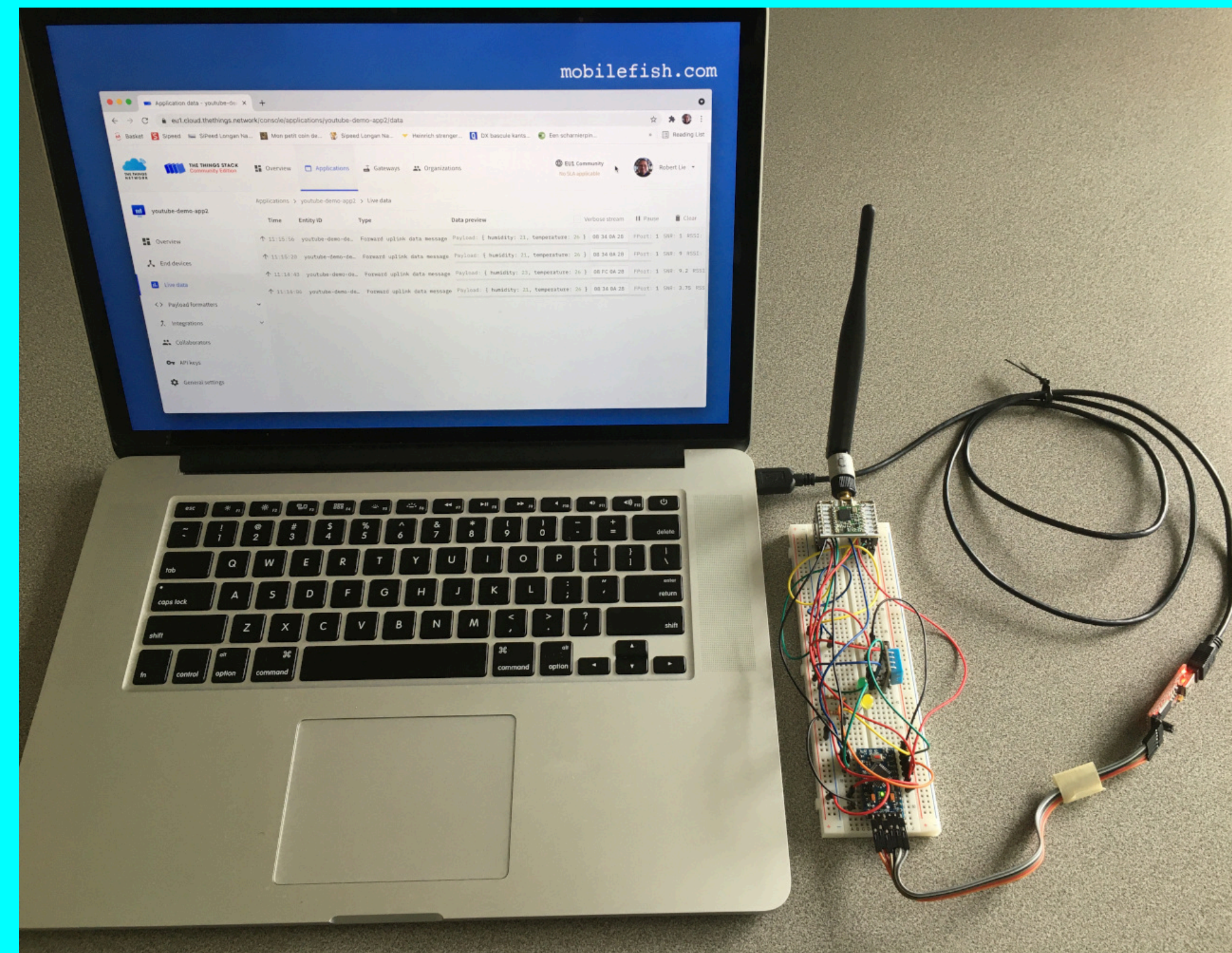


LORA / LORAWAN TUTORIAL 57

Sending messages to/from The Things Stack Community Edition (V3)



INTRO

- In this tutorial I will demonstrate how to send uplink messages from an end device to The Things Stack Community Edition network (V3).
- I will also demonstrate how to send downlink messages from The Things Stack Community Edition network (V3) to an end device.

