RAK2461 Quick Start Guide

Prerequisite

Before going through each and every step in the installation guide of the WisNode Bridge IO Lite, make sure to prepare the necessary items listed below:

Hardware Tools

1. RAK2461 WisNode Bridge IO Lite
2. USB configuration cable
3. Gateway in range, for Testing
4. A Windows/macOS/Linux Computer

Software Tools

IO.Box Desktop is a software application that will allow you to configure the devices from the RAK24XX series. You can download the application from here:

- Windows
- Linux
- Mac

Package Inclusions

Variant for Wall Mounting

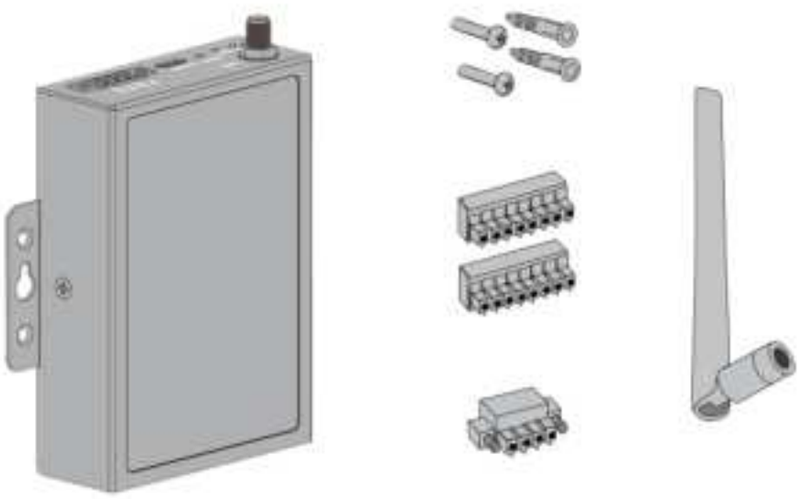

Figure 1: RAK2461 Package Inclusions 1

Variant for DIN Rail Mounting

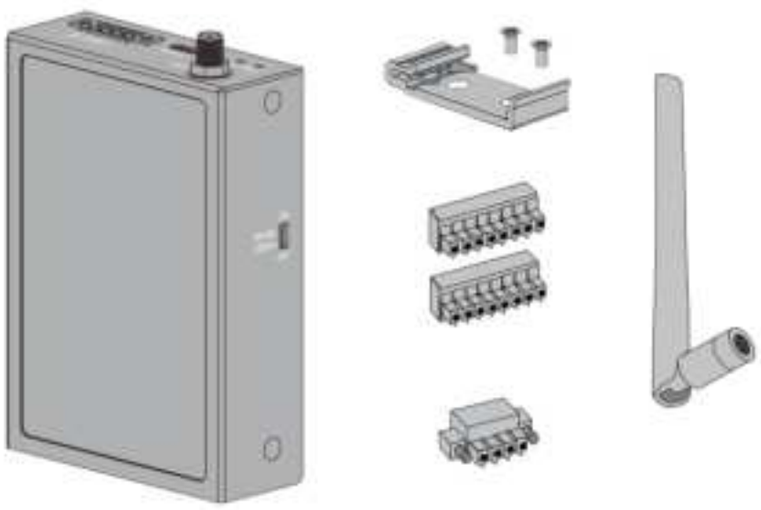

Figure 2: RAK2461 Package Inclusions 2

The package inclusions depend on the bundle you purchase.

- **Variant for Wall Mounting**
  - One (1) RAK2461 WisNode Bridge IO Lite (RS485-DIx4-DOx1 or RS485-DOx4)
  - One (1) Screw Kit
  - One (1) LoRa Antenna
  - One (1) Power Adapter
  - One (1) USB Cable (Type C to Type A)
  - One (1) 4-Pin Terminal Block
  - Two (2) 8-Pin Terminal Block
- **Variant for DIN Rail Mounting**
  - One (1) RAK2461 WisNode Bridge IO Lite (RS485-DIx4-DOx1 or RS485-DOx4)
  - One (1) DIN rail Mounting Kit
  - One (1) LoRa Antenna
  - One (1) Power Adapter
  - One (1) USB Cable (Type C to Type A)
  - One (1) 4-Pin Terminal Block
  - Two (2) 8-Pin Terminal Block

Installation

RAK2461 allows for two installation methods: wall mounting and DIN rail installation.

Wall Mounting

1. Drill the wall corresponding to the device dimensions and insert the anchors in the holes.

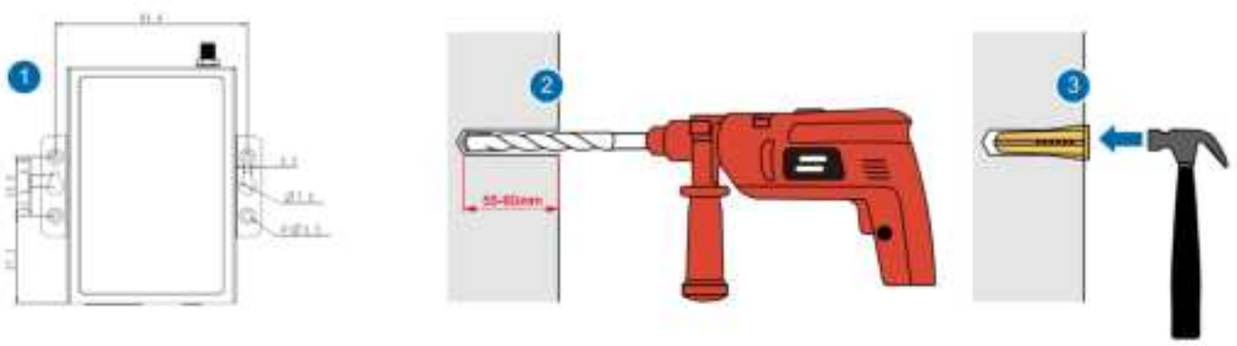

Figure 3: Hole drilling

2. Fix the device to the wall with two tapping screws.

Figure 4: Wall mounting

DIN Rail Mounting

1. Attach the DIN rail mounting clip on the device with two M3*6 countersink screws.

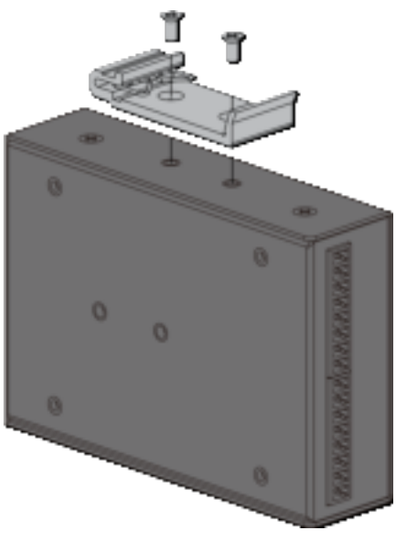

Figure 5: Attaching the clip

2. Mount the device to the DIN rail.

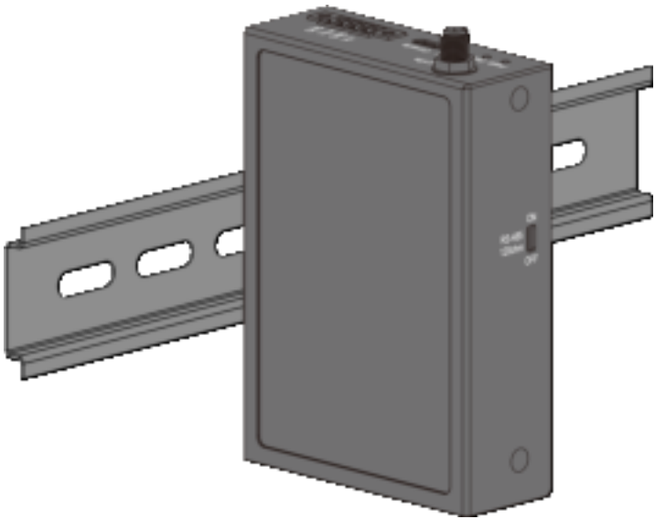

Figure 6: DIN rail mounting

Product Configuration

Typical Network Application

RAK2461 WisNode Bridge IO Lite provides different Digital Inputs, Outputs (Relay), and RS485 communication. It can convert the data of the connected devices into LoRaWAN that can be sent to the cloud via a standard gateway. Cloud servers can also actively send data to RS485 terminals and control the DI/DO transmission to achieve two-way data transmission. Using RAK2461, what used to be a costly and time-consuming cable line network deployment can be transformed into a rapid and cost-efficient wireless network deployment.

An example would be using the RAK7268V2 WisGate Edge Lite 2 LoRaWAN gateway coupled with the RAK WisDM cloud management platform, to realize an end-to-end industrial field data acquisition and control system. Using the built-in LoRa Server, which comes standard with any RAK LoRaWAN gateway, one could seamlessly achieve transmission of the end device data to any application server. Furthermore, the MQTT integration allows for high security and efficiency.

Figure 7: RAK2461 WisNode Bridge IO Lite network structure

Connect the RAK2461 to the Sensor

Power Interface Configuration

The RAK2461 device can be powered either by:

- 9-24 V_{DC} input
- USB type-C

The USB type-C port of the device can be used for configuration. Powering the device from the type-C port will not provide power to the sensor but only to the device itself. To power the device and sensor, you should use the 9-

24 V_{DC} input of the RAK2461.

The RS485 serial interface supports up to 32 RS485 devices. The Vout pin can supply the external power to the RS485 sensors connected to RAK2461.

Figure 8: Power interface connection

Data Interface Connection

For this example, an RS-FSXCS-N01-3 Ultrasonic Weather Station is used. Here are the basic communication parameters of the sensor:

Parameter	Definition
Format	8-bit binary
Data bit	8-bit
Parity	No
Stop bit	1
Error checking	CRC
Baud rate	Supports: 2400, 4800, 9600 (default is 4800)

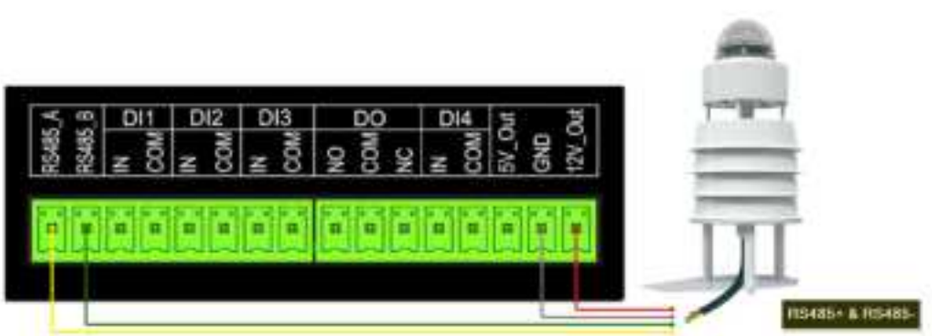

Figure 9: Data interface connection

> 📝 **NOTE**
>
> For connecting to other devices, read their specific documentation carefully and connect accordingly.

> 📝 **NOTE**
>
> For a demonstration, the RAK2461 Bridge Lite shall be connected to an RAKwireless gateway. For the gateway, the built-in LNS will be used. Listed below are the requisites for this section.
>
> - IOBox Desktop
> - WisGateOS 2 User Manual - a guide on how to configure the RAK7268 WisGate Edge Lite 2 V2
> - RS-FSXCS-N01-3 Manual - guide for the Ultrasonic Integrated Weather Station

