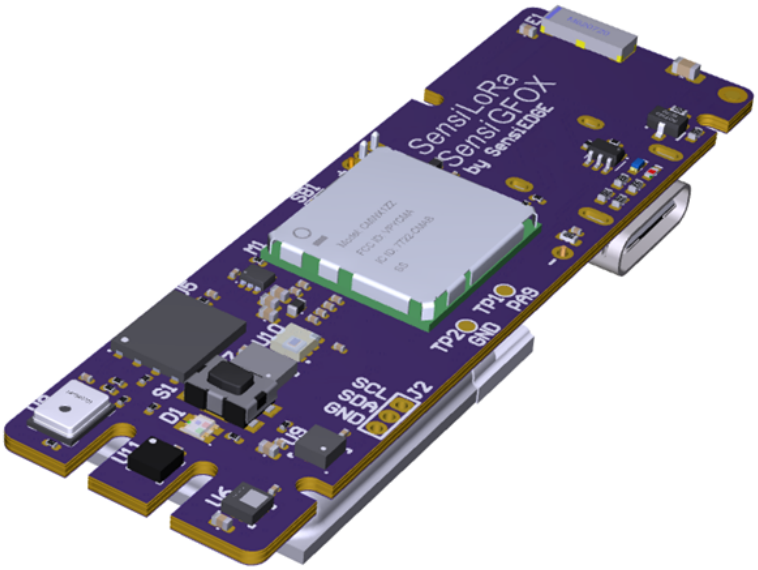
*Sensi*LoRa 2.0

Getting Started

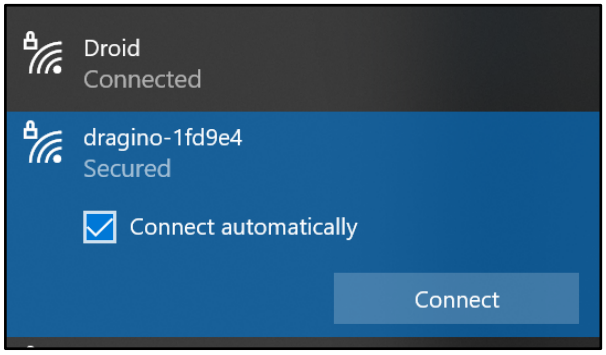


1 Config Dragino Pico Station

1.1 Connect to Dragino

1. Connect the antenna, and network cable and turn on the device. After starting the device, it should be defined on the Wi-Fi network as " **dragino-xxxxxx** " (Figure 1). When the device is found, we connect to it and enter the default password: "**dragino+dragino**".

Figure 1. Wi-Fi network

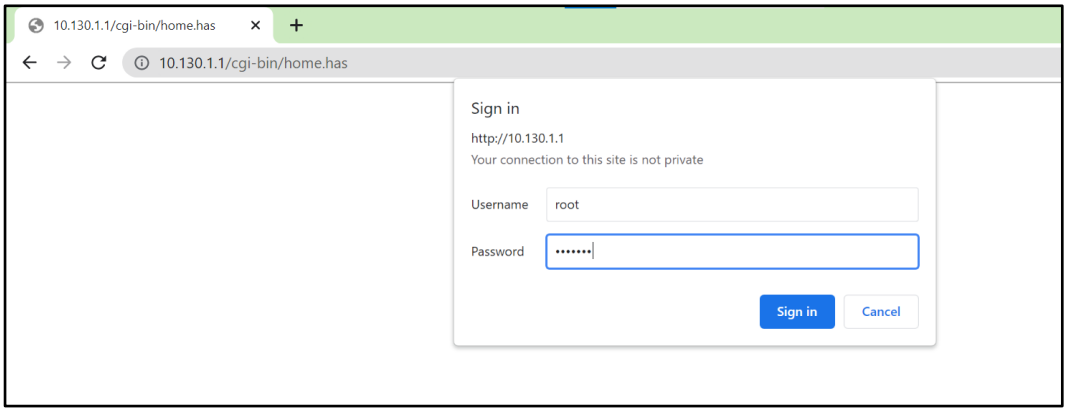


2. When connected to the device, open the browser and enter the address: http://10.130.1.1/ and enter (Figure 2):

User Name: root

Password: dragino

Figure 2. Site



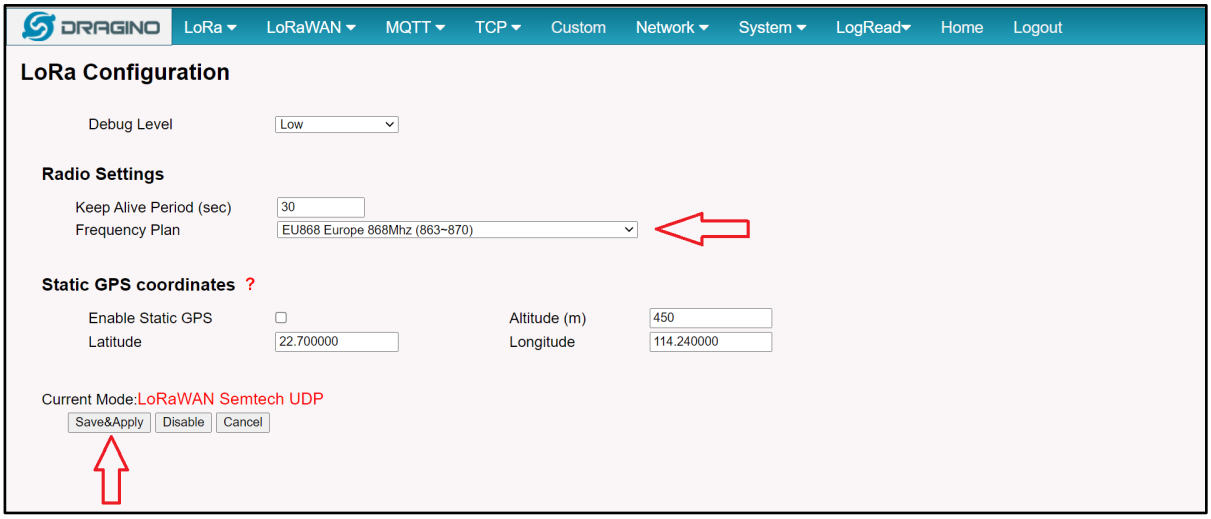
3. Go to network settings LoRa (Figure 3).

Figure 3. Go to LoRa settings

1.2 Configuration LoRa

1. In LoRa Configuration select the desired frequency (EU868 or US915) and click on **Save&Apply** (Figure 4).

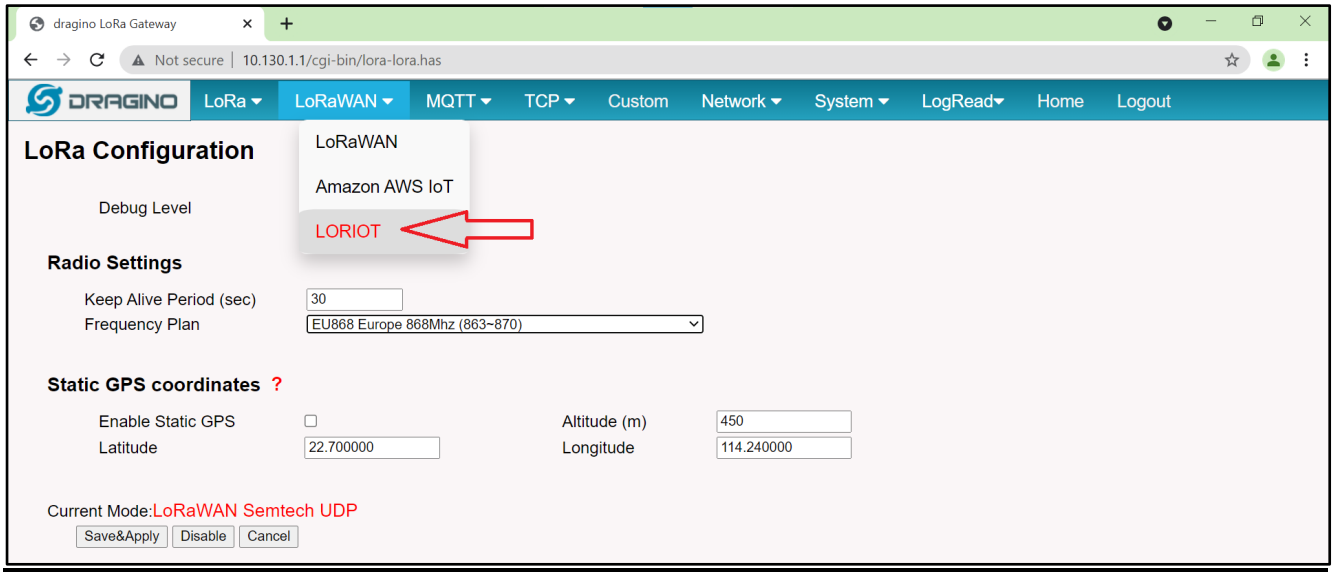
Figure 4. Configuration Lora



1.3 Configuration LORIOT

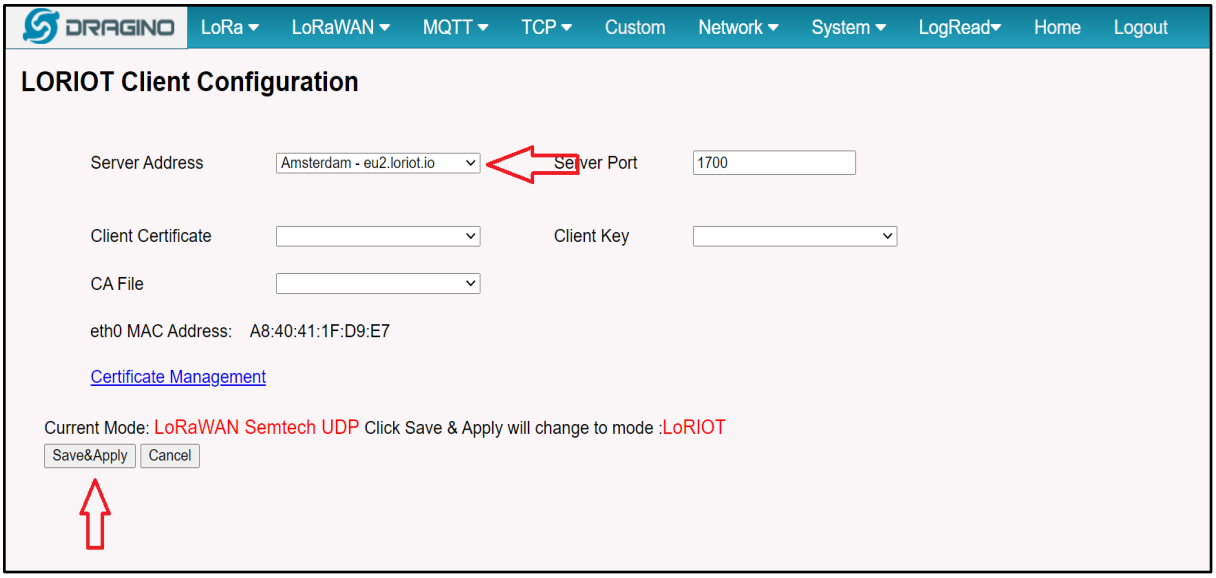
1. Go to configuration **LORIOT** (Figure 5).

Figure 5. Go to Loriot's settings



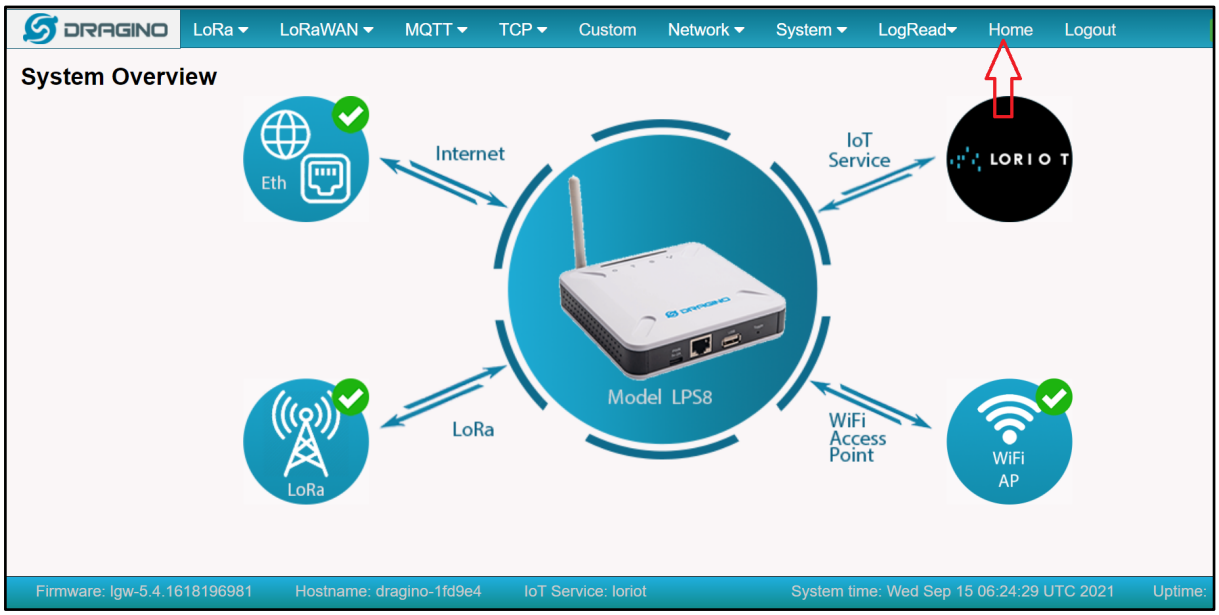
2. In the LORIOT configuration, select the desired server (example: **Amsterdam - eu2.loriot.io**) and click on **Save&Apply** (Figure 6).

Figure 6. Configuration Loriot



3. After configuring the LORIOT, go to the **Home** tab and see green checkmarks as in the picture. This means that everything is working (Figure 7).

Figure 7. Home page

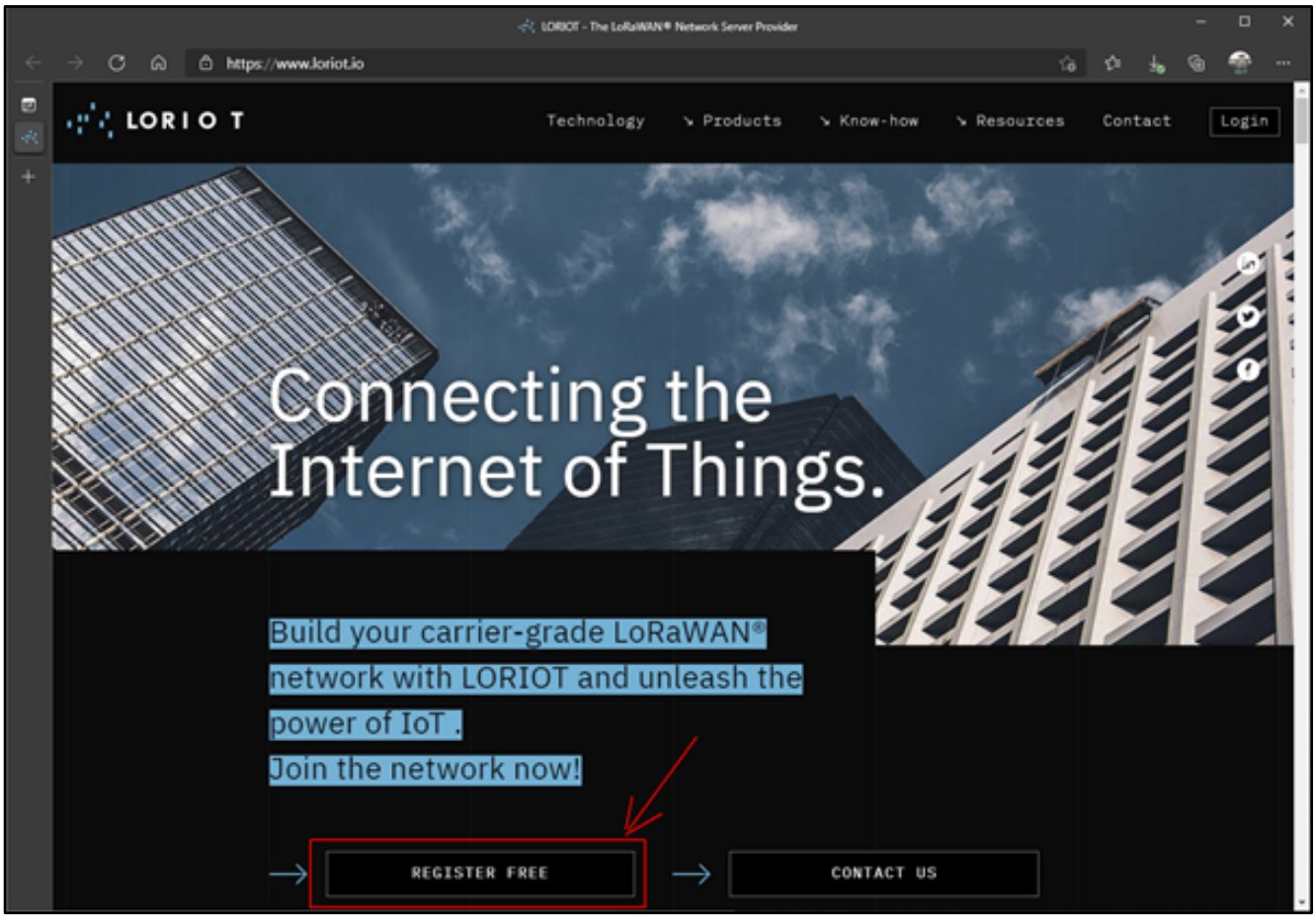


2 Registration in LORIOT

2.1 Registration in Server

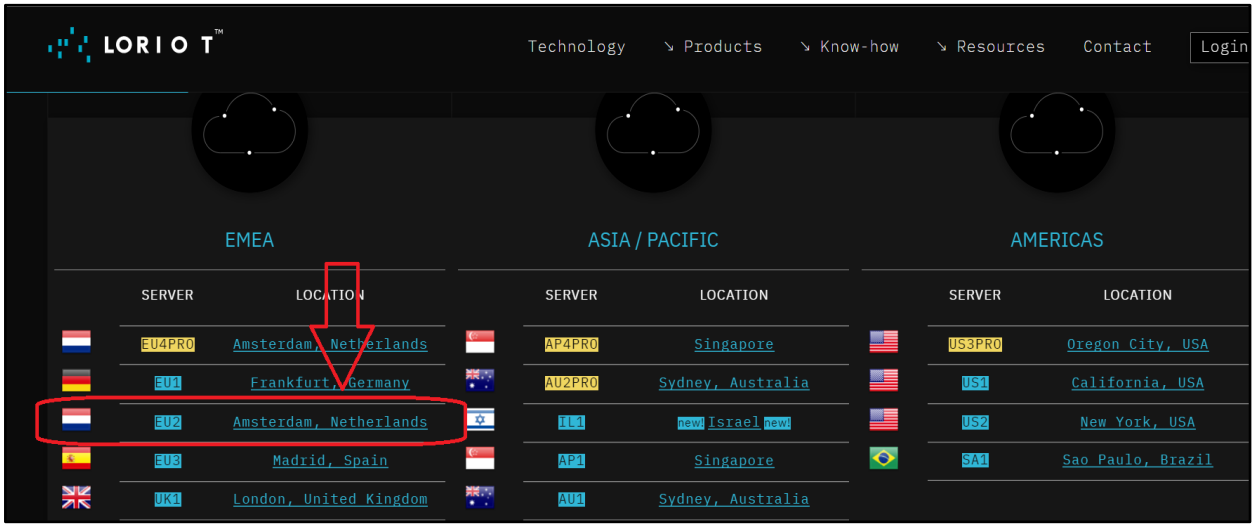
1. Go to https://www.loriot.io/ and press **REGISTER FREE** (Figure 8).

Figure 8. LORIOT site



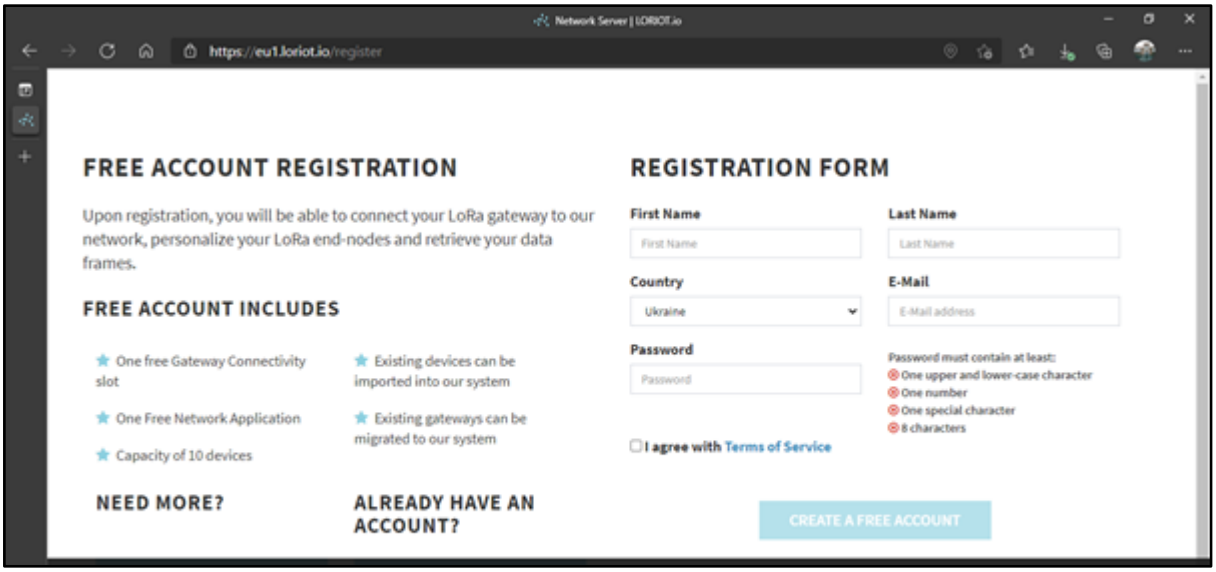
2. Select server **EU2 Amsterdam, Netherlands** (Figure 9).

Figure 9. Select server



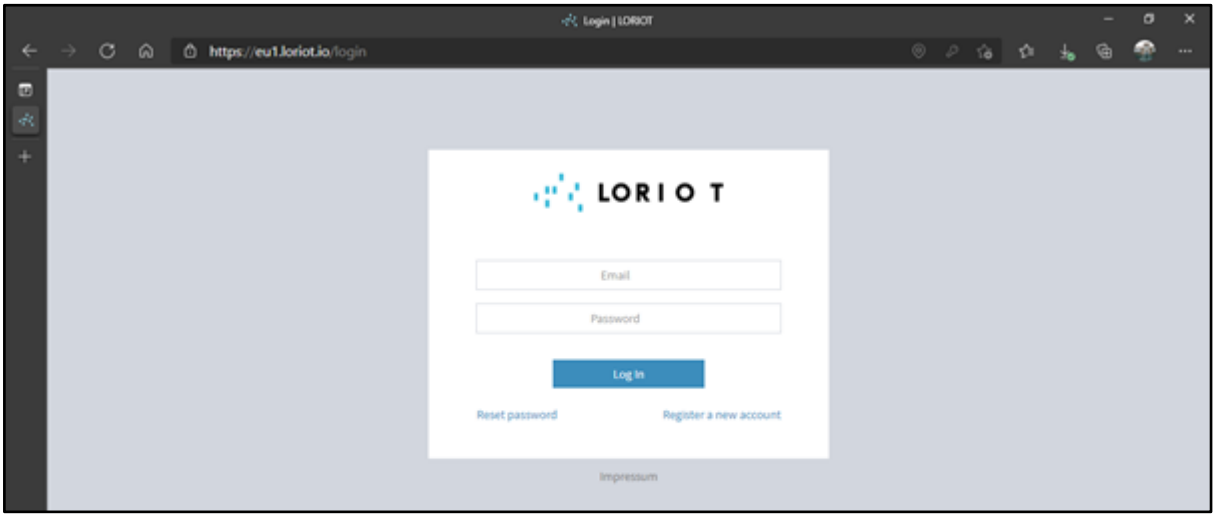
3. Input all data and press the button **CREATE A FREE ACCOUNT** (Figure 10).

Figure 10. Create account



4. After confirmation via email enter the site (Figure 11).

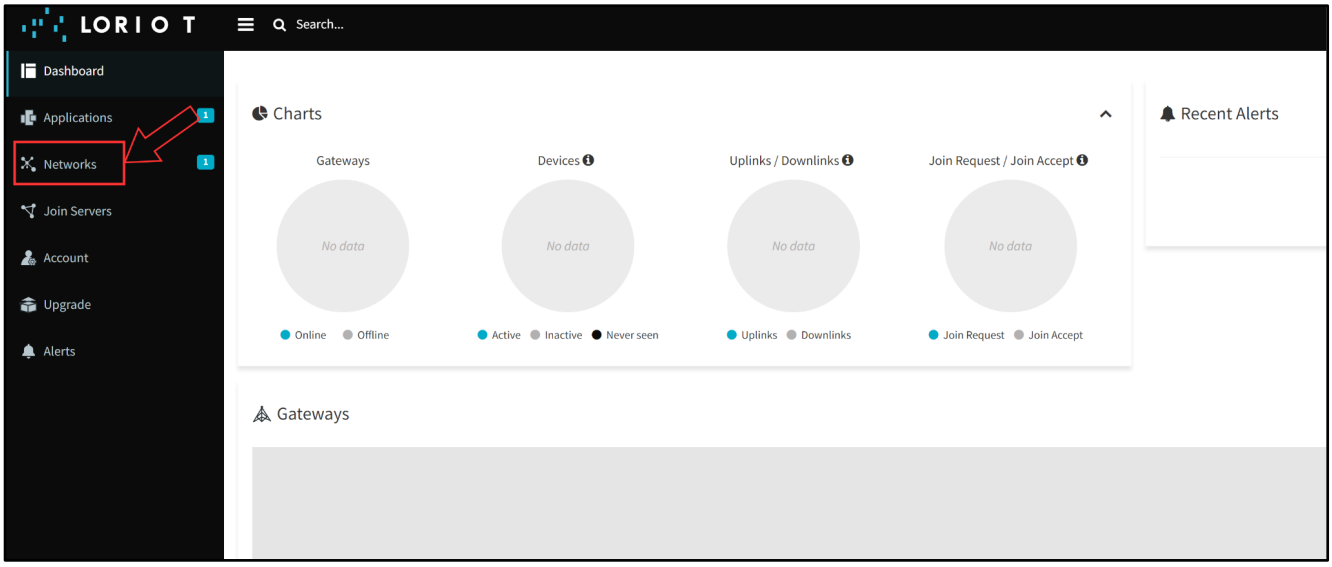
Figure 11. Login to server



2.2 Register a gateway (Dragino LPS8)

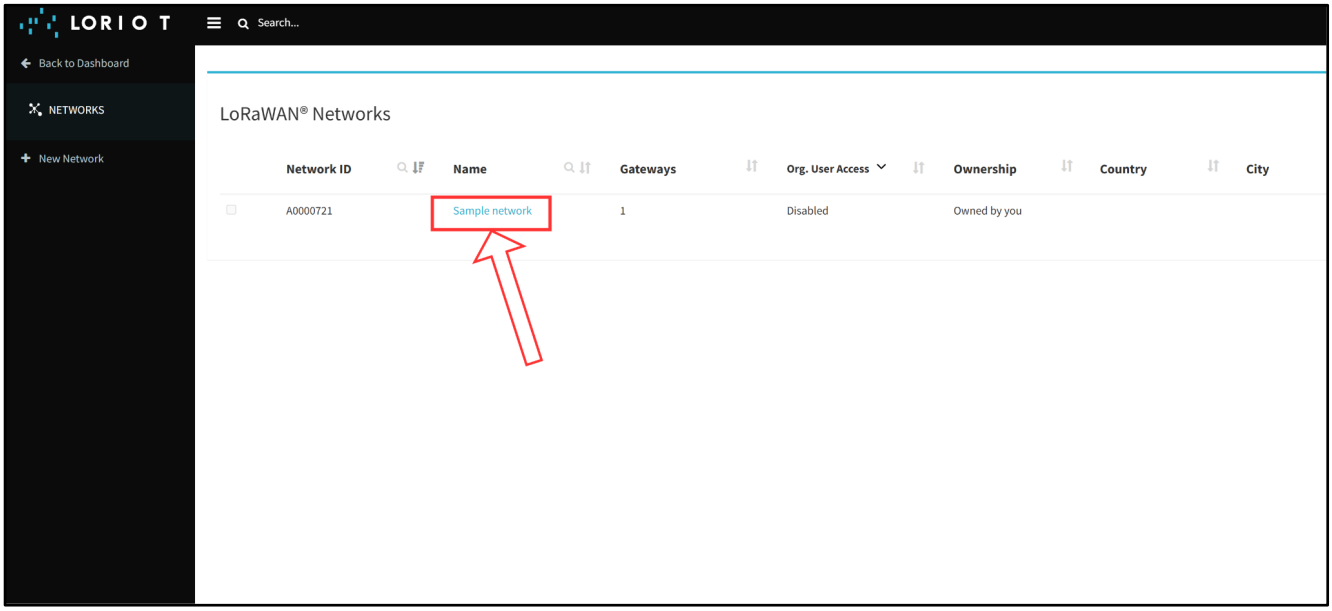
1. Go to the **Networks** page (Figure 12).

