Milesight DeviceHub

User Guide

Preface

This guide teaches you how to connect Milesight devices to the Milesight DeviceHub, and how to manage the devices on the Milesight DeviceHub.

Readers

This guide is intended for the following users:

- Distributors
- Network Planners
- On-site technical support and maintenance personnel
- Network administrators responsible for network configuration and maintenance

For assistance, please contact

Milesight technical support:

Email: iot.support@milesight.com

Support Portal: support.milesight-iot.com

Tel: 86-592-5085280

Fax: 86-592-5023065

Address: Building C09, Software Park III, Xiamen 361024, China

Revision History

Date	Doc Version	Description
Jan. 15, 2014	V 3.0	Initial version of DeviceHub V2

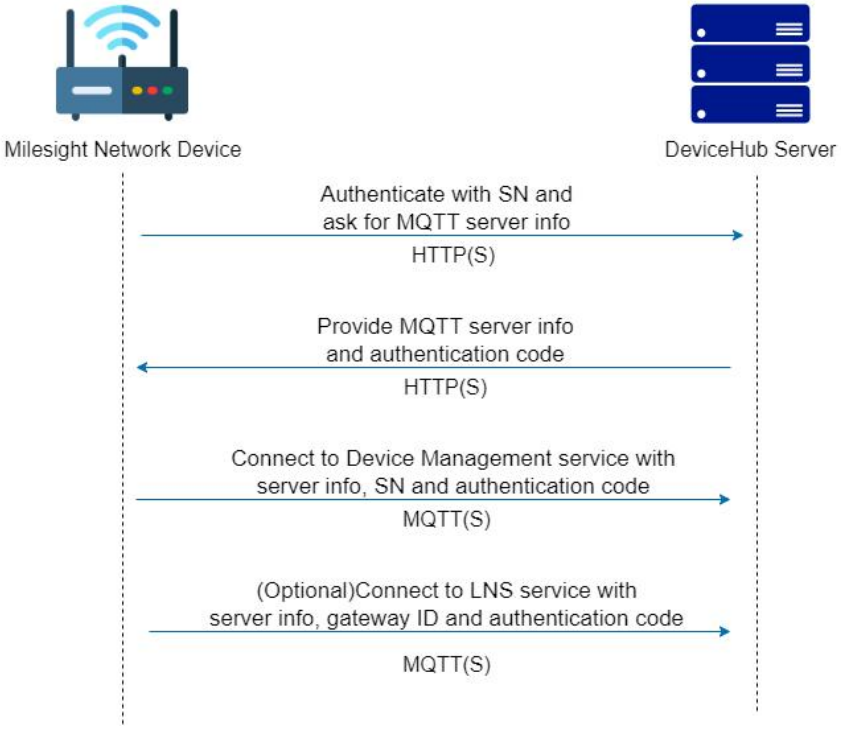
Contents

Introduction

Milesight DeviceHub provides a high-efficiency, low maintenance On-Premises solution to easily deploy Milesight devices across multiple locations, reducing complexity and increasing productivity. Milesight DeviceHub is consist of two services:

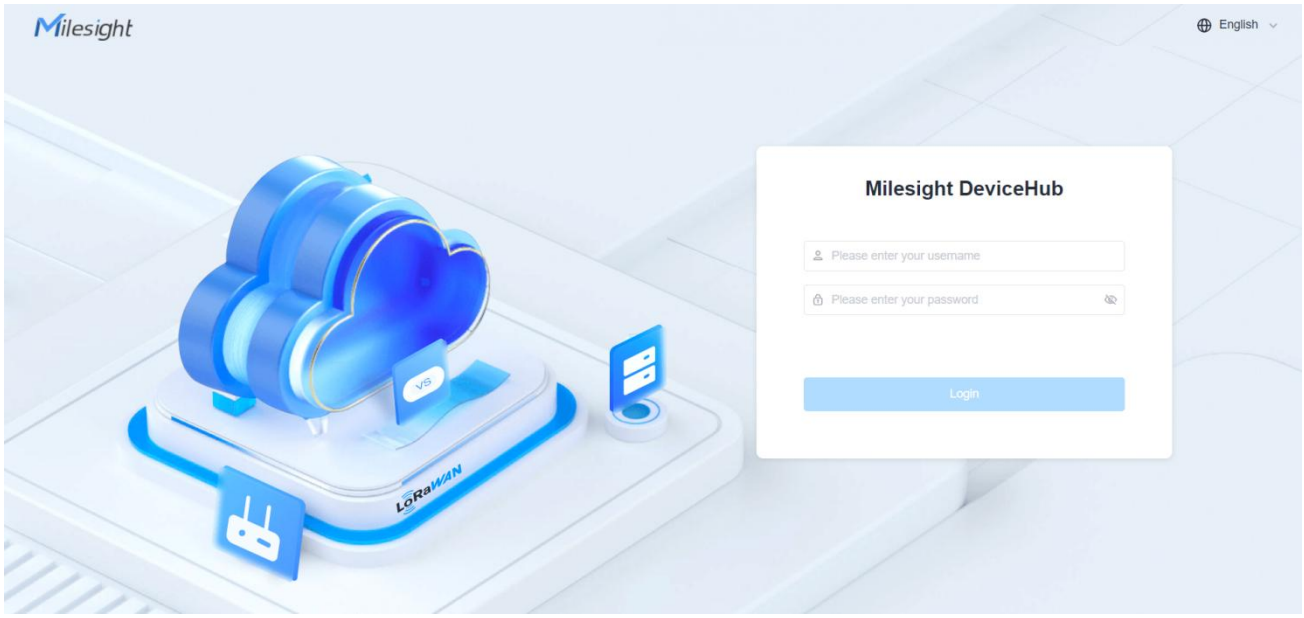
- Device Management: manage network accessible devices remotely
- LoRaWAN® Network Server: process the LoRaWAN data from Milesight LoRaWAN® gateways

Milesight network devices setup the connections with DeviceHub server according to below diagram:

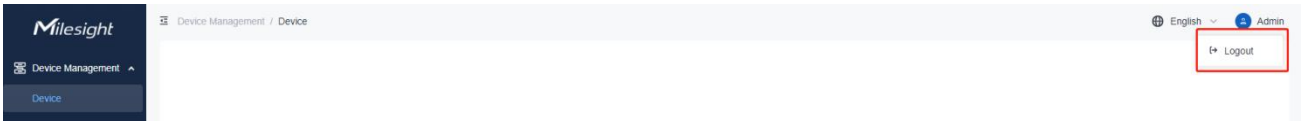


DeviceHub Login and Logout

Install DeviceHub referring to ***DeviceHub Installation Guide***. After installing, log in the DeviceHub with IP address http://xx.xx.xx.xx. The default login info:
Username: **admin**
Password: **password**
Note: the DeviceHub will logout automatically when there is not operation on the web GUI for 30 minutes.



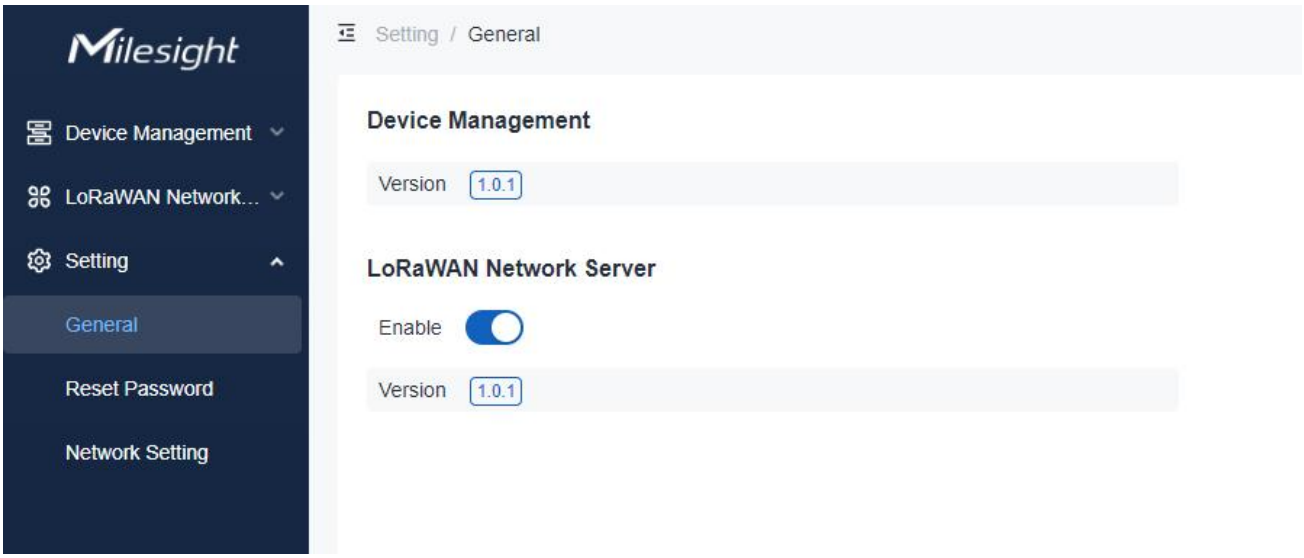
Click the account name to logout the account as required.



Settings

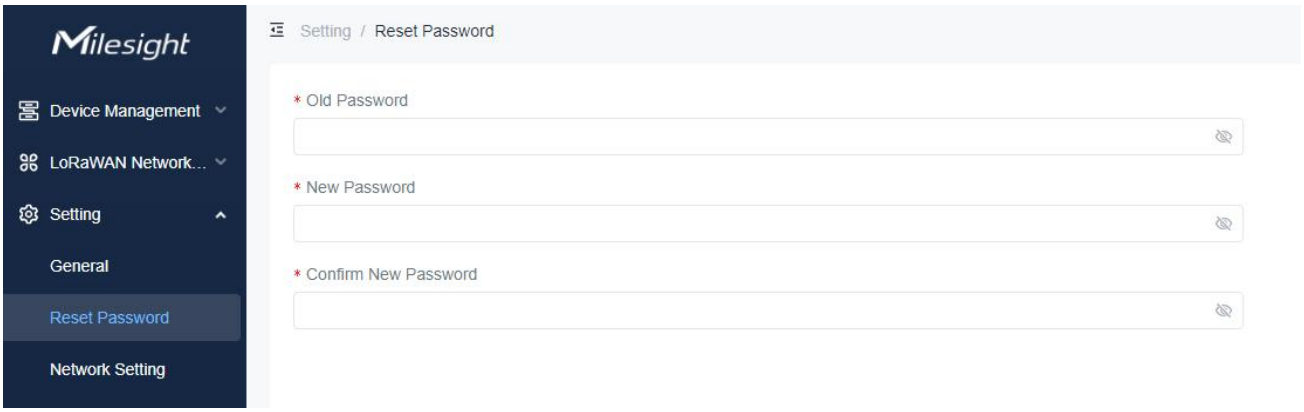
General Settings

This page supports to check the version of Device Management and LoRaWAN® Network Server feature. Besides, it supports to disable the feature of LoRaWAN® Network Server and hide this page.



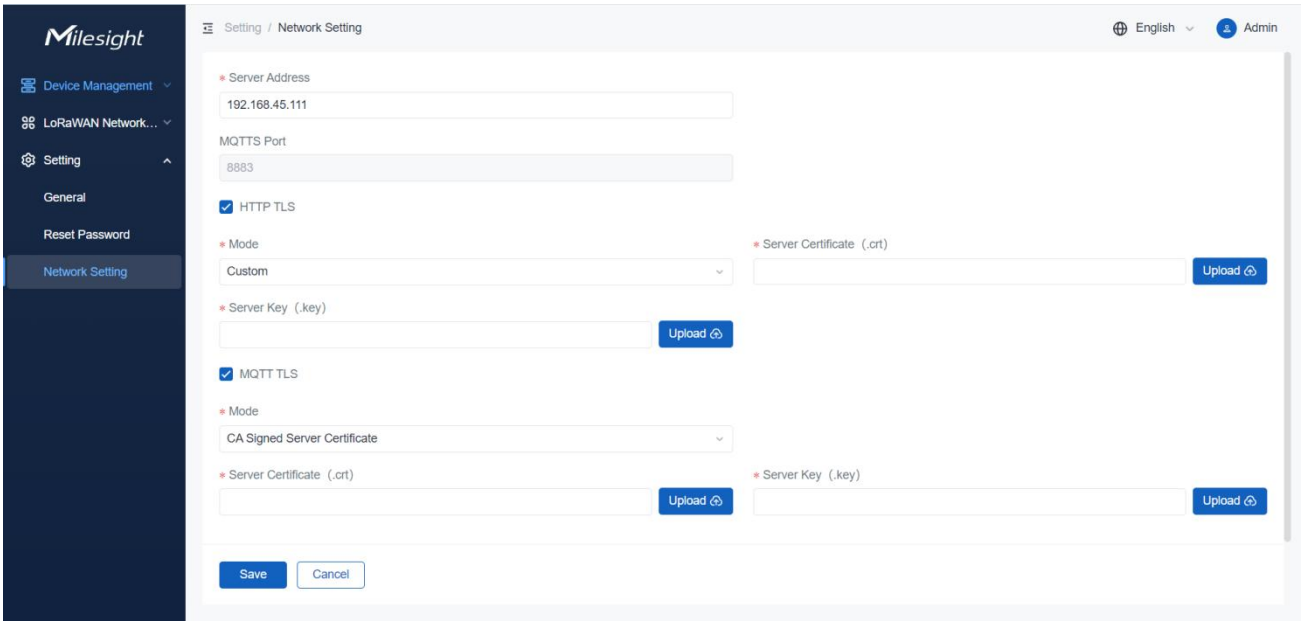
Reset Password

This page supports to change login password. We recommend that you set a robust password with lower cases, upper cases and numbers.



Network Settings

DeviceHub supports to configure network settings for web access and device communication.



Parameters	Description
Server Address	Set the IP address or domain bind to this DeviceHub server.
MQTT/MQTTS Port	Show the communication port between devices and DeviceHub server.
HTTP TLS	Enable HTTPS web access.
Mode	Select HTTP TLS authentication mode. **Default:** verify with the certificate and key that pre-loaded on the DeviceHub.

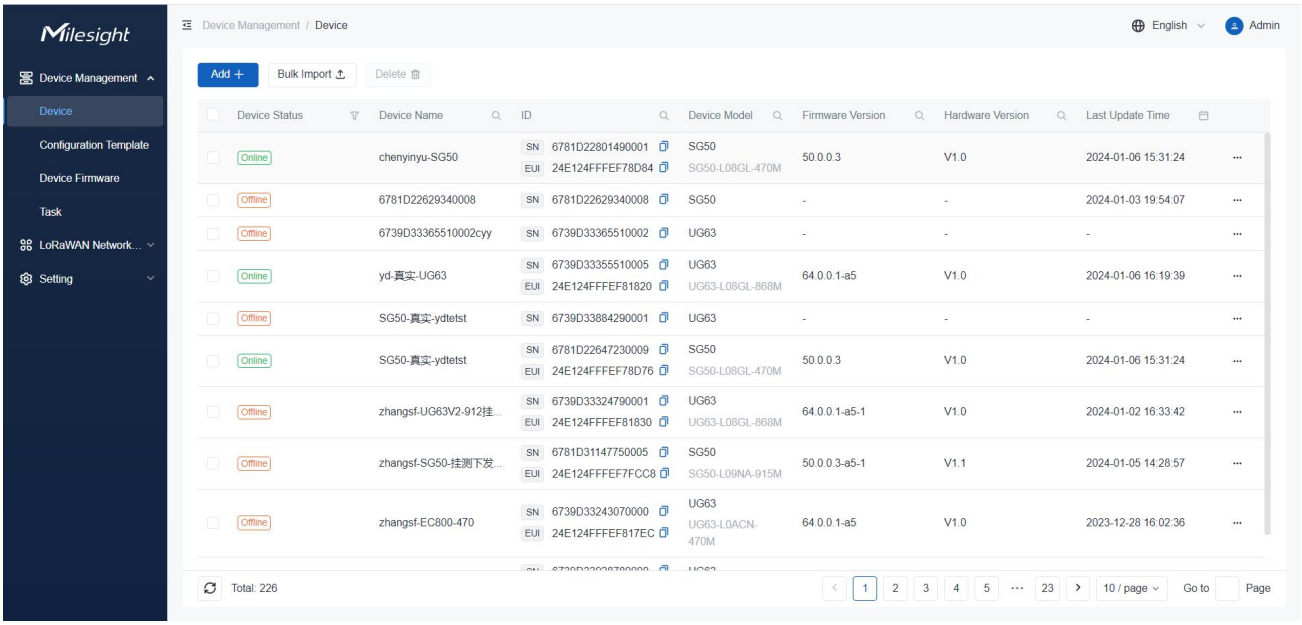
	Custom: upload the custom server certificate and server key for verification.
MQTT TLS	Enable MQTTS transmission between devices and DeviceHub.
Mode	Select MQTT TLS authentication mode. **Default:** verify with the certificate issued by Certificate Authority (CA), server certificate and server key that pre-loaded on device. **CA signed Server Certificate:** verify with the certificate issued by Certificate Authority (CA) that pre-loaded on device and upload the custom server certificate and server key. **Self-signed Certificate:** upload the custom CA certificates, client certificates and secret key for verification.

Device Management

DeviceHub supports to manage network devices remotely.

Device

Navigate to **Device Management > Device** page to check, edit or manage devices.



Parameters	Description
Device Status	Online or offline status of devices.
Device Name	The custom name of devices. Every device should have a unique name.
ID	The SN of the device. For LoRaWAN® gateways, it will also show

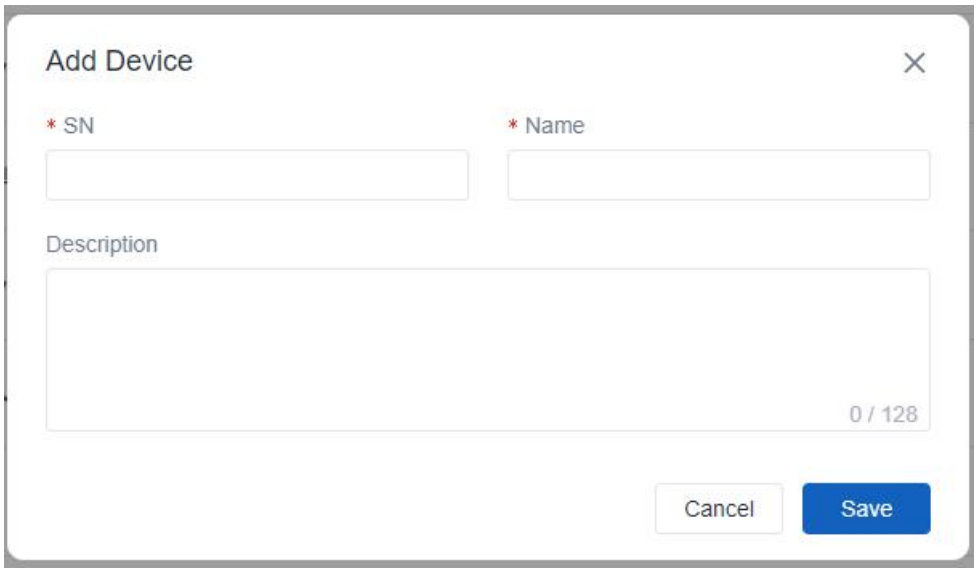
	gateway EUI.
Device Model	Full model name of the device.
Firmware Version	Current firmware version of the device.
Hardware Version	Hardware version of the device.
Last Update Time	The last time the device sent heartbeat packet to the DeviceHub.
...	Click the dots icons to show more operations of every device: **Edit:** modify the name and description of this device. **Detail:** check details of this device, including basic information, network information, battery information, etc. **Get Current Configuration:** get the online device configurations. **Restart:** restart this online device. **Delete:** delete this device from DeviceHub.

