

Embedded LNS Gateway Instruction

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1. Introduction

TEKTELIC Embedded LNS Gateways simplify the integration of LoRaWAN devices with industrial protocols such as MQTT, BACnet IP, and Modbus TCP/IP.

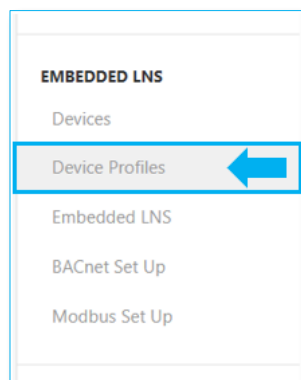
Depending on the intended use case, the configuration steps for these gateways may vary. To start, ensure that all components are correctly set up as follows:

1. Initial Setup:
 - Add LoRaWAN Devices, and Device Profiles using Kona Link. ([Section 2](#))
2. Protocol-Specific Configuration: Use Node-RED to configure and manage the supported protocols:
 - BACnet/IP: Refer to [Section 3.1](#) for setup guidelines.
 - Modbus TCP/IP: Refer to [Section 3.2](#) for detailed steps.
 - MQTT: Refer to [Section 3.3](#) for configuration instructions.

You can see some troubleshooting tips specific for the use cases in [Section 4](#)

2. Manage LoRaWAN Devices

1. Login to Kona Link web page using “Host Name” or “IP Address”:
 - Using “Host Name”
Host Name URL: <https://kona-<GW variant>-<last 6 digit GW ID>.local/>
Eg: <https://kona-micro-0011ab.local/>
 - Using “IP Address”
IP Address URL: <https://<GW IP Address>/>
Eg: <https://192.0.2.111/>
2. Navigate to **Device Profile** section.



3. Click on **Add Device Profile**.



4. User has two options for Configuration of device profiles:
 - 7.1. Select a Device Profile from the existing list of **Device profile Templates**
 - Click on **Select device-profile template**

- Select a **Vendor**.
- Select from the **Device Profile Template**, from the dropdown menu

- Click on **Confirm**

- Click on **“Submit”** to save the Device profile

7.2. Add Device Profile Manually

- Configure device profile based on the documentation from your device vendor:
 - Assign a name for the device
 - Enter the Description
 - Enter MAC version and regional parameters revision appropriate for your device. Default MAC version is LoRaWAN 1.0.2 and Regional parameters revision as RP002-1.0.2.
 - Enter the Expected uplink interval in seconds

Add Device Profile

[Select device-profile template](#)

GENERAL
JOIN
CLASS B
CLASS C
CODEC

Name*

Description

MAC version*

Regional parameters revision*

☒ Flush queue on activate

Expected uplink interval (secs)*

Device-status request frequency (req/day)

Discard
Submit

- Select **CODEC** tab, and enter the Decoder code here.

Add Device Profile

[Select device-profile template](#)

GENERAL
JOIN
CLASS B
CLASS C
CODEC

```

/**
 * Decode uplink function
 */
 * @param (object) input
 * @param (number[]) input.Bytes Byte array containing the uplink payload, e.g. [255, 230, 255, 0]
 * @param (number) input.Port Uplink Port
 * @param (Record<string, string>) input.variables Object containing the configured device variables.
 *
 * @returns ([data: object]) Object representing the decoded payload.
 */
function decodeUplink(input) {
  return {
    data: {
      // temp: 22.5
    }
  };
}

/**
 * Encode downlink function.

```

Enter the Decoder code here

Discard
Submit

- Contact your device vendor to obtain the decoder script.
For Example: For Tektelic devices, go to [LoRa Alliance Payload Codec 1.0.0](#) folder in [Tektelic GitHub](#) (LoRa Alliance format).

TektelicCommunications / data-converters
(Public)

<> Code
Issues 3
Pull requests
Actions
Projects
Security
Insights

master
2 Branches
0 Tags

kschluff-tektelic Merge pull request #5 from TektelicCommunications/seal-v1.0

7c7ef2d · 8 months ago

39 Commits

Encoders

add seal 1.0 converters

8 months ago

LoRa Alliance Payload Codec 1.0.0

add seal 1.0 converters

8 months ago

TTN v2

add seal 1.0 converters

8 months ago

- Choose the folder named according to your device type

Name	Last commit message	Last commit date
..		
agro	Replaced US916 with US915	last year
aura-flux	Added separate folder for Tektelic v2	last year
breeze	Replaced US916 with US915	last year
comfort-vivid	Replaced US916 with US915	last year

- Copy the code and insert it into Device Profile Codec tab

neerajsunil Replaced US916 with US915

5b93cfc · 2 years ago History

Code Blame 1384 lines (1370 loc) · 37.6 KB

Raw

```

1 function decodeUplink(input){
2
3     var decoded_data = {};
4     var decoder = {};
5     var errors = [];
6     var bytes = convertToUint8Array(input.bytes);
7     decoded_data['raw'] = toHexString(bytes).toUpperCase();
8     decoded_data['fPort'] = input.fPort;

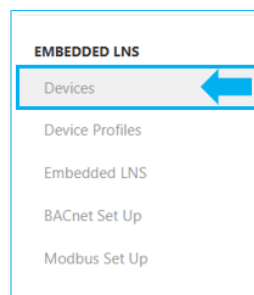
```

- Click on “**Submit**” to save the Device profile

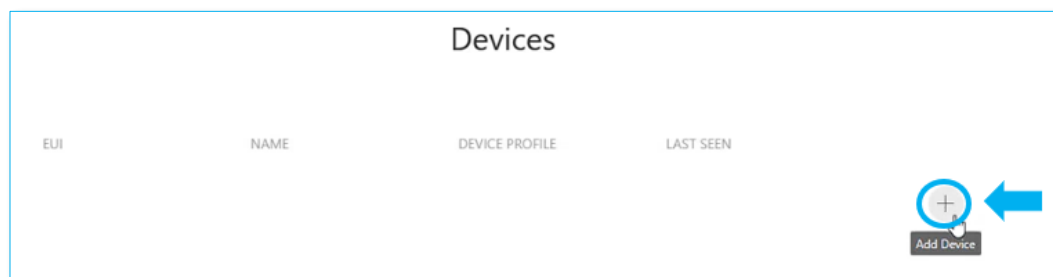
Discard

Submit

5. Navigate to **Devices** section.

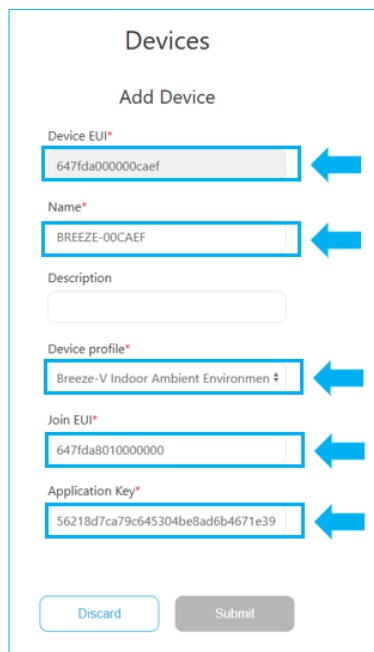


6. Click on **Add Device**



7. Configure device parameters:

- DevEUI (Device Unique Identifier)
- Name
- Device profile (chose existing from the dropdown list)
- JoinEUI (Join Server Identifier)
- Application Key (on submit)



The screenshot shows a web form titled "Devices" with a sub-header "Add Device". The form contains the following fields and controls:

- Device EUI***: A text input field containing "647fda00000caef".
- Name***: A text input field containing "BREEZE-00CAEF".
- Description**: An empty text input field.
- Device profile***: A dropdown menu showing "Breeze-V Indoor Ambient Environmen #".
- Join EUI***: A text input field containing "647fda8010000000".
- Application Key***: A text input field containing "56218d7ca79c645304be8ad6b4671e39".
- Buttons**: "Discard" and "Submit" buttons at the bottom.

Blue boxes and arrows highlight the Device EUI, Name, Device profile, Join EUI, and Application Key fields, indicating they are the focus of the configuration step.

8. Click on **Submit**.



This screenshot shows the bottom of the form with two buttons: "Discard" and "Submit". The "Submit" button is highlighted in blue, indicating it is the button to be clicked.

9. When first added, the device is marked as '**Never seen**'. You can either force the device to rejoin the network or wait for the next uplink, which will automatically update the '**Last Seen**' status.

