THE NEW GENERATION LORAWAN SENSORS OF SENSECAP

SenseCAP A1101

LoRaWAN Vision Al Sensor

User Guide



Version: v1.0.4

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1. Product Introduction

1.1 Overview



SenseCAP A1101 LoRaWAN Vision AI Sensor combines TinyML AI technology and LoRaWAN long-range transmission to enable a low-power, high-performance AI device solution for both indoor and outdoor use.

This sensor features Himax's high-performance, low-power AI vision solution which supports the Google TensorFlow Lite framework and multiple TinyML AI platforms.

Different models can implement different AI functions, for example, people counting, object recognition, meter recognition, etc. Users can adopt models provided by native firmware, or train and generate their own models through AI training tools, or procure deployable, commercial models from third-party model providers.

With the IP66 rating, -40 ~ +85C ° operating temperature, built-in 19Ah high-capacity battery and devices' low power consumption, the A1101 sensor can operate in harsh outdoor environments for up to 10 years with a range of up to 10km. The built-in Bluetooth facilitates setup and greatly reduces large-scale deployment costs. Users can focus on application development with the easy set-up and start retrieving data in a few steps. Just install the device, bind it using the QR code and configure the network,

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then data can be viewed from the SenseCAP portal, which supports popular IoT protocols such as HTTP and MQTT.

1.2 Features

• Ultra-Low Power and Powerful Himax Camara: 400Mhz DSP, Maximum camera frame rate 640*480*VGA 60 FPS, Local inferencing

• Low Power and Long Range Transmission: Down to 2.3uWh sleep mode power consumption, powered by Wio-E5 LoRaWAN Modules, transfers data up to miles

• **High Data Security by Edge Computing:** Local image inferencing and transfers the final result data to the Cloud, suitable for applications that require limited data transmission and high data privacy.

• Easy to Visualize Data: Few clicks to display and manage data via SenseCAP Mate App and SenseCAP Dashboard, wide compatibility with other third-party tools

• High Industrial Protection Grade: -40 ~ 85°C operating temperature and IP66 rating, suitable for indoor and outdoor deployment

• Easy for Scalable Deployment: 1min to add and configure the device by scanning the device QR code, low LoRaWAN network cost and maintenance cost ensure business scalability.

2. Part List

Before installing, please check the part list to ensure nothing is missing.

Picture	Name	Quantity
	Sensor Node	1
	Bracket	1
Quick Start for SenseCAP S2I0X Sensors	Quick Start Guide	1
	KA4*20mm Self-drilling Screw	4

3. Key Parameters of the Sensor

3.1 Introduction of Key Parameters

Using the LoRaWAN protocol generally involves the following parameters.

Parameters	Description
LoRaWAN MAC Version	v1.0.4
Join Type	OTAA (Default) ABP (It can be modified through App)
Device EUI	Unique identification of device, one of the join network parameters (OTAA mode).
Device Code (KEY)	On the device label, for device binding and API call.
App EUI	Unique identification of application, one of the join network parameters (OTAA mode).
Арр Кеу	Application key, one of the join network parameters (OTAA mode).
DevAddr	This parameter is available only in ABP mode, one of the join network parameters.
NwkSkey	This parameter is available only in ABP mode, one of the join network parameters.
AppSkey	This parameter is available only in ABP mode, one of the join network parameters.

3.2 Get Device EUI, App EUI and Key

3.2.1 Get the parameters via API

(1) Device EUI and Device Code is on the SenseCAP product label.

► LoRaWAN Sensor	
EUI: 2CF7F12041000003 KEY: E4F15C10A50FABFB S/N: 1149928462219000001	Node EUI Device Code



The "Key" on the label is Device Code, which is not the App Key!

(2) SenseCAP Node's App EUI and App Key have been flashed into the device by Seeed. Use HTTP API to get App EUI and App Key. You can use a browser (Google Chrome) to launch an HTTP GET request.

Curl:

https://sensecap.seeed.cc/makerapi/device/view_device_info?nodeEui=<mark>2CF7F120147002</mark> <mark>97</mark>&deviceCode=<mark>34BF25920A4EFBF4</mark>

In the API, replace the Device EUI and device Code with your own Device EUI and Device Code respectively. And you will get the following response:

dev_eui	Device EUI	2CF7F12014700297
app_eui	App EUI	<mark>800000000000006</mark>
app_key	Арр Кеу	6FD0EF47CBC6E00F1921A08C2E94E8E5

```
{
    "code": "0",
    "data": {
        "nodeEui": "2CF7F12014700297",
        "deviceCode": "34BF25920A4EFBF4",
        "lorawanInformation": {
            "dev_eui": "2CF7F12014700297",
            "app_eui": "8000000000006",
            "app_eui": "8000000000006",
            "app_key": "6FD0EF47CBC6E00F1921A08C2E94E8E5"
        }
    },
    "time": 0.019
}
```

Mote1:

The SenseCAP LoRaWAN Sensor can modify to EUI, Key, and Frequency.

Please refer to the following sections.

Mote2:

When connecting to SenseCAP, use the default EUI, App EUI and App Key.

When using another LoRa network server, the EUI will not change, and the App EUI and App Key will be randomly generated according to the rules.

3.2.1 Get the parameters via SenseCAP Mate App

Please refer to the section 5.

4. LED of Sensor Working Status



You can refer to the LED indicator for the Sensor Node for its working status. Please see the status explanations in the chart below:

Actions	Description	Green LED Status	
First power up, press and hold for 9s Power on and activate the Bluetooth		LED flashes at 1s frequency, waiting for Bluetooth connection. If Bluetooth not connected within 1 minute, the machine will shut down again.	
Press once	Reboot device and join LoRa network	 The LED will be on for 15 seconds for initialization Waiting for join LoRa network: breathing light flashing Join LoRa network success: LED flashes fast for 2s LoRa network join failure: LED suddenly stop. 	

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Press and hold for 3s	Activate Bluetooth again	 Waiting for Bluetooth connection: LED flashes at 1s frequency Enter configuration mode after Bluetooth connection is successful: LED flashes at 2s frequency If Bluetooth is not connected within 1 minute, the device will reboot and join LoRa network.
Press and hold for 9s	Power off	In the 3rd seconds will start flashing at 1s frequency, until the light is steady on, release the button, the light will go out.

ANote:

After power off, you need to reconfigure the frequency band.

Power off is recommended when not deployed.

5. SenseCAP Mate App

5.1 Download App

As a tool, SenseCAP Mate App is used to configurate LoRa parameters, set interval, bind devices to your account and check device basic information.

Mote:

SenseCAP Mate App functions are being iterated in stages: Stage1: Equipment configuration, firmware update. (Done) Stage2: Bind the device to SenseCAP Portal and manage the device. (Done) Stage3: Data visualization and scene monitoring. (Developing)

- (1) For iOS, please search for "SenseCAP Mate" in the App Store and download it.
- (2) For Android, please search for "SenseCAP Mate" in the Google Store and download it.

You can also download App from <u>https://www.pgyer.com/sensecapmate</u> or <u>https://install.appcenter.ms/orgs/seeed/apps/sensecap-</u> mate/distribution_groups/public

5.2 How to connect sensor to App

5.2.1 Create a New Account

SenseCAP Mate supports device configuration and remote management. To use the SenseCAP Portal platform and other functions, please register an account. If only the device configuration function is used, click "Skip".

Please select **Global** of Server Location.



You can also set up an account through the website.

Portal Website: http://sensecap.seeed.cc

- 1) Select register account, enter email information and click "register", the registered email will be sent to the user's mailbox.
- 2) Open the "SenseCAP..."Email, click the jump link, fill in the relevant information, and complete the registration.
- 3) Return to the login interface and complete the login.

ANote:

If you can't find the email, it may be automatically identified as "spam" and put in the "trash can".

5.2.2 Connect to Sensor to App

1) Press button and hold for **3 seconds**, the LED will flash at 1s frequency. Please use the App to connect the sensor within 1 minute; otherwise, the device will power off or re.



2) Please select "Vision Al Sensor".

Please click the "Setup" button to turn on Bluetooth and click "Scan" to start scanning the sensor's Bluetooth.



3) Select the Sensor by S/N (S/N is on the front label of the sensor). Then, the basic information of the sensor will be displayed after entering.