Gateway Configuration

Set-up the Built-in Network Server

1. Start by accessing the gateway. You can see how to do it on the WisGateOS V2 user manual.

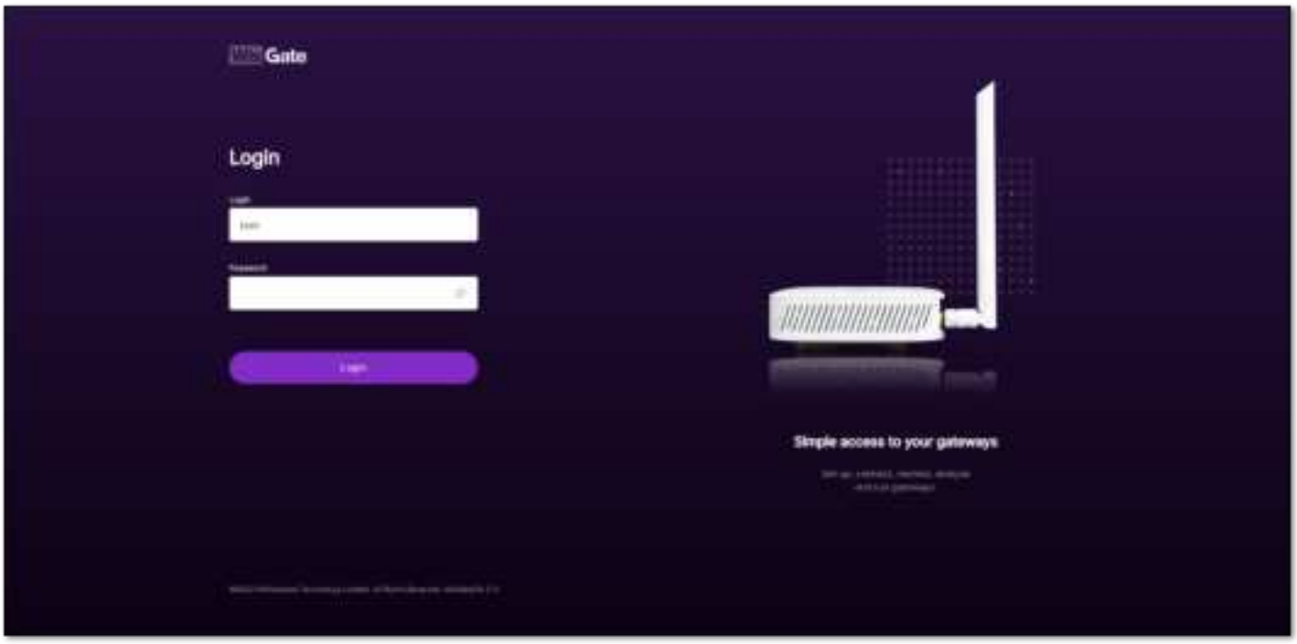

Figure 10: WisGateOS2 login page

2. Once logged in, head to the **LoRa** menu.

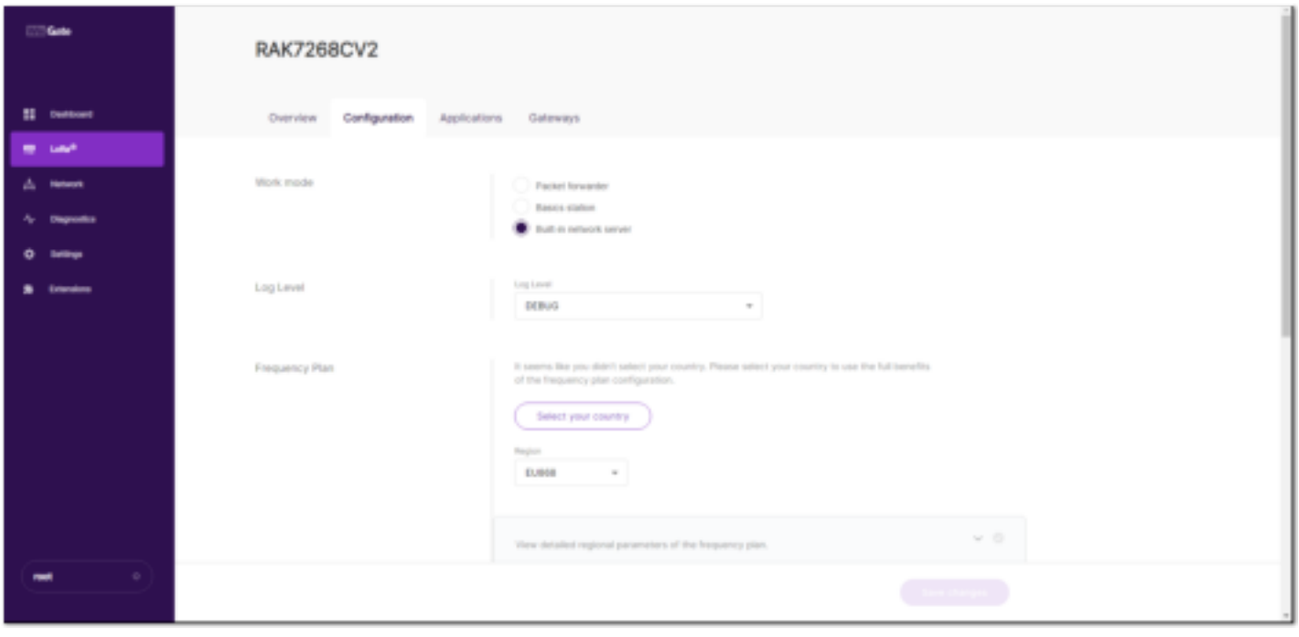

Figure 11: LoRa page

1. By default, the gateway works as a Built-In Network Server. If that is not the case, check the Built-in Network Server Mode Settings on the WisGateOS V2 User manual to switch the mode.

Adding Application

1. Once the gateway is in Built-in network server mode, head to the **Applications** tab.

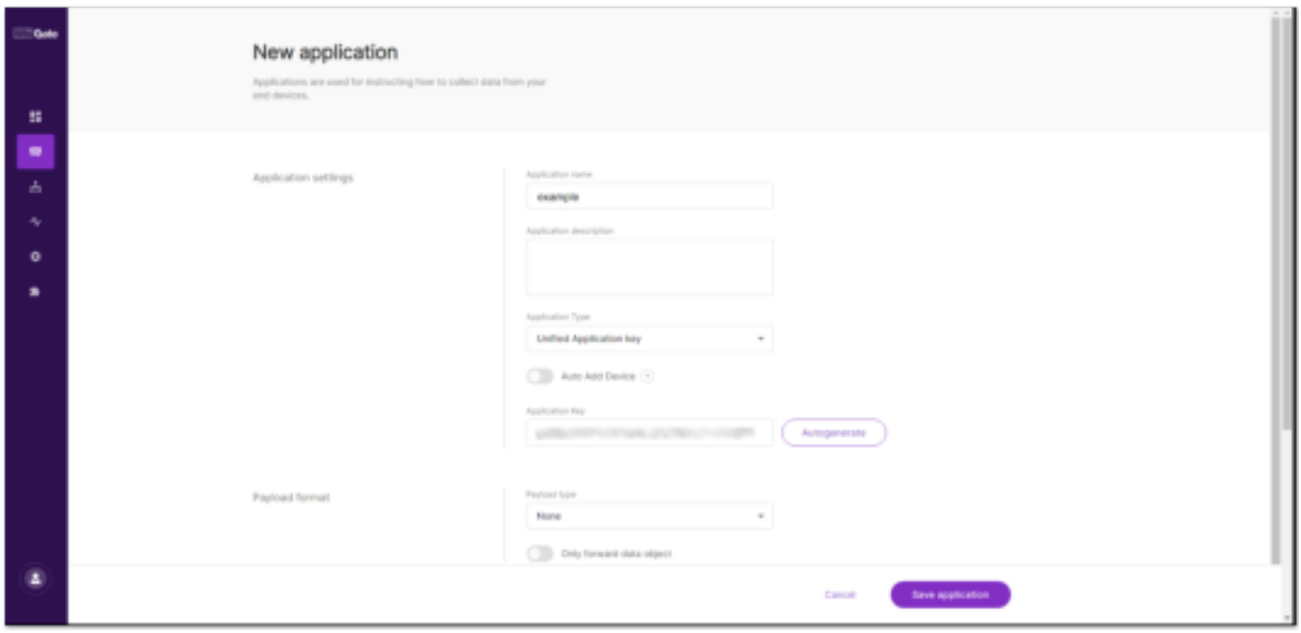

Figure 12: Create Application in the Built-In Network Server

2. Click the **Add application** button or **add one now** link to add a new application. On the new page, fill in the following information:

- **Application name** - type a name for the application.
- **Application description** - optionally you can write a description of the application.
- **Application Type** - from the drop-down menu select the type of application.
- **Unified Application key** - all devices will use the same application key. Selecting this option pops up an **Application Key** field. You can type your application key there or use the **Autogenerate** button to generate one.

Figure 13: Unified application key

The **Auto Add Device** switch activates the **Application EUI** field. The device will be automatically added to the application after the application EUI and key verification.

Figure 14: Auto add device

- **Separate Application keys** – each device will have its own application key. The key is added when registering the device.
- **Payload type** - from the drop-down, select **CayenneLPP** payload type and turn on the **Only forward data object** feature.

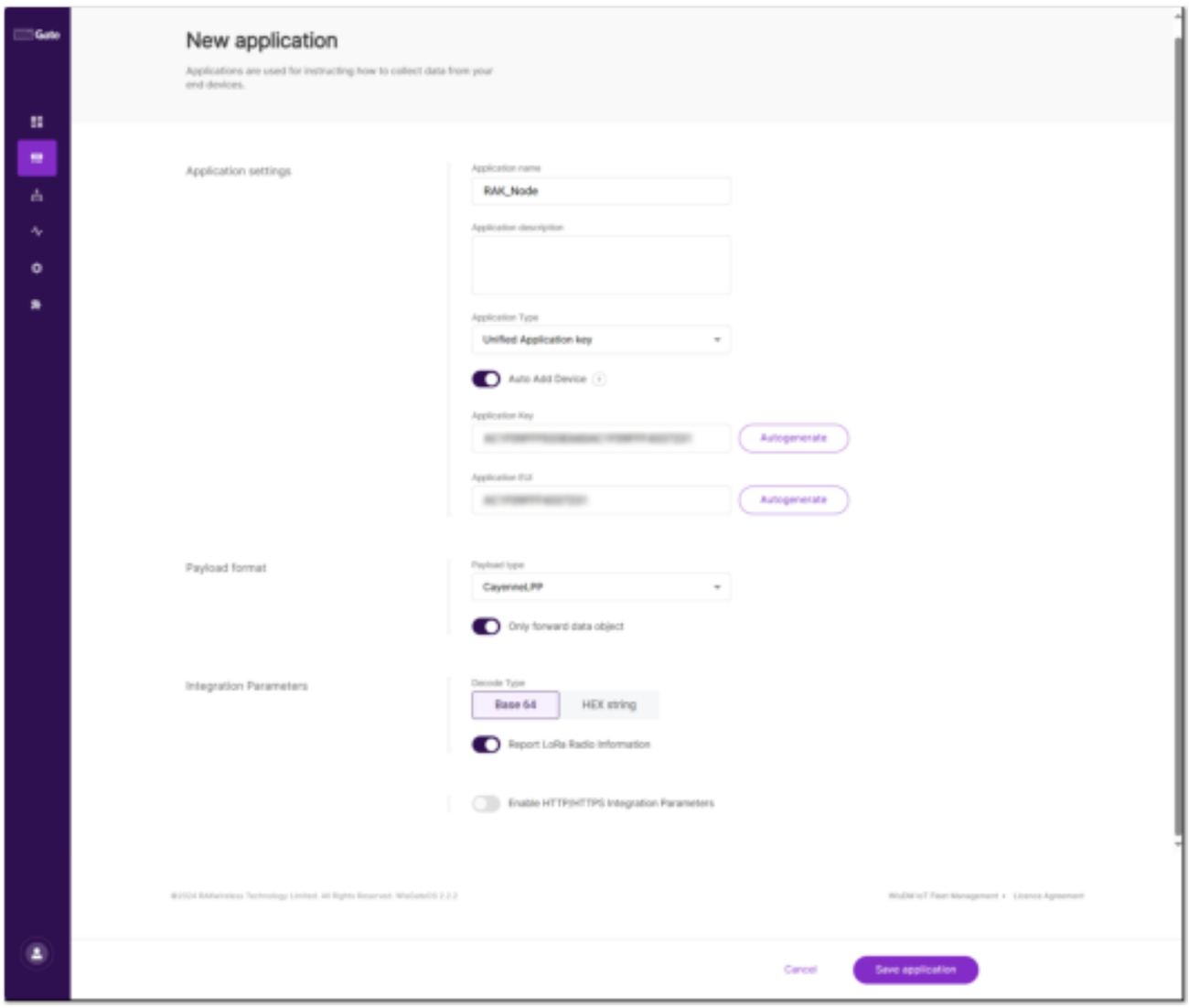

Figure 15: Adding application

3. Once set, click **Save application** to add the application.
4. After the application is added, head to the **End devices** tab. The devices should automatically register upon join request if you are using the Auto Add Device feature.

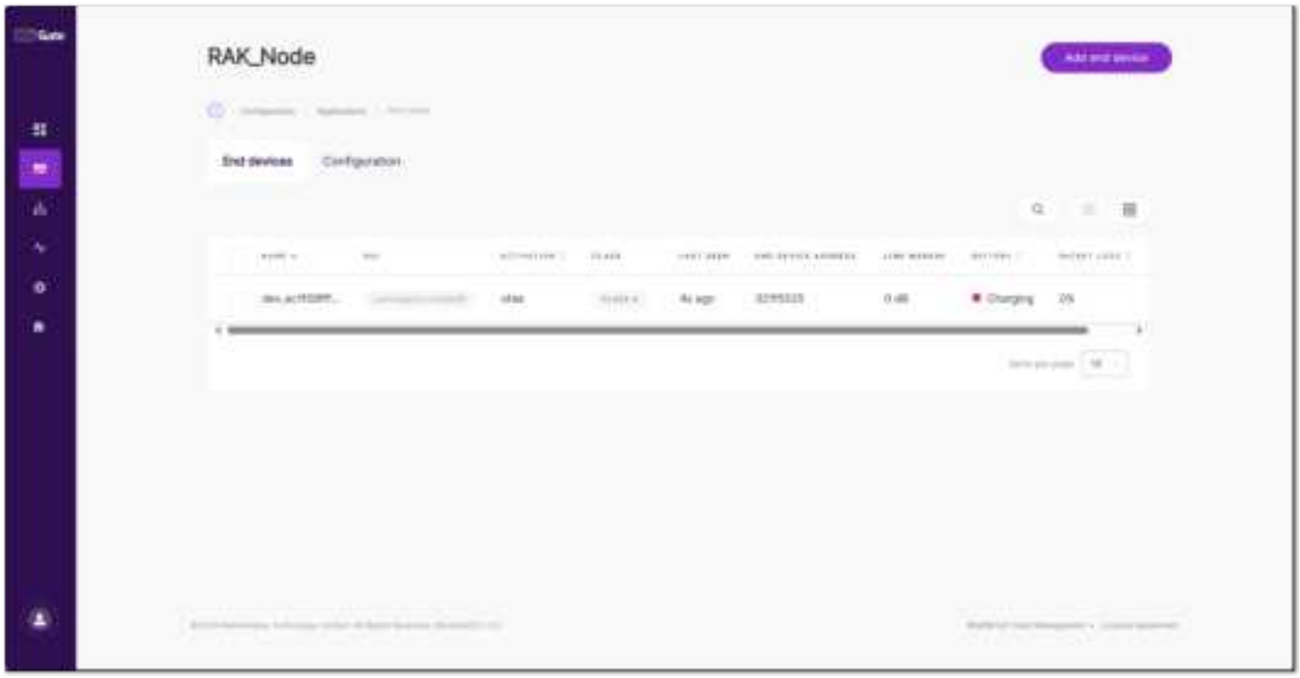

Figure 16: Successfully added end device

If that's not the case, click the **Add end device** button. On the **End device information** page fill in the following information:

- **Activation Mode** - choose the activation mode of your device:
  - **OTAA**
  - **ABP** - This mode pops up two additional fields:
    - **Application Session Key**
    - **Network Session Key**

Figure 17: Adding ABP device

- **End device (group) name** – the name of the device.
- **End device description (optional)** – optionally, you can add a description for the device.
- **Class** – the class of the device.
- **Frame Counter width** – the width of the frame counter. Leave it as default.
- **LoRaWAN MAC Version** – the LoRaWAN MAC version. V1.0.2 pops up a **LoRaWAN Regional Parameters reversion** field where you need to select the reversion of the device.

