SENSECAP

SenseCAP Tracker T1000-A/B

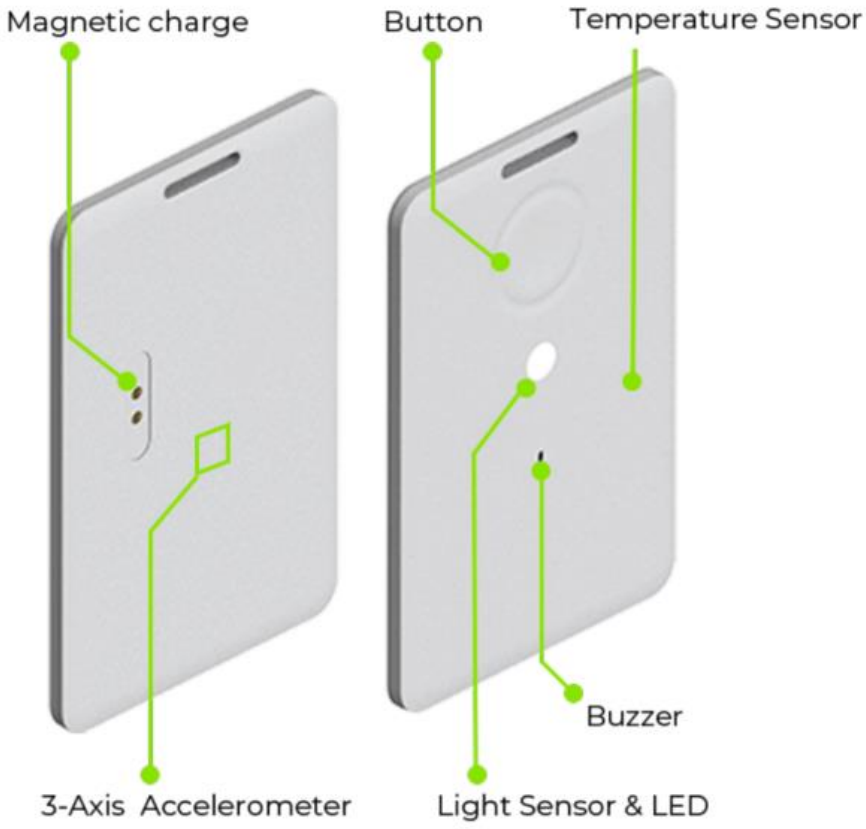
User Guide

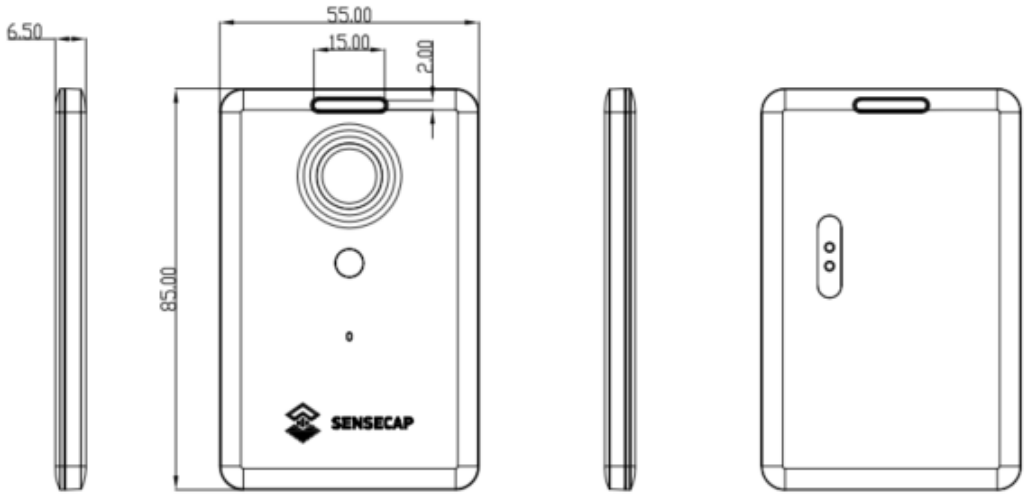
Version: V1.2

Contents

1. Introduction

SenseCAP T1000 is a credit card-sized tracker designed for asset and personal tracking. It utilizes GNSS/Wi-Fi/Bluetooth to provide high accuracy positioning in both outdoor and indoor scenarios.





2. Features

2.1 Hardware Specifications

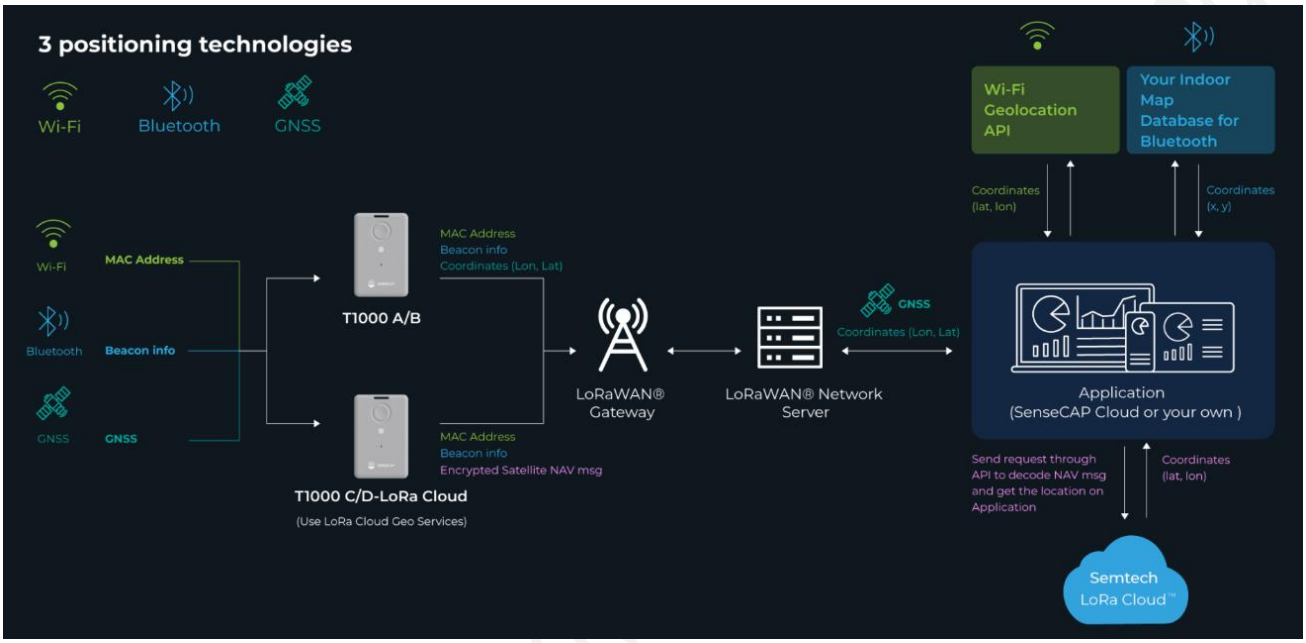
General Parameters	
Product Model	T1000-A/T1000-B/T1000-C/T1000-D
Backhaul	LoRaWAN® (v1.0.4 Class A)
Bluetooth	Bluetooth v5.1, setting via App
LoRaWAN Channel Plan	IN865/EU868/US915/AU915/AS923/KR920/RU864
Temperature	Range: -20 to 60℃; Accuracy: ± 1℃ (min ±0.5℃, max ±1℃) Resolution: 0.1℃
Light	0 to 100% (0% is dark, 100% is brightest)
3-Axis Accelerometer	3-Axis Accelerometer to detect movement
LED and Buzzer	1xLED and 1x buzzer to indicate status
Button	1xButton to operate and trigger events (SOS)
Antenna	Internal (GNSS/LoRa/Wi-Fi/BLE)
Communication Distance	2 to 5km (depending on gateway antenna, installation, and environments)
IP Rating	IP65
Dimensions	85 x 55 x 6.5 mm
Device Weight	32g
Operating Temperature	-20℃ to +60℃
Operating Humidity	5% - 95% (No condensation)
Certification	CE /FCC /TELEC /RoHS /REACH
Location	
GNSS Constellation	T1000-A/B: GPS/GLONASS/Galileo/BeiDou/QZSS T1000-C/D: GPS/ BeiDou
GNSS Sensitivity	-145dBm cold start / -160 dBm Tracking
GNSS Location Accuracy	2.5m CEP 50%
Wi-Fi Positioning	Passive scanning, uploads the scanned 4 MAC addresses
Bluetooth Positioning	uploads the scanned 3 best signal MAC addresses of Beacon
Data Cache	Cache 1000 data when there is no LoRaWAN network
Battery	
Battey Capacity	Rechargeable lithium battery, 700mAh
*Battery Life Estimates	4 months on a single charge (uplink every 1 hour, only GNSS data)
Battery Life Monitoring	Periodic uplink battery level
Charge Cable (Adapter not included)	USB magnetic charging cable, 1 meter

Power Input Voltage	4.7 to 5.5V DC
Charging Temperature Limit	0 to +45℃ (Beyond the temperature range, the charge will be limited, and the LED will blink quickly)

*Battery life depends on temperature, installation, location interval, network coverage and sensor settings.

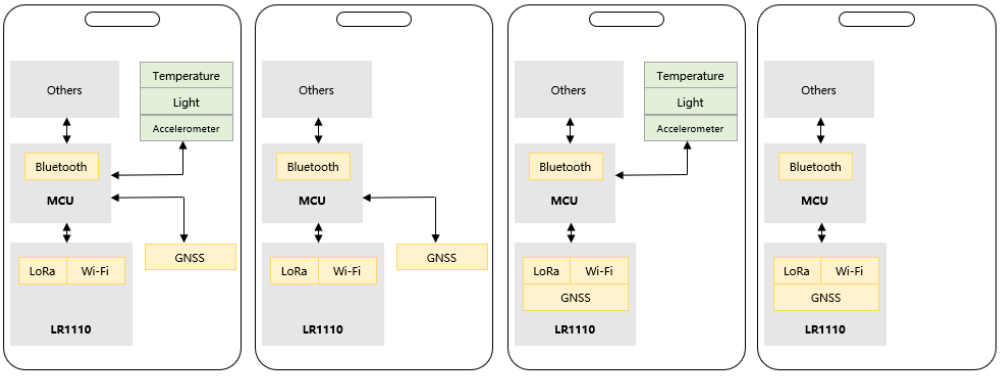
2.2 Model Selection

Architecture:



We offer two different solutions:

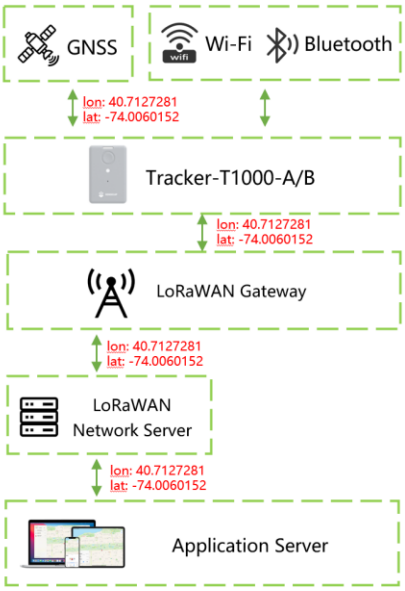
1) T1000-A/T1000-B: GNSS data without special encryption.
2) T1000-C/T1000-D: GNSS data encrypted via Semtech LoRa Edge, GNSS data needs to be decrypted through LoRa Cloud.