PRESENTATION

- This presentation can be found at:
https://www.mobilefish.com/download/lora/lora_part57.pdf
- All my LoRa/LoRaWAN tutorials and presentations can be found at:
https://www.mobilefish.com/developer/lorawan/lorawan_quickguide_tutorial.html
- In this video when V3 is mentioned, V3 refers to The Things Stack Community Edition.

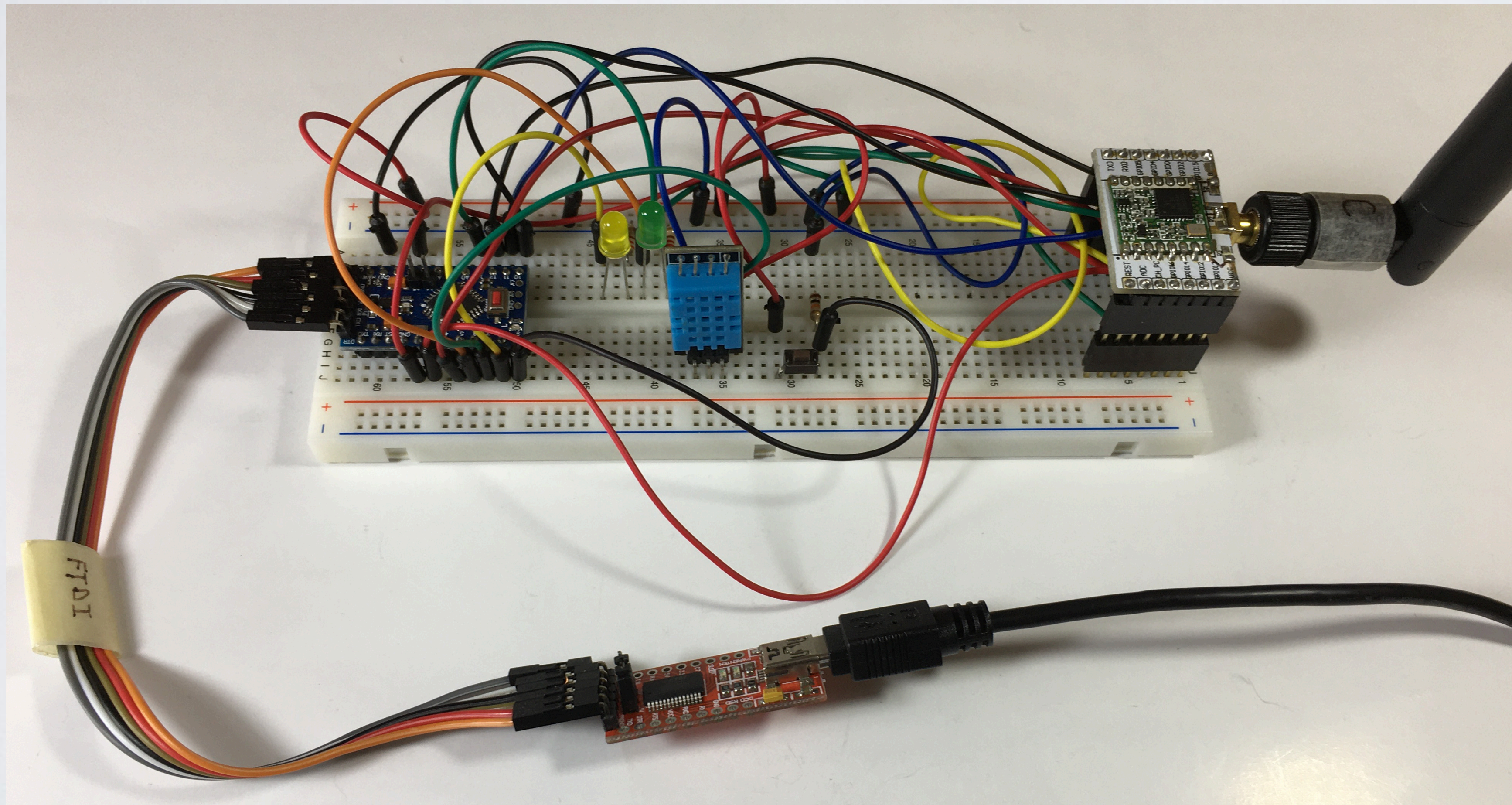
DETAILED TUTORIAL AVAILABLE

- I have written a detailed tutorial how to send messages to/from The Things Stack Community Edition (V3):
https://www.mobilefish.com/developer/lorawan/lorawan_quickguide_build_lora_node_rfm95_arduino_pro_mini_v3.html
- In this video I will not go step-by-step thru the detailed tutorial, instead I will only show the most relevant information.

