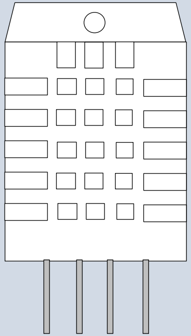
https://www.halvorsen.blog



Arduino and DHT22

DHT22 Temperature and Humidity Sensor

Hans-Petter Halvorsen

Contents

- Introduction to Arduino
- DHT11/DHT22
  - Temperature and Humidity Sensor
- Arduino Examples
  - Read Data from DHT22 Sensor
  - Write Data to ThingSpeak

Arduino

Table of Contents

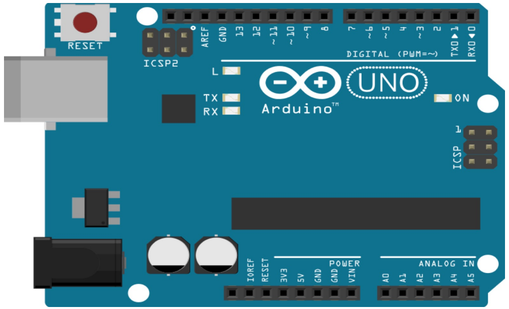
Arduino

- Arduino is an open-source electronics platform based on easy-to-use hardware and software.
- It's intended for anyone making interactive projects, from kids to grown-ups.
- You can connect different Sensors, like Temperature, etc.
- It is used a lots in Internet of Things (IoT) projects
- Homepage: https://www.arduino.cc

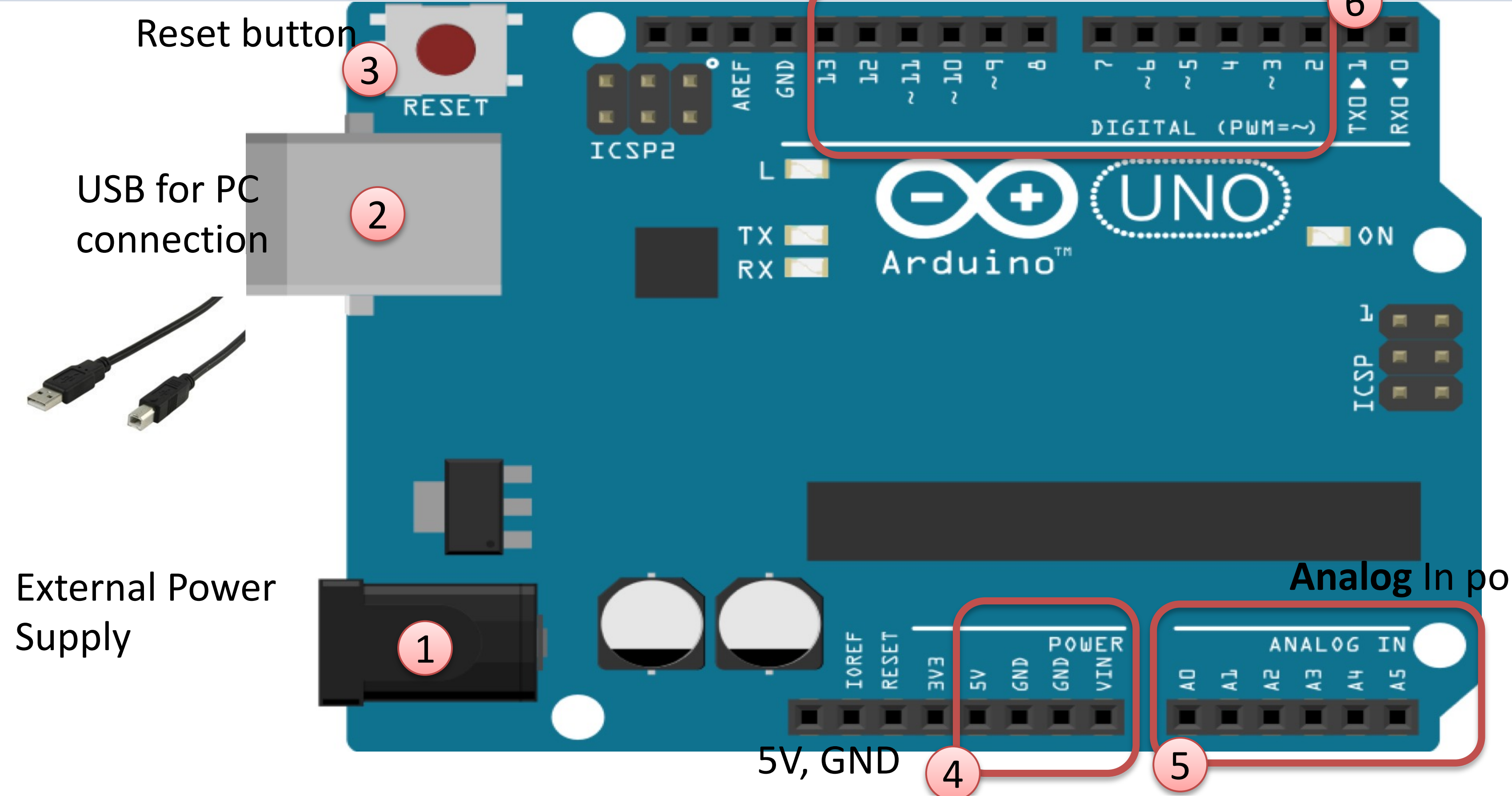
Arduino

- Arduino is a Microcontroller
- Arduino is an open-source platform with Input/Output Pins (Digital In/Out, Analog In and PWM)
- Price about $20
- Arduino Starter Kit ~$40-80

with Cables, Wires, Resistors, Sensors, etc.



Arduino UNO



Digital ports (2-13)

Reset button

USB for PC connection

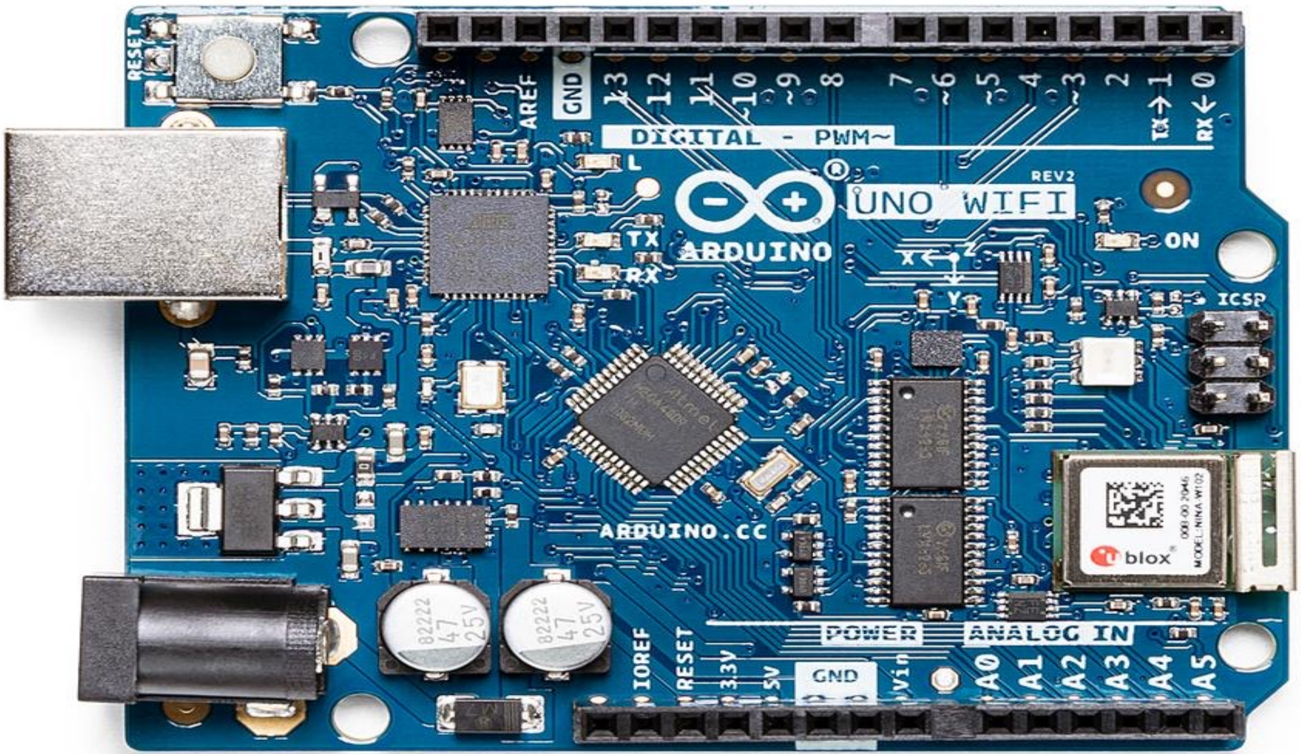
External Power Supply

Analog In ports (0-5)

5V, GND

Arduino UNO WiFi Rev 2

The Arduino Uno WiFi is functionally the same as the Arduino Uno Rev3, but with the addition of WiFi / Bluetooth and some other enhancements.