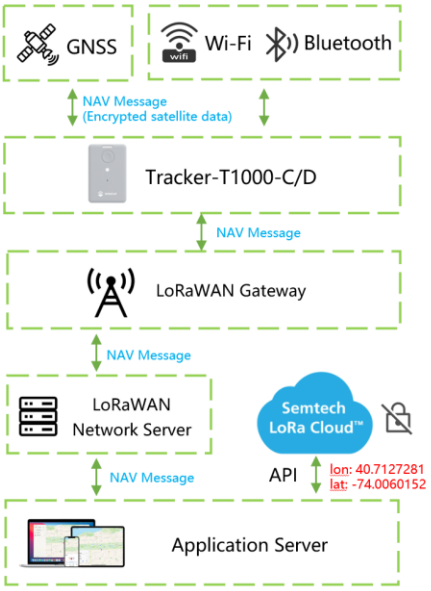
T1000-A T1000-B T1000-C T1000-D

Model	GNSS*	Sensors (Temp&Light/3-Axis)
T1000-A	Local	√
T1000-B	Local	×
T1000-C	Cloud	√
T1000-D	Cloud	×

The main chip used in the T1000 is based on Semtech LR1110, LR1110 has built-in GNSS function to obtain encrypted satellite data, which is finally uploaded to the Cloud and parsed by LoRa Cloud.



T1000-A/B: Get Location Locally

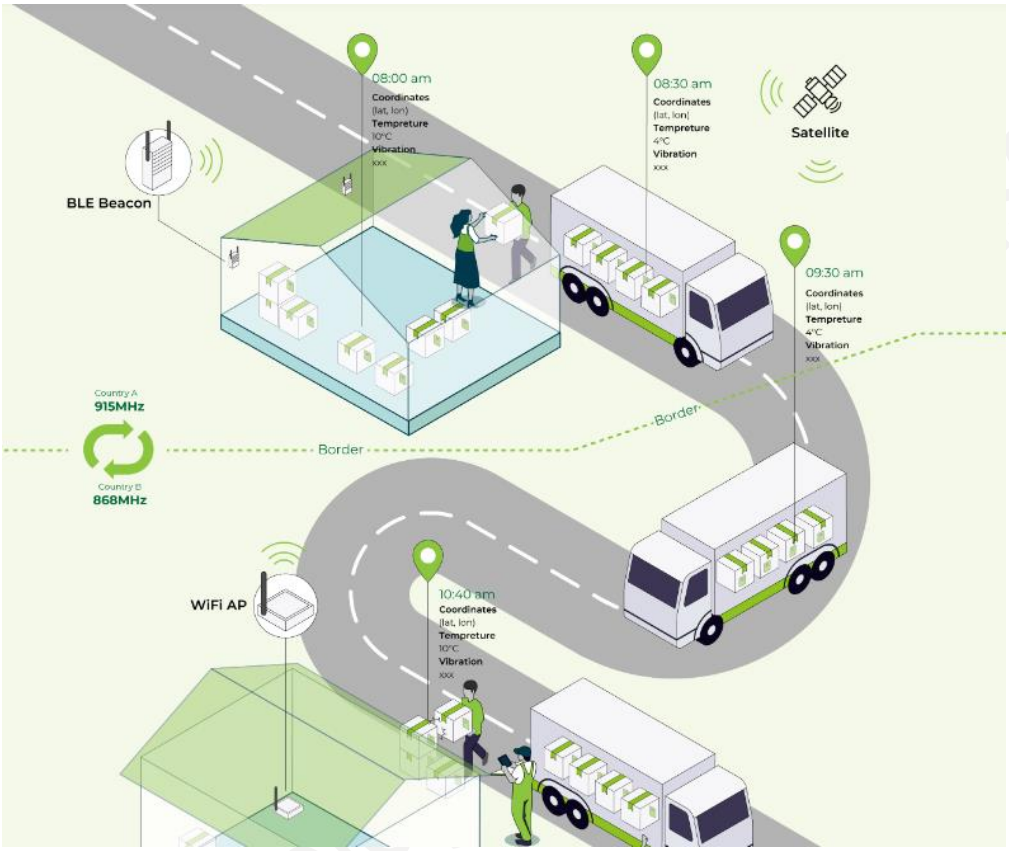


T1000-C/D: Get Location via LoRa Cloud

As depicted in the above figure, the entire network comprises multiple components ranging from hardware to software.

2.3 How to Get the Location

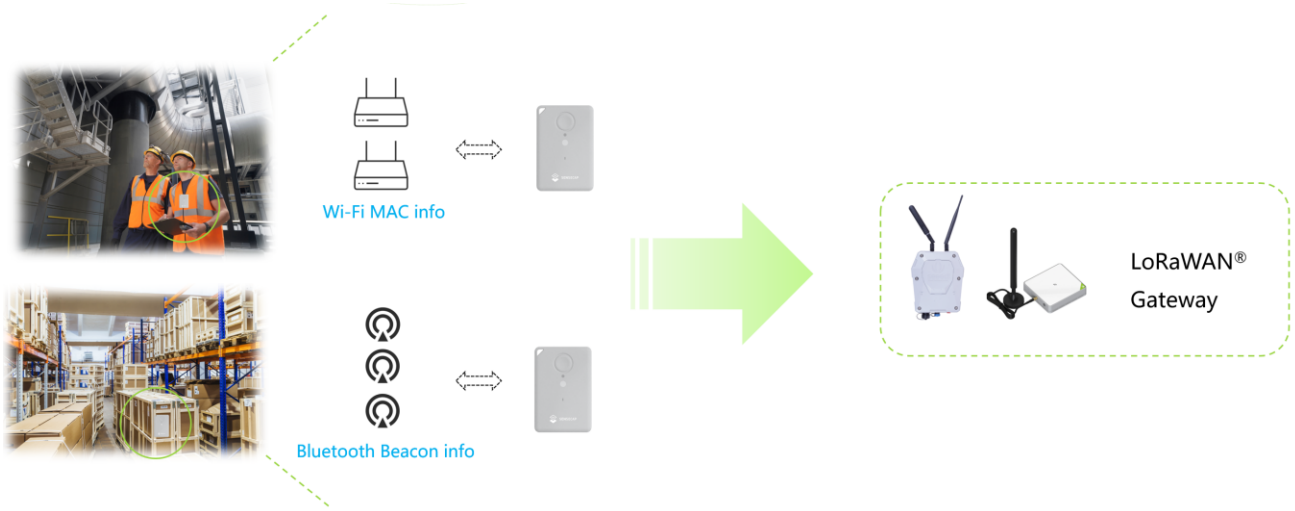
2.3.1 Get the GNSS Location



The tracker will get location outdoor via satellite system (GPS/BeiDou/more), then uploads the data to server by LoRa wireless.

2.3.2 Get the Wi-Fi Location

Tracker uses the passive Wi-Fi AP MAC address scanner to obtain the MAC address and RSSI of nearby Wi-Fi and upload it through LoRaWAN. The application server resolves the location according to the global Wi-Fi location service (such as Google Geolocation API) to obtain the final location.



Indoor: Located by Wi-Fi and Bluetooth

2.3.3 Get the Bluetooth Location

The Tracker T1000 scans the MAC address and RSSI of nearby Bluetooth beacons and uploads them through LoRa. The application server needs to calculate the real geographical location based on the MAC address and signal strength (RSSI) of the Bluetooth beacons.

Bluetooth beacons work by transmitting packets of data that are picked up by the tracker via radio waves. The tracker periodically scans around up to 8 Bluetooth beacons and sorts according to RSSI, uploading the UUID and RSSI of the 3 Bluetooth beacons with the best signal strength via LoRa.

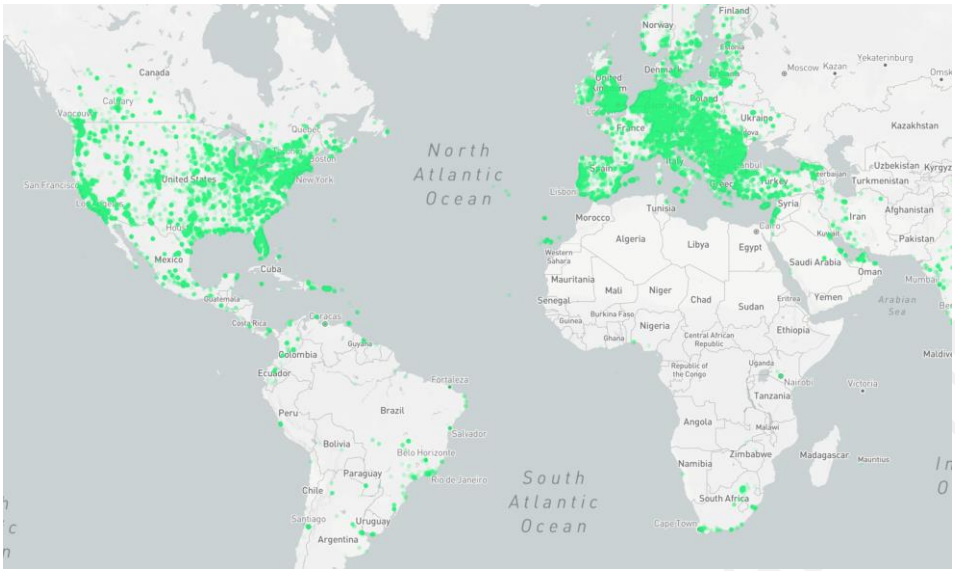
2.3.4 How to use the LoRaWAN Network

There are already many large LoRaWAN network providers around the world whose base stations already fully cover many cities and regions, so the tracker can run on these large LoRaWAN networks.
Such as Helium, The Things Network, Actility, Loriot, Senet, Everynet, KPN etc.

If you want to deploy your own private network, you can also purchase a gateway. SenseCAP offers cost-effective indoor and outdoor gateways.

- SenseCAP Outdoor Gateway

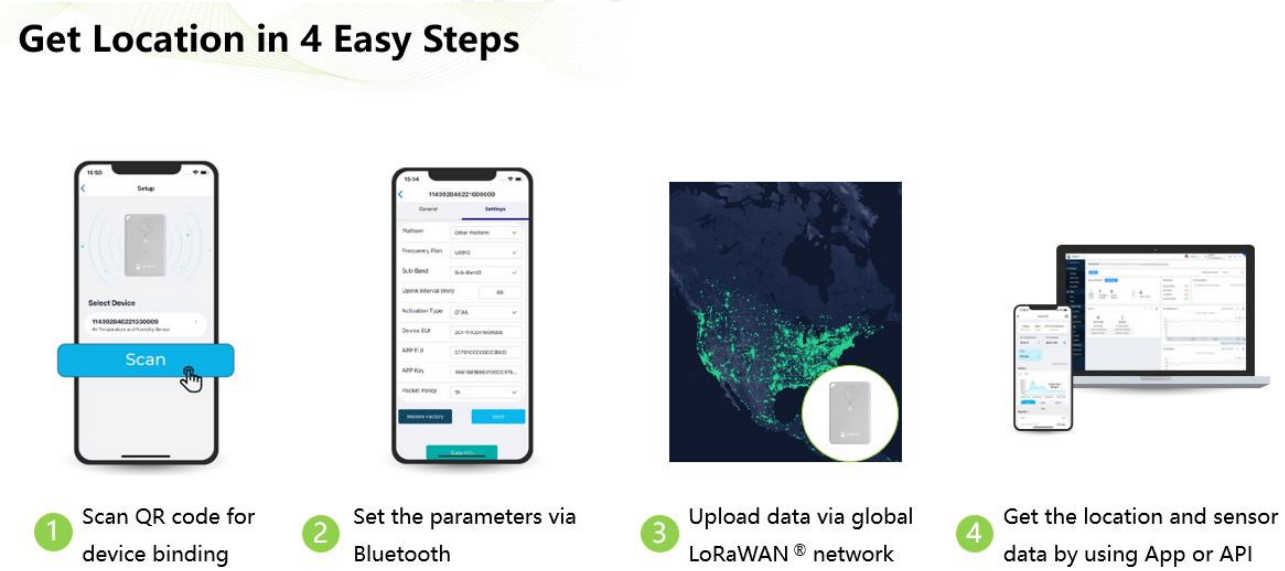
- SenseCAP Indoor Gateway



(Helium Network)

2.3.5 Application

SenseCAP provides the SenseCAP Mate App and SenseCAP Portal, which are mainly used as device settings and basic functions for users to quickly experience the basic functions of the Tracker. We also provide App and platform customization services. Please refer to the last chapter and contact our team.



