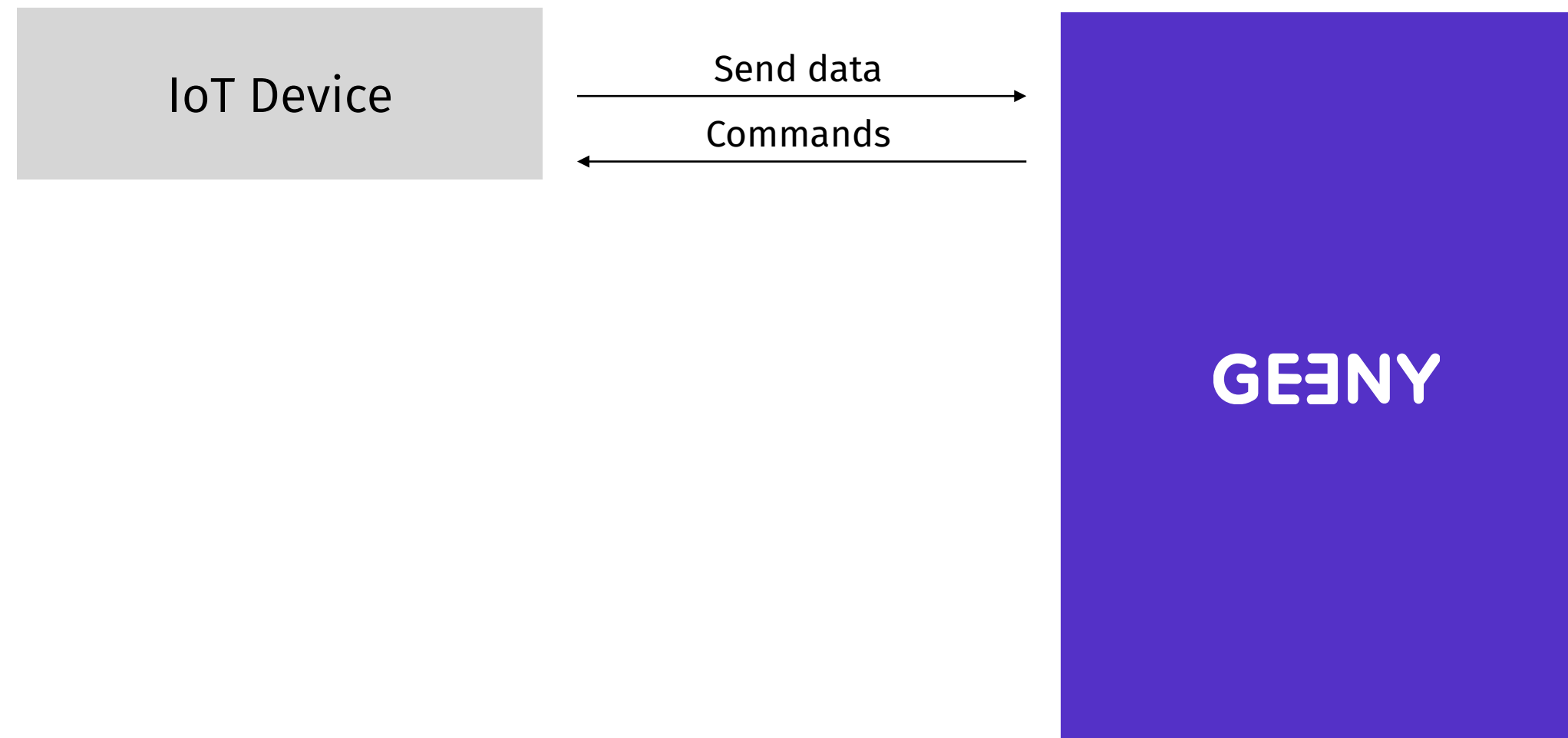


# **Intro to Making** • How to connect the NodeMCU to Geeny

8.3.2018

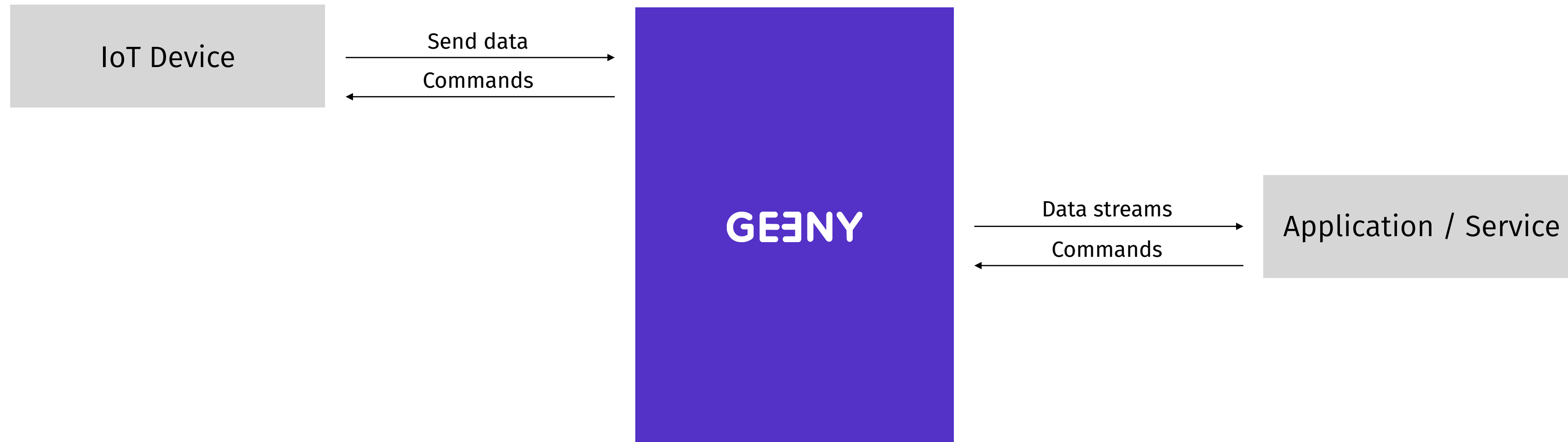
## What is Geeny?

Geeny is the consumer IoT platform by Telefónica NEXT



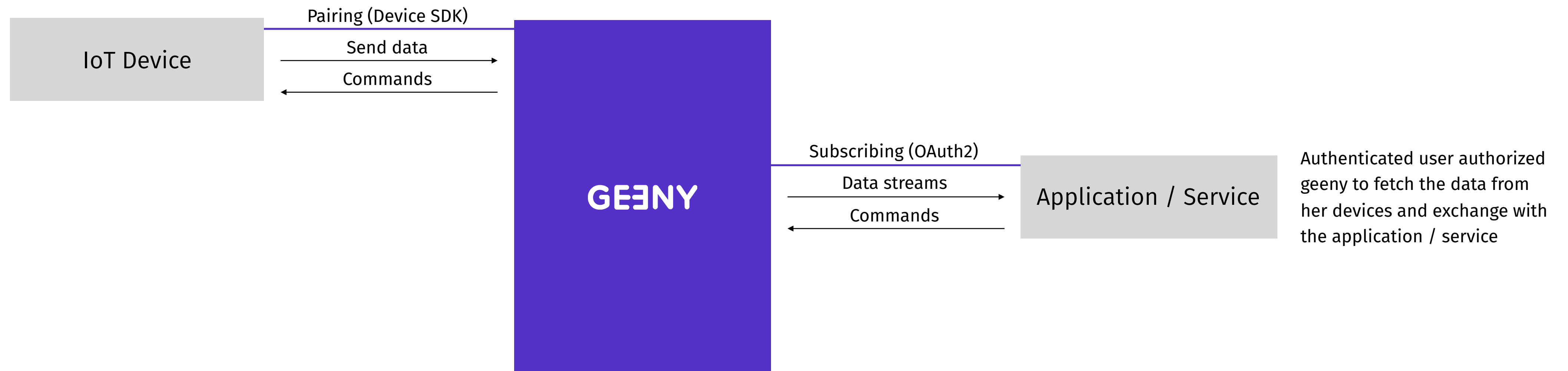
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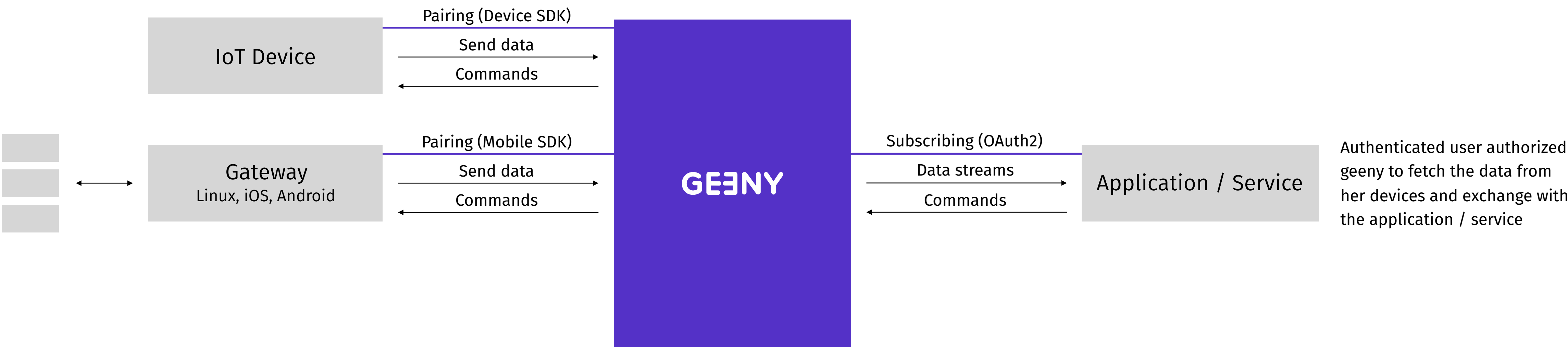
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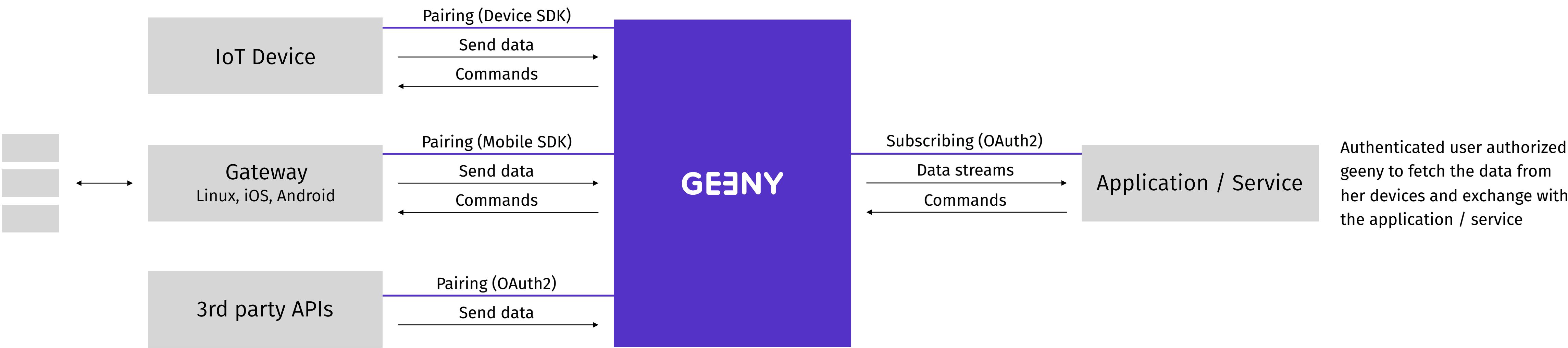
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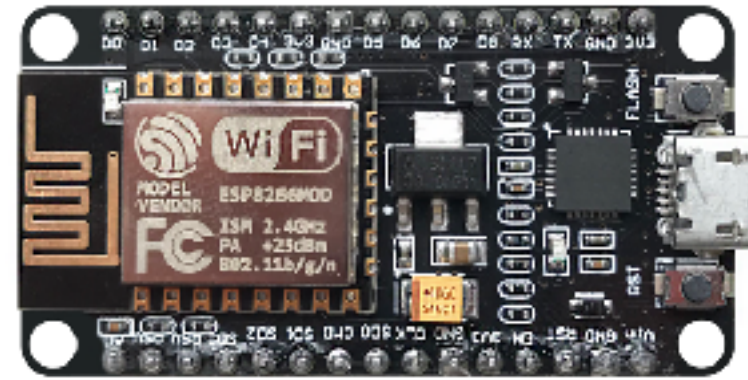


# What is Geeny?

Geeny is the consumer IoT platform by Telefónica NEXT



# The Journey



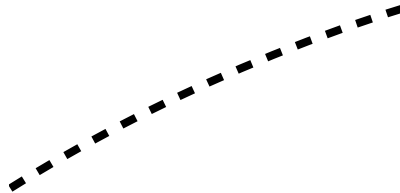


You are here ▶ 





You are here



Set up  
IDE



You are here ▶

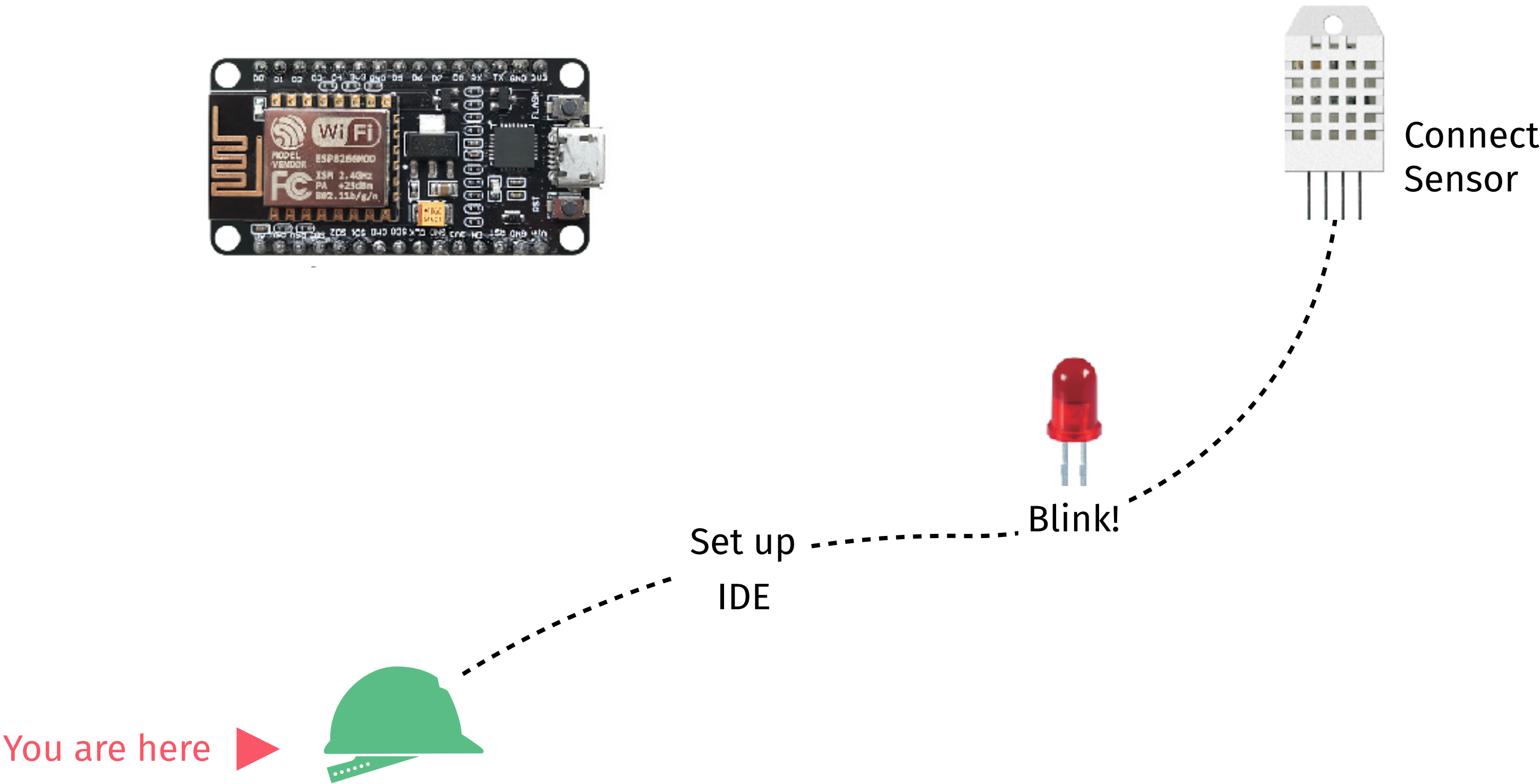


Set up  
IDE

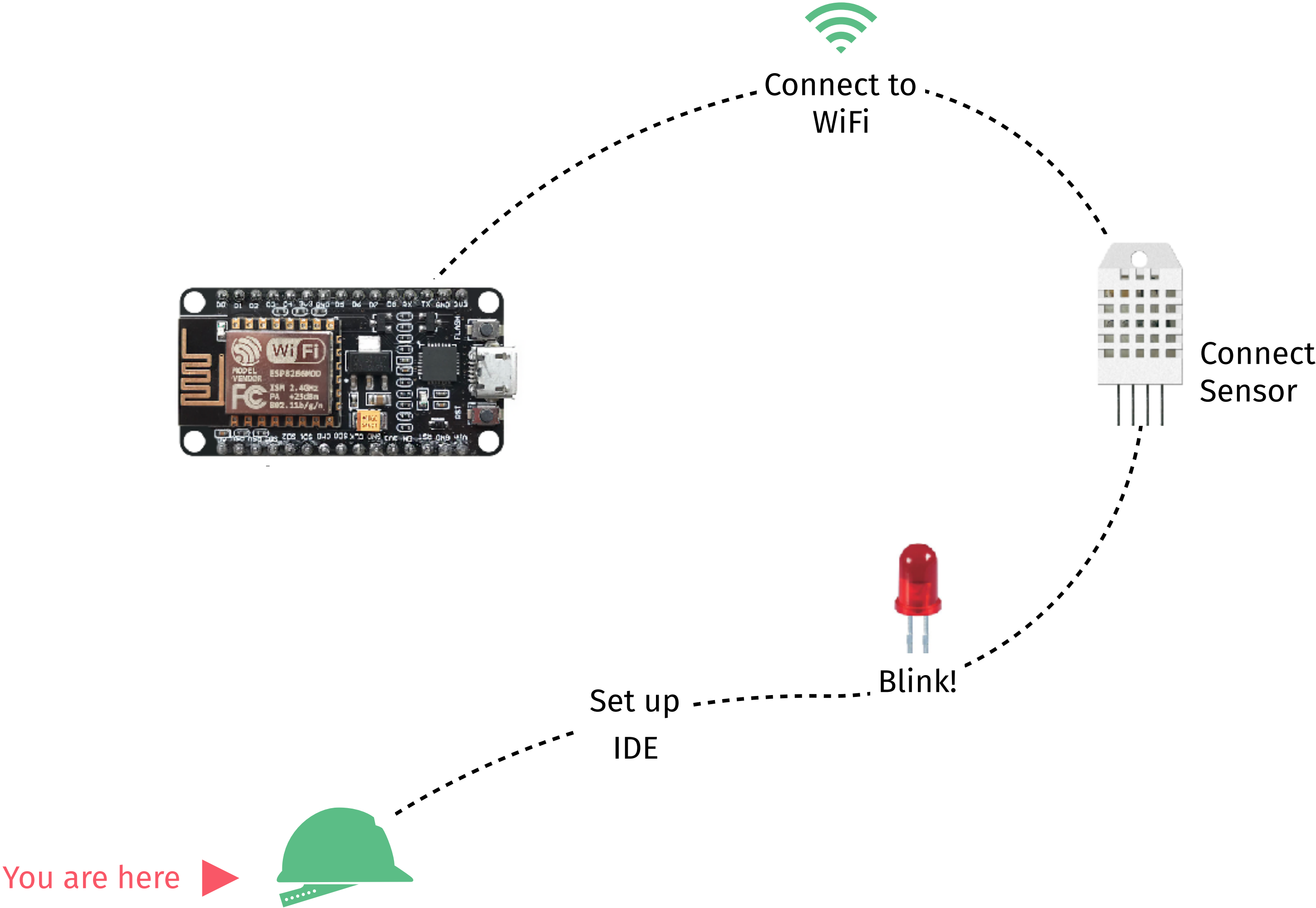


Blink!