Arduino Software

Upload Code to Arduino Board

Compile and Check if Code is OK

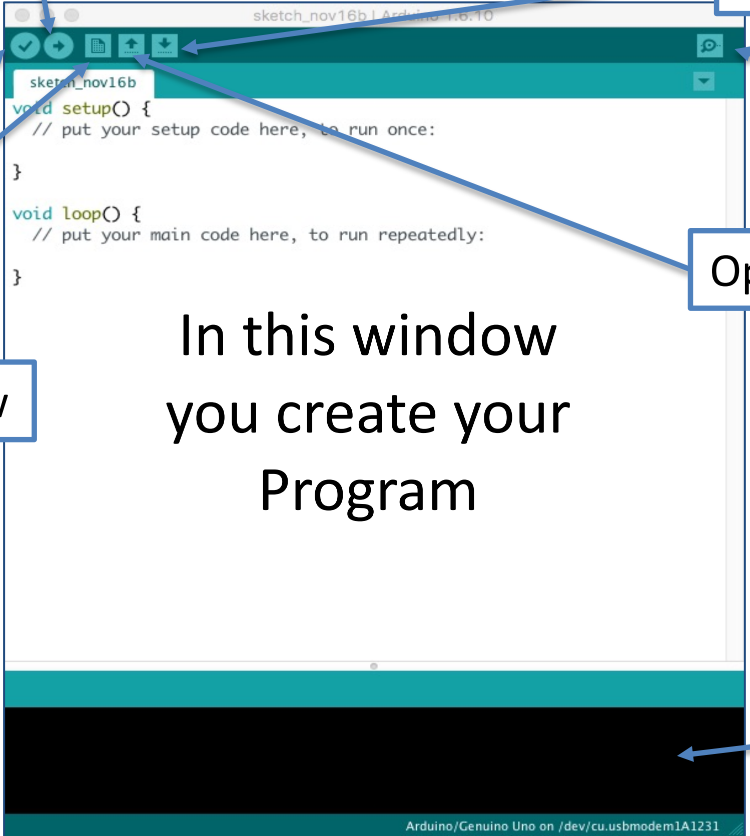
Creates a New Code Window

Save

Open Serial Monitor

Open existing Code

Error Messages can be seen here



sketch_nov16b | Arduino 1.6.10
sketch_nov16b

```
void setup() {
  // put your setup code here, to run once:

}

void loop() {
  // put your main code here, to run repeatedly:

}
```

Arduino/Genuino Uno on /dev/cu.usbmodem1A1231

In this window you create your Program

The software can be downloaded for free:

www.arduino.cc

DHT11/22

Temperature and Humidity Sensor

Hans-Petter Halvorsen

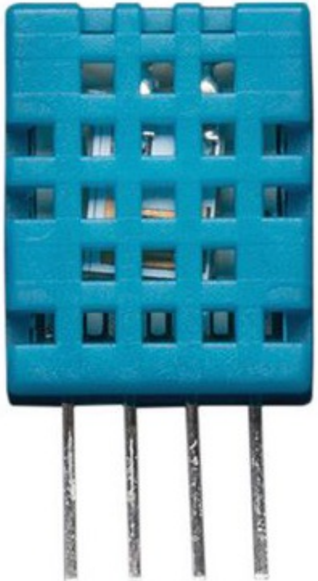
Table of Contents

DHT11/DHT22

DHT11/DHT22 are Breadboard friendly and easy to wire. They use a single-wire to send data.

DHT11

- Good for 20-80% humidity readings with 5% accuracy
- Good for 0-50°C temperature readings ±2°C accuracy
- 1 Hz sampling rate (once every second)
- Price: a few bucks



DHT22

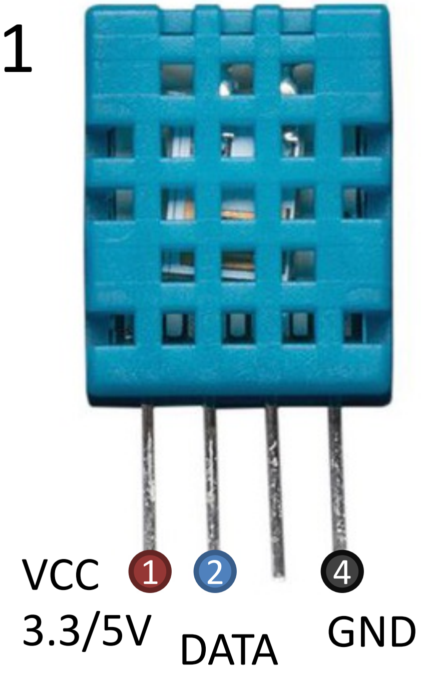
DHT22 is more precise, more accurate and works in a bigger range of temperature and humidity, but its larger and more expensive

- 0-100% RH
- -40-125°C

Typically you need a 10K resistor, which you will want to use as a pullup from the data pin to Vcc. This is included in the package.

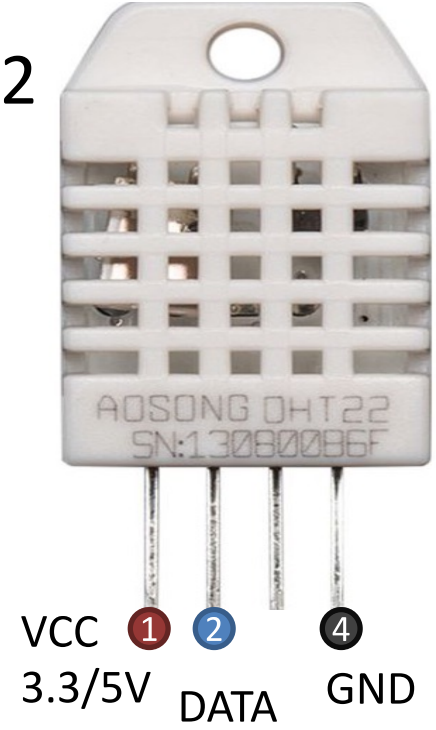
DHT11/DHT22

DHT11



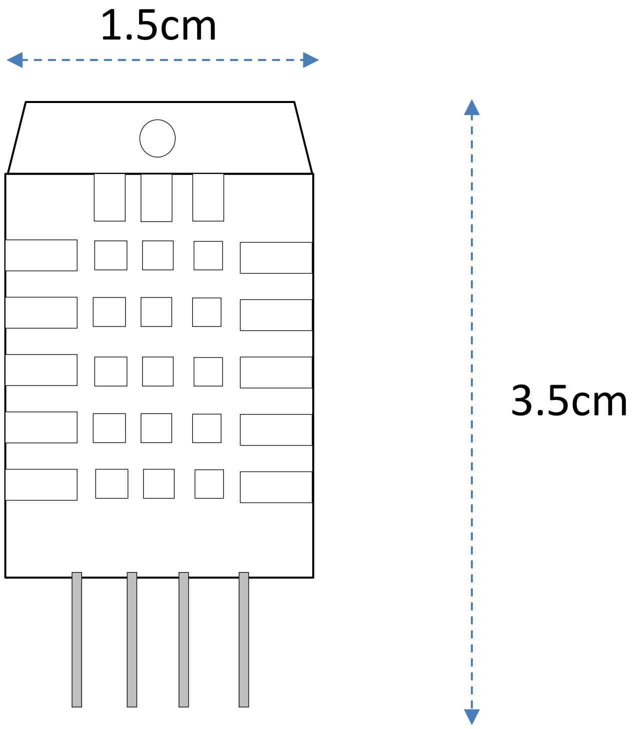
Pin 3 is not in use

DHT22



Pin 3 is not in use

DHT22



DHTxx Resources

- https://learn.adafruit.com/dht
- https://www.sparkfun.com/datasheets/Sensors/Temperature/DHT22.pdf

