THE NEW GENERATION LORAWAN SENSORS OF SENSECAP

# SenseCAP A1101 LoRaWAN Vision AI Sensor User Guide



Version: v1.0.6

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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

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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, 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  $\sim$  85°C operating temperature and IP66 rating, suitable for indoor and outdoor deployment

• **Easy for Scalable Deployment:** Imin 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 S210X 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.



#### 🗥 Note:

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>2CF7F12</mark> 014700297&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	80000000000006
app_key	Арр Кеу	6FD0EF47CBC6E00F1921A08C2E94E8E5

```
{
    "code": "0",
    "data": {
        "nodeEui": "2CF7F12014700297",
        "deviceCode": "34BF25920A4EFBF4",
        "lorawanInformation": {
            "dev_eui": "2CF7F12014700297",
            "app_eui": "800000000000006",
            "app_key": "6FD0EF47CBC6E00F1921A08C2E94E8E5"
        }
    },
    "time": 0.019
}
```

## 🗥 Note1:

The SenseCAP LoRaWAN Sensor can modify to EUI, Key, and Frequency. Please refer to the following sections.

#### 🗥 Note2:

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 <u>section 5</u>.

# 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	1. The LED will for 15 second initialization	
	Reboot device and join LoRa network	2. Waiting for join LoRa network: breathing light flashing
		3. Join LoRa network success: LED flashes fast for 2s
		4. LoRa network join

IoT into the Wild

		failure: LED suddenly stop.
Press and hold for 3s		1. Waiting for Bluetooth connection: LED flashes at 1s frequency
	Activate Bluetooth again	2. 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.

# 🗥 Note:

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 https://www.pgyer.com/sensecapmate or https://install.appcenter.ms/orgs/seeed/apps/sensecapmate/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.

#### 🗥 Note:

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 🕸	8 8 kul 8 17kul 200	16:34   0.0K/s 🖏	- <b>8</b> 8 hai 8 mai
← Setup		← 110991764	1223000024
		General	Settings
111		Basic	
		Device Model	SenseCAPS2106
		Device EUI	2CF7F1C042800023
1.		Sensor Type	Vision Al Sensor
Select Devic	e	Algorithm	Image Classification
1109917642230		Al Model	1.5
		Backup Firmware	Version 1.5
	Scan	Software Version	1.5
		Hardware Version	V1.2
		LoRaWAN Version	V1.0.3
		Class Type	ClassA
		Battery	99%
		Al Preview	
			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	<del>?</del> I
11499	2846221600009	< 11499:	2846221600009
General	Settings	General	Settings
Platform	Other Platform V	Platform	Other Platform V
Frequency Plan	US915 ~	Frequency Plan	US915 ~
Sub-Band	Sub-Band2 🗸	Sub-Band	Sub-Band2 V
Uplink Interval (m	nin) 6	Uplink Interval (m	in) 60
Activation Type		EU868	—
Device EUI	2CF7F1C04160000B	US915	
SenseCAP for Th	ne Things Network	AU915	
SenseCAP for Helium		AS923	
Helium		IN865	
The Things Netw	vork	KR920	
Other Platform		RU864	

Platform	Description	
SenseCAP for The Things Network	It must be used with SenseCAP Outdoor Gateway (https://www.seeedstudio.com/LoRaWAN-Gateway-EU868- p-4305.html). 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	<b>Default platform.</b> 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-TTN	Frequency plan for TTN
	AS923-1	
AS923	AS923-2	Frequency plan for Helium
AS923-3 AS923-4		
	AS923-4	
RU864-867	RU864	

A1101 Sensors support the following frequency plan:

# 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/

# ANote2:

- 1) When using the SenseCAP platform, the EUI, APP EUI and APP Key are fixed and are the same as the sensor label.
- 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 strategy, the mode can minimize the packet loss however the device will consume the most data packer TTN, or date credits in Helium network.		
IC	1C (1 confirm) the device will sleep after get 1 received confirm packet from server.		
١N	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.	

-17



АВР	Activation By Personalization, it joins the network through DevAddr, NwkSkey, and AppSkey.	
	DevAddi, Twikskey, and Appskey.	

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

Parameter	Description		
DevAddr	32 bits, hexadecimal from 0 ~ F		
NwkSkey	32 bits, hexadecimal from 0 ~ F		
AppSkey	8 bits, hexadecimal from 0 ~ F		

Activation Type	ABP 🗸	
Nwk Skey	D65CF04A554CB71ECCC0D58C4	
Only hexadecin digits are allowed	nal numbers of 0-F with a maximum of 32 to be filled in.	
APP Skey	24CEAFD65CF04A554CB71ECCC	
	nal numbers of 0-F with a maximum of 32	

Only hexadecimal numbers of 0-F with a maximum of 8 digits are allowed to be filled in.

# <mark>∕∆</mark>Note:

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 ම	18 B 16.0 B 170	aul 💶	21:41   0.4K/s ල	×	3 🛙 "Faul 🗟 : 1 Faul 🖂
← 11099176422	23000024		← 1109917642	223000024	
General	Settings		General	S	Settings
Platform	SenseCAP for The Thir	~	Platform	SenseCAP fo	r The Thir 🗸
Algorithm	Object Detection	~	Algorithm	Object Detec	ction 🗸
Al Model	Face Detection	~	Al Model	Face Detecti	on 🗸
Credibility (1-100%)	70		Credibility (1~100%)		70
Frequency Plan	EU868	~	Frequency Plan	EU868	~
Uplink Interval (min)	60		Uplink Interval (min)		60
Packet Policy	2C+1N	•	Packet Policy	2C+1N	~
Restore Factory	Send		Restore Factory		Send
Object Detection					
Object Counting				_	
Image Classification			Face 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.