Figure 12. Go to Networks



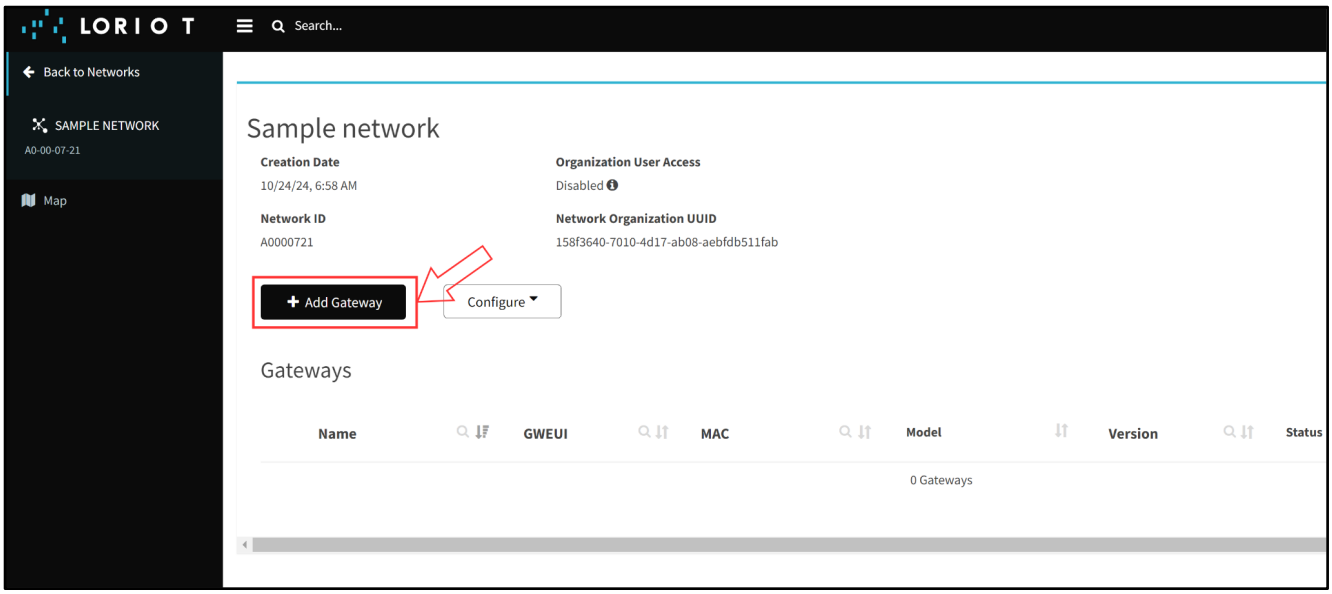
1. Go to the **Sample network** (Figure 13).

Figure 13. Choose the Sample network



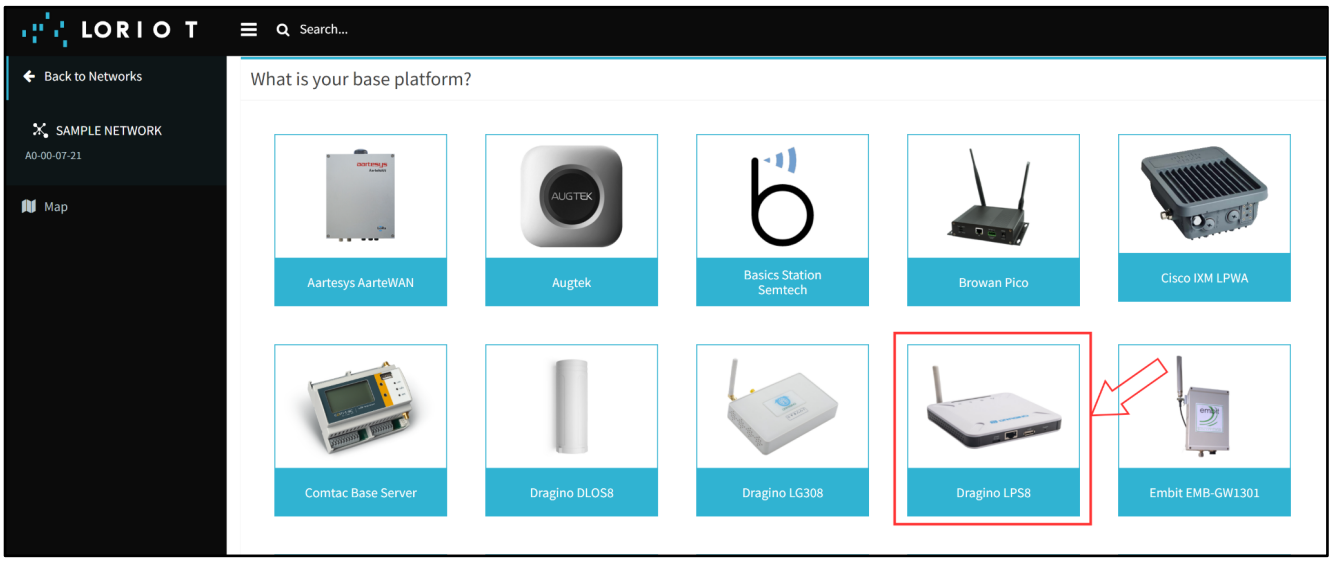
1. Add Gateway. Press the button **Add Gateway** (Figure 14).

Figure 14. Add gateway



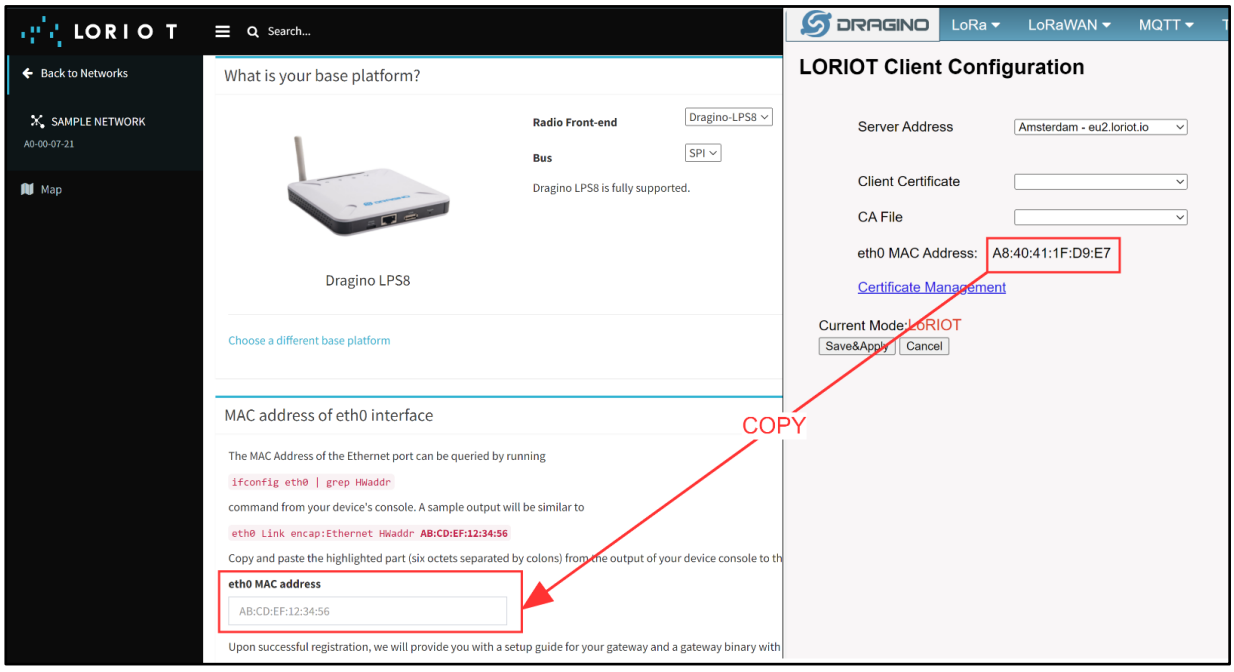
2. Scroll down and select **Dragino LPS8** (Figure 15).

Figure 15. Add the Dragino LPS8



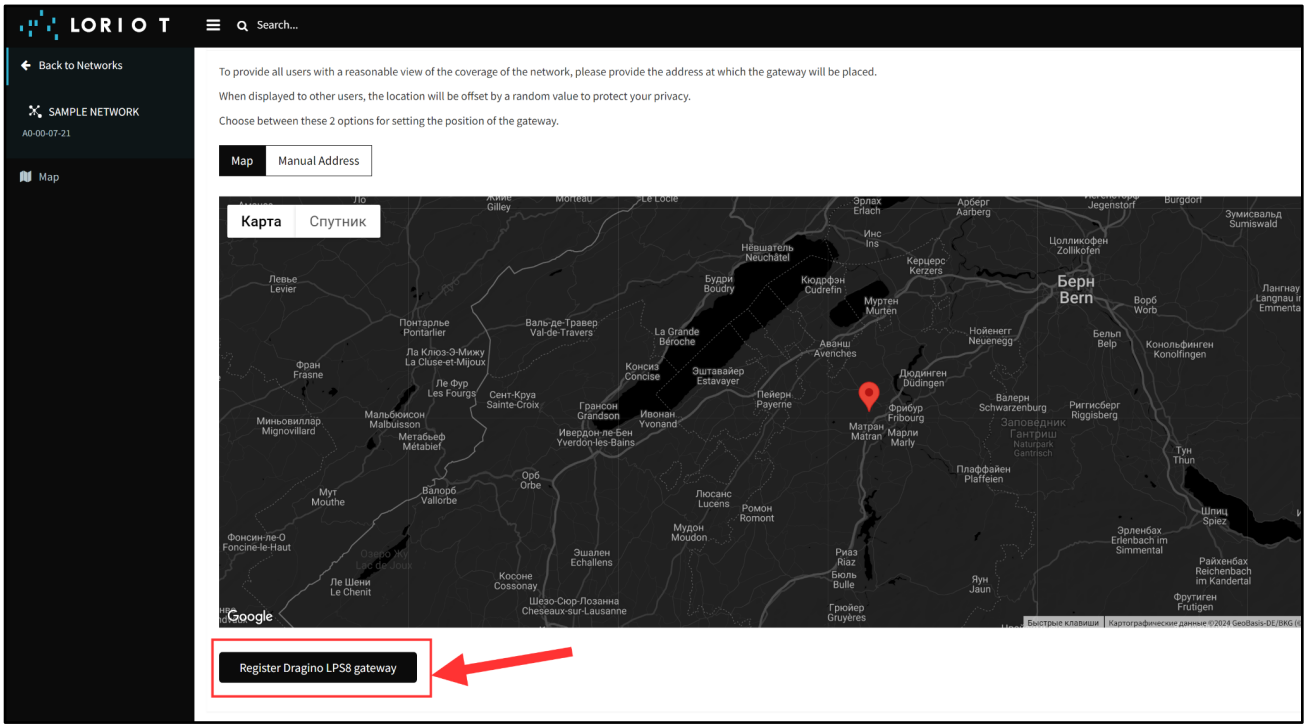
3. Scroll a little below and you will see a field for entering the device address (Figure 14). If a Dragoni LPS8 is used, the Eth0 Mac address can be taken on a *web-based GUI Dragino website* in LORIOT Client Configuration 1.3 Configuration LORIOT (Figure 16).

Figure 16. Eth0 Mac address



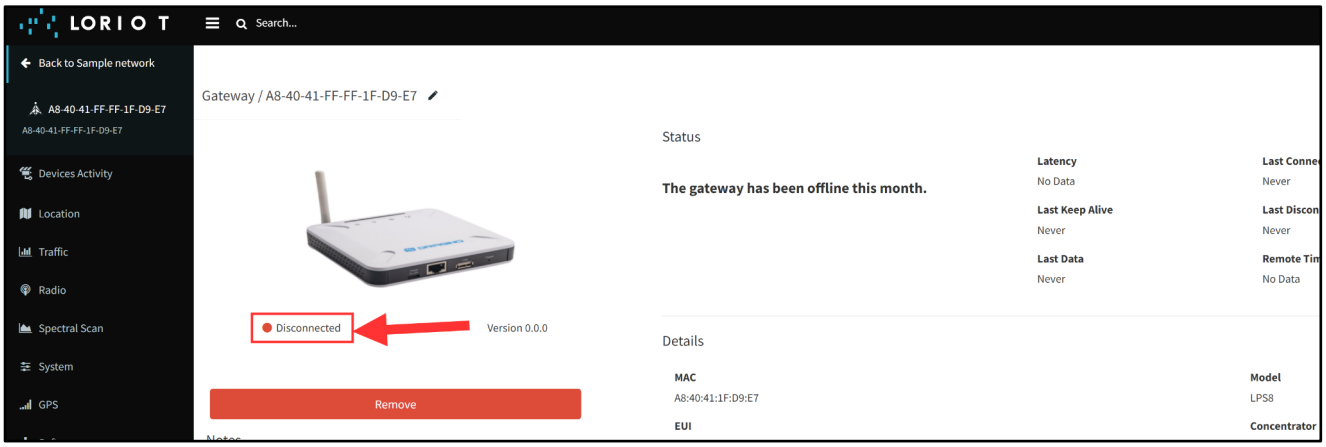
4. Scroll down and indicate the modem's location here, then click on **Register Dragino LPS8 gateway** (Figure 17).

Figure 17. Register Gateway



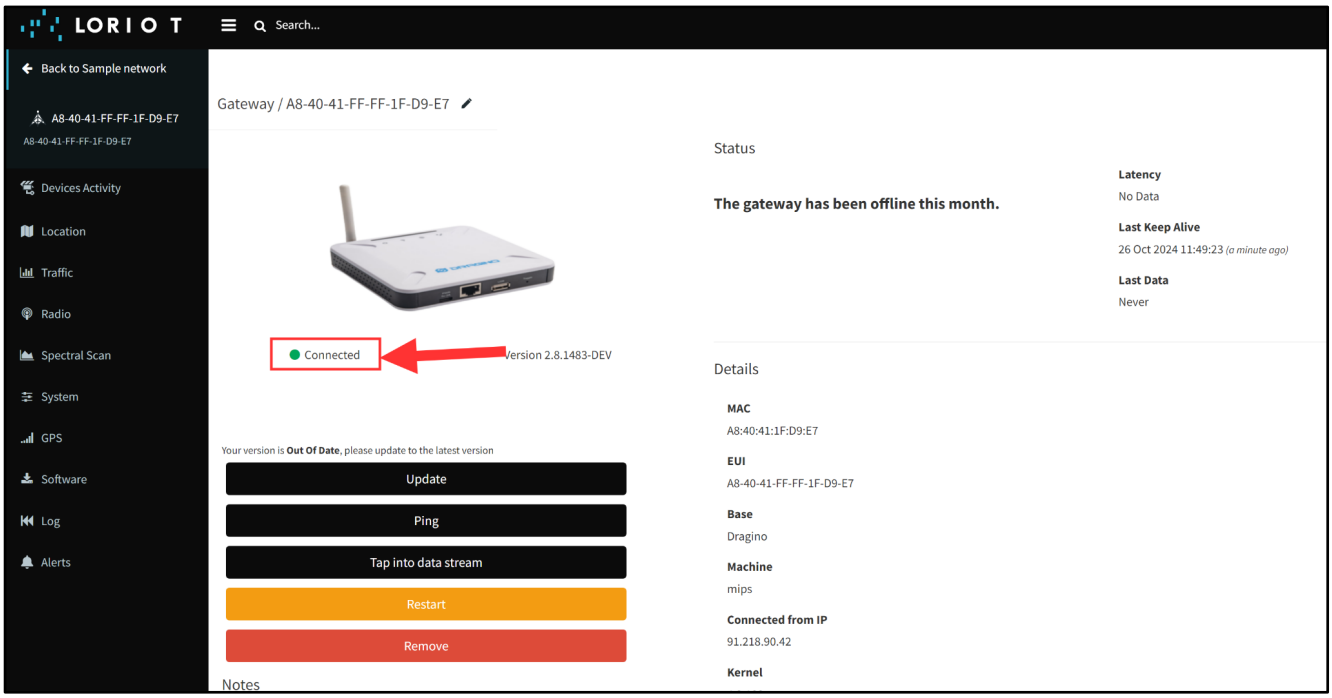
5. After registering the gateway, a page with the gateway status will appear, and it will be written that the connection status is **Disconnected** (Figure 18).

Figure 18. Gateway status



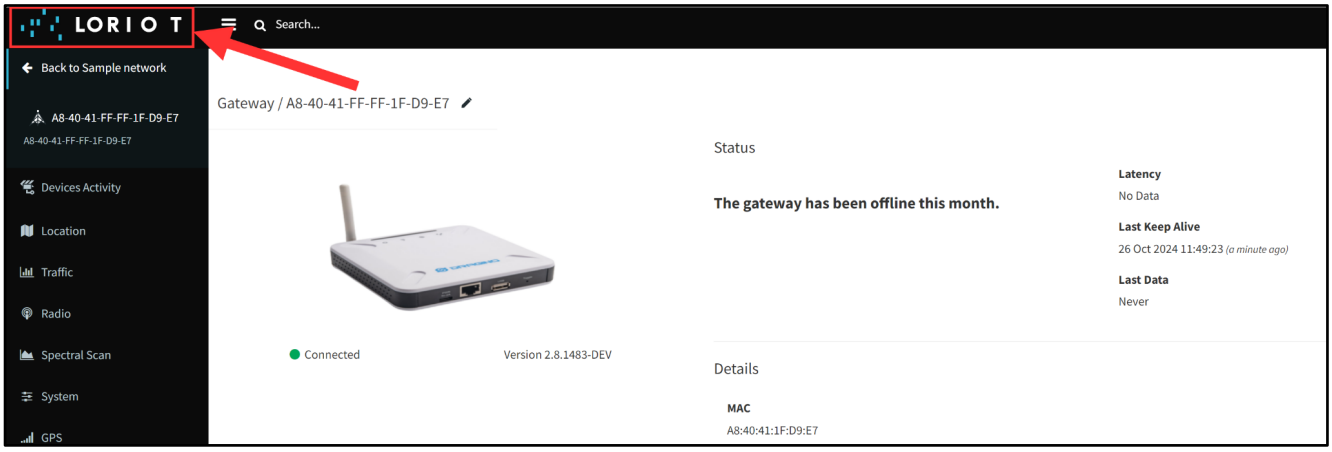
6. To speed up the procedure for connecting the gateway to the server, you need to reboot the Gateway. Refresh the page and wait until the Gateway's status changes to connected (Figure 19).

Figure 19. Gateway Connected



7. Go to the server's main page by clicking on the **LORIOT icon** (Figure 20).

Figure 20. Go to the main page

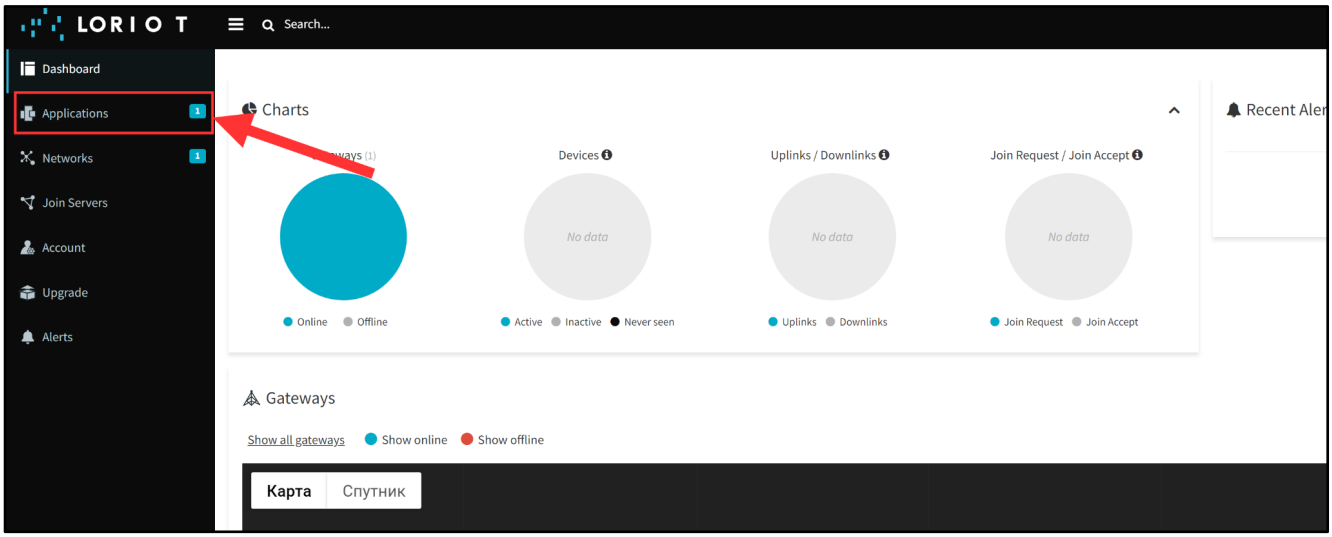


2.3 Add a Device

1. To add the SensiLoRa 2.0 device, need **AppKey**, **JoinEui,** and **DevEui** keys. These keys can be found using the SensiConfigurator program, download: Download SensiConfigurator Windows. Use the Getting Started SensiConfigurator document in section 3.2 Device Information.

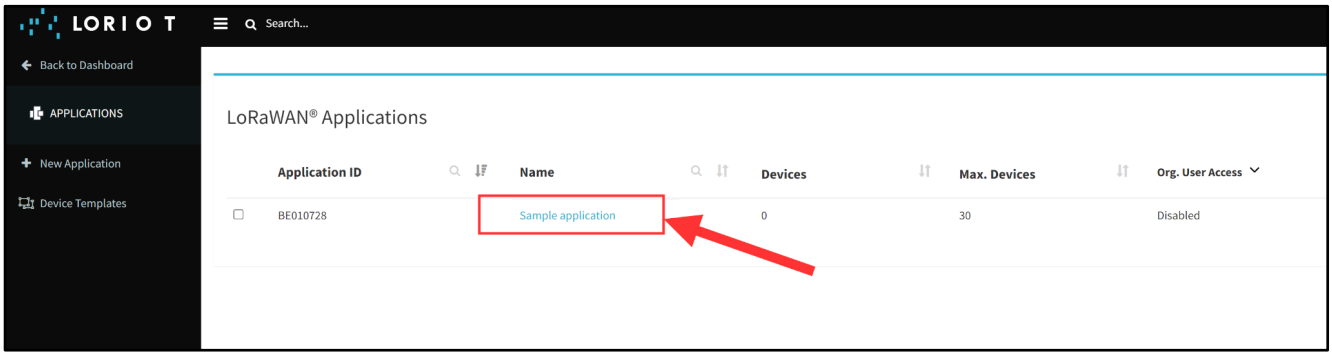
2. Go to the **Applications** page (Figure 21).

Figure 21. Go to Applications



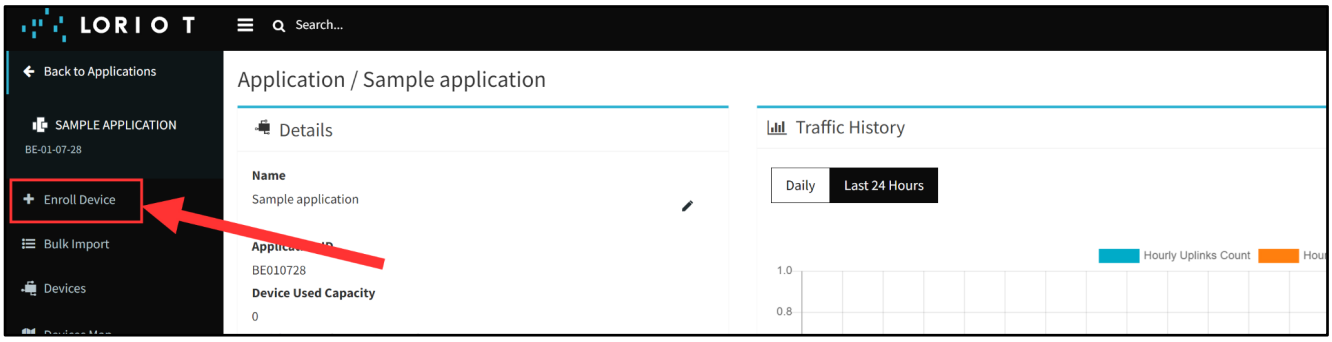
3. Choose a **Sample application** (Figure 22).

Figure 22. Choose a Sample application



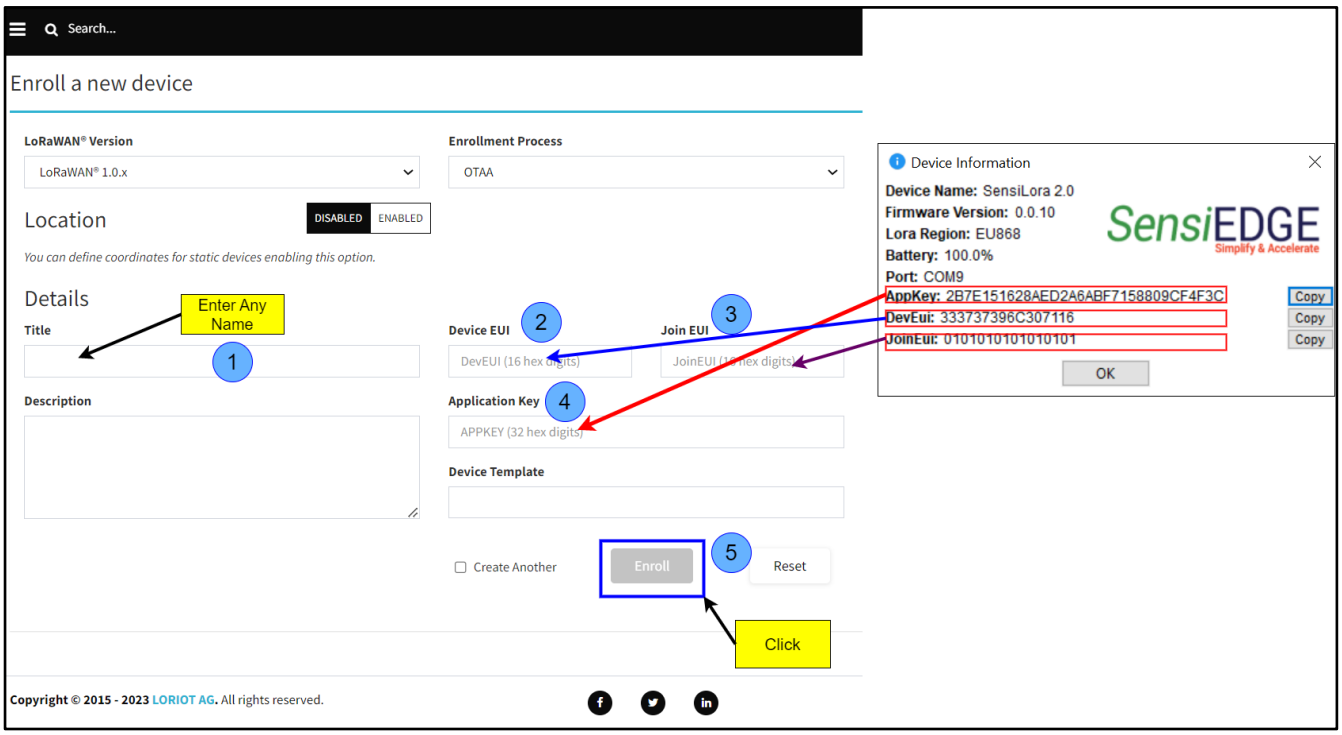
3. Click on **Enroll Device** (Figure 23).

Figure 23. Enroll Device



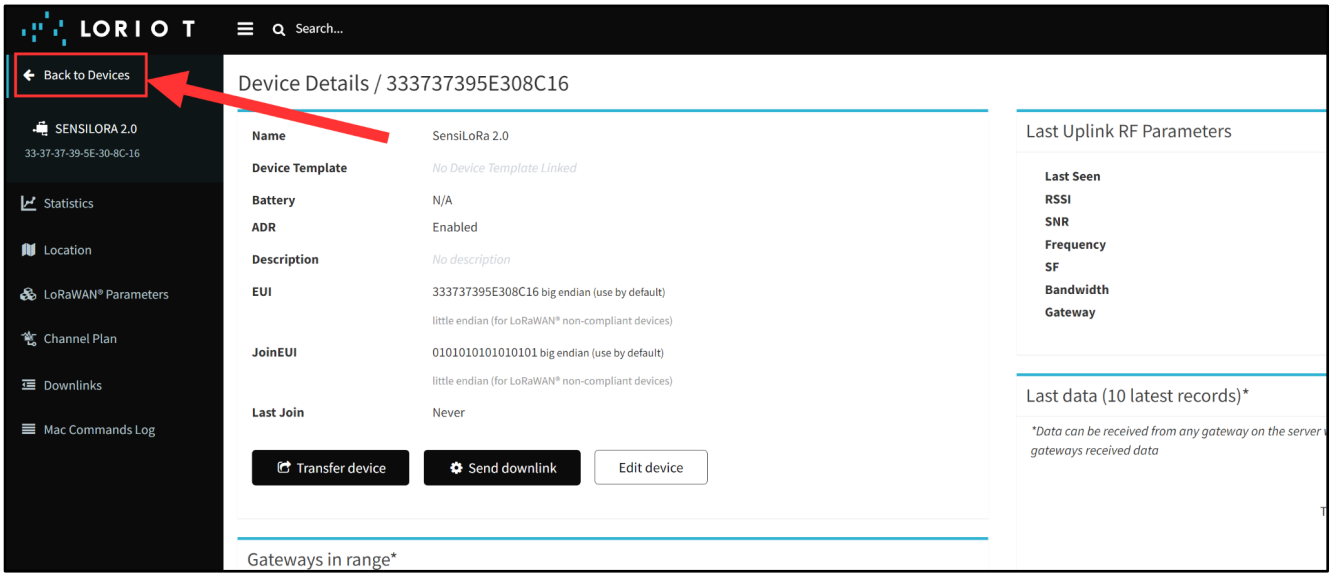
4. In the tab Enroll Device, enter any Name in **Title**, for example SensiLoRa 2.0 (step 1), then enter **Application key** (step 4), **Device EUI** (step 2), and **Join Eui** (step 3), (these keys can be found using the SensiConfigurator program, download: Download SensiConfigurator Windows . Use Getting Started SensiConfigurator document section 3.2 Device Information). Click **Enroll** (step 5) (Figure 24).