2.4 Main Function

2.4.1 Work Mode

The Tracker can run different modes in different scenarios.

Work Mode	Description	Scene
Standby Mode	Only heartbeat packets are uploaded, just includes battery info. The location can be obtained using the LoRa downlink command.	If you need to locate the device for a long time and the device can run for a long time before being charged, the cloud platform can issue a location request command to locate the device.
Periodic Mode	Set an interval at which the device periodically uploads location and sensor data.	This mode is recommended for most scenarios.
Event Mode	Adjust the upload interval according to the temperature, light and acceleration sensor of the tracker, including temperature event, light event, motion event, motionless timeout, and shock event.	It can be used in complex scenarios, such as monitoring the transportation of important items. But the power consumption increases a lot.

2.4.2 Enable or Disable Sensors

You can choose enable or disable these sensors:

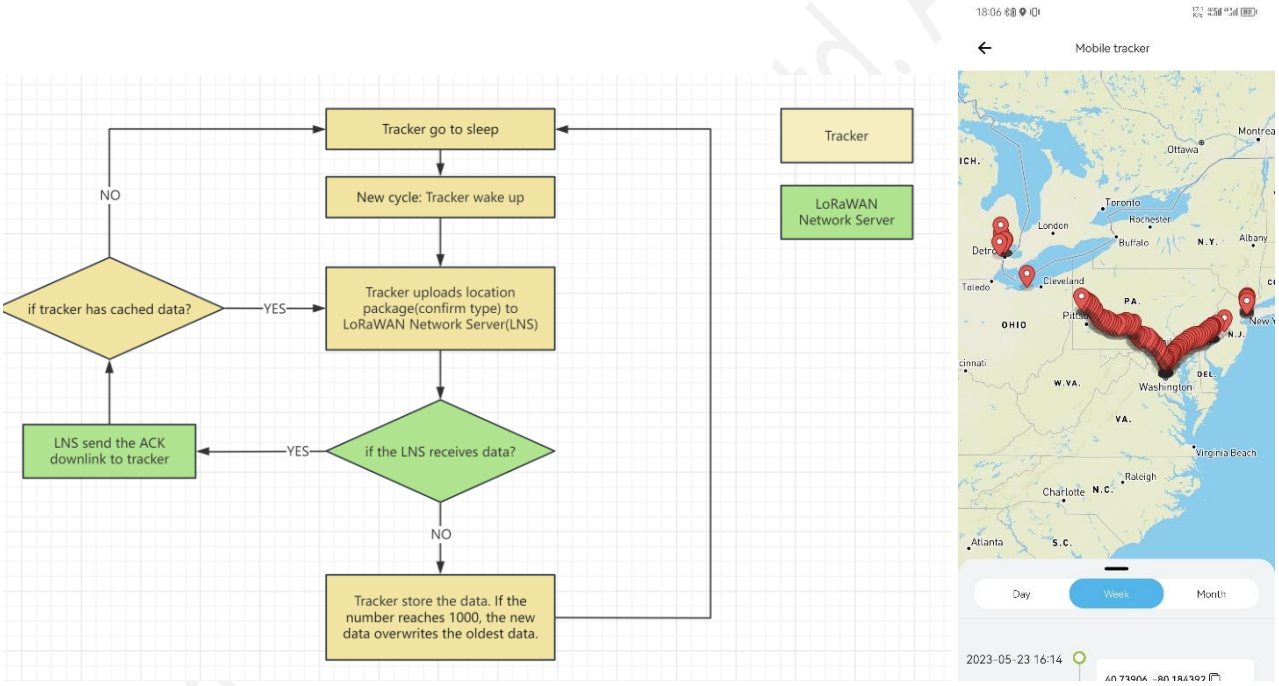
1) Turn off all sensors, but you can also choose a version without sensor to reduce costs.
2) Only the temperature and light sensors are enabled to monitor data periodically with low power consumption.
3) When temperature, illumination and accelerometer are used as trigger conditions, the sensor will always be powered, and the device consumes a lot of power.

Sensor	Description
Temperature	This is an onboard independent temperature sensor with **an accuracy of ±0.5~1℃**. It should be noted that there may be some temperature measurement delay here, because it is separated from the shell. Range: -20 to 60℃; Accuracy: ± 1℃(min 0.5℃, max 1℃); Resolution: 0.1℃
Light	The light sensor is not the actual lumen value monitored, but a percentage of the

	light from dark to amount. Mainly can be used for anti-demolition monitoring and some light sensitive monitoring. Range: 0 to 100%, (0% is dark, 100% is brightest)
3-Axis Accelerometer	By setting the value of acceleration, motion event and shock event are triggered.

2.4.3 Data Cache

The device can cache data, which can be enabled through Bluetooth configuration by opening "GNSS Data Cache". The device uploads confirmation packets. When the LoRaWAN signal coverage is weak or there is no network coverage, the device cannot receive an ack when uploading data. In this case, the data will be saved and entered the next cycle. When the device successfully uploads data at some point, it will send offline data. The maximum number of data that can be cached is 1000 records.



3. How to Operate the Button

Actions	Description	LED Status	Buzzer
Press button and hold for 3 seconds	If the tracker is powered off, press and hold the button for 3 seconds to turn it on. The Bluetooth pairing will be activated automatically, and the user can use the app to scan and connect.	The LED flashes once a second.	Melody of rise
	If the device is powered on, press and hold the button for 3 seconds to activate Bluetooth pairing.	The LED flashes once a second.	None
Press button and hold for 9 seconds	Power off.	None	Melody of descent
Join LoRa network	After exiting the Bluetooth settings, try to join the LoRaWAN network.	The breathing light flashes when trying to access the network, and flashes quickly if the network is successfully joined	A quick and cheerful melody when the network is successfully joined
Press once	Get location/sensor data, upload data, and trigger the "Press once" event immediately.	The LED is bright for 2 seconds	A sound will beep when the data is uploaded successfully.
	If Bluetooth pairing is turned on, press once can be turned off Bluetooth.	The LED will off	None
Press twice continuously	If the SOS is set to single-shot mode, double-clicking the button will activate the single-shot SOS mode and upload the location/sensor data and SOS events once.	Twinkle with the sound	3 seconds of alarm sound
	If the SOS is set to continuous mode, double-click the button to activate the continuous SOS mode. The location, sensor data, and SOS events will be uploaded once every minute, and the mode will automatically end after 30 times.	Twinkle with the sound	A constant alarm sound

	Double-click twice to exit SOS mode	None	None

Note:

1. *Power off is recommended when not deployed.*
2. *When first turned on, it is recommended to go to outdoors, and the GPS needs to update the time via satellite.*

2. If the frequency band does not match the gateway frequency, the tracker cannot join the network.

4. How to Configure via Bluetooth

4.1 Download SenseCAP Mate App

As a tool, SenseCAP Mate App is used to config LoRa parameters, interval, bind devices to your account and check device basic information. You can download App from https://install.appcenter.ms/orgs/seeed/apps/sensecap-mate/distribution_groups/public

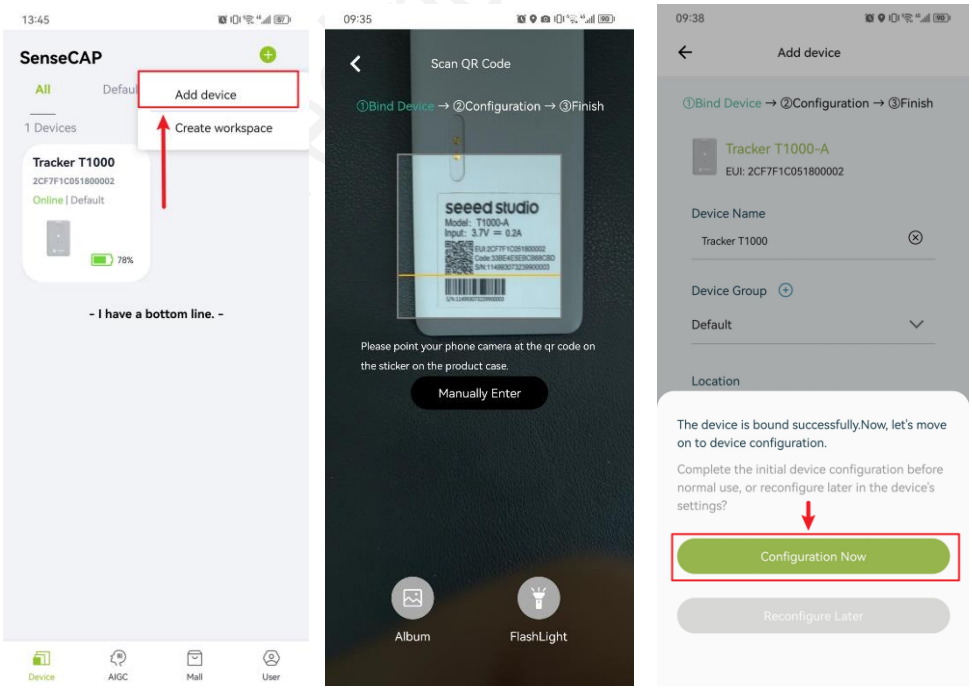
1) For iOS, please search for “SenseCAP Mate” in the App Store and download it.

2) For Android, please search for “SenseCAP Mate” in the Google Store and download it.

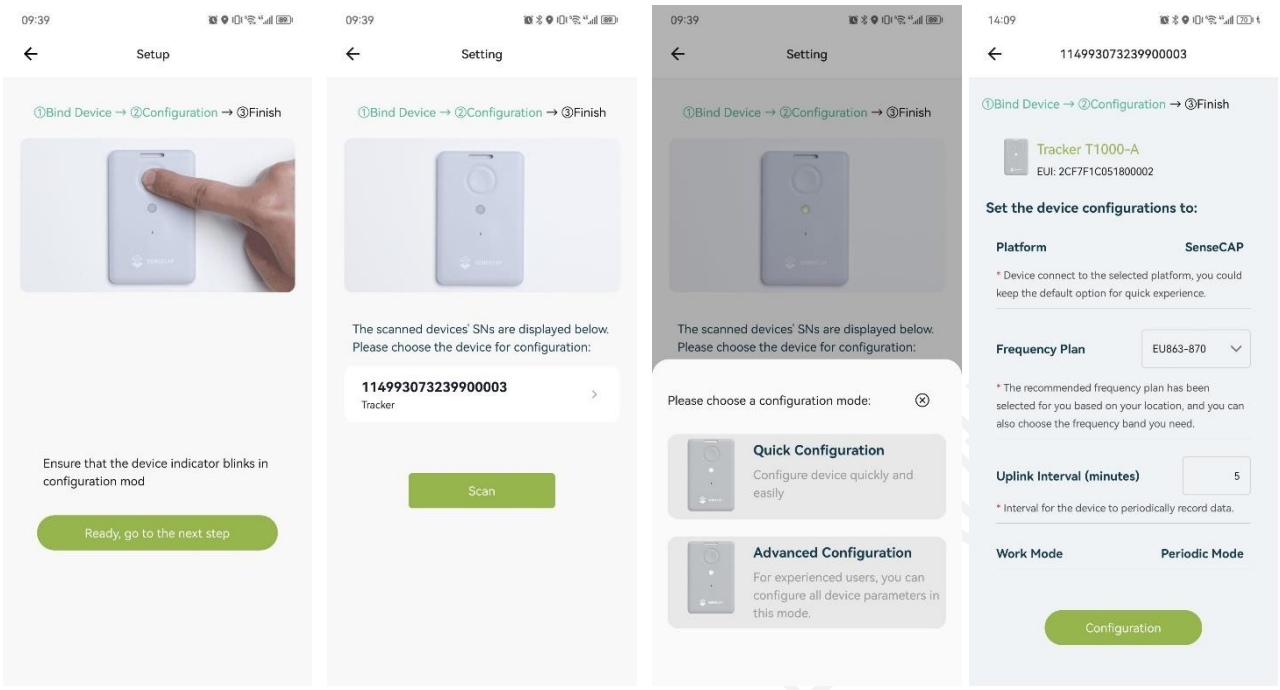
GET IT ON Google Play Download on the App Store

4.2 Quick Start with SenseCAP Server

1) Add Device via scanning QR code.