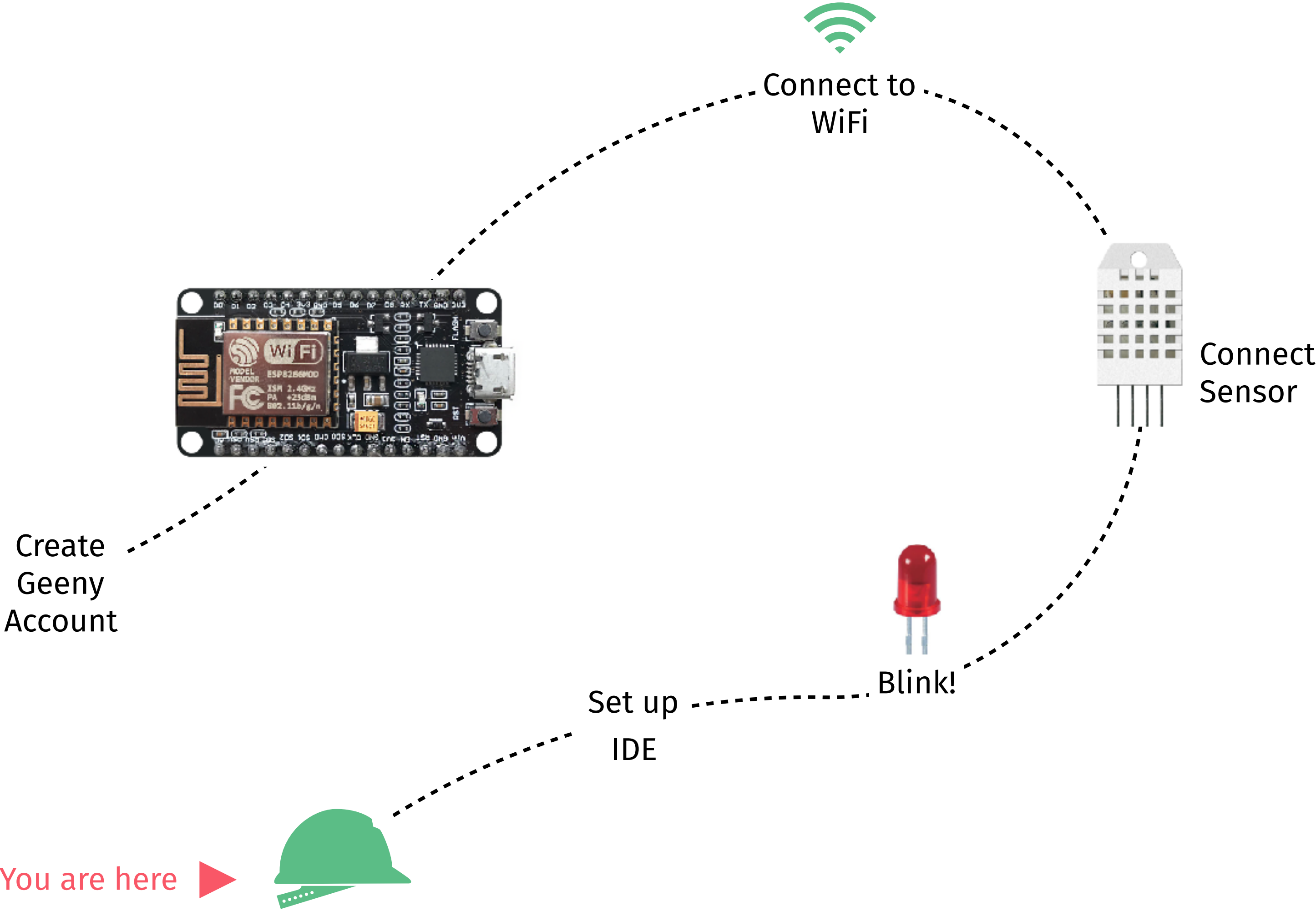
# The Journey



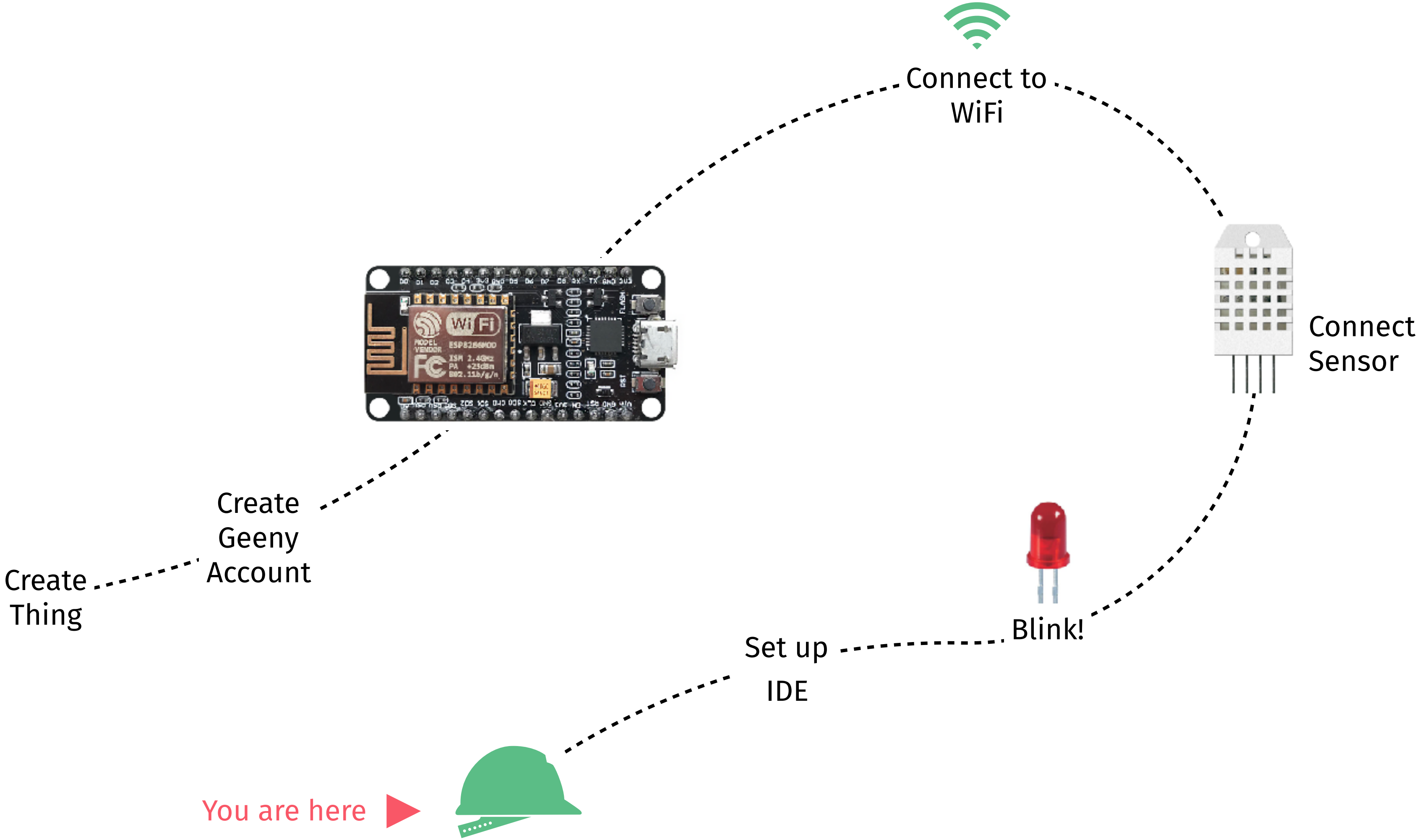
# The Journey



# The Journey

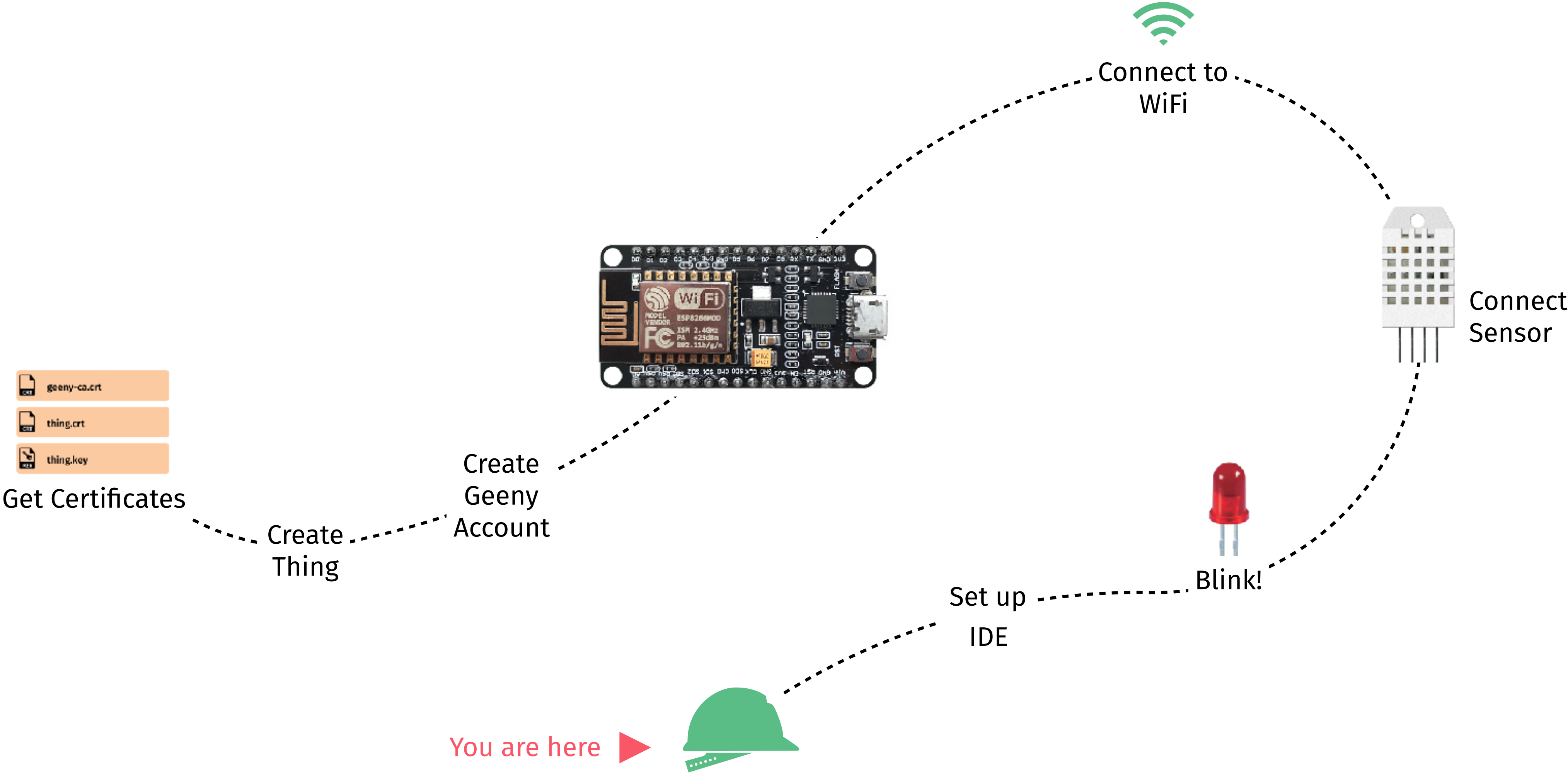


# The Journey

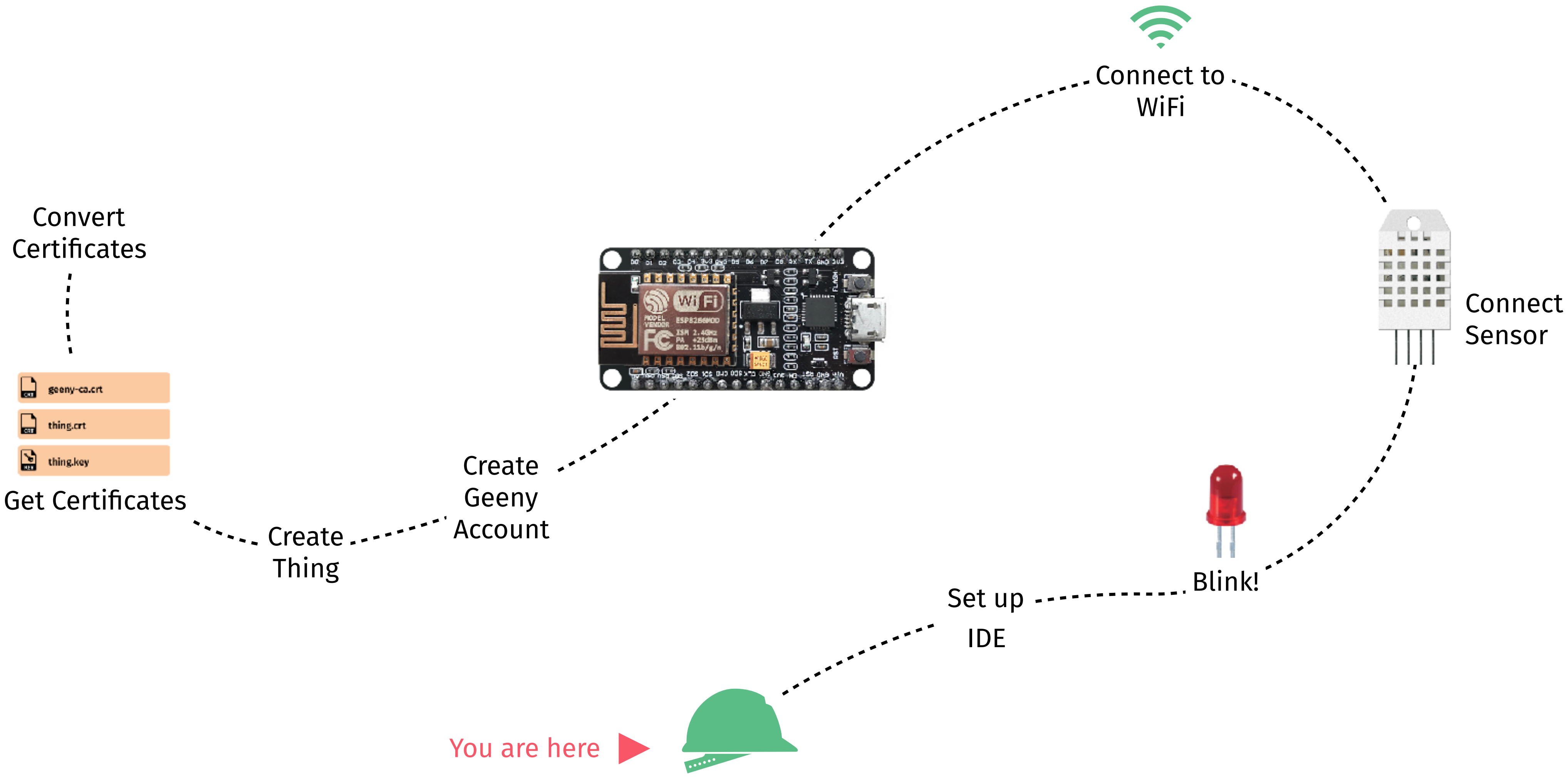




# The Journey

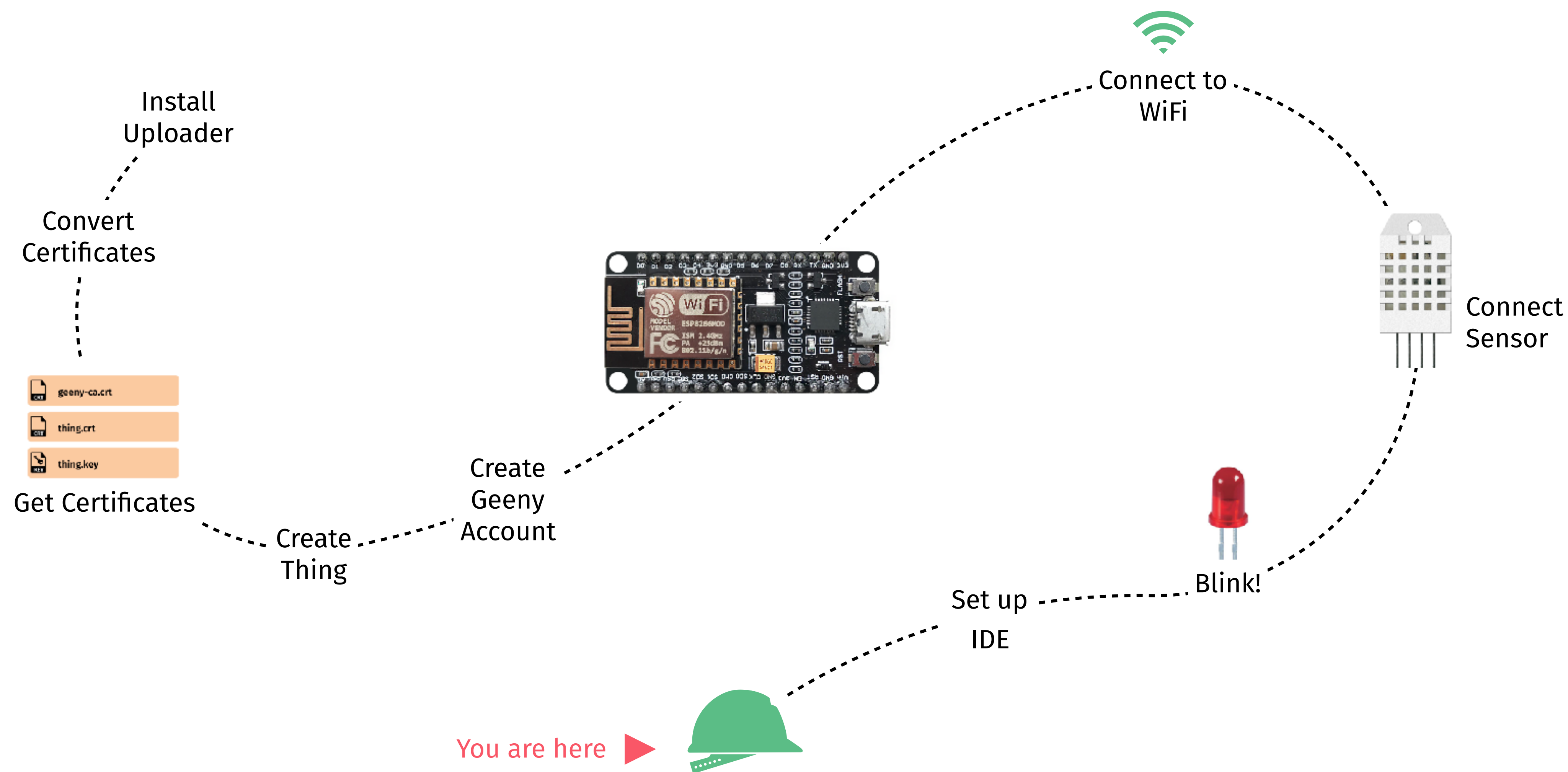


# The Journey

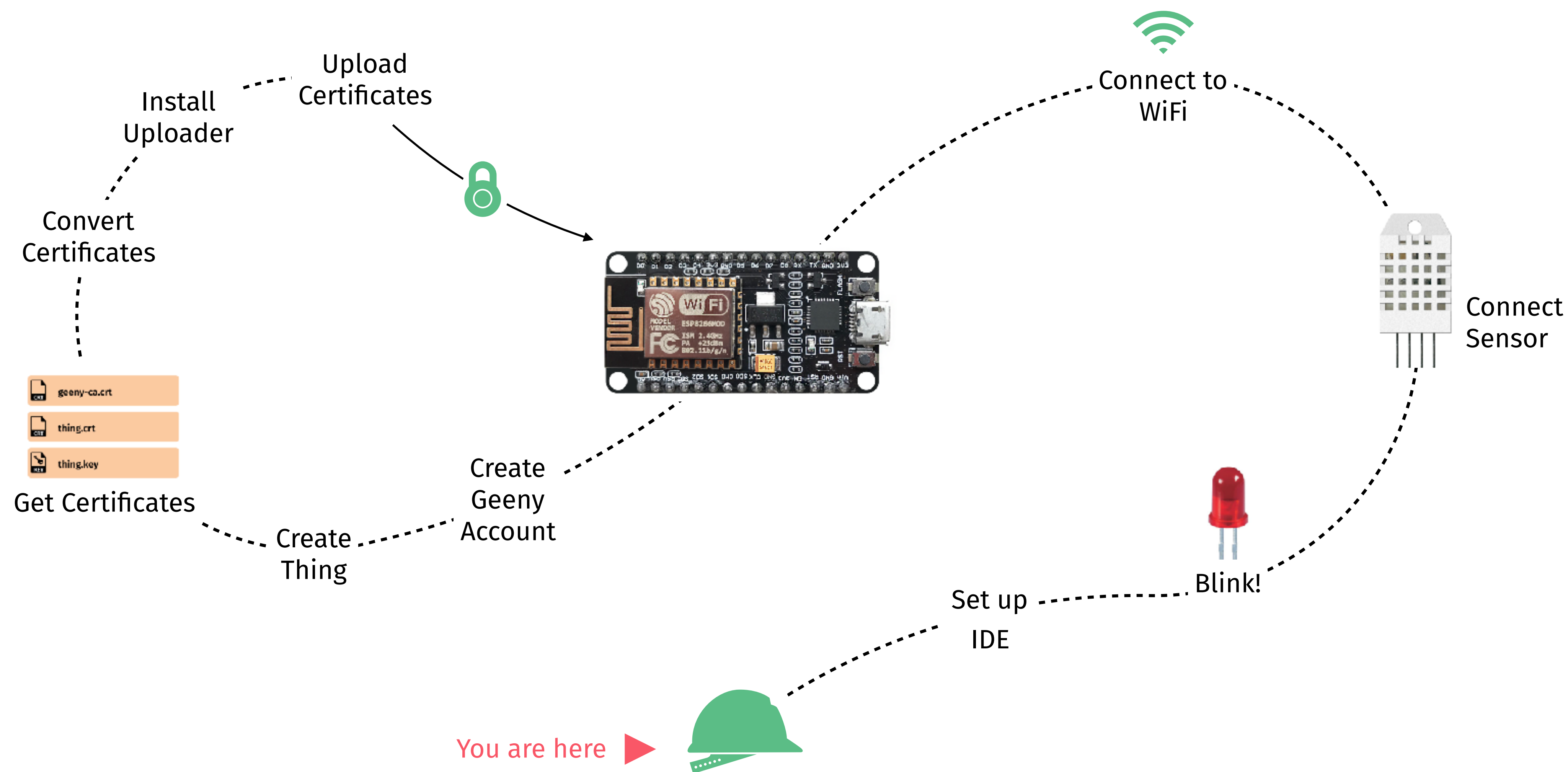




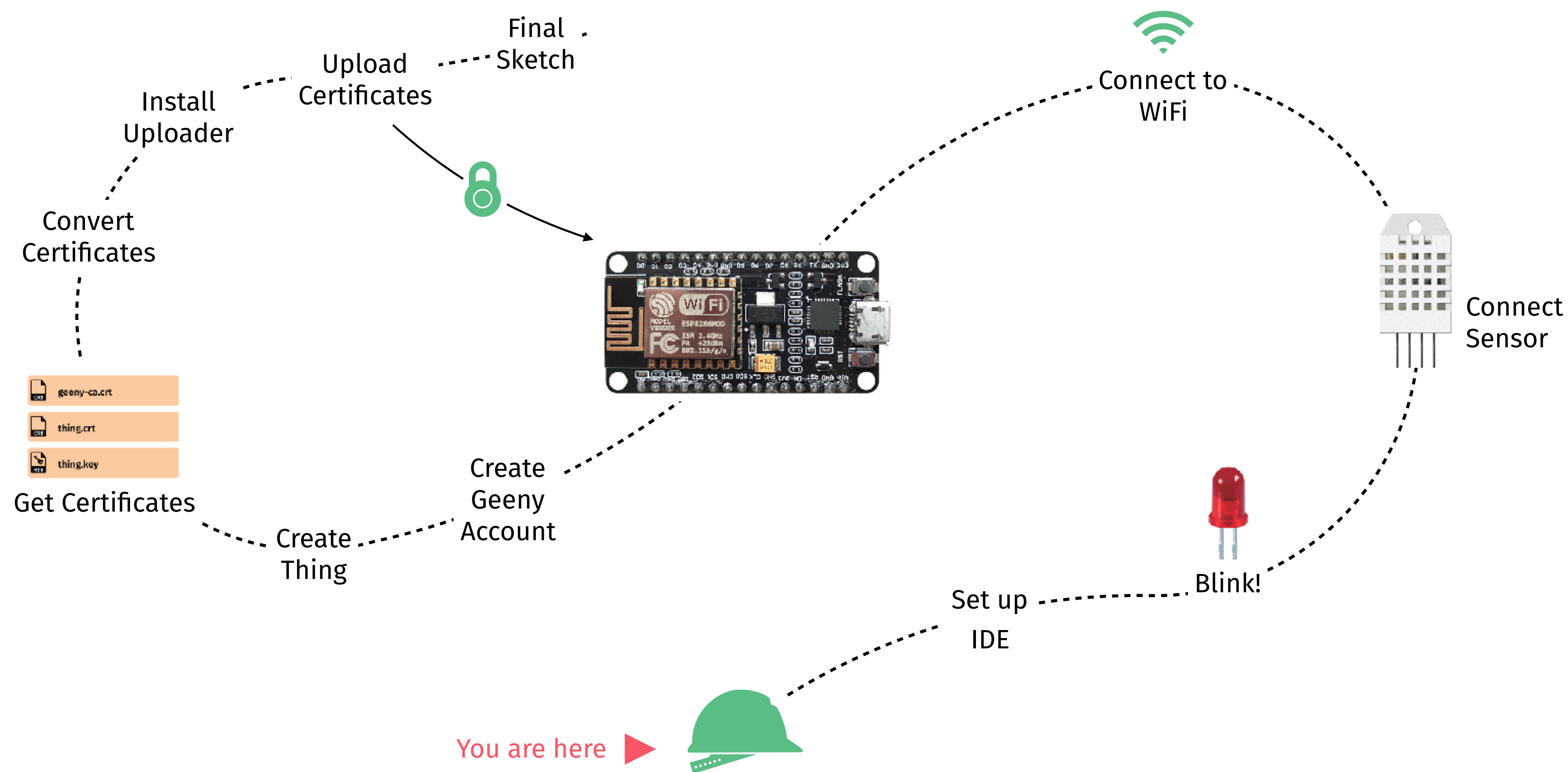
# The Journey



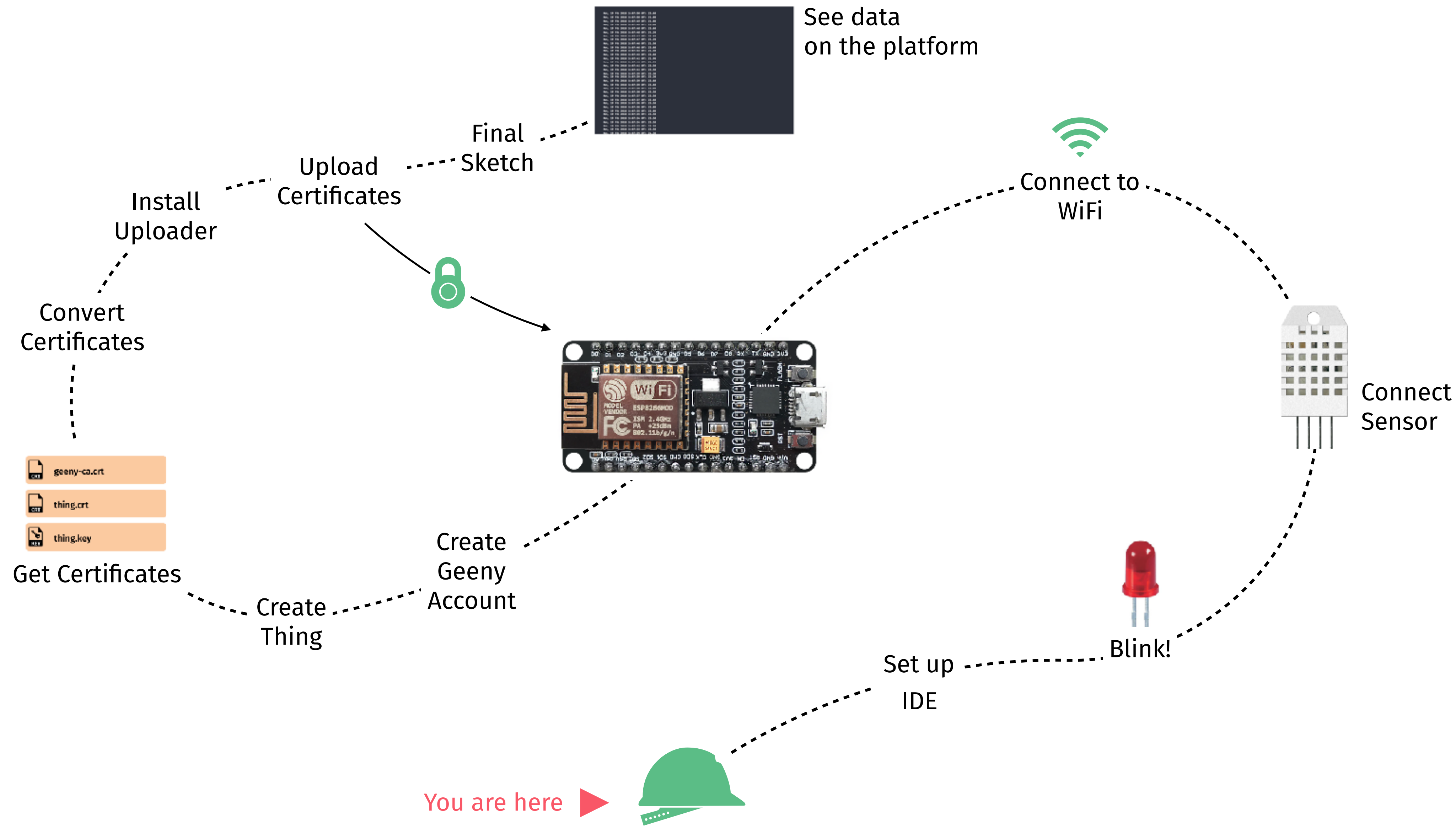
# The Journey



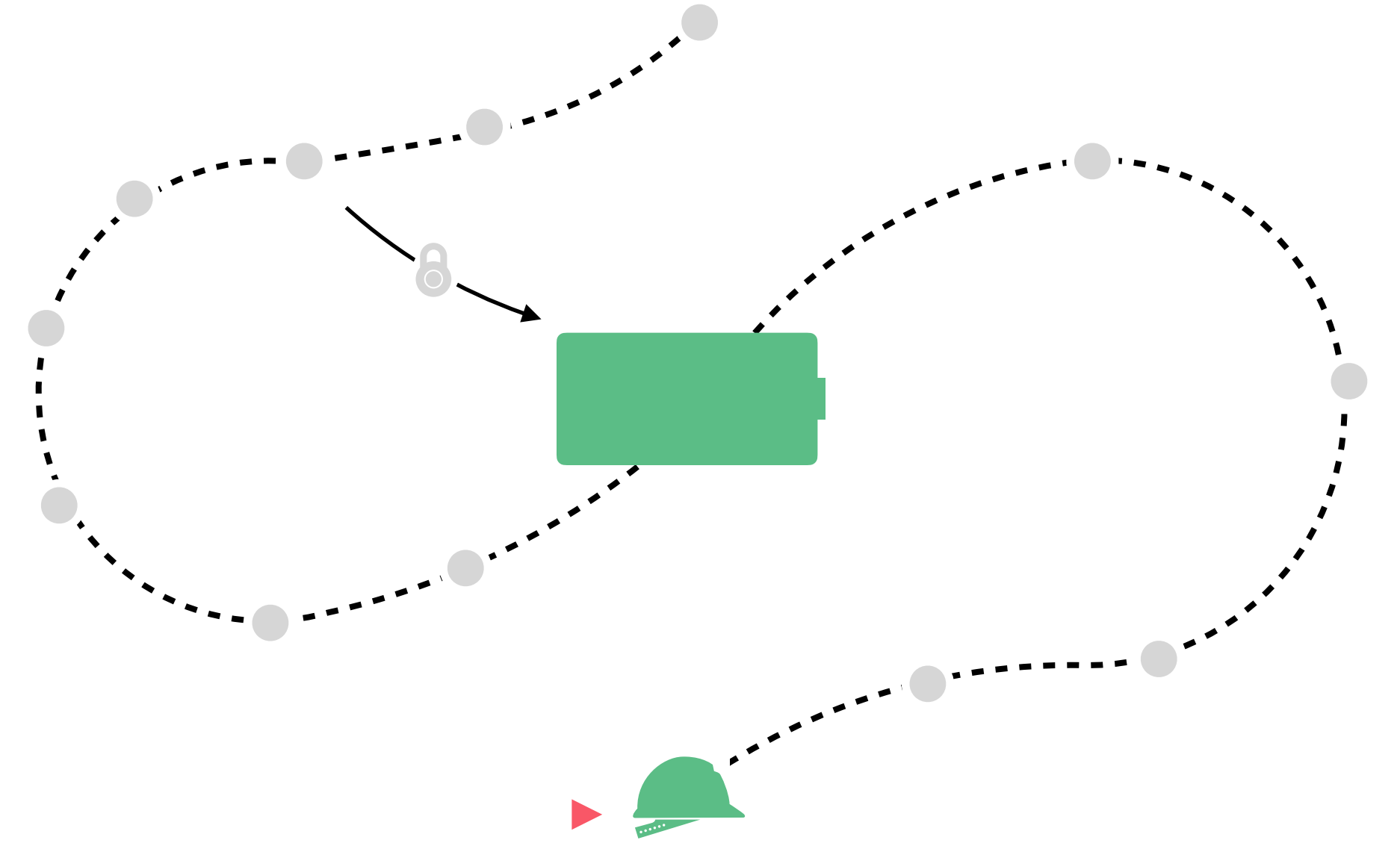
# The Journey



# The Journey



## First Steps



## First Steps

### 1. Set up the IDE

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1. Install Arduino IDE from [www.arduino.cc](http://www.arduino.cc)