	223000024	_		
General	Settin	ngs	General	Settings
Platform	SenseCAP for The	e Thir 🗸	Platform	SenseCAP for The Thir ~
Algorithm	Object Detection	~	Algorithm	Object Detection ~
Al Model	Face Detection	~	Al Model	Face Detection
Credibility (1~100%)		70	(1-100%)	
		· ·	Set up succ	essfully
				costony.
Frequency Plan	EU868	~	1	coording.
Frequency Plan Uplink Interval (min)		60		IOME CONTINUE SETTING
Uplink Interval (min)				
Uplink Interval (min) Packet Policy	2C+1N	~	F BACK TO H Packet Policy	IOME CONTINUE SETTING
Uplink Interval (min)	2C+1N		E BACK TO H	OME CONTINUE SETTING
Uplink Interval (min) Packet Policy	2C+1N	~	F BACK TO H Packet Policy	IOME CONTINUE SETTING
Jplink Interval (min) Packet Policy	2C+1N	~	F BACK TO H Packet Policy	IOME CONTINUE SETTING

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.

:32   2.2K/s 🕸 🥸 🧿 ઉ	18 tul 8 tul 8 🏹 (19
110991764223	6000024
General	Settings
Device EUI	2CF7F1C042800023
Sensor Type	Vision Al Sensor
Algorithm	Object Counting
Al Model	1.5
Backup Firmware Versi	on 1.5
Software Version	1.5
Hardware Version	V1.2
oRaWAN Version	V1.0.3
Class Type	ClassA
Battery	100%
I Preview	
/our sensor detected 1	category and 1 target
	0

#### 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-AI-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.

Devices 🗸	Dashboard Add+				Data update interval: Manual 🗸 💿
Gateway	Devices Overview			Monitoring	Announcement
Node Group Sensor Node Data ~ Table Graph	1	Gateway	8 Sensor Node	Galeway Offine 0 Node Offline 0 Low Battery 0	1
) Security 🗸 🗸	Gurrent Value 🧷		+ x ×	CO2 //	Chart Settings 54 ×
Access AP1 keys	UL 99529Pa AirPressure (20F7F12210400074) *Online   2019-08-08 14:12:03	28°C Air Temperature (2CF7F12210400083) •Onine   2019-08-08 13:53:11	68%FH Air Hunidfy (2057#12210400083) *Online   2019-08-08 13:53:11	500 400 300 200	-O- CO2 (2CF7F12210400070) 1 1 1
	- ) 172.8Lux Light (2CF7F1221040007E)	CO2 385ppm CO2 (20F7F12210400070)		0 )19-08-09 10:50:00 2019-08-0	te 013800 2019-08-09 162600 2019-08-11 071400 2019-08-12 2202 O Chart Stettings 않 X Lighe (2CF7F1221040007E) 소 교

#### 6.1.1 Create a New Account

Portal Website: <u>http://sensecap.seeed.cc</u>

- 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.

#### Mote:

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.

#### Mote:

SenseCAPPortalUserGuide:<a href="https://sensecap-docs.seeed.cc/quickstart.html">https://sensecap-docs.seeed.cc/quickstart.html</a>

#### 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: <u>https://sensecap-docs.seeed.cc/</u>





# 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 <u>section 5</u> 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.

IoT into the Wild	
1:53 🕇	uli 4G 🔳
	+
ALL	Add device
	Add workspace

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.



## (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.



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IoT into the Wild

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



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#### 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	
11499	2846221600009	< 114992	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
Jplink 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	əlium	AS923	
Helium		IN865	
The Things Netw	rork	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.

SENSECAP 📃							Đ	nglish 🗸 🕴 👱 xfa	actory.SZ@seeed.cc 🍷 📑	
Dashboard	Devices / S	ensor Node								
Dovicos 🗸										
Gateway	All	Lol	Ra NB-I	01						
Node Group		EUI Device EUI		Frequency(MHz)	Frequency					
Sensor Node	Device	Group Device Group		Online Status	Online Status					
Data 🗸 🗸										
Table	Registration	Time From		— То		<b></b>	1Day 7Days 30Days	5		
Graph	Search	Clear Clear	ne number of search results: 4							
		Clear Clear Tr	re number of search results: 4							
	Search NO.	Clear C Tr	ne number of search results: 4 Device Name		Sensor Count	Device Group	Online Status	Operation	Last Message Time	
Security 🗸	0				Sensor Count	Device Group station-1	Online Status Online	Operation Move	Last Message Time 2019-11-15 10:28:16	
Security 🗸	• <sub>NO.</sub>	EUI	Device Name	и						
)Security 🗸	• NO.	EUI 2CE7F12210400070	Device Name CO2 Sensor	я	1	station-1	Online	Move	2019-11-15 10:28:16	



# 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.


- 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 <u>section 5</u> for detail.

