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# Embedded LNS Gateway Instruction

## BSP 7.1.10.6 Release

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## 1. Introduction

Tektelic Embedded LNS Gateways simplify the integration of LoRaWAN devices with industrial protocols such as MQTT, Modbus TCP/IP, and BACnet 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 ([Section 2](#)):
  - Add Gateways, Devices, and Codecs in the Embedded LNS platform.
  - Enable specific protocol using Kona Link.
2. Protocol-Specific Configuration: Use Node-RED to configure and manage the supported protocols:
  - Modbus TCP/IP: Refer to [Section 3.1](#) for detailed steps.
  - MQTT: Refer to [Section 3.2](#) for configuration instructions.
  - BACnet/IP: Refer to [Section 3.3](#) for setup guidelines.

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

## 2. Configure Embedded LNS

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/>

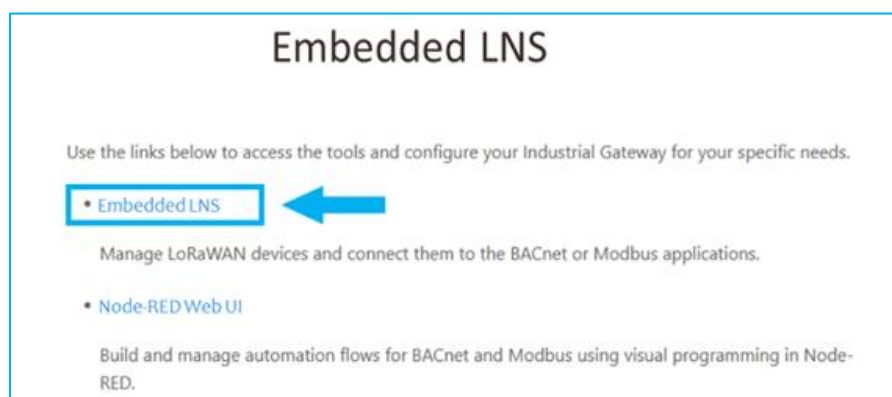
Eg: <https://kona-micro-0011ab.local/>

- Using “IP Address”

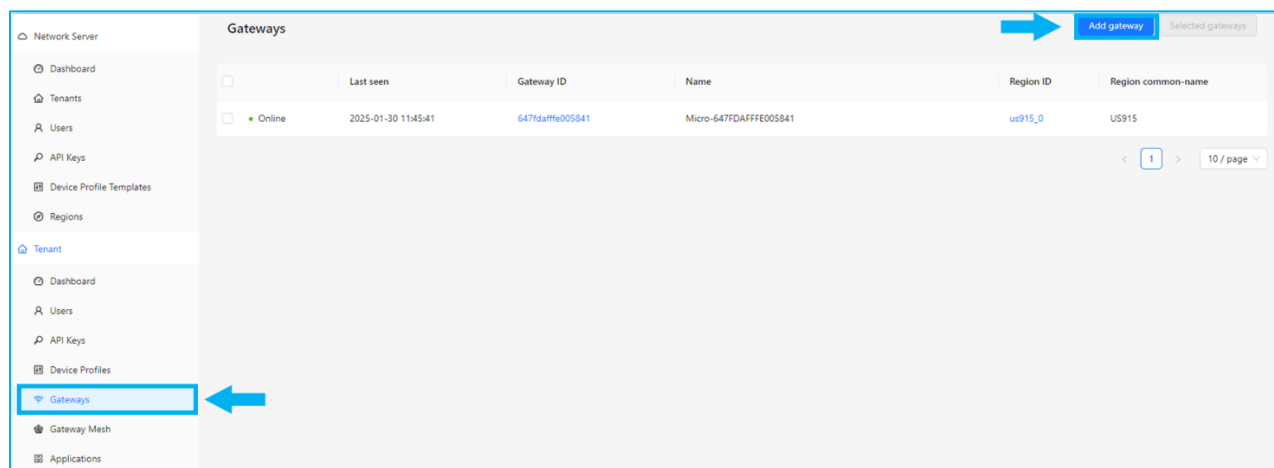
IP Address URL: <https://<GW IP Address>/>

Eg: <https://192.0.2.111/>

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

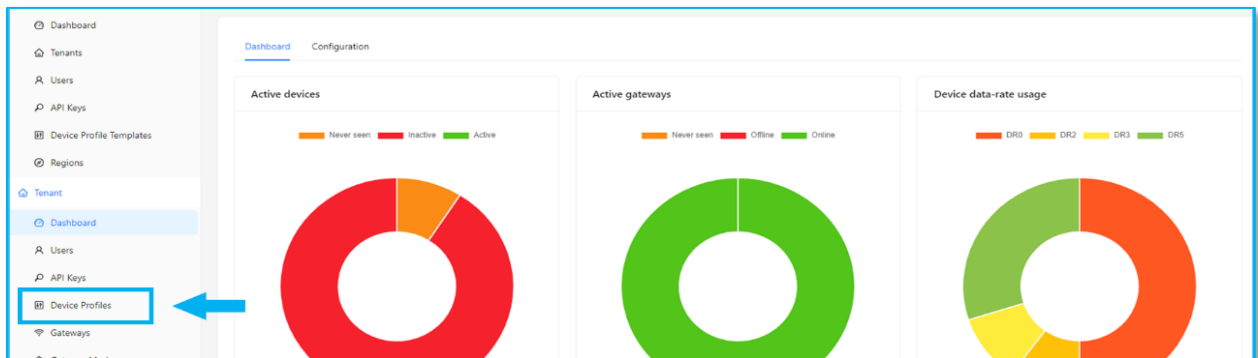


3. Navigate to **Gateway** section and click **Add Gateway**.



4. Provide the **name** and **Gateway ID**(can be found on the KONA Link home page) and click submit.

5. Navigate to **Device Profile** section.



6. Press **Add Device Profile**.

Tenants / ChirpStack / Device profiles

Add device profile

Name	Region	MAC version	Revision	Supports OTAA	Supports Class-B	Supports Class-C
<a href="#">EU868 Test Profile Comfort</a>	EU868	LoRaWAN 1.0.2	RP002-1.0.2	yes	no	no
<a href="#">US915</a>	US915	LoRaWAN 1.0.2	RP002-1.0.2	yes	no	no
<a href="#">load test</a>	EU868	LoRaWAN 1.0.2	RP002-1.0.2	no	no	no