Hardware setup

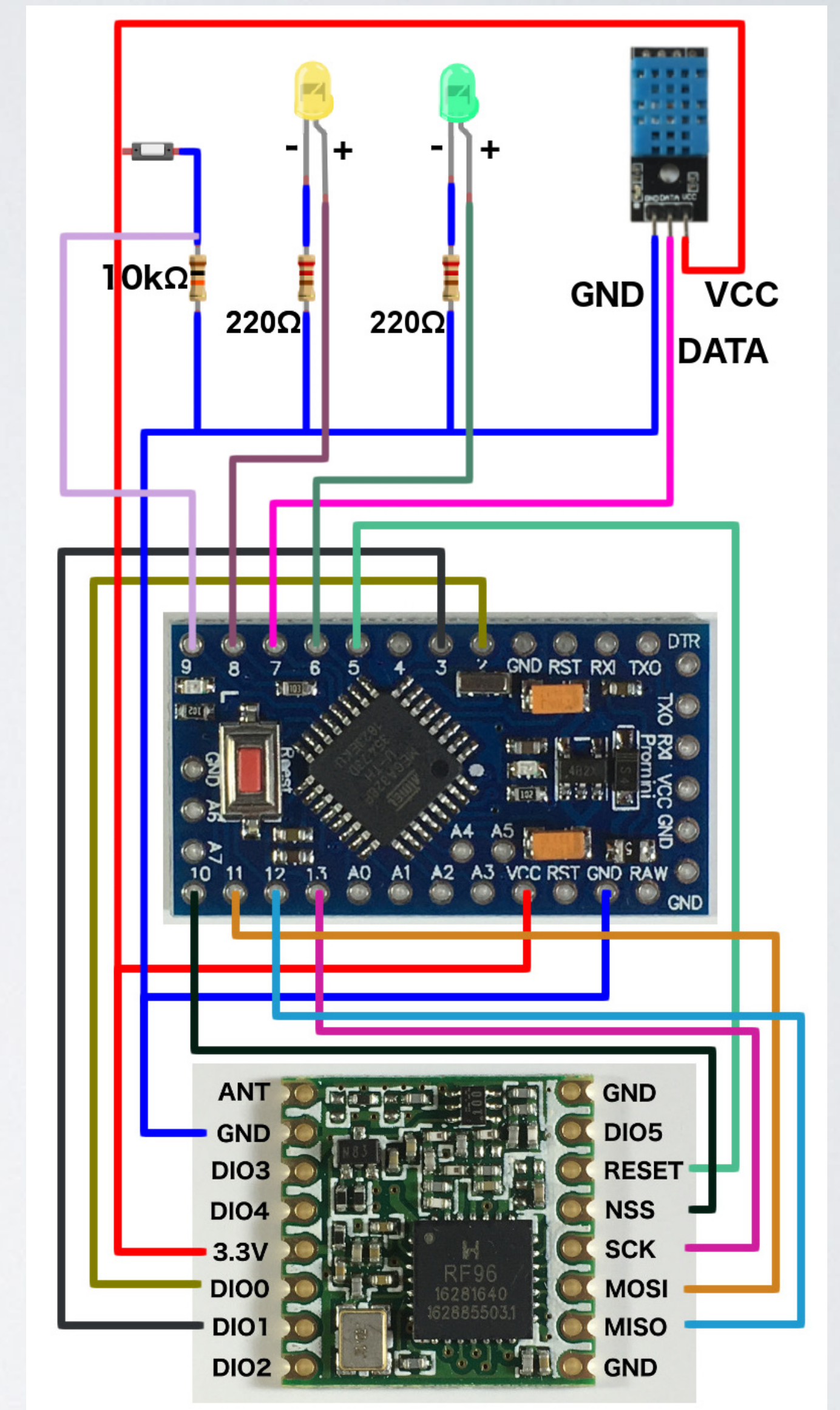
HARDWARE SETUP

- The hardware setup is described in detail in: https://www.mobilefish.com/developer/lorawan/lorawan_quickguide_build_lora_node_rfm95_arduino_pro_mini_v3.html