Devices

Successfully Added Device

EUI	NAME	DEVICE PROFILE	LAST SEEN
647fda000000caef	BREEZE-00CAEF	Breeze-V Indoor Ambient Environment Monitoring	Never Seen

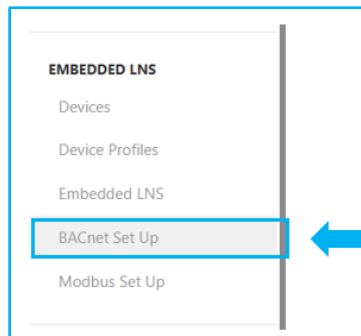
Devices

EUI	NAME	DEVICE PROFILE	LAST SEEN
647fda000000caef	BREEZE-00CAEF	Breeze-V Indoor Ambient Environment Monitoring	2025-06-10 16:46:50

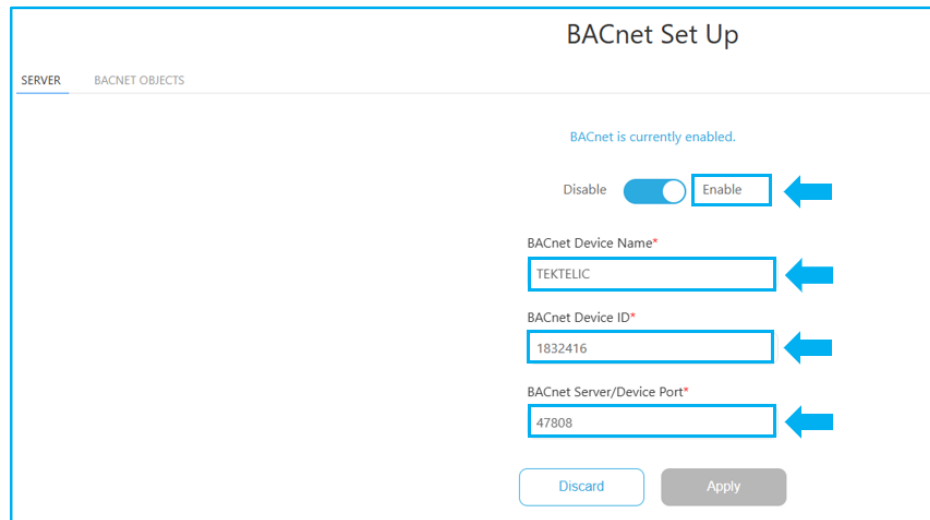
3. Application Specific Configurations

3.1 Connecting to BACnet IP

1. Login to Kona Link web page using “Host Name” or “IP Address”:
 - Using “Host Name”
Host Name URL: https://kona-<GW variant>-<last 6 digit GW ID>.local/
Eg: https://kona-micro-0011ab.local/
 - Using “IP Address”
IP Address URL: https://<GW IP Address>/
Eg: https://192.0.2.111/
2. Navigate to **BACnet Set Up**



3. “**Enable**” the BACnet server, the default setting is “Disable”
4. Enter the details in Name, Device Id and Device Port fields

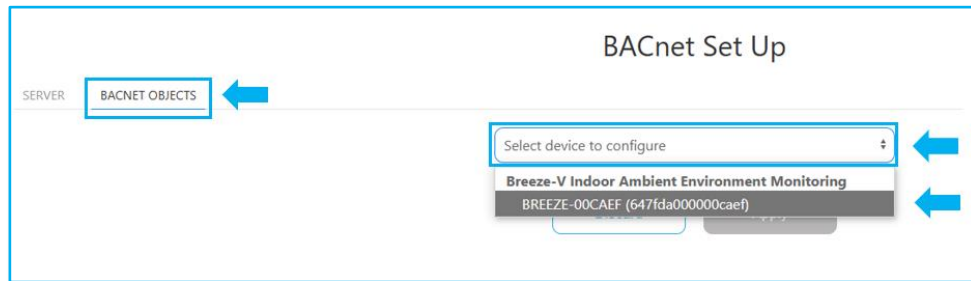
A screenshot of the "BACnet Set Up" configuration page. The page has two tabs: "SERVER" and "BACNET OBJECTS". The "SERVER" tab is active. The page shows a status message "BACnet is currently enabled." and a toggle switch set to "Enable". Below this are three input fields: "BACnet Device Name*" with the value "TEKTELIC", "BACnet Device ID*" with the value "1832416", and "BACnet Server/Device Port*" with the value "47808". At the bottom are "Discard" and "Apply" buttons. Blue arrows point to the "Enable" toggle, the "BACnet Device Name" field, the "BACnet Device ID" field, and the "BACnet Server/Device Port" field.

5. Switch to “**BACnet Objects**” tab to configure BACnet objects.
6. Select from the devices already configured. (Please note the devices are organized by Device Type)

7. Device Selection and BACnet Object Configuration:

7.1. BACnet Object Configuration for TEKTELIC Devices

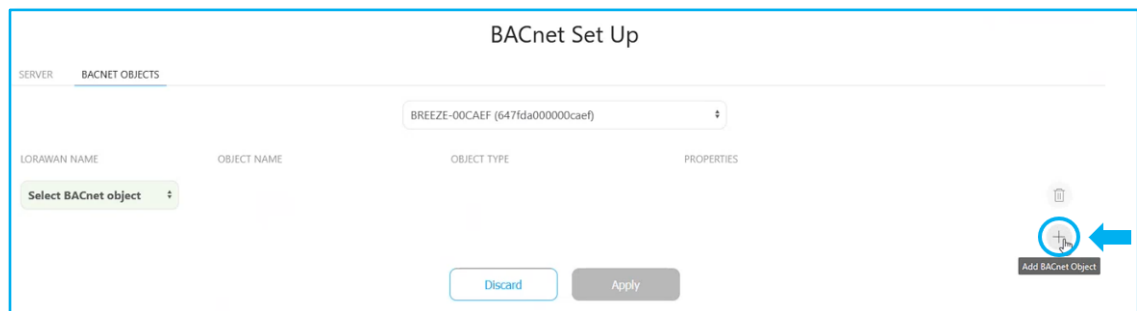
- Click on Select device-profile template



NOTE: BACnet objects are automatically be created upon receiving an LoRaWAN Uplink. Alternately, users may follow “Manual configuration of BACnet Objects” steps to setup BACnet objects.

NOTE: Only “Uplink” objects are created automatically, BACnet objects used to send LoRaWAN Downlinks must be configured manually by the user following the steps for “Manual configuration of BACnet Objects”.

- Steps for Manual Configuration of BACnet Objects
 - Click on “**Add**” BACnet Objects



- b. Select the BACnet object, i.e the LoRaWAN parameter name from the drop down.

The screenshot shows the 'BACnet Set Up' interface. At the top, there's a 'SERVER' tab and a 'BACNET OBJECTS' tab. Below the tabs, there's a dropdown menu for the server ID, currently showing 'BREEZE-00CAEF (647fda000000caef)'. Below this, there are four columns: 'LORAWAN NAME', 'OBJECT NAME', 'OBJECT TYPE', and 'PROPERTIES'. The 'LORAWAN NAME' dropdown is open, showing a list of parameters. 'temperature' is highlighted. A blue arrow points to this dropdown. Below the dropdown, there are 'Discard' and 'Apply' buttons. At the bottom, there's a copyright notice: 'Copyright © 2022-2024 TEKTELIC Communications Inc. KONA Link v1.0.6'.

- c. The Object Name, Object Type and Properties (units) are populated automatically. User may modify these fields as needed.

The screenshot shows the 'BACnet Set Up' interface with the 'LORAWAN NAME' dropdown set to 'temperature'. The 'OBJECT NAME' field is populated with '647fda000000caef-temperature'. The 'OBJECT TYPE' dropdown is set to 'Analog Input'. The 'PROPERTIES' field has a 'Units' dropdown set to 'Degrees Celsius'. Below these fields are 'Discard' and 'Apply' buttons.

- d. The Object Type for an Uplinks are typically Multi-state Input, Character string value, Analog Input, or Binary Input. Object types used for downlinks are typically Analog Value, Binary Value, Character String Value, or Octet String Value.

The screenshot shows the 'OBJECT TYPE' dropdown menu. The dropdown is open, showing a list of options. 'Multi-state Input' is highlighted. Blue arrows point to the 'Multi-state Input' option and the 'Analog Input' option.

- e. Repeat the steps above to add all required BACnet uplink and downlink objects.
- f. Click on **“Apply”**

The screenshot shows the 'BACnet Set Up' interface with the 'BACNET OBJECTS' tab selected. A dropdown menu at the top shows 'BREEZE-00CAEF (647fda000000caef)'. Below is a table with columns: LORAWAN NAME, OBJECT NAME, OBJECT TYPE, and PROPERTIES. The table contains three rows: 'temperature' (Analog Input, Degrees Celsius), 'loramac_opts' (Octet String Value), and 'relative_humidity' (Analog Input, Percent). At the bottom, there are 'Discard' and 'Apply' buttons, with a blue arrow pointing to the 'Apply' button.

LORAWAN NAME	OBJECT NAME	OBJECT TYPE	PROPERTIES
temperature	647fda000000caef-temperature	Analog Input	Units: Degrees Celsius
loramac_opts	647fda000000caef-loramac_opts	Octet String Value	
relative_humidity	647fda000000caef-relative_humidity	Analog Input	Units: Percent

7.2. Manul Configuration of BACnet Objects

- Click on “Select device to configure” and choose the Custom Device.

