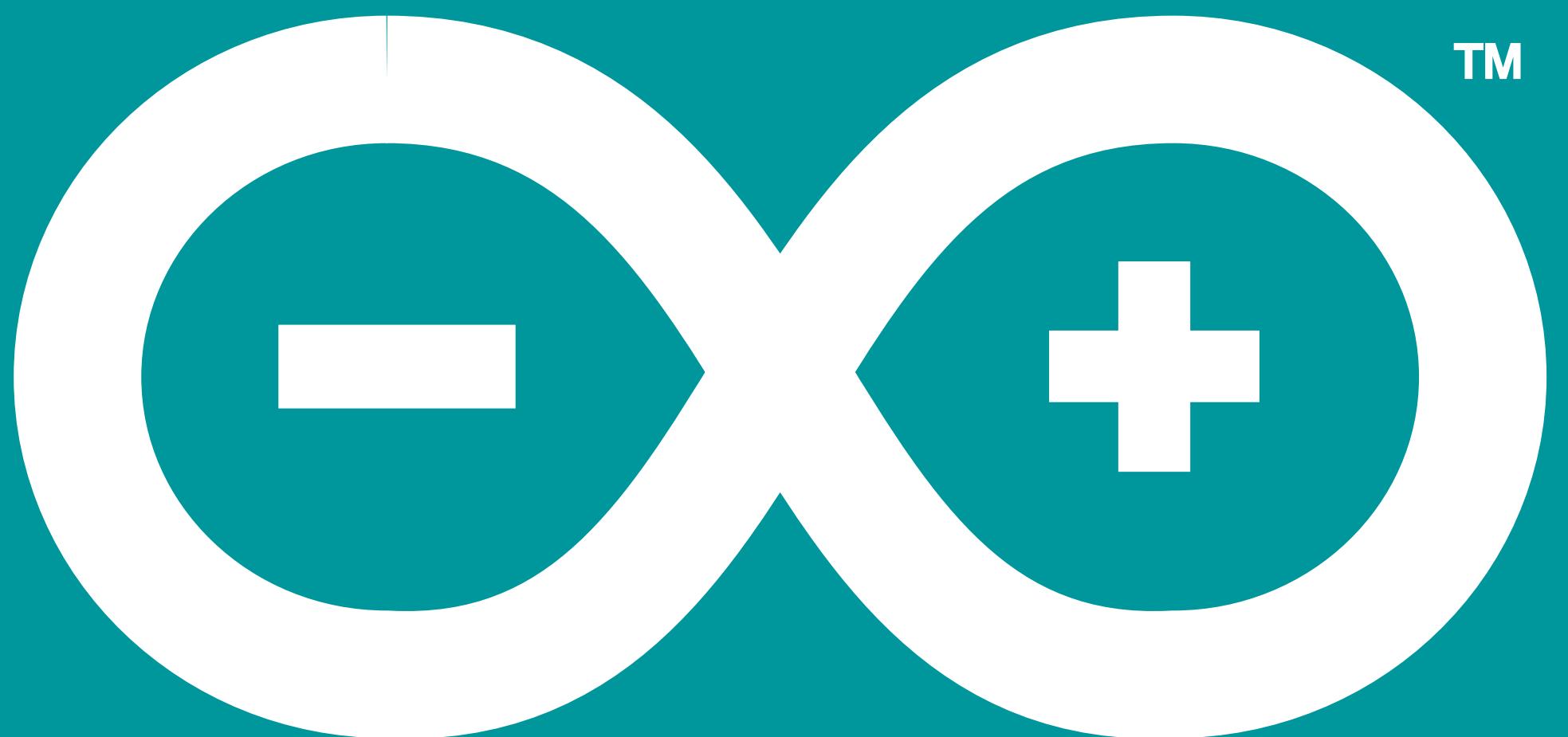


# workshop (right?)

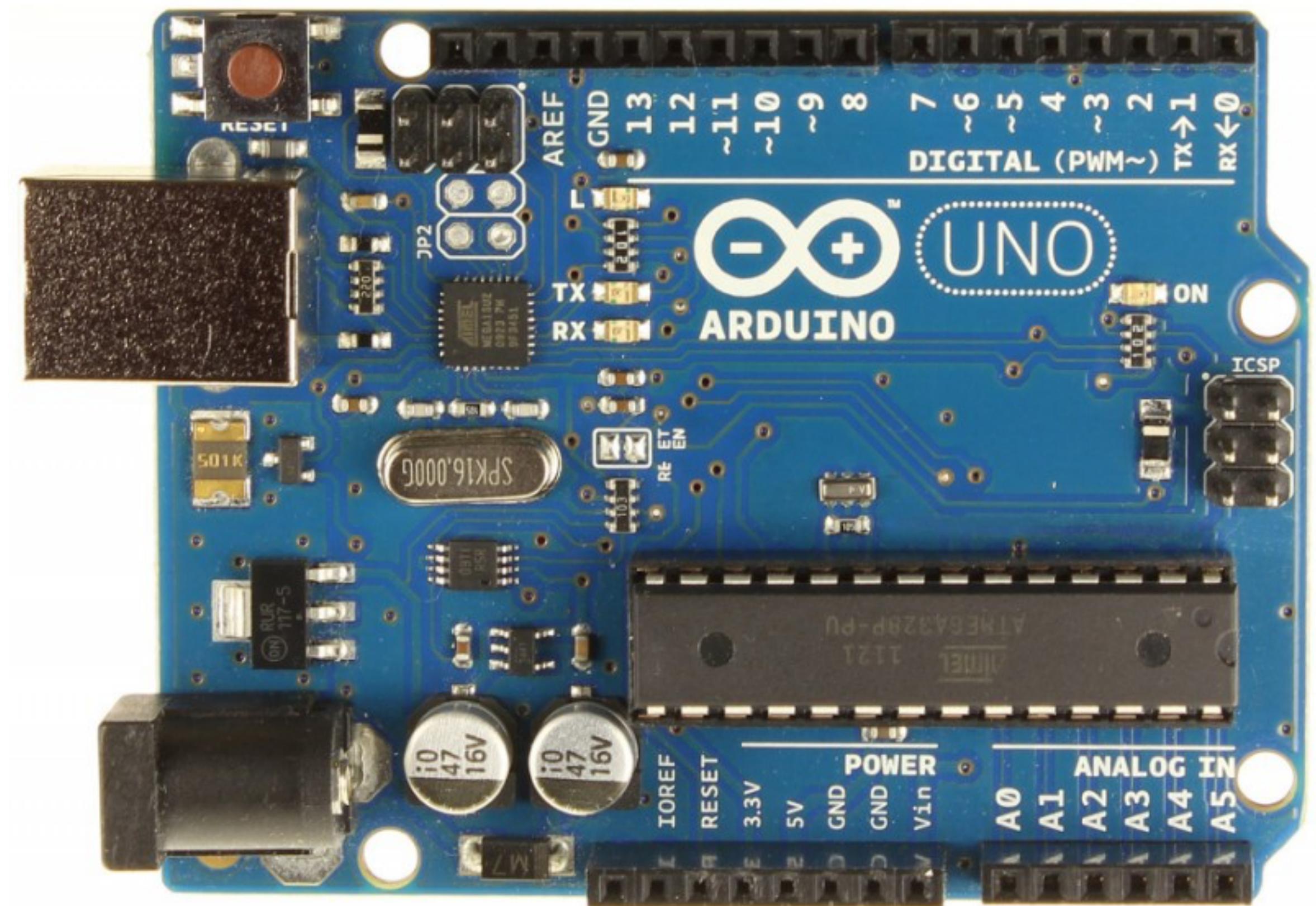
- \_ Microcontrollers
- \_ Arduino
- \_ ESP32
- \_ Inter-device Communication

# MICROCONTROLLERS

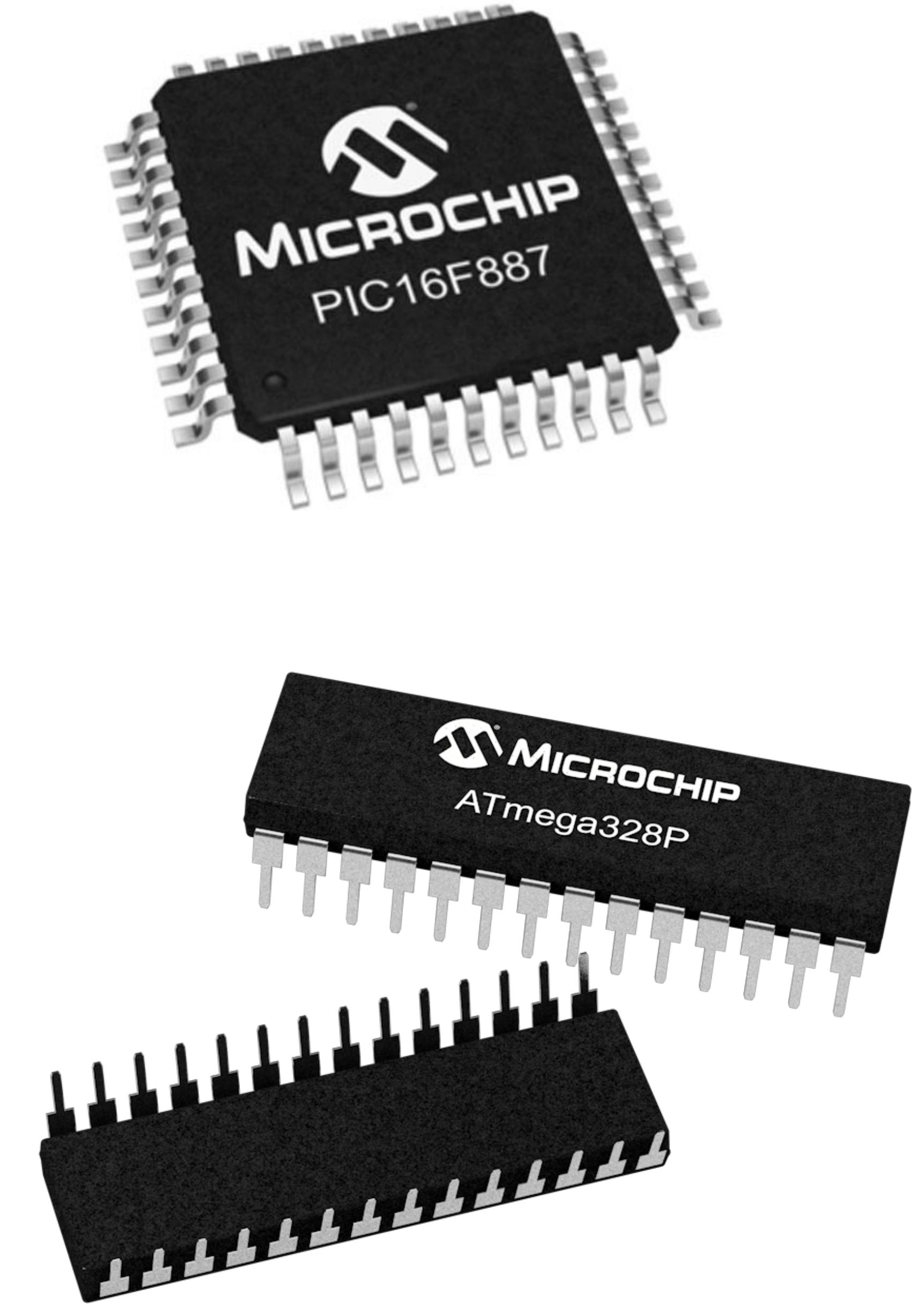
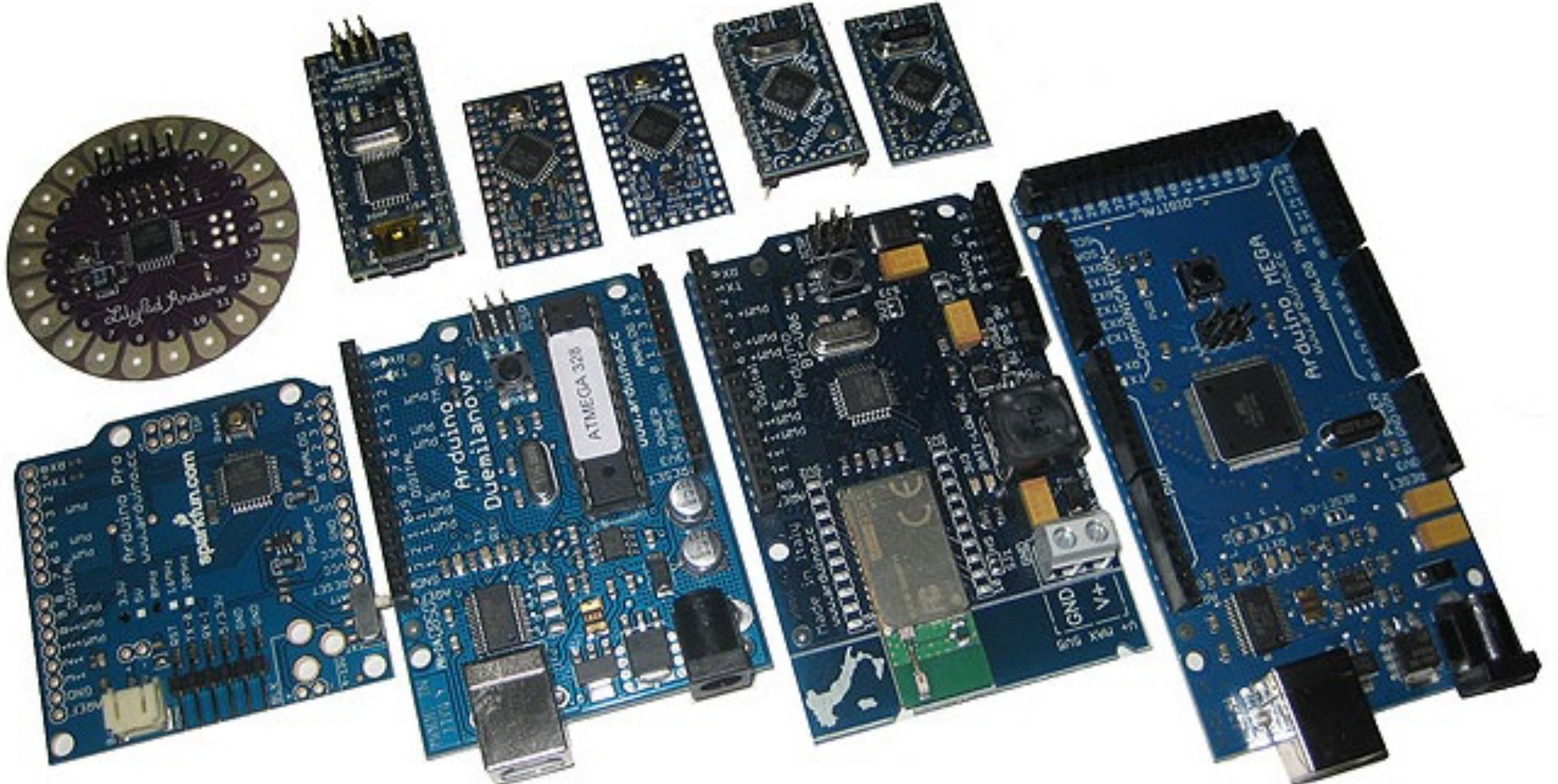


