

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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INTEL-IRRIS starter-kit

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



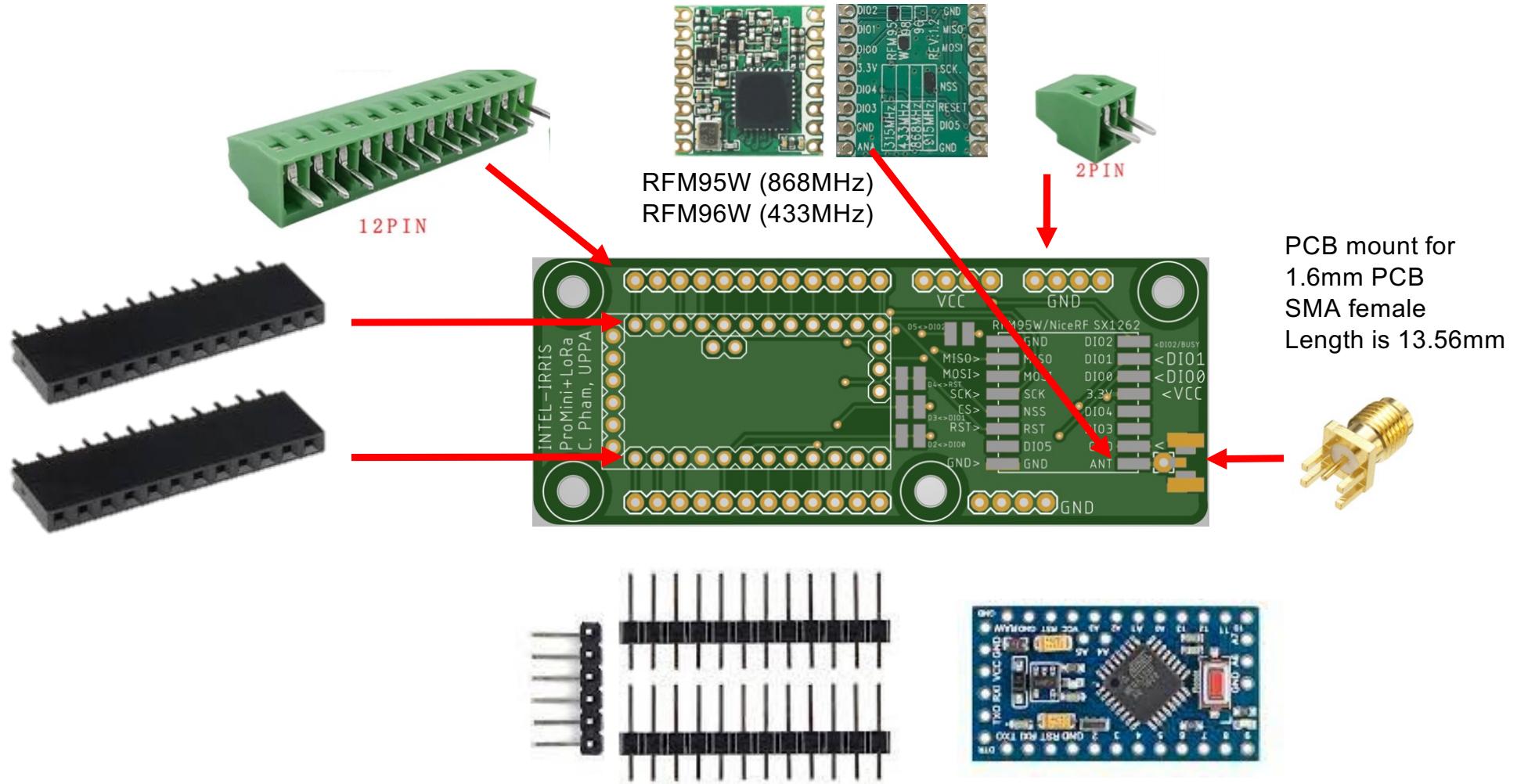
Preparing the starter-kits at UPPA



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

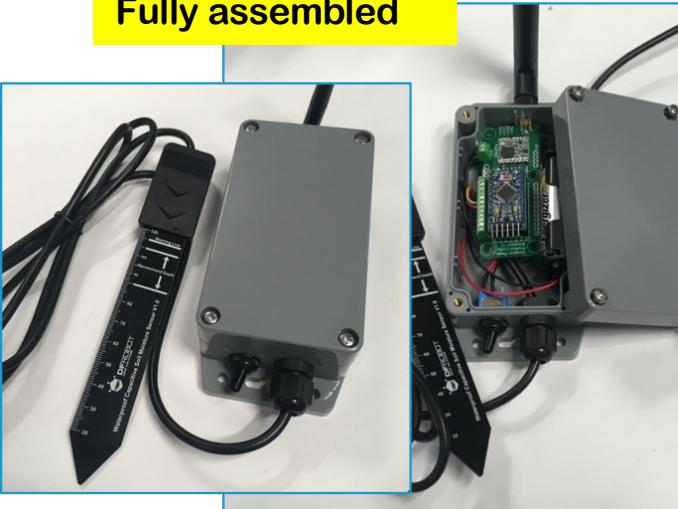


Soil sensor: electronic parts starter-kit version



Soil sensor device

Fully assembled

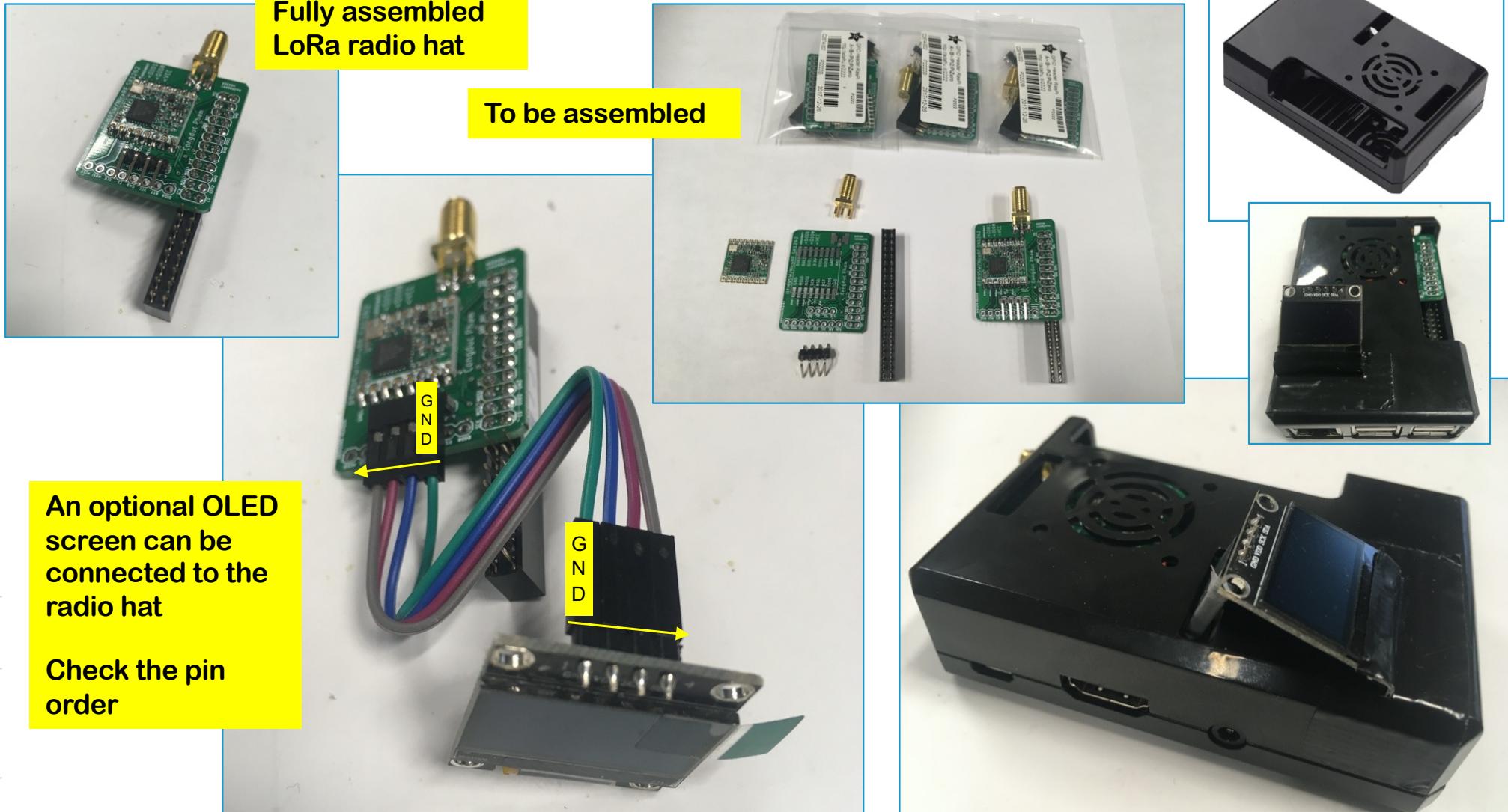


2 versions of the soil device



A soil temperature sensor can be added

INTEL-IRRIS gateway (WaziGate)



Assembling starter-kit

Algeria (UORAN1), Morocco (ENSA Safi)

- Part 1: Soil sensor device

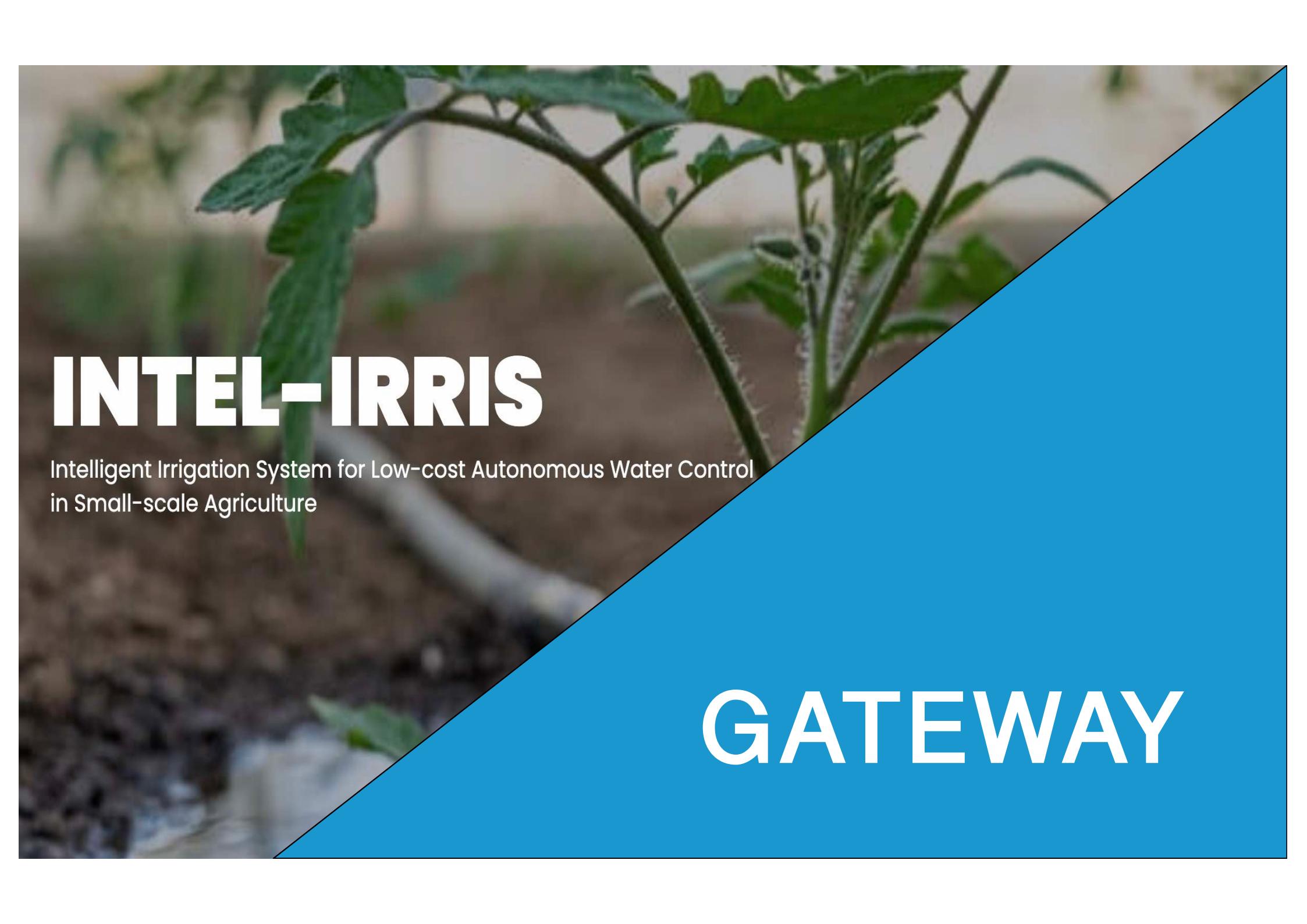
- [Tutorial slides on building & assembling the outdoor LoRa IoT soil sensor device](#)
- [Video n°1. YouTube tutorial video showing how to build the IoT microcontroller platform for the LoRa IoT soil sensor device.](#)
<https://youtu.be/3jdQ0Uo0phQ>
- [Video n°2. YouTube tutorial video showing how to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

Preparation steps for the starter-kit

- Preparing WaziGate (hardware)
- Prepare INTEL-IRRIS WaziGate SD card image (software)
- Boot and check the INTEL-IRRIS WaziGate
- Preparing soil sensor device
- Testing transmission to INTEL-IRRIS WaziGate
- **IMPORTANT**
 - 1 starter-kit = 1 soil sensor device + 1 INTEL-IRRIS WaziGate
 - device can be either with capacitive sensor or tensiometer sensor
 - 1 starter-kit per farm to be deployed and tested
 - The INTEL-IRRIS WaziGate 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-iris.eu/tutorials-slides>

A close-up photograph of a young green plant with serrated leaves. A thin, clear tube, likely made of PVC or Teflon, is attached to the stem, presumably for an irrigation system. The background is blurred, showing more plants and possibly a garden setting.