The screenshot shows the 'BACnet Set Up' interface with the 'BACNET OBJECTS' tab selected. A dropdown menu is open, showing the option 'Custom Device' selected. Below it are two other options: 'Pelican (647fda000001dae9)' and 'Breeze-V Indoor Ambient Environment Monitoring BREEZE-00CAEF (647fda000000caef)'.

- Steps for Manual Configuration of BACnet Objects
 - a. Click on “+” to add a BACnet Object

The screenshot shows the 'BACnet Set Up' interface with the 'BACNET OBJECTS' tab selected. The dropdown menu shows 'Pelican (647fda000001dae9)'. Below is a table with columns: LORAWAN NAME, OBJECT NAME, OBJECT TYPE, and PROPERTIES. The table is empty, and a message box says 'BACnet object mappings haven't been added yet. Add some to see them here.' At the bottom, there are 'Discard' and 'Apply' buttons. On the right side, there is a blue circular button with a plus sign and a downward arrow.

- b. User can enter the **LoRaWAN Name** (ensuring it matches the parameter name used in the LoRaWAN decoder), along with the **Object Name**, **Object Type**, and **Properties** (such as units).

The screenshot shows the 'BACnet Set Up' interface. At the top, there's a dropdown menu for 'Pelican (6475da000001dae9)'. Below it is a table with columns: 'LoRaWAN NAME', 'OBJECT NAME', 'OBJECT TYPE', and 'PROPERTIES'. The table contains three rows of existing objects and one row for a new object where the input fields are highlighted with blue boxes.

LoRaWAN NAME	OBJECT NAME	OBJECT TYPE	PROPERTIES
rem_batt_days	6475da000001dae9 rem_batt_days	Analog Input	Units: No Units
Location_Latitude	6475da000001dae9 Location_Latitude	Analog Input	Units: Degrees Angular
rem_batt_capacity	6475da000001dae9 rem_batt_capacity	Analog Input	Units: No Units
Enter LoRaWAN name	Enter Object name	Analog Input	Units: No Units

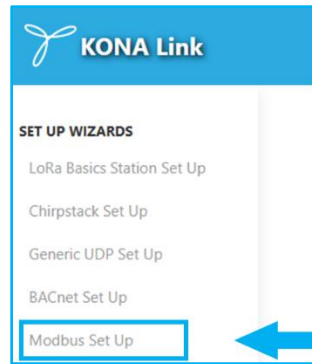
At the bottom of the table, there are two buttons: 'Discard' and 'Apply'.

- g. Repeat the steps above to add all required BACnet uplink and downlink objects.
h. Click on **“Apply”**

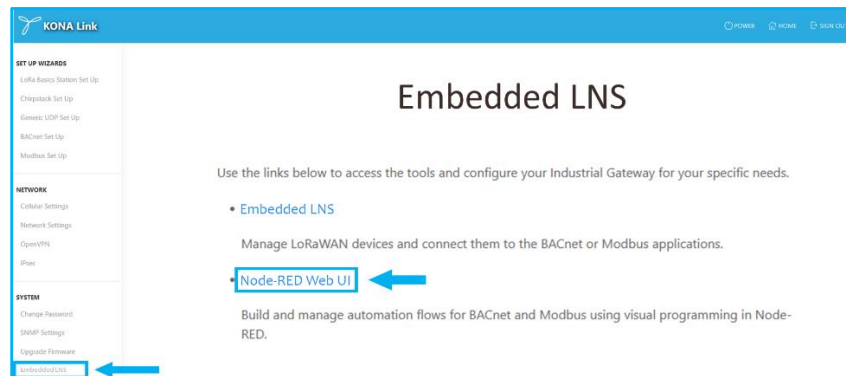
3.2 Connecting to Modbus TCP/IP

NOTE: Before moving on to Modbus Configurations in Node Red, Gateways, Devices and Codec should be registered and configured correctly. And Device should join and send uplinks successfully.

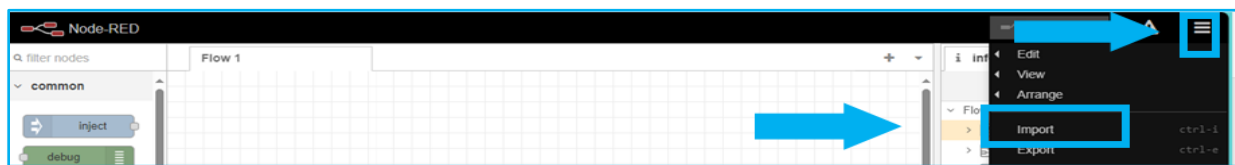
- Login to Kona Link web page using “Host Name” or “IP Address”:
 - Using “Host Name”
Host Name URL: <https://kona-<GW variant>-<last 6 digit GW ID>.local/>
Eg: <https://kona-micro-0011ab.local/>
 - Using “IP Address”
IP Address URL: <https://<GW IP Address>/>
Eg: <https://192.0.2.111/>
- In SET UP WIZARDS section use Modbus Set Up to enable Modbus



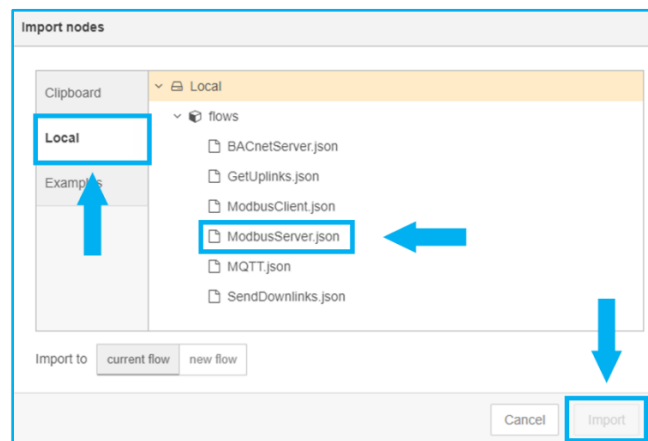
3. Follow the **Node-RED Web UI** link in Embedded LNS subsection in Kona Link



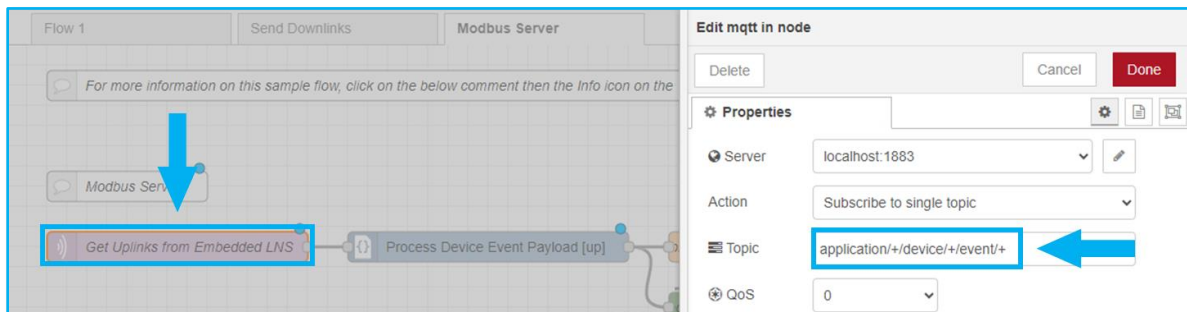
4. In a new flow go to menu and select **Import**



