



SENSECAP

THE NEW GENERATION LORAWAN SENSORS OF SENSECAP

How to connect S210X Sensors to The Things Network

Version: v1.1.1



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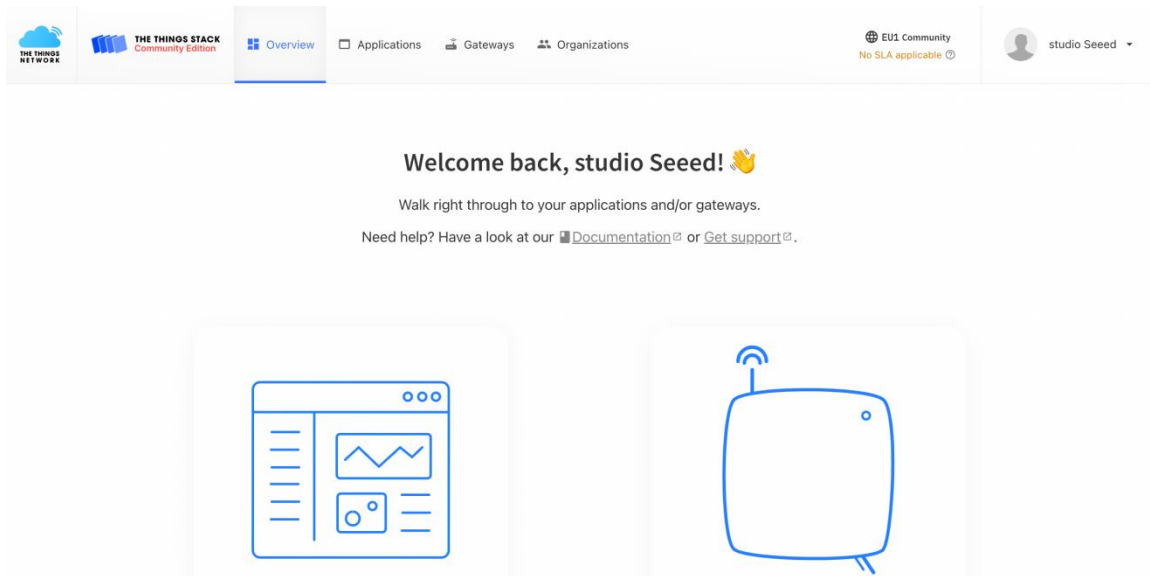
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1. Connect to The Things Network

1.1 The Things Network

The Things Stack is an enterprise grade LoRaWAN network server, built on an open-source core. The Things Stack allows you to build and manage LoRaWAN networks on your own hardware or in the cloud.





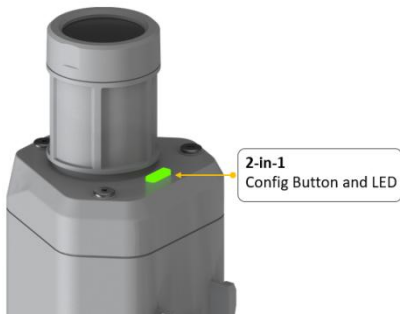
1.2 Connect to The Things Network

1.2.1 Create a New Account

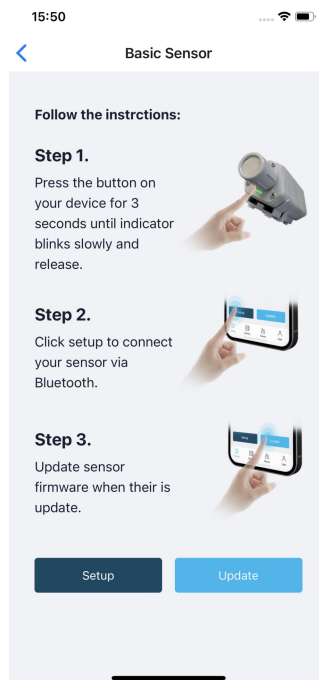
TTN Website: <https://www.thethingsnetwork.org/>