Add Device

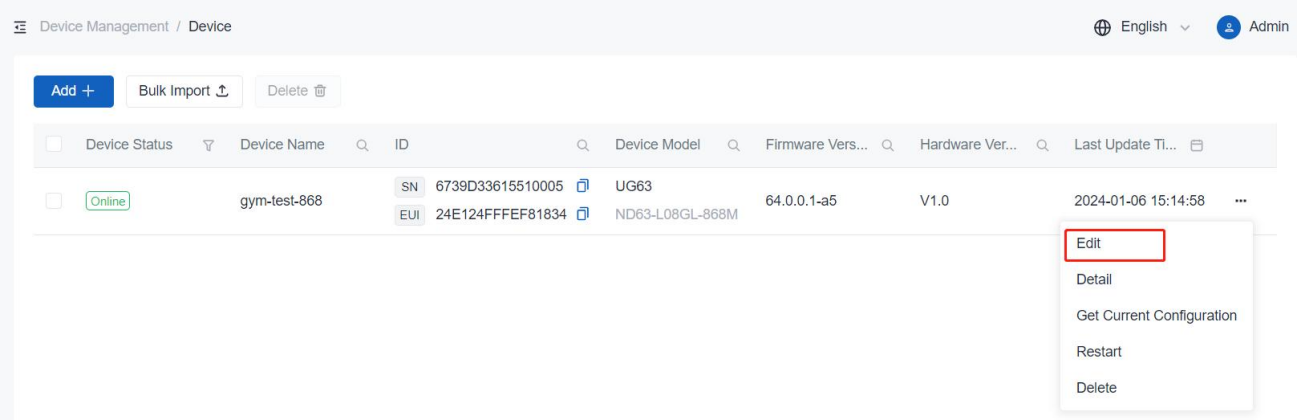
DeviceHub supports to add a single device or bulks of devices.

Add a Single Device

Click **Add+** to add the device by typing the device's SN and customize a unique name, then save the settings.

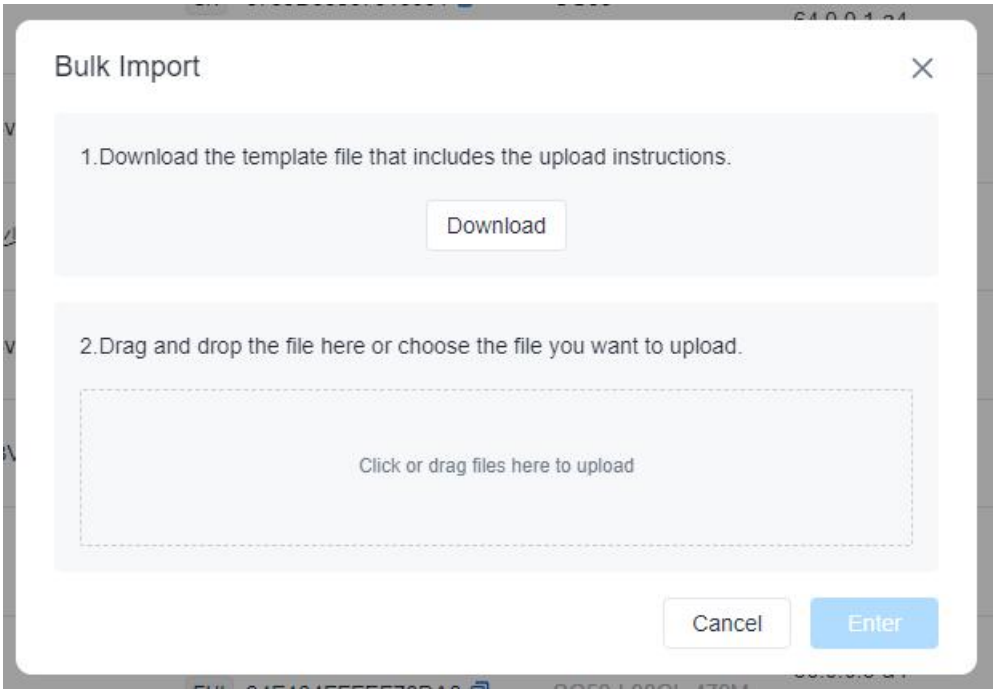


Click **More > Edit** to modify the name and description as required.



Add bulks of Devices

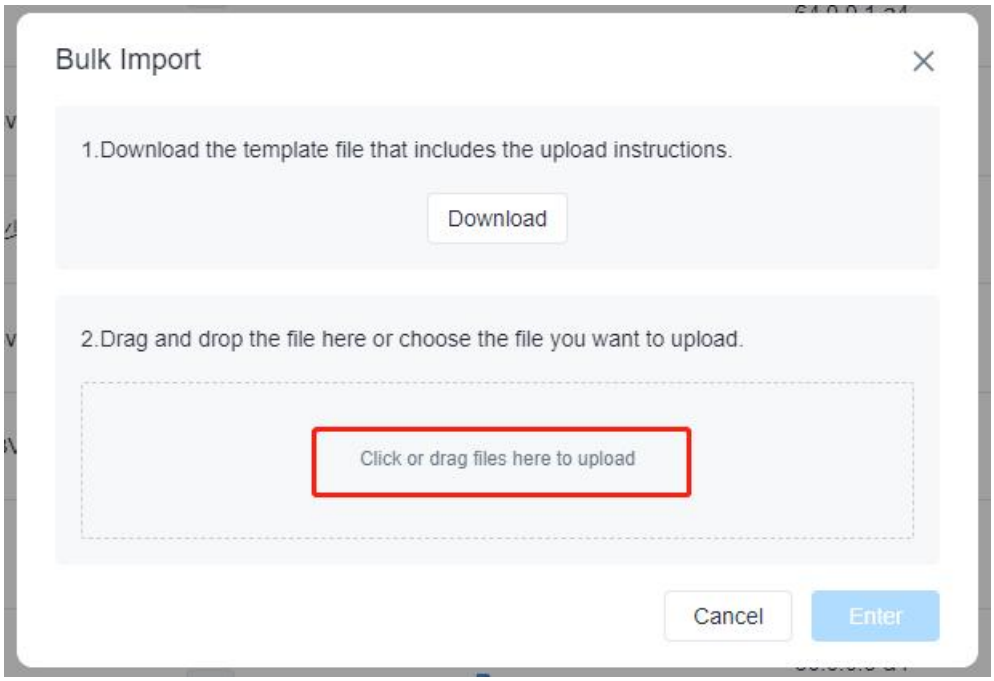
1. Click **Bulk Import** to download the template file.

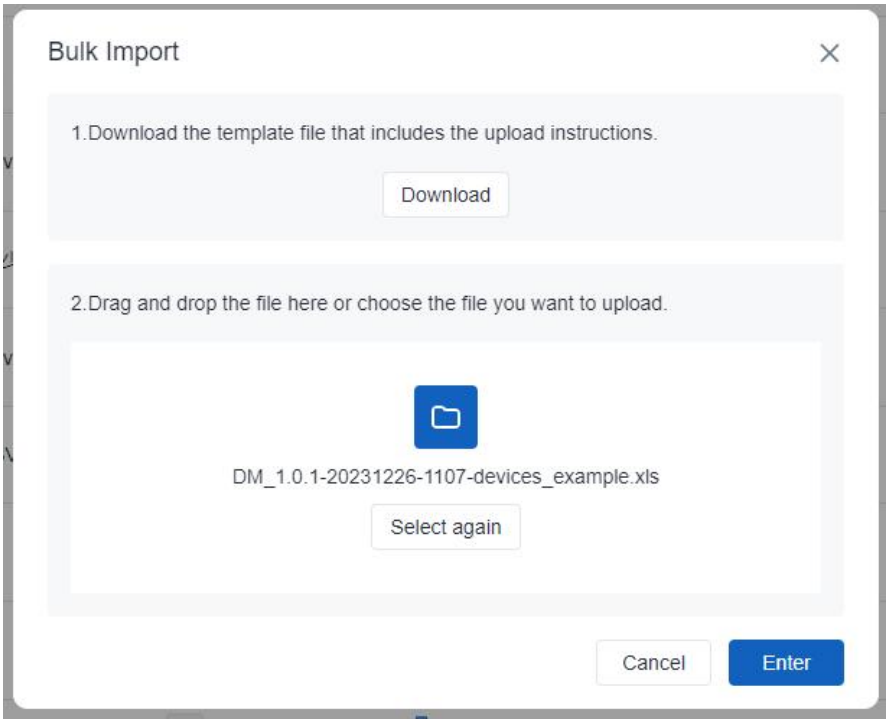


2. Edit and save the template file.

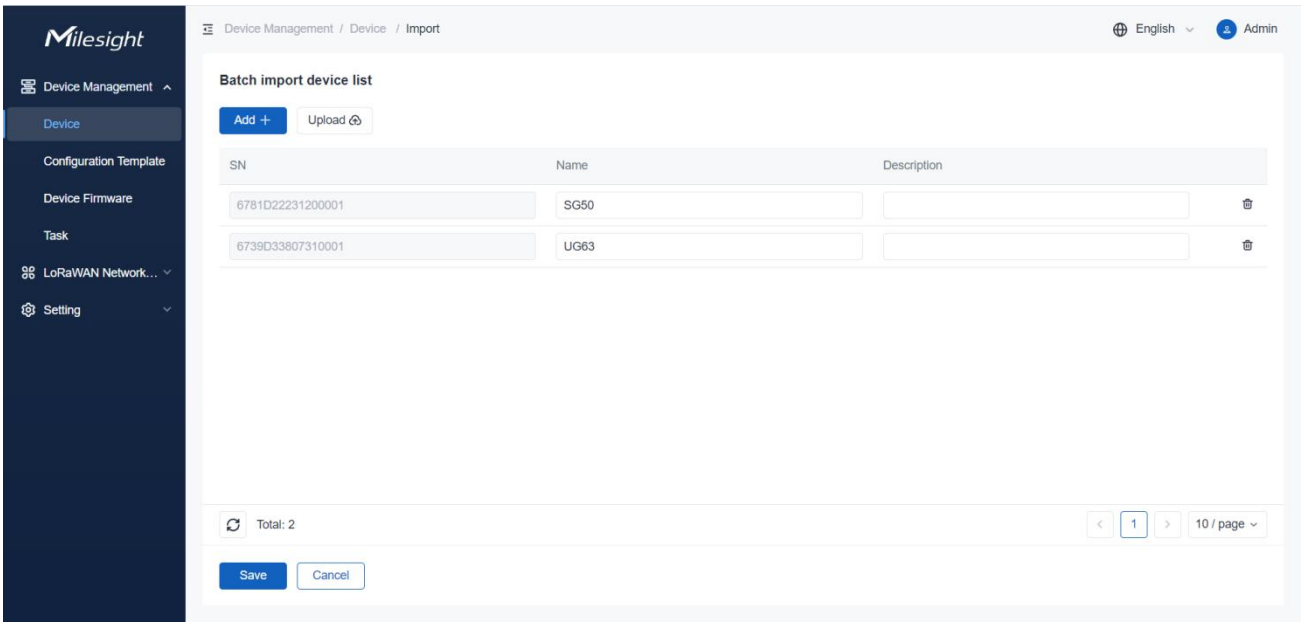
sn	name	description
6781D22231200001	SG50	
6739D33807310001	UG63	

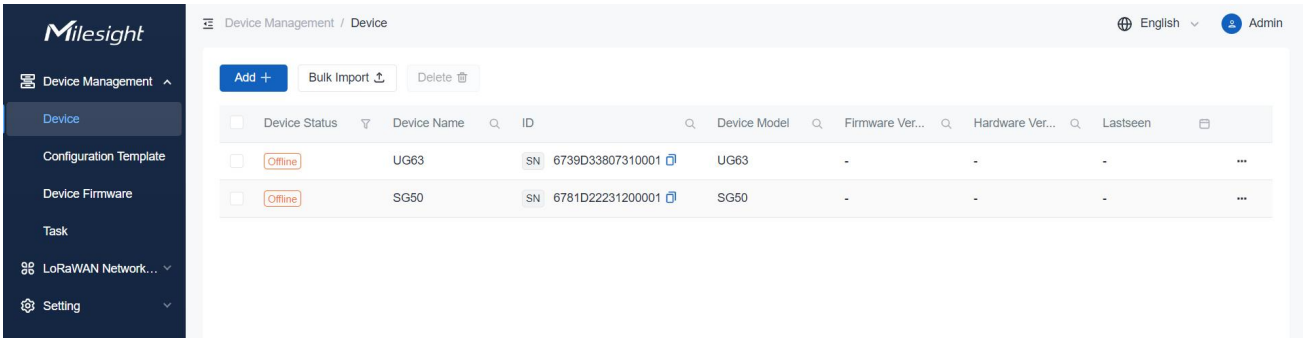
3. Click the zone to select template file or drag the file to the corresponding zone to upload. Then click **Enter** to import the devices.





4. Check and edit the import list, then click **Save** to add the devices.

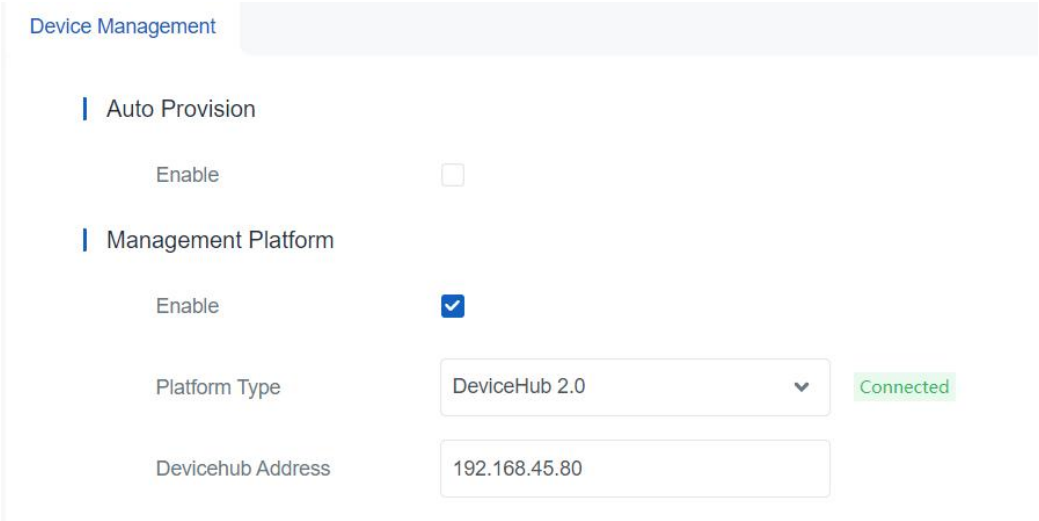




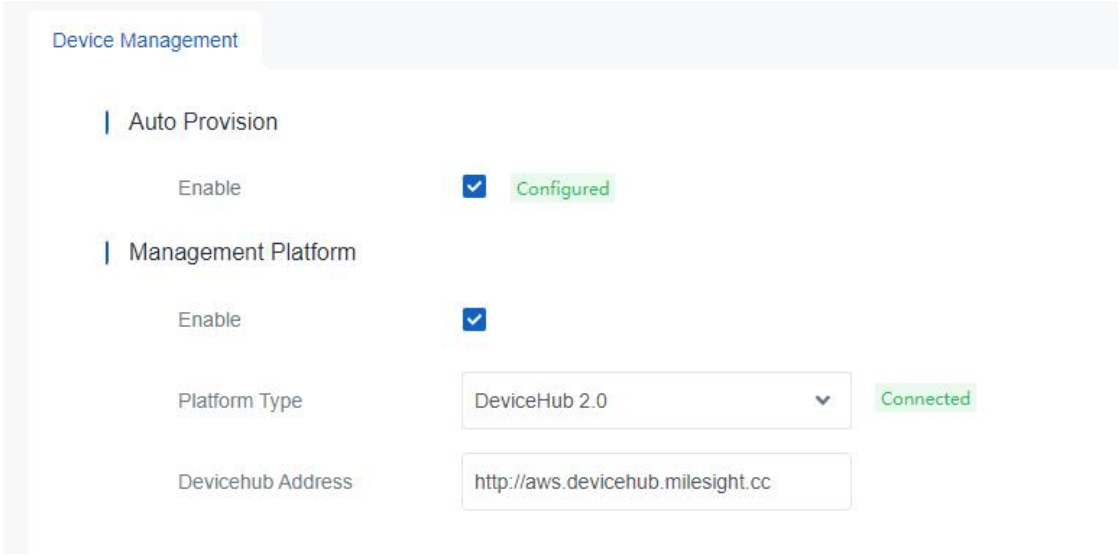
Device Settings

1. Configure the device network settings to ensure the device is able to reach the DeviceHub server.
2. Enable the management platform mode and choose platform type as DeviceHub 2.0, then type the valid DeviceHub server *<http(s)//X.X.X.X: port>* or *<http(s)://domain name:port>* and save the settings.

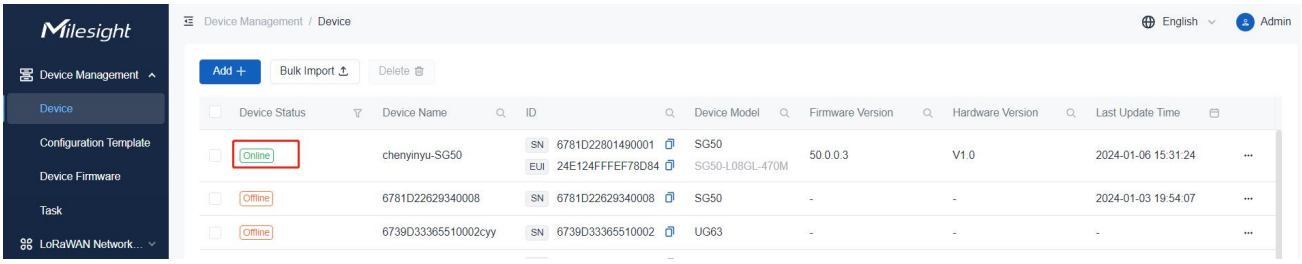
Note: if the DeviceHub address does not include port information, the device will use 80(HTTP) or 443 (HTTPS) by default.



3. When the device is connected to the Milesight DeviceHub, the status will show “Connected”.

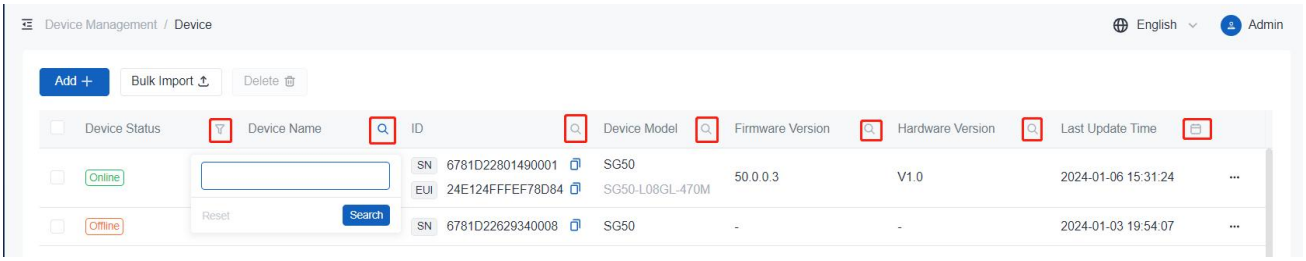


The connected device will be in “Online” status on DeviceHub server page.