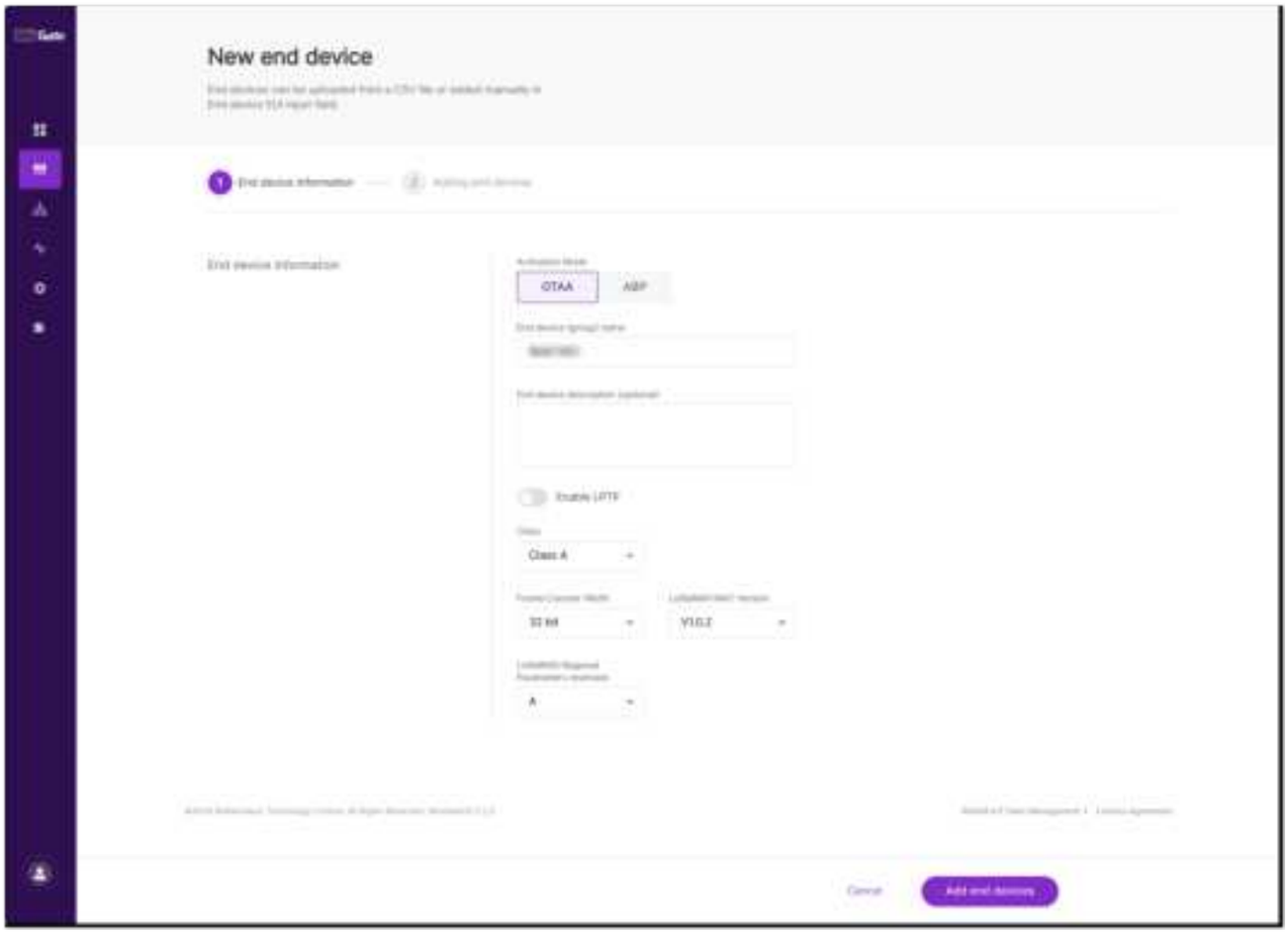

Figure 18: Successfully created application

Adding the Device

1. Once everything is set, click **Add end devices** to go to the page and add the device.

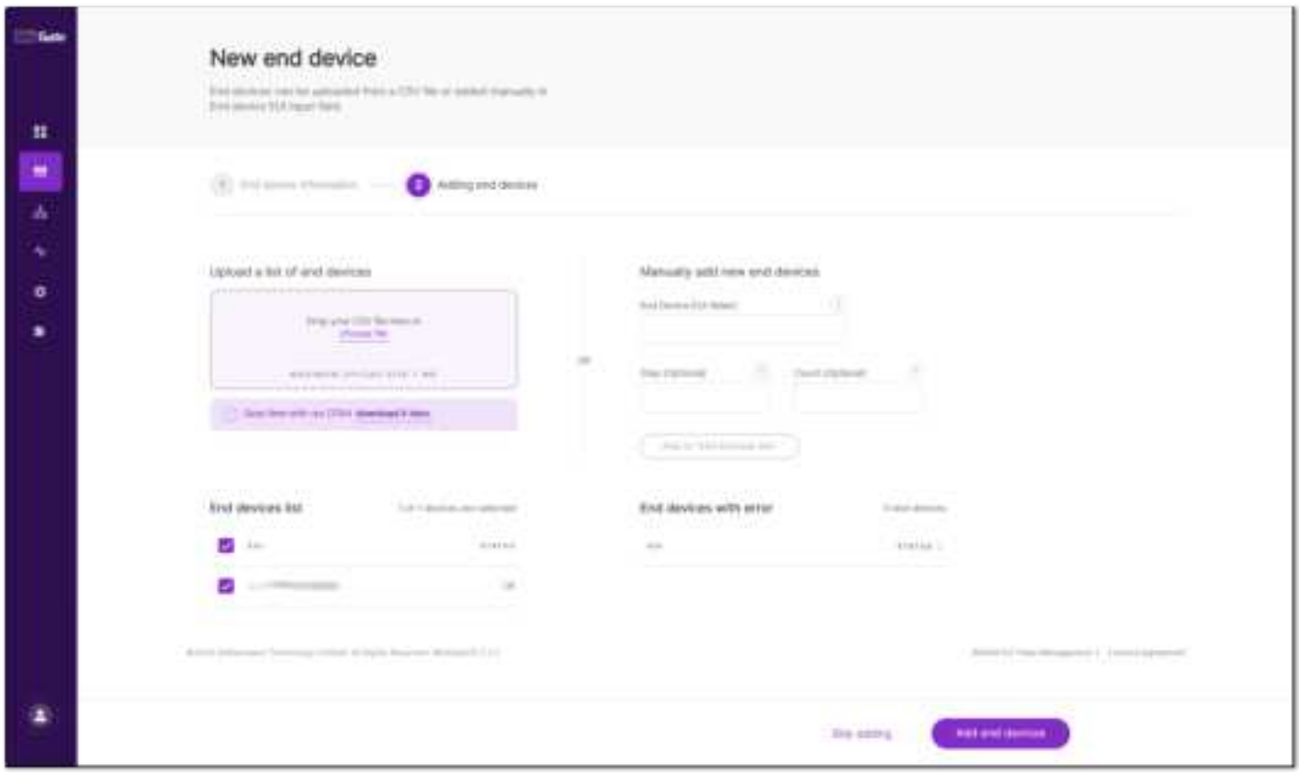

Figure 19: Adding end device

2. On the **Adding end devices** page, type the device EUI at the **End Device EUI (main)** and click **Add to “End Devices list”**.
   - If the EUI is correct, the device will show in the **End devices list**.
   - If the EUI is not correct, the devices will show in the **End devices with an error**.

3. Once the device is added to the **End devices list** click **Add end devices**. Confirm you are adding the device.

Figure 20: Confirmation message for adding a device

RAK2461 Configuration

Connect the rak2461 to Your Network

1. Download and open the IO.Box application.
2. Connect the rak2461 to a computer using the USB type-C cable. Note that this will work for the LoRaWAN configuration, but when configuring the sensor you would need to connect the 9-24 V_{DC} power supply in order to provide power to the sensor itself. Make sure that the USB type-C cable that you are using supports data transfer and no other serial software is connected to the COM port that RAK2461 uses.
3. Click **Connect Device** in the IO.Box console.

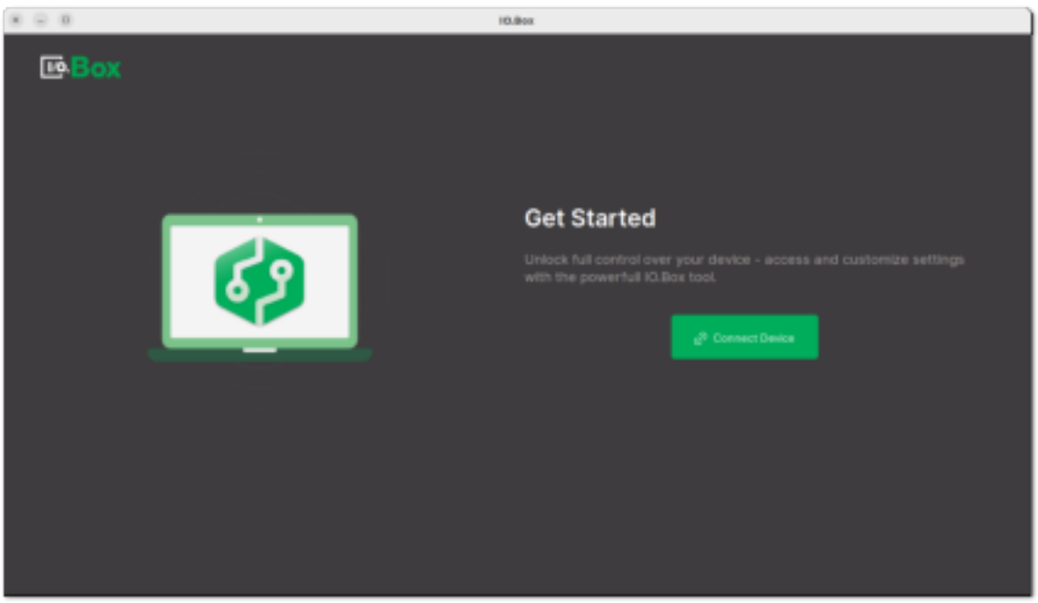

Figure 21: IOBox get started

If an error occurs that shows no device detected, here are some possible causes for that and how to fix it:

- Double-check the quality of the USB cable and if the correct COM port is used.
- Check if other terminal software is active and still connected to the RAK2461.

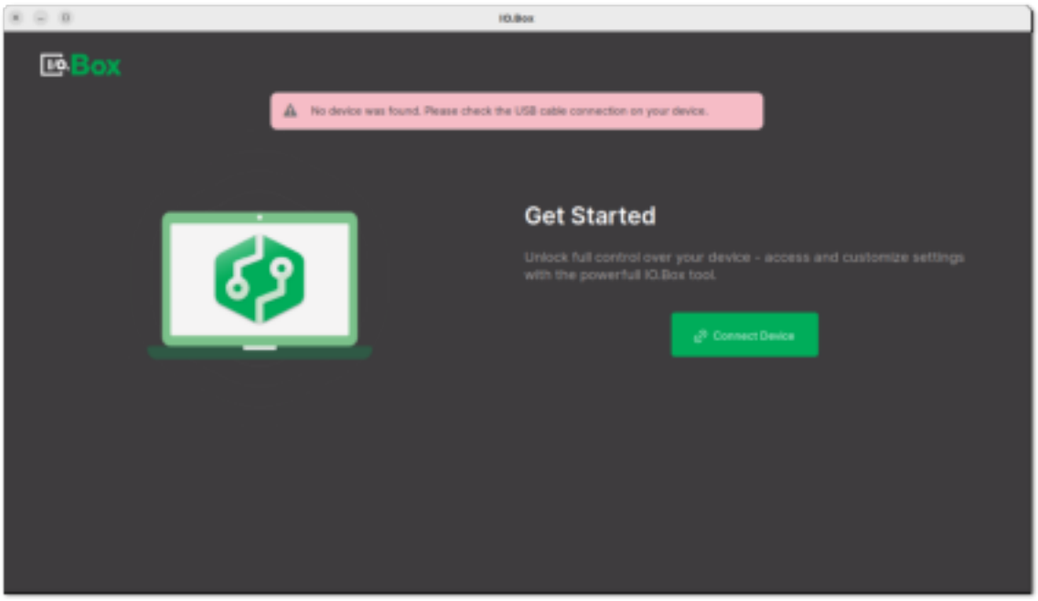

Figure 22: No device error

4. On the IO.Box dashboard screen, you can see information about the devices connected to the PC in the form of a list of connected devices with device models and EUIs. Choose the device that you wish to configure via the **Connect** button next to it.

