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 3: the INTEL-IRRIS starter-kit

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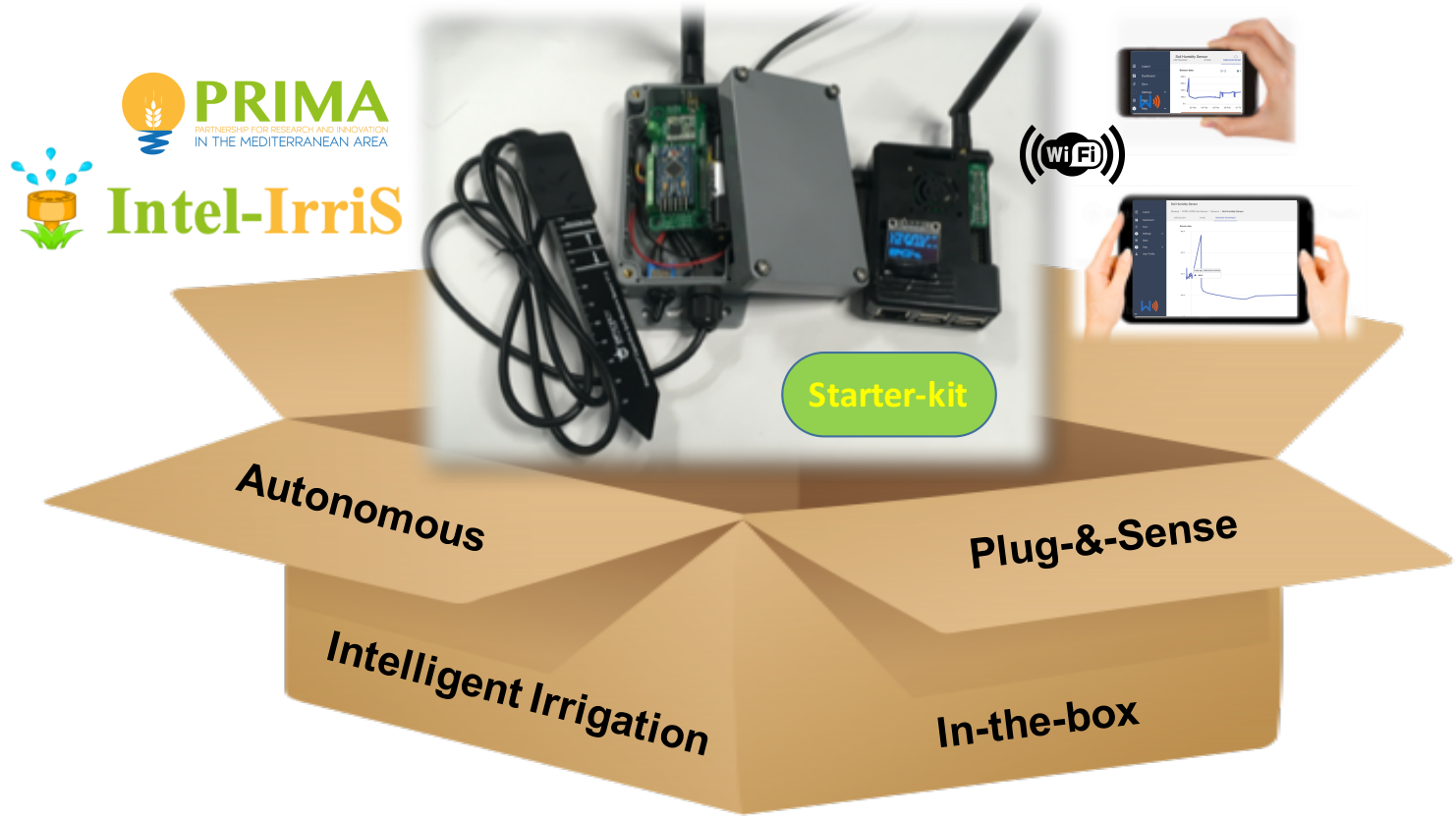
UNIVERSITÉ DE PAU ET DES PAYS DE L'ADOUR

LIUPPA

WAZIup
IoT – from idea to reality
WAZIhub

INTEL-IRRIS starter-kit

- "Intelligent Irrigation in-the-box", "plug-&-sense"



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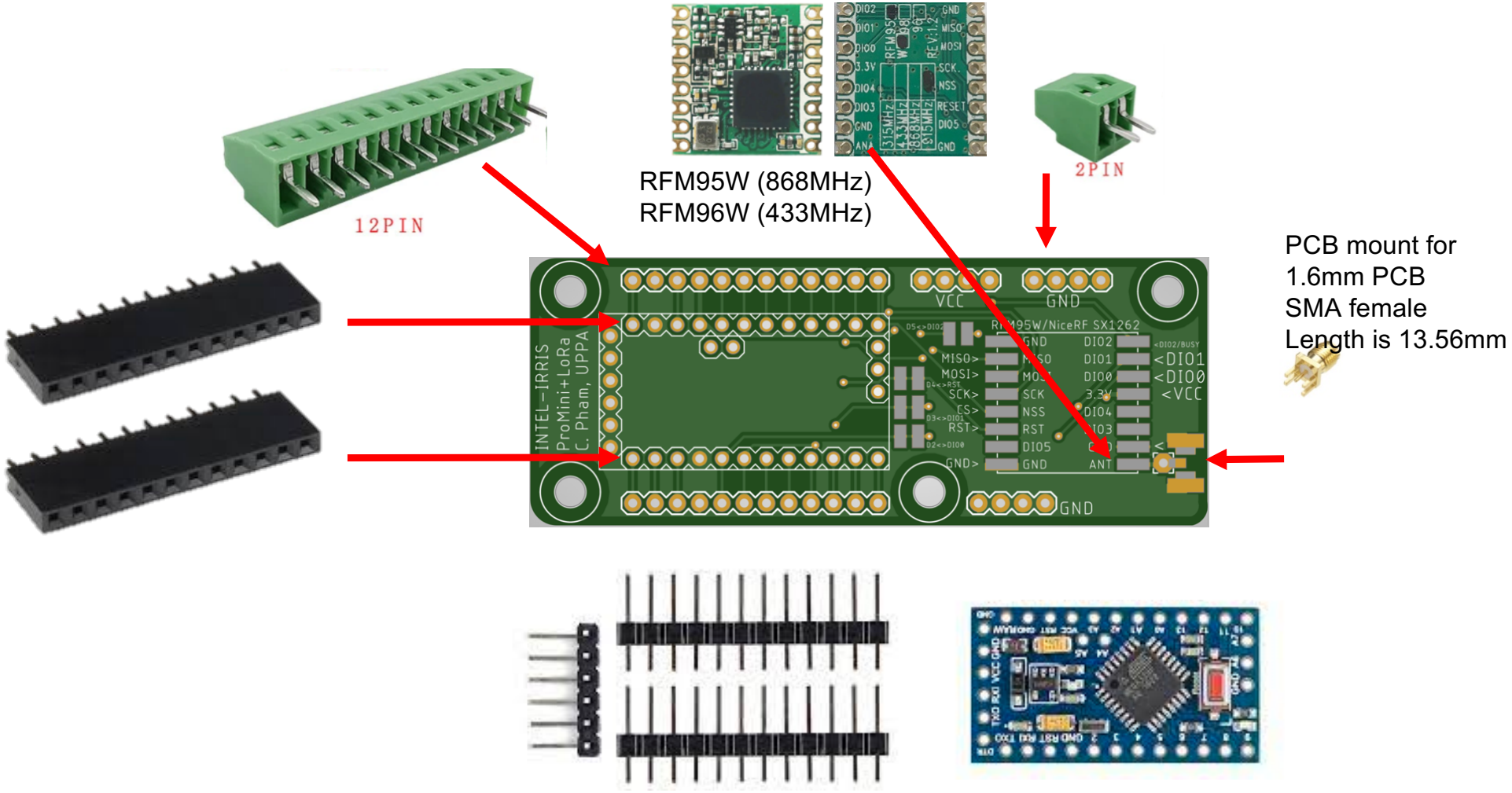
Preparing the starter-kits at UPPA