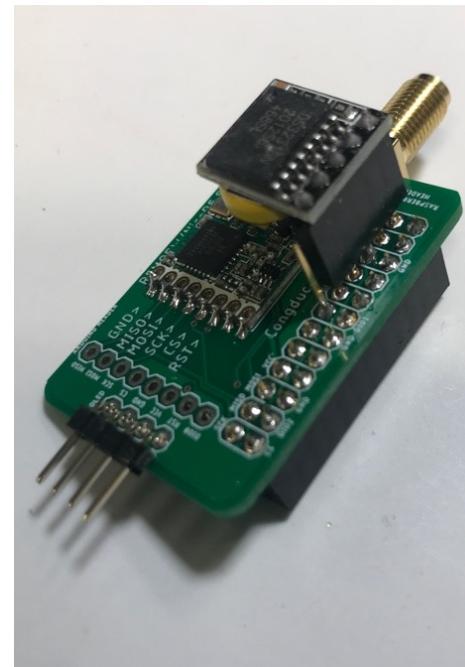
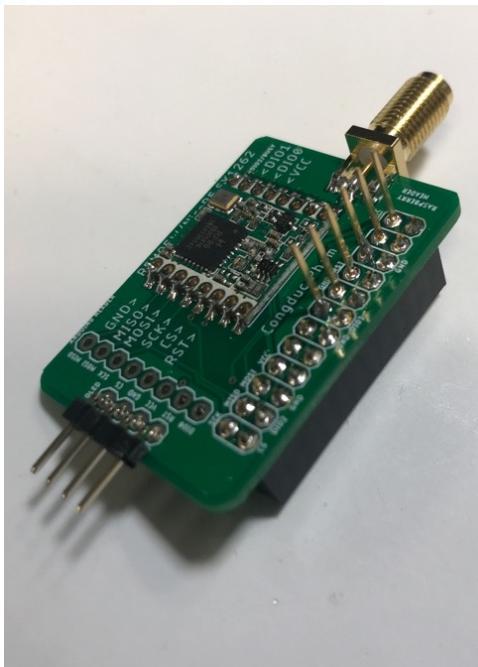
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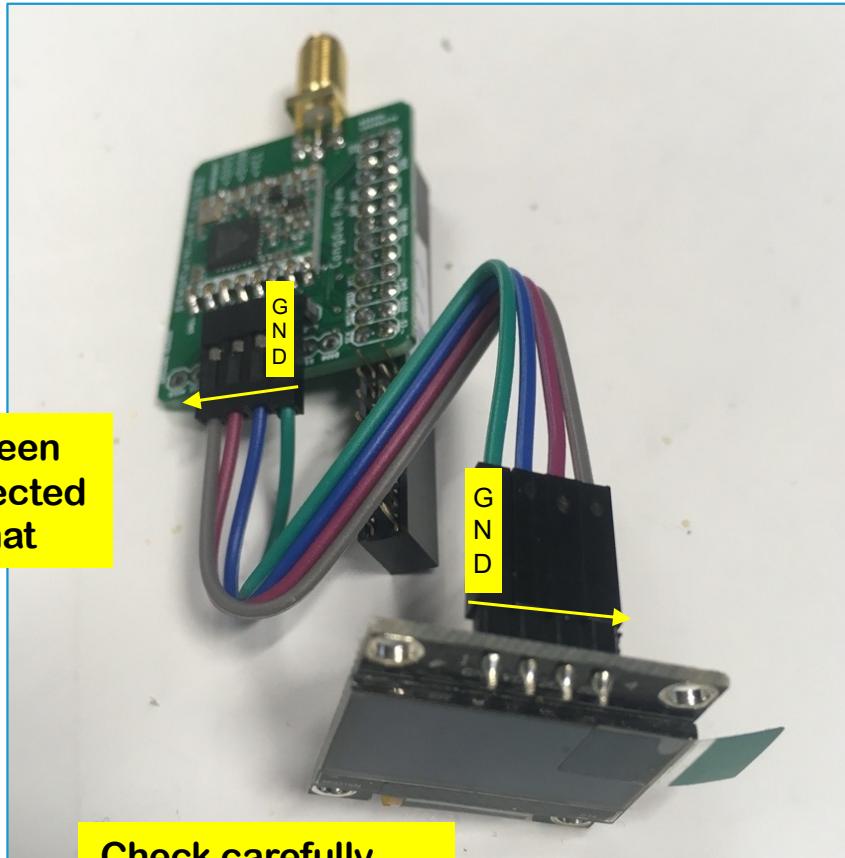
GATEWAY

Preparing WaziGate: RTC

- Connect Real-Time Clock module to LoRa hat (recommended)
 - With an additional RTC module, the INTEL-IRRIS WaziGate 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



Preparing WaziGate: OLED



Preparing WaziGate: 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 EU433 frequency band (Algeria, Morocco, France)
- Flash SD card (minimum 8GB): [Video n°4 at t=124s](#),
<https://youtu.be/j-1Nk0tv0xM?t=124>, then insert SD card

WaziGate 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

Synching the RTC module

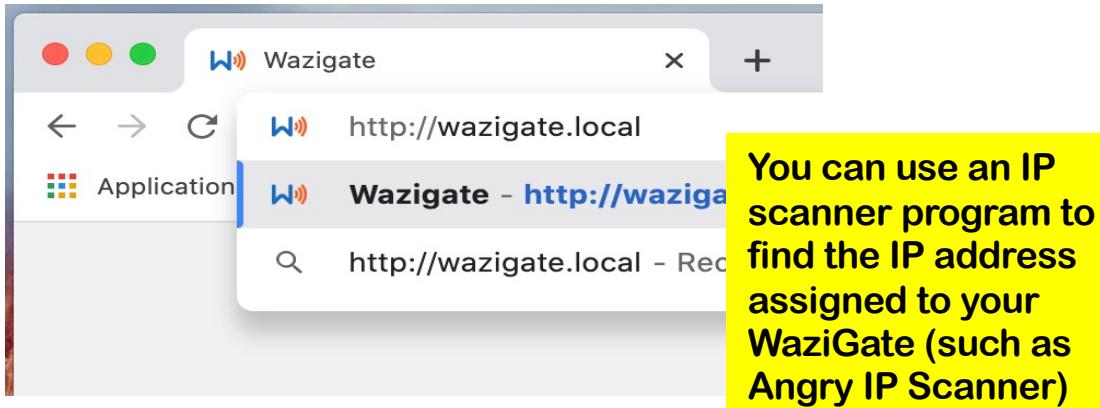
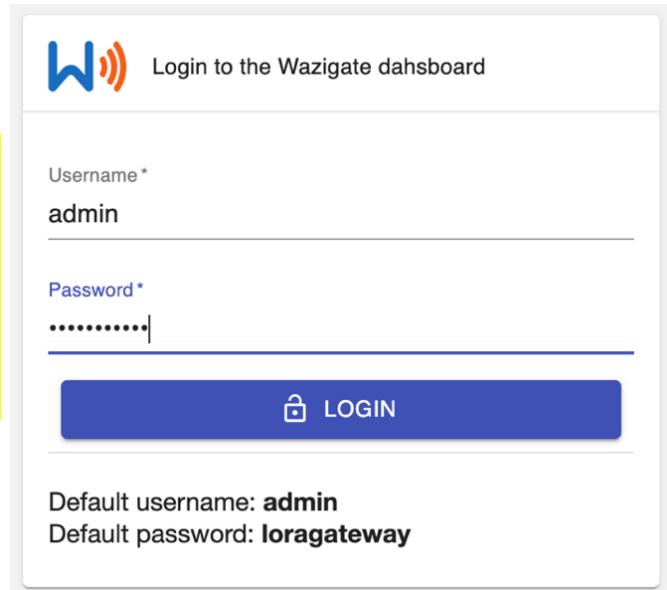
- As WaziGate will run without Internet access, its clock should be synched with an RTC module that also needs to be synched once
- Use your laptop that should itself be connected to the Internet (using your smartphone's WiFi sharing feature for instance)
- Make sure that your laptop will share its Internet 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 WaziGate, connect it to your laptop by Ethernet cable**
- Then power the WaziGate and you should see the first [Internet OK] screen. Wait until the main INTEL-IRRIS OLED screen appears
- On boot, the RTC module will then be synched with Internet's time & date



Checking the WaziGate (Ethernet)



- Connect the WaziGate to your laptop which has Internet
- Enable Internet sharing, laptop provides IP address to WaziGate
- Power the WaziGate, wait 3-4mins for boot process
- Open web navigator. Go to <http://wazigate.local> or use IP address

You can use an IP scanner program to find the IP address assigned to your WaziGate (such as Angry IP Scanner)

Login to the Wazigate dashboard

Username*
admin

Password*
.....|

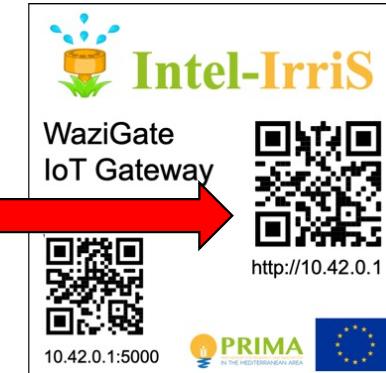
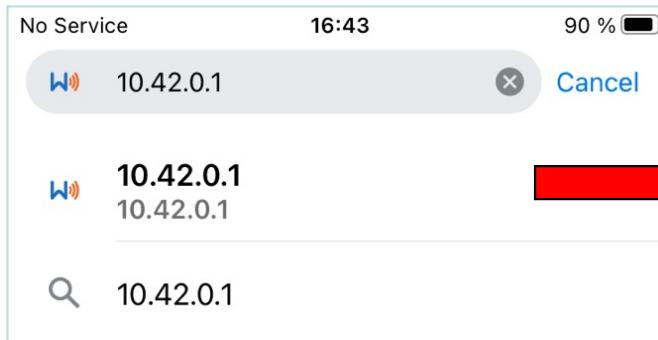
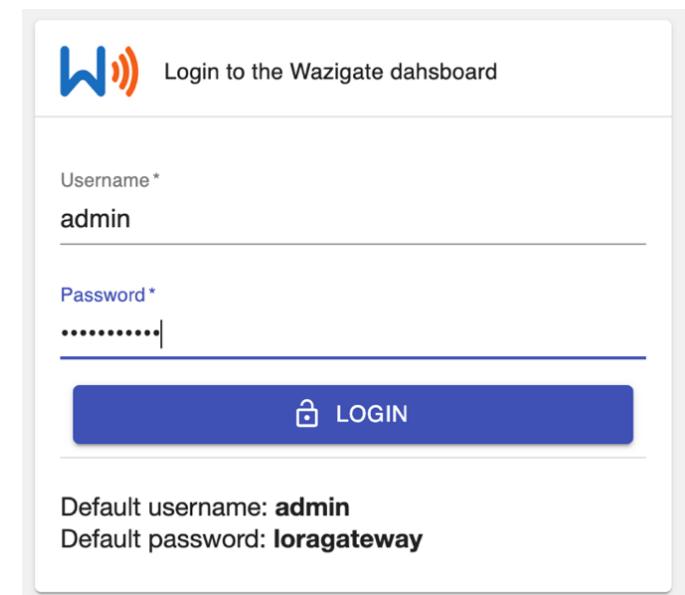
LOGIN

Default username: admin
Default password: loragateway

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

Checking the WaziGate (WiFi)

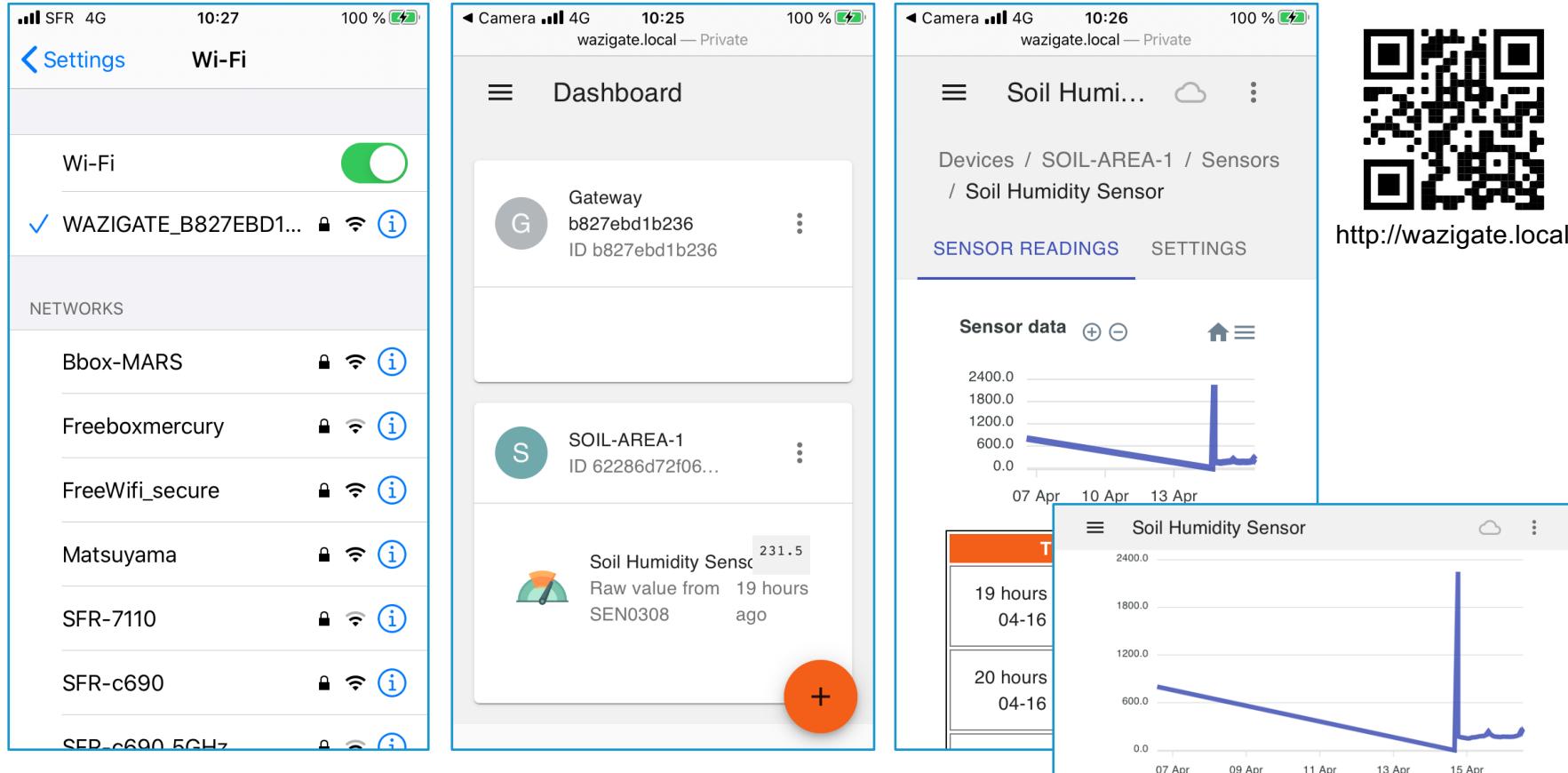
- Use a smartphone to check access to WaziGate through WiFi
- Connect to WAZIGATE_XXXXXXXXXXXXXX WiFi network
 - default WiFi password is loragateway
- Open web navigator. Go to <http://wazigate.local> or <http://10.42.0.1> or flash QR code

The login page for the Wazigate dashboard. It features the Intel-Irris logo and the text "Login to the Wazigate dashboard". There are fields for "Username *" containing "admin" and "Password *" containing "loragateway". A blue "LOGIN" button is at the bottom. Below the button, text states "Default username: admin" and "Default password: loragateway".

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

Dashboard from a smartphone



The figure displays three screenshots of a smartphone interface for monitoring soil humidity. The first screenshot shows the WiFi settings screen with a selected network named "WAZIGATE_B827EBD1...". The second screenshot shows the main dashboard with a gateway and a soil area entry. The third screenshot shows a detailed view of the "Soil Humidity Sensor" data over time, with a significant spike visible.