Search Device

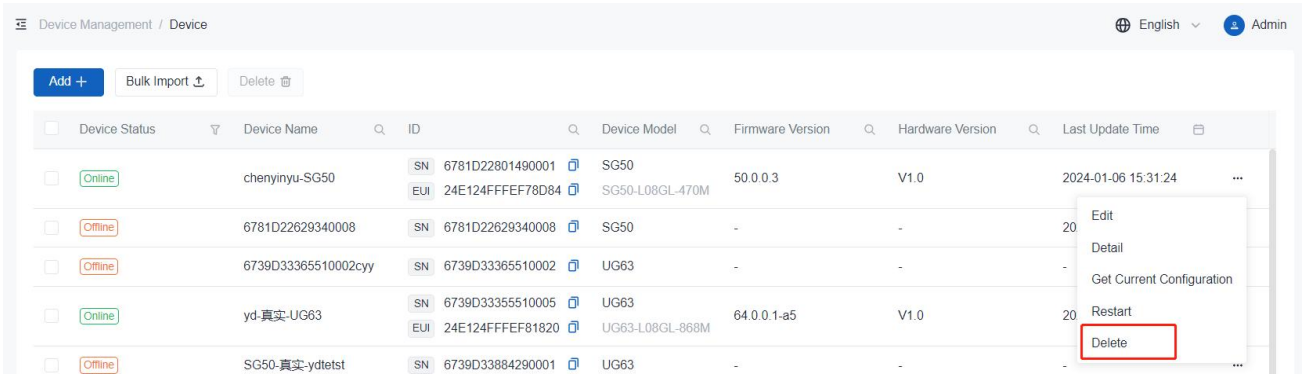
Search for device by typing or selecting the specific condition on the searching box.



Delete Device

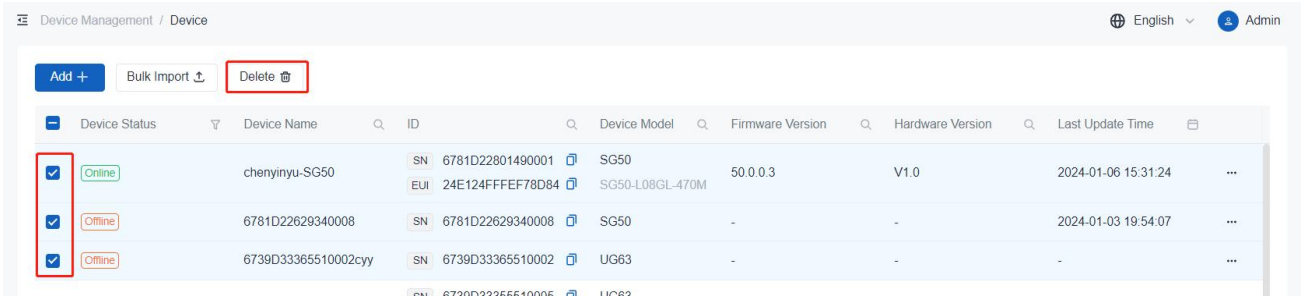
Delete a Single Device

Click **More** to delete the specific device.



Delete bulks of Devices

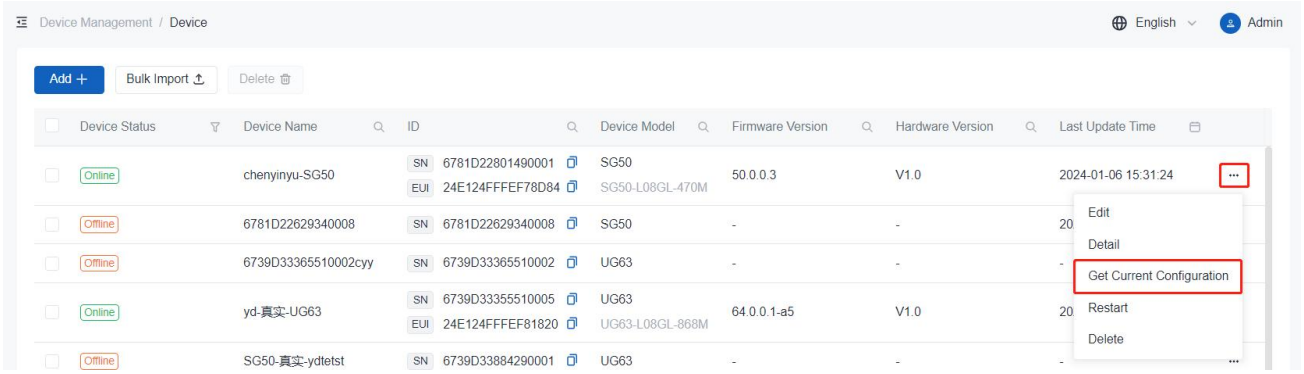
Check the boxes in front of device list and click **Delete** to delete multiple devices.



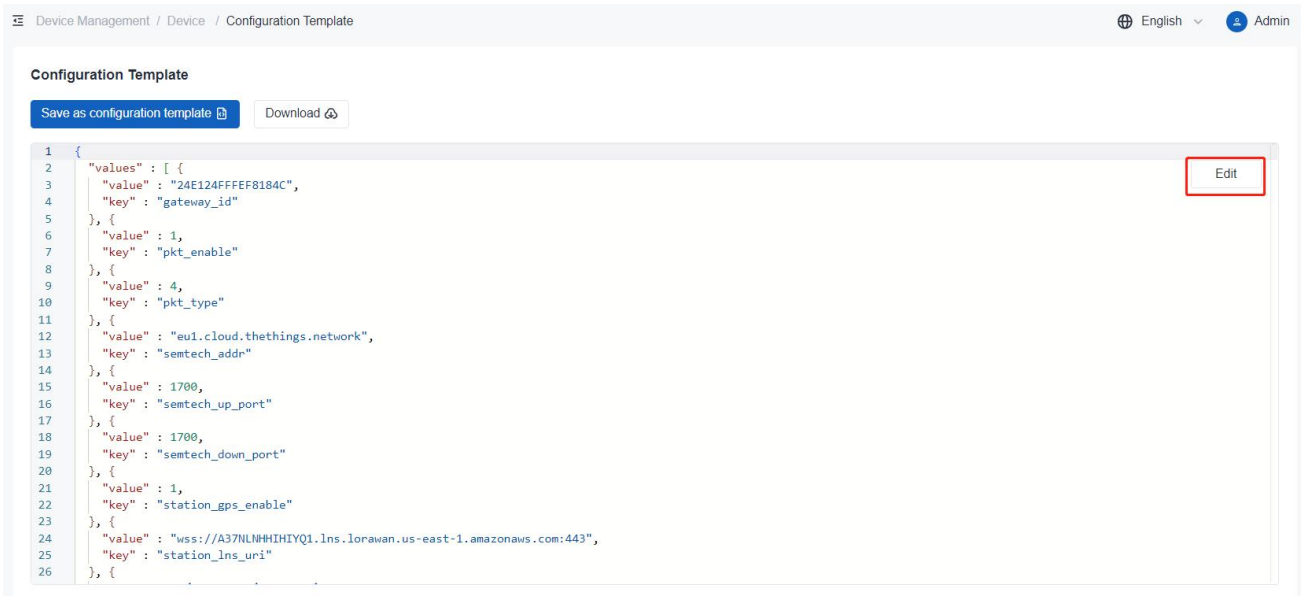
Configuration Deploy

DeviceHub supports to deploy the configurations of devices remotely.

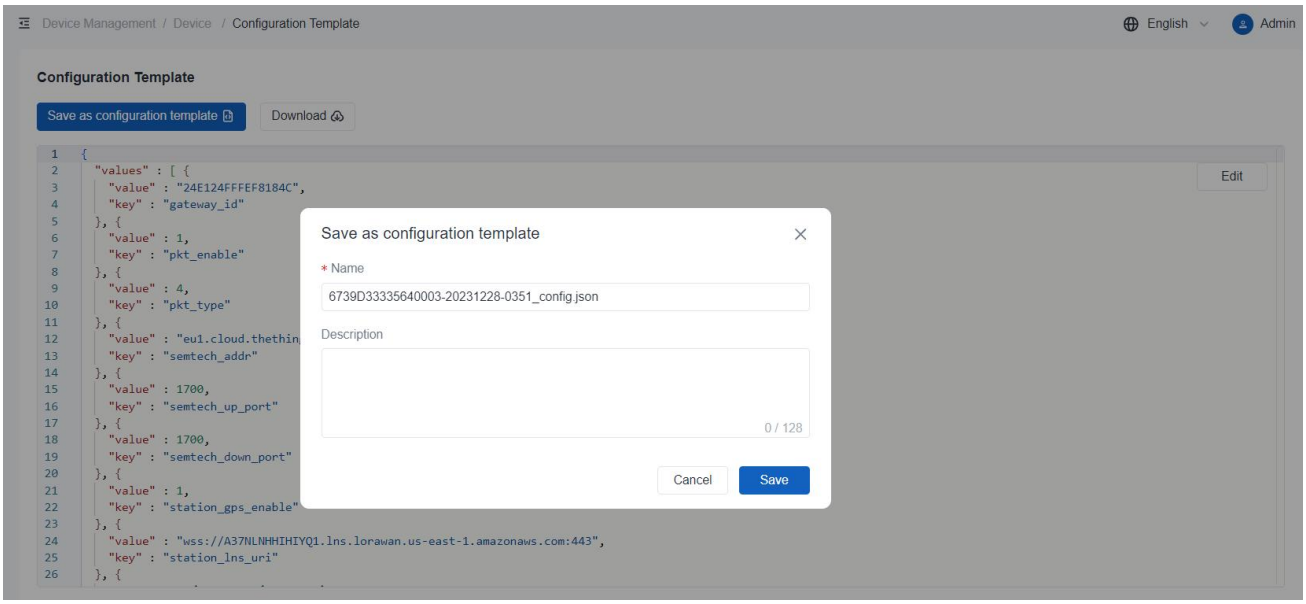
1. Navigate to **Device Management > Device** page, and click **More > Get current configuration** to receive current configurations from online devices.

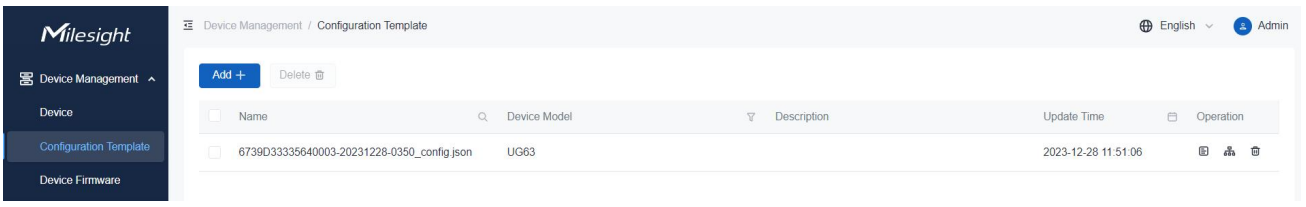


2. Click **Edit** to modify the settings as required and then save the settings.

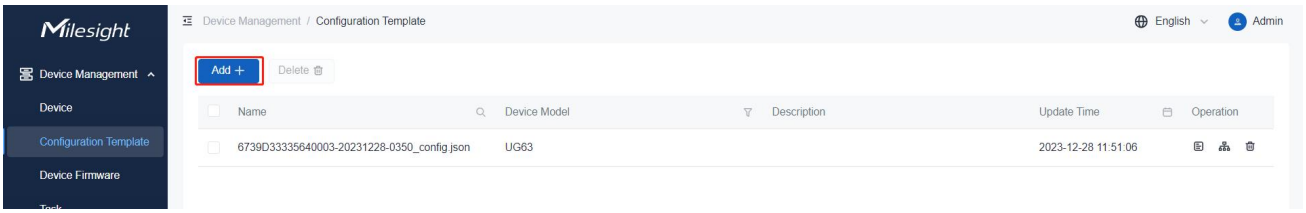


3. Click **Download** to download the configuration file to local path or click **Save as configuration template** to save the template file to DeviceHub.

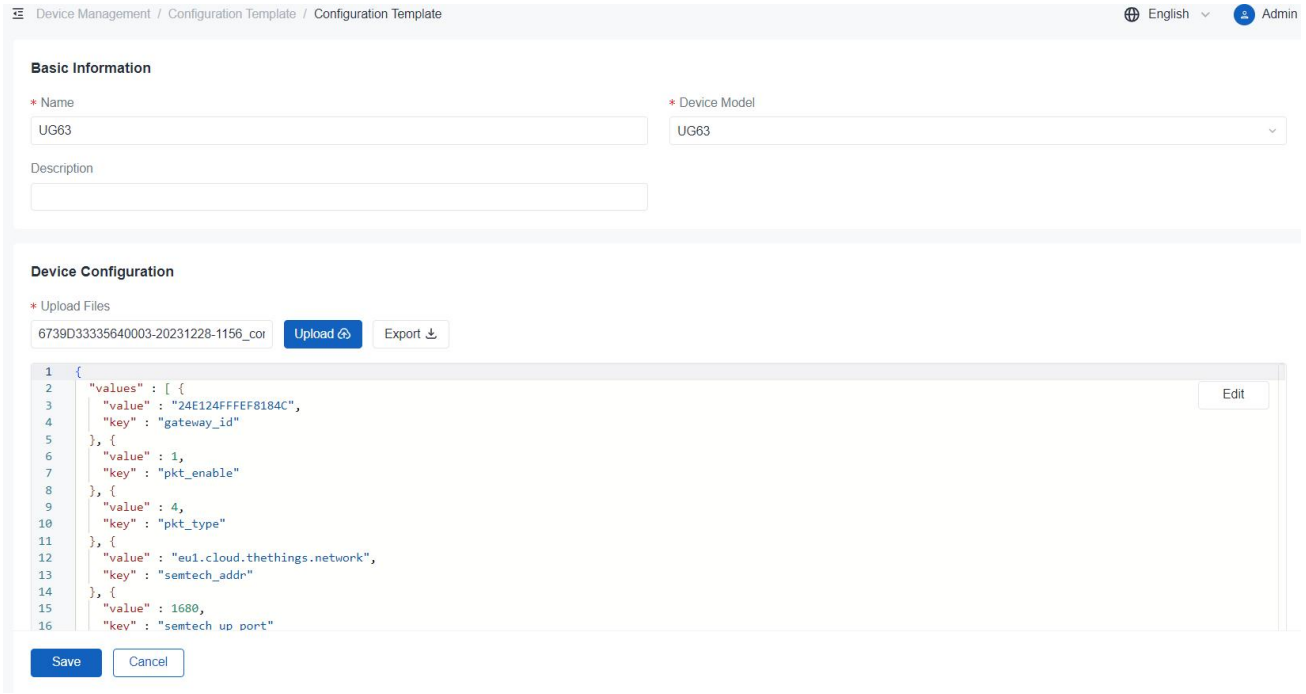




4. Navigate to **Device Management > Configuration Template** page, click **Add+** to generate a template. If you have already clicked **Save as configuration template** in the previous step, skip this step.



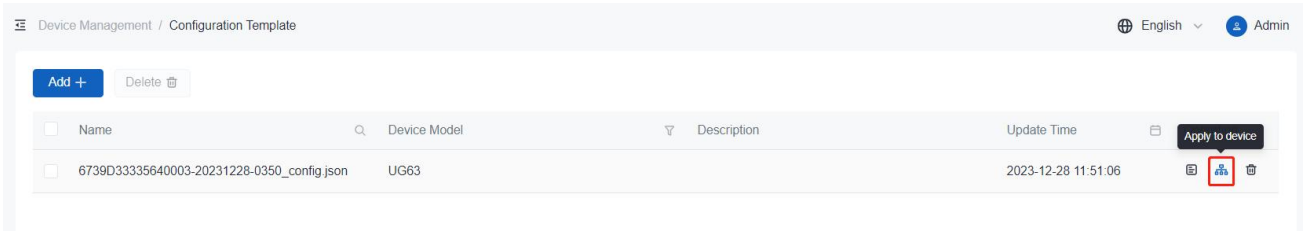
Customize the template name and select the device model, click **Upload** to upload the configuration file from local path, then save the settings. Users can also edit the uploaded configuration file here.

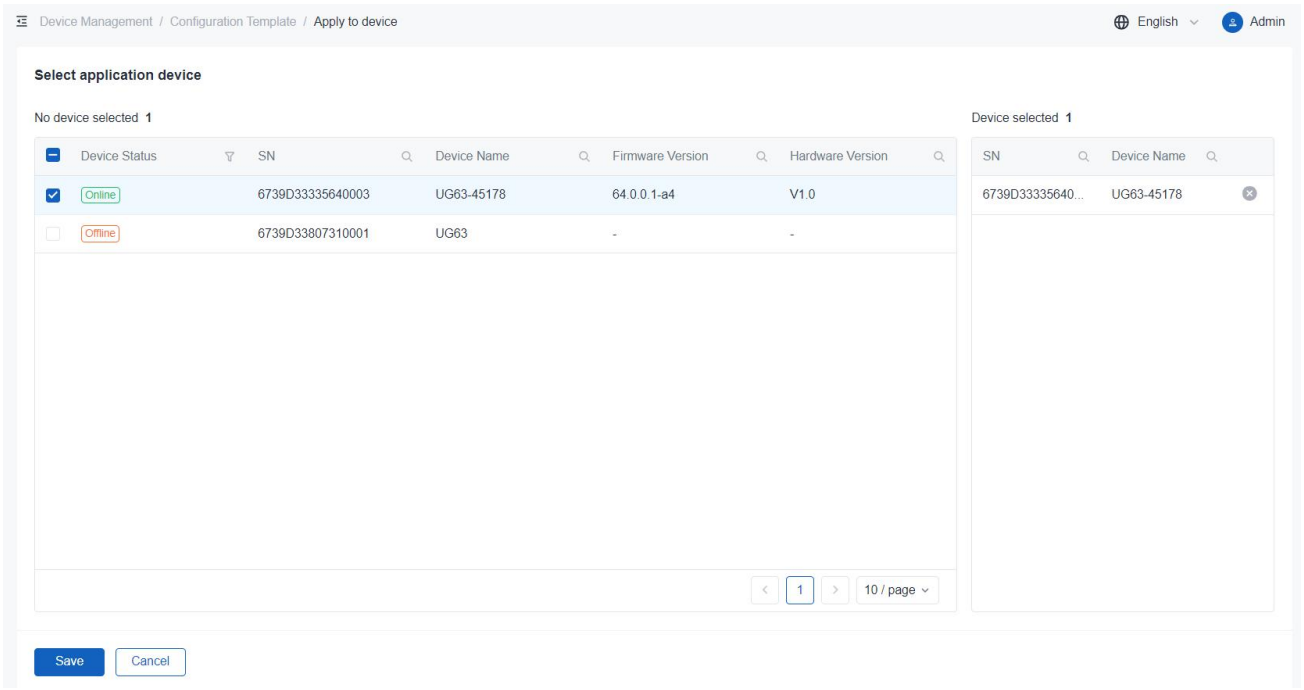


Note: it is suggested to get custom profile of device by two methods:

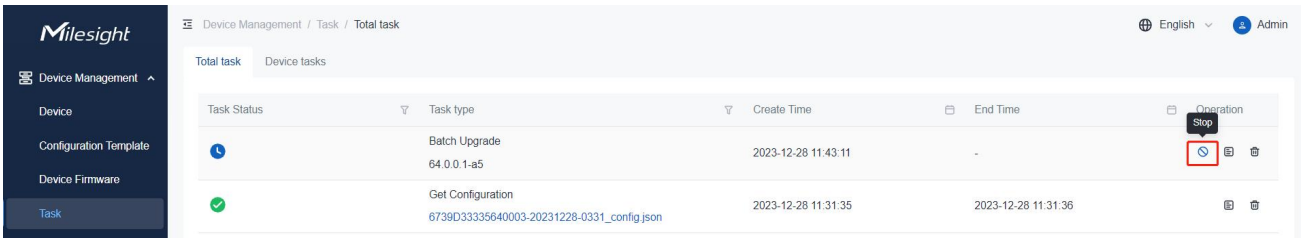
- Configure the device and download the configuration profile from device
- Customize the profile from [Milesight Development Platform]

5. Click **Apply to device** to select the devices you want to deploy, and save the settings. If the device is online, the deployment process will be applied immediately; if the device is offline, the deployment process will take effect once the device reconnects to DeviceHub.