This non-technical video shows the preparation of the kits
https://youtu.be/5nznRcIoe40

Soil sensor: electronic parts

starter-kit version



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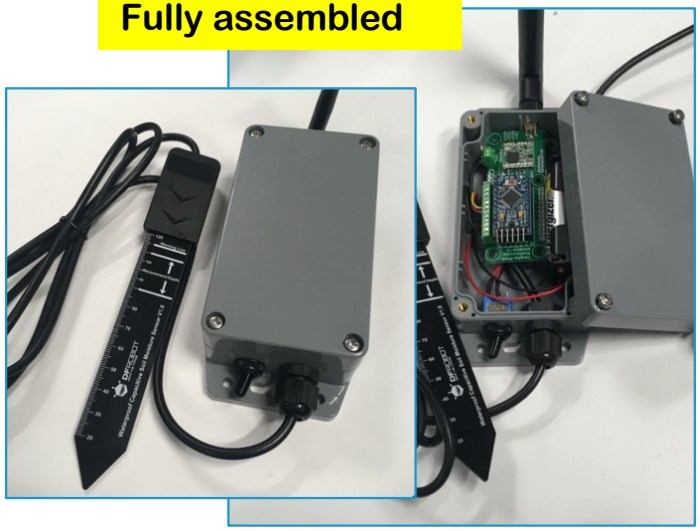
Soil sensor device

Fully assembled

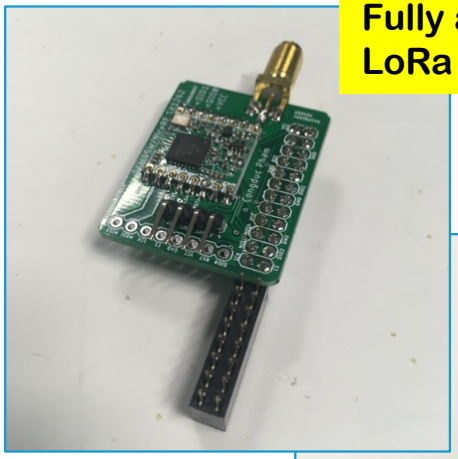


Packaging in enclosure

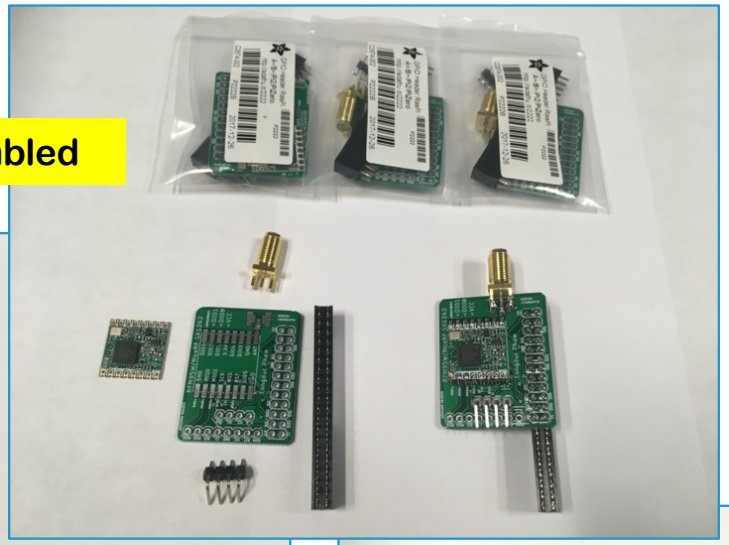
To be assembled

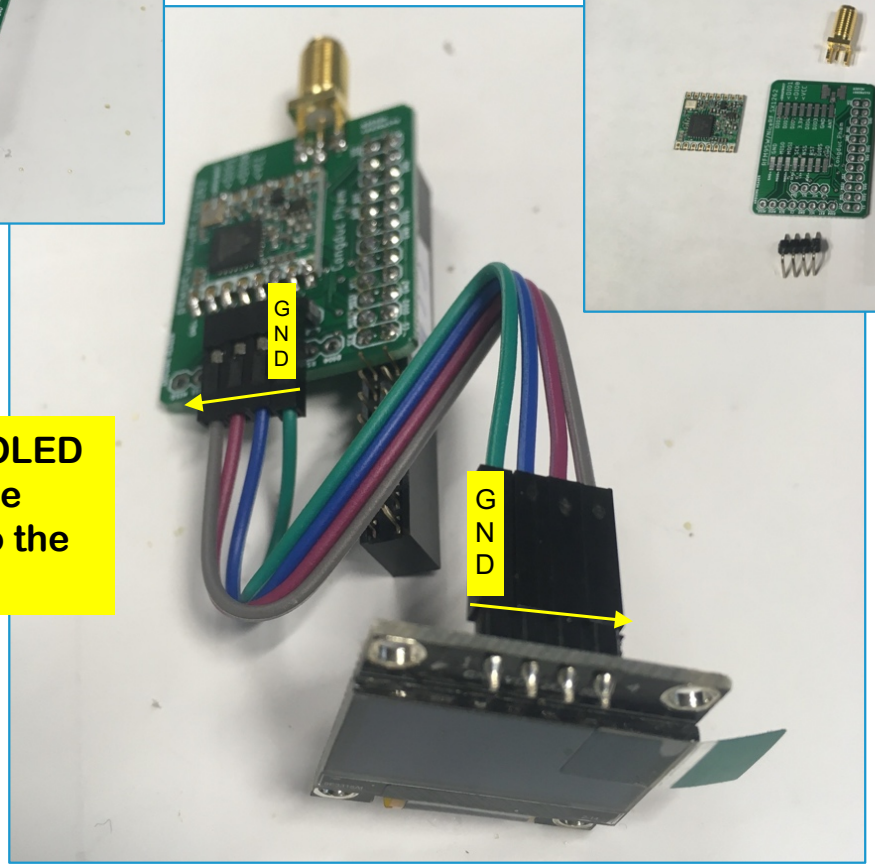
Gateway (WaziGate)

Fully assembled LoRa radio hat



To be assembled





An optional OLED screen can be connected to the radio hat

First round of starter-kits

- 1 fully assembled & configured soil sensor device
- NEED TO INSTALL 2-AA BATTERIES
- 4 soil sensor devices to be assembled & configured
- 1 fully assembled radio LoRa hat
- 4 radio LoRa hats to be assembled
- INTEL-IRRIS WaziGate image to be downloaded & flashed
- **IMPORTANT**
  - 1 starter-kit= 1 soil sensor + 1 INTEL-IRRIS WaziGate gateway
  - 1 starter-kit / farm to be deployed and tested
  - The WaziGate is only pre-configured for 1 soil sensor / farm
  - If there are several soil sensors in a farm, see advanced configuration

Assembling starter-kit

Algeria (UORAN1), Morocco (ENSA Safi)

- Soil sensor device
  - Tutorial slides on building & assembling the outdoor LoRa IoT soil sensor device
  - Video n°1. YouTube tutorial video showing how to build the IoT microcontroller platform for the LoRa IoT soil sensor device
  - Video n°2. YouTube tutorial video showing how to build the outdoor LoRa IoT soil sensor device
  - Video n°3. YouTube tutorial video showing how to wire the SEN0308 capacitive sensor
- INTEL-IRRIS WaziGate
  - Tutorial slides on preparing the INTEL-IRRIS WaziGate IoT gateway
  - Video n°4. YouTube tutorial video demonstrating the INTEL-IRRIS soil sensor device & WaziGate framework