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2. Go to *Files>Preference* (Mac: *Arduino>Preferences*) in the Arduino IDE
3. Copy the below link in the *Additional boards Manager* field:  
[http://arduino.esp8266.com/stable/package\\_esp8266com\\_index.json](http://arduino.esp8266.com/stable/package_esp8266com_index.json)

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4. Go to *Tools>Boards>Board Manager*

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4. Go to *Tools>Boards>Board Manager*
5. Search for [esp8266](#) (by *esp8266 community*) and install it

## First Steps

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4. Go to *Tools>Boards>Board Manager*
5. Search for [esp8266](#) (by *esp8266 community*) and install it
6. Select from *Tools>Board* the [NodeMCU 1.0 \(ESP12E module\)](#)

## First Steps

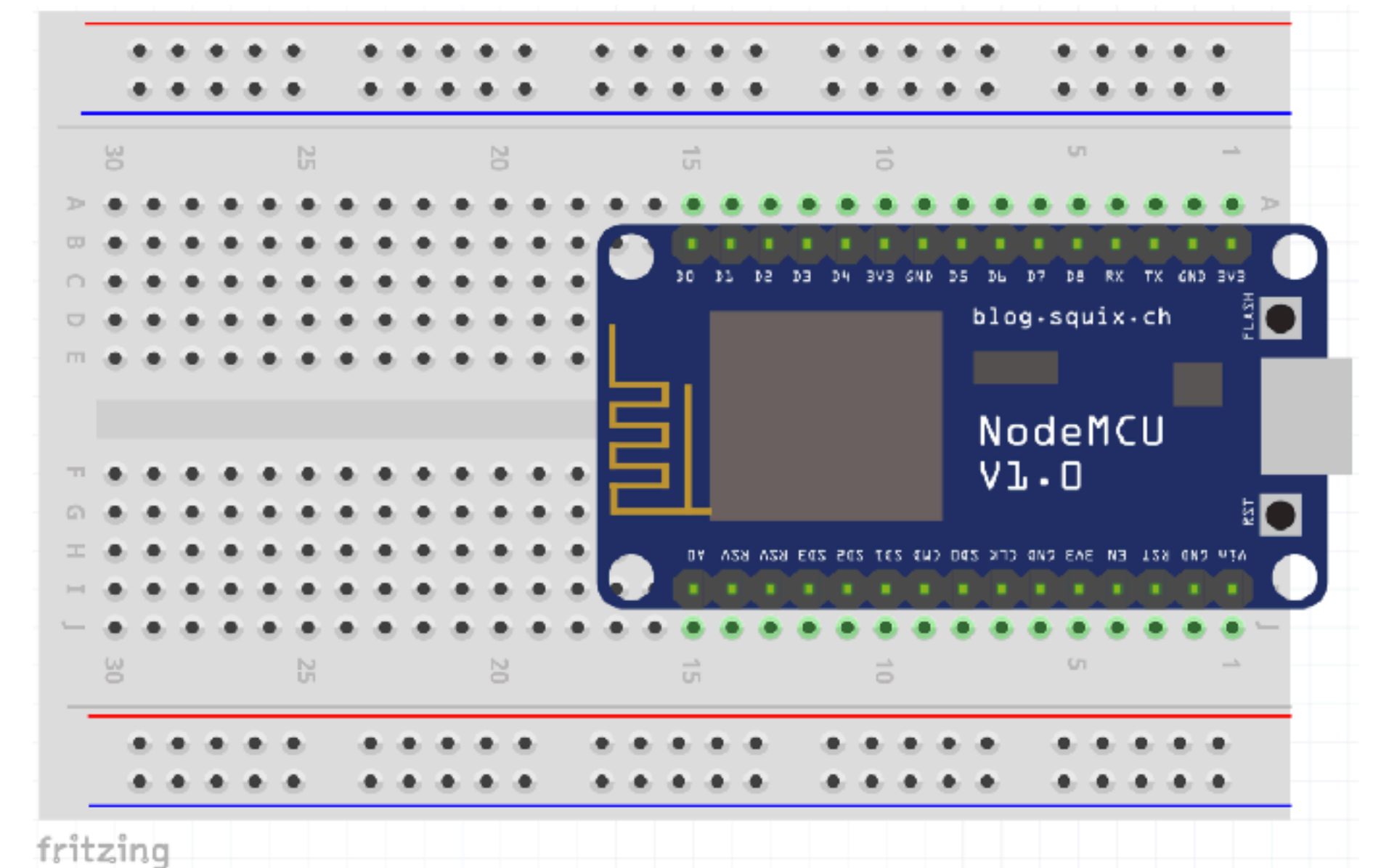
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[http://arduino.esp8266.com/stable/package\\_esp8266com\\_index.json](http://arduino.esp8266.com/stable/package_esp8266com_index.json)
4. Go to *Tools>Boards>Board Manager*
5. Search for [esp8266](#) (by *esp8266 community*) and install it
6. Select from *Tools>Board* the [NodeMCU 1.0 \(ESP12E module\)](#)
7. Maybe: Install USB driver from  
<https://www.silabs.com/products/development-tools/software/usb-to-uart-bridge-vcp-drivers>

## First Steps

### 2. Blink()

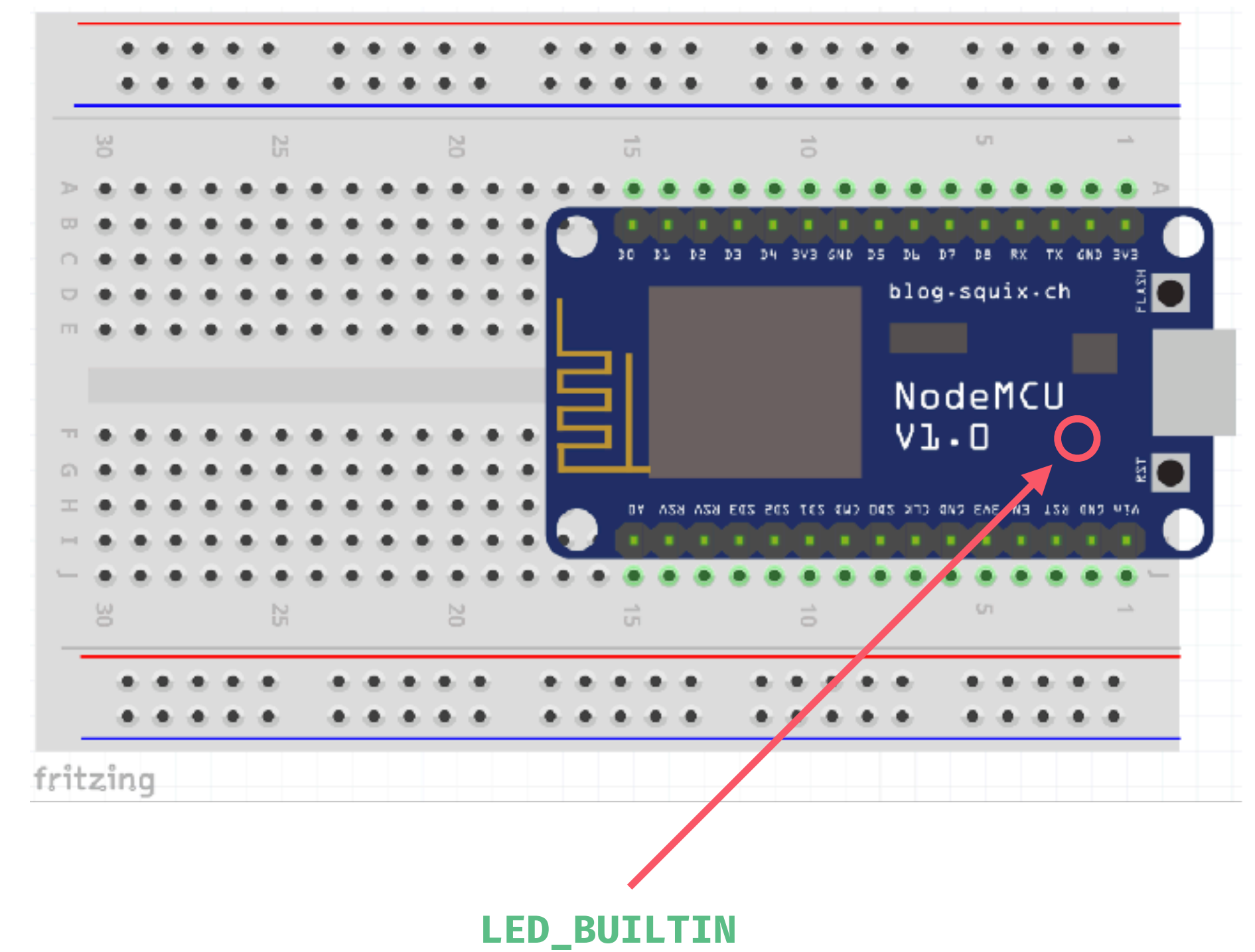
1. Open *Files>Examples>Basics>Blink*
2. Go to *Tools>Port* and select (usually) the last entry
3. Upload the code to the NodeMCU:  
*Sketch>Upload* or click the upload button in the menu



## First Steps

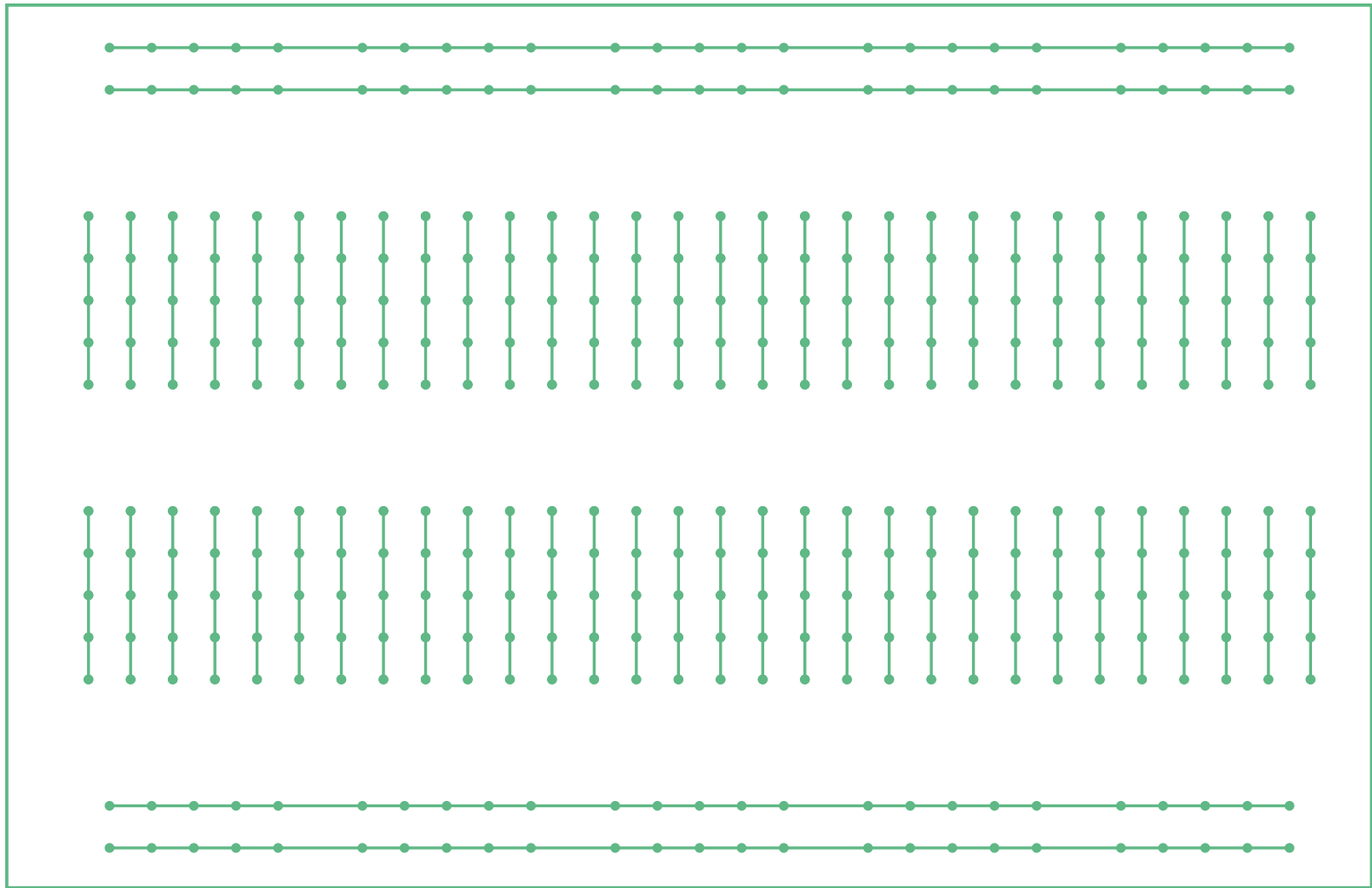
### 2. Blink()

```
void setup() {  
  pinMode(LED_BUILTIN, OUTPUT);  
}  
  
void loop() {  
  digitalWrite(LED_BUILTIN, HIGH);  
  delay(1000);  
  digitalWrite(LED_BUILTIN, LOW);  
  delay(1000);  
}
```

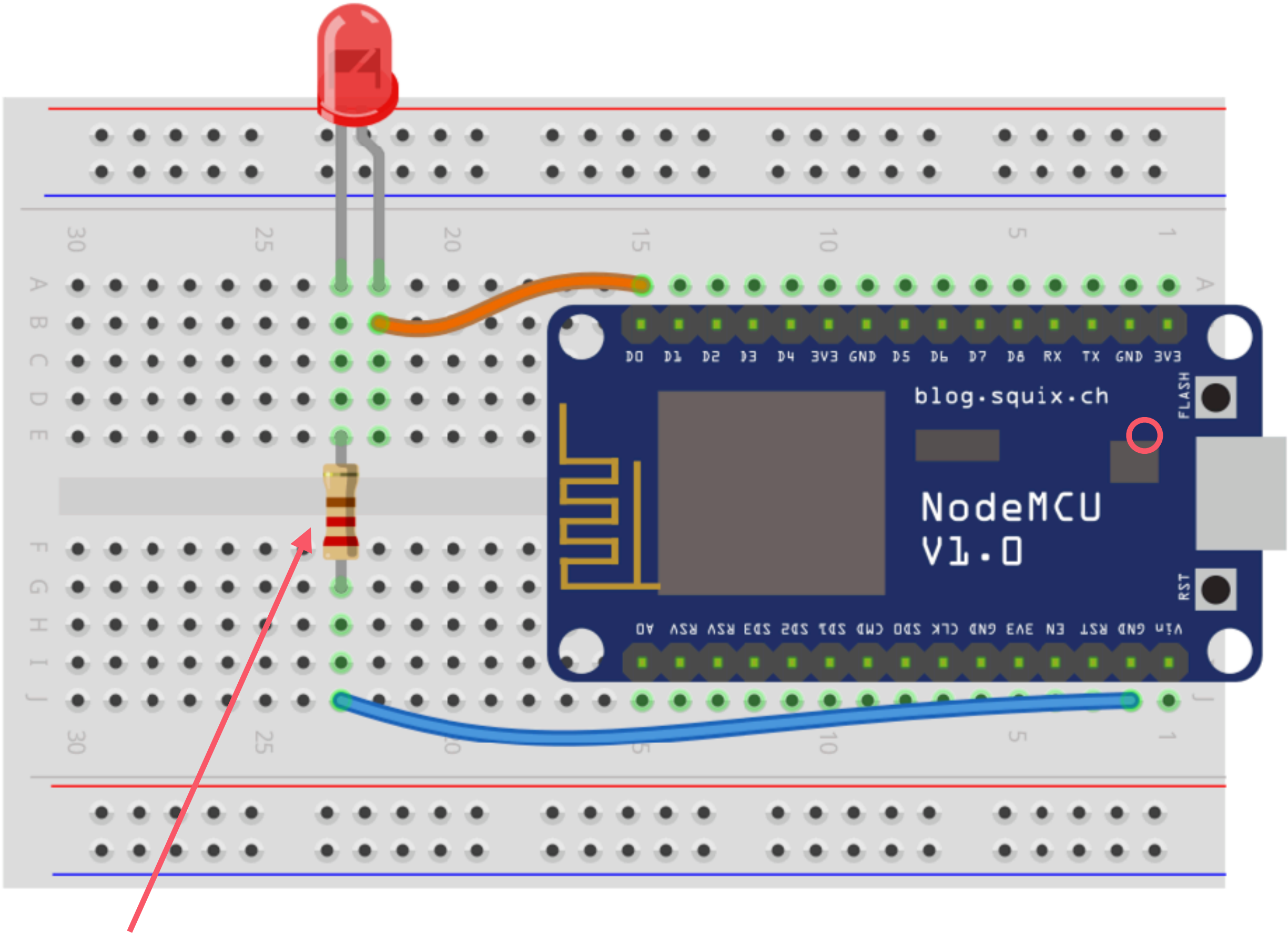




# First Steps



Interconnections of the Breadboard



220  $\Omega$  resistor



4 band resistor (red, red, brown) or



5 band resistor (red, red, black, black)



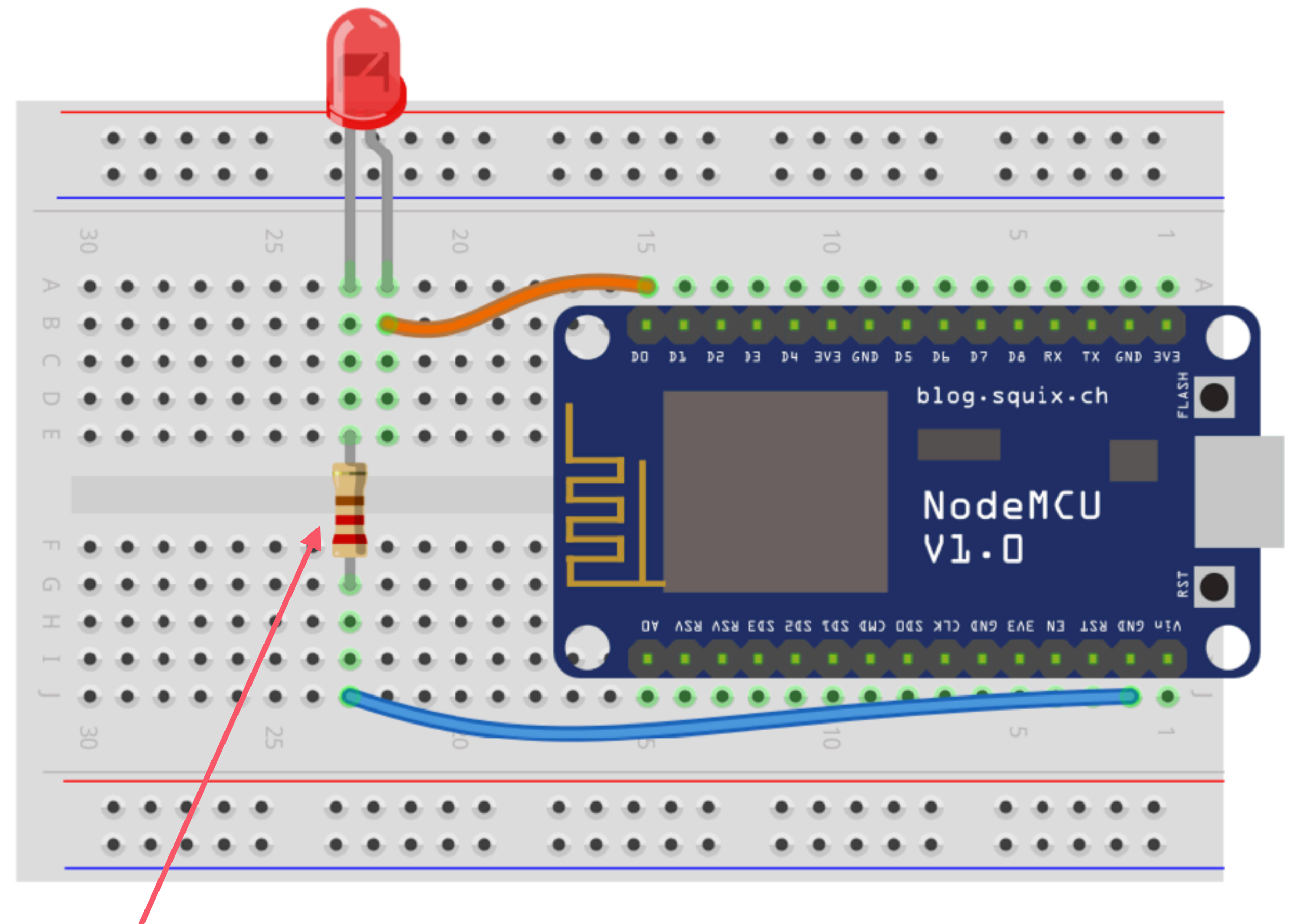
## First Steps

### 2. Blink()

```
int ledPin = D0;

void setup() {
  pinMode(ledPin, OUTPUT);
}

void loop() {
  digitalWrite(ledPin, HIGH);
  delay(1000);
  digitalWrite(ledPin, LOW);
  delay(1000);
}
```