Figure 24. Add device



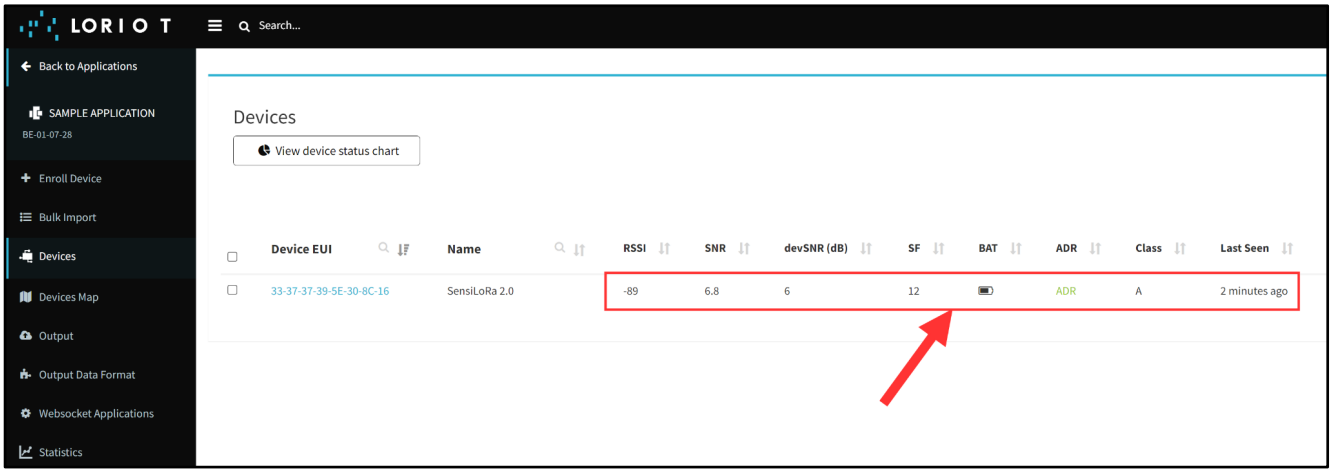
5. Go to the Devices page by clicking on the icon **Back To Devices** (Figure 25).

Figure 25. Back to Devices



6. In the **Devices** tab, you can view the addition of a device. When the added device connects to the server then we should see the value: **RSSI, SNR, devSNR, SF, and BAT,** for example, in Figure 26.

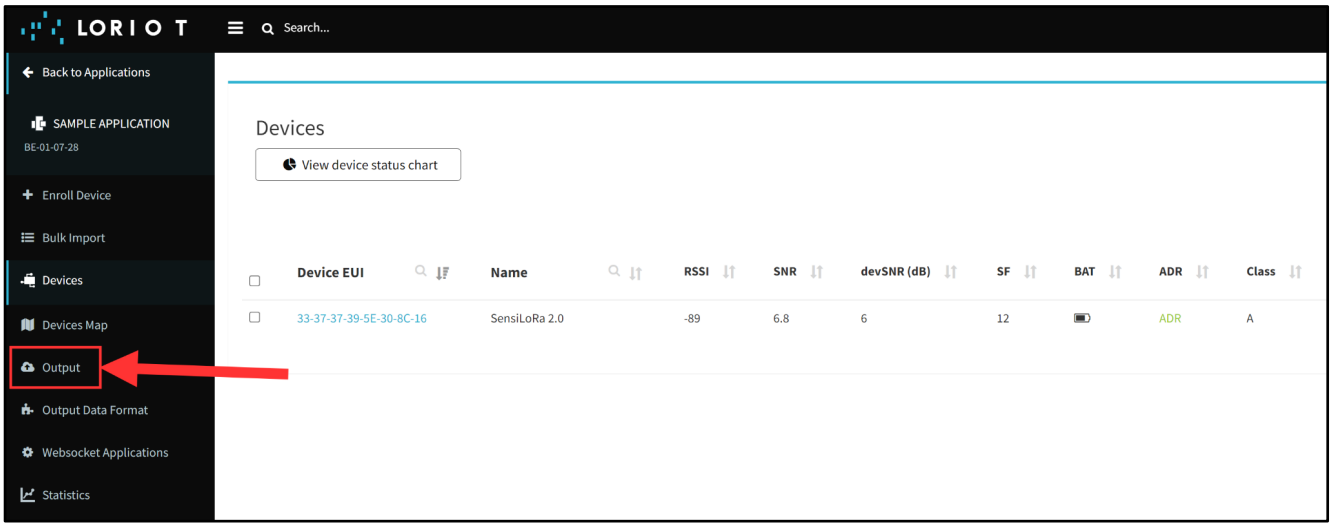
Figure 26. Status device



2.4 Output

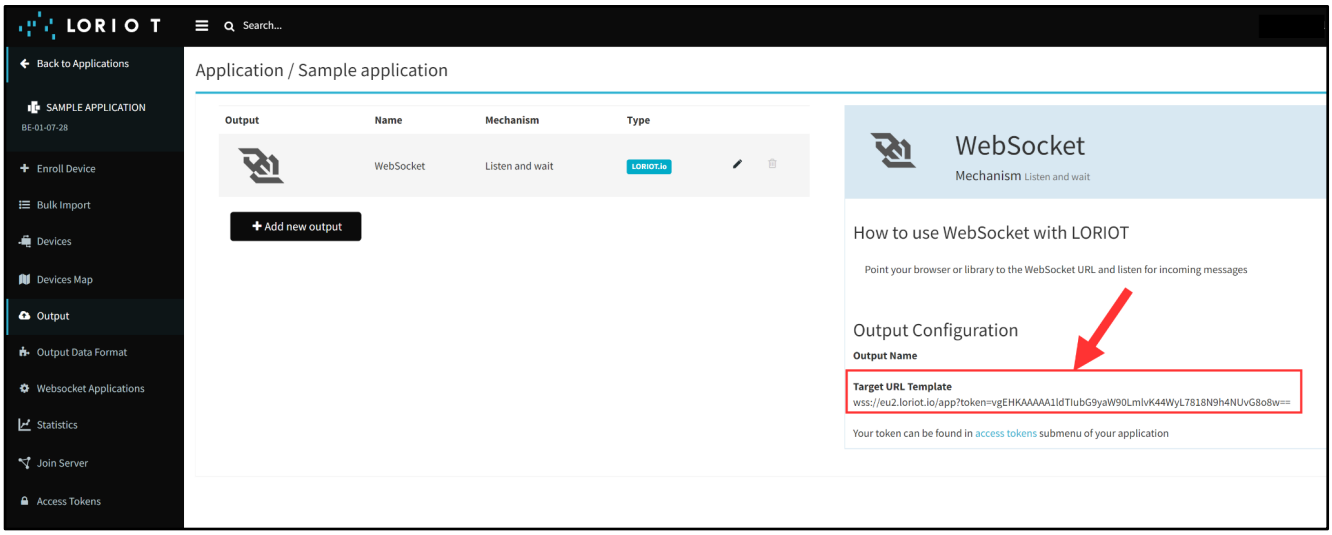
1. In the SampleApp, go to the **Output** page (Figure 27).

Figure 27. Go to Output



2. Data output link. Example: Use the **Target URL Template,** for Stm32CubeMonitor (Figure 28).

Figure 28. Target URL link



3 LORIOT Integration to Thingsboard

3.1 Overview

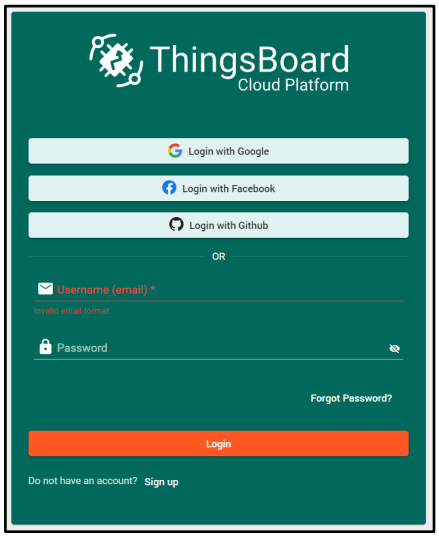
1. After integrating LORIOT with the ThingsBoard, you can connect, communicate, process, and visualize data from devices in the ThingsBoard

IoT platform. For Integration LORIOT needs to use **Professional Edition**, his edition is paid, and it costs $10/month, but upon registration, a trial (free) period of 30 days is given. For more information visit the website LORIOT Integration.

3.2 Registration

1. Go to ThingsBoard.cloud suit and register in the cloud (Figure 29).

Figure 29. ThingsBoard Registration

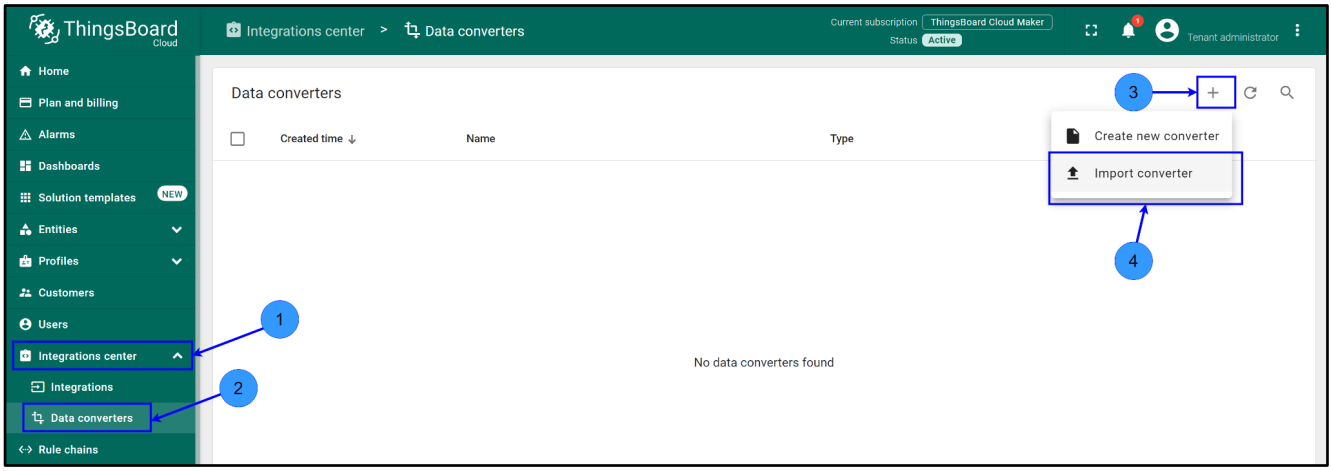


3.3 Import a Data Converter

1. After registering and entering the clouds Download DataConverter: SensiLoRa2_0_DataConverterV0.2.json.

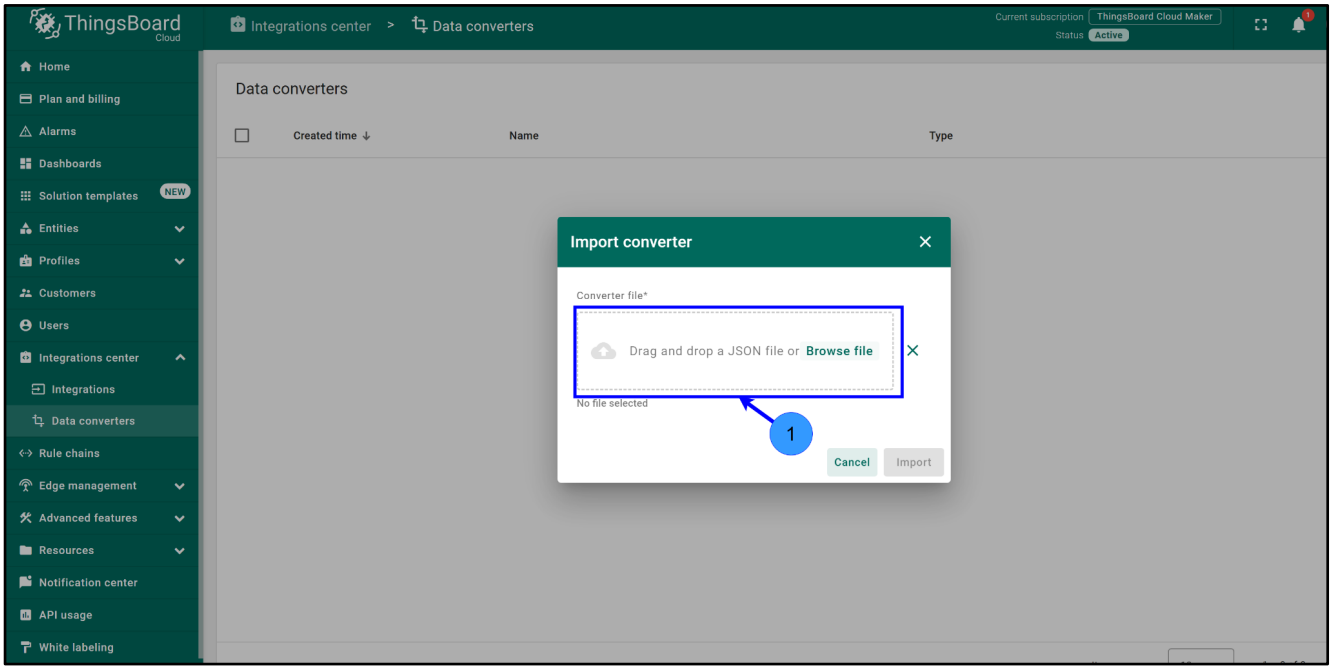
2. Add a Data Converter in ThingsBoard for this, go to the **Integrations center** (step 1), **Data converters** (step 2), click on **+** (step 3), and choose **Import converter** (step 4) (Figure 30).

Figure 30. Import a Data Converter



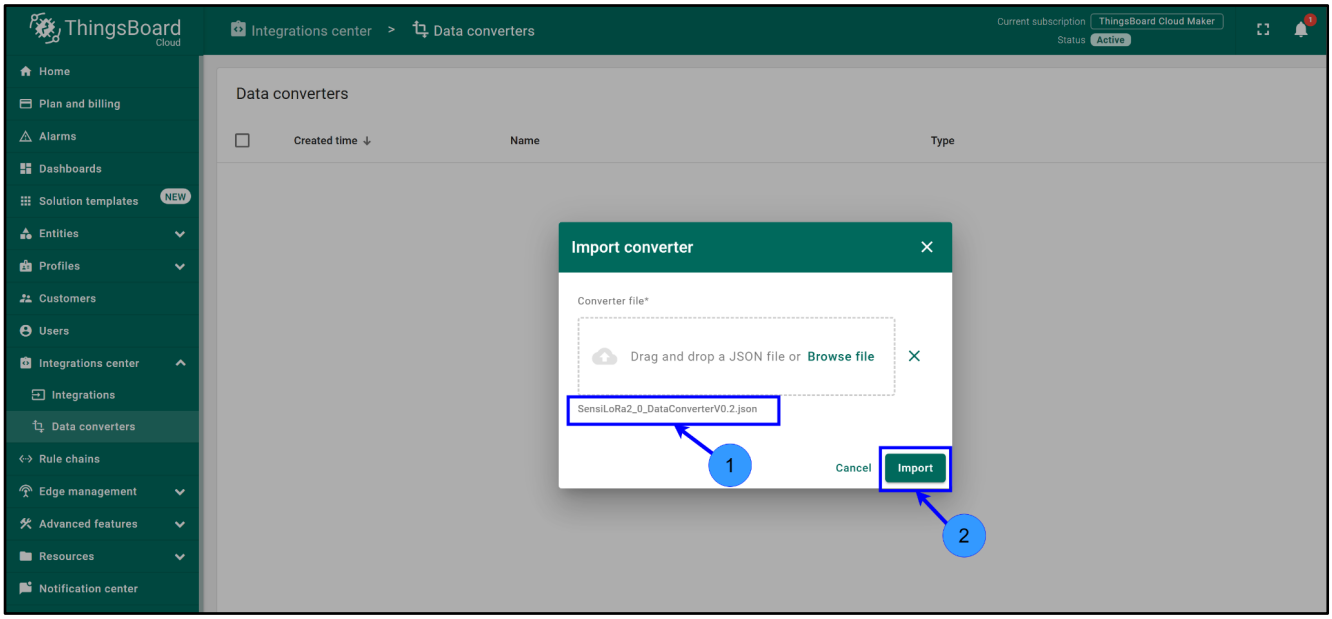
2. In the window, Import Convert drag the downloaded Data Converter or click on the **Browse file** (step 1) and select the SensiLoRa2_0_DataConverterV0.2.json (Figure 31).

Figure 31. Choose a Data Converter



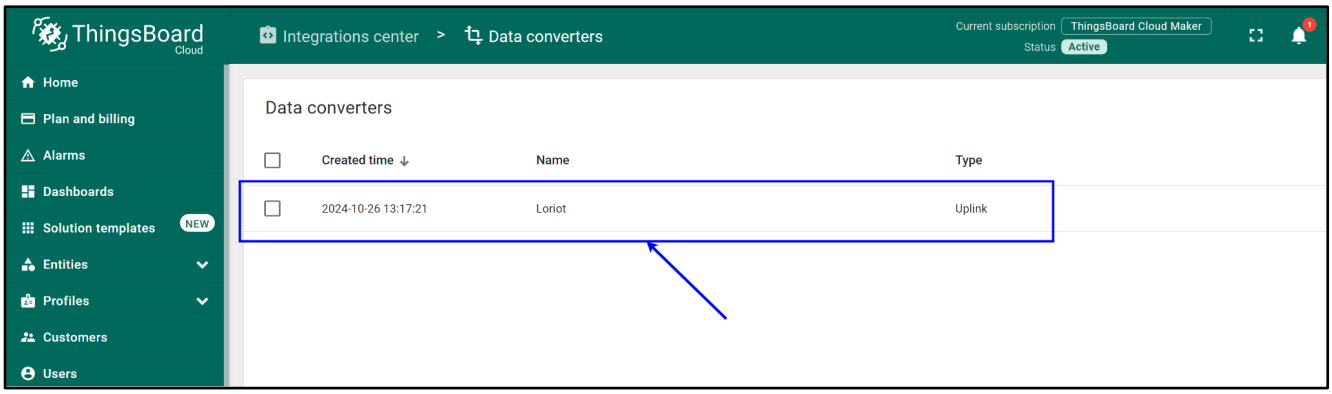
3. The selected Data converter will appear (step 1) and then click on **Import** (step 2) (Figure 32).

Figure 32. Click Import a Data Converter



4. After Importing, a Data Converter named **Loriot** will appear in the window Data converters (step 1) (Figure 33).

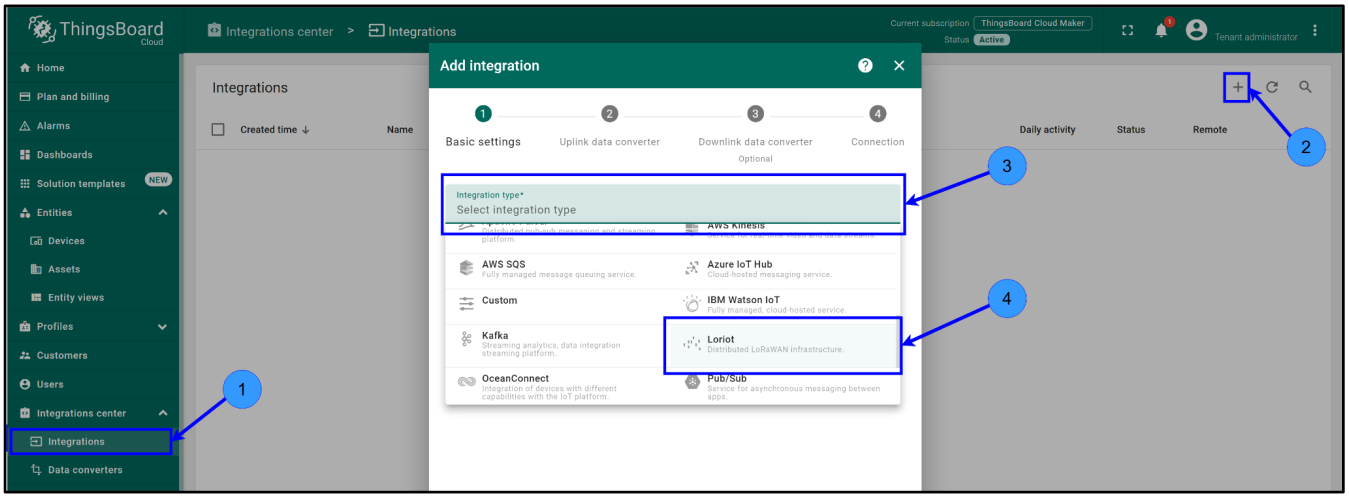
Figure 33. Loriot Data Converter



3.4. Create Integration

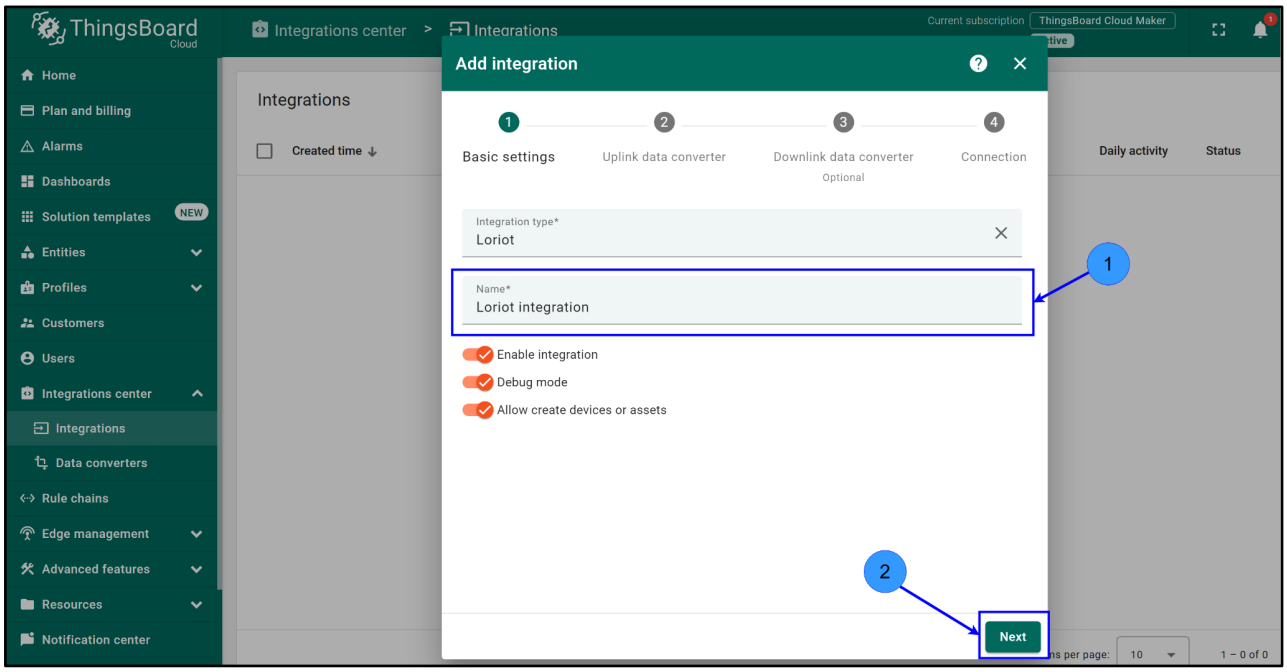
1. After importing Data Converter move on to the creation of Integration. Go to **Integrations** (step 1), click on **+** (step 2), and in **Integration type** (step 3), choose **Loriot** (step 4) (Figure 34).

Figure 34. Add Integration



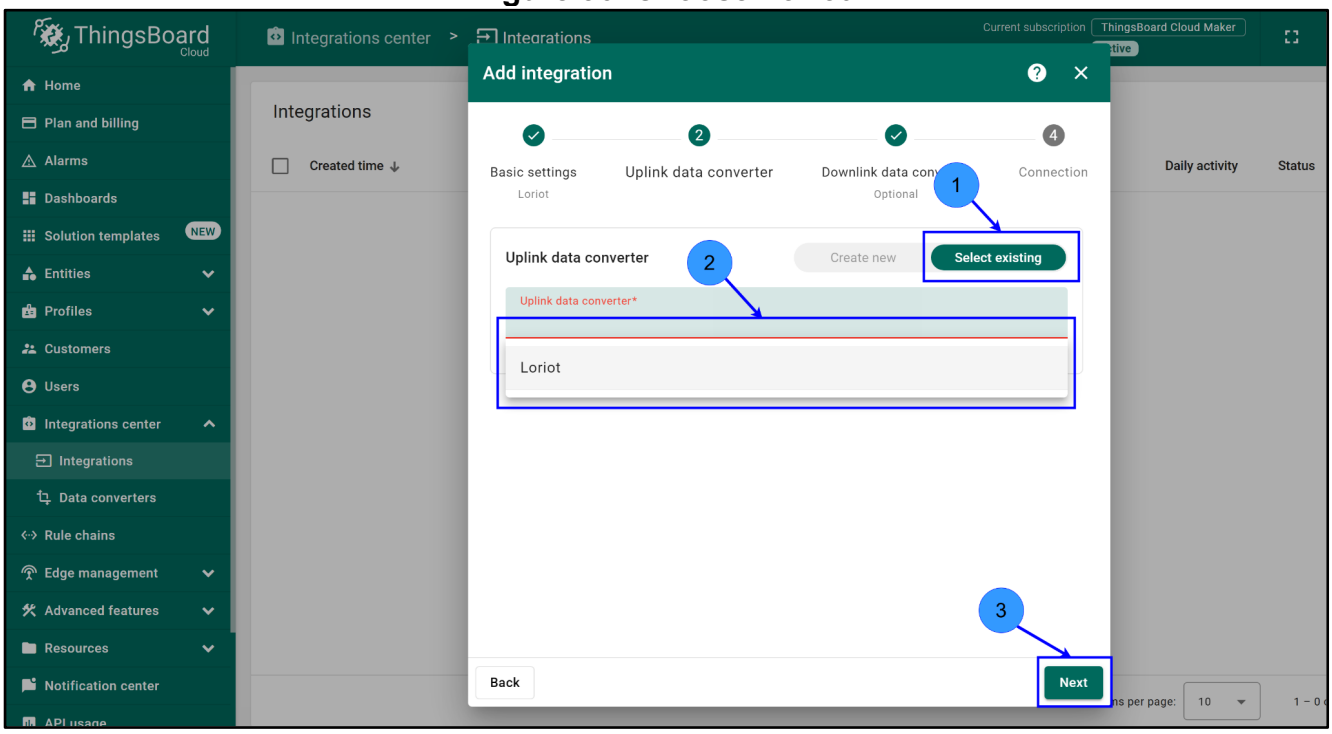
2. In the field **Name** enter the name **Loriot Integration** (step 1) and click **Next** (step 2) (Figure 35).

Figure 35. Basic settings Integration



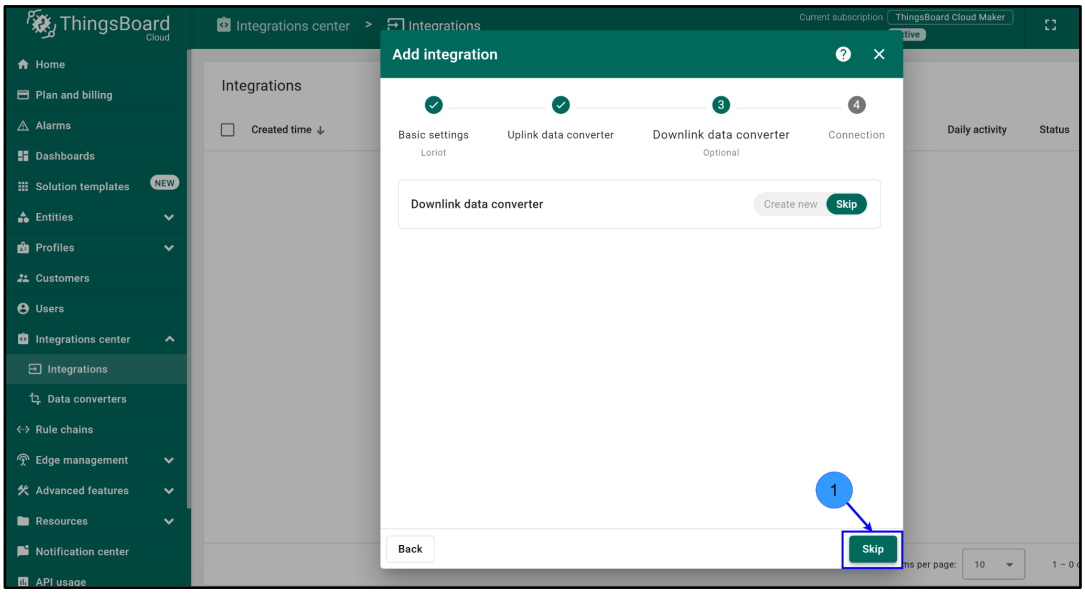
3. Choose **Select existing** (step 1) and in the **Uplink Data Converter** field choose **Loriot** (step 2) and click **Next** (step 3) (Figure 36).

Figure 36. Choose Loriot



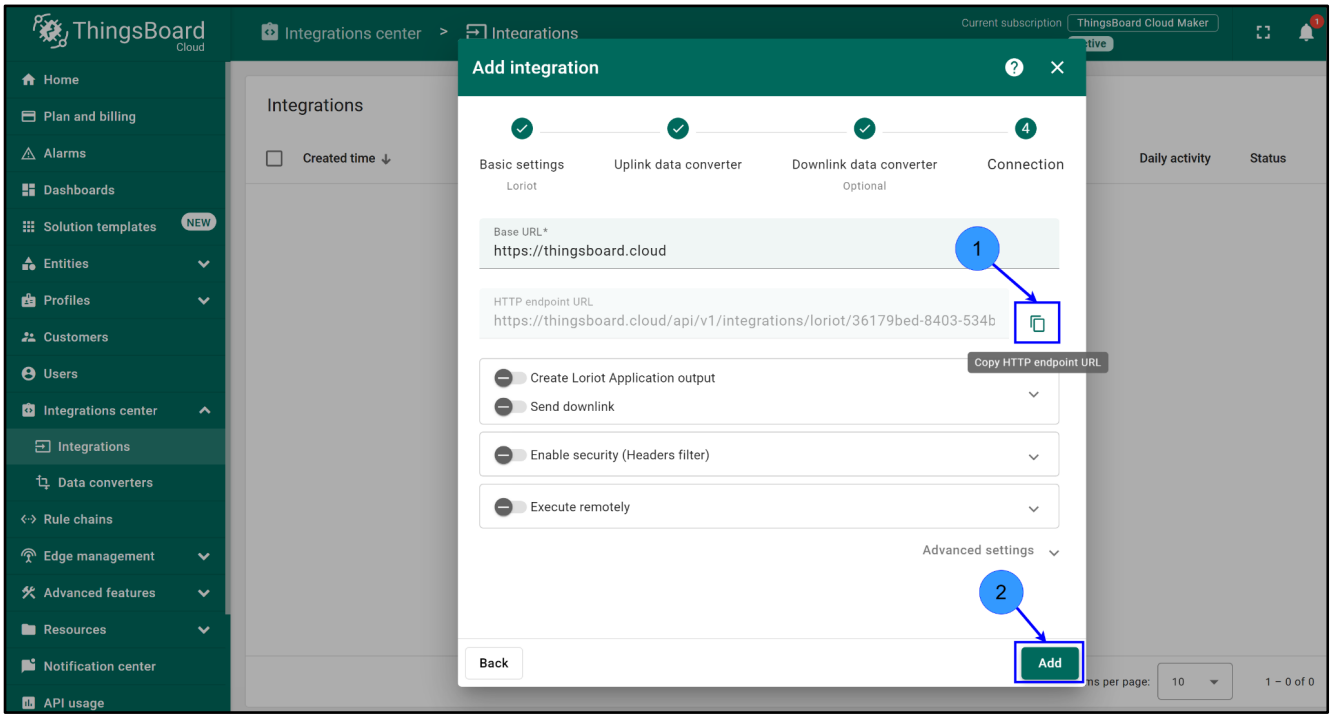
4. Click on **Skip** (step 1) (Figure 37).