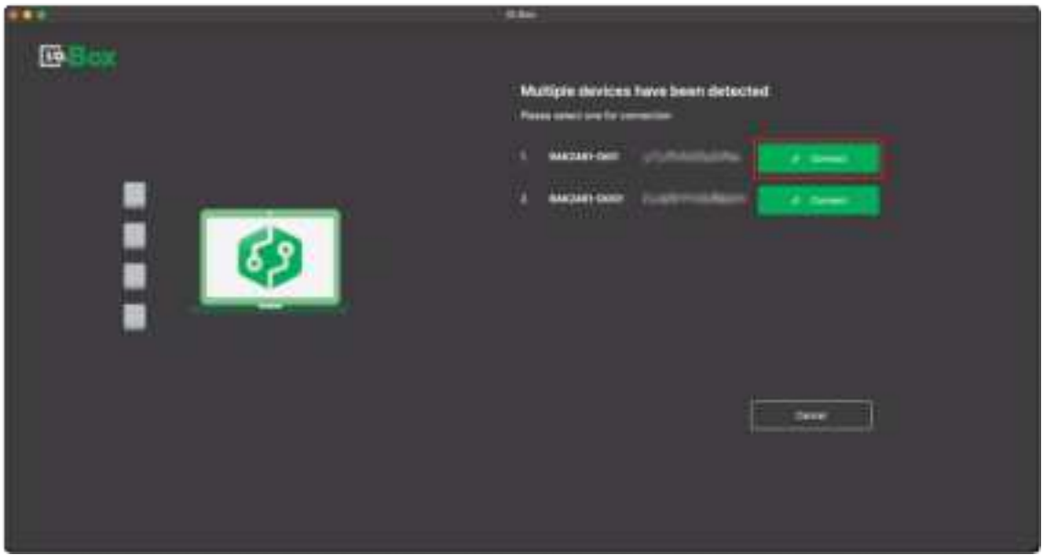

Figure 23: List of connected devices

5. On the main menu to the left, choose **LoRaWAN** to configure the LoRaWAN settings as needed. Do not forget to click **Save** below the changes.

- **Device EUI** - This is the unique identifier provided by RAKwireless.
- **Region** - The LoRaWAN region/band.
- **Class** - The LoRaWAN class (C).
- **Join Mode** - Choose between OTAA and ABP according to LoRaWAN protocol.
- **Application EUI** - Enter the unique identifier assigned by the application server.
- **Application Key** - Enter the unique secure key assigned by the application server.
- **Confirm Mode** - Activate to receive confirmation messages from the network server for each uplink.
- **ADR** - Enable Adaptive Data Rate allowing the network server to control the data rate for your device.
- **DataRate** - Manually set the data transmission rate. Lower rates extend coverage but increase transmission time and power usage. Choose based on the distance and signal quality to the gateway.
- **TX Power Level** - Adjust the transmission power level. The lower the number the higher the power. 0 is the maximum allowed in the selected region and each incrementation of 1 to the number reduces the power by 2 dBm.
- **Data Report Interval** - Set up the global data report period of the device. Range: 60–86400 in seconds.

- **LoRaWAN Status** - Indicates the activity of the device in the LoRaWAN network.
- To check the previously configured Application EUI and Key, run the commands:

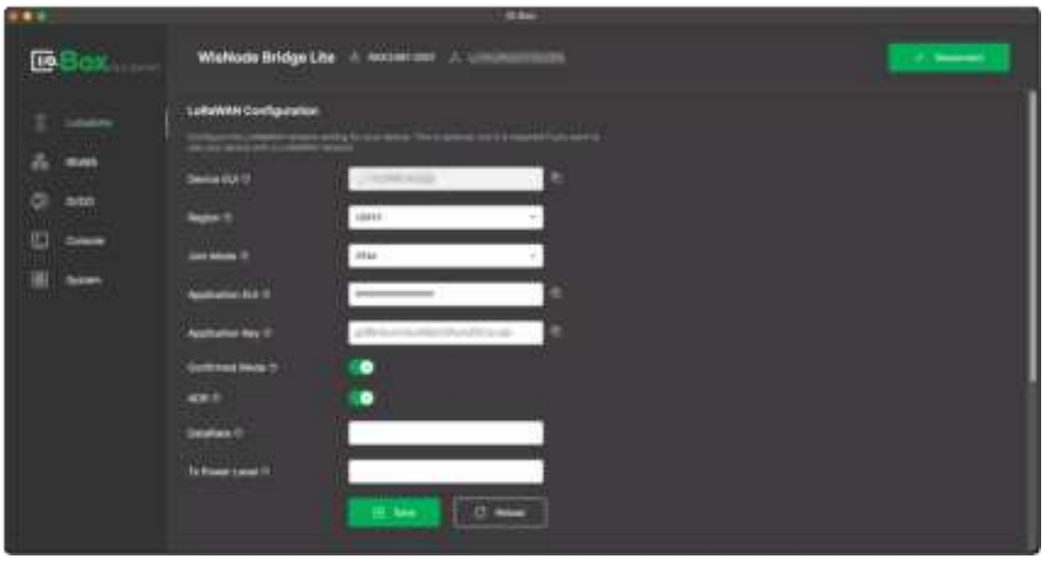

Figure 24: LoRaWAN tab

6. Make sure you've added the RAK2461 WisNode Bridge IO Lite to the LoRaWAN Network Server of choice (Built-in LNS in this example).
7. After the device has successfully joined the LNS, you will see the LoRaWAN status toggle as activated. You might need to refresh the page.

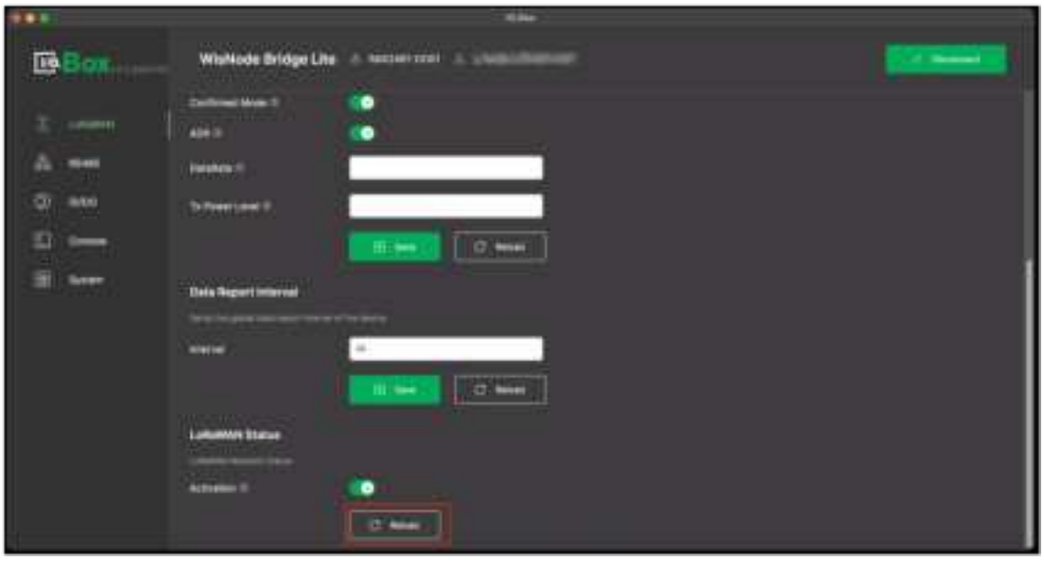

Figure 25: LoRaWAN status

RS485 Configuration

RS485 Interface Configuration

Go to the **RS485** tab from the main menu and configure the interface according to the sensor/device you are connecting to. Do not forget to save your changes. In this tab you will find:

- **Baudrate** - Select the communication speed for the RS485 interface, measured in bits per second. Choose a rate that matches your device's requirements.
- **Databits** - Select the number of data bits for each character in the RS485 communication. Typically, options include 7 or 8 bits, depending on your device's protocol requirements.
- **Stopbits** - Select the number of stop bits used in the RS485 communication. Common options are 1 or 2, depending on your device's data transmission protocol.
- **Parity** - Select the parity setting for the RS485 interface. Options typically include **None** for no parity, **Even** for even parity, or **Odd** for odd parity. Choose based on your device's communication requirements.

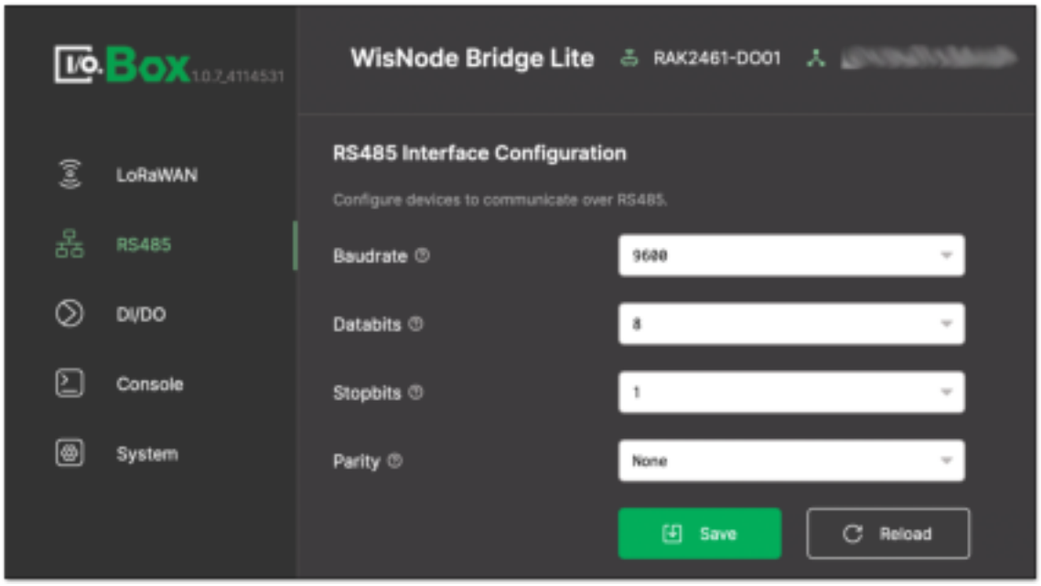

Figure 26: RS485 interface configuration

Add Modbus Poll Task

In the **Modbus Poll Task** menu click **+ Add** for a new poll. You will see the **Polling Task parameters** that need to be configured.

Figure 27: Add poll task

- **Task ID** - Enter the identifier for the polling task. This ID is included in the device's uplink data to indicate the task.
- **Device Address** - The Modbus slave address in decimal format. Range: 1-254.
- **Function Code** - The Modbus function code defines this poll's operation.
- **Register Addr** - The address of the register that you wish to access in hexadecimal format.
- **Quantity** - The number of register addresses that you want to access.
- **Data Type** - The data type of the Modbus response.
- **Scale** - To adjust the raw data from the Modbus response to the desired units. For example, to convert kilograms to grams set the scale to X1000.
- **Remark** - Length: 15 characters.
- **Enable** - Enable or disable this polling task.
- **Sensor Type** - Choose the unit of the data obtained from the Modbus slave device. If no exact match is available, select **Generic xxxx** as a default option.
- **Modbus Request** - Displays the Modbus command generated based on the settings you've selected above. This command will be used to communicate with the Modbus device.
- **Modbus Response** - Displays the response received from the Modbus slave device.

- **Value** - This shows the data extracted from the Modbus Response is parsed according to the above configuration.
- **Uplink Data** - Displays the data payload format that will be sent to the server, based on the configuration above.
- **Check** - Modbus CRC check. Before saving the task click **Check** for automatic validation.
- **Save** - Save the polling task.

Figure 28: Polling task parameters

Creating a Raw Data in Binary Poll Task

Fill in the **register address** and other relevant fields according to the specific sensor's datasheet, then after clicking the **Check** button, you will see the Reply Frame on the IO.Box.

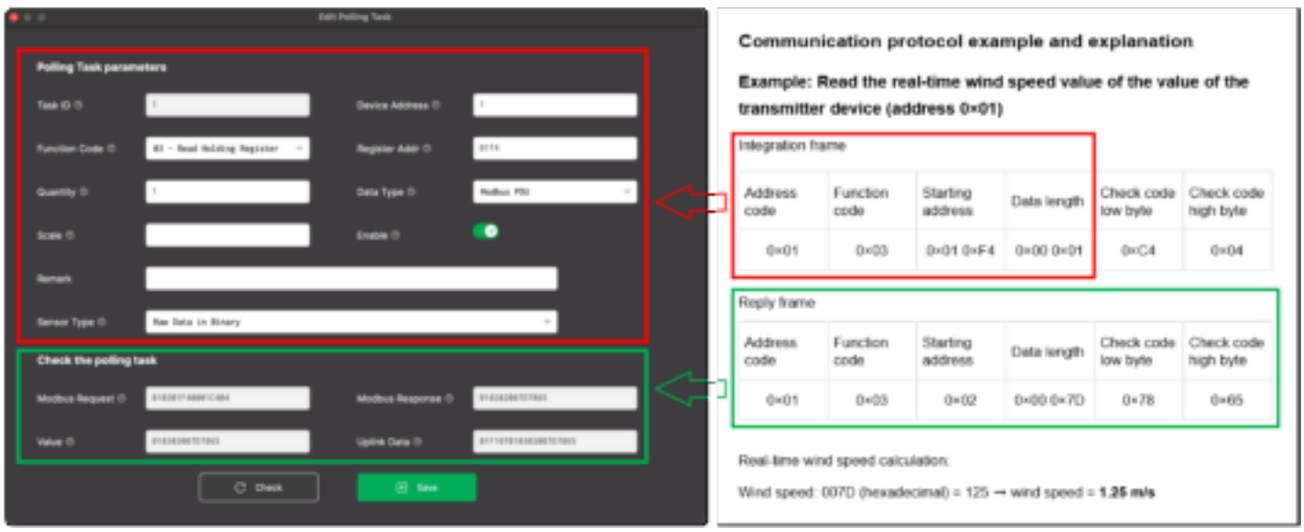

Figure 29: Fill-in sensor specific data

After saving the polling task, wait awhile and you will see the uplink data from the LoRaWAN network. The format of the uplink message would be as follows: TaskID + Sensor Type + Length + Value

```sh
01 + f1(Raw Data in Binary) + 07 + 010302007d7865
```

Figure 30: Uplink data

Creating a Wind Speed Poll Task - Example

Fill in the relevant fields according to the specific sensor's datasheet, then after clicking the **Check** button, you will see the Reply Frame on the IO.Box.