220  $\Omega$  resistor

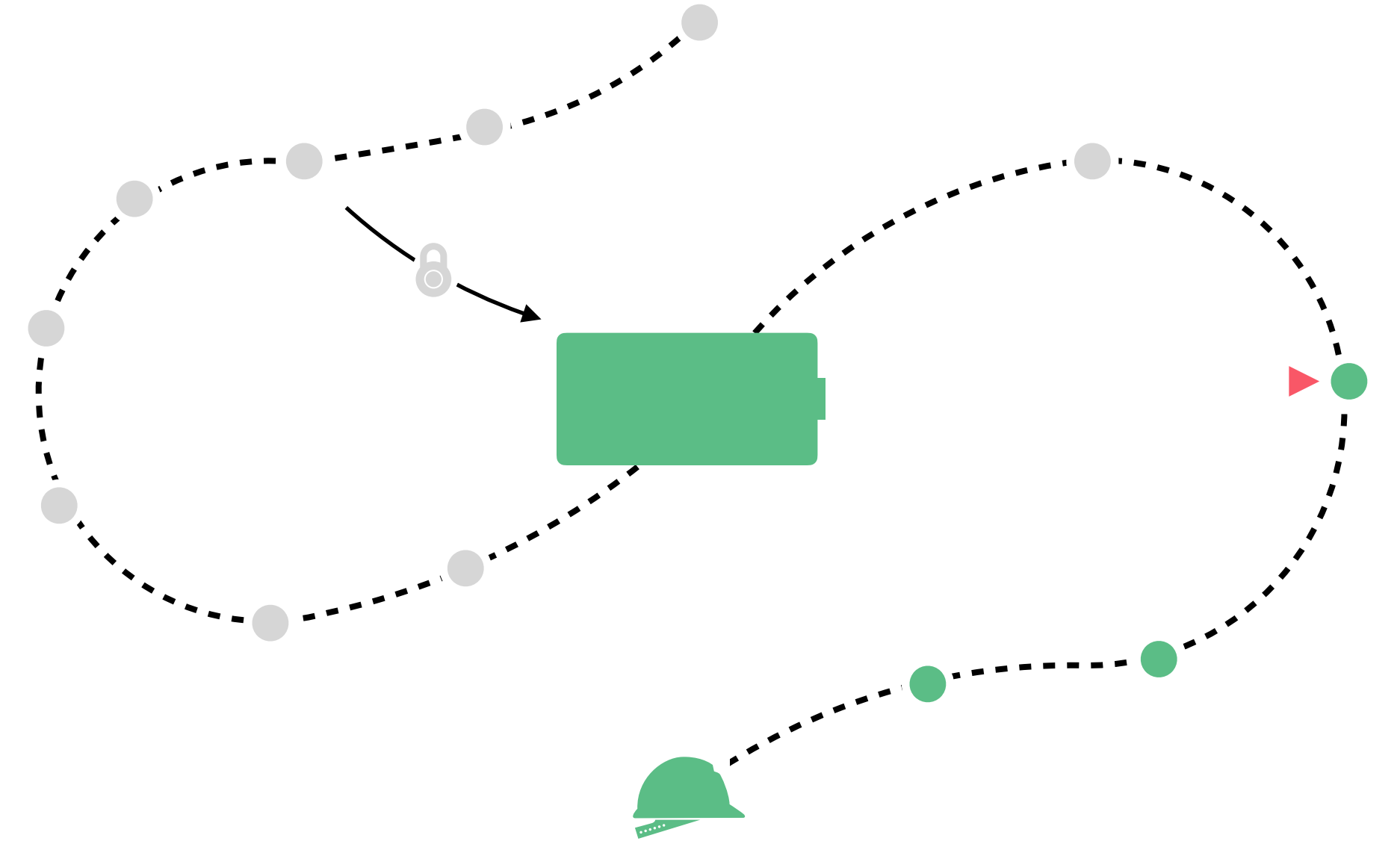


4 band resistor (red, red, brown) or



5 band resistor (red, red, black, black)

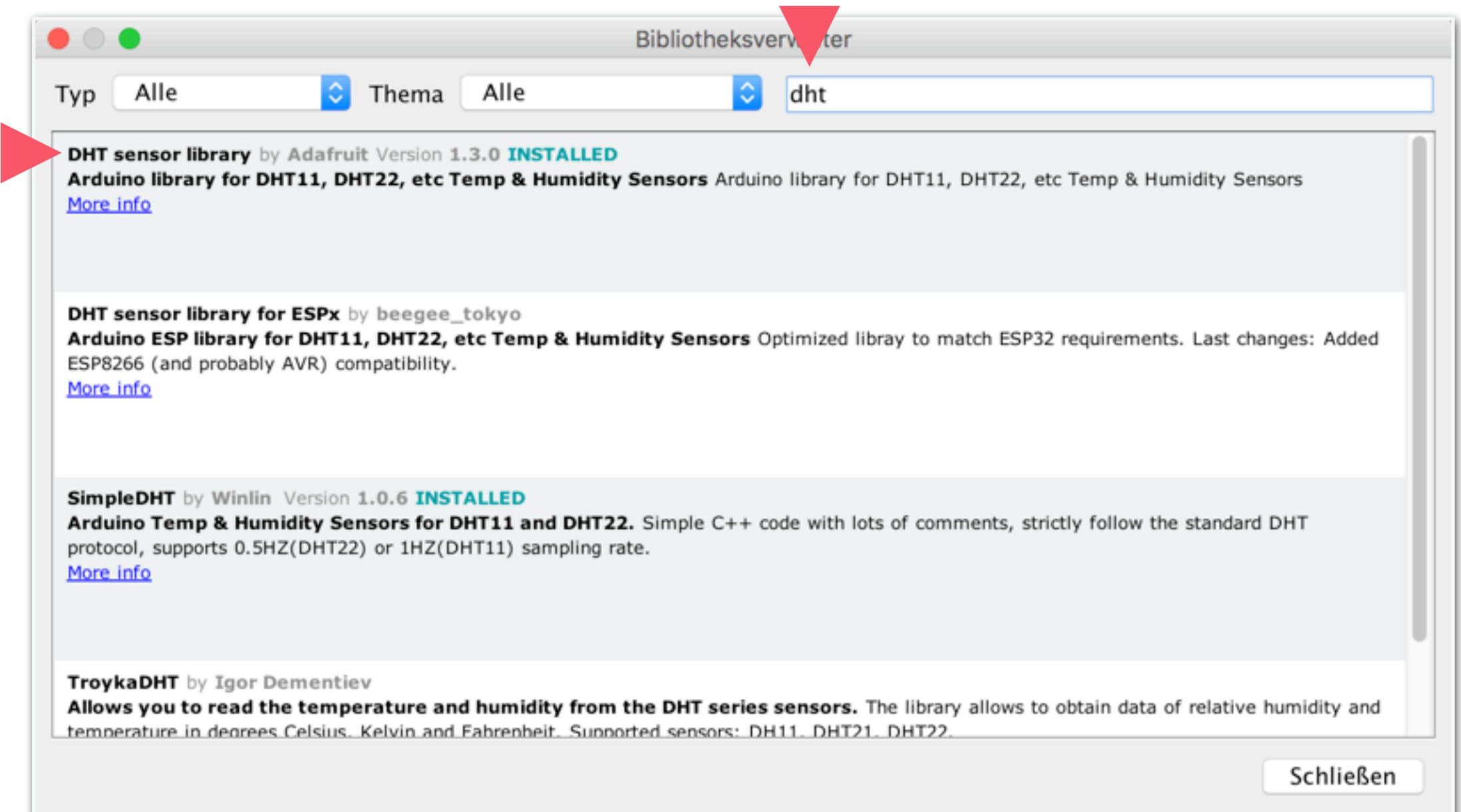
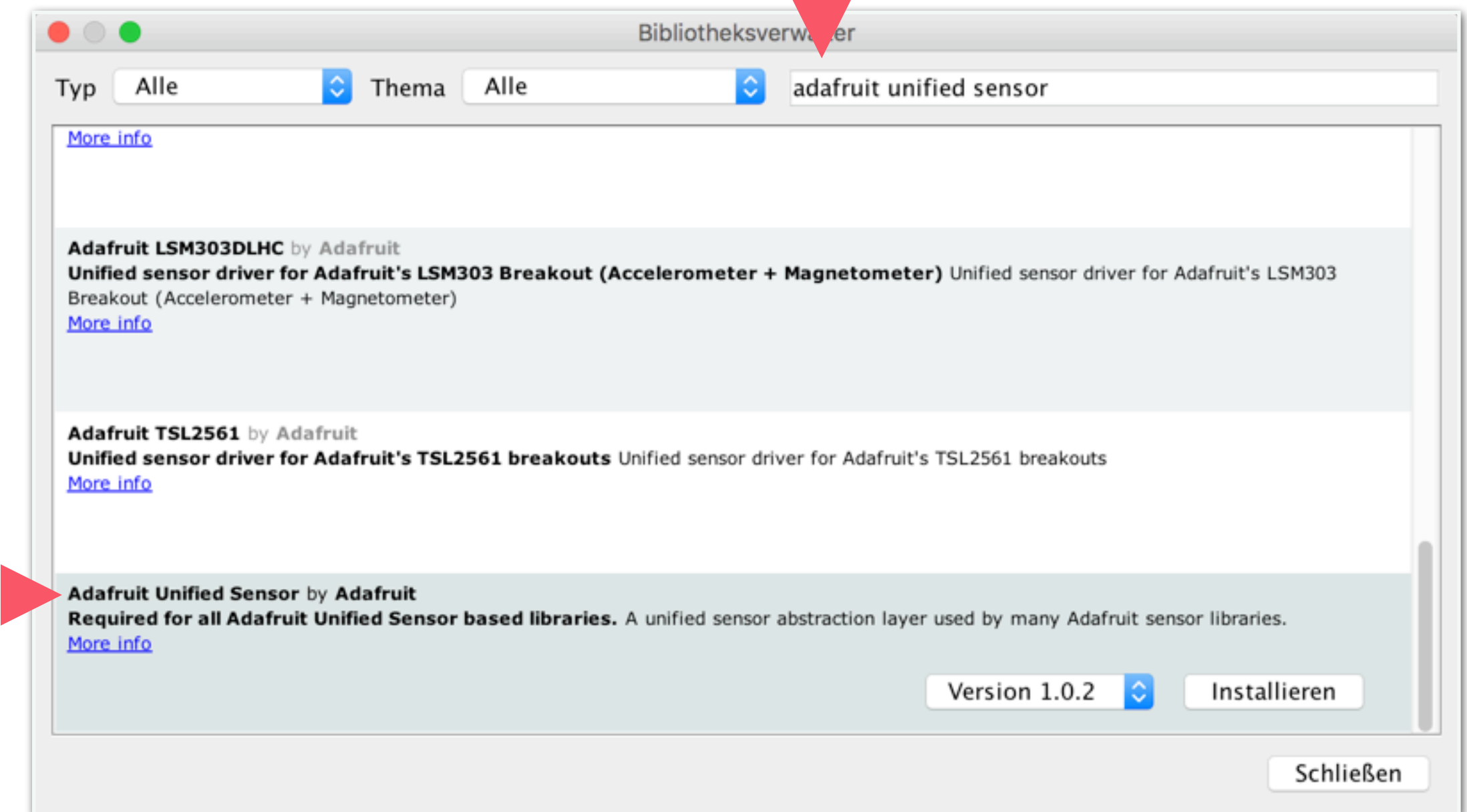
## DHT22 Temperature and Humidity



## DHT22 Temperature and Humidity

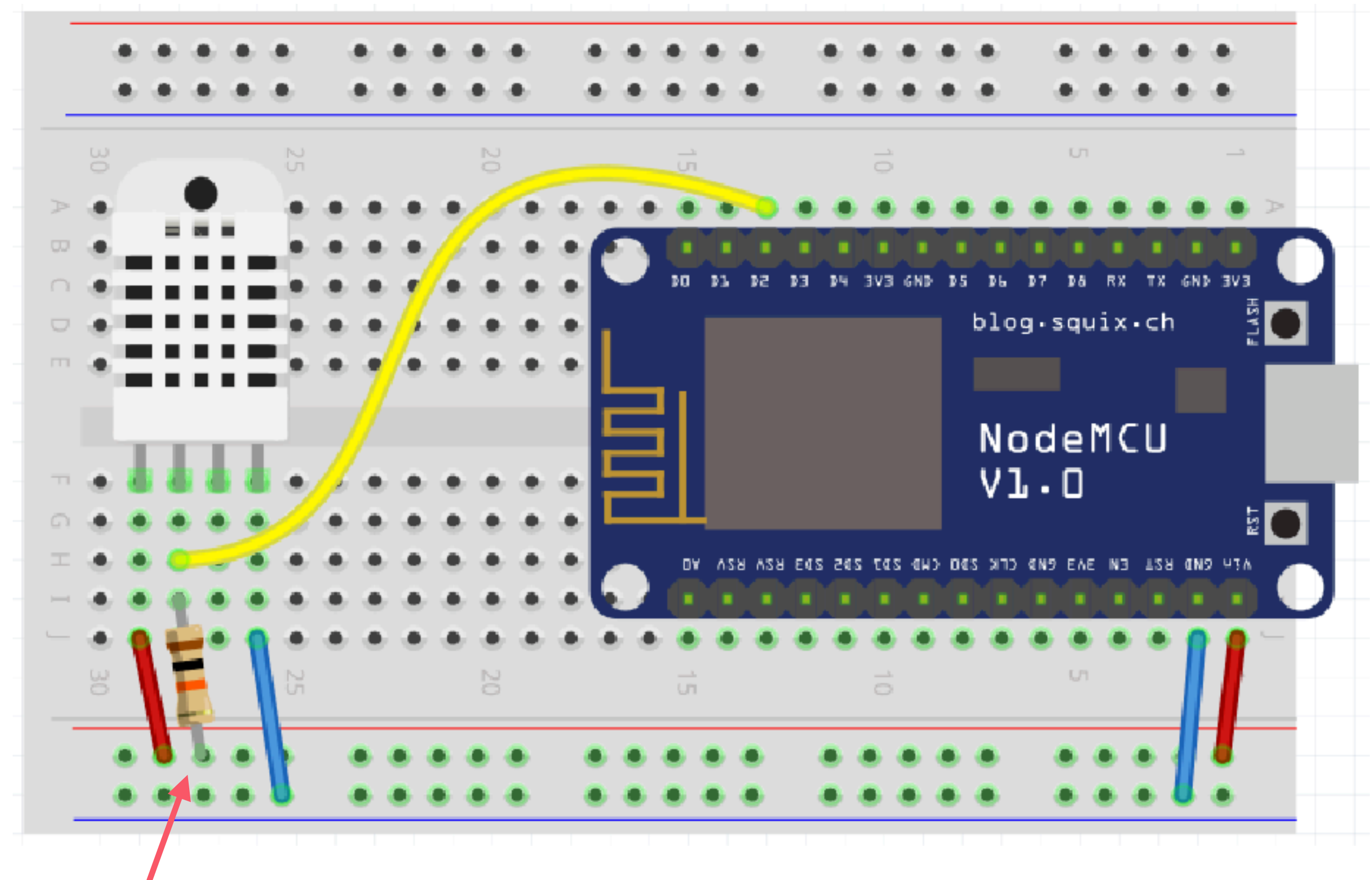
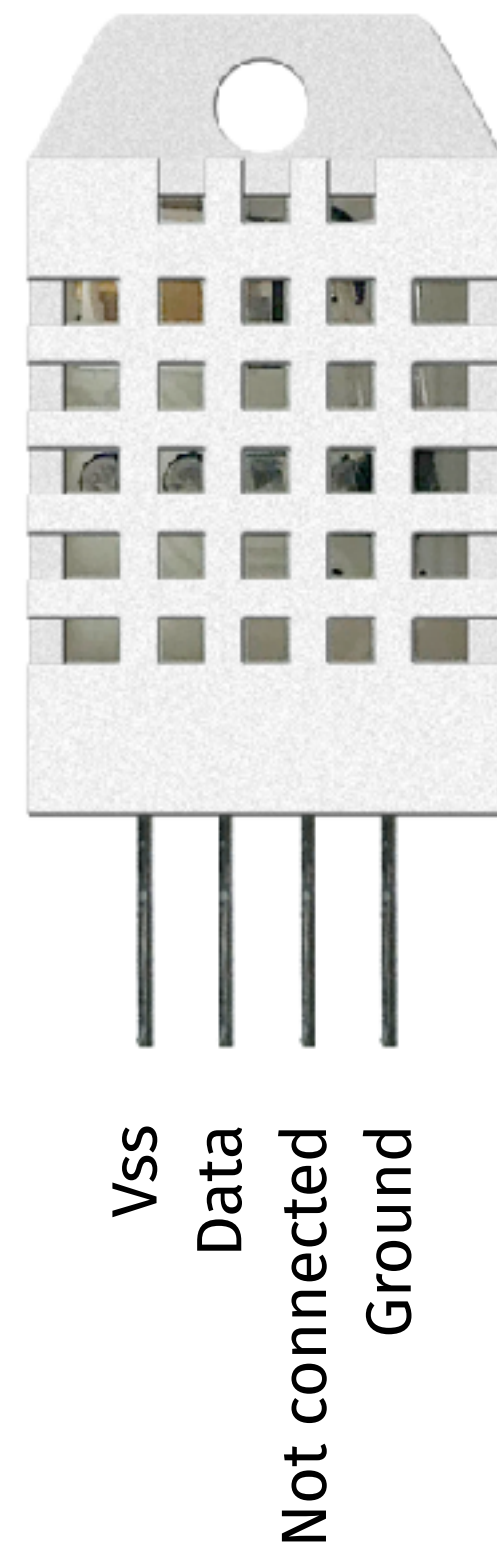
### 1. Install library

1. In the Arduino IDE go to *Sketch>Include Library>Manage libraries ...* and search for **adafruit unified sensor**
2. Install the **Adafruit Unified Sensor by Adafruit** library
3. Once again but this time search for **dht**
4. Install the **DHT sensor library by Adafruit** library



## DHT22 Temperature and Humidity

### 2. Build the circuit



10 k $\Omega$  resistor



4 band resistor (brown, black, orange) or



5 band resistor (brown, black, black, red)



## DHT22 Temperature and Humidity

### 3. The sketch (2\_DHT22.ino)

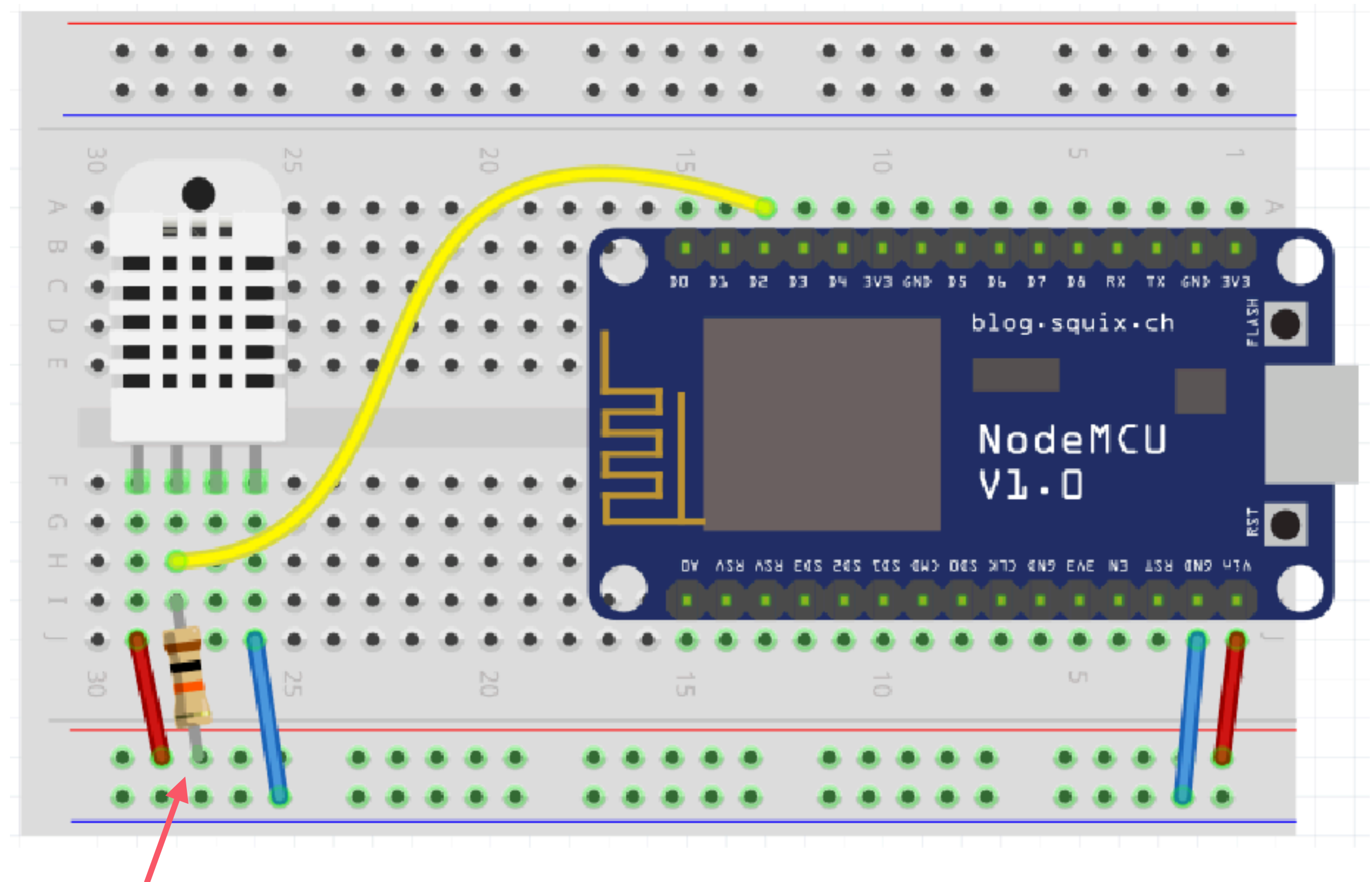
```
#include <ESP8266WiFi.h>
#include <DHT.h>

#define DHTPIN D2
#define DHTTYPE DHT22
DHT dht(DHTPIN, DHTTYPE);

unsigned long lastMillis = 0;

void setup() {
  Serial.begin(115200);
  Serial.println("Startup");
}

void loop() {
  if (millis() - lastMillis > 1000) {
    lastMillis = millis();
    sendSensorData();
  }
}
```



10 kΩ resistor



4 band resistor (brown, black, orange) or

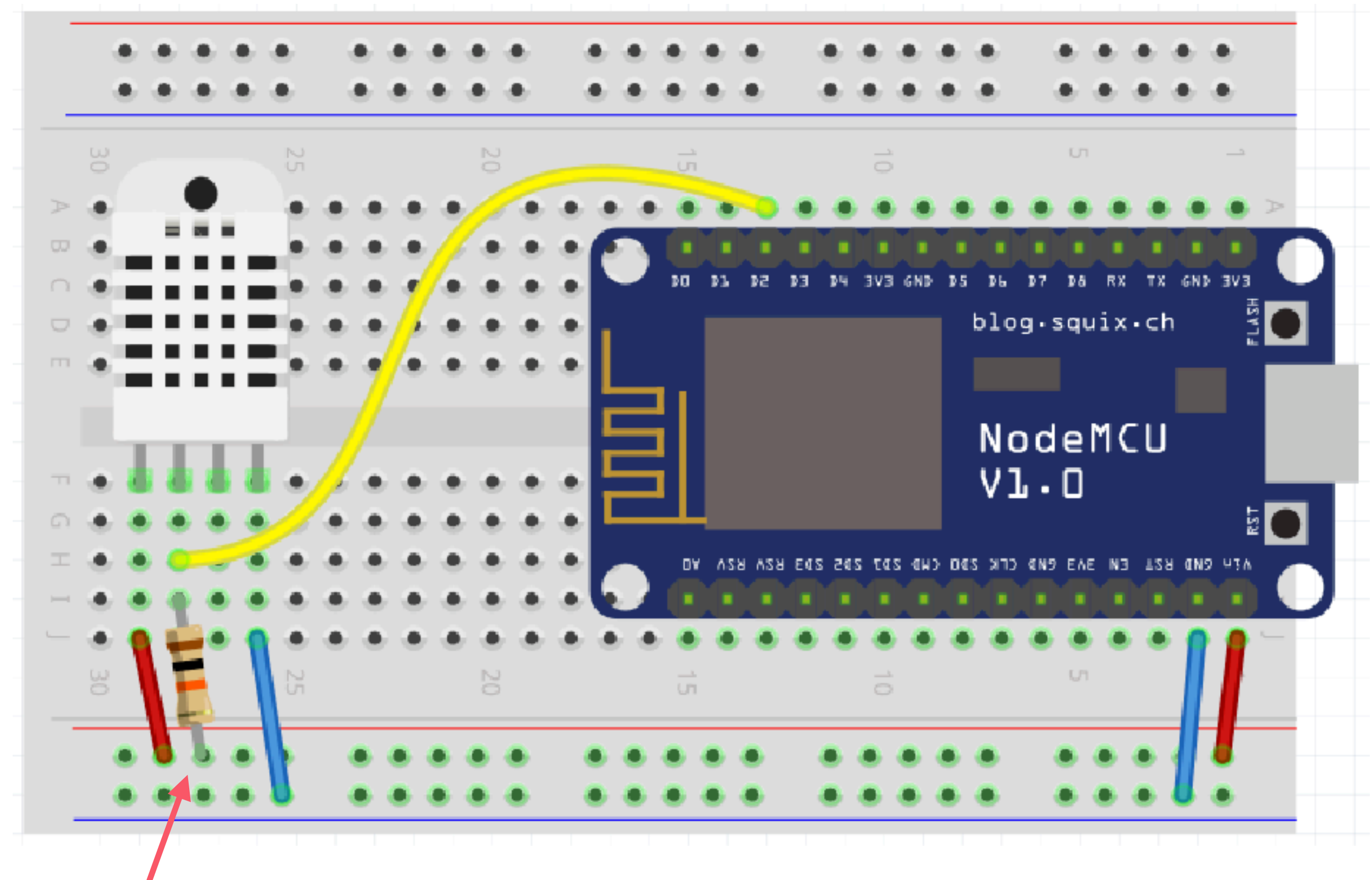


5 band resistor (brown, black, black, red)

## DHT22 Temperature and Humidity

### 3. The sketch (2\_DHT22.ino)

```
void sendSensorData() {  
  float theTemperature = dht.readTemperature();  
  float theHumidity = dht.readHumidity();  
  if (isnan(theHumidity) || isnan(theTemperature)) {  
    Serial.println("Failed to read from DHT sensor!");  
    return;  
  }  
  
  Serial.print(theTemperature);  
  Serial.print(" °C\t");  
  Serial.print(theHumidity);  
  Serial.println(" %");  
}
```