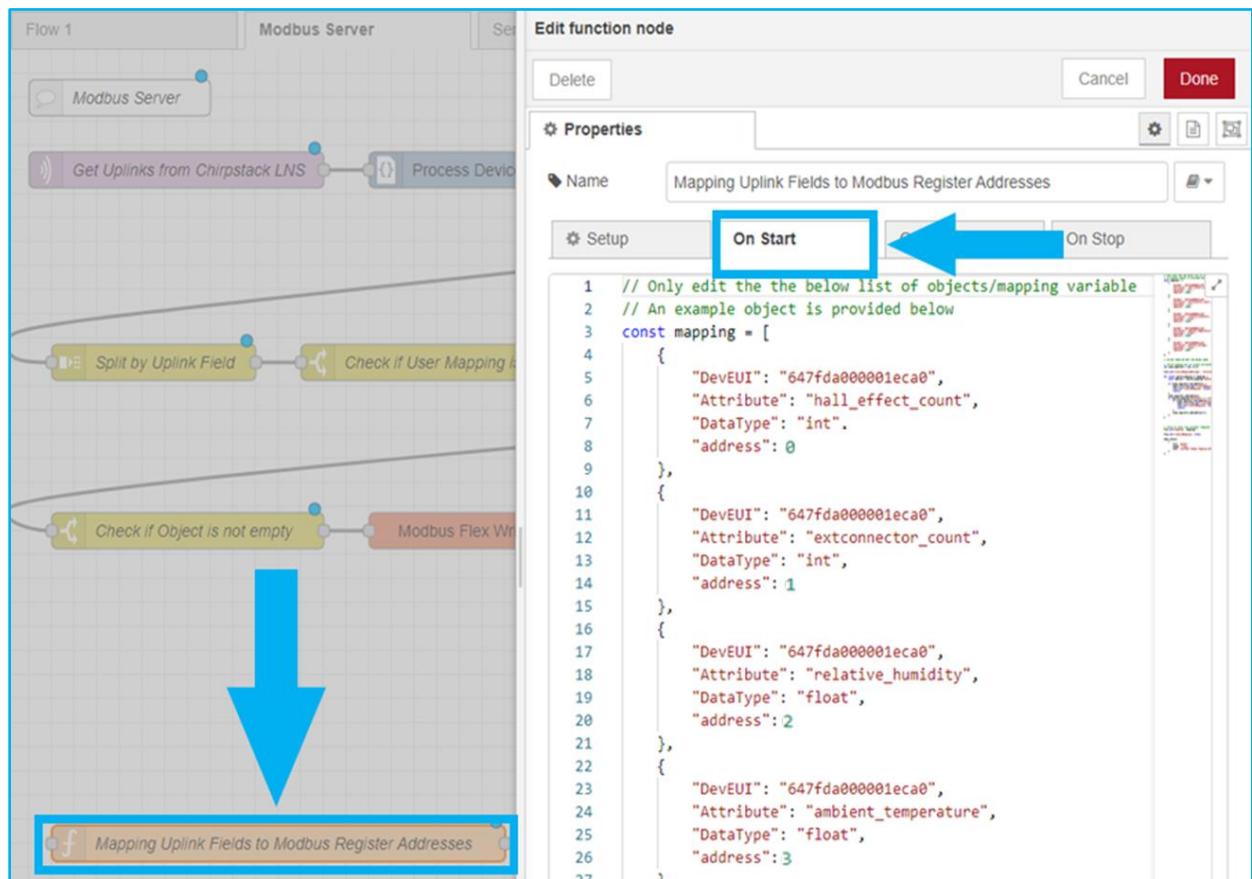
5. Go to section **Local** and select **Modbus Server** flow:



6. In the Modbus Server flow and in the **Get Uplinks from Embedded LNS** node, configure the following. Set the subscription topic to match the one being used by your LoRaWAN device (e.g., device uplinks) or leave default.



7. In **Mapping Uplink Fields to Modbus Register Addresses** node Open the **On Start** tab.



8. Add a mapping object for all possible uplink fields for each and every device you would like. The four attributes required for each mapping object are as follows:
- DEVEUI: The device EUI for a given device
 - Attribute: The uplink field name exactly as it is written in the decoded uplink object.
 - DataType: Choose between float (decimal number), int (16-bit unsigned integer) and int32 (32-bit signed integer). Please note that floats and int32 require 2 contiguous

registers. So, for example, if you have an uplink field that is a float assigned to register 0, then both 0 and 1 register addresses are unavailable.

- address: The Modbus register address that you would like the above specified attribute to write to.

9. Deploy the changes. The data from the uplink should now be available in Modbus format.

3.3 Send Decoded Uplink to External MQTT Broker

1. Login to Kona Link web page using “Host Name” or “IP Address”:

- Using “Host Name”

Host Name URL: <https://kona-<GW variant>-<last 6 digit GW ID>.local/>

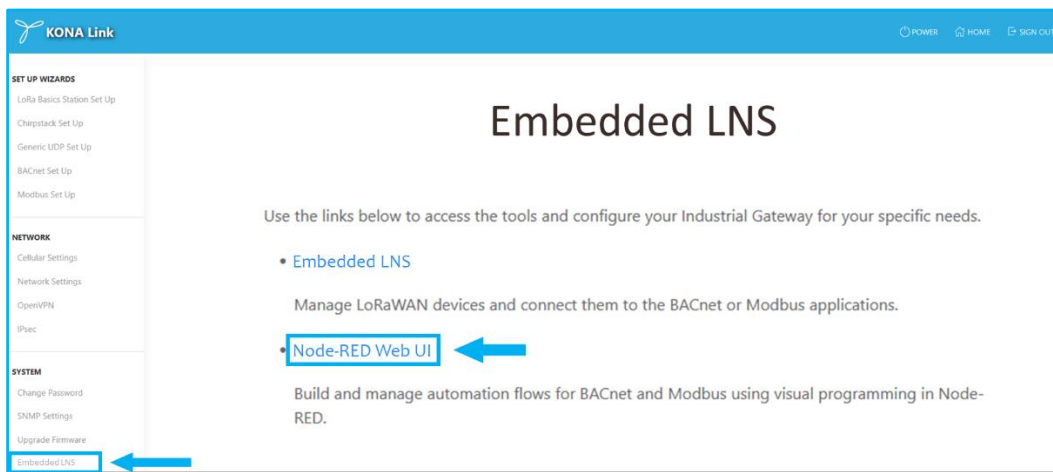
Eg: <https://kona-micro-0011ab.local/>

- Using “IP Address”

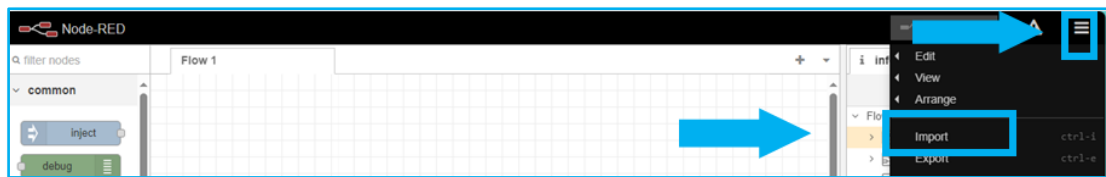
IP Address URL: <https://<GW IP Address>/>

Eg: <https://192.0.2.111/>

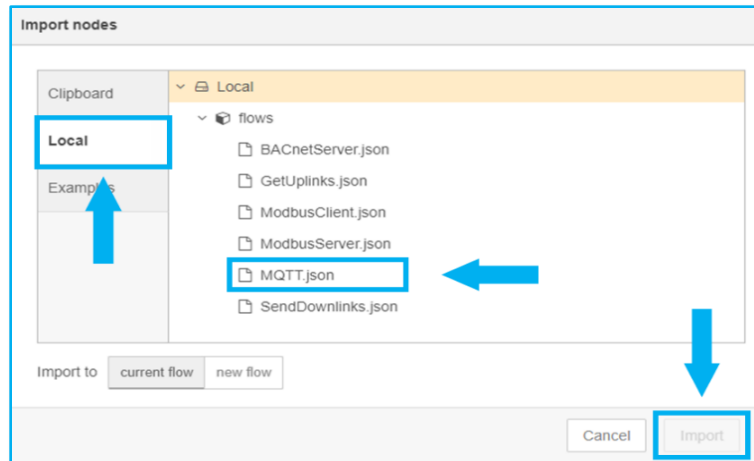
2. Follow the **Node-RED Web UI** link in Embedded LNS subsection in Kona Link



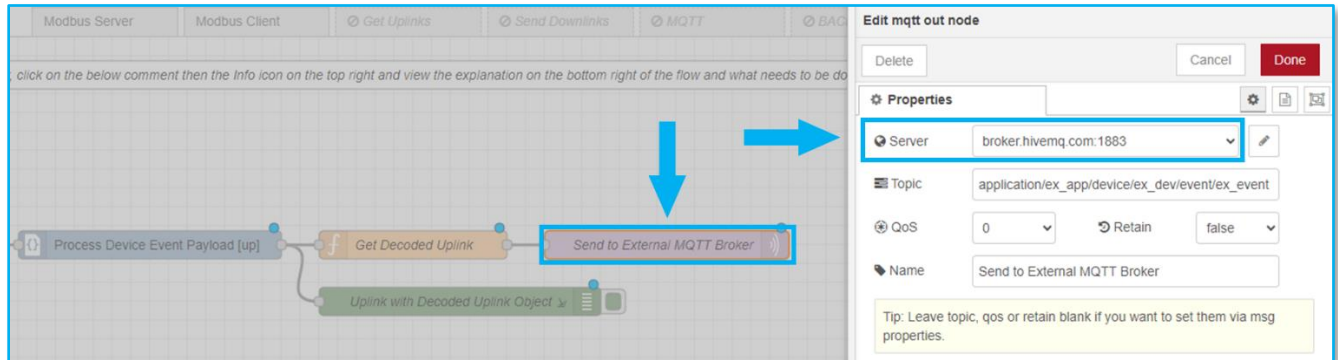
3. In a new flow go to menu and select **Import**