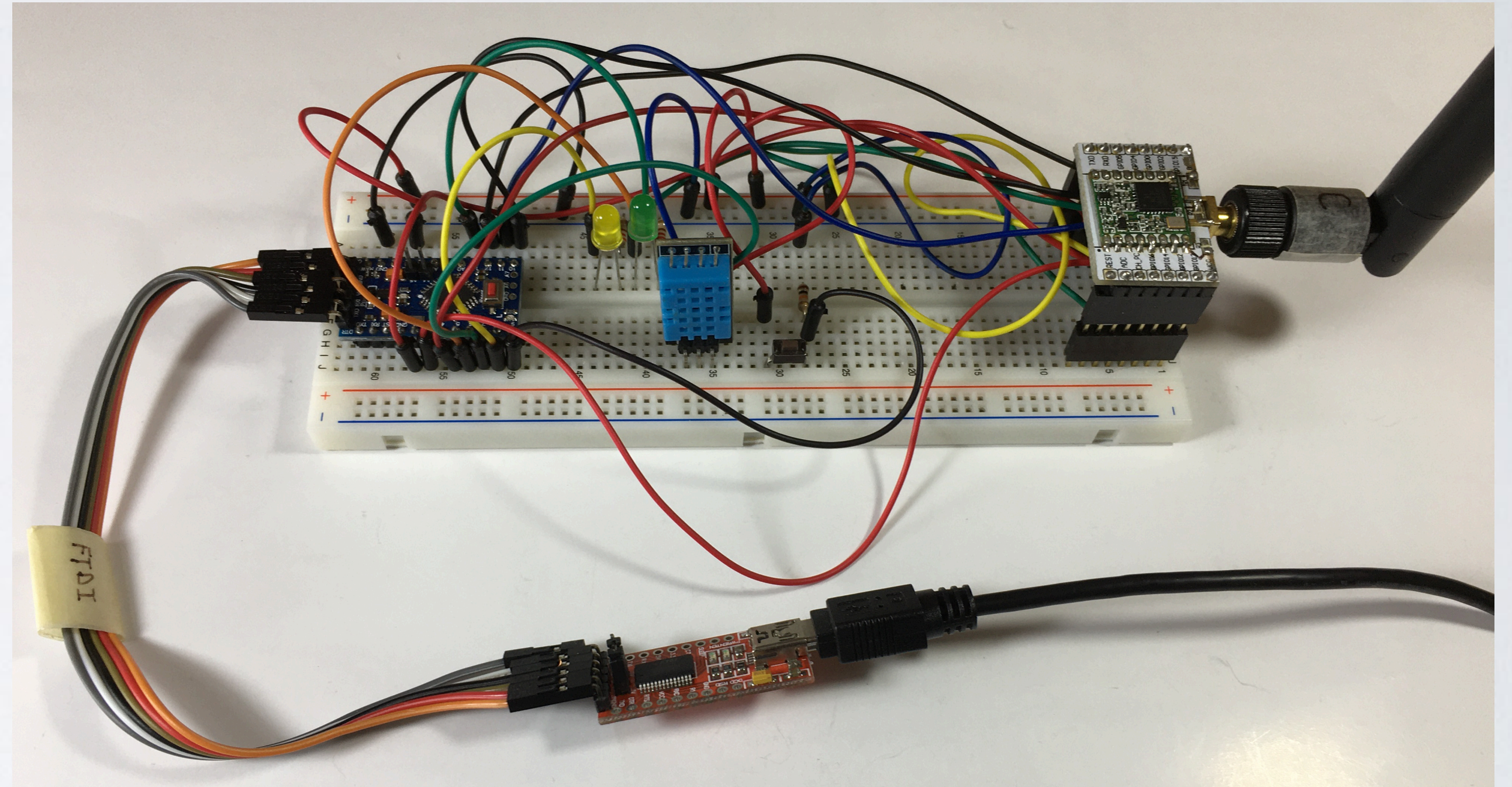
HARDWARE COMPONENTS

- Components:
 - Arduino Pro Mini (ATmega328P / 3.3V / 8 MHz)
 - HopeRF RFM95 LoRa transceiver module
 - Button switch
 - DHT11 sensor
 - 2x led (green and yellow)
 - 1x 10k Ω and 2x 220 Ω resistors.



