Intel-IrriS

PRIMA
PARTNERSHIP FOR RESEARCH AND INNOVATION
IN THE MEDITERRANEAN AREA

Intelligent Irrigation System for Low-cost Autonomous Water Control in Small-scale Agriculture

Intel-IrriS

Building the Intel-IrriS LoRa IoT platform Part 2: edge-enabled gateway (WaziGate)

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UNIVERSITÉ DE PAU ET DES PAYS DE L'ADOUR

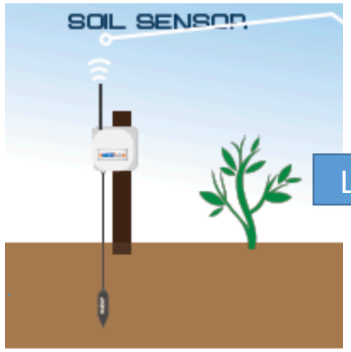
LIUPPA

WAZIup
IoT – from idea to reality
WAZIhub

Review: Technology components

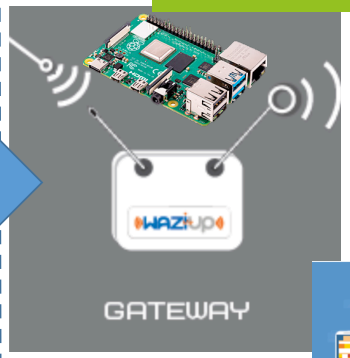
Sensor part

Intel-IrriS



LPWAN

Control part



Embedded Database

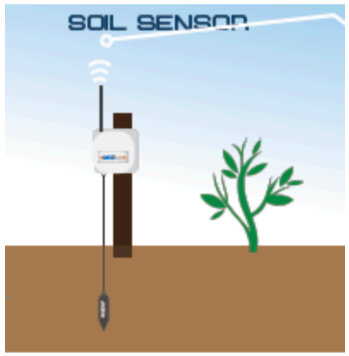
Software updates

Embedded User Interface

Review: Low-cost sensors

Sensor part

Intel-IrriS



- Build on low-cost, low-power IoT expertise
- Increase accuracy of low-cost sensors by automatic and remotely controlled procedures for advanced calibration
- Enable deployment of several complementary low-cost sensors
- Include agricultural models / knowledge with corrective & predictive analytics

Review: Smart embedded control

- Build on low-cost embedded & open IoT gateway expertise
- Implement the “Intelligent Irrigation in-the-box” with "plug-&-sense" approach
- Model complex water-soil-plant interaction
- Embed Decision Support System (DSS) and disruptive Artificial Intelligence (AI)
- Integration of various knowledge streams
- Fully autonomous

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INTEL-IRRIS starter-kit

- "Intelligent Irrigation in-the-box", "plug-&-sense"
- From idea to reality!

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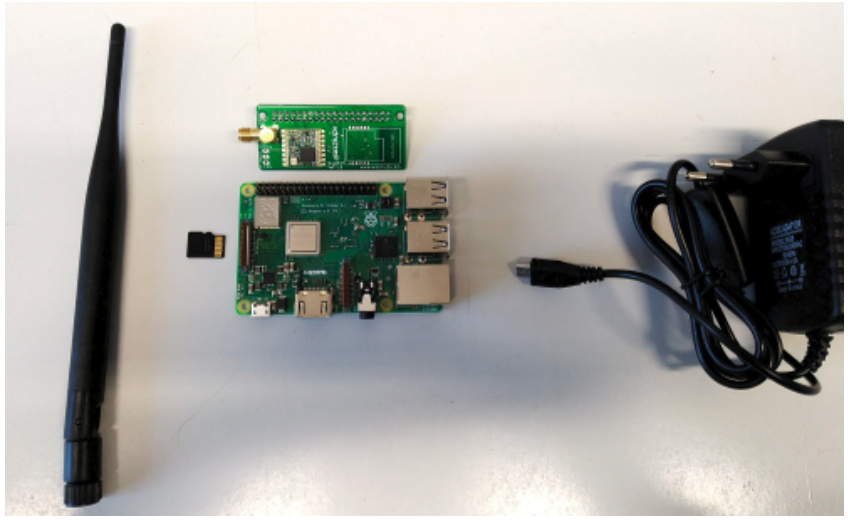
WaziGate

- WaziGate is an IoT LoRa Gateway developed by WAZIUP
- WaziGate implements the edge-enabled IoT gateway approach
  - customized applications can be directly hosted in the gateway
  - the gateway can easily work without Internet connectivity
  - data are available to end-users in an embedded database
  - web-based visualization module provides graphical user interface
- You can find all the WaziGate documentation on the WaziGate documentation page. There are 4 main sections describing the generic WaziGate main features:
  - Quick start: https://www.waziup.io/documentation/wazigate/v2/quick_start/
  - Installation: https://www.waziup.io/documentation/wazigate/v2/install/
  - LoRaWAN: https://www.waziup.io/documentation/wazigate/v2/lorawan/
  - WaziApps: https://www.waziup.io/documentation/wazigate/v2/waziapps/
  - Look at the generic installation video: https://youtu.be/DvGdmdsGZHA

Install your WaziGate (1)

- **INTEL-IRRIS WaziGate distribution (RPI3B/3B+/4B)**
  - comes pre-configured with a soil sensor device
  - will work out-of-the box with the INTEL-IRRIS soil sensor device
  - will be updated to host the INTEL-IRRIS irrigation application
  - **Download the INTEL-IRRIS WaziGate SD card image from project website**
  - http://intel-irris.eu/results
  - Image uses EU433 frequency band
  - EU868 can be configured afterwards
  - Flash the SD card image on 8GB SD card class 10



Look at the INTEL-IRRIS WaziGate video
Video n°4 at t=124s: https://youtu.be/j-1Nk0tv0xM?t=124

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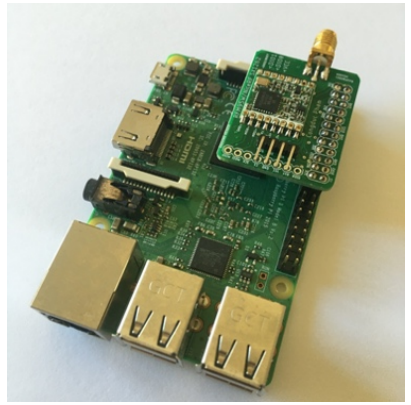
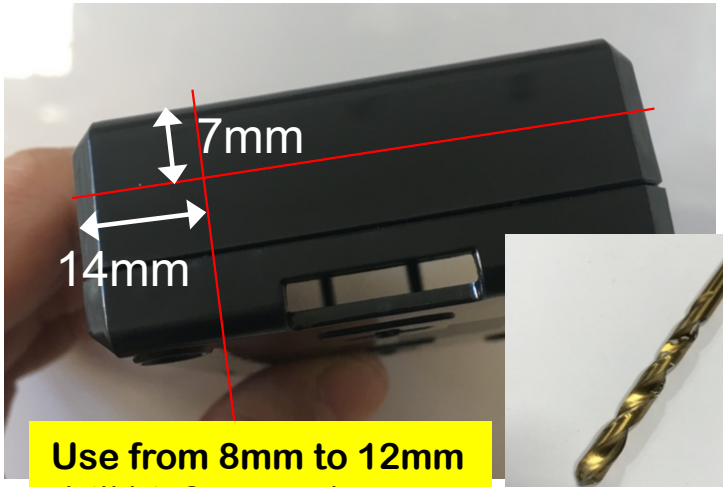
Install you WaziGate (2)