1.2.2 Setup the Sensor

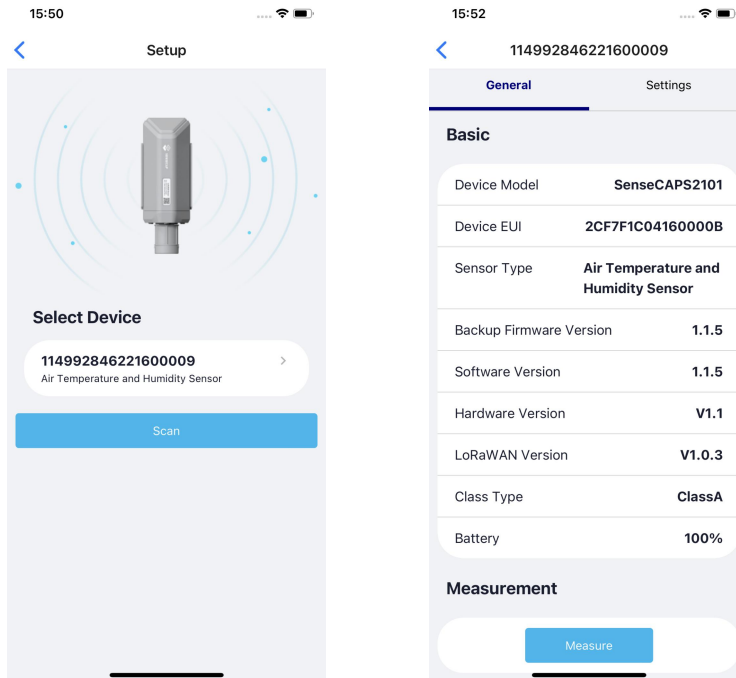
- 1) Open the SenseCAP Mate App
- 2) Press button and hold for 3 seconds, the LED will flash at 1s frequency.



- 3) Please click the “Setup” button to turn on Bluetooth and click “Scan ” to start scanning the sensor's Bluetooth.



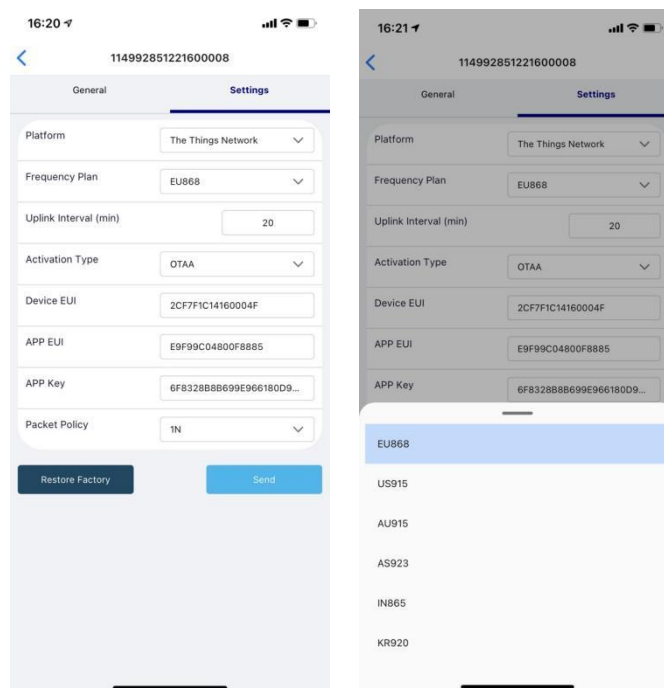
- 4) Select the Sensor by S/N (label). Then, the basic information of the sensor will be displayed after entering.



1.2.3 Set Frequency of Sensor via SenseCAP Mate App

Set the corresponding frequency band based on the frequency band of the gateway.

- 1) Click the “Setting” and select the platform is “The Things Network”.



- 2) Select the Frequency Plan, if your gateway is US915, set the sensor to US915.



- 3) The device uses OTAA to join the LoRaWAN network by default. So, we can set the device EUI, App EUI and APP Key here.

The screenshot shows a web interface for configuring a LoRaWAN device. The 'Setting' tab is selected. The configuration includes: Platform (The Things Network), Frequency Plan (EU868), Uplink Interval (min) (30), Activation Type (OTAA), Device EUI, APP EUI, APP Key (all highlighted with a red box), and Packet Policy (1N). Buttons for 'Restore Factory' and 'Send' are at the bottom.