Figure 37. Skip Downlink data converter



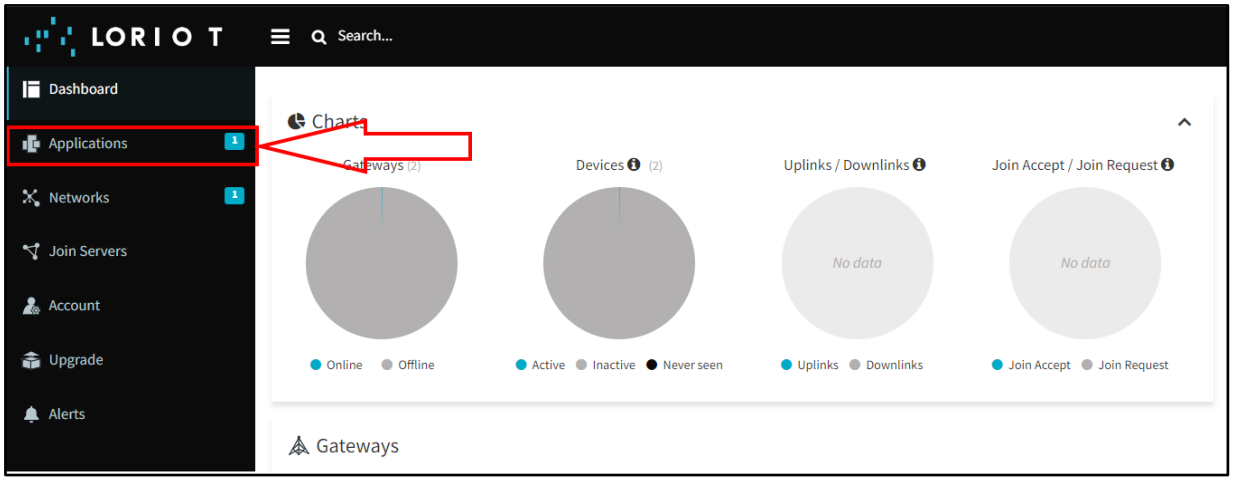
5. Click to **Copy HTTP endpoint URL** (step 1) and click on **Add** (step 2) (Figure 38).

Figure 38. Copy HTTP



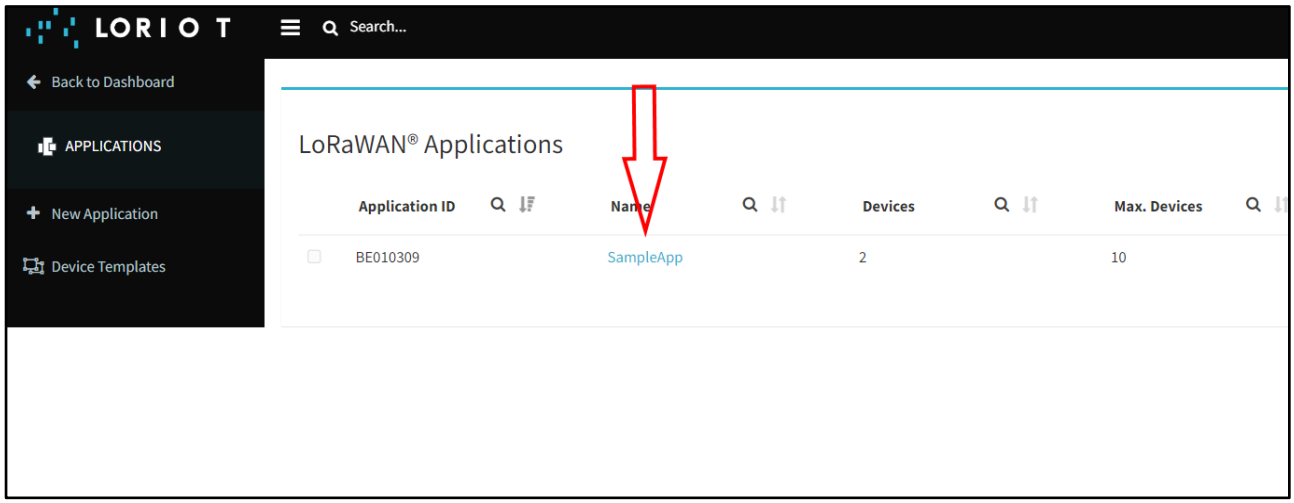
6. Go to **Applications** in LORIOT (Figure 39).

Figure 39. Go to Applications



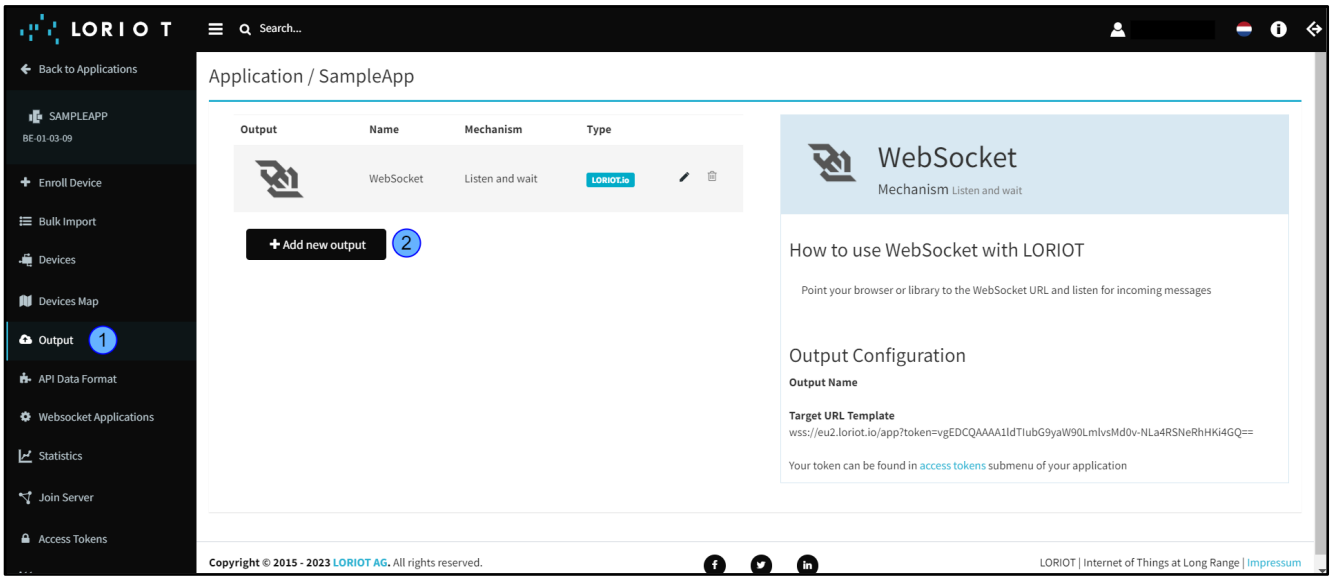
7. Select **Sample App** Application (Figure 40).

Figure 40. Select SampleApp



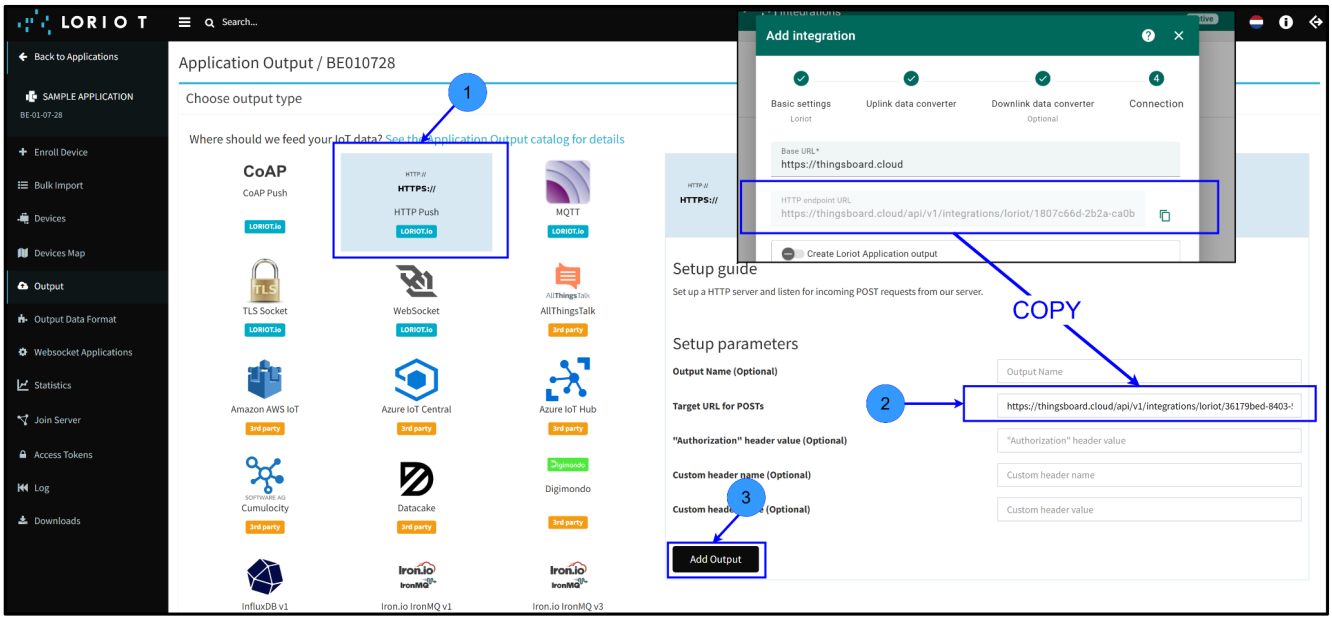
8. In Application go to **Output** (step 1) and click on **Add new output** (step 2) (Figure 41).

Figure 41. Add Output



9. Select **HTTP PUSH** output type (step 1). In **Target URL for POSTs** paste the HTTP URL with ThingsBoard (step 2) and click **Add Output** (step 3) (Figure 42).

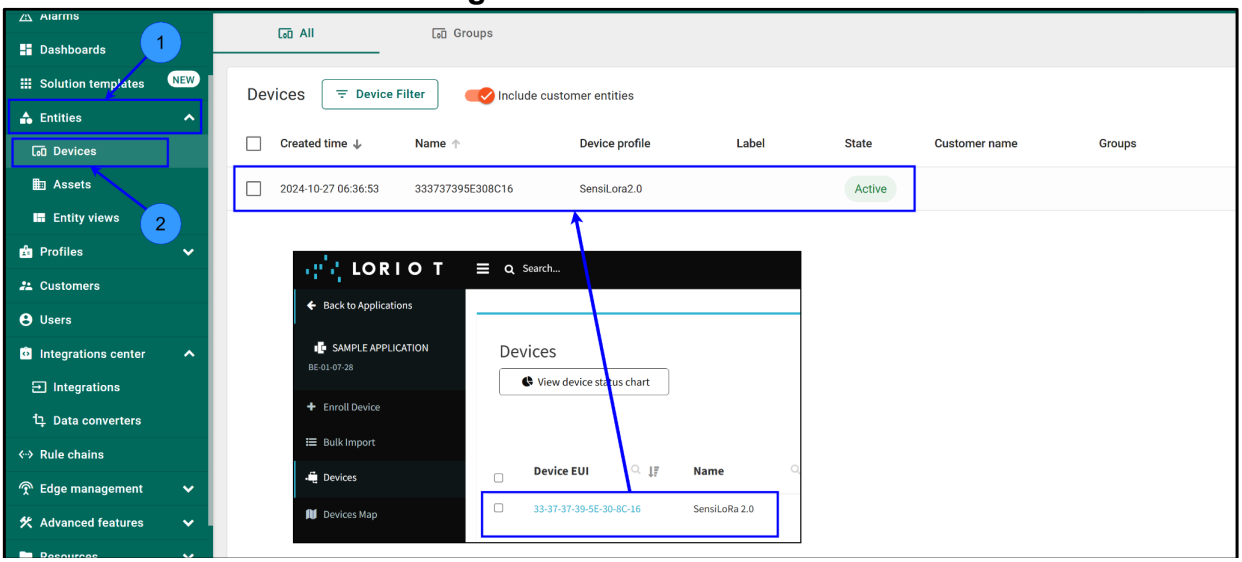
Figure 42. Create HTTP Push



3.5 Device

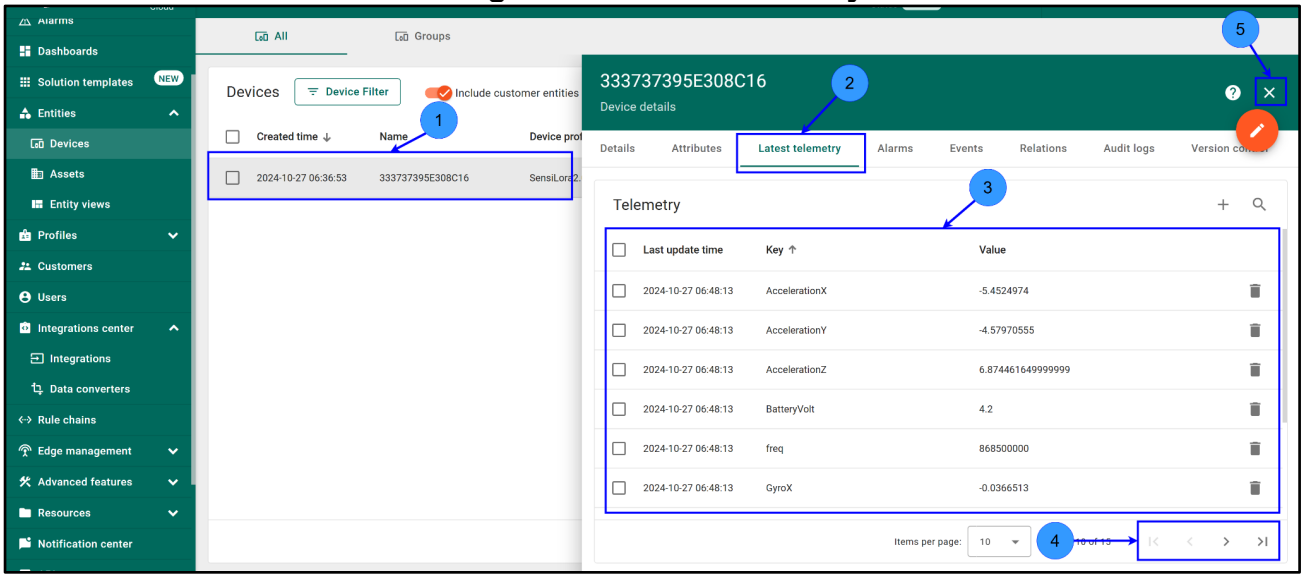
1. To view, the active devices go to the **Entities** page(step 1), choose **Devices**(step 2), and there will be devices that are connected to the Loriot server and transmitting data to it (Figure 43).

Figure 43. Active Devices



2. To view the data from the sensors, click on Device **SensiLora2.0** (step 1), and choose the **Latest telemetry** (step 2). Here are the sensor values (step 3), click on the **>** (step 4), to view other values. To close the Device details, click on the **X** (step 5) (Figure 44).

Figure 44. Latest telemetry



3.6 Dashboard

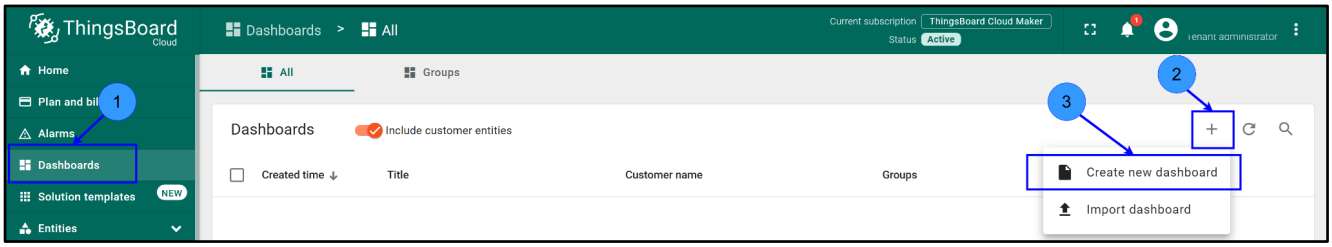
3.6.1 Overview

1. You can import a Dashboard and skip the next steps, for this go to section 3.6.5 Import Dashboard.

3.6.2 Add Dashboard

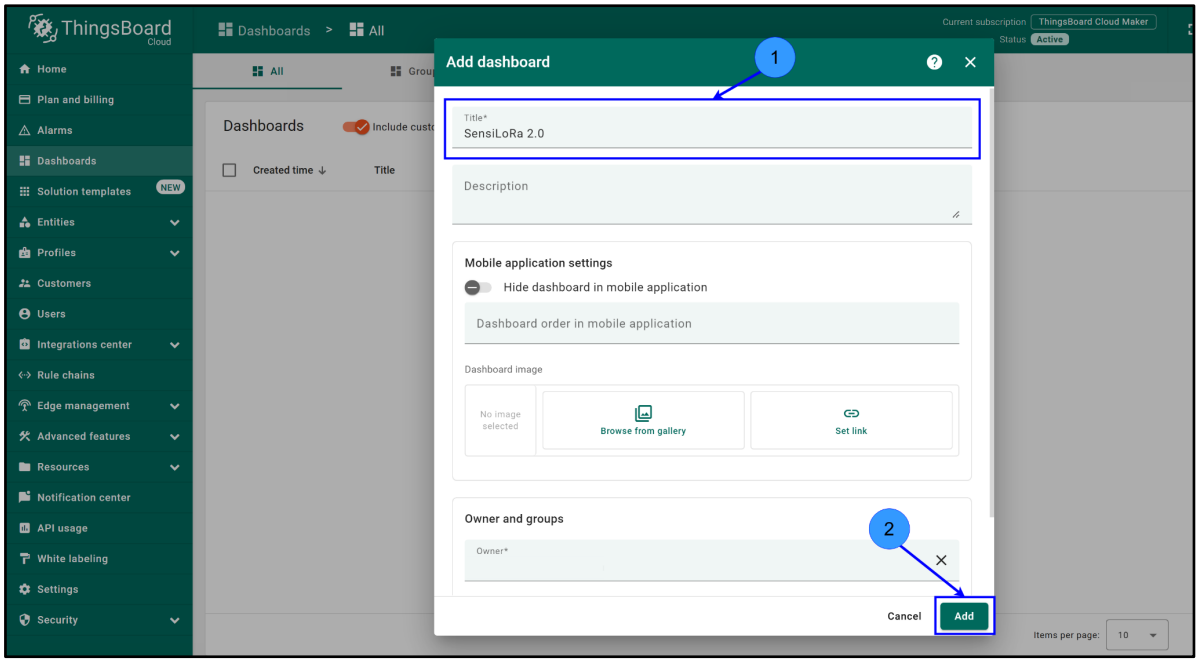
1. Add Dashboard, go to **Dashboards** (step 1), click **+** (step 2), and choose **Create new dashboard** (step 3) (Figure 45).

Figure 45. Create new Dashboard



2. Enter the name **SensiLora 2.0** in the **Title** field (step 1) and click **Add** (step 2) (Figure 46).

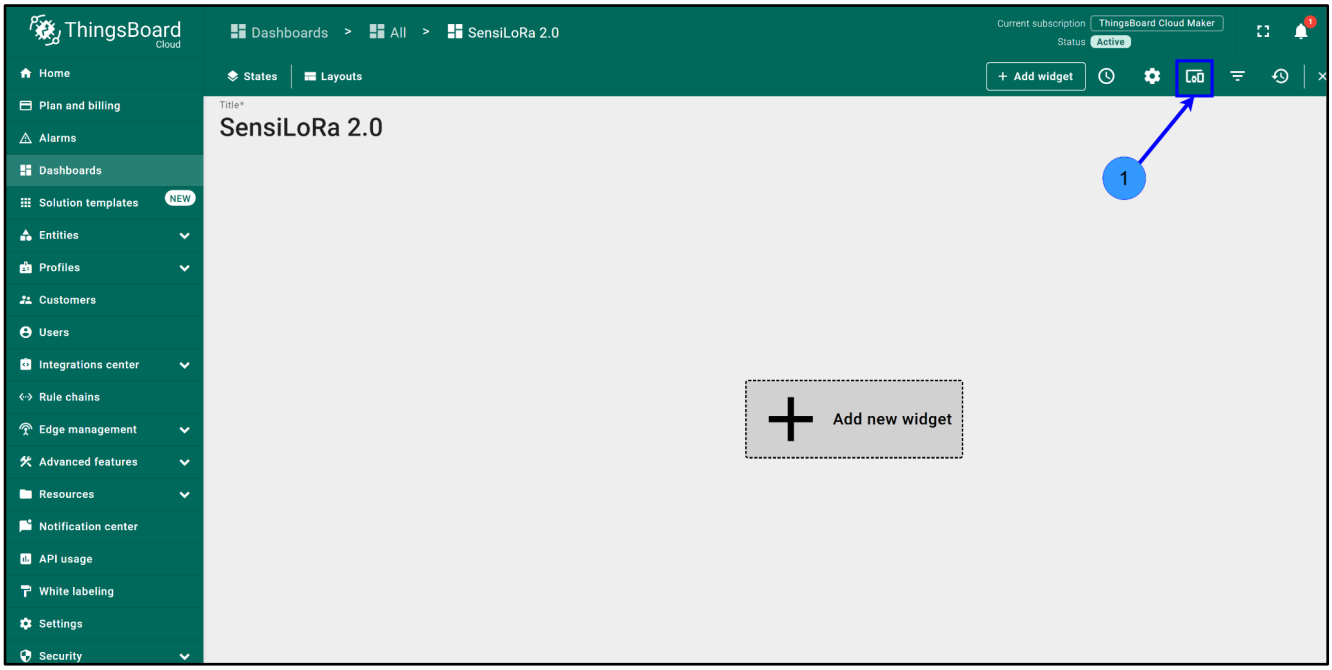
Figure 46. Add SesnsiLoRa 2.0 Dashboard



3.6.3 Add Entity Aliases

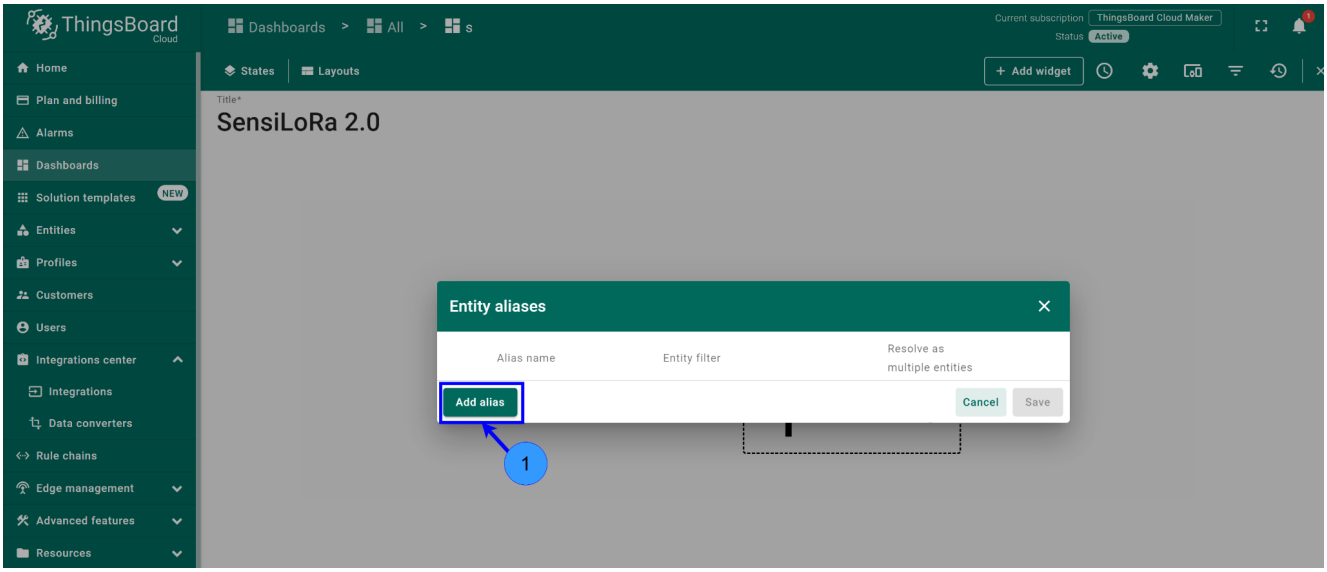
2. Click on **Entity aliases** (step 1) (Figure 47).

Figure 47. Entity aliases



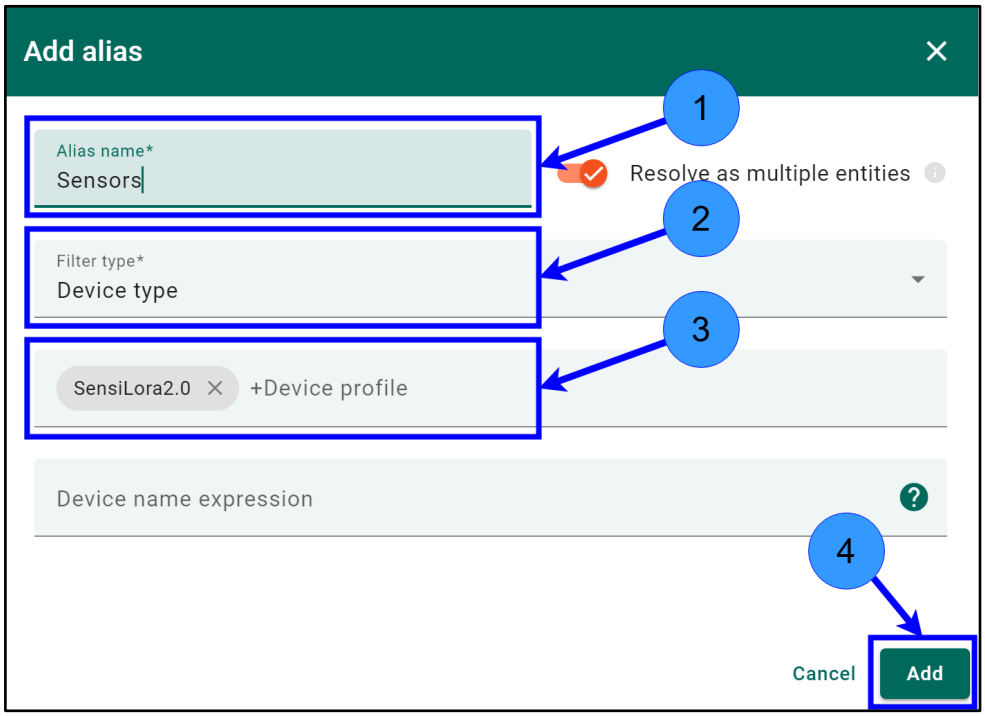
3. Click on **Add alias** (step 1) (Figure 48).

Figure 48. Go to Add alias



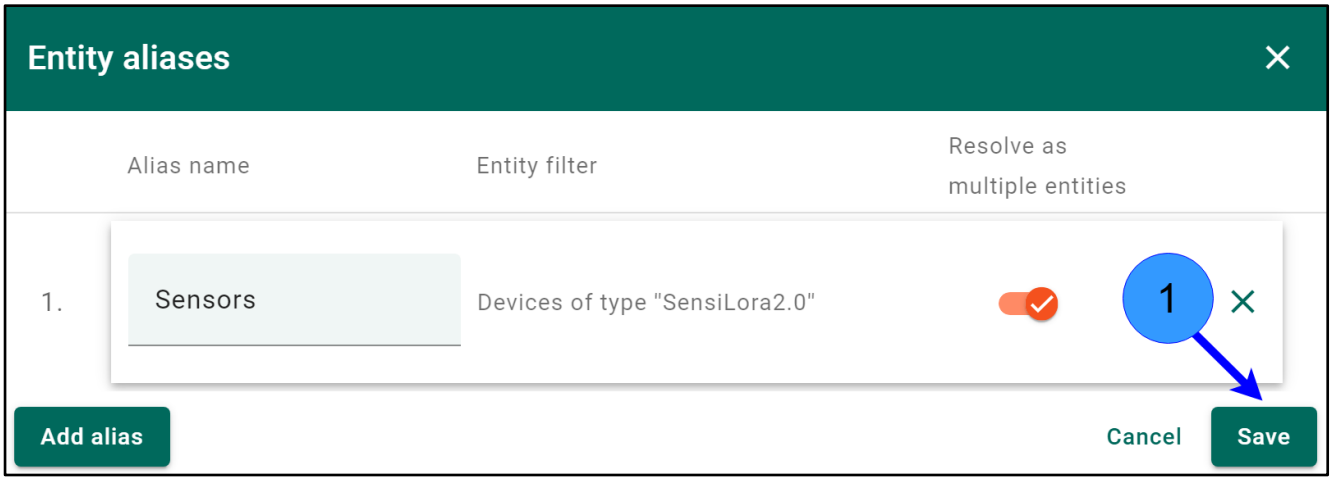
4. Enter the **Alias name**: **Sensors** (step 1), choose in **Filter type**: **Device type** (step 2), choose **SensiLora2.0** Device profile(step 3), and click **Add** (step 4) (Figure 49).