- Recommended RPI model is RPI3B
  - plug in the radio LoRa hat
  - The OLED screen is optional but highly recommended
- Drill a hole for the SMA connector on the RPI enclosure, at the SD card slot side



Use from 8mm to 12mm drill bit for metal

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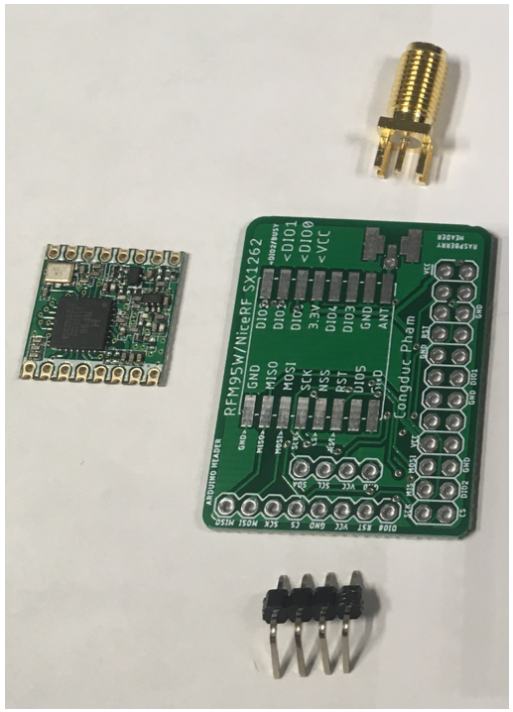
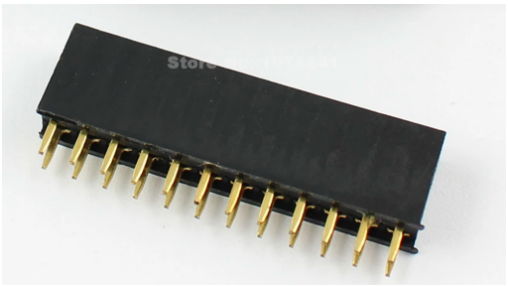
The LoRa radio hat

https://github.com/CongducPham/PRIMA-Intel-IrriS/blob/main/Tutorials/Intel-Irris-PCB.pdf

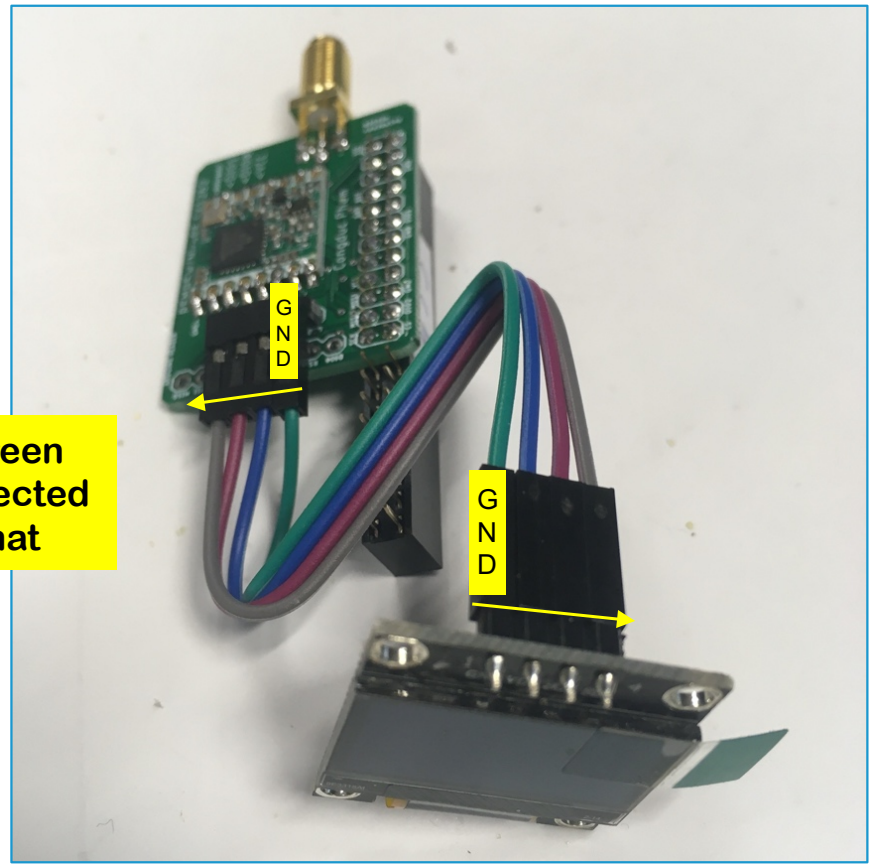




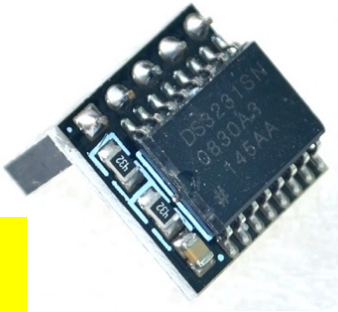
2-row 12-pin header
or
2 X 1-row 12-pin header

Installing OLED (recommended)

An OLED screen can be connected to the radio hat



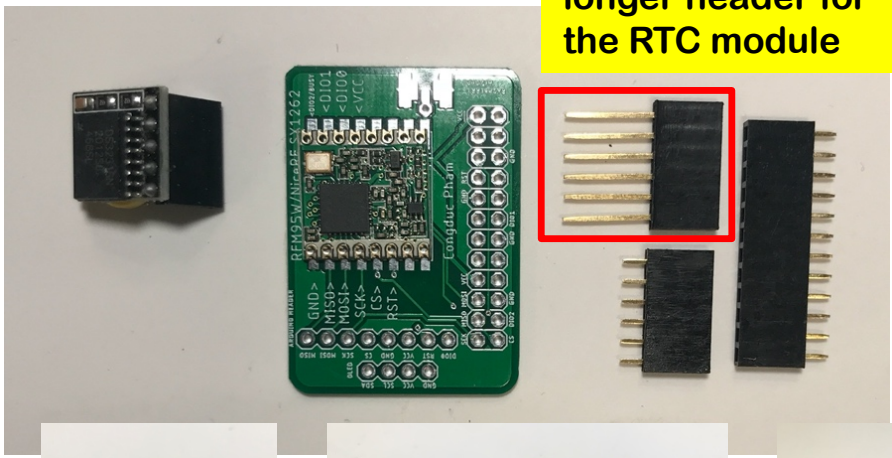
Connecting an RTC module (1)

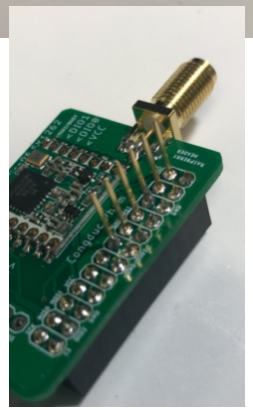


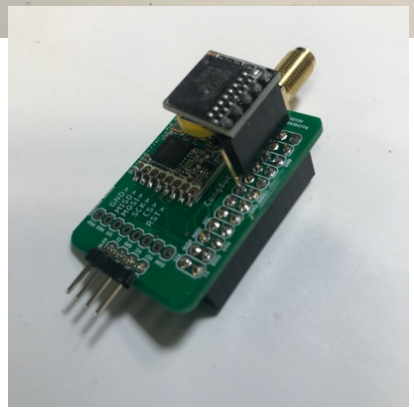
- Several possibilities depending on availability of components

Solder a header with longer pins to connect the RTC module. You can then cut the remaining pins if you want