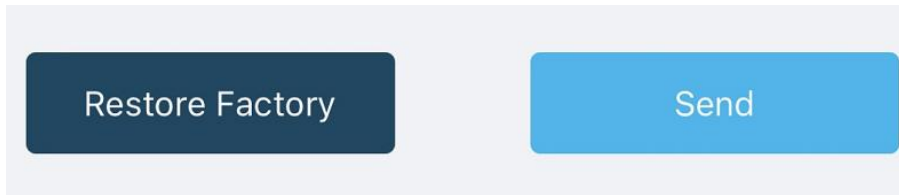
Parameter	Type
Device EUI	16, hexadecimal from 0 ~ F
App EUI	16, hexadecimal from 0 ~ F
App Key	32, hexadecimal from 0 ~ F

- 4) Set the Packet Policy. The sensor uplink packet strategy has three modes.

Parameter	Description
2C+1N (default)	2C+1N (2 confirm packets and 1 none-confirm) is the best strategy, the mode can minimize the packet loss rate, however the device will consume the most data packet in TTN, or data credits in Helium network.
1C	1C (1 confirm) the device will sleep after get 1 received confirm packet from server.
1N	1N (1 none-confirm) the device only send packet and then start to sleep, no matter the server received the data or not.



- 5) Click the “Send” button, send the setting to the sensor for it to take effect.



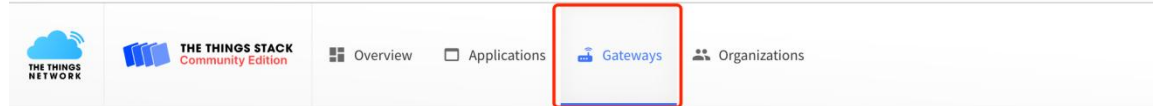
- 6) Click the “Home” button, the App will disconnect the Bluetooth connection.
Then, the sensor will reboot.
- 7) When the device is disconnected from Bluetooth, the LED lights up for **5 seconds** and then flashes as a **breathing light**.



1.3 TTN configuration

1.3.1 Gateway Registration on TTN

Create a Gateway on the TTN console based on actual information.



Register gateway

Register your gateway to enable data traffic between nearby end devices and the network.
Learn more in our [Gateway Guide](#).

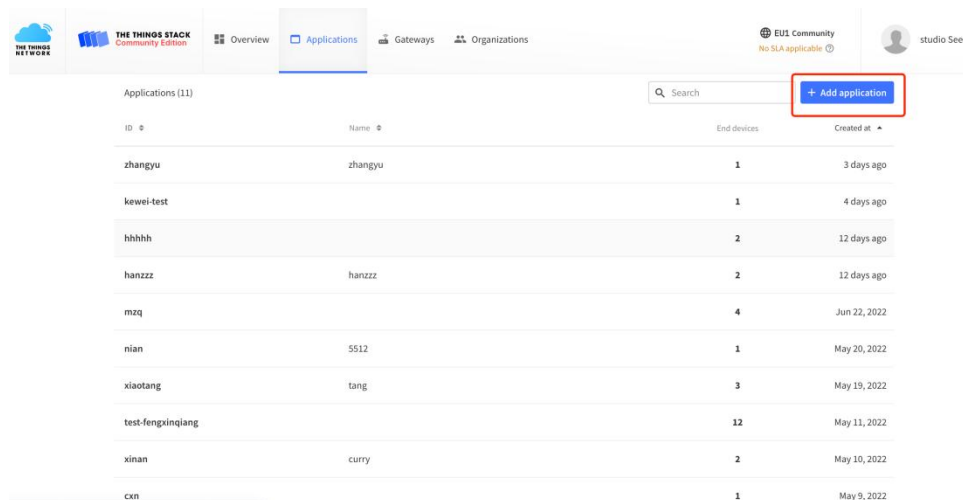
Gateway EUI

Continue without EUI

To continue, please confirm the Gateway EUI so we can determine onboarding options

1.3.2 Create the Application

Create an application on your TTN console. Within applications, you can register and manage end devices and their network data. After setting up your device fleet, use one of our many integration options to pass relevant data to your external services.





1.4 Add Sensor to TTN Console

- 1) Select the Application you have created, and click the 'Register end device' to add end your device.