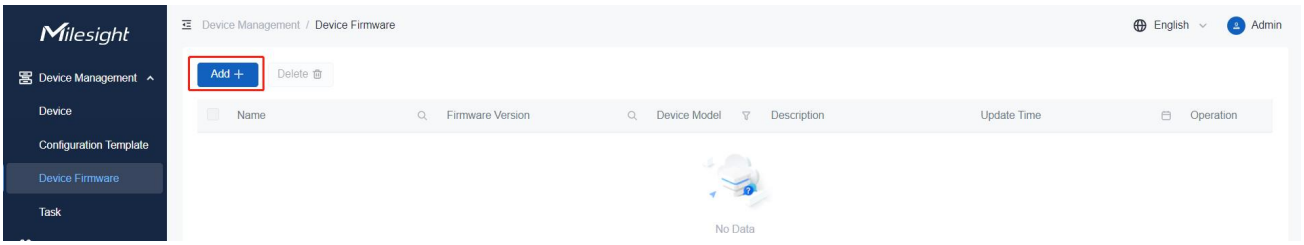


6. Navigate to **Device Management > Task** page to check batch configuration deployment status. If the upgrade process is scheduled but has not yet begun, click **Stop** to stop the process or click **Start** to start the process.

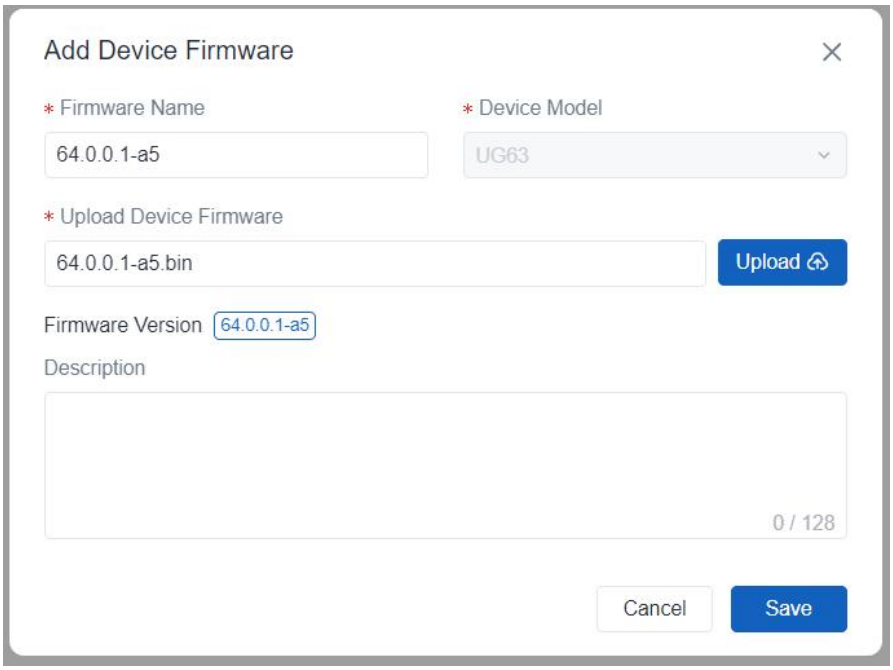


Device Upgrade

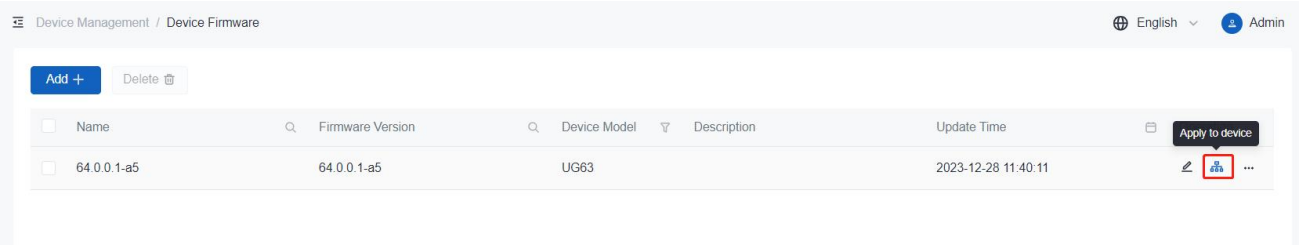
1. Navigate to **Device Management > Device Firmware** page, click **Add+** to generate a firmware event.

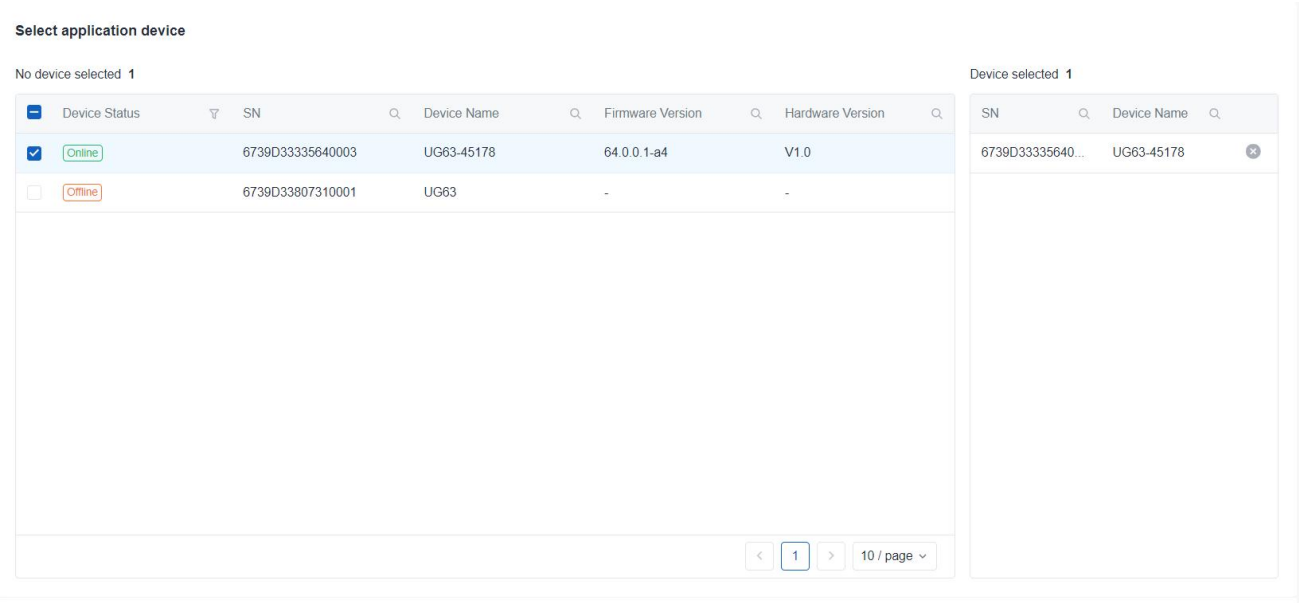


2. Customize the firmware name and select the device model, click **Upload** to upload the firmware, then save the settings.

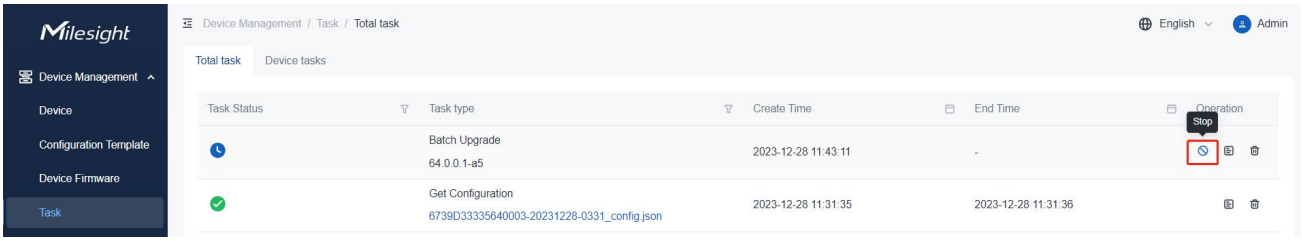


3. Click **Apply to device** to select the devices you want to upgrade, and save the settings. If the device is online, the upgrade process will be applied immediately; if the device is offline, the upgrade process will take effect once the device reconnects to DeviceHub.



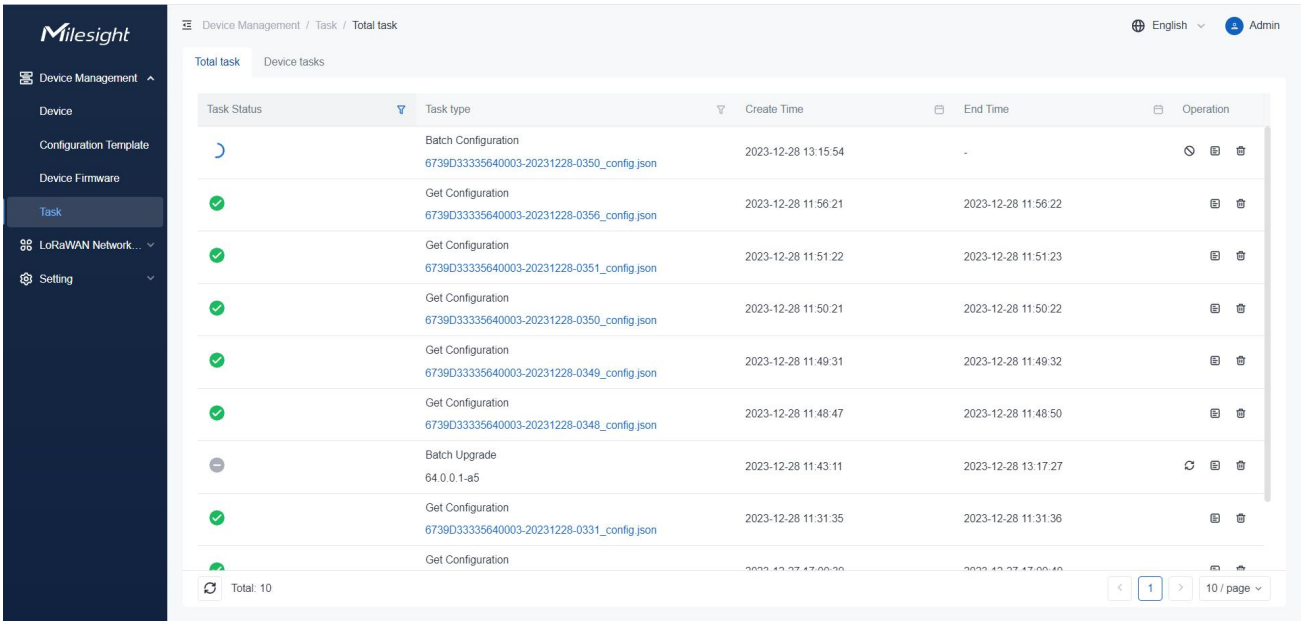


4. Navigate to **Device Management > Task** page to check upgrade status. If the upgrade process is scheduled but has not yet begun, click **Stop** to stop the process or click **Start** to start the process.



Task

On this page, users can check and search task for Upgrade, Configuration Obtaining, and Configuration Deployment. Click **Start** to restart the failed or stopped tasks, click **Stop** to stop pending tasks.



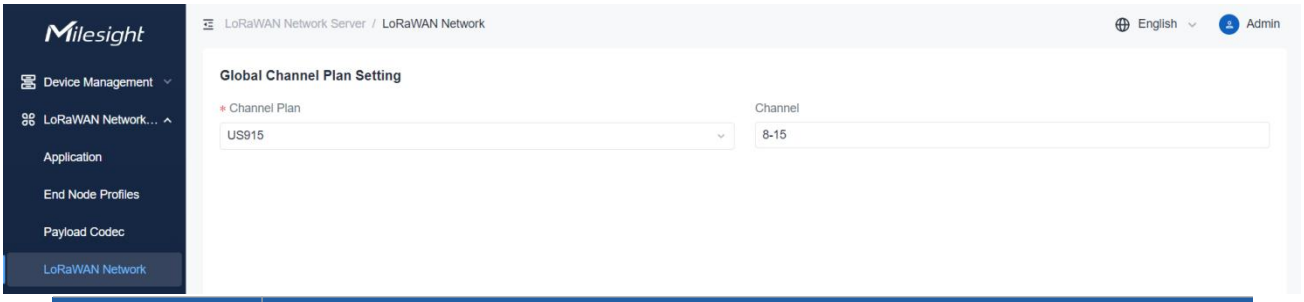
Task Status	Description
	**Successfully:** The task is executed successfully.
	**Executing:** The task is executing.
	**Scheduled:** The task is scheduled and pending.
	**Stopped:** The scheduled task is stopped.
	**Failed:** It failed to execute the task .

LoRaWAN® Network Server

DeviceHub supports to work as a LoRaWAN® network server, working with standard LoRaWAN® end devices of any brands.. Before using, ensure the Milesight gateway has been added (see Add Device) and connected to DeviceHub Device Management program.

LoRaWAN® Network

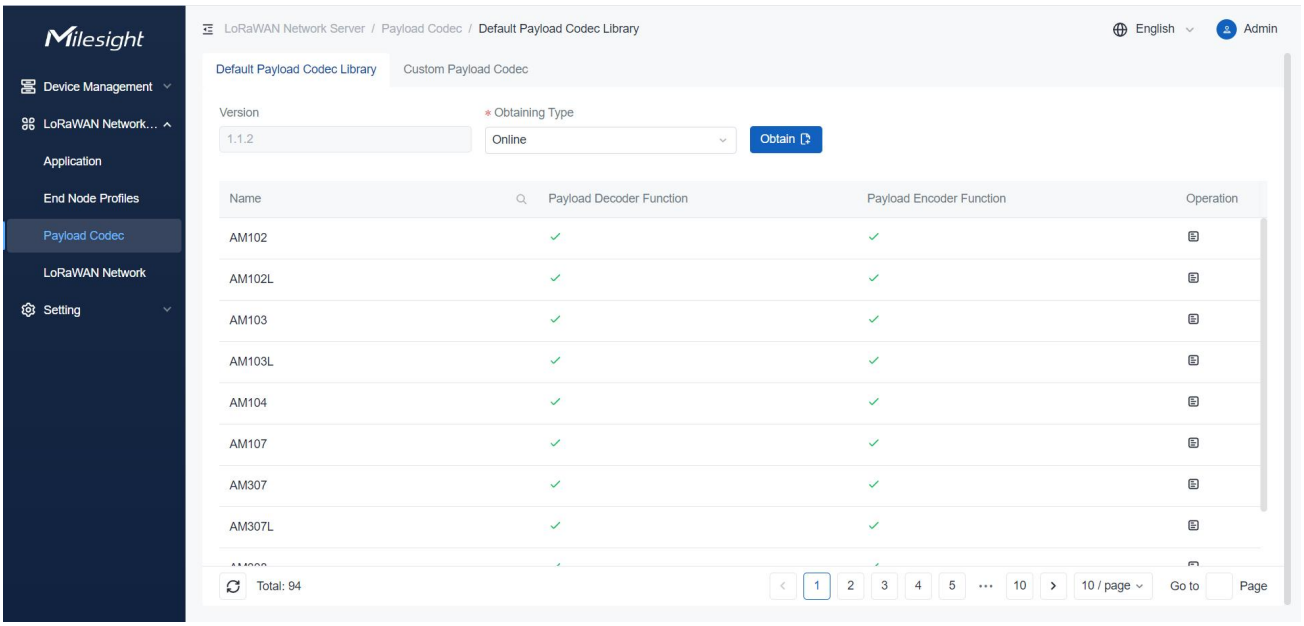
Navigate to **LoRaWAN Network Server > LoRaWAN Network** page to choose the channel plan and configure the channel of this network server.



Parameters	Description
Channel Plan	Choose LoRaWAN® channel plan used for the upstream and downlink frequencies and datarates. This must be in line with LoRaWAN® gateway and LoRaWAN® end device's settings.
Channel	Allow end devices to communicate with specific frequency channels. It allows to enter the index of the channels. **Examples:** 1, 40: Enabling Channel 1 and Channel 40 1-40: Enabling Channel 1 to Channel 40 1-40, 60: Enabling Channel 1 to Channel 40 and Channel 60 **Note:** For AU915/US915, leaving it blank means 0-63 channels are enabled; for other frequencies, leaving it blank means all usable channels are enabled.

Payload Codec

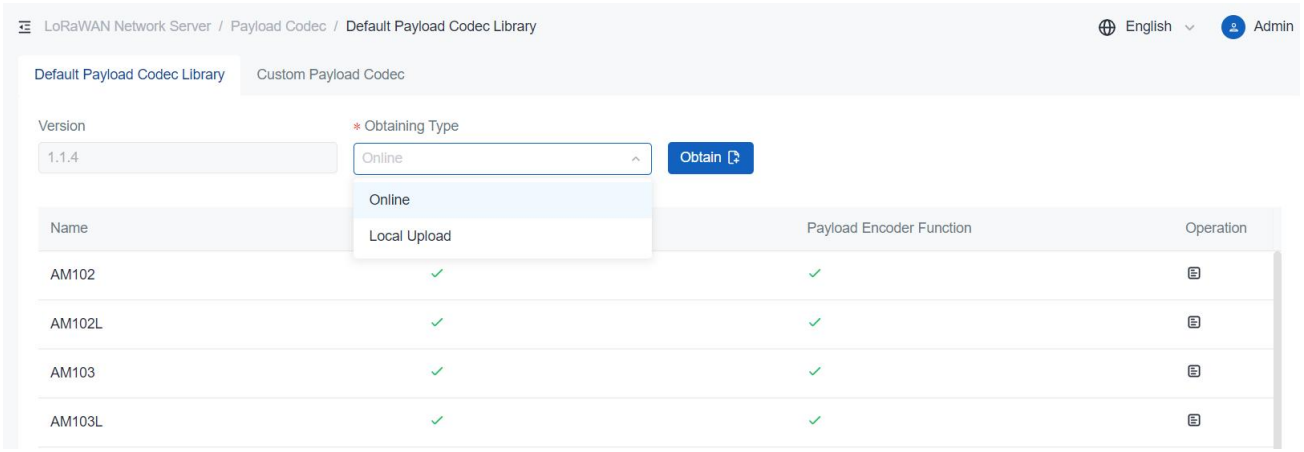
Payload Codec provides the inbuilt payload codec library of Milesight LoRaWAN® devices to decode and encode the data easily. Users can also customize the payload codec of devices of other brands or adjust the uplink and downlink contents as requirements.