Or use only a 6-pin longer header for the RTC module

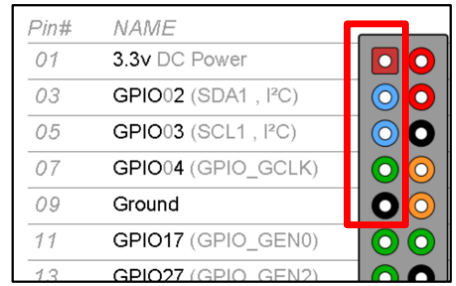


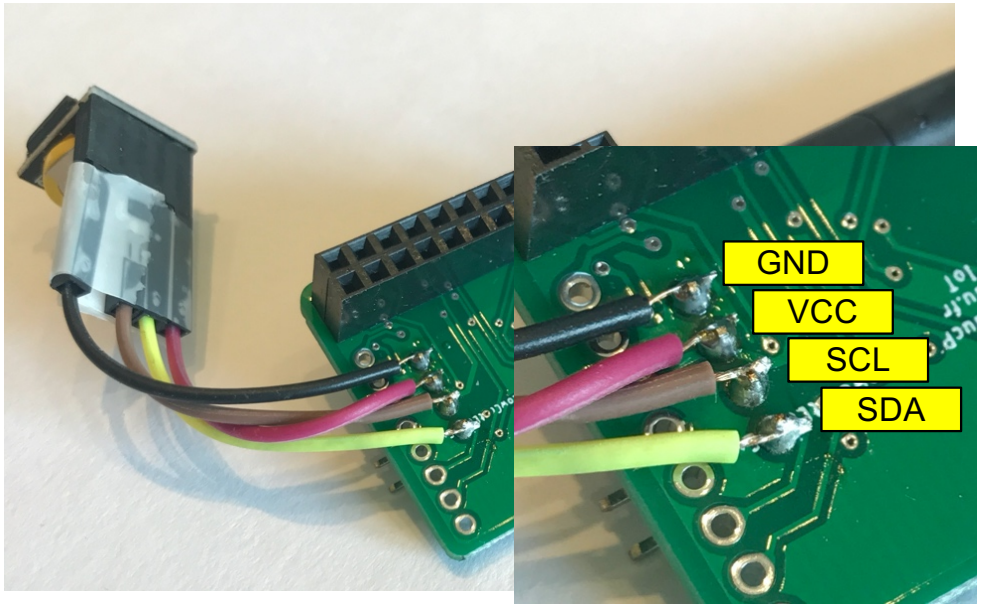


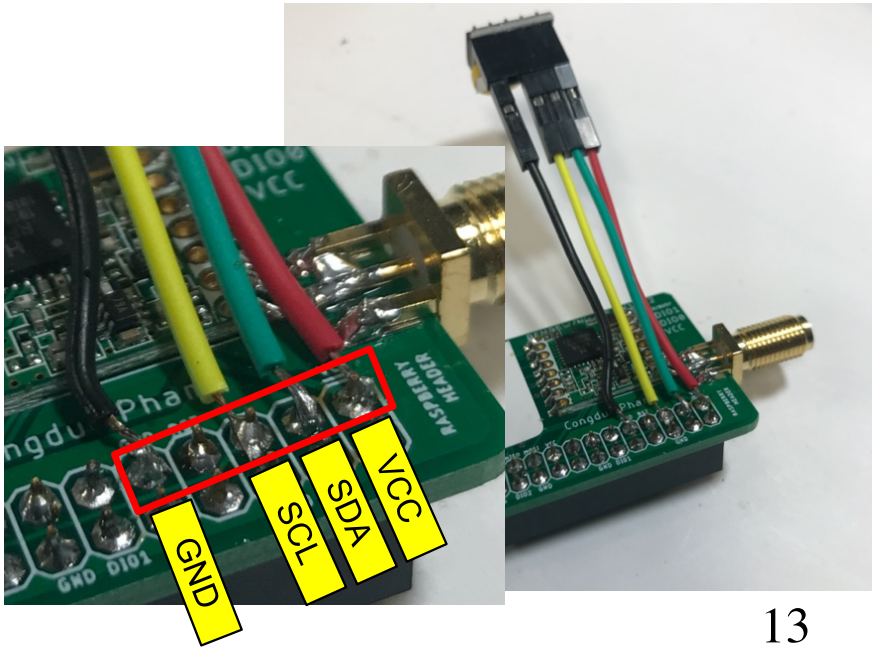


Connecting an RTC module (2)

- If you already have the LoRa hat, you can also just solder 4 wires for the RTC module. 2 possibilities
  - On the back side of the I2C header (left figure)
  - On the RPI GPIO header (right figure)
- Check carefully to avoid short circuits







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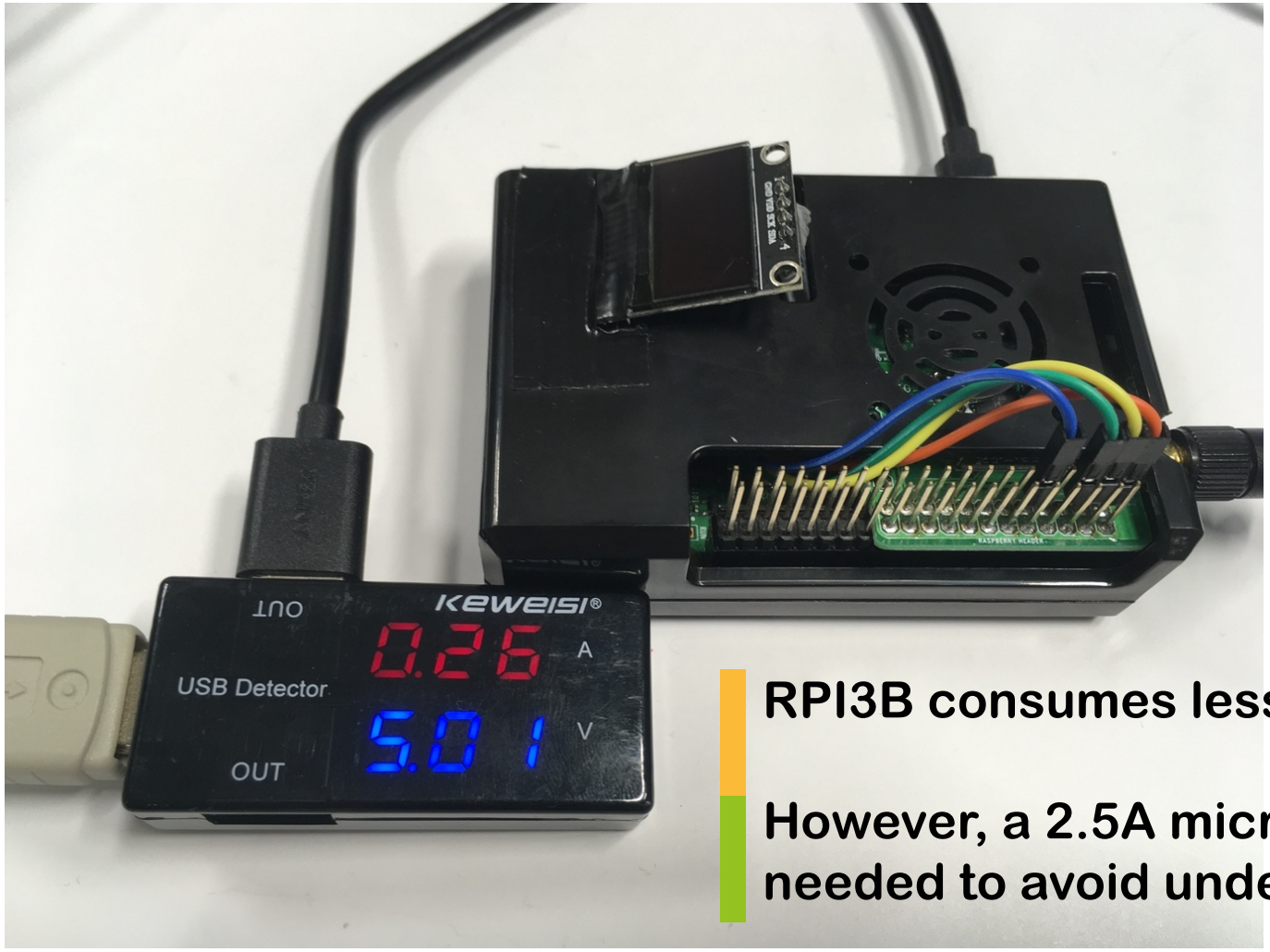
WaziGate power consumption