2) Press the tracker's button for 3 seconds, and select device by SN. For quick start, you can select quick config the basic parameters, if you want to set more parameters, please select "Advanced Configuration".

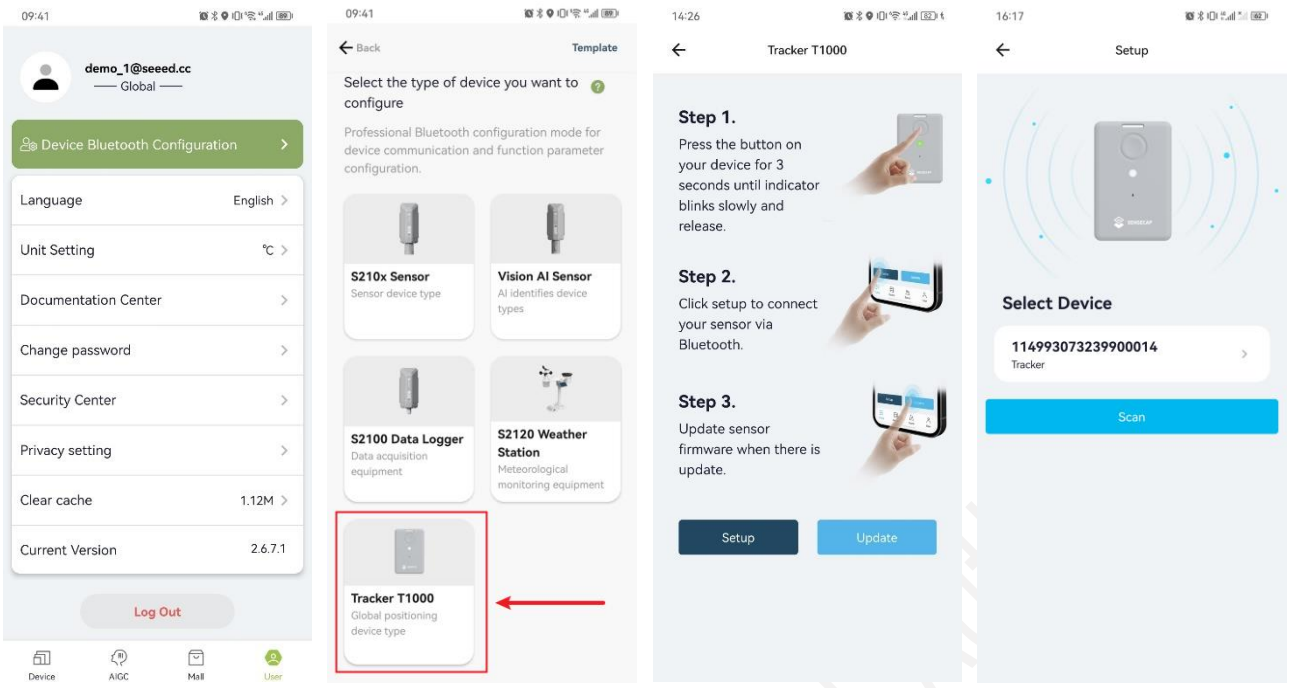


3) Select the frequency, it is same to your gateway. Set the Uplink interval, work mode default is "Periodic Mode", you can set other mode via "Device Bluetooth Configuration" on "User" page.
4) Tracker will try to join LoRaWAN network, the breathing light flashes when trying to join the network, and flashes quickly if the network is successfully joined with a quick and cheerful melody.

4.3 Setting the Tracker Parameters through the App

4.3.1 Enable Bluetooth Pairing

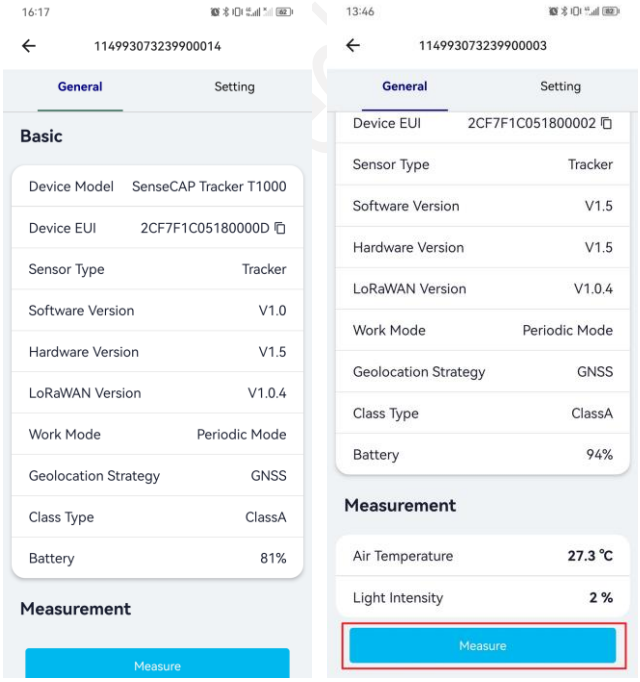
1) Press button and hold for 3 seconds to turn it on, then turn on the Bluetooth pairing automatically, user can use the app to scan and connect.
2) Open the App and click the "Tracker T1000". Select the "Setup" to config the tracker.
3) Select the device by S/N (S/N is on the label of the device). Then, the basic information of the sensor will be displayed after entering.



4.3.2 Test the Sensor

Click the “Measure”, it will read the sensor value:

Temperature	Range: -20 to 60℃; Accuracy: ± 1℃(min 0.5℃, max 1℃); Resolution: 0.1℃
Light	0 to 100%, (0% is dark, 100% is brightest)

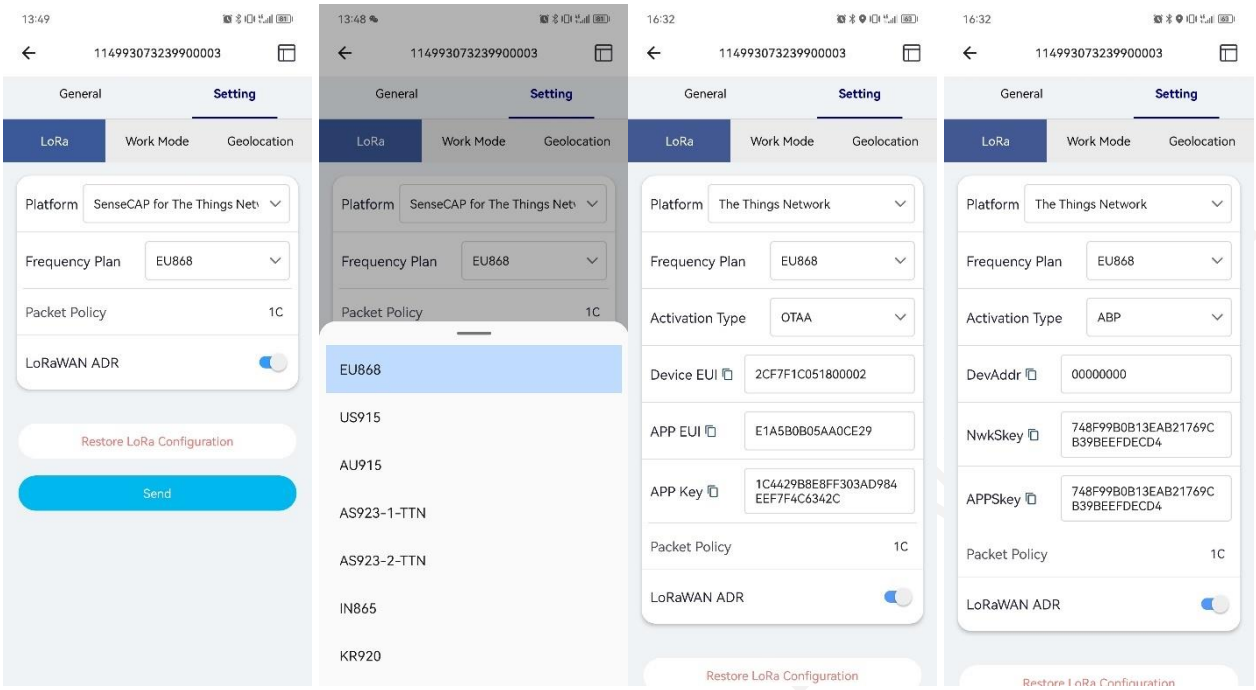


4.3.3 Set the LoRa Parameters

Trackers are manufactured to support universal frequency plan from 863MHz ~928MHz in one SKU. Every single device can support 7 frequency plans.

Parameters	Description	
Platform	SenseCAP for The Things Network	Default platform. It must be used with SenseCAP Gateway. SenseCAP builds a proprietary TTN server that enables sensors to be used out of the box when paired with an SenseCAP gateway. ● SenseCAP Outdoor Gateway ● SenseCAP Indoor Gateway
	SenseCAP for Helium	When there is the Helium network coverage, data can upload via Helium. Devices run on a private Helium console of SenseCAP. Users do not need to create devices on Helium console, out of the box with SenseCAP Mate App and Portal. Helium coverage: https://explorer.helium.com/
	Helium	Connect device to your public Helium console.
	The Things Network	Connect device to your TTN(TTS) server.
	Other Platform	Other LoRaWAN Network Server.
Frequency Plan	EU868 / US915 / AU915 / KR920 / IN865 / AS923-1 / AS923-2 / AS923-3 / AS923-4	Default EU868
Packet Policy	1C	LoRaWAN use confirm packet.
LoRaWAN ADR	Default open.	LoRaWAN parameters, default open is recommended.
Restore LoRa Configuration	When “Platform” switches back to SenseCAP from another platform, LoRa parameters (EUI/App EUI/ App Key etc.)	You can use this function when you need to restore LoRa parameters to factory defaults.

	need to be restored.	



4.3.4 Explanation of Frequency Plan and EUI

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.