Payload Codec Library

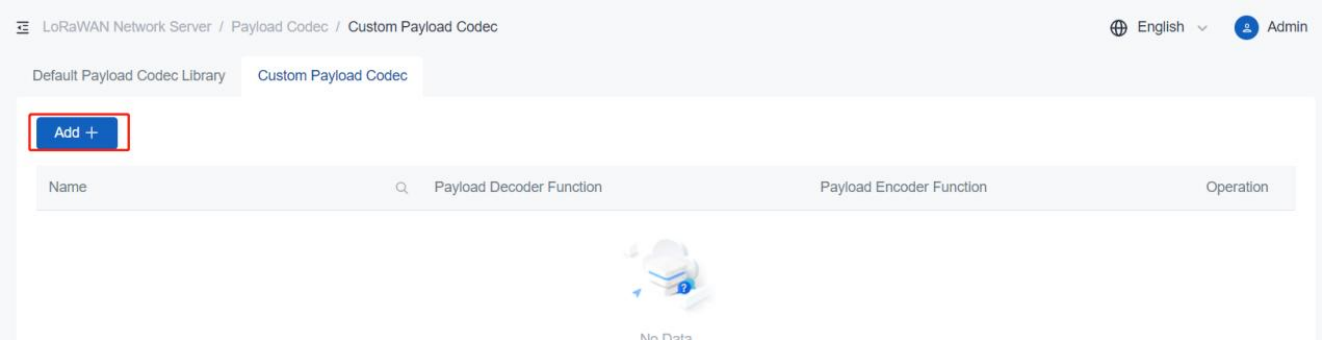
Select the type to update the Milesight devices payload codec library.

- **Online:** click **Obtain** button to check update status and update the library. Ensure that the DeviceHub has access to the Internet.
- **Local Upload:** click **Upload** button to upload the zip format payload codec package and click **Import** to update the library.



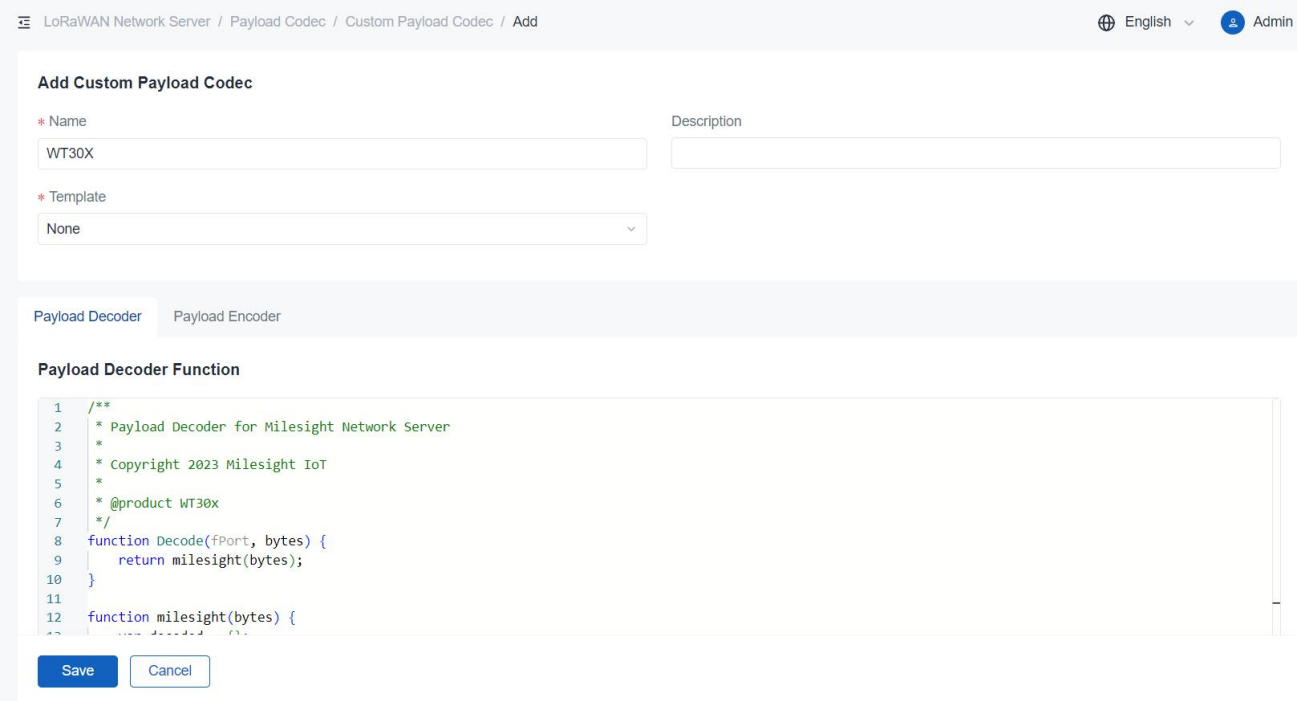
Custom Payload Codec

1. Click **Add+** to add a payload codec.



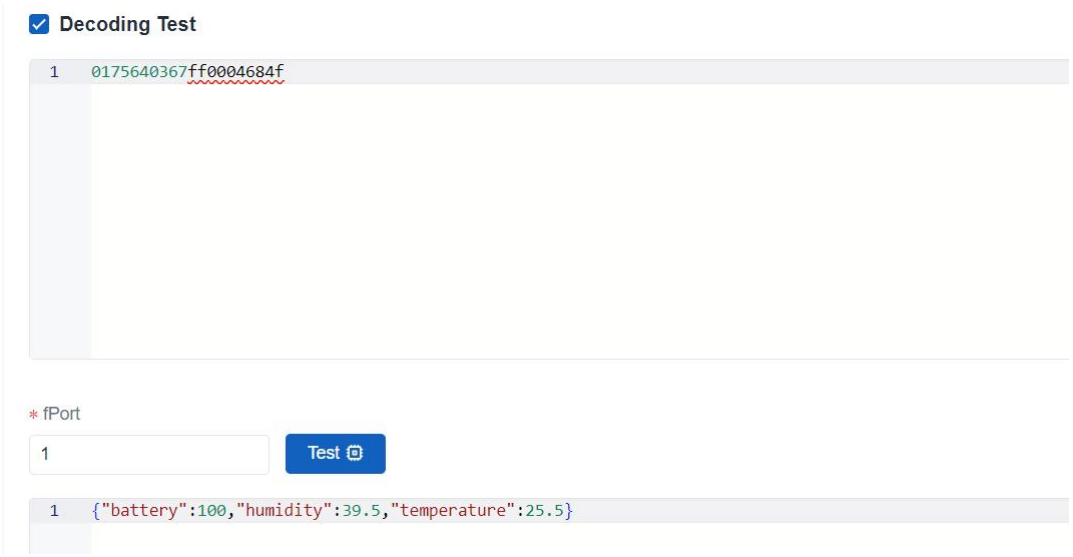
2. Customize a unique name and type the content of decoder and encoder. Users can also select an exist decoder as a template.

Note: click here to refer guide to add specific attribute as required.

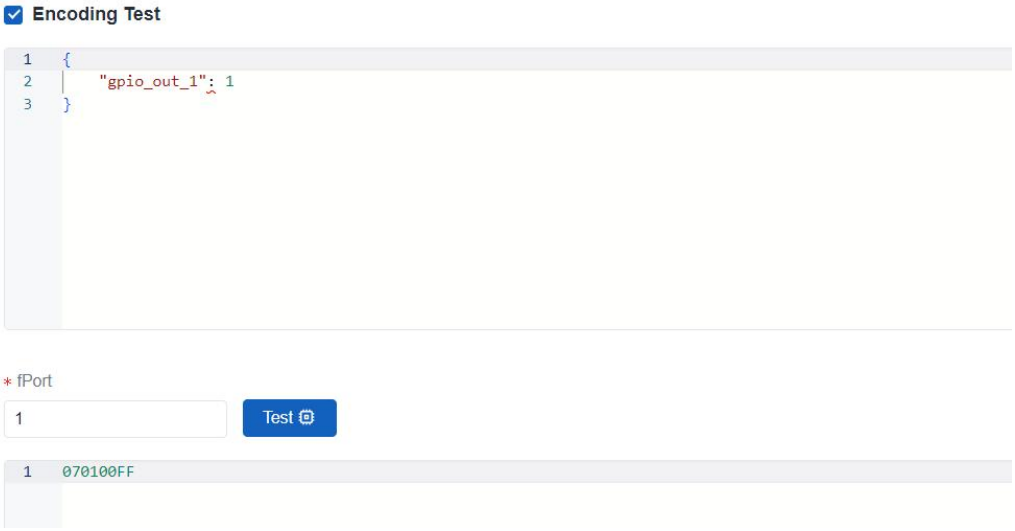


3. Check the box of **Decoding Test** or **Encoding Test**, type an example to test the output result. If it is successful, save this payload codec.

- Decoder is used to convert hex format data to json output results.

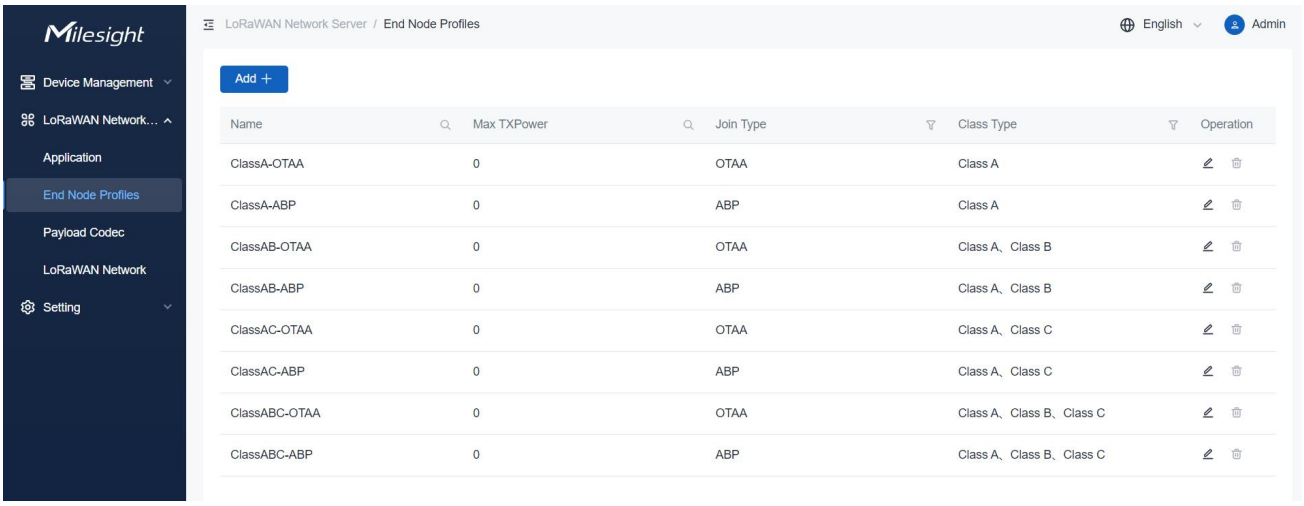


- Encoder is used to convert json format downlink message to hex output results.

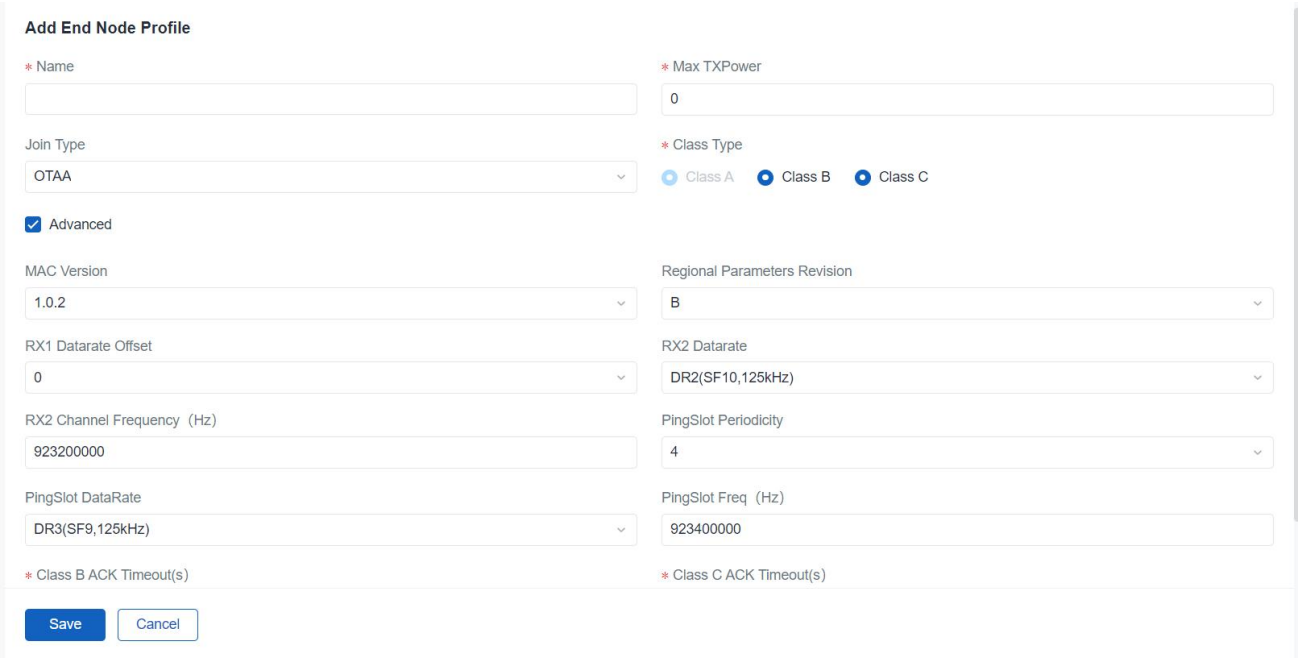


End Device Profiles

A profile defines the device capabilities and boot parameters that are needed by the Network Server for settings the LoRaWAN radio access service. These information elements shall be provided by the end-device manufacturer. DeviceHub LNS allows to preset 8 kinds of device profiles. Users can also customize the device profiles.



Create Profile

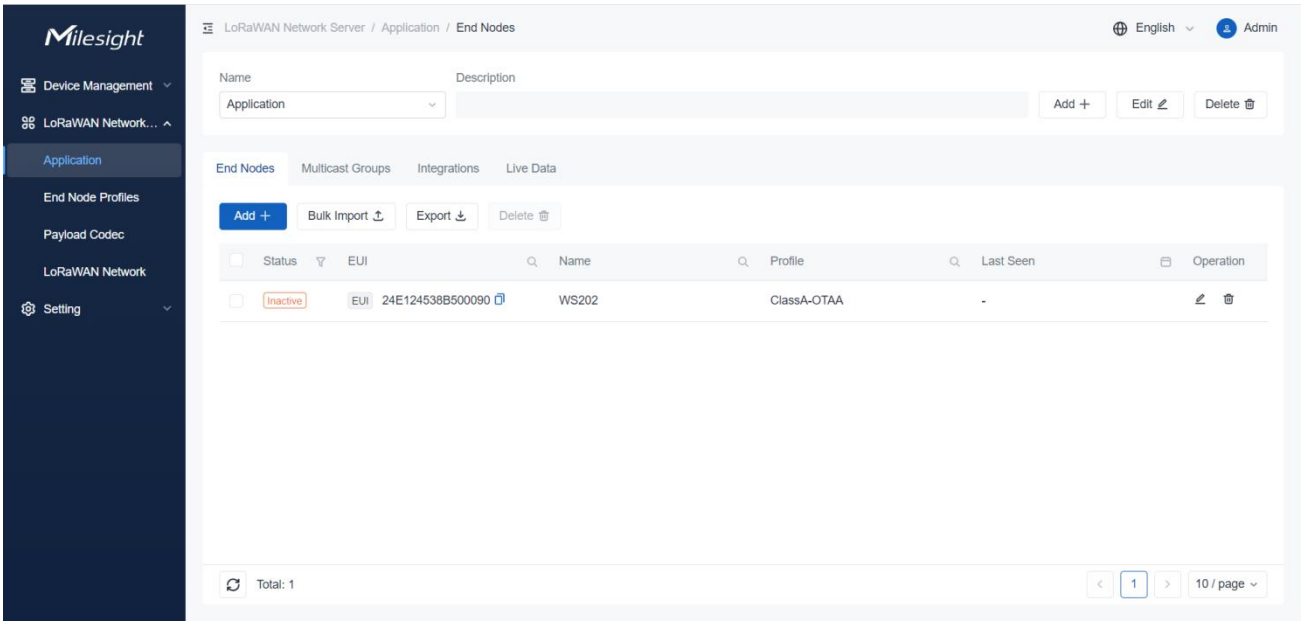


Parameters	Description
Name	Custom a unique name of the device profile.
Max TXPower	The TXPower indicates power levels relative to the Max EIRP level of the end-device. 0 means using the max EIRP. EIRP refers to the Equivalent Isotropically Radiated Power.
Join Type	Select from: “OTAA” and “ABP”.
Class Type	Class A is enabled by default. Users can check the box of Class B or Class C to add the class type.
Advanced	
MAC Version	Choose the version of the LoRaWAN® supported by the end-device.
Regional Parameter	Revision of the Regional Parameters document supported by the end-device.

Revision	
RX1 Datarate Offset	The offset which used for calculating the RX1 data-rate which is based on the uplink data-rate.
RX2 Datarate	Enter the RX2 datarate which used for the RX2 receive-window.
RX2 Channel Frequency	RX2 channel frequency which used for the RX2 receive-window.
PingSlot Periodicity	Period of opening the pingslot for Class B node devices.
PingSlot DataRate	Data-rate of the Class B node receiving downlinks.
PingSlot Freq/Hz	Frequency of the Class B node receiving downlinks.
ACK Timeout	The time for confirmed downlink transmissions. This option is only applicable to class B and class C.

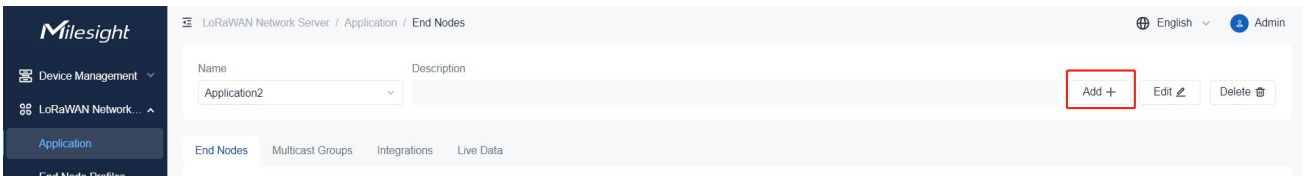
Application

An application is a collection of devices with the same purpose/of the same type. Users can add a series of devices to one application which needs to send data to the same destination.