4. Go to section Local and select **MQTT.json** flow for your application:



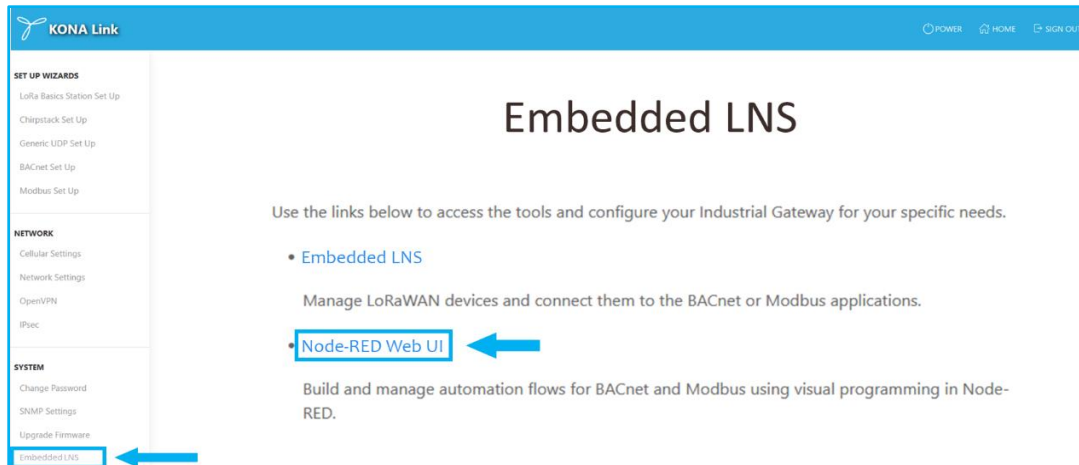
5. In **Send External MQTT Broker** node in Server field enter the address of the MQTT broker you wish to use



6. Deploy the flow.

3.4 Get Decoded Uplinks from Chirpstack LNS to Node Red

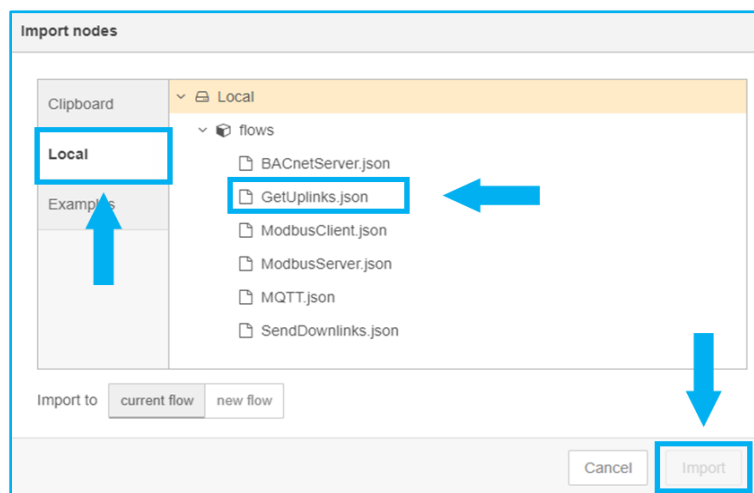
1. Login to Kona Link web page using "Host Name" or "IP Address":
 - Using "Host Name"
Host Name URL: <https://kona-<GW variant>-<last 6 digit GW ID>.local/>
Eg: <https://kona-micro-0011ab.local/>
 - Using "IP Address"
IP Address URL: <https://<GW IP Address>/>
Eg: <https://192.0.2.111/>
2. Follow the **Node-RED Web UI** link in Embedded LNS subsection in Kona Link



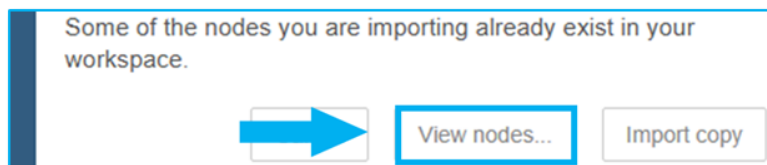
3. In a new flow go to menu and select **Import**



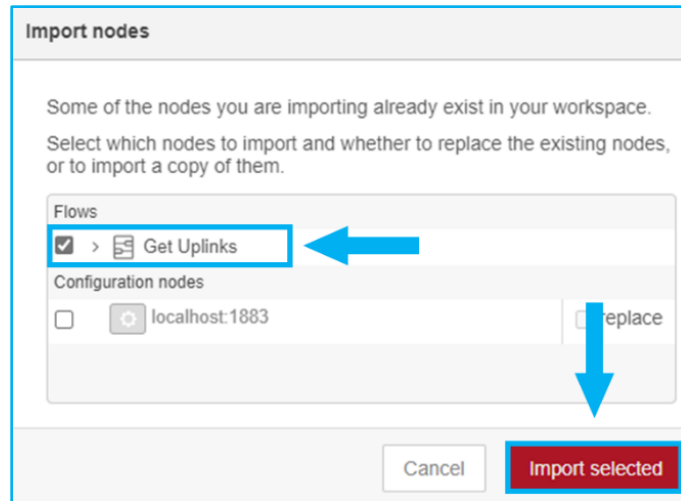
4. Go to section Local and select **GetUplinks** flow for your application:



5. On the incoming warning message, click on **View nodes**.



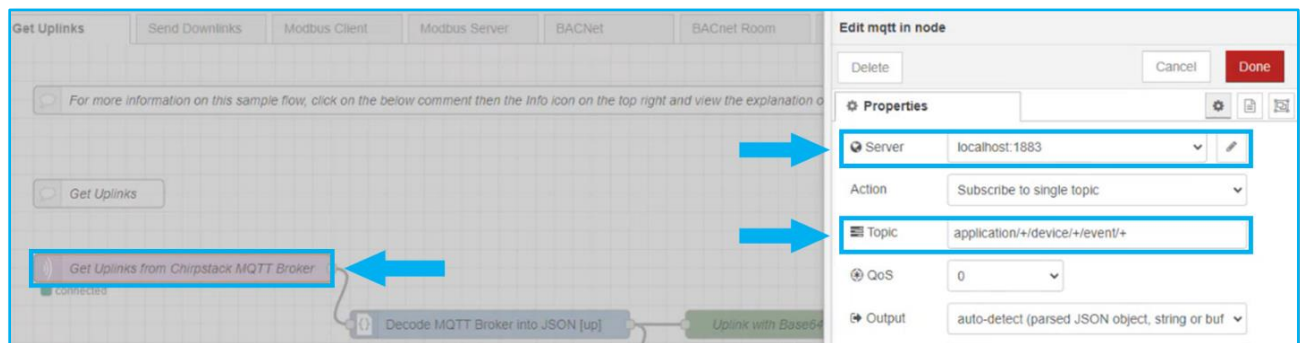
6. On the Import nodes window, ensure that only Get Uplinks is checked, then click on **Import selected**.



7. In GetUplinks flow configure Get Uplinks from Embedded LNS MQTT Server input node:

1.1. Server: localhost:1883 for Embedded LNS

1.2. Topic: Set the subscription topic to match the topic of your LoRaWAN device (e.g., device uplink).



8. Once you receive the uplink data, use a function node to process it. You may need to decode the payload using a data converter if Embedded LNS is set up with the correct profiles.

9. After decoding the data, you can use it to trigger other actions, such as sending data to a database, displaying it on a dashboard, or forwarding it to other systems.

10. Deploy the flow.

4. Troubleshooting

4.1 Check gateway Configuration

1. If the user has trouble connecting, check the gateway BSP version
2. If your Gateway was shipped with BSP version 7.10.12 or earlier, follow the below steps to check if the Gateway is listed.

a. Login to Kona Link web page using “Host Name” or “IP Address”:

- Using “Host Name”

Host Name URL: <https://kona-<GW variant>-<last 6 digit GW ID>.local/>

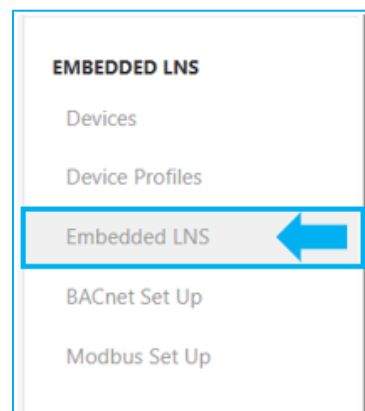
Eg: <https://kona-micro-0011ab.local/>

- Using “IP Address”

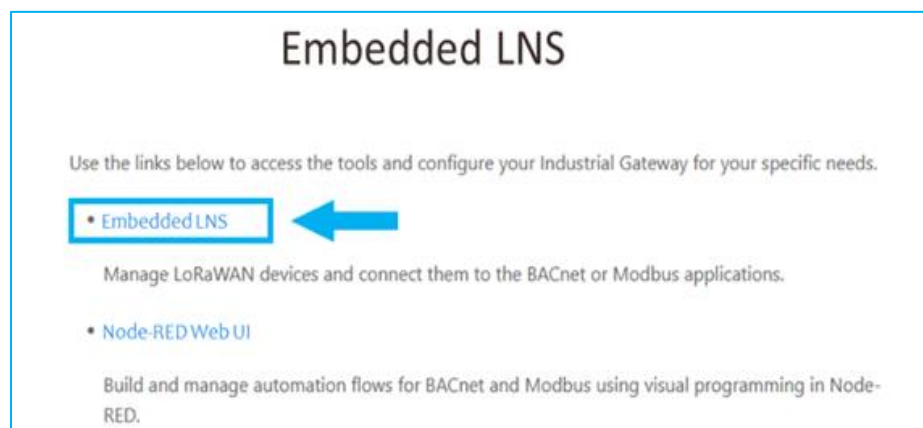
IP Address URL: <https://<GW IP Address>/>