10 kΩ resistor



4 band resistor (brown, black, orange) or

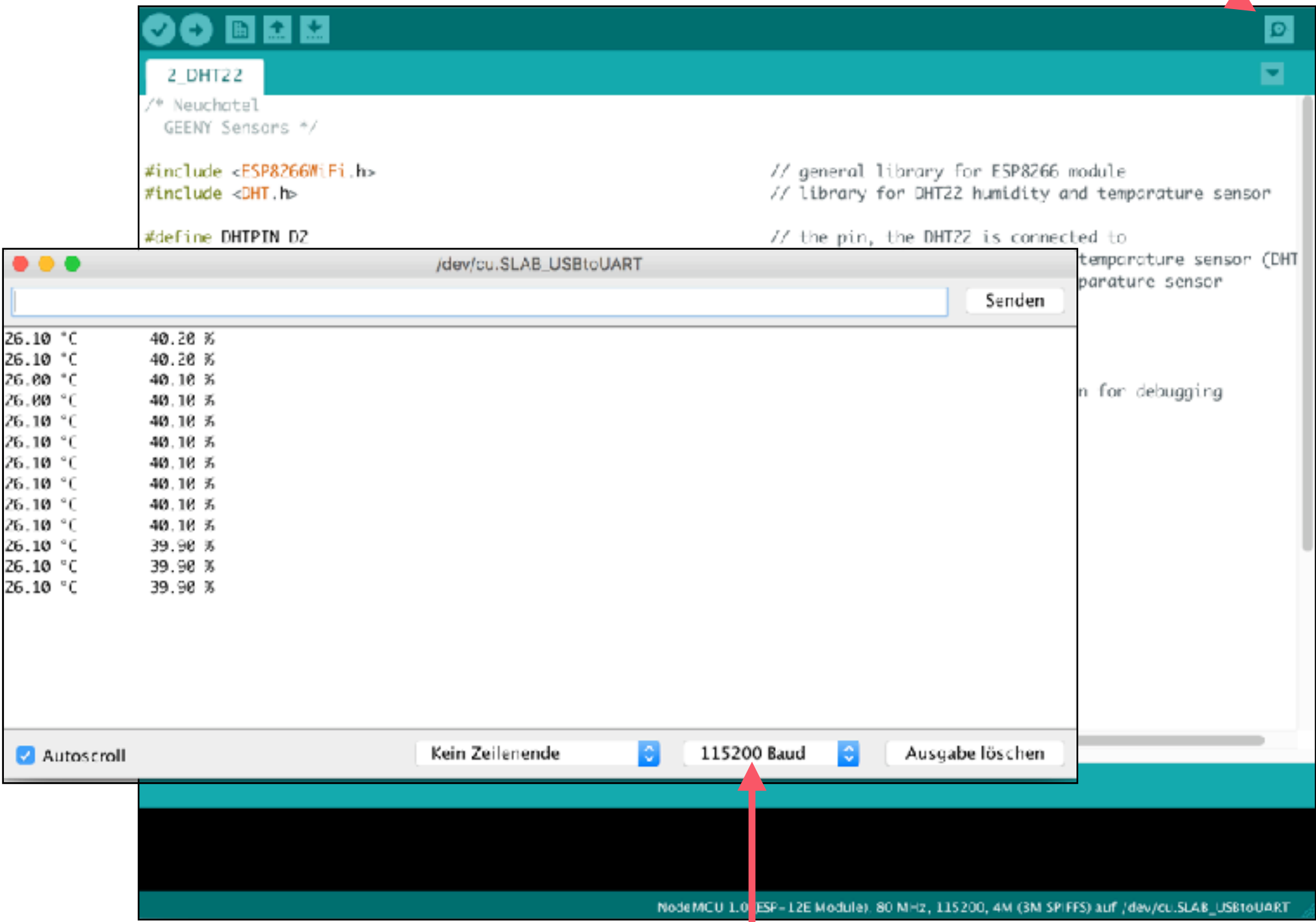


5 band resistor (brown, black, black, red)

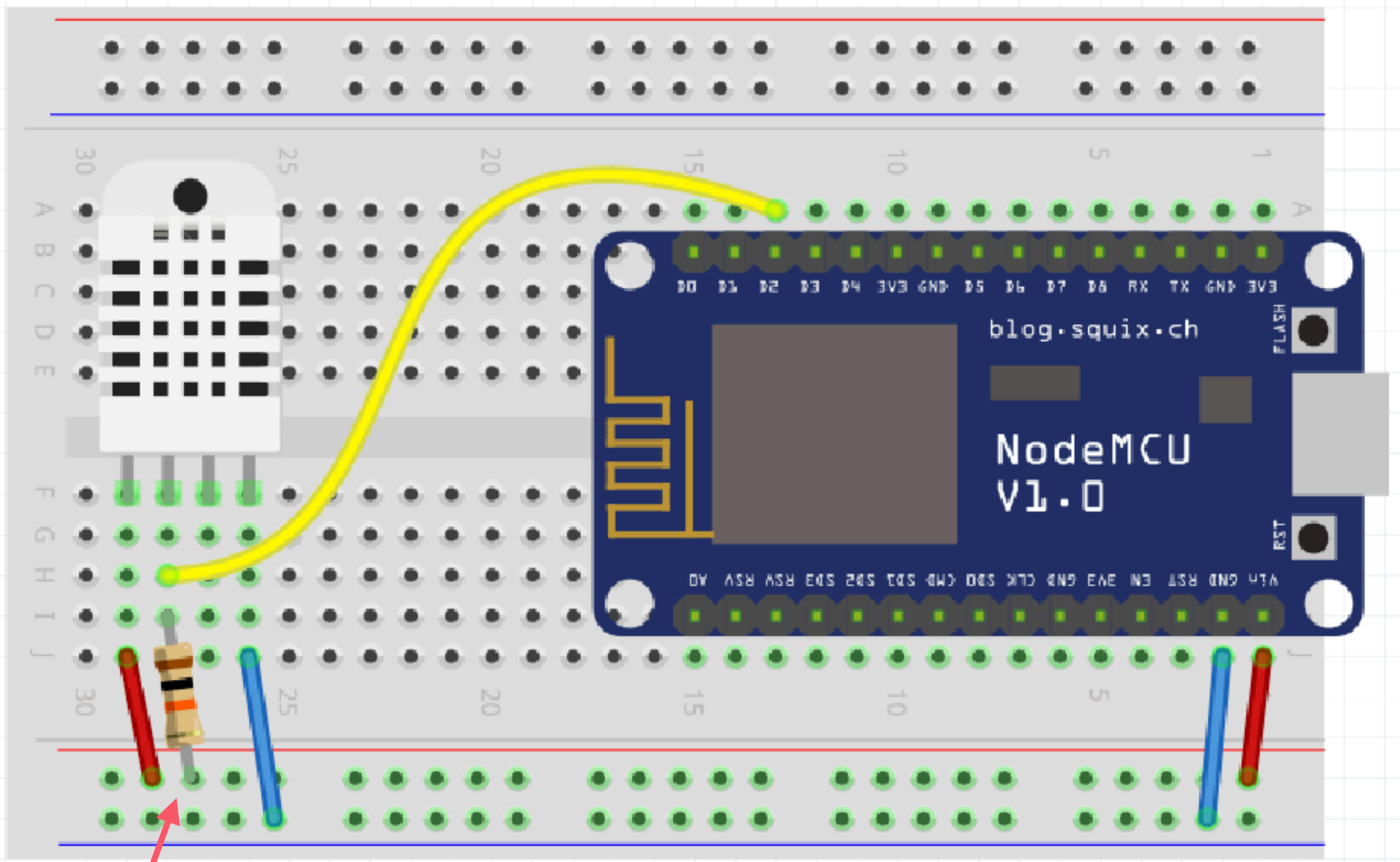
# DHT22 Temperature and Humidity

## 3. The sketch (2\_DHT22.ino)

Click to open SerialMonitor

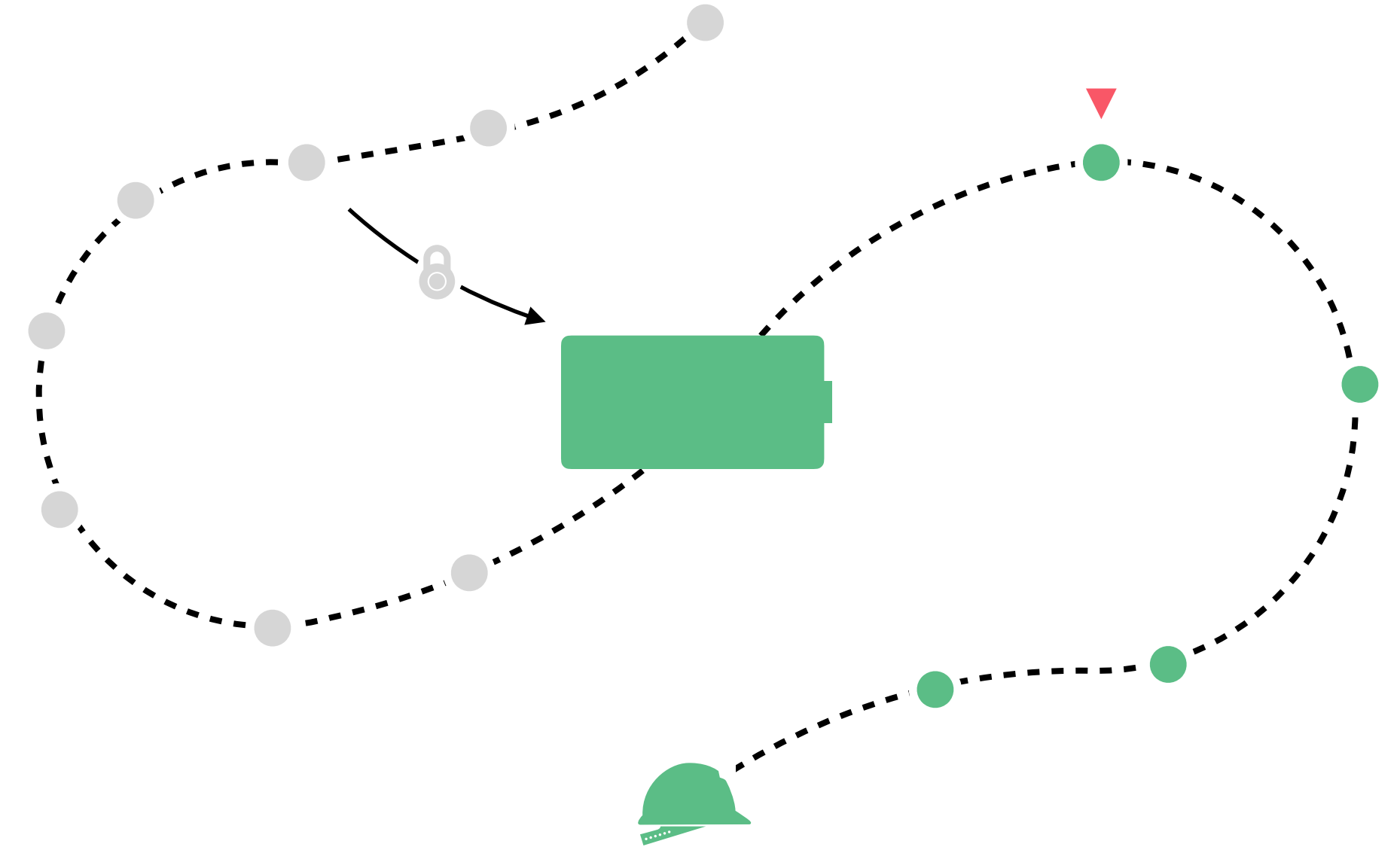


Make sure to set the baud rate to 115200



- 10 kΩ resistor
- 4 band resistor (brown, black, orange) or
- 5 band resistor (brown, black, black, red)

## Connect to Wifi





## DHT22 Temperature and Humidity

### 3. The sketch (3\_DHT22Wifi.ino)

1. Change the wifi settings and upload the sketch

```
#include <ESP8266WiFi.h>
#include <DHT.h>

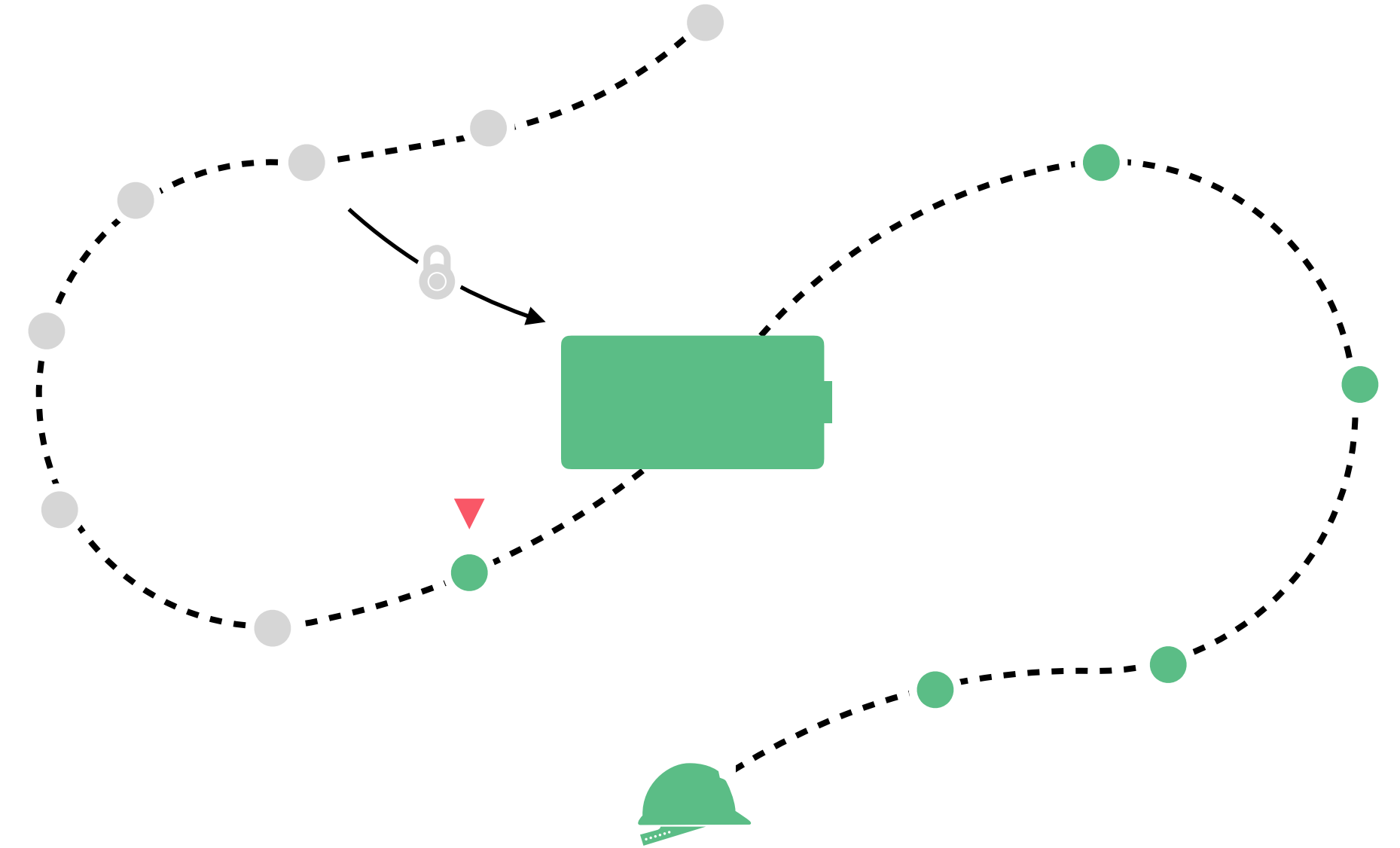
#define DHTPIN D2
#define DHTTYPE DHT22
DHT dht(DHTPIN, DHTTYPE);
const char* ssid      = "#####";
const char* password = "#####";

WiFiClient net;
unsigned long lastMillis = 0;
```

2. Open the Serial Monitor



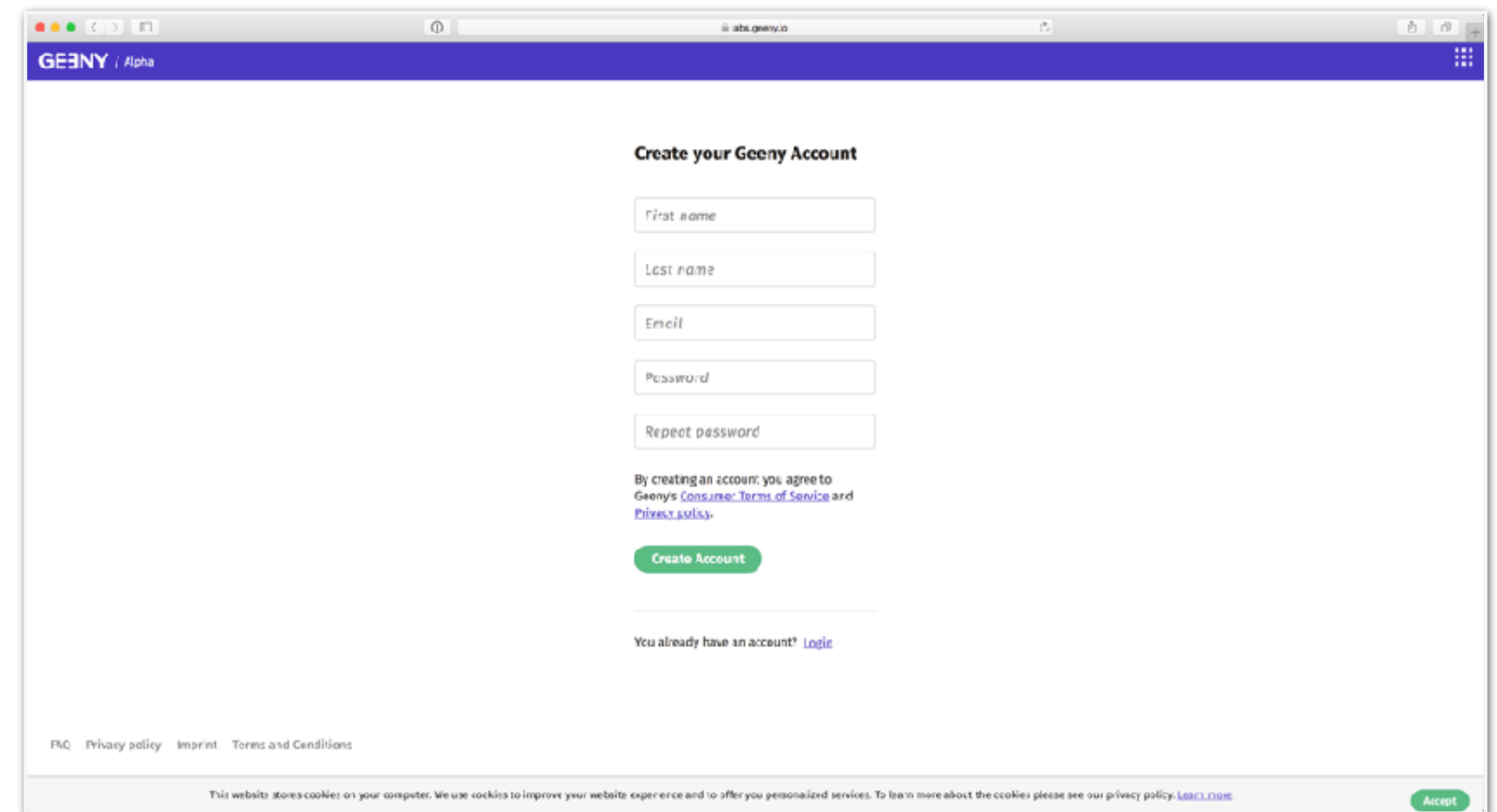
## Create Geeny Account



## Create Geeny Account

### 1. Create a Geeny account

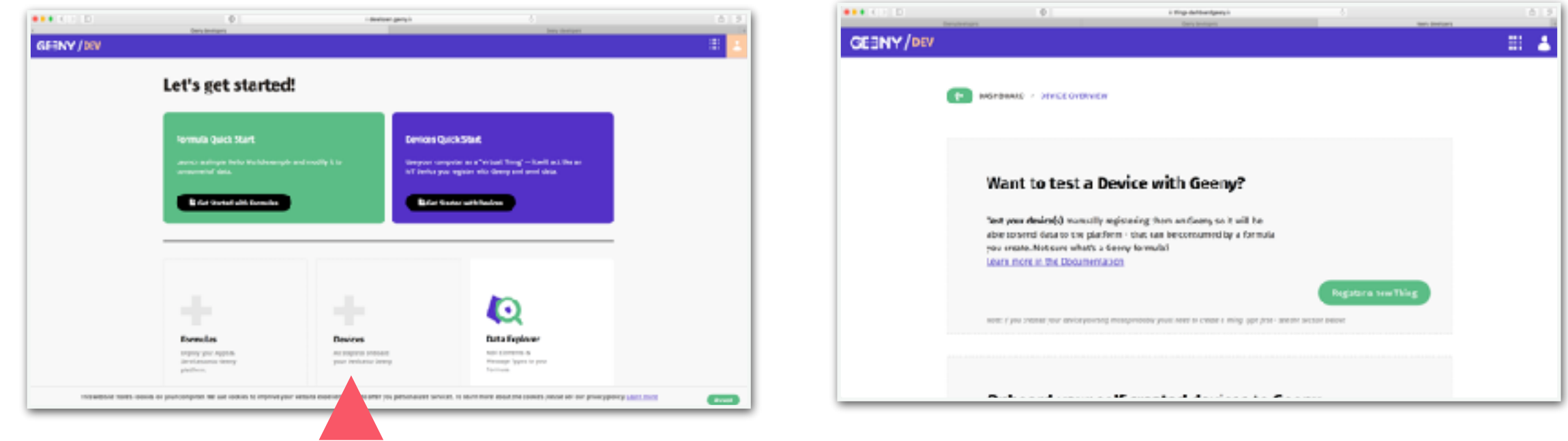
1. Go to Geeny.io and create a new account
2. Click on *Become a developer*



The screenshot shows a web browser window with the URL `alpha.geeny.io`. The page has a blue header with the "GEENY / Alpha" logo. The main content area is titled "Create your Geeny Account" and contains a form with the following fields: "First name", "Last name", "Email", "Password", and "Repeat password". Below the form, there is a line of text: "By creating an account, you agree to Geeny's [Consumer Terms of Service](#) and [Privacy Policy](#)." followed by a green "Create Account" button. At the bottom of the form, there is a link: "You already have an account? [Login](#)". The footer of the page includes links for "FAQ", "Privacy policy", "Imprint", and "Terms and Conditions". A cookie notice is displayed at the very bottom, stating: "This website stores cookies on your computer. We use cookies to improve your website experience and to offer you personalized services. To learn more about the cookies please see our privacy policy: [LINK TO OUR](#)" with an "Accept" button.

## Create Geeny Account

### 2. Create a new *Thing*

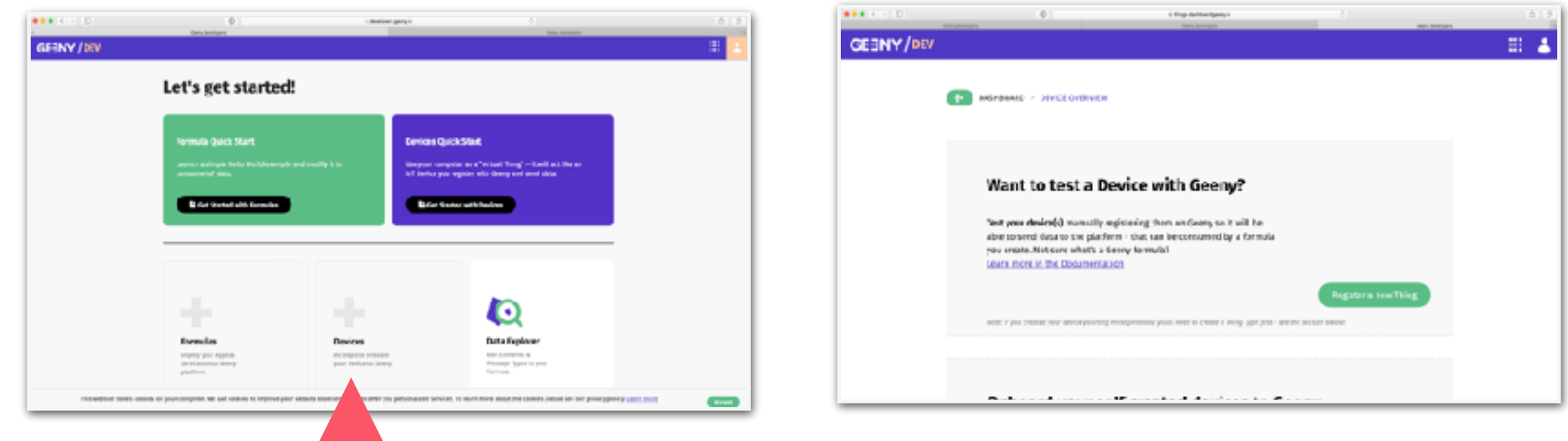


The screenshot shows the 'Create Thing' page in the Geeny web interface. The page has a blue header with the Geeny logo and a user profile icon. Below the header, there is a breadcrumb trail: 'DEVICE OVERVIEW > CREATE THING'. The main heading is 'Register a new instance of NodeMCU+DHT22\_1'. Below this, there is a notification box with a green icon and the text: 'You are about to register on Geeny a specific instance of NodeMCU+DHT22\_1'. The main form is titled 'Please describe your Thing' and has three input fields: 'NAME (i)' with the value 'MyNodeMCU', 'SERIAL NUMBER (i)' with the value '3b403993-9409-445f-9fcb-f9eb', and 'THING TYPE (i)' with a dropdown menu showing 'NodeMCU+DHT22\_1'. A green 'Register this Thing' button is located at the bottom right of the form.