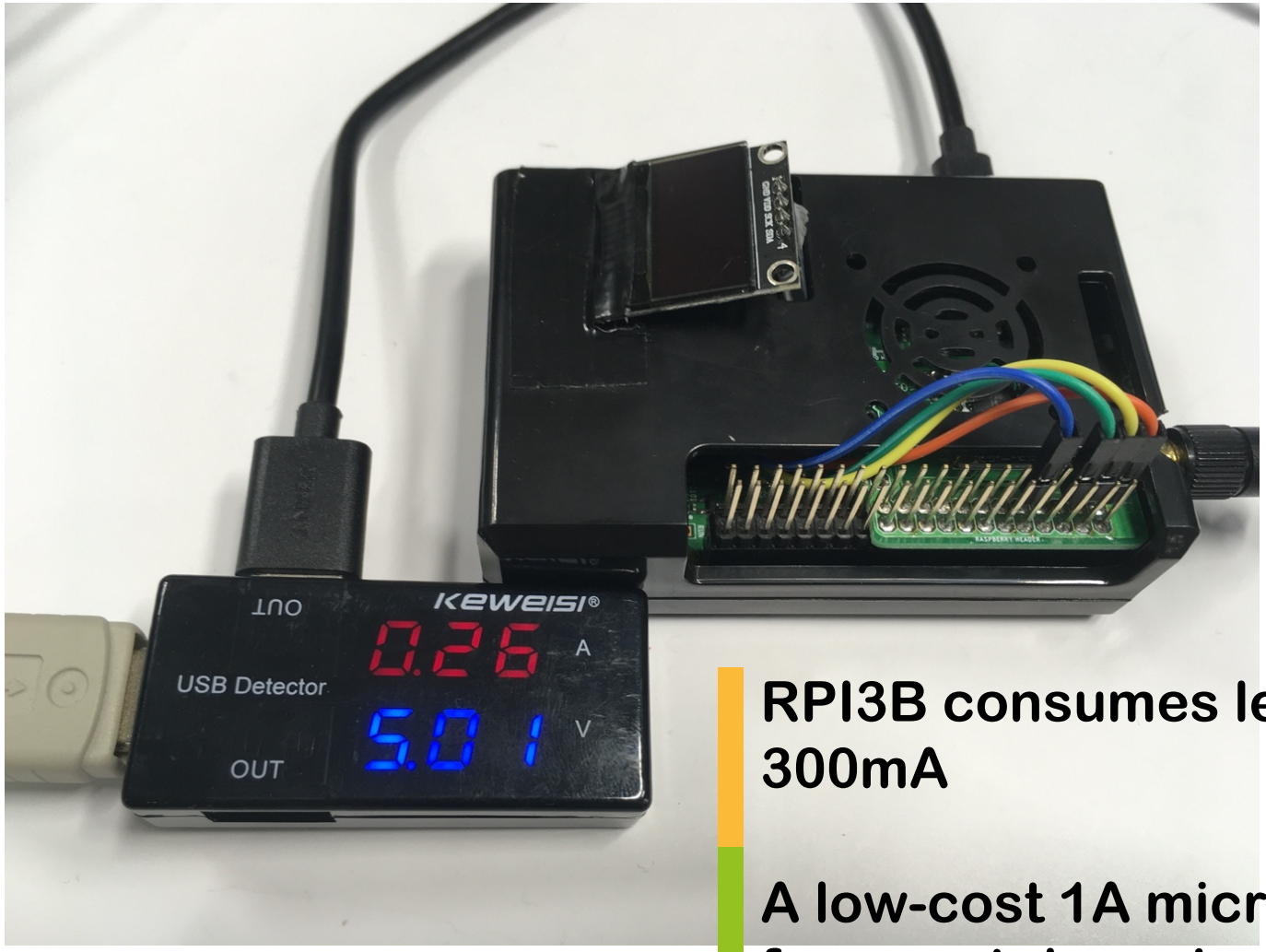
Preparing Wazigate

- Plug the LoRa radio hat on the Raspberry, screw in the antenna



- Download SD card image, select EU433 (Algeria, Morocco) or EU868 (France)
- Flash SD card: Video n°4 at t=124s, then insert SD card

Powering the WaziGate

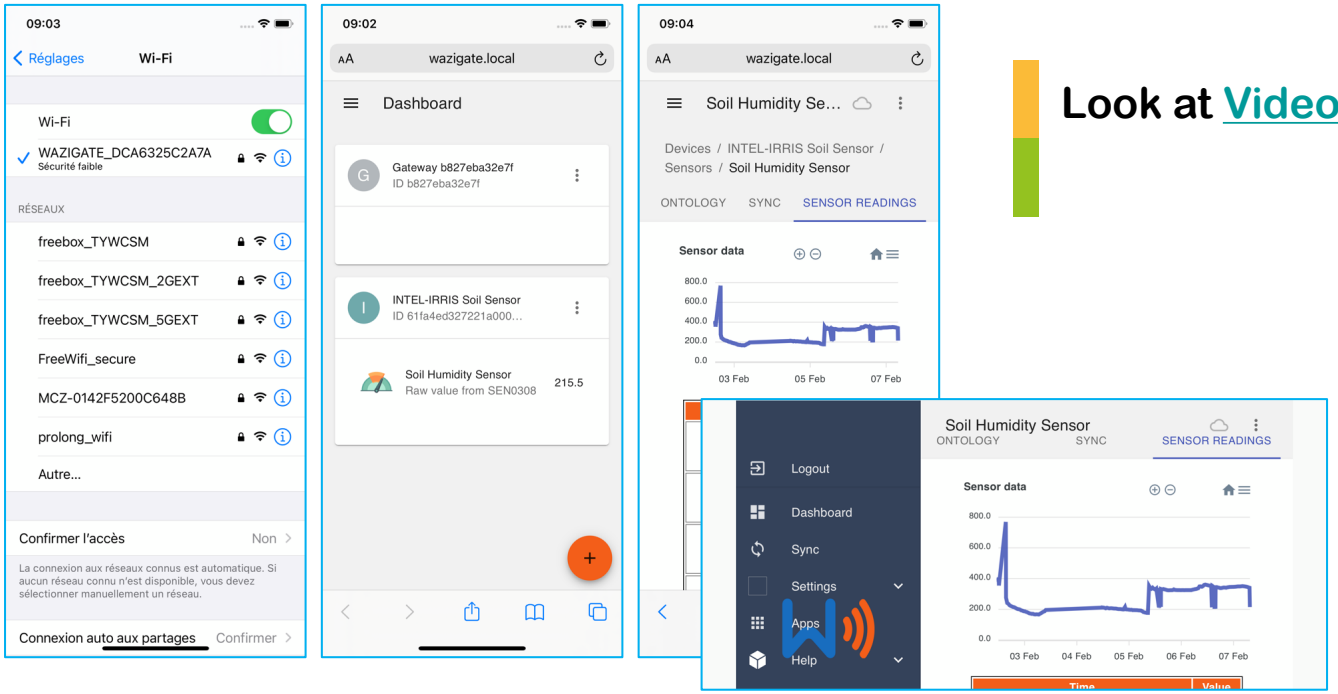


RPI3B consumes less than 300mA

A low-cost 1A micro USB charger for smartphone is suitable

Checking WaziGate

- Power the WaziGate, no Internet is required
- Wait 3-4mins for the gateway to boot
- Connect to the WaziGate's WiFi with a smartphone
- Open http://wazigate.local or http://10.42.0.1