Arduino Examples

Hans-Petter Halvorsen

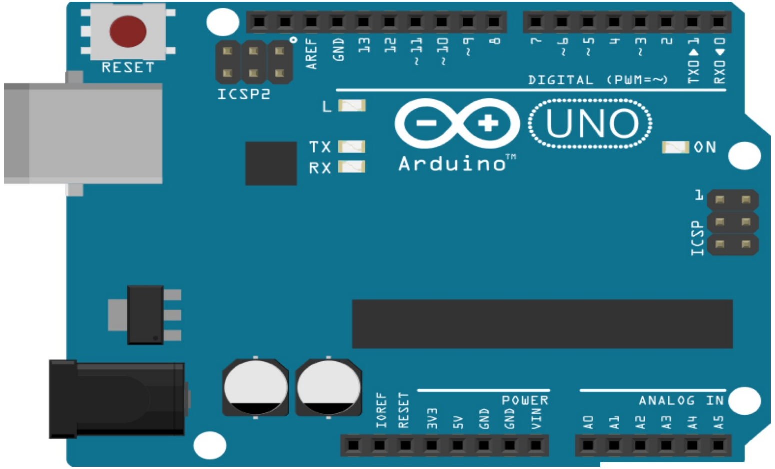
Table of Contents

Read Humidity and Temperature Data

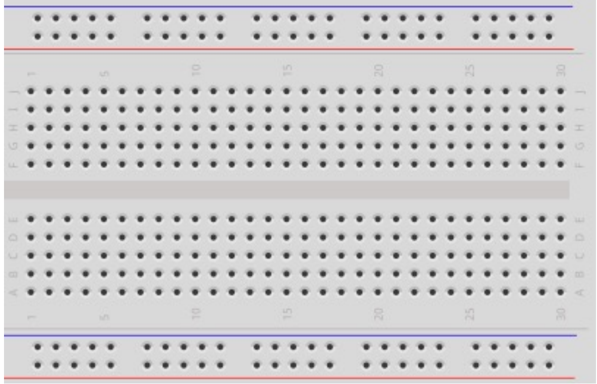
Hans-Petter Halvorsen

Table of Contents

Equipment

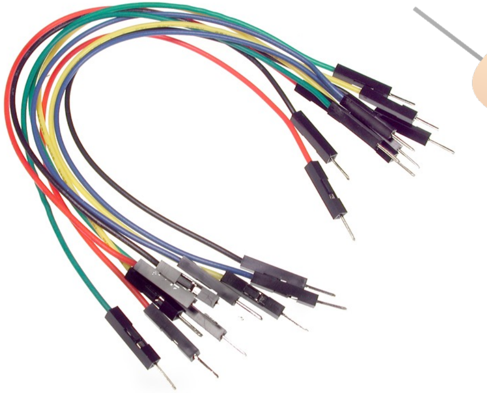


Arduino

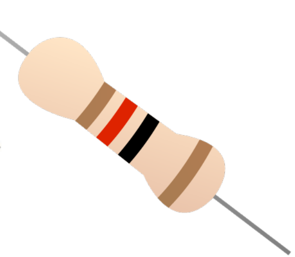


Breadboard

DHT11/22

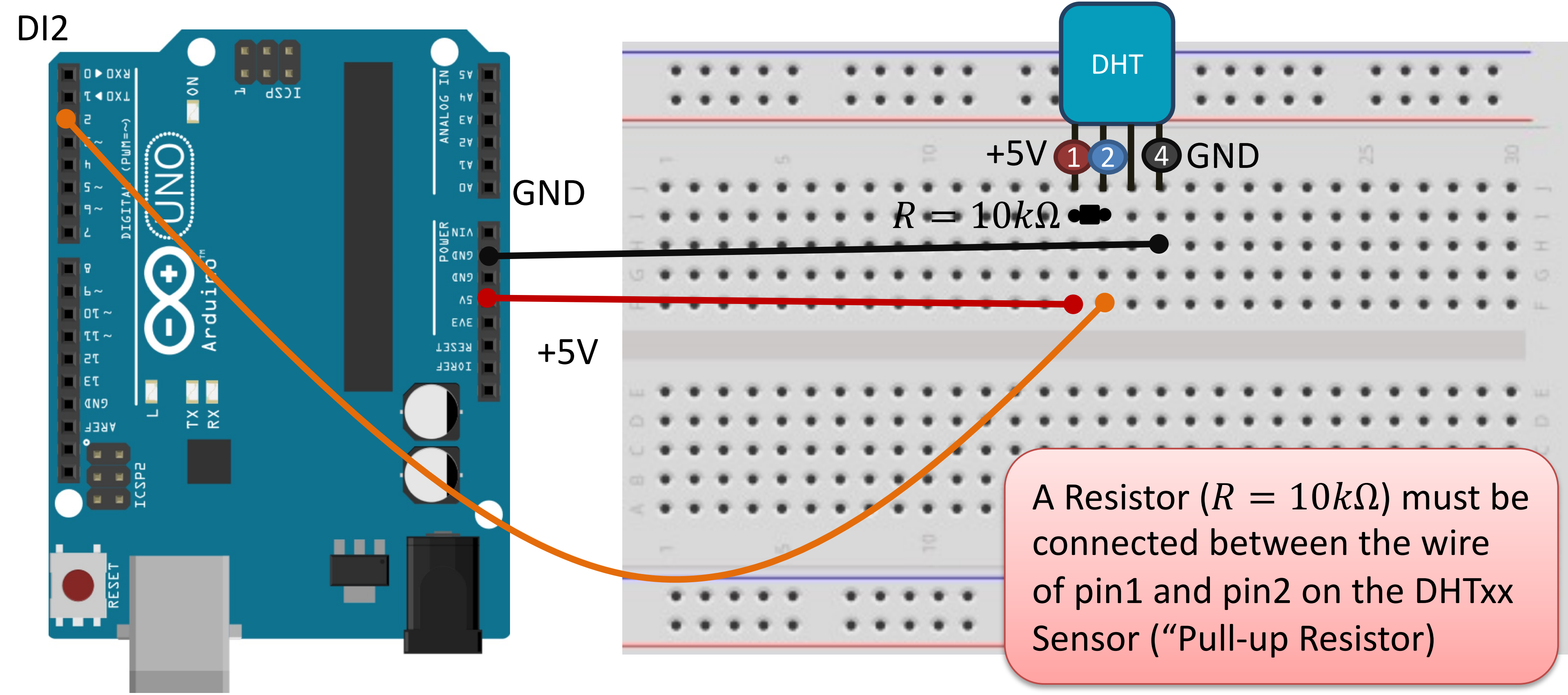


Wires



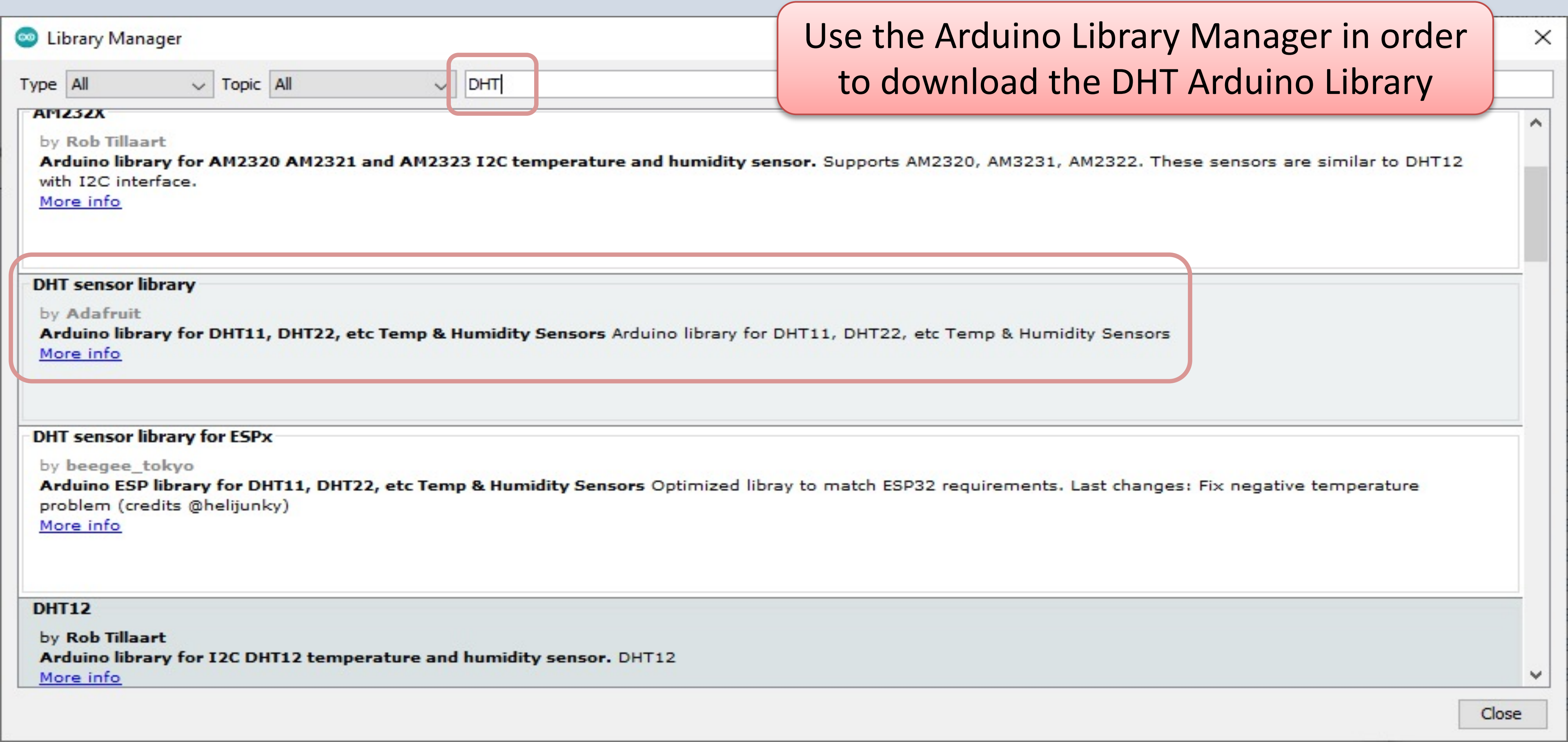
Resistor $R = 10\text{k}\Omega$

DHT11/DHT22 Wiring



A Resistor ($R = 10k\Omega$) must be connected between the wire of pin1 and pin2 on the DHTxx Sensor (“Pull-up Resistor)

DHT Library



Use the Arduino Library Manager in order to download the DHT Arduino Library

AM232X

by Rob Tillaart

Arduino library for AM2320 AM2321 and AM2323 I2C temperature and humidity sensor. Supports AM2320, AM3231, AM2322. These sensors are similar to DHT12 with I2C interface.