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

15:53	🗢 🗖	15:54	<b>? ()</b> .
<b>〈</b> 114992	2846221600009	< 114993	2846221600009
General	Settings	General	Settings
Platform	Other Platform V	Platform	Other Platform
Frequency Plan	US915 ~	Frequency Plan	US915 V
Sub-Band	Sub-Band2 V	Sub-Band	Sub-Band2 🗸
Uplink Interval (m	in) 6	Uplink Interval (m	in) 60
Activation Type		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

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# 7. Connect to Helium Network

# 7.1 Register

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

	Welcome to Helium Console	
Flows	Harness the power of the work1's first peer-to-peer wireless network	
NODES		
Devices	Show the Welcome Screen every time Hogin	And the second se
Functions		
Integrations		
CONTICA		
Alerts		
ADR	Get Started with Console	Developer Resources
Multiple Packets		
CF List	Add and Manage Devices for the Hollum Network 🕨	View Documentation and Tutorials >
	Set up an Integration to send and receive device data •	Watch our How-to Videos 🕨
ADMN	Apply Functions to your devices >	Join our Community Discord Channel >
Organizations	Invite other Users to your Console Organization I	Read our Engineering Update Blog 🕨
Data Credits Users		

# 7.2 Add New Device

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

	My Devices	
	DADAwices     (w)     (w)	
T	All Devices Daick Action V	
Flows Notes	Torvice Name © Device EUI © Labels Frame Up © Frame Down © Packets Transferred © DC Used © Date Activated © Last Connected ©	
Functions		
costica Aleris		
ADR Multiple Packets CF List	10 results > ( ( ) >	
ADMIN Organizations Data Credits Users		

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

#### My Devices

Vew Device nt: The limit time a device joins the Network could take up to 20 mins. Learn more about adding devices		
1 DEVICE DETAILS		£
me SenseCAP-AIr-TH	15/50	Import Devices You can import your devices directly from the Things Network, or in bulk via.csv uplaad.
v EUI 2CF7F121210000C2	8 / 8 Rytes	How do I format my.csv?
P EUI 800000000000000	8 / 8 Byles	Import from The Things Network
p Key @ 3BF3D4C5744A057E0A1A61F4800EB080	16 / 16 Bytes	Drag, usy file here on click to choose file
ch a Label (Optional)		

#### 3) Save device.

My Devices

All Devices (H)								
All Devices						Edit Columns	Quick Action	
Device Name	Device EUI	Cabels Frame 0	Jp 🗘 Frame Down	Packets Transferred	DC Used      ‡	Date Activated	Last Connected	
2CF7F121210000C2 ( Pending)	8000000000008	None		٥	0	Aug 27, 2021 8:09 PM		
							10 results V	<    t    >

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



	Which I	Devices do you want to	× add this		
		Label to?			
	Devices	SELECT ALL DEVICES			
	Labels	Search here	٩		
		2CF7F12121000062			
			-		
		Cancel Add Label to Devices			
			,		
Devices				_	
Al Devices     (iii)     (iii)     (iii)     (iii)     (iii)     (iii)     (iii)     (iii)					
enseCAP-TH-Node				Edit Columns 🔞 Label Settings Quick Action	

## 7.3 Check the data on Helium

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

Live Data										<ul> <li>Integration Success</li> <li>Integration Error</li> <li>No Integration</li> </ul>
0 -20 -40 -80 -80										
-120 0e	-30a	-806	-906	-1206	-150e Time Past in Seconds	-180a	-210a	-240e	-2706	-320a

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

IoT into the Wild								
20 -40 -80 -30 -100 -100 -120								
0s -30s	-60s	-90s	-120s	-150s Time Past in Seconds	-180s	-210s	-240s	-270s
				time Past in Seconds				
Event Log Expand All Show Dropped	Uplinks: Late Inactive D	Device T Filter Ever	nts w/ Commands	lime Past in Seconds				E
Event Log Expand All Show Dropped	Uplinks: Late Inactive D	Device Filter Ever	nts w/ Commands	ume Hast in Seconds	Time			B
		Device Filter Ever		ime Past in Seconds		11:19:28.115 PM		Ð
Event	Туре	Device Filter Ever	No. of Hotspots	Inte Past in Seconds	Aug 27, 2021	11:19:28.115 PM 11:19:21.666 PM		Đ
Event + <b>•</b> 3	Type Acknowledge	Device Filter Fver	No. of Hotspots	ing has n accords	Aug 27, 202 Aug 27, 202			E
Event + •••• + ••••	Type Acknowledge Uplink *	Device Filter Ever	No. of Hotspots	inter Hall in Labora	Aug 27, 202 Aug 27, 202 Aug 27, 202	11:19:21.666 PM		Б
Event + 23 + 43 + 22 0	Type Acknowledge Uplink * Downlink	Sevice Filter Ever	No. of Hotspots 1 1 1 1 1 1		Aug 27, 202' Aug 27, 202' Aug 27, 202' Aug 27, 202'	11:19:21.666 PM 11:19:07.557 PM		Đ
Event + <b>13</b> + <b>23</b> + <b>12 3</b> + <b>12</b>	Type Acknowledge Uplink ** Downlink: Uplink **	Device Rear Poer	No. of Hotspots		Aug 27, 202' Aug 27, 202' Aug 27, 202' Aug 27, 202' Aug 27, 202'	11:19:21.666 PM 11:19:07.557 PM 11:19:03.479 PM		Đ
Event + 23 + 22 + 22 + 22 + 22 + 22	Type Acknowledge Uplink x <sup>4</sup> Downlink Uplink x <sup>4</sup> Acknowledge Uplink x <sup>4</sup> Acknowledge	Device FRer Free	No. of Hotspots		Aug 27, 202' Aug 27, 202' Aug 27, 202' Aug 27, 202' Aug 27, 202' Aug 27, 202'	11:19:21.666 PM 11:19:07.557 PM 11:19:03:479 PM 11:18:52:133 PM		Đ
Event + 23 + 22 + 22 + 22 + 22 + 23 + 23 + 23	Type Acknowledge Uplink ** Dewnlink Uplink ** Acknowledge Uplink **	Device FRee Free	No. of Hotspots.		Aug 27, 202' Aug 27, 202'	11:19:21.666 PM 11:19:07.557 PM 11:19:03:479 PM 11:18:22.133 PM 11:18:48:383 PM 11:18:35:797 PM 11:18:31.018 PM		Đ
Event + 23 + 22 20 + 22 20 + 22 20 + 22 20 + 22 20 + 23 + 23	Type Acknowledge Uplink x <sup>4</sup> Downlink Uplink x <sup>4</sup> Acknowledge Uplink x <sup>4</sup> Acknowledge	Device PRer Ever	No. of Hotspots		Aug 27, 202' Aug 27, 202'	11:19:21.666 PM 11:19:07.557 PM 11:19:03:479 PM 11:18:52:133 PM 11:18:48:383 PM 11:18:35:797 PM		Đ