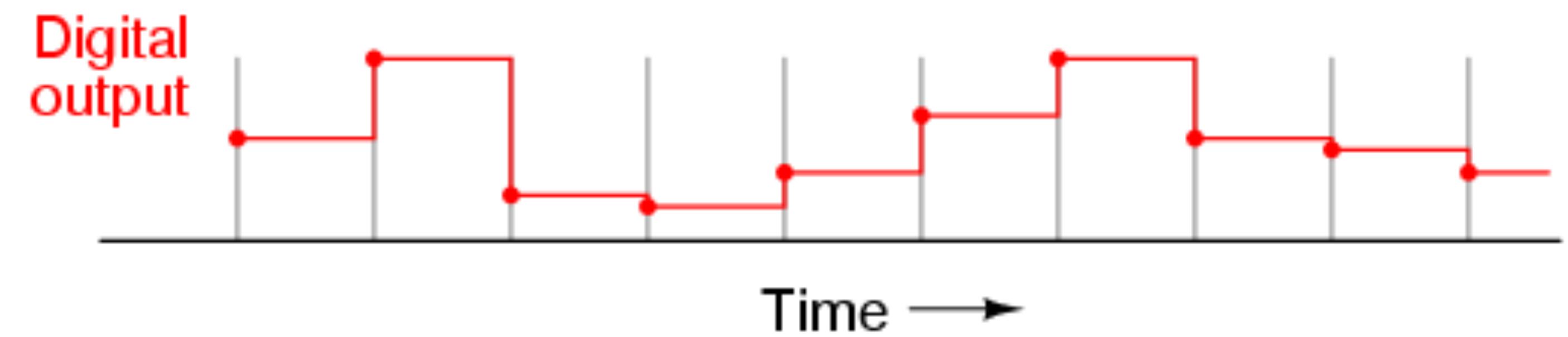
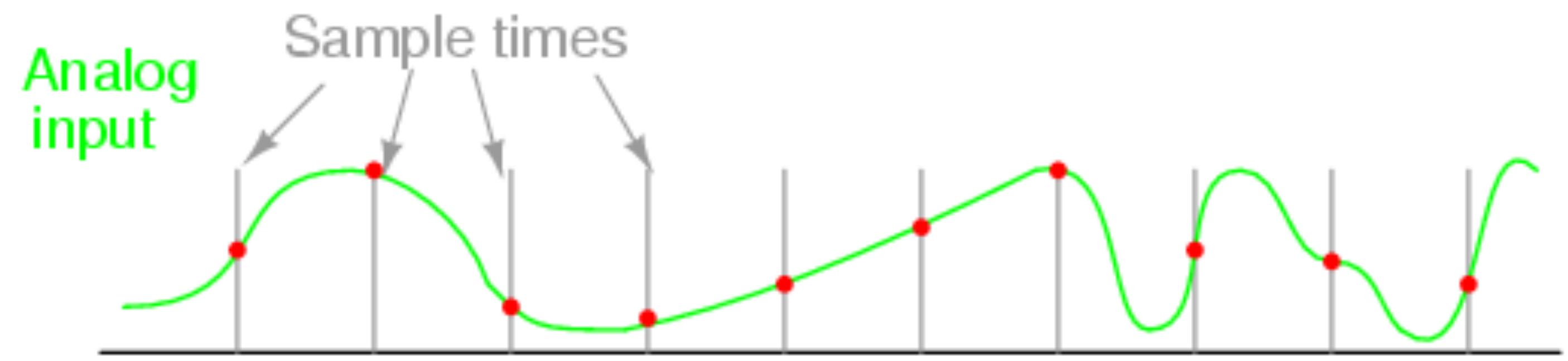
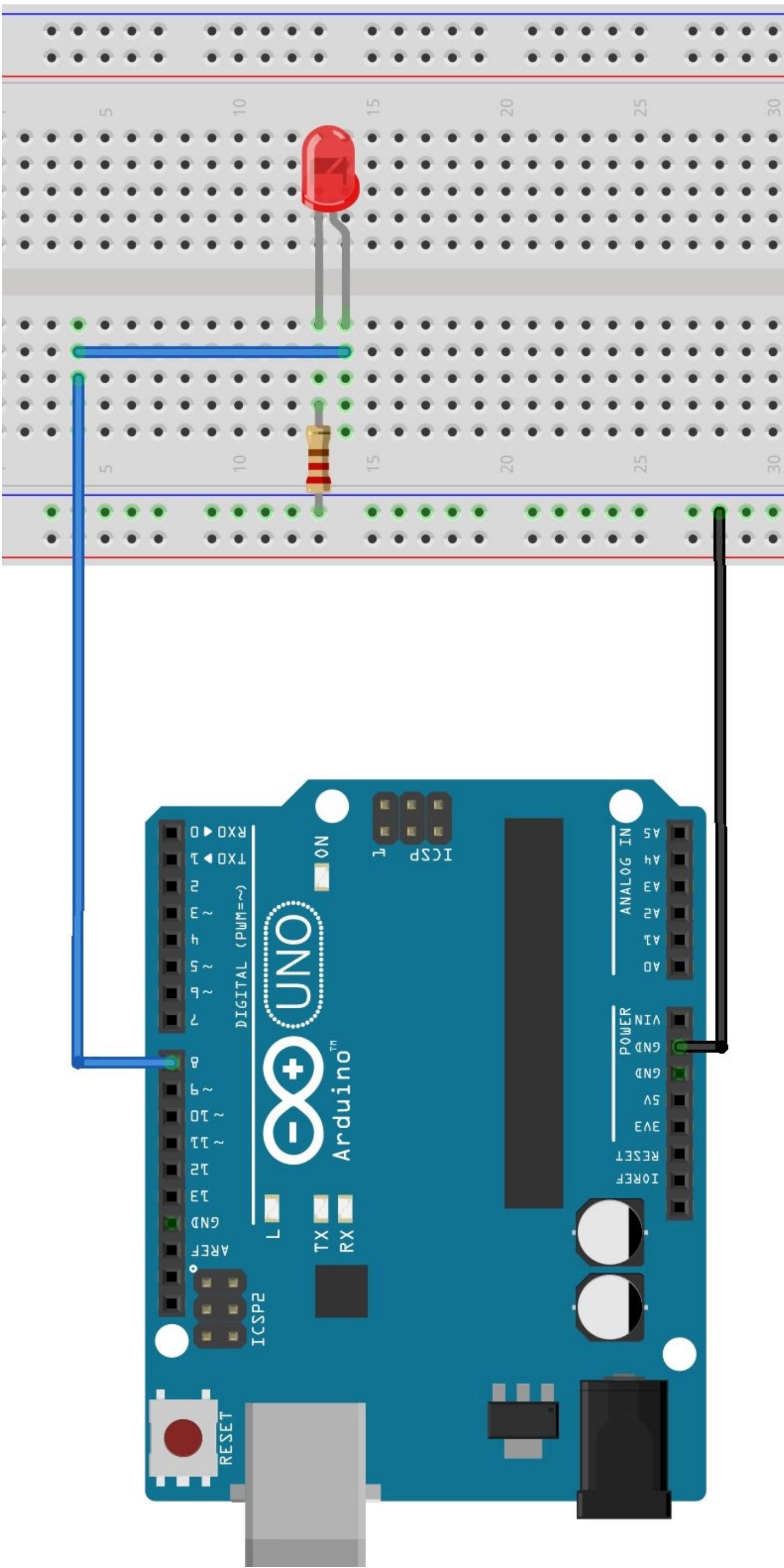