16:33 0.0K/s 🕸			16:34 0.0K/s	0	8 8 "had 8 1"had (390
÷	Setup		← 1109	917642230000	24
	12 -	1.	Gener	ral	Settings
		$\left(\right) $	Device Mo	del	SenseCAPS2106
))))	Device EUI	2CF7	F1C042800023
(), M		17/	Sensor Type	e	Vision Al Sensor
Sol	act Davica		Algorithm	Ima	age Classification
110	0001764222000024		Al Model		1.5
	J991764223000024	· · ·	Backup Firr	nware Version	1.5
	Scan		Software Ve	ersion	1.5
			Hardware V	/ersion	V1.2
			LoRaWAN V	/ersion	V1.0.3
			Class Type		ClassA
		Battery		99%	
			Al Previev	v	
				Detect	
					_

4) Enter configuration mode after Bluetooth connection is successful: LED flashes at 2s frequency.

5.3 Configure parameters through App

5.3.1 Select the Platform and Frequency

A1101 Sensors are manufactured to support universal frequency plan from 863MHz ~928MHz in one SKU. That is to say, every single device can support 7 frequency plans.

15:53	🗢 🔳	15:54	···· 🕈 🔳
114992	846221600009	< 114993	2846221600009
General	Settings	General	Settings
Platform	Other Platform V	Platform	Other Platform
Frequency Plan	US915 V	Frequency Plan	US915 ~
Sub-Band	Sub-Band2 V	Sub-Band	Sub-Band2 V
Uplink Interval (mi	n) 6	Uplink Interval (m	in) 60
Activation Type	OTAA 🗸	EU868	_
Device EUI	2CF7F1C04160000B	US915	
SenseCAP for Th	e Things Network	AU915	
SenseCAP for He	lium	AS923	
Helium		IN865	
The Things Netwo	ork	KR920	
Other Platform		RU864	

Platform	Description
SenseCAP for The Things Network	It must be used with SenseCAP Outdoor Gateway (<u>https://www.seeedstudio.com/LoRaWAN-Gateway-EU868-p-4305.html</u>). SenseCAP builds a proprietary TTN server that enables sensors to be used out of the box when paired with an SenseCAP outdoor gateway.
SenseCAP for Helium	Default platform. When there is the Helium network around the user, data can be uploaded using sensors. Devices run on a private Helium console of SenseCAP. Users do not need to create devices on Helium console, right out of the box.
Helium	Connect Sensor to public Helium console.
The Things Network	Connect Sensor to your TTN(TTS) server.
Other Platform	Other LoRaWAN Network Server.

1) SenseCAP for Helium:

We provide the SenseCAP Portal to manage devices and data: sensecap.seeed.cc

We built a private Helium Console with an embedded SenseCAP Portal. When users get the SenseCAP sensors, you can use it by scanning the code and binding it to the Portal.

"SenseCAP for Helium" is selected by default. The device runs in a fixed main frequency and sub-band, refer to Helium Frequency Plan (<u>https://docs.helium.com/lorawan-on-helium/frequency-plans/</u>). You only need to select the main frequency, such as EU868 and US915.

SenseCAP for Helium supports the following frequency plan:

EU868 / US915 / AU915 / KR920 / IN865 / AS923-1 / AS923-2 / AS923-3 / AS923-4

2) SenseCAP for The Things Network

SenseCAP Portal also builds the TTN private server, and the sensor must be used together with the SenseCAP Outdoor Gateway (<u>https://www.seeedstudio.com/LoRaWAN-Gateway-EU868-p-4305.html</u>) or SenseCAP Multi-Platform LoRaWAN Indoor Gateway (<u>https://www.seeedstudio.com/SenseCAP-Multi-Platform-LoRaWAN-Indoor-Gateway-SX1302-EU868-p-5471.html</u>).

SenseCAP Multi-Platform LoRaWAN Indoor Gateway supports the following frequency plans:

IN865 / EU868 / RU864 / US915 / AU915 / KR920 / AS923.

3) Helium

Users can choose sensors to use on the public helium console:

https://console.helium.com/

4) The Things Network

Users can choose sensors to use on the public The Things Network server:

https://console.cloud.thethings.network/

5) Other Platform:

When you use other LoRaWAN network server, please select Other Platform.

At this point, you need to determine the sensor frequency band according to the gateway frequency and sub-band.

Sensor Frequency	Common Name	Sub-band	
EU863-870	EU868		
US902-928	US915	Sub band from 1 to 8 (default sub-band 2)	
AU915-928	AU915	Sub band from 1 to 8 (default sub-band 2)	
KR920-923	KR920		
IN865-867	IN865		
AS923	AS923-TTN	Frequency plan for TTN	
	AS923-1		
	AS923-2	Frequency plan for Helium	
	AS923-3		
	AS923-4		
RU864-867	RU864		

ANote1:

Different countries and LoRaWAN network servers use different frequency plans. For Helium network, please refer to:

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

For The Things Network, please refer to:

https://www.thethingsnetwork.org/docs/lorawan/frequency-plans/

Mote2:

1) When using the SenseCAP platform, the EUI, APP EUI and APP Key are fixed and are the same as the sensor label.

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2) When the sensor is selected to be used with a public platform such as Helium or TTN, the EUI will not change, and the sensor will generate a new fixed App EUI and App Key for network access.

5.3.2 Set the Interval

The working mode of device: wake up the device every interval and collect measurement values and upload them through LoRa. For example, the device collects and uploads data **every 60 minutes by default**.

Parameter	Туре
Uplink Interval	Unit: minutes, number from 1 to 1440.

Uplink Interval (min)	60	

5.3.3 Set the EUI and Key

The device uses OTAA to join the LoRaWAN network by default. So, it can set the device EUI and App EUI.

Parameter	Туре
Device EUI	16 bits, hexadecimal from 0 ~ F
App EUI	16 bits, hexadecimal from 0 ~ F
Арр Кеу	32 bits, hexadecimal from 0 ~ F

Device EUI	2CF7F1C04160000B
APP EUI	577D1C6ECDCC3B8D
АРР Кеу	466F991B963100CC478

5.3.4 Set the Packet Policy

The sensor uplink packet strategy has three modes.

Packet Policy	1N	~
Restore Factory		Send

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 date 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.

5.3.5 Set the Activation Type

The sensor supports two network access modes, OTAA by default.

Parameter	Description
OTAA (default)	Over The Air Activation, it joins the network through Device EUI, App EUI, and App Key.
ABP	Activation By Personalization, it joins the network through DevAddr, NwkSkey, and AppSkey.

When using ABP mode, you need to configure the following information:

Parameter	Description
DevAddr	32 bits, hexadecimal from 0 ~ F

ΙοΤ	into	the	Wild

NwkSkey	32 bits, hexadecimal from 0 ~ F
AppSkey	8 bits, hexadecimal from 0 ~ F

Activation Type	ABP 🗸 🗸	
Nwk Skey Only hexadecimal digits are allowed to	D65CF04A554CB71ECCC0D58C4 numbers of 0-F with a maximum of 32 be filled in.	C
APP Skey Only hexadecimal digits are allowed to	24CEAFD65CF04A554CB71ECCC numbers of 0-F with a maximum of 32 be filled in.	C
Dev Addr Only hexadecimal digits are allowed to	0100000A numbers of 0-F with a maximum of 8 be filled in.	



The factory defaults to a fixed value.

5.3.6 Restore Factory Setting

When selecting the SenseCAP platform, you must use the fixed EUI/App EUI/App Key. Therefore, you need to restore the factory Settings before switching back to the SenseCAP platform from other platforms.



When we make a mistake or want to reset everything, we can click the button. The device will be restored to the factory's default configuration.

5.4 **Preview AI Recognition Results**

5.4.1 Select AI Algorithms and Models

There are several built-in AI models for A1101, and users can select models according to their needs. Currently, the following algorithms and models are available:

Algorithm	Al Model
Object Detection	Human Body Detection
	User-defined
Object Counting	People Counting
	User-defined
Image Classification	Person&Panda Recognition
	User-defined

Model selection and configuration is also done in the Setting interface.

First select the Algorithm, different algorithms achieve different functions and show different results in the APP preview.Clicking on the drop-down triangle behind the algorithm will bring up the selection box.

Then select the AI model, click on the model, the selection box pops up, select the model.

21:41 0.2K/s to 8 ₪ tanl ₪ i*tanl ← 110991764223000024		21:4	110.4K/s ପ 1109917642	23000024	8 8 'taul 8 it taul Ge
General	Settings	~	General	23000024	Settings
Platform	SenseCAP for The Thir	Plat	form	SenseCAP f	or The Thir 🗸 🗸
Algorithm	Object Detection	Algo	orithm	Object Dete	ection 🗸
Al Model	Face Detection	AIM	lodel	Face Detect	ion 🗸
Credibility (1~100%)	70	Cred	dibility (1~100%)		70
Frequency Plan	EU868	Frec	quency Plan	EU868	~
Uplink Interval (min)	60	Upli	nk Interval (min)		60
Packet Policy	2C+1N	Pack	ket Policy	2C+1N	~
Restore Factory	Send	Re	store Factory		Send
	_				
Object Detection					
Object Counting				—	
Image Classification		Fac	e Detection		

5.4.2 Set Score Threshold

The **scores** represent the reliability of the AI model predictions. The higher the score, the more likely the identified object is the target object. Users can choose to upload more reliable results or more flexible results to the App and cloud by setting the **Score Threshold**. The Score Threshold ranges from 1 to 100, and only the results with a score greater than the Score Threshold will be uploaded to the APP and the cloud.