7. Configure device profile parameters:

- Name after the device type
- Enter Region and Regional configuration based on gateway
- 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. For Tektelic devices on LoRaMAC version 1.0.4 such as Breeze and eDoctor, the MAC version should be set to LoRaWAN 1.0.4 and Regional parameters revision as RP002-1.0.4.
- Set ADR algorithm as Default ADR
- Leave other fields as default

General Join (OTAA / ABP) Class-B Class-C Codec Relay Tags Measurements Select device-profile template

\* Name

Description

\* Region  Region configuration

\* MAC version  \* Regional parameters revision

\* ADR algorithm

8. In Codec tab choose **JavaScript functions** in **Payload codec**.

EU868 Test Profile Comfort device profile id: 82e332e4-6aed-4168-92e2-a6d1fc6100f0 Delete device profile

General Join (OTAA / ABP) Class-B Class-C **Codec** Relay Measurements Select device-profile template

Payload codec

Codec functions

**Insert Decoder here**

9. Contact your device vendor to obtain the decoder script. 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  Code

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
<b>comfort-vivid</b>	Replaced US916 with US915	last year

- Copy the code and insert it into Embedded LNS Codec functions window

```
1 function decodeUplink(input){
2
3     var decoded_data = {};
4     var decoder = [];
5     var errors = [];
6     var bytes = convertToInt8Array(input.bytes);
7     decoded_data['raw'] = toHexString(bytes).toUpperCase();
8     decoded_data['#Port'] = input.#Port;
```

10. Navigate to the **Application** section.

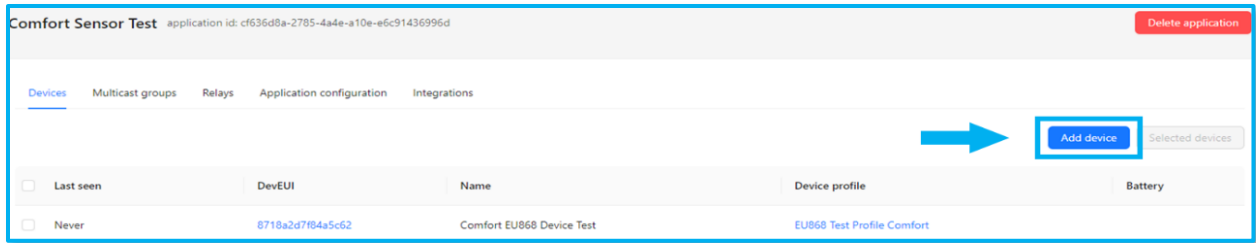


11. Create a new application or pick an existing one. You need application for each type of device so it's recommended to name application after a device type.

**Applications** Add application

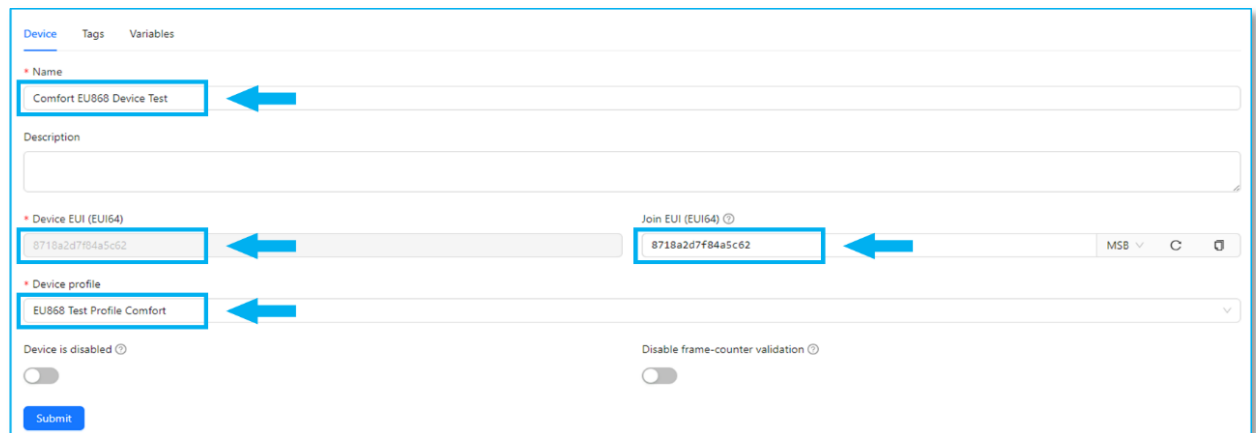
Name	Description
<input type="text" value="Your Application Name"/>	

12. Press **Add Device**.



### 13. Configure device parameters:

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



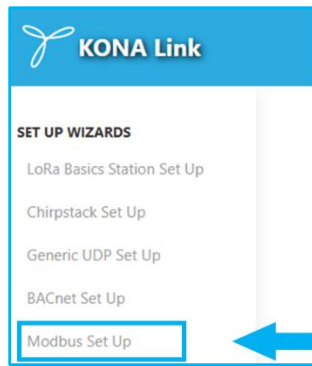
14. Press **Submit**. Before moving on to Protocol Configurations in Node Red, Gateways, Devices and Codec should be registered and configured correctly. And Device should join and start sending uplinks successfully.

### 3. Application Specific Configurations

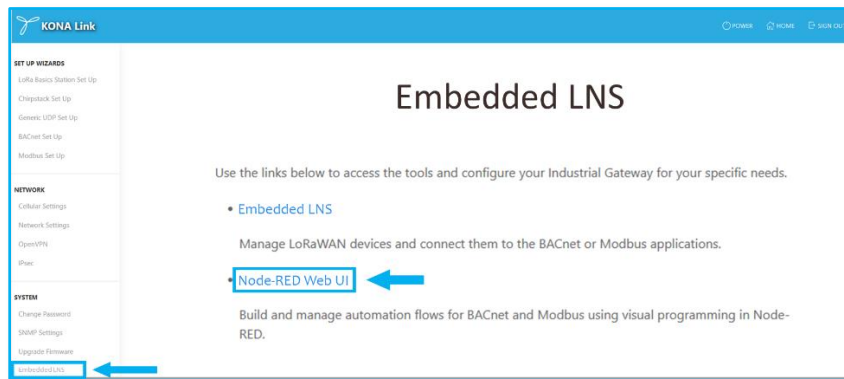
#### 3.1 Connecting to Modbus TCP/IP

**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.

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. In SET UP WIZARDS section use Modbus Set Up to enable Modbus