RPI3B consumes less than 300mA

However, a 2.5A micro USB charger is needed to avoid undervoltage

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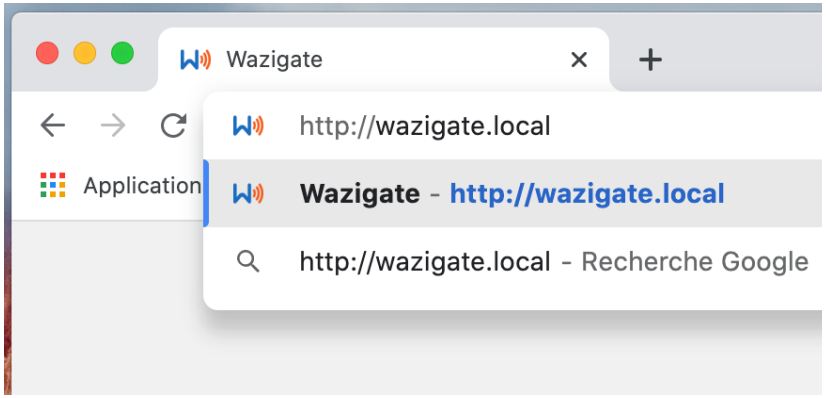
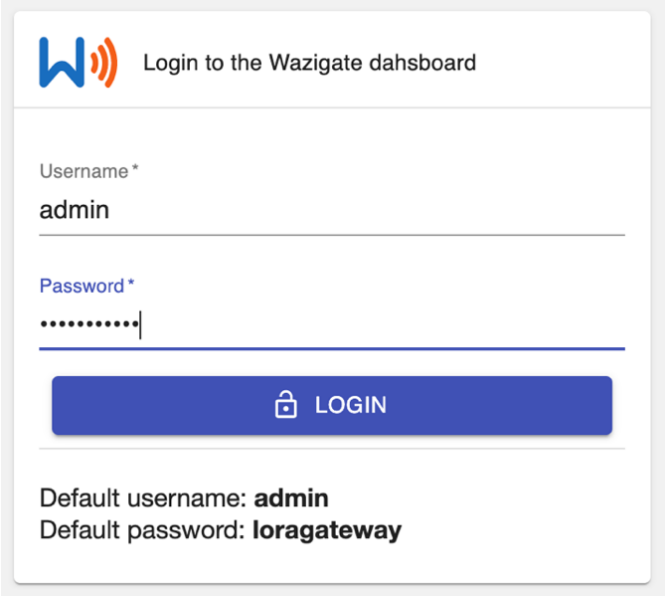
Accessing your WaziGate

- Power the WaziGate, no Internet is required, wait 3-4mins (boot)
- Connect to WAZIGATE_XXXXXXXXXXXX WiFi network
  - default WiFi password is loragateway
- Open web navigator. Go to http://wazigate.local or http://10.42.0.1