ARDUINO

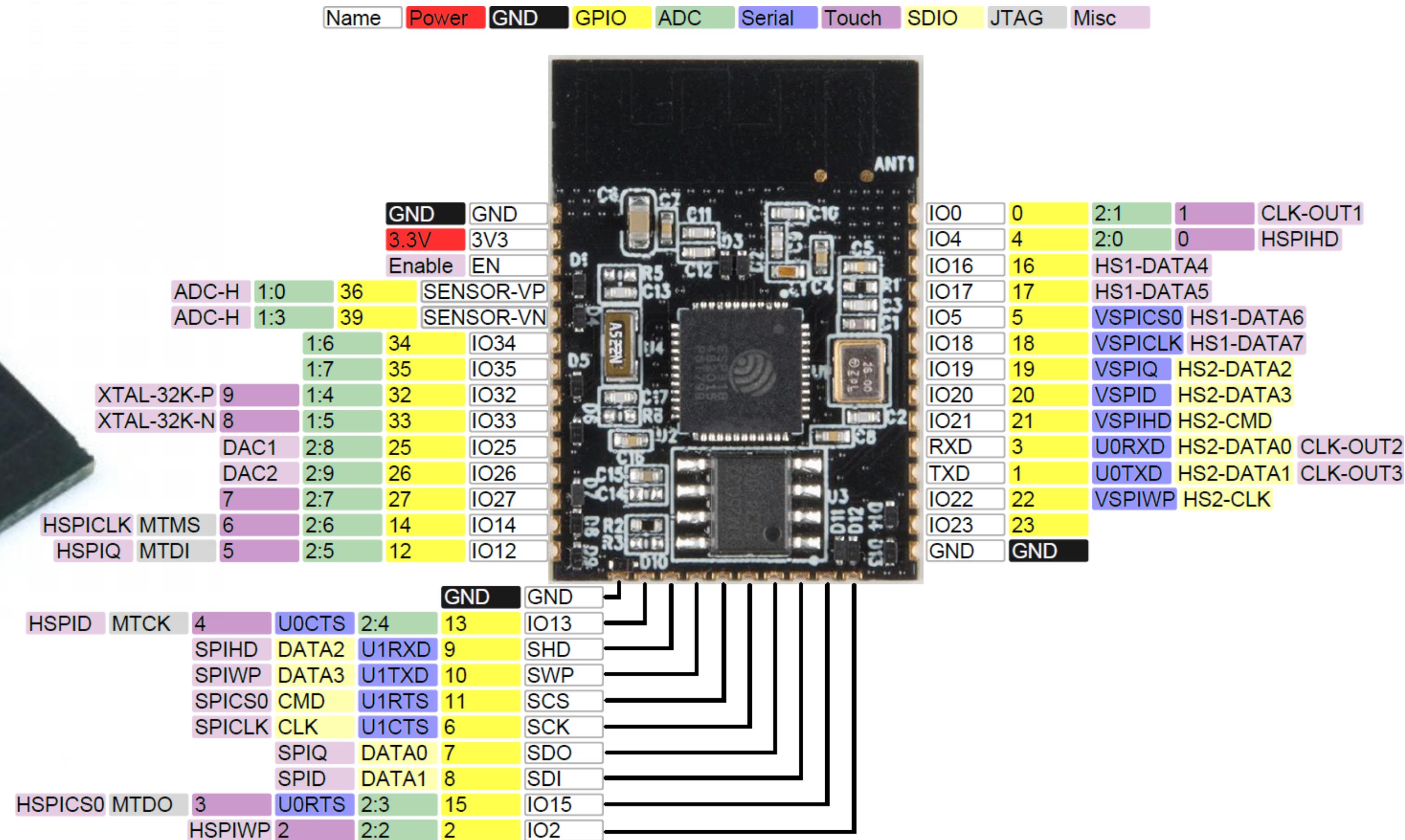


# Micro-controllador ARDUINO based





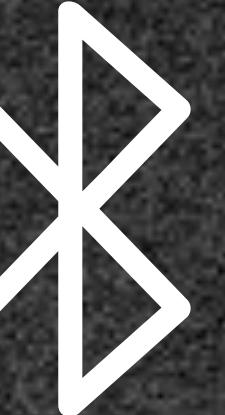
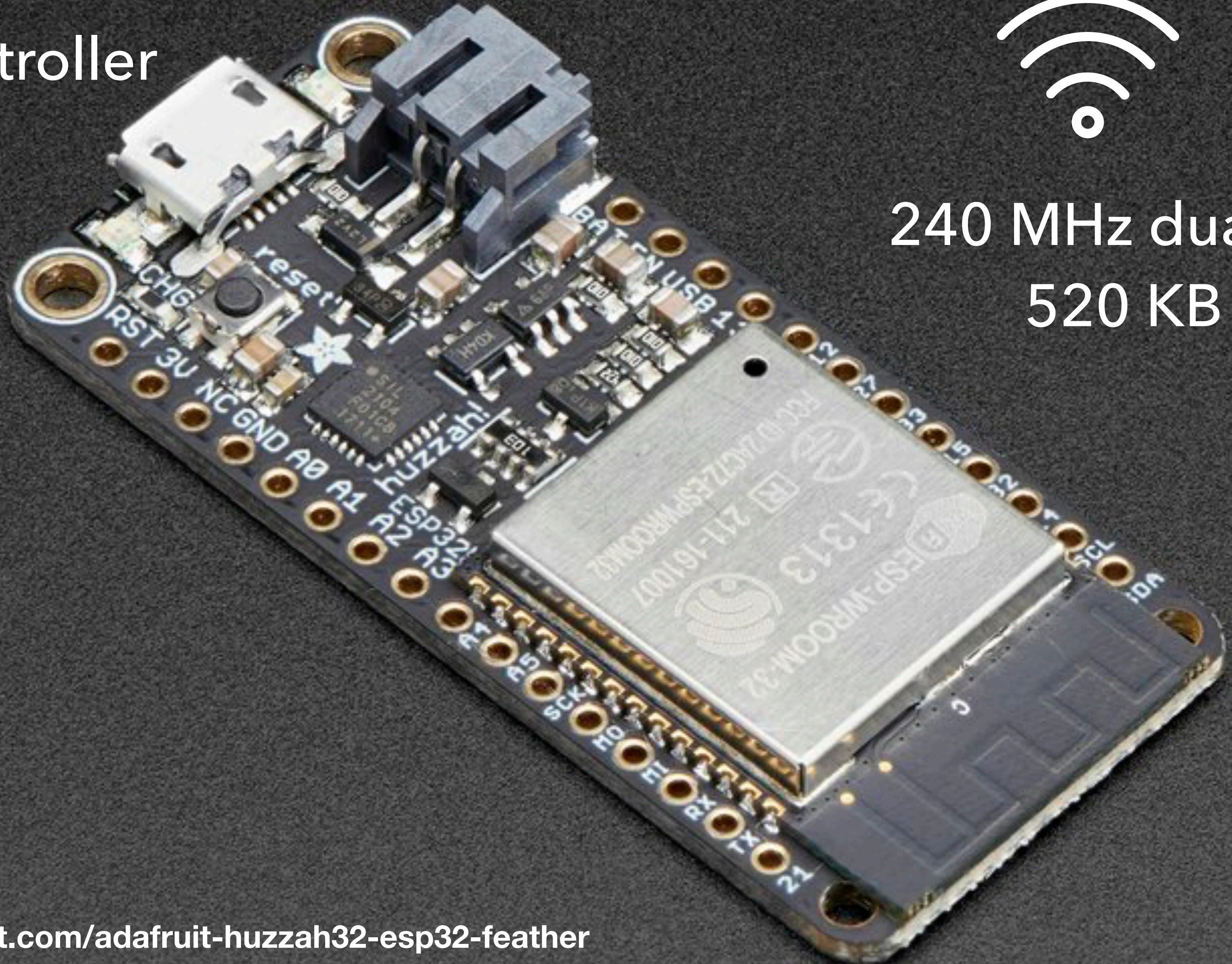
# Micro-controller ESP32



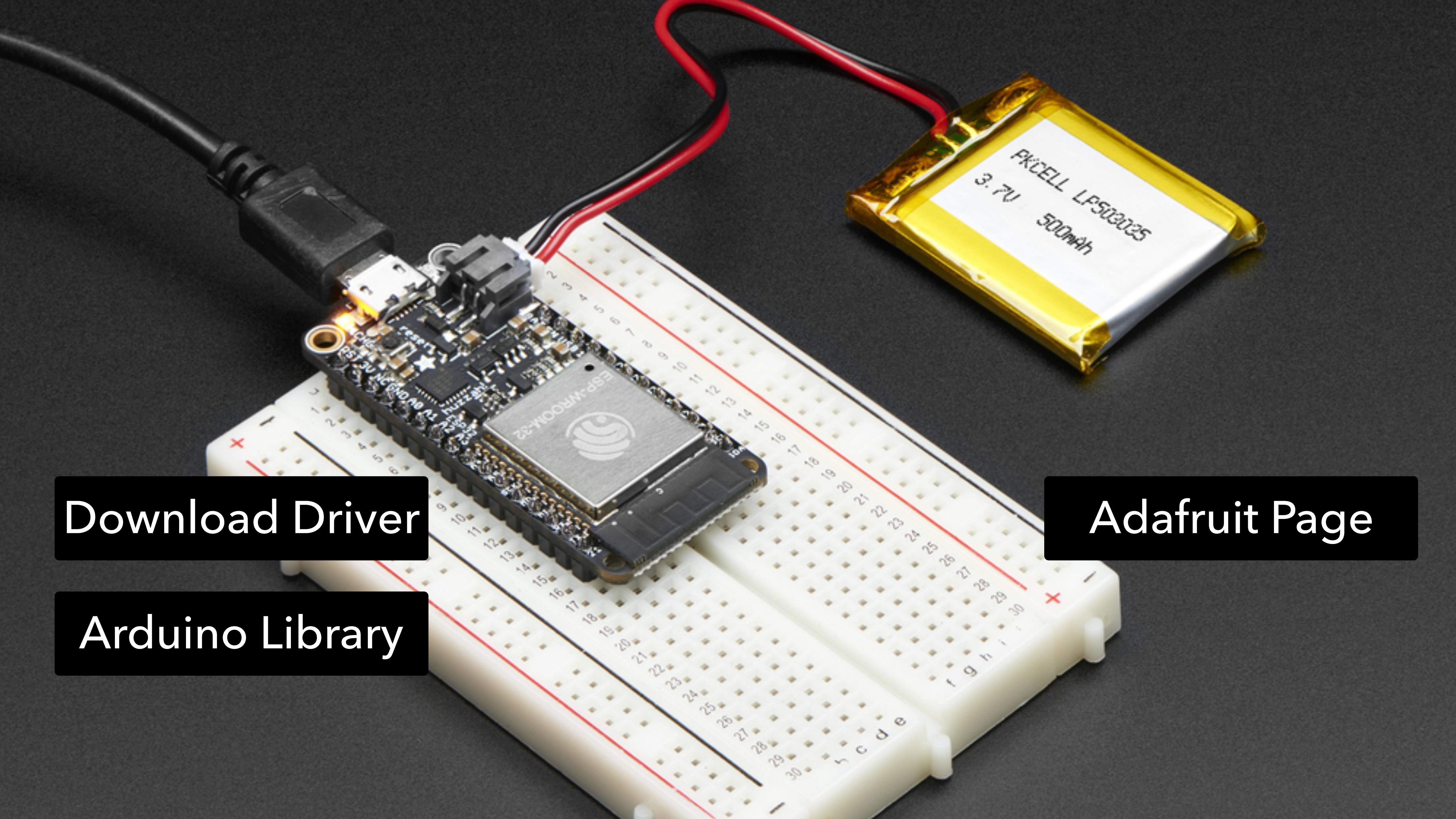
Motor PWM: Any GPIO - Four channels of 16-bit timers to generate PWM waveforms.