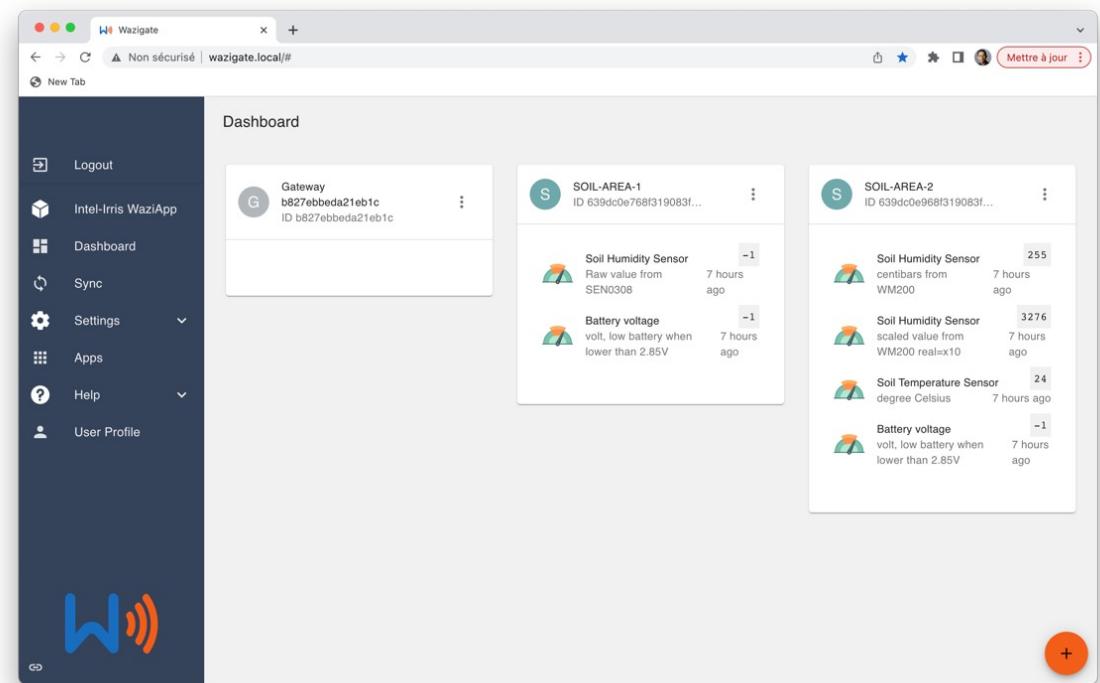
Look at [Video n°4 at t=239s](#)

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

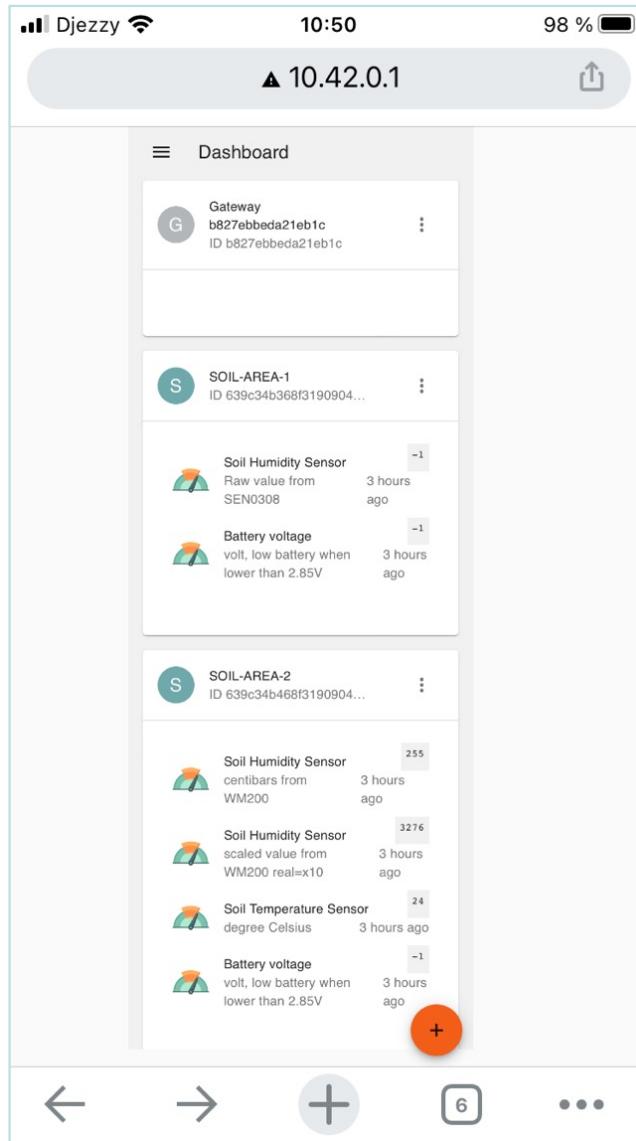
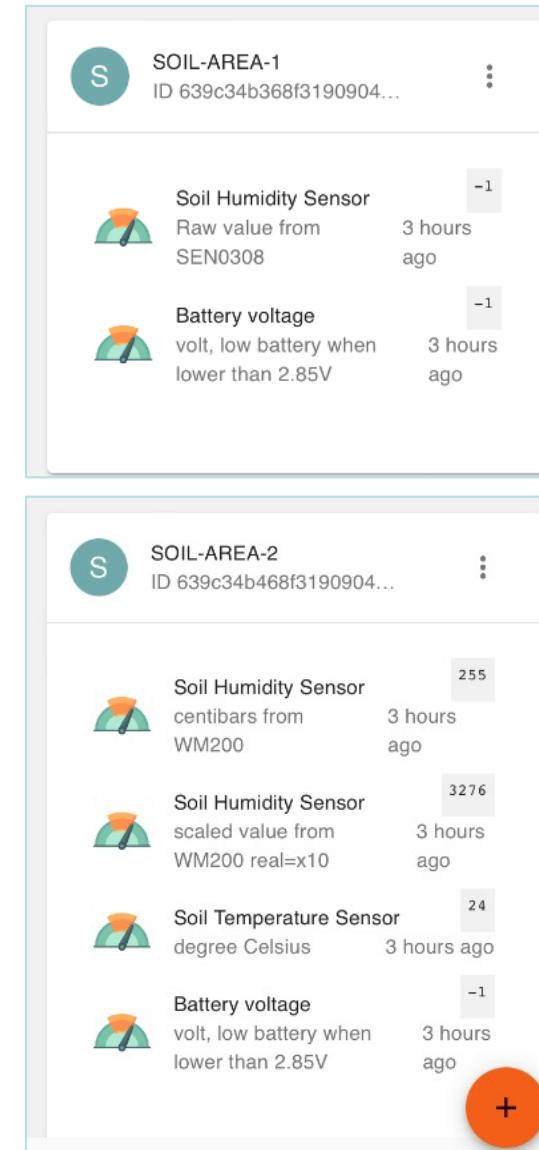


Default WaziGate configuration (1)

- For the starter-kit, the INTEL-IRRIS WaziGate 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 WaziGate configuration (2)

This section shows the WaziGate mobile application interface for two different soil monitoring areas: SOIL-AREA-1 and SOIL-AREA-2.

- SOIL-AREA-1:** Displays two sensor readings:
 - Soil Humidity Sensor: Raw value from SEN0308, value "-1", timestamp "3 hours ago".
 - Battery voltage: volt, low battery when lower than 2.85V, value "-1", timestamp "3 hours ago".
- SOIL-AREA-2:** Displays four sensor readings:
 - Soil Humidity Sensor: centibars from WM200, value "255", timestamp "3 hours ago".
 - Soil Humidity Sensor: scaled value from WM200 real=x10, value "3276", timestamp "3 hours ago".
 - Soil Temperature Sensor: degree Celsius, value "24", timestamp "3 hours ago".
 - Battery voltage: volt, low battery when lower than 2.85V, value "-1", timestamp "3 hours ago".

Each card has a "..." button at the top right and a red "+" button at the bottom right.

Default values for the SEN0308 capacitive sensor

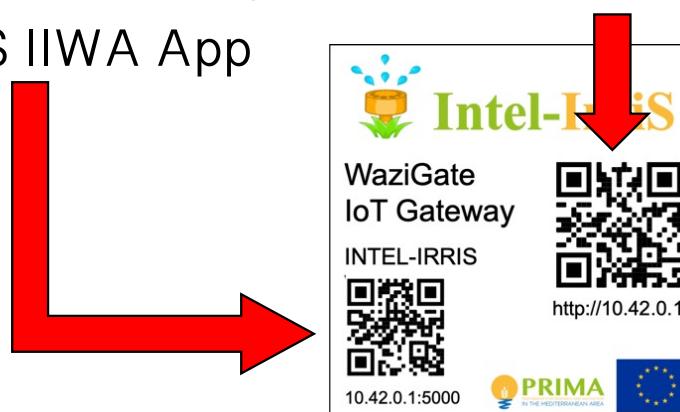


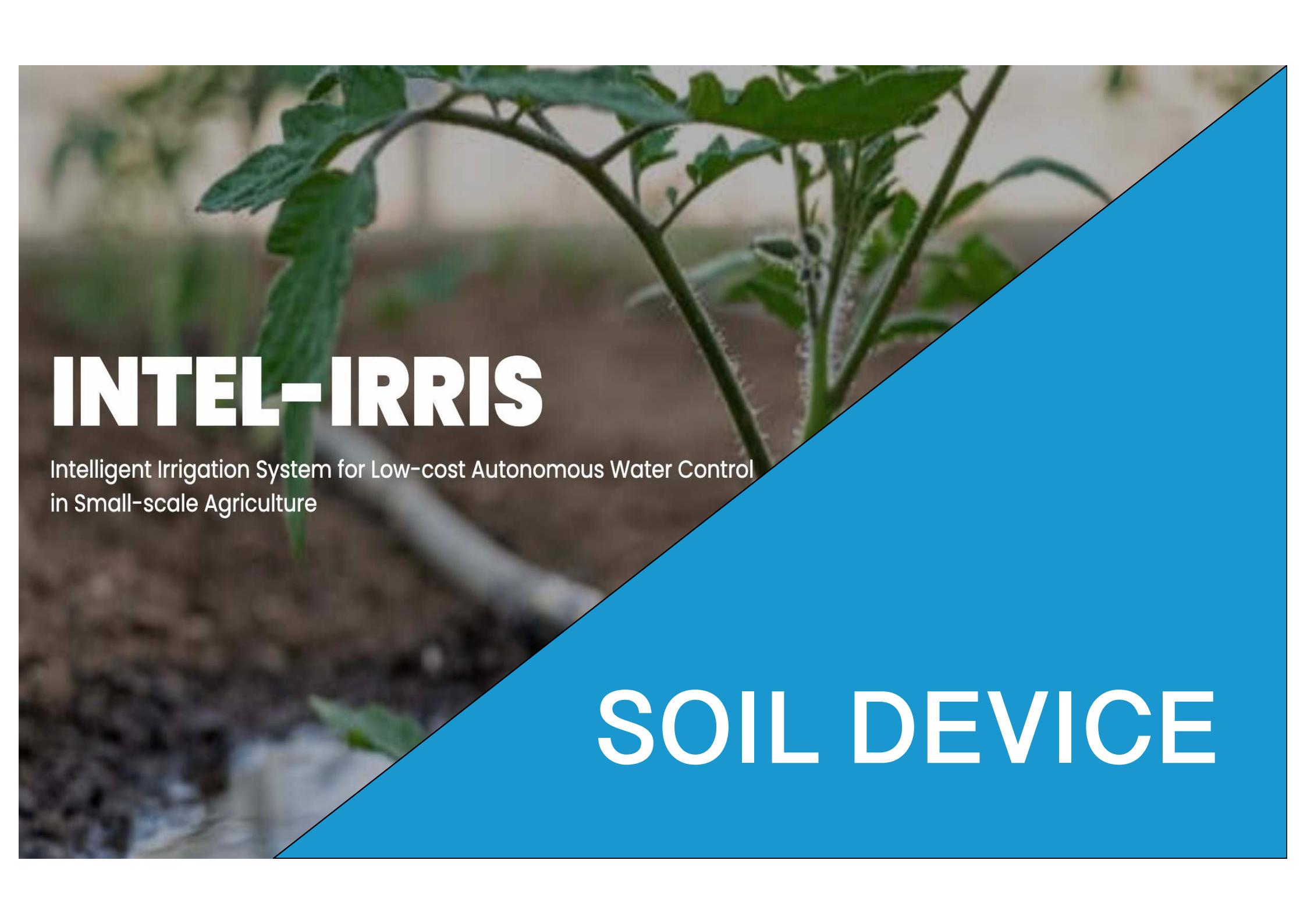
Default values for the WM200 tensiometer sensor



QR code for connecting to WiFi

- The WaziGate 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 WaziGate sticker to connect to the WaziGate's dashboard or the INTEL-IRRIS IIWA App



A close-up photograph of a young green plant with several leaves and a thin stem, growing out of dark brown soil. The background is slightly blurred.

