



# INTEL-IRRIS

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



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



## Building the INTEL-IRRIS LoRa IoT platform Part 3: the INTEL-IRRIS starter-kit



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Université de Pau, France



# INTEL-IRRIS starter-kit

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



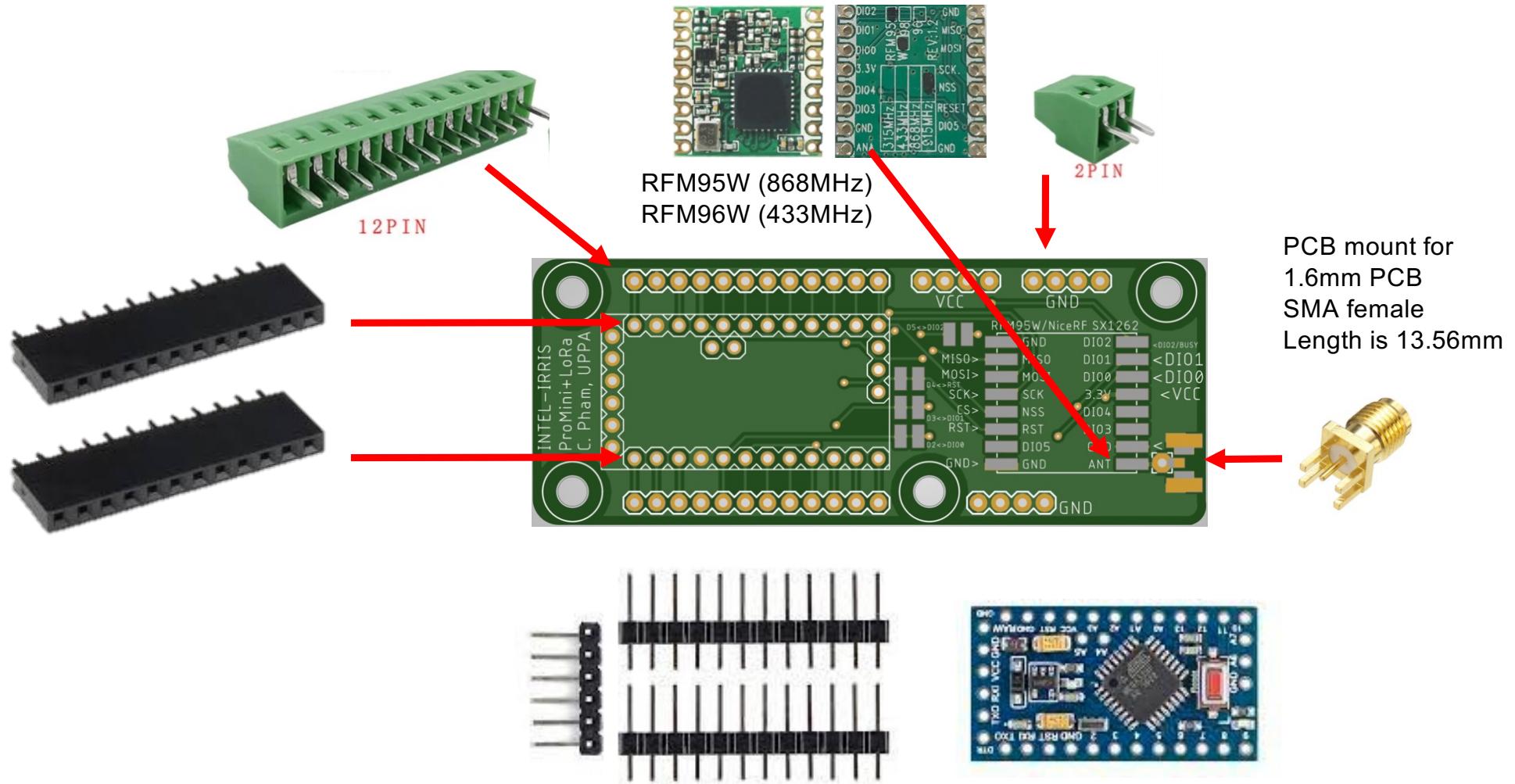
# Preparing the starter-kits at UPPA



This non-technical video shows  
the preparation of the kits  
<https://youtu.be/5nznRcloe40>

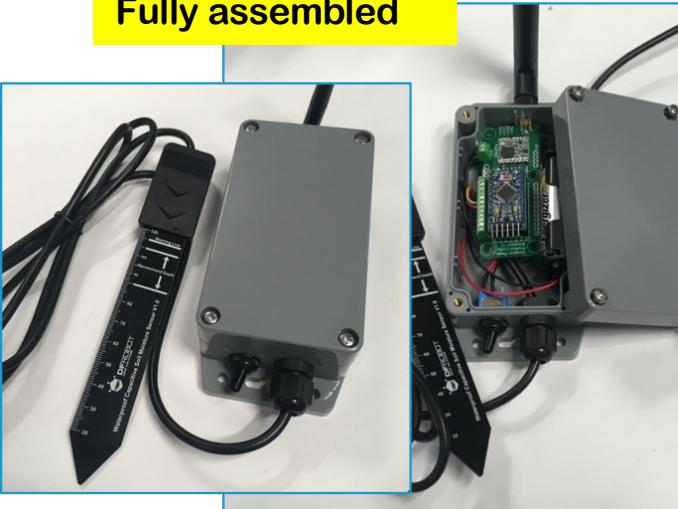


# Soil sensor: electronic parts starter-kit version



# Soil sensor device

Fully assembled



Packaging in enclosure



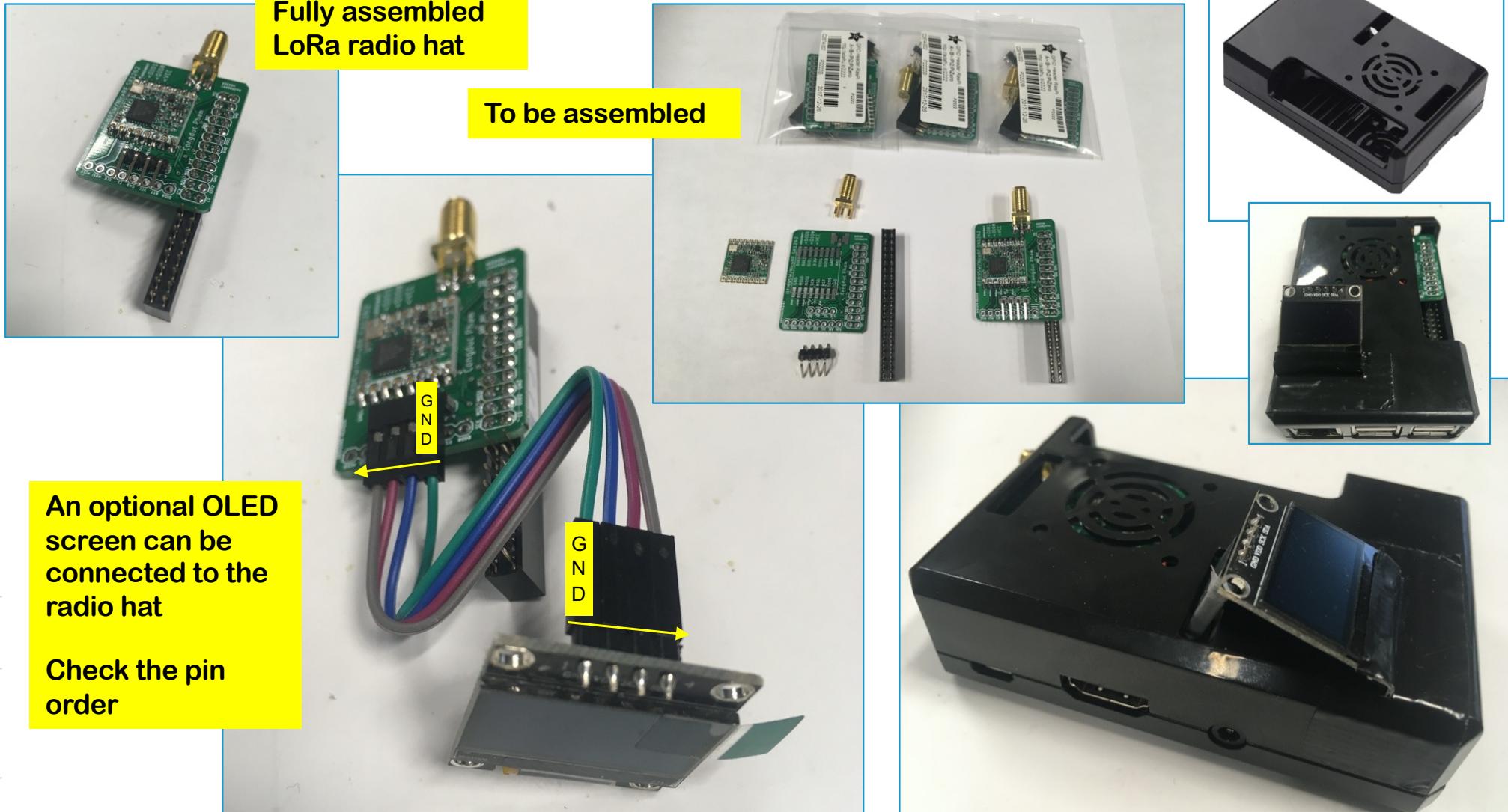
To be assembled

# 2 versions of the soil device



A soil temperature sensor can be added

# INTEL-IRRIS gateway (WaziGate)



# Assembling starter-kit

## Algeria (UORAN1), Morocco (ENSA Safi)

- Part 1: Soil sensor device

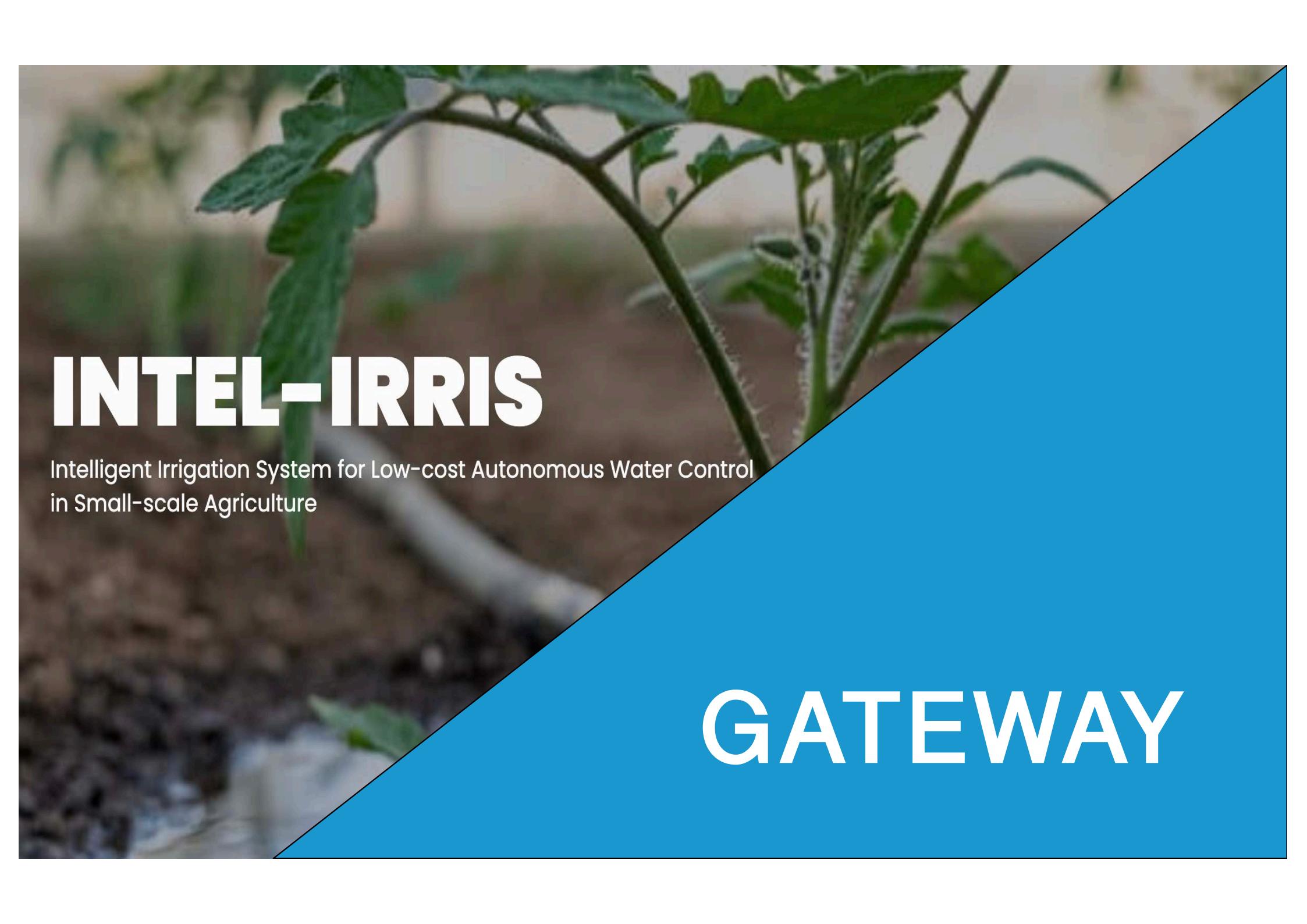
- [Tutorial slides on building & assembling the outdoor LoRa IoT soil sensor device](#)
- [Video n°1. YouTube tutorial video showing how to build the IoT microcontroller platform for the LoRa IoT soil sensor device.](#)  
<https://youtu.be/3jdQ0Uo0phQ>
- [Video n°2. YouTube tutorial video showing how to build the outdoor LoRa IoT soil sensor device.](#) <https://youtu.be/zcazzDbXvHk>
- [Video n°3. YouTube tutorial video showing how to wire the SEN0308 capacitive sensor.](#) <https://youtu.be/zcazzDbXvHk>

- Part 2: INTEL-IRRIS gateway

- [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.](#) <https://youtu.be/zcazzDbXvHk>

# Preparation steps for the starter-kit

- Preparing gateway (hardware)
- Prepare INTEL-IRRIS gateway SD card image (software)
- Boot and check the INTEL-IRRIS gateway
- Preparing soil sensor device
- Testing transmission to INTEL-IRRIS gateway
- **IMPORTANT**
  - 1 starter-kit = 1 soil sensor device + 1 INTEL-IRRIS gateway
    - device can be either with capacitive sensor or tensiometer sensor
  - 1 starter-kit per farm to be deployed and tested
  - The INTEL-IRRIS gateway is **pre-configured to be ready for**
    - 1 capacitive sensor & 1 tensiometer sensor (but only 1 device in starter-kit)
  - If there are need for other devices in a farm, see **advanced configuration**
- **All tutorials & videos:** <http://intel-irris.eu/tutorials-slides>

A close-up photograph of a young green plant with large, serrated leaves growing in dark brown soil. The plant has several thin stems and leaves, some with small white flowers or buds. The background is slightly blurred.