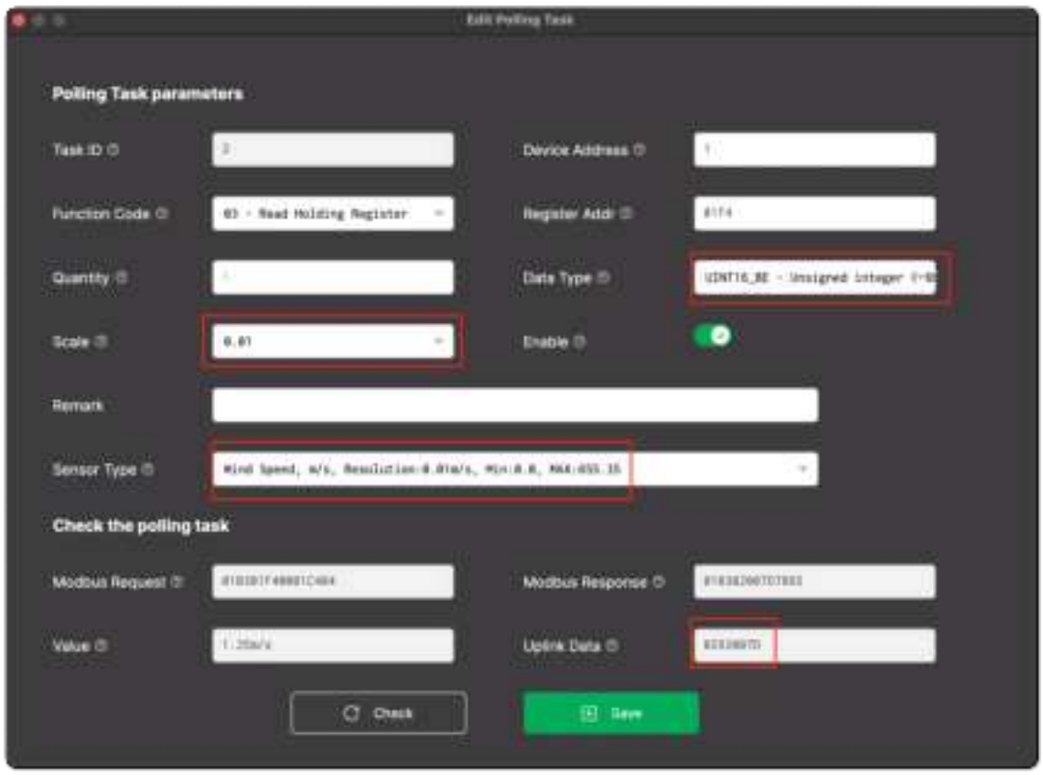

Figure 31: Fill in sensor specific data

After saving the polling task wait awhile and you will see the uplink data from the LoRaWAN network in the gateway Web UI. The format of the uplink message would be as follows: TaskID + Sensor type + Value

```sh
02 + 92(Wind Speed) + 007D(Hex) 125(Dec) 1.25m Wind Speed
```

Figure 32: Uplink data

Click Reload to Fetch the Latest Uplink Data

Figure 33: Fetching latest uplink

Search Task

Figure 34: Search task

Sort Task Based on the Task ID, Address, Function Code, Register Address, Data Type, Sensor Type or Remark

Figure 35: Sort task

Export an Existing Task List and Import it into Another Node

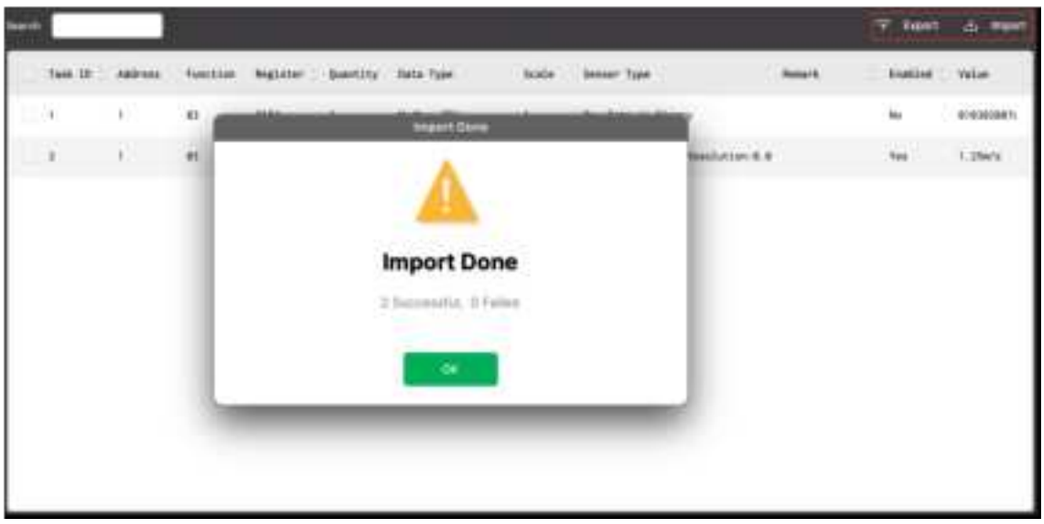

Figure 36: Export/Import task

Digital Input/Output Configuration

From the main menu of IO.Box, go to the **DI/DO** tab and configure the interface according to the sensor/device you are connecting to. Do not forget to save your changes. In this tab you will find:

- **Port ID** - The identifier of the digital input port. You can find the port ID on the device's enclosure label.

- **Task ID** - An identifier of the polling task. The ID will be included in the uplink data to indicate the source of the data.
- **Debounce** - Set a delay (Range: 50-2000 ms) to stabilize the signal from a switch or button, ensuring only a single action is registered and eliminating false triggers due to contact bounce.
- **Input State** - Displays this digital input port's status (active or inactive).
- **Output State** - Toggle to change this digital output port's current state (active or inactive).
- **Enable** - Toggle to activate the polling task for this port, allowing it to report the port's state.

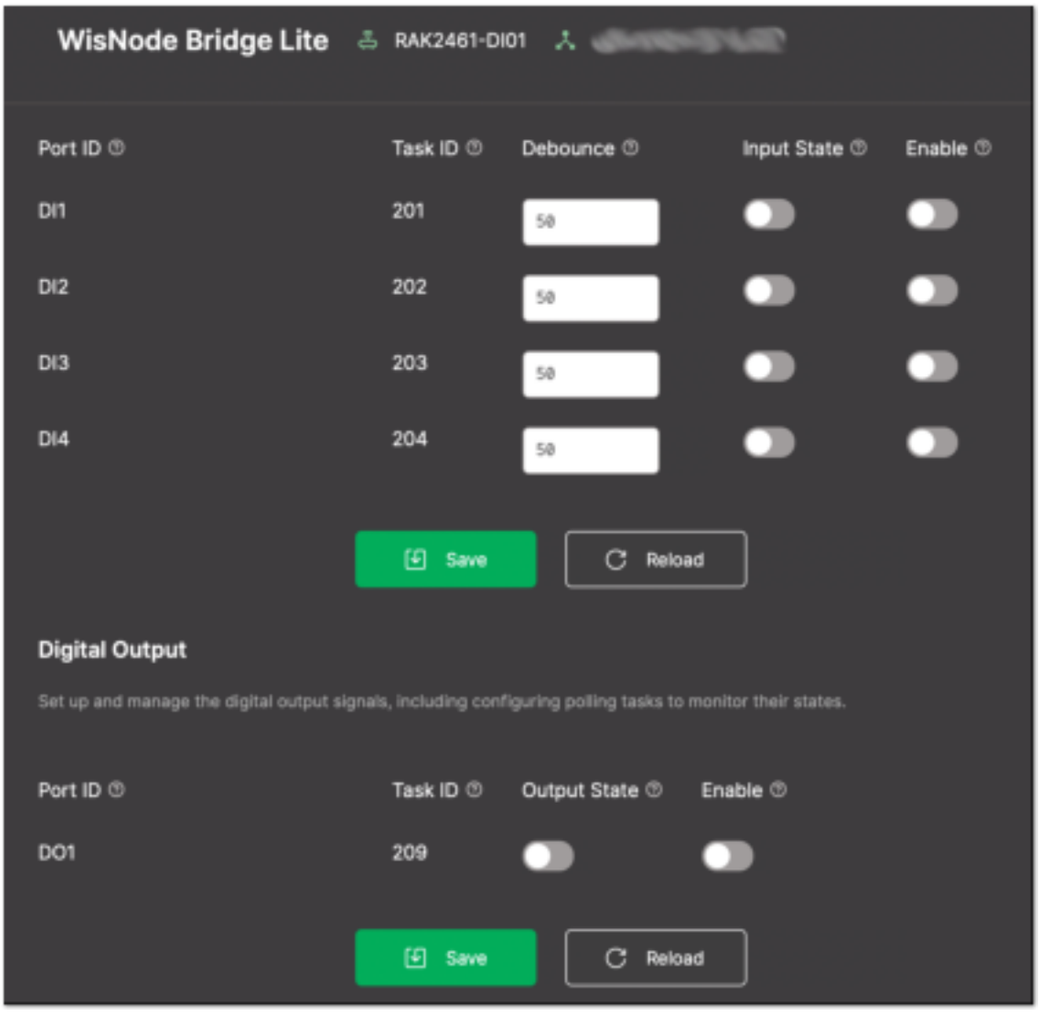

Figure 37: DI/DO parameters

Connecting a PIR Motion Sensor With Digital Input

For this example, a DH-ARD631-50 Outdoor active PIR sensor is used in the following way:

1. Have two devices, one transmitter and one receiver.
2. The transmitter's POWER(1/2) is connected to the V_{out} and GND of the bridge.
3. The receiver's POWER(2/3) is connected to the 12V_Out and GND of the bridge.
4. The receiver's ALARM(5/6) is connected to the DI4 COM and DI4 IN of the bridge.