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

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

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	--------
AS923-1-TTN	AS1	Frequency plan for TTN
AS923-2-TTN	AS2	Frequency plan for TTN
AS923	AS923-1	Frequency plan for Helium
	AS923-2	
	AS923-3	
	AS923-4	

⚠ ***Note1:***

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/

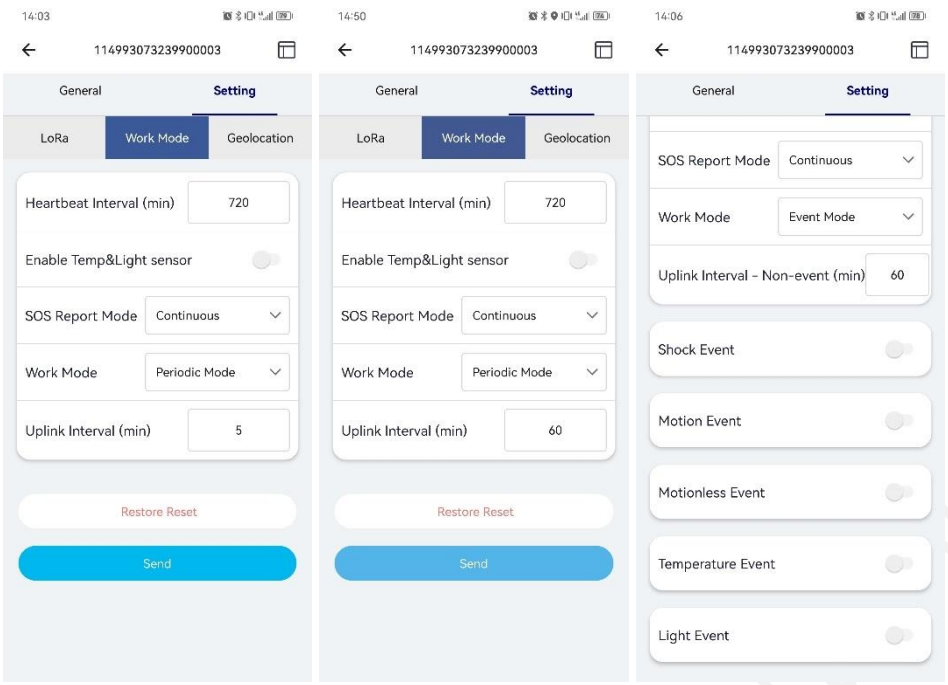
⚠ ***Note2:***

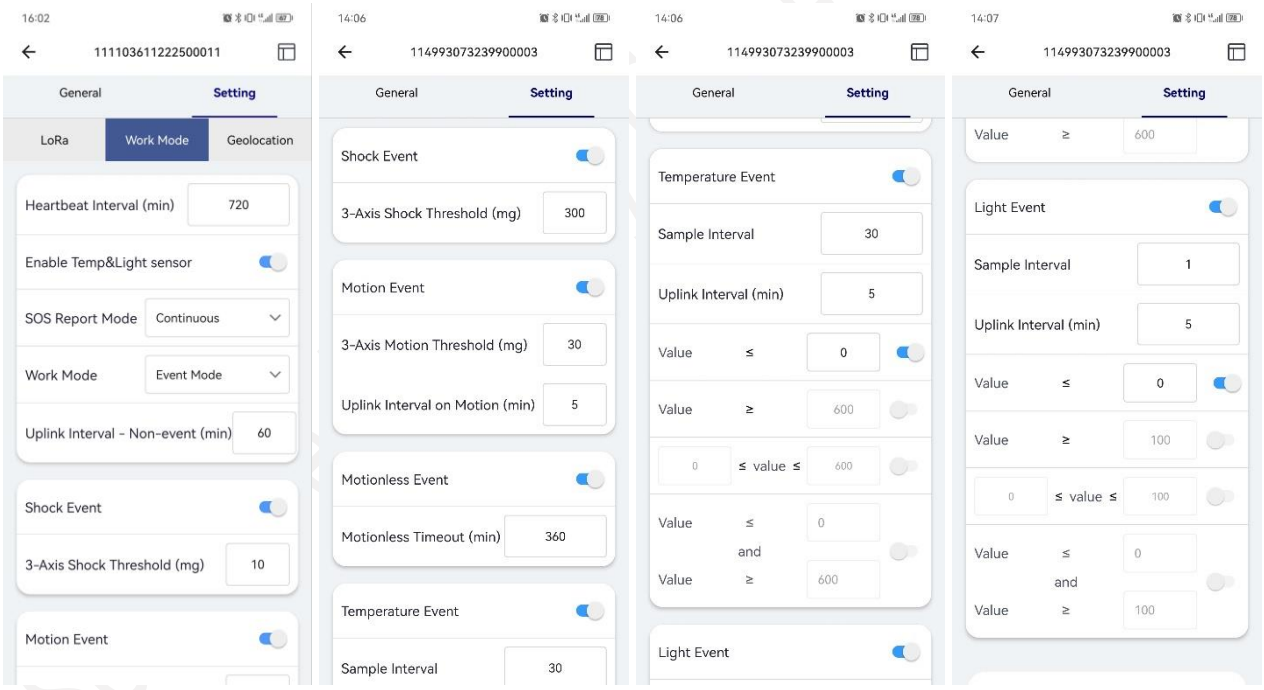
1) *When using the SenseCAP platform, the EUI, APP EUI and APP Key are fixed and are the same as the sensor label.*
2) *When the sensor is selected to be used with a public platform such as Helium or TTN, the EUI will not change, and the sensor will generate a new fixed App EUI and App Key for network access.*
3) *To obtain EUI information in batches, please contact our sales team.*

4.3.5 Setting the Work Mode

Parameters	Description	
Heartbeat Interval	When no data is uploaded by the device within the heartbeat interval, a heartbeat packet will be triggered. This packet only contains battery information.	Default 720 minutes.
Enable Temp&Light	If this switch is turned on, temperature and light will be collected and uploaded, but it will increase power consumption.	Off by default.
SOS Report Mode	Single	If SOS is set to single mode, double-clicking the button will enable the single-shot SOS mode and upload the location/sensor data and SOS events once
	Continuous	Default use continuous. If SOS is set to continuous mode, double-click the button to open the continuous mode of SOS, and upload location, sensor data and SOS events once in 1 minute, and automatically end after 30 times
Work Mode	Standby Mode	Upload heartbeat packets (battery level only) based on the heartbeat interval.
	Periodic Mode	Location and sensor data are uploaded according to the upload interval.
	Event Mode	Set threshold trigger conditions according to measured values such as temperature, light, and movement, and adjust the upload interval after trigger.
Uplink Interval (min) – Periodic Mode	Periodically locate and upload data.	Default 60 minutes. The higher the frequency, the higher the power consumption.
Restore All	Restore all configuration parameters to factory Settings, includes LoRa, Work	

Settings	Mode and Geolocation.	





Event Mode	Description	
Uplink Interval – Non-event (min)	This is the upload interval when no events are triggered.	Default 60 minutes. Range: 1~10080 min.
Shock Event	When the shock event is enabled, the shock of the tracker will trigger a data	Off by default.

	report, including the shock event, location, and sensor data.	
	3-Axis Motion Threshold (mg)	Default is 300. When the acceleration exceeds 300mg, the shock event is triggered.
Motion Event	When the acceleration exceeds the set value, the device starts to move, and when there is no movement for 2 minutes, the device movement stops. Set the upload interval according to the start movement and stop movement.	Off by default.
	3-Axis Motion Threshold (mg)	Default is 30. When the acceleration exceeds 30mg, determine that the device is in motion, when it is 2 minutes below this value, determine that the device is in motionless.
	Uplink Interval on Motion(min)	Set the upload interval for the current state when the device is in motion.
Motionless Event	When the device is stationary in a location for more than a certain amount of time, a stationary timeout event is triggered.	
	Motionless Timeout(min)	Default is 360 minutes.
Temperature Event	If the temperature event is enabled, you can set the upload interval based on the temperature.	For example, Uplink Interval=10, Value ⩾ 30, if the temperature is higher than 30 ° C, device will upload the location at 10 minutes interval.
	Sample Interval (s)	Default 30 seconds. The temperature is detected every 30 seconds. When the threshold is triggered, upload location and sensor data.
	Uplink Interval (min)	When the temperature exceeds the threshold, the location and sensor data are uploaded according to this interval.
	Value Rule	One of the four threshold rules can be set.
Light Event	If the light event is enabled, you can set	For example, Uplink Interval=10,

	the upload interval based on the light.	Value⩾30, if the light is higher than 30 %, device will upload the location at 10 minutes interval.
	Uplink Interval (min)	When the light exceeds the threshold, the location and sensor data are uploaded according to this interval.
	Value Rule	One of the four threshold rules can be set.

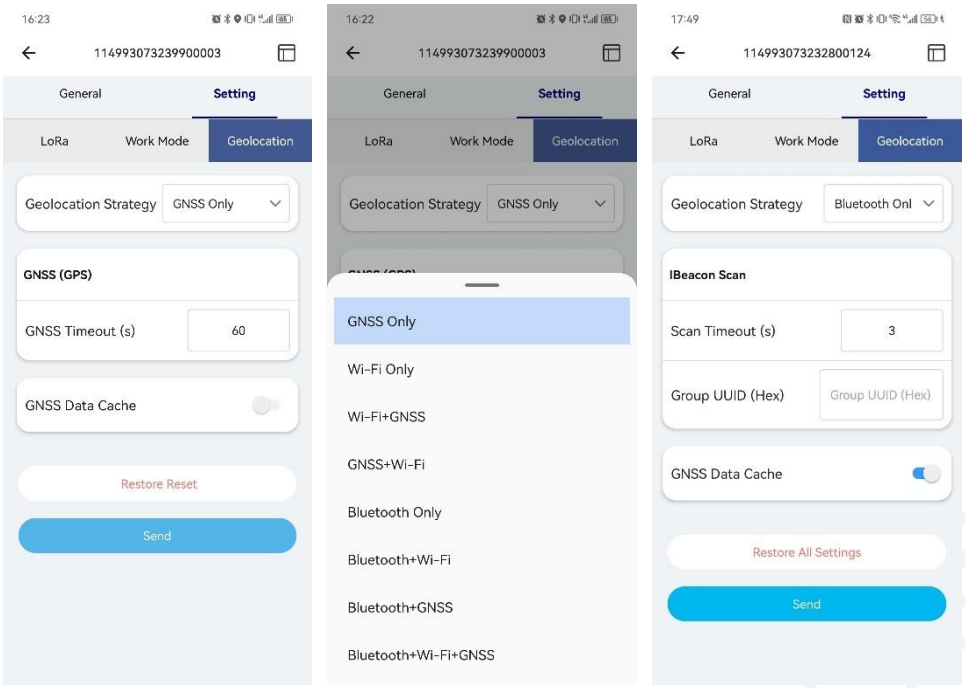
4.3.6 Configuring Geolocation Settings

The tracker supports positioning via GNSS, Wi-Fi, and Bluetooth.

- GNSS: The longitude and latitude can be directly obtained through GPS and other satellite positioning, then upload data via LoRa.
- Wi-Fi: Passive scanning, uploads the scanned 4 MAC addresses via LoRa.
- BLE: Uploads the scanned 3 best signal MAC addresses of Beacon via LoRa.

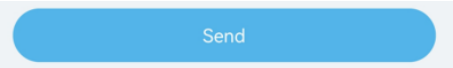
Geolocation	Description	
Geolocation Strategy	Only GNSS	Default use GNSS. Only GNSS is used for position.
	Only Wi-Fi	Only Wi-Fi scans are used for position.
	Wi-Fi+GNSS	Use Wi-Fi before GNSS. If Wi-Fi fails, then use GNSS in one geolocation cycle.
	GNSS + Wi-Fi	Use GNSS before Wi-Fi. If GNSS fails, then use Wi-Fi in one geolocation cycle.
	Only Bluetooth	Only Bluetooth scans are used for position.
	Bluetooth + Wi-Fi	Use Bluetooth before Wi-Fi. If Bluetooth fails, then use Wi-Fi in one geolocation cycle.
	Bluetooth + GNSS	Use Bluetooth before GNSS. If Bluetooth fails, then use GNSS in

		one geolocation cycle.
	Bluetooth + Wi-Fi + GNSS	Use Bluetooth, Wi-Fi and GNSS for positioning in turn (switch to the next type of positioning after one type of positioning fails)
GNSS Timeout	The maximum time to spend waiting for the GNSS to get a coarse position fix	Default is 60s. It is not recommended to modify, the longer of the time, the bigger of power consumption.
GNSS Data Cache	When it is not possible to upload data through LoRa, the data is saved locally and uploaded when the LoRa signal is recovered.	Off by default.
Beacon Scan	The tracker periodically scans around up to 8 Bluetooth beacons and sorts according to RSSI, uploading the UUID and RSSI of the 3 Bluetooth beacons with the best signal strength via LoRa.	
	Scan Timeout (s)	Set the maximum time for Bluetooth scanning.
	Group UUID(Hex)	Set UUID Filter, up to 16 bytes. For example, if set as '01 02 03 04', it will filter beacons with the pattern '01 02 03 04 xx xx xx ...'