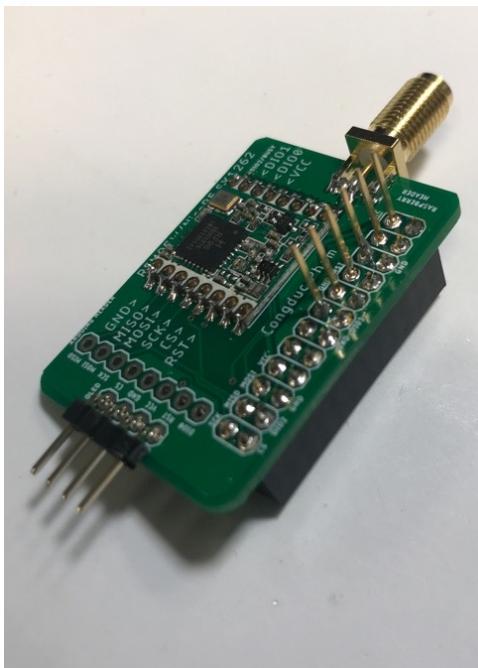
# INTEL-IRRIS

Intelligent Irrigation System for Low-cost Autonomous Water Control  
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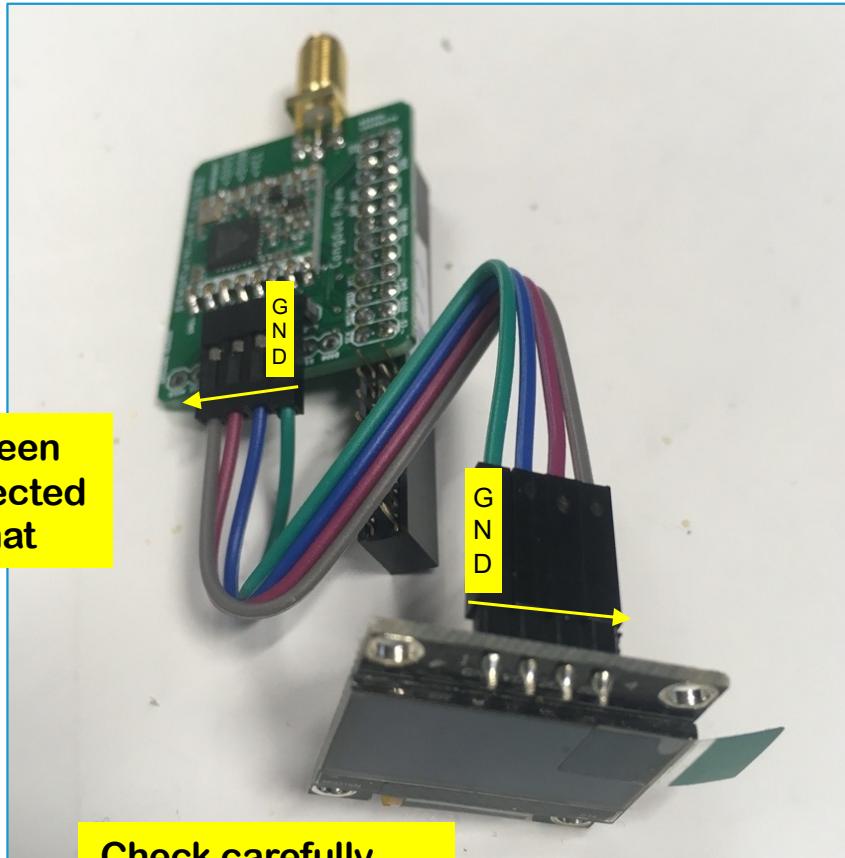
# GATEWAY

# Preparing gateway: RTC

- Connect Real-Time Clock module to LoRa hat (recommended)
  - With an additional RTC module, the INTEL-IRRIS gateway working without Internet can keep the correct date & time
  - Connect the RTC module to the LoRa hat which should have been soldered with longer header pins – **be careful to insert as shown**



# Preparing gateway: OLED



# Preparing gateway: case & SD card

- Plug the LoRa hat on the RPI, insert in case, **screw the antenna**



- Download SD card image from <http://intel-irris.eu/results>
- Image uses EU868 frequency band (Algeria, France)
- Flash SD card (minimum 8GB): [Video n°4 at t=124s](#),  
<https://youtu.be/j-1Nk0tv0xM?t=124>, then insert SD card

# Installing a higher gain antenna



- The "small" antenna shipped by default with the INTEL-IRRIS gateway may be too small to provide good reception in case of large distance or many obstacles between the soil sensor device and the gateway
- You can use a higher gain antenna to be screwed in an indoor antenna base
- More information in the [antenna tests tutorial](#)



# Gateway power consumption



RPI3B consumes less than 300mA

There can be peak up to 800mA when booting

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

# Power the gateway

## Option 1: with Internet, enabling RTC to sync on boot

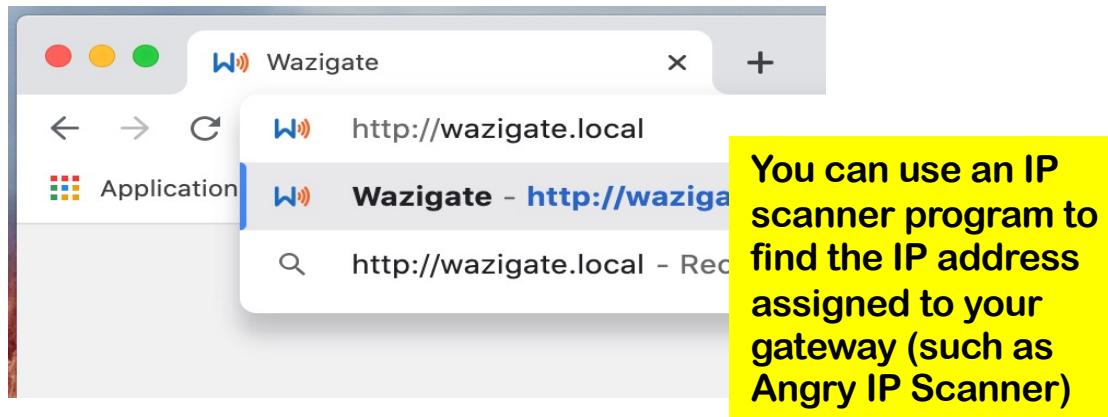
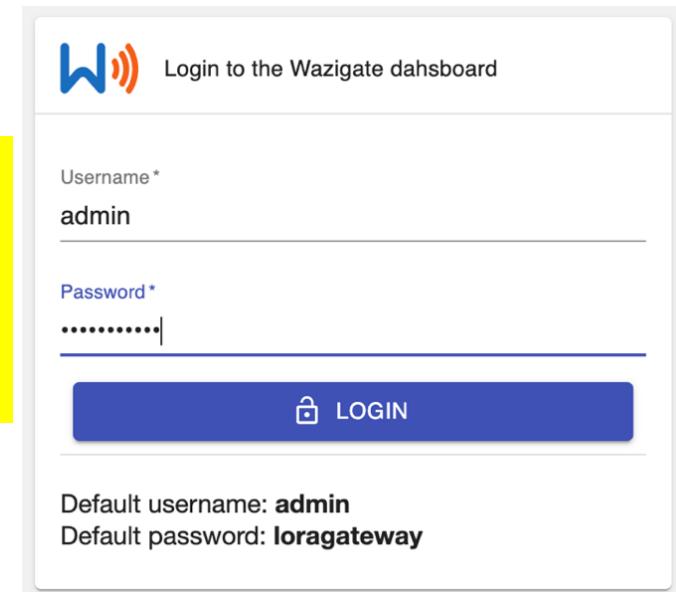
- Use your laptop that should itself be **connected to the Internet** (using your smartphone's WiFi sharing feature for instance)
- Make sure that your laptop will share its Internet connection to devices connected on its Ethernet port. See how to do so:  
<https://www.waziup.io/documentation/wazigate/v2/install/#connect-with-ethernet-cable-to-pc>
- **Before powering gateway, connect it to your laptop by Ethernet cable**
- As the gateway will normally run without Internet, so its clock should be synched with an **RTC module that also needs to be synched once**
- Then power the gateway. You should see the first [Internet OK] screen.  
 Wait 3-4mins for the main INTEL-IRRIS OLED screen to appear
- **On boot (and only on boot), the RTC**  
 module will then be automatically  
 synched with Internet's time & date



# Checking the gateway

## Solution 1

- Once the QR code appears on the gateway's OLED screen
- Open web navigator. Go to <http://wazigate.local> or use IP address

Login to the Wazigate dashboard

Username \*  
admin

Password \*  
.....

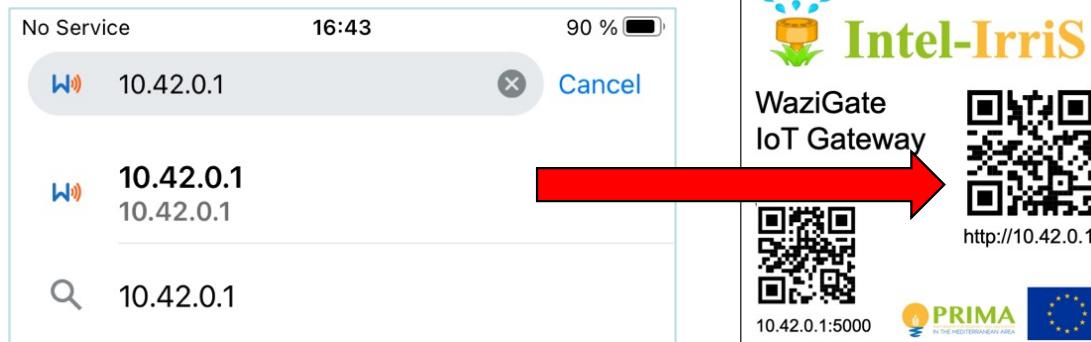
Default username: **admin**  
Default password: **loragateway**

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

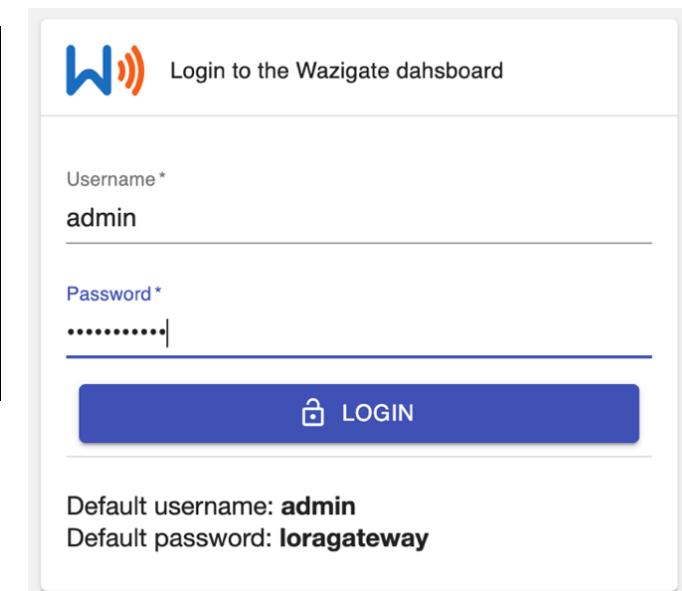
# Checking the gateway

## Solution 2: with WiFi

- Use a smartphone/laptop to access WaziGate through WiFi
- Connect to **WAZIGATE\_XXXXXXXXXXXXXX** WiFi network
  - default WiFi password is loragateway
- Open web navigator. Go to <http://wazigate.local> or <http://10.42.0.1> or flash QR code



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



Login to the Wazigate dashboard

Username \*  
admin

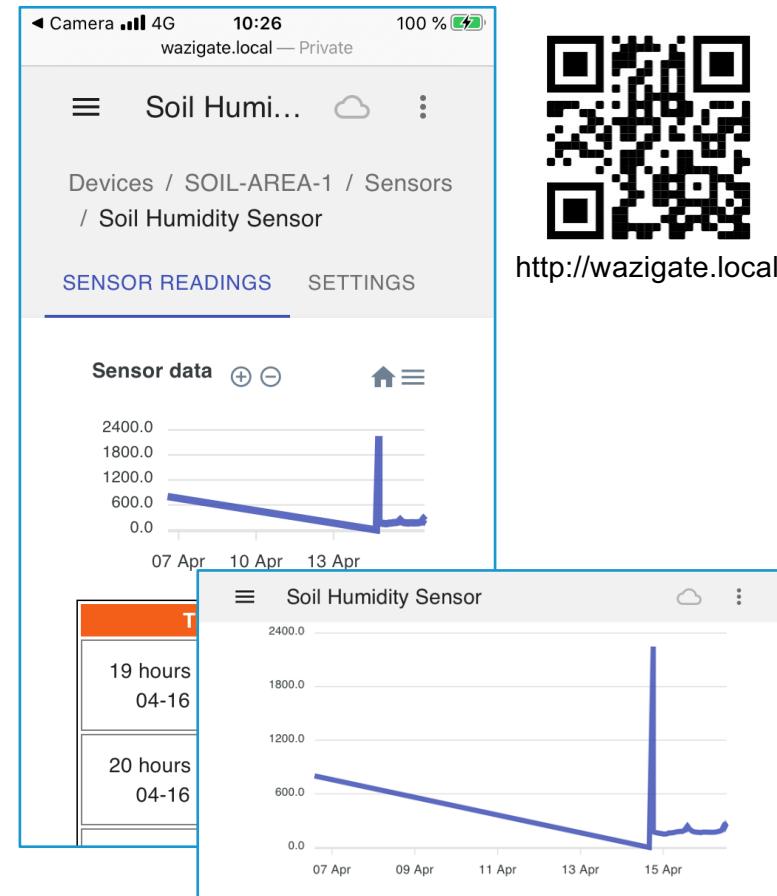
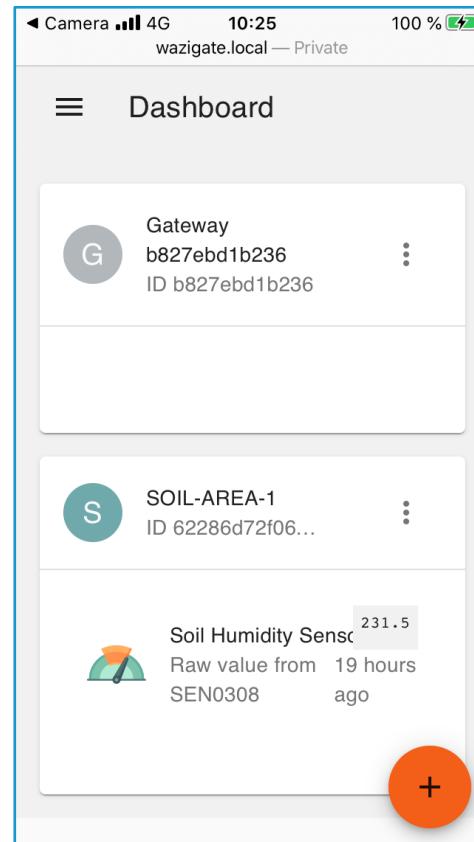
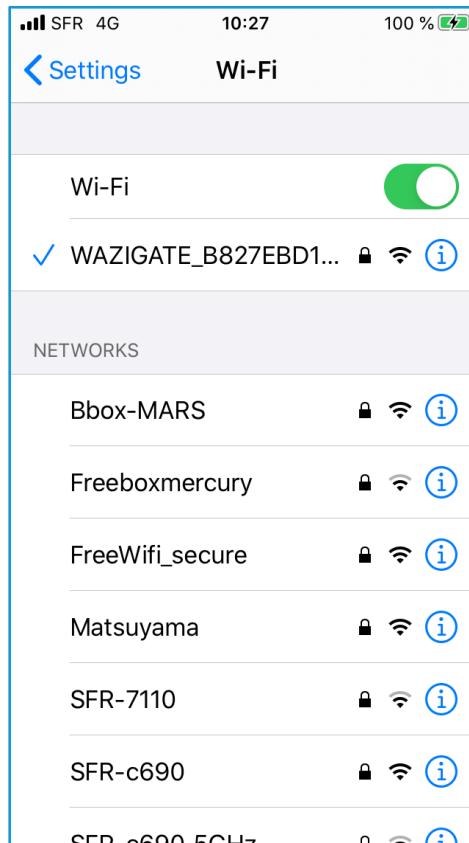
Password \*  
loragateway

**LOGIN**

Default username: **admin**  
 Default password: **loragateway**

# Dashboard from a smartphone

## Solution 2: with WiFi



<http://wazigate.local>



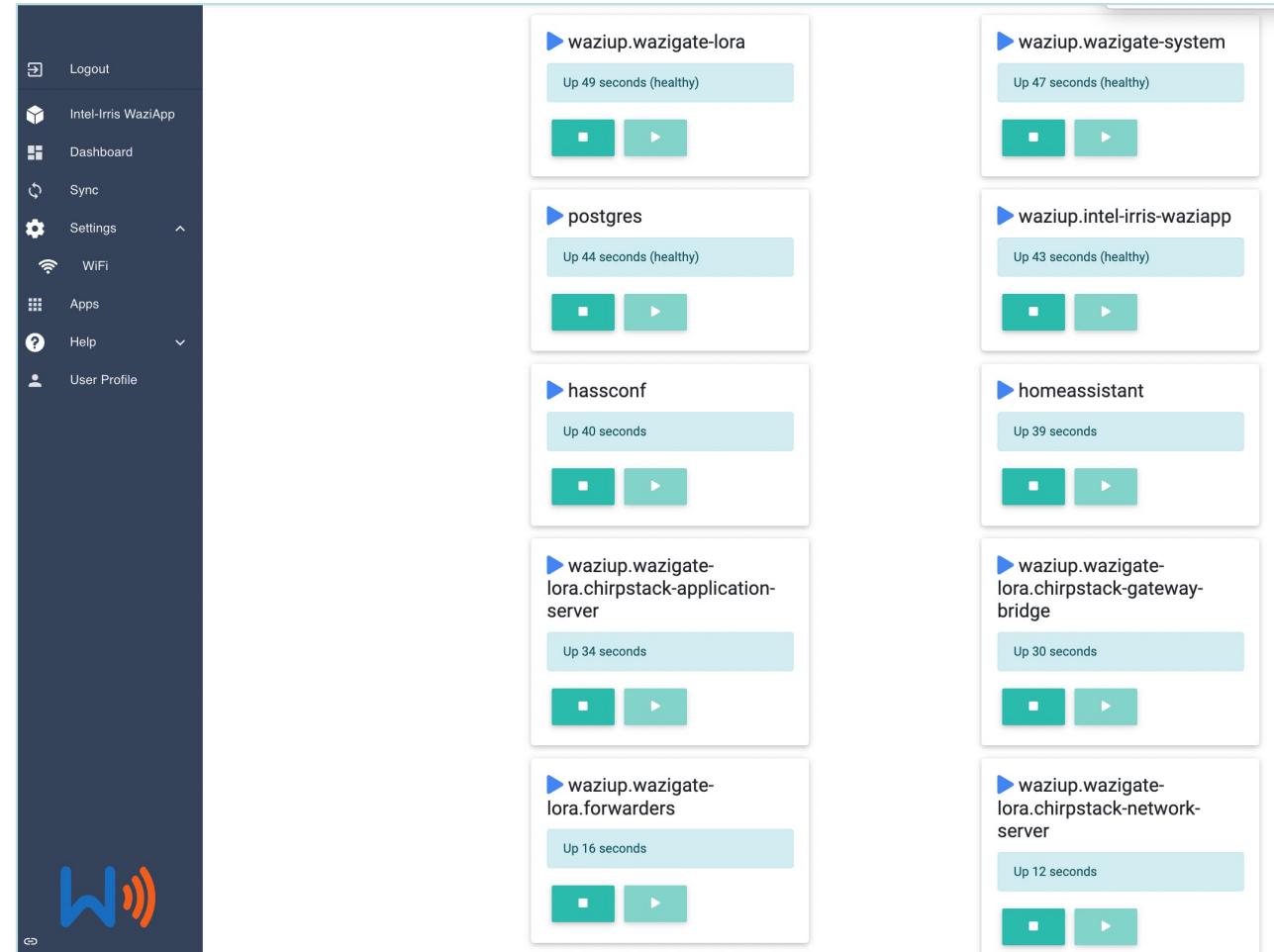
<http://10.42.0.1>

Look at [Video n°4 at t=239s](#)