Look at Video n°4 at t=239s

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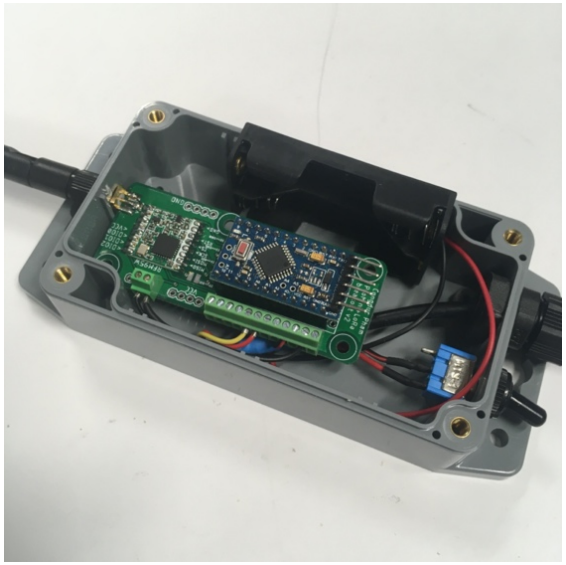
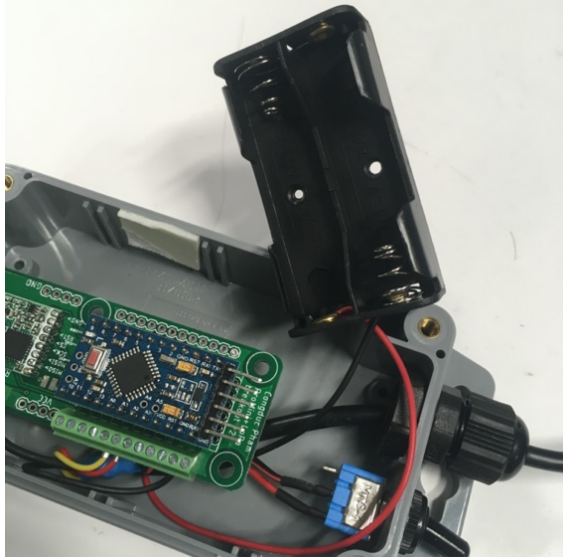
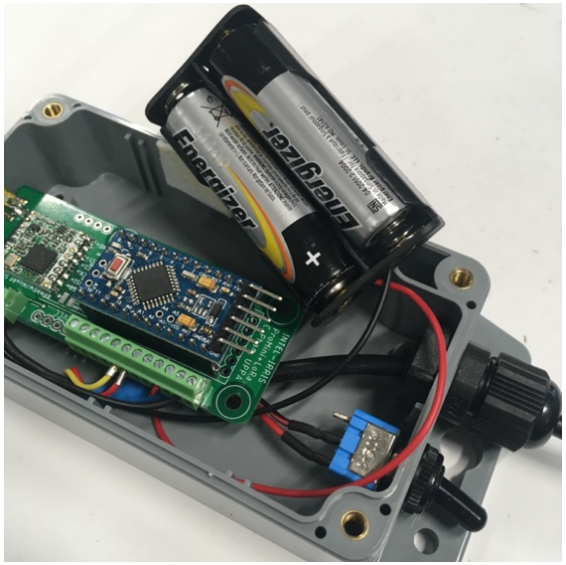
Preparing soil sensor device
install batteries

- Remove cover & install 2-AA batteries in battery holder
- Best way is to detach the battery holder

- Put back cover and be sure to tighten the cover
- Procedure is the same if you need to replace the batteries

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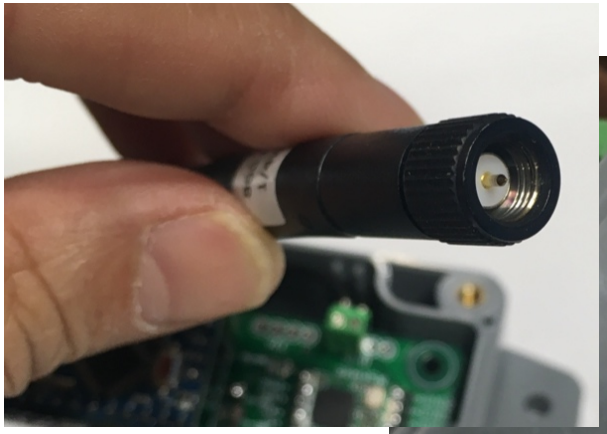
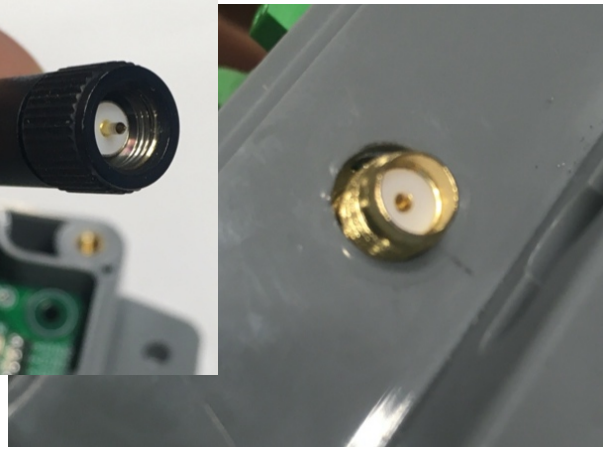
Take good AA batteries

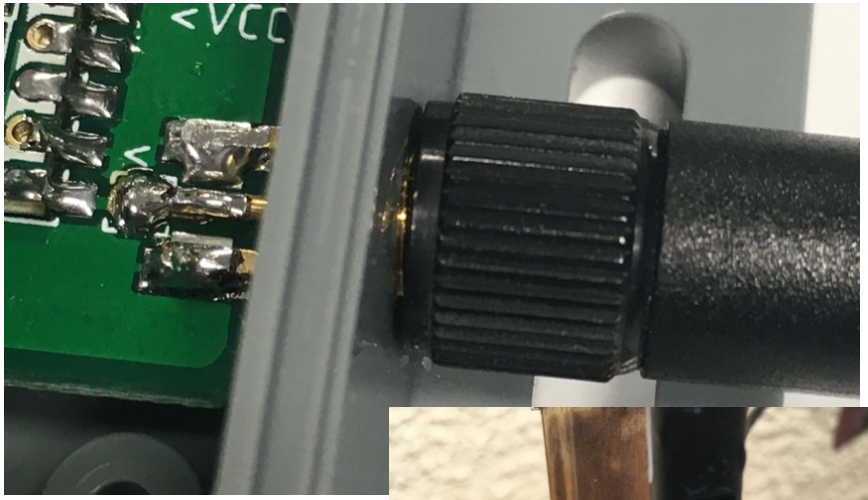
- Install new & high-grade alkaline AA batteries to allow for at least 2 years of autonomy
- Take a well-known brand

Preparing soil sensor device

screw in the antenna



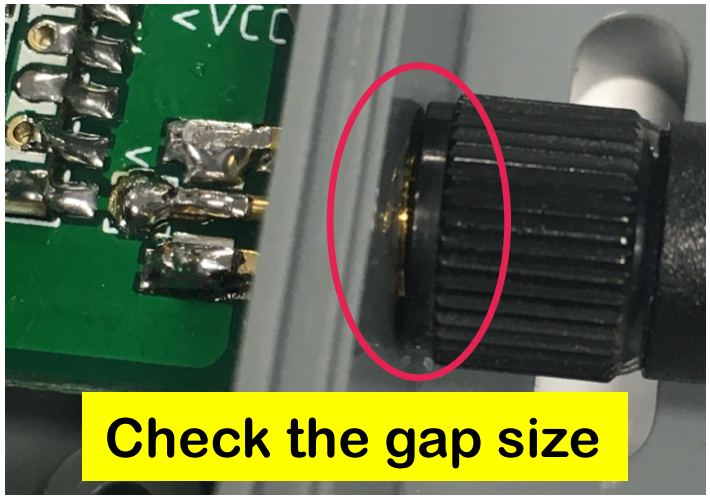


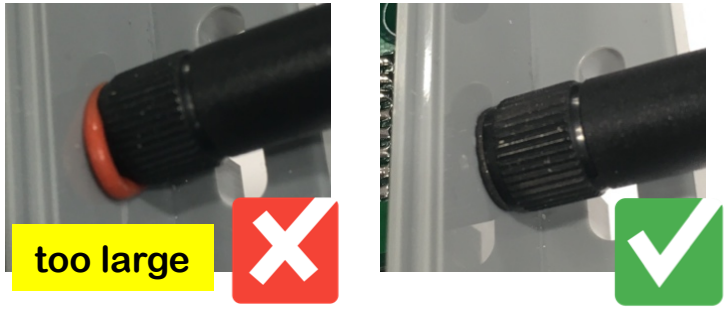


Be sure to connect the matching antenna
Here, SMA female with SMA male antenna
Need to screw the antenna in all the way

The antenna junction is critical because this is where rain water can come in

The antenna junction





Even when the antenna is screwed in all the way, there might still be a gap

Even with no apparent gap, it is necessary to waterproof the junction

Take an o-ring for that purpose, but do not take it too thick or too large!