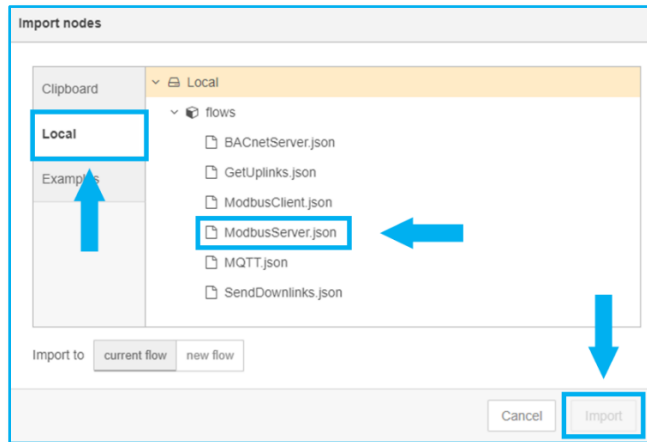
3. Follow the **Node-RED Web UI** link in Embedded LNS subsection in Kona Link



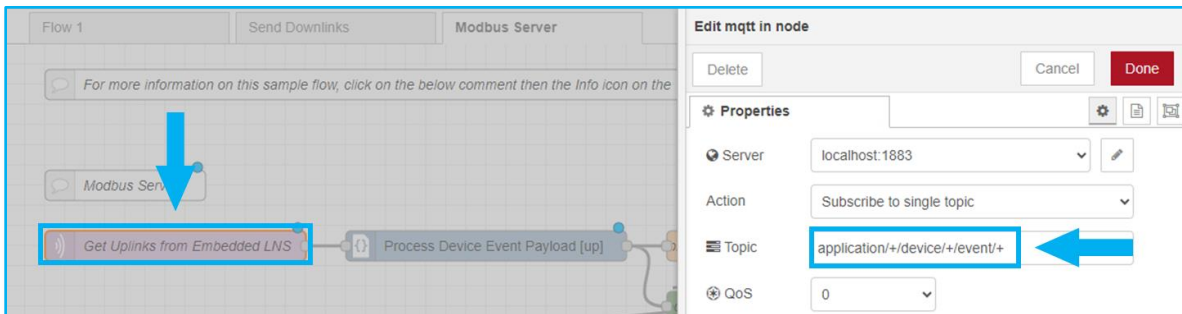
4. In a new flow go to menu and select **Import**



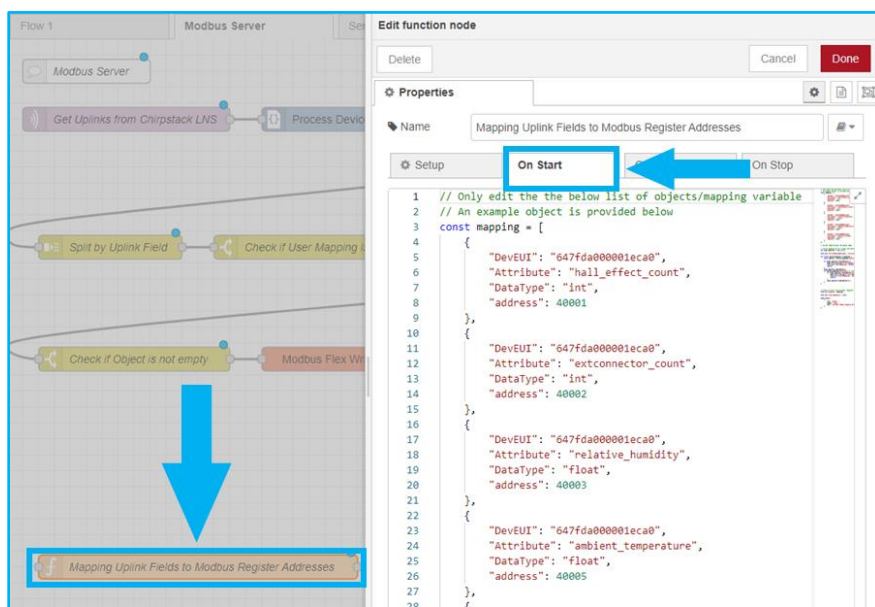
5. Go to section **Local** and select **Modbus Server** flow:



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.



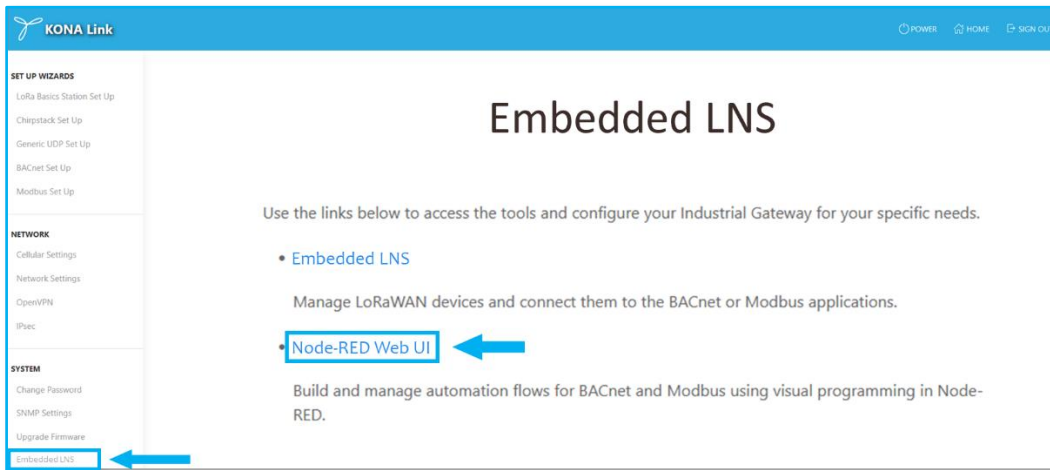
7. In **Mapping Uplink Fields to Modbus Register Addresses** node click on the **On Start** tab.



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 40001, then both 40001 and 40002 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.