<https://youtu.be/j-1Nk0tv0xM?t=239>

# Check all containers

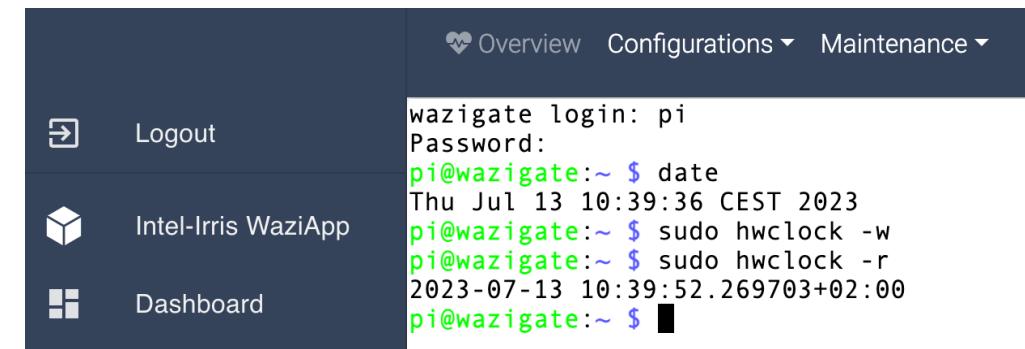
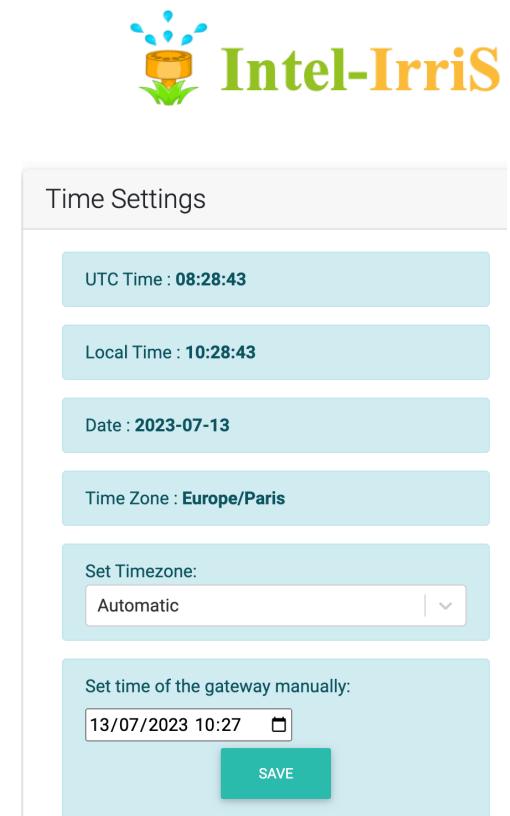
- Go in Settings/Maintenance/Containers
- Check that all containers are up and running
- Otherwise, click on the "run" icon of the faulty container



# Synching the RTC module

## Option 2: without Internet (or not on boot)

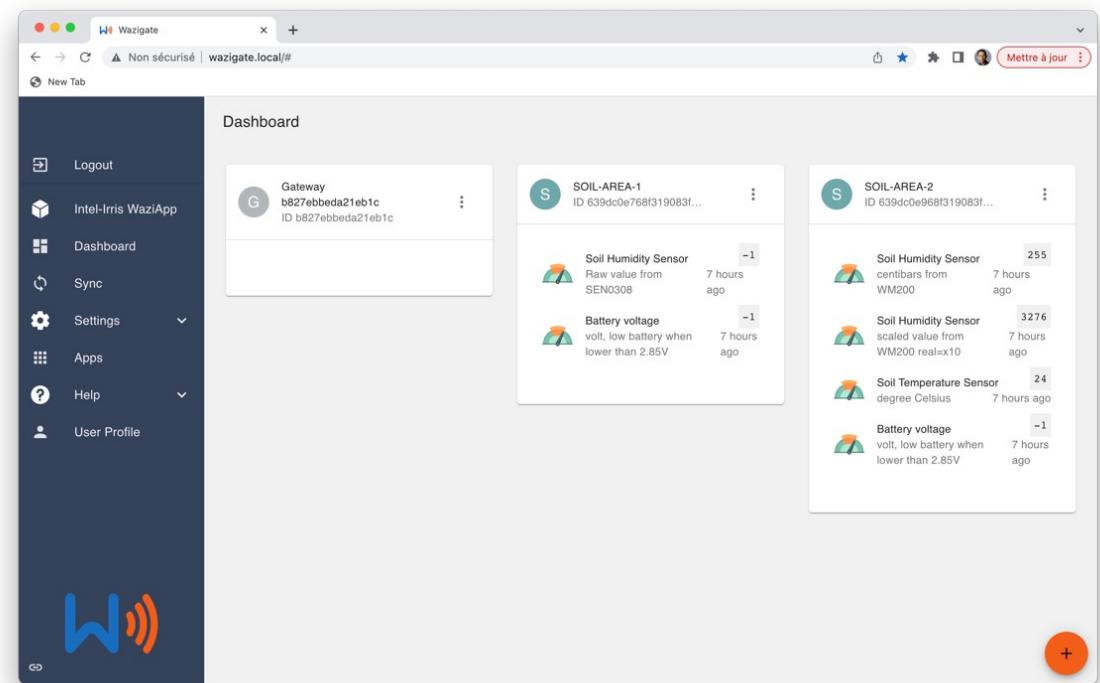
- It is possible to sync the RTC manually, after boot
- First, power then connect to gateway's WiFi
- Go to Settings then Configuration in Configurations top menu. Set time & date manually. Click on SAVE
- Then use the embedded SSH functionalities (in Settings/Maintenance) to log in the gateway (user pi/ pwd loragateway)
- Then type "date" to check if the previously date & time has been saved
- Then "sudo hwclock -w"
- Check with "sudo hwclock -r"
- **It is possible to sync other RTC modules with this method by hot plugging another RTC module**



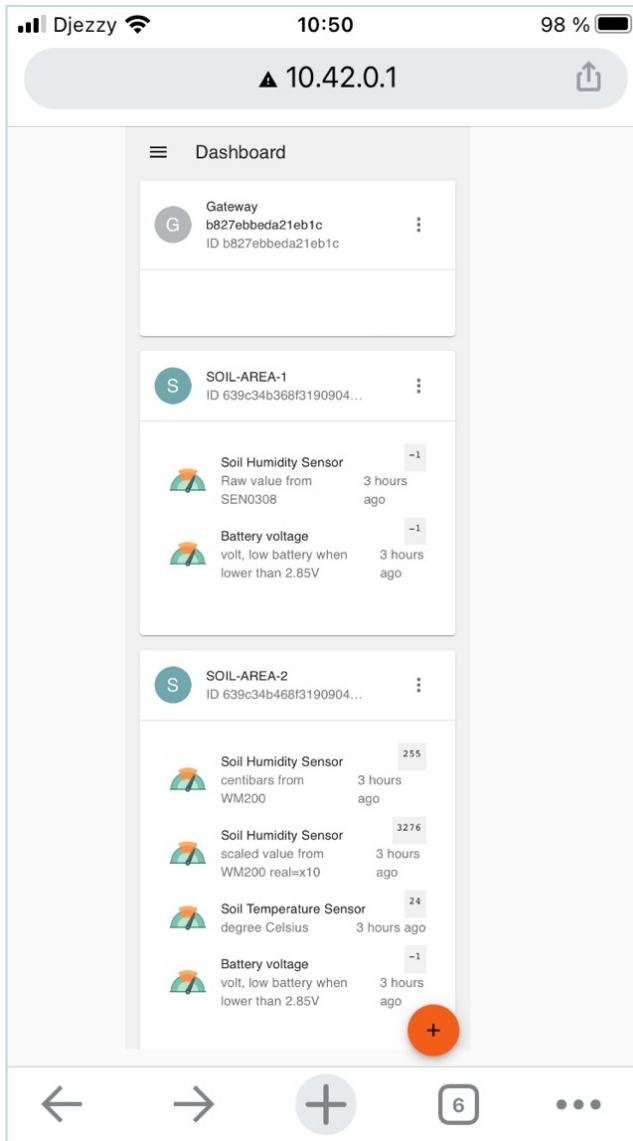
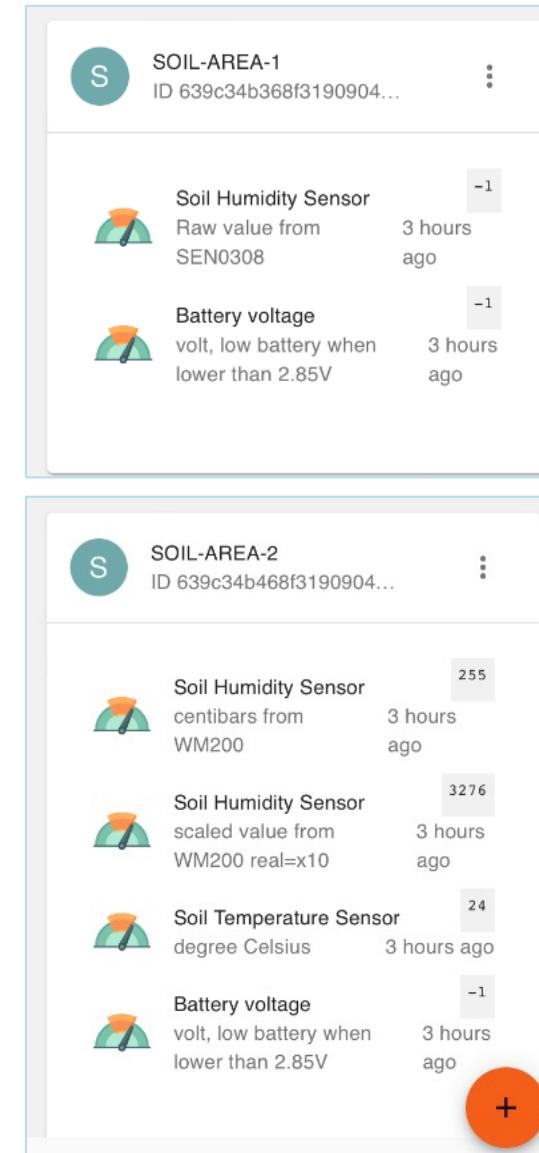
# Default gateway configuration (1)



- For the starter-kit, the INTEL-IRRIS gateway will be ready for
  - **1 capacitive sensor named SOIL-AREA-1 with address 26011DAA**
  - **1 tensiometer sensor named SOIL-AREA-2 with address 26011DB1**
- Capacitive device will show humidity and battery values
- Tensiometer device will show centibar, raw resistance, soil temperature and battery values



# Default gateway configuration (2)

SOIL-AREA-1  
ID 639c34b368f3190904...

Soil Humidity Sensor  
Raw value from SEN0308 -1 3 hours ago

Battery voltage  
volt, low battery when lower than 2.85V -1 3 hours ago

SOIL-AREA-2  
ID 639c34b468f3190904...

Soil Humidity Sensor  
centibars from WM200 255 3 hours ago

Soil Humidity Sensor  
scaled value from WM200 real=x10 3276 3 hours ago

Soil Temperature Sensor  
degree Celsius 24 3 hours ago

Battery voltage  
volt, low battery when lower than 2.85V -1 3 hours ago

+

**Default values for the SEN0308 capacitive sensor**



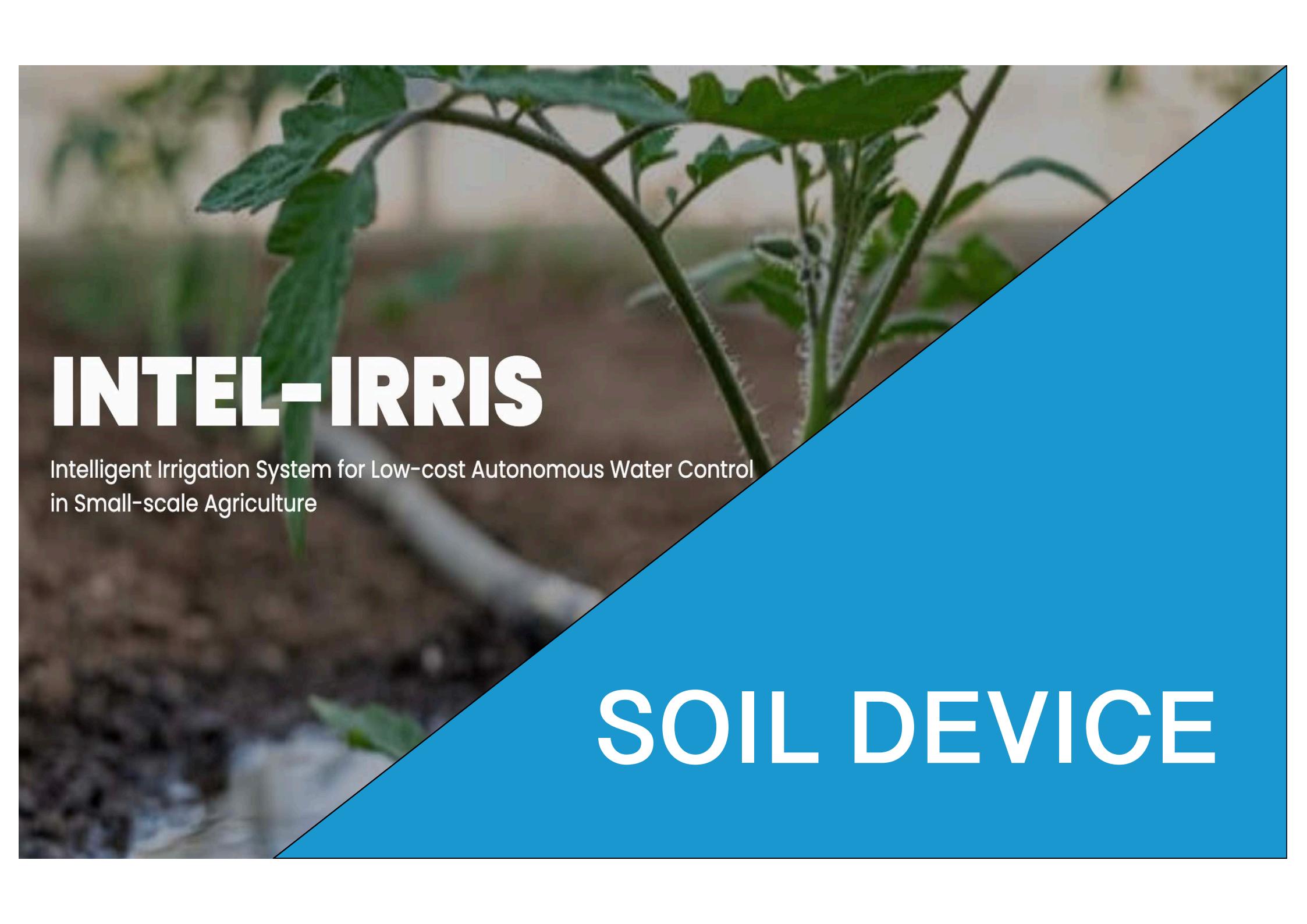
**Default values for the WM200 tensiometer sensor**



# QR code for connecting to WiFi

- The gateway WiFi is WAZIGATE\_XXXXXXXXXXXX where XXXXXXXXXXXX is the MAC address of the RPI
- For instance WAZIGATE\_B827EBD1B236
- With the OLED, a QR code for joining the WiFi network is dynamically generated 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 gateway sticker to connect to the gateway's dashboard or the INTEL-IRRIS IIWA App



A close-up photograph of a young green plant with serrated leaves growing out of dark brown soil. The background is slightly blurred.