HARDWARE COMPONENTS

- FTDI FT232RL 3.3/5V
- Breadboard MB-102
- USB 2.0 cable, USB-A - Mini USB-B
- Jumper wires 15 cm long (6x female-female) to connect FTDI to Arduino.
- Jumper wires 20 cm long (19x male-male)
- Female pin headers 8 pins (4 pcs)



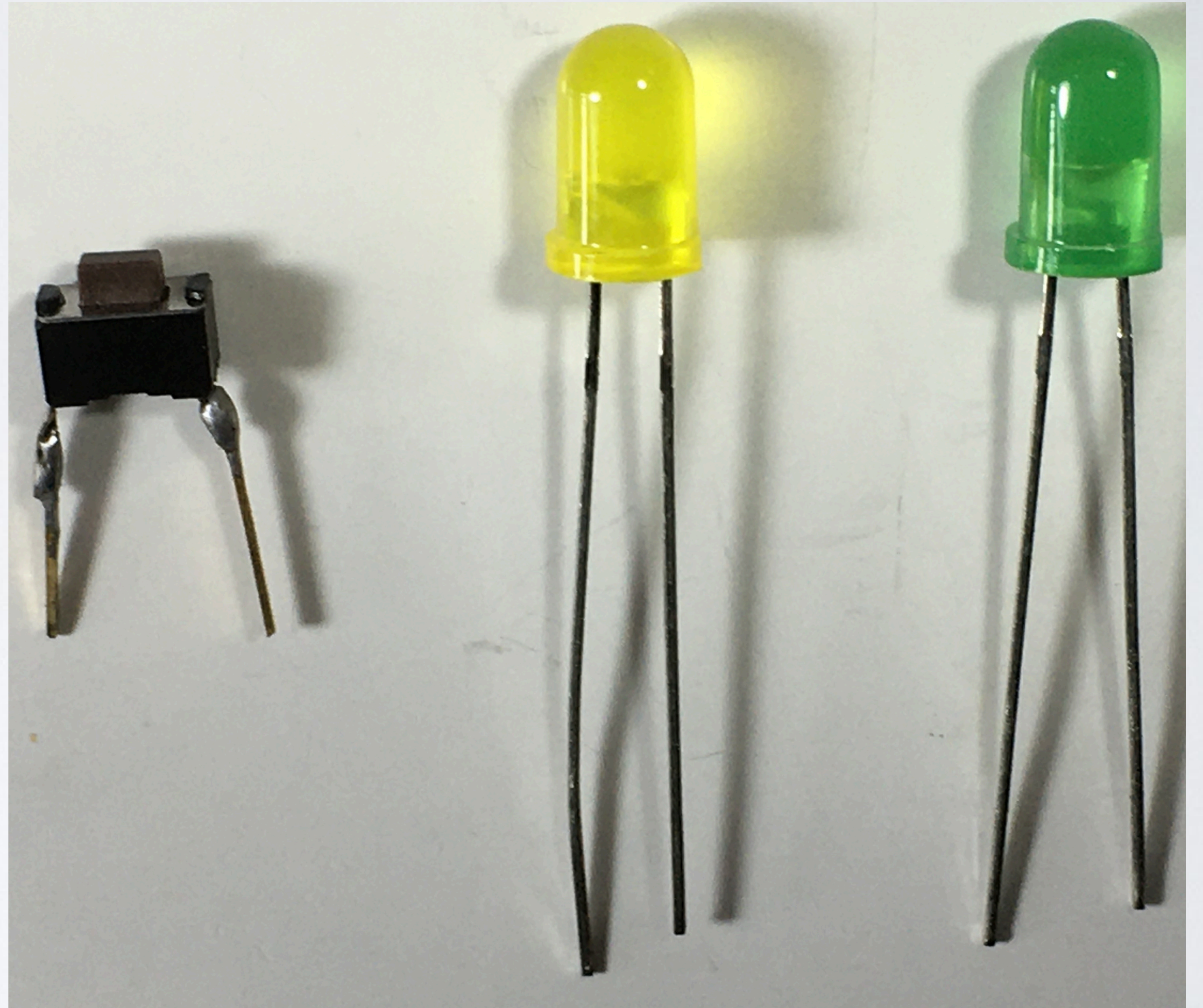
HARDWARE COMPONENTS

- Sleeve dipole antenna (868 MHz)