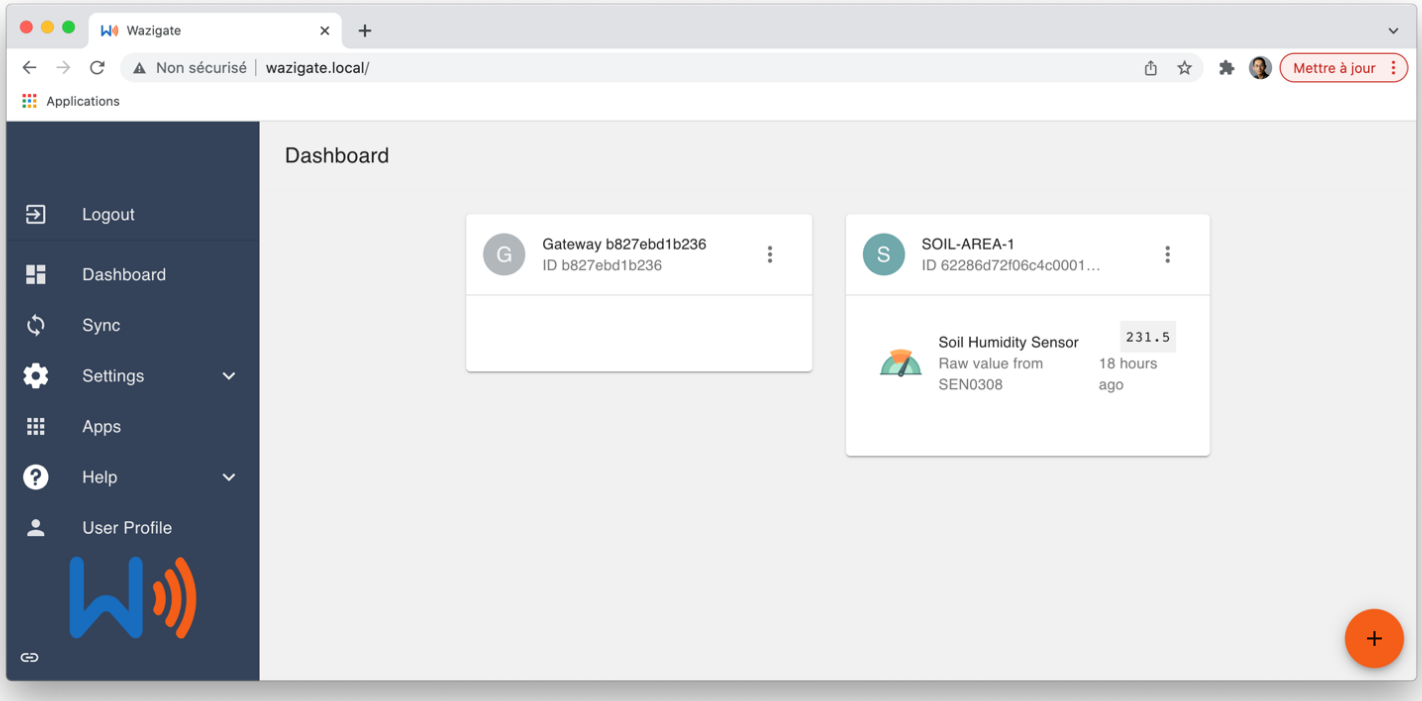
http://wazigate.local

http://10.42.0.1



- Use default login to connect
  - User: admin
  - Password: loragateway

WaziGate dashboard

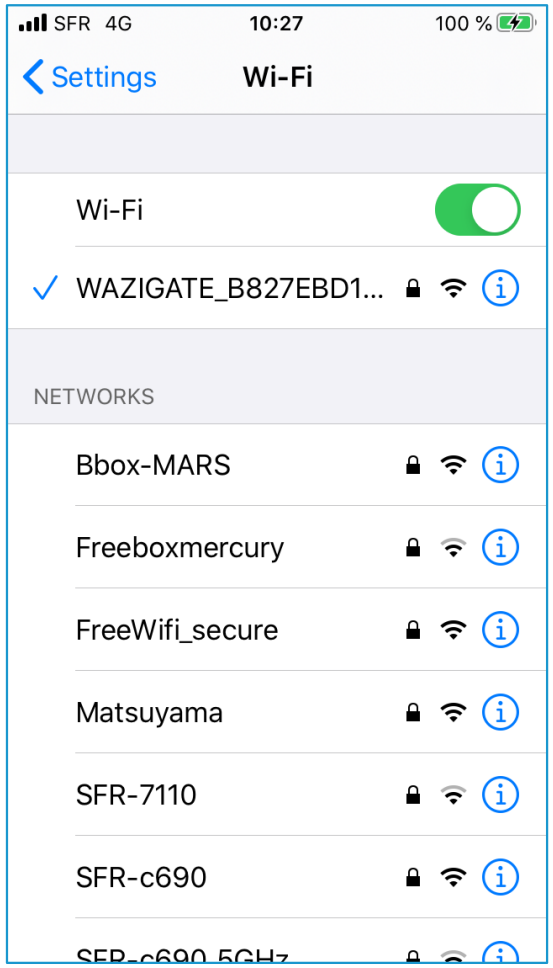


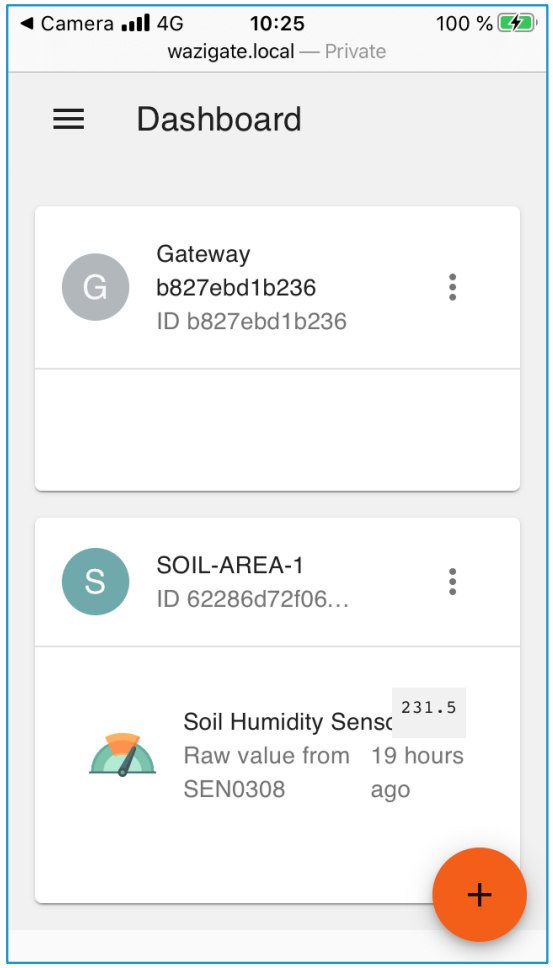
Pre-configured soil sensor device (SOIL-AREA-1) with a capacitive SEN0308 soil humidity sensor ready to receive data

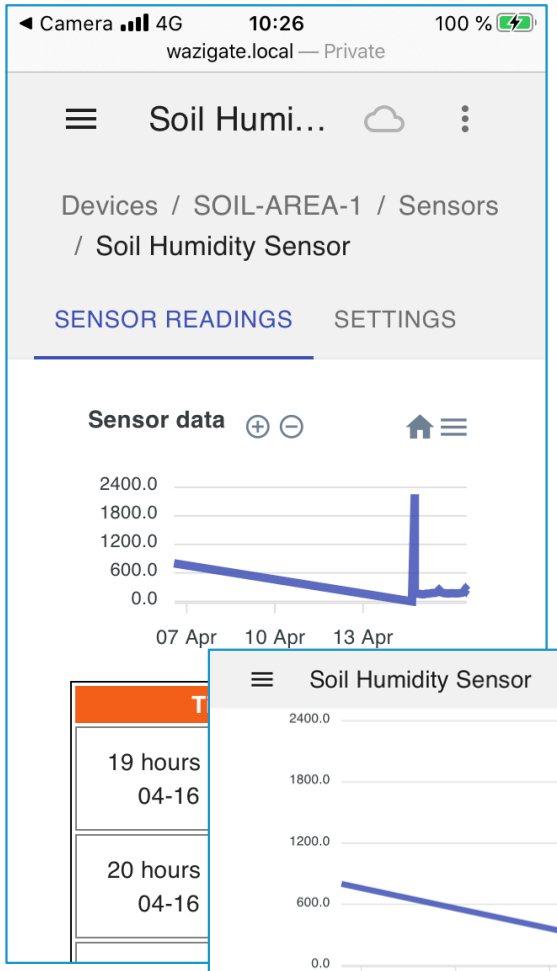
The last received value is displayed in the device block