Too thick: the antenna will not be screwed in all the way!

There are o-ring for SMA connector but the gap size is an indication

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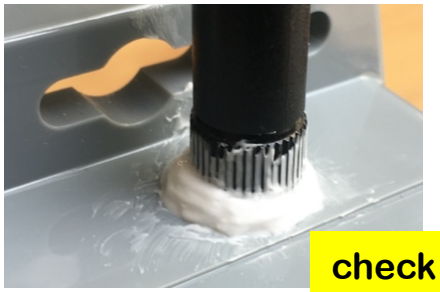
Do not have or can not use o-ring?

Maybe the gap is too big? Use silicon joint sealant

First, screw in the antenna <u>all the way</u>

Put small amount of silicon around the antenna junction (use a flat screw driver or other flat tool)

Use a <u>wet</u> toothpick to finish and clean the silicon all around the antenna junction



check especially the back side

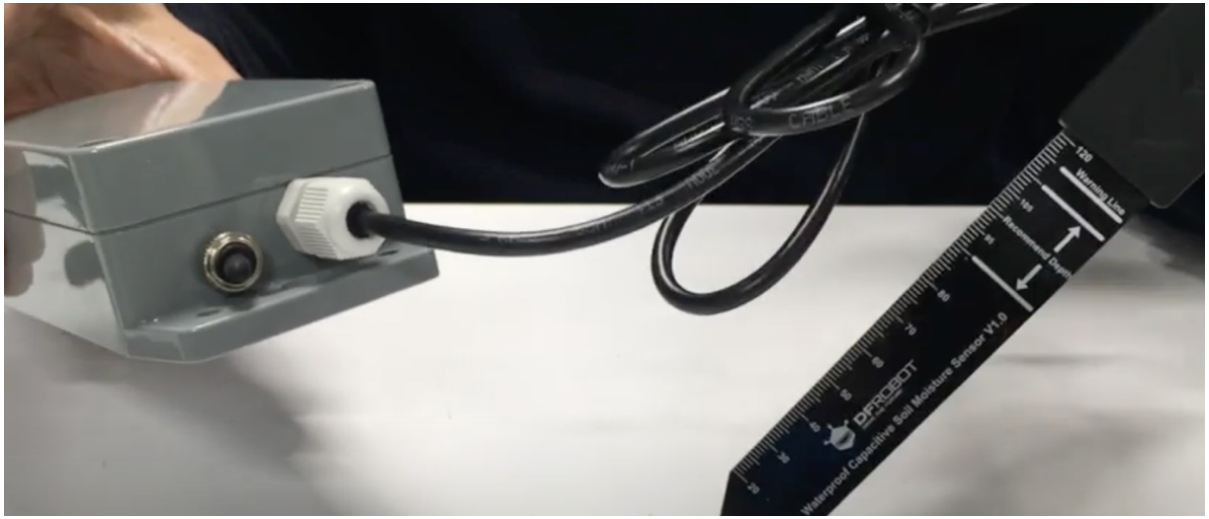
Even with o-ring, if is good to add silicon!

Never transmit without antenna

- NEVER, NEVER transmit without an antenna
- Doing so can damage the radio module
- If your board is already connected to the radio module and you need to flash the board, connect the antenna
- If you need to update the existing code and your device already run a code that transmit data, connect the antenna
- It is safer when programming the device to remove the Arduino board from the female header and program it disconnected from the radio module
- If you deploy a device, make sure that the antenna is correctly connected before powering on the device and realizing any transmission test

Testing transmission to WaziGate

- Test with the fully assembled & configured soil sensor device
  - Check that antenna is connected
  - Toggle switch on the soil sensor device to get data transmission
  - Check reception of data on WaziGate's dashboard



Look at Video n°4 at t=331s

Transmission to WaziGate

Parameters for
WaziGate (default in red)

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

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Configure soil device for WaziGate

Be sure that

`#define TO_WAZIGATE`

is uncommented

Configuring for EU433 band

If you use the EU433 band

Edit SX127X_RadioSettings.h

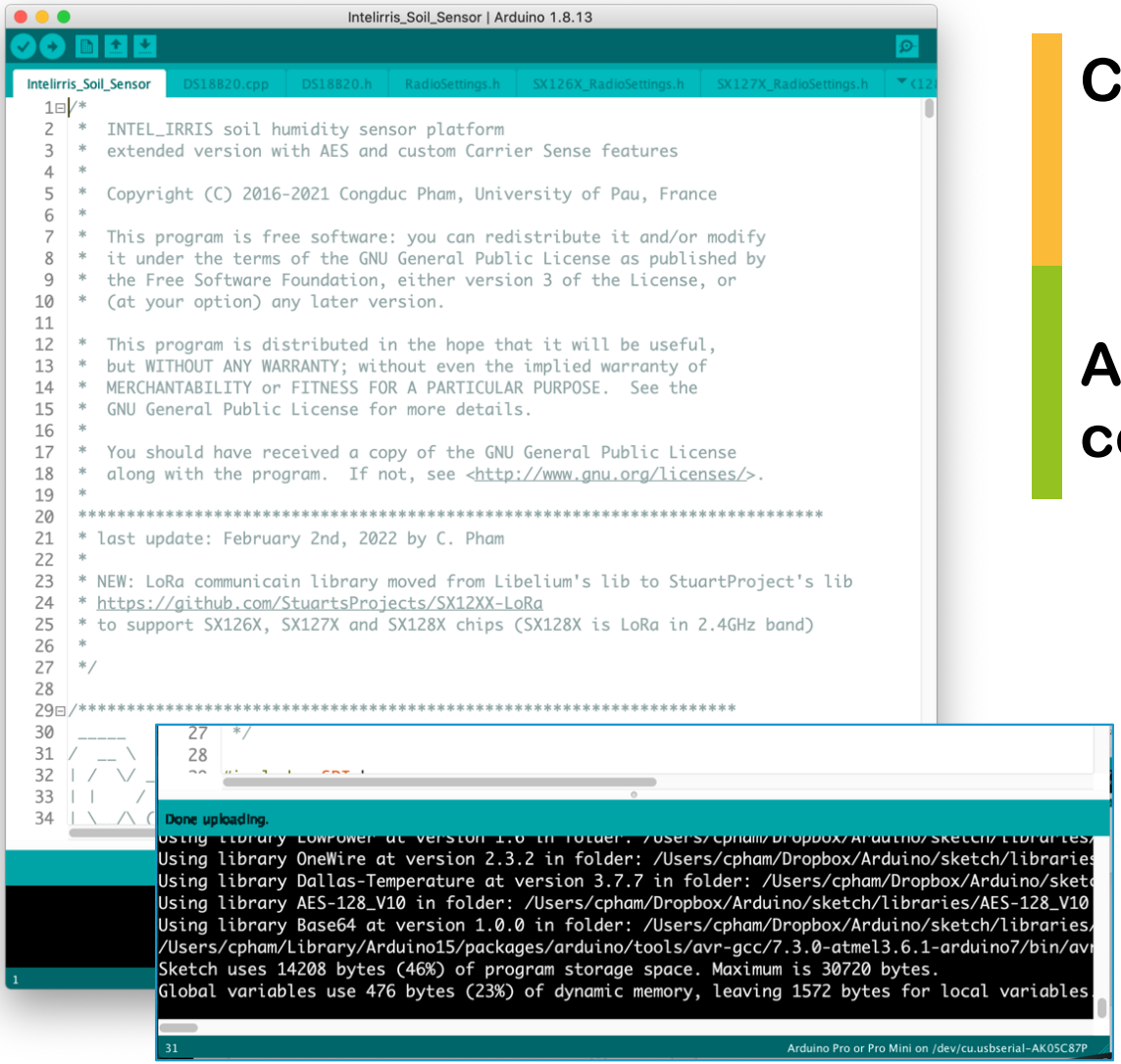
comment

```
//#define BAND868
```

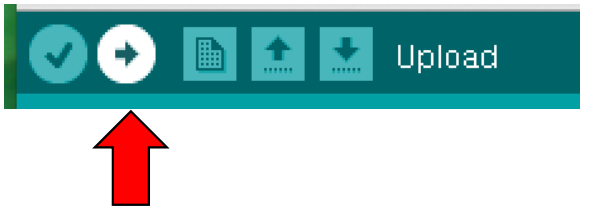
and uncommented

```
#define BAND433
```