BUTTON & LEDs

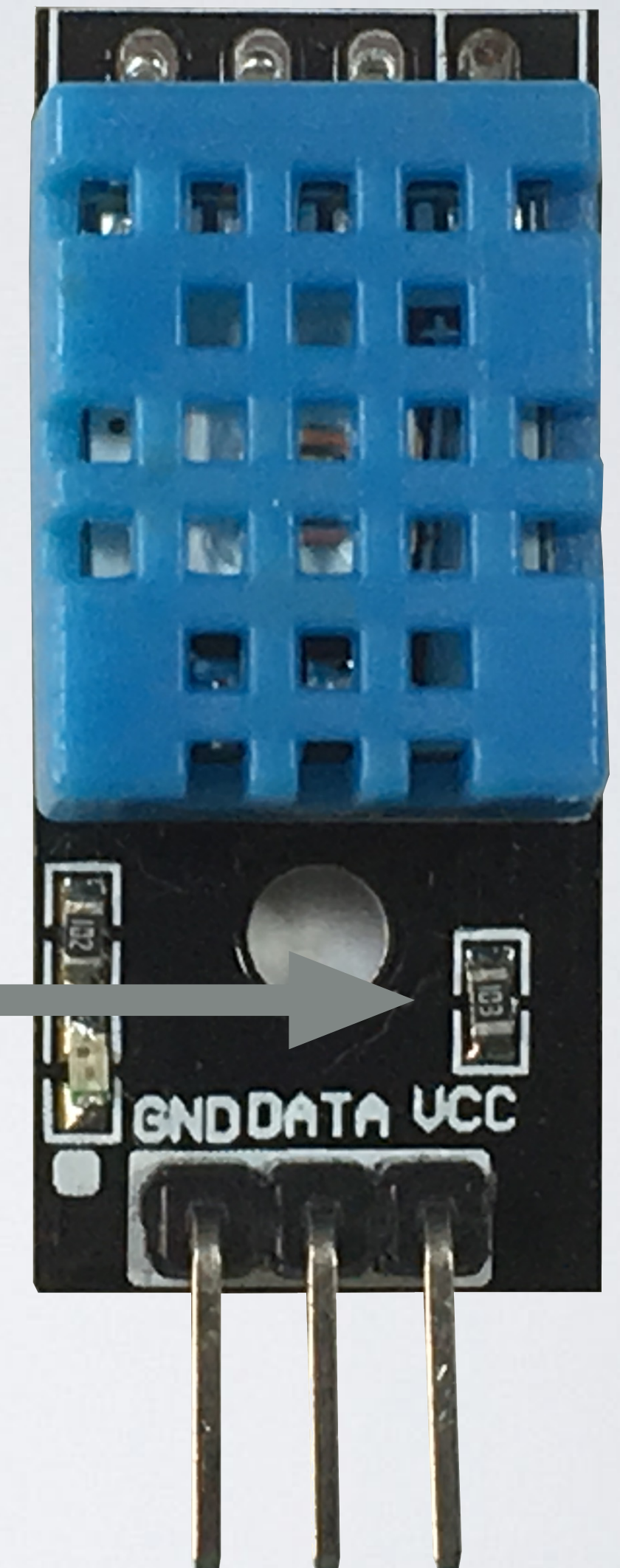
- Simple button switch
- Two LEDs (yellow & green)