More info

DHT sensor library

by Adafruit

Arduino library for DHT11, DHT22, etc Temp & Humidity Sensors Arduino library for DHT11, DHT22, etc Temp & Humidity Sensors

More info

DHT sensor library for ESPx

by beegee_tokyo

Arduino ESP library for DHT11, DHT22, etc Temp & Humidity Sensors Optimized libray to match ESP32 requirements. Last changes: Fix negative temperature problem (credits @helijunky)

More info

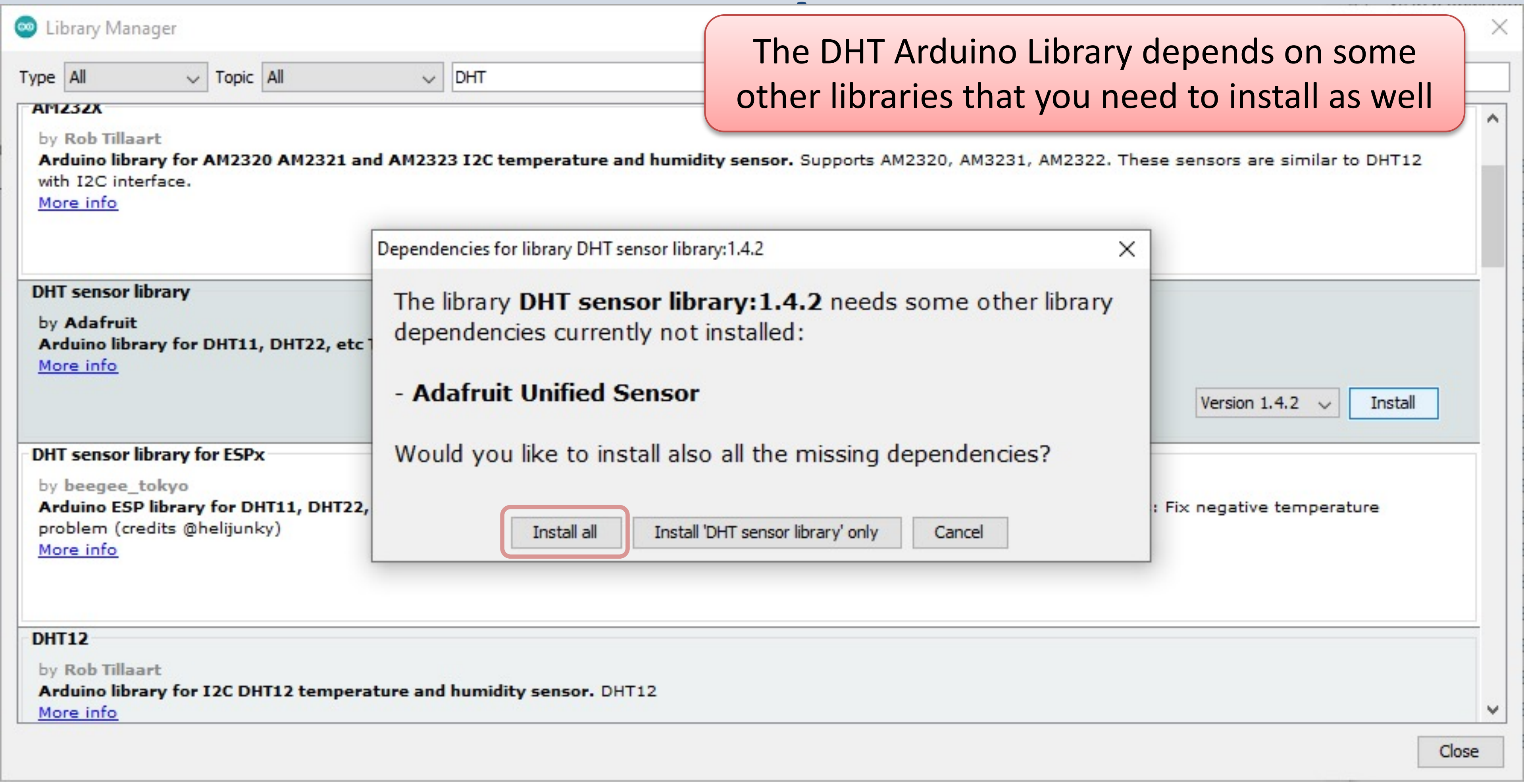
DHT12

by Rob Tillaart

Arduino library for I2C DHT12 temperature and humidity sensor. DHT12

More info

The DHT Arduino Library depends on some other libraries that you need to install as well



Type All Topic All DHT

AM232X

by Rob Tillaart

Arduino library for AM2320 AM2321 and AM2323 I2C temperature and humidity sensor. Supports AM2320, AM3231, AM2322. These sensors are similar to DHT12 with I2C interface.