Figure 49. Filling Add alias



5. Click on **Save** (step 1) (Figure 50).

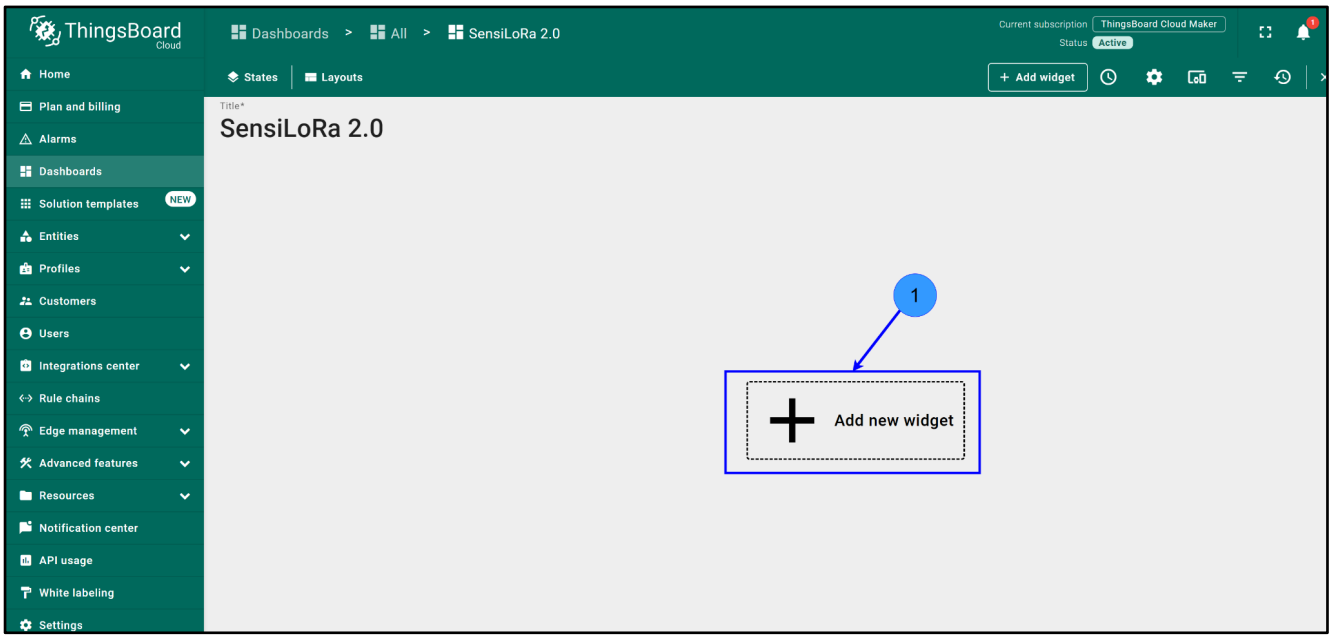
Figure 50. Save alias



3.6.4 Add Temperature widget

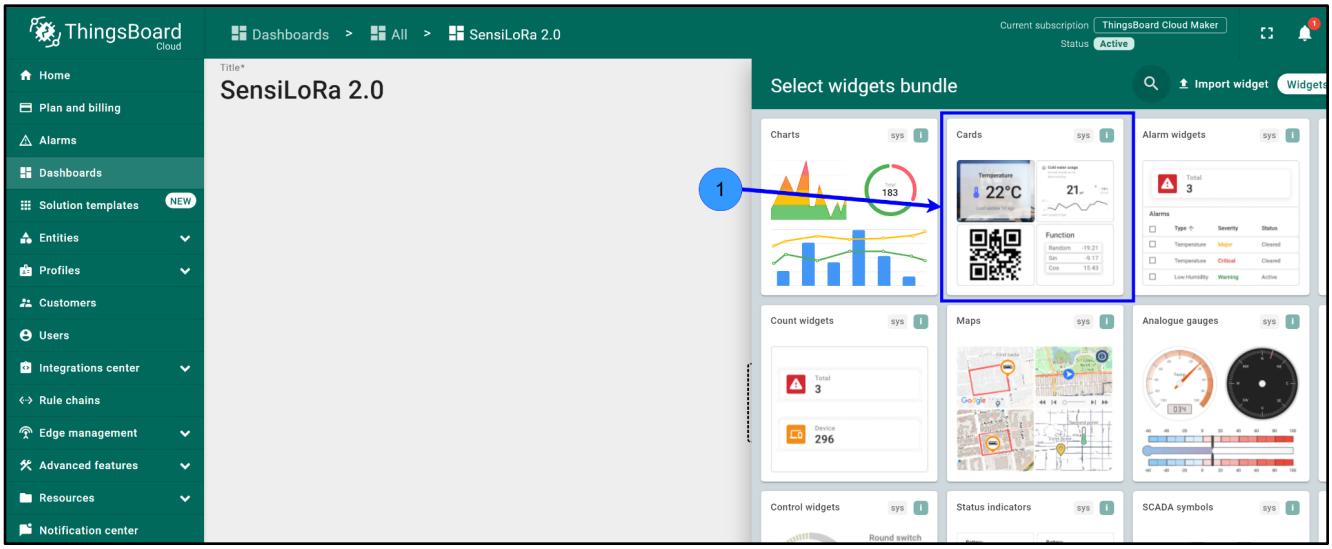
1. Add a new widget. For this click **Add new widget** (step 1) (Figure 51).

Figure 51. Add widget



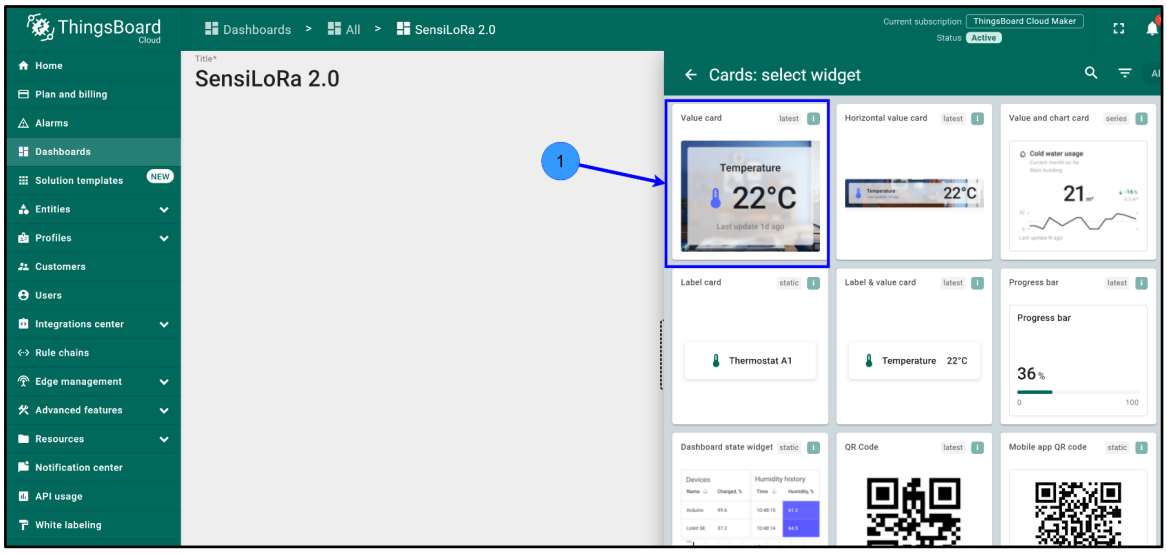
2. Choose the **Cards** widget bundle (step 1) (Figure 52).

Figure 52. Choose the Cards widget



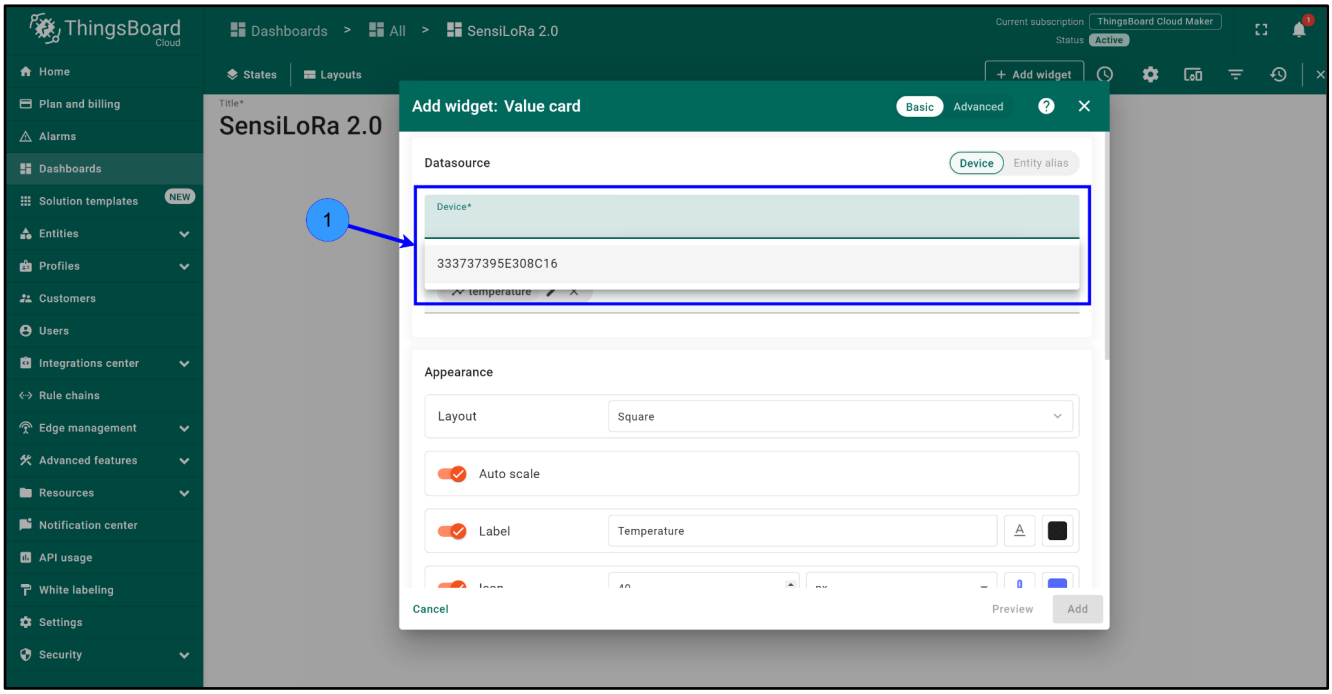
3. Choose the **Value card** widget (step 1) (Figure 53).

Figure 53. Choose the Value card



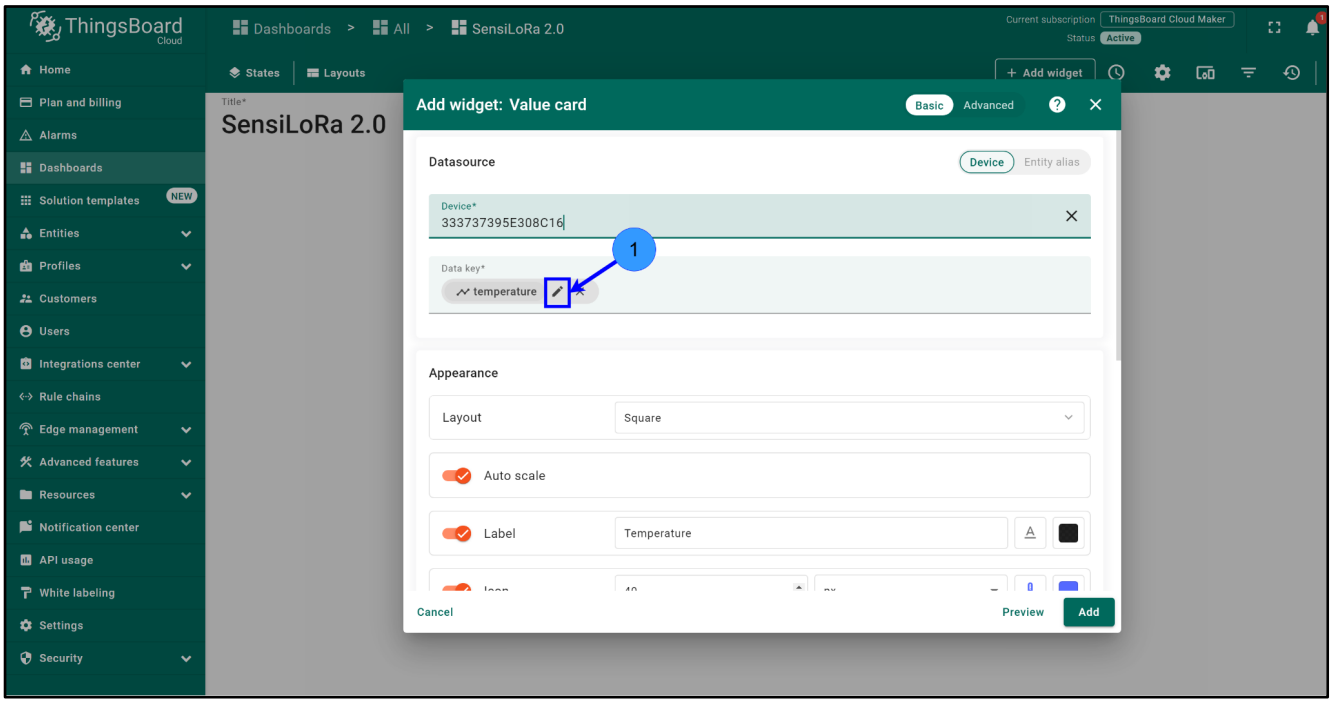
4. In the **Device field** choose the **Device** (step 1) (Figure 54).

Figure 54. Add Datasource



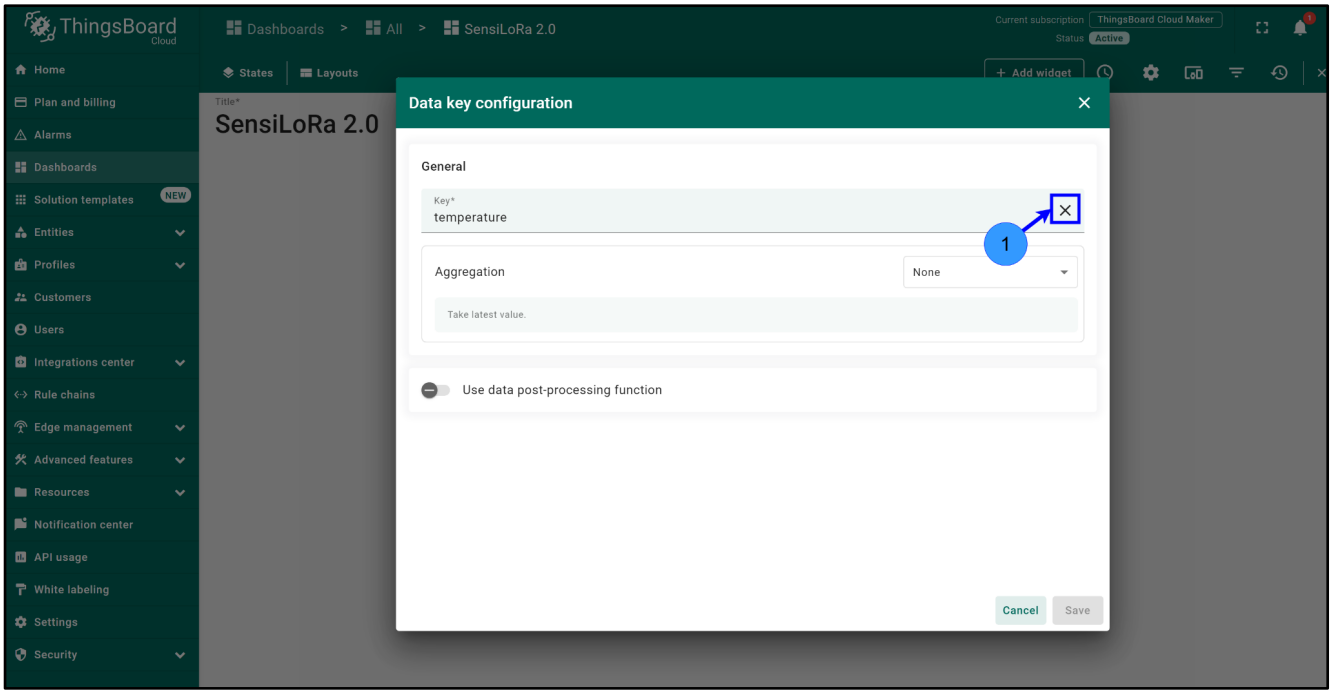
5. Click on the **edit** temperature Data key (Step 1) (Figure 55).

Figure 55. Edit Data key



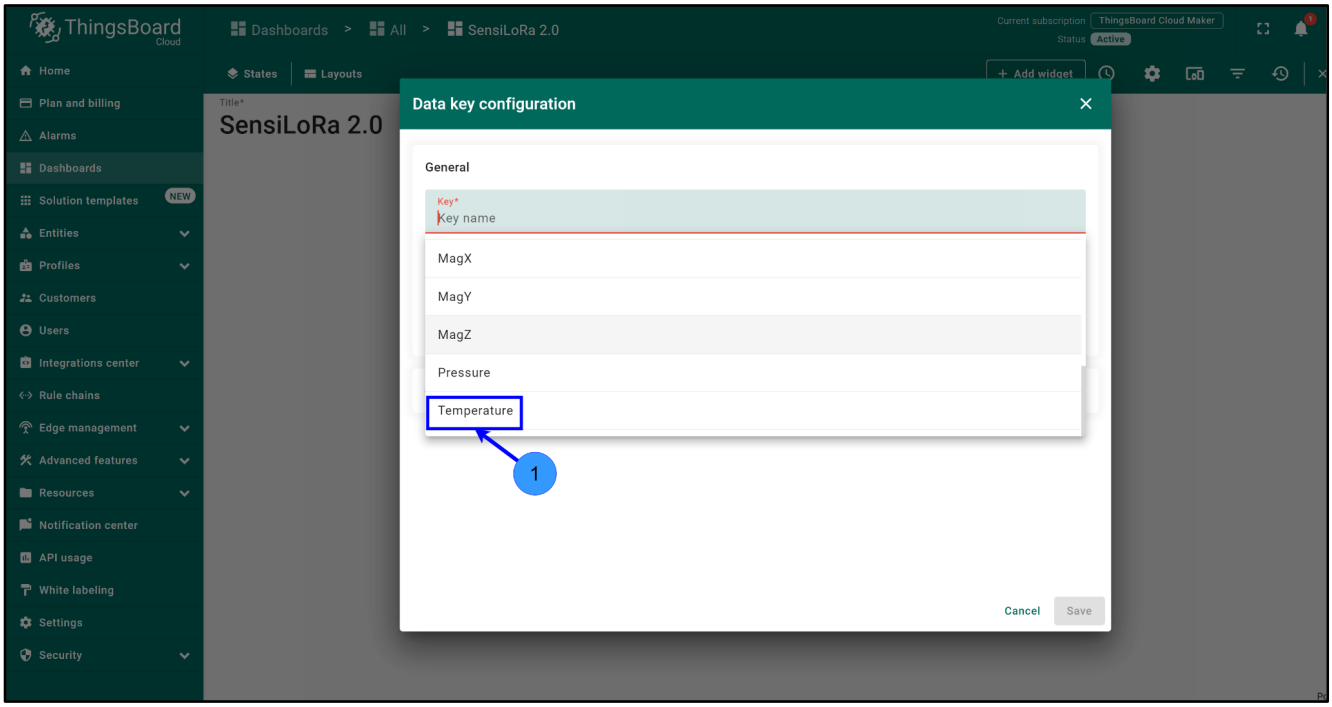
6. Delete the **temperature** key (step 1) (Figure 56).

Figure 56. Delete Data key



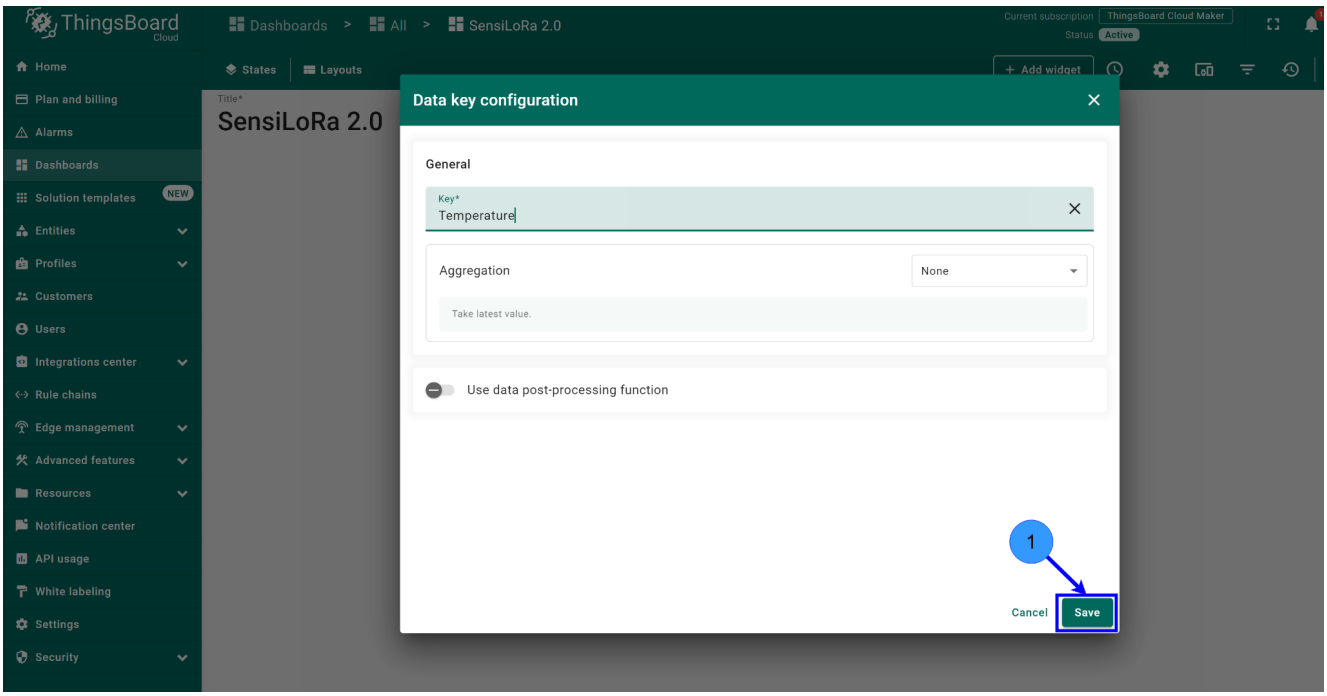
6. Choose the **Temperature** key from the list(step 1) (Figure 57).

Figure 57. Add Temperature key



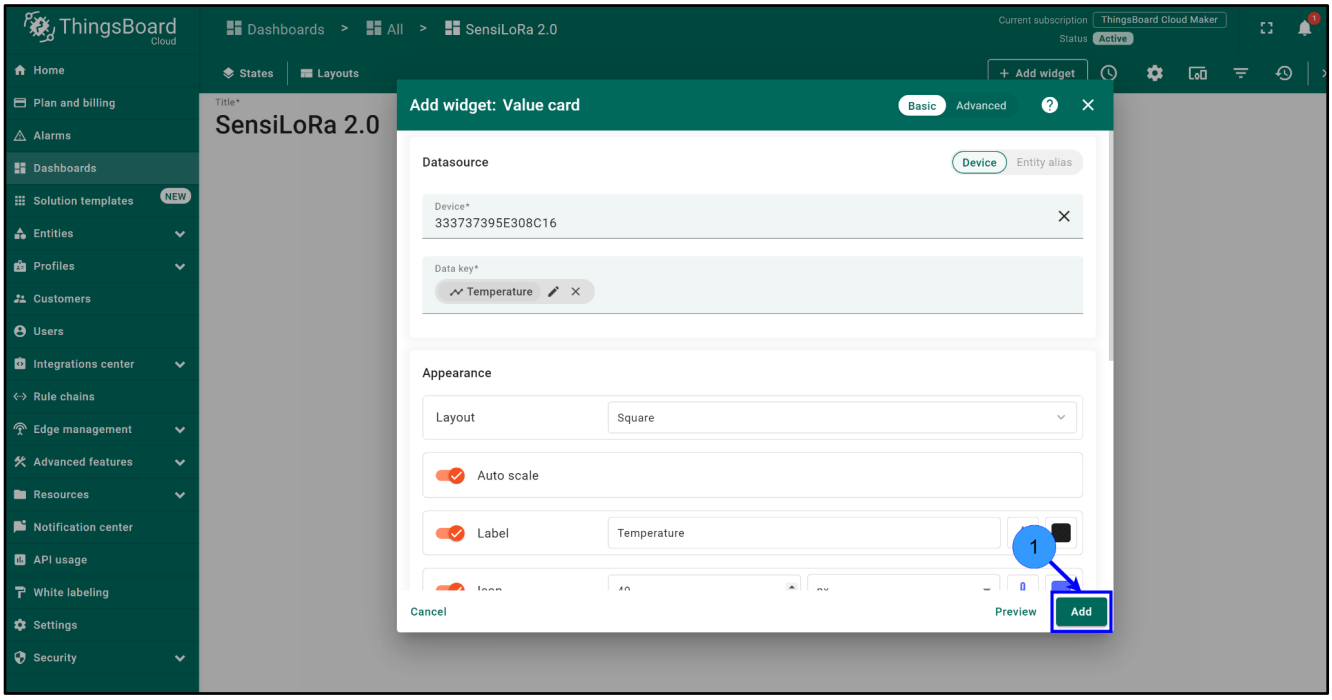
6. Click on **Save** (step 1) (Figure 58).

Figure 58. Save Data key



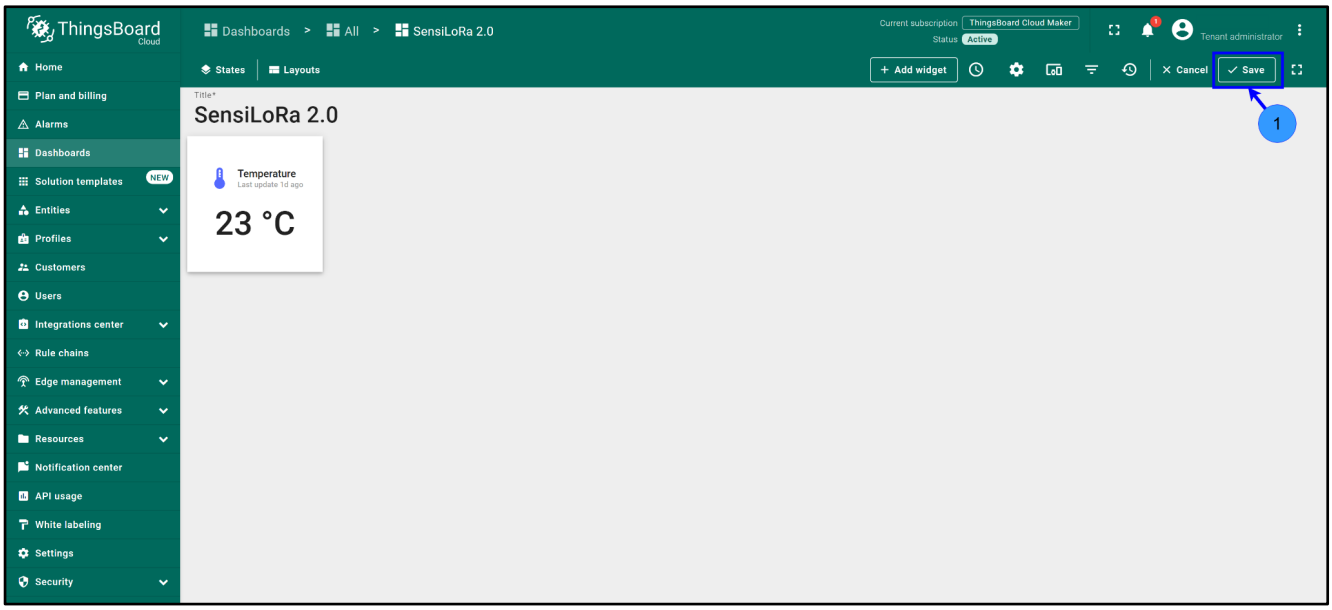
7. Click on the **Add** widget (step 1) (Figure 59).

Figure 59. Save widget



7. The added widget can be seen on the Dashboard. For save changes click on **Save** (step 1) (Figure 60).

Figure 60. Save Dashboard

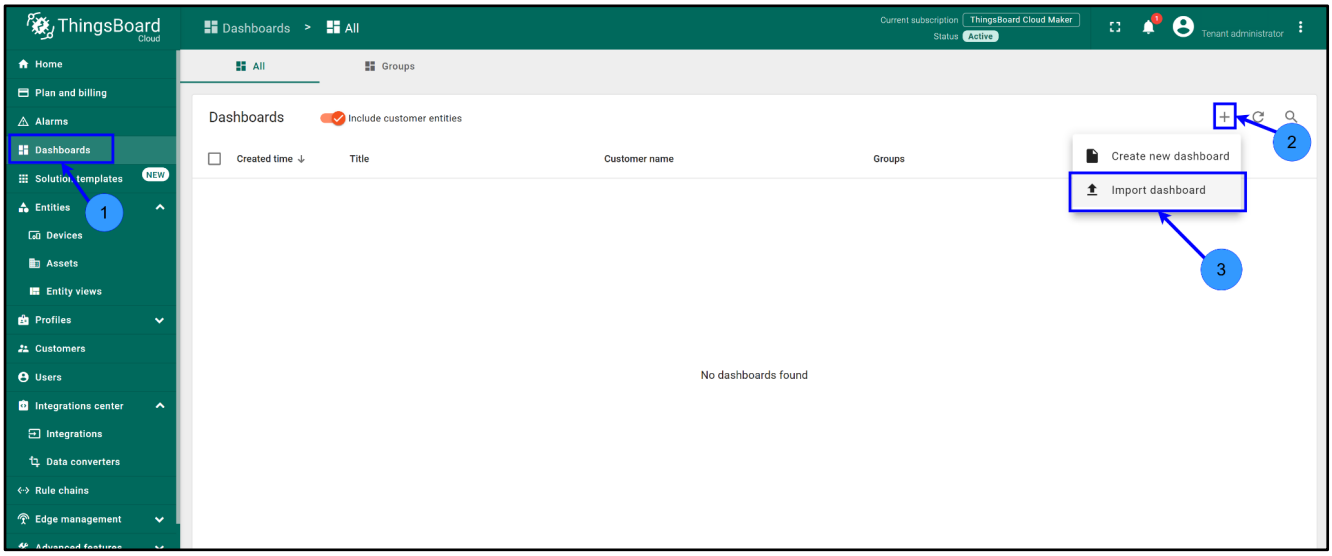


3.6.5 Import Dashboard

1. Download the Dashboard: SensiLoRa2_0_DashboardV0.1.json

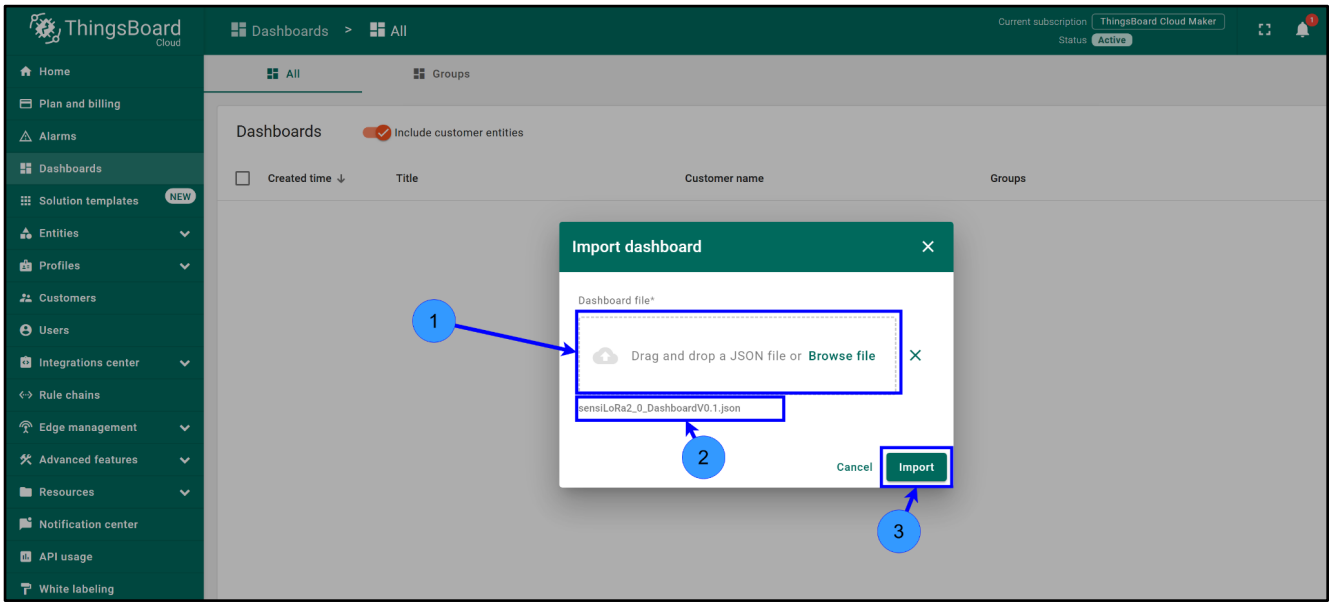
2. Go to **Dashboards**(step 1), click on **+** (step 2), and choose the **Import dashboard** (step 3) (Figure 61).

Figure 61. Choose Import Dashboard



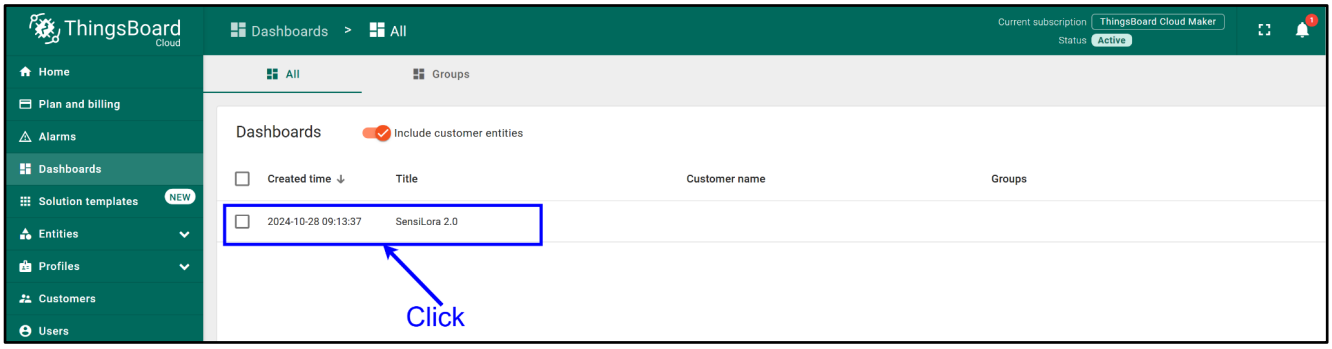
3. Drag and drop the downloaded Dashboard (SensiLoRa2_0_DashboardV0.1.json) (step 1). Import Dashboard should be displayed (step 2), after clicking **Import** (step 3) (Figure 62).

Figure 62. Import Dashboard



4. Go to **SensiLoRa 2.0** Dashboard (Figure 63).

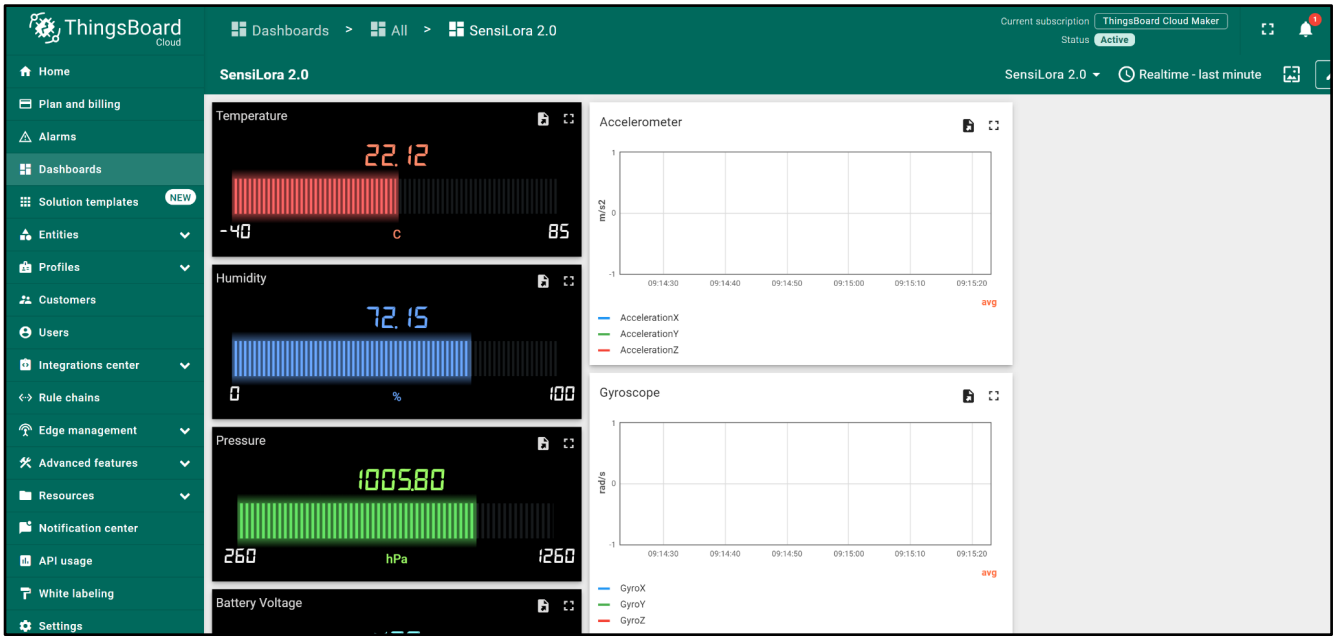
Figure 63. Go to Dashboard



5. In SensiLoRa 2.0 Dashboard the following widgets are located:

- **Temperature**, units: °C
- **Humidity**, units: %
- **Pressure**, units: hPa
- **Battery voltage**, units: V
- **Light**, units: lux
- **Accelerometer**, units: m/s2
- **Gyroscope**, units: rad/sec
- **Magnetometer**, units: µT

Figure 64. SensiLoRa 2.0 Dashboard

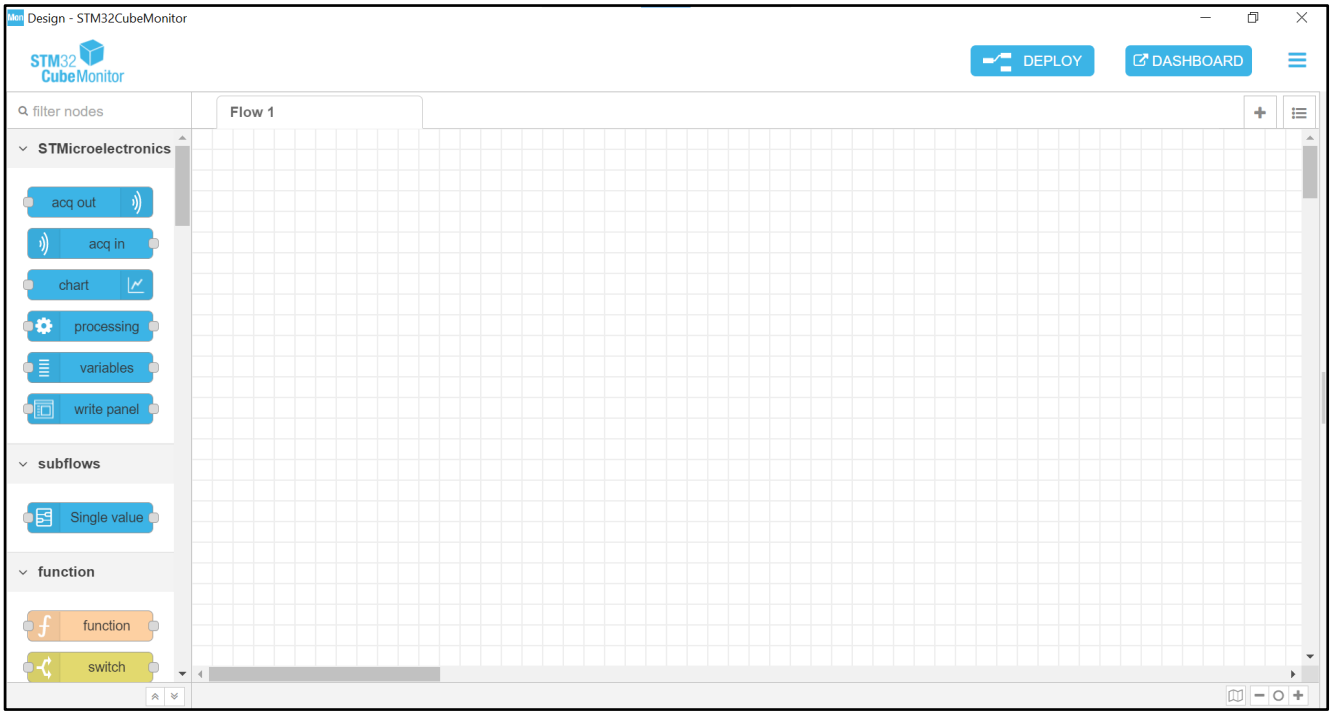


4 STM32CubeMonitor

4.1 Install STM32CubeMonitor

1. Download and install a program from the ST site at this link STM32CubeMonitor and download an example project by this link SensiLoRaCubeMonitorV0.3.json (Figure 65).

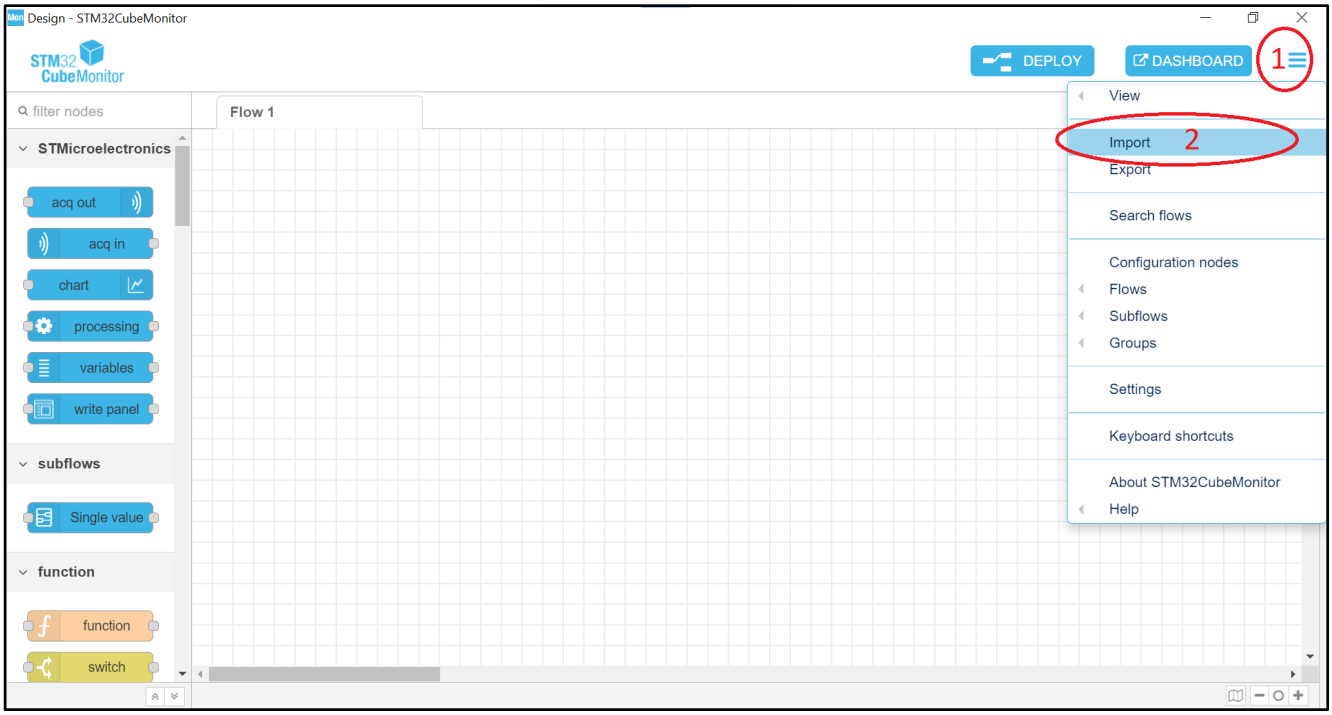
Figure 65. Main window STM32CubeMonitor



4.2 Import project

1. Opening the program and clicking on the **selection tab** (step 1), a selection menu will open, and then select **Import** (step 2) (Figure 66).

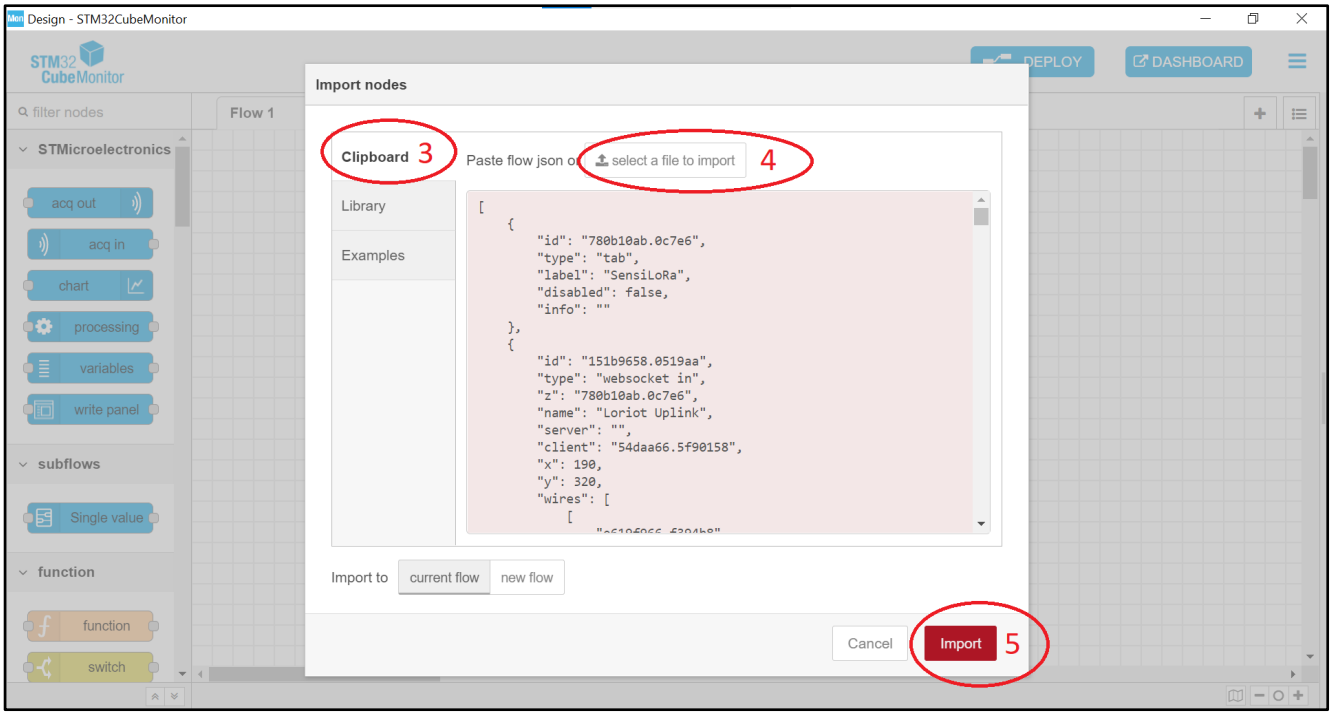
Figure 66. Selection Import menu



2. A window will open with the choice of a file to import. In the import window, select **Clipboard** (step 3), then click on **Select a file to import**

(step 4) and select the file SensiLoRaCubeMonitorV0.3.json which we downloaded. After selecting the file click on **Import** (step 5) (Figure 67).

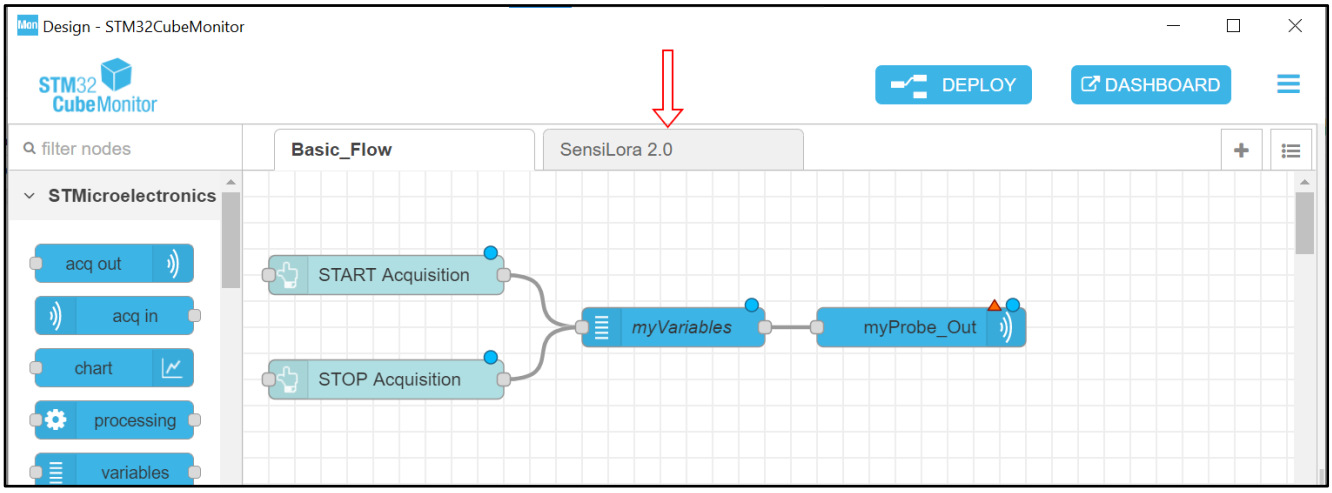
Figure 67. Import project



4.3 Configuration Loriot Uplink

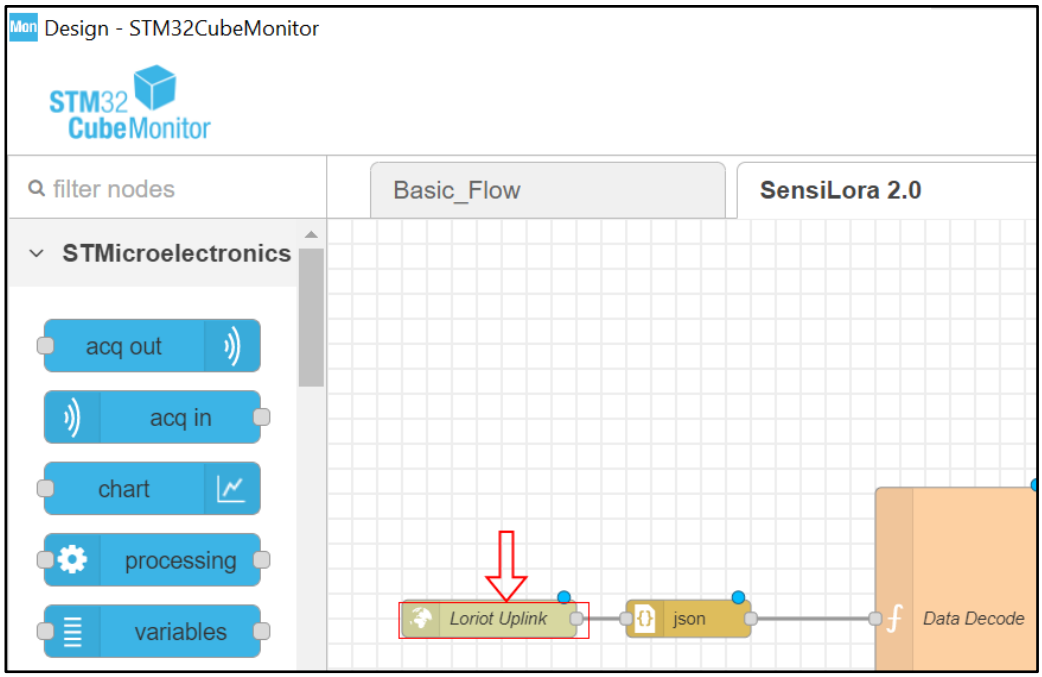
1. Go to the tab SensiLoRa 2.0 (Figure 68).

Figure 68. Go to the SensiLoRa project



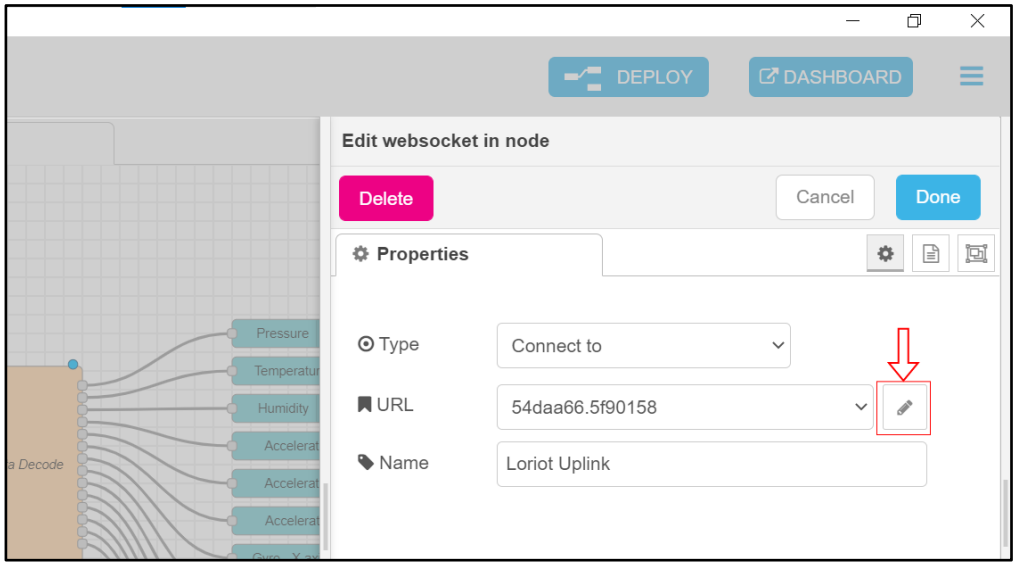
2. Configure the WebSocket **Loriot Uplink**, and double-click on it to open settings (Figure 69).

Figure 69. Open Loriot Uplink



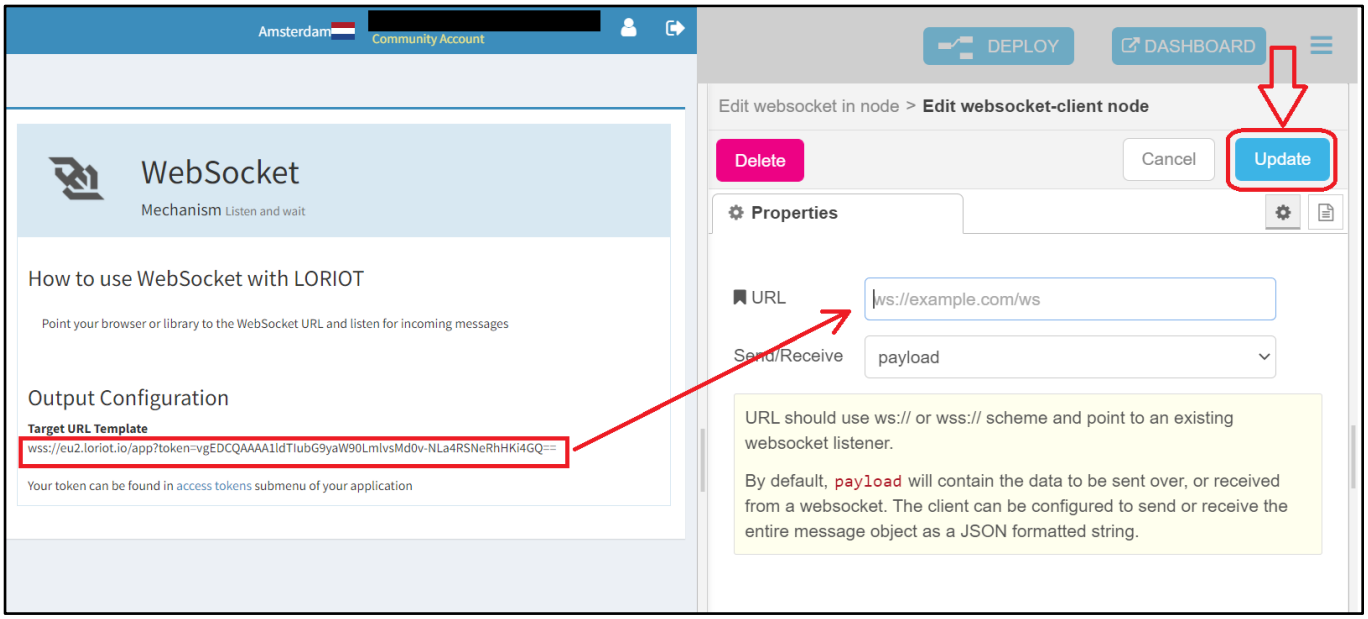
3. When opening the settings window, here we click on the **URL editing icon** (Figure 70).

Figure 70. Setting the Loriot Uplink



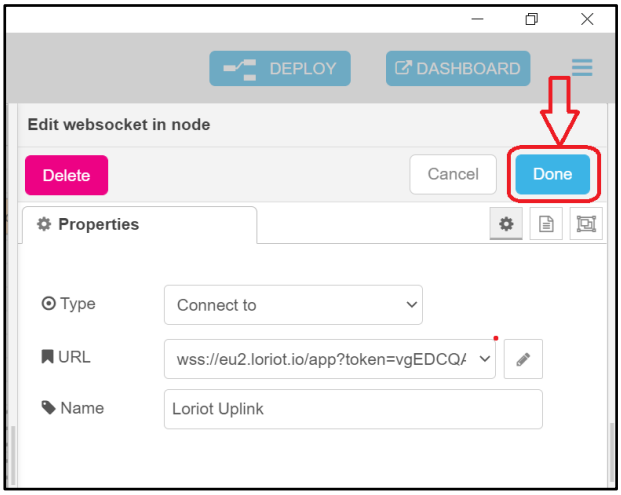
4. In this window, we must insert the URL. If the Loriot server is used, then the link must be taken from 2.4 Loriot Uplink. After inserting the URL, click on **Update** (Figure 71).

Figure 71. URL



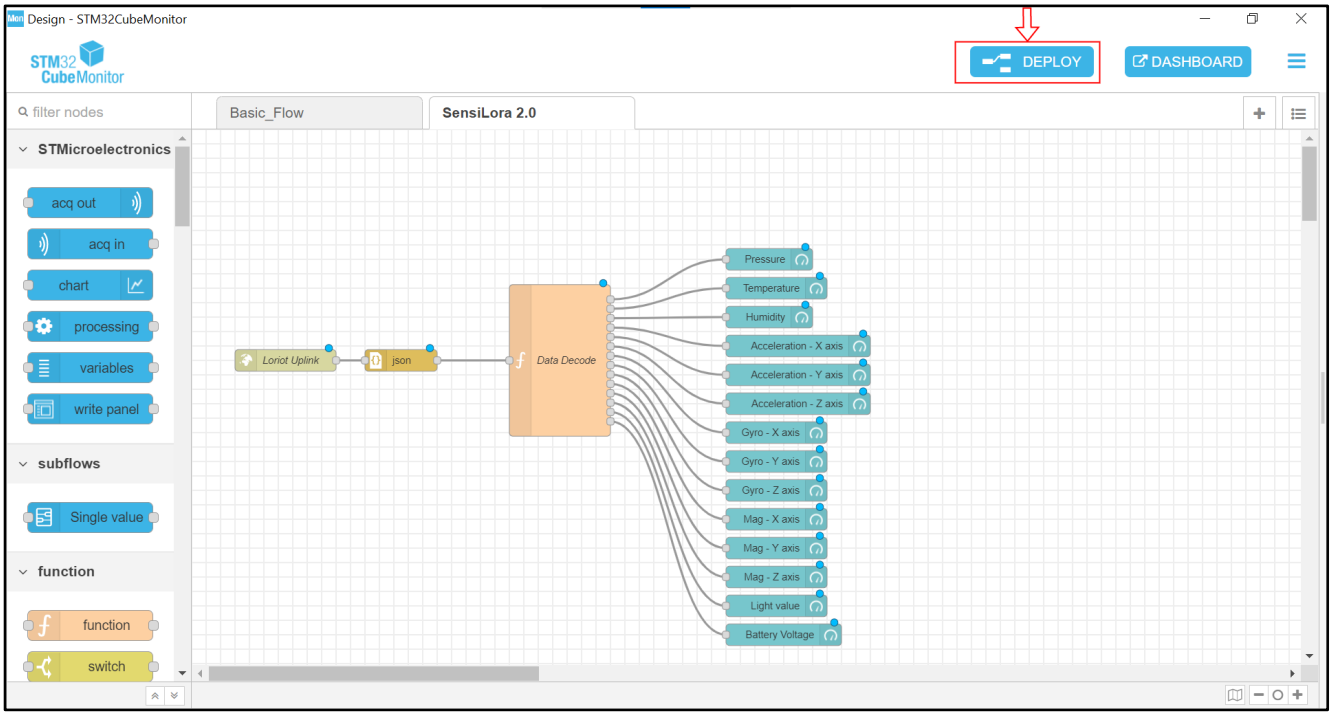
5. Click on **Done** to save the URL (Figure 72).