# INTEL-IRRIS

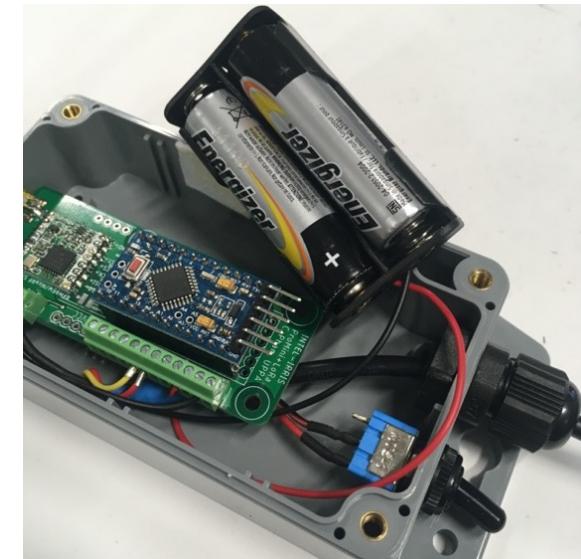
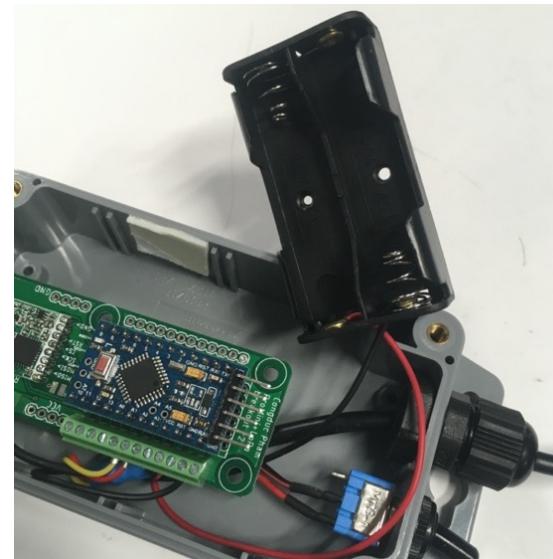
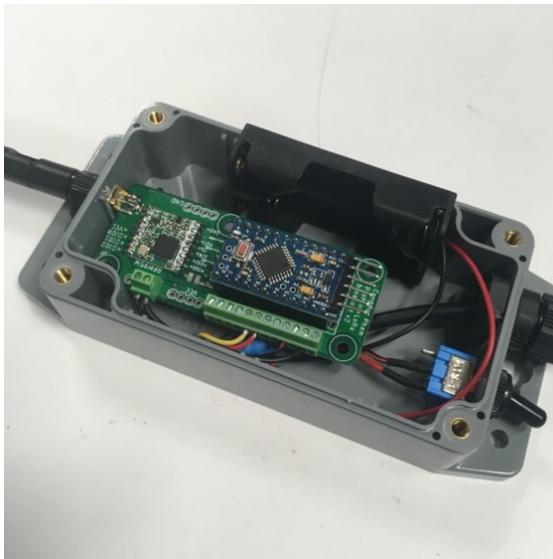
Intelligent Irrigation System for Low-cost Autonomous Water Control  
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# SOIL DEVICE

# 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



# 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



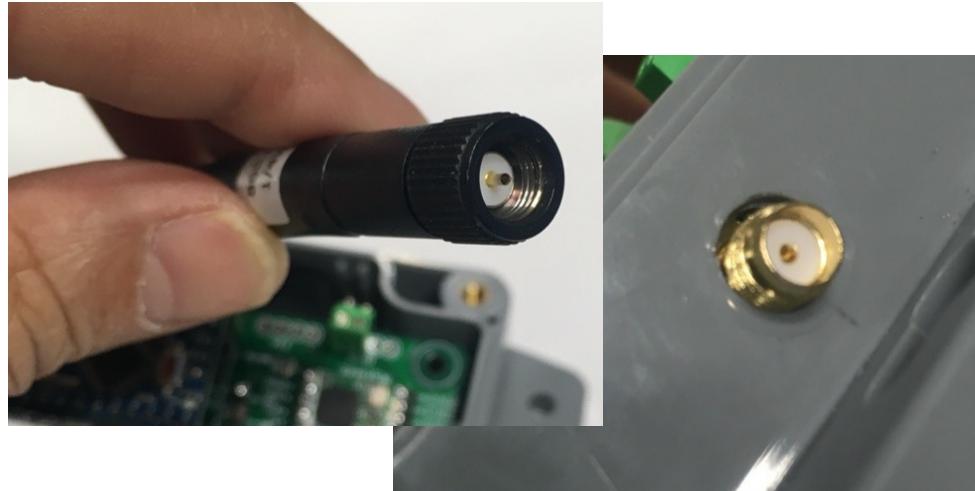


# Never transmit without antenna

- 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 PCB 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

# Preparing soil sensor device

## screw in the antenna

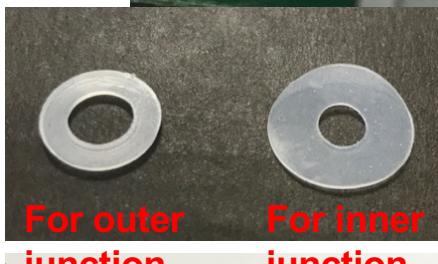


Be sure to connect the matching antenna  
Here, SMA female with SMA male antenna  
Need to screw the antenna in all the way

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

# Waterproofing the antenna junction

Check the gap size



See example in  
the list of part



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

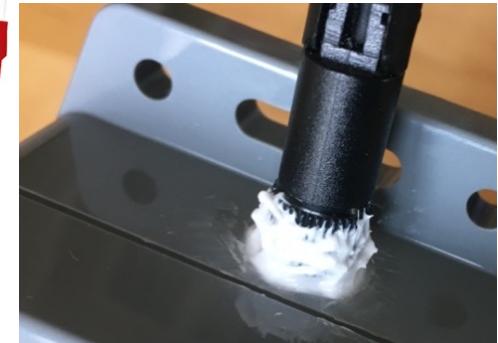
Even with no apparent gap, it is  
necessary to waterproof the  
junction

Take flat silicon seals for that  
purpose, but do not take it too  
thick or too large!

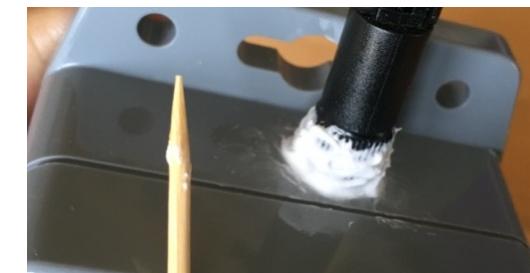
Too thick: the antenna will not be  
screwed in all the way!

# Do not have or can not use flat seal?

Maybe the gap is too big? Use silicon joint sealant



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



Use a wet toothpick to finish and clean the silicon all around the antenna junction



check especially  
the back side

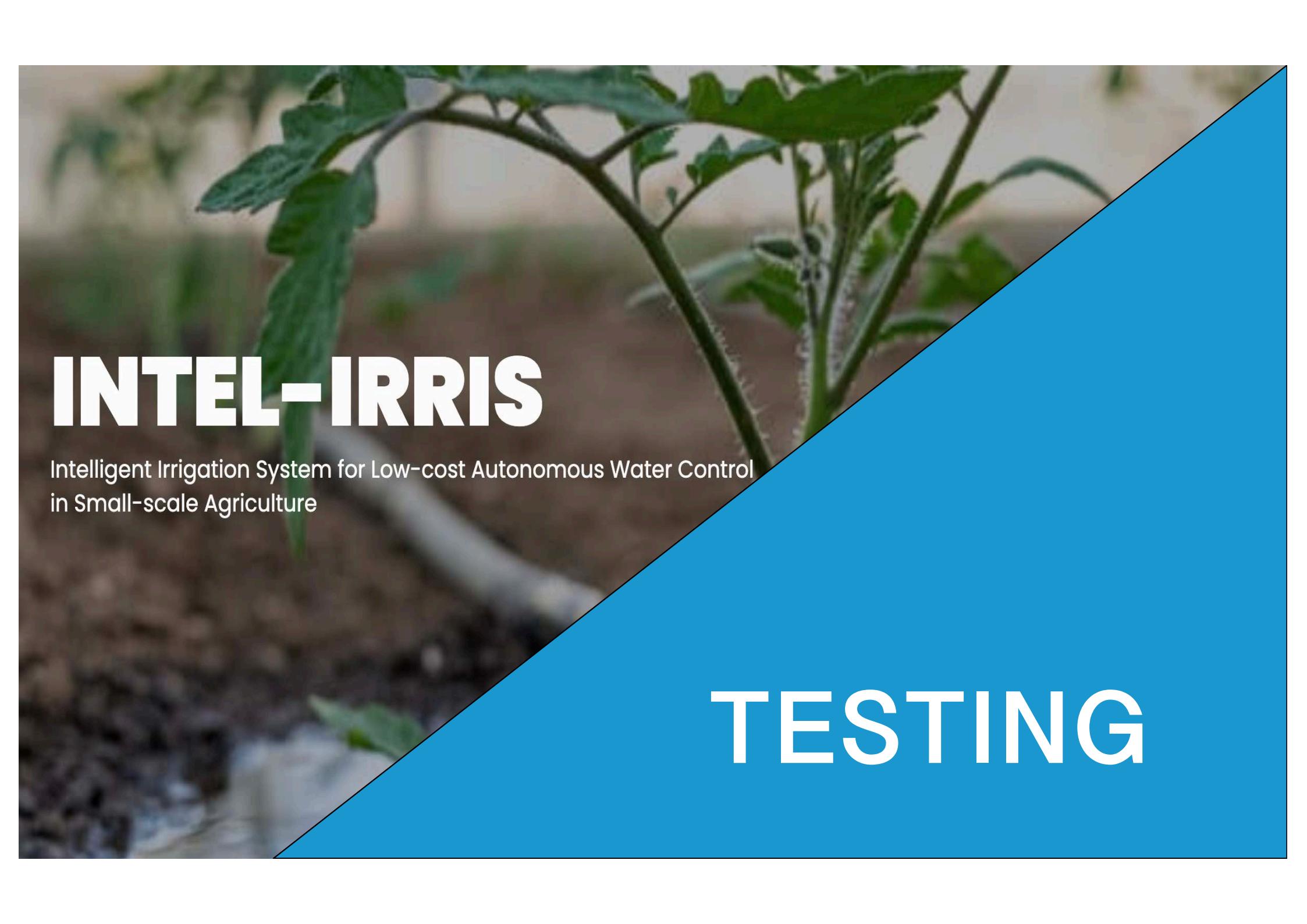
# Put the device sticker

- Put the INTEL-IRRIS device sticker on the device cover
- See how the OFF and ON position are indicated
- You may use a waterproof marker to write the device address



**SEN0308 capacitive device  
has default address  
26011DAA**

**WM200 tensiometer device  
has default address  
26011DB1**

A close-up photograph of a young green plant with serrated leaves growing in dark brown soil. The plant has several thin stems and small leaves. The background is slightly blurred.

# INTEL-IRRIS

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# TESTING

# Testing transmission to gateway

- Test with the fully assembled & configured soil sensor device
  - Check that antenna is connected
  - Switch ON the soil sensor device to get data transmission
  - Wait for about 10s, then switch OFF the soil sensor device
  - Check reception of data on gateway's dashboard
  - You need to refresh the web page on the web navigator



Look at [Video n°4 at t=331s](#)  
<https://youtu.be/j-1Nk0tv0xM?t=331>

# Transmission to gateway



Parameters for  
INTEL-IRRIS gateway  
(default in red)

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



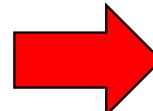
This dedicated video will show all these steps, from connecting the SEN0308 to testing transmission to the gateway  
 Video n°4: <https://youtu.be/j-1Nk0tv0xM>

# Check data reception on OLED

YOU CAN ALSO VIEW ON DASHBOARD

Default values for the  
SEN0308 capacitive sensor

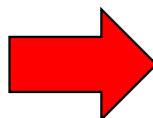
Testing with  
capacitive device



Default values for the WM200  
tensiometer sensor

VALUES ARE ONLY INDICATIVE

Testing with  
tensiometer device

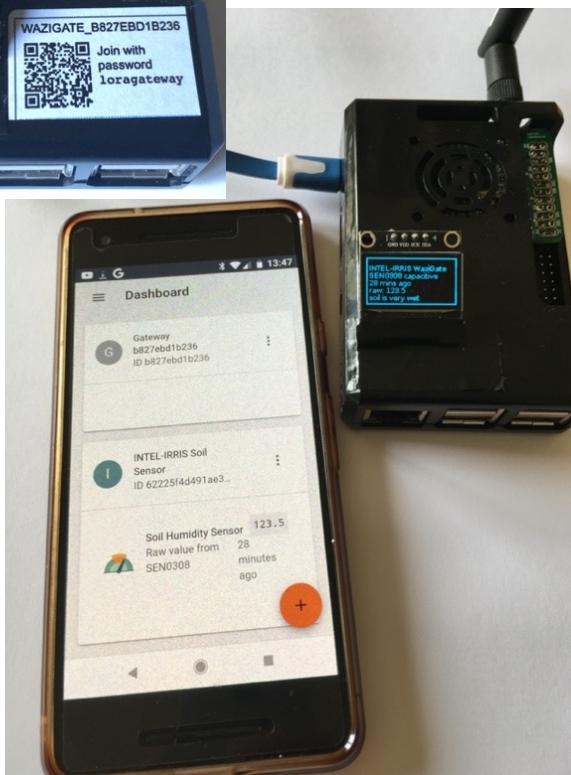
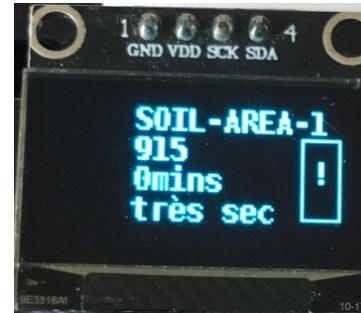


# Soil sensor information on OLED

- The OLED displays the latest received sensor data 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: saturated | 4 bars: wet
- 3 bars: wet | 2 bars: dry
- 1 bar: dry | 0 bar: very dry



# Summary of INTEL-IRRIS gateway various User Interfaces



**Intel-Irris Irrigation WaziApp (IIWA)**

**SOIL-AREA-1**

Soil condition : wet capacitive

Value : 123



**SOIL-AREA-2**

Soil condition : saturated tensiometer\_cbar

Value : 5



# Deploying the starter-kit

- Install the soil sensor device in the field
  - See dedicated slides/videos
- Install the INTEL-IRRIS gateway in the farmer's office/home
  - Just power the gateway, no Internet is required
  - Test access to gateway's dashboard with farmer's smartphone
- **NEVER TRANSMIT WITHOUT AN ANTENNA**
- Test correct data reception on INTEL-IRRIS gateway
  - Switch ON the soil sensor device to get data transmission
  - Check reception of data on gateway's dashboard or OLED screen

A close-up photograph of a young green plant with several leaves. In the background, a white, ribbed irrigation tube lies on the dark brown soil. The top right corner of the slide features a solid blue diagonal band.

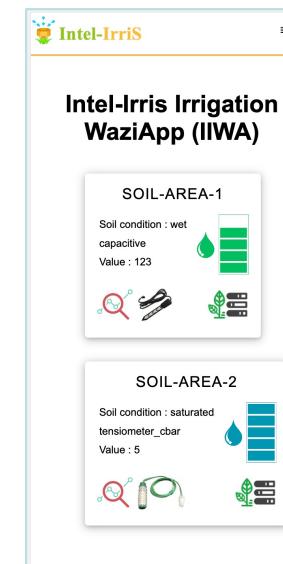
# INTEL-IRRIS

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IIWA

# INTEL-IRRIS Irrigation WaziApp

- The INTEL-IRRIS Irrigation WaziApp (IIWA) is an embedded application running on the INTEL-IRRIS gateway itself
- It is included in the starter-kit to implement the "**intelligent Irrigation in-the-box**" & "**plug-&-sense**" approach
- Its objective is to enhance the irrigation indication by applying sensor calibration models with soil/plant/weather parameters



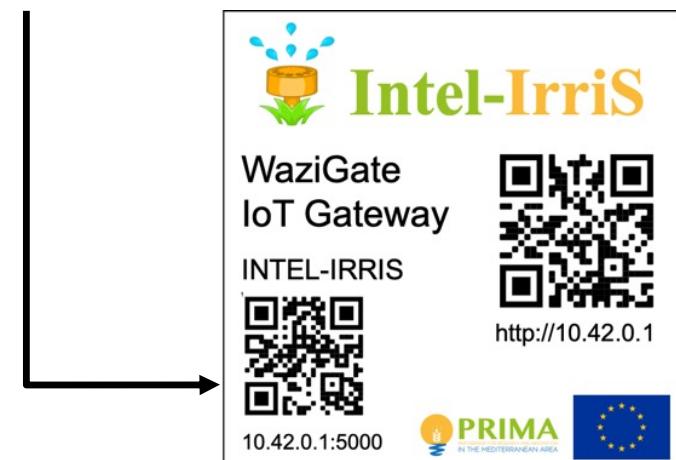
# Connect to IIWA

- First, connect to INTEL-IRRIS gateway WiFi which should look like WAZIGATE\_XXXXXXXXXXXX
  - Password is loragateway
- Otherwise, with the OLED screen, a QR code for automatically joining the WiFi network is periodically displayed for 10s
  - scan the displayed QR code with a smartphone to connect to gateway's WiFi
- Then, scan the static QR code on the gateway sticker to connect to the INTEL-IRRIS Irrigation WaziApp on : <http://10.42.0.1:5000>



EXAMPLE:

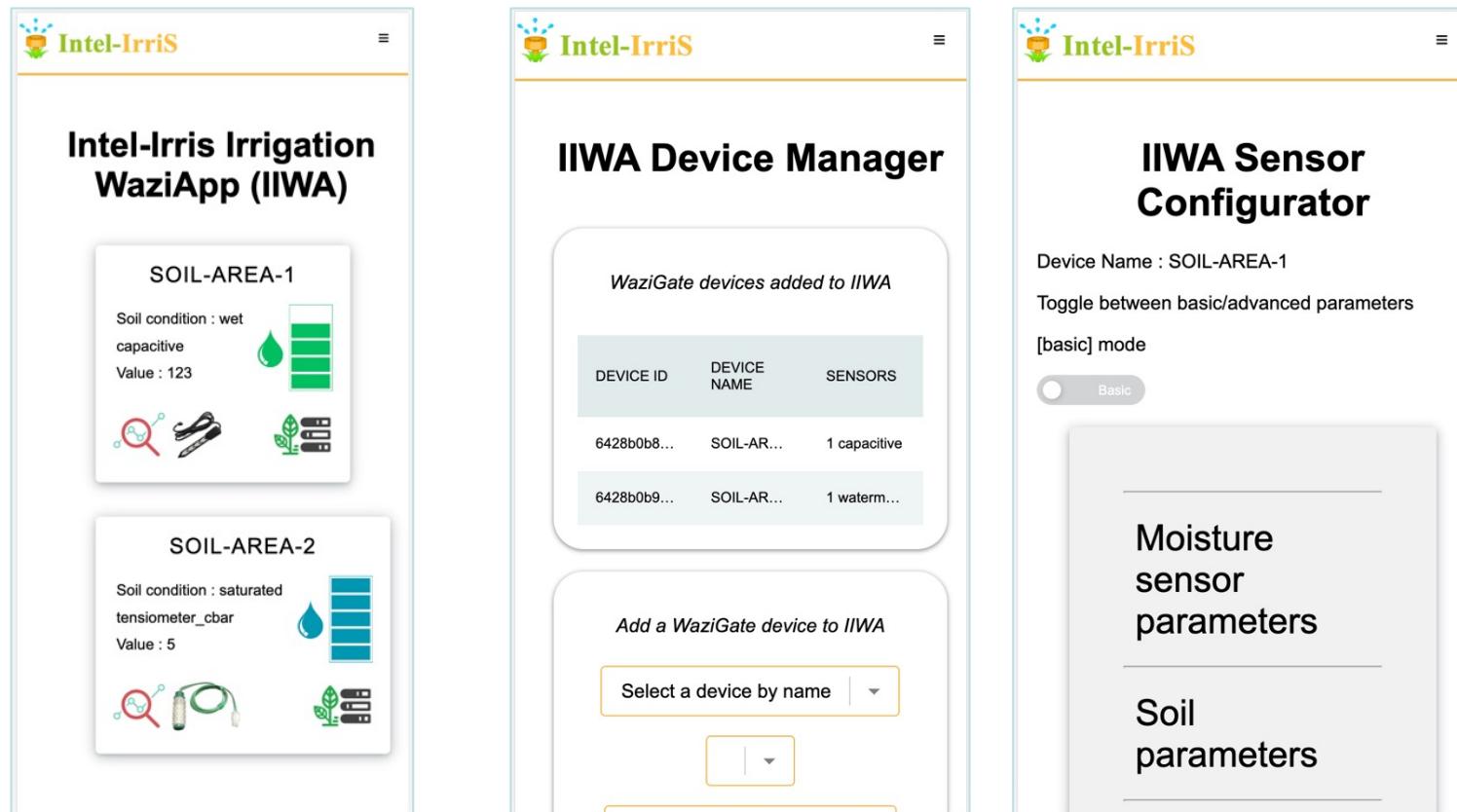
WAZIGATE\_DCA6325C2A7A



# Get the IIWA presentation slides

- Part 4: the INTEL-IRRIS Irrigation WaziApp

- Tutorial slides on the INTEL-IRRIS Irrigation WaziApp



The image displays three screenshots of the Intel-Irris Irrigation WaziApp (IIWA) interface, showing different features of the app:

- Intel-Irris Irrigation WaziApp (IIWA)**: This screen shows two soil monitoring areas.   
  - SOIL-AREA-1**: Soil condition: wet, capacitive; Value: 123. It includes icons for a magnifying glass, a pair of shears, and a plant.
  - SOIL-AREA-2**: Soil condition: saturated, tensiometer\_cbar; Value: 5. It includes icons for a magnifying glass, a tensiometer probe, and a plant.
- IIWA Device Manager**: This screen lists WaziGate devices added to IIWA.   

DEVICE ID	DEVICE NAME	SENSORS
6428b0b8...	SOIL-AR...	1 capacitive
6428b0b9...	SOIL-AR...	1 waterm...

Below this is a section to "Add a WaziGate device to IIWA" with a dropdown menu labeled "Select a device by name".
- IIWA Sensor Configurator**: This screen is for configuring sensors.   

Device Name : SOIL-AREA-1  
 Toggle between basic/advanced parameters  
 [basic] mode

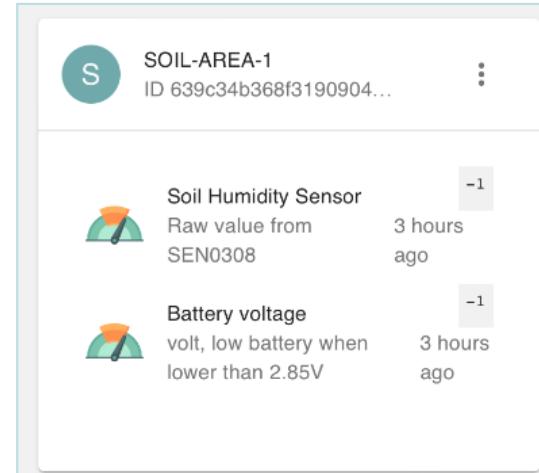
Basic

**Moisture sensor parameters**

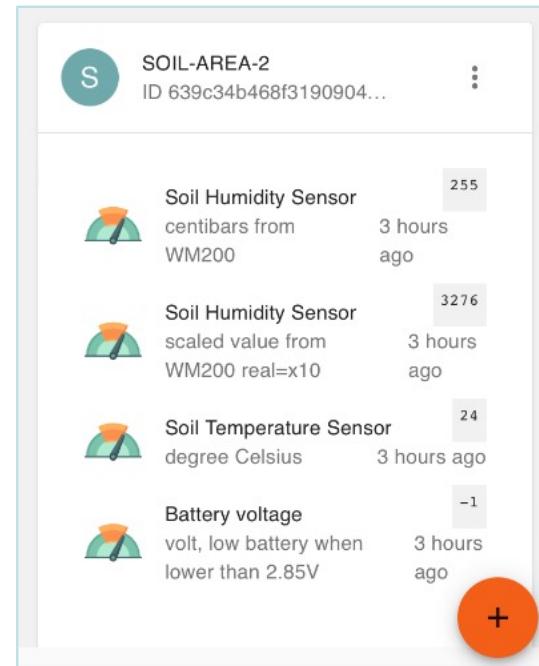
**Soil parameters**

# Default gateway configuration & IIWA

- For the starter-kit, the INTEL-IRRIS gateway will be ready for
  - 1 capacitive sensor named SOIL-AREA-1 with address 26011DAA
  - 1 tensiometer sensor named SOIL-AREA-2 with address 26011DB1
- IIWA default configuration
  - Both SOIL-AREA-1 & SOIL-AREA-2 are added to IIWA
  - Soil condition will be determined for both devices, if relevant data are received



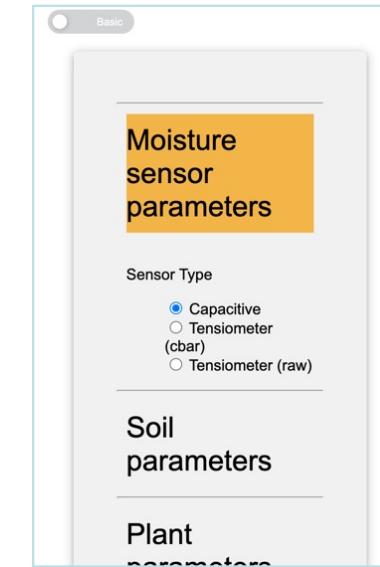
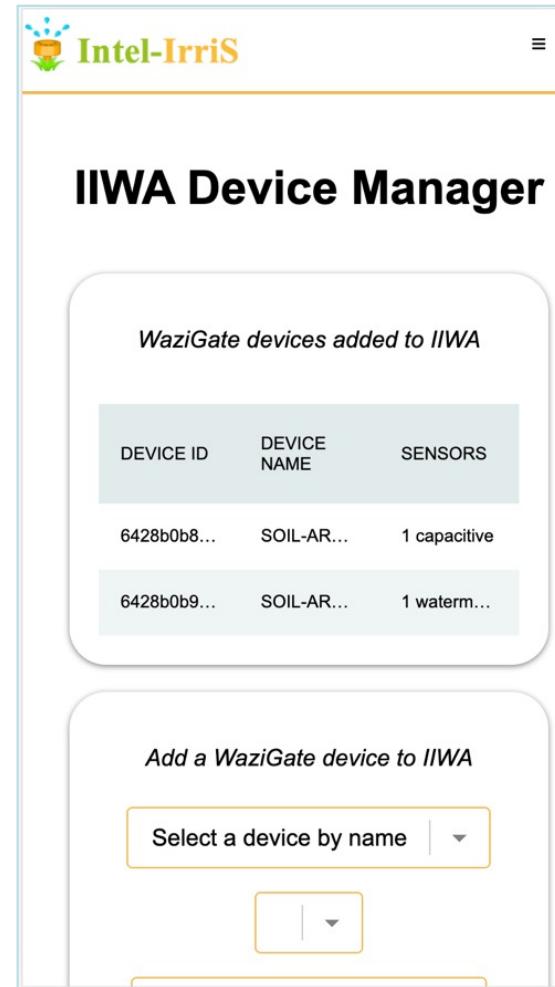
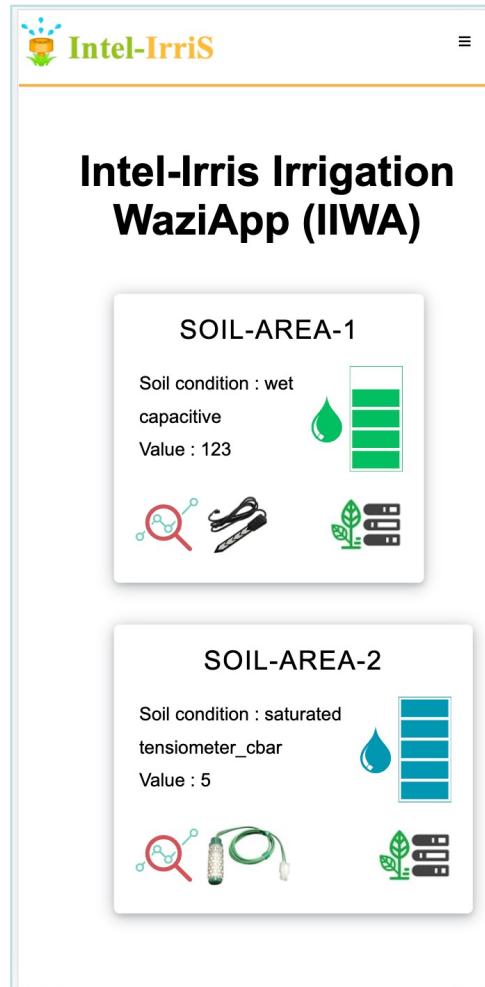
Default values for the SEN0308 capacitive sensor



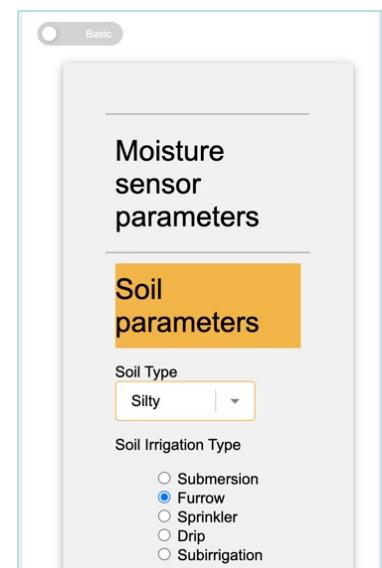
Default values for the WM200 tensiometer sensor

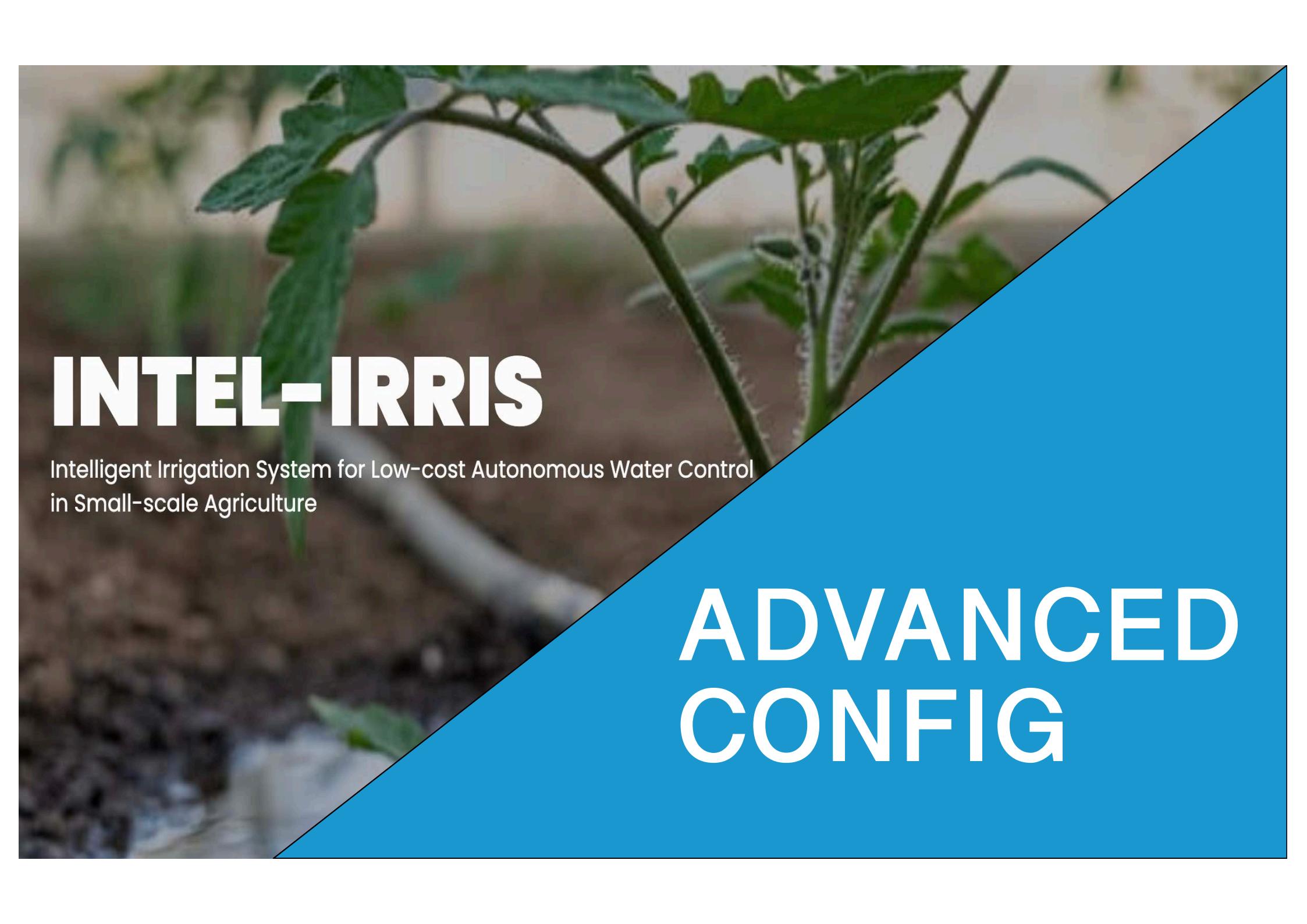


# Default IIWA screens & configuration



**It is OK to use the IIWA default configuration**





# INTEL-IRRIS

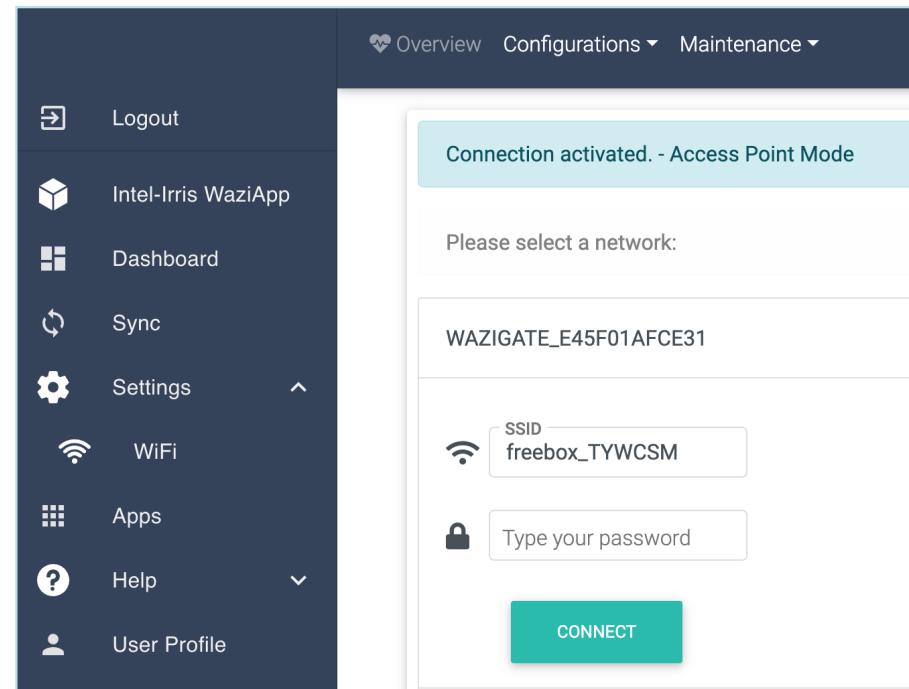
Intelligent Irrigation System for Low-cost Autonomous Water Control  
in Small-scale Agriculture

## ADVANCED CONFIG

# Advanced configuration

## connect gateway to a WiFi network

- By default, the gateway acts as a WiFi Access Point
- To connect the gateway to a WiFi network, go to Setting/WiFi to list all available WiFi networks
- Then select the one you want in order to provide the WiFi password
- Ex: connect to freebox\_TYWCSM
- Once connected, gateway is in WiFi Client mode



# Advanced configuration

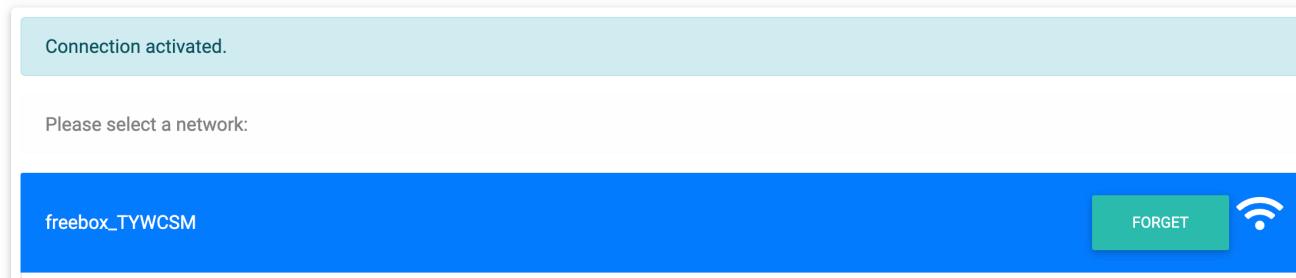
## connect gateway to a WiFi network, con't

- You can connect to several WiFi networks, one after another, to have a list of known WiFi networks
- They will be memorized and if the current WiFi network is not available, another available network in the list of known WiFi networks will be selected
- If there are no available WiFi networks in the list of known WiFi networks anymore, then the gateway switches back to Access Point mode

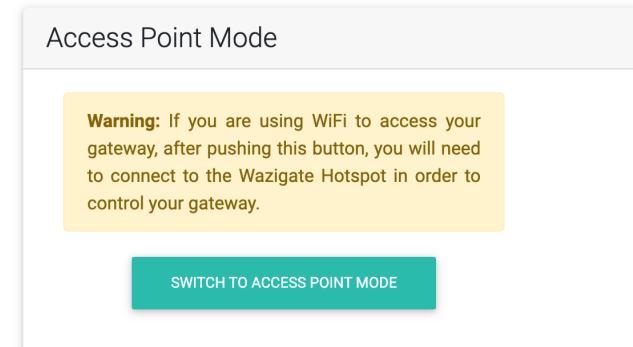
# Advanced configuration

## switch gateway back to WiFi access point mode

- To get back to Access Point mode, go to Setting/WiFi and simply click on "Forget" for the current WiFi network



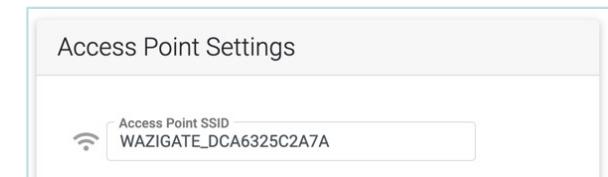
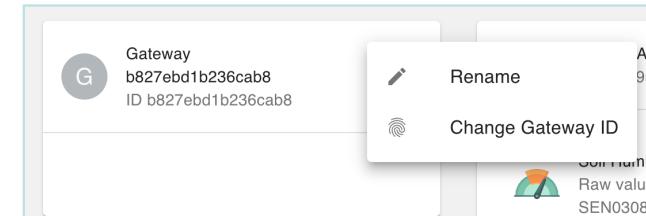
- If you previously added several WiFi networks, click on "Forget" for **ALL** known & memorized WiFi networks
- **DO NOT USE** the "SWITCH TO ACCESS POINT MODE" option
- **IT IS NOT STABLE!**



# Advanced configuration

## sync gateway and its devices to the cloud

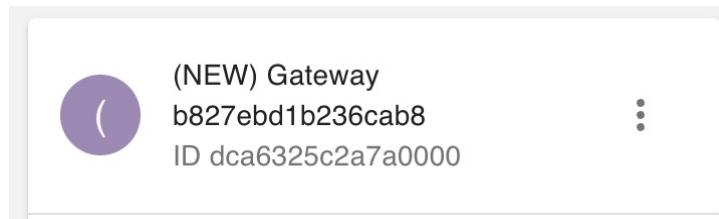
- To sync your gateway to the Waziup Cloud, look at this tutorial
  - <https://www.waziup.io/documentation/wazigate/v2/install/#registration-with-the-cloud>
- You will need an account on Waziup Cloud dashboard
  - If you don't have one, you need to create one first
  - <https://dashboard.waziup.io/>
- Then, you NEED to change your gateway id
  - Use the unique MAC address of your gateway that appears in Settings/Configuration (it is used as your gateway's WiFi hotspot)
  - Here: DCA6325C2A7A
  - Add 0000 at the end to have 16 digits
  - -> DCA6325C2A7A0000



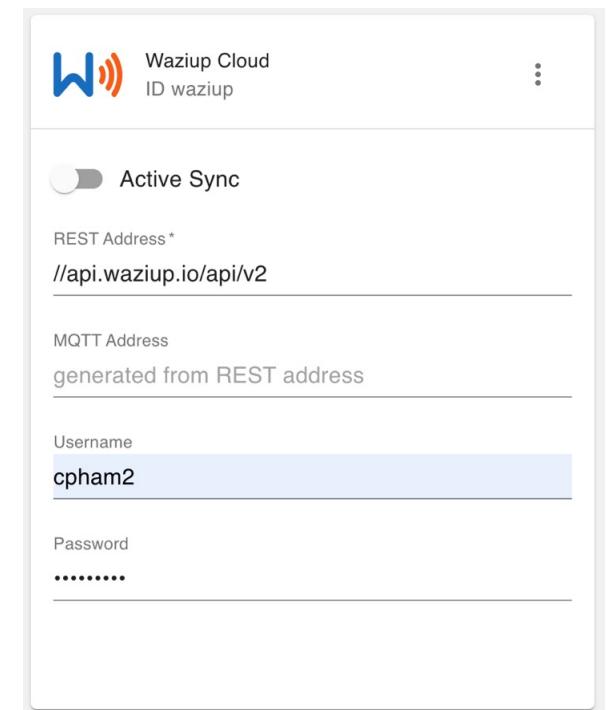
# Advanced configuration

## sync gateway and its devices to the cloud, con't

- You should have a new gateway on your dashboard with the new ID



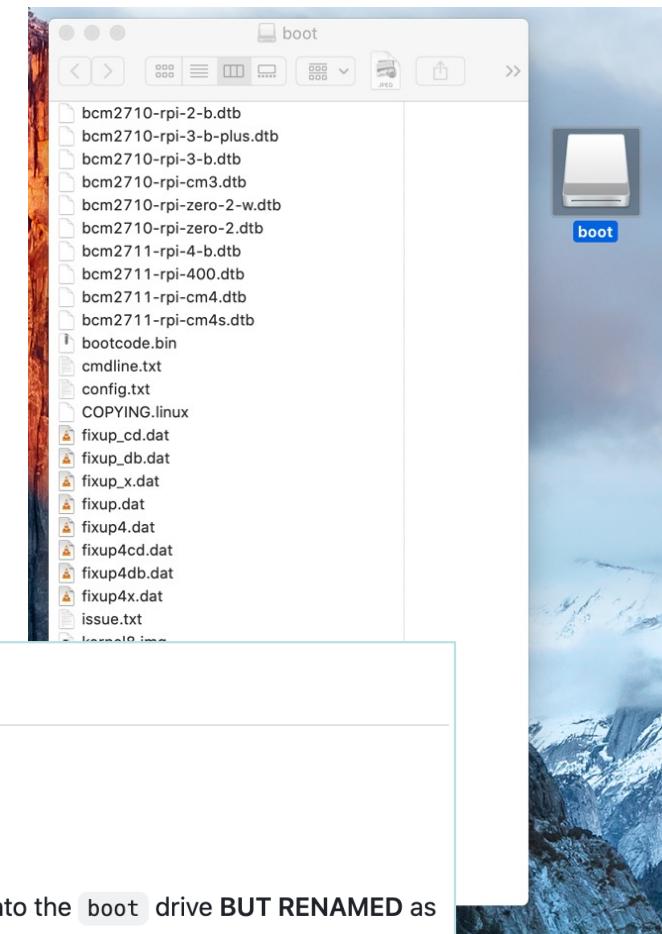
- Enter your Waziup Cloud credentials in the Sync menu
- Then, just activate sync on your gateway which needs to be connected to Internet
- Log in the Waziup Cloud dashboard and check that you see your gateway and your device
- You can activate/deactivate synchronization at anytime



# Advanced configuration

## use 433MHz frequency band

- The default SD card image uses EU868 frequency band
- To set to 433MHz, read carefully & use the auto-configuration mechanism
  - <https://github.com/CongducPham/PRIMA-Intel-Irris/tree/main/Gateway/boot#auto-configuration-on-boot-for-the-intel-irris-wazigate>



### Example 1: set INTEL-IRRIS WaziGate in 433MHz version

- flash the INTEL-IRRIS WaziGate SD card image
- insert the SD card in any computer (Windows, Linux, MacOS)
- open the `boot` drive that should appear on your computer
- download from INTEL-IRRIS GitHub (`Gateway/boot`) `intel-irris-band-433.txt` to be copied into the `boot` drive **BUT RENAMED** as `intel-irris-band.txt`
- be sure that there is no `intel-irris-auto-config.done` file in the `boot` drive, otherwise delete the file
- safely eject the `boot` drive
- insert the SD card in the RPI and power the RPI

**ex 1:** have several capacitive soil sensor devices

- Only to have several capacitive soil devices on 1 Wazigate – change the device address in the soil device Arduino code

```
Intelirris_Soil_Sensor | Arduino 1.8.13

Intelirris_Soil_Sensor DS18B20.cpp DS18B20.h RadioSettings.h SK128X_RadioSettings.h SK127X_RadioSettings.h SK128X_RadioSettings.h
181 //*****
182 //***** [REDACTED]
183 //***** [REDACTED]
184 //***** [REDACTED]
185 //***** [REDACTED]
186 //*****
187
188 /////////////////
189 // LORAWAN OR EXTENDED DEVICE ADDRESS FOR LORAWAN CLOUD
190 #if defined LORAWAN || defined EXTDEVADDR
191 //////////////////
192 //ENTER HERE your Device Address from the TTN device info (same order, i.e. msb). Example for 0x12345678
193 //unsigned char DevAddr[4] = { 0x12, 0x34, 0x56, 0x78 };
194 //////////////////
195
196 #if defined WITH_WATERMARK && not defined WMLAS_PRIMARY_SENSOR
197 //Watermark soil sensor device has a different address from the default address 26011DAA
198 //26011DB1
199 //if you need another address for tensiometer sensor device, use B1, B2, B3,..., BF
200 unsigned char DevAddr[4] = {0x26, 0x01, 0x1D, 0xAA};
201 #else
202 //default device address for WaziGate configuration, mainly for SEN0308 capacitive soil sensor device
203 //26011DAA
204 //if you need another address for capacitive sensor device, use AA, AB, AC,..., AF
205 unsigned char DevAddr[4] = {0x26, 0x01, 0x1D, 0xAA};
206 #endif
207
208 #else
209 //////////////////
210 // DO NOT CHANGE HERE
211 unsigned char DevAddr[4] = { 0x00, 0x00, 0x00, node_addr };
212 //////////////////
213 #endif
214
215 //////////////////
216
```

# **Default address for capacitive sensor is**

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

**Just increase the last byte**

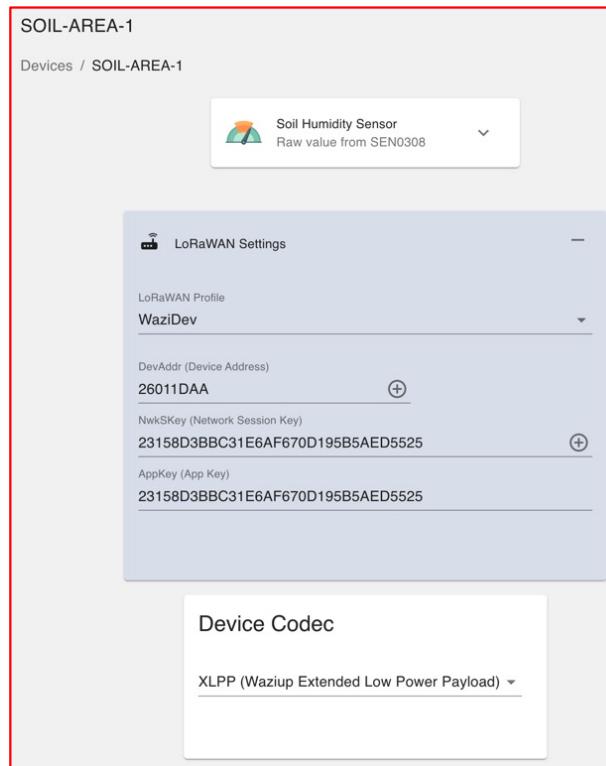
```
{ 0x26, 0x01, 0x1D, 0xAB };
```

# Compile and upload the code to the additional soil sensor device

# Advanced configuration

ex 1: have several capacitive soil sensor devices, con't

- Left figure shows gateway config with 1 soil sensor device
- Create a new device, e.g. device name SOIL-AREA-2
- Avoid space, limit to 12 characters for correct display on OLED



SOIL-AREA-1

Devices / SOIL-AREA-1

Soil Humidity Sensor  
Raw value from SEN0308

LoRaWAN Settings

LoRaWAN Profile: WaziDev

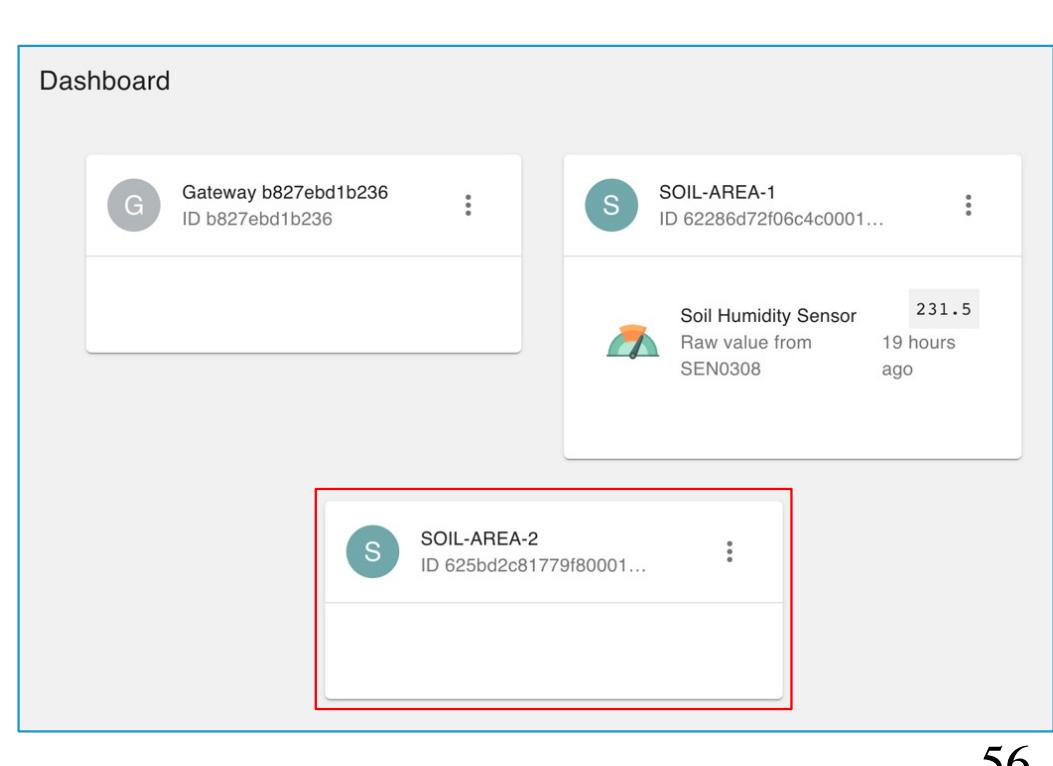
DevAddr (Device Address): 26011DAA

NwkKey (Network Session Key): 23158D3BBC31E6AF670D195B5AED5525

AppKey (App Key): 23158D3BBC31E6AF670D195B5AED5525

Device Codec

XLPP (Waziup Extended Low Power Payload)



Dashboard

G Gateway b827ebd1b236 ID b827ebd1b236

S SOIL-AREA-1 ID 62286d72f06c4c0001...

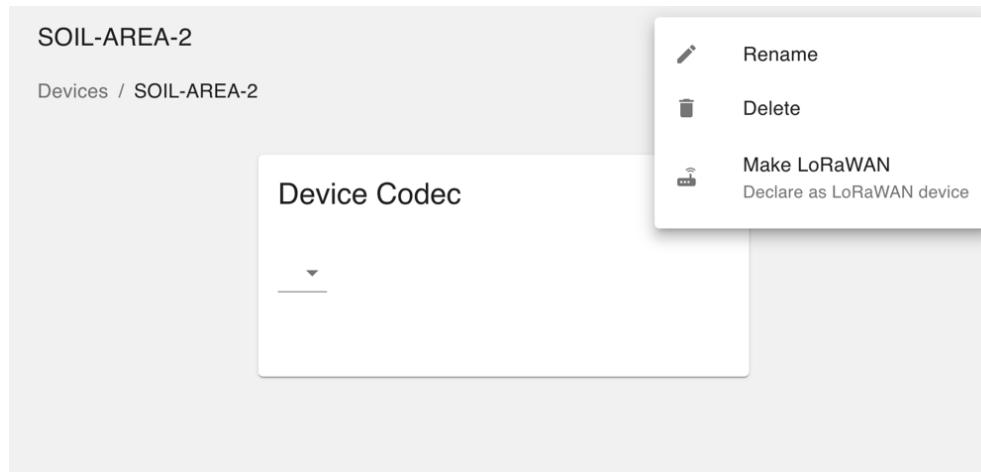
S SOIL-AREA-2 ID 625bd2c81779f80001...

Soil Humidity Sensor Raw value from SEN0308 231.5 19 hours ago

# Advanced configuration

ex 1: have several capacitive soil sensor devices, con't

- Select the new device 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

LoRaWAN Settings

LoRaWAN Profile: WaziDev

DevAddr (Device Address): 26011DAB

NwkSKey (Network Session Key): 23158D3BBC31E6AF670D195B5AED5525

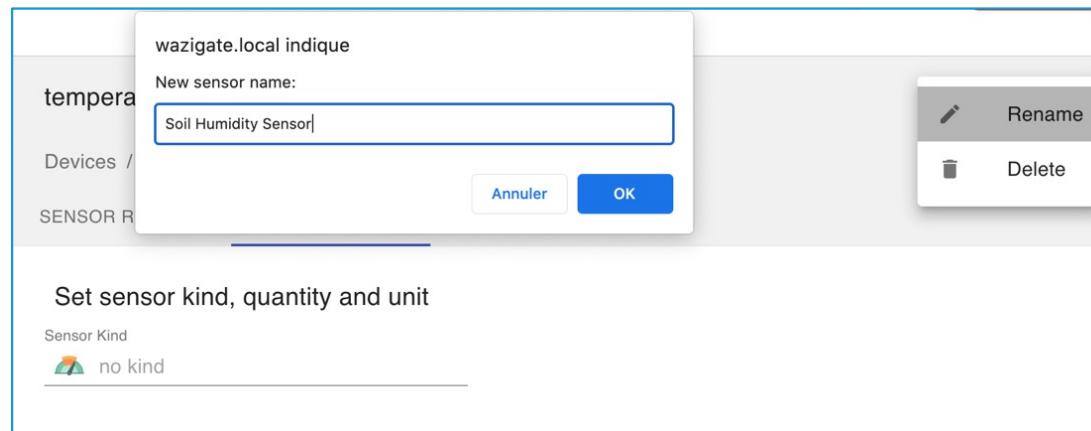
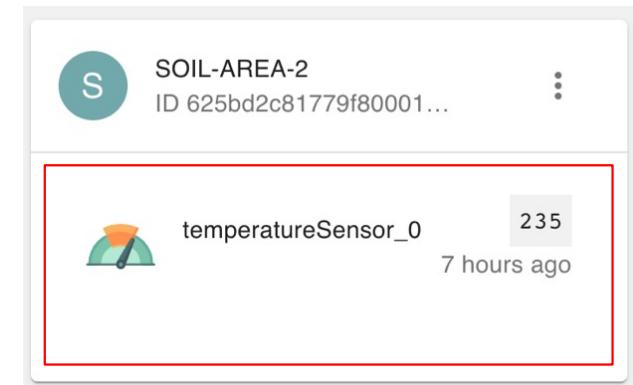
AppKey (App Key): 23158D3BBC31E6AF670D195B5AED5525

SAVE    RESET

# Advanced configuration

ex 1: have several capacitive soil sensor devices, con't

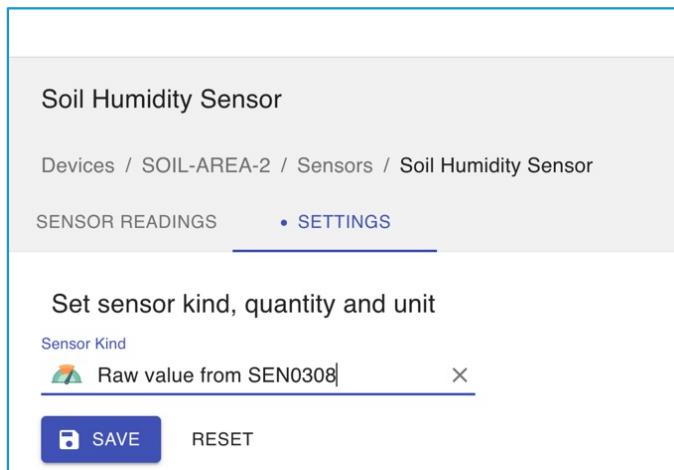
- DO NOT manually create a sensor. Instead,...
- ... power on the new soil sensor device for data transmission
- Refresh the gateway dashboard, the new data should appear
- New sensor name is "temperatureSensor\_0"
- Click on "temperatureSensor\_0" and then rename it, e.g. "Soil Humidity Sensor"



# Advanced configuration

ex 1: have several capacitive soil sensor devices, con't

- Change Sensor kind to "Raw value from SEN0308"



Soil Humidity Sensor

Devices / SOIL-AREA-2 / Sensors / Soil Humidity Sensor

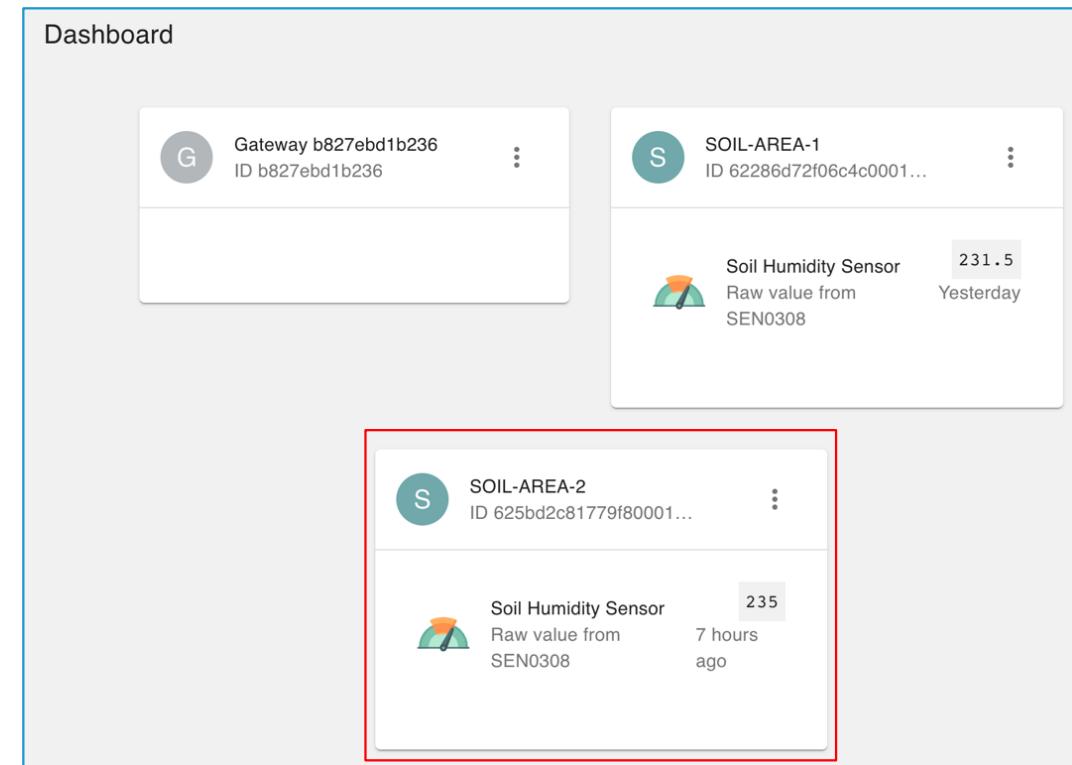
SENSOR READINGS • SETTINGS

Set sensor kind, quantity and unit

Sensor Kind

Raw value from SEN0308

SAVE RESET



Dashboard

G Gateway b827ebd1b236 ID b827ebd1b236 ...

S SOIL-AREA-1 ID 62286d72f06c4c0001... ...

Soil Humidity Sensor Raw value from SEN0308 231.5 Yesterday

S SOIL-AREA-2 ID 625bd2c81779f80001... ...

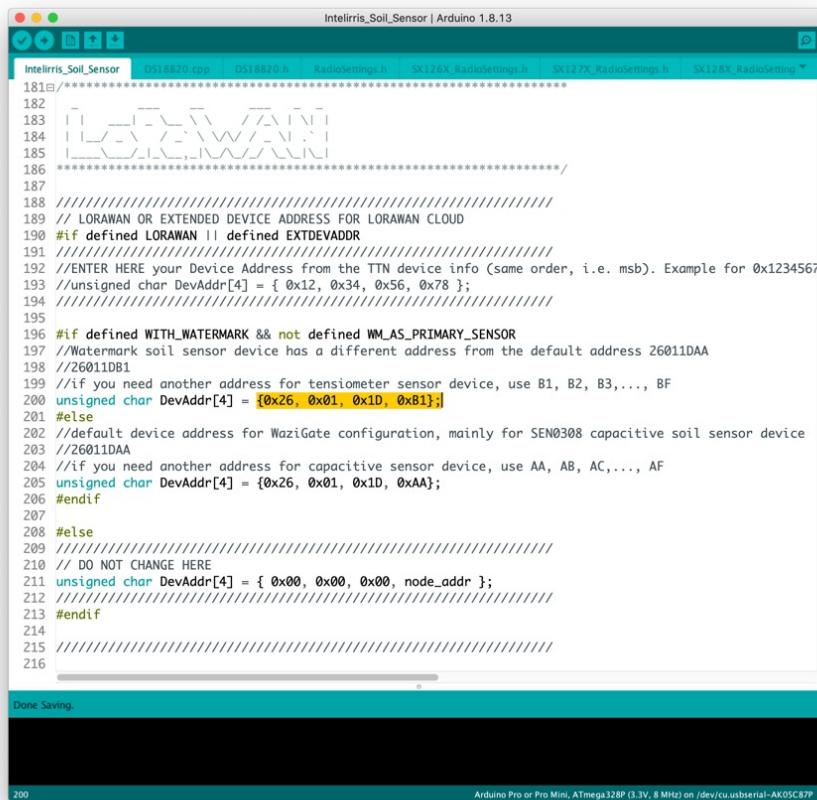
Soil Humidity Sensor Raw value from SEN0308 235 7 hours ago

- The dashboard now displays correctly the new device with its sensor

# Advanced configuration

ex 2: have several tensiometer soil sensor devices

- Only to have several tensiometer soil devices on 1 Wazigate – change the device address in the soil device Arduino code



```

 181 //*****
 182 // WAZIGATE
 183 // WAZIGATE
 184 // WAZIGATE
 185 //*****
 186 *****/
 187
 188 //////////////// LORAWAN OR EXTENDED DEVICE ADDRESS FOR LORAWAN CLOUD
 189 #if defined LORAWAN || defined EXTDEVADDR
 190 //ENTER HERE your Device Address from the TTN device info (same order, i.e. msb). Example for 0x1234567
 191 //unsigned char DevAddr[4] = { 0x12, 0x34, 0x56, 0x78 };
 192 ///////////////
 193 #if defined WITH_WATERMARK && not defined WM_AS_PRIMARY_SENSOR
 194 //Watermark soil sensor device has a different address from the default address 26011DAA
 195 //26011DB1
 196 // if you need another address for tensiometer sensor device, use B1, B2, B3,..., BF
 197 unsigned char DevAddr[4] = {0x26, 0x01, 0x1D, 0xB1};
 198 #else
 199 //default device address for WaziGate configuration, mainly for SEN0308 capacitive soil sensor device
 200 //26011DA
 201 // if you need another address for capacitive sensor device, use AA, AB, AC,..., AF
 202 unsigned char DevAddr[4] = {0x26, 0x01, 0x1D, 0xAA};
 203 #endif
 204 // DO NOT CHANGE HERE
 205 #ifndef node_addr
 206 unsigned char DevAddr[4] = { 0x00, 0x00, 0x00, node_addr };
 207 #endif
 208 ///////////////
 209 // DO NOT CHANGE HERE
 210 #endif
 211 // DO NOT CHANGE HERE
 212 #endif
 213 // DO NOT CHANGE HERE
 214 // DO NOT CHANGE HERE
 215 // DO NOT CHANGE HERE
 216

```

Done Saving.

Arduino Pro or Pro Mini, ATmega328P (3.3V, 8 MHz) on /dev/cu.usbserial-AK05C87P

**Default address for tensiometer sensor is**

{ 0x26, 0x01, 0x1D, 0xB1 };

**Just increase the last byte**

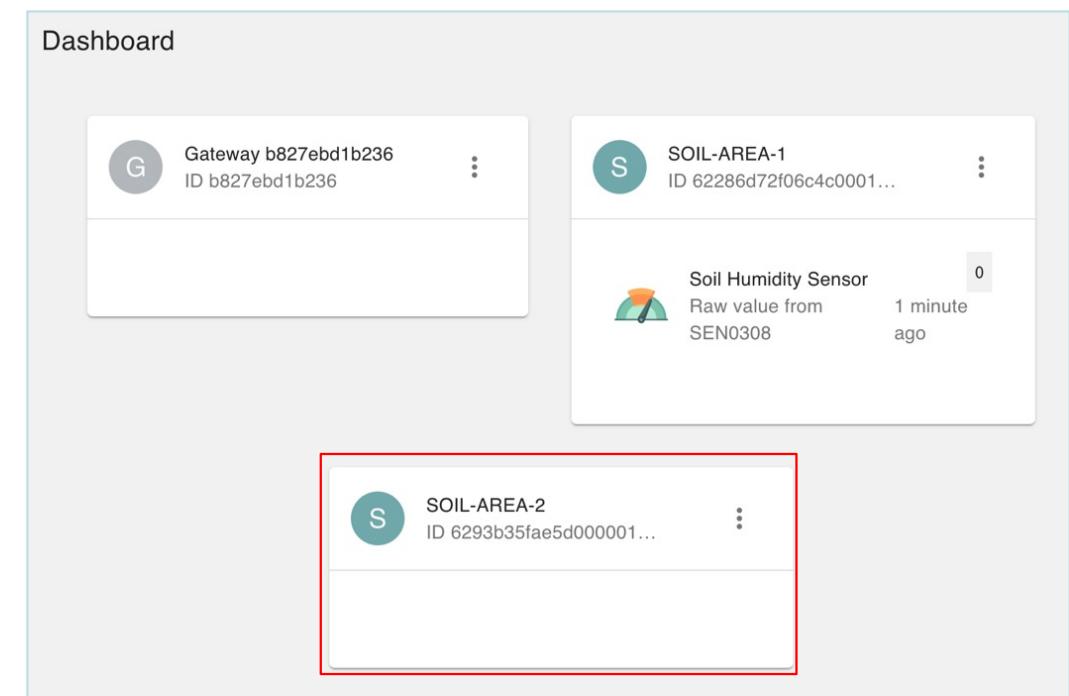
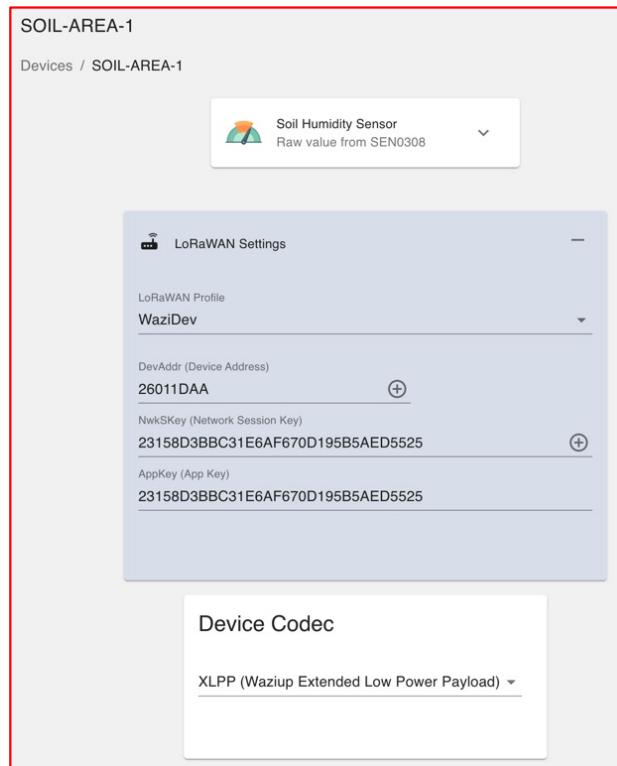
{ 0x26, 0x01, 0x1D, 0xB2 };

**Compile and upload the code to the soil sensor device**

# Advanced configuration

ex 2: have several tensiometer soil sensor devices, con't

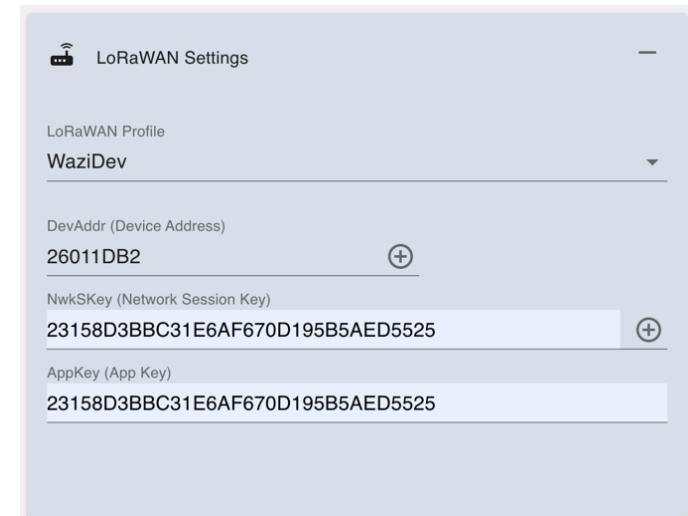
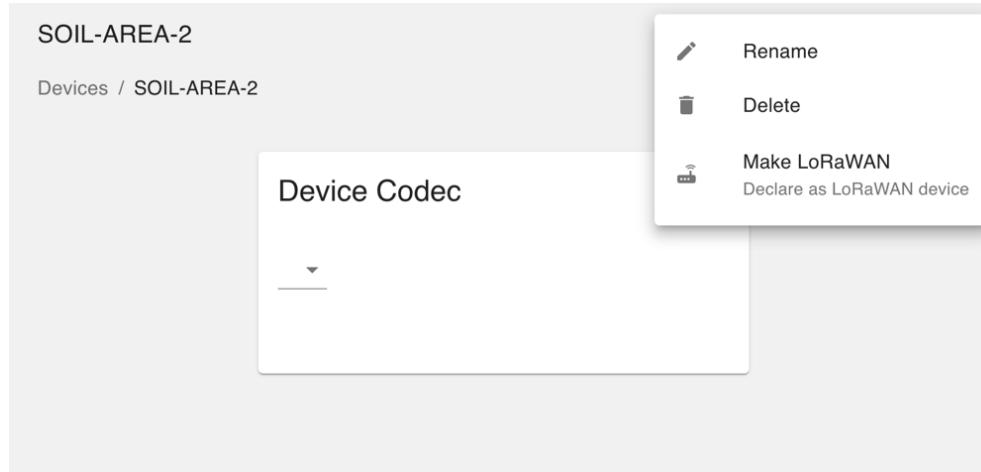
- Left figure shows gateway config with 1 soil sensor device
- Create a new device, e.g. device name SOIL-AREA-2
- Avoid space, limit to 12 characters for correct display on OLED



# Advanced configuration

ex 2: have several tensiometer soil sensor devices, con't

- Select the new device and make it as LoRaWAN device

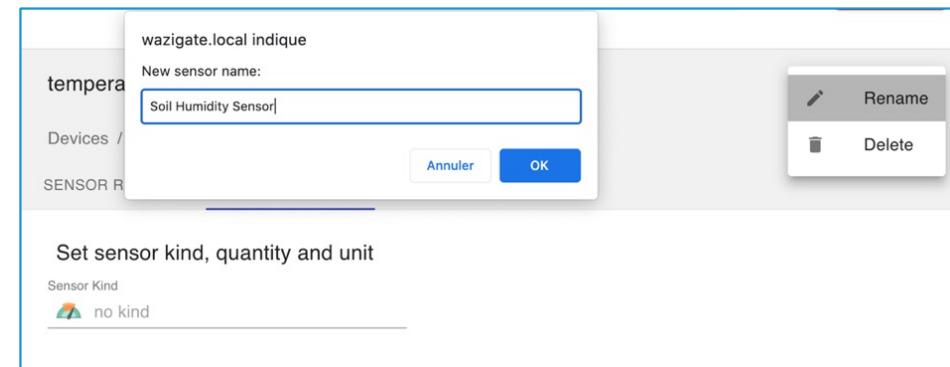
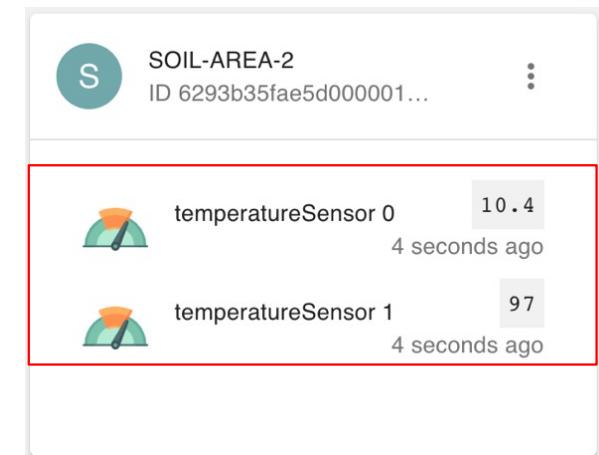


- Set the new address, matching the one of the Arduino code: 26011DB2
- keep same encryption keys
- Select XLPP as codec

# Advanced configuration

ex 2: have several tensiometer soil sensor devices, con't

- DO NOT manually create a sensor. Instead,...
- ... power on the new soil sensor device for data transmission
- Refresh the gateway dashboard, the new data should appear
- There should be 2 new sensor names
  - "temperatureSensor\_0" & "temperatureSensor\_1"
- Click on "temperatureSensor\_0" and then rename it, e.g. "Soil Humidity Sensor"
- Do the same for "temperatureSensor\_1"



# Advanced configuration

ex 2: have several tensiometer soil sensor devices, con't

- For first sensor, change Sensor kind to "centibars from WM200"
- For second sensor, use "scaled value from WM200 real=x10"

Soil Humidity Sensor

Devices / SOIL-AREA-2 / Sensors / Soil Humidity Sensor

SENSOR READINGS • SETTINGS

Set sensor kind, quantity and unit

Sensor Kind

 centibars from WM200 ×

SAVE RESET

Dashboard

G Gateway b827ebd1b236 ID b827ebd1b236 ...

S SOIL-AREA-1 ID 62286d72f06c4c0001... ...

 Soil Humidity Sensor Raw value from SEN0308 0 12 minutes ago

S SOIL-AREA-2 ID 6293b35fae5d000001... ...

 Soil Humidity Sensor centibars from WM200 10.4 3 minutes ago

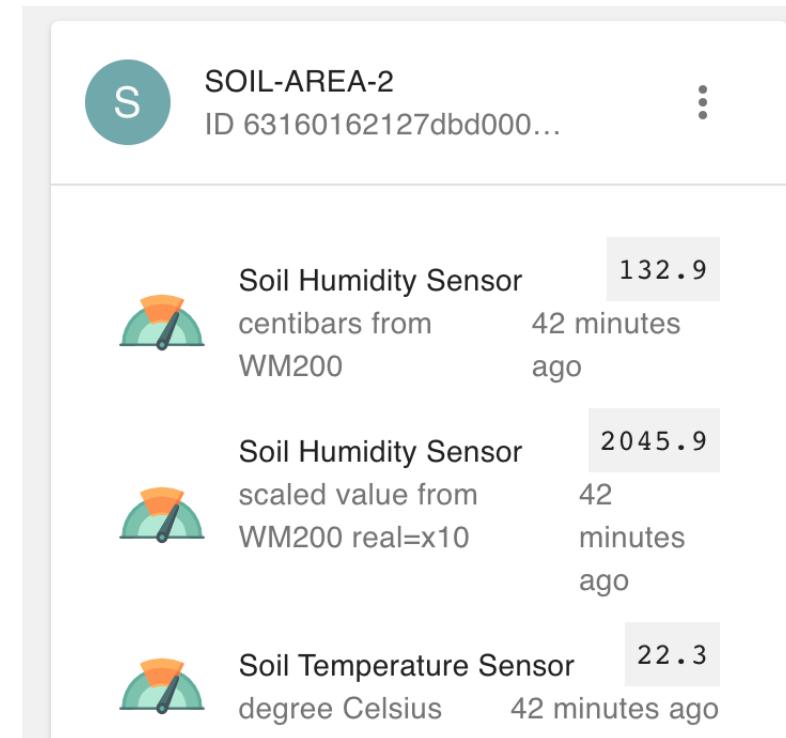
 Soil Humidity Sensor Scaled value from WM200 real=x10 97 3 minutes ago

- The dashboard now displays correctly the new device with its sensors

# Advanced configuration

## ex 1 & 2: with a soil temperature sensor

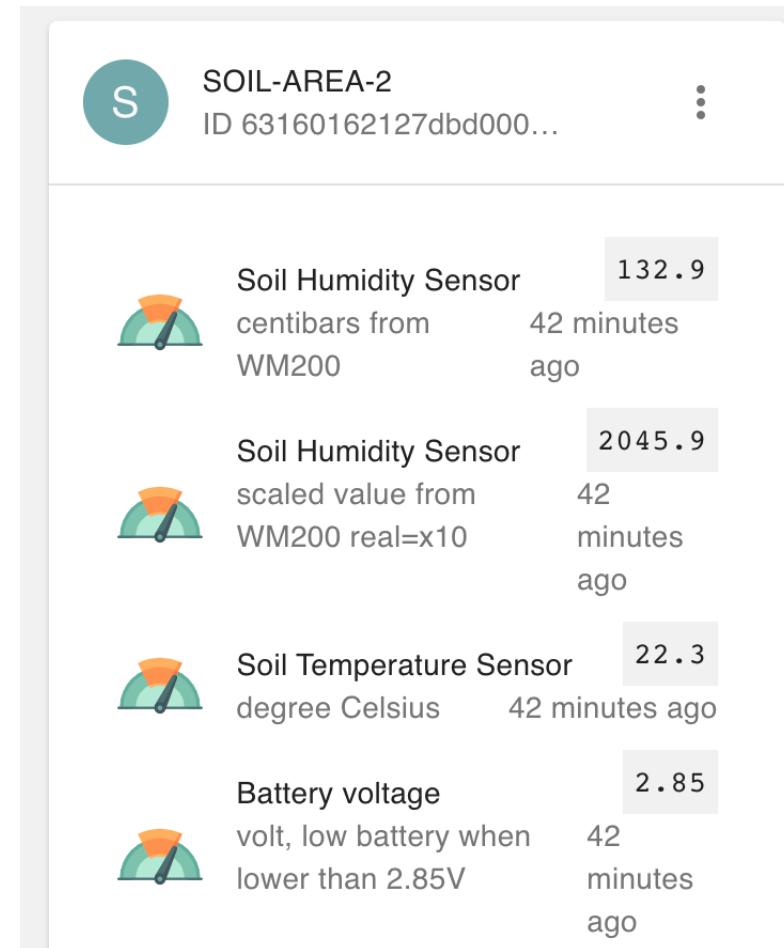
- If there is a soil temperature sensor attached, a sensor named "temperatureSensor\_5" will also appear
- Click on "temperatureSensor\_5" and then rename it, e.g. "Soil Temperature Sensor"
- Change Sensor kind to "degree Celsius"
- Reload dashboard which should now displays correctly the new device with its sensors



# Advanced configuration

## ex 1 & 2: with battery voltage monitor

- With battery voltage monitor, a sensor named "analogSensor\_6" will also appear
- Click on "analogSensor\_6" and then rename it, e.g. "Battery voltage"
- Change Sensor kind to "volt, low battery when lower than 2.85V"
- Reload dashboard which should now displays correctly the new device with its sensors



# Advanced configuration

## execute automatic custom configuration

- Default SD card image defines
  - 1 capacitive sensor SOIL-AREA-1
  - 1 tensiometer sensor SOIL-AREA-2
- To change configuration, read carefully & use the auto-configuration mechanism
  - <https://github.com/CongducPham/PRIMA-Intel-Irris/tree/main/Gateway/boot#auto-configuration-on-boot-for-the-intel-irris-wazigate>
- Default auto-configuration (GitHub: Gateway/boot)
  - create-starter-kit-demo-capacitive-watermark-st-iiwa-ha  
default capacitive: SOIL-AREA-1, 26011DAA  
default tensiometer + 1 soil temperature: SOIL-AREA-2, 26011DB1  
Home Assistant included  
these 2 devices are added to IIWA and HA

# Advanced configuration

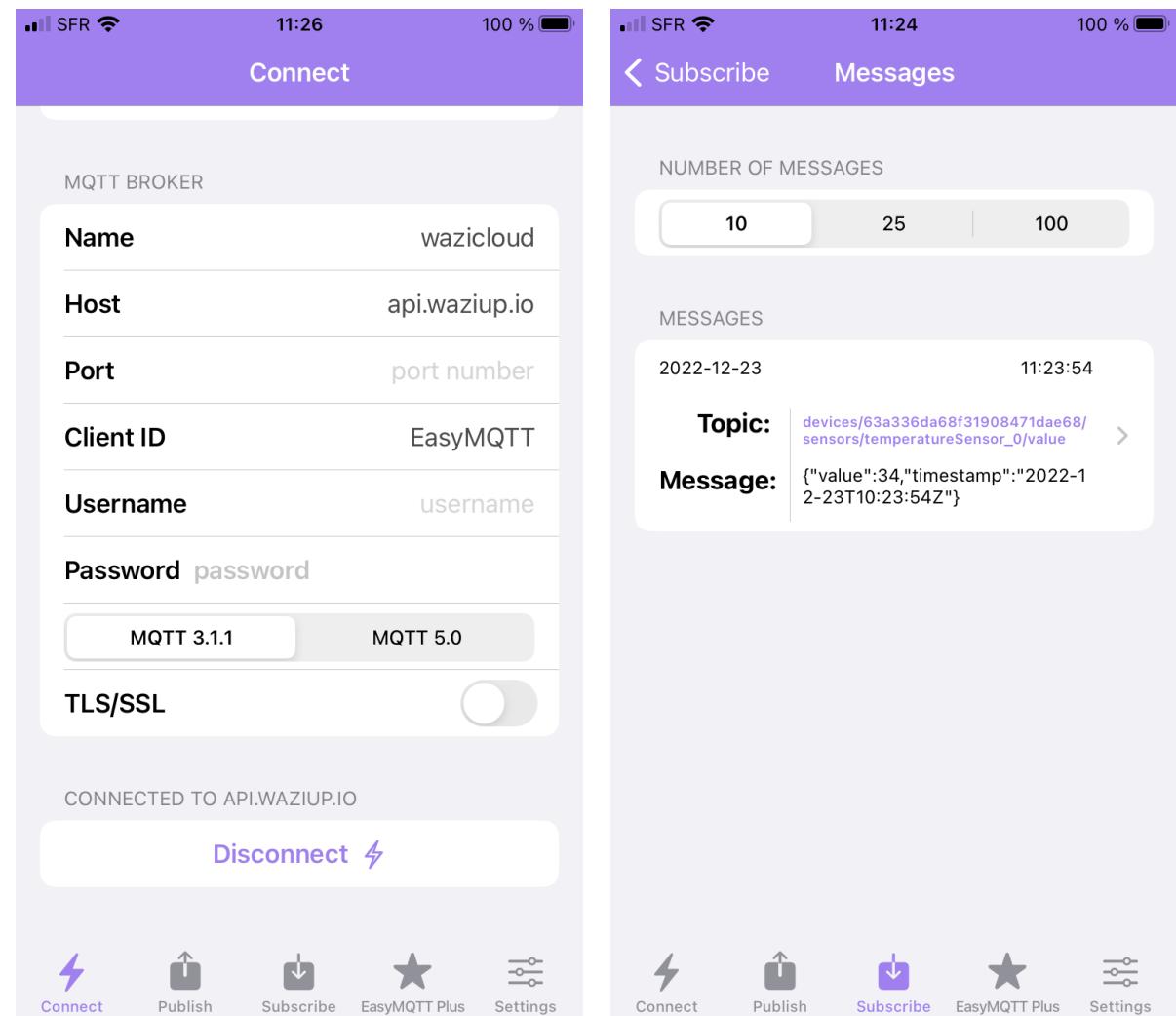
## MQTT integration

- With sensor data on WaziCloud, it is possible to subscribe to those data with MQTT protocol
- With command line mosquitto\_sub
  - mosquitto\_sub  
-L "mqtt://api.waziup.io/devices/<deviceID>/sensors/<sensorID>/value"
  - mosquitto\_sub  
-h api.waziup.io -t devices/<deviceID>/sensors/<sensorID>/value
- With other MQTT integration client/platform
  - Host: api.waziup.io
  - Topic: devices/<deviceID>/sensors/<sensorID>/value
- Output
  - { "value": 34, "timestamp": "2022-12-23T10:23:54Z" }

# Advanced configuration

## MQTT integration, con't

- ➊ Example with an MQTT client (EasyMQTT) on an iPhone7



# NOTICE ON THE STARTER-KIT



- NEVER TRANSMIT WITHOUT AN ANTENNA
- 1 FULLY ASSEMBLED & CONFIGURED SOIL SENSOR
  - NEED TO INSTALL 2-AA BATTERIES
  - TAKE HIGH-GRADE BATTERIES
  - DO NOT SWITCH ON WITHOUT ANTENNA ATTACHED
  - ALREADY CONFIGURED FOR WAZIGATE
- STARTER-KIT= 1 SOIL SENSOR + 1 GATEWAY
- INTEL-IRRIS GATEWAY IMAGE TO BE DOWNLOADED FROM <https://intel-iris.eu/results>
- FLASH IMAGE ON 8GB SD CARD (OR 16GB OR 32GB)
- THE GATEWAY IS ONLY PRE-CONFIGURED FOR 1 SOIL SENSOR PER FARM
- STARTER-KIT TUTORIAL : <https://intel-iris.eu/tutorials-slides>