## Create Geeny Account

### 2. Create a new *Thing*

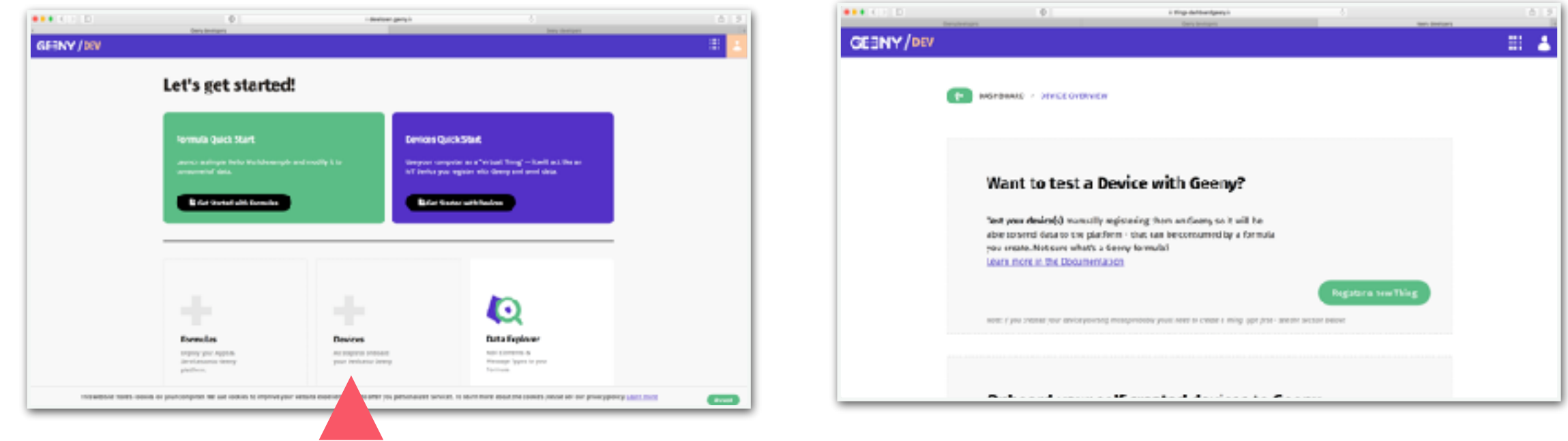
1. Click on *Devices*

The screenshot shows the 'CREATE THING' page in the Geeny dashboard. The breadcrumb navigation shows 'DEVICE OVERVIEW > CREATE THING'. The main heading is 'Register a new instance of NodeMCU+DHT22\_1'. A warning box states: 'You are about to register on Geeny a specific instance of NodeMCU+DHT22\_1'. Below this, the section 'Please describe your Thing' contains three input fields: 'NAME (i)' with the value 'MyNodeMCU', 'SERIAL NUMBER (i)' with the value '3b403993-9409-445f-9fcb-f9eb', and 'THING TYPE (i)' with a dropdown menu showing 'NodeMCU+DHT22\_1'. A green 'Register this Thing' button is located at the bottom right.

## Create Geeny Account

### 2. Create a new *Thing*

1. Click on *Devices*
2. Click on *Register a new Thing*

A screenshot of the 'Register a new instance of NodeMCU+DHT22\_1' page in the Geeny web interface. The page shows a form to describe the Thing, with fields for Name, Serial Number, and Thing Type, and a 'Register this Thing' button.

← DEVICE OVERVIEW > CREATE THING

Register a new instance of **NodeMCU+DHT22\_1**

You are about to register on Geeny a specific instance of NodeMCU+DHT22\_1

Please describe your Thing

NAME (i) SERIAL NUMBER (i) THING TYPE (i)

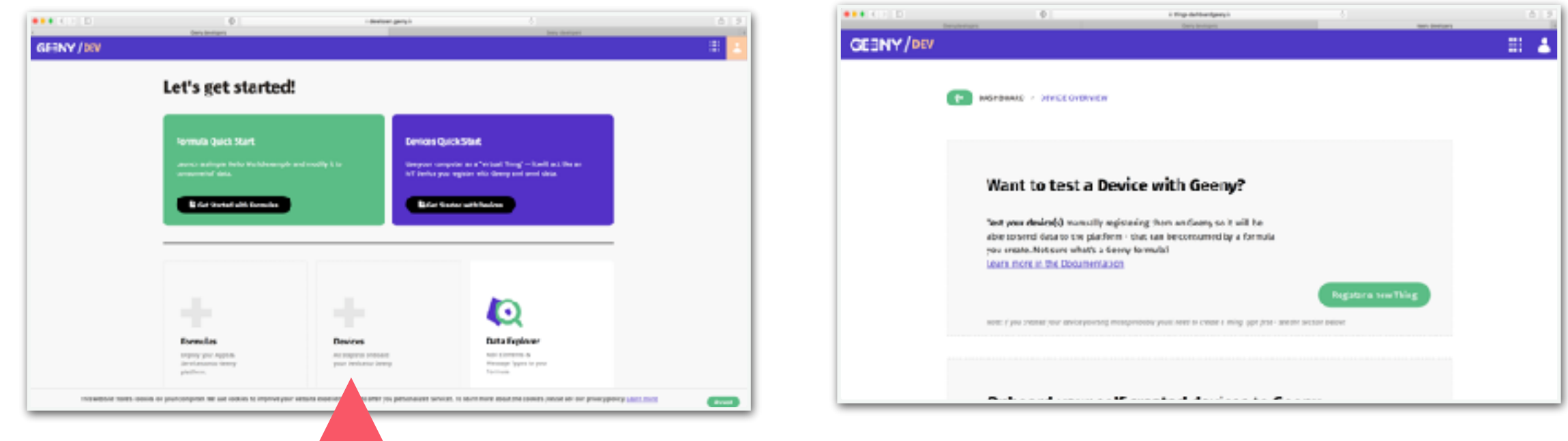
MyNodeMCU 3b403993-9409-445f-9fcb-f9eb NodeMCU+DHT22\_1

Register this Thing

## Create Geeny Account

### 2. Create a new *Thing*

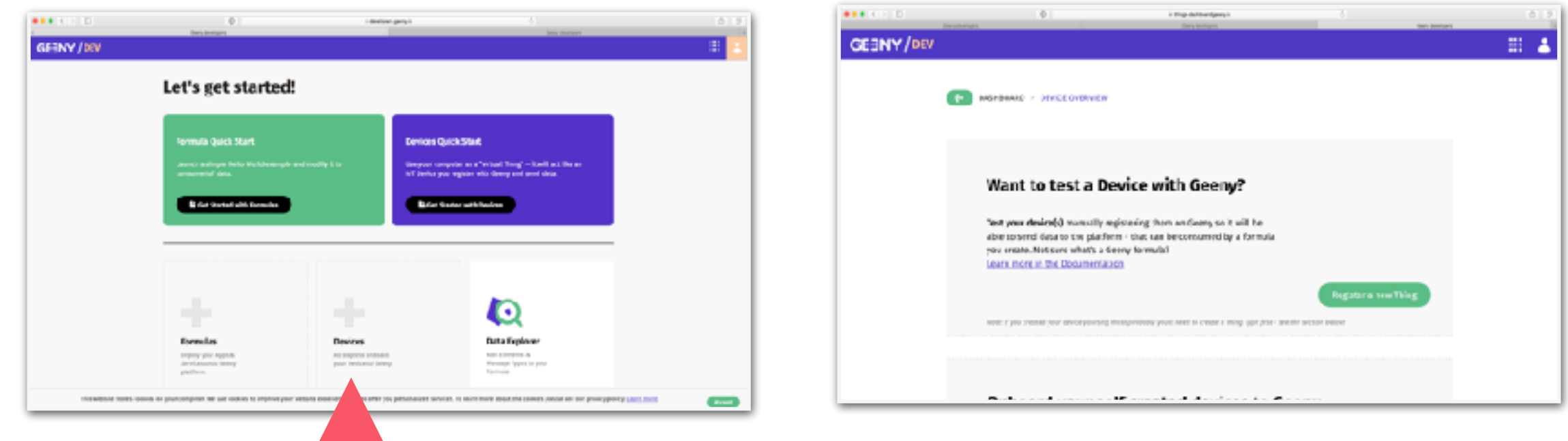
1. Click on *Devices*
2. Click on *Register a new Thing*
3. fill out the form:

The image shows a single screenshot of the 'Register a new instance of NodeMCU+DHT22\_1' form in the Geeny web application. The form is titled 'Register a new instance of NodeMCU+DHT22\_1'. Below the title, there is a warning message: 'You are about to register on Geeny a specific instance of NodeMCU+DHT22\_1'. Below the warning, there is a section titled 'Please describe your Thing'. This section contains three input fields: 'NAME (i)' with the value 'MyNodeMCU', 'SERIAL NUMBER (i)' with the value '3b403993-9409-445f-9fcb-f9eb', and 'THING TYPE (i)' with a dropdown menu showing 'NodeMCU+DHT22\_1'. At the bottom right of the form is a green button labeled 'Register this Thing'.

## Create Geeny Account

### 2. Create a new *Thing*

1. Click on *Devices*
2. Click on *Register a new Thing*
3. fill out the form:
  1. give it a name you like,

The image shows a screenshot of the 'Register a new instance of NodeMCU+DHT22\_1' form in the Geeny web interface. The form includes a breadcrumb trail 'DEVICE OVERVIEW > CREATE THING', a title 'Register a new instance of NodeMCU+DHT22\_1', a warning message 'You are about to register on Geeny a specific instance of NodeMCU+DHT22\_1', and a section 'Please describe your Thing' with input fields for NAME (MyNodeMCU), SERIAL NUMBER (3b403993-9409-445f-9fcb-f9eb), and THING TYPE (NodeMCU+DHT22\_1), followed by a 'Register this Thing' button.



## Create Geeny Account

### 2. Create a new *Thing*

1. Click on *Devices*
2. Click on *Register a new Thing*
3. fill out the form:
  1. give it a name you like,
  2. serial number  
(a new UUID e.g. from [www.uuidgenerator.net](http://www.uuidgenerator.net))

The first screenshot shows the Geeny 'Let's get started!' page with a 'Devices Quick Start' button highlighted by a red triangle. The second screenshot shows the 'Want to test a Device with Geeny?' page with a 'Register new Thing' button. The third screenshot shows the 'CREATE THING' form for a 'NodeMCU+DHT22\_1' device, with fields for NAME, SERIAL NUMBER, and THING TYPE, and a 'Register this Thing' button.

Let's get started!

Formula Quick Start

Devices Quick Start

Want to test a Device with Geeny?

Register new Thing

GEENY / DEV

DEVICE OVERVIEW > CREATE THING

Register a new instance of **NodeMCU+DHT22\_1**

You are about to register on Geeny a specific instance of NodeMCU+DHT22\_1

Please describe your Thing

NAME (i) MyNodeMCU

SERIAL NUMBER (i) 3b403993-9409-445f-9fcb-f9eb

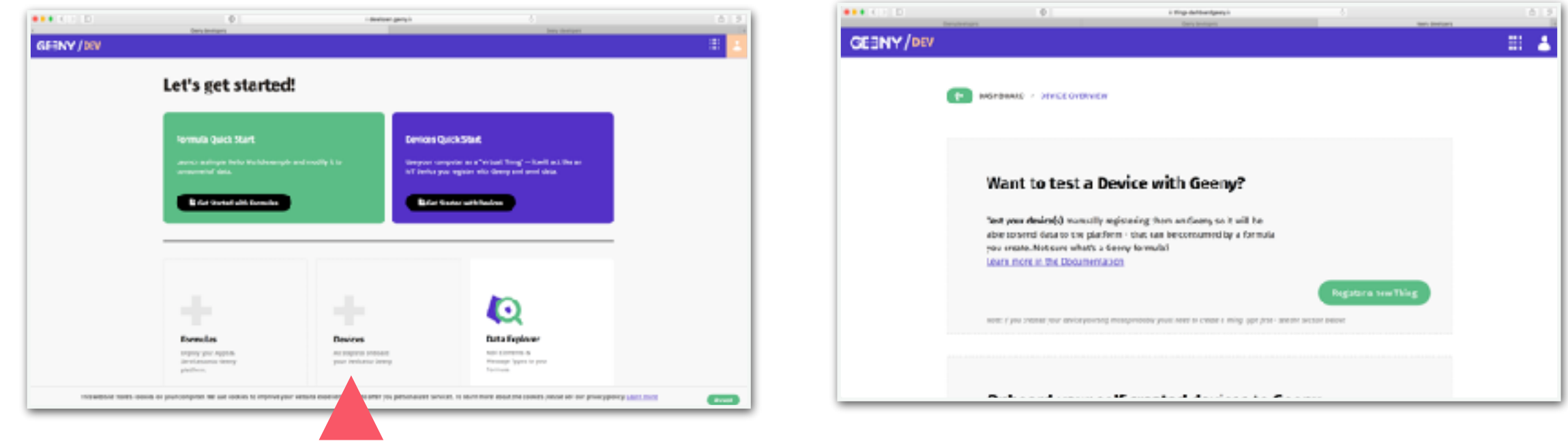
THING TYPE (i) NodeMCU+DHT22\_1

Register this Thing

## Create Geeny Account

### 2. Create a new *Thing*

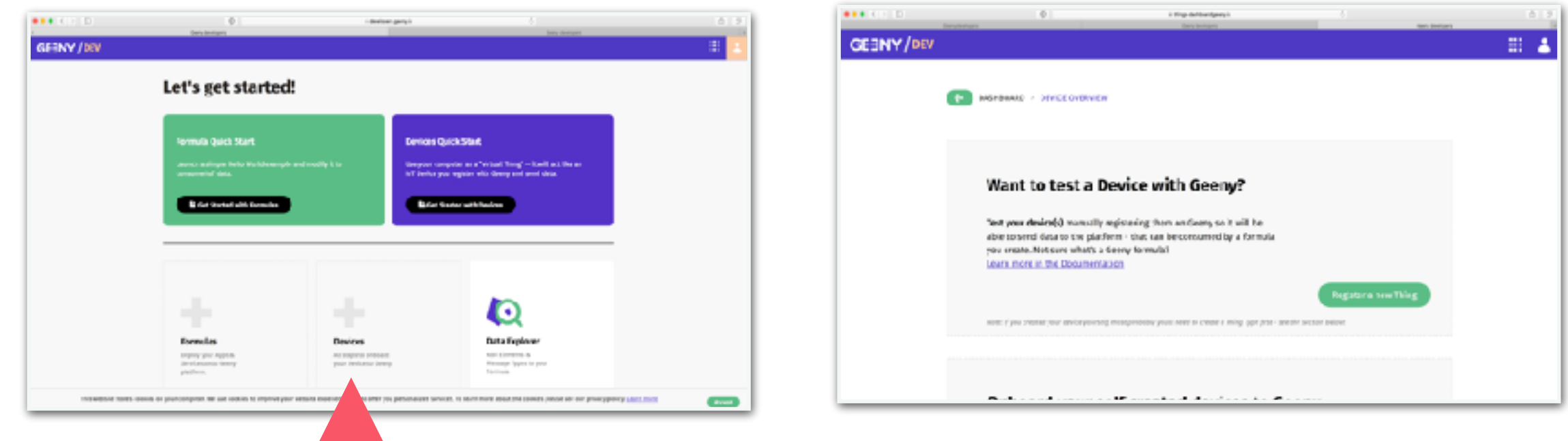
1. Click on *Devices*
2. Click on *Register a new Thing*
3. fill out the form:
  1. give it a name you like,
  2. serial number  
(a new UUID e.g. from [www.uuidgenerator.net](http://www.uuidgenerator.net))
  3. and select the Thing Type *NodeMCU+DHT22\_1*

This screenshot shows the 'Register a new instance of NodeMCU+DHT22\_1' form in the Geeny web interface. The form is titled 'Register a new instance of NodeMCU+DHT22\_1' and includes a message: 'You are about to register on Geeny a specific instance of NodeMCU+DHT22\_1'. Below this, there is a section titled 'Please describe your Thing' with three input fields: 'NAME (i)' containing 'MyNodeMCU', 'SERIAL NUMBER (i)' containing '3b403993-9409-445f-9fcb-f9eb', and 'THING TYPE (i)' set to 'NodeMCU+DHT22\_1'. A green 'Register this Thing' button is located at the bottom right of the form.

## Create Geeny Account

### 2. Create a new *Thing*

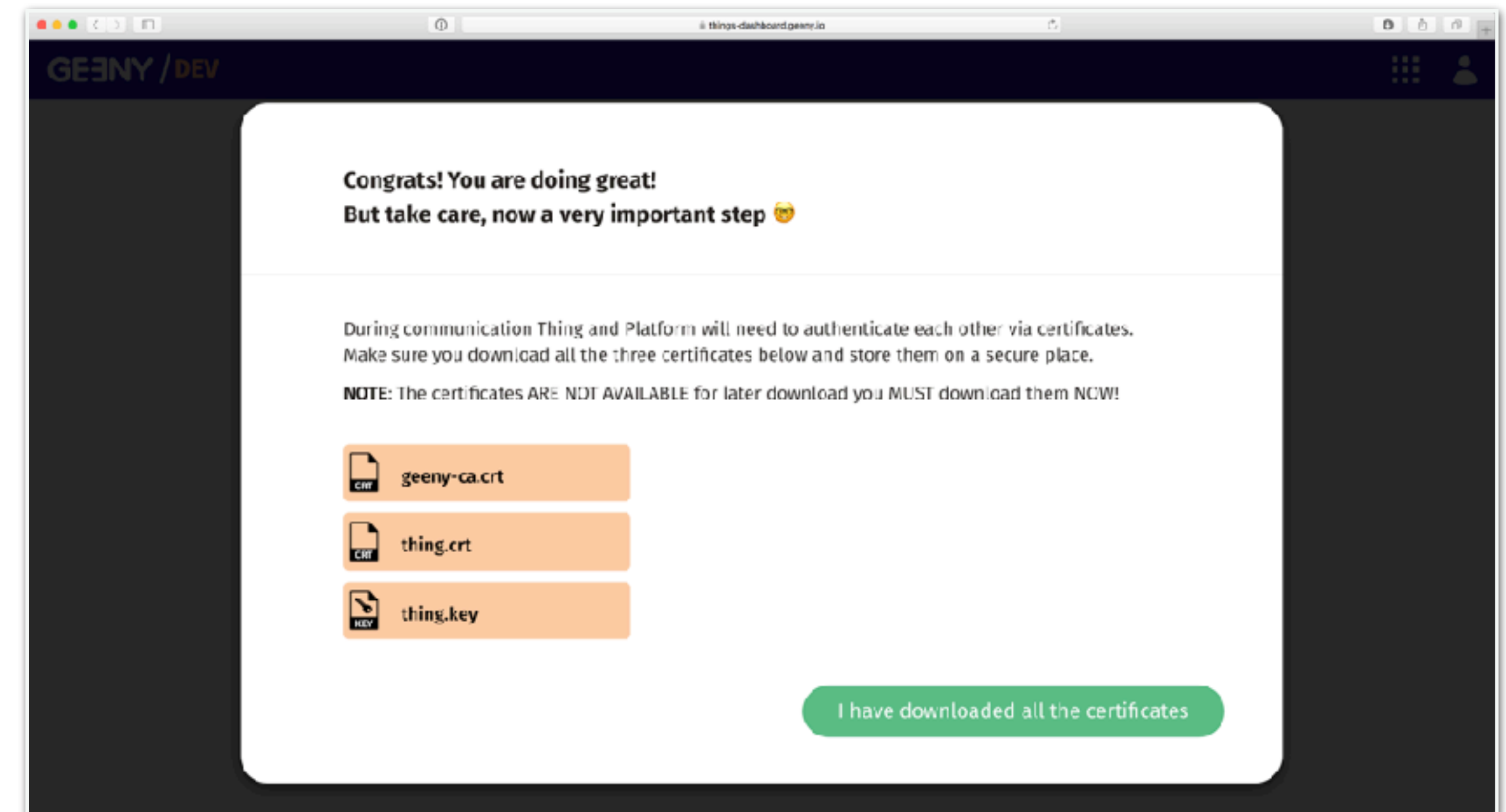
1. Click on *Devices*
2. Click on *Register a new Thing*
3. fill out the form:
  1. give it a name you like,
  2. serial number  
(a new UUID e.g. from [www.uuidgenerator.net](http://www.uuidgenerator.net))
  3. and select the Thing Type *NodeMCU+DHT22\_1*
4. Click on *Register this Thing*

This screenshot shows the 'Register a new instance of NodeMCU+DHT22\_1' form. At the top, there's a breadcrumb 'DEVICE OVERVIEW > CREATE THING'. Below it, a message box says 'You are about to register on Geeny a specific instance of NodeMCU+DHT22\_1'. The form is titled 'Please describe your Thing' and contains three input fields: 'NAME (i)' with the value 'MyNodeMCU', 'SERIAL NUMBER (i)' with the value '3b403993-9409-445f-9fcb-f9eb', and 'THING TYPE (i)' with a dropdown menu showing 'NodeMCU+DHT22\_1'. A green 'Register this Thing' button is at the bottom right.

## Create Geeny Account

### 3. Download the certificates\*

1. Now a screen opens asking to download the certificate files. Save the files on your computer by clicking each file.



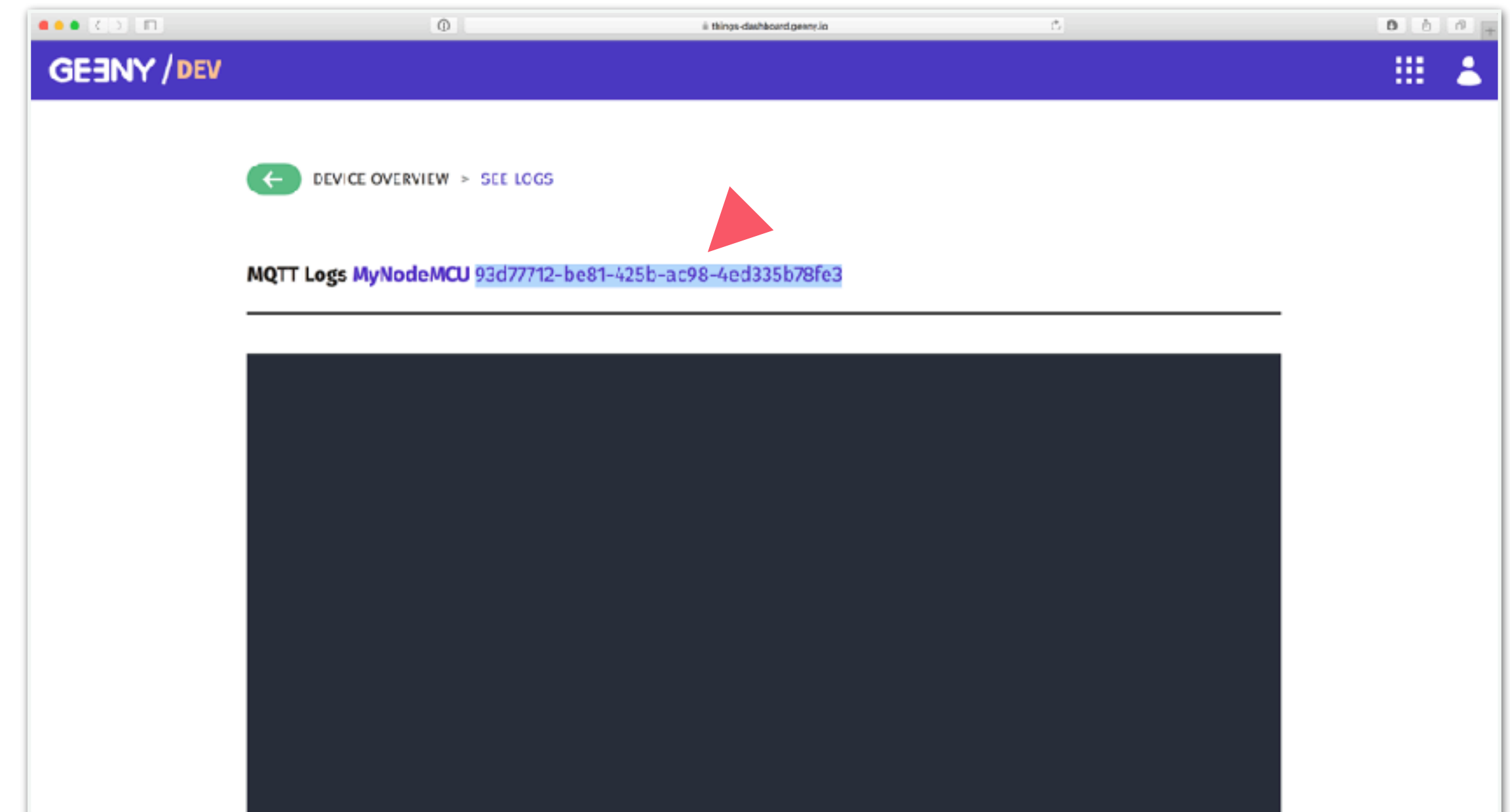
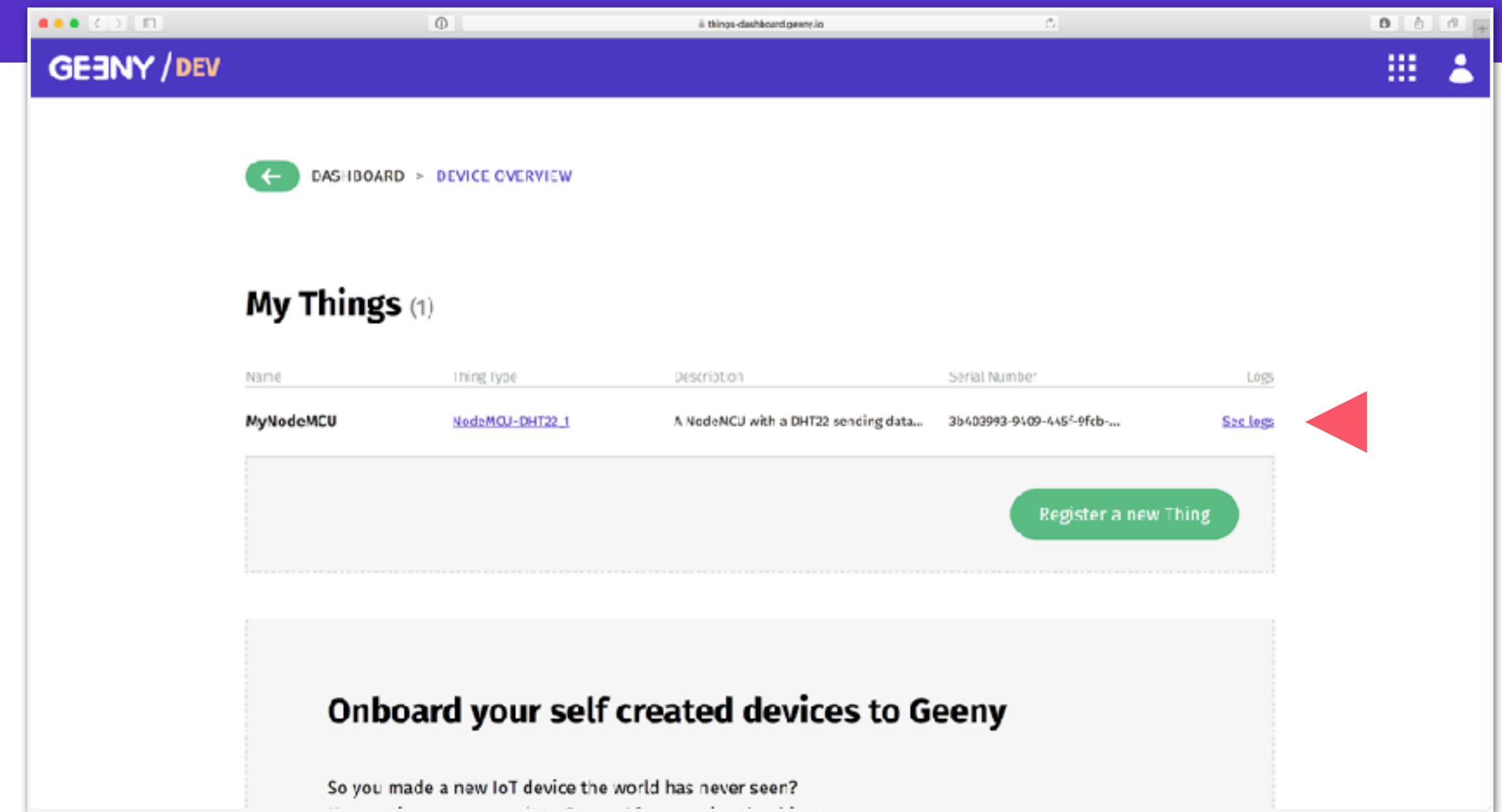
*\*Certificates are used to authenticate the participants in a secure communication process. In this example it authenticates the NodeMCU and Geeny.*