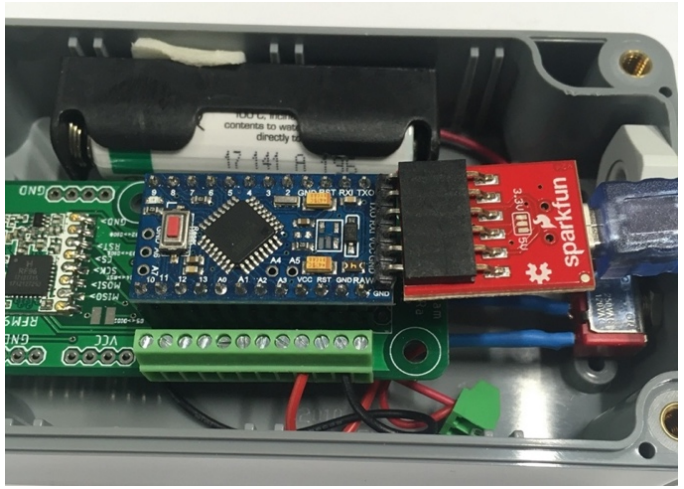
Uploading to your board



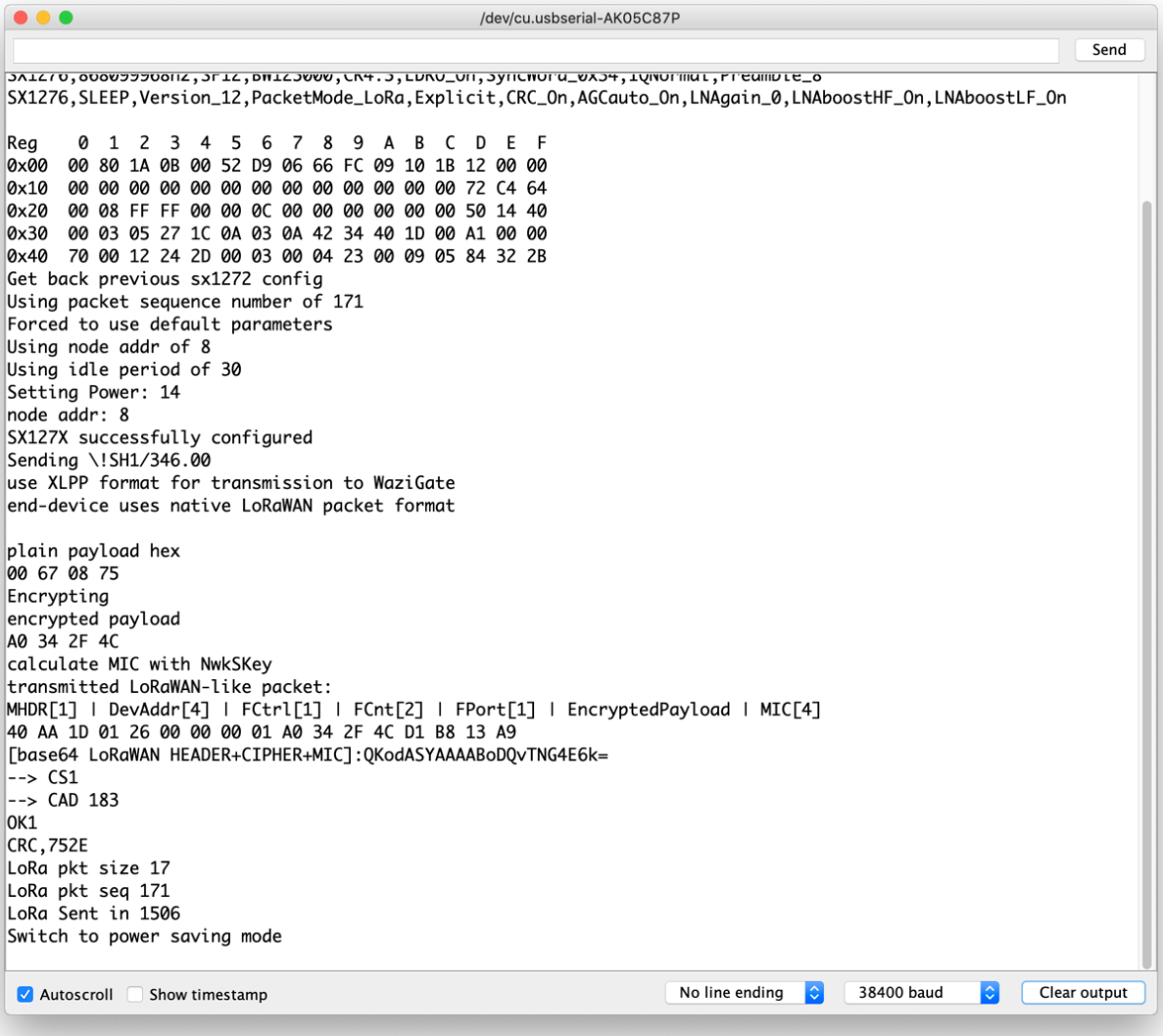
Click on the "upload" button



And wait until upload is completed



Checking that device is operational



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

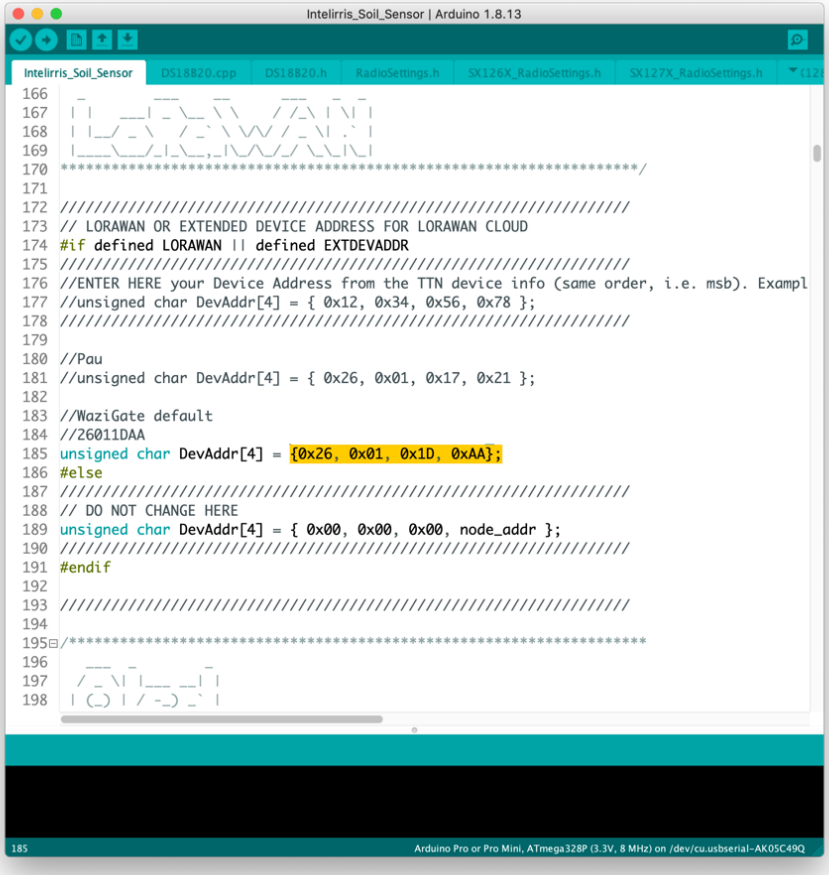
Deploying the starter-kit

- Calibrate the soil sensor device
  - See dedicated slides/videos
- Install the soil sensor device in the field
  - See dedicated slides/videos
- Install the WaziGate in the farmer's office/home/premise
  - Just power the WaziGate, no Internet is required
  - Test access to WaziGate's dashboard with farmer's smarphone
- NEVER TRANSMIT WITHOUT AN ANTENNA
- Test correct data reception on WaziGate
  - Toggle switch on the soil sensor device to get data transmission
  - Check reception of data on WaziGate's dashboard