INTEL-IRRIS

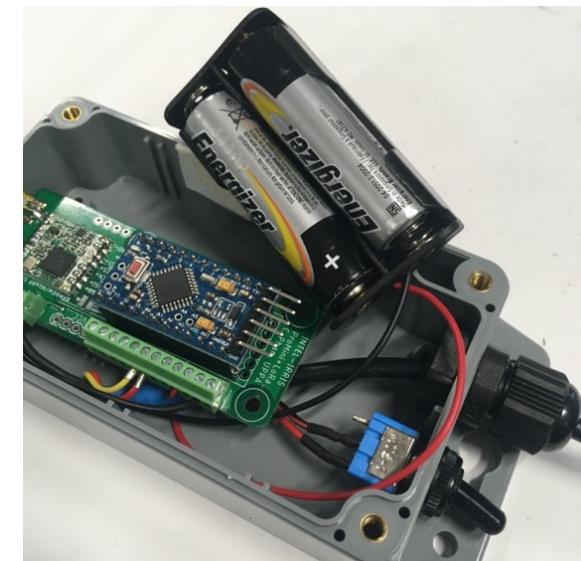
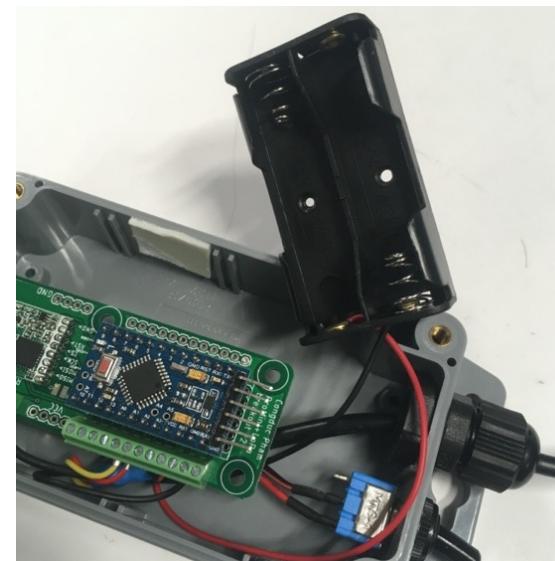
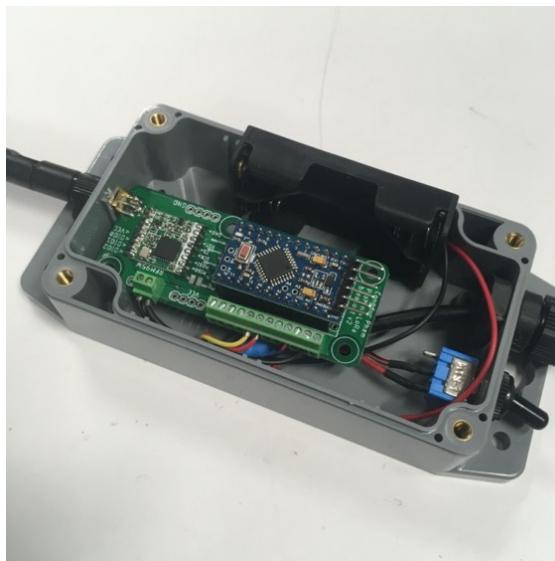
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SOIL DEVICE

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



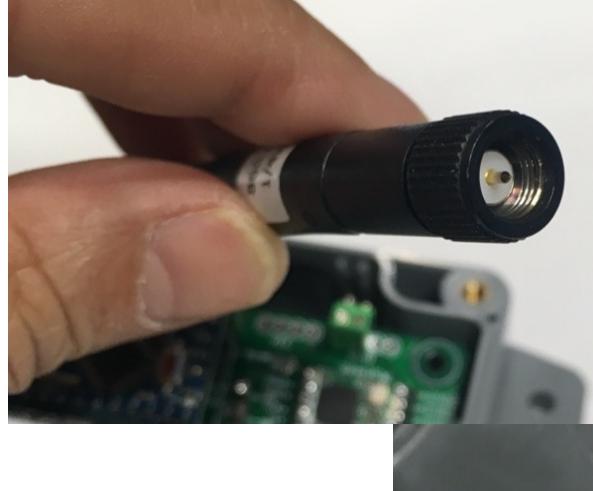


Never transmit without antenna

- 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

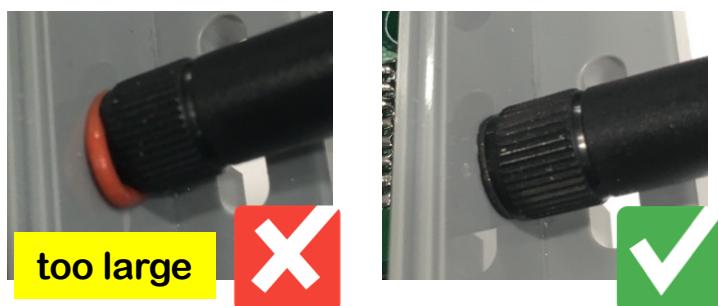
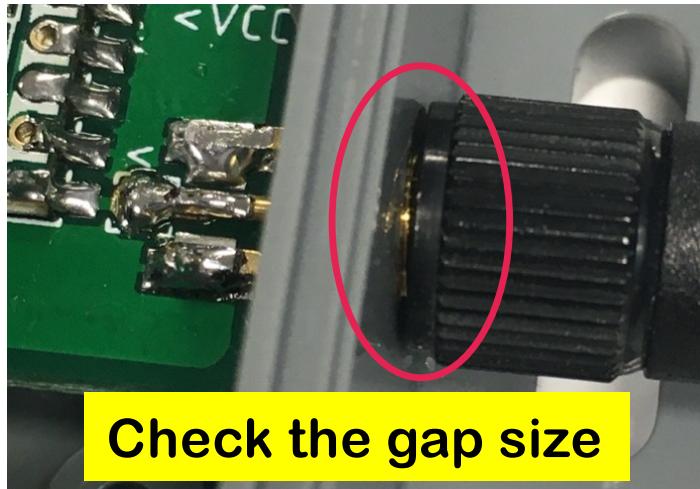


Be sure to connect the matching antenna
Here, SMA female with SMA male antenna
Need to screw the antenna in all the way

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



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

Do not have or can not use o-ring?

Maybe the gap is too big? Use silicon joint sealant



First, screw in the antenna all the way

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

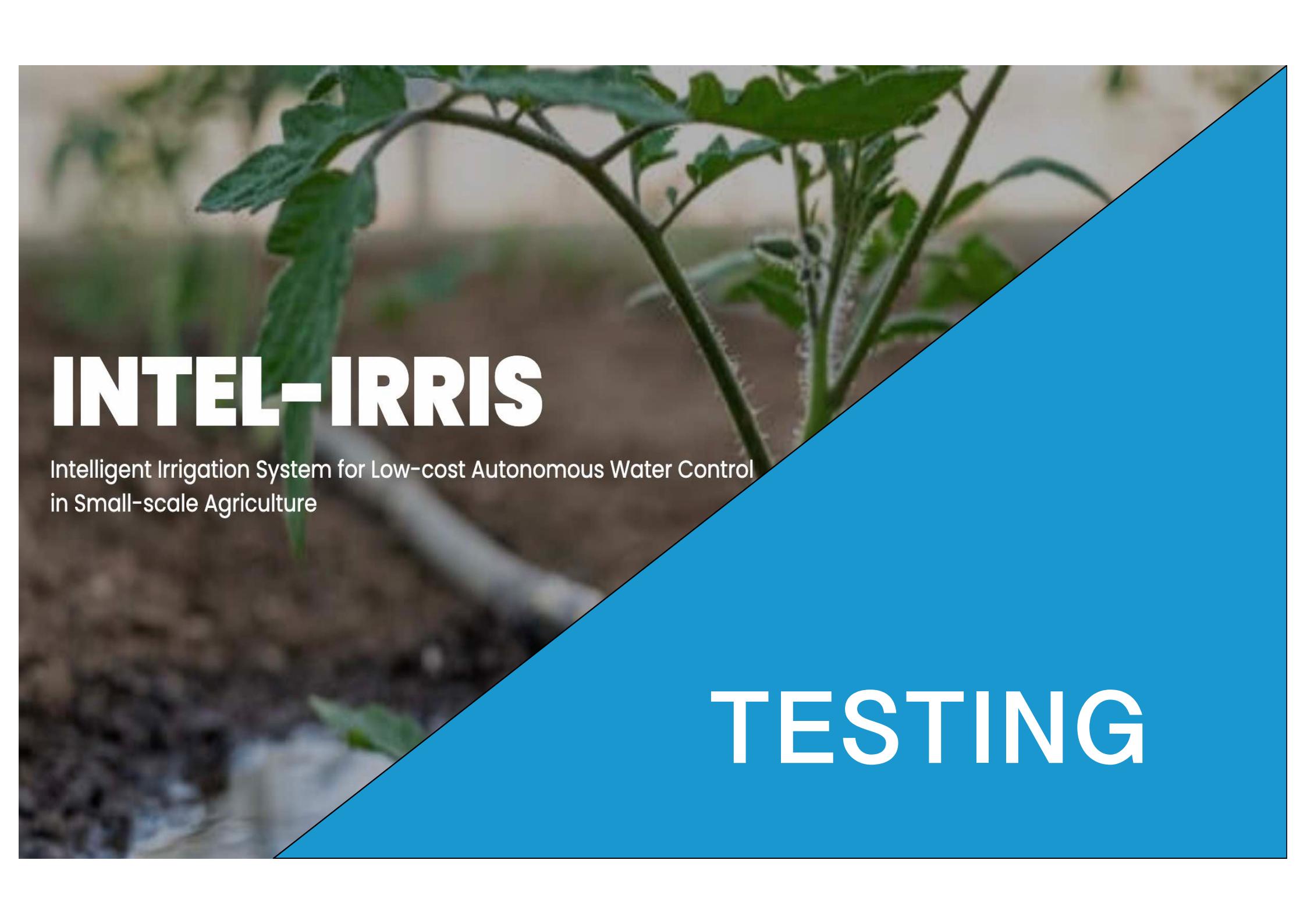
Even with o-ring, it is safer to add silicon!

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



WM200 tensiometer device
has default address
26011DB1

A close-up photograph of a young green plant with several leaves and a thin stem. In the background, a white plastic pipe lies on the brown soil, with a small amount of water leaking from a hole, illustrating the irrigation system.

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TESTING

Testing transmission to WaziGate

- 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 WaziGate'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 WaziGate

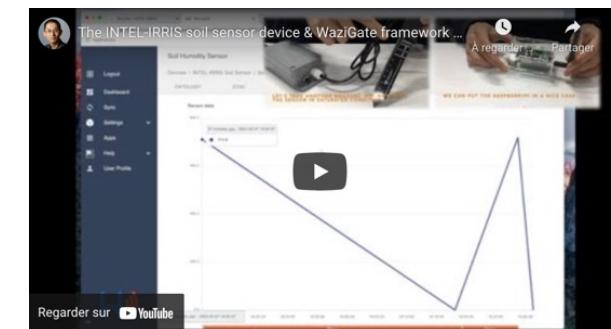


Parameters for
INTEL-IRRIS WaziGate
(default in red)

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 WaziGate
 Video n°4: <https://youtu.be/j-1Nk0tv0xM>

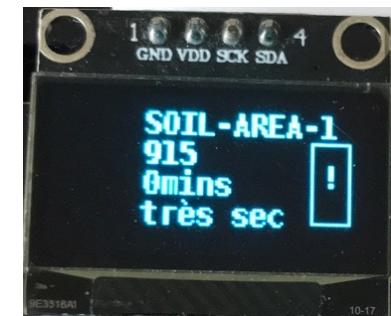
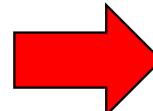


Check data reception on OLED

YOU CAN ALSO VIEW ON DASHBOARD

Default values for the
SEN0308 capacitive sensor

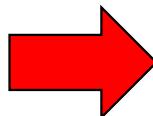
Testing with
capacitive device



VALUES ARE ONLY INDICATIVE

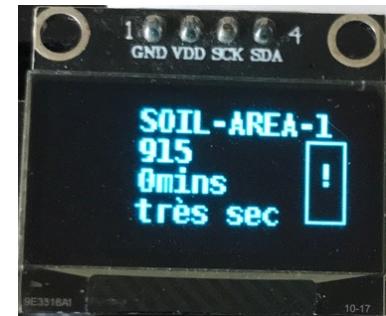
Default values for the WM200
tensiometer sensor

Testing with
tensiometer device

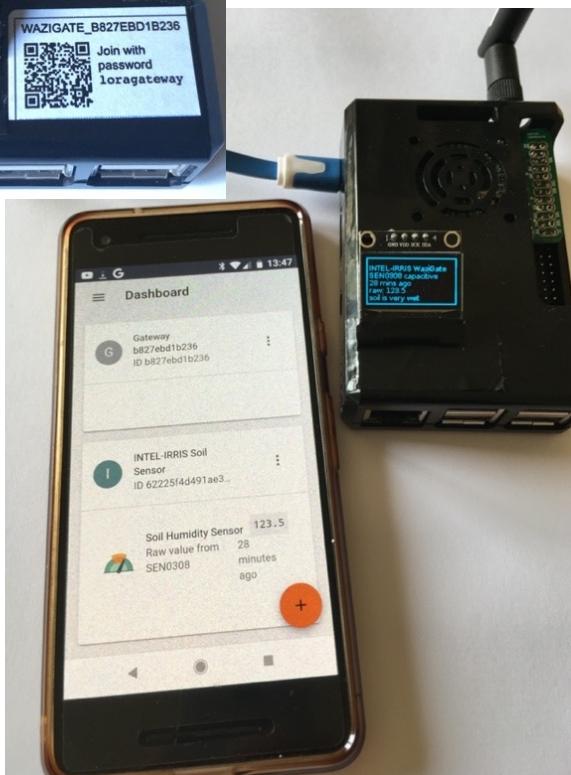
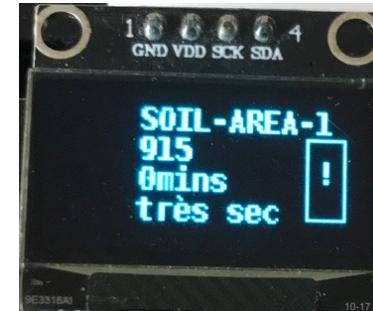


Soil sensor information on OLED

- 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 WaziGate various User Interfaces



 **Intel-Irris**

Intel-Irris Irrigation WaziApp (IIWA)

SOIL-AREA-1

Soil condition : wet capacitive

Value : 123






SOIL-AREA-2

Soil condition : saturated tensiometer_cbar

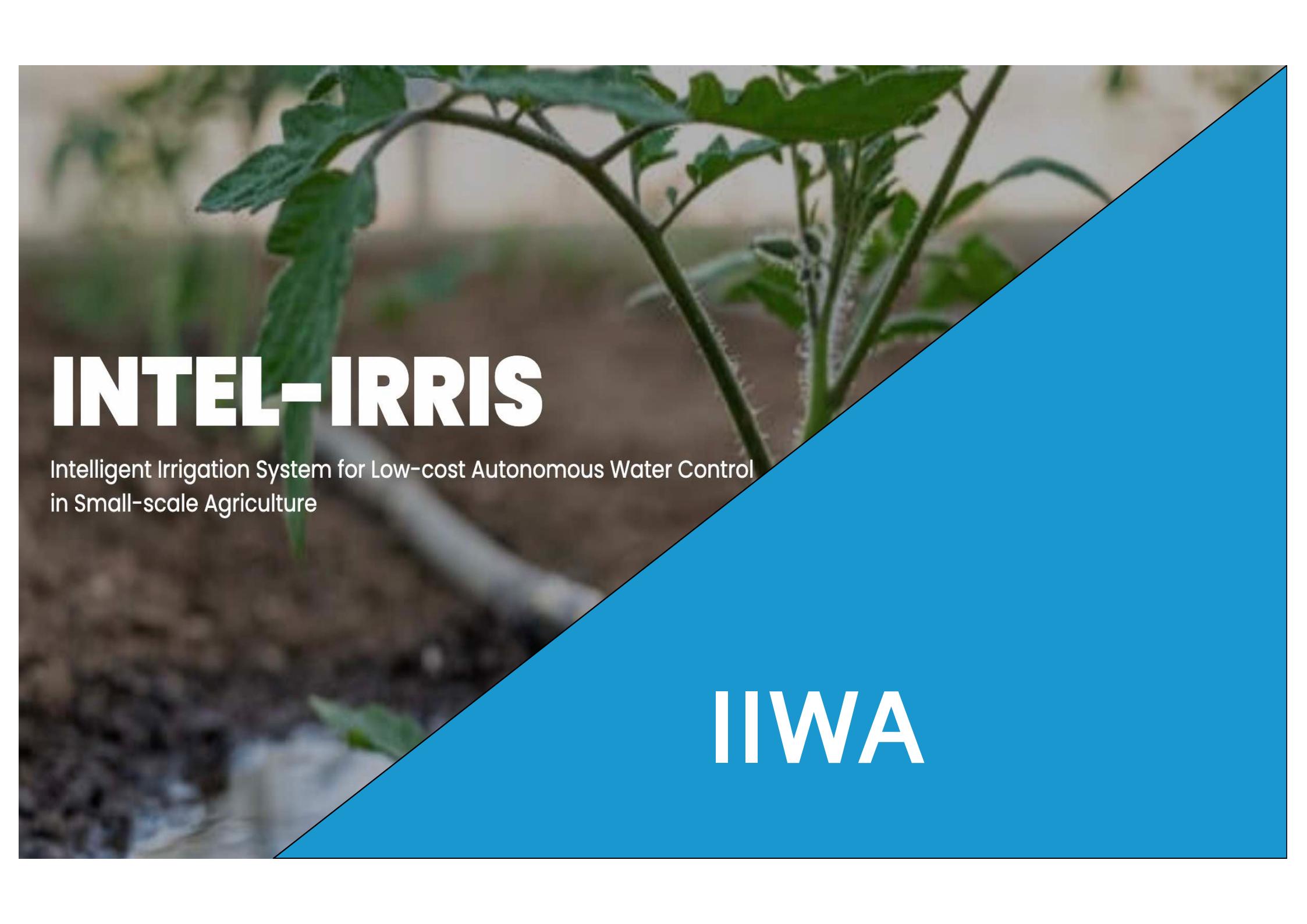
Value : 5






Deploying the starter-kit

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



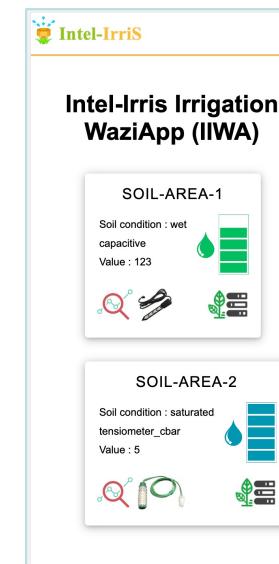
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IIWA