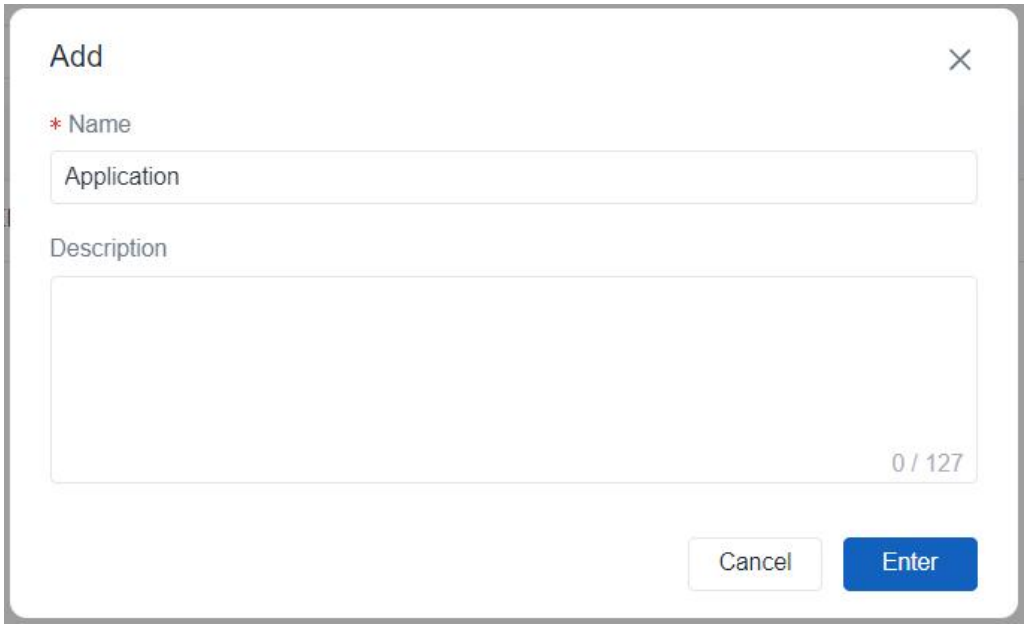


Add/Edit/Delete Application

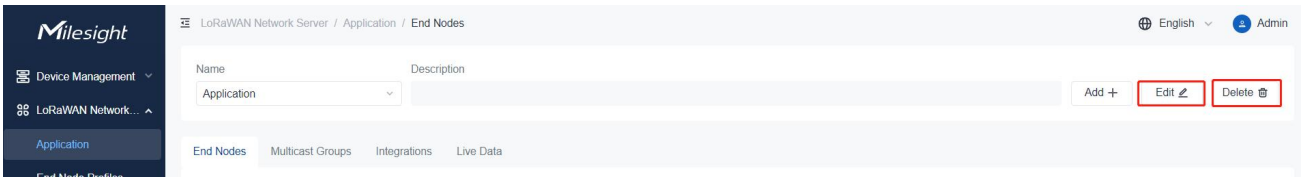
1. Click **Add+** to add an application.



Customize a unique application name and save the setting.

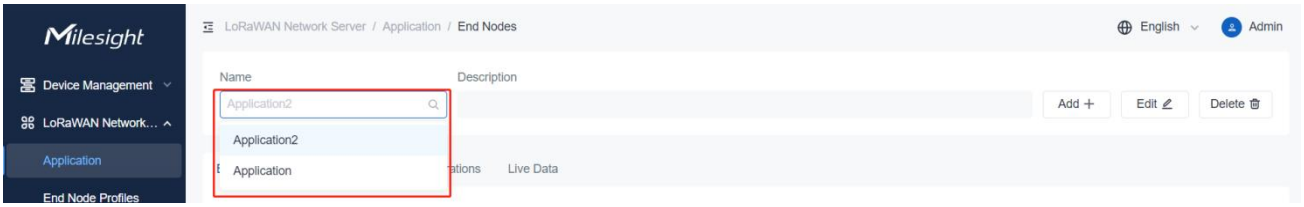


2. Click **Edit** to change the name and description of an application, click **Delete** to delete an application.



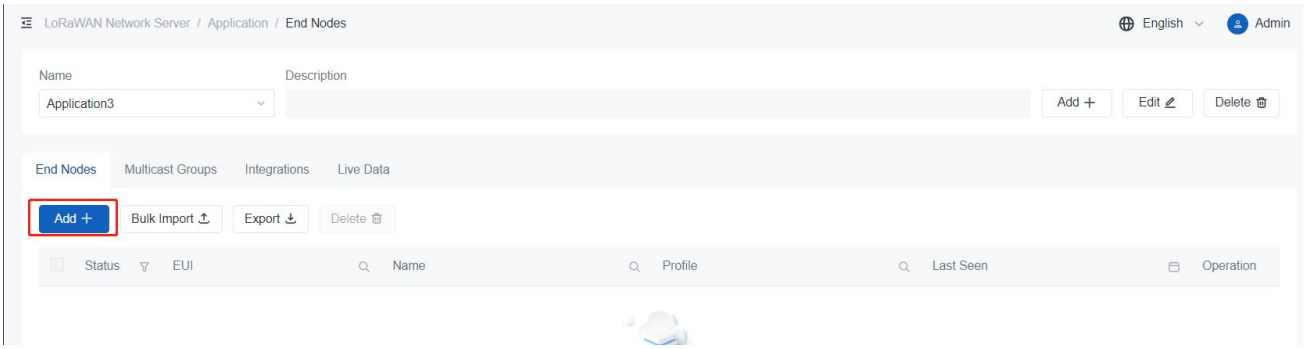
Add LoRaWAN® End Device

DeviceHub supports to add a single device or bulks of devices. Before adding, select the application you need to add devices first.

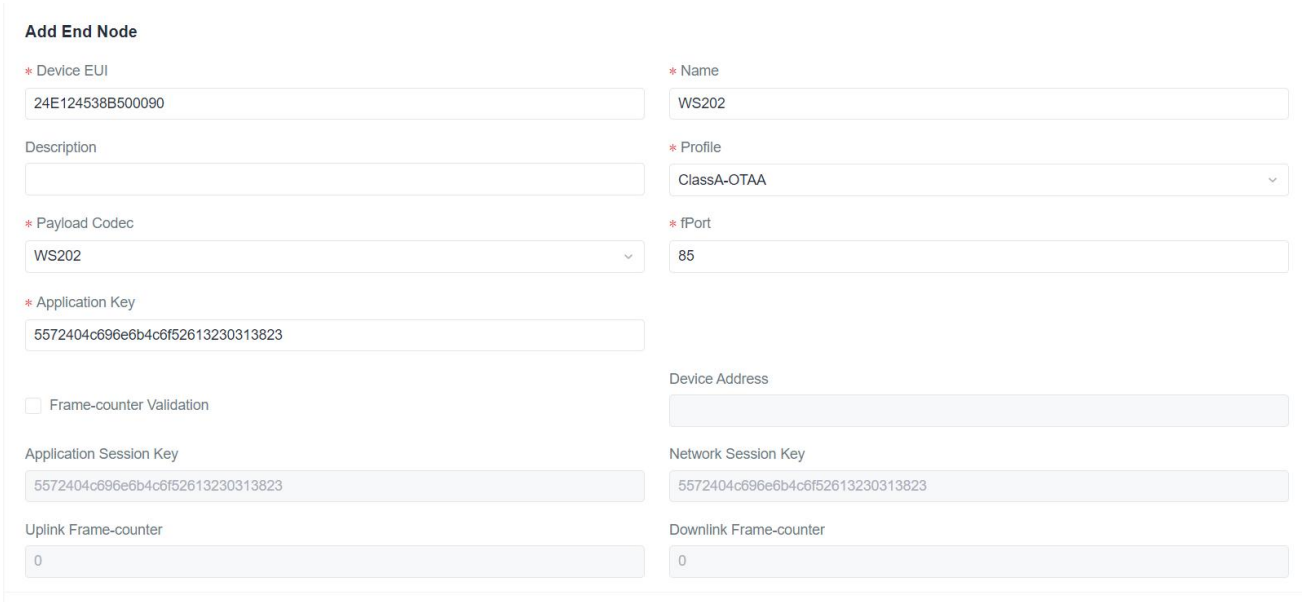


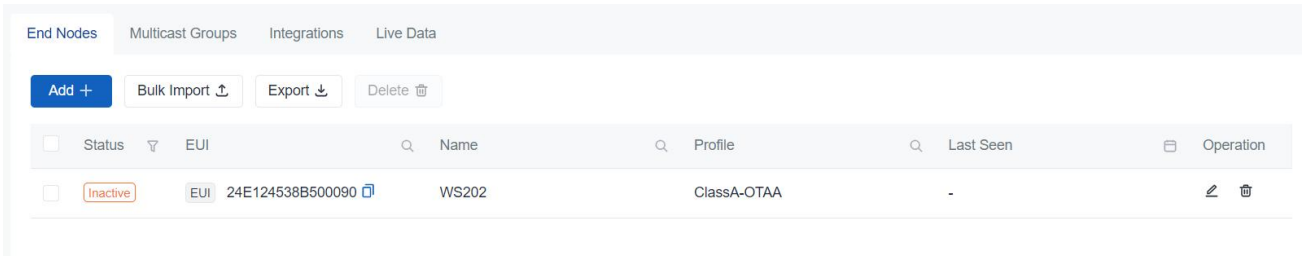
Add a Single Device

1. Click **Add+** to add the device.



2. Customize a unique device name and type the device information, then save the settings.



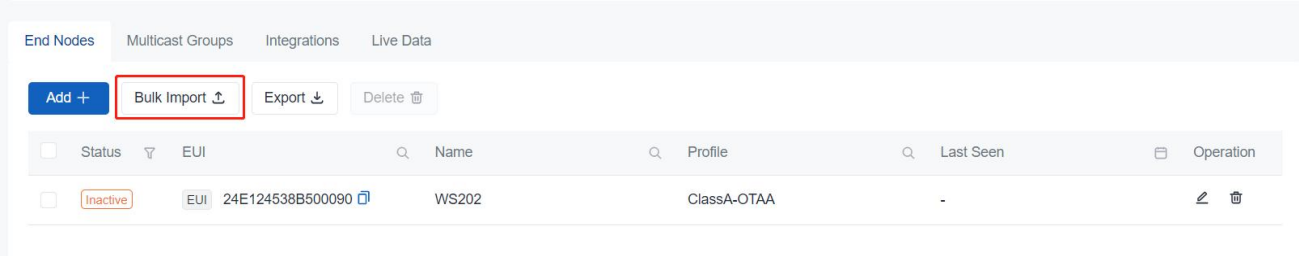


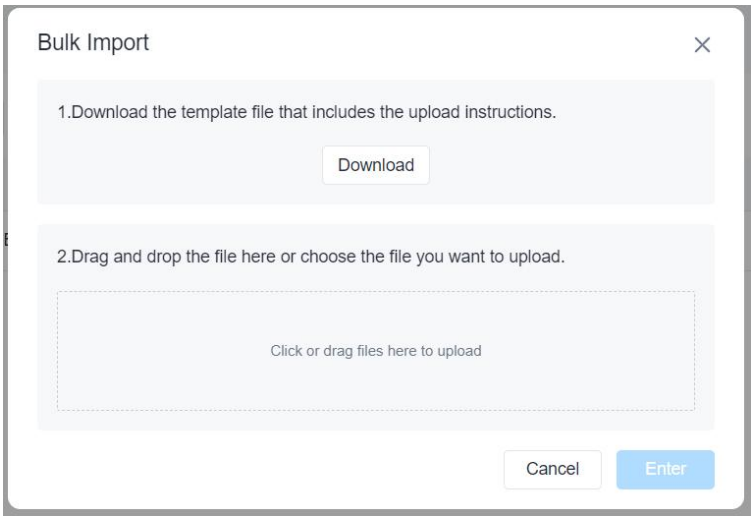
Parameters	Description
Device EUI	The unique ID for the device provided by device manufacturers.
Name	Customize a unique name of the device.
Description	Customize the description for this device.
Profile	Select the profile to indicate the join type and class type. For two join types, the device needs to type below parameters provided by device manufacturers: **OTAA:** Application Key (App Key) **ABP:** Device Address (Device Addr), Application Session Key (AppS Key), Network Session Key (NwkS Key)
Payload Codec	Choose the payload codec existed on **Payload Codec** page.

fPort	The communication port between device and network server.
Modbus RTU Data Transmission	Set up communication between TCP client (Modbus TCP client) and Milesight LoRaWAN® controllers.
Frame-counter Validation	When Frame-counter of end device is more than LNS recorded counter, LNS will sync node's frame-counter. When Frame-counter of end device is fewer than LNS recorded counter, LNS will discard uplink packets from node until node frame-counter is equal to LNS's.

Add bulks of Devices

1. Click **Bulk Import** to download the template file.

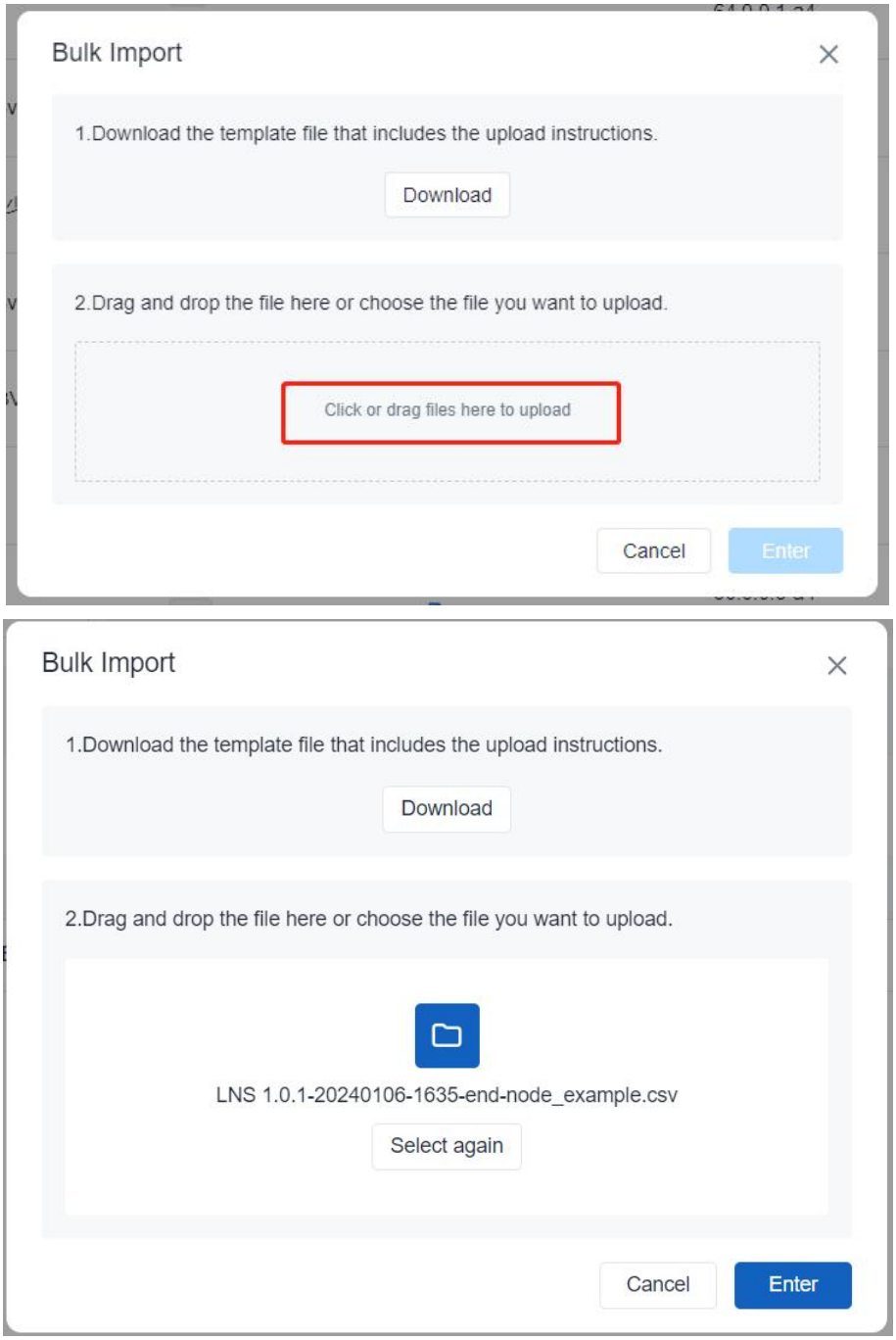




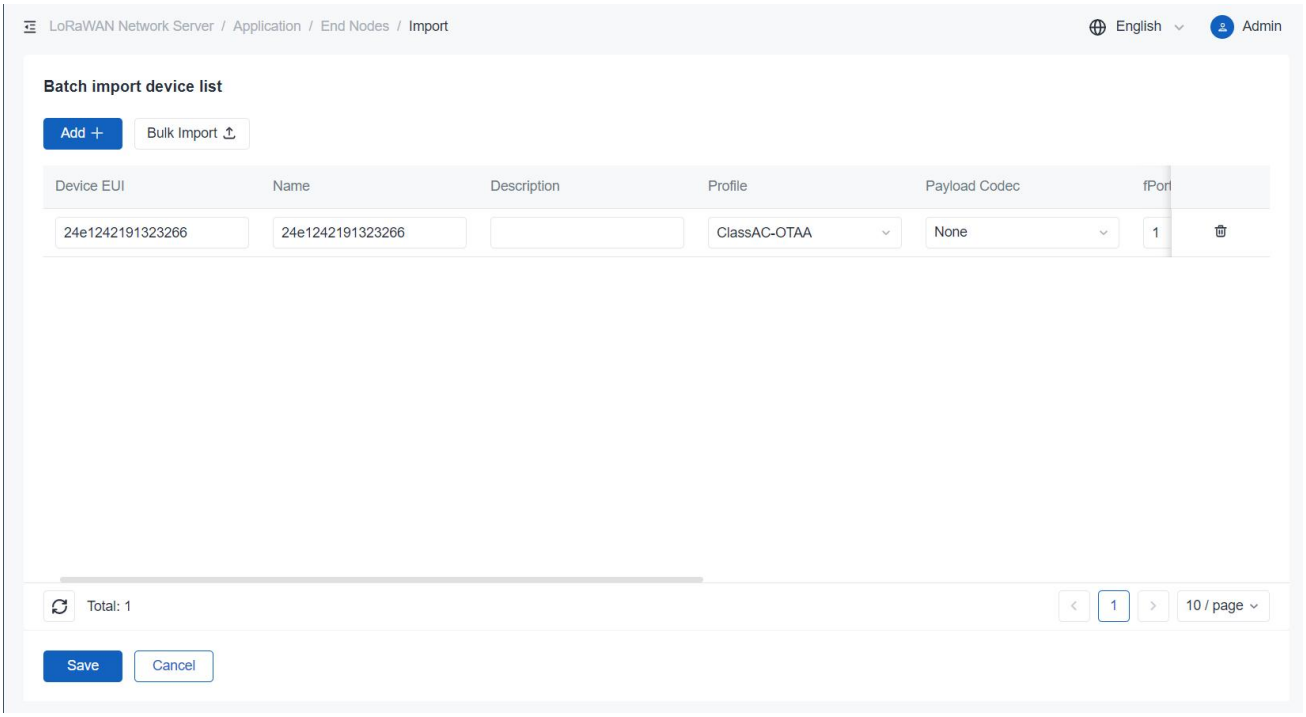
2. Edit and save the template file.

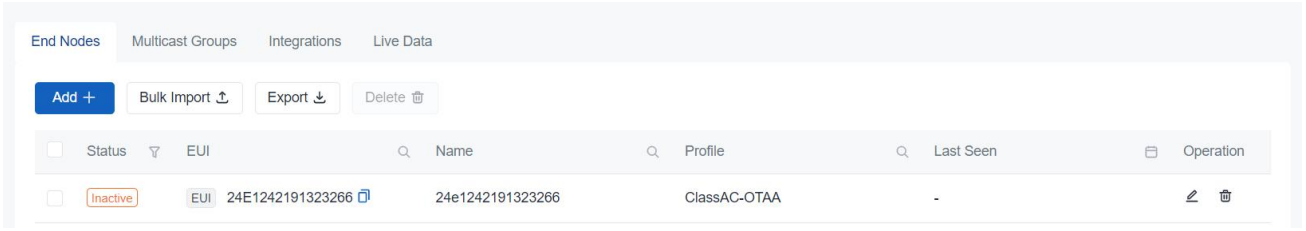
deveui	name	description	deviceprofile	payloadcodec	fport	appkey	devaddr	nwkskey	appskey
24e1242191323266	24e1242191323266		ClassAC-OTAA		1	11223344556677899aa112233445566			

3. Click the zone to select template file or drag the file to the zone to upload. Then click **Enter** to import the devices.