21:42 0.0K/s@	8 Bial Birai 300	21:53 0.0K/s 🛛 🖬	8 8 hai 8 mai 🚥
General	Settings	General	Settings
Platform	SenseCAP for The Thir V	Platform	SenseCAP for The Thir V
Algorithm	Object Detection V	Algorithm	Object Detection V
Al Model	Face Detection 🗸	Al Model	Face Detection
Credibility (1~100%)	zoj	Credibility (1-100%) Set up success	fully!
Frequency Plan	EU868 ~	1	
Uplink Interval (min)	60	BACK TO HOME	E CONTINUE SETTING
Packet Policy	2C+1N V	Packet Policy	2C+1N ~
Restore Factory	Send	Restore Factory	Send

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After completing the above configuration and selection, click "Send" to send the configuration information to the device. If the configuration is successful, it will prompt "Set up successfully".

5.4.3 Detect and Preview

Click the "General" button, then click "Detect". Pointing the lens at the target object, adjust the angle and distance appropriately, and the recognition result will be displayed at the bottom of the screen.

General	Settings
Device EUI	2CF7F1C042800023
Sensor Type	Vision Al Sensor
Algorithm	Object Counting
Al Model	1.5
Backup Firmware Ver	sion 1.5
Software Version	1.5
Hardware Version	V1.2
LoRaWAN Version	V1.0.3
Class Type	ClassA
Battery	100%
I Preview	
Your sensor detected	1 category and 1 target
	۵ .

5.4.4 Train Custom Models

SenseCAP A1101 supports user-defined AI models, for more details please check the link below:

https://wiki.seeedstudio.com/Train-Deploy-Al-Model-SenseCAP-A1101

6. Connect to the SenseCAP Portal

6.1 SenseCAP Portal

The main function of the SenseCAP Portal is to manage SenseCAP devices and to store data. It is built on Azure, a secure and reliable cloud service from Microsoft. You can apply for an account and bind all devices to this account. SenseCAP provides the web portal and API. The web portal includes Dashboard, Device Management, Data Management, and Access Key Management, while API is open to users for further development.

📚 SENSECAP 📃					English . 🙎 xfactory.SZ@seeed.cc 🔻 🗐 🌲
⊙ Dashboard	Dashboard Add+				Data update interval: Manual - 🕑
Gateway	Devices Overview			Monitoring	Announcement
Node Group Sensor Node II Data Table Graph	1	Sateway	8 Sensor Node	Gateway Offline 0 Node Offline 0 Low Battery 0	Welcome
🛛 Security 🗸 🗸	Gurrent Value 🧷		(+) 20 ×	GO2 //	Ochart Settings
Access API keys	UL 99529Pa Air Pressur (2077;712210400074) •Online [2019-08-08 14:12:03	28°C 28°C Ar Temperature (26°771221040008) •Online [2019-08-08 13:53:11	68%RH Ar Hunidiy (26777 12210400083) «Online 2019-08-08 13:53:11	500 400 200 100 	-O- CO2 (2CF7F12210400070)
	172.8Lux Light (2CF7F1221040007E) •Online 2019-08-08 13:37:41	385ppm CO2 (2CF7F12210400070) •Online 2019-08-08 13:31:09		Light //	● Chart Settings 21 × Light (2CF771221040007E) 生 値 〇 ()

6.1.1 Create a New Account

Portal Website: http://sensecap.seeed.cc

- 4) Select register account, enter email information and click "register", the registered email will be sent to the user's mailbox.
- 5) Open the "SenseCAP..."Email, click the jump link, fill in the relevant information, and complete the registration.
- 6) Return to the login interface and complete the login.

ANote:

If you can't find the email, it may be automatically identified as "spam" and put in the "trash can".

6.1.2 Other Functions

- **Dashboard:** Including Device Overview, Announcement, Scene Data, and Data Chart, etc.
- Device Management: Manage SenseCAP devices.
- **Data Management:** Manage data, including Data Table and Graph section, providing methods to search for data.
- Subaccount System: Register subaccounts with different permissions.
- Access Key Management: Manage Access Key (to access API service), including Key Create, Key Update, and Key Check.

SenseCAP Portal User Guide: https://sensecap-docs.seeed.cc/quickstart.html

6.1.3 API Instruction

SenseCAP API is for users to manage IoT devices and data. It combines 3 types of API methods: HTTP protocol, MQTT protocol, and Websocket protocol.

- With HTTP API, users can manage LoRa devices, to get raw data or historical data.
- With MQTT API, users can subscribe to the sensor's real-time measurement data through the MQTT protocol.
- With Websocket API, users can get real-time measurement data of sensors through Websocket protocol.

Please refer to this link for API User Guide: https://sensecap-docs.seeed.cc/

Normality ()	Participal Participal
HTTP API >	Dattourd - Senecut APP -
Tala Tjure (Second 2011)	Llovics Management (
LolfaWAN Borks	Boffware Tools
3 of 500 WK Carlossey and Witedness Samerar Carbing V1.4 pell 3	Tanna CAI "Reds Configuration Tool 2
ServeCAP Product User Guide(LaPLANAN Series)-V1.3.pdf >	Sense CAP Sensor Hub Configuration Tool >
Second AP 1 of SWAR Second State Manual VI II pet 2	

6.2 Connect to SenseCAP with Helium Network

6.2.1 Quick Start

Follow this process to quickly use the sensor, see the following section for details.



6.2.2 Preparation

1) SenseCAP Mate App

Download the App, please refer to section 5 for using.

2) Coverage of Helium network

Option 1: Use the Helium network that already exists nearby.

Please refer to the map, search your location to see if there's any helium network around: <u>https://explorer.helium.com/</u>

A green hexagon indicates the presence of the network.



Option 2: Deploy a new Helium gateway.

You can purchase M1, M2 gateways to cover your surroundings with the Helium network: <u>https://www.sensecapmx.com/</u>

6.2.3 Bind Sensor to SenseCAP Portal

Please open SenseCAP Mate App.

(1) Scan QR Code

1) Click "Add device" on the upper-right corner of device page to enter the device binding page.



2) Scan the QR code on the device to bind the device to your account. If you do not set it to a designated group, the device will be put into the "default" group.

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(2) Manually fill in the EUI

If the QR code sticker is damaged, you can manually fill in the EUI of the device to bind the device to your account. Please make sure you put in the EUI in the format suggested by the system and then click "confirm".



6.2.4 Setup the Sensor

- 1) Open the SenseCAP Mate App
- 2) Press button and hold for 9 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.

15:50		🕈 🔳	15:52		🕈 🔳
<	Setup		< .	114992846	5221600009
			Gene	eral	Settings
(11)			Basic		-
• ((((Device M	odel	SenseCAPS2101
$\left(\right) \left(\right)$	14	.	Device El	JI	2CF7F1C04160000B
			Sensor Ty	ype	Air Temperature and Humidity Sensor
Select Dev	vice		Backup F	irmware Ve	rsion 1.1.5
114992846 Air Temperatur	6221600009 'e and Humidity Sensor	>	Software	Version	1.1.5
	Scan		Hardware	e Version	V1.1
			LoRaWAN	Version	V1.0.3
			Class Typ	be	ClassA
			Battery		100%
			Measure	ement	
				Ме	asure

6.2.5 Set Frequency of Sensor via SenseCAP Mate App

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

Please refer to <u>section 5</u> for detail.

1) Click the "Setting" and select the platform is "SenseCAP for Helium".

15:53		15:54	
114992	2846221600009	< 114992	2846221600009
General	Settings	General	Settings
Platform	Other Platform V	Platform	Other Platform V
Frequency Plan	US915 V	Frequency Plan	US915 ~
Sub-Band	Sub-Band2 V	Sub-Band	Sub-Band2 V
Uplink Interval (m	in) 6	Uplink Interval (m	in) 60
Activation Type	OTAA 🗸	EU868	_
Device EUI	2CF7F1C04160000B	US915	
SenseCAP for Th	e Things Network	AU915	
SenseCAP for He	lium	AS923	
Helium		IN865	
The Things Netw	ork	KR920	
Other Platform		RU864	
_			

- 2) Select the Frequency Plan, if the gateway is US915, set the sensor to US915.
- 3) Click the "Send" button, send the setting to the sensor for it to take effect.