### 3.2 Send Decoded Uplink to External MQTT Broker

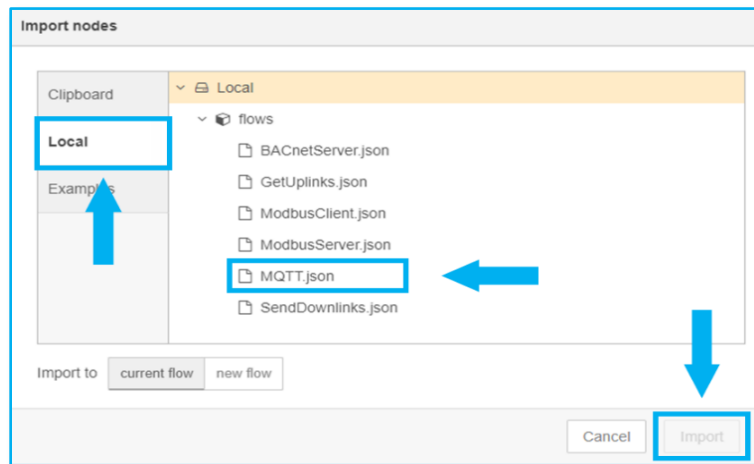
1. Login to Kona Link web page using “Host Name” or “IP Address”:
  - Using “Host Name”  
Host Name URL: <https://kona-<GW variant>-<last 6 digit GW ID>.local/>  
Eg: <https://kona-micro-0011ab.local/>
  - Using “IP Address”  
IP Address URL: <https://<GW IP Address>/>  
Eg: <https://192.0.2.111/>
2.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



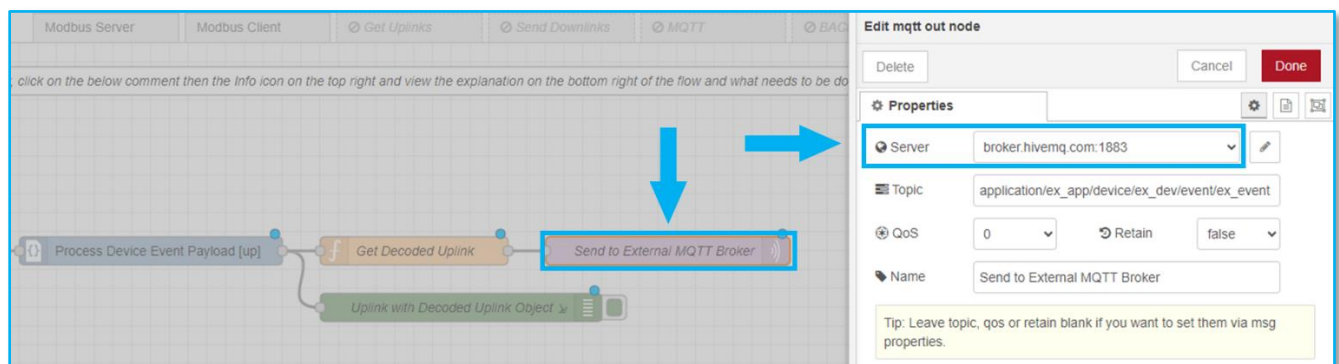
3. In a new flow go to menu and select **Import**



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



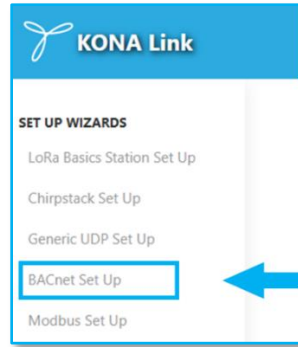
6. Deploy the flow.

### 3.3 Connecting to BACnet IP

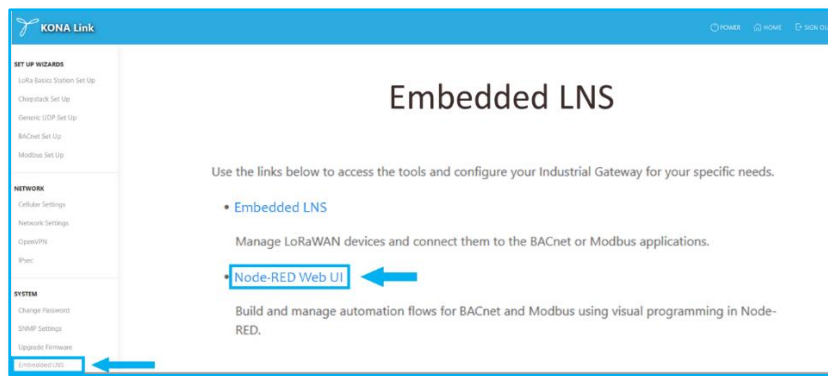
**NOTE:** Before moving on to BACnet Configurations in Node Red, Gateways, Devices and Codec should be registered and configured correctly. And Device should join and start sending uplinks successfully.

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/>

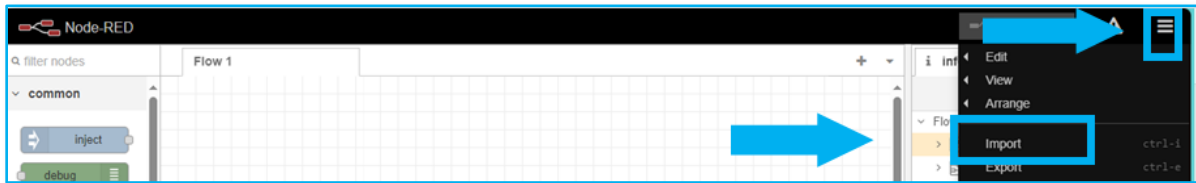
2. In **SET UP WIZARDS** section use **BACnet Set Up** to enable the BACnet server



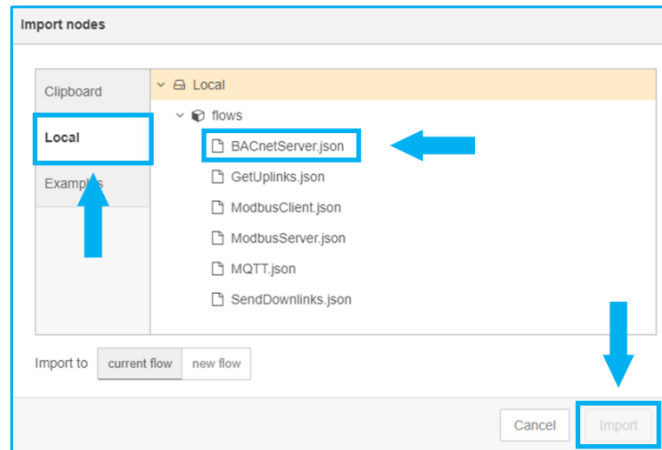
3. Follow the **Node-RED Web UI** link in Embedded LNS subsection in Kona Link