## Create Geeny Account

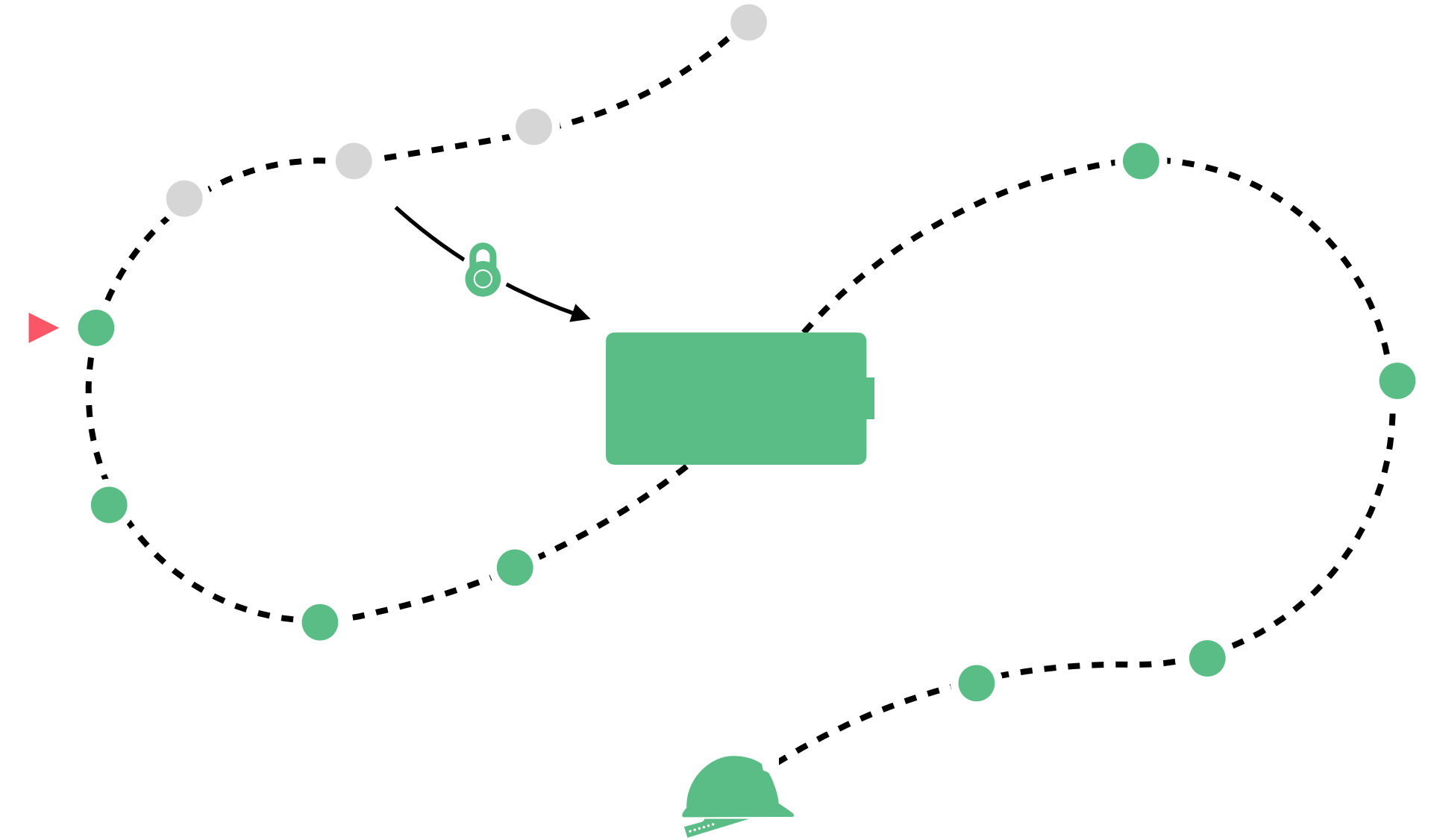
### 4. Get your *Thing-ID*

1. On the *Device overview* page you see your newly created Thing. Click on *See logs*
2. Copy the *Thing-ID* shown on top of the page and save it somewhere

BTW: this is where we will see the data later on



## Upload Certificates





## Upload Certificates

### 1. Generate DER files

#### OSX

1. Open a Terminal window and navigate to the folder where you stores the certificate files
2. Enter the two following commands

```
openssl rsa -outform der -in thing.key -out thing-key.der
openssl x509 -outform der -in thing.crt -out thing-crt.der
```
3. Now you should see two new files in your folder with the file extension .der
4. Copy this files into the *data* folder of your Sketch (*4\_DHT22Geeny*)

#### Windows

1. Download and install OpenSSL from [slproweb.com/products/Win32OpenSSL.html](http://slproweb.com/products/Win32OpenSSL.html) (File: *Win32 OpenSSL v1.1.0g Light*)
2. Copy the Certificates to *C:\Geeny*
3. Open a Command Window (Windows+R and enter CMD)
4. Go to *C:\OpenSSL-Win32\bin* and run *openssl.exe*
5. Enter the two following commands

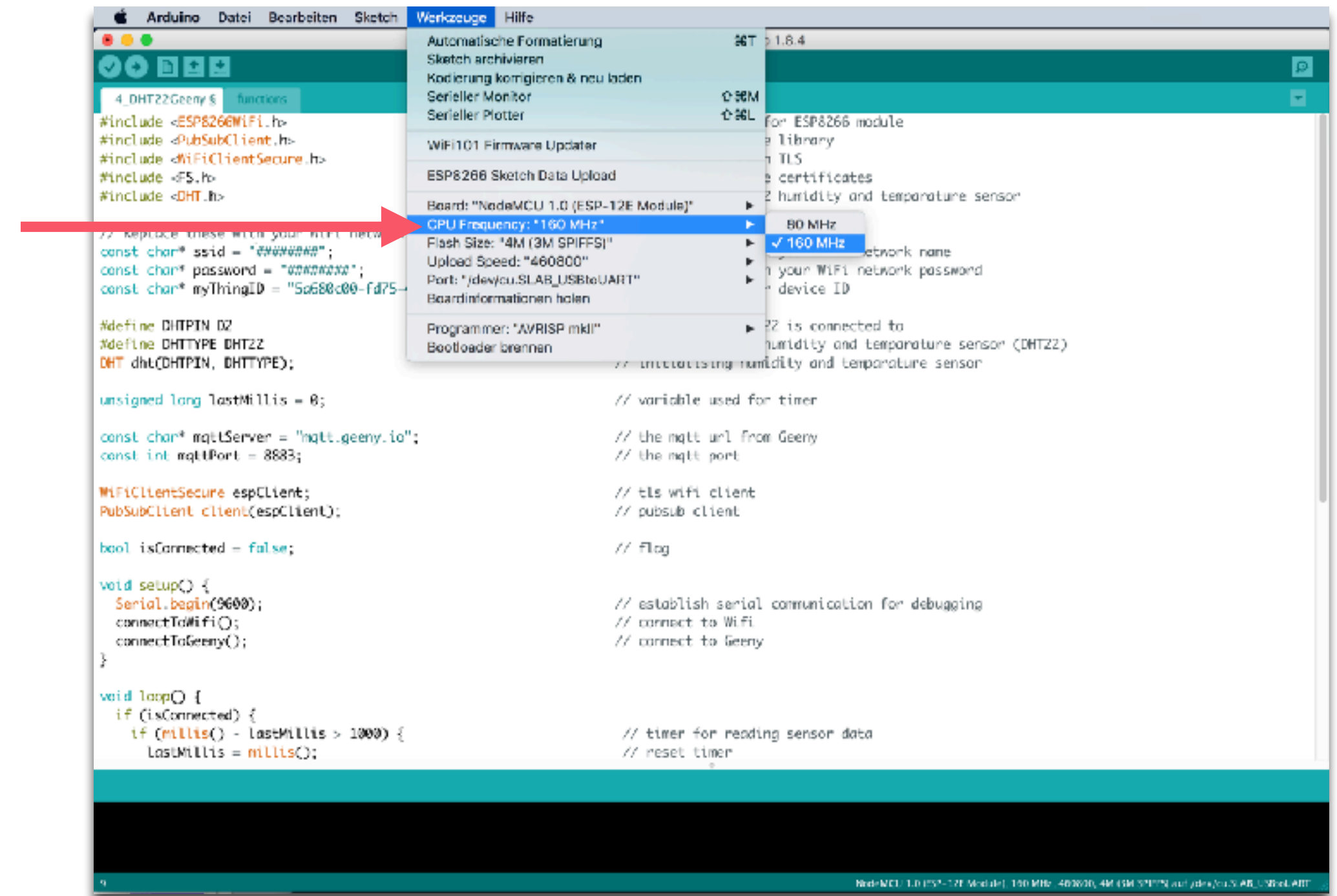
```
openssl rsa -outform der -in c:\Geeny\thing.key
-out c:\Geeny\thing-key.der

openssl x509 -outform der -in c:\Geeny\thing.crt
-out c:\Geeny\thing-crt.der
```
6. Now you should see two new files with the file extension .der in this folder
7. Copy this files into the *data* folder of your Sketch (*4\_DHT22Geeny*)

## Upload Certificates

### 2. Upload DER files to NodeMCU

1. In order to upload the certificates to the NodeMCE, you need a plugin for the Arduino IDE. Download the plugin from: <https://github.com/esp8266/arduino-esp8266fs-plugin/releases/download/0.2.0/ESP8266FS-0.2.0.zip>
2. In your Arduino sketchbook directory, create tools directory if it doesn't exist yet
3. Unpack the tool into tools directory  
(../Arduino/tools/ESP8266FS/tool/esp8266fs.jar)
4. Restart Arduino IDE
5. Set the CPU frequency to 160 MHz

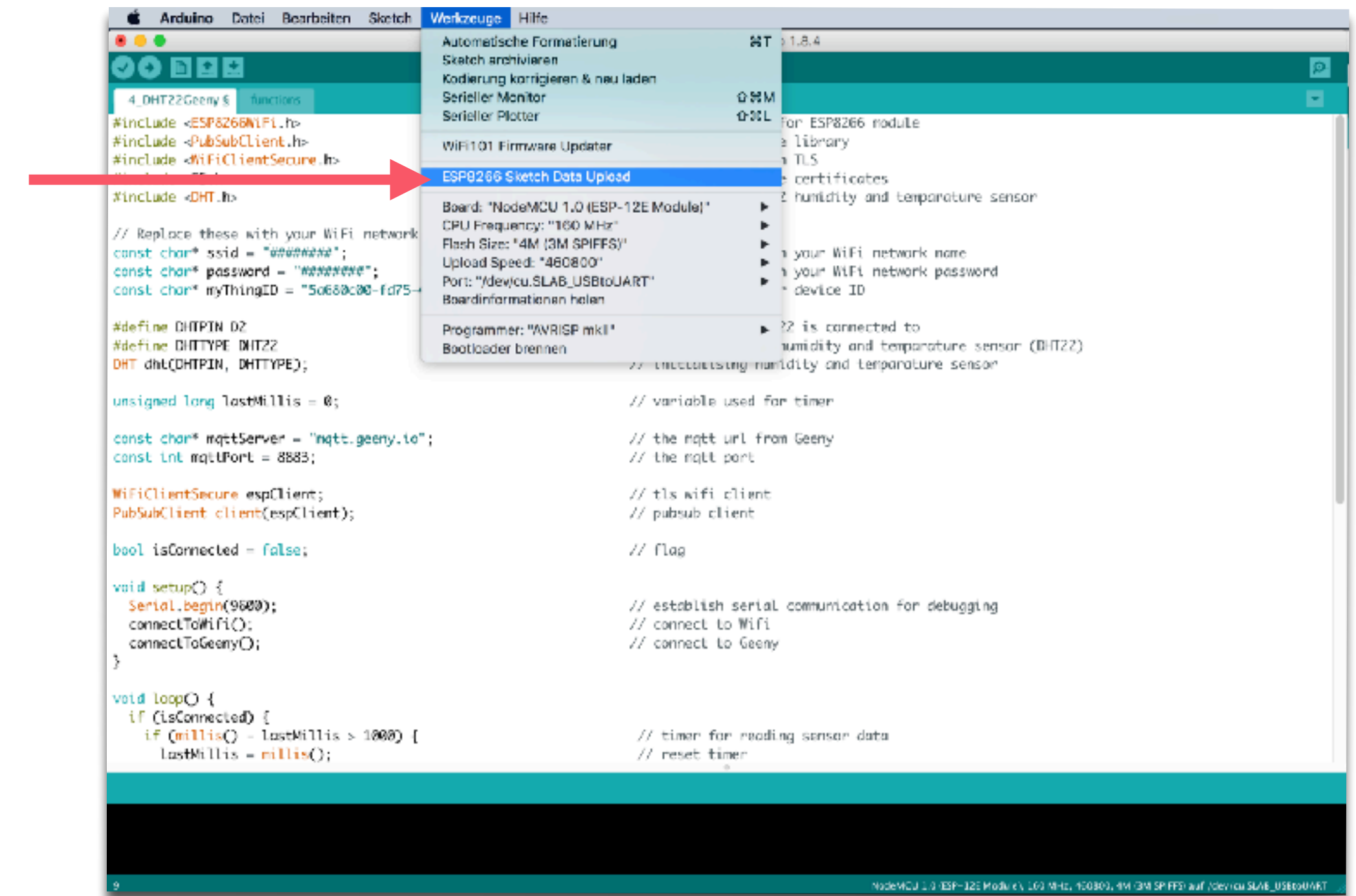




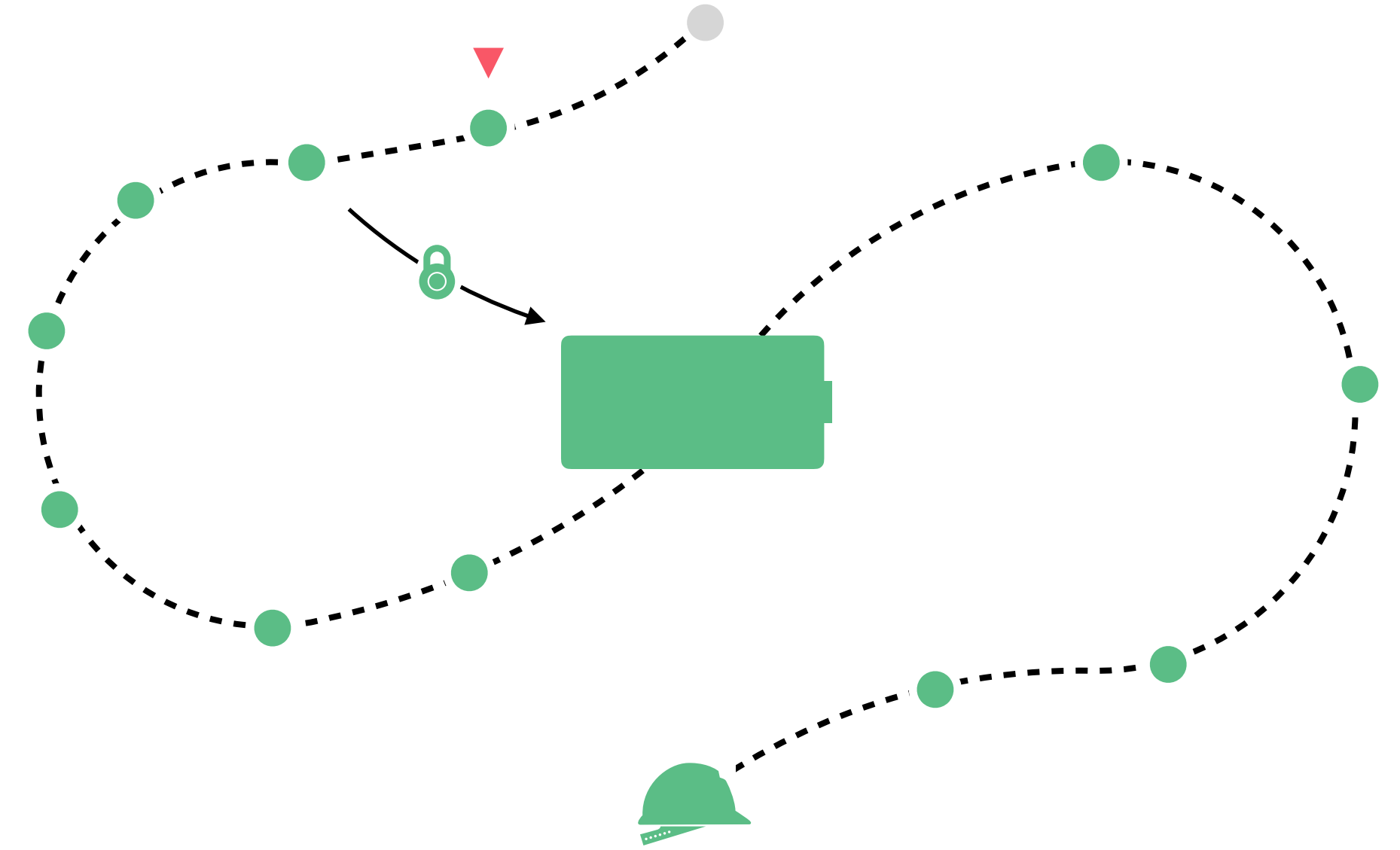
## Upload Certificates

### 2. Upload DER files to NodeMCU

1. Click on *Tools>ESP8266 Sketch Data Upload*



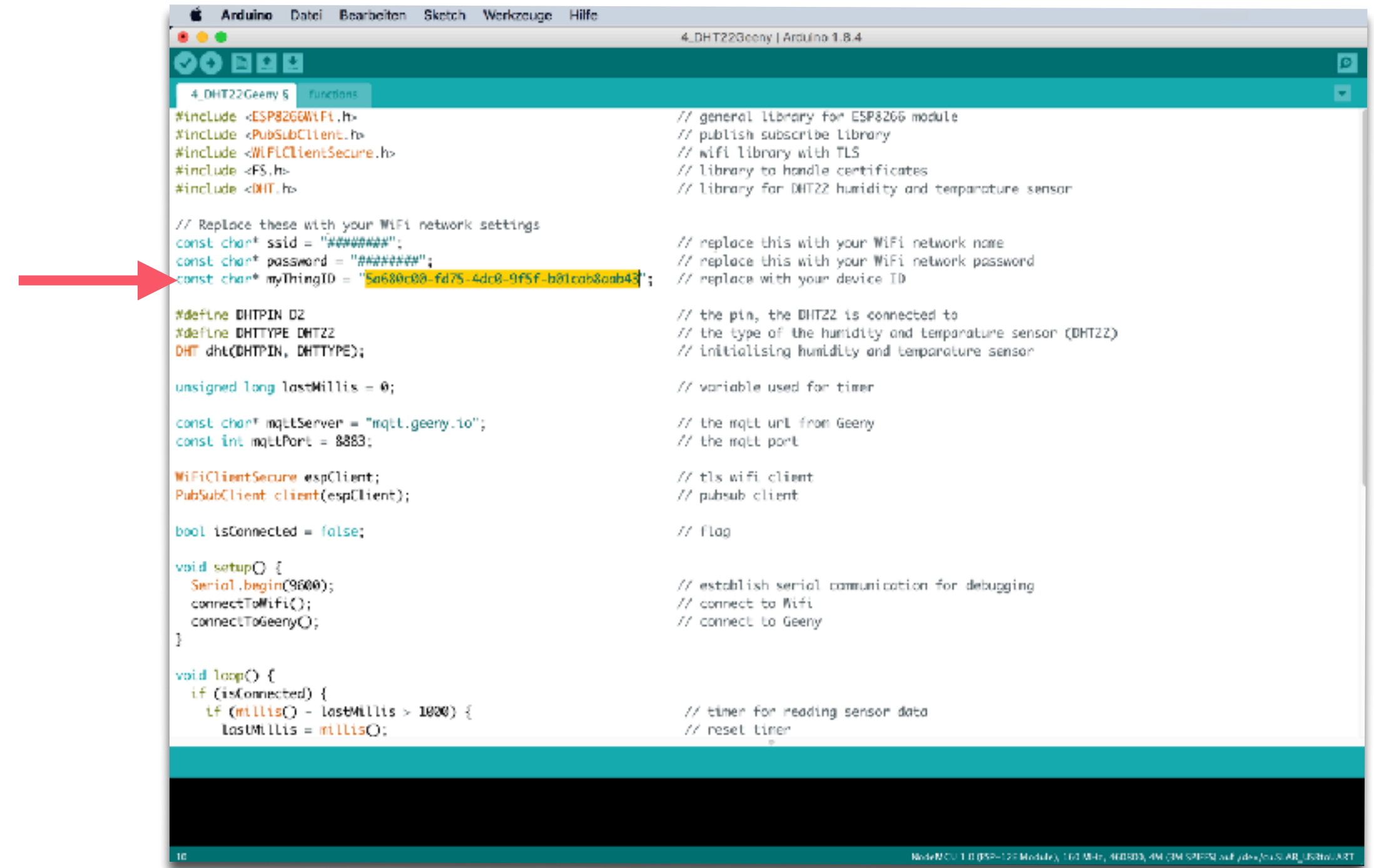
## The Final Sketch



## Final Sketch

### 2. Upload DER files to NodeMCU

1. Click on *Tools>ESP8266 Sketch Data Upload*



```
Arduino IDE - 4_DHT22Geeny [Arduino 1.8.4]
4_DHT22Geeny.g
Functions
#include <ESP8266WiFi.h> // general library for ESP8266 module
#include <PubSubClient.h> // publish subscribe library
#include <WiFiClientSecure.h> // wifi library with TLS
#include <FS.h> // library to handle certificates
#include <DHT.h> // library for DHT22 humidity and temperature sensor

// Replace these with your Wifi network settings
const char* ssid = "#####"; // replace this with your Wifi network name
const char* password = "#####"; // replace this with your Wifi network password
const char* myThingID = "8a580c0a-fd75-4dc0-9f5f-b01cab8cab43"; // replace with your device ID

#define DHTPIN D2 // the pin, the DHT22 is connected to
#define DHTTYPE DHT22 // the type of the humidity and temperature sensor (DHT22)
DHT dht(DHTPIN, DHTTYPE); // Initialising humidity and temperature sensor

unsigned long lastMillis = 0; // variable used for timer

const char* mqttServer = "mqtt.geeny.io"; // the mqtt url from Geeny
const int mqttPort = 8883; // the mqtt port

WiFiClientSecure espClient; // tls wifi client
PubSubClient client(espClient); // pubsub client

bool isConnected = false; // flag

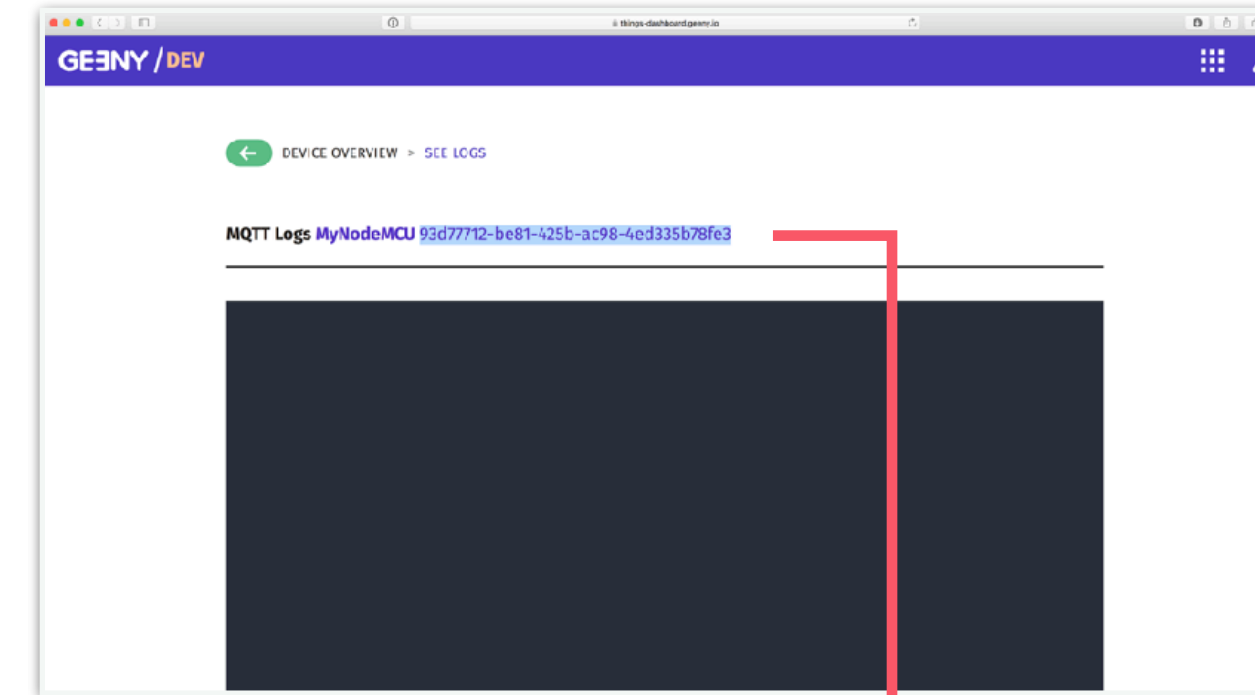
void setup() {
  Serial.begin(9600); // establish serial communication for debugging
  connectToWifi(); // connect to Wifi
  connectToGeeny(); // connect to Geeny
}

void loop() {
  if (isConnected) {
    if (millis() - lastMillis > 1000) { // timer for reading sensor data
      lastMillis = millis(); // reset timer
    }
  }
}
```