4) Click the "Home" button, the App will disconnect the Bluetooth connection.

Then, the sensor will reboot.

- 5) When the device is disconnected from Bluetooth, the LED lights up for **15 seconds** and then flashes as a **breathing light**.
- 6) After joining the network successfully, LED flashes fast for 2s.

6.2.6 Check Data on SenseCAP Portal

On the SenseCAP App or the website <u>http://sensecap.seeed.cc/</u>, you can check the device online status and the latest data. In the list for each Sensor, you can check its online status and the time of its last data upload.

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SENSECAP	≡								English 🖌	xfactory.SZ@seeed.cc 💌	
O Dashboard		Devices / Se	ensor Node								
🖶 Devices	~										
Gateway		All		LoRa NB-	-loT						
Node Group			EUI Device EUI		Frequency(MHz)	Frequency		*			
Sensor Node		Device G	aroup Device Group		Online Status	Online Status					
🍌 Data	~										
Table		Registration	Time From	i	— To			1Day 7Days 30	Days		
Graph		Search	Clear C	The number of search results: 4			1		_		
Security	~										
Access API keys		NO.	EUI	Device Name		Sensor Count	Device Group	Online Status	Operation	Last Message Time	22
		01	2CF7F12210400070	CO2 Sensor		1	station-1	Online	Move	2019-11-15 10:28:16	
		0 2	2CF7F12210400074	Barometric Pressure Sens	or	1	station-1	Online	Move	2019-11-15 10:09:27	
		03	2CF7F1221040007E	Light Intensity Sensor		1	station-1	Online	Move	2019-11-15 09:43:47	
		0 4	2CF7F12210400083	Air Temperature and Hum	idity Sensor	1	station+1	Online	Move	2019-11-15 10:02:47	
						L					

6.3 Connect to SenseCAP with private TTN

6.3.1 Quick Start

Follow this process to quickly use the sensor, see the following section for details.

6.3.2 Preparation

1) SenseCAP Mate App

Download the App, please refer to section 5 for using.

2) SenseCAP Outdoor Gateway

Now, the sensor needs to be used with the SenseCAP Outdoor Gateway (<u>https://www.seeedstudio.com/LoRaWAN-Gateway-EU868-p-4305.html</u>) to transmit data to the SenseCAP Portal.

1) Setup the Gateway, connect to power cable and Internet.

• 31

loT into the Wild

- 2) Bind the gateway to SenseCAP Portal.
- 3) Ensure the gateway indicator is steady on.

4) Ensure the gateway is displayed online on the portal.

Online status	Online

6.3.3 Bind Sensor to SenseCAP Portal

Please refer to the section 6.2.3

6.3.4 Setup the Sensor

Please refer to the section 6.2.4

6.3.5 Set Frequency of Sensor via SenseCAP Mate App

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

Please refer to section 5 for detail.

1) Click the "Setting" and select the platform is "SenseCAP for The Things Network".

15:53		15:54	
114992	2846221600009	< 114992	2846221600009
General	Settings	General	Settings
Platform	Other Platform V	Platform	Other Platform V
Frequency Plan	US915 V	Frequency Plan	US915 ~
Sub-Band	Sub-Band2 V	Sub-Band	Sub-Band2 V
Uplink Interval (m	in) 6	Uplink Interval (m	in) 60
Activation Type	OTAA 🗸	EU868	_
Device EUI	2CF7F1C04160000B	US915	
SenseCAP for Th	e Things Network	AU915	
SenseCAP for He	lium	AS923	
Helium		IN865	
The Things Netw	ork	KR920	
Other Platform		RU864	
_			

- 2) Select the Frequency Plan, if the gateway is US915, set the sensor to US915.
- 3) Click the "Send" button, send the setting to the sensor for it to take effect.

4) Click the "Home" button, the App will disconnect the Bluetooth connection.

Then, the sensor will reboot.

- 5) When the device is disconnected from Bluetooth, the LED lights up for **15 seconds** and then flashes as a **breathing light**.
- 6) After joining the network successfully, LED flashes fast for 2s.

6.3.6 Check Data on SenseCAP Portal

Please refer to the section 6.2.6

7. Connect to Helium Network

7.1 Register

Please go to https://console.helium.com/, and register your account.

Provide Homess the prove of the world's first poer-to-poer viciless network Notes Devices Devices Image: State of the state of	
Notes Devices Functions Integrations Control Avera Avera Avera Arr C I bit C I dow the Water on Screen every line big in C Control Arr C I bit C I dow the Water on Screen every line big in C I dow the Water on Scre	Homess the power of the workfs first peer-to-peer wireless network
Devices devices devices and the set of the s	
Functions Integrations Connes, Alverts ADP Multiple Packets CF Libl Add and Manage Devices for the Hottan Network View Documentation and Interfails View Documentation and View Documentation and View Docum	Show the Welcome Sareen every time Log in
Integrations coareica Alertía Abra Abra Abra CP Luti CP Luti	
Coancia Aleria ADR & Get Started with Console Developer Resources Multiple Packets CF List Add and Menage Devices for the Hourn Network View Documentation and Listerias View Documentation and Listerias View Documentation	
Allerta Set Started with Console Developer Resources ADR Get Started with Console Developer Resources Multiple Packets Add and Merage Devices for the House Network > Vew Documentation and Idatala > CF Lbst Add and Merage Devices for the House Network > Vew Documentation and Idatala >	
Aleris ADR & Get Started with Console Developer Resources Multiple Packets CF List Add and Manage Devices for the Holum Network Vow Documentation and Listratis V	
ADR CLAIMER WITH CONSULE Multiple Packels CF LIst Add and Menage Devices for the Hollum Network & View Documentation and Lidentals &	🛕 Cat Stated with Connels
Multiple Packets CF List Add and Manage Devices for the Holium Network Vew Documentation and Tutorials	Get stand with Console Developer Resources
	Add and Manage Devices for the Hellum Network Vew Documentation and Tutorials
Set up an Integration to send and receive device data Match our How-to Videos Match our How-to Videos Match our	Set up an Integration to send and receive device data M Watch our How-to Videos M
ADMN Apply Functions to your devices > Join our Community Discord Channel >	Apply Functions to your devices Join our Community Discord Channel
Organizations Invite other Users to your Concole Organization Read our Engineering Update Blog	Invite other Users to your Console Organization Read our Engineering Update Blog
Data Credits	
Users	

7.2 Add New Device

1) Click "Devices" -> "Add New Device"

	My Devices
	Image: Contract of the second seco
Flows	All Devices Edit Columns Ouids Action V
NODES	Device Name © Device EUI © Labels Frame Up © Frame Down © Packets Transferred © DC Used © Date Activated © Last Connected ©
Eunctions	
CONFIGS	
Alerts ADR Multiple Packets	10 results ~ < 0 >
CF List	
Organizations Data Credits	
Users	

2) Enter the Device EUI, App EUI, App Key: please refer to Section 1.1 for details.

3) Save device.

My Devices

All Devices 1 Devices ((9)								
All Devices						Edit Columns	Quick Action	
Device Name	Device EUI	tabels Frame	Up 💠 Frame Down	Packets Transferred	DC Used	Date Activated	Last Connected	t. T
2CF7F121210000C2 Pending)	800000000000008	None		0	0	Aug 27, 2021 8:09 PM		• •
							10 results $ \smallsetminus $	< 1 >

Save Device

4) Add a new label, then add the label to a device.

My Devices	
Al Dovices (*)	
ENTER LABEL DETAILS	
SenseCAP TH Node	16/50
Label names must be unque	সি Save Lab
Devices	
M Devices (v) E SenecCAP10-Hade 1 Devices (v)	
enseCAP-TH-Node	umns 🔯 Label Settings Quick Action
Device Name Device EUI Labels Frame Up Frame Down	Add this Label to a Device Date Activated Pause Packet Transfer for Selected Device
	Remove Selected Devices from Label Delete Selected Devices Delete This Label
No Data	
	< 0

IoT into the Wild				
Whi	ich Devices do you w Label to?	× vant to add this		
Dev	SELECT ALL DEVICES			
Lab	Search here	٩		
	2CF7F121210000C2			
	Cancel Add Label to	Devices		
My Devices			•	
ing beneed				
AT Devices (0) (0) (0) (0) (0) (0) (0)				
SenseCAP-TH-Node			Edit Columns 🛛 🕸 Label Settings 🖉 Guick Action	
Device Name Device EUI Labels Fram	te Up ≑ Frame Down ≎ Pac	kets Transferred 🕆 DC Used	Date Activated Date Connected	¢ k
2CF7F121210000C2 seesecoores SenseCAP-TH-Node	٥	0	Aug 27, 2021 8:09 PM	()

7.3 Check the data on Helium

1) Enter device details page and find the REAL TIME PACKETS.