INTEL-IRRIS Irrigation WaziApp

- The INTEL-IRRIS Irrigation WaziApp (IIWA) is an embedded application running on the INTEL-IRRIS WaziGate 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



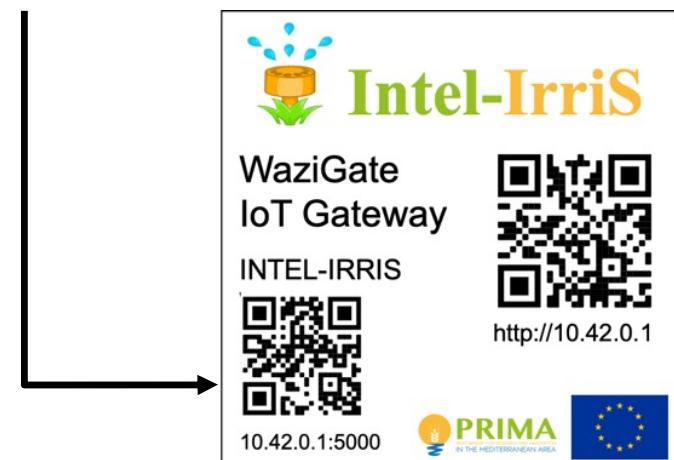
Connect to IIWA

- First, connect to INTEL-IRRIS WaziGate 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 WaziGate's WiFi
- Then, scan the static QR code on the WaziGate sticker to connect to the INTEL-IRRIS Irrigation WaziApp on : <http://10.42.0.1:5000>



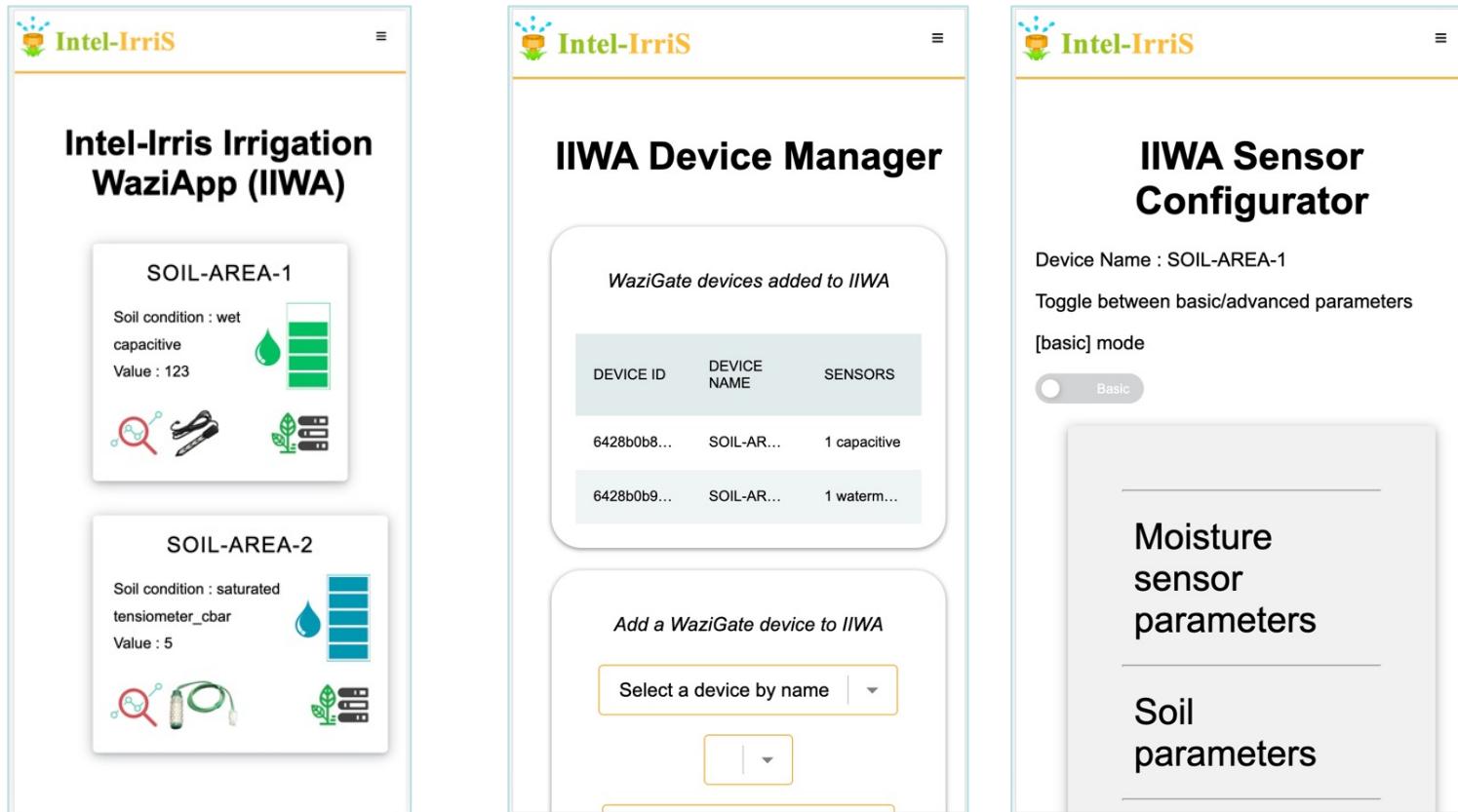
EXAMPLE:

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:

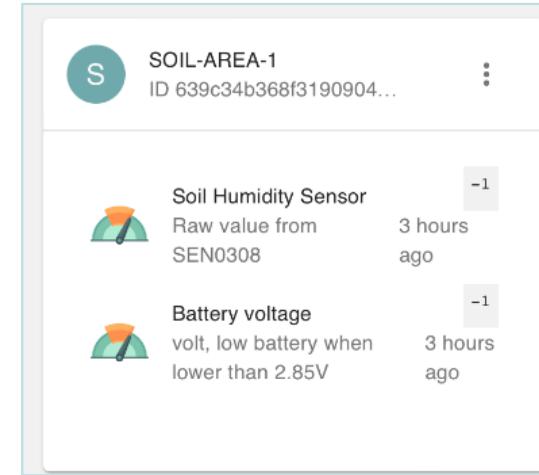
- Intel-Irris Irrigation WaziApp (IIWA)**: This screen shows two soil monitoring areas.
SOIL-AREA-1: Soil condition: wet, capacitive; Value: 123.
SOIL-AREA-2: Soil condition: saturated tensiometer_cbar; Value: 5.
- IIWA Device Manager**: This screen lists WaziGate devices added to IIWA.

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

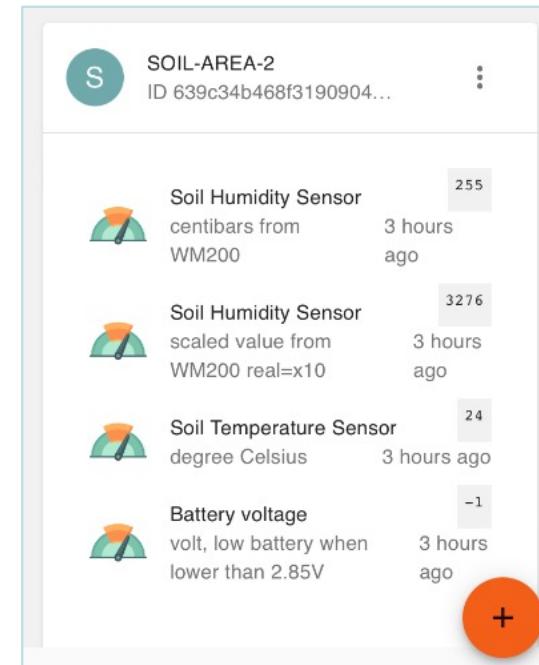
 Below this is a section to "Add a WaziGate device to IIWA" with a dropdown menu labeled "Select a device by name".
- IIWA Sensor Configurator**: This screen is for configuring sensors. It shows the device name: SOIL-AREA-1, a toggle switch for basic/advanced parameters set to [basic] mode, and two sections: "Moisture sensor parameters" and "Soil parameters".

Default WaziGate configuration & IIWA

- For the starter-kit, the INTEL-IRRIS WaziGate 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-AREA-1 is the active device**
 - Raw value from SEN0308 is the active sensor



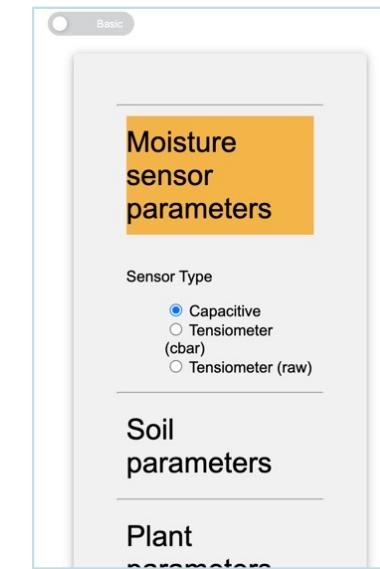
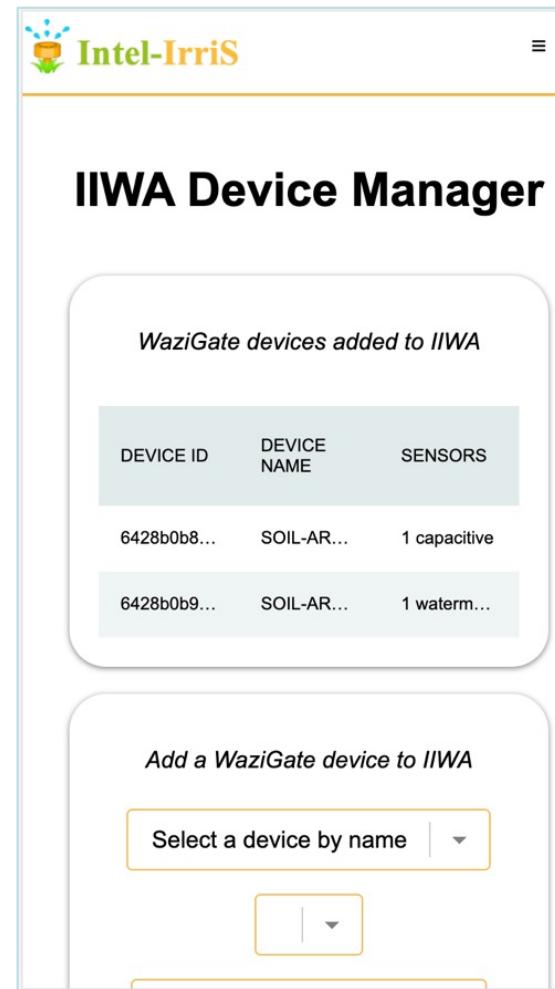
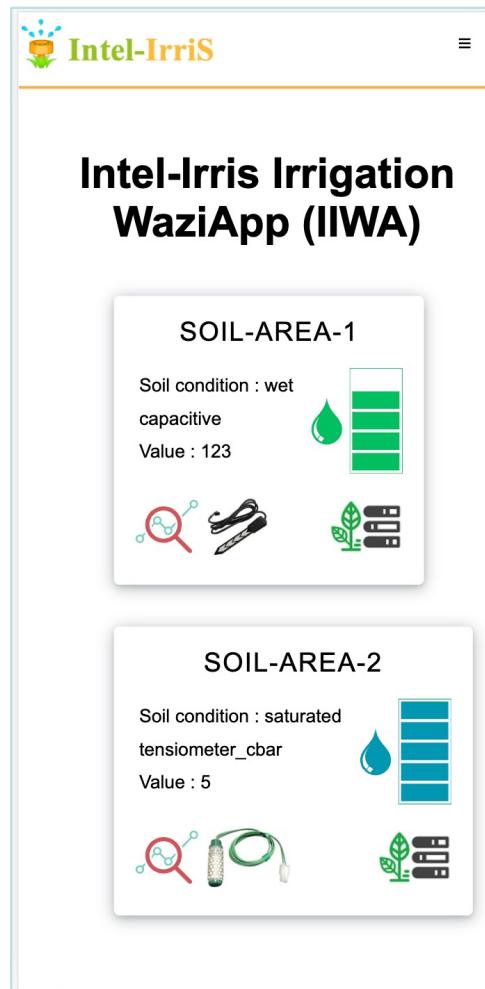
Default values for the SEN0308 capacitive sensor



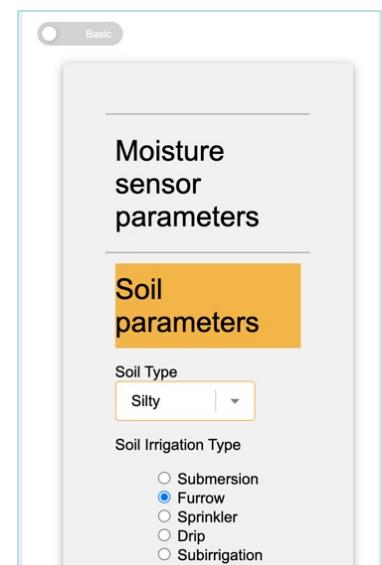
Default values for the WM200 tensiometer sensor



Default IIWA screens & configuration



It is OK to use the IIWA default configuration



A close-up photograph of a young green plant with several leaves and a thin stem. A clear plastic tube is wrapped around the stem, likely part of an irrigation system. The background is blurred, showing more plants and possibly a garden setting.