Eg: <https://192.0.2.111/>

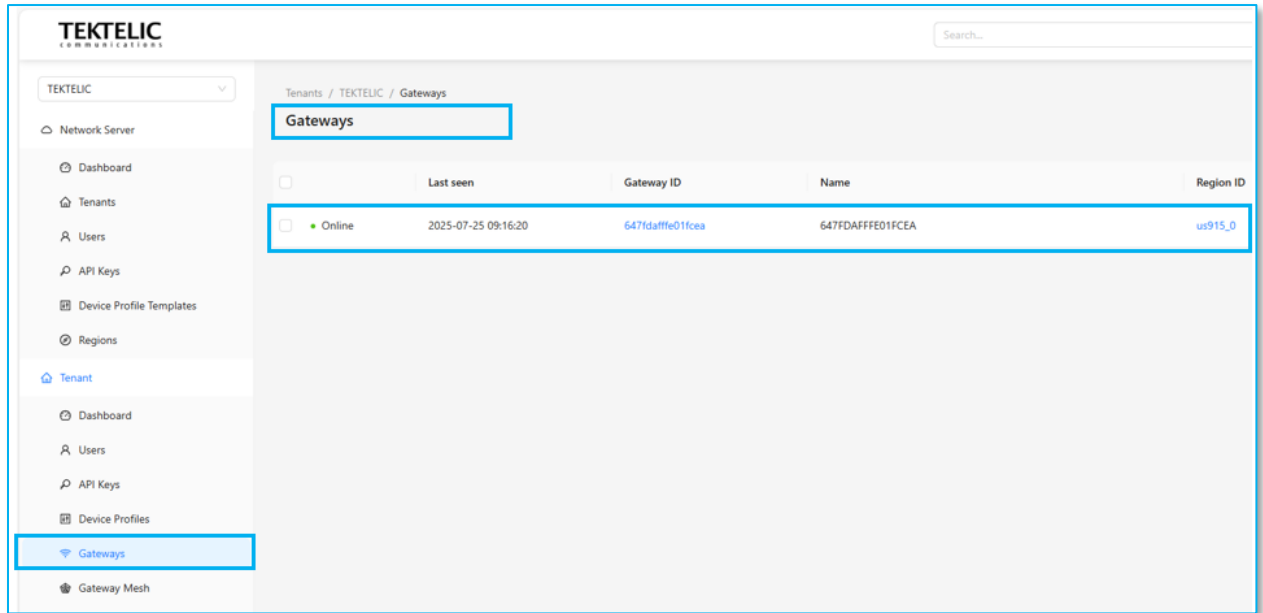
b. Navigate to Embedded LNS



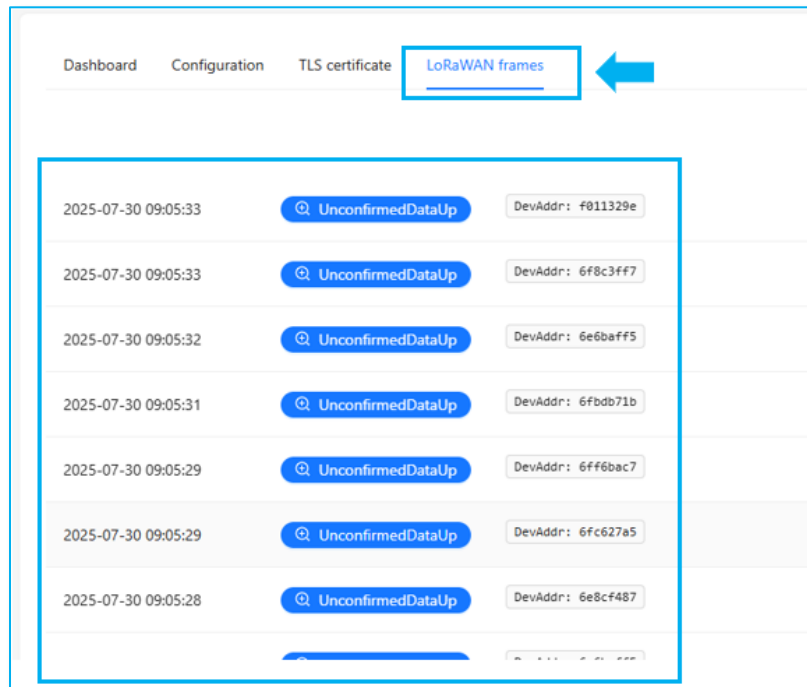
c. Log into Embedded LNS Network Server by Embedded LNS link in Kona Link Embedded LNS link in Kona Link.



d. Navigate to Gateway section, and verify if a gateway is listed.



3. If the gateway is listed,
 - a. Click on “Gateway ID”
 - b. Select “LoRaWAN frames” tab
 - c. Verify if the packets are being received



4. If the gateway is not listed,
 - a. Click on “Add gateway”, using the Gateway ID shown on the KONA Link home page.

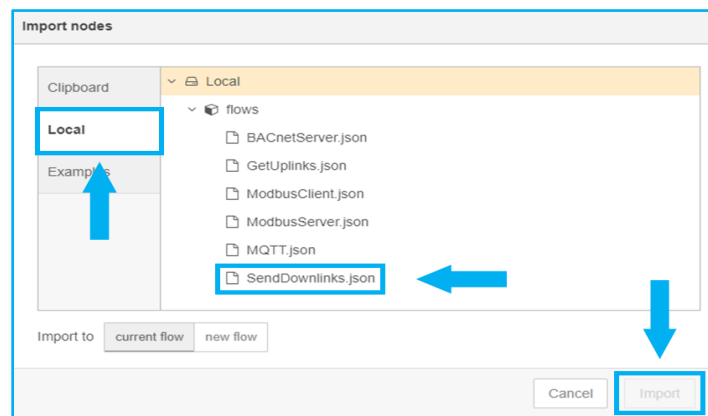


4.2 Sending Downlinks to Embedded LNS

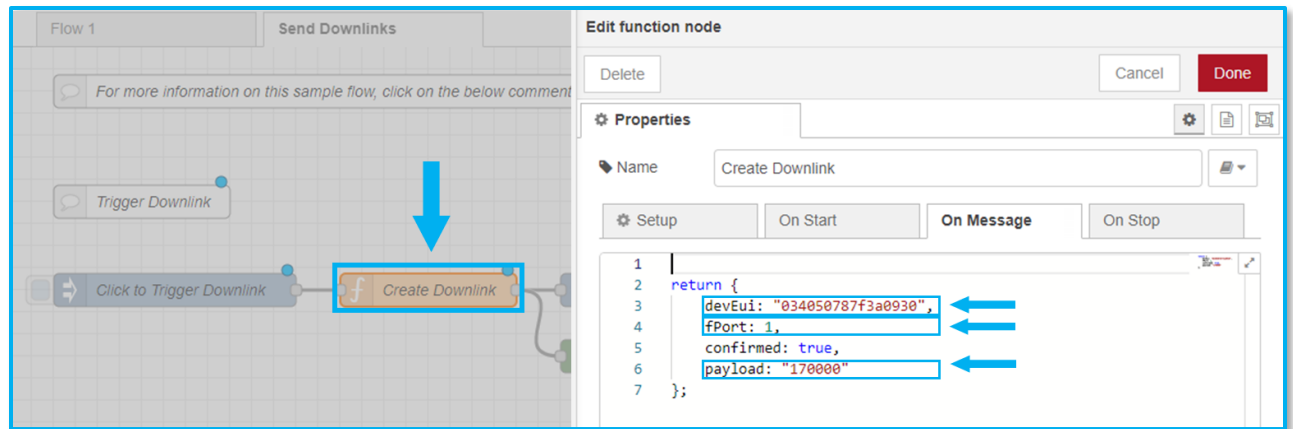
5. In a new flow go to menu and select **Import**