4.3.7 Sending and Exiting Bluetooth Pairing

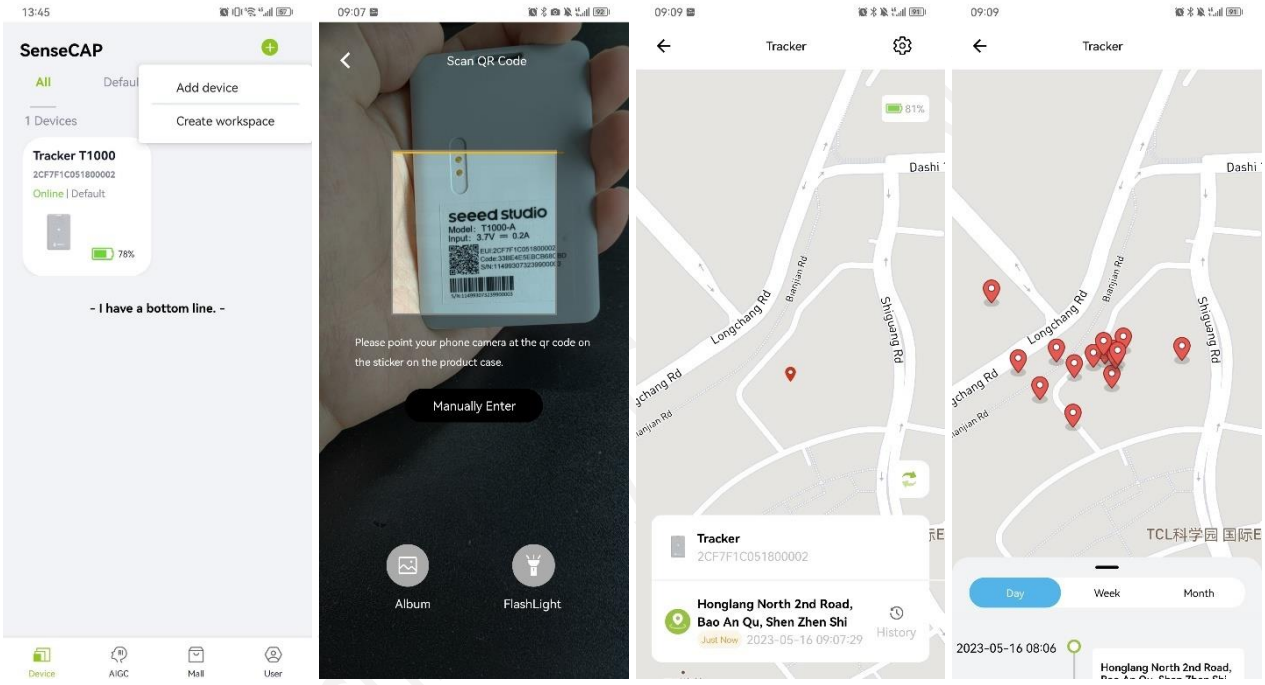
After all parameters are configured, click “Send”.
If no parameter needs to be modified, exit Bluetooth configuration, and return to the home page. At this point, the device initiates a LoRa network access request.



5. Binding the Device and Checking the Data

5.1 Check Data via App

1) When exiting the Bluetooth configuration, the device will begin to join the LoRaWAN network. The LED will breathe flash while attempting to join the network. If the network is joined successfully, the LED will flash quickly, and the buzzer will emit a cheerful melody.
2) Scan the QR code and bind the device using the SenseCAP Mate App.
3) Check the Location on the APP.

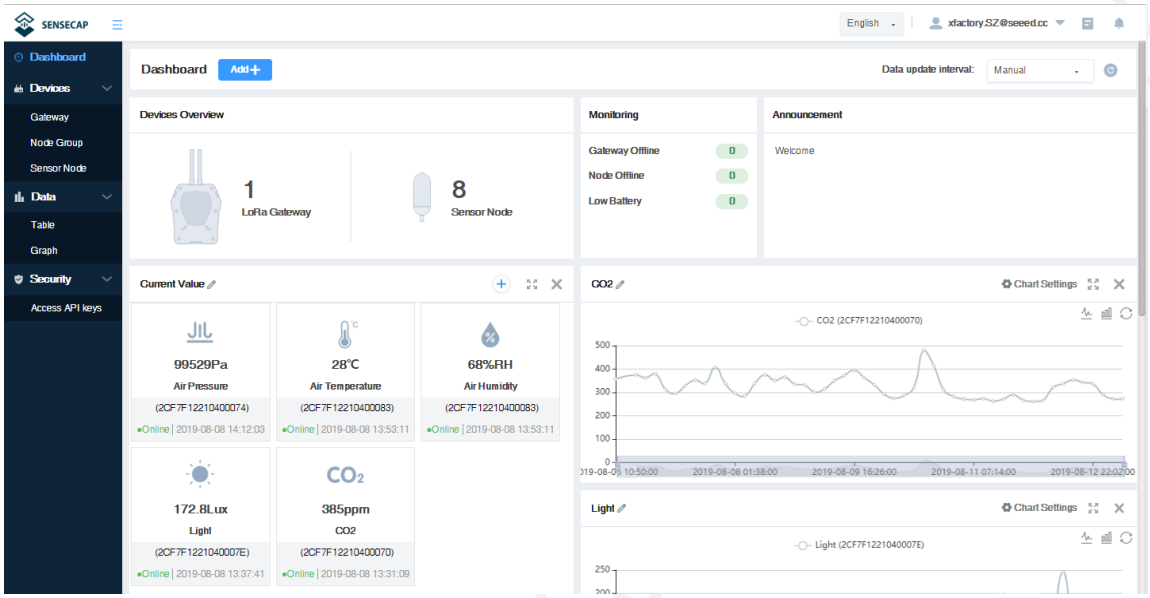


5.2 Check Data via SenseCAP Portal

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

- **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.



5.2.1 Create Account and Query Data

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

If you have created an account through the APP, you can log in directly.

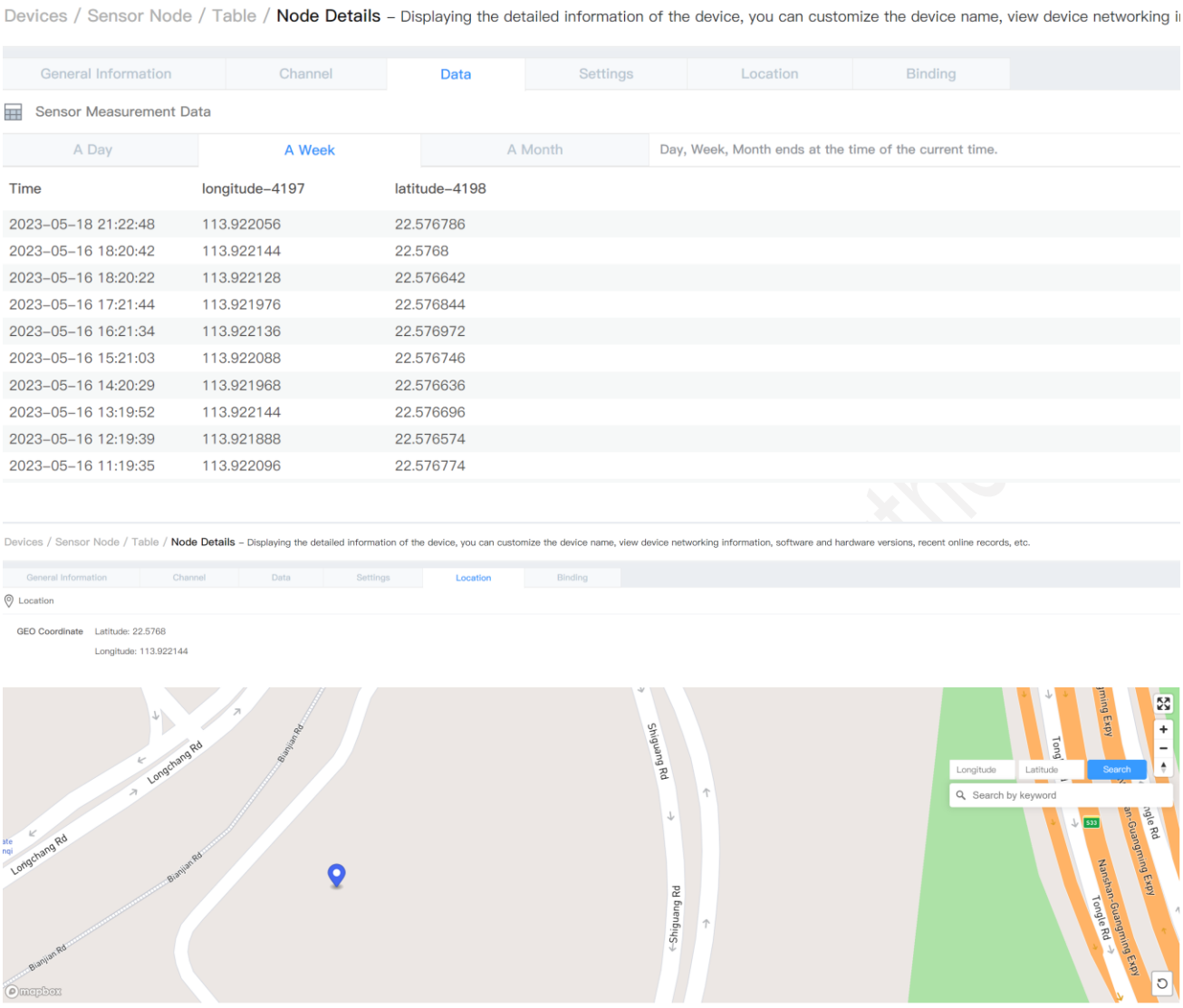
1) Select register account, enter email information, and click "register", the registered email will be sent to the user's mailbox.

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:

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



5.2.2 API Instruction

SenseCAP API is for users to manage IoT devices and data. It includes 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/

6. Payload Decoder and Format

6.1 Decoder Code – GitHub Link

Please visit: https://github.com/Seeed-Solution/SenseCAP-Decoder/tree/main/T1000

The Things Network (TTN/TTS) payload decoding script:

https://github.com/Seeed-Solution/SenseCAP-Decoder/blob/main/T1000/TTN/SenseCAP_T1000_TTN_Decoder.js

Helium decoder:

https://github.com/Seeed-Solution/SenseCAP-Decoder/blob/main/T1000/Helium/SenseCAP_T1000_Helium_Decoder.js

AWS decoder:

https://github.com/Seeed-Solution/SenseCAP-Decoder/blob/main/T1000/AWS/SenseCAP_T1000_AWS_Decoder.js

Chirpstack V3 decoder (Chirpstack V4 use TTN decoder):

https://github.com/Seeed-Solution/SenseCAP-Decoder/blob/main/T1000/ChirpStack/SenseCAP_T1000_ChirpStackV3_Decoder.js

6.2 Uplink Packet Parsing

The Tracker data protocol provides different packets to correspond to different information, and the number of bytes of each packet may vary. The structure of the frame is shown in the image below. The frame content is sent in **big-endian byte order**.