LED PWM: Any GPIO - 8 independent channels running at 80MHz clock

# Micro-controller ESP32 Feather



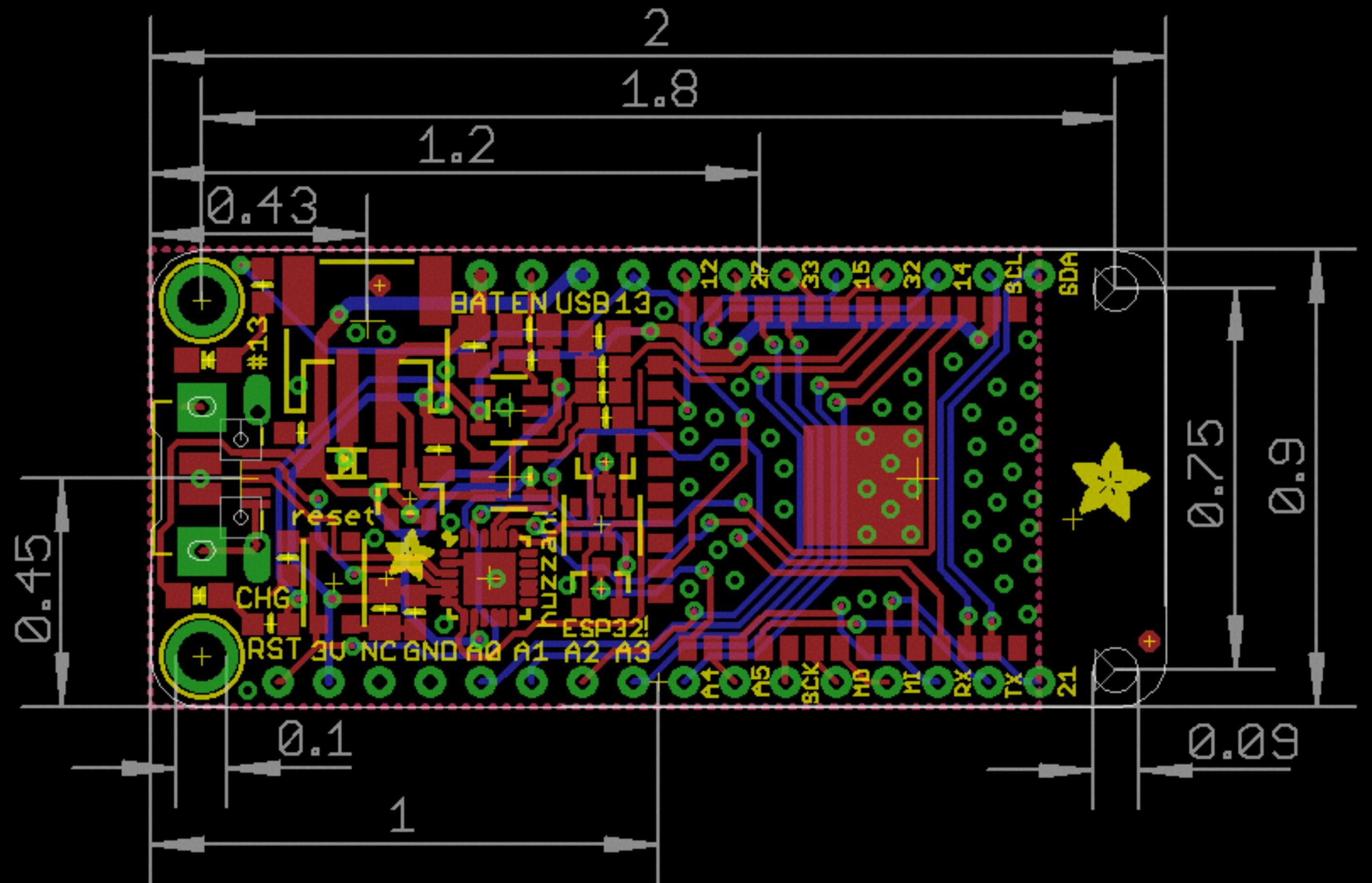
240 MHz dual core  
520 KB SRAM

A photograph of an ESP32 development board mounted on a breadboard. The board is connected to a 3.7V 500mAh LiPo battery via red and black wires. A USB cable is also connected to the board. The breadboard has numbered pins from 1 to 30 along its edges.

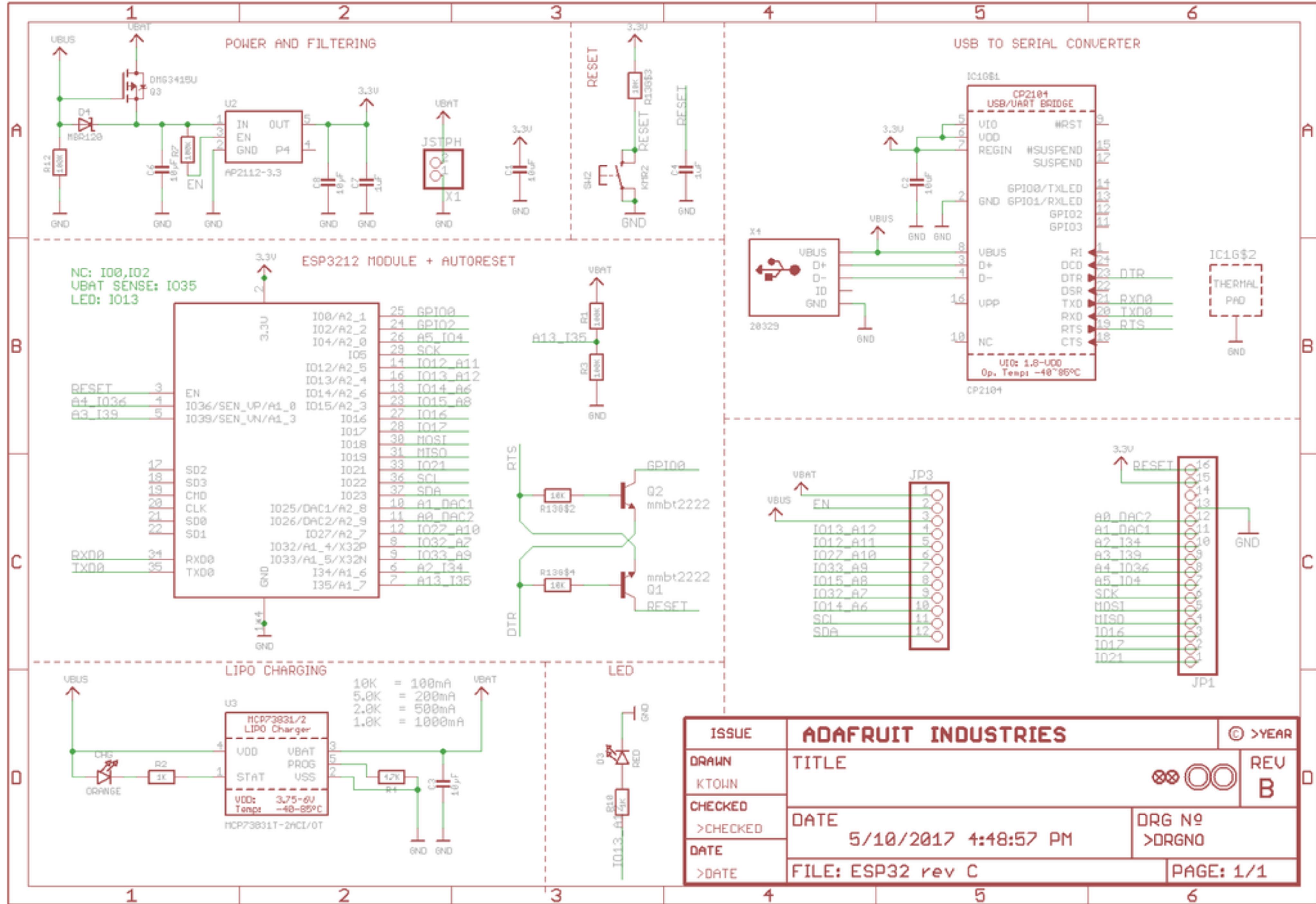
[Download Driver](#)

[Arduino Library](#)

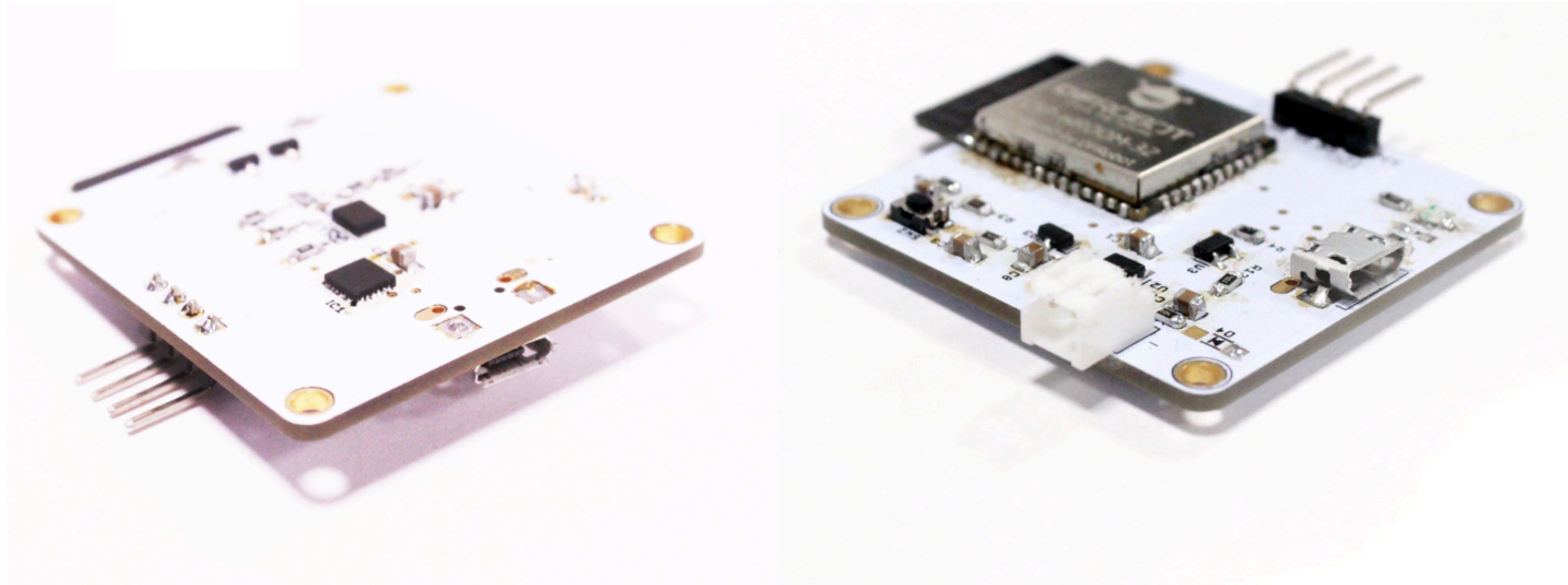
[Adafruit Page](#)



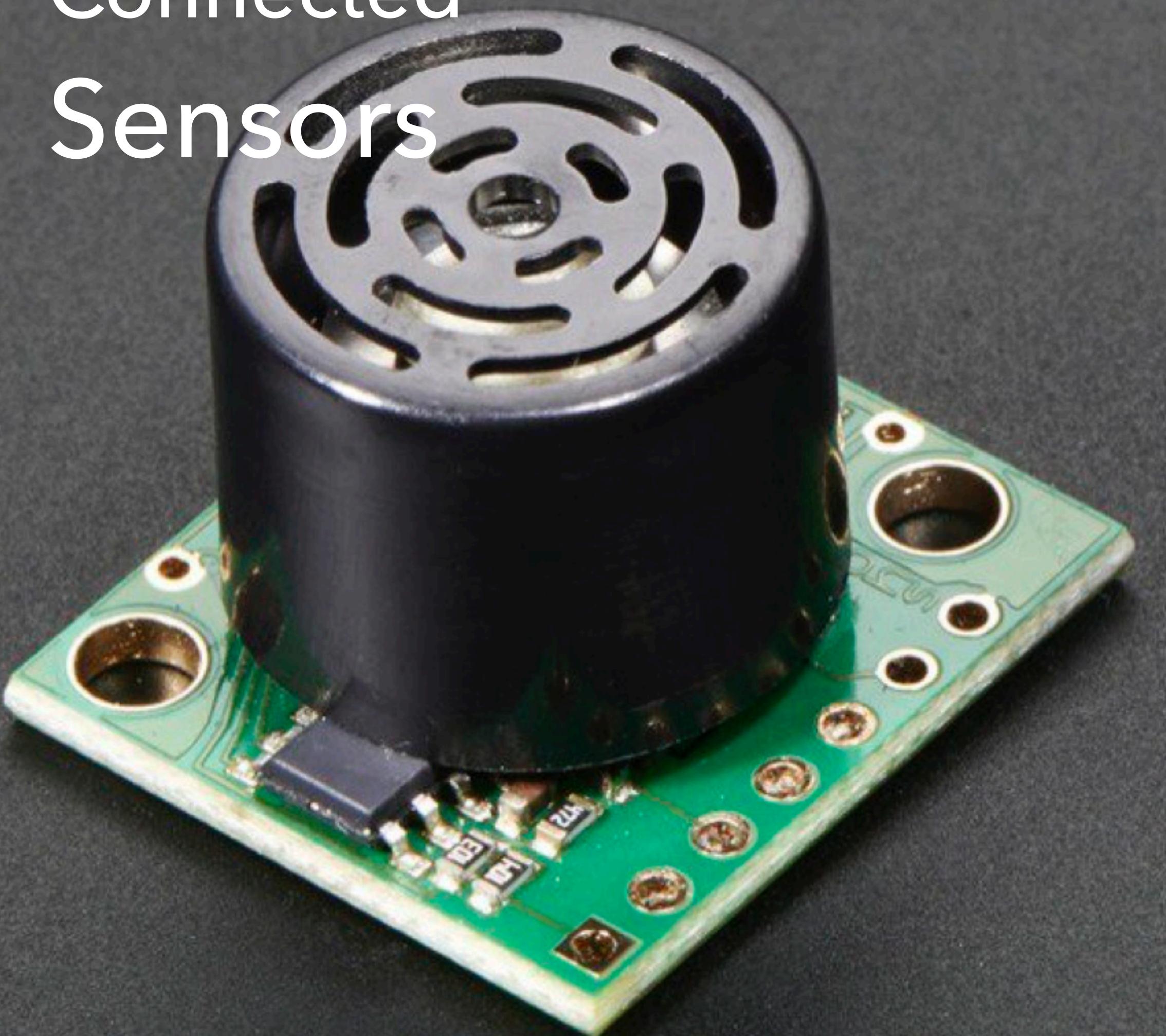
<https://learn.adafruit.com/adafruit-huzzah32-esp32-feather>



# Custom/Optimized PCBs

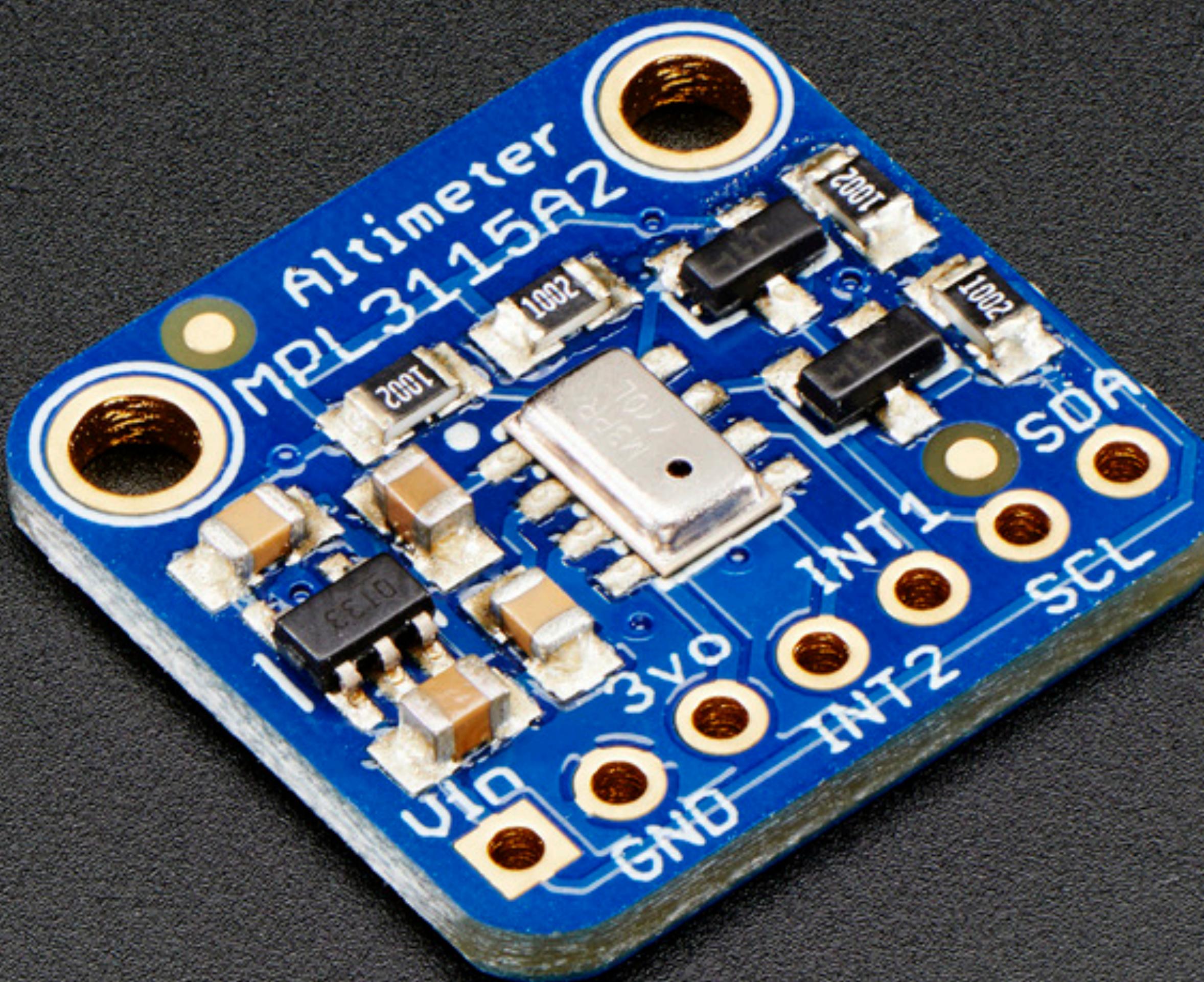


# Connected Sensors



RANGE

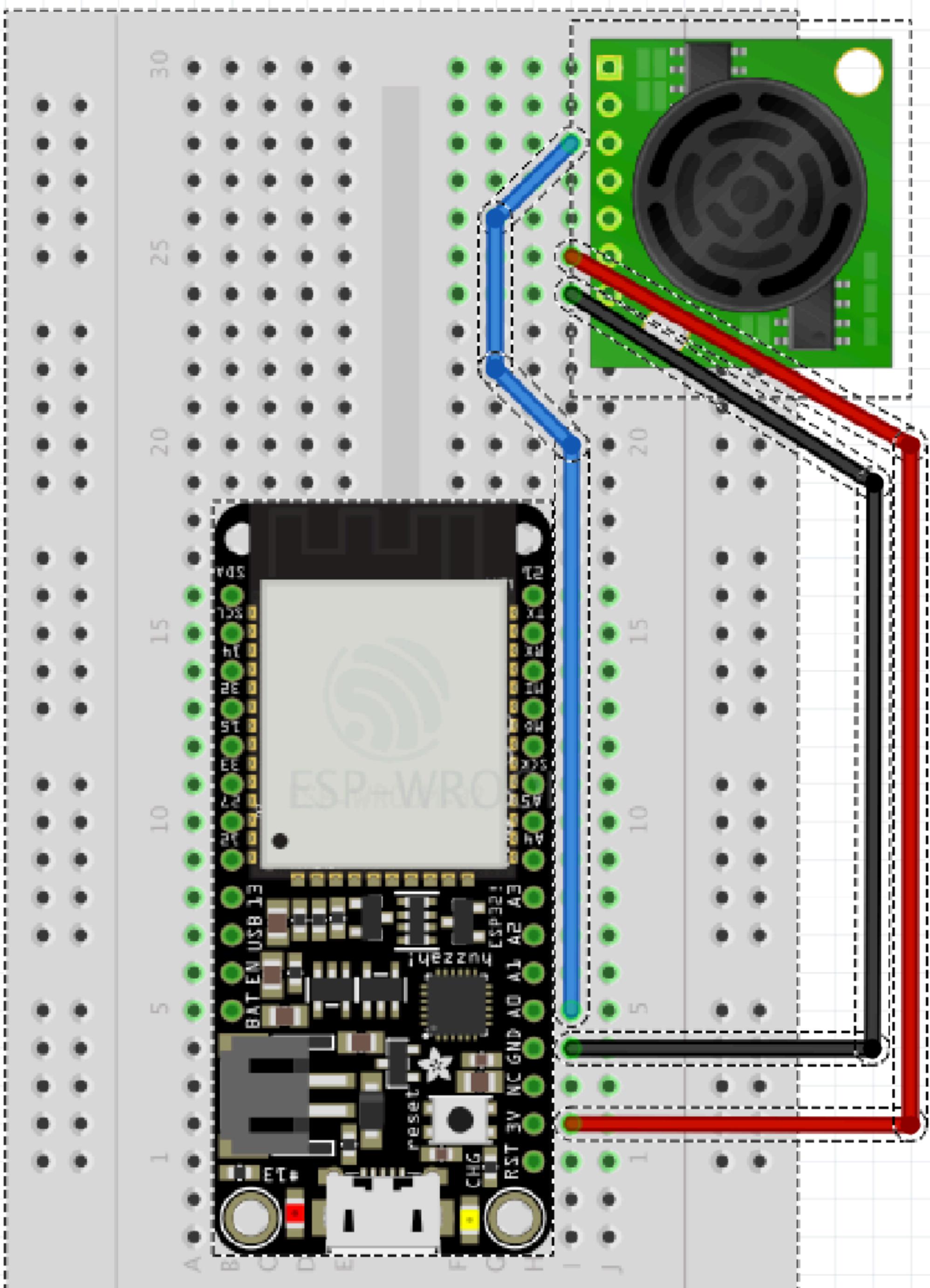
Ultrasonic Rangefinder - LV-EZ1 - LV-EZ1

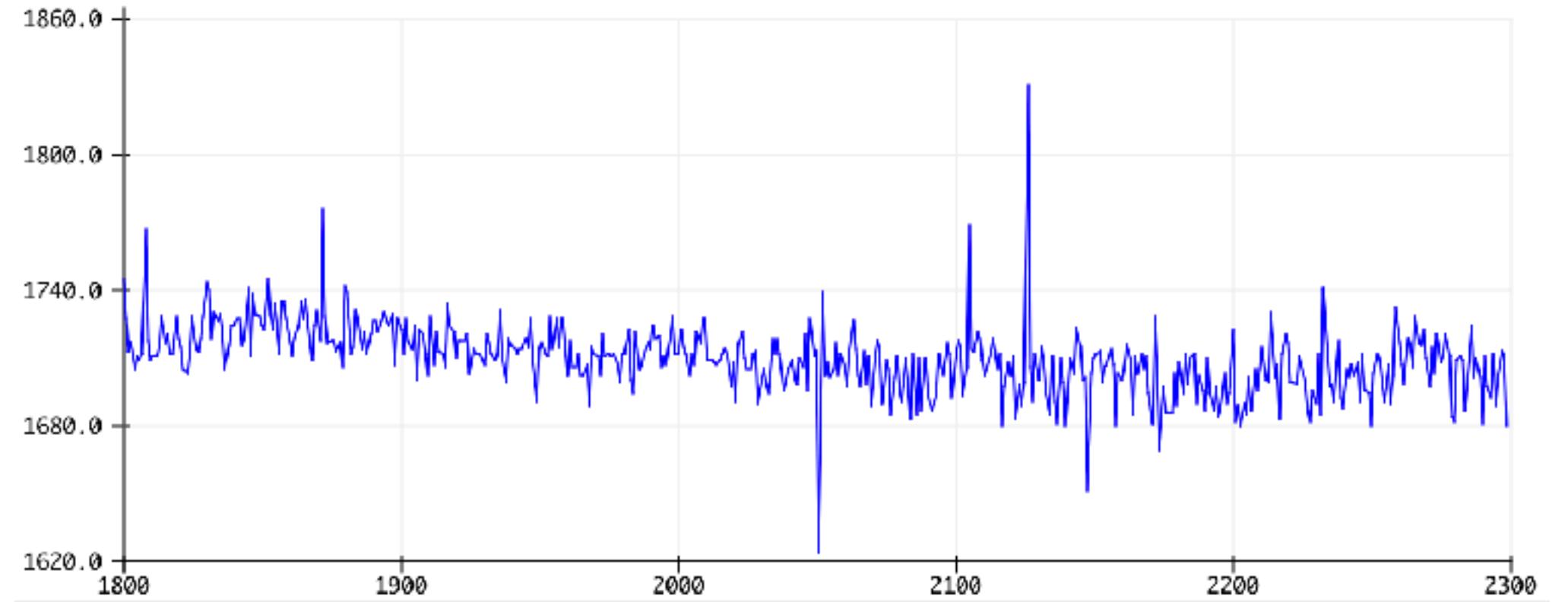


TEMPERATURE

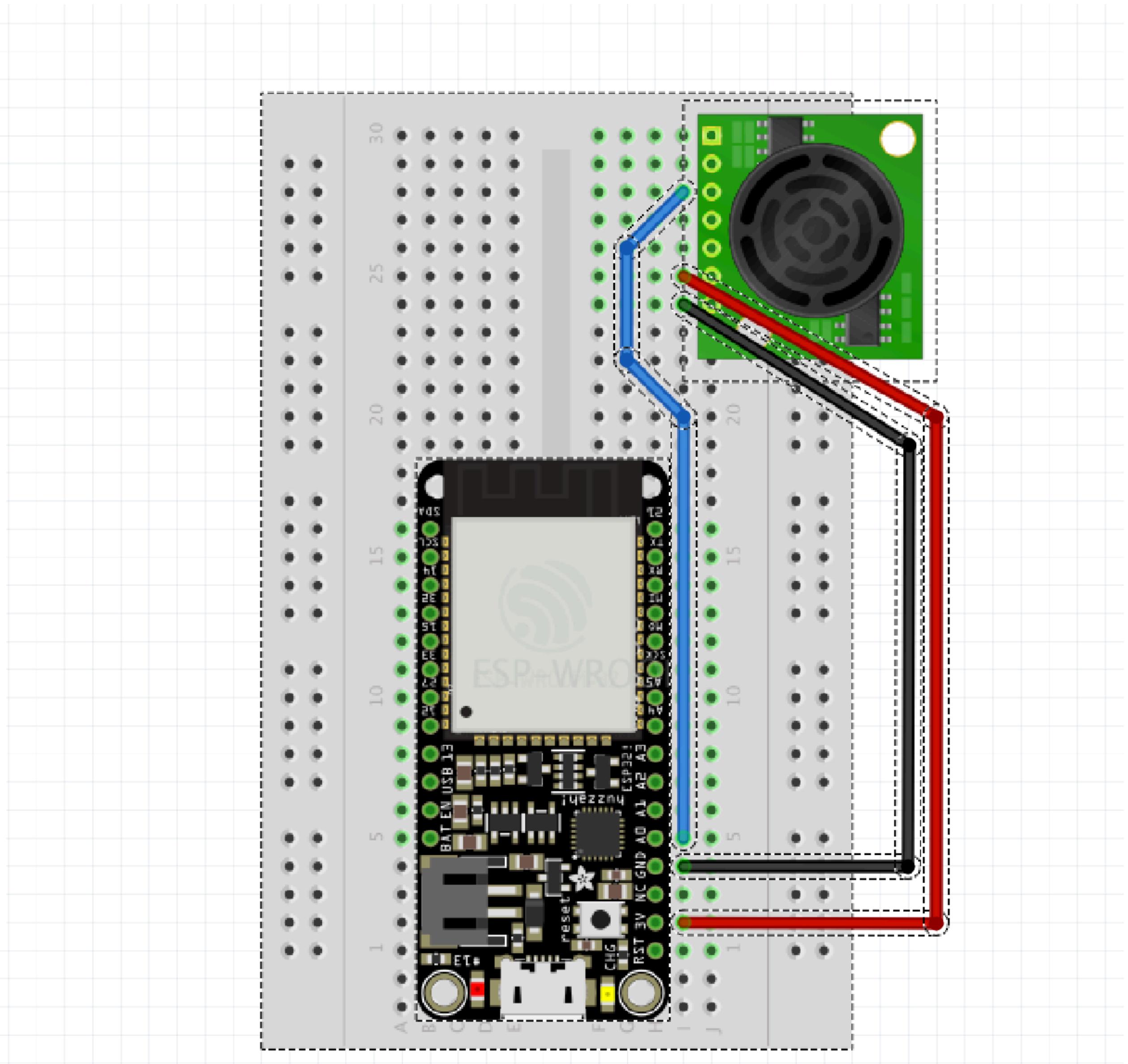
BME680 - Temperature, Humidity, Pressure and Gas Sensor

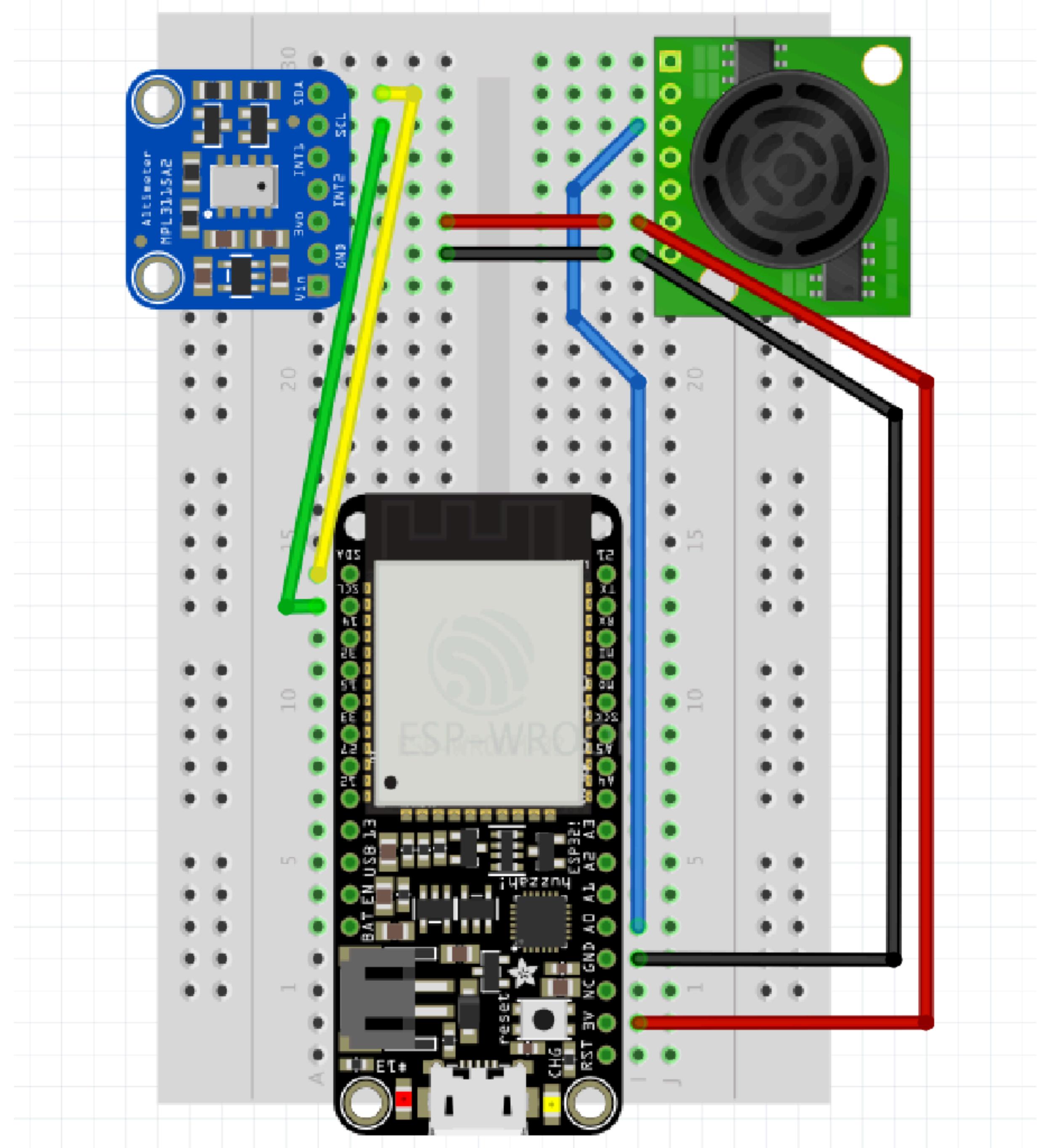
```
1 int rangeSensor = A0;  
2  
3 void setup(){  
4     Serial.begin(9600);  
5 }  
6  
7 void loop()  
8 {  
9     int voltage = analogRead(rangeSensor);  
10    Serial.println(voltage);  
11    delay(100);  
12 }
```





```
1 int rangeSensor = A0;  
2  
3 void setup(){  
4     Serial.begin(9600);  
5 }  
6  
7 void loop()  
8 {  
9     int voltage = analogRead(rangeSensor);  
10    Serial.println(voltage);  
11    delay(100);  
12 }
```

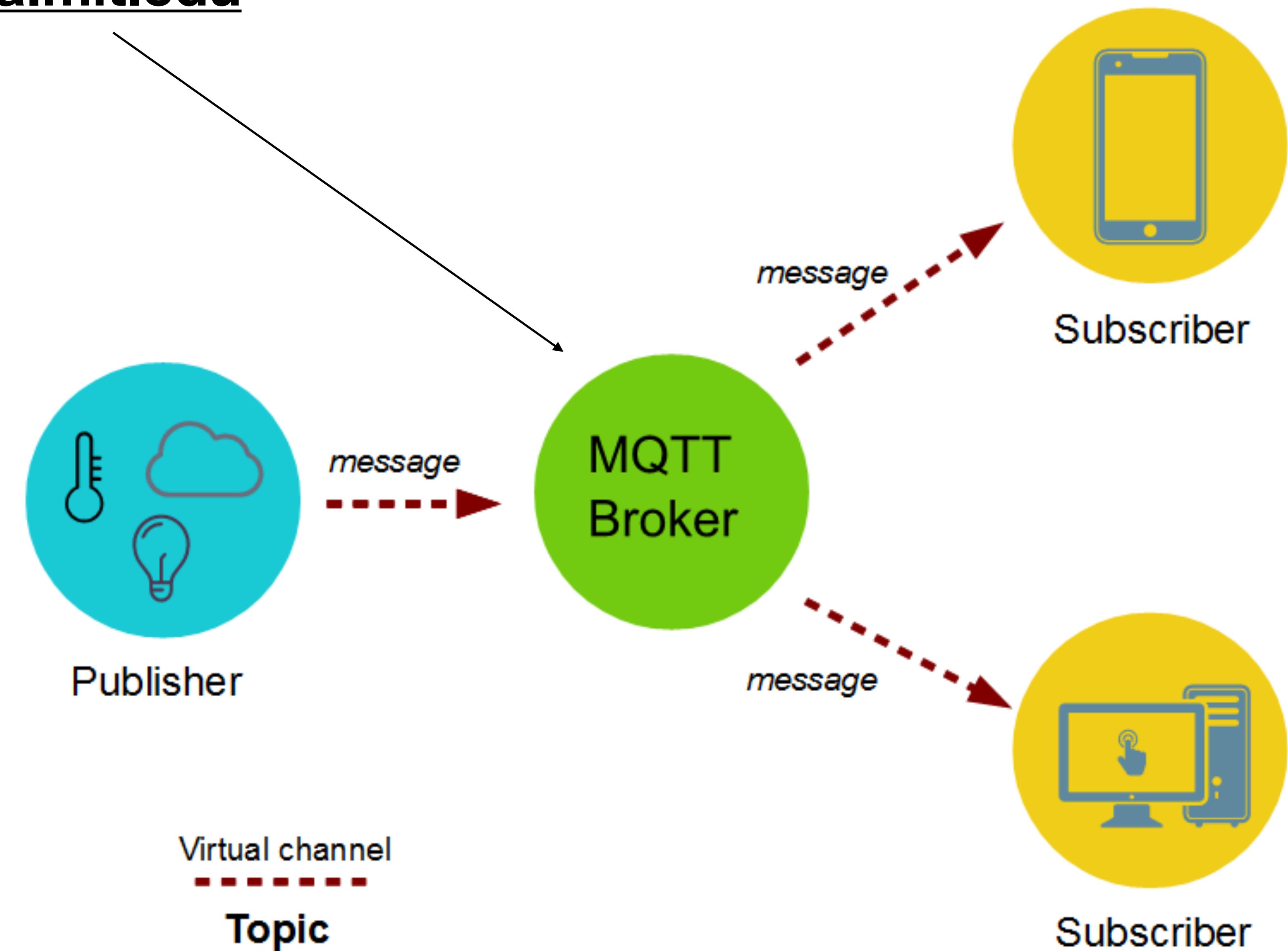




# IoT 101

part2 - 3D Data Visualization

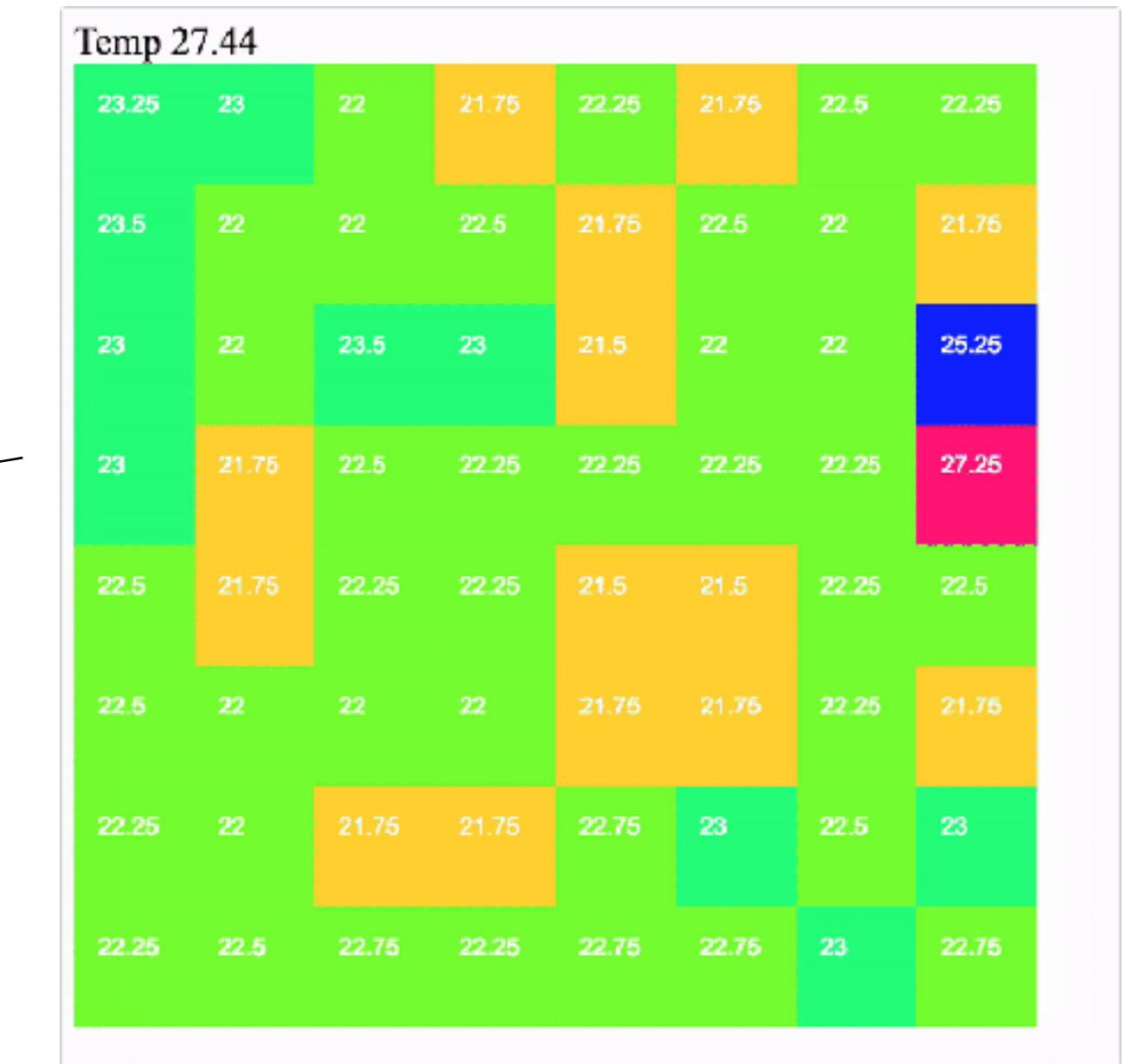
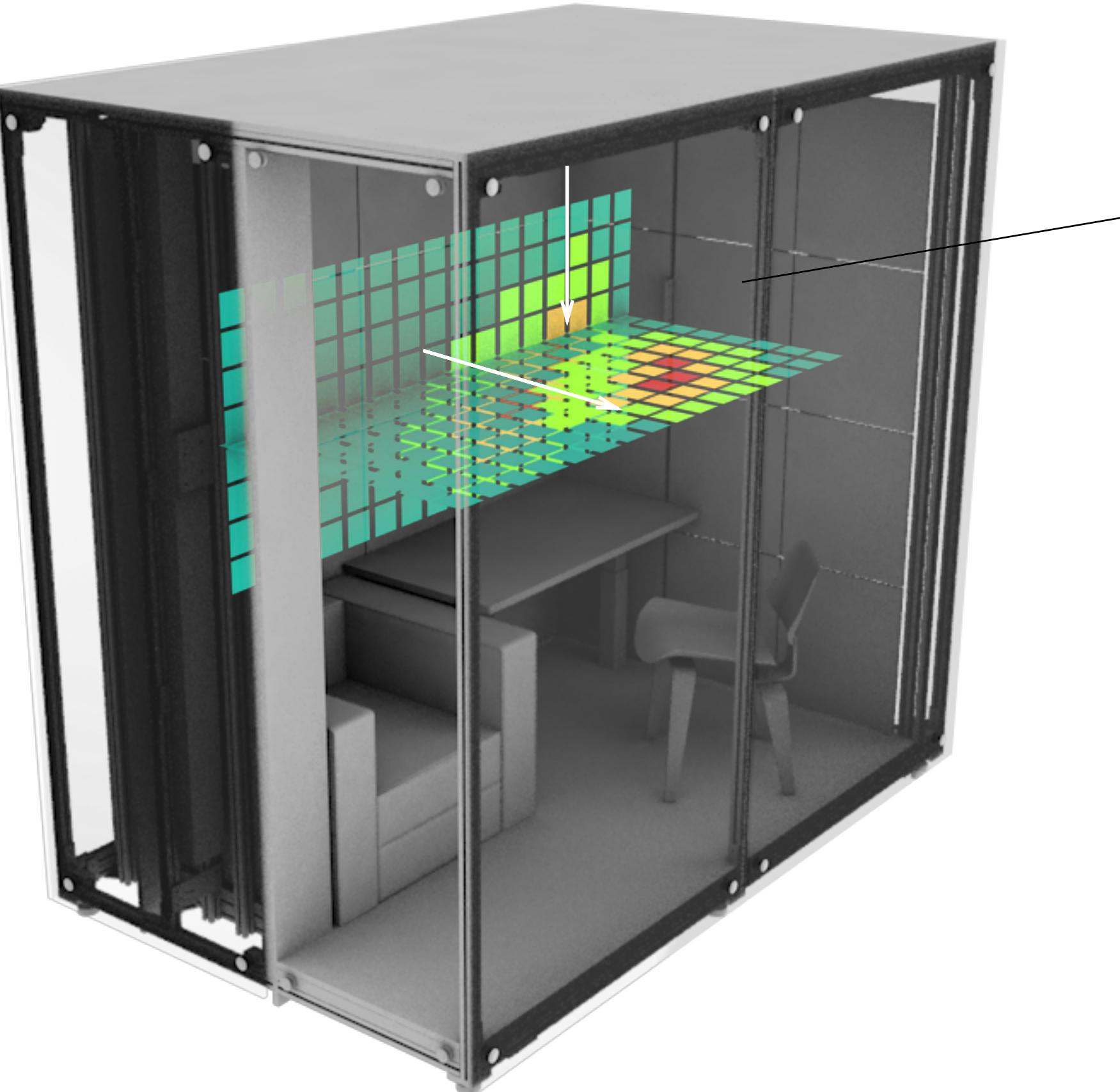
mqtt://replace.media.mit.edu



# IoT 101

part2 - 3D Data Visualization

# Required (base-line) Sensors

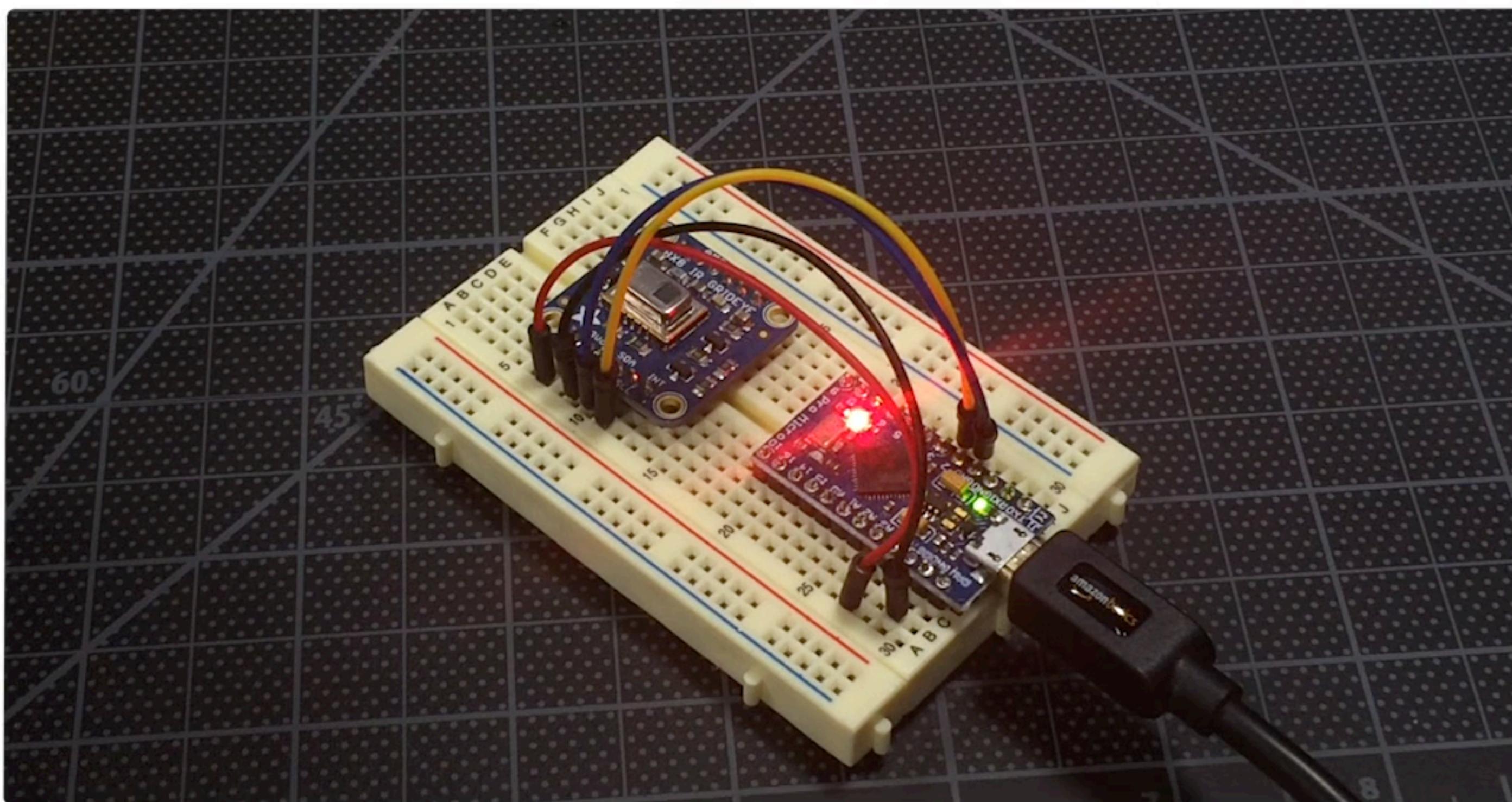


**AMG8833**

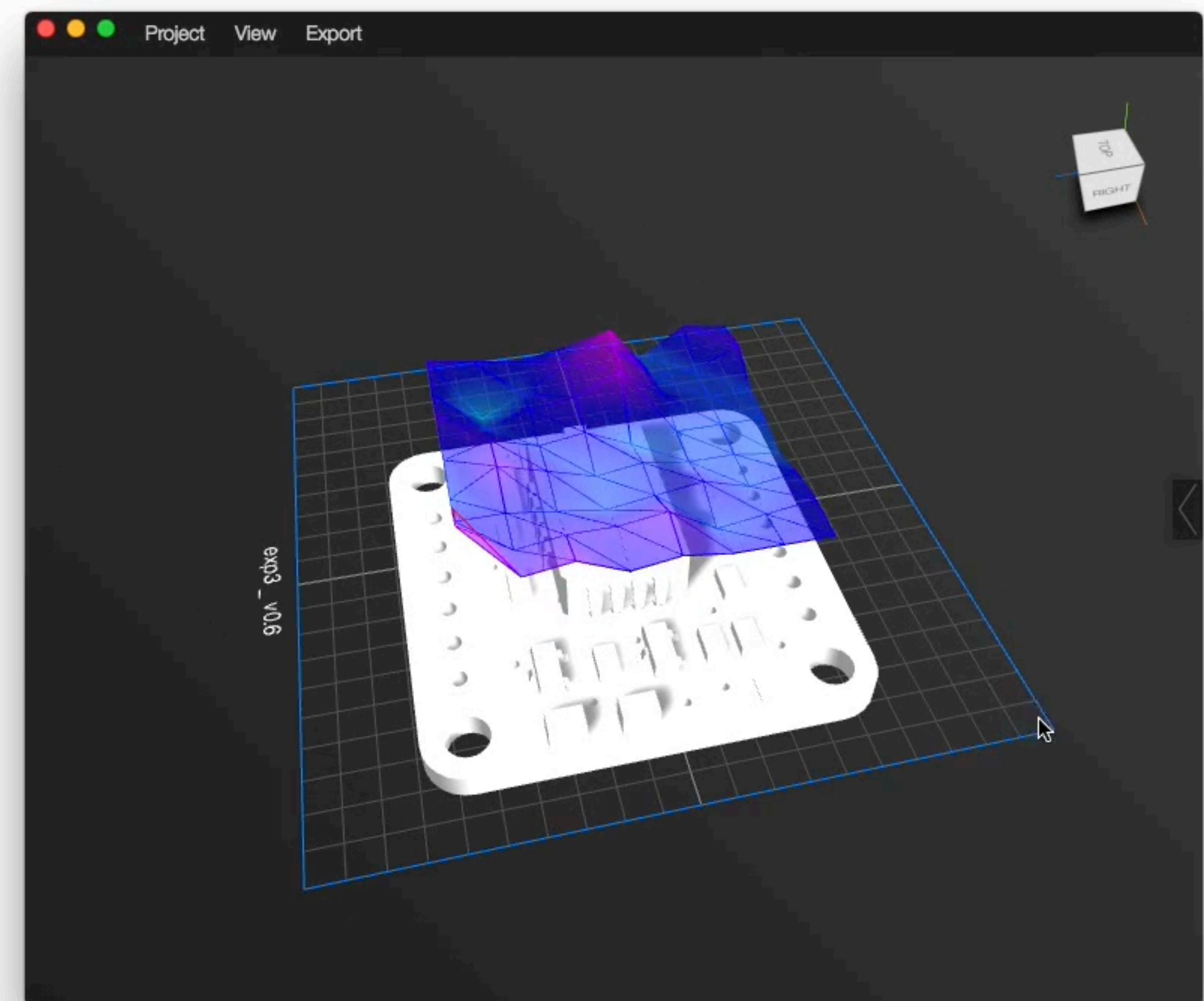
# Test #01 \_ Thermal Sensors

cassiano@mit.edu . Jan2018

Sensor + Arduino



3D Visualization Editor





Prototype 3D Data Visualizations

[Download App](#)

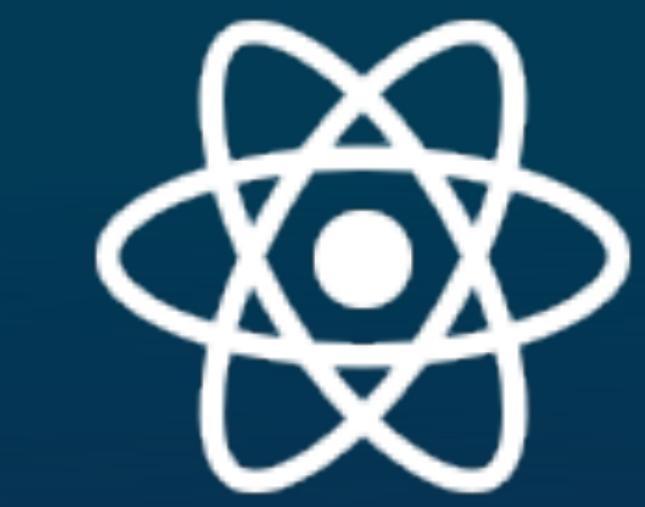
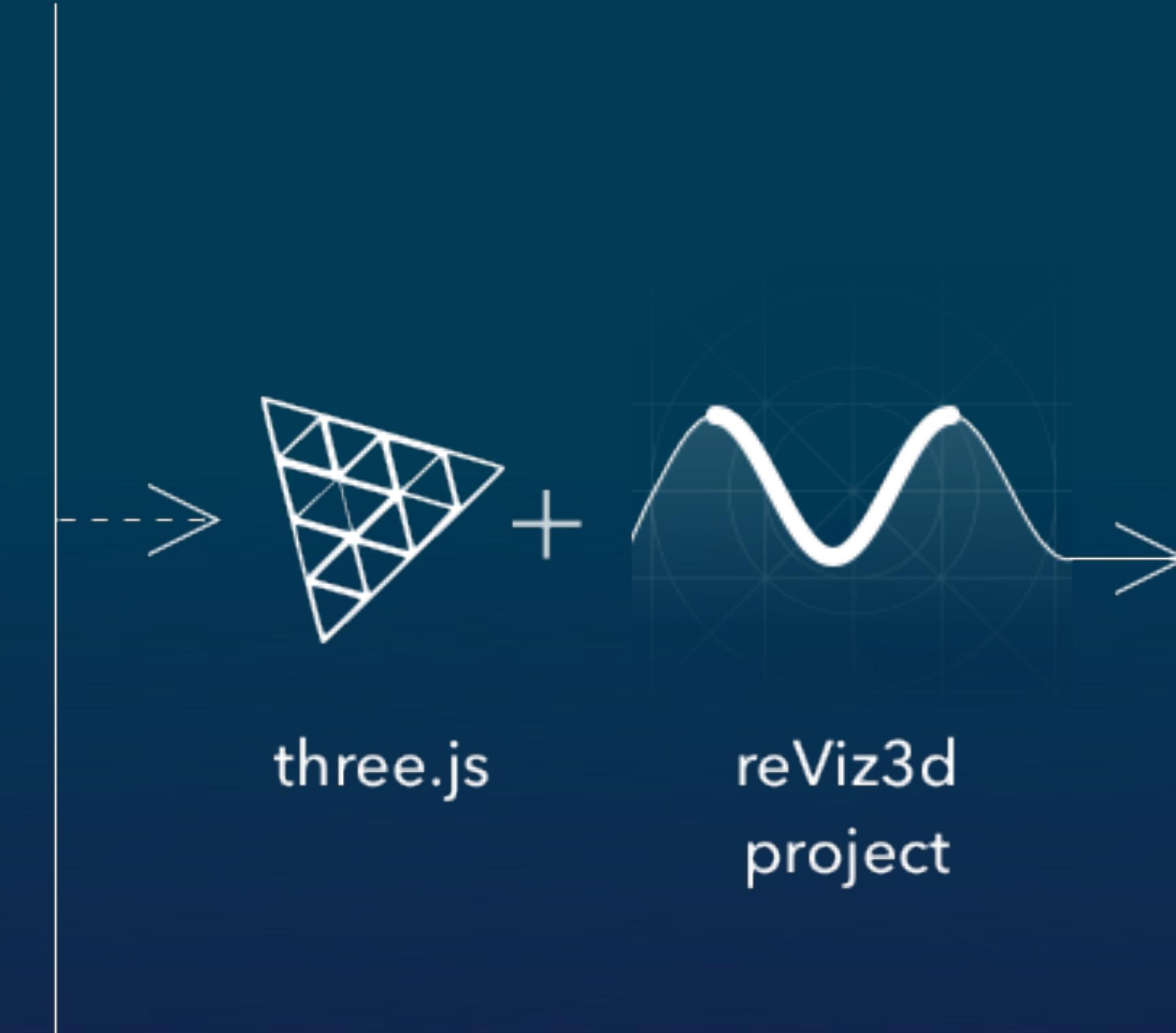


OSX

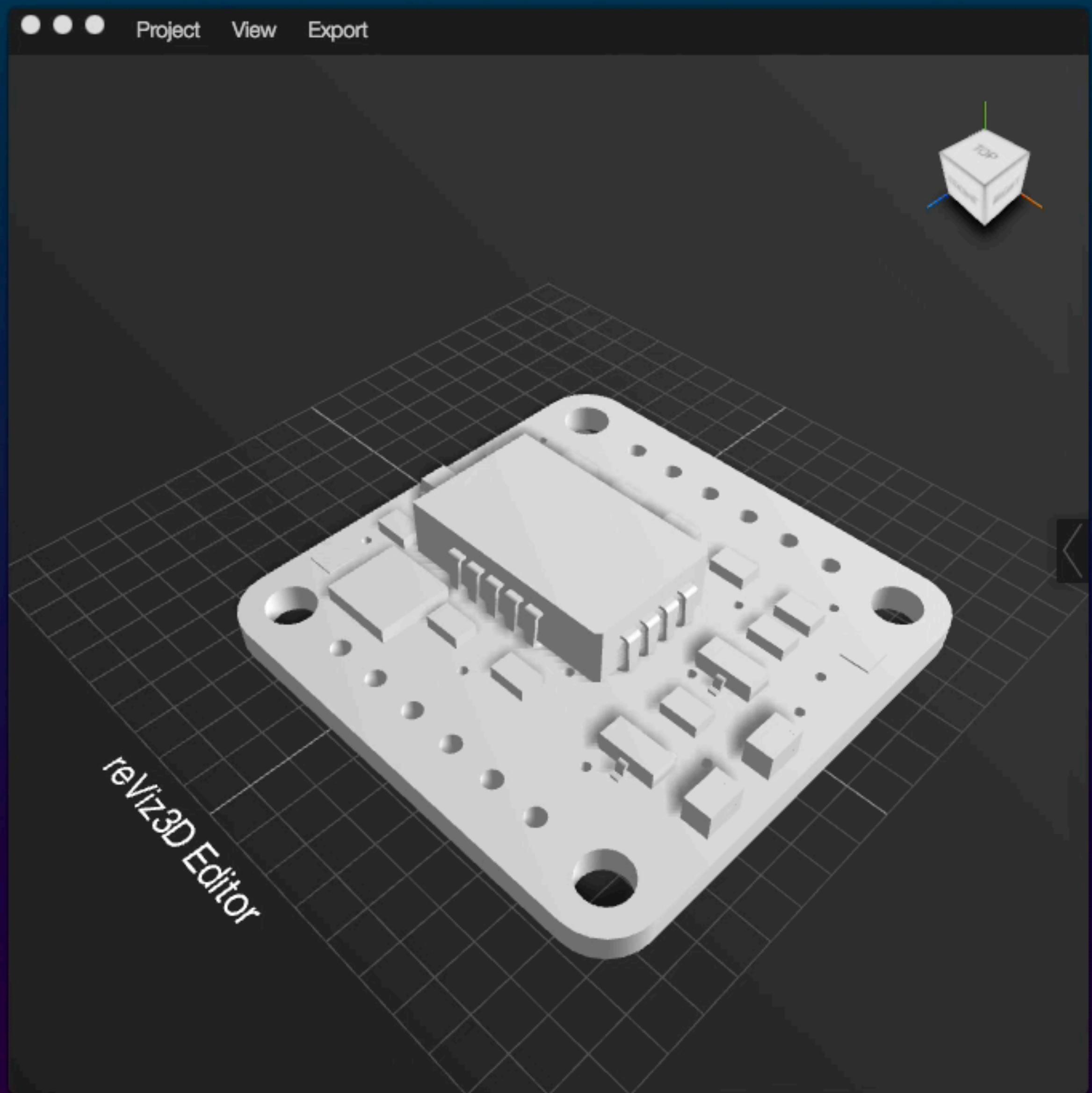


Win

<https://lucascassiano.github.io/reViz3d/>



react  
component



main.js — ReViz3D

```
main.js basic.frag
```

```
1 /*-----  
2 ReViz3D Example  
3 +name: thermal camera - AMG8833  
4 +author: lucascassiano  
5 -----*/  
6 var sphere;  
7 var t = 0;  
8 var label;  
9 var uniforms = {  
10   time: {  
11     value: 1.0  
12   },  
13   vertex_color: 1.0  
14 };  
15  
16 var attributes = {  
17   size: {  
18     type: "f",  
19     value: []  
20   },  
21   endPosition: {  
22     type: "v3",  
23     value: []  
24   }  
25 };  
26  
27 var plane;  
28 var plane2;  
29  
30 var addModels = (scene) => {  
31   for (var i in MODELS.obj) {  
32     scene.add(MODELS.obj[i]);  
33   }  
34 }  
35
```