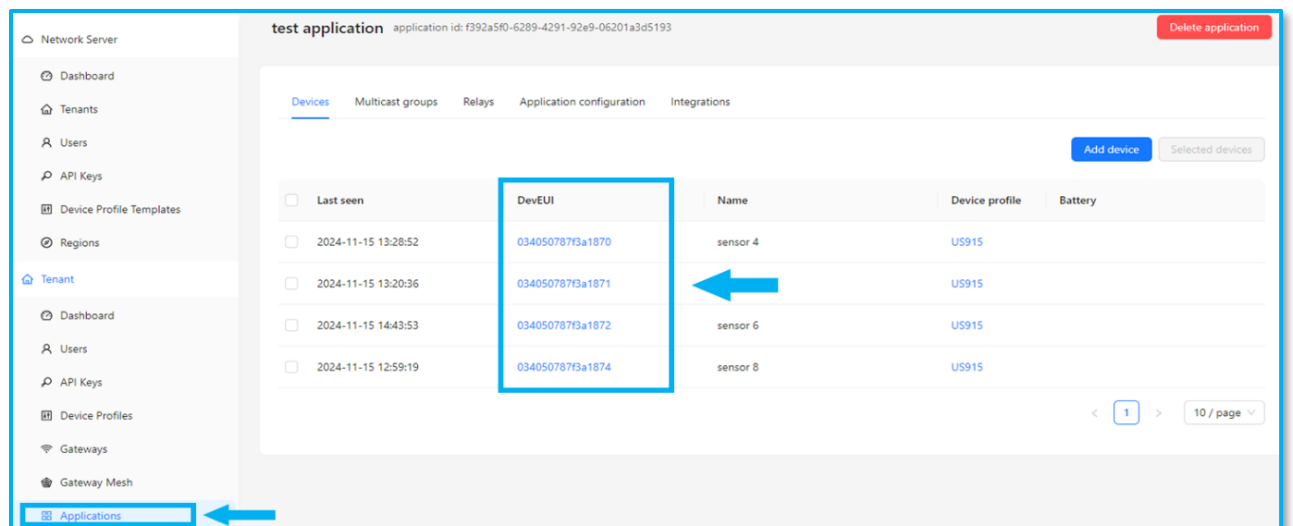
6. Go to section Local and select **SendDownlinks** flow for your application:



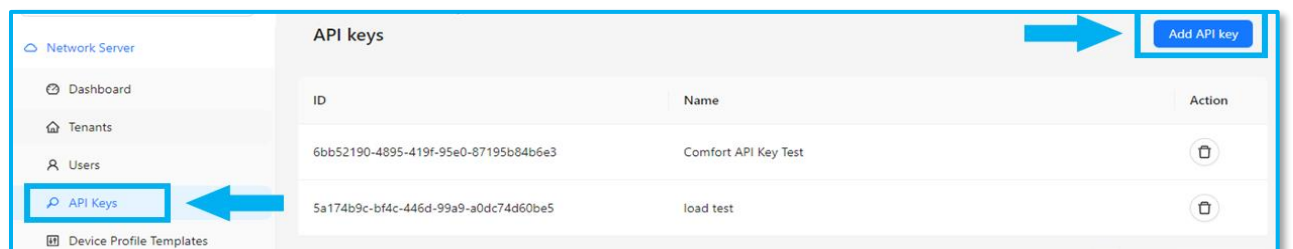
7. Click twice on **Send Downlink** and configure deveui, fPort and payload for your device according to the device documentation. For TEKTELIC devices, you can use the KONA Atlas tool to generate the payload.



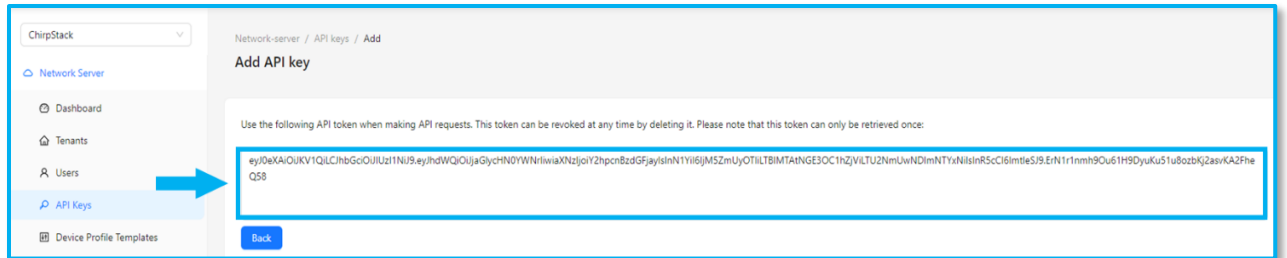
8. To get the DevEUI go to **Application** section in Embedded LNS and pick the application.
In Devices section pick the **DevEUI** of the Device.



9. In Embedded LNS go to **API Keys** section and click on **Add API Key**

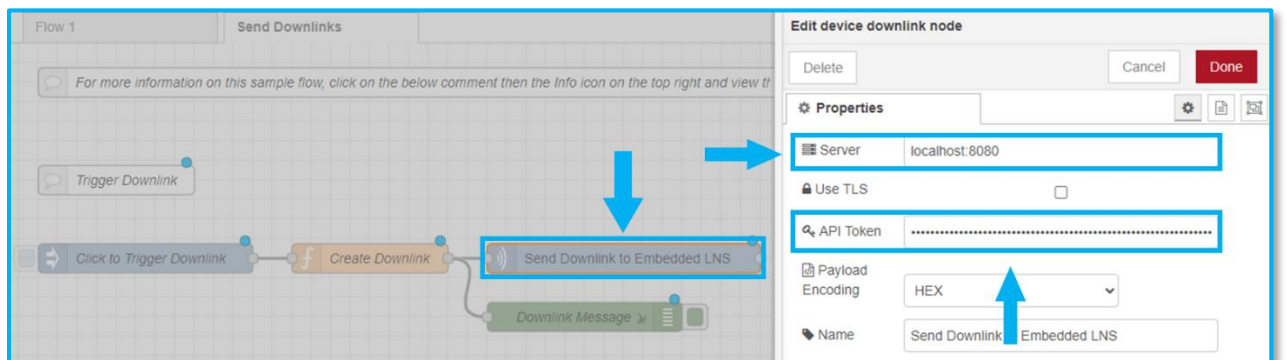


10. Record and copy the API key then click on **“Back”**. It is critical that this key is recorded as it cannot be viewed again in the future. If the key is lost, you will need to generate a new one.



11. Back in NodeRED:

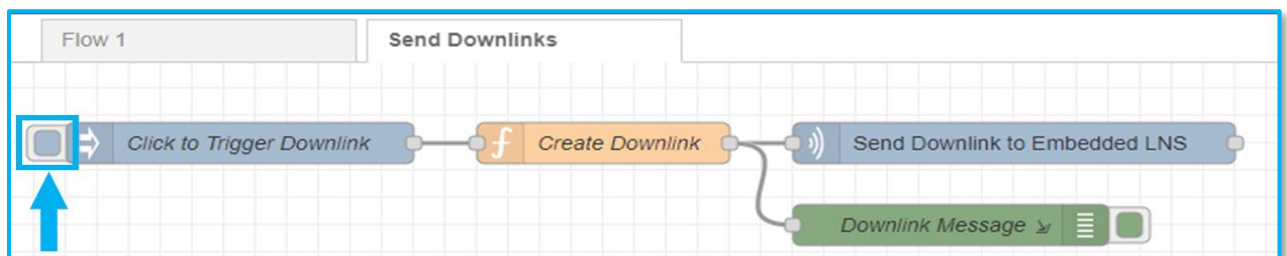
- Double click on Send Downlink to Embedded LNS
- make sure the Server is localhost:8080
- insert API Token (Key) you got from Embedded LNS into API Token line
- Click on **“Done”** and then after window closes click on **“Deploy”**



12. Click on **“Deploy”**

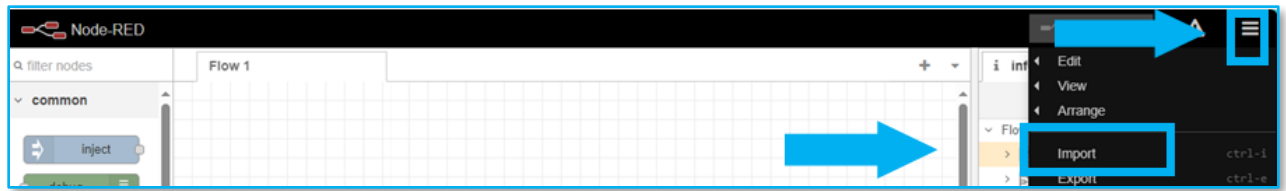


13. Trigger downlink by pushing the activating button

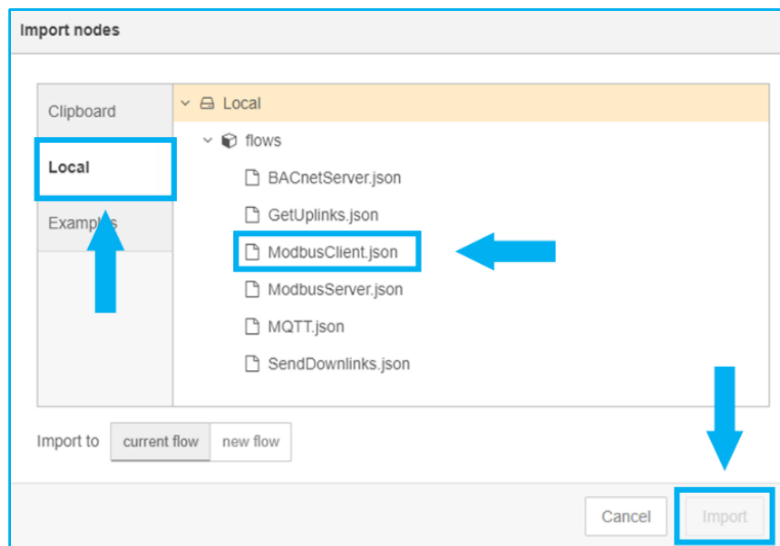


4.3 Configure a Modbus Client

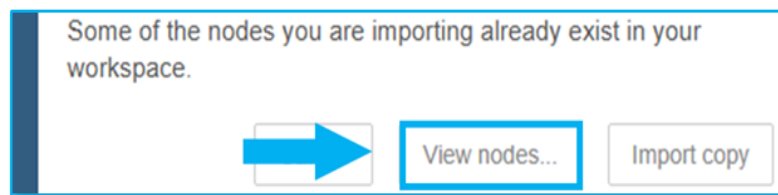
1. In a new flow go to menu and select **Import**