DHT sensor library

by **Adafruit**

Arduino library for DHT11, DHT22, etc

Version 1.4.2

DHT sensor library for ESPx

by beegee_tokyo

Arduino ESP library for DHT11, DHT22, : Fix negative temperature problem (credits @helijunky)

DHT12

by Rob Tillaart

Arduino library for I2C DHT12 temperature and humidity sensor. DHT12

Dependencies for library DHT sensor library:1.4.2

The library **DHT sensor library:1.4.2** needs some other library dependencies currently not installed:

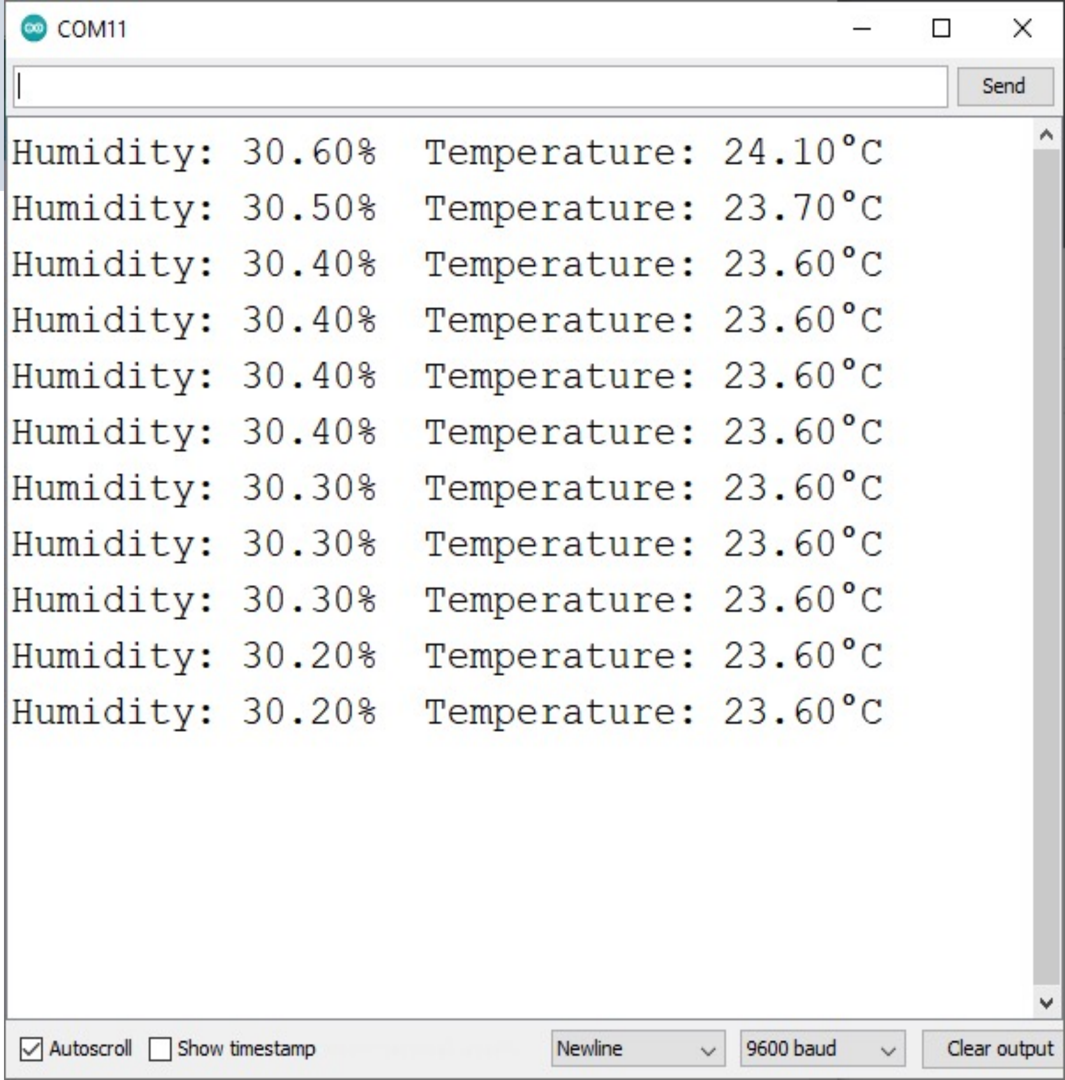
- **Adafruit Unified Sensor**

Would you like to install also all the missing dependencies?

Arduino Code

```
#include "DHT.h"

#define DHTPIN 2
#define DHTTYPE DHT22
DHT dht(DHTPIN, DHTTYPE);

void setup() {
  Serial.begin(9600);
  dht.begin();
}

void loop() {
  delay(2000);

  float humidity = dht.readHumidity();
  float temperature = dht.readTemperature();

  // Check if any Errors
  if (isnan(humidity) || isnan(temperature)) {
    Serial.println("Error reading DHT sensor");
  }

  Serial.print("Humidity: ");
  Serial.print(humidity);
  Serial.print("%  Temperature: ");
  Serial.print(temperature);
  Serial.println("°C");
}
```

Serial Monitor



```
Humidity: 30.60%  Temperature: 24.10°C
Humidity: 30.50%  Temperature: 23.70°C
Humidity: 30.40%  Temperature: 23.60°C
Humidity: 30.40%  Temperature: 23.60°C
Humidity: 30.40%  Temperature: 23.60°C
Humidity: 30.40%  Temperature: 23.60°C
Humidity: 30.30%  Temperature: 23.60°C
Humidity: 30.30%  Temperature: 23.60°C
Humidity: 30.30%  Temperature: 23.60°C
Humidity: 30.20%  Temperature: 23.60°C
Humidity: 30.20%  Temperature: 23.60°C
```

☑ Autoscroll □ Show timestamp Newline 9600 baud

Log Sensor Data to ThingSpeak

Hans-Petter Halvorsen

Table of Contents

Log Data to ThingSpeak

- In this Example we will read Humidity and Temperature data from the DHT22 Sensor (same as previous example)
- Then we will Write Humidity and Temperature data to the ThingSpeak Cloud Service