4. Check and edit the import list, then click **Save** to add the devices.



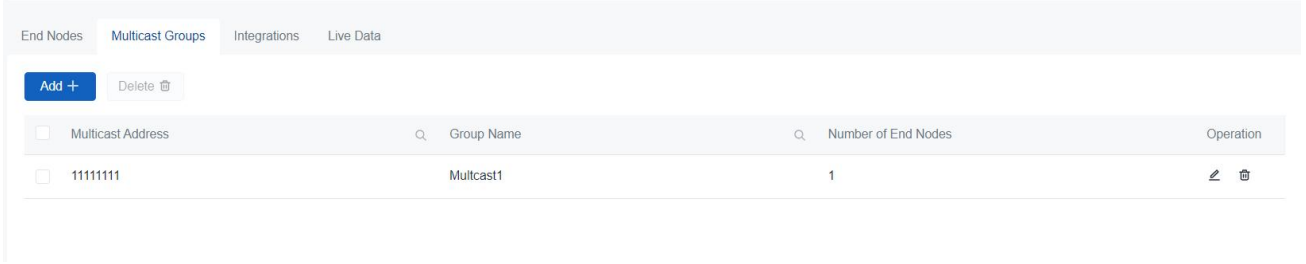


Multicast Group

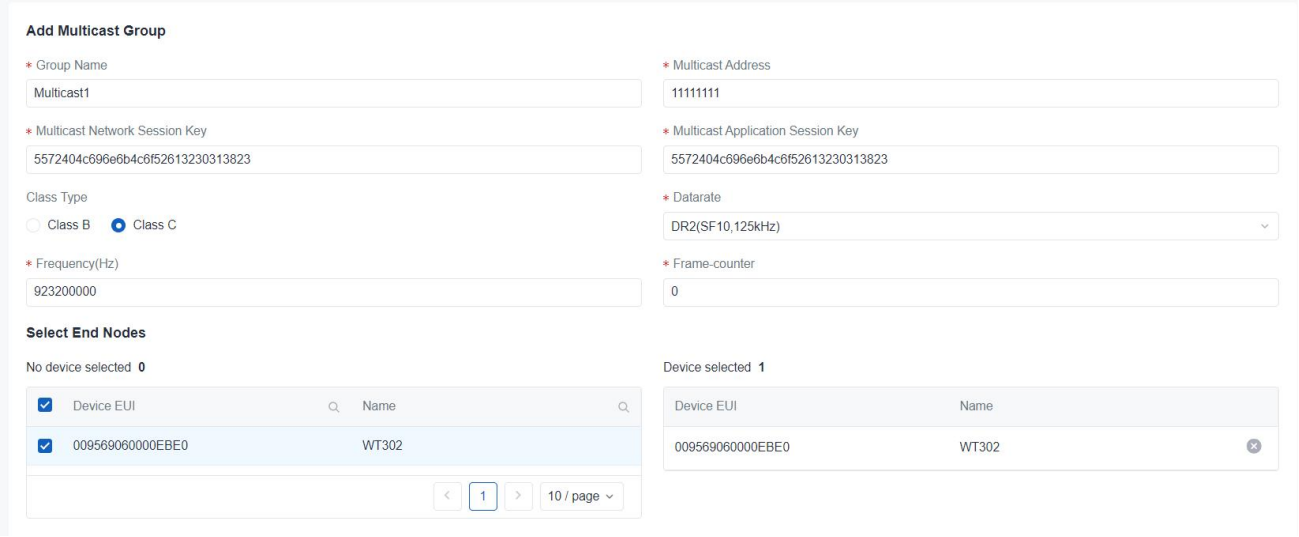
DeviceHub LNS supports the creation of multicast-groups to which devices can be assigned. A multicast group is a virtual ABP device, where multiple physical devices share the same DevAddr and session keys. It does not support uplink, confirmed downlink, nor MAC commands.
Multicast can be used for the following device-classes:

- Class-B
- Class-C

Besides, the end devices should also support multicast feature.



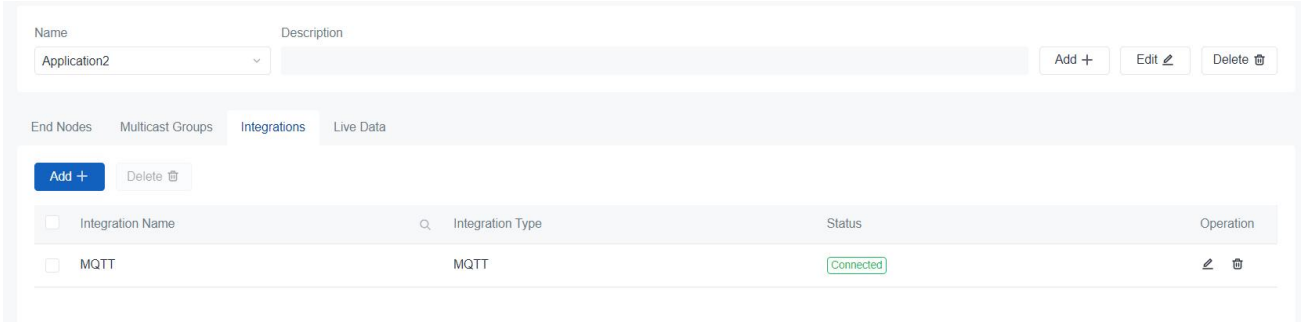
Click **Add+** to add the multicast group.



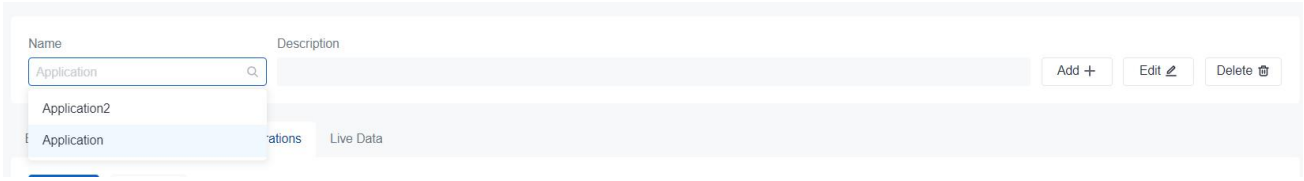
Parameters	Description
Group Name	Customize a unique name of this multicast group.
Multicast Address	Device address (Dev Addr) of all devices in this group.
Multicast Network Session Key	The network session key (Netwks Key) of all devices in this group.
Multicast Application Session Key	The application session key (AppSKey) of all devices in this group.
Class Type	Class B and Class C are optional.
Datarate	Data-rate of the node receiving downlinks
Frequency	Downlink frequency of all devices in this group.
Frame-counter	The number of data frames which received by the end-device downlink from the network server. It will be incremented by the network server.
Ping Slot Periodicity	Period of opening the pingslot. This is only applied to Class B end devices.
Select End Devices	Select devices to add to this multicast group.

HTTP(s)/MQTT(s) Integration

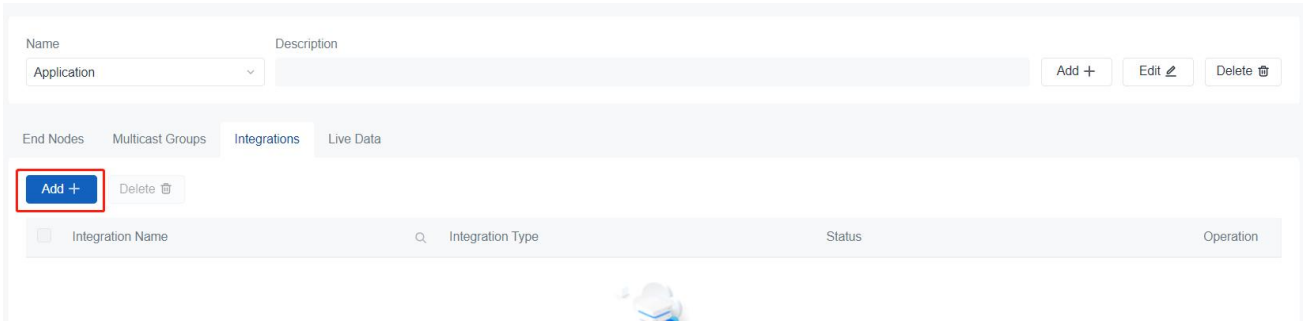
DeviceHub LNS supports to set up integration with third-party servers via HTTP(s) or MQTT(s) protocol. After adding the integration, the device uplink data under the specific application will be forwarded to the corresponding server. An application supports to add only one MQTT integration and one HTTP(s) integration.



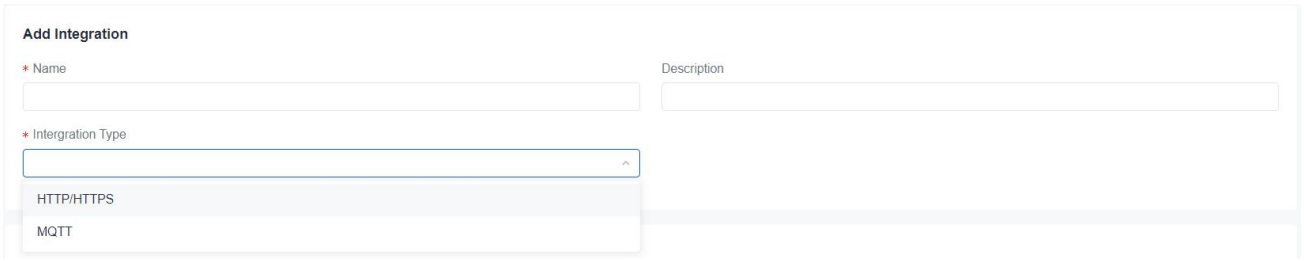
1. Select the correct application which has added devices.



2. Click **Add+** to add the integration for this application.

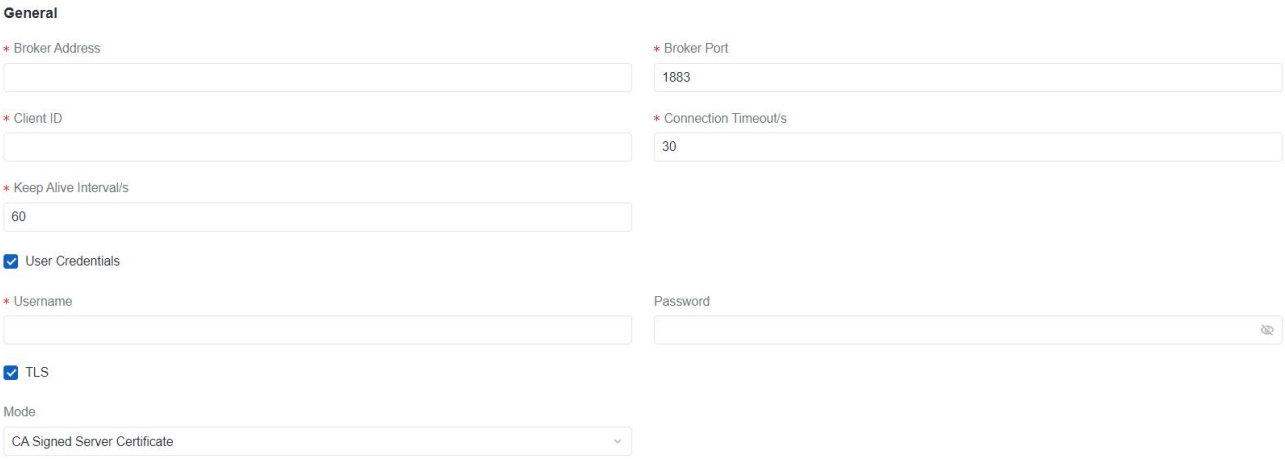


3. Customize a unique name for this integration and select the integration type.



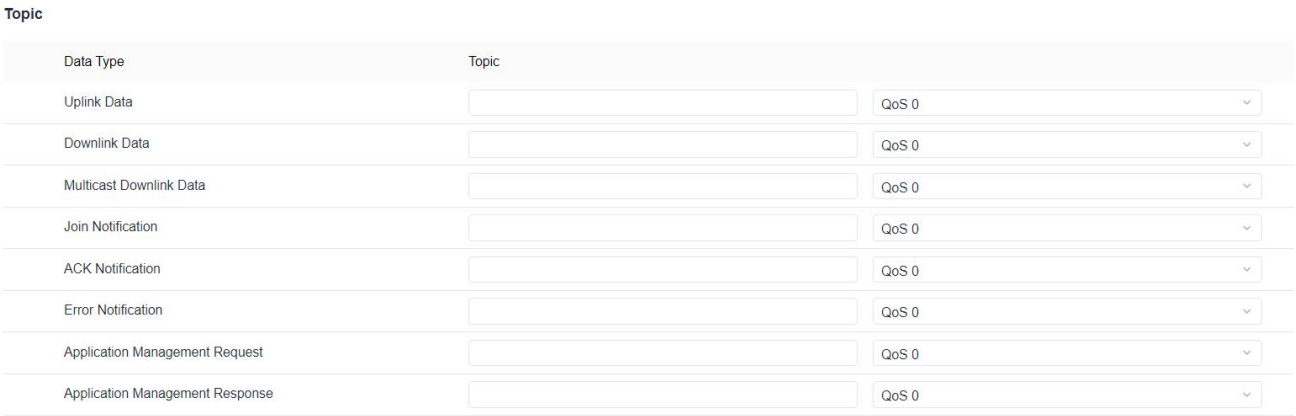
4. Type the information of third-party MQTT broker or HTTP server.

MQTT Integration



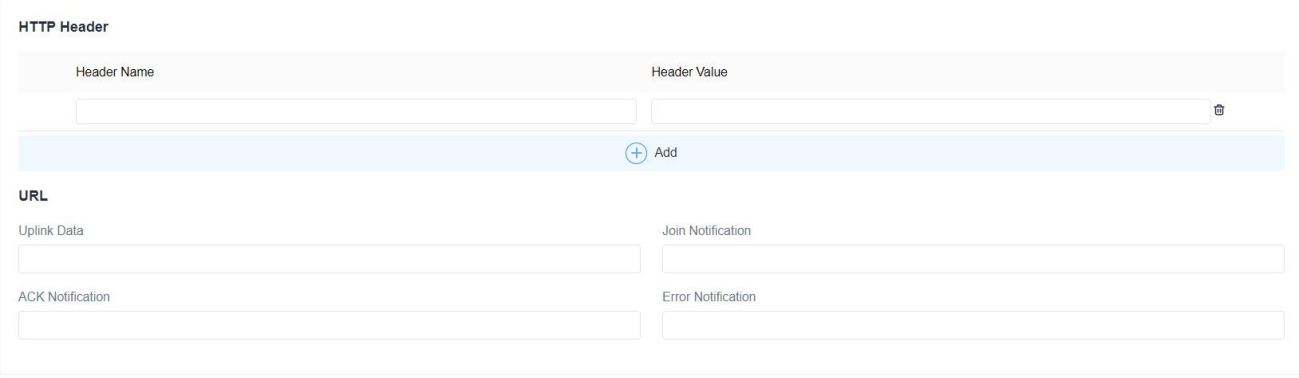
Parameters	Description
Broker Address	MQTT broker address to receive data.
Broker Port	MQTT broker port to receive data.
Client ID	Client ID is the unique identity of the client to the server.
Connection Timeout/s	If the client does not get a response after the connection timeout, the connection will be considered as broken. The Range: 1-65535
Keep Alive Interval/s	After the client is connected with the server, the client will send heartbeat packet to the server regularly to keep alive. Range: 1-65535
User Credentials	
Username	The username used for connecting to MQTT broker.
Password	The password used for connecting to MQTT broker.
TLS	
Mode	Self-signed certificates or CA signed server certificate is optional. **CA signed server certificate:** verify with the certificate issued by Certificate Authority (CA) that pre-loaded on the DeviceHub. **Self-signed certificates:** upload the custom CA certificates, client certificates and secret key for verification.

Note: if MQTT broker type is HiveMQ, please enable **TLS** and set the option as **CA signed server certificate.**



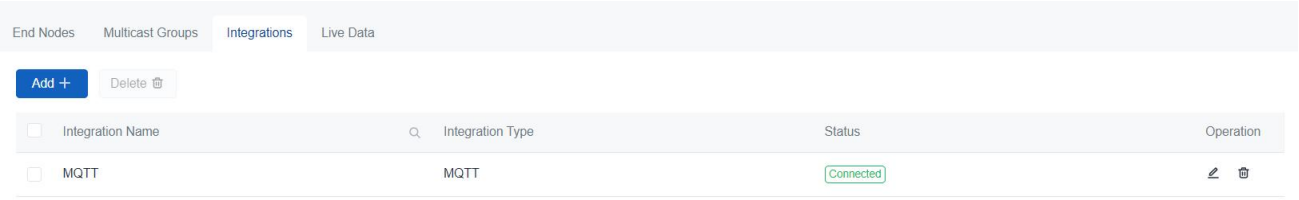
Parameters	Description
Data Type	Data type to communicate with MQTT broker: **Uplink Data:** receive device uplink packets **Downlink Data:** send downlink commands to device **Multicast Downlink Data:** send downlink commands to multicast group **Join Notification:** receive join request packets from devices **ACK Notification:** receive ACK packets from devices **Error Notification:** receive error packets from devices **Application Management Request:** send requests to enquire and configure the LNS **Application Management Response:** receive the request responses
Topic	Topic name of the data type used for publishing.
QoS	QoS 0 – Only Once This is the fastest method and requires only 1 message. It is also the most unreliable transfer mode. QoS 1 – At Least Once This level guarantees that the message will be delivered at least once, but may be delivered more than once. QoS 2 – Exactly Once QoS 2 is the highest level of service in MQTT. This level guarantees that each message is received only once by the intended recipients. QoS 2 is the safest and slowest quality of service level.

HTTP/HTTPS Integration



Parameters	Description
HTTP Header	
Header Name	A core set of fields in HTTP header.
Header Value	Value of the HTTP header.
URL	
Data Type	Data type sent to HTTP/HTTPS server.
Topic	Topic name of the data type using for publish.
URL	HTTP/HTTPS server URL to receive data.

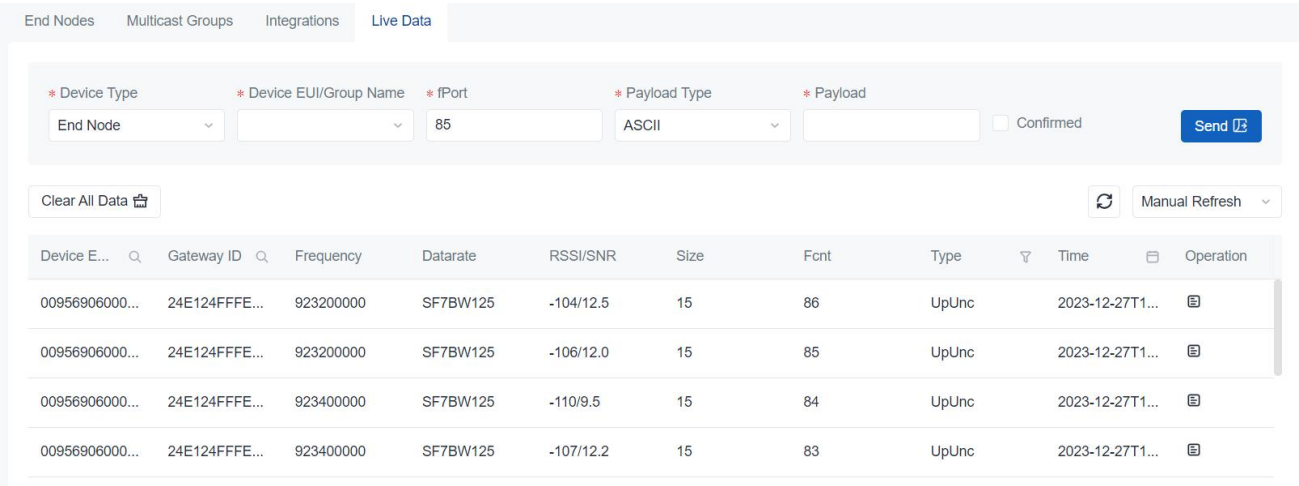
5. Save the settings and check the connection status between DeviceHub LNS and the third-party server.