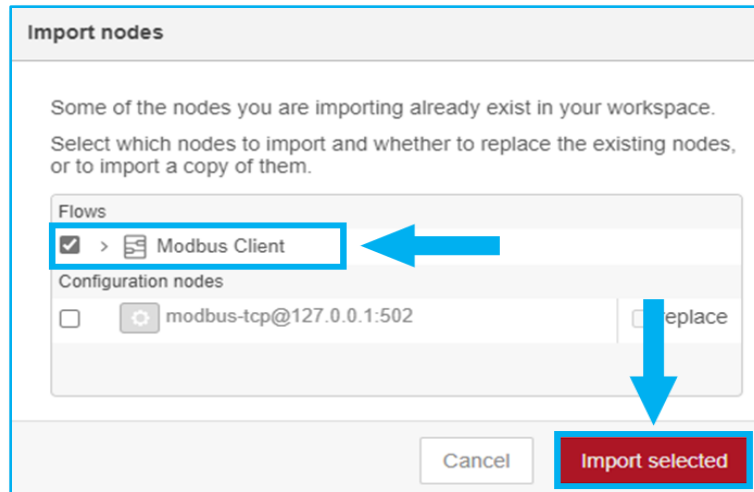
2. Go to section Local and select **Modbus Client** flow:



3. On the incoming warning message, click **View nodes**.

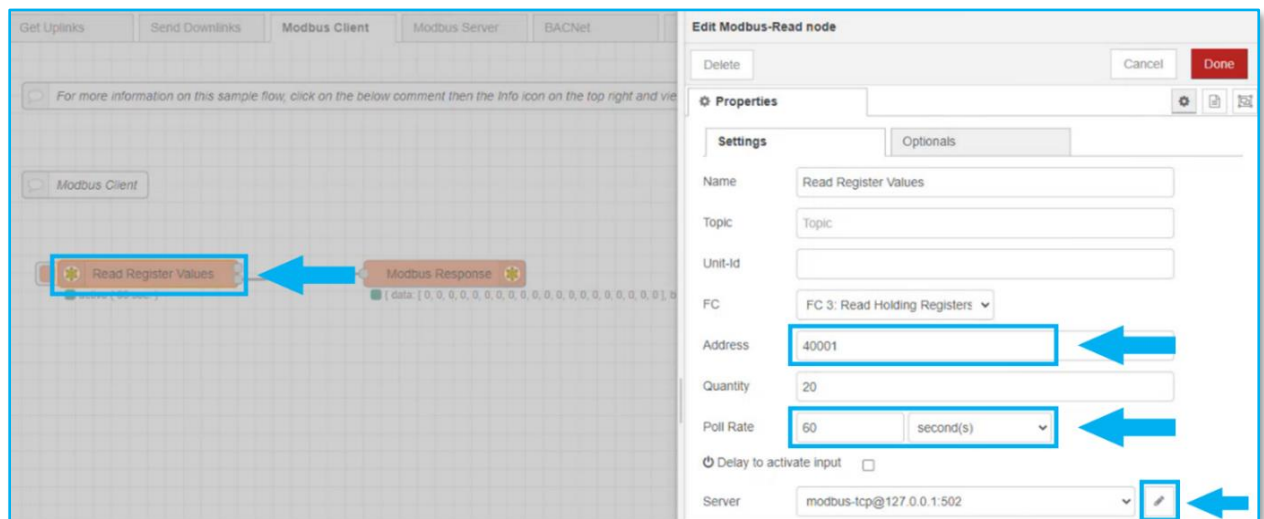


4. On the **Import nodes** window, ensure that only **Modbus Client** is checked, then click on "Import selected".

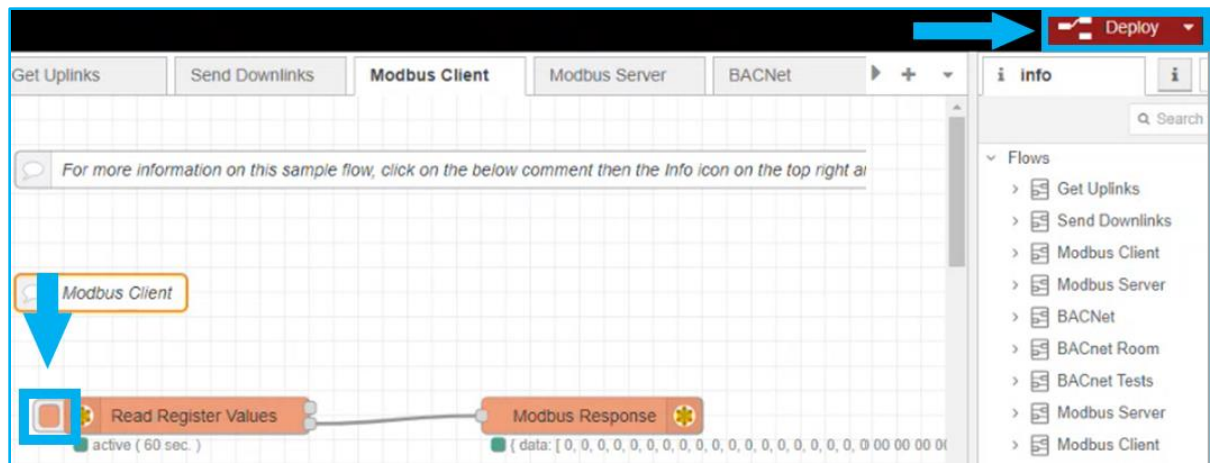


5. In Modbus Client flow in Read Register Values node:

- Address: 40001
- Quantity: 20 (means read 20 registers starting at the 40001 Modbus register address)
- Poll Rate: 60 seconds (value update time period)
- Update the server address

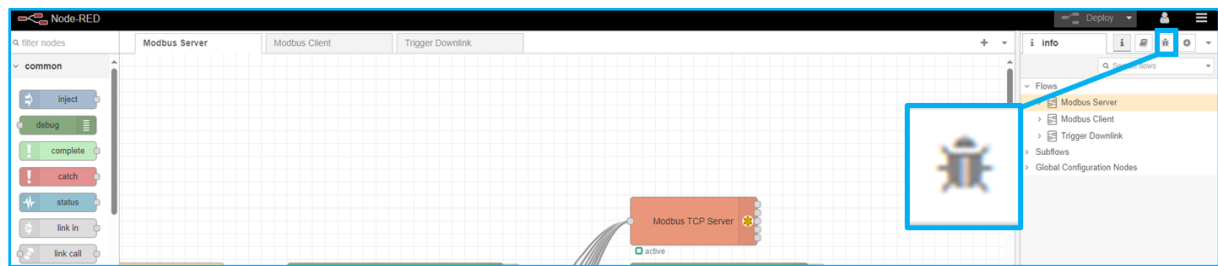


6. Deploy changes. After that you can activate push button to read the Modbus register values.

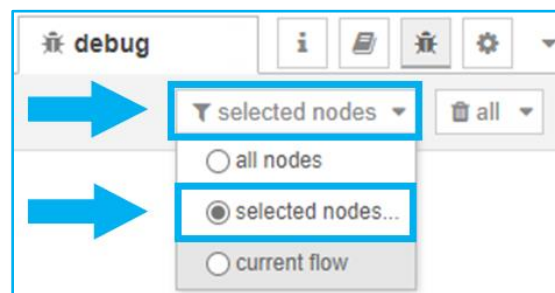


4.4 View Uplink Messages

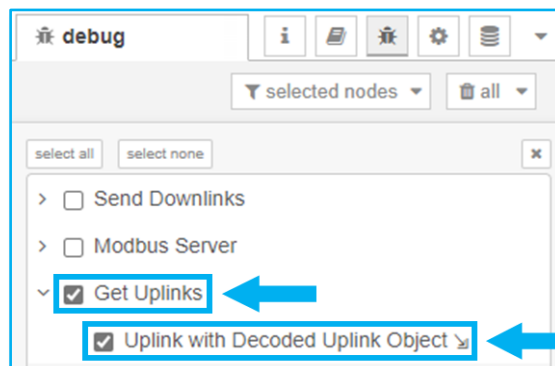
1. In a right panel select the debug icon represented by a bug.



2. In the nodes filter menu click on **selected nodes**



3. Select the flow you want to view uplinks for



4. You will be able to see decoded Uplink messages.