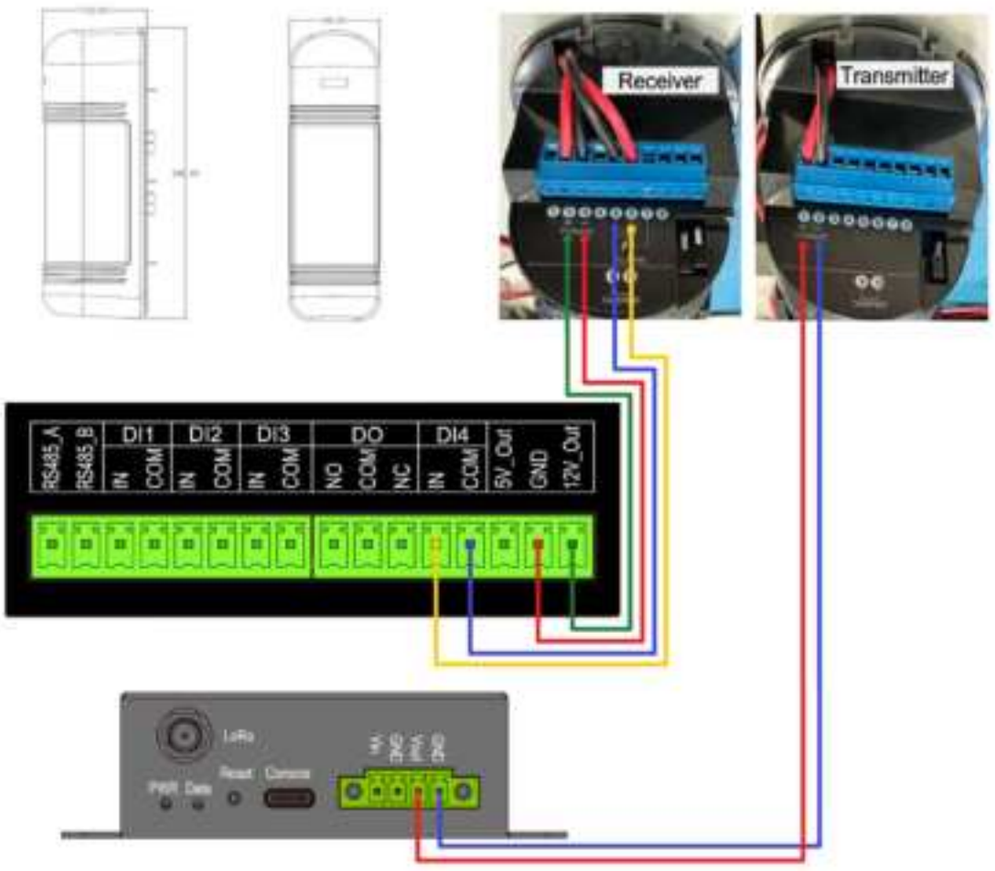

Figure 38: Sensor to Bridge wiring

5. Enable the DC V_{out} and the 12 V_{DC} power outputs in the IO.Box console, located in the **System** tab.

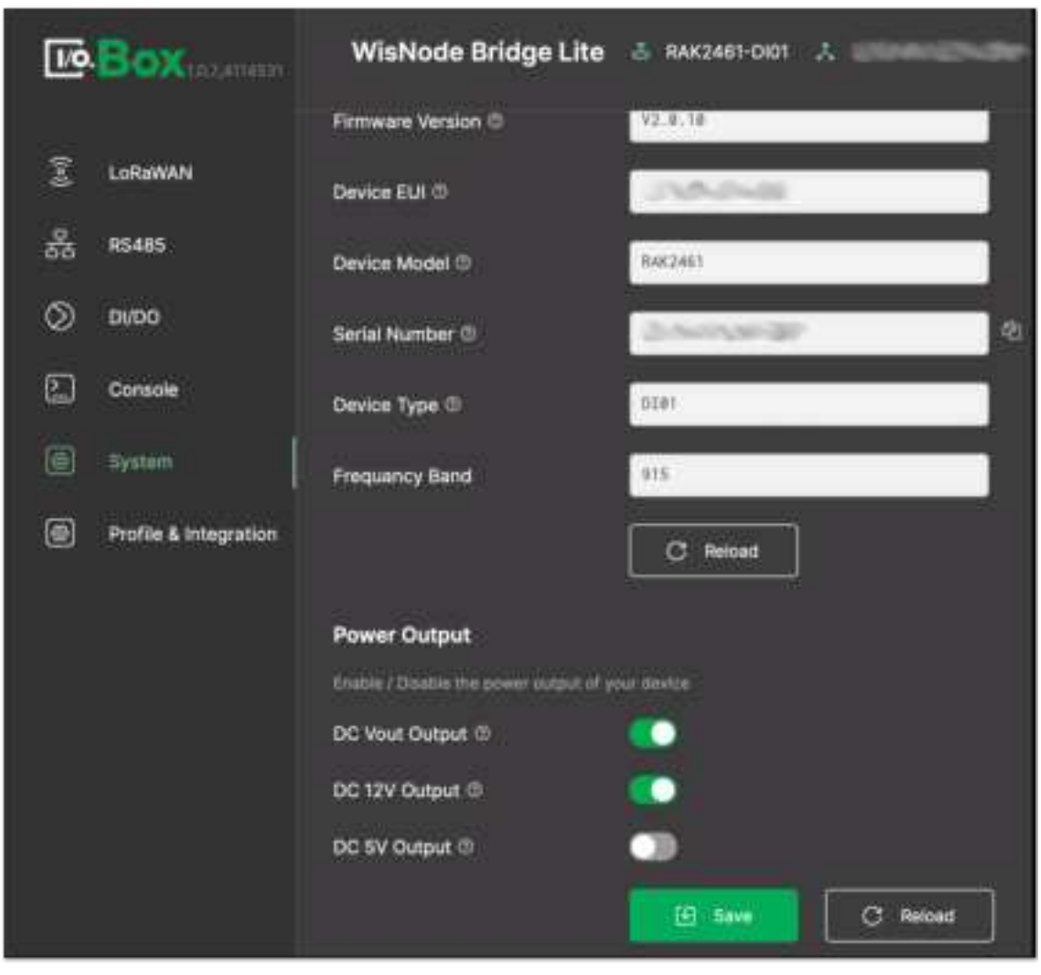

Figure 39: Enabling power outputs

6. After enabling DI4 and reloading, you will see the input state enabled.

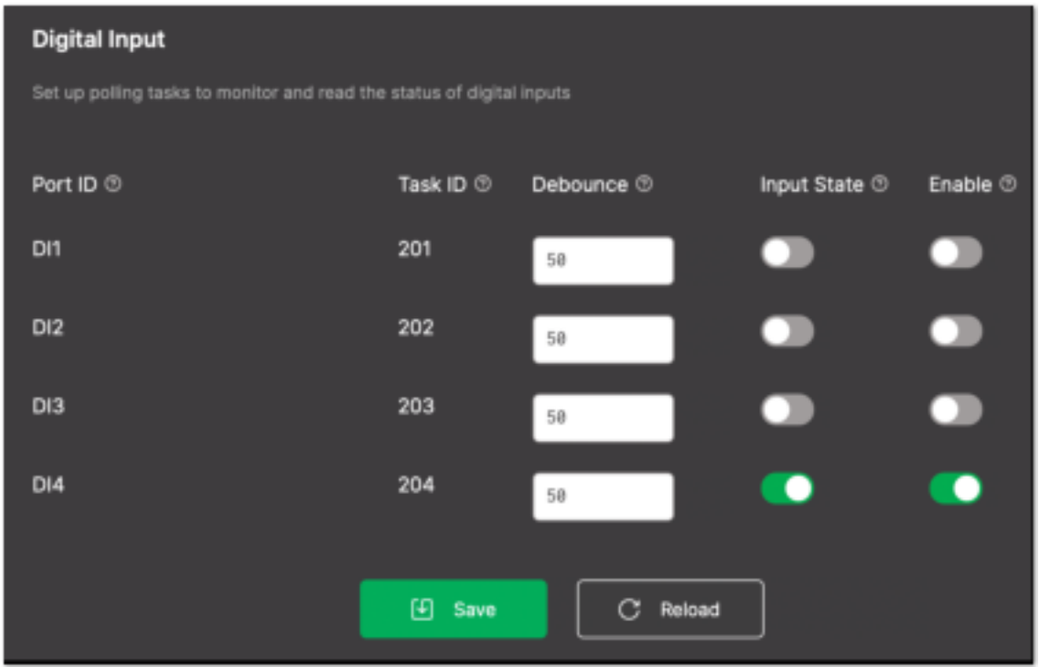

Figure 40: Enabling DI4

7. When triggered, the LNS will receive the packet after the debounce time or a periodic uplink.

Digital Output for Switching Applications

1. You can connect any module or device to the port of the Digital Output as long as it operates on the recommended voltage rating.

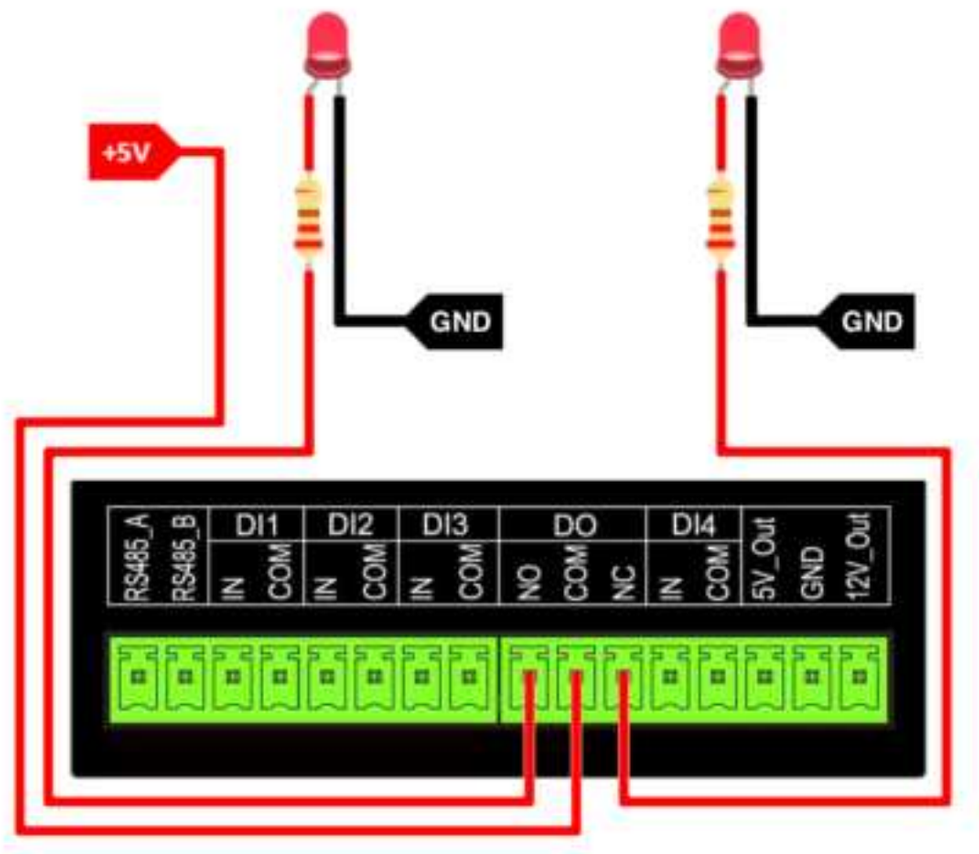

Figure 41: Wiring

2. When the output state is enable in the IO.Box console, the left bulb is supplied, when it is disabled, the right bulb is supplied.

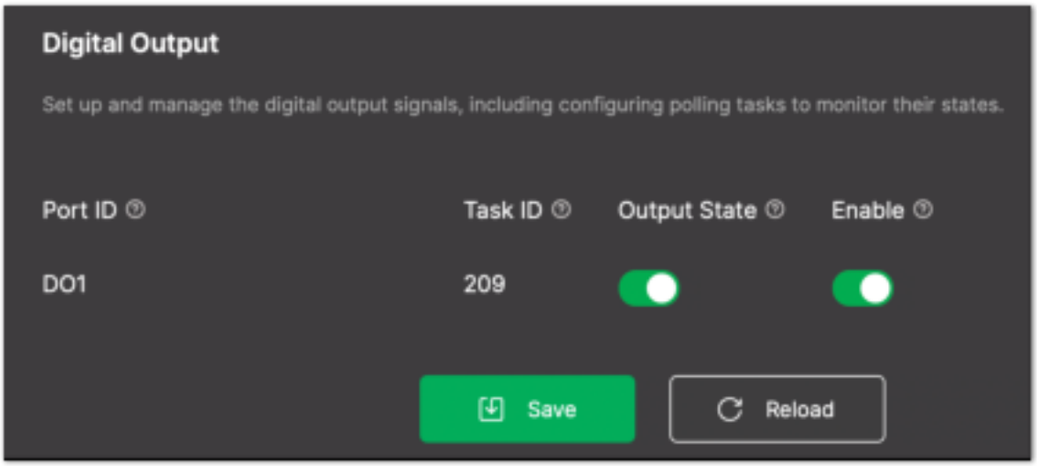

Figure 42: Output state

3. Additionally, modifications can be made through a Downlink message.

Figure 43: Downlink

System

From the main menu of IO.Box, go to the **System** tab to find device information for the RAK2461 as well as power output toggles and firmware update options. Do not forget to save your changes. In this tab you will find:

- **Hardware Version** - Displays the specific version of the device’s hardware.
- **Firmware Version** - Displays the device's firmware version.
- **Device EUI** - Displays the unique identifier assigned by the manufacturer.
- **Device Model** - Displays the specific model name or number of the device.
- **Serial Number** - Displays the device’s serial number of the device.
- **Device Type** - Indicates the category or classification of the device, defining its interface types and functionalities. For detailed specifications refer to the device’s model information.
- **Frequency Band** - The device’s frequency band.
- **DC Vout Output** - Toggle to enable or disable the Vout power output. When enabled, Vout passes through the same voltage as the Vin input.
- **DC 12V Output** - Toggle to enable or disable the 12V_Out power output. When enabled, it provides a 12 V / 0.5 A power output.
- **DC 5V Output** - Toggle to enable or disable the 5V_Out power output. When enabled, it provides a 5 V / 0.5 A power output.