INTEL-IRRIS

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

ADVANCED CONFIG

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 // 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60 61 62 63 64 65 66 67 68 69 70 71 72 73 74 75 76 77 78 79 80 81 82 83 84 85 86 87 88 89 // LORAWAN OR EXTENDED DEVICE ADDRESS FOR LORAWAN CLOUD
90 #if defined LORAWAN || defined EXTEVADDR
91 //ENTER HERE your Device Address from the TTN device info (same order, i.e. msb). Example for 0x12345678
92 //unsigned char DevAddr[4] = { 0x12, 0x34, 0x56, 0x78 };
93 //unsigned char DevAddr[4] = { 0x26, 0x01, 0x1D, 0xBA };
94 //if you need another address for tensiometer sensor device, use B1, B2, B3,..., BF
95 #if defined WITH_WATERMARK && !defined WMLAS_PRIMARY_SENSOR
96 //Watermark soil sensor device has a different address from the default address 26011DAA
97 //26011DB1
98 //if you need another address for capacitive sensor device, use AA, AB, AC,..., AF
99 unsigned char DevAddr[4] = { 0x26, 0x01, 0x1D, 0xAA };
100#endif
101//default device address for WaziGate configuration, mainly for SEN0308 capacitive soil sensor device
102//26011DAA
103//if you need another address for capacitive sensor device, use AA, AB, AC,..., AF
104unsigned char DevAddr[4] = { 0x26, 0x01, 0x1D, 0xAA };
105#endif
106
107#endif
108//DO NOT CHANGE HERE
109unsigned char DevAddr[4] = { 0x00, 0x00, 0x00, node_addr };
110#endif
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```

Default address for capacitive sensor is

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

Just increase the last byte

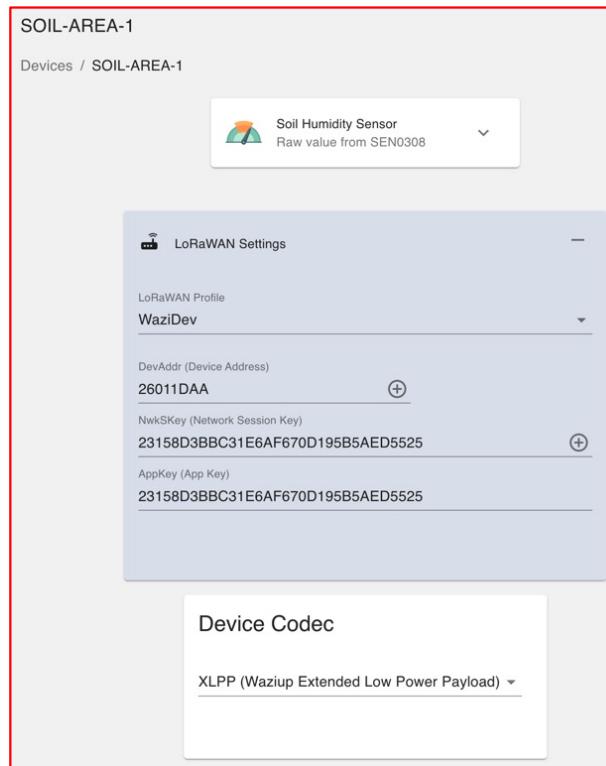
```
{ 0x26, 0x01, 0x1D, 0xAB };
```

Compile and upload the code to the additional soil sensor device

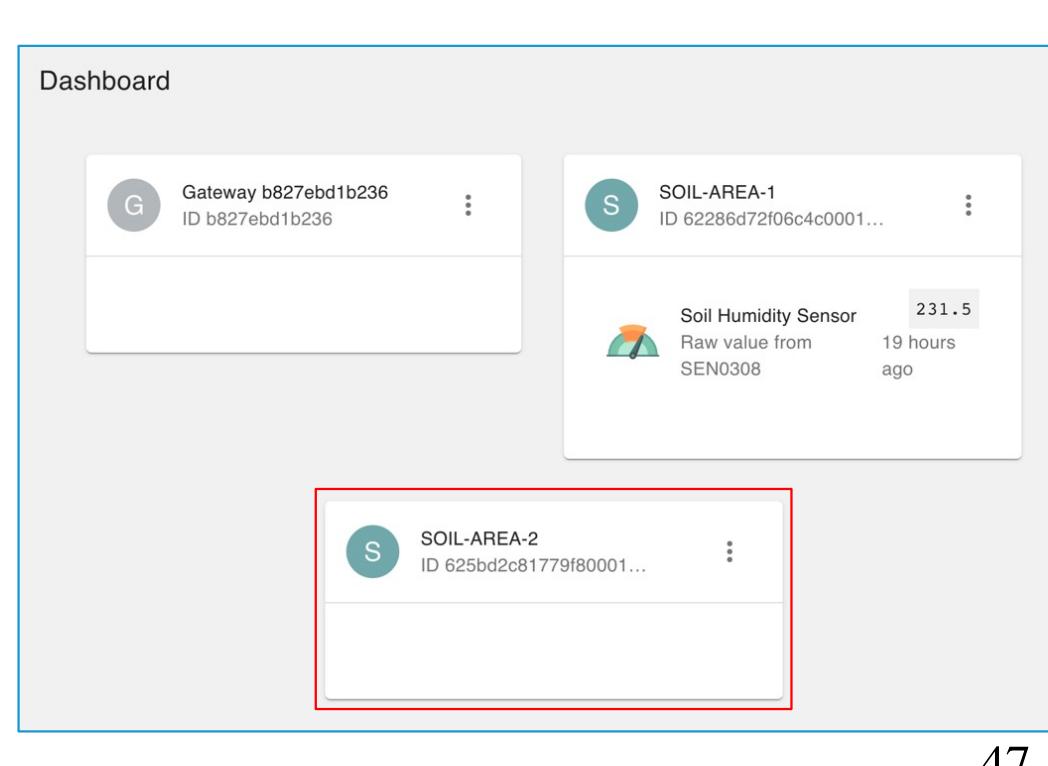
Advanced configuration

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

- Left figure shows WaziGate 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



The screenshot shows the WaziGate configuration interface for a device named "SOIL-AREA-1". It includes sections for "LoRaWAN Settings" (with fields for DevAddr, NwkKey, and AppKey), "Device Codec" (set to XLPP), and a summary card for a "Soil Humidity Sensor" from "SEN0308".



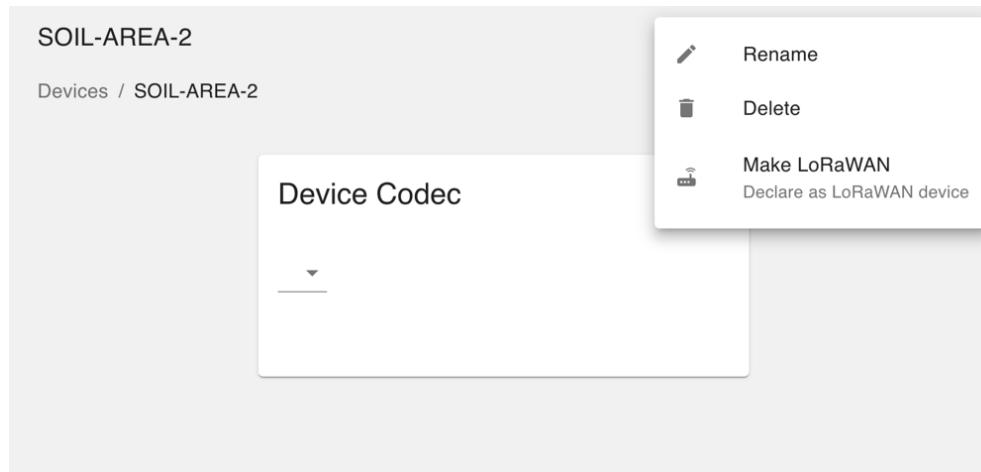
The screenshot shows the WaziGate dashboard with three entries: a gateway and two soil sensor devices. The second device, "SOIL-AREA-2", is highlighted with a red box.

Device Type	Device ID	Sensor Type	Last Value	Last Update
Gateway	b827ebd1b236			
SOIL-AREA-1	62286d72f06c4c0001...	Soil Humidity Sensor	231.5	19 hours ago
SOIL-AREA-2	625bd2c81779f80001...	Soil Humidity Sensor	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

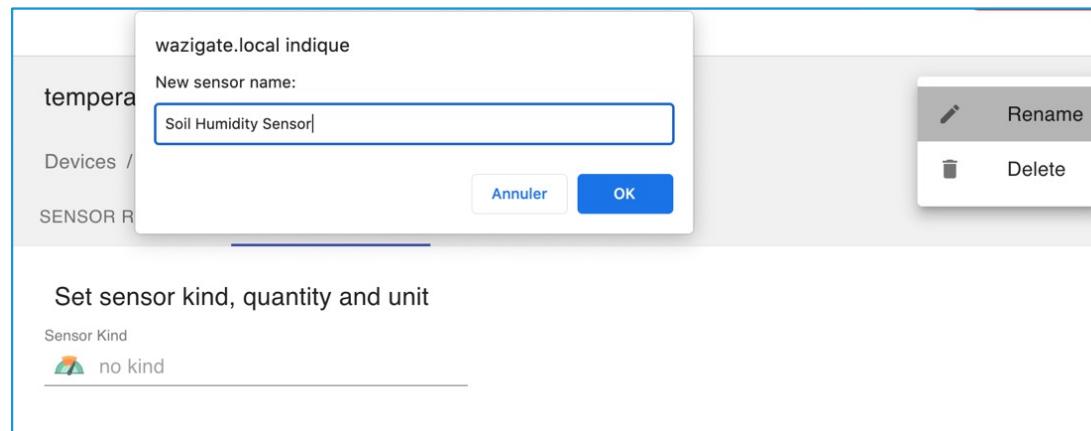
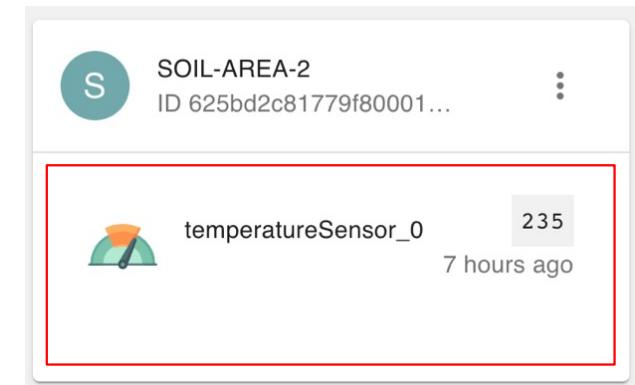
AppKey (App Key): 23158D3BBC31E6AF670D195B5AED5525

SAVE **RESET**

Advanced configuration

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

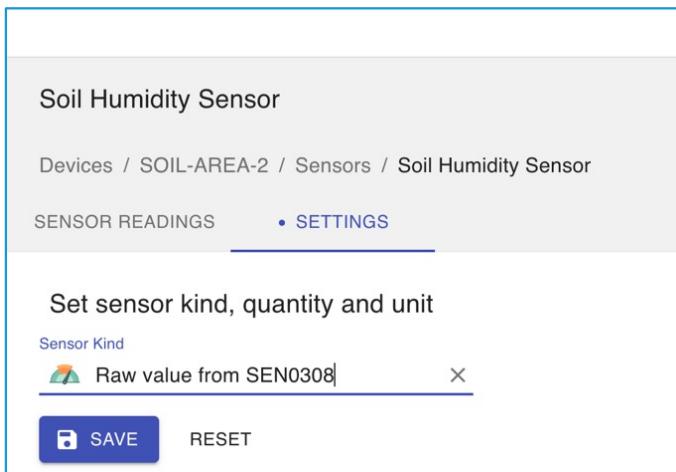
- DO NOT manually create a sensor. Instead,...
- ... power on the new soil sensor device for data transmission
- Refresh the WaziGate dashboard, the new data should appear
- New sensor name is "temperatureSensor_0"
- Click on "temperatureSensor_0" and then rename it, e.g. "Soil Humidity Sensor"



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

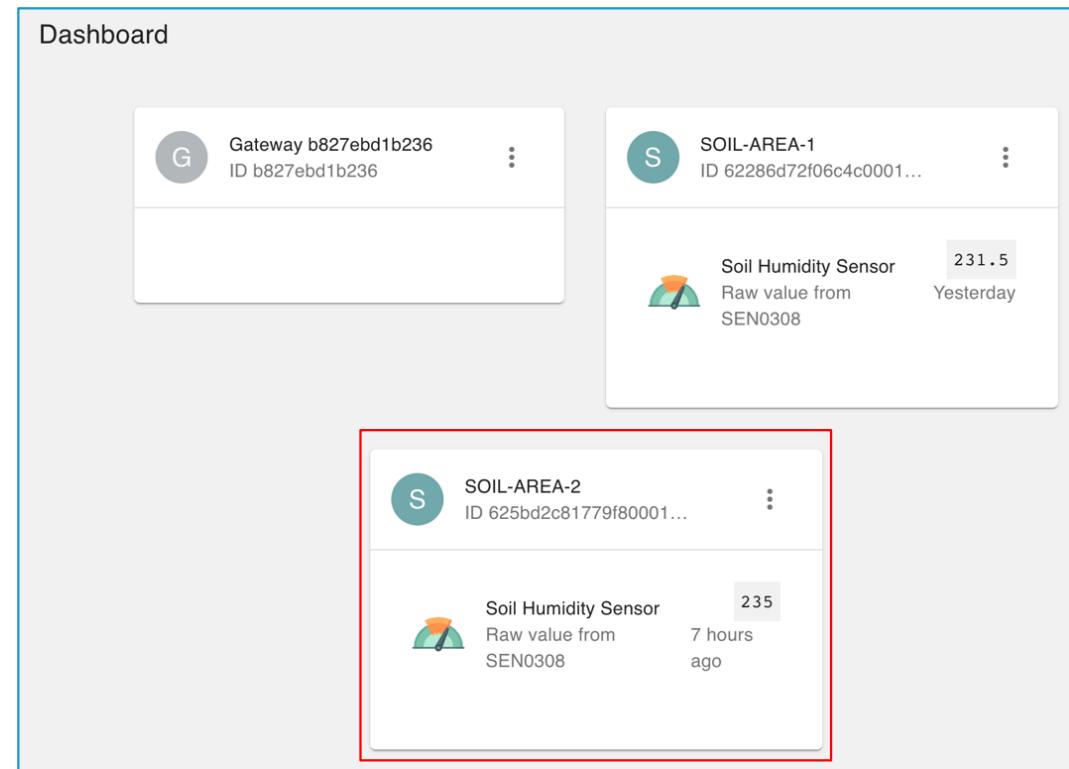
SENSOR READINGS • SETTINGS

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... 231.5 ...