## Final Sketch

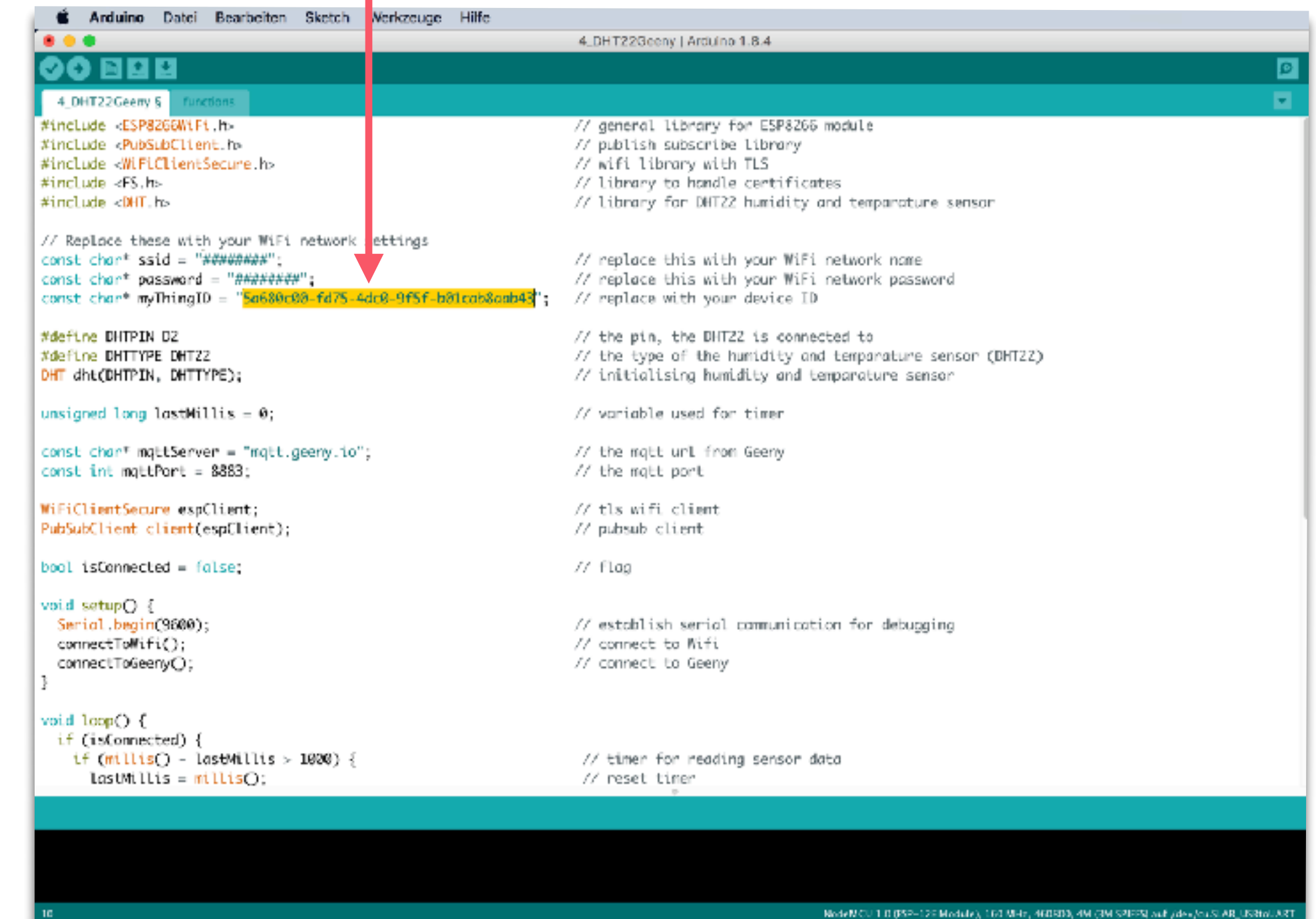
### 1. Upload sketch to NodeMCU

1. Open the Sketch *4\_DHT22Geeny*
2. Change your Wifi settings
3. Change myThingID to the one you copied from the *Device logs* page
4. Upload the sketch to your NodeMCU
5. You should now see data on the Device log page!



Device logs page

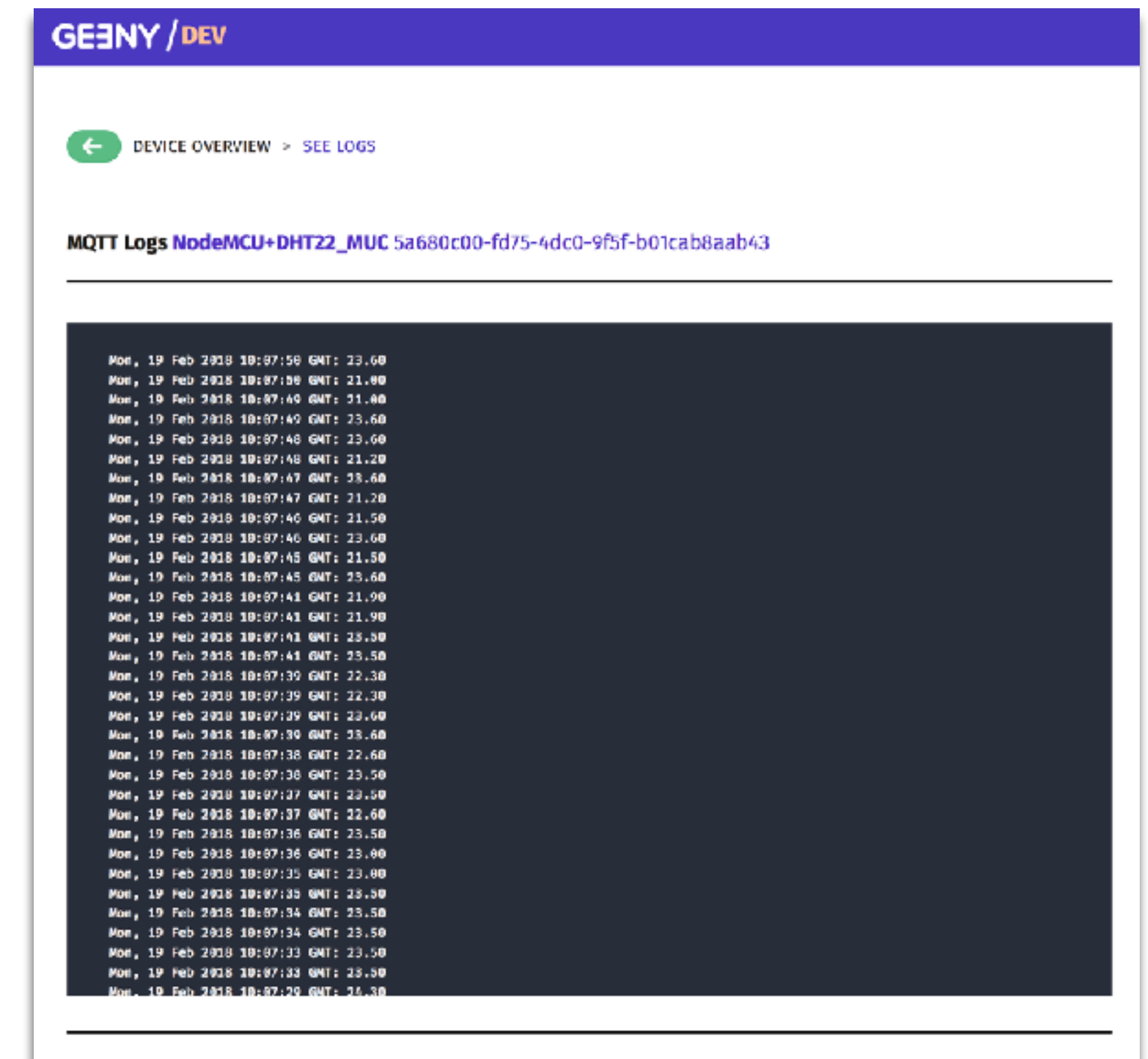
Things ID



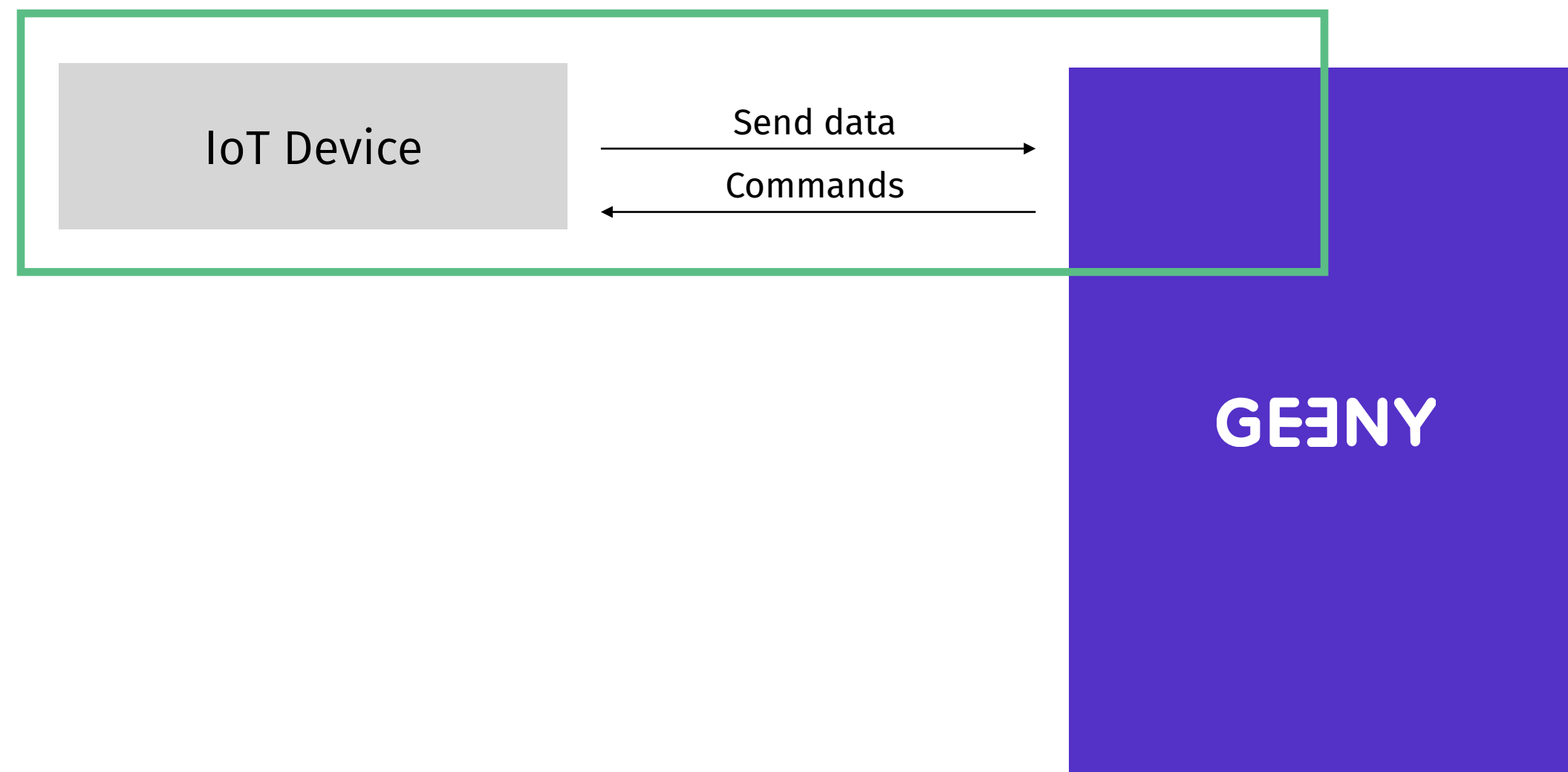
## Final Sketch

### 1. Upload sketch to NodeMCU

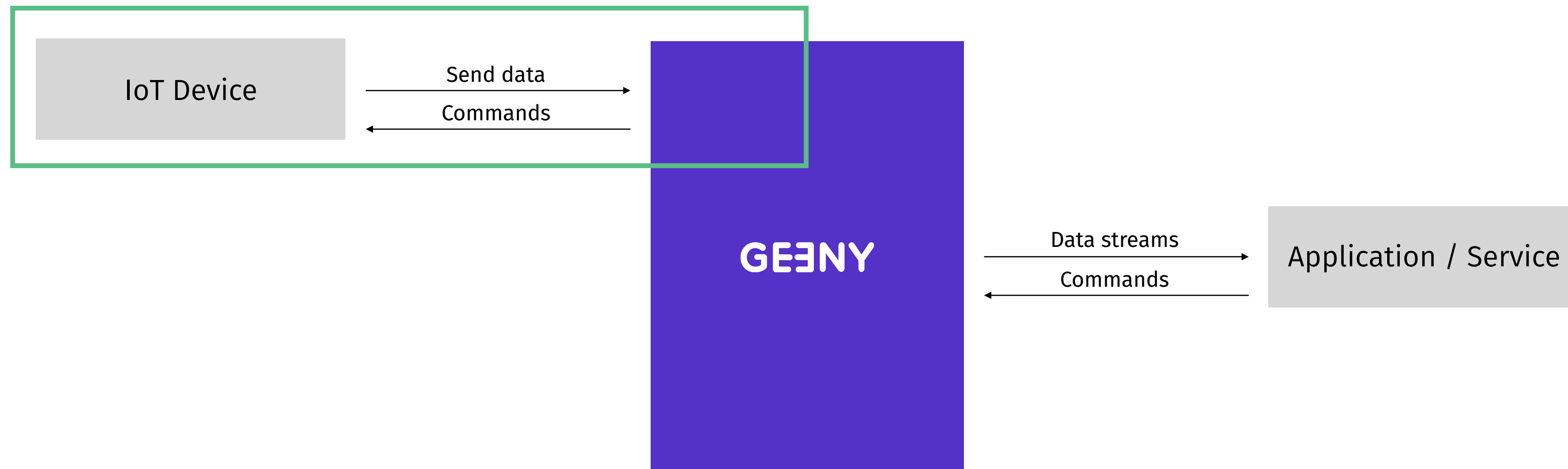
1. Open the Sketch [4\\_DHT22Geeny](#)
2. Change your Wifi settings
3. Change myThingID to the one you copied from the *Device logs* page
4. Upload the sketch to your NodeMCU
5. You should now see data on the Device log page!



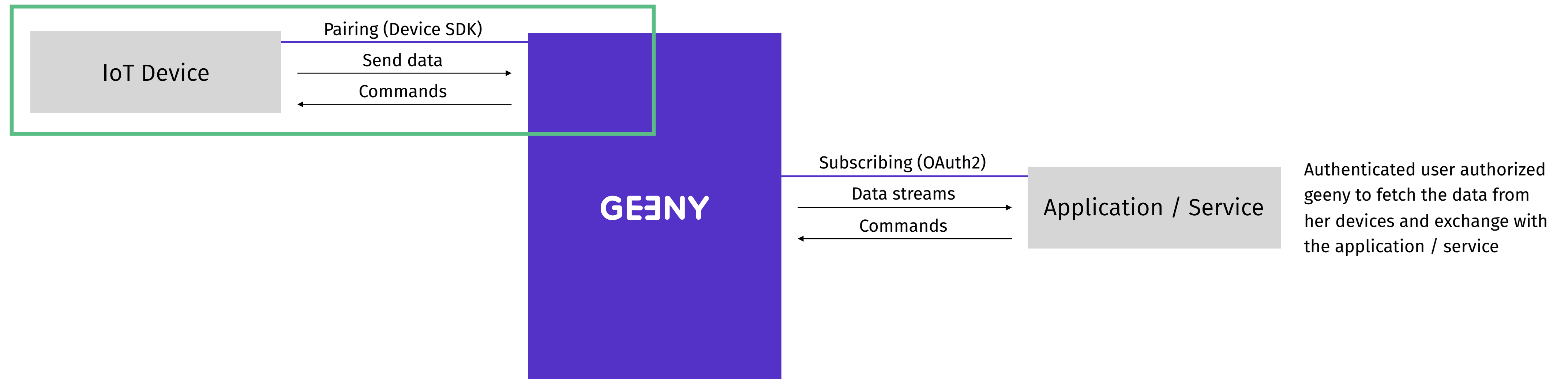
# Outlook



# Outlook

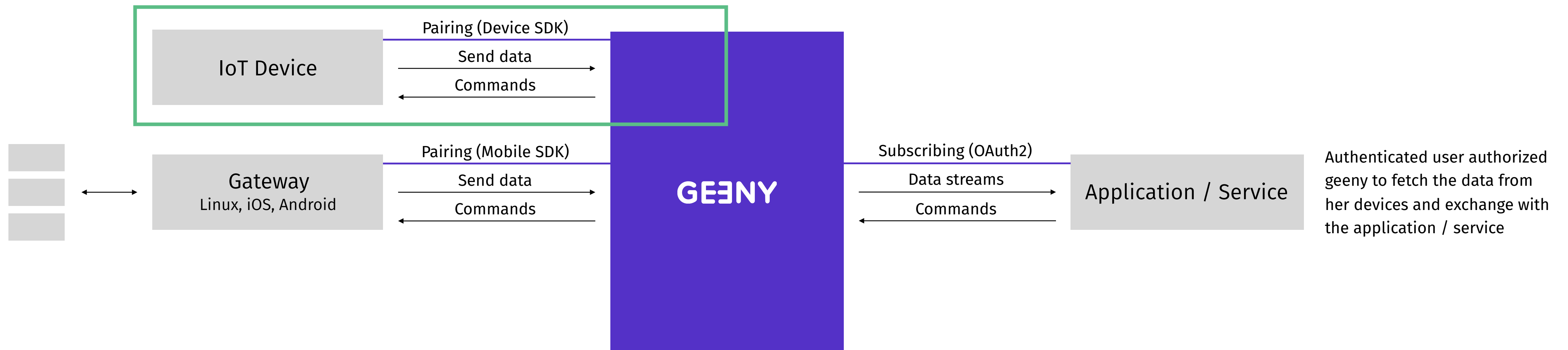


# Outlook

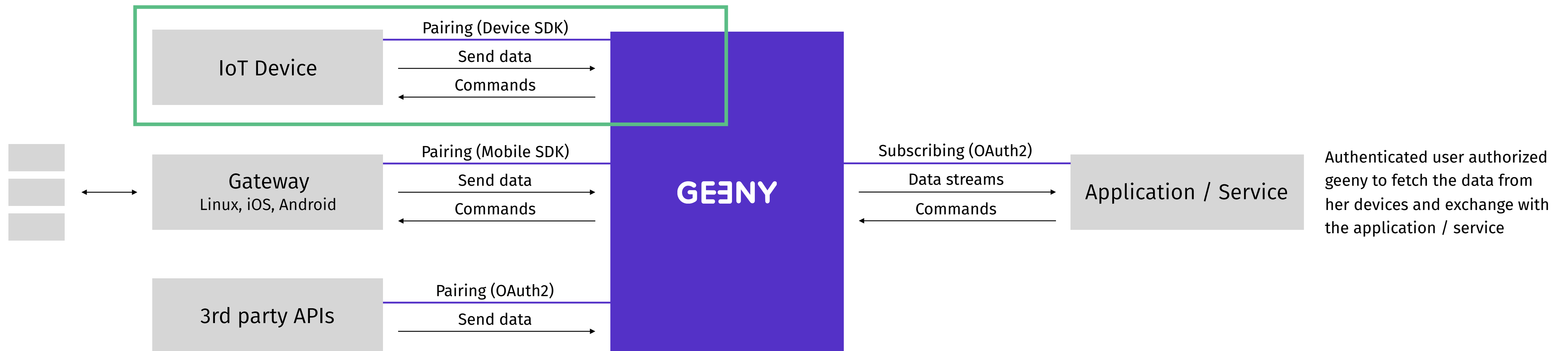




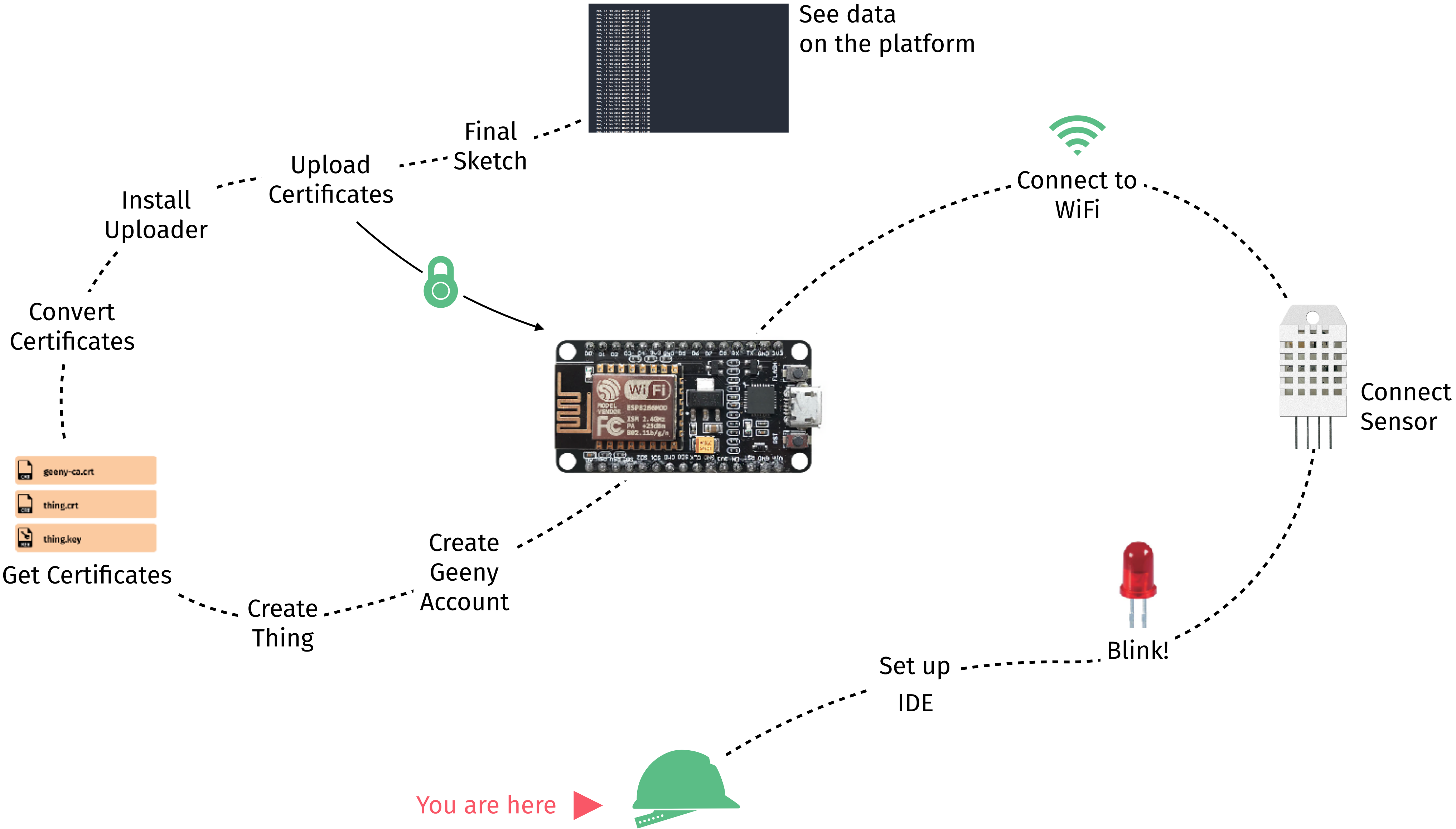
# Outlook



# Outlook



# The Journey



# That's all folks!

## # Let's stay in touch!

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