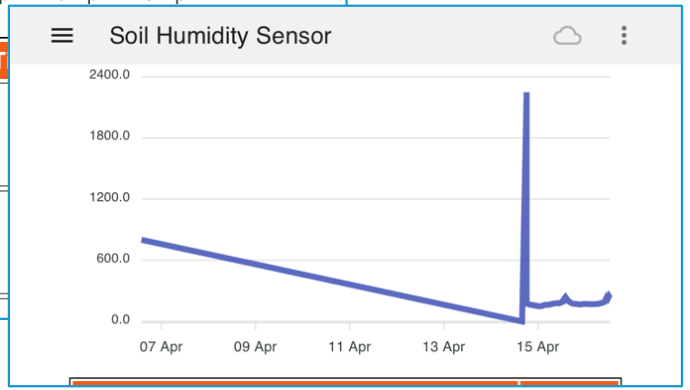
Display sensor data

All these steps with a smartphone

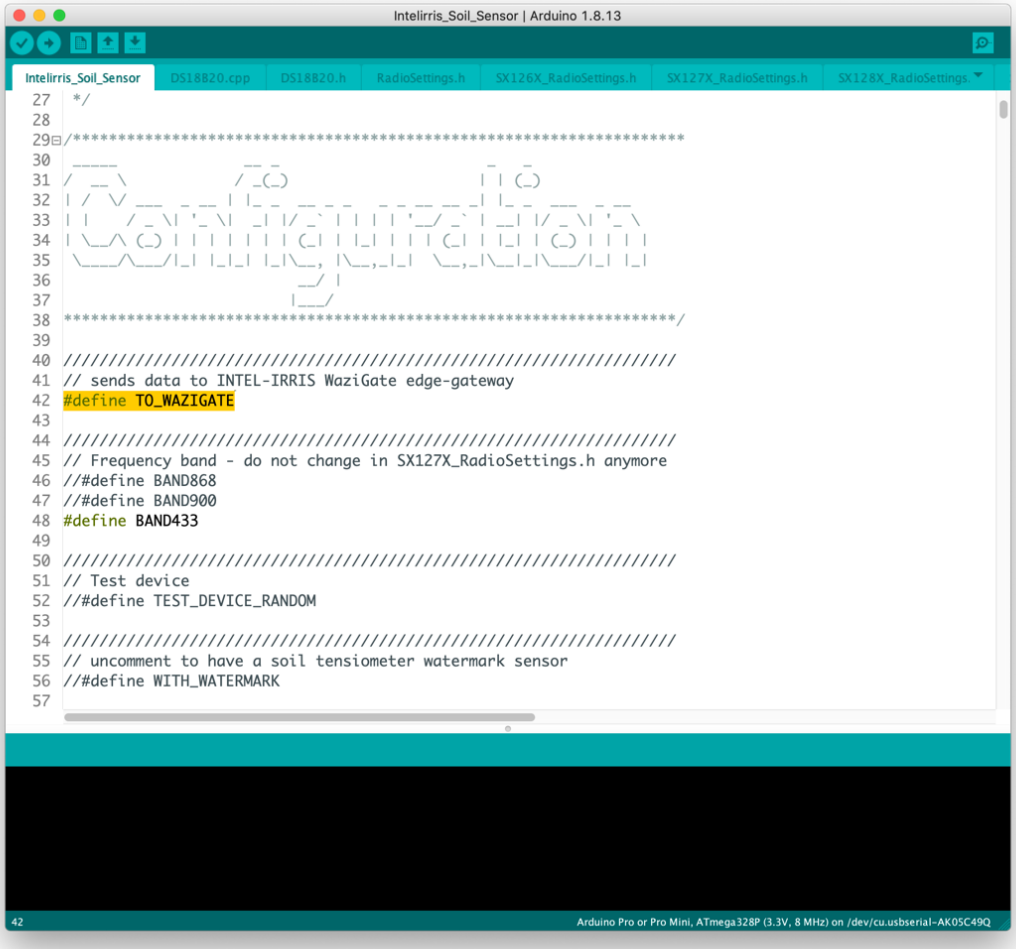








Configure soil device for WaziGate



Be sure that

`#define TO_WAZIGATE`

is uncommented

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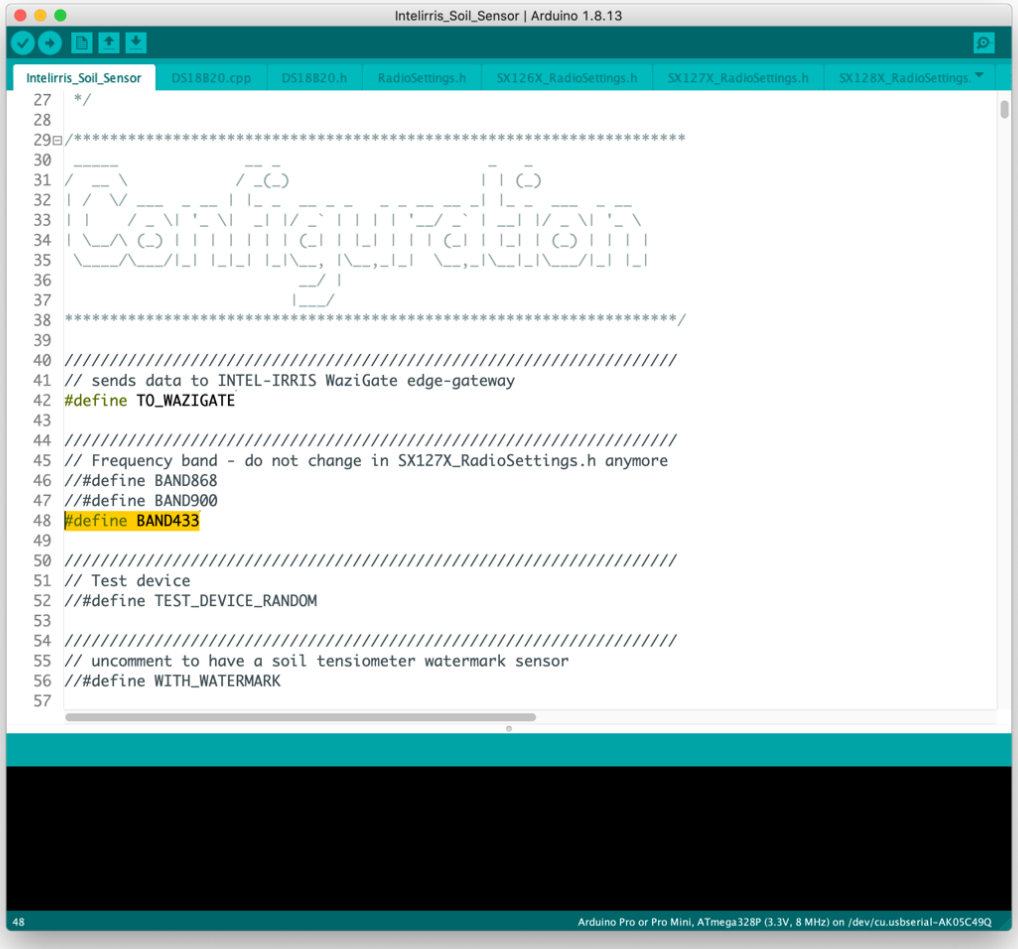
Configuring for EU433 band



If you use the EU433 band

make sure that

`#define BAND433`

is the only uncommented band option

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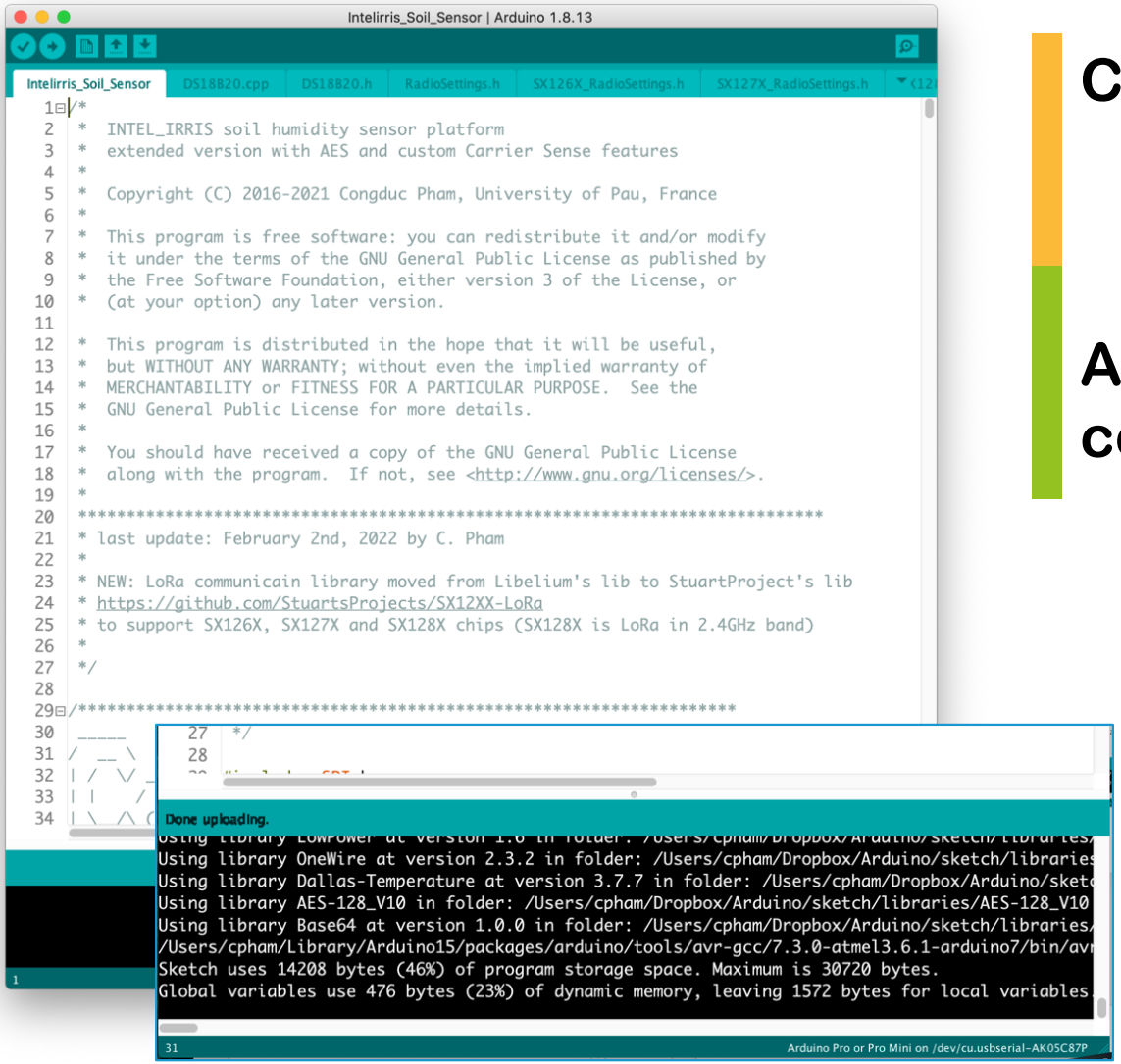
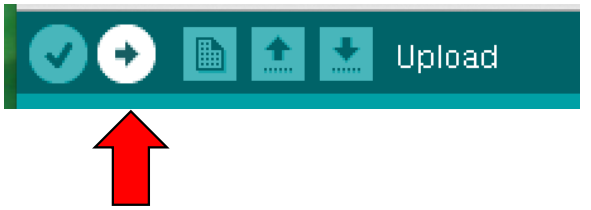
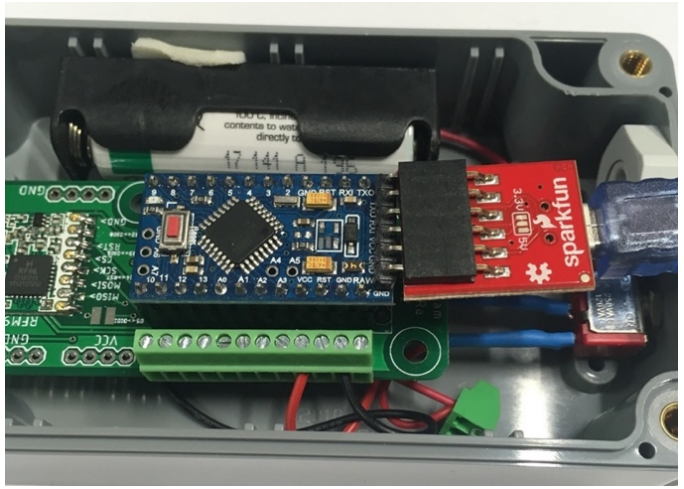
Uploading to your board