Soil Humidity Sensor Raw value from SEN0308 Yesterday

S SOIL-AREA-2 ID 625bd2c81779f80001... 235 ...

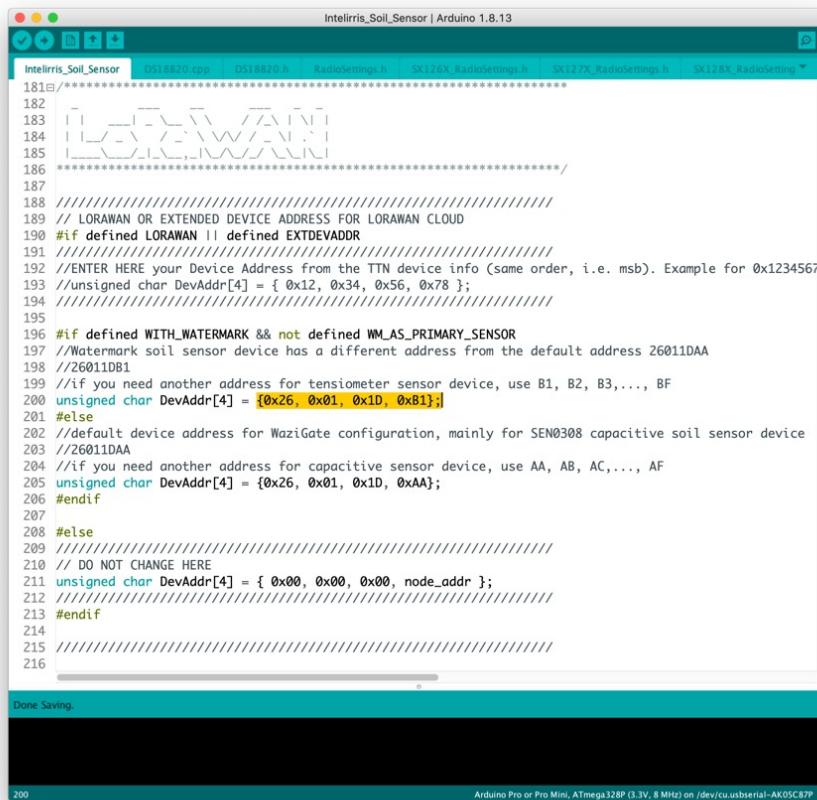
Soil Humidity Sensor Raw value from SEN0308 7 hours ago

- 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 //unsigned char DevAddr[4] = { 0x00, 0x00, 0x00, node_addr };
 206 #endif
 207
 208 #else
 209 ///////////////
 210 // DO NOT CHANGE HERE
 211 //unsigned char DevAddr[4] = { 0x00, 0x00, 0x00, node_addr };
 212 #endif
 213
 214 ///////////////
 215
 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

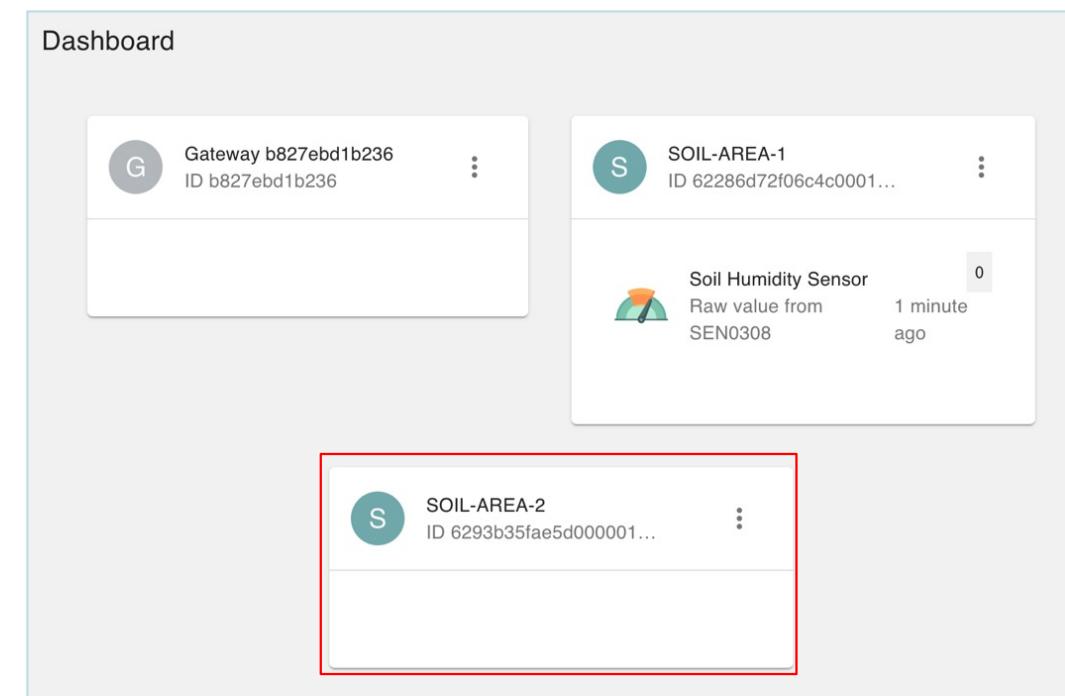
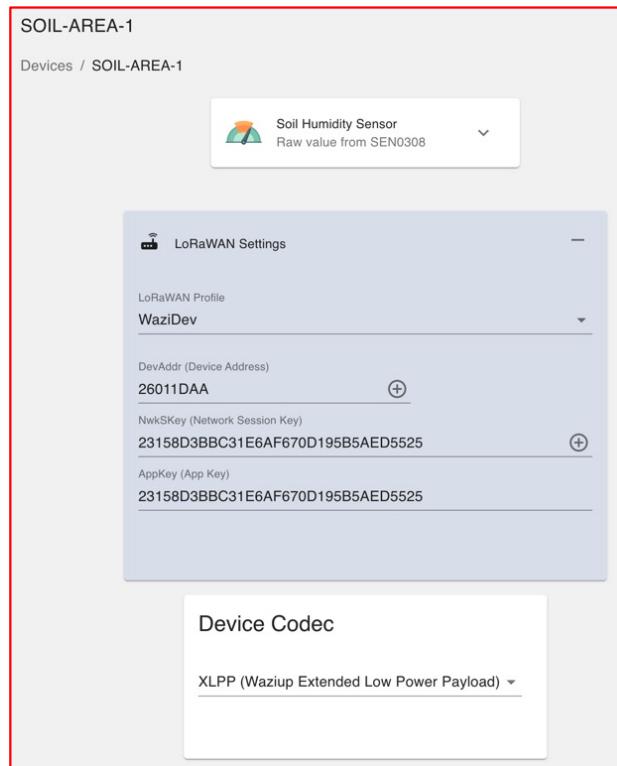
{ 0x26, 0x01, 0x1D, 0xB2 };

Compile and upload the code to the soil sensor device

Advanced configuration

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

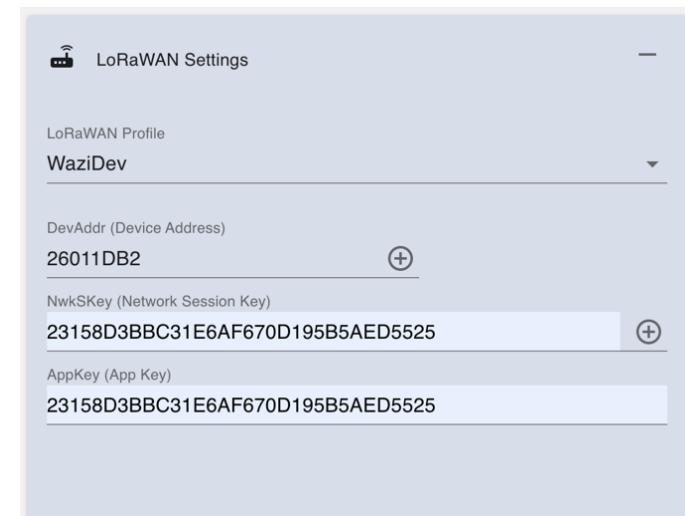
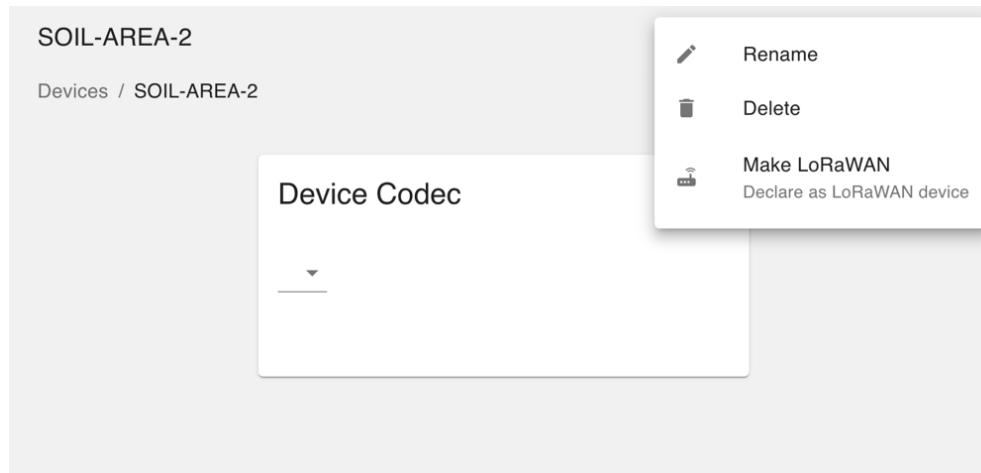
- Left figure shows WaziGate config with 1 soil sensor device
- Create a new device, e.g. device name SOIL-AREA-2
- Avoid space, limit to 12 characters for correct display on OLED



Advanced configuration

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

- Select the new device and make it as LoRaWAN device

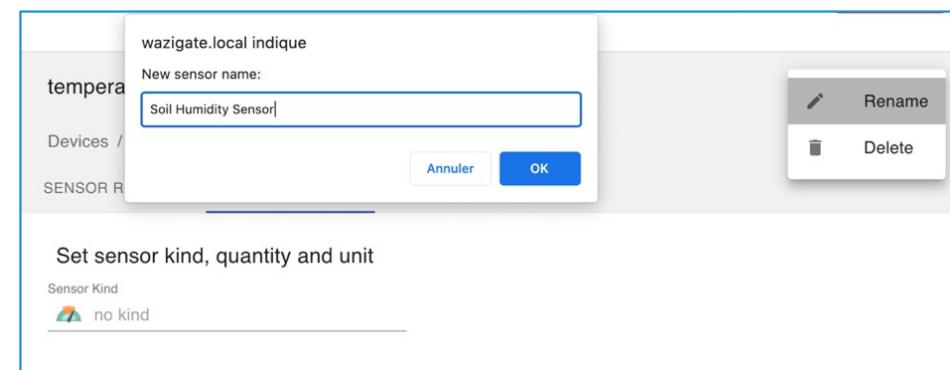
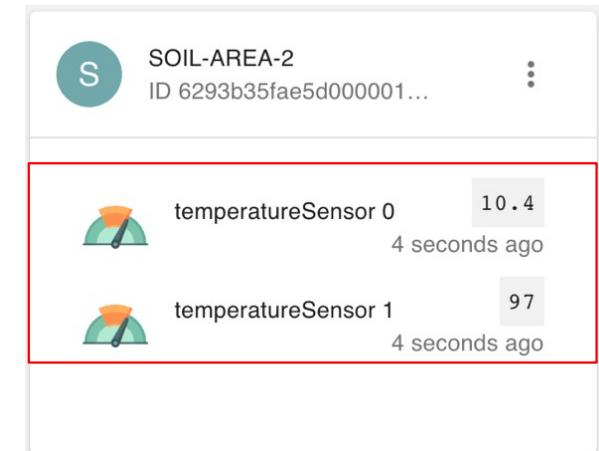


- Set the new address, matching the one of the Arduino code: 26011DB2
- keep same encryption keys
- Select XLPP as codec

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 WaziGate 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

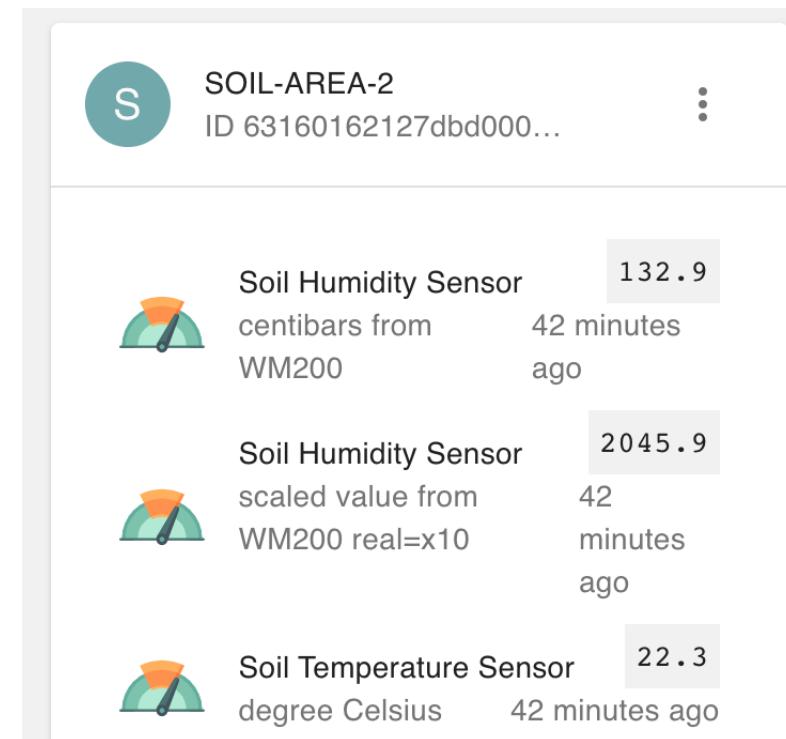
 Soil Humidity Sensor Scaled value from WM200 real=x10 97 3 minutes ago