# 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>

Ci	reate an Account
First Name	Last Name
음 e.g. John	😤 e.g. Doe
Email	
El e.g. john.doe@example.com	n
Name of your first Workspace	any or your name
Password	Confirm Password
🗇 Password	🗇 Confirm Password
number and one special character (@\$1	characters, including at least one uppercase letter, one lowercase letter, on we are provided in the second sec

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

IoT into	the Wild		
UU			
S SenseCAP 0	DATACAKE		
SenseCAP	Rect > Devices		
Add Workspace	Devices	Q. Search	Columns ~ + Add Device
Edit Profile	DEVICE	LOCATION	
Logout "A" Gateways			
88 Members		(!)	
안 Rules ② Workspace		There are no devices in your Workspace, yet. Start by adding your first Device using the button above.	
workspace     Integrations			
🛇 White Label	Showing 0 to 0 of 0 results		50 per page v Previous Next
台 Billing			
			· · · · · · · · · · · · · · · · · · ·
		Datacake offers both a <a>RESTful API</a> for simple tasks as well as a feature-rich	
은 My Acc	count	href="https://docs.datacake.de/v/english/integrations/api/graphql-api" target="_blan	
Passw	ord 🔻	API. For both, you need an API token.	
4.51		Please note that your API token gives access to your whole account, so treat it with ca	aution
≓ API		g	
		You can find your API token below.	
		* ************************************	

#### 7.4.2 Add New Integration on Helium Console

1) Click "Integrations" → "Add New Integration" → "Datacake".

I	My Integrations
	AN Integrations     Concorres
Flows	ADD A PREDULT BUSINGRION
Devices Functions	🧖 👦 🔛 🖸 🗈 🖽 📖
connes Alerts	Herium Cargo myDevices Coverine Ubidota Adsitu/UO Datacave Tapolo Google Sheeta Microshare Intro
ADR Multiple Packets CF List	ADD A CUSTOM INTEGRATION
ADMIN Organizations Data Credits	
water a	HTTP NGTT AVISIOT CAN:
	HTTP: NGTT AVSING Care

2) Enter Datacake Token (Refer to <u>the section</u>) and name your integration.

IoT into the Wild		 
My Integrations		
All Integrations     Difference		
STEP 1 - CHOOSE AN INTEGRATION TYPE		
Datacake This integration simplifies sending data to the Data me more about setting up this integration.	accele IoT platform. Tell	Change
STEP 2 - ENDPOINT DETAILS		
Enter Datacake Token: 475890c0a4ef7a9e03fc585a3cfe59fff20b0276	79	
STEP 3 - NAME YOUR INTEGRATION (REQUIRED)		
SenseCAP 8/50		

- 7.4.3 Configure the Flows on Helium
- 1) Click "Flows".



2) Drag the Label into a blank place.

IODES				
bels Dev	icos Functions	Integrations		
🛅 Sense	CAP-TH-Node			
1 Device				
	X			
		0		
		$\mathbf{X}$		
		*		
		SenseCAP-TH-Ne	ode .	
		1 Device		

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



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

<b>@</b>	<b>X</b> Particle	<pre>{API}</pre>	ً⊘	Ø		
LoRaWAN	PARTICLE	API	D Zero	D Zero LTE	PINCODE	
STEP 1 Product	STEP 2 Network	Server	STEP 3 Devices		STEP 4 Plan	
Datacake Produ You can add devices one of the templates more) betweep devi	s to an existing s. Products allo	A CONTRACTOR OF A CONTRACTOR				
New Product fro template Create new proo from a template	duct	Existing Pr Add device existing pro	es to an		Product te new empty uct	
Device Templat		ces from diffe	rent manufac	turers out of th	ne box without	
Datacake sur ports l complex conjugurati	LoRaWAN devic		1		ne box without	
Datacake supports I	LoRaWAN devic	ces from diffe	rent manufact		ne box without	0
Datacake sur ports I complex conjigurati	LoRaWAN devic on and setup. dio SenseCAP	٩	1		() seeed	0
Datacake sur ports I complex configurati Seeed Seeed Studio Seeed Studio	LoRaWAN devic on and setup. dio SenseCAP o dio SenseCAP	Q.	1			0
Datacake sur ports I complex configuration Seeed Barometric Seeed Studion Seeed Studion Seeed Studion Seeed Studion Seeed Studion	LoRaWAN devic on and setup.	o, nsor P CO2	1		() seeed	C

3) Select the Sensor Template.