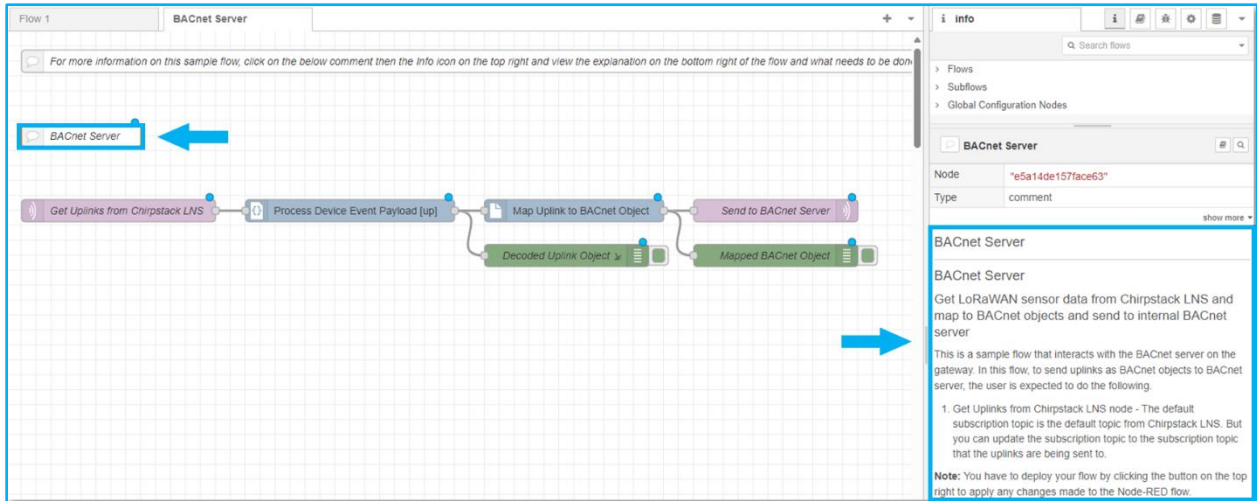
4. In a new flow go to menu and select **Import**



5. Go to section Local and select **BACnetServer** flow for your application and click **Import**



6. In BACnet Server flow press the BACnet Server information node to get extra instruction



7. After implementing needed changes deploy flow

### 3.4 Get Decoded Uplinks from Embedded 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/](https://kona-<br/><GW variant>-<last 6 digit GW ID>.local/)

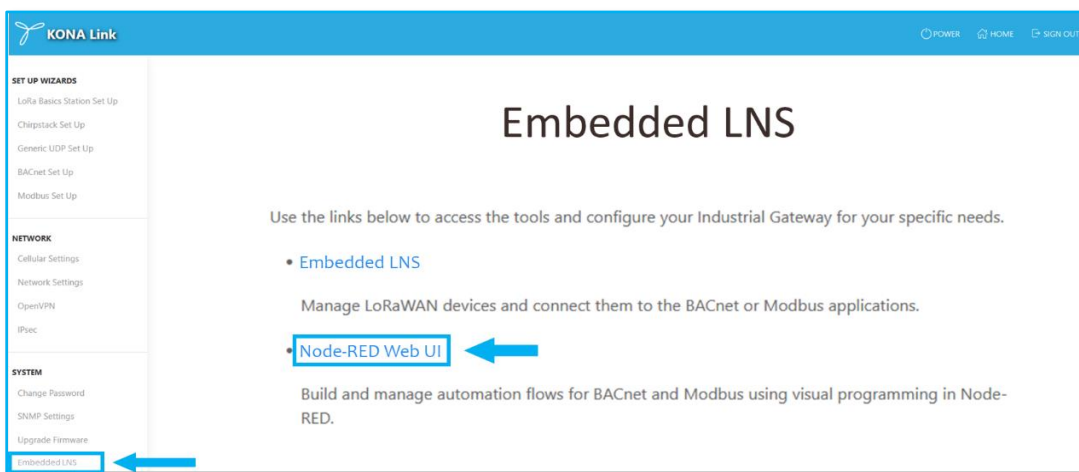
Eg: <https://kona-micro-0011ab.local/>

- Using "IP Address"

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

Eg: <https://192.0.2.111/>

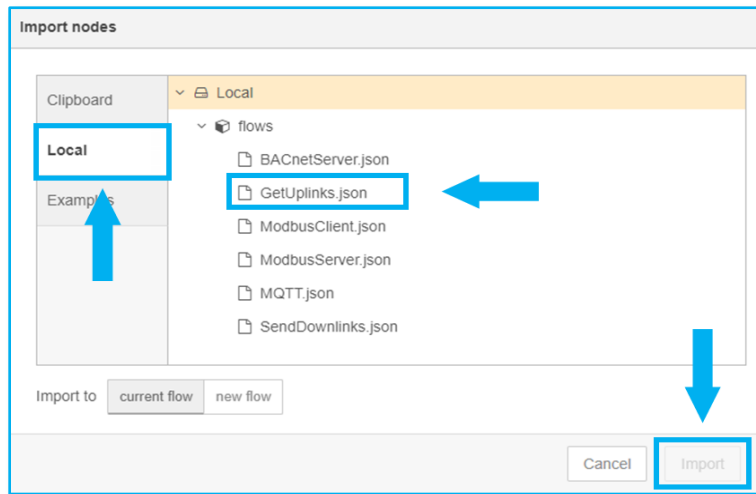
2. Follow the **Node-RED Web UI** link in Embedded LNS subsection in Kona Link



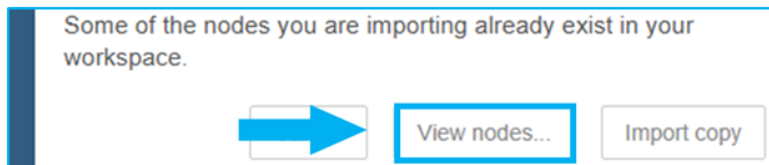
3. In a new flow go to menu and select **Import**