Advanced configuration

change soil sensor device address

- Only if you need to have several soil sensors in a single farm:
  change the device address in the soil sensor Arduino code



Default address is

```
{0x26, 0x01, 0x1D, 0xAA};
```

Just increase the last byte

```
{0x26, 0x01, 0x1D, 0xAB};
```

Compile and upload the code to the soil sensor device

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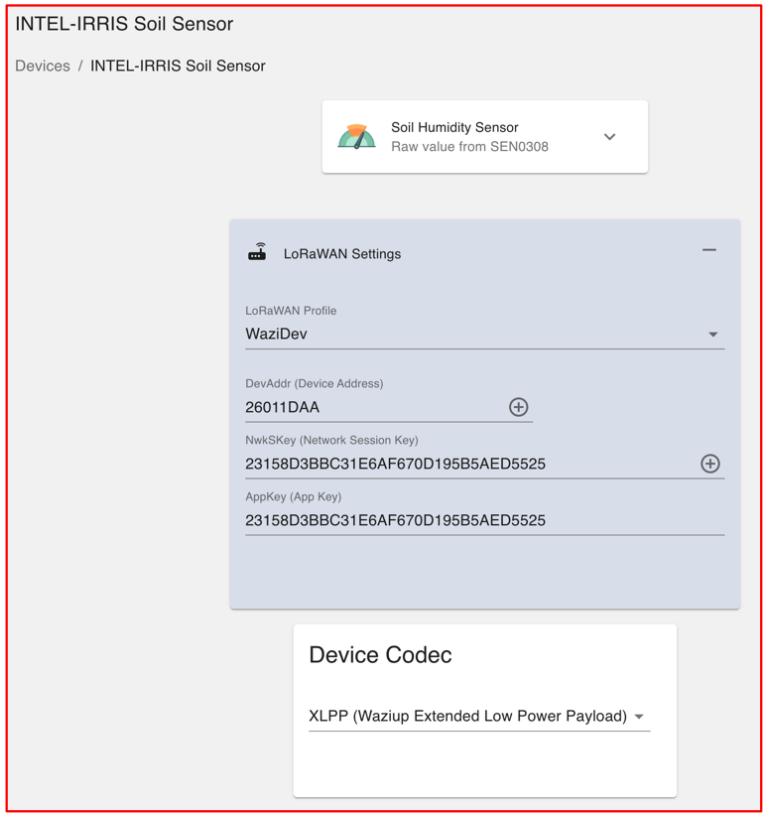
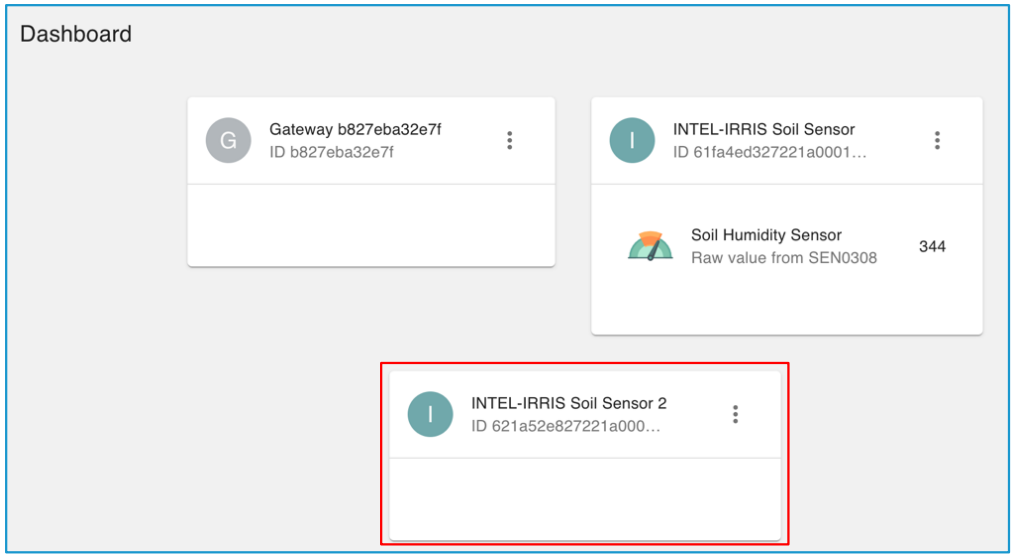
Advanced configuration

create a new sensor device on WaziGate

- Here is the configuration of the default soil sensor device
- Create a new sensor: INTEL-IRRIS Soil Sensor 2