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

4) Select "Helium".

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Add Dev	ጯ	Particle		Ø	Ø	
STEP 1 Product	oRaWAN	STEP 2 Network	API Server	D Zero STEP 3 Devices	D Zero LTE	PINCODE STEP 4 Plan
		oRaWAN Netwo	ck V3	at your devices	are connected	
0	E THINGS	The Things Net The old Things			Uplin	ks Downlinks
0 0	helium	Helium			Uplin	ks Downlinks
0	DRIO T	LORIOT			Uplin	ks Downlinks
O ke	er <b>link</b>	Kerlink Wanesy				Uplinks
Showi	ng 1 to 5	of 8 results			Prev	ious Next
						Back Next

5) Enter your Device EUI and Name.

Add Device	Particle AI	D Zero	D Zero LTE PINCODE
STEP 1 Product	STEP 2 Network Server	STEP 3 Devices	STEP 4 Plan
Add Devices			
Enter one or mor	e LoRaWAN Device EUIs a		vill have on Datacake.
Enter one or mor	e LoRaWAN Device EUIs a F1 21 21 10 01 2, 8 byte	NAME	vill have on Datacake. nseCAP-Air TH
Enter one or mor	F1 21 21 10 01 2 8 byte	NAME	

6) Select your Plan and add device.

LoRaWAN	Particle API	D Zero LTE	PINCODE
TEP 1 roduct	STEP 2 Network Server	STEP 3 Devices	STEP 4 Plan
Free 0.00€ / month	Light 1.00€ / month	Standard 3.00€ / month	Plus 5.00€ / month
7 days data retention	1 month data retention	3 months data retention	12 months data retention
500 datapoints / day max. 2 per workspace Cancel any time	1,000 datapoints / day Cancel any time	2,500 datapoints / day Cancel any time	7,500 datapoints / day Cancel any time

### 7.4.5 Check Data from Datacake

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

#### SenseCAP-Air-TH

Serial Nu 2CF7F12	1211000DE	story 11 Downlinks O Configuration
Deb	ug Log	
The D	ebug Log shows the I	ast up to 100 debug messages.
Tim	e Title	Details
Sat,		Decoder returned:
Aug 28, 202	3, from payload 021 decoder 2:57	П
12: AM		Log:
AM		null
		Recorded measurements:
		Decoder execution time: 26.178312ms
Sat,	Received	Raw webhook:
Aug 28, 202	from helium	b'{"app_eu1":"880000000000000000000000000000000000
12: AM		
Sat,	Recorded	Decoder returned:
Aug 28, 202	from payload	П
12:		Log:
AM		null

#### SenseCAP-Air-TH

Serial Number	Last update	
20E7E121211000DE	Navar	

Dashboard 📲 Hi	istory     Downlinks 🗘 Configuration 🔊 Debug 🧠 Rules 🏥 Permissions
Debug Log	
The Debug Log shows the Time Title	Isatu po to 100 debug messages. Details
Sat. Recorded measurements 28, from payload 2021 decoder 101 AM	Decoder Hutmef: $\begin{bmatrix} & & & \\ & & & & \\ & & & \\ & & $
Sat, Received Aug webhook data 28, from helium 2021 1.01 AM	Ram method: b'("spp.eu1";"0000000000000"," 6er.eu1";"257712121100005"," 6ereddr"; "AC030645", "Gemilink.url";"https://consile.helium.com/upi/v1/dom/55854577-0036-4751-4255-037785223274/hdvsilzz2/559cumyjD0xA7Ex59766523274/hdvsilzz2/559cumyjD0xA7Ex5976523274/hdvsilzz2/559cumyjD0xA7Ex59765223274/hdvsilz
Sat, Recorded Aug measurements 28, from payload 2021 decoder 1.01 AM	Decoder returne:
	regi Activate Windows Go to Settings to activate Windows

Last update Never	
wnlinks 🔹 Configuration 🎧 Debug 🔍 Rules 🚉 Permissions	
1/8/27 2021/8	8/27 2021/8/27 2021/8/27 2021/8/28
	Never

# 8. Connect to The Things Network

The Things Network website: <u>https://www.thethingsnetwork.org</u>

The Things Industries login: https://accounts.thethingsindustries.com/login

TTN Quick Start: <a href="https://www.thethingsnetwork.org/docs/quick-start/">https://www.thethingsnetwork.org/docs/quick-start/</a>

### 8.1 Preparation

8.1.1 Gateway Registration on TTN

Create a Gateway on the TTN console.

THE THINGS S T A C K	view 🗖 Applications 📑 Gateways 🗮 (	Organizations
	Add gateway	
	General settings	
	Owner •	sensecap 🗸 🗸
	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
	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.

IoT into the Wild			
THE THINGS STACK DVerview Applica	ations 🗳 Gateways 🔩 O	rganizations	
	Add application		
	Owner •	sensecap	~
	Application ID •	my-new-application	
	Application name	My new application	
	Description	Description for my new application	
		Optional application description; can also be used to save notes about the application	le
	Linking	✓ Link new application to Network Server automatically	
	Network Server address	Leave empty to link to the Network Server in the same cluster	
	Create application		

#### 8.2 Add Sensor to TTN Console

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

SenseCAP node	Applications > SenseCAP node > End c	levices			
Jensecar node	End devices (0)		Q Search by ID	≡+ Import end devices	+ Add end device
Overview	¢ GI	Name \$ Dev201	JoinEU		Lastseen
👗 End devices 🗕					
🖬 Live data		No items f	found		
<>> Payload formatters ~					

- 2) Select the end device
- $(\underline{1})$  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. 🤉 *	Firmware Ver. ⑦*	Profile (Region) *	
SenseCAP	SenseCAP Wireless Air T 🗸	2.0 🗸 🗸 🗸	3.4 🗸 🗸 🗸	EU_863_870	$\sim$
1	SenseCAP Wireless Air Tempe MAC V1.0.2, PHY V1.0.2 REV B, Over the			(4) aWAN	
	It measures temperature and humidity sensor, a custom battery, and an indus cases that need reliable data collection	ry-grade enclosure, op	U		
	Product website 🛛				

#### 2. Enter registration data



2cf7f120252000bb

#### After registration

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

**Register end device** 

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(5) Frequency plan: Get it from SenseCAP Mate App.

(6) Device EUI、 App EUI、 App Key: Get it from SenseCAP Mate App.

⑦ 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.

			2cf7f12	20252000bl	6											
			Last seen info unava		4.2							Created	d 2 hours ago			
												Greated				
				data Messaginj	g Location Payl	load formatters CL	laiming 0	General settings								
туре		D	ata preview											V	erbose stream	II Pause
/:43 Forwar	d uplink data mes				payload: '01060000											
7:12 Foisois	d uplink dala mesa	sage P	ayload: { eii: 0,	nessages: [],	payload: '00000004	330002000700640005	6001010001	101000101020007	02001501030030	F1F72C0104003	A0C1314010	500000000001010	0°, valid: L	LUE } 00 00 00 04	03 00 02 00 07 0	00 64 00 05 00
	join request															
5:34 Update	e end device	1	"Lool_Reys.app Ne	ey.key" ]												
s:14 Join m	equest to cluster	local Join Se., M	UC mismatch													
lications	s > 🥪 si	ensecap-nod	le > Devi	ices > 🕴	📄 th-sen	sor > Da	ta							Overview	Data	Sett
PPLIC	CATION	DATA													II pa	use 🛍 !
Filters	uplink	downlink	activation	ack	error											
	time	counter	port													
	time 9:25:48	counter 4	2	retry confirmed	payload: 0:	1 01 10 90 6	55 OO O	00 01 02 1	10 78 E6 (	00 00 92	AF					
<b>1</b> 9			2	retry confirmed	payload: 0	1 01 10 90 6	55 00 0	00 01 02 1	10 78 E6 (	00 00 92	AF					
▲ 19 ▼ 19	9:25:48		2 0	retry confirmed		1 01 10 90 e 1 01 10 90 e										
<ul> <li>15</li> <li>15</li> <li>15</li> <li>15</li> </ul>	9:25:48 9:25:47	4	2 0	confirmed	payload: 0:		55 OO O	00 01 02 1								
<ul> <li>15</li> <li>15</li> <li>15</li> <li>15</li> <li>15</li> </ul>	9:25:48 9:25:47 9:25:47	4	2 0	confirmed	payload: 0:	1 01 10 90 6	55 OO O	00 01 02 1								
<ul> <li>19</li> <li>19</li> <li>19</li> <li>19</li> <li>19</li> <li>19</li> <li>19</li> <li>19</li> <li>19</li> </ul>	9:25:48 9:25:47 9:25:47 9:25:25	4	2 0 0 2 0 2 0	confirmed	payload: 0: payload: 0:	1 01 10 90 6	55 00 0 00 00 0	00 01 02 1 00 2F 87								
<ul> <li>15</li> <li>15</li> <li>15</li> <li>15</li> <li>15</li> <li>15</li> <li>15</li> <li>15</li> <li>15</li> </ul>	9:25:48 9:25:47 9:25:47 9:25:25 9:25:05	4	2 0 0 2 0 2 0	confirmed confirmed	payload: 0: payload: 0:	1 01 10 90 <i>6</i> 1 06 00 00 0	55 00 0 00 00 0	00 01 02 1 00 2F 87								
<ul> <li>15</li> </ul>	9:25:48 9:25:47 9:25:47 9:25:25 9:25:25 9:25:05 9:25:04	4	2 0 0 2 0 2 0 0 2 0 0 2 0 0 0	confirmed confirmed	payload: 02 payload: 02 payload: 02	1 01 10 90 <i>6</i> 1 06 00 00 0	55 00 0 00 00 0 00 00 0	00 01 02 1 00 2F 87 00 2F 87								
<ul> <li>15</li> </ul>	9:25:48 9:25:47 9:25:47 9:25:25 9:25:05 9:25:04 9:24:48	4 4 3 2	2 0 0 2 0 2 0 0 2 0 0 2 0 0 0	confirmed confirmed	payload: 02 payload: 02 payload: 02	1 01 10 90 6 1 06 00 00 0 1 06 00 00 0	55 00 0 00 00 0 00 00 0	00 01 02 1 00 2F 87 00 2F 87								
<ul> <li>15</li> </ul>	9:25:48 9:25:47 9:25:47 9:25:25 9:25:05 9:25:04 9:24:48 9:24:47	4 4 3 2	2 ( 0 ( 2 ( 0	confirmed confirmed	payload: 0: payload: 0: payload: 0: payload: 0:	1 01 10 90 6 1 06 00 00 0 1 06 00 00 0		D0 01 02 1 D0 2F 87 D0 2F 87 D0 2F 87	10 78 E6 f	00 00 92	AF	00 01 00	01010	12 00 99 00	30 12 01	. 03 00
<ul> <li>15</li> </ul>	9:25:48 9:25:47 9:25:25 9:25:05 9:25:04 9:24:48 9:24:47	4 4 3 2 1	2 ( 0 ( 2 ( 0 ( 0 ( 2 ( 0 ( 0 ( 2 ( 0	confirmed confirmed confirmed	payload: 0: payload: 0: payload: 0: payload: 0:	1 01 10 90 e 1 06 00 00 0 1 06 00 00 0 1 06 00 00 0		D0 01 02 1 D0 2F 87 D0 2F 87 D0 2F 87	10 78 E6 f	00 00 92	AF	00 01 00	01010	2 00 99 00	30 12 01	. 03 00