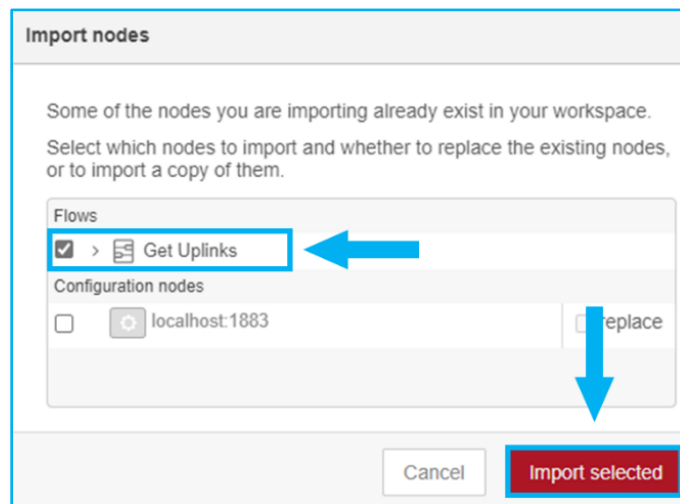
4. Go to section Local and select **GetUplinks** flow for your application:



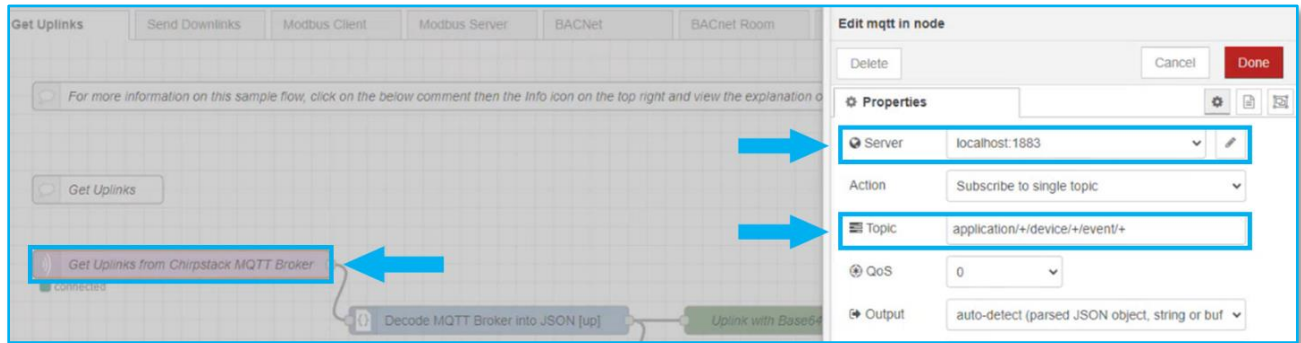
5. On the incoming warning message, click **View nodes**.



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

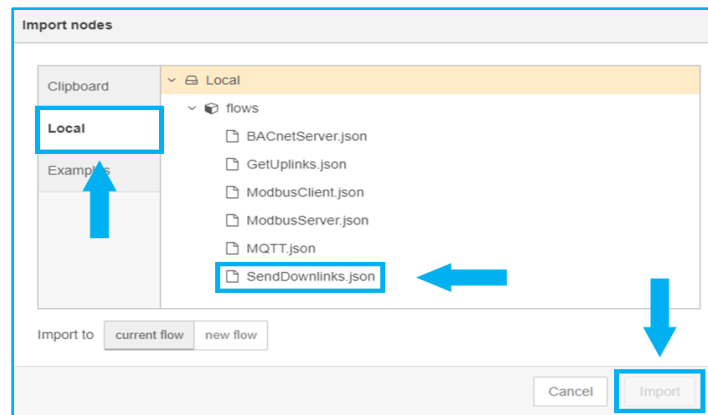
## 4. Troubleshooting

### 4.1 Sending Downlinks to Embedded LNS

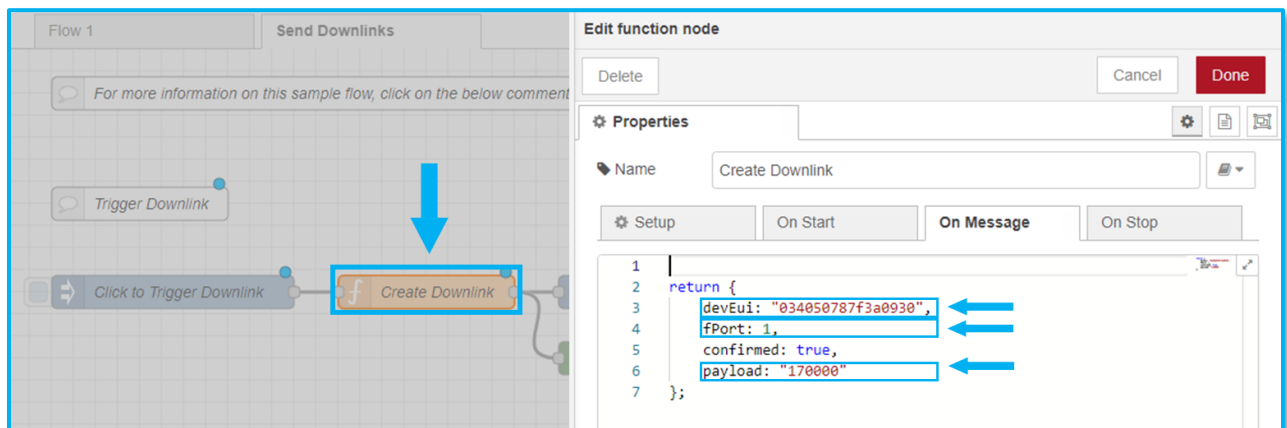
1. In a new flow go to menu and select **Import**



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

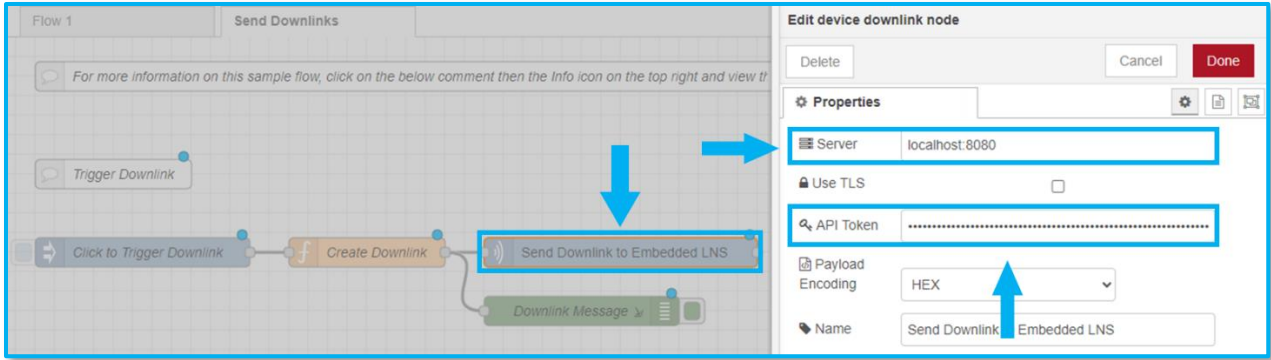


3. Click twice on **Send Downlink** and configure deveui, fPort and payload for your device according to the device documentation. For Tektelic devices, you can use the KONA Atlas tool to generate the payload.