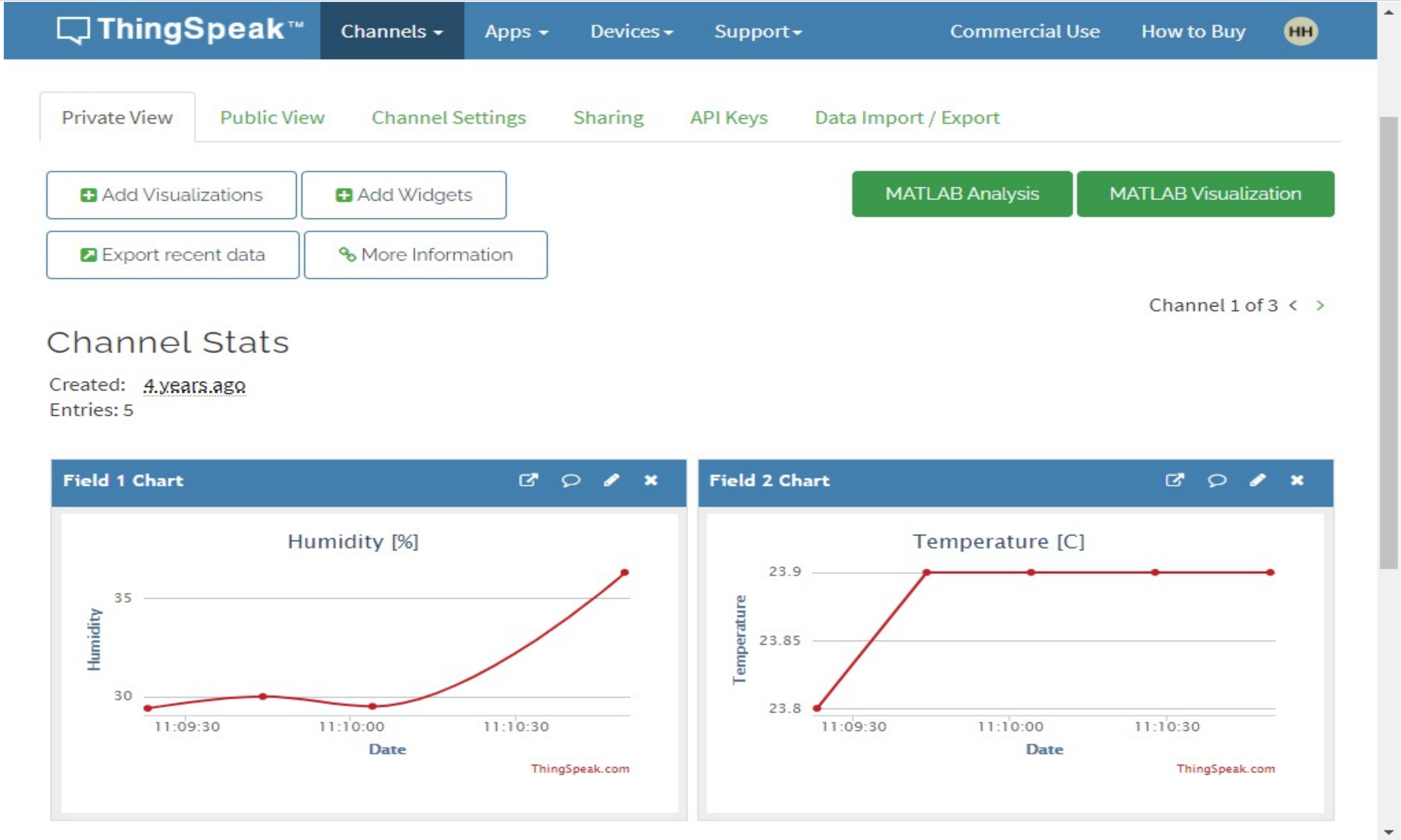
ThingSpeak

- ThingSpeak is an IoT analytics platform service that lets you collect and store sensor data in the cloud and develop Internet of Things (IoT) applications.
- ThingSpeak has a free Web Service (REST API) that lets you collect and store sensor data in the cloud and develop Internet of Things applications.
- It works with Arduino, Raspberry Pi, MATLAB and LabVIEW, Python, etc.

https://thingspeak.com

ThingSpeak

https://thingspeak.com



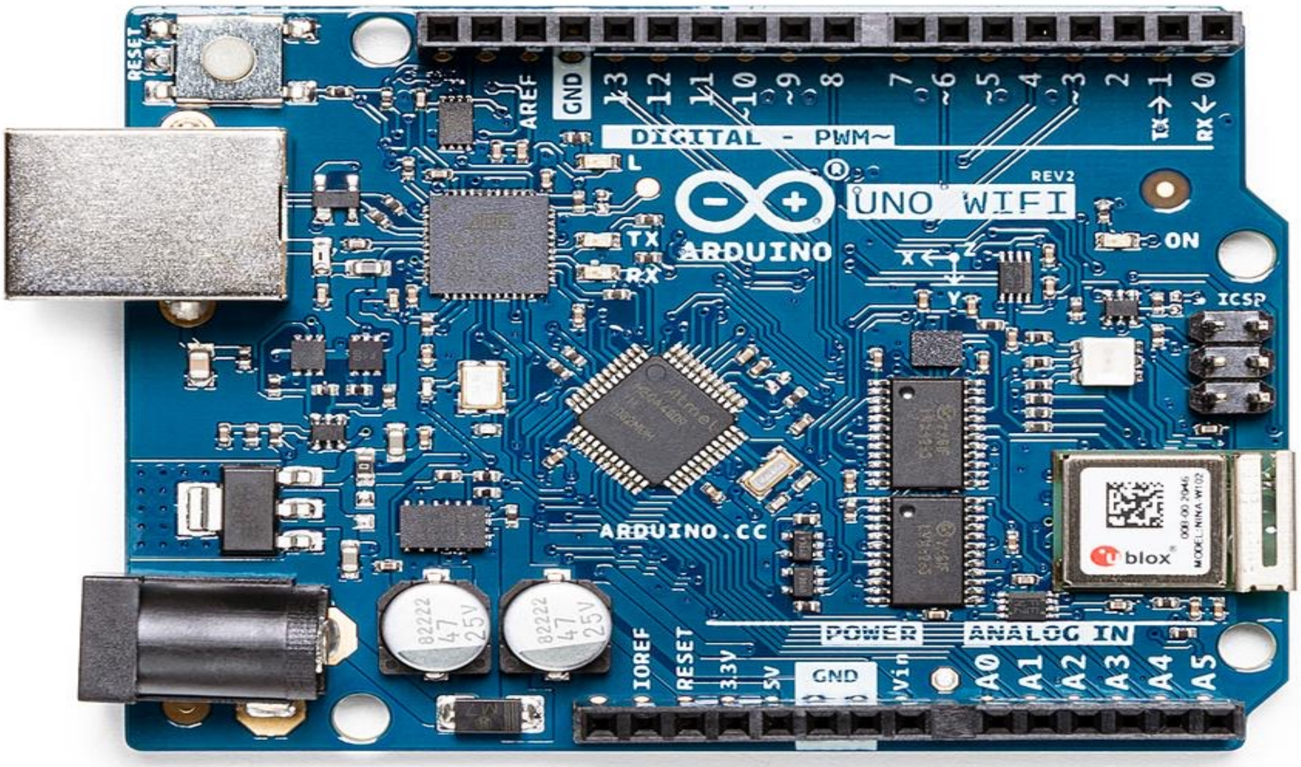
Channel Stats

Created: 4 years ago

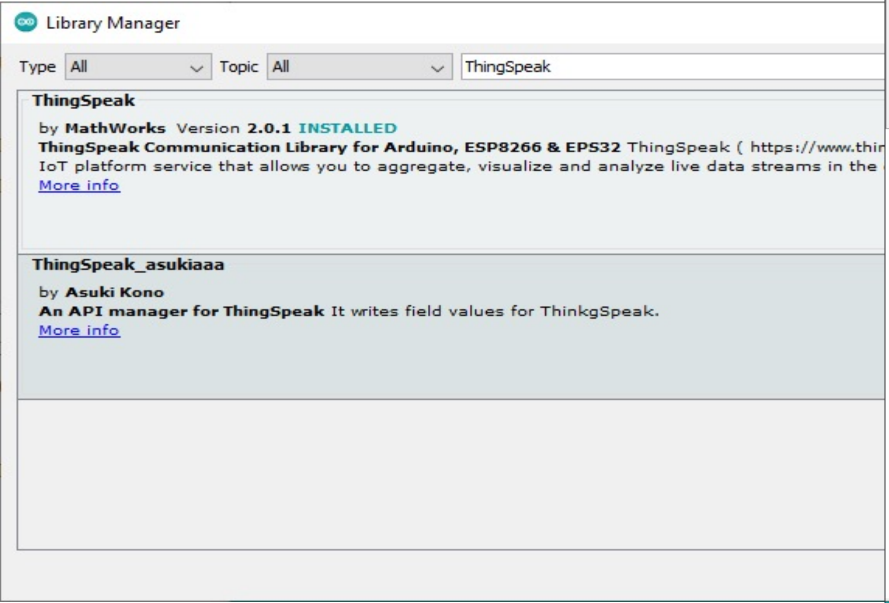
Entries: 5

Arduino UNO WiFi Rev 2

The Arduino Uno WiFi is functionally the same as the Arduino Uno Rev3, but with the addition of WiFi / Bluetooth and some other enhancements.