# 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\_new-v3.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.

PPLIC	CATION	DATA						II <u>pause</u> 📋
liters	uplink	downlink	activatio	n ack	error			
	time	counter	port					
<b>•</b> 11	1:19:12		0					
<b>^</b> 11	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 packets
- 11	1:18:58		0					

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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 Example – A1101 Vision AI Sensor

Device Nam	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 LoRaWAN	A1101 Vision	- Al	AI Detection No.05	4179	
Sensor	VISION	AI	Al Detection No.06	4180	
			AI Detection No.07	4181	
			AI Detection No.08	4182	
			Al Detection No.09	4183	
			AI Detection No.10	4184	

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Vision AI Sensor measurement packet on the Human Body Detection Model:



Part	Value	Raw Data	Description
1	Vision Al Data info	<mark>01</mark> <mark>4F10</mark> 7A030000	<ul> <li>OI is the channel number.</li> <li>4FIO is 0x104F (little-endian byte order), which is the measurement ID 4175 for AI detection.</li> <li>7A030000 is actually 0x0000037A, whose equivalent decimal value is 890. Divide it by1000, and you will get the actual measurement value 0.89.</li> <li>The integer digit is the target number (target Id range: 1~10), 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.</li> </ul>
2	CRC	427D	The CRC verification part.

Vision AI Sensor measurement packet on the People Counting Model:



Part	Value	Raw Data		Description
1	Vision Al Data info	<mark>01</mark>	<mark>0A00000</mark>	<ul> <li>OI is the channel number.</li> <li>4FIO is 0x104F (little-endian byte order), which is the measurement ID 4175 for AI detection.</li> <li>OA000000 is actually 0x000000A, whose equivalent decimal value is 1. Divide it by1000, and you will get the actual measurement value 0.01. That</li> </ul>



01 4F10 98030000 BEF0

			means only 1 people here. The integer digit is the target number (target Id range: 1~10), and the decimal digit is the number of person.
2	CRC	<mark>63C8</mark>	The CRC verification part.

Vision AI Sensor measurement packet on the Person&Recognition Model:

Part	Value	Raw Data		Description
1	Vision Al Data info	<mark>01 4.F10 94 BEF0</mark>	<mark>8030000</mark>	<ul> <li>OI is the channel number.</li> <li>4FIO is 0x104F (little-endian byte order), which is the measurement ID 4175 for AI detection.</li> <li>98030000 is actually 0x00000398, whose equivalent decimal value is 920. Divide it by1000, and you will get the actual measurement value 0.92. That means the probability of people.</li> <li>The integer digit is the target number (target Id range: 1~10), and the decimal digit is the probability of person or</li> </ul>
				panda
2	CRC	<mark>BEF0</mark>		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.

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↓ 18:09:48	Successfully scheduled data downlink	DevAddr:	27 08 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 D8 0E 13 4F 44 87 D7	FPort: 2 SNR: 7.5 Bandwidth: 125000
↑ 18:09:48	Forward uplink data message	DevAddr:	27 00 59 27	FRMPayload: 00 07 00 64 00 05 0	0 01 06 10 B4 5F 00 00 01 07 10 A4 1F 00 08 32 59	FPort: 2 SNR: 7.5 Bandwidth: 125000
↑ 18:09:48	Receive uplink data message	DevAddr:	27 00 59 27		Battery Package	
↑ 18:09:48	Successfully processed data message	DevAddr:	27 08 59 27	FPort: 2 FCnt: 5 FRMPayload:	FE 39 78 39 59 DE 1E A8 C5 5F 0D 63 BE F6 5E 7E D	DB 0E 13 4F 44 87 D7 Bandwidth: 125000 SNR: 7.5 Raw payload: 80 27 5
<-> 18:09:48	Link ADR accept received	DevAddr:	27 00 59 27			
↑ 18:89:48	Receive data message	DevAddr:	27 00 59 27	FPort: 2 FCnt: 5 FRMPayload:	FE 39 78 39 59 DE 1E A8 C5 SF 0D 63 BE F6 5E 7E D	DB 0E 13 4F 44 87 D7 Bandwidth: 125080 SNR: 7.5 Raw payload: 80 27 5