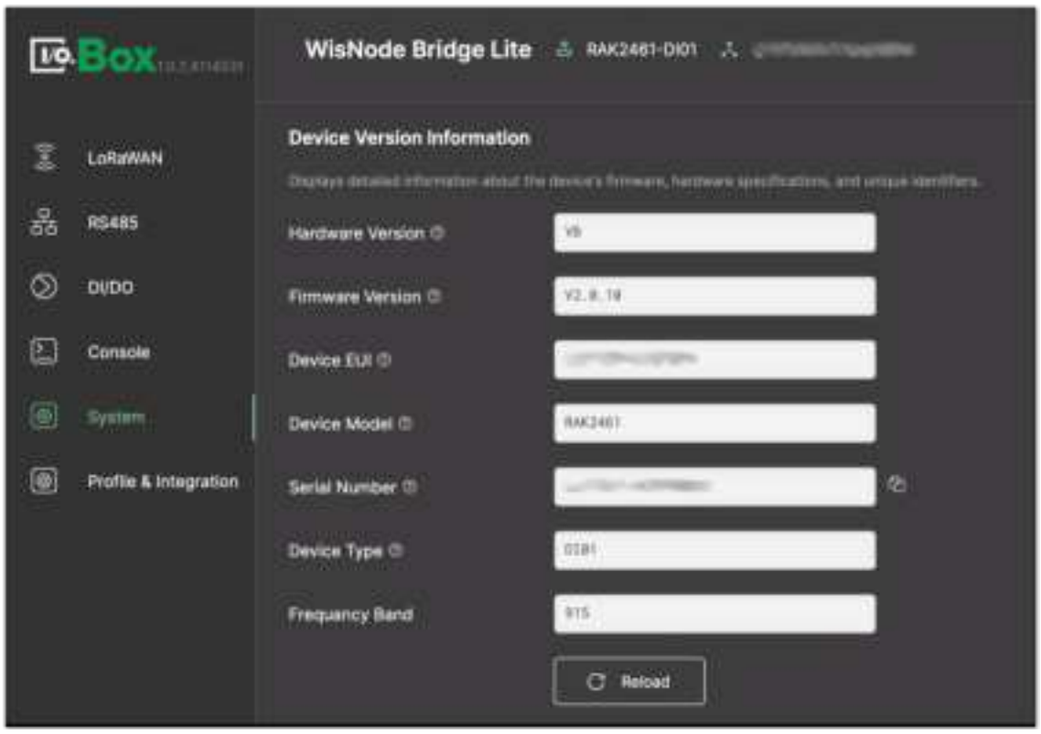

Figure 44: System information overview

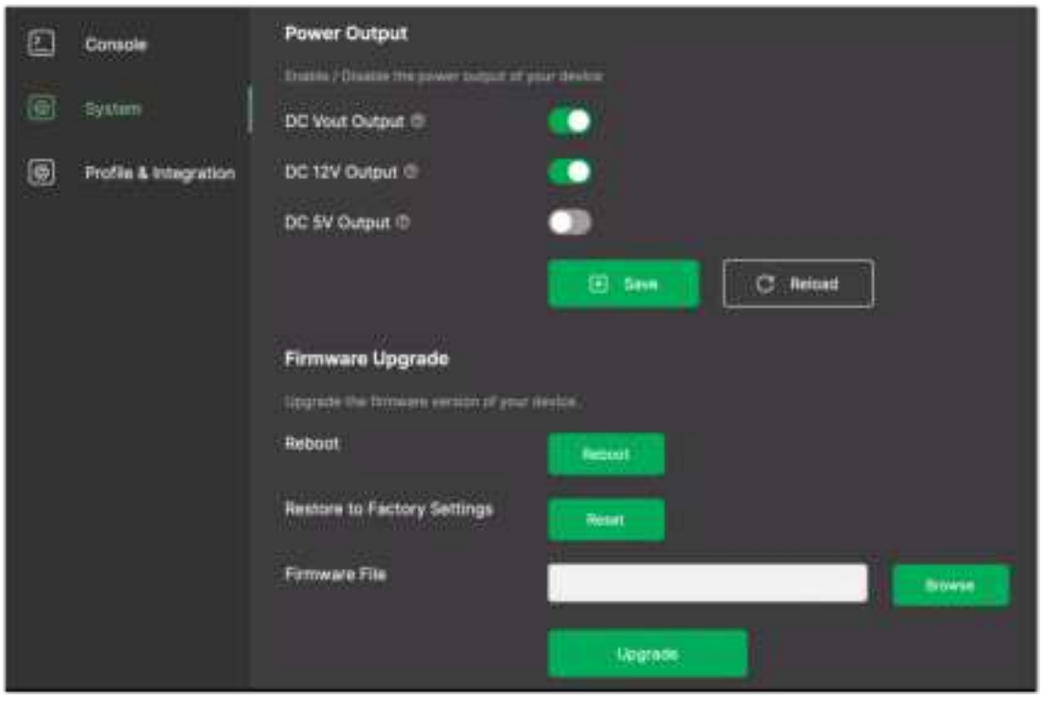

Figure 45: System information overview

Reboot

Simply press the **Reboot** button under the **Firmware Upgrade** section.

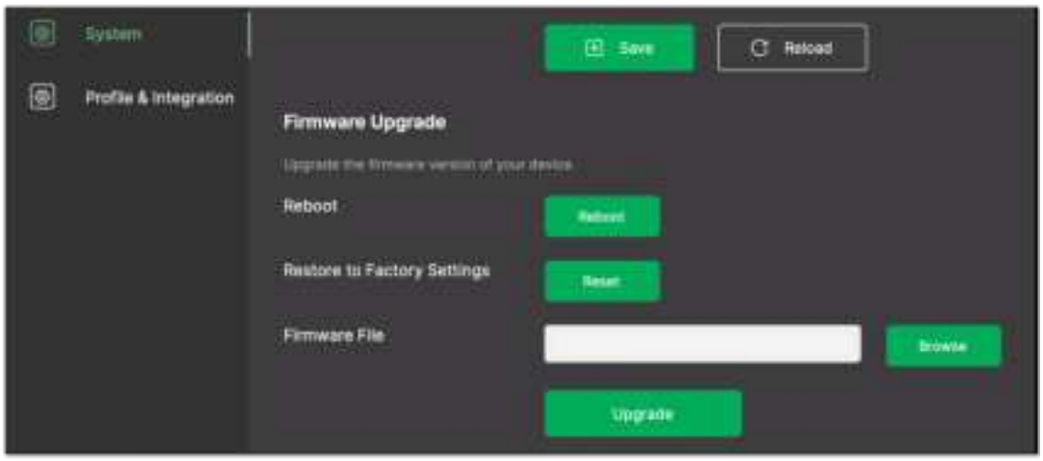

Figure 46: Reboot button

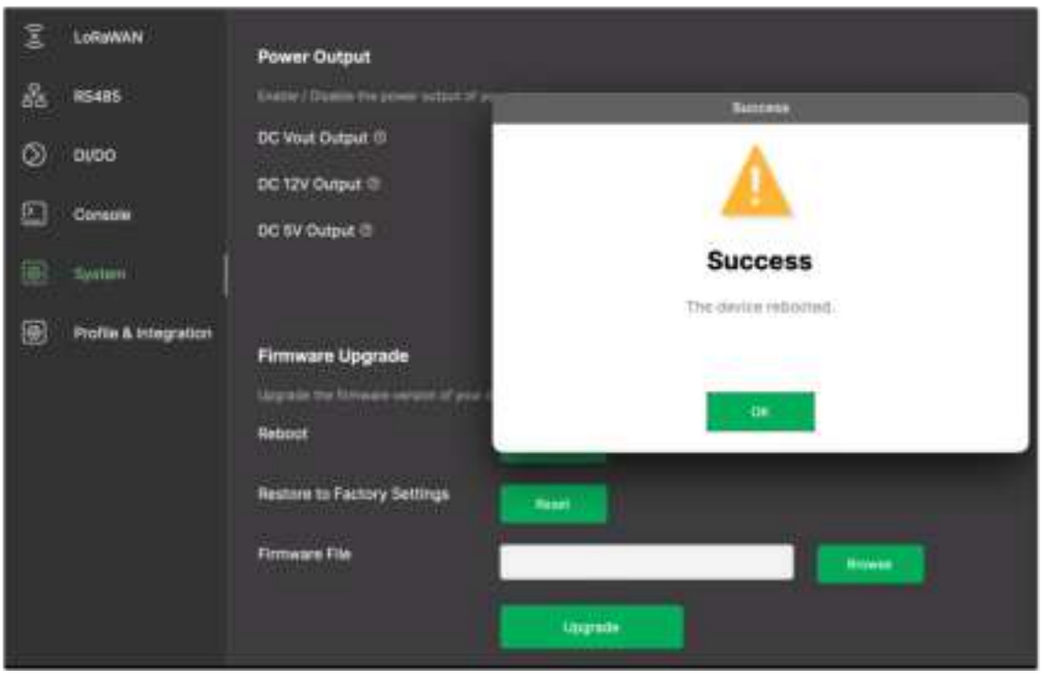

Figure 47: Successful reboot

Factory Reset

To restore the device to factory settings, press the **Reset** button under the **Firmware Upgrade** section and wait for the process to be completed.