The screenshot shows the TTN Console interface for an application named 'kewei-test'. The left sidebar contains navigation links: Overview, End devices, Live data, Payload formatters, Integrations, Collaborators, API keys, and General settings. The main content area shows the application details, including its ID, creation time, and last update time. A 'Live data' section displays a list of uplink messages. At the bottom, there is a table for 'End devices (2)' with columns for ID, Name, DevEUI, JoinEUI, and Last activity. To the right of the table are buttons for 'Search', 'Import end devices', and a red-bordered '+ Register end device' button.

- 2) Select the end device in the LoRaWAN Device Repository.

The screenshot shows the 'Register end device' page in the TTN Console. The left sidebar is the same as the previous screenshot. The main content area has a heading 'Register end device' and a sub-heading 'End device type'. Under 'Input Method', there are two radio buttons: 'Select the end device in the LoRaWAN Device Repository' (which is selected and highlighted with a red box) and 'Enter end device specifics manually'. Below the radio buttons is a search bar labeled 'End device brand' with a placeholder 'Type to search...'. At the bottom, there is a note: 'Cannot find your exact end device? [Get help here](#) and try enter end device specifics manually option above.'

And then based on the brand, configure items like the ones below.



curry

Overview

End devices

Live data

Payload formatters

Integrations

Collaborators

API keys

General settings

Scan end device QR code [Learn more](#)

End device type

Input Method

Select the end device in the LoRaWAN Device Repository

Enter end device specifics manually

End device brand *

Model *

Hardware Ver. *

Firmware Ver. *

Profile (Region) *

SenseCAP

SenseCAP S2101- L...

1.0

1.0

US_902_928

SenseCAP S2101- LoRaWAN® Air Temperature and Humidity Sensor

LoRaWAN Specification 1.0.2, RP001 Regional Parameters 1.0.2 revision B, Over the air activation (OTAA), Class A

SenseCAP 2101 air temperature & humidity sensor satisfies industrial IoT long-distance data acquisition with measuring ranges from -40°C to 85°C and 0 to 100 %RH respectively. With Bluetooth 5.0 for easy wireless configuration and firmware upgrade and a built-in replaceable battery for minimal maintenance, it also supports three different LoRaWAN® network architectures to make it easily become Helium-compatible IoT device.

[Product website](#) | [Data sheet](#)

Frequency plan *

United States 902-928 MHz, FSB 2 (used by TTN)

- End device brand: Select SenseCAP.
- Model: Select your sensor model. (If not, use manual add)
- Hardware / Firmware Version: Usually, choose the latest one.
- Profile(Region)/Frequency plan: Get it from SenseCAP Mate App

Sensor Frequency	Common Name	Description
EU863-870	EU868	Europe 863-870 MHz (SF9 for RX2 - recommended)
US902-928	US915	United States 902-928 MHz, FSB 2 (used by TTN)
AU915-928	AU915	Australia 915-928 MHz, FSB 2 (used by TTN)
KR920-923	KR920	-----
IN865-867	IN865	-----
AS923	AS923-1	Asia 920-923 MHZ
	AS923-2	

Different countries and LoRaWAN network servers use different frequency plans.

For Helium network, please refer to:

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<https://docs.helium.com/lorawan-on-helium/frequency-plans>

curry

Overview

End devices

Live data

Payload formatters

Integrations

Collaborators

API keys

General settings

End device brand [?] * SenseCAP

Model [?] * SenseCAP S2101- L...

Hardware Ver. [?] * 1.0

Firmware 1.0

United States 902-928 MHz, FSB 1

United States 902-928 MHz, FSB 2 (used by TTN)

United States 902-928 MHz, FSB 3

United States 902-928 MHz, FSB 4

United States 902-928 MHz, FSB 5

United States 902-928 MHz, FSB 6

United States 902-928 MHz, FSB 7

United States 902-928 MHz, FSB 8

United States 902-928 MHz, FSB 2 (used by TTN)

Temperature a

al Parameters 1.0.:

sensor satisfies inc

°C to 85°C and 0 to

n and firmware upi

ports three differe

le IoT device.

3) Configure 'Provisioning information'.

Provisioning information

JoinEUI [?] *

..... Confirm

To continue, please enter the JoinEUI of the end device so we can determine onboarding options

- JoinEUI: which means the **APP EUI**, you can get it from SenseCAP Mate App.

What is this?

The JoinEUI (formerly called AppEUI) is a 64 bit extended unique identifier used to identify the Join Server during activation.

- Device EUI/ App Key: Get it from the configuration page via SenseCAP Mate App. Like the below picture.



General

Setting

Platform

The Things Network

Frequency Plan

EU868

Uplink Interval (min)

30

Activation Type

OTAA

Device EUI

APP EUI

APP Key

Packet Policy

1N

Restore Factory

Send

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Overview

End devices

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General settings

Product website | Data sheet

Frequency plan *
United States 902-928 MHz, FSB 2 (used by TTN)

Provisioning information

JoinEUI *
16 12 89 98 C1 16 7A CC Reset
This end device can be registered on the network

DevEUI *
... .. Generate 1/50 used

AppKey *
... .. Generate

End device ID *
my-new-device
This value is automatically prefilled using the DevEUI

After registration
☒ View registered end device
☐ Register another end device of this type

Register end device



4) Register end device.

After you finish the above items, Click the “Register end device” to save your modification.

***Note:** If joining the network successfully, LED will **flashes fast for 2s**.

1.5 Check Data on TTN Console

On the Data page, data package is uploading. For the format of the payload, refer to the section of Payload Decoding.

The screenshot displays the TTN Console interface for a specific end device. The device ID is **2cf7f1c141600052**. The 'Live data' tab is selected, showing a list of events. A red box highlights the event 'Forward uplink data message' at 16:41:07. A red arrow points from this event to the 'Event details' panel on the right. In the 'Event details' panel, the 'decoded_payload' is shown as a JSON object containing three telemetry reports. A red box highlights this JSON object.

Device ID: 2cf7f1c141600052
ID: 2cf7f1c141600052
↑ 559 ↓ 29 • Last activity 4 minutes ago

Overview **Live data** Messaging Location Payload formatters Claiming General settings

Time	Type	Data preview
↑ 16:41:13	Successfully processed dat...	DevAddr: 26 0B 3E EC <> [icon]
ⓘ 16:41:08	Fail to send webhook	Request
↑ 16:41:07	Forward uplink data message	DevAddr: 26 0B 3E EC <> [icon] Pay...
↑ 16:41:07	Successfully processed dat...	DevAddr: 26 0B 3E EC <> [icon]
↑ 16:31:13	Successfully processed dat...	
ⓘ 16:31:07	Fail to send webhook	
↑ 16:31:07	Forward uplink data message	
↑ 16:31:07	Successfully processed dat...	
↑ 16:26:05	Successfully processed dat...	
ⓘ 16:25:59	Fail to send webhook	

Event details

```
39 "session_key_id": "AYMSRt6a9wuDzkydhVjKpA==",
40 "f_port": 2,
41 "f_cnt": 559,
42 "frm_payload": "AQ0Q2PkPAAEBEH5oAAABAhAA8AAACSQ=",
43 "decoded_payload": {
44   "err": 0,
45   "messages": [
46     {
47       "measurementId": 4100,
48       "measurementValue": 1047,
49       "type": "report_telemetry"
50     },
51     {
52       "measurementId": 4097,
53       "measurementValue": 26.75,
54       "type": "report_telemetry"
55     },
56     {
57       "measurementId": 4098,
58       "measurementValue": 61.44,
59       "type": "report_telemetry"
60     }
61   ]
62 },
63 "payload": "010410D8F90F000101107E68000001021000F00000092",
64 "valid": true
65 },
66 "rx_metadata": [
67   {
68     ...
69   }
70 ]
```



2. Trouble Shooting

2.1 Support

Support is provided Monday to Friday, from 09:00 to 18:00 GMT+8. Due to different time zones, we cannot offer live support. However, your questions will be answered as soon as possible in the before-mentioned schedule.

Provide as much information as possible regarding your enquiry (product models, accurately describe your problem and steps to replicate it etc.) and send a mail to: sensecap@seeed.cc

2.2 Document Version

Version	Date	Description	Editor
V1.0.0	7/27/2022	First edition	Kelvin Lee
V1.0.1	10/17/2022	Update the configuration page.	Kelvin Lee
V1.1.1	12/8/2022	Update the configuration page.	Kelvin Lee