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

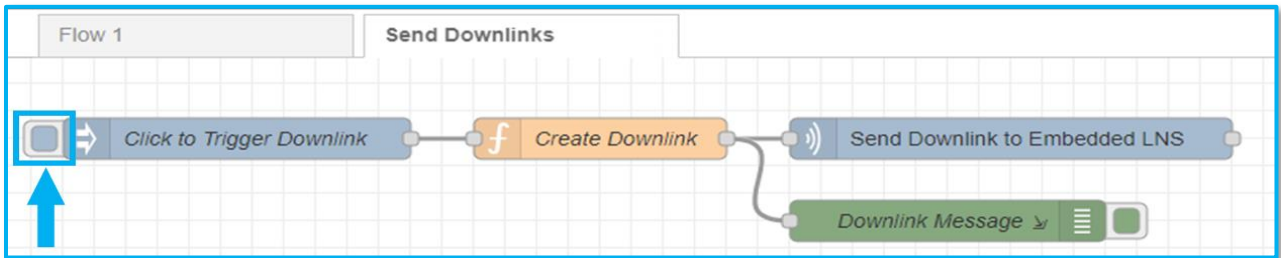




8. Click Deploy

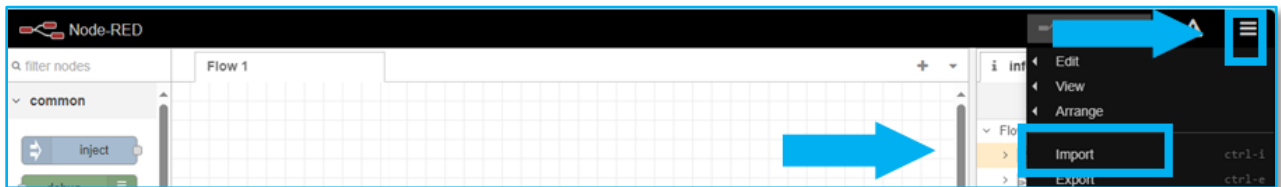


9. Trigger downlink by pushing the activating button

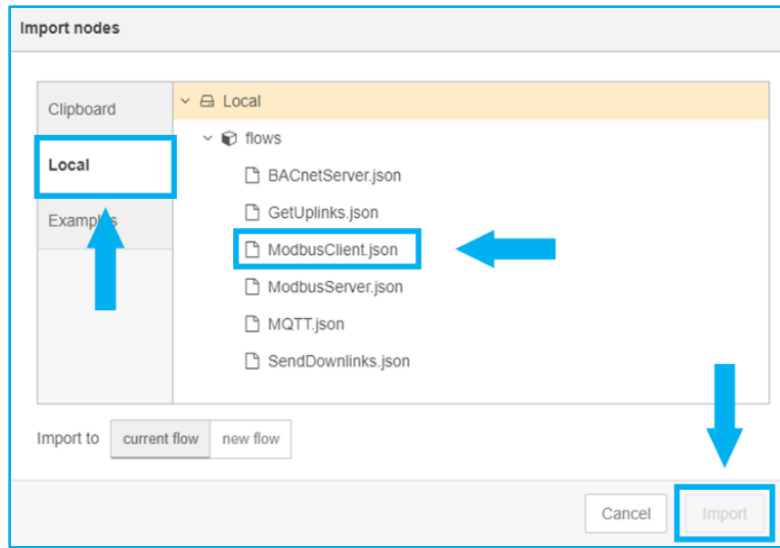


## 4.2 Configure a Modbus Client

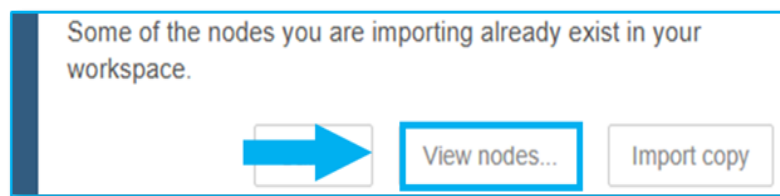
1. In a new flow go to menu and select **Import**



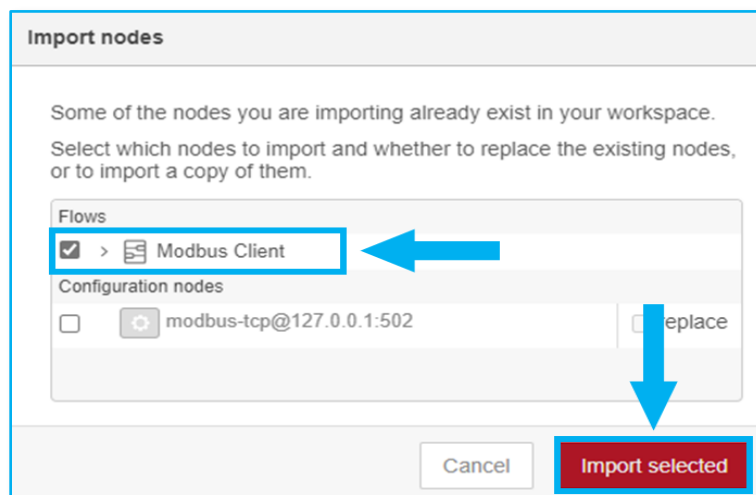
2. Go to section Local and select **Modbus Client** flow:



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



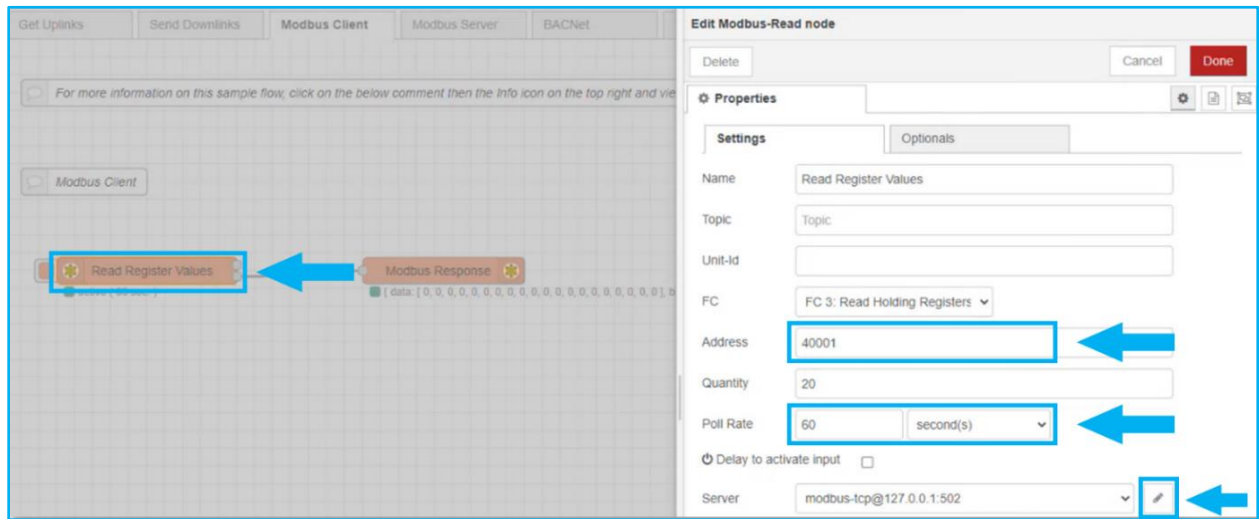
4. On the **Import nodes** window, ensure that only **Modbus Client** is checked, then click **Import selected**.



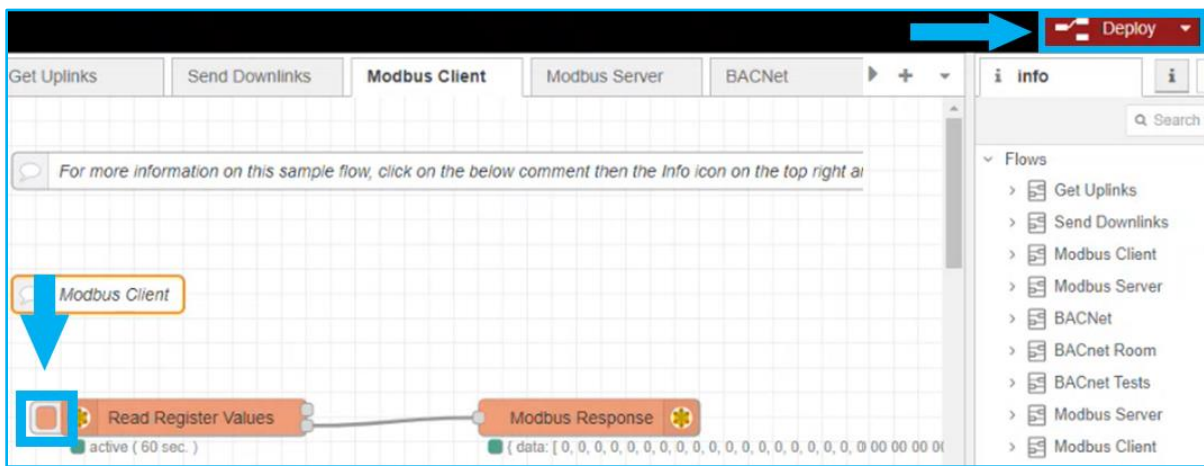
5. In Modbus Client flow in Read Register Values node:

- 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

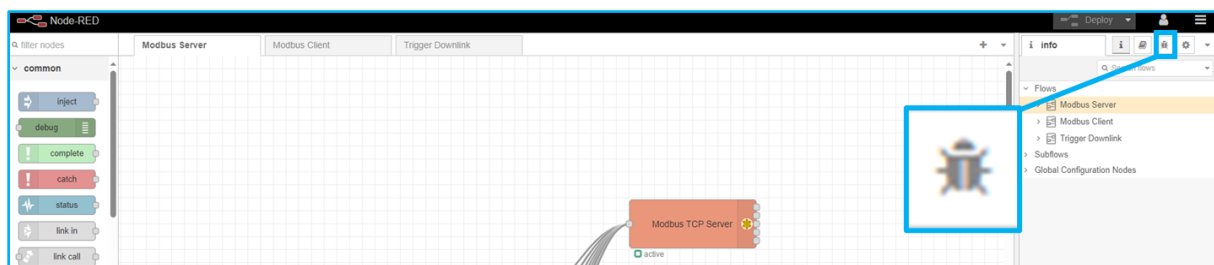


6. Deploy changes. After that you can activate push button to read the Modbus register values.

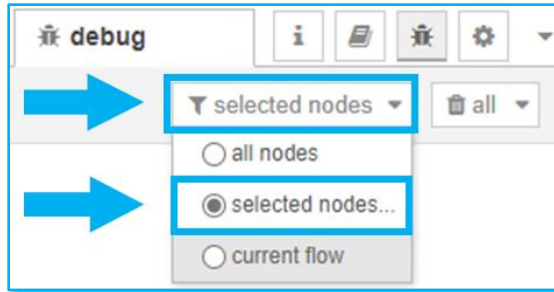


### 4.3 View Uplink Messages

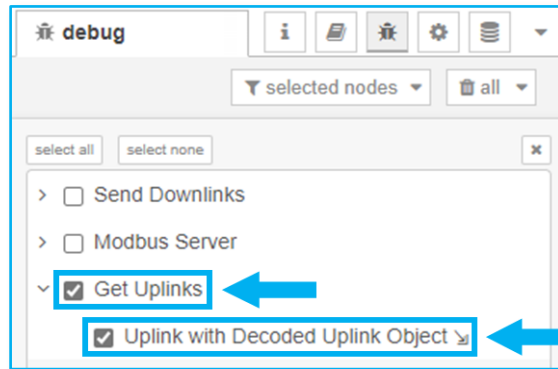
1. In a right panel select the debug icon represented by a bug.



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.