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

Advanced configuration

ex 1 & 2: with a soil temperature sensor

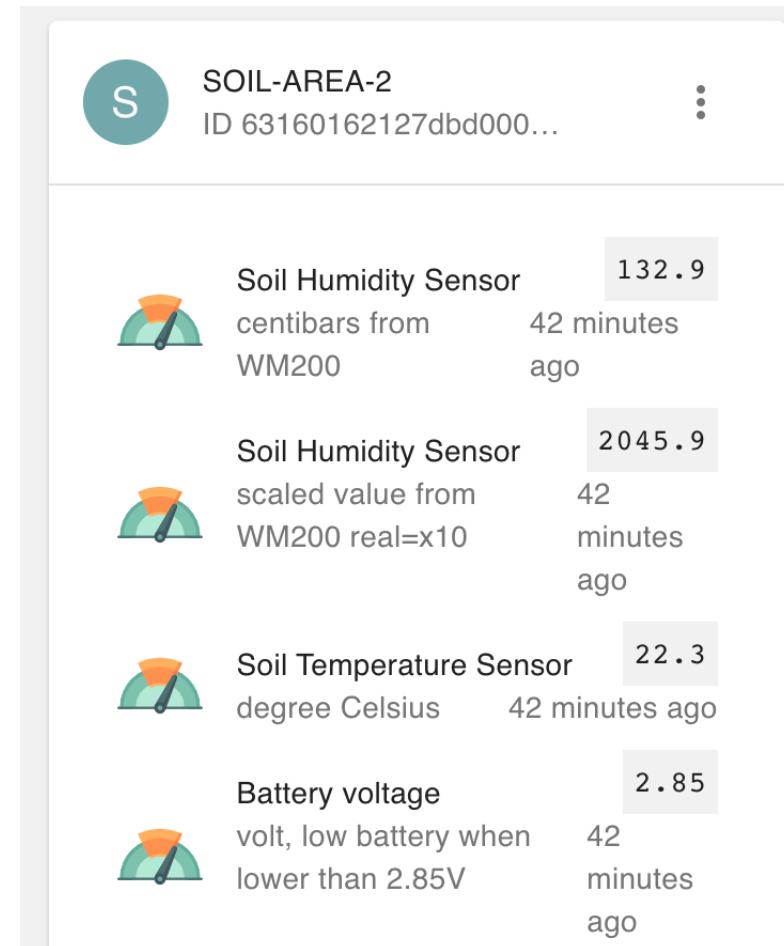
- If there is a soil temperature sensor attached, a sensor named "temperatureSensor_5" will also appear
- Click on "temperatureSensor_5" and then rename it, e.g. "Soil Temperature Sensor"
- Change Sensor kind to "degree Celsius"
- Reload dashboard which should now displays correctly the new device with 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

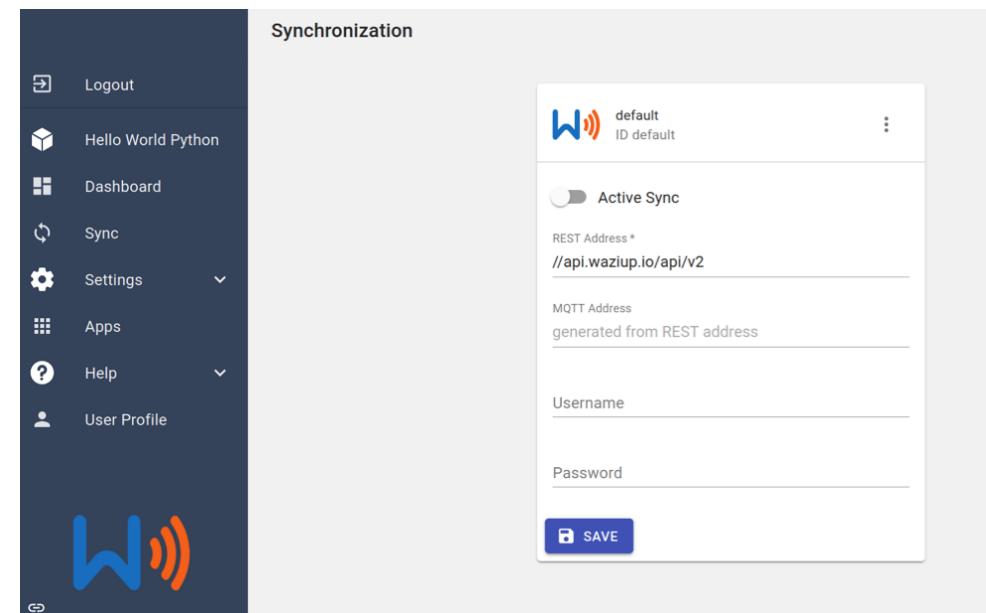


Advanced configuration

ex 3: sync WaziGate and its devices to the cloud

- If you want to sync your WaziGate to the WAZIUP Cloud, look at this tutorial page to see what it means
 - <https://www.waziup.io/documentation/wazigate/v2/install/#registration-with-the-cloud>

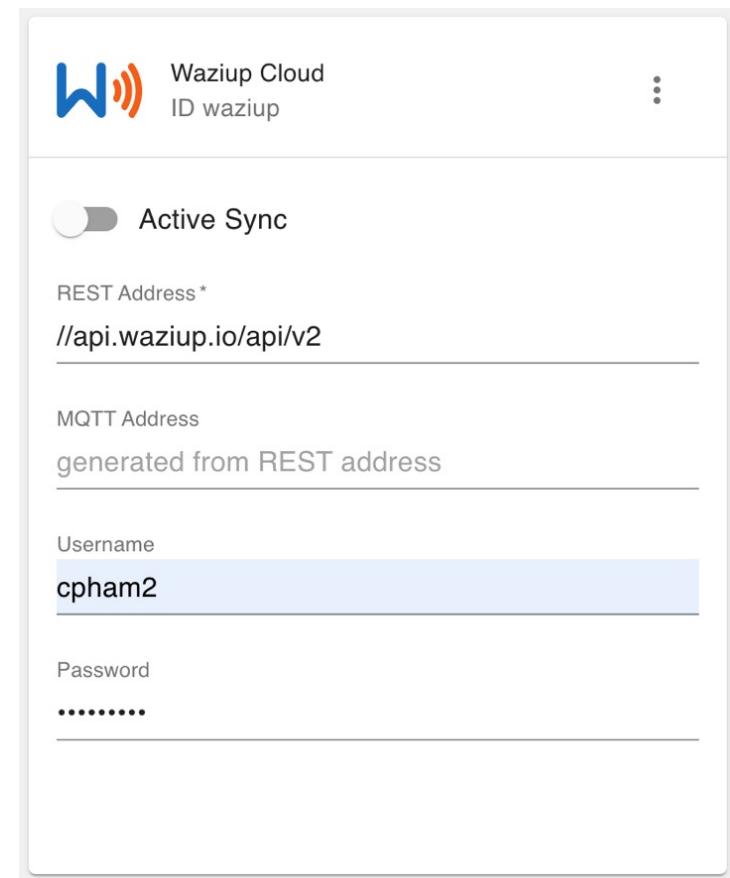
- You will need an account on WAZIUP Cloud dashboard
- If you don't have one, you need to create one first
- <https://dashboard.waziup.io/>



Advanced configuration

ex 3: sync WaziGate and its devices to the cloud, con't

- Then, enter your WAZIUP account credential in the sync menu
- And enable "Active Sync"
- Log in the WAZIUP Cloud dashboard and check that you see your gateway and your device



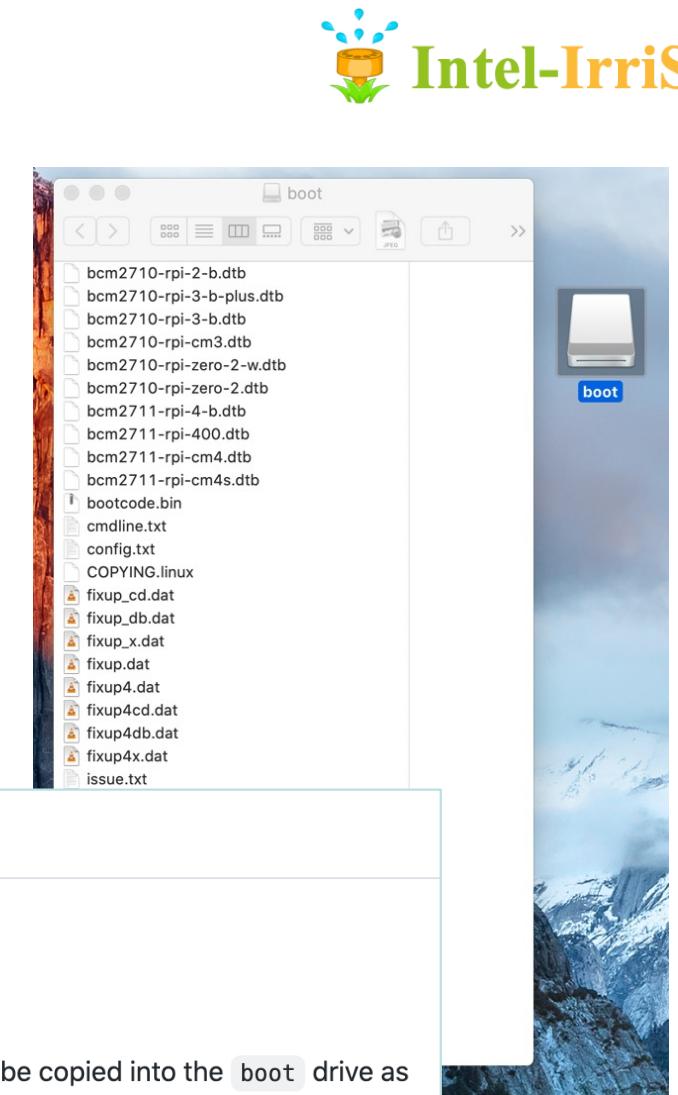
Advanced configuration

ex 4: use 868MHz frequency band

- The default SD card image uses EU433 frequency band
- To set to 868MHz, 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 868MHz 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-868.txt` to be copied into the `boot` drive 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



Advanced configuration

ex 5: 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>

Example 4: have the INTEL-IRRIS WaziGate working with a customized setting

- 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`) `create-custom-example/intel-irris-auto-config.sh` and see how the script creates one capacitive and one tensiometer device (SOIL-AREA-1/26011DAA and SOIL-AREA-2/26011DB1)
- based on this example, you can create on your computer an `intel-irris-auto-config.sh` script that actually creates and configures devices according to your setting
- copy the file into the `boot` drive as `intel-irris-auto-config.sh`
- 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

Advanced configuration

ex 5: execute automatic custom configuration, con't

- Some of auto-configuration options (GitHub: Gateway/boot)
 - create-starter-kit-demo-capacitive-watermark-st-iiwa-ha: **default config of starter-kit**
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
 - create-default-capacitive: default capacitive
SOIL-AREA-1, 26011DAA
 - create-default-watermark: replace default capacitive by default WM
SOIL-AREA-1, 26011DB1
 - create-default-watermark-st: default WM + 1 soil temperature (s-t)
SOIL-AREA-1, 26011DB1
 - create-default-2-watermark: 2 default WM (on same device)
SOIL-AREA-1, 26011DB1
 - create-default-2-watermark-st: 2 default WM (same device) + 1 soil temperature
SOIL-AREA-1, 26011DB1
 - create-4-watermark: 4 devices, each with 1 default WM
SOIL-AREA-[1, 2, 3, 4], 26011D[B1, B2, B3, B4]

Advanced configuration

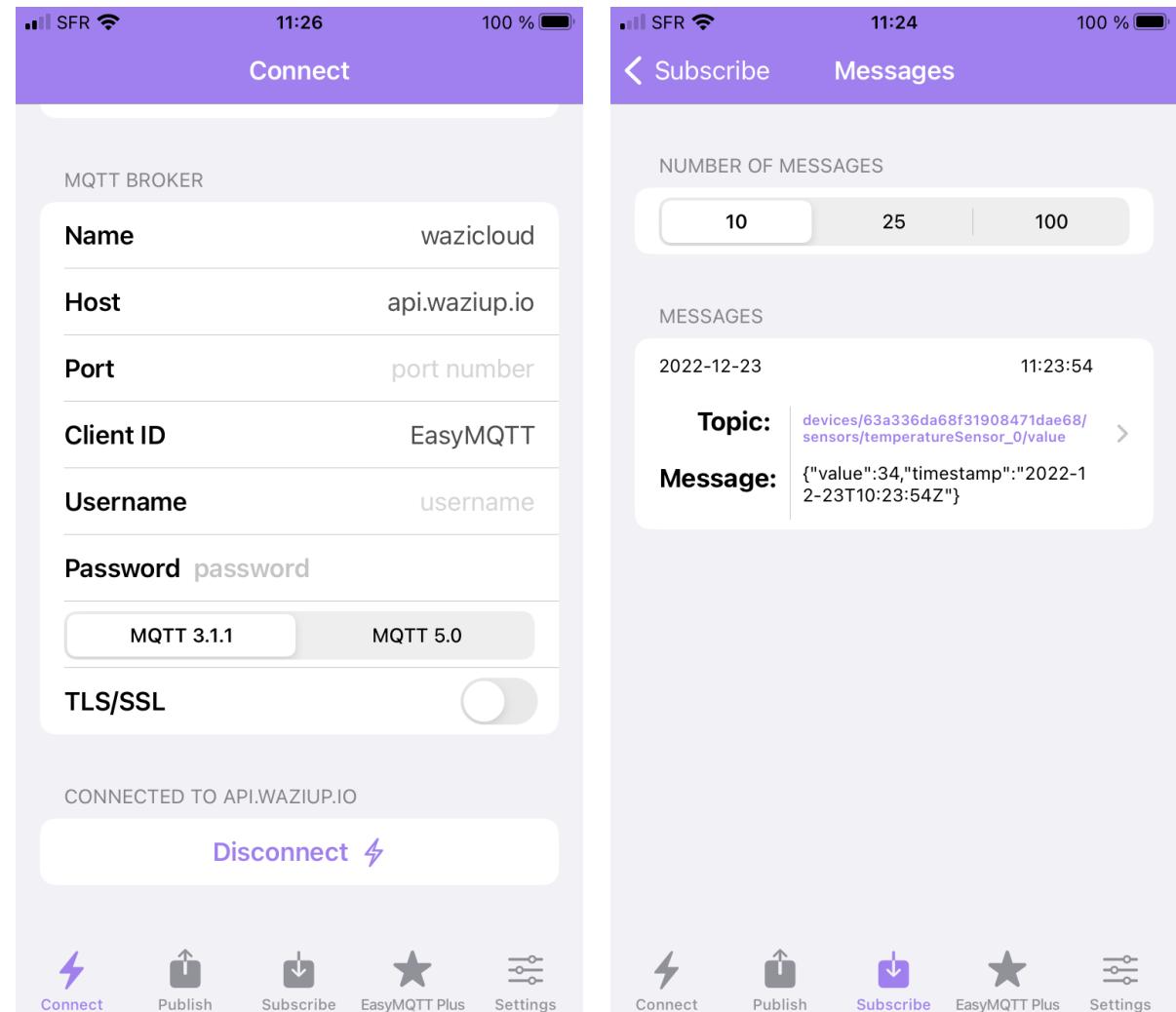
ex 6: MQTT integration

- 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

ex 6: MQTT integration, con't

- 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 WAZIGATE
- INTEL-IRRIS WAZIGATE IMAGE TO BE DOWNLOADED FROM <http://intel-iris.eu/results>
- FLASH IMAGE ON 8GB SD CARD (OR 16GB OR 32GB)
- THE WAZIGATE IS ONLY PRE-CONFIGURED FOR 1 SOIL SENSOR PER FARM
- STARTER-KIT TUTORIAL : <http://intel-iris.eu/tutorials-slides>