Figure 72. Save the URL



6. Click on **Deploy** so that our changes are saved and take effect (Figure 73).

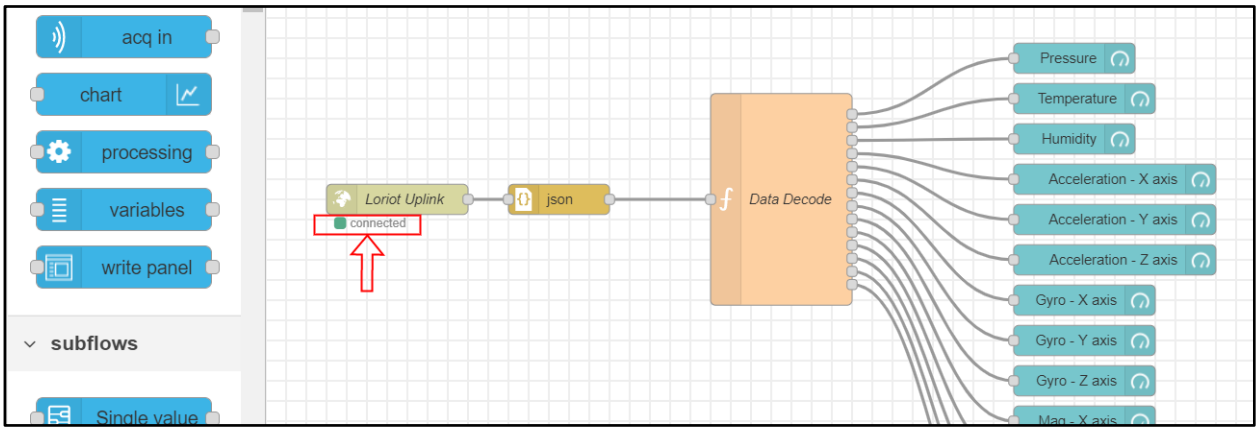
Figure 73. Deploy



4.4 Dashboard

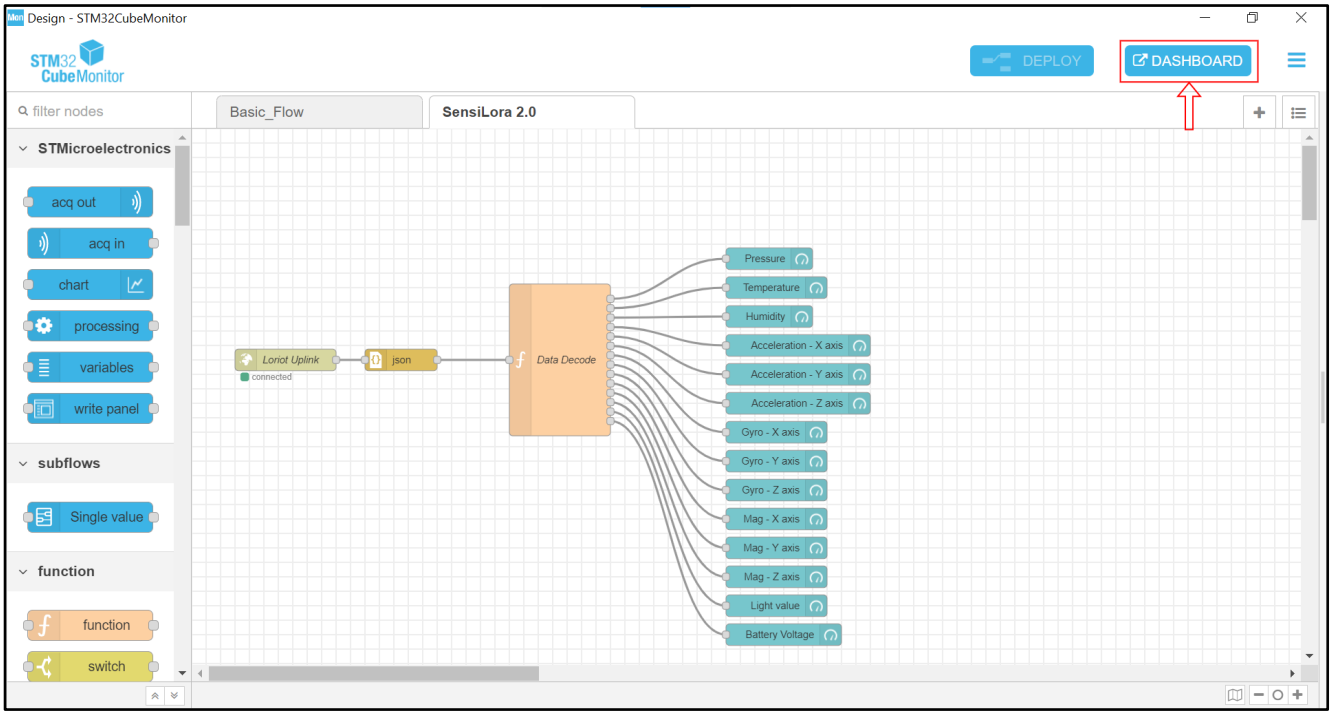
1. When we have changed the Server URL to the necessary their status should be **connected** (Figure 74).

Figure 74. Status Loriot



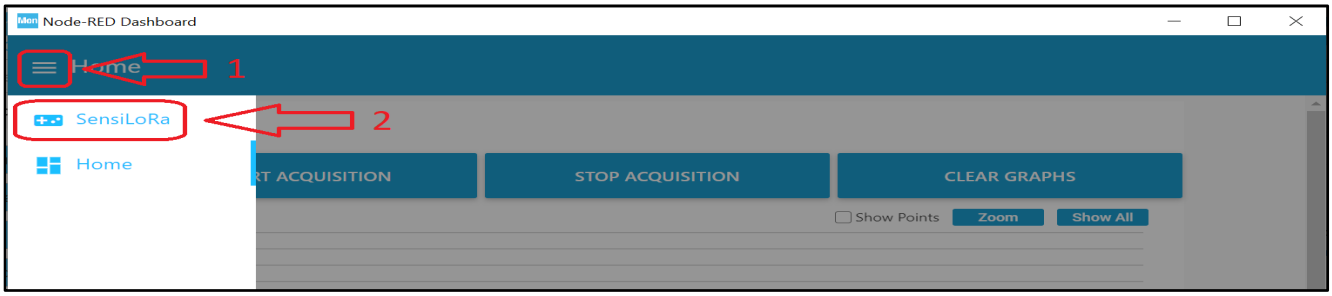
2. Click the **DASHBOARD** (Figure 75).

Figure 75. Go to the Dashboard



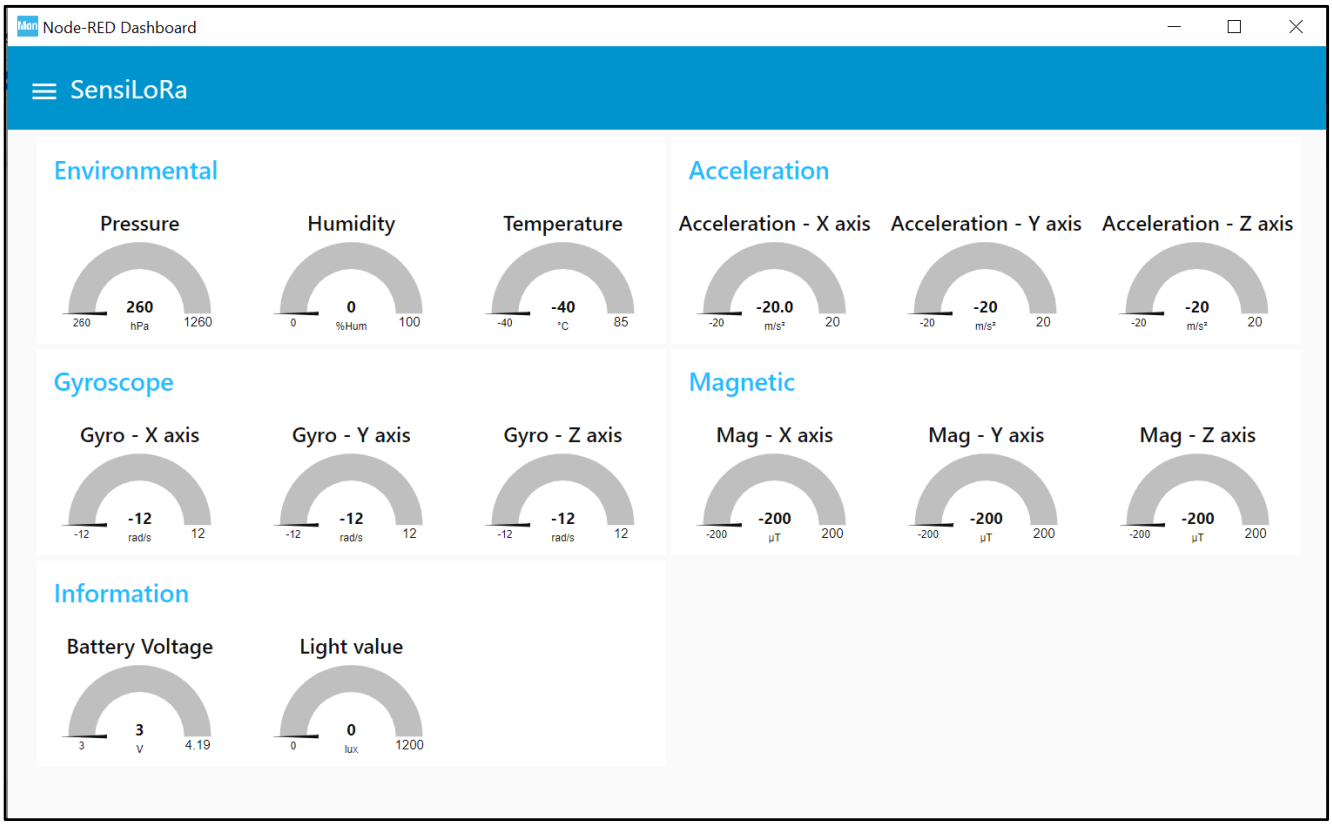
3. If several projects are open, then we need to go to the tab of our project, for this, we click on the selection project (step 1) and then click on **SensiloRa** (step 2) (Figure 76).

Figure 76. Selection of a project



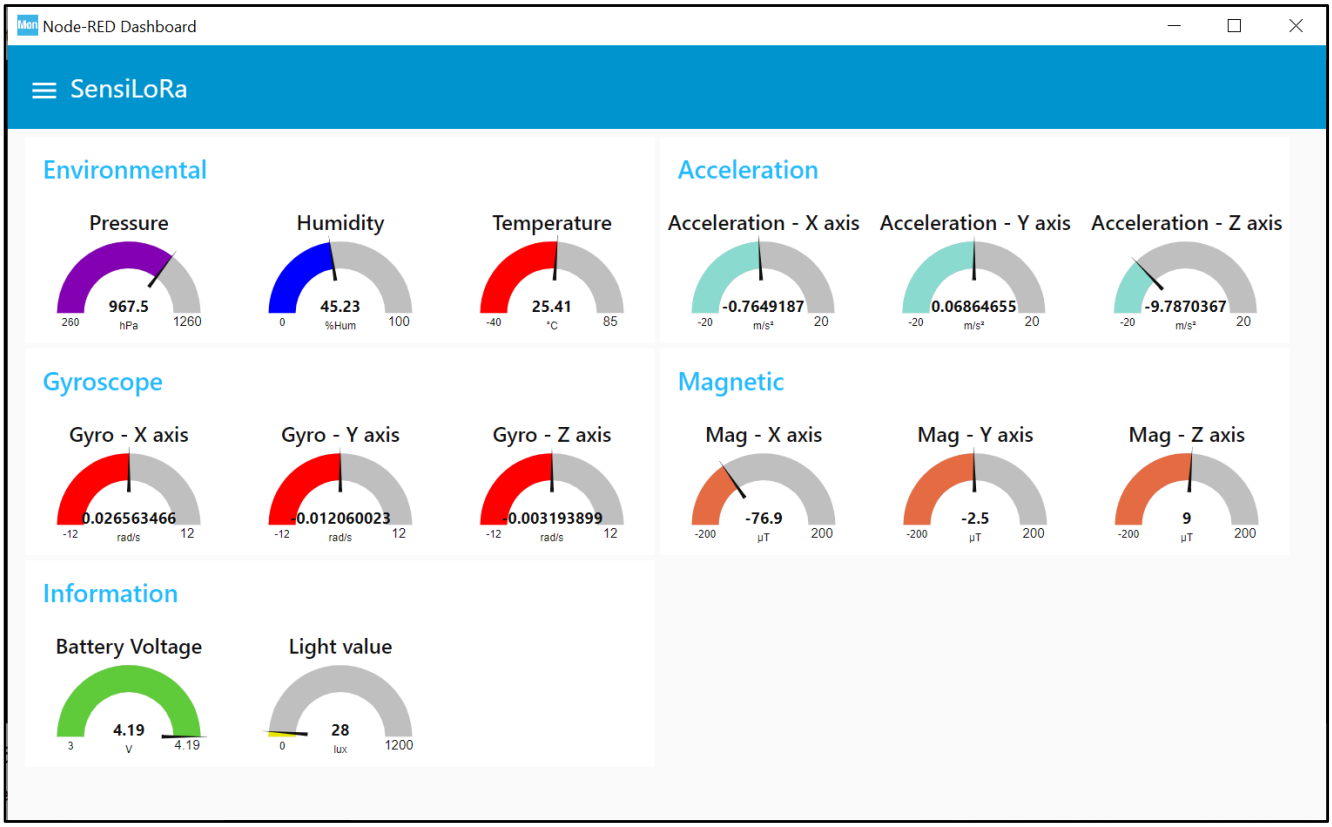
4. After selecting the project, we should see a window (Figure 77).

Figure 77. Dashboard SensiLora



5. When the data is sent by SensiLoRa 2.0 to the server Loriot, we will see the value of the sensors (Figure 78).

Figure 78. Data with sensors

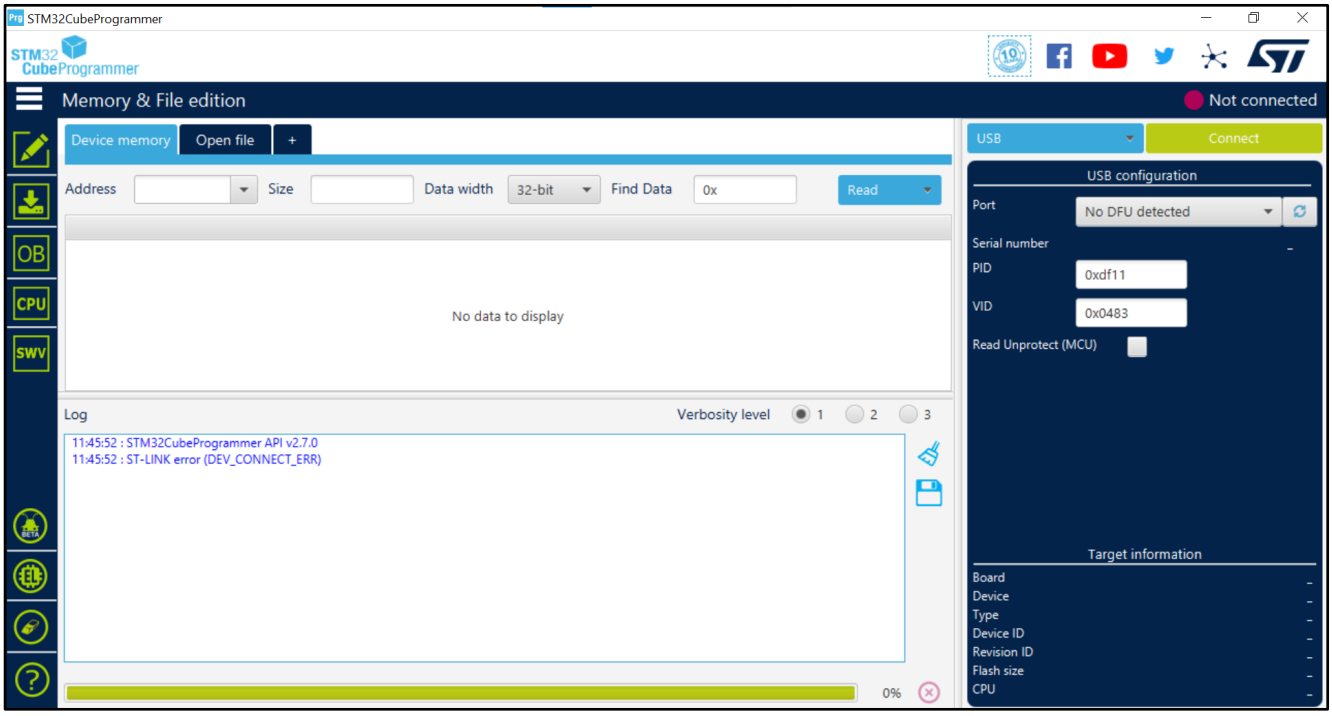

Node-RED Dashboard
SensiLoRa
Environmental
Pressure
967.5
260
hPa
1260
Humidity
45.23
0
%Hum
100
Temperature
25.41
-40
°C
85
Acceleration
Acceleration - X axis
-0.7649187
-20
m/s²
20
Acceleration - Y axis
0.06864655
-20
m/s²
20
Acceleration - Z axis
-9.7870367
-20
m/s²
20
Gyroscope
Gyro - X axis
0.026563466
-12
rad/s
12
Gyro - Y axis
-0.012060023
-12
rad/s
12
Gyro - Z axis
-0.003193899
-12
rad/s
12
Magnetic
Mag - X axis
-76.9
-200
µT
200
Mag - Y axis
-2.5
-200
µT
200
Mag - Z axis
9
-200
µT
200
Information
Battery Voltage
4.19
3
V
4.19
Light value
28
0
lux
1200

5 Flashing SensiLoRa 2.0

5.1 Install STM32CubeProgrammer

1. Download and install STM32CubeProgrammer from the ST site at this link: STM32CubeMonitor (Figure 79). There are several versions of the firmware, which differ in the operating frequencies of the LoRa, so pay attention to the name of the firmware, the operating frequency is indicated there. Download the firmware: (Firmware SensiLoRa 2.0).

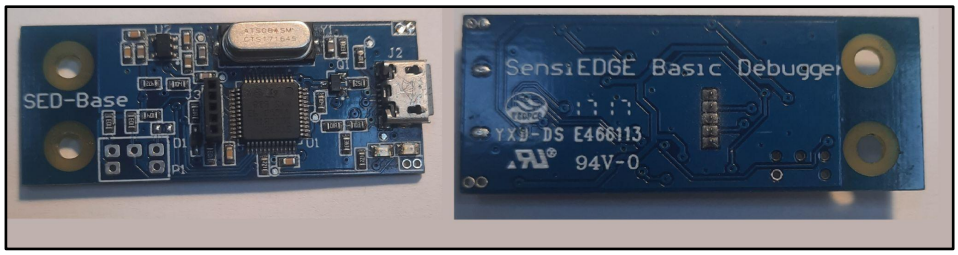
Figure 79. STM32CubeProgrammer



5.2 Flashing with SensiEdge Basic Debugger

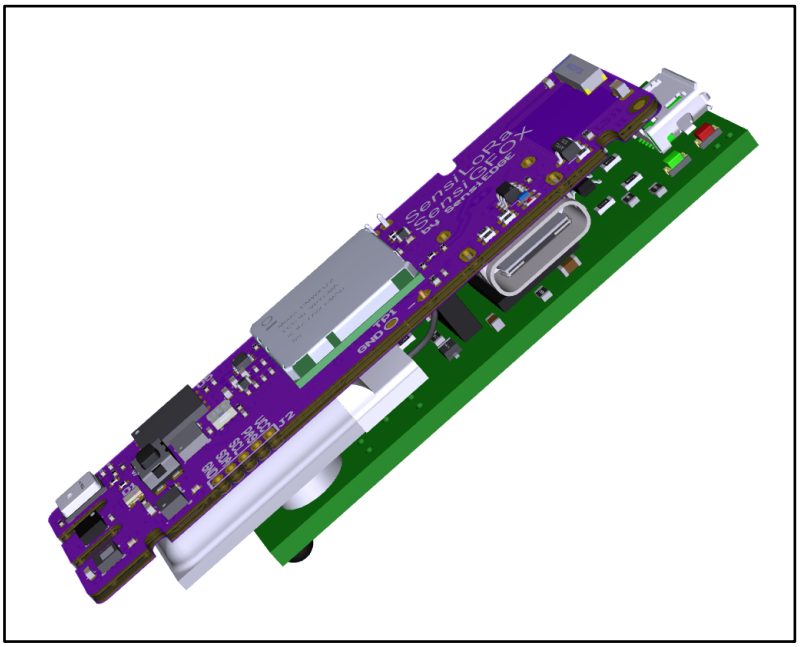
1. For the programming SensiLoRa 2.0 use the programmer SensiEdge Basic Debugger (Figure 80), if you don't have one, then go to 4.3 Flashing via USB Type-c.

Figure 80. SensiEdge Basic Debugger



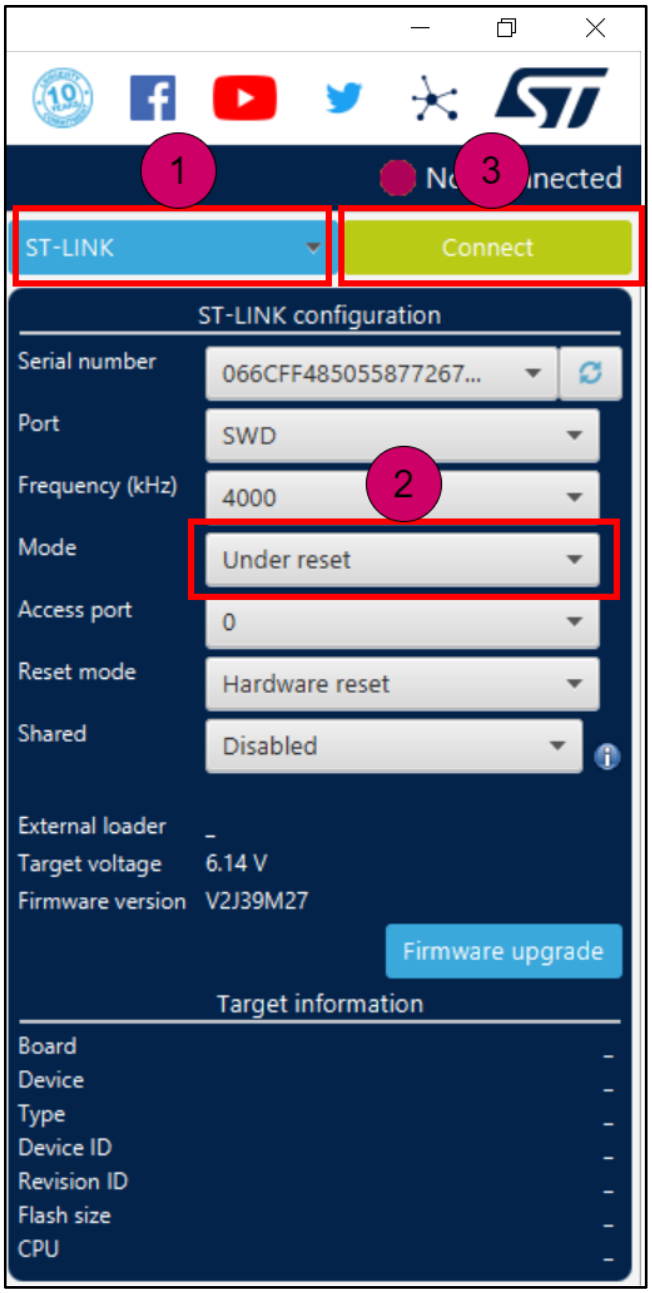
2. Connect the SensiLoRa 2.0 to the programmer's SensiEdge Basic Debugger (Figure 81) and then connect the USB to the programmer.

Figure 81. Connect to programmer



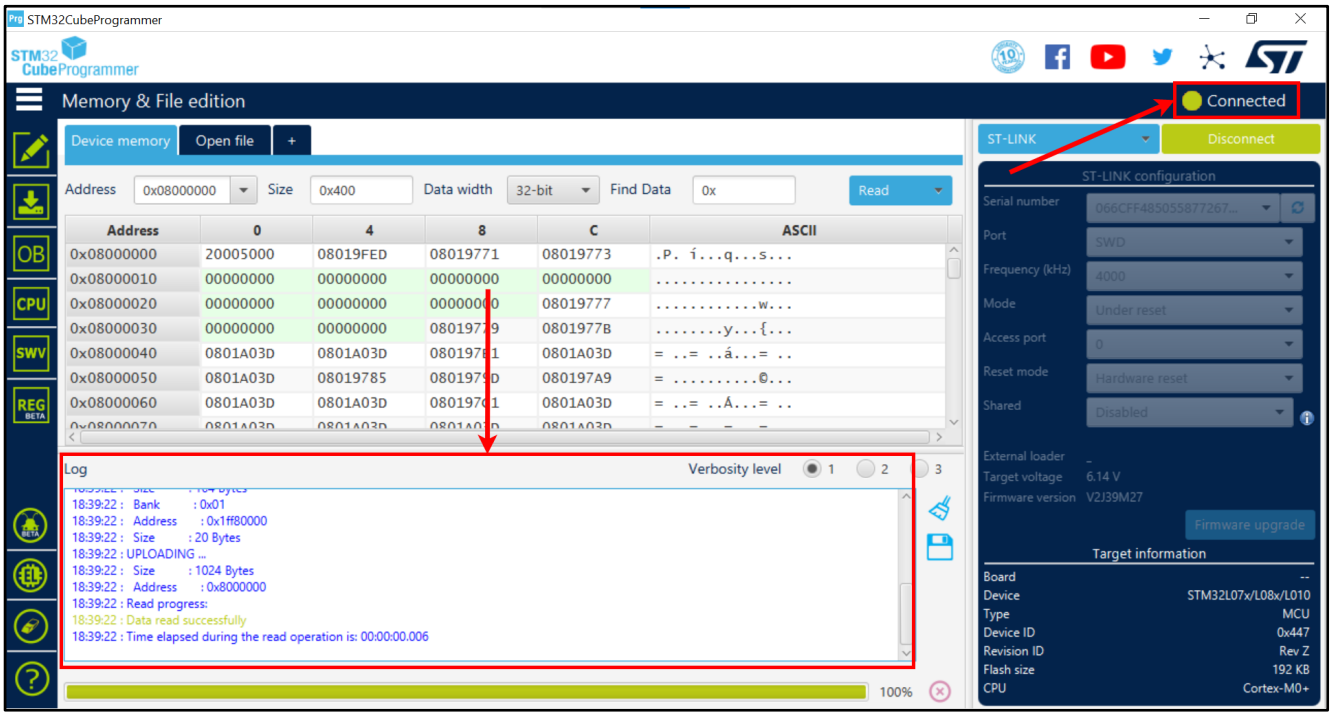
3. Open the program STM32CubeProgrammer and select the **ST_LINK** (step 1), in **Mode** select **Under reset** (step 2) and then click on **Connect** (step 3) (Figure 82).

Figure 82. Connect to SensiLoRa 2.0



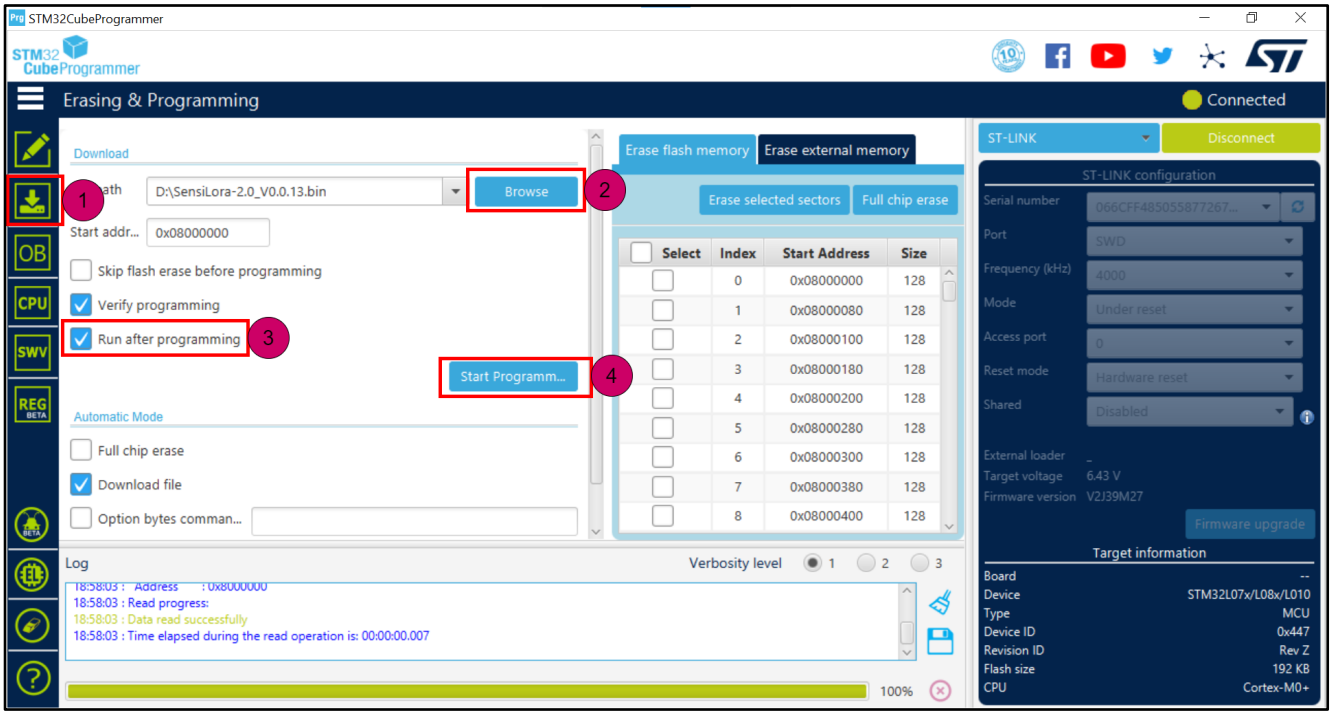
4. If the connection was successful, then we should see information about the controller and the status must be **Connected** (Figure 83).