Data ID	Data Value
1 byte	50 bytes (Max)

Data ID: Function number.

Data Value: Position, sensor data an d other information.

6.2.1 Device Status Packet -Event Mode 0x01

The Device Status Packet is uploaded when join LoRaWAN network. The Device Status packet has two packet formats in different working modes:

1) Event Mode, ID=0x01
2) Periodic Mode, ID= 0x02

Device Status Packet -Event Mode: 0x01

0x01	Byte2	Byte3~4	Byte5~6	Byte7	Byte8	Byte9~10	Byte11~12
ID	Battery level	Software version	Hardware version	Work mode	Positioning strategy	Heartbeat interval	Uplink interval

Byte13~14	Byte15	Byte16	Byte17	Byte18~19	Byte20~21
Event mode uplink interval	Temp&light switch	SOS mode	Enable motion event	3-axis motion threshold	Motion start interval

Byte22	Byte23~24	Byte25	Byte26~27	Byte28	Byte29~30
Enable motionless event	Motionless timeout	Enable shock event	3-axis shock threshold	Enable temperature event	Temperature event uplink interval

Byte31~32	Byte33~34	Byte35~36	Byte37	Byte38	Byte39~40
Temperature sample interval	Temperature threshold max	Temperature threshold min	Temperature warning type	Enable light event	Light event uplink interval

Byte41~42	Byte43~44	Byte45~46	Byte47
Light sample interval	Light threshold max	Light threshold min	Light warning type

The raw payload:

01530105010502070001e00050005010000001e0005000168010120c000005001e0258000000000005000100640000000

Byte	Value	Type	Raw Data	Description
1	Frame ID	uint8	01	01 is the packet ID.
2	Battery level	uint8	53	53 is 0x53 = 83(DEC) The battery level is 83%
3~4	Software version	uint16	0105	0105 is 0x0105 == v1.5 The software version is v1.5
5~6	Hardware version	uint16	0105	0105 is 0x0105 == v1.5 The hardware version is v1.5
7	Work mode	uint8	02	02 is 0x02, means the device use “Event mode”. 00: Standby mode 01: Periodic mode 02: Event mode
8	Positioning strategy	uint8	07	07 is 0x07, means the device use Bluetooth + Wi-Fi + GNSS positioning strategy. 00: Only GNSS 01: Only Wi-Fi 02: Wi-Fi+GNSS 03: GNSS + Wi-Fi 04: Only Bluetooth 05: Bluetooth + Wi-Fi 06: Bluetooth + GNSS 07: Bluetooth + Wi-Fi + GNSS
9~10	Heartbeat interval	uint16	001e	001e is 0x001E = 30(DEC), the heartbeat interval is 30 minutes.
11~12	Uplink Interval	uint16	0005	0005 is 0x0005 = 5(DEC), the uplink interval is 5 minutes.
13~14	Event mode uplink interval	uint16	0005	0005 is 0x0005 = 5(DEC), the event mode uplink interval is 5 minutes.
15	Temp&light switch	uint8	01	01 means open the temperature and light sensor. 00: Close the temperature and light sensor. 01: Open the temperature and light sensor.

16	SOS mode	uint8	00	00 means use SOS single mode. 00: use SOS single mode. 01: use SOS continuous mode.
17	Enable motion event	uint8	00	00 means disable Event mode. 00: disable Event mode. 01: enable Event mode.
18~19	3-Axis motion threshold	uint16	001e	001e is 0x001E=30(DEC) mg When the acceleration exceeds 30mg, determine that the device is in motion, when it is 2 minutes below this value, determine that the device is in motionless.
20~21	Motion start interval	uint16	0005	0005 is 0x0005 = 5(DEC), when device is on motion, the interval is 5 minutes.
22	Enable motionless event	uint8	00	00 means disable motionless event. 00: disable motionless event. 01: enable motionless event.
23~24	Motionless timeout	uint16	0168	0168 is 0x0168 = 360(DEC), when the device is stationary in a location for more than 360 minutes, a motionless timeout event is triggered.
25	Enable shock event	uint8	01	01 means enable shock event. 00: disable shock event. 01: enable shock event.
26~27	3-Axis shock threshold	uint16	012c	012c is 0x012C=300(DEC) mg When the acceleration exceeds 300mg, the shock event is triggered.
28	Enable temperature event	uint8	00	00 means enable shock event. 00: disable shock event. 01: enable shock event.
29~30	Temperature event uplink interval	uint16	0005	0005 is 0x0005 = 5(DEC), when the temperature exceeds the threshold, the location and sensor data will upload every 5 minutes.
31~32	Temperature sample interval	uint16	001e	001e is 0x001E=30(DEC) seconds The temperature is detected every 30 seconds. When the threshold is triggered,

				upload location and sensor data.
33~34	Temperature threshold max	int16	0258	0258 is 0x0258 = 600(DEC), Maximum threshold =600/10=60.0 ℃
35~36	Temperature threshold min	int16	0000	0000 is 0x0000 = 0(DEC), Minimum threshold=0/10=0.0 ℃
37	Temperature threshold rule	uint8	00	00 means when temperature ⩽ min threshold, device will upload location and temperature event. 00: temp ⩽ min threshold 01: temp ⩾ max threshold 02: temp ⩽ min threshold and temp ⩾ max threshold 03: min threshold⩽ temp ⩽max threshold
38	Enable light event	uint8	00	00 means disable light event. 00: disable light event. 01: enable light event.
39~40	Light event uplink interval	uint16	0005	0005 is 0x0005 = 5(DEC), when the light exceeds the threshold, the location and sensor data will upload every 5 minutes.
41~42	Light sample interval	uint16	0001	0001is 0x0001=1(DEC) seconds The temperature is detected every 1 seconds. When the threshold is triggered, upload location and sensor data.
43~44	Light threshold max	uint16	0064	0064 is 0x0064 = 100(DEC) % Maximum threshold =100%
45~46	Light threshold min	uint16	0000	0000 is 0x0000 = 0(DEC) % Minimum threshold=0%
47	Light warning type	uint8	00	00 means when light ⩽ min threshold, device will upload location and light event. 00: light ⩽ min threshold 01: light ⩾ max threshold 02: light ⩽ min threshold and light ⩾ max threshold 03: min threshold⩽ light ⩽max threshold

6.2.2 Device Status Packet -Periodic Mode 0x02

The Device Status package is uploaded when join LoRaWAN network. The Device Status packet has two packet formats in different working modes:

1) Event Mode, ID=0x01
2) Periodic Mode, ID= 0x02

Device Status Packet -Periodic Mode: 0x02

0x02	Byte2	Byte3~4	Byte5~6	Byte7	Byte8	Byte9~10	Byte11~12
ID	battery level	software version	hardware version	work mode	positioning strategy	heartbeat interval	uplink Interval

Byte13~14	Byte15	Byte16
event mode uplink interval	temp&light switch	SOS mode

The raw payload:

02560105010501000 2d0003c003c0000

Byte	Value	Type	Raw Data	Description
1	Frame ID	uint8	02	02 is the packet ID.
2	Battery level	uint8	56	56 is 0x56 = 86(DEC) The battery level is 86%
3~4	Software version	uint16	0105	0105 is 0x0105 == v1.5 The software version is v1.5
5~6	Hardware version	uint16	0105	0105 is 0x0105 == v1.5 The hardware version is v1.5
7	Work mode	uint8	01	01 is 0x01, means the device use “Periodic mode”. 00: Standby mode 01: Periodic mode 02: Event mode
8	Positioning	uint8	00	00 is 0x01, means the device use “GNSS

	strategy			only" positioning strategy. 00: Only GNSS 01: Only Wi-Fi 02: Wi-Fi+GNSS 03: GNSS + Wi-Fi 04: Only Bluetooth 05: Bluetooth + Wi-Fi 06: Bluetooth + GNSS 07: Bluetooth + Wi-Fi + GNSS
9~10	Heartbeat interval	uint16	02d0	02d0 is 0x02D0 = 720(DEC) minutes, the heartbeat interval is 720 minutes.
11~12	Uplink Interval	uint16	003c	003c is 0x003C = 60(DEC) minutes, the uplink interval is 60 minutes.
13~14	Event mode uplink interval	uint16	003c	003c is 0x003C = 60(DEC), the event mode uplink interval is 60 minutes.
15	Temp&light switch	uint8	00	00 means open the temperature and light sensor. 00: Close the temperature and light sensor. 01: Open the temperature and light sensor.
16	SOS mode	uint8	00	00 means use SOS single mode. 00: use SOS single mode. 01: use SOS continuous mode.

6.2.3 Heartbeat Packet -0x05

When no data is uploaded by the device within the heartbeat interval, a heartbeat packet will be triggered. This packet only contains battery information.

0x05	Byte2	Byte3	Byte4	Byte5
ID	battery level	work mode	positioning strategy	SOS mode

The raw payload:
0564010001

Byte	Value	Type	Raw Data	Description
1	Frame ID	uint8	05	05 is the packet ID.
2	Battery level	uint8	64	64 is 0x64 = 100(DEC) The battery level is 100%
3	Work mode	uint8	01	01 is 0x01, means the device use “Periodic mode”. 00: Standby mode 01: Periodic mode 02: Event mode
4	Positioning strategy	uint8	00	00 is 0x01, means the device use “GNSS only” positioning strategy. 00: Only GNSS 01: Only Wi-Fi 02: Wi-Fi+GNSS 03: GNSS + Wi-Fi 04: Only Bluetooth 05: Bluetooth + Wi-Fi 06: Bluetooth + GNSS 07: Bluetooth + Wi-Fi + GNSS
5	SOS mode	uint8	00	00 means use SOS single mode. 00: use SOS single mode. 01: use SOS continuous mode.

6.2.4 GNSS Location and Sensor Packet-0x06

ID 0x06 is used to upload GNSS location, sensor data and battery.

0x06	Byte2~4	Byte5	Byte6~9	Byte10~13	Byte14~17
ID	event status	motion segment number	UTC time	longitude	latitude

Byte18~19	Byte20~21	Byte22

Temperature	Light	battery level

The raw payload:

06000008006462248d06ca502801587ec600fe000057

Byte	Value	Type	Raw Data	Description
1	Frame ID	uint8	06	06 is the packet ID.
2~4	event status	uint24	000008	000008 is 0x000008, 0x0000XX is reserved and 0x08 is the event status. This byte has 8 bits, each representing an event. Bit1: Start moving event. Bit2: End movement event. Bit3: Motionless event. Bit4: Shock event. Bit5: Temperature event. Bit6: Light event. Bit7: SOS event. Bit8: Press once event. Convert to hexadecimal: 0x000000: no event 0x000001: Start moving event. 0x000002: End movement event. 0x000004: Motionless event. 0x000008: Shock event. 0x000010: Temperature event. 0x000020: Light event. 0x000040: SOS event. 0x000080: Press once event.
5	Motion segment number	uint8	00	00 is 0x00 == 0. When the motion begins, the count increases by 1. Record that this is a movement.
6~9	UTC time	uint32	6462248d	6462248d is 0x6462248D = 1684153485(DEC) seconds. Convert it to Beijing Time: 2023-05-15

				20:24:45
10~13	Longitude	int32	06ca5028	06ca5028 is 0x06CA5028 = 113922088(DEC), the longitude= 113922088/1000000=113.922088
14~17	Latitude	int32	01587ec6	01587ec6 is 0x01587EC6 = 22576838(DEC), the Latitude = 22576838/1000000=22.576838
18~19	Temperature	int16	00fe	00fe is 0x00FE = 254(DEC), temperature=254/10=25.4℃
20~21	Light	uint16	0000	0000 is 0x0000 = 0(DEC) minutes, the light=0=0%
22	Battery level	uint8	57	57 is 0x57 = 87(DEC) The battery level is 87%

6.2.5 Wi-Fi Location and Sensor Packet-0x07

ID 0x07 is used to upload Wi-Fi Mac addresses, sensor data and battery.