DHT11 SENSOR

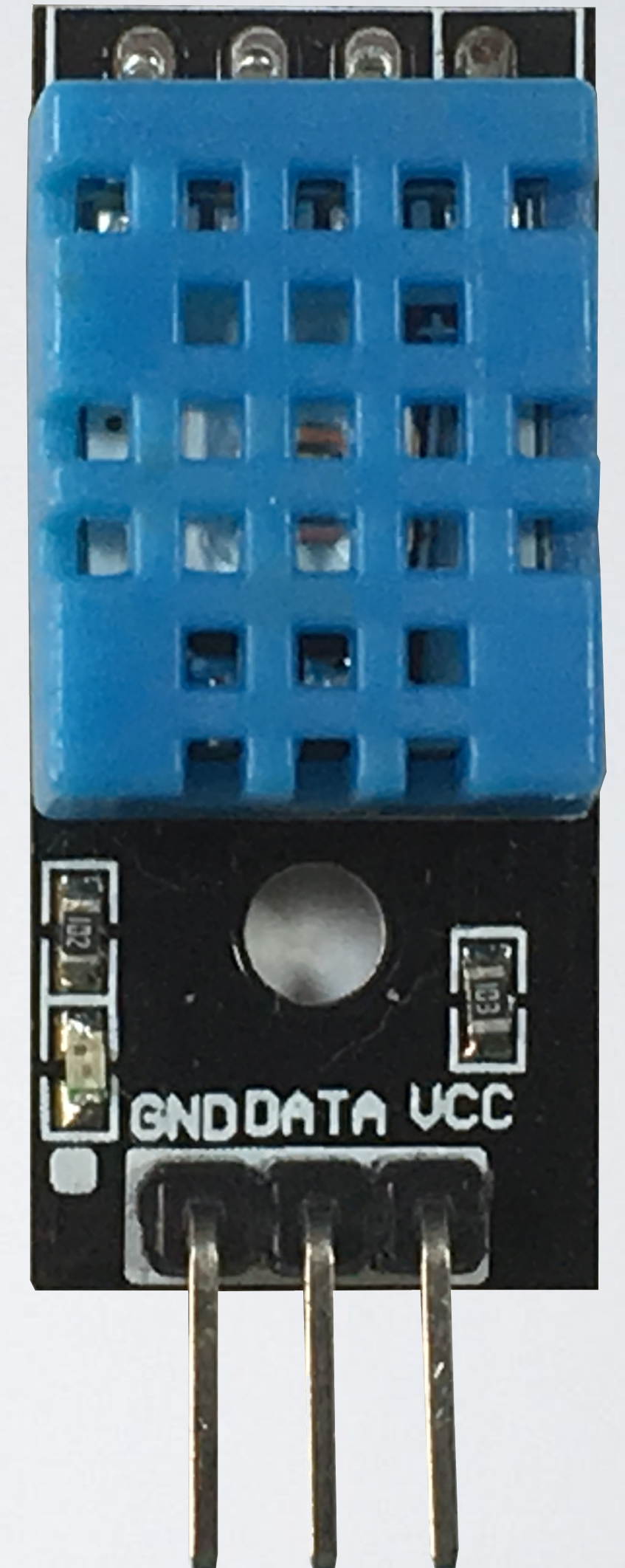
- Digital Humidity & Temperature (DHT11) module aka DHT11 sensor.
- This particular DHT11 sensor comes with a $10\text{ k}\Omega$ pull up resistor from the data pin to Vcc.
- Pin VCC connected to Arduino Pro Mini 3.3V
Pin DATA connected to Arduino Pro Mini pin 7
Pin GND connected to Arduino Pro Mini GND
- A DHT11 sensor is cheap, less precise and less accurate. For better accuracy and precision use a DHT22.

**SMD 103
10 k Ω pull up
resistor**



DHT11 SPECIFICATION

- Supply voltage: 3 to 5.5V DC
- Output: single-bus digital signal
- Measuring range: humidity 20 to 90% RH, temperature 0 to 50°C
- Accuracy: humidity $\pm 5\%$ RH, temperature $\pm 2^\circ\text{C}$
- Resolution: Humidity 1% RH, temperature 1°C
- Long-term stability: $< \pm 1\%$ RH / Year



LIBRARIES, ARDUINO SKETCH, PAYLOAD FORMATTER

- Used libraries, Arduino sketch, and payload formatter:
 - Adafruit Unified Sensor library
https://github.com/adafruit/Adafruit_Sensor
 - DHT sensor library
<https://github.com/adafruit/DHT-sensor-library>
 - MCCI LoRaWAN LMIC library
<https://github.com/mcci-catena/arduino-lmic>
 - The Arduino sketch
<https://www.mobilefish.com/download/lora/ttsce-otaa-pro-mini-sensors.ino.txt>

LIBRARIES, ARDUINO SKETCH, PAYLOAD FORMATTER

- Payload formatter: Javascript decodeUplink
<https://www.mobilefish.com/download/lora/ttsce-otaa-pro-mini-sensors-decodeuplink.txt>
- The HopeRF RFM95 LoRa transceiver module does not have a built-in DevEUI or AppEUI. In such case you should let the TTSCCE console generate the required DevEUI or AppEUI.
- The AppEUI, DevEUI and AppKey are used in the Arduino sketch
<https://www.mobilefish.com/download/lora/ttsce-otaa-pro-mini-sensors.ino.txt>

LIBRARIES, ARDUINO SKETCH, PAYLOAD FORMATTER

- In this Arduino sketch the DevEUI or AppEUI must be converted to an array of 8 bytes in LSB order.
- The AppKey must be converted to an array of 16 bytes in MSB order.
- I have created an online tool which converts these values to a bytes array in its correct order (LSB / MSB):
https://www.mobilefish.com/download/lora/eui_key_converter.html