Figure 83. Connect successfully



5. After successfully connecting to the controller, select the tab **Erasing & Programming** (step 1) then click on the button **Browse** (step 2) a window will open where we have to specify the firmware file. Where to get the firmware file is described in 4.1 Install STM32CubeProgrammer. Check the box for **Run after programming** (step 3) and click **Start Programm…**. (step 4) (Figure 84).

Figure 84. Programming SensiLoRa 2.0



6. After successfully loading the firmware, we should see the message Download verified successfully (Figure 85).

Figure 85. Successful programming

5.3 Flashing via USB Type-c

1. For flashing we will use such a program STM32CubeProgramming. First, we must disconnect the battery by disconnecting the jumper **J4** (Figure 82), then we must hold down button **S2** (Figure 86) and connect the cable **USB Type-c** (Figure 87) and after a couple of seconds we release the button, and the board enters the programming mode.

Figure 86. Jumper J4 and Button S2

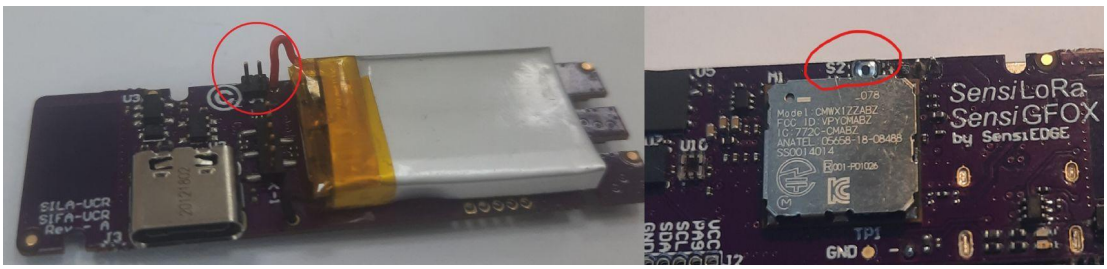
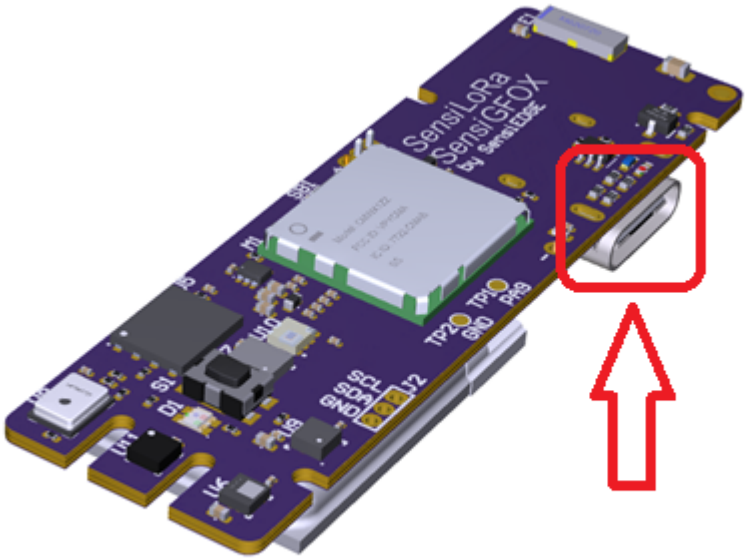
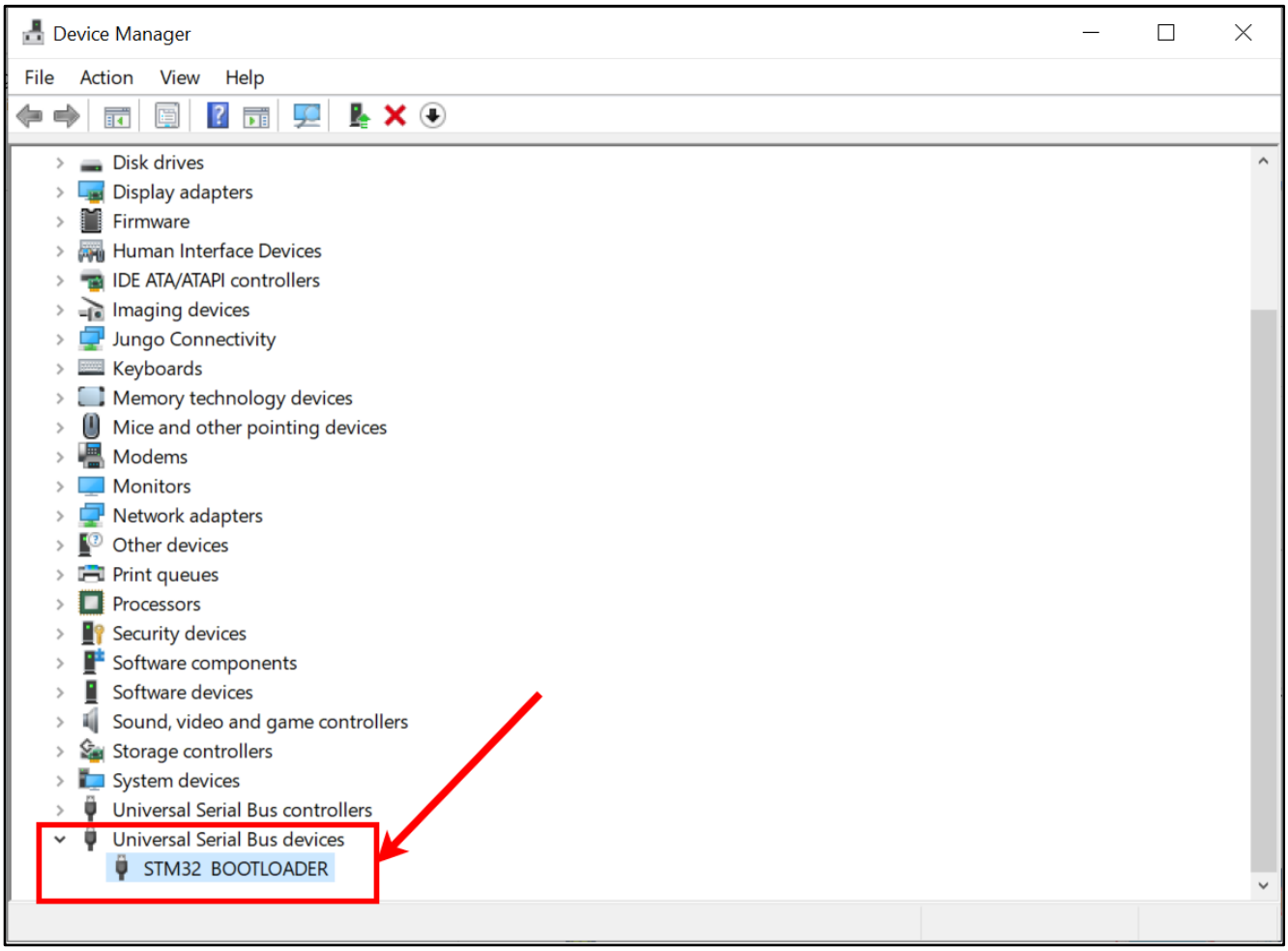


Figure 87. Connect USB



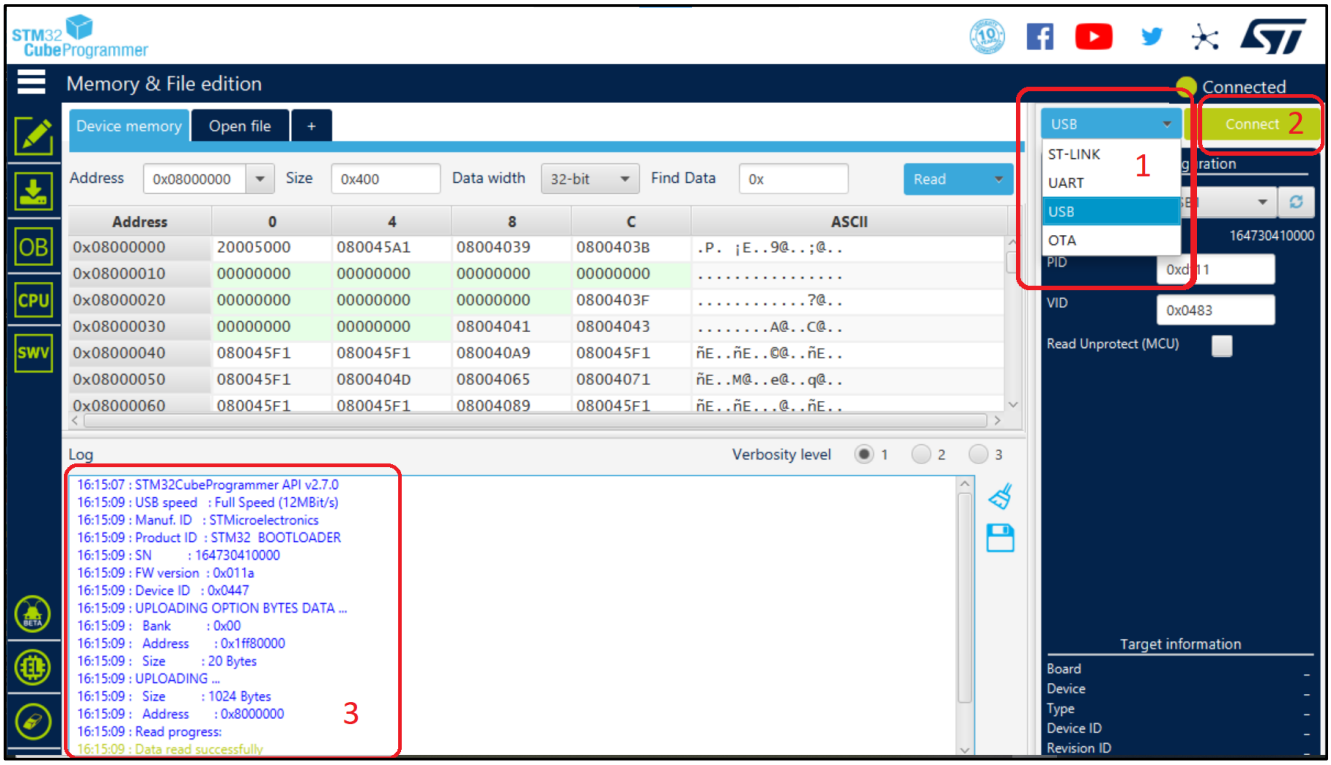
2. In Device Manager should appear STM32 BOOTLOADER (Figure 88). If this does not happen, repeat step 1.

Figure 88. STM32 BOOTLOADER



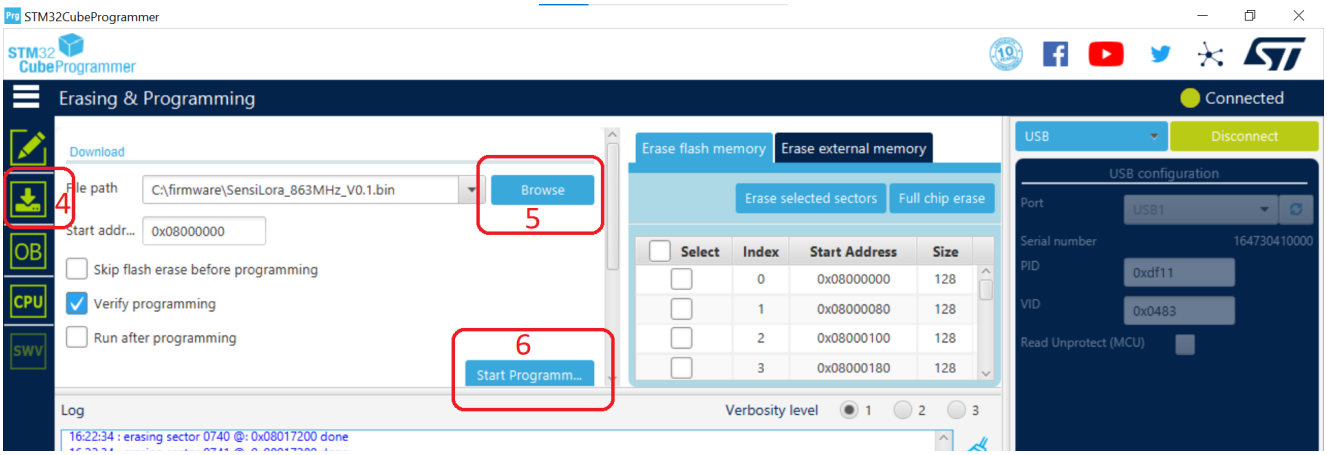
3. Open the program STM32CubeProgrammer select the **USB** (step 1) and then click on **Connect** (step 2) if the connection is successful, then we should see information about the controller (step 3) (Figure 89).

Figure 89. Connect via USB



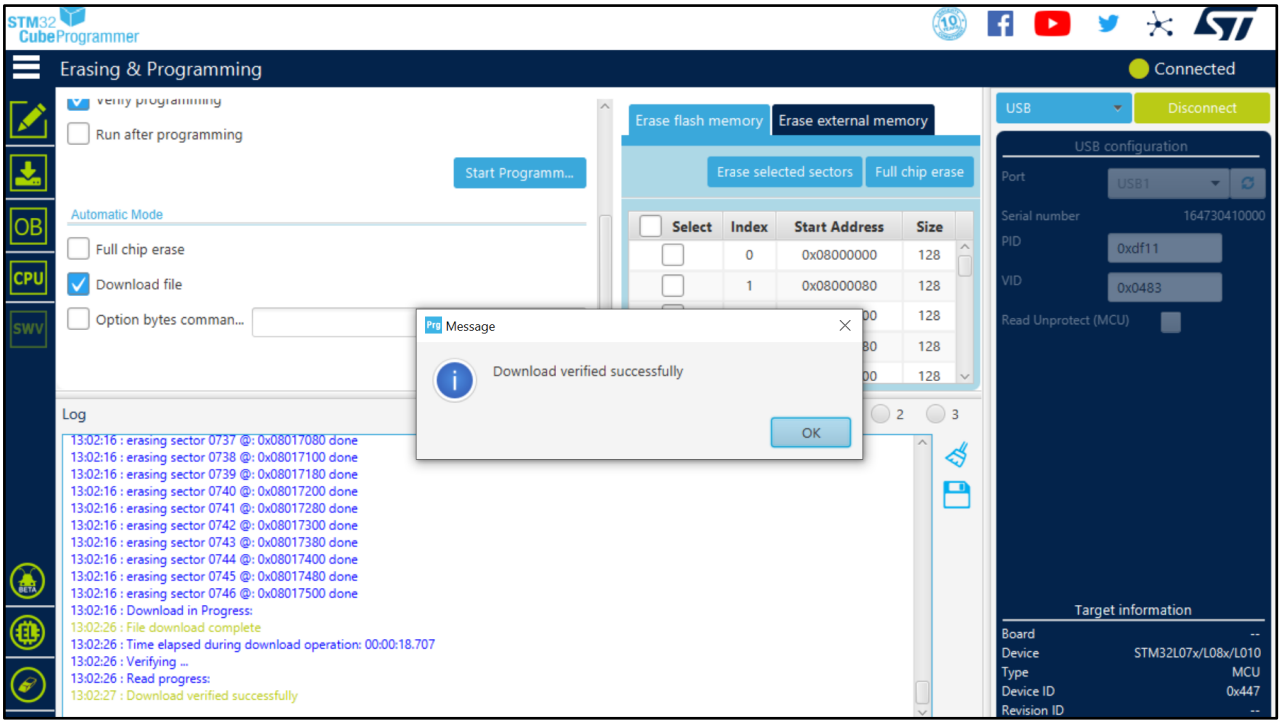
4. After successfully connecting to the controller, select the tab **Erasing & Programming** (step 4) then click on the button **Browse** (step 5) a window will open where we have to specify the firmware file. Where to get the firmware file is described in 4.1 Install STM32CubeProgrammer. After selecting the firmware file, press **Start Programm…**. (Figure 90).

Figure 90. Programming via USB



5. After successfully loading the firmware, we should see the message Download verified successfully (Figure 91). After that, you can disconnect the device from the computer and return the jumper **J4**.

Figure 91. Successful programming

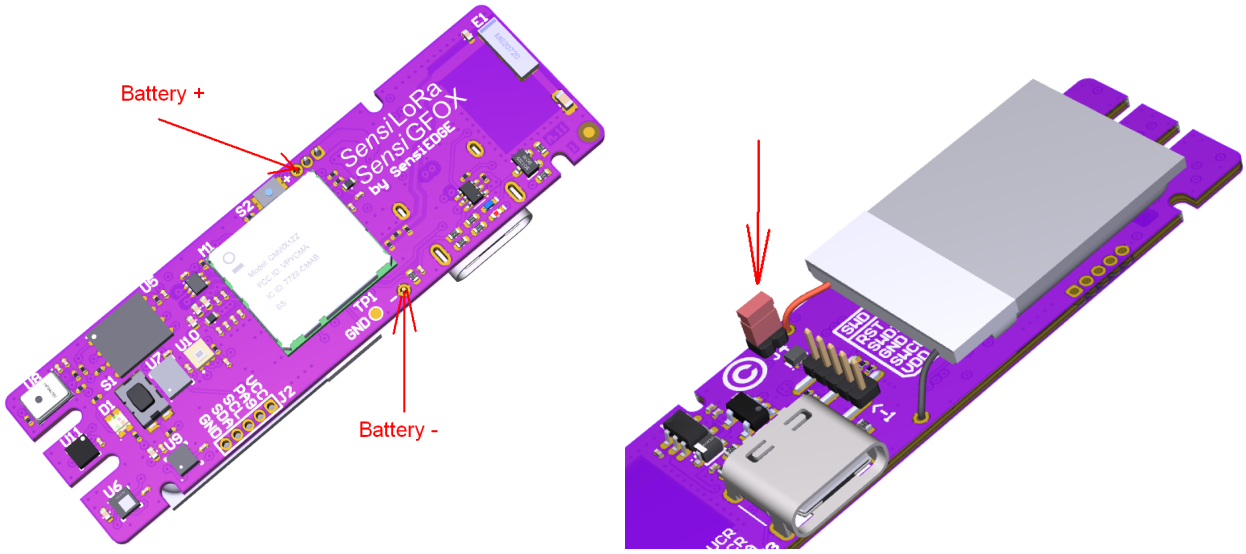


6 Battery power

6.1 Overview

1. SensiLoRa 2.0 integrating **SILA-UCR** (LoRa) and **SIFA-UCR** (Sigfox). Same hardware but different Software Firmware. Every board comes with a Rechargeable battery of 100mA**.** The battery is soldered but disconnected until the user closes the jumper. Install a jumper in J4 to operate the device on battery power (Figure 92).

Figure 92. Battery power



Warning: During USB charging additional heating is influenced by Temperature and Pressure sensor. Be advised to use the measurement of those sensors only from battery operation.

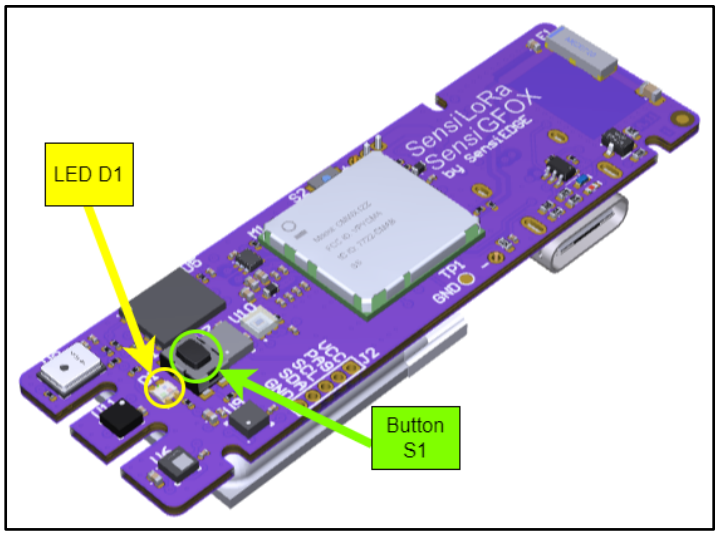
7 Turn on/off SensiLoRa 2.0

7.1 Turn on board

1. The SensiLoRa 2.0 board automatically turns on when power is applied.

2. To start the board after turning it off, you need to press the button **S1** (Figure 93) once, and after that, the **LED D1** (Figure 93)should light up in red for a short period.

Figure 93. Button and LED placement



7.2 Turn off board

1. to turn off the board, you need to hold down the button **S1** (at least 2 seconds) (Figure 93) until the **LED D1** turns green (Figure 93).

2. The green **LED D1** (Figure 93) should turn off after 2 seconds, after that the SesiLoRa 2.0 board goes into a deep sleep and stops sending data to the LoRa server.

3. In sleep mode, the SensiLoRa 2.0 device consumes minimal power from the battery. A fully charged battery will last for 30 days. To completely de-energize the SensiLoRa 2.0 board, you need to disconnect the battery by removing the jumper from the jumper **J4**.

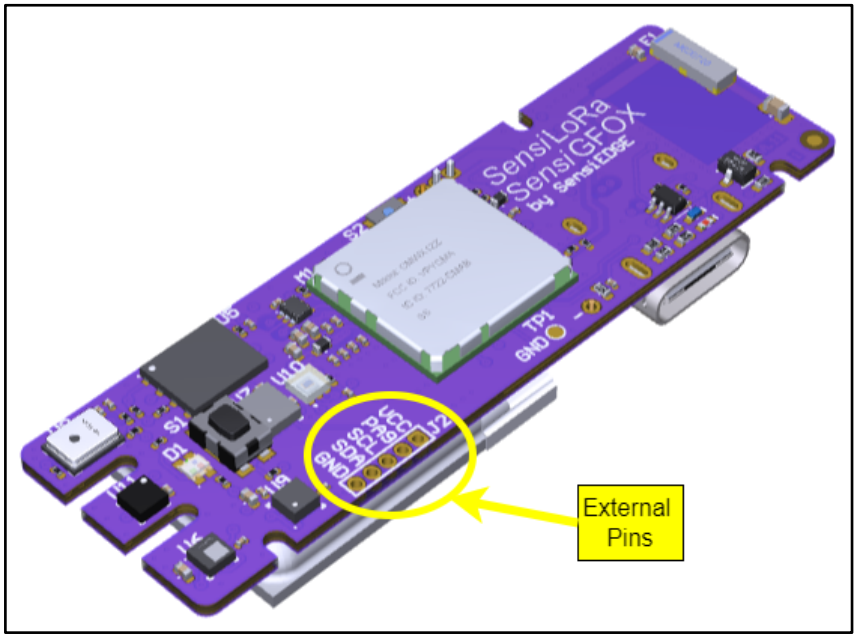
8 External pins

8.1 Overview

1. The SensiLoRa 2.0 board has a connector **J2** for external connection (Figure 94), it has such pins:

- **VCC** - 3.0 volt supply
- **PA9** - UART TX, for debug information
- **SCL** - the clock signal for I2C
- **SDA** - the data signal for I2C
- **GND** - ground

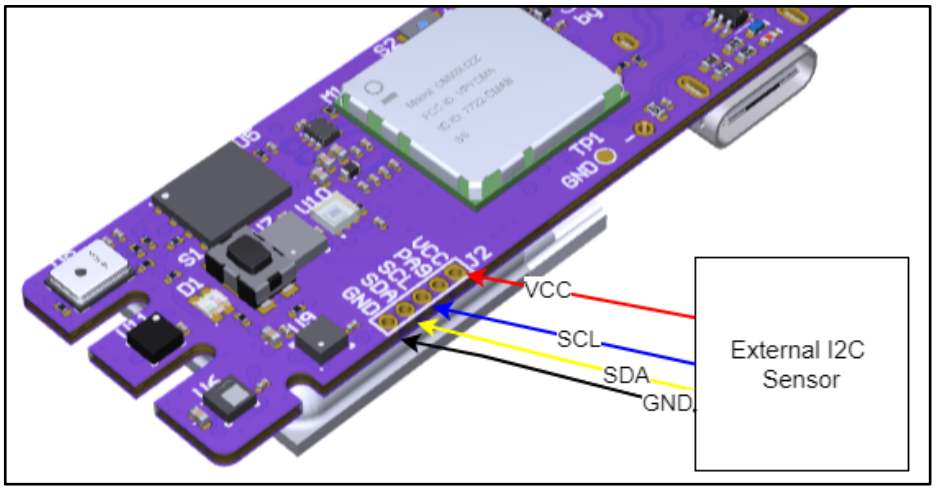
Figure 94. External Pins



8.2 External I2C

1. To connect an external sensor with an interface I2C for the SensiLoRa 2.0, you need to connect the sensor, as done in (Figure 95).

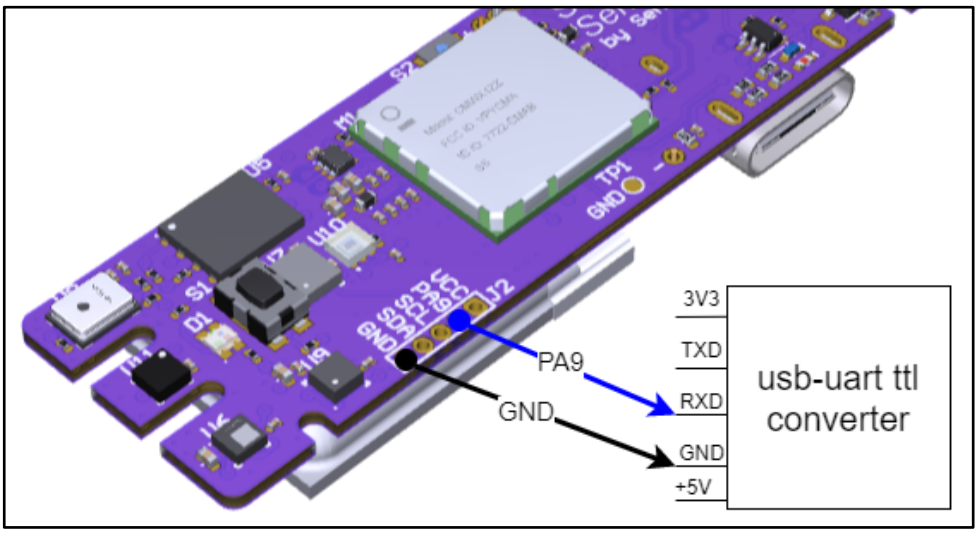
Figure 95. Connect Sensor



8.3 Debug information PA9 pin

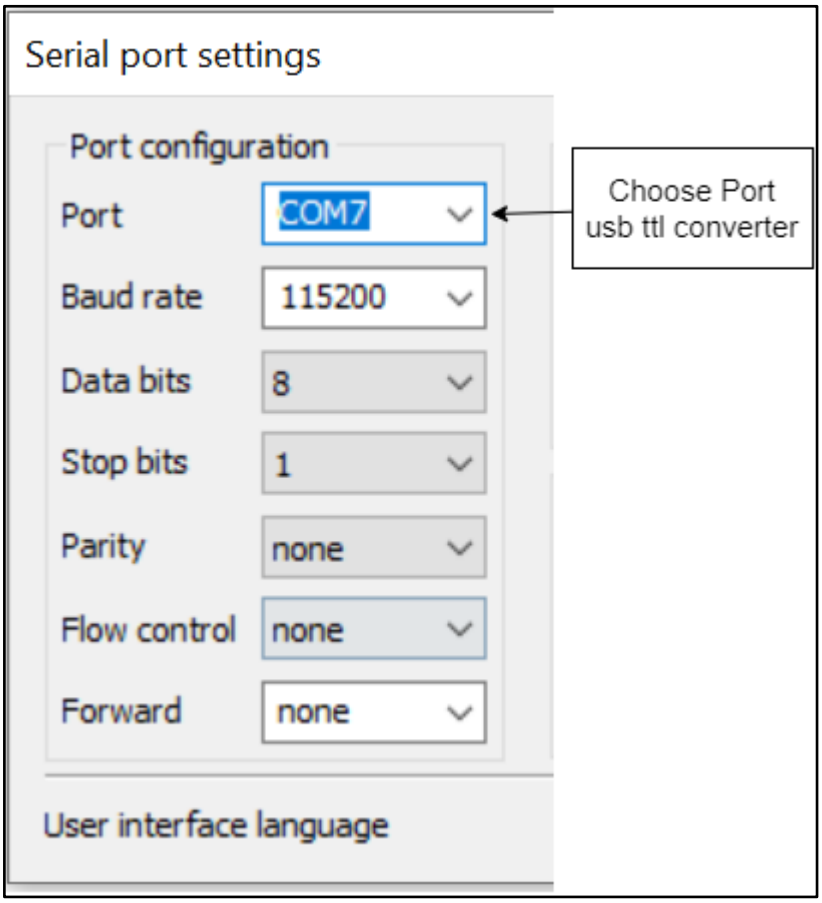
1. To see the debug information you need to use a **usb-uart ttl converter** and connect it to the SensiLoRa 2.0 (Figure 96).

Figure 96. Button and LED placement



2. Any Terminal can be used to display Debug information. In the **Port settings** in the Terminal, select the **USB TTL converter port** and other settings as in (Figure 97), then open the port.

Figure 97. Port Settings



3. When the board starts, the output of the information shown in (Figure 98) will begin. Also here you can see the keys: **AppKey, DevEui, and JoinEui(AppEui)**, which are used to connect the device to the LoRa server.

Figure 98. Debug Information