0x07	Byte2~4	Byte5	Byte6~9	Byte10~15	Byte16
ID	event status	motion segment number	UTC time	MAC address 1	The RSSI of MAC address 1, int8

Byte17~22	Byte23	Byte24~29	Byte30	Byte31~36	Byte37
MAC address 2	The RSSI of MAC address 2, int8	MAC address 3	The RSSI of MAC address 3, int8	MAC address 4	The RSSI of MAC address 4, int8

Byte38~39	Byte40~41	Byte42
Temperature	Light	battery level

The raw payload:

07000008006462247248739716223 4bb3ccd5798fd2ebc74cf002f3ad0a9ec26ca022958b900fe000057

Byte	Value	Type	Raw Data	Description
1	Frame ID	uint8	07	07 is the packet ID.

2~4	event status	uint24	000008	000008 is 0x000008, 0x0000XX is reserved and 0x08 is the event status. This byte has 8 bits, each representing an event. Bit1: Start moving event. Bit2: End movement event. Bit3: Motionless event. Bit4: Shock event. Bit5: Temperature event. Bit6: Light event. Bit7: SOS event. Bit8: Press once event. Convert to hexadecimal: 0x000000: no event 0x000001: Start moving event. 0x000002: End movement event. 0x000004: Motionless event. 0x000008: Shock event. 0x000010: Temperature event. 0x000020: Light event. 0x000040: SOS event. 0x000080: Press once event.
5	Motion segment number	uint8	00	00 is 0x00 == 0. When the motion begins, the count increases by 1. Record that this is a movement.
6~9	UTC time	uint32	64622472	64622472 is 0x64622472 = 1684153458 (DEC) seconds. Convert it to Beijing Time: 2023-05-15 20:24:18
10~15	MAC address 1	----	487397162234	487397162234 the MAC address (HEX)= 48:73:97:16:22:34
16	The RSSI of MAC address 1	int8	bb	bb is 0xBB = -69(DEC), the type is int8 the RSSI = -69
17~22	MAC address 2	----	3ccd5798fd2e	3ccd5798fd2e the MAC address (HEX)=

				3C:CD:57:98:FD:2E
23	The RSSI of MAC address 2	int8	bc	bc is 0xBC = -68(DEC), the type is int8 the RSSI = -68
24~29	MAC address 3	----	74cf002f3ad0	74cf002f3ad0 the MAC address (HEX)= 74:CF:00:2F:3A:D0
30	The RSSI of MAC address 3	int8	a9	a9 is 0xA9 = -87(DEC), the type is int8 the RSSI = -87
31~36	MAC address 4	----	ec26ca022958	ec26ca022958 the MAC address (HEX)= EC:26:CA:02:29:58
37	The RSSI of MAC address 4	int8	b9	b9 is 0xA9 = -71(DEC), the type is int8 the RSSI = -71
38~39	Temperature	int16	00fe	00fe is 0x00FE = 254(DEC), temperature=254/10=25.4℃
40~41	Light	uint16	0000	0000 is 0x0000 = 0(DEC) minutes, the light=0=0%
42	battery level	uint8	57	57 is 0x57 = 87(DEC) The battery level is 87%

6.2.6 Bluetooth Location and Sensor Packet-0x08

ID 0x08 is used to upload Bluetooth Beacon MAC addresses, sensor data and battery.

0x08	Byte2~4	Byte5	Byte6~9	Byte10~15	Byte16
ID	event status	motion segment number	UTC time	MAC address 1	The RSSI of MAC address 1, int8

Byte17~22	Byte23	Byte24~29	Byte30	Byte31~32	Byte33~34	Byte 35
MAC address 2	The RSSI of MAC address 2, int8	MAC address 3	The RSSI of MAC address 3, int8	Temperature	light	battery level

The raw payload:

08000008000646225bb5162d2c1b9d3ca1b5bd2afeae5c0d0e2d70529e8c900fa000057

Byte	Value	Type	Raw Data	Description
1	Frame ID	uint8	08	08 is the packet ID.
2~4	event status	uint24	000008	000008 is 0x000008, 0x0000XX is reserved and 0x08 is the event status. This byte has 8 bits, each representing an event. Bit1: Start moving event. Bit2: End movement event. Bit3: Motionless event. Bit4: Shock event. Bit5: Temperature event. Bit6: Light event. Bit7: SOS event. Bit8: Press once event. Convert to hexadecimal: 0x000000: no event 0x000001: Start moving event. 0x000002: End movement event. 0x000004: Motionless event. 0x000008: Shock event. 0x000010: Temperature event. 0x000020: Light event. 0x000040: SOS event. 0x000080: Press once event.
5	Motion segment number	uint8	00	00 is 0x00 == 0. When the motion begins, the count increases by 1. Record that this is a movement.
6~9	UTC time	uint32	646225bb	646225bb is 0x646225BB = 1684153787 (DEC) seconds. Convert it to Beijing Time: 2023-05-15 20:29:47
10~15	MAC address 1	-----	5162d2c1b9d3	5162d2c1b9d3 the MAC address (HEX)=51:62:D2:C1:B9:D3

16	The RSSI of MAC address 1	int8	c0	c0 is 0xC0 = -64(DEC), the type is int8 the RSSI = -64
17~22	MAC address 2	-----	1b5bd2afeae5	1b5bd2afeae5 the MAC address (HEX)= 1B:5B:D2:AF:EA:E5
23	The RSSI of MAC address 2	int8	bc	bc is 0xBC = -68(DEC), the type is int8 the RSSI = -68
24~29	MAC address 3	-----	d0e2d70529e8	d0e2d70529e8 the MAC address (HEX)= D0:E2:D7:05:29:E8
30	The RSSI of MAC address 3	int8	c9	c9 is 0xC9 = -55(DEC), the type is int8 the RSSI = -55
31~32	Temperature	int16	00fa	00fa is 0x00FA = 250(DEC), temperature=254/10=25.0℃
33~34	Light	uint16	0000	0000 is 0x0000 = 0(DEC) minutes, the light=0=0%
35	battery level	uint8	57	57 is 0x57 = 87(DEC) The battery level is 87%

6.2.7 GNSS Location Only Packet-0x09

When the sensor is turned off, the device does not upload the sensor measurement value. Only the location data is uploaded.

0x09	Byte2~4	Byte5	Byte6~9	Byte10~13	Byte14~17	Byte18
ID	event status	motion segment number	UTC time	longitude	latitude	battery level

The raw payload:

09000000006463186806ca506801587e4c56

Byte	Value	Type	Raw Data	Description
1	Frame ID	uint8	09	09 is the packet ID.

2~4	event status	uint24	000000	000000 is 0x000008, 0x0000XX is reserved and 0x08 is the event status. This byte has 8 bits, each representing an event. Bit1: Start moving event. Bit2: End movement event. Bit3: Motionless event. Bit4: Shock event. Bit5: Temperature event. Bit6: Light event. Bit7: SOS event. Bit8: Press once event. Convert to hexadecimal: 0x000000: no event 0x000001: Start moving event. 0x000002: End movement event. 0x000004: Motionless event. 0x000008: Shock event. 0x000010: Temperature event. 0x000020: Light event. 0x000040: SOS event. 0x000080: Press once event.
5	Motion segment number	uint8	00	00 is 0x00 == 0. When the motion begins, the count increases by 1. Record that this is a movement.
6~9	UTC time	uint32	64631868	64631868 is 0x64631868 = 1684215912 (DEC) seconds. Convert it to Beijing Time: 2023-05-16 13:45:12
10~13	Longitude	int32	06ca5068	06ca5068 is 0x06CA5068 = 113922152 (DEC), the longitude= 113922152/1000000=113.922152
14~17	Latitude	int32	01587e4c	01587e4c is 0x01587E4C = 22576716 (DEC), the Latitude = 22576716/1000000=22.576716
18	Battery level	uint8	56	56 is 0x56 = 86(DEC) The battery level is 86%

6.2.8 Wi-Fi Location Only Packet-0x0A

0x0A	Byte2~4	Byte5	Byte6~9	Byte10~15	Byte16
ID	event status	motion segment number	UTC time	MAC address 1	The RSSI of MAC address 1, int8

Byte17~22	Byte23	Byte24~29	Byte30	Byte31~36	Byte37	Byte38
MAC address 2	The RSSI of MAC address 2, int8	MAC address 3	The RSSI of MAC address 3, int8	MAC address 4	The RSSI of MAC address 4, int8	battery level

The raw payload:

0A000008006462247248739716223 4bb3ccd5798fd2ebc74cf002f3ad0a9ec26ca022958b957

Byte	Value	Type	Raw Data	Description
1	Frame ID	uint8	0A	0A is the packet ID.
2~4	event status	uint32	000008	000008 is 0x000008, 0x0000XX is reserved and 0x08 is the event status. This byte has 8 bits, each representing an event. Bit1: Start moving event. Bit2: End movement event. Bit3: Motionless event. Bit4: Shock event. Bit5: Temperature event. Bit6: Light event. Bit7: SOS event. Bit8: Press once event. Convert to hexadecimal: 0x000000: no event 0x000001: Start moving event.

				0x000002: End movement event. 0x000004: Motionless event. 0x000008: Shock event. 0x000010: Temperature event. 0x000020: Light event. 0x000040: SOS event. 0x000080: Press once event.
5	Motion segment number	uint8	00	00 is 0x00 == 0. When the motion begins, the count increases by 1. Record that this is a movement.
6~9	UTC time	uint32	64622472	64622472 is 0x64622472 = 1684153458 (DEC) seconds. Convert it to Beijing Time: 2023-05-15 20:24:18
10~15	MAC address 1	-----	487397162234	487397162234 the MAC address (HEX)= 48:73:97:16:22:34
16	The RSSI of MAC address 1	int8	bb	bb is 0xBB = -69(DEC), the type is int8 the RSSI = -69
17~22	MAC address 2	-----	3ccd5798fd2e	3ccd5798fd2e the MAC address (HEX)= 3C:CD:57:98:FD:2E
23	The RSSI of MAC address 2	int8	bc	bc is 0xBC = -68(DEC), the type is int8 the RSSI = -68
24~29	MAC address 3	-----	74cf002f3ad0	74cf002f3ad0 the MAC address (HEX)= 74:CF:00:2F:3A:D0
30	The RSSI of MAC address 3	int8	a9	a9 is 0xA9 = -87(DEC), the type is int8 the RSSI = -87
31~36	MAC address 4	-----	ec26ca022958	ec26ca022958 the MAC address (HEX)= EC:26:CA:02:29:58
37	The RSSI of MAC address	int8	b9	b9 is 0xA9 = -71(DEC), the type is int8

	4, int8			the RSSI = -71
38	battery level	uint8	57	57 is 0x57 = 87(DEC) The battery level is 87%

6.2.9 Bluetooth Location Only Packet-0x0B

0x0B	Byte2~4	Byte5	Byte6~9	Byte10~15	Byte16
ID	event status	motion segment number	UTC time	MAC address 1	The RSSI of MAC address 1, int8

Byte17~22	Byte23	Byte24~29	Byte30	Byte31
MAC address 2	The RSSI of MAC address 2, int8	MAC address 3	The RSSI of MAC address 3, int8	battery level

The raