IEEE CS TECHX Region 3
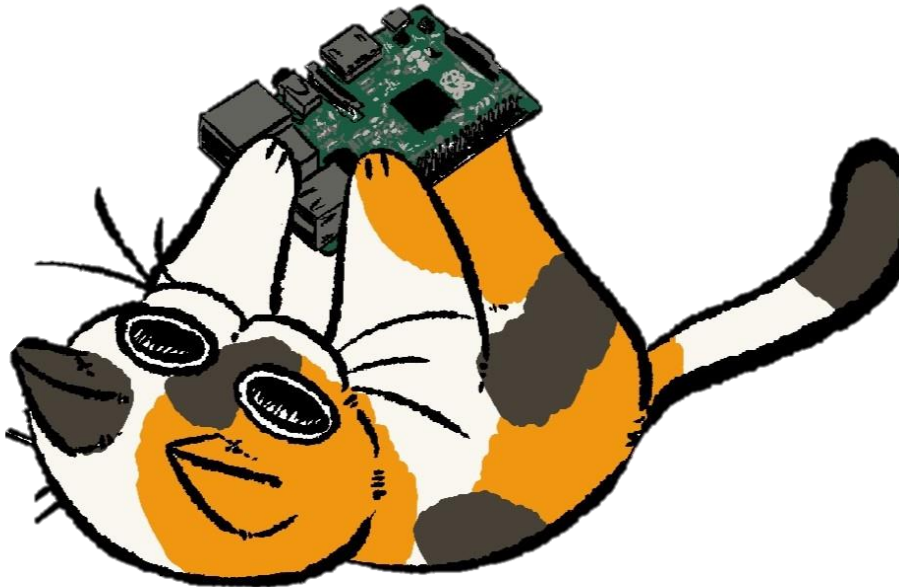
Building an IoT Temperature Sensor
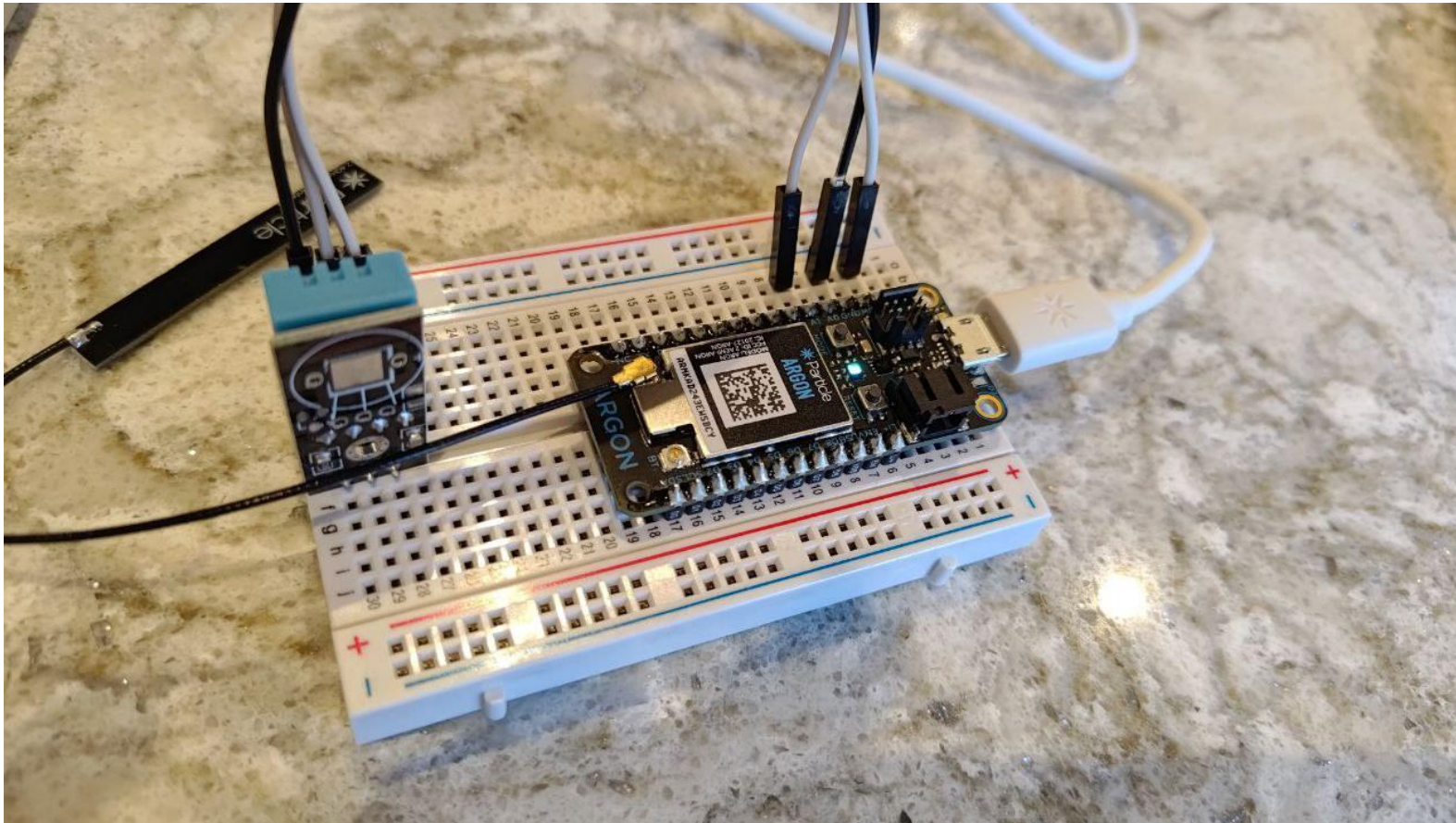
Liam Osman

GitHub Link:

- These presentation slides

- Firmware code for reference

IEEE CS
TECHX Region 3

What are we building today?

Your IoT board will be able to measure temperature and humidity!