Click on the "upload" button



And wait until upload is completed



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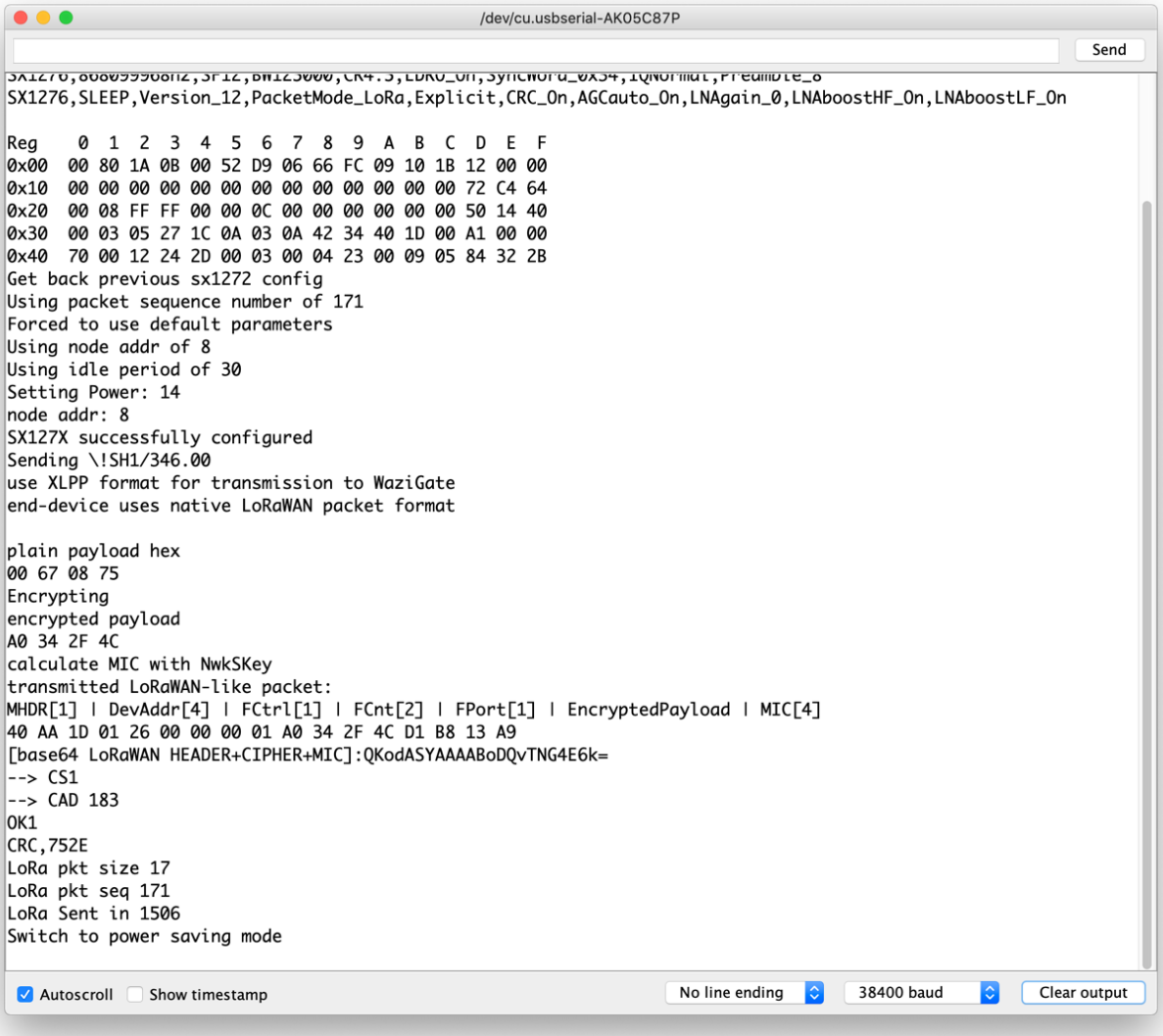
Checking that device is operational



- Open serial monitor
- Set baud rate to 38400
- See output from board
- Check that transmission is OK

Transmission to WaziGate

Parameters for
INTEL-IRRIS WaziGate

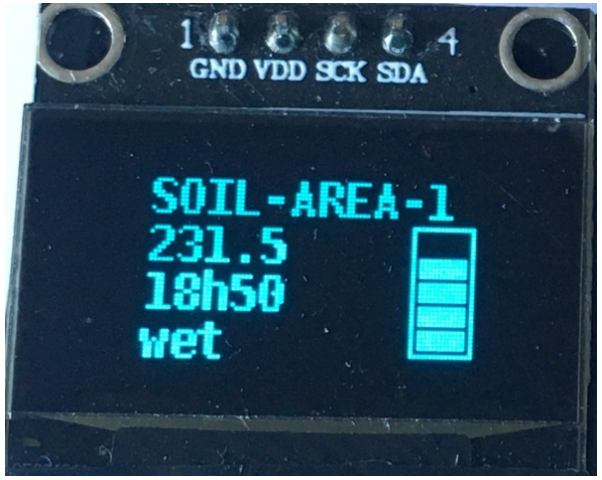
LoRaWAN

SF12BW125
868.1MHz | 433.175MHz
Node id is 26011DAA
1 msg/60mins
1 sensor
XLPP data