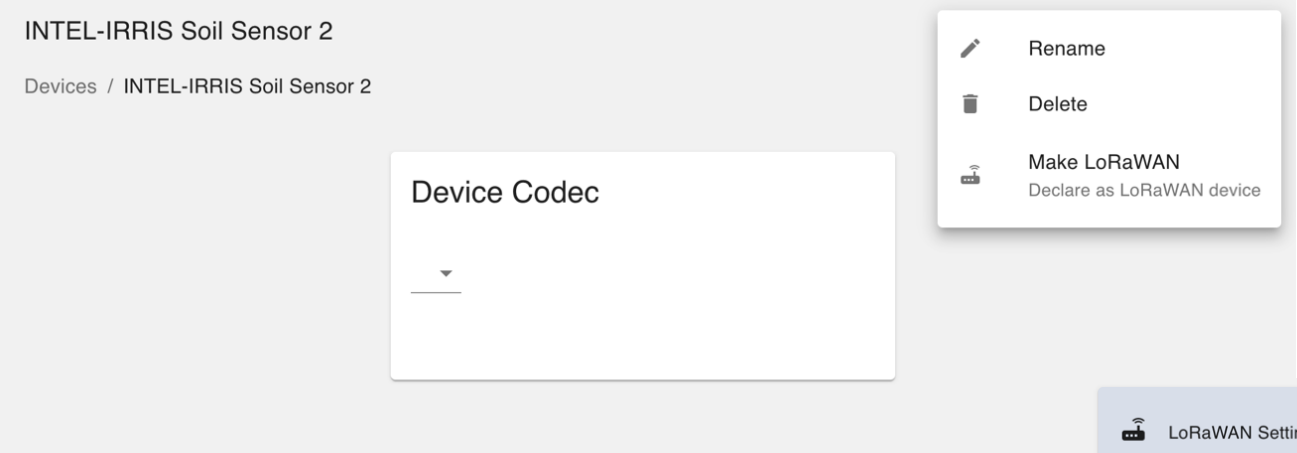




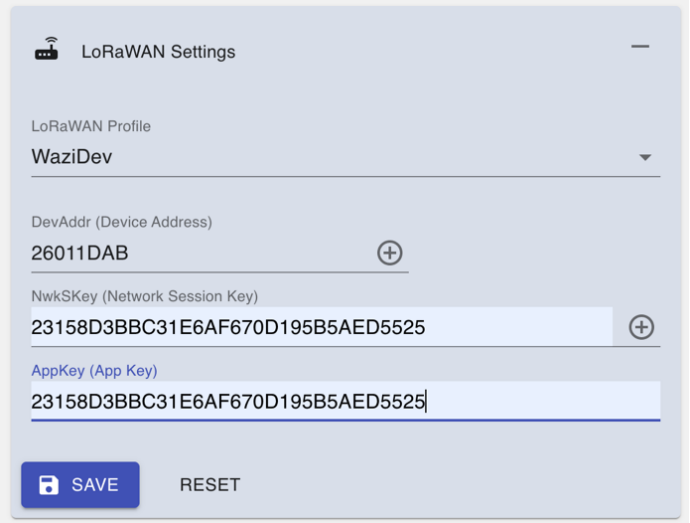
Advanced configuration

configure LoRaWAN parameters

- Select the new sensor and make it as LoRaWAN device



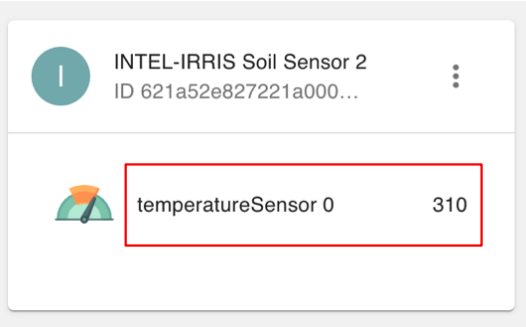
- Set the new address, matching the one of the Arduino code: 26011DAB
- keep same encryption keys
- Select XLPP as codec



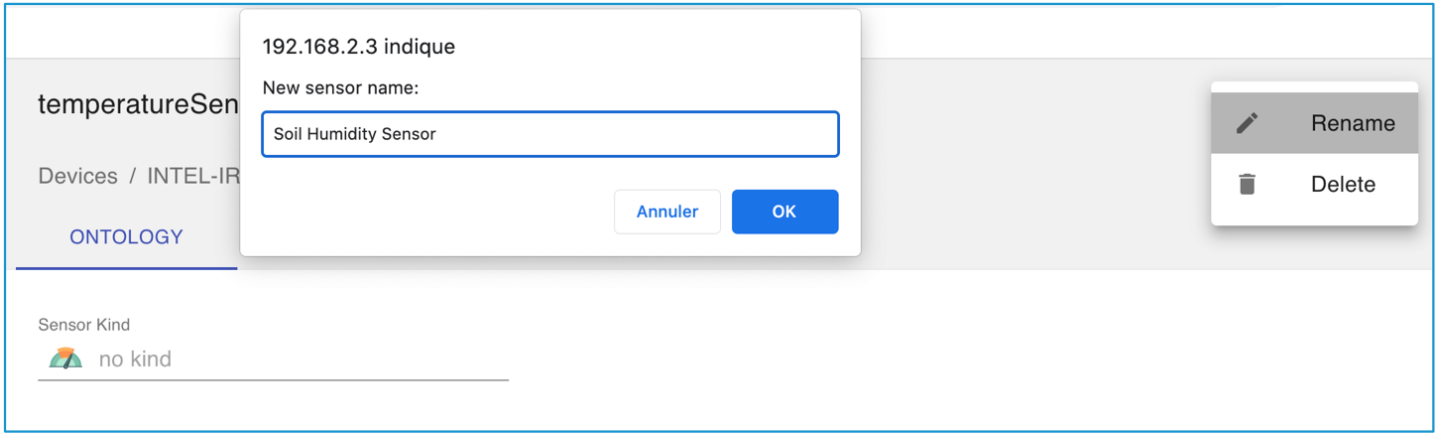
Advanced configuration

configure sensor name

- Power on the new soil sensor device to trigger data transmission
- Refresh the WaziGate dashboard, the new data should appear



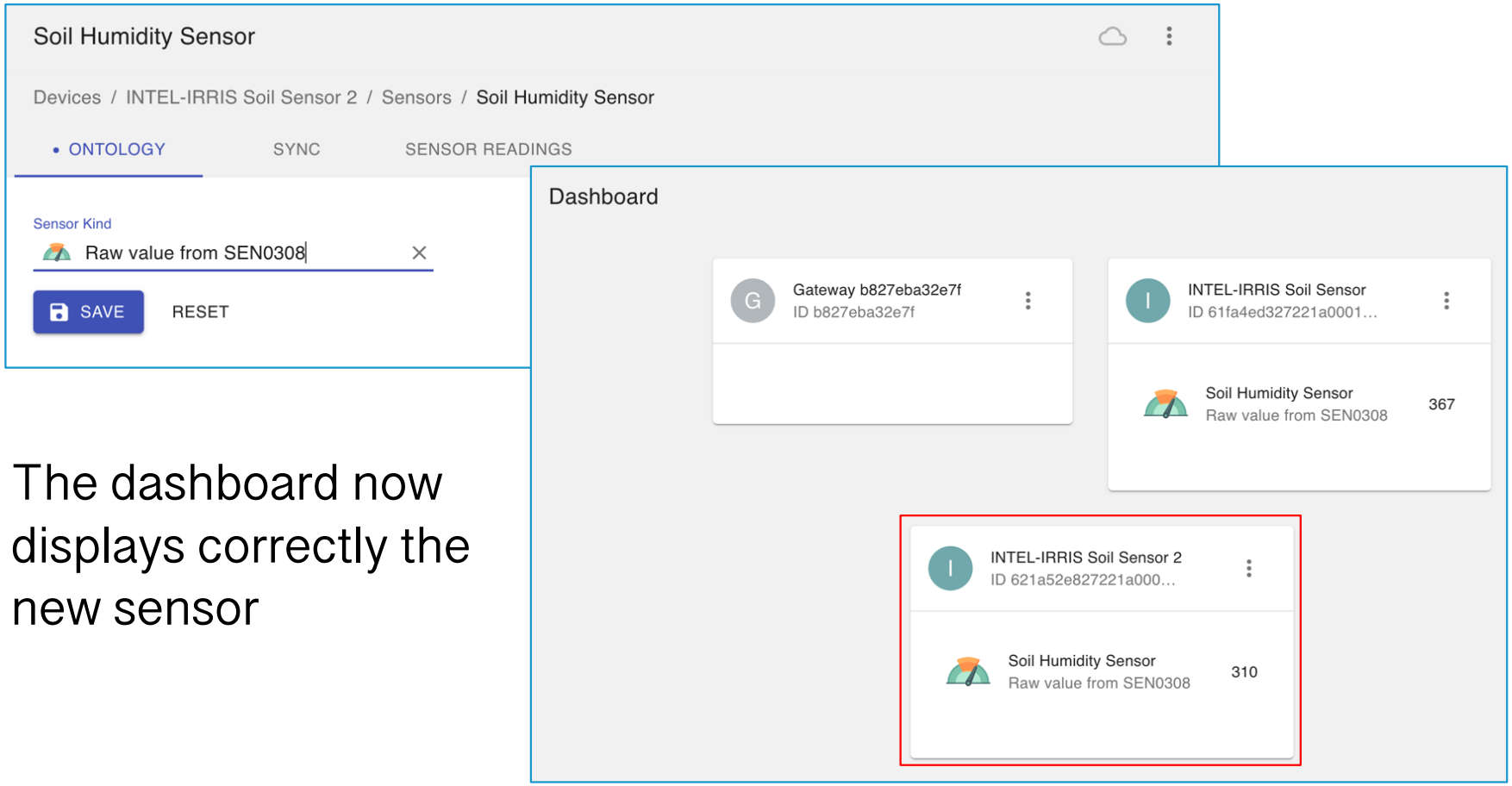
- Click on the "temperatureSensor 0" and then rename it



Advanced configuration

configure sensor kind

- Change de Sensor kind to "Raw value from SEN0308"



- The dashboard now displays correctly the new sensor