Variables ↻

v humidity (double) = **43** 📋   Get

v temperature (double) = **18** 📋   Get

IEEE CS
TECHX Region 3

Workshop Stages:

1. Unbox and set up physical components

2. Register for and set up Particle account

3. Coding firmware and flashing to device
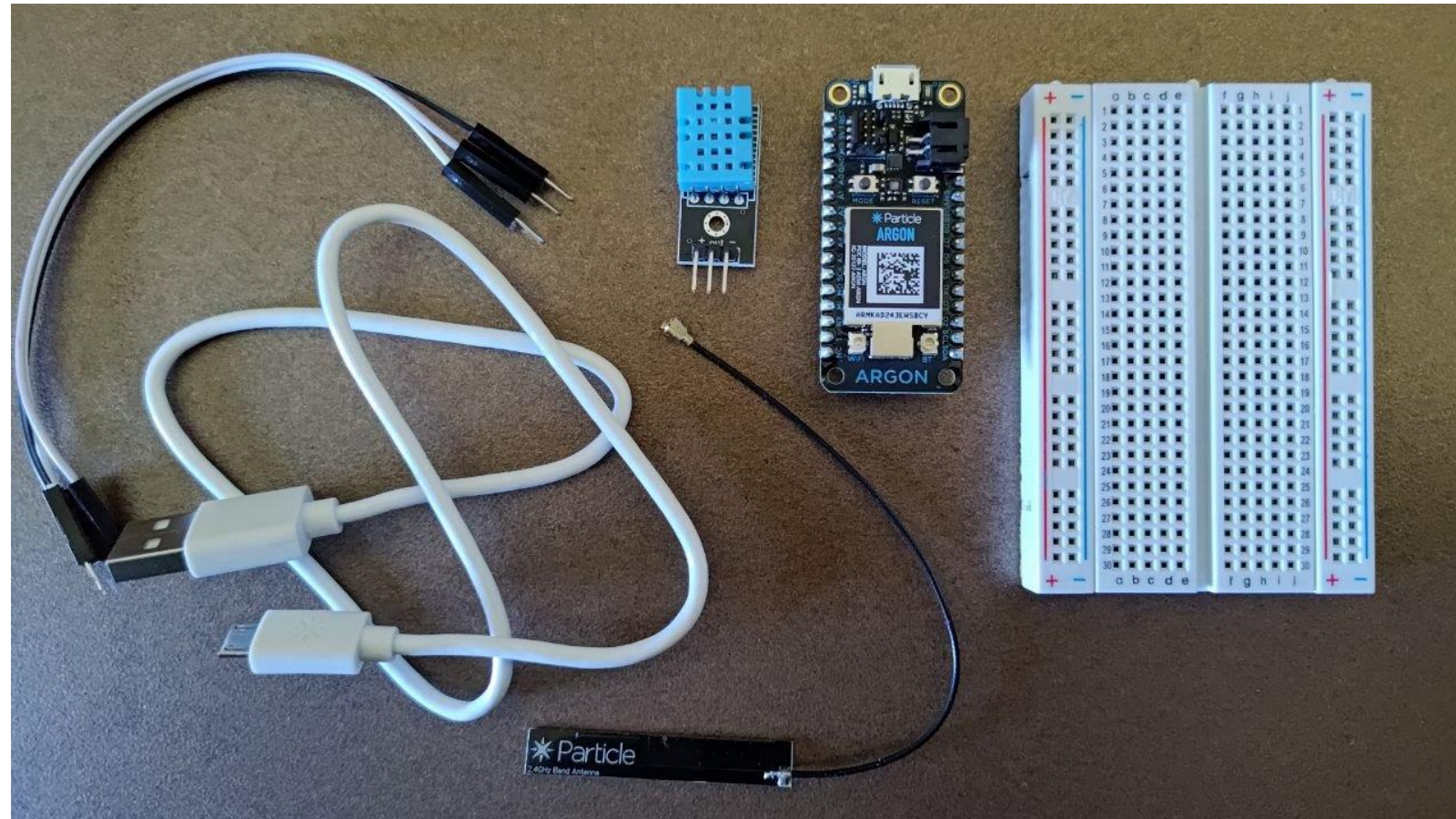
IEEE CS
TECHX
Region 3

Physical Components
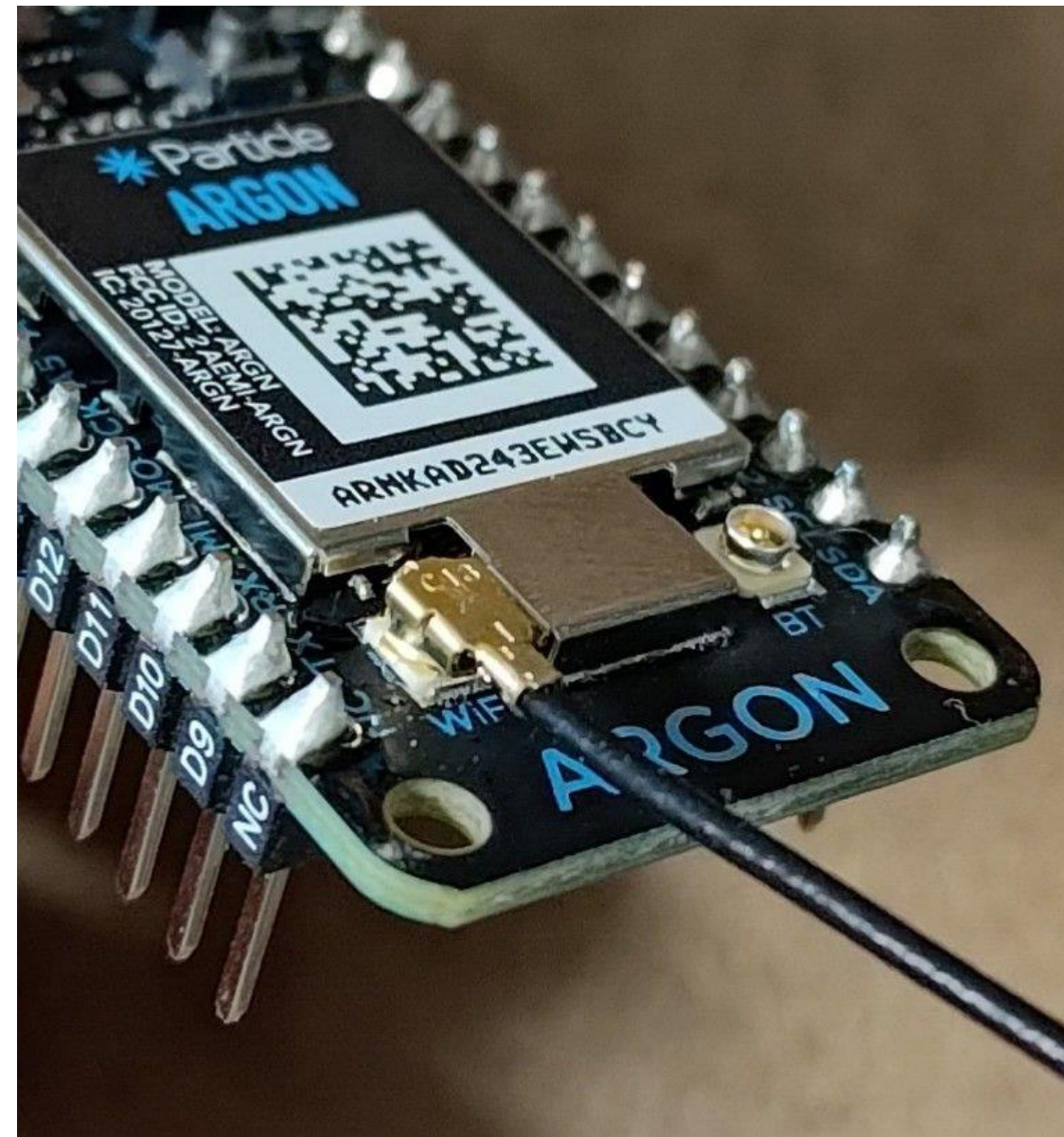
Unpack Components Needed

- Breadboard

- USB cable

- Argon Board

- DHT11 sensor
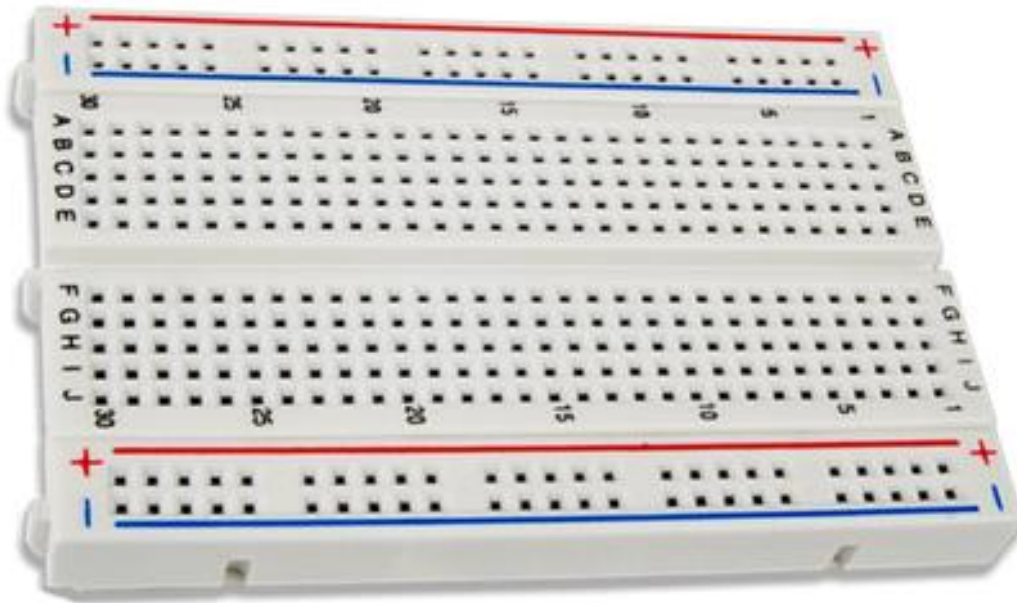
- Jumper Wires

- Wireless antenna

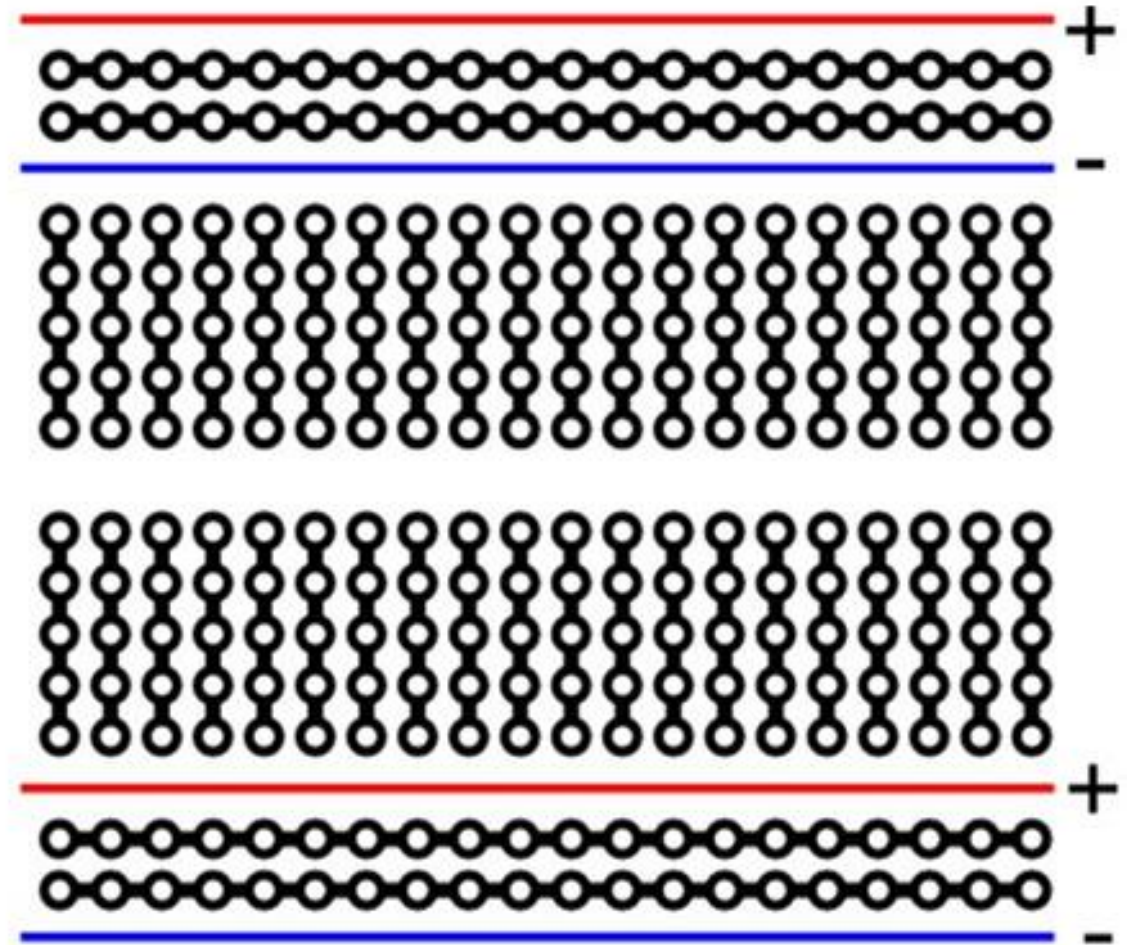# Attaching the Antenna

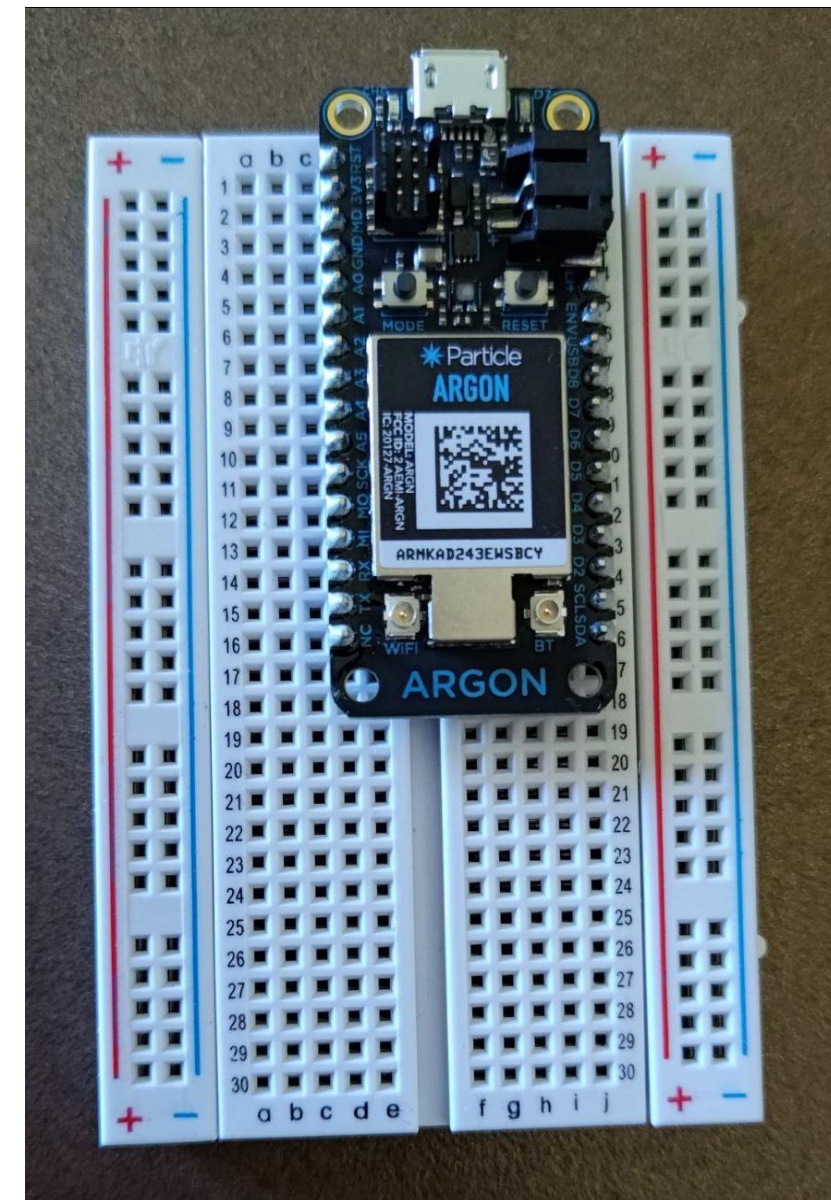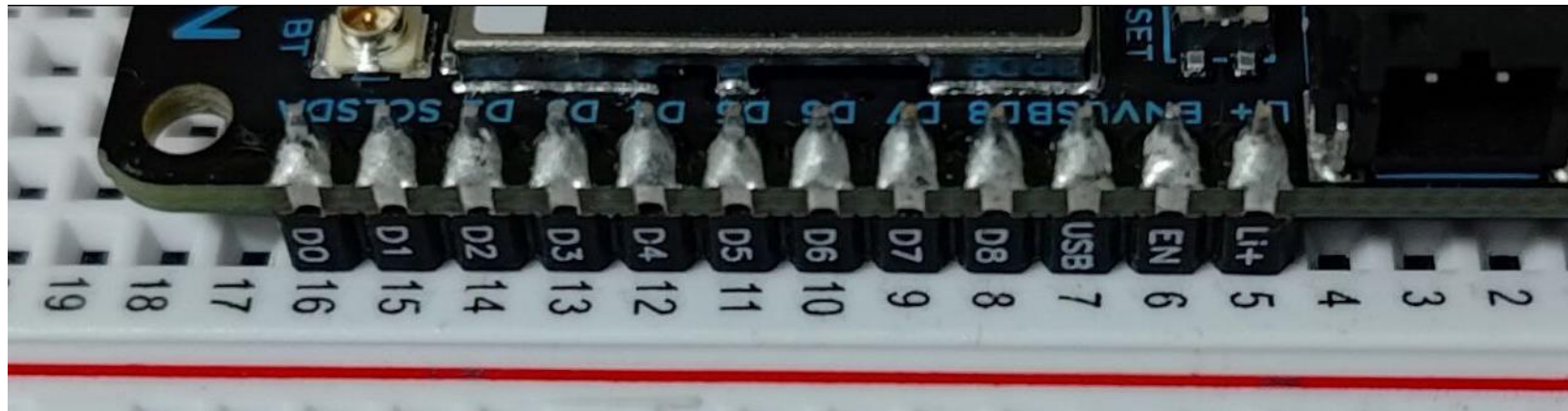Snap coaxial cable onto "WiFi"
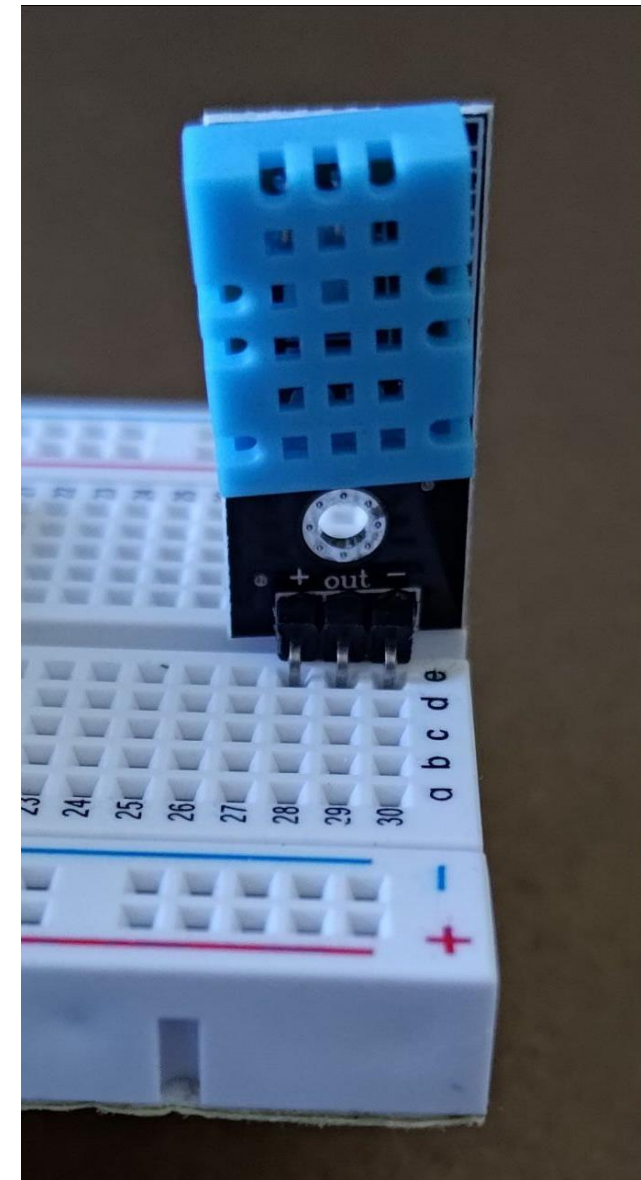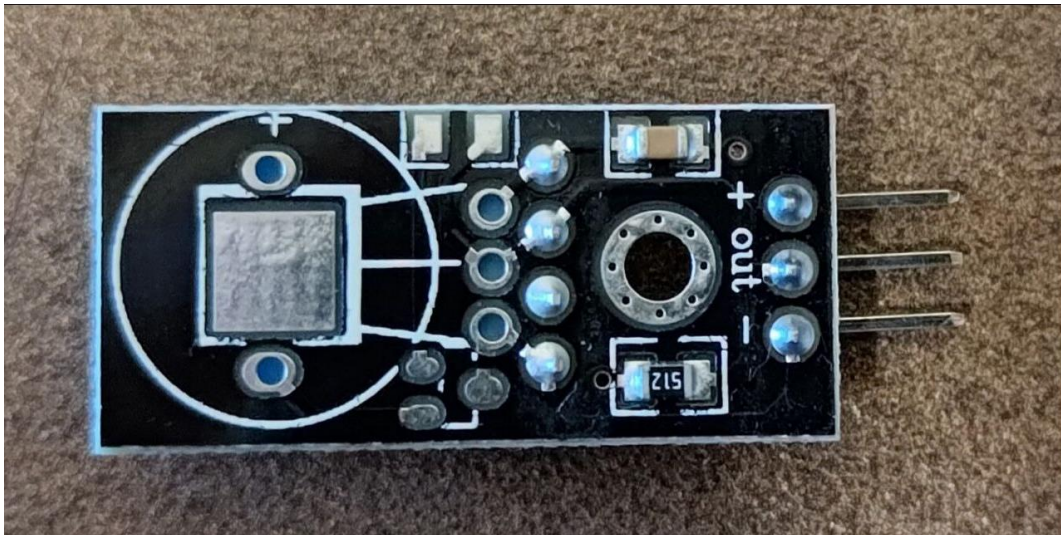
Breadboard Diagram

Placing into the Breadboard

- Anywhere theoretically works

- Example put in the upper right corner

- May take a bit of force to insert

IEEE CS
TECHX Region 3

Placing the DHT11 Sensor

- 3 pins on DHT11 sensor board used today

- Place sensor away on different row from Argon

- The back of the board has built-in resistors
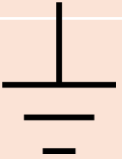
Plug in Board to Laptop
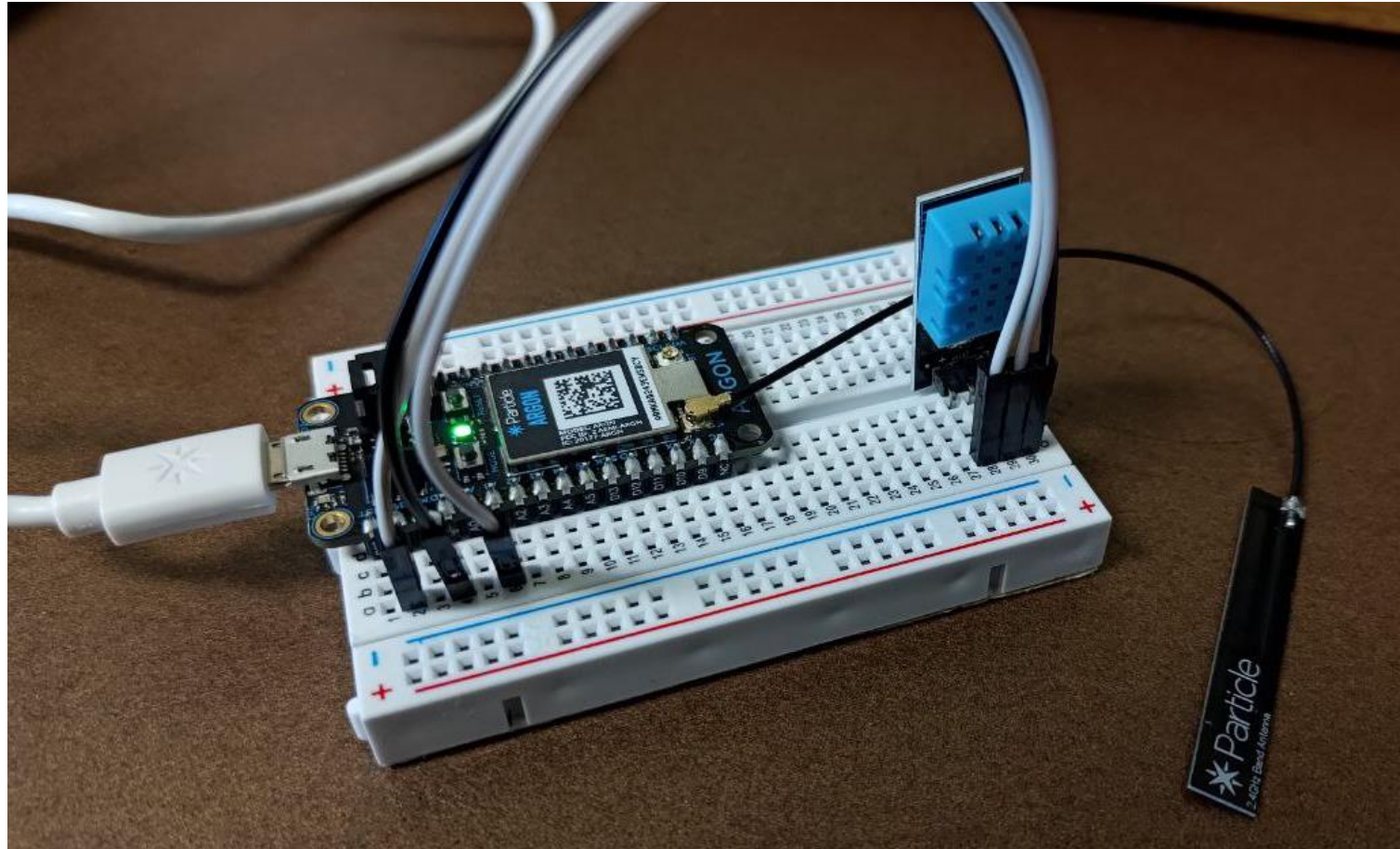
Connecting Jumper Wires

Link the jumper cables on the same numbers as pins to connect them

Argon Board		DHT11 Sensor	
Pins	Bread board	Pins	Bread board
3.3	2	+	28
A1	6	Out	29
⏚	4	-	30

IEEE CS
TECHX Region 3
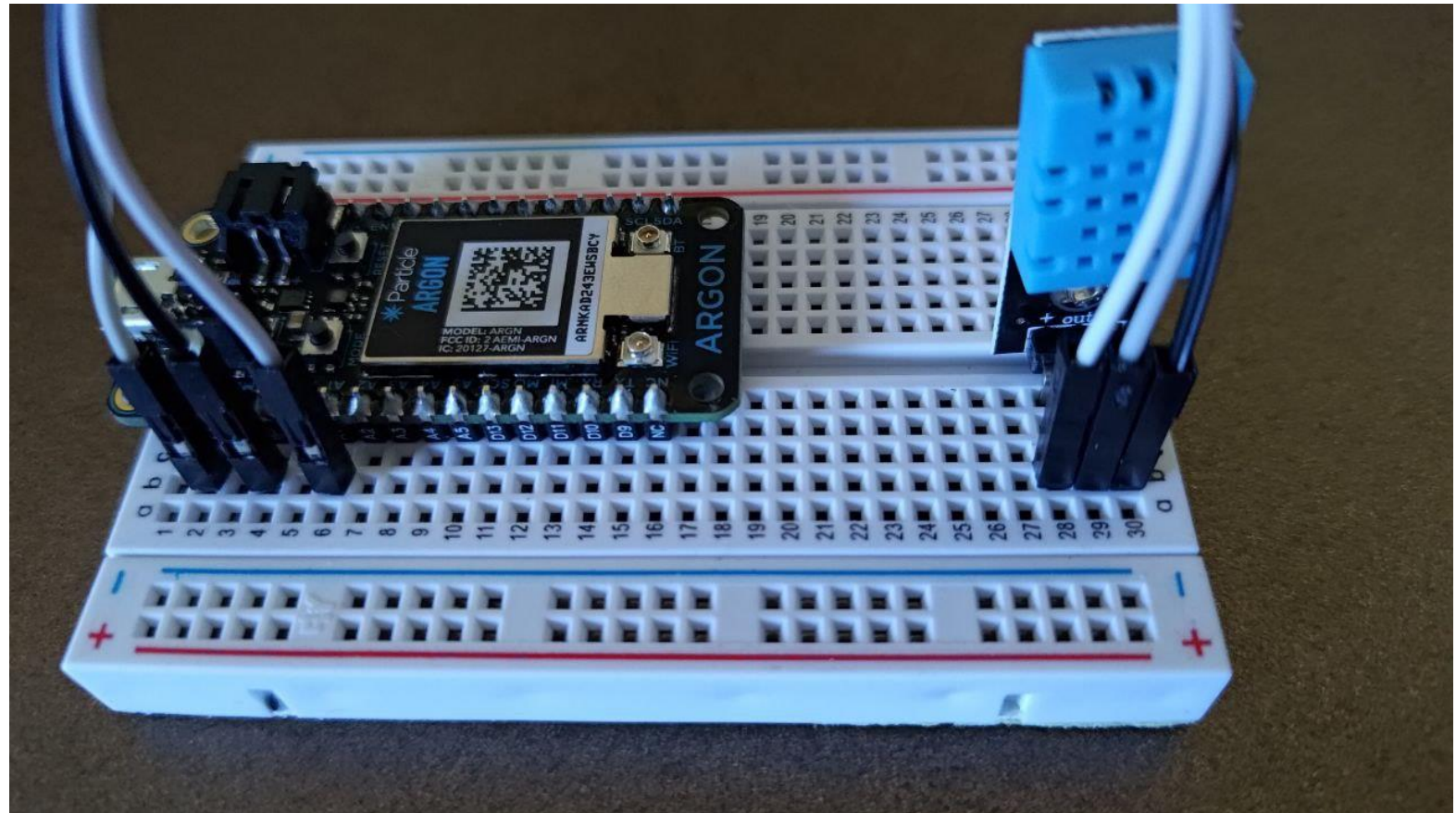
Account Setup

Particle Setup

https://setup.particle.io/?family=mesh&device=argon

1. Press "Get started"

2. Create a "Personal" account

3. "Get started" again

4. Start setting up my device

   o "Device with USB port"

IEEE CS
TECHX Region 3

Particle Setup

1. Press "Select device"

2. Connect Argon

3. Update device

   o Should go into DFU mode

4. Continue

Particle Setup

1. Use Personal Sandbox

2. Make a new product

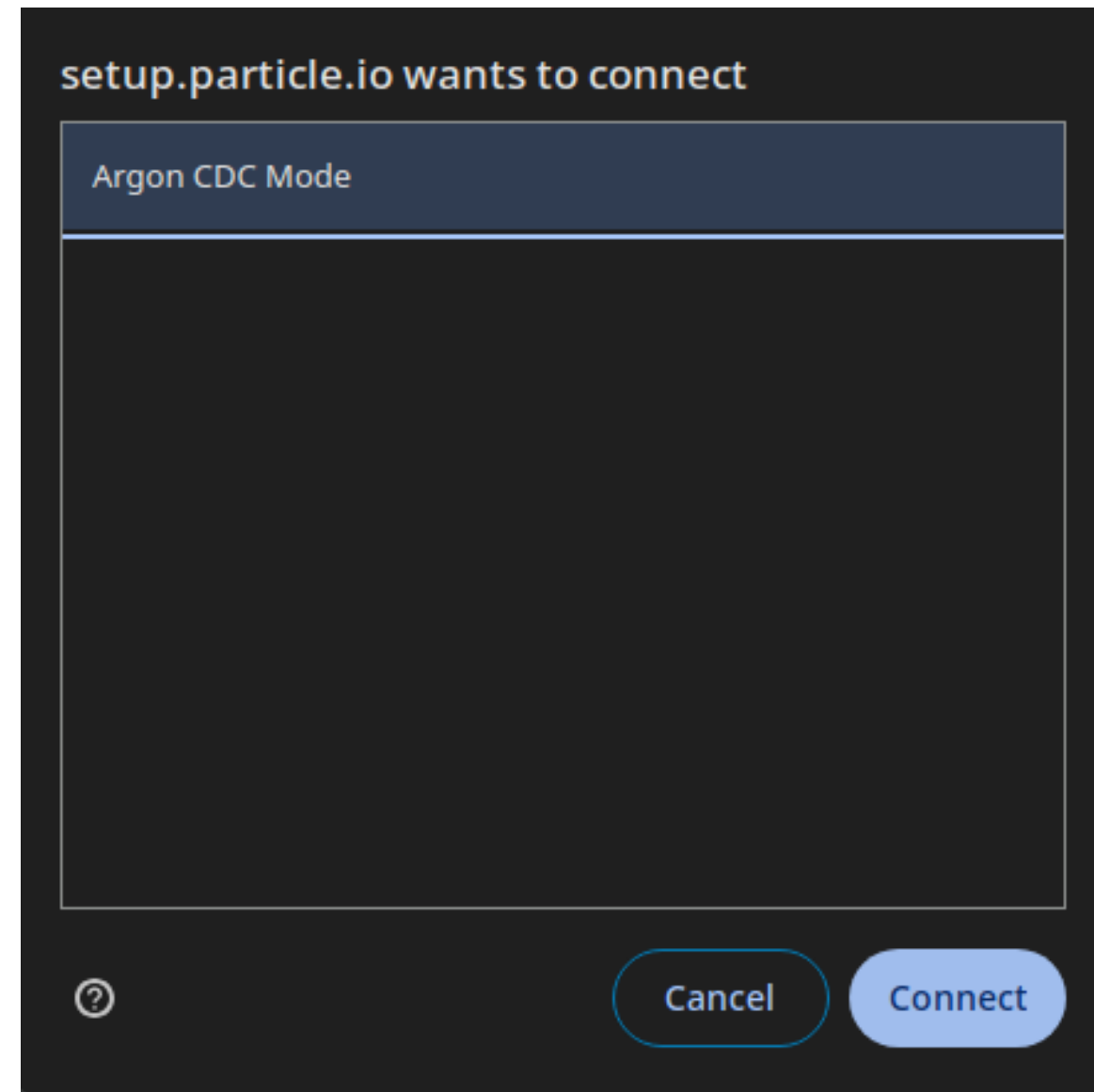3. Add to product

4. Give device a name or just keep default

Select your organization *

Personal Sandbox

Select a product within your organization *

AirReader

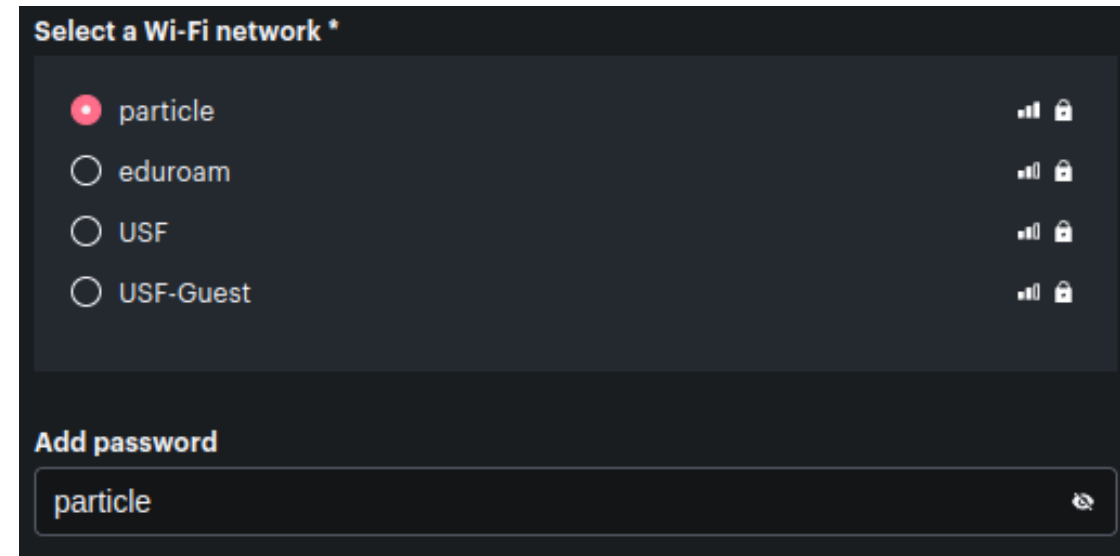Or create a new product

Give your device a name

Name your device *

hamster_hare

Use underscores instead of spaces

Particle Setup

1. Start a mobile data hotspot (or use a neighbor's)

   o   We can't connect to University WiFi!

2. Connect to your hotspot network

   o   This can take a minute

3. Press "Go to console"

IEEE CS TECHX Region 3

Firmware

Particle Web IDE

1. From the console, open the web IDE

2. Give your App a name

3. Delete all contents

Web IDE

Current App

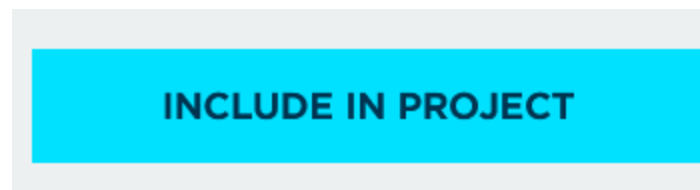TemperatureSensor

Optional description

Importing a library

Libraries —

1. Open "Libraries" on the bottom left of the IDE

2. Search for PietteTech_DHT

3. Press it and include into your app

INCLUDE IN PROJECT

Constants

```
 3   // Include a sensor library for DHT11
 4   // This one was created by Scott Piette
 5   // Remember to "Include in Project"
 6   #include <PietteTech_DHT.h>
 7
 8   // Constant Declarations
 9   #define DHT_TYPE              DHT11
10   #define DHT_PIN               A1
11   #define DHT_SAMPLE_INTERVAL 2000
```

Instantiations

```
13   // Instantiate a DHT sensor object of our type
14   PietteTech_DHT DHT(DHT_PIN, DHT_TYPE, dht_wrapper);
15   // DHT wrapper function necessary for object
16   void dht_wrapper() { DHT.isrCallback(); }
17
18   // Declare variables on board memory
19   double temperature = 0;
20   double humidity = 0;
```

Setup

```
22   // Setup runs only once when board is started
23 ▾ void setup() {
24
25      // Connects variables to Particle cloud data
26      Particle.variable("humidity", humidity);
27      Particle.variable("temperature", temperature);
28
29      // Starts our sensor object behavior
30      DHT.begin();
31   }
```

Loop

```
33    // Runs forever while device is on
34    void loop() {
35
36        // DHT sensor can only acquire new value
37        // once every interval, so this prevents
38        // updating every loop cycle of device
39        if (!DHT.acquiring()) {
40
41            // update variables with methods
42            humidity = DHT.getHumidity();
43            temperature = DHT.readTemperature();
44        }
45    }
```