6. Check the data on the third-party server. The uplink content of every device follows the output of Payload Codec. If the device does not add payload codec file, it will send the packet as LoRa Object format.

Live Data

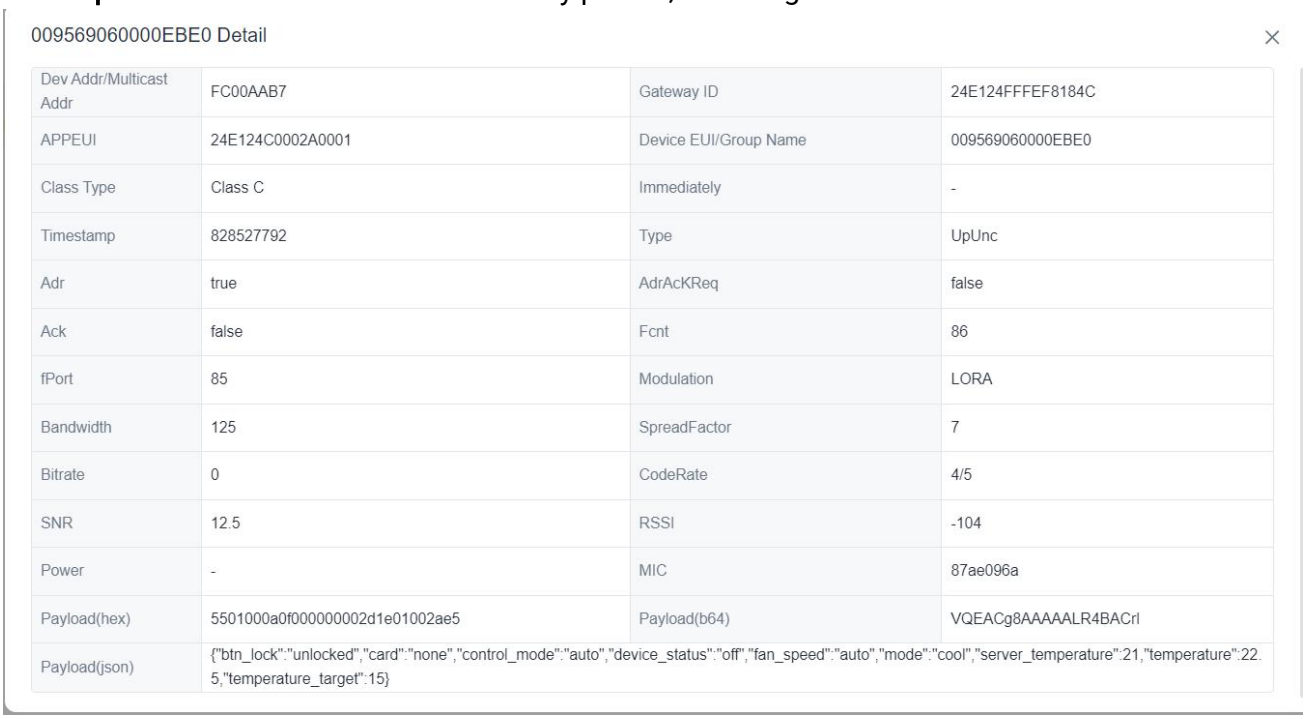
When the device is sending data to DeviceHub LNS, DeviceHub LNS supports to show live data.



Parameters	Description
Device EUI/Group	The device EUI of the device or multicast group name.
Gateway ID	The gateway ID to transmit this packet.
Frequency	The used frequency to transmit this packet.
Datarate	The used data-rate to transmit this packet.
RSSI/SNR	Show the signal-noise ratio and the received signal strength indicator.
Size	The size of payload or downlink command.
Fcnt	The frame counter of uplink or downlink.
Type	The type of the packet: JnReq - Join Request Packet from End-device (OTAA Only) JnAcc - Join Accept Packet from Network Server (OTAA Only) UpUnc - Uplink Unconfirmed Packet UpCnf - Uplink Confirmed Packet - ACK response from network requested

	DnUnc - Downlink Unconfirmed Packet DnCnf - Downlink Confirmed Packet- ACK response from end-device requested
Time	The time of packet was sent or received. It's fixed as UTC+0 timezone.

Click **Operation** to check the details of every packet, including the decoded results.

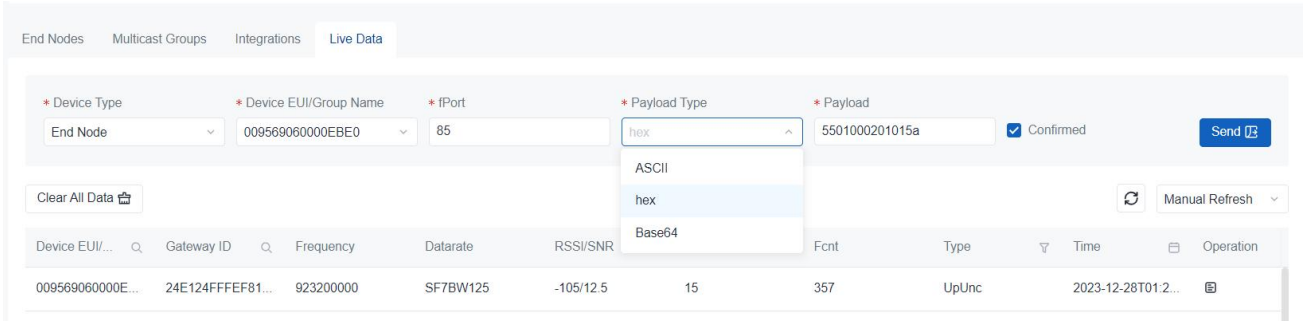


Downlink Test

DeviceHub LNS supports to send downlink commands to a specific device or a multicast group for test or troubleshooting.

Send Downlink via DeviceHub LNS

Navigate to **LoRaWAN Network Server > Application > Live Data** page to select the device or multicast group and type the downlink contents.



Parameters	Description
Device Type	Select device type as end node or multicast group.
Device EUI/Group Name	Select or type the specific device EUI or the multicast group name.
fPort	The LoRaWAN® communication port for packet transmission between device and Network Server. It's 85 by default for Milesight end devices.
Payload Type	Select from: "ASCII", "hex", and "base64".
Payload	The downlink command to be sent to this device. These should be provided by the end-device manufacturer.
Confirmed	After enabled, when the end device receives downlink packet, it should answer ACK (acknowledgement) packet to the network server. Multicast feature does not support confirmed downlink.

Send Downlink via MQTT

1. Add a MQTT integration in an application and ensure the data can be forwarded to the MQTT broker.
2. Customize the topic names of downlink data or multicast downlink data, then save the settings. The Downlink Data topic supports to add wildcard "$deveui" to send downlink to specific devices.

3. Use another MQTT client to publish the JSON format downlink message to the downlink topic. The downlink content should be converted as Base64 format.

Downlink Data Format:

```
{
  "confirmed": true,
  "fport": 85,
  "data": "VQEAAgEBWg=="
}
```

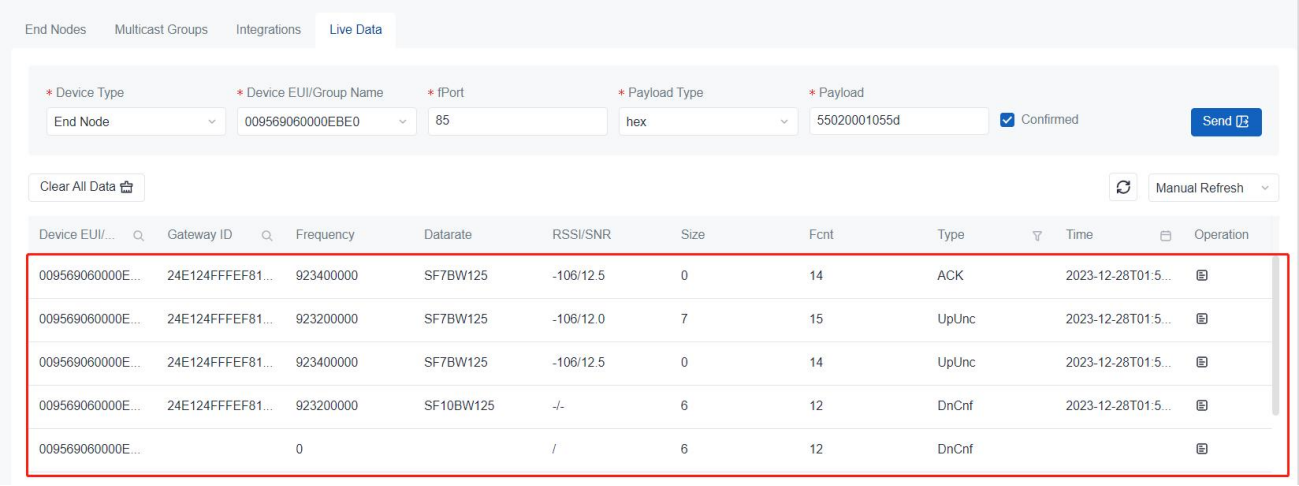
Multicast Downlink Data Format:

```
{
  "multicastName": "group1",
  "fport": 85,
  "data": "VQEAAgEBWg=="
}
```

Check Sending Results

After sending, click **Manual Refresh** or wait for automatic refresh to check the downlink commands and the replies.

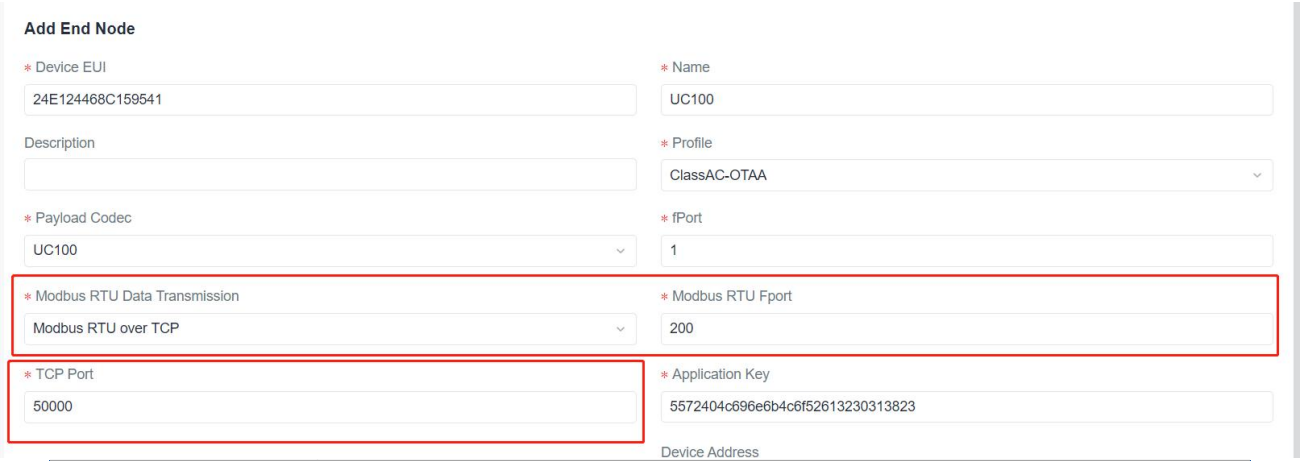
Note: For Class A devices, the network server will only send data to the device after it has sent an uplink packet. The downlink command will be stored on the waiting queue of the network server and send in order. The downlink packet without any frequency, data-rate and time information means this packet is under waiting queue.



Modbus RTU Data Transmission

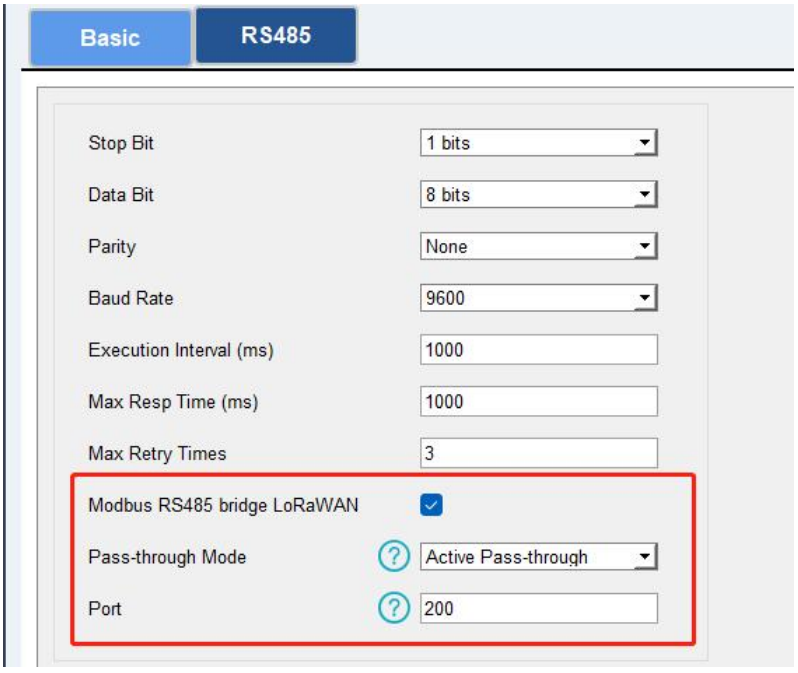
DeviceHub LNS supports to work as a TCP server to set up communication between TCP client (Modbus TCP client) and Milesight LoRaWAN® controllers.

1. Type a device EUI of Milesight controller when adding a device, the option to set Modbus RTU Transmission will pop up automatically.



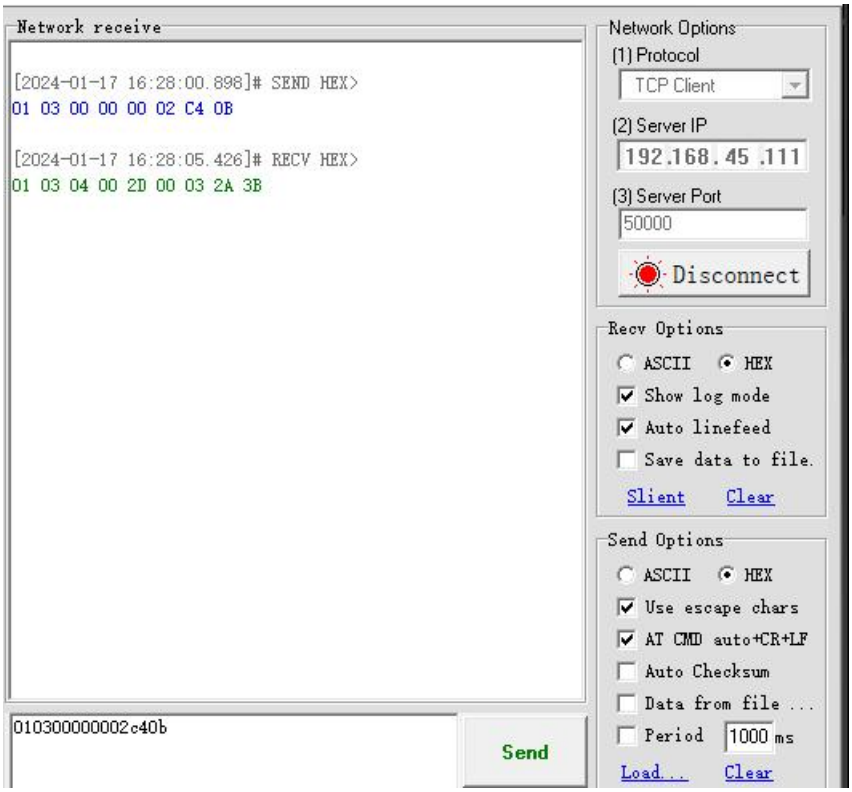
Parameters	Description
Modbus RTU Data Transmission	Choose from: "Disable", "Modbus RTU to TCP", and "Modbus RTU over TCP". **Modbus RTU to TCP:** TCP client can send Modbus TCP commands to Milesight controller. **Modbus RTU over TCP:** TCP client can send Modbus RTU commands to Milesight controller.
Modbus RTU Fport	Set the communication port for transparent transmission between Milesight LoRaWAN® controllers and DeviceHub LNS. Range: 2-84, 86-223.
TCP Port	Set the TCP port for data transmission between the TCP Client and DeviceHub LNS.Range: 50000-50100.

2. Enable **Modbus RS485 bridge LoRaWAN** feature on Milesight controller and set the port the same as the Modbus RTU Fport of DeviceHub LNS.

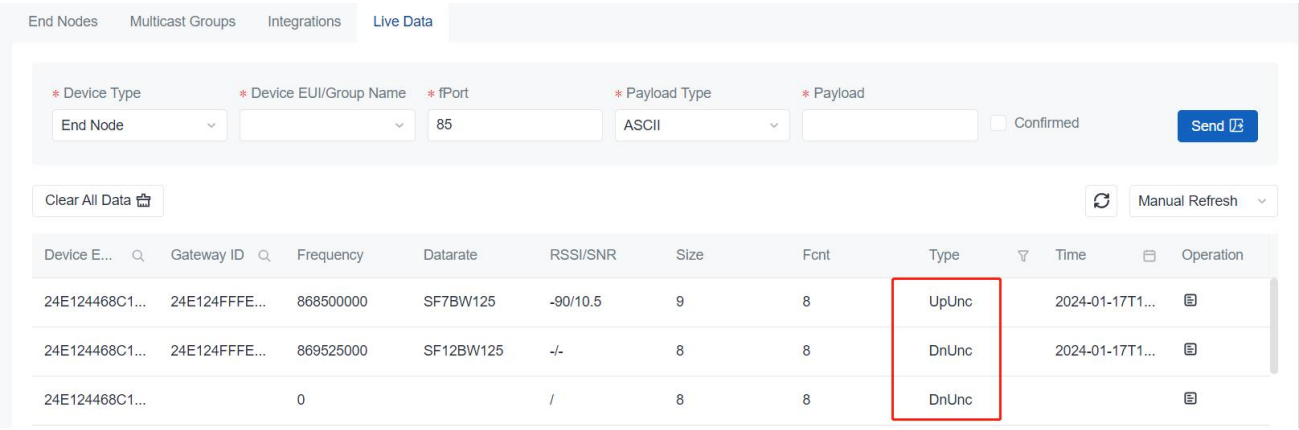


3. Connect the TCP client to DeviceHub LNS, then send Modbus TCP commands or Modbus RTU

commands with hex format and check if any replies.



4. The commands and replies can also be found on **Live Data** tab.



Note: if the DeviceHub LNS does not receive the Modbus replies for 10s, it will consider it as a timeout event. So it is not suggested to use this feature under below conditions:

1) Device class type is Class A (UC502, UC501 with Class A mode);
2) The network delay is long between gateway and DeviceHub LNS, between DeviceHub LNS and TCP client.

-END-