ThingSpeak Library



Library Manager

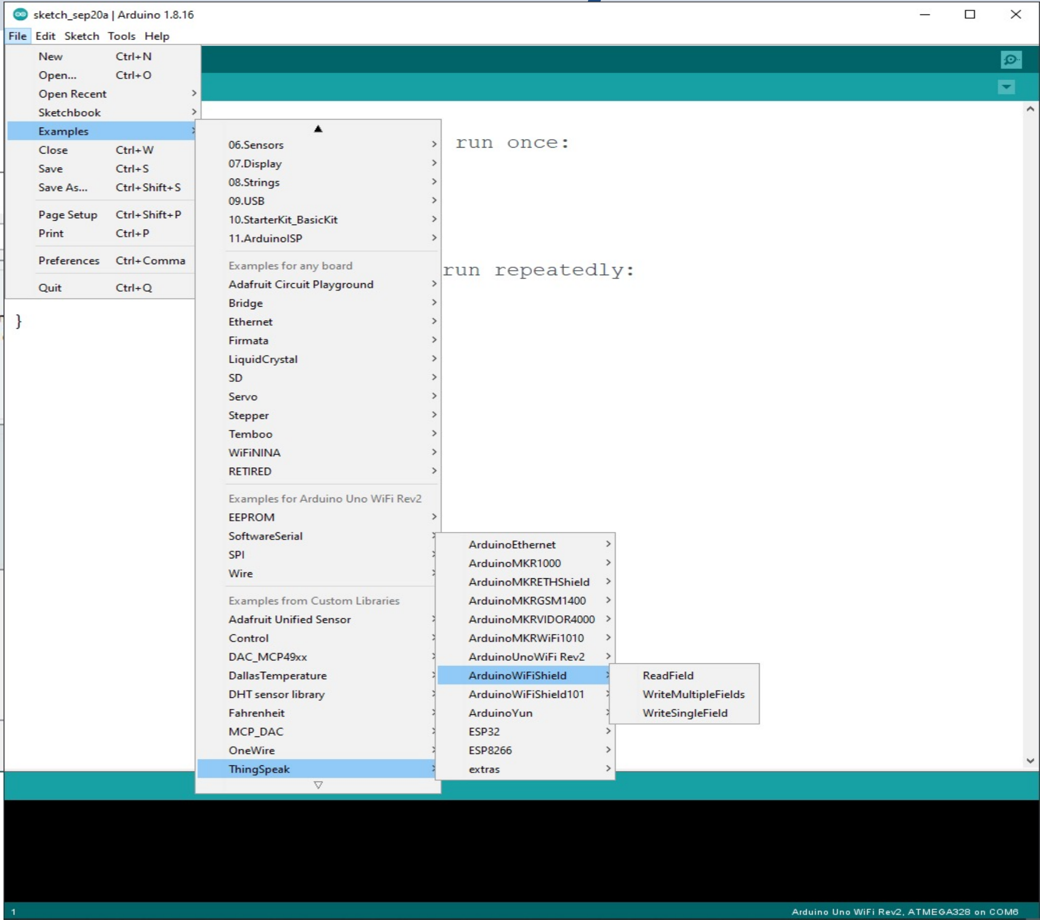
Type: All Topic: All ThingSpeak

ThingSpeak

by **MathWorks** Version **2.0.1** **INSTALLED**
ThingSpeak Communication Library for Arduino, ESP8266 & EPS32 ThingSpeak (https://www.thir
IoT platform service that allows you to aggregate, visualize and analyze live data streams in the
More info

ThingSpeak_asukiaaa

by **Asuki Kono**
An API manager for ThingSpeak It writes field values for ThinkgSpeak.
More info



Arduino Code

Here you see the main code structure:

We have created separate Functions for:

- **CheckWiFi()**
- **ConnectWiFi()**
- **ReadSensorData()**
- **ThingSpeakWrite()**

The Functions are presented on the next pages.

```
#include "DHT.h"
#include "ThingSpeak.h"
#include <WiFiNINA.h>
#include "secrets.h"

#define DHTPIN 2
#define DHTTYPE DHT22

DHT dht(DHTPIN, DHTTYPE);

WiFiClient  client;
int wait = 20000;
float humidity;
float temperature;

void setup()
{
  Serial.begin(9600);
  dht.begin();
  CheckWiFi();
  ThingSpeak.begin(client);
}

void loop()
{
  ConnectWiFi();
  ReadSensorData();
  ThingSpeakWrite();
  delay(wait);
}
```

Arduino Code

Secrets.h

```
#define SECRET_SSID "xxxxxx"
#define SECRET_PASS "xxxxxx"

#define SECRET_CH_ID xxxxxx

#define SECRET_WRITE_APIKEY "xxxxxx"
```

```
void CheckWiFi()
{
  // check for the WiFi module:
  if (WiFi.status() == WL_NO_MODULE) {
    Serial.println("Communication with WiFi module failed!");
    // don't continue
    while (true);
  }

  String fv = WiFi.firmwareVersion();
  if (fv != "1.0.0") {
    Serial.println("Please upgrade the firmware");
  }
}

void ConnectWiFi()
{
  char ssid[] = SECRET_SSID;
  char pass[] = SECRET_PASS;

  if(WiFi.status() != WL_CONNECTED)
  {
    Serial.print("Attempting to connect to SSID: ");
    Serial.println(SECRET_SSID);
    while(WiFi.status() != WL_CONNECTED)
    {
      WiFi.begin(ssid, pass);
      Serial.print(".");
      delay(5000);
    }
    Serial.println("\nConnected.");
  }
}
```

Arduino Code

```
void ReadSensorData()
{
  humidity = dht.readHumidity();
  temperature = dht.readTemperature();

  // Check if any Errors
  if (isnan(humidity) || isnan(temperature))
  {
    Serial.println("Error reading DHT sensor");
  }

  Serial.print("Humidity: ");
  Serial.print(humidity);
  Serial.print("%  Temperature: ");
  Serial.print(temperature);
  Serial.println("°C");
}
```