IEEE CS
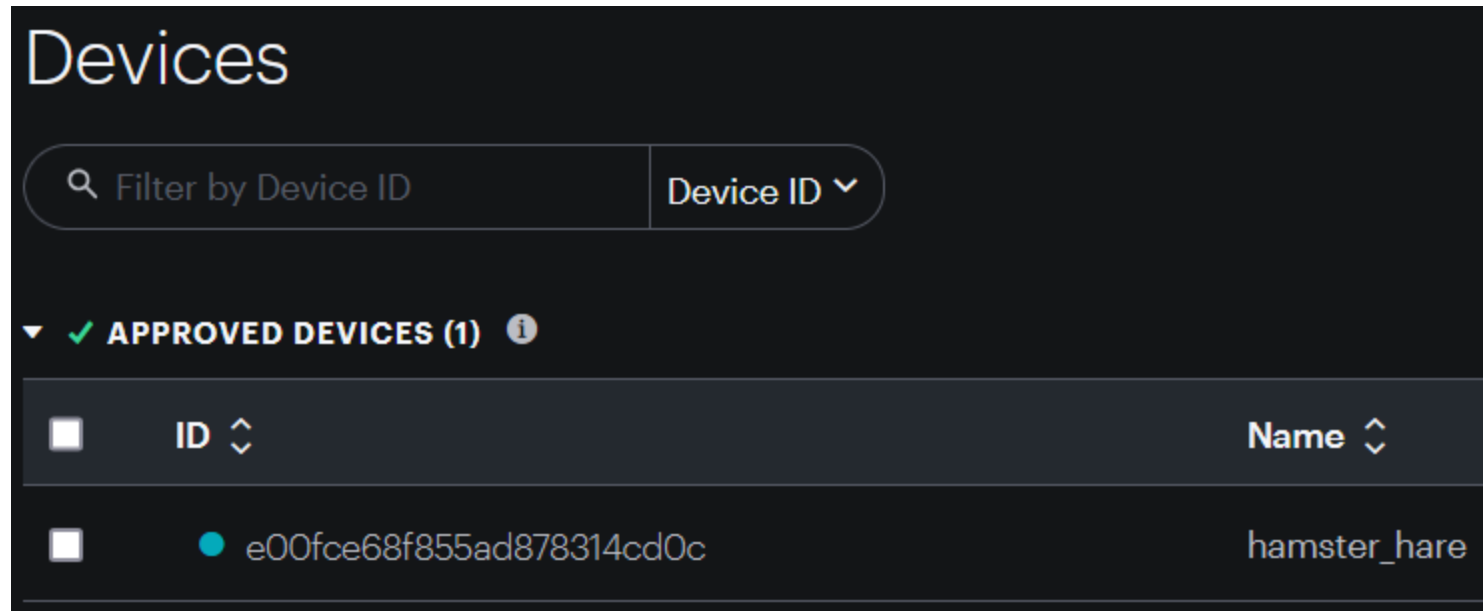TECHX Region 3

Flashing

- Verify compiles your firmware

- Flash programs your board

- May take a minute or two
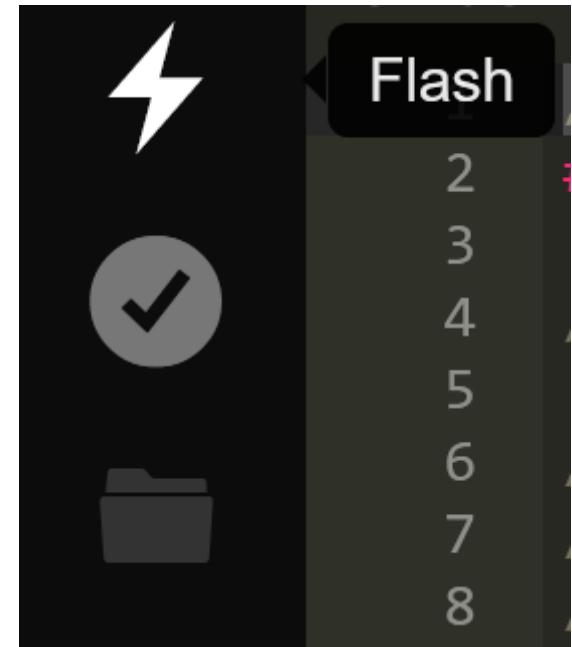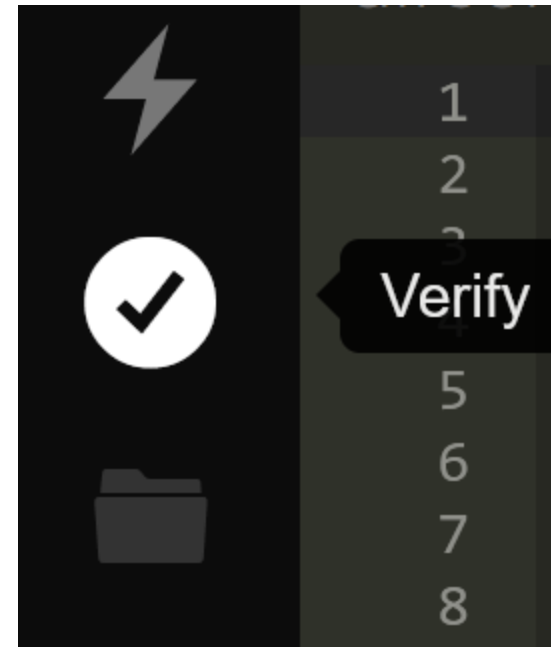
Console

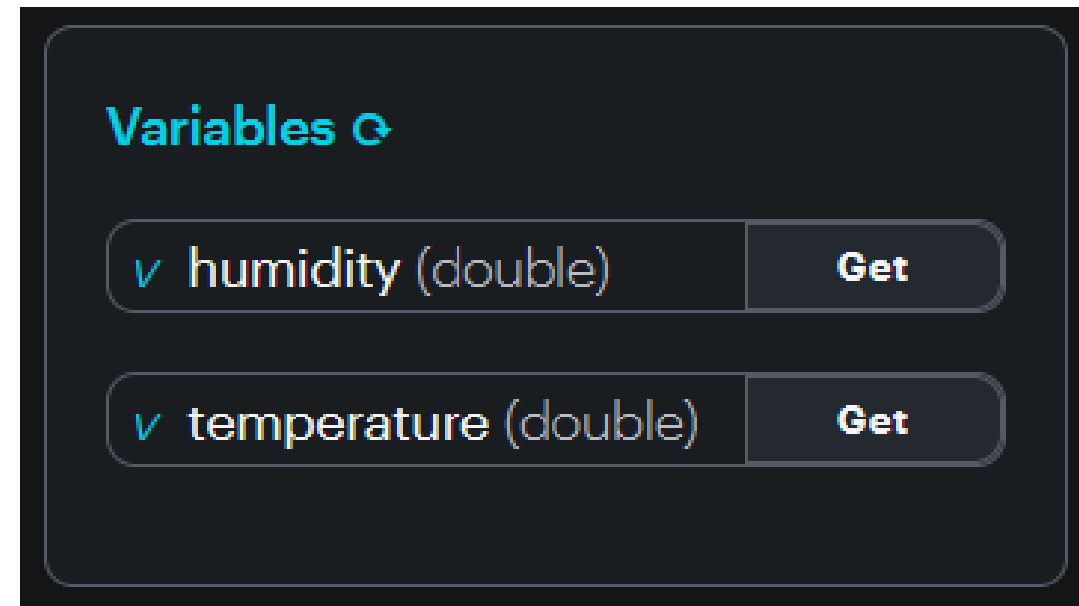Navigate back to the console, and open your product and device

Reading Results

1. Scroll down to find the "Variables" box

2. Press "Get" to read your sensor!

Homework Challenge:

Can you make it output Fahrenheit?

Try looking into our imported library

Follow Us

Instagram

LinkedIn

Discord

IEEE CS
TECHX Region 3