#### Original Info:

00070064000500<mark>010610B45F0000010710A41F0000</mark>3259

Battery Package: 00070064000500

#### Example:

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

<mark>00070064000500<mark>010610B45F0000</mark>010710A41F0000<mark>3259</mark></mark>

Part	Value	Raw Data	Description
1	Battery	<mark>00</mark> 0700 <mark>6400</mark> 0500	<ul> <li>00 is the channel number.</li> <li>0700 is 0x0007 (little-endian byte order), which is the measurement ID for battery.</li> <li>6400 is 0x0064 (little-endian byte order), whose equivalent decimal value is 100. Battery level is 100%.</li> <li>0500 is 0x0005 (little-endian byte order), whose equivalent decimal value is 5. Upload interval is 5 minutes.</li> </ul>
2	Soil Temperature	<mark>01</mark> 0610 B45F0000	<ul> <li>OI is the channel number.</li> <li>O610 is 0x1006 ( little-endian byte order) , which is the measurement ID for soil temperature.</li> <li>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.</li> </ul>

			01 is the channel number. 0710 is 0x1007 (little-endian byte order), which is the measurement ID for soil moisture.
3	Soil Moisture	<mark>01</mark>	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	<mark>3259</mark>	The CRC verification part.

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# 10. LoRaWAN Downlink Command

### 10.1 Set the Data Uplink Interval

- (1) Using the Network Server's portal or API to send downlink command, then the Node will respond to the ack. The downlink command takes effect and responds the next time the node uploads data.
- (2) Downlink as follow:

0x00	0x89	0x00	prepareld_L	prepareId_H	duty_L	duty_H	crc-L	crc-H
------	------	------	-------------	-------------	--------	--------	-------	-------

0x00	Fixed field
0x89	Fixed field
0x00	Fixed field
prepareId_L	Command ID low byte, you can customize the values, it allows each
prepareid_L	command ID to be the same
prepareId_H	Command ID high byte, you can customize the values, it allows each
	command ID to be the same
duty_L	Data interval low byte, you can set the data interval, unit: minute
duty_H	Data interval high byte, you can set the data interval, unit: minute
crc-L	CRC low byte, it's calculated by the CRC-16/CCITT
crc-H	CRC low byte, it's calculated by the CRC-16/CCITT

(3) When you send the downlink command, the Node responds to the ack command.

0.00	0.15	0.00				0.00	orol	ara
0x00	Ox1F	0x00	prepareId_L	prepareId_H	result	0x00	Crc-L	Crc-H

0x00	Fixed field
0x1F	Fixed field
0x00	Fixed field
prepareld_L	Command ID low byte, it is the same as the downlink command
prepareld_H	Command ID high byte, it is the same as the downlink command
result	If the downlink command is in force, it responds 0x01, else it responds
	0x00
0x00	Fixed field
crc-L	CRC low byte, it's calculated by the CRC-16/KERMIT
crc-H	CRC low byte, it's calculated by the CRC-16/ KERMIT

(3) Use the FPort = 2

CRC Tool: <u>https://crccalc.com/</u>, select the algorithm of CRC-16/KERMIT.



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Example: Set the Node's data interval is 10 minutes.

Send the downlink command (HEX) via FPort=2:

#### <mark>00 89 00 11 22 0A 00 38 B4</mark>

0x0	0x8	0x0	prepareld_	prepareld_	duty_	duty_	crc	crc
0	9	0	L	H	L	H	-L	-H
00	89	00	11	22	0A	00	38	

ACK Response:

#### <mark>00 1F 00 11 22 01 00 78 0F</mark>

0x00	0x1F	0x00	prepareld_L	prepareId_H	result	0x00	crc- L	crc- H
00	١F	00	11	22	01	00	78	OF

### **Command List:**

Description	Command
Set Uplink interval = 1 minute	008900112201009050
Set Uplink interval = 5 minutes	00890011220500F037
Set Uplink interval = 10 minutes	00890011220A0038B4
Set Uplink interval = 15 minutes	00890011220F0080CA
Set Uplink interval = 20 minutes	0089001122150061A2
Set Uplink interval = 30 minutes	00890011221E00C946
Set Uplink interval = 60	00890011223C004A56

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minutes

### 10.2 Reboot the device

FPort = 2

Command: 00C80000000002B26

## 10.3 How to send downlink

Example: use the Helium Console to send

chedulin	g	FPort	Region		
First	Last	2	US915		$\vee$
008900	112205	500F037		Base64	Text
00890011220500F037				Base64	Tex

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# 11. Device Installation

## 11.1 Installing Sensor

#### 11.1.1 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.



- 11.1.1 Mount on Pole and Wall
- 1) Mount on pole



2) Mount on wall



### 11.2 Replace the Battery

11.2.1 How to Buy the Battery

We suggest buying it from Amazon.

- 1) EEMB ER34615: <u>Click here</u>
- 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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#### 11.2.2 How to Replace a New Battery

1) Remove three screws.

### ANote:

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



3\*PWM3.0x20.0MM

2) Install a new battery.





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



3) Install screws.



# **Mote**:

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

# 12. Trouble Shooting

## 12.1 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: <a href="mailto:support@sensecapmx.com">support@sensecapmx.com</a>

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
V1.0.5	17/3/2023	Modified A1101 Decoder Description	Lee
V1.0.6	1/6/2023	A1101 Downlink Command	Andrea Ouyang

### 12.2 Document Version