This dedicated video will show all these steps, from connecting the SEN0308 to testing transmission to the WaziGate
Video n°4: https://youtu.be/j-1Nk0tv0xM

With the OLED screen

- With a small .96" OLED screen, information summary is displayed for the end-user: the device name, the time of last received data, the sensor raw value and the soil condition
- The main screen is displayed for 6s every 30s. Then a screen saver display will show a shorter version of these information with a 5-bar visual
- 5 bars: very wet | 4 bars: wet
- 3 bars: wet-dry | 2 bars: dry-wet
- 1 bar: dry | 0 bar: very dry



QR code for connecting to WiFi

- The WaziGate WiFi is WAZIGATE_XXXXXXXXXXXX where XXXXXXXXXXXX is the MAC address of the Raspberry
- For instance WAZIGATE_B827EBD1B236
- With the OLED, a QR code for joining the WiFi network is generated dynamically at boot time and displayed for 10s before the main screen so that users can automatically join with a smartphone
- Then, users can scan the static QR code on the WaziGate sticker to connect to the WaziGate's dashboard or the INTEL-IRRIS WaziApp

WAZIGATE_B827EBD1B236

WAZIGATE_DCA6325C2A7A

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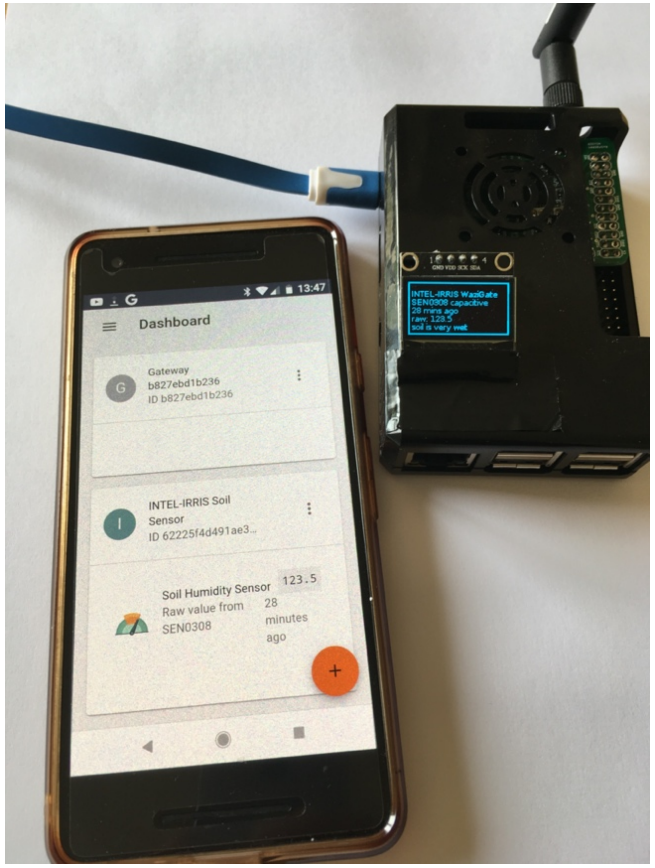
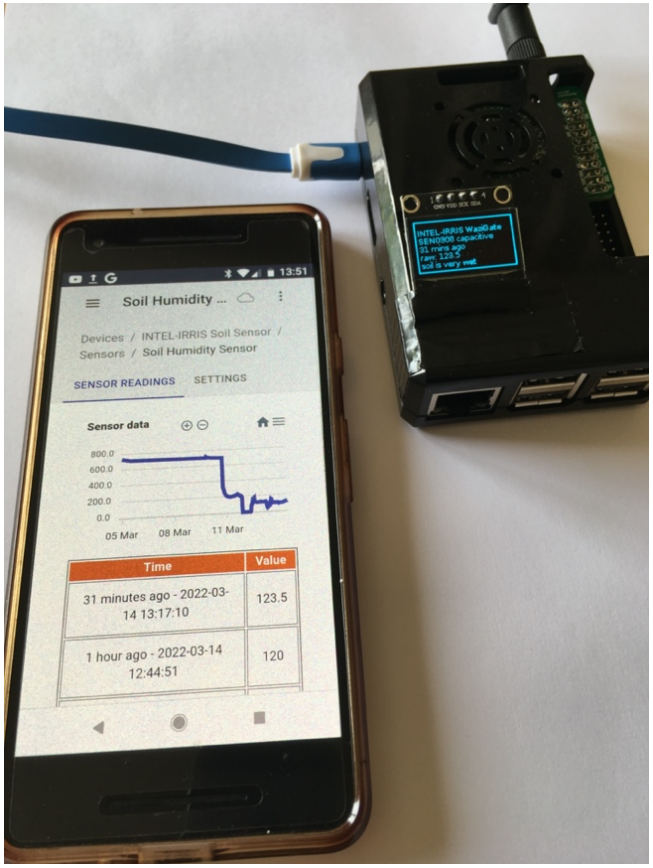
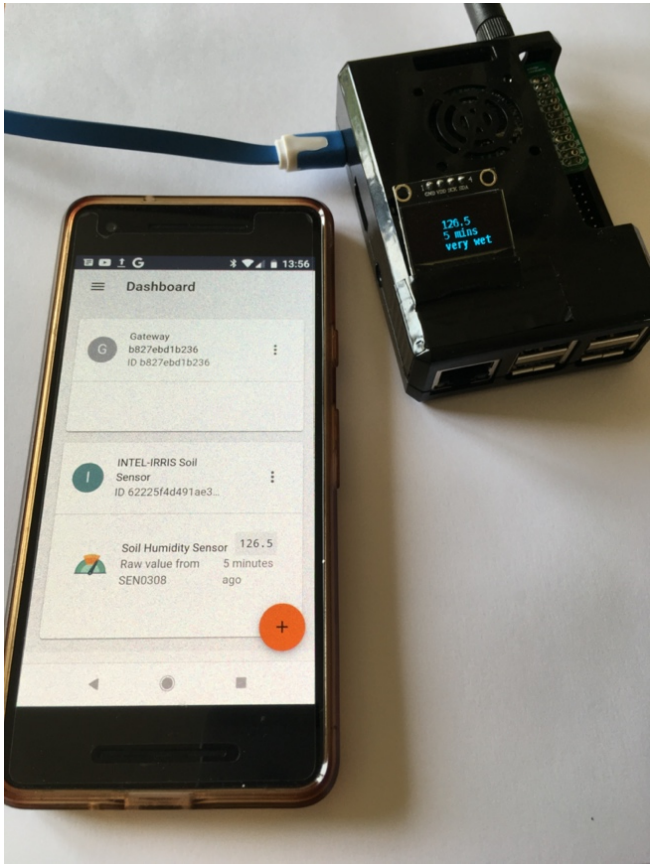
WaziGate User Interface







The WaziGate provides the simple OLED interface but also more advanced features through the WaziGate dashboard and embedded application interface (WaziApps)

A dedicated INTEL-IRRIS Irrigation WaziApps is currently being developed

Advanced configuration

Synching your WaziGate to the cloud

- If you want to sync your WaziGate to the Waziup Cloud, look at this tutorial page
  - https://www.waziup.io/documentation/wazigate/v2/install/#registration-with-the-cloud
- You will need an account on Waziup Cloud dashboard
  - If you don't have one, you need to create one first
  - https://dashboard.waziup.io/
- Then, just activate sync on your WaziGate which needs to be connected to Internet