REAL TIME F	PACKETS										
● Live Da	ta										Integration Success Integration Error No Integration
-20											
-40											
0880											•
-80											
-100											
-120											
Ce		-308	-608	-906	-1206	-1506 Time Past in Seconds	-1806	-210a	-2408	-2706	-300s
Event Log	Cxpand All	Show Dropped Uplinks:	Late Inactive De	sice Filter Events	s w/ Commands						Export JSON

2) Power on the Sensor, it will display raw data.

loT into the W	/ild			
-20 -40 -00 -100 •				
-120 0s -30s	-80s -80	s -120s -150 Time Past in	la -180a -210a Seconds	-240s -270s
Event Log Expand All Show Dro	opped Uplinks: Late Inactive Device	Filter Events w/ Commands		
Event	Туре	No. of Hotspots	Time	
+ 🔽	Acknowledge	1	Aug 27, 2021 11:19:28.115 PM	
+ 🔺	Uplink 🖉	1		
			Aug 27, 2021 11:19:21.666 PM	
+ 🔽 🔕	Downlink	1	Aug 27, 2021 11:19:21.666 PM Aug 27, 2021 11:19:07.557 PM	
+ 1 2 (2) + 1 2	Downlink Uplink 💉	1	Aug 27, 2021 11:19:21.666 PM Aug 27, 2021 11:19:07.557 PM Aug 27, 2021 11:19:03:479 PM	
+ • • 2 • 3 + • • 2 + • • 1	Downlink Uplink ≠ [≪] Acknowledge	1 1 1	Aug 27, 2021 11:19 21,666 PM Aug 27, 2021 11:19 07,557 PM Aug 27, 2021 11:19 07,557 PM Aug 27, 2021 11:19 03,479 PM Aug 27, 2021 11:18 52,133 PM	
+ C2 (2) + C2 + C1 + C1	Downlink Uplink # Acknowledge Uplink #	1 1 1 1	Aug 27, 2021 11:19 21,666 PM Aug 27, 2021 11:19 07,557 PM Aug 27, 2021 11:19 03,479 PM Aug 27, 2021 11:19 03,479 PM Aug 27, 2021 11:18 48,383 PM	
 + (2) (3) + (5) + (5) + (5) + (5) + (7) 	Downlink Uplink ** Acknowledge Uplink ** Acknowledge	1 1 1 1 1	Aug 27, 2021 11:19 21,666 PM Aug 27, 2021 11:19 07,557 PM Aug 27, 2021 11:19 03,479 PM Aug 27, 2021 11:19 03,479 PM Aug 27, 2021 11:18 48,383 PM Aug 27, 2021 11:18 48,383 PM	
+ • • • • • • • • • • • • • • • • • • •	Downlink Uplink ** Acknowledge Uplink ** Acknowledge Uplink **	1 1 1 1 1 1 1 1	Aug 27, 2021 11:19 21:666 PM Aug 27, 2021 11:19 07:557 PM Aug 27, 2021 11:19 03:479 PM Aug 27, 2021 11:19 03:479 PM Aug 27, 2021 11:18:25, 133 PM Aug 27, 2021 11:18:35, 797 PM Aug 27, 2021 11:18:31,018 PM	
+ (72) (3) + (22) + (71) + (51) + (70) + (70) + (70) + (70)	Downlink. Uptink ** Acknowledge Uptink ** Acknowledge Uptink ** Join Accept	1 1 1 1 1 1 1 1 1	Aug 27, 2021 11:19 21:666 PM Aug 27, 2021 11:19 07:557 PM Aug 27, 2021 11:19 03:479 PM Aug 27, 2021 11:18 52:133 PM Aug 27, 2021 11:18:52:133 PM Aug 27, 2021 11:18:35,797 PM Aug 27, 2021 11:18:31.018 PM Aug 27, 2021 11:18:29:051 PM	

7.4 Upload Data from Helium to Datacake

7.4.1 Create a Datacake Account

1) Create a new account, website: <u>https://datacake.co/</u>

Cre	ate an Account
First Name	Last Name
음 e.g. John	e.g. Doe
Email	
e.g. john.doe@example.com	
Password	Confirm Password
A Password	Confirm Password
Passwords must have a minimum of 8 chan number and one special character (@\$1%*#	racters, including at least one uppercase letter, one lowercase letter, on 78).
I agree to the Terms of Use and a second	nd Privacy Policy. I also agree to receive relevant informatic

2) Click the "Edit Profile" \rightarrow "API" \rightarrow Get API token.

IoT int	o the Wild —		
SenseCAP	DATACAKE		
C strationary *	Fleet > Devices		
SenseCAP 0 Devices 1 Members	Devices	Q. Search	Columns 👻 🗕 + Add Device
Add Workspace	DEVICE	LICATION	
Edit Profile			
'A' Gateways		\bigcirc	
8% Members		(!)	
© Kutes		There are no devices in your Workspace, yet. Start by adding your first Device using the button above.	
Integrations			
🛇 White Label	Showing 0 to 0 of 0 results		50 per page v Previous Next
🖄 Billing			
은 My Acc	count	Datacake offers both a <a>RESTful API for simple tasks as well as a feature-ri	ch <a< td=""></a<>
	ard 🔰	href="https://docs.datacake.de/v/english/integrations/api/graphql-api" target="_bl	ank">GraphQL
29 Passwo	oru ·	API. For both, you need an API token.	
≓ API		Please note that your API token gives access to your whole account, so treat it with	n caution!
		You can find your API token below.	
	,	accorrected accorr	

7.4.2 Add New Integration on Helium Console

1) Click "Integrations" \rightarrow "Add New Integration" \rightarrow "Datacake".

	My Integrations
	A Mikrysten Encurrer
Flows	ACO A PREDICT INDEGRATION
NODES Devices Functions	
CONTIGE Alerts	Helium Cargo myOevices Cayerine Ublidds Adolhuit ID Datacake ToppiO Google Sheets Microshare ITTP INTP INTP INTP INTP INTP INTP INTP
Multiple Packets CF List	ADD A CUSTOM INTEGRATION
Organizations Data Credits Users	
	HTTP MGTT ANSING Care

2) Enter Datacake Token (Refer to the section) and name your integration.

IoT into the Wild	
My Integrations	
Al Registions Originates	
STEP 1 - CHOOSE AN INTEGRATION TYPE	
Datacake This integration simplifies sending data to the Datacake IoT platform. Tell me more about setting up this integration.	Change
STEP 2 - ENDPOINT DETAILS	
Enter Datacular Token: 475890-0044r7/a9e03rc585a3crle59ff20b0279	
STEP 3 - NAME YOUR INTEGRATION (REGUIRED)	
SenseCAP 850	
Add Integration	

7.4.3 Configure the Flows on Helium

1) Click "Flows".

2) Drag the Label into a blank place.

IODES			
Labels	Devices	Functions	Integrations
	SenseCAF	P-TH-Node	
1 Dev	vce		-
		\backslash	
			\mathbf{X}
			\mathbf{X}
			X
			🖿 s
			1 Devic

3) Drag the Integration in to a blank place.

||

4) Connect the two blocks.

5) Save Changes.

7.4.4 Add the Sensor on Datacake

1) Return Datacake Dashboard, and click "Device"→"Add Device"

2) Search "Seeed", You can select some sensors directly.

	_					
LoRaWAN	Particle PARTICLE	(API)	D Zero	D Zero LTE	PINCODE	
STEP 1 Product	STEP 2 Network S	Server	STEP 3 Devices		<mark>STEP 4</mark> Plan	
Datacake Produ You can add devices one of the templates more) between device	I Ct s to an existing p s. Products allow ces.	product on Da w you to share	tacake, create e the same co	e a new empty nfiguration (fi	/ product or star elds, dashboard	rt wit I and
New Product fro template Create new prod from a template	r m luct	Existing Pro Add devices existing pro	oduct s to an oduct	New Crea prod	Product te new empty uct	
Device Template Datacake supports L complex configuration	e .oRaWAN devic on and setup.	es from differ	ent manufact	urers out of th	ne box without	<u>^</u>
		Č,				
Seeed Stud Barometric Seeed Studio	lio SenseCAP Pressure Sen	ISOR]		()) seeed	Ş
Seeed Studio Barometric Seeed Studio Seeed Studio Sensor Seeed Studio	lio SenseCAP Pressure Sen	isor CO2]		() seeed () seeed	~
Seeed Studi Barometric Seeed Studio Sensor Seeed Studio Seeed Studio Preset Seeed Studio	io SenseCAP Pressure Ser io SenseCAP io SenseCAP	nsor CO2 Generic			() seeed () seeed () seeed	

3) Select the Sensor Template.

Seeed Studio SenseCAP Barometric Pressure Sensor Seeed Studio	() seed
Seeed Studio SenseCAP CO2 Sensor Seeed Studio	() seeed
Seeed Studio SenseCAP Generic Preset Seeed Studio	() seeed
Seeed Studio SenseCAP Temperature Humidity Sensor Seeed Studio	() seeed

4) Select "Helium".

Add Device	Particle API	D Zero	D Zero LTE PINCODE
STEP 1 Product	STEP 2 Network Server	STEP 3 Devices	STEP 4 Plan
Network Serve Please choose the	LoRaWAN Network Server the The Things Stack V3 TTN V3 / Things Industries	at your devices a	uplinks Downlinks
THETHINGS	The Things Network V2 The old Things Network		Uplinks Downlinks
o ø helium	Helium		Uplinks Downlinks
LORIO T	LORIOT		Uplinks Downlinks
kerlink	Kerlink Wanesy		Uplinks
Showing 1 to 5	of 8 results		Previous Next
			Back

5) Enter your Device EUI and Name.

Add Device	Particle Particle AP	B D Zero	D Zero LTE PINCODE
STEP 1 Product	STEP 2 Network Server	STEP 3 Devices	STEP 4 Plan
Add Devices			
Add Devices Enter one or more L	oRaWAN Device EUIs ar	nd the names they v	will have on Datacake.
Add Devices Enter one or more L DEVEUI	oRaWAN Device EUIs ar 21 21 10 01 2.8 bytes	NAME	will have on Datacake. nseCAP-Air TH
Add Devices Enter one or more L DEVEUI @ 2C F7 F1 + Add another de	oRaWAN Device EUIs ar 21 21 10 01 2, 8 bytes svice	NAME	will have on Datacake.

6) Select your Plan and add device.

LoraWAN	Particle API	D Zero	PINCODE
STEP 1 Product	STEP 2 Network Server	STEP 3 Devices	STEP 4 Plan
Free 0.00€ / month 7 days data retention	Light 1.00€ / month 1 month data retention	Standard 3.00€ / month 3 months data retention	Plus 5.00€ / month 12 months data retention
day max. 2 per workspace Cancel any time	7,000 datapoints / day Cancel any time	2,500 datapoints / day Cancel any time	/,500 datapoints / day Cancel any time
Have a code?			Apply

7.4.5 Check Data from Datacake

1) Click Debug button, it will display debug log.

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SenseCAP-Air-TH

Serial Numb	er	Last update
2CF7F12121	1000DE	Never
Dashbo	ard 💵 His	tory 111 Downlinks I Configuration
Debug	Log	
The Debu	ig Log shows the la	st up to 100 debug messages.
Time	Title	Details
Sat,	Recorded	Decoder returned:
Aug 28, 2021	measurements from payload decoder	Π
12:57		Log:
AM		null
		Recorded measurements:
		Decoder execution time: 26.178312ms
Sat,	Received	Raw webhook
Aug 28, 2021	webhook data from helium	b'{"app_eu1":"80000000000000000","dev_eu1":"2CF7F121211000DE","devaddr":"AC030048","downlink_ur1":"https://console.helium.com/api/v1/down/598b5477-e036-4751-
12:57 AM		
Sat,	Recorded	Decoder returned:
Aug 28, 2021	measurements from payload decoder	Ο
12:56		Log:
AM		null

SenseCAP-Air-TH

Serial Number	Last update	
## Dashboard ### Hi	History III Downlinks 🗘 Configuration 🚴 Debug 💖 Rufes 🎎 Permissions	
Debug Log		
The Debug Log shows the	e last up to 100 debug messages. Deale	
Sat, Recorded Aug measurements 28, from psyload 2021 decoder 1.01 AM	Vecoder strumed:	
Sat. Received Aug webhook data 28, from helium 2021 1:01 AM	Rar wohook: b'('sp.exi')'6000000000000",'Sev.exi')'2077/2121100000",'Seveddr')'A0000040', 'dwedink.wi')'https://consie.heliwm.com/axi/v1/down/5805677-4056-0578-4056-05786528274.hDvelixe2059KomyjEbW2E640VD	15/73178e3b-fdfo-479d-95c8-82
Sat, Recorded Aug measurements 28, from payload 2021 decoder 1:01 AM	Decider returned:	
	real Constraints Activate W Real Constraints Constraints	to activate Windows.

SenseCAP-Air-TH	
Serial Number 2CF7F121211000DE	Last update Never
Dashboard III History Downlinks Configure	tion 🔊 Debug 🖏 Rules 🚉 Permissions
a minute ago	
27.4	
2021/8/27 2021/8/27 2021/8/27 2021/8/27 2021/8/27 2021/8/27 2021/8/27	7 2021/8/27 2021/8/27 2021/8/27 2021/8/27 2021/8/27 2021/8/27 2021/8/27 2021/8/27 2021/8/27 2021/8/27 2021/8/28
a minute ago	
63.4	
2021/8/27 2021/8/27 2021/8/27 2021/8/27 2021/8/27 2021/8/27 2021/8/27	7 2021/8/27 2021/8/27 2021/8/27 2021/8/27 2021/8/27 2021/8/27 2021/8/27 2021/8/27 2021/8/27 2021/8/27 2021/8/27 2021/8/28 Humidity

8. Connect to The Things Network

The Things Network website: <u>https://www.thethingsnetwork.org</u> The Things Industries login: <u>https://accounts.thethingsindustries.com/login</u>

TTN Quick Start: https://www.thethingsnetwork.org/docs/quick-start/

8.1 **Preparation**

8.1.1 Gateway Registration on TTN

Create a Gateway on the TTN console.

THE THINGS S T A C K	Overview D Applications	s 🚠 Gateways 🚢 Orga	anizations	
		Add gateway		
		General settings		
	(Owner •	sensecap	$ $ \vee
	(Gateway ID •	my-new-gateway	
	(Gateway EUI	Gateway EUI	
	(Gateway Name	My new gateway	
	(Gateway description	Description for my new gateway	
			Optional gateway description; can also be used to save notes about the gateway	h
	(Gateway Server address	sensecap-stts-sg-1.seeed.cc	
			The address of the Gateway Server to connect to	

8.1.2 Create the Application

Create an application on your TTN console.

UoT into the Wild	
THE THINGS STACK III Overview Applications	Sateways 🚢 Organizations
Add a	pplication
Owner •	sensecap 🗸 🗸
Applicatic	n ID - my-new-application
Applicatic	n name My new application
Descriptic	n Description for my new application
	Optional application description; can also be used to save notes about the application
Linking	Link new application to Network Server automatically
Network 3	erver address Leave empty to link to the Network Server in the same cluster
Creat	application

8.2 Add Sensor to TTN Console

1) Application \rightarrow End Devices \rightarrow Add end device

set SenseCAB node	Applications y beneed	node y endocrees				
Jenseux noue	End devices (0)		Q. Sea	rch by ID	=+ Import end devices	+ Add end device
Overview	ID \$	Name 🗢	6561W26.03	JoinEUI		Last seen
🙏 End devices						
Live data			No items found			
<> Payload formatters ~						

- 2) Select the end device
- 1 Brand: SenseCAP
- (2) Model: Select your sensor. (If not, use manual add)
- ③ Hardware / Firmware Version: Usually choose the latest
- ④ Device ID: Enter a unique name.

Applications > SenseCAP node > End devices > Register from The LoRaWAN Device Repository

Register end device

From The LoRaWAN Device Repository Manually

1. Select the end device

Brand ⑦ *	Model ⑦ *	Hardware Ver. ⑦*	Firmware Ver. ⑦*	Profile (I	Region) *
SenseCAP	SenseCAP Wireless Air T 🗸	2.0 🗸 🗸	3.4 🗸 🗸	EU_86	3_870 🛛 🗸 🗸
1	2 SenseCAP Wireless Air Tempera	ature and Humid	3) lity Sensor - LoRa	aWAN	4
	MAC V1.0.2, PHY V1.0.2 REV B, Over the a It measures temperature and humidity in sensor, a custom battery, and an industry cases that need reliable data collection f				
	Product website 🛛				

2. Enter registration data

2cf7f120252000bb

After registration

- View registered end device
- Register another end device of this type

Register end device

- ⑤ Frequency plan: Get it from SenseCAP Mate App.
- 6 Device EUI、 App EUI、 App Key: Get it from SenseCAP Mate App.
- 1 Register end device.

8.3 Check Data on TTN Console

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

			opportantia y occur	care more y cris		anner y arrange								
			2cf7f12	20252000bb										
			Last seen info unava	ailable 🛧 3 🤸	↓2				Crea	ated 2 hours ago				
			Anning Lind	inter Managina	. Location Deale	ed formations - Claim	in Constantion							
			CVEIWEW LITEU	uata messaging	g Lucation Paylo	autormatters claim	ing deteral seconds							
Time Type		D	ata preview								Ver	oose stream III P	ause	Clea
18:57:43 Forwa	rd uplink data messar	se P	ayload: [err: 0,	messages: [.],	payload: '018608888	.80602187", valid: t	true] 01 06 00 00 00 00 0	96 2F 87 FPort: 2 SNR:	12 HSSI: 42 Bandwidth	h: 125060				
18:57:12 Forma	id uplink data mesasag	te M	ayload: { eii: 0,	nessages: [],	payload: '0000000403				0A001314010500000000000	1816", valid: Lru	00 00 00 04 0	3 00 02 00 07 00 64	00 05 00 0	31 01 0
18:56:46 Accep	t join request													
18:56:34 Updal	e ond device	1	"root_keys.app_ke	ey.key" [
18:56:14 Join	request to cluster lo	ncal Join Se., M	IC mismatch											
pplication	s > 🥪 ser	nsecap-nod	le > Devi	ices > 🚦	📄 th-sens	or > Data	I							
										C	Verview	Data	Setti	ings
													-	
APPLI	CATION											pause		clear
	uplink	downlink	activation	ack	error									
Filters														
	time	counter	port											
1	9:25:48	4	2	retry	payload: 01	01 10 90 65	00 00 01 02 10	78 F6 00 00 92	2 AF				-	•
			- 0	confirmea									_	
• 1	9:25:47		0										- 8	
													- 1	
 1	9:25:47	4	2 0	confirmed	payload: 01	01 10 90 65	00 00 01 02 10	78 E6 00 00 92	2 AF				- 8	
▲ 1	9:25:25	3	2		payload: 01	06 00 00 00	00 00 2F 87						- 8	
▼ 1	9:25:05		0										- 8	
^ 1	9:25:04	2	2 0	confirmed	payload: 01	06 00 00 00	00 00 2F 87						- 8	
• 1	9:24:48		0										- 1	
	0.04.47	4	0	(and and 01	0/ 00 00 00	00 00 05 07							
1	9:24:47	1	2 0	confirmed	payload: 01	06 00 00 00	00002F87						- 1	
- 1	0.04.00		0											
• 1	7:24:30		0											
	0.24.20	0	2	confirmed	navload. 00	00 00 02 02	00 02 00 07 00	44.00.20.00.01	01 00 00 01 0	0 01 01 02	00.00.00	0 12 01 02	2 00	
- 1	7.24.27	0	2 0	Completineu	payloau. 00	00 00 03 03	0002000700		1010000010	0010102	00 77 00 3	0 12 01 03	,00	
•													+	
	9:24:19				dev addr: 26	50127DB	app eui: 80 00 0	00 00 00 00 00 00	06 dev eui: 20	F7 F1 20	14 70 02 9	7		

9. Payload Decoder

9.1 Decoder Code

TTN payload decoding script for SenseCAP A1101:

https://github.com/Seeed-Solution/TTN-Payload-Decoder/blob/master/decoder_newv3.js

TTN payload decoding script for SenseCAP S210X:

https://github.com/Seeed-Solution/TTN-Payload-Decoder/

Helium payload decoding script for SenseCAP A1101:

https://github.com/Seeed-Solution/Helium-Console-Decoder/blob/main/decoder_datacake.js

9.2 Packet Parsing

9.2.1 Packet Initialization

After being powered on or reboot, SenseCAP Sensors will be connected to the network using the OTAA activation method. Each Sensor Node will send data packets to the server, including the following data:

Initial packets (no need to learn about these initial packets)

One packet with device info including hardware version, software version, battery level, sensor hardware & software version, sensor EUI, power, and sensor power time counter at each channel.

Measurement data packets

The only thing we should pay attention to is the sensor measurement data packets.

APPLICATION DATA							<u>pause</u>	🛍 <u>cle</u>		
F	ilters	uplink	downlink	activatio	n ack	error				
		time	counter	port						
	▼ 1:	1:19:12		0						
[• 1:	1:19:16	5	2	confirmed	payload: 01	01 10 B0 68 00 00 01 02 10 88 F4 00 00 8C FF	Measurement data packe	ts	
	• 1	1:18:58		0						

Packet Structure

The structure of the frame is shown in the image below.

channel	frame type	frame content
1 byte	2 bytes	≥ 4 bytes

1 byte for channel, default as 1, means the sensor has been well connected.

2 bytes for frame type, in this case, it will be 0110 and 0210, means temperature value and humidity value

4 bytes for content, is the sensor value with CRC

The frame content is sent in little-endian byte order.

9.3 Data Parsing Example

9.3.1 Measurements List

Measurements	Measurement ID (HEX)	Resolution	Unit
Air Temperature	0x1001	0.01	°C
Air Humidity	0x1002	0.01	%RH
Light Intensity	0x1003	1	Lux
CO2	0x1004	1	ppm
Soil Temperature	0x1006	0.1	°C
Soil Moisture	0x1007	0.1	%
Soil EC (Electrical Conductivity)	0x100C	0.01	dS/m

9.3.2 Example – S2101 Air Temperature and Humidity Sensor

Air Temperature and Humidity Sensor measurement packet:

01 0110 B0680000 01 0210 88F40000 8CFF

Part Value

Raw Data

Description

1	Air Temperature	<mark>01</mark> 0110 B0680000	 O1 is the channel number. O110 is 0x1001 (little-endian byte order) , which is the measurement ID for air temperature. B0680000 is actually 0x000068B0, whose equivalent decimal value is 26800. Divide it by 1000, and you will get the actual measurement value for air temperature as 26.8°C.
2	Air Humidity	<mark>01</mark> 0210 88F40000	 01 is the channel number. 0210 is 0x1002 (little-endian byte order), which is the measurement ID for air humidity. 88F40000 is actually 0x0000F488, whose equivalent decimal value is 62600. Divide it by 1000, and you will get the actual value for air humidity as 62.6%RH.
3	CRC	8CFF	The CRC verification part.

9.3.1 Example – S2102 Light Intensity Sensor

Light Intensity Sensor measurement packet:

<mark>01 0310</mark> A8550200 <mark>E3E9</mark>

Part	Value	Raw Data	Description
1	Light Intensity	<mark>01 0310</mark> A8550200	 O1 is the channel number. O310 is 0x1003 (little-endian byte order) , which is the measurement ID for Light Intensity. A8550200 is actually 0x000255A8, whose equivalent decimal value is 153000. Divide it by 1000, and you'll get the actual measurement value for Light Intensity as 153 Lux.
3	CRC	E3E9	The CRC verification part.

9.3.2 Example – S2103 CO2, Temperature and Humidity Sensor

CO2, Temperature and Humidity Sensor measurement packet:

- 52

Part	Value	Raw Data	Description
1	CO2	<mark>01</mark>	 01 is the channel number. 0410 is 0x1004 (little-endian byte order) , which is the measurement ID for CO2. 80140700 is actually 0x00071480, whose equivalent decimal value is 464000. Divide it by 1000, and you will get the actual measurement value for CO2 as 464 ppm.
2	Air Temperature	<mark>01 0110</mark> F4650000	 01 is the channel number. 0110 is 0x1001 (little-endian byte order) , which is the measurement ID for air temperature. F4650000 is actually 0x000065F4, whose equivalent decimal value is 26100. Divide it by 1000, and you will get the actual measurement value for air temperature as 26.1 °C.
3	Air Humidity	01 0210 7C7D0100	 01 is the channel number. 0210 is 0x1002 (little-endian byte order), which is the measurement ID for air humidity. 7C7D0100 is actually 0x00017D7C, whose equivalent decimal value is 97660. Divide it by 1000, and you will get the actual measurement value for air humidity as 97.66 %RH.
4	CRC	3C4D	The CRC verification part.

9.3.3 Example – S2104 Soil Moisture and Temperature Sensor

Soil Moisture and Temperature Sensor measurement packet:

01 0610 245E0000 01 0710 BCB10000 A3D9

Part	Value	Raw Data	Description
1	Soil Temperature	<mark>01</mark> 0610 245E0000	01 is the channel number.

			0610 is 0x1006 (little-endian byte order), which is the measurement ID for soil temperature.
			245E0000 is actually 0x00005E24, whose equivalent decimal value is 24100. Divide it by 1000, and you will get the actual measurement value for soil temperature as 24.1℃.
	Soil Moisture	<mark>01</mark>	01 is the channel number.
			0710 is 0x1007 (little-endian byte order), which is the measurement ID for soil moisture.
2			BCB10000 is actually 0x0000B1BC, whose equivalent decimal value is 45500. Divide it by 1000, and you will get the actual measurement value for soil moisture as 45.5%RH.
3	CRC	A3D9	The CRC verification part.

9.3.4 Example – S2105 Soil Moisture, Temperature and EC Sensor

Soil Moisture, Temperature and EC Sensor measurement packet:

01 0610 5C5D0000 01 0710 48A30000 01 0C10 B4000000 DD0A

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IoT into the Wild -

Part	Value	Raw Data	Description
1	Soil Temperature	<mark>01 0610</mark> 5C5D0000	 01 is the channel number. 0610 is 0x1006 (little-endian byte order) , which is the measurement ID for soil temperature. 5C5D0000 is actually 0x00005D5C, whose equivalent decimal value is 23900. Divide it
			by 1000, and you will get the actual measurement value for soil temperature as 23.9℃.
	Soil Moisture		01 is the channel number.
2		<mark>01</mark>	0710 is 0x1007 (little-endian byte order), which is the measurement ID for soil moisture.
			48A30000 is actually 0x0000B1BC, whose equivalent decimal value is 45500. Divide it by 1000, and you will get the actual

			measurement value for soil moisture as 45.5%RH.
3	Soil Electrical Conductivity	<mark>01</mark>	01 is the channel number. 0C10 is 0x100C (little-endian byte order), which is the measurement ID for soil EC. B4000000 is actually 0x000000B4, whose equivalent decimal value is 180. Divide it by 1000, and you will get the actual measurement value for soil EC as 0.18 dS/m.
4	CRC	DD0A	The CRC verification part.

9.3.1 Example – A1101 Vision Al Sensor

Device Name	Measurements	Measurement ID (HEX)	
	AI Detection No.01	4175	
	AI Detection No.02	4176	
	AI Detection No.03	4177	
	AI Detection No.04	4178	
SenseCAP A1101 -	AI Detection No.05	4179	
LoRaWAN Vision AI Sensor	AI Detection No.06	4180	
	AI Detection No.07	4181	
	AI Detection No.08	4182	
	AI Detection No.09	4183	
	AI Detection No.10	4184	

Vision AI Sensor measurement packet:

Part Value

Raw Data

Description

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1	Vision Al Data info	<mark>01</mark>	01 is the channel number. 0110 is 0x4F10 (little-endian byte order), which is the measurement ID for AI detection 7A030000 is actually 0x000000, The integer digit is the target number (targetId range: 1~39), and the decimal digit is the confidence level or count value (range: 0~99). The confidence level 0~99 indicates the confidence level of 1~100.
2	CRC	CD14	The CRC verification part.

Vision AI Sensor measurement packet: 01 0900 00 00 01 00 C289

Part	Value	Raw Data	Description
1	Vision AI Channel Information	01 0900 0000 01 00	01 is the channel number.
			0900 is 0x0900 (little-endian byte order) , which is the data ID for AI detection
			0000 is 0x000 (little-endian byte order),
			Model self-incrementing version number, this ID changes every time the model changes, from 0 to 255, reset to 0 when it exceeds 255
			01 model ld
			00 Is detection type:
			0x00: Object Detection
			0x01: Object Counting
			0x02: Image Classification
			0xFF: Unknown
2	CRC	CD14	The CRC verification part.

9.4 Battery Information

Please note the counter number. After 20 packets, it will follow one special packet with battery info.

You can either ignore this packet or get rid of the battery info in your code.

↓ 18:09:	48 Successfully scheduled data downlink	DevAddr:	27 00 59 27							
↓ 18:09:	48 Schedule data downlink for transmissi	FPort: 5								
↑ 18:09:	48 Forward data message to Application S	DevAddr:	27 00 59 27	FRMPayload:	FE 39 78 39 59 DE 1	E A8 C5 5F 0D 63 BE F6 5E 7E DB 0E 13 4F 44 87 D7	FPort: 2 SNR: 7.	5 Bandwidth: 125000		
个 18:09:	18 Forward uplink data message	DevAddr:	27 00 59 27	FRMPayload:	08 87 88 64 88 85 8	0 01 06 10 B4 5F 00 00 01 07 10 A4 1F 00 00 32 59	FPoit: 2 SNR: 7.	5 Bandwidth: 125000		
↑ 18:09:	18 Receive uplink data message	DevAddr:	27 00 59 27			Battery Package				
↑ 18:09:	48 Successfully processed data message	DevAddr:	27 00 59 27	FPort: 2 FCn	t: 5 FRMPayload:	FE 39 78 39 59 DE 1E A8 C5 5F 0D 63 BE F6 5E 7E 0	DB 0E 13 4F 44 87 D7	Bandwidth: 125000 S	WR: 7.5 Raw payload:	88 27 59
<⇒ 18:09:	48 Link ADR accept received	DevAddr:	27 00 59 27							
↑ 18:89:	18 Receive data message	DevAddr:	27 00 59 27	FPort: 2 FCn	t: 5 FRMPayload:	FE 39 78 39 59 DE 1E A8 C5 5F 0D 63 BE F6 5E 7E 0	DB 0E 13 4F 44 87 D7	Bandwidth: 125080 S	NR: 7.5 Raw payload:	88 27 59

Original Info:

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IoT into the Wild =

00070064000500010610B45F0000010710A41F00003259

Battery Package: 00070064000500

Example:

Battery & Soil Moisture and Temperature Sensor(S2104) measurement packet:

00070064000500<mark>010610B45F0000010710A41F0000</mark>3259

Part	Value	Raw Data	Description	
1	Battery	<mark>00</mark> 0700 <mark>6400</mark> 0500	 00 is the channel number. 0700 is 0x0007 (little-endian byte order), which is the measurement ID for battery. 6400 is 0x0064 (little-endian byte order), whose equivalent decimal value is 100. Battery level is 100%. 0500 is 0x0005 (little-endian byte order), whose equivalent decimal value is 5. Upload interval is 5 minutes. 	
2	Soil Temperature	<mark>01</mark>	 01 is the channel number. 0610 is 0x1006 (little-endian byte order) , which is the measurement ID for soil temperature. B45F0000 is actually 0x00005FB4, whose equivalent decimal value is 24500. Divide it by 1000, and you will get the actual measurement value for soil temperature as 24.5°C. 	
3	Soil Moisture	<mark>01</mark>	01 is the channel number. 0710 is 0x1007 (little-endian byte order), which is the measurement ID for soil moisture.	

			A41F0000 is actually 0x00001FA4, whose equivalent decimal value is 8100. Divide it by 1000, and you will get the actual measurement value for soil moisture as 8.1%RH.
4	CRC	3259	The CRC verification part.

10. Device Installation

10.1 Installing Sensor

10.1.1 Installing the Sensor Bracket

Specially designed for installing SenseCAP Sensors, the bracket is a sliding cap. With designated screw-holes, the bracket helps fasten the Sensor Node firmly onto a pole or a wall.

1) With the sensor in one hand and a bracket in the other, find an unobstructed direction along the back of the sensor.

2) One hand holds the clasp while the other holds the device. Pull outward with opposite force. Press the upper part of the buckle with your finger.\

10.1.1 Mount on Pole and Wall

1) Mount on pole

2) Mount on wall

10.2 Replace the Battery

10.2.1 How to Buy the Battery

We suggest buying it from Amazon.

- 1) EEMB ER34615: Click here
- 2) Search the key word: LiSOCI2 ER34615 battery. Compare the batteries that meet the following parameters. The most important thing is to match the voltage.

Battery Specification				
Nominal capacity	19000mAh			
Model	Li-SOCI2, ER34615			
Nominal voltage	3.6V			
Max. continuous current	230mA			
Max. pulse current capability	400mA			
Dimension	Ø 34.0*61.5mm (D size)			

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10.2.2 How to Replace a New Battery

1) Remove three screws.

Mote:

The sensor and PCBA are connected by wire, please disassemble carefully.

3*PWM3.0x20.0MM

2) Install a new battery.

Note:

Pay attention to the positive and negative terminals of the battery.

3) Install screws.

During the installation, ensure that the waterproof washer is properly installed and the screws are locked; otherwise, water will flow into the device.

11. Trouble Shooting

11.1 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

Version	Date	Description	Editor
V1.0.0	5/01/2022	First edition	Jenkin Lu
V1.0.1	6/14/2022	Add App description	Jenkin Lu
V1.0.2	11/2/2022	A1101 Description	Ming Wen
V1.0.3	13/1/2022	A1101 Decoder Link Updated	Ming Wen
V1.0.4	3/2/2023	A1101 Decoder Demo Added	Ming Wen

11.2 Document Version