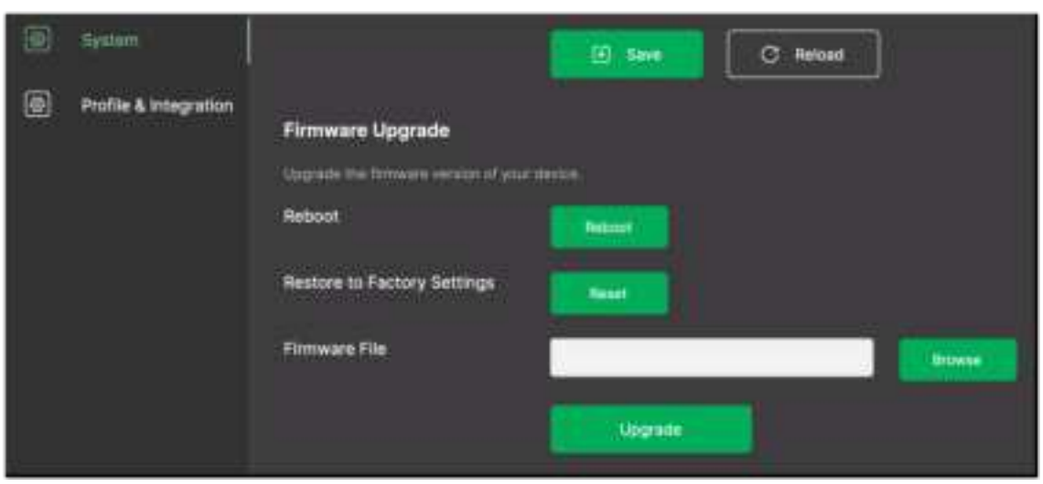

Figure 48: Reset Button

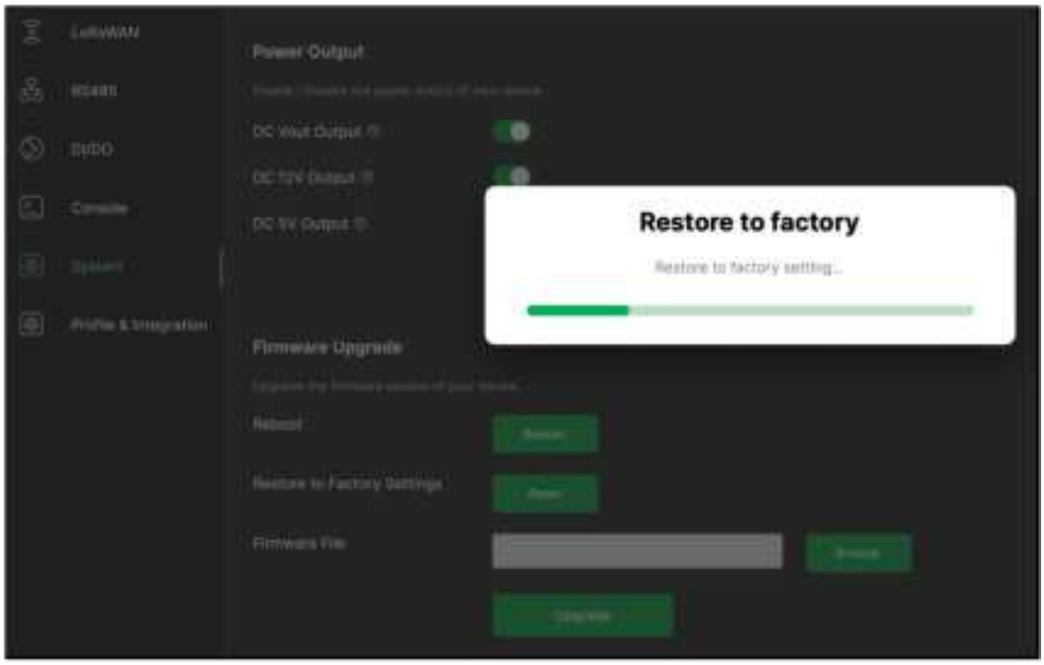

Figure 49: Reset progress

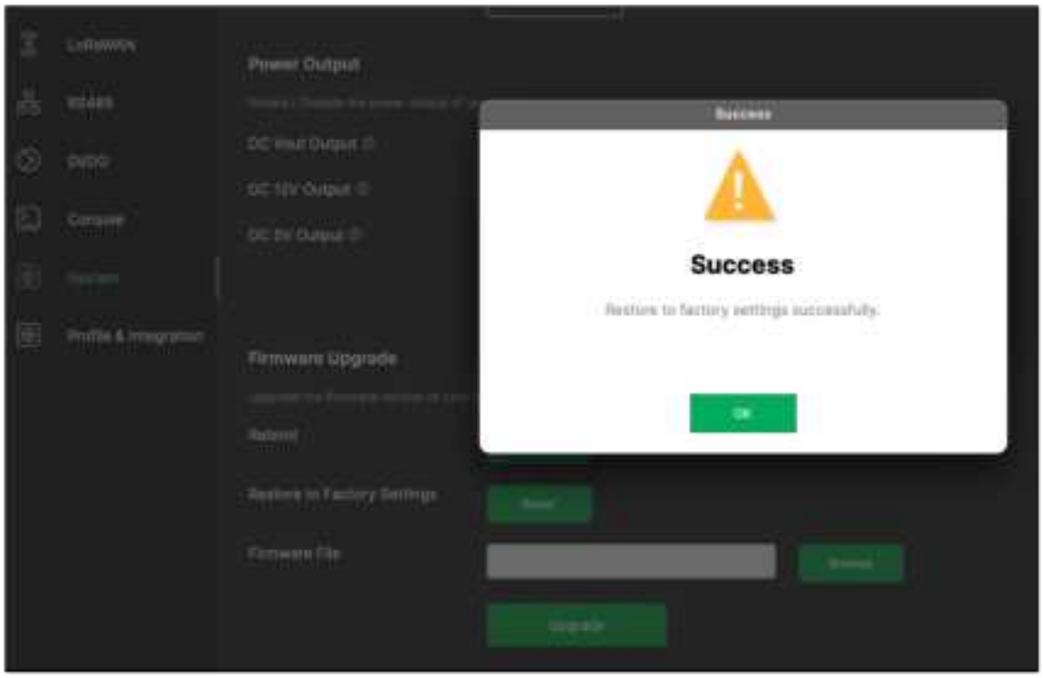

Figure 50: Successful reset

Firmware Update

Normal Firmware Update

1. After downloading the latest firmware, click **Browse**.

Figure 51: Browse button

2. Select the correct file.

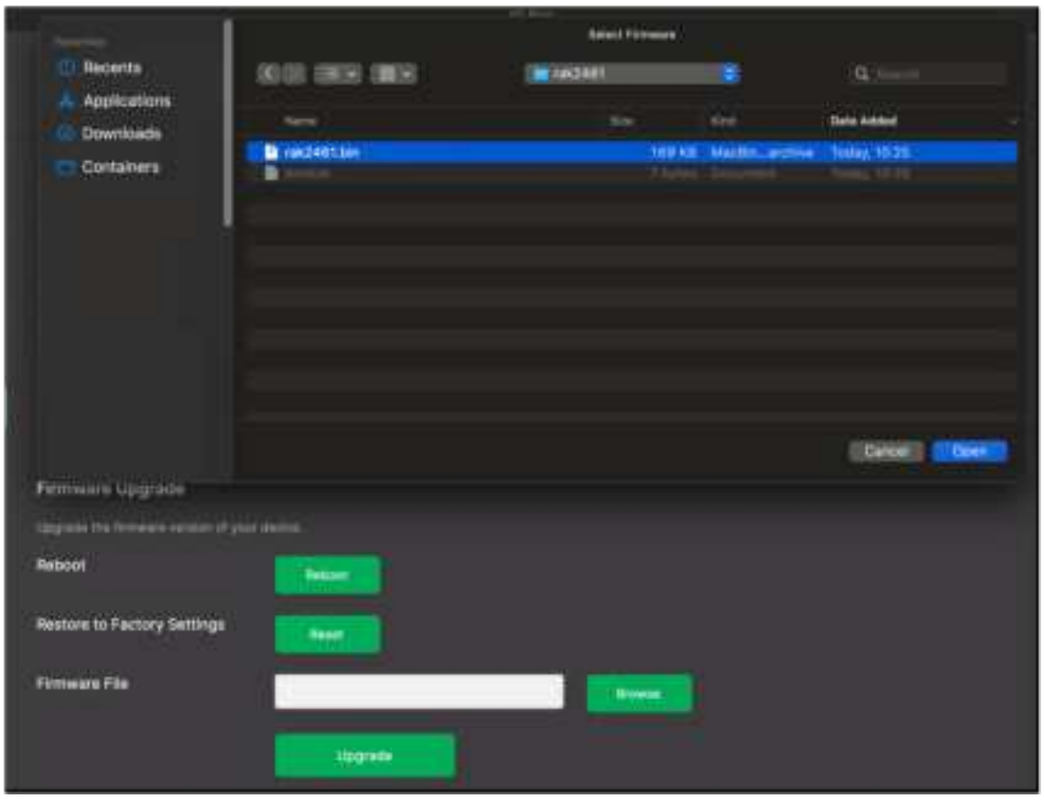

Figure 52: Selecting the file

3. Click **Upgrade** and wait for the procedure to finish.

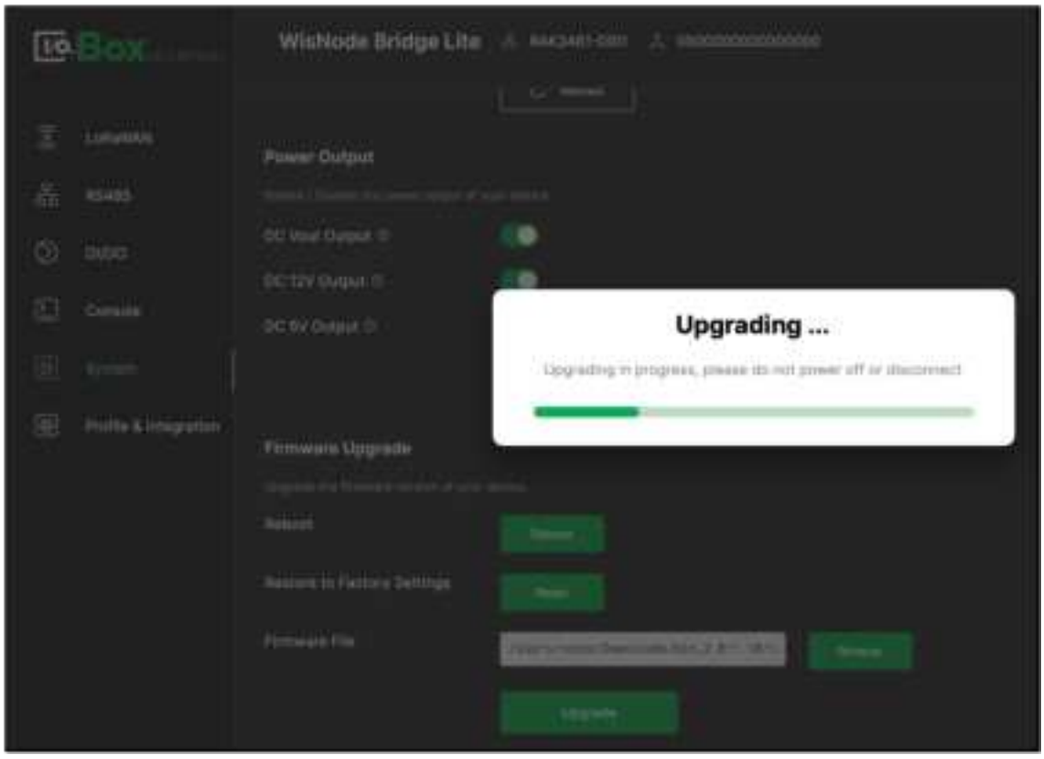

Figure 53: Upgrading procedure

Figure 54: Successful upgrade

Manual Firmware Update

Follow this procedure if the upgrade process fails unexpectedly, or to upgrade the damaged device in boot mode.

Figure 55: upgrade fail

1. Open the IO.Box application and click **Connect Device**.

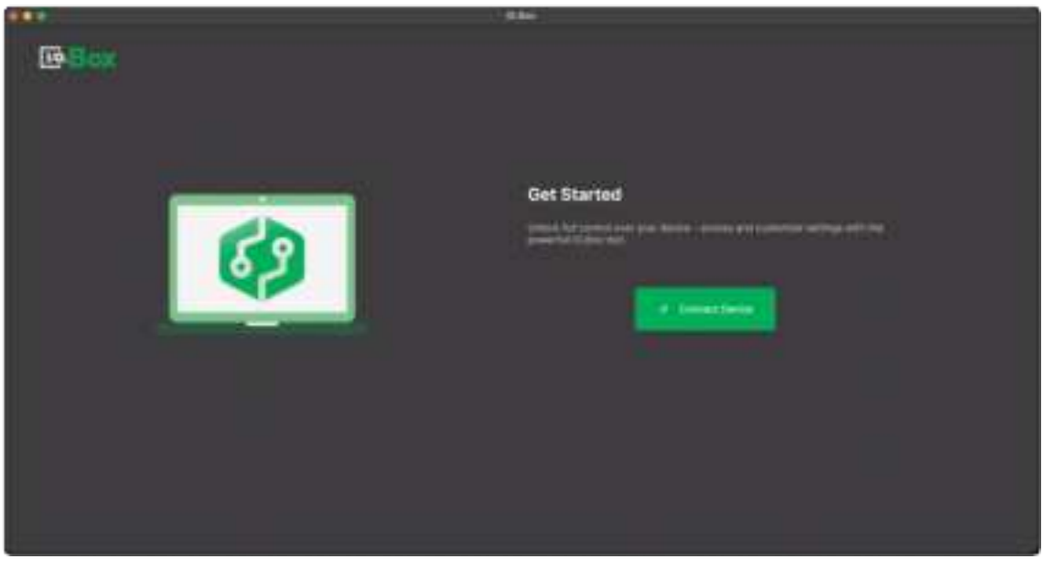

Figure 56: IOBox application

2. Select **Connect Manually**.

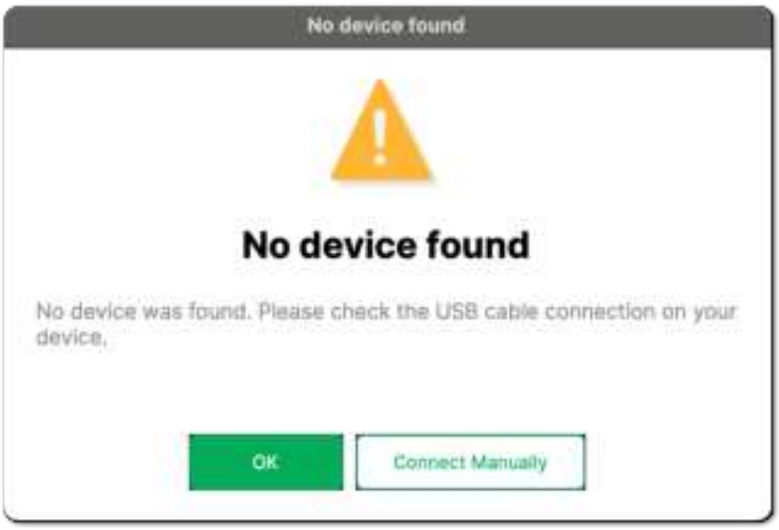

Figure 57: No device found

3. Manually input the port and device model.

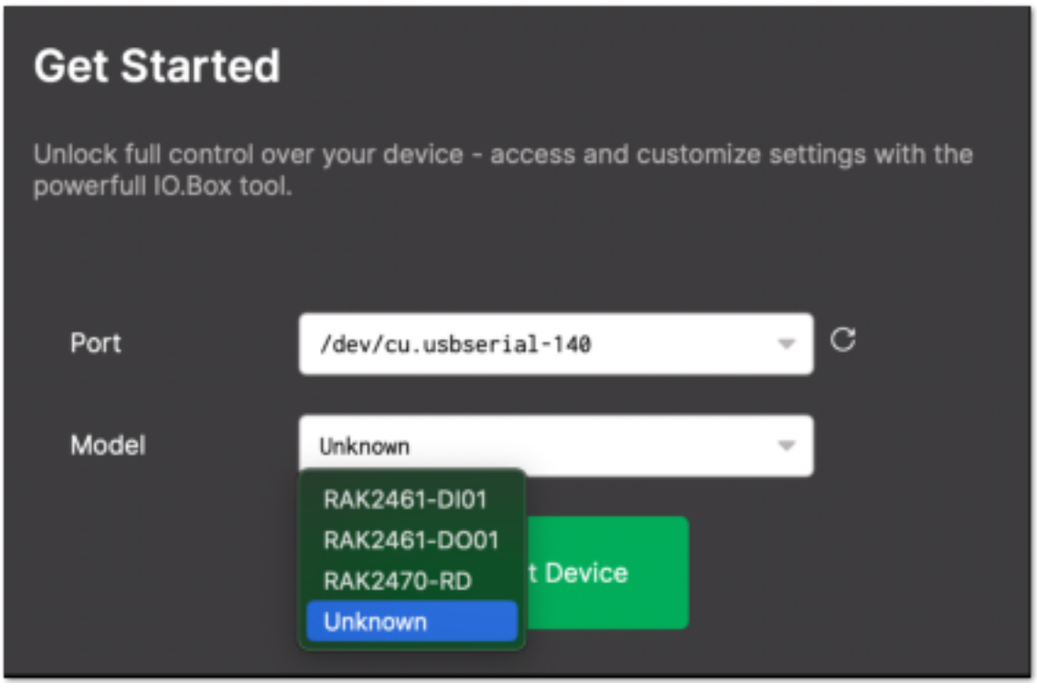

Figure 58: Manually selecting the device

4. Follow the steps of the normal upgrade procedure above by browsing and selecting the firmware file and so on.

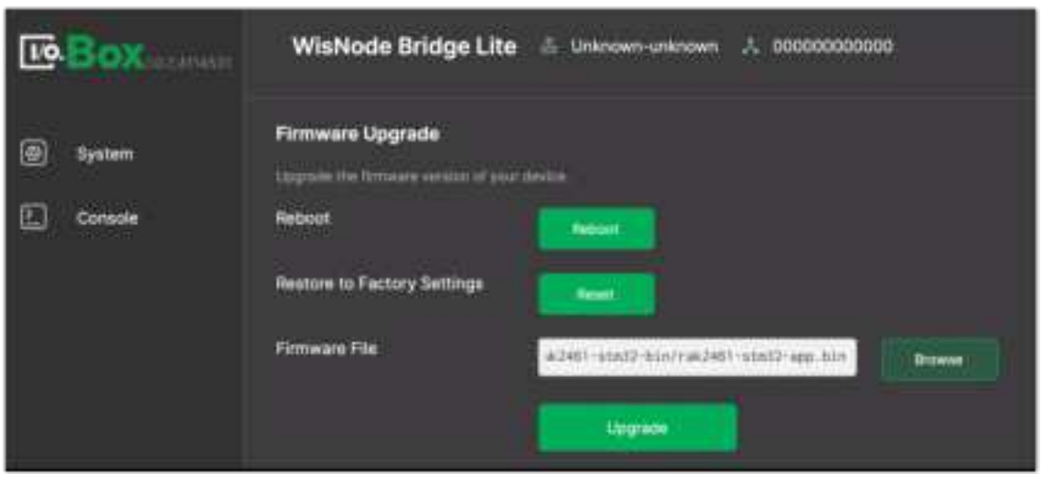

Figure 59: Normal upgrade procedure

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