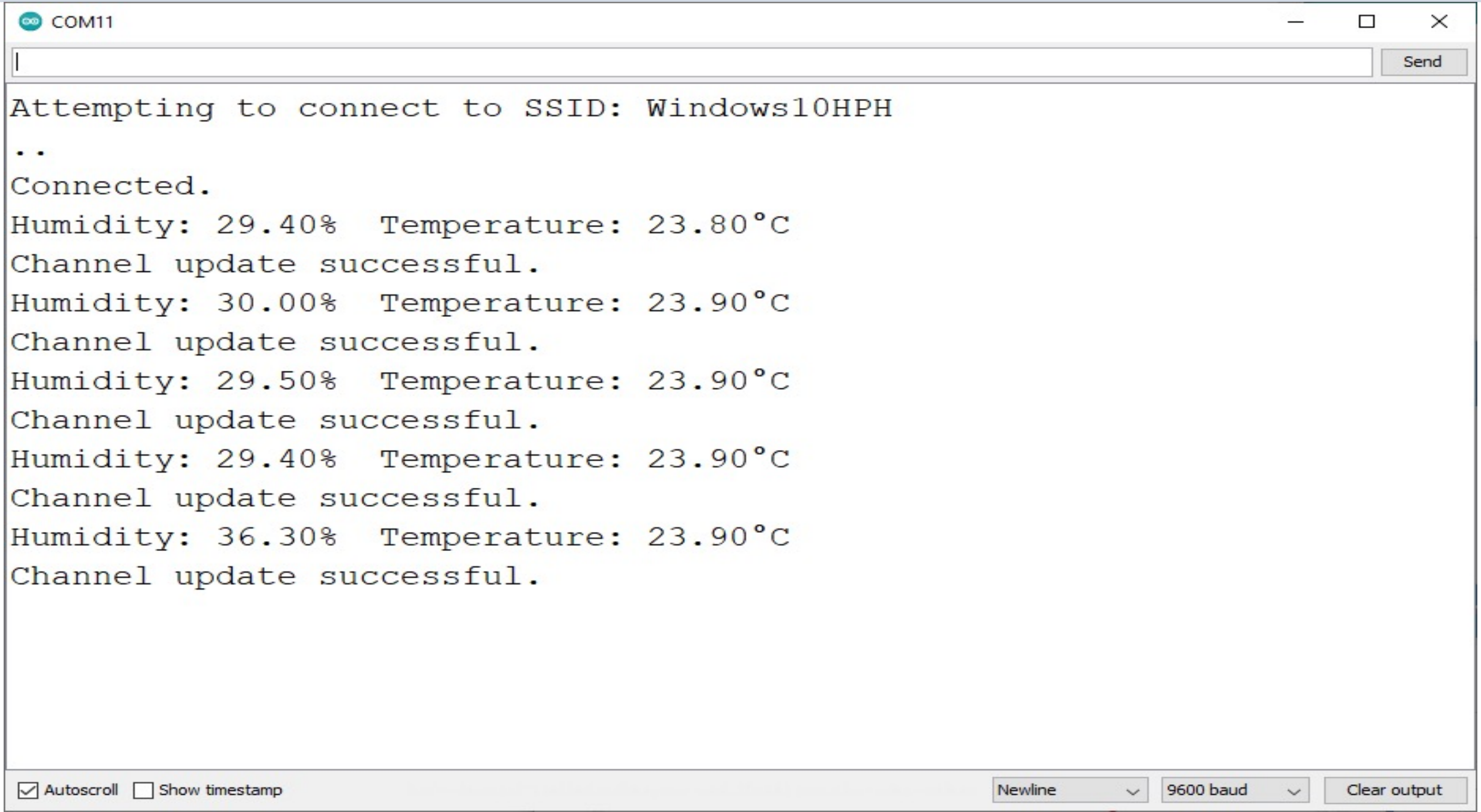
Arduino Code

Secrets.h

```
#define SECRET_SSID "xxxxxx"
#define SECRET_PASS "xxxxxx"

#define SECRET_CH_ID xxxxxx

#define SECRET_WRITE_APIKEY "xxxxxx"
```

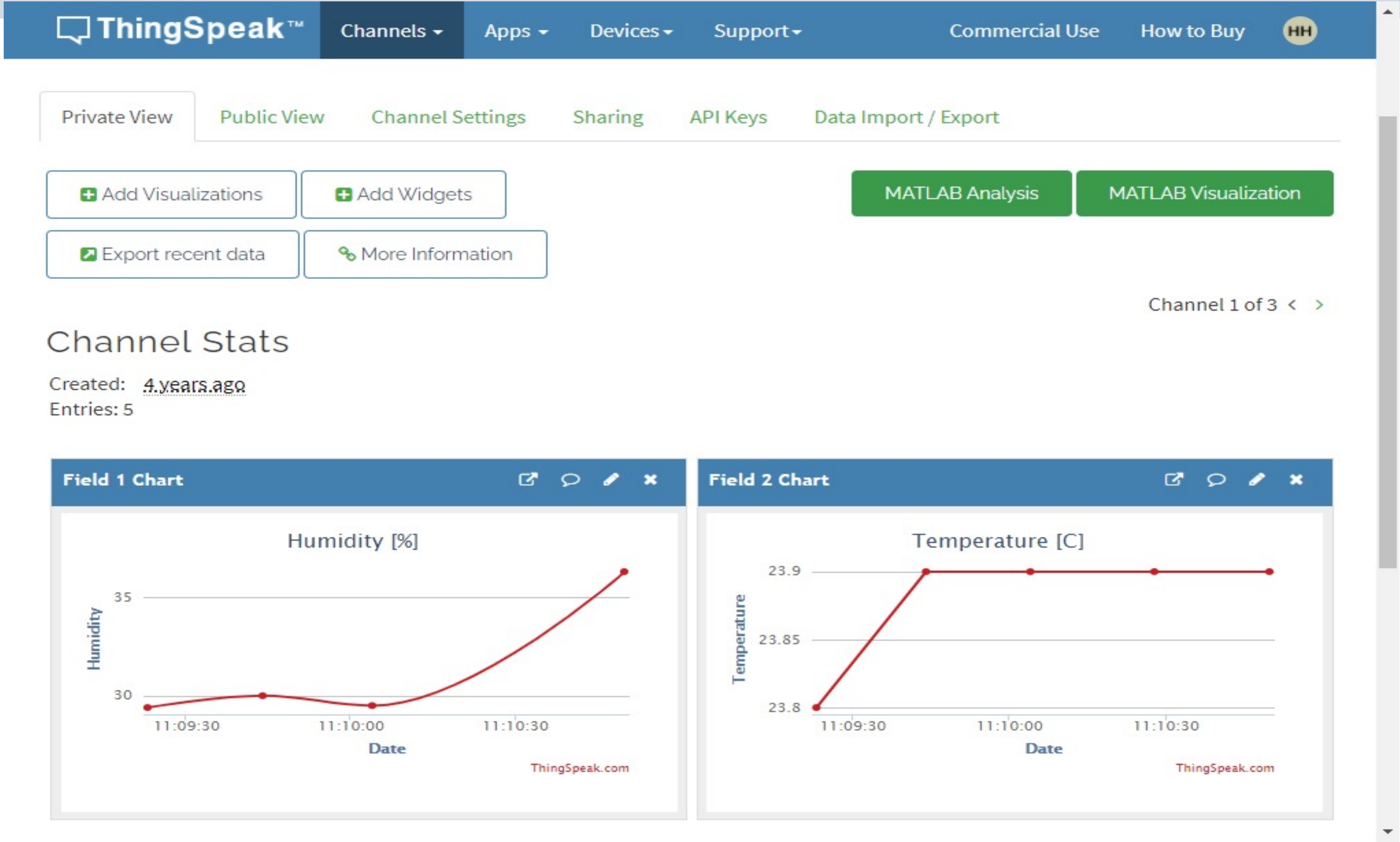
```
void ThingSpeakWrite()
{
  unsigned long myChannelNumber = SECRET_CH_ID;
  const char * myWriteAPIKey = SECRET_WRITE_APIKEY;

  ThingSpeak.setField(1, humidity);
  ThingSpeak.setField(2, temperature);
  int x = ThingSpeak.writeFields(myChannelNumber, myWriteAPIKey);
  if(x == 200){
    Serial.println("Channel update successful.");
  }
  else{
    Serial.println("Problem updating channel. HTTP error code " + String(x));
  }
}
```

Serial Monitor



```
Attempting to connect to SSID: Windows10HPH
..
Connected.
Humidity: 29.40%  Temperature: 23.80°C
Channel update successful.
Humidity: 30.00%  Temperature: 23.90°C
Channel update successful.
Humidity: 29.50%  Temperature: 23.90°C
Channel update successful.
Humidity: 29.40%  Temperature: 23.90°C
Channel update successful.
Humidity: 36.30%  Temperature: 23.90°C
Channel update successful.
```

ThingSpeak



Channel Stats

Created: 4 years ago
Entries: 5

Summary

- In this Tutorial we have been using a **DHT22 Humidity and Temperature Sensor**
- We connected the Sensor to Arduino and was able to read both Humidity and Temperature Data from the Sensor
- Finally, we also Logged the Humidity and Temperature Data to the **ThingSpeak** Cloud Service

References

- https://create.arduino.cc/projecthub/MinukaThesathYapa/dht11-dht22-sensors-temperature-using-arduino-b7a8d6
- https://create.arduino.cc/projecthub/mafzal/temperature-monitoring-with-dht22-arduino-15b013
- https://create.arduino.cc/projecthub/MisterBotBreak/how-to-use-temperature-and-humidity-dht-sensors-9e5975?ref=similar&ref_id=386990&offset=0

Hans-Petter Halvorsen

University of South-Eastern Norway

www.usn.no

E-mail: hans.p.halvorsen@usn.no

Web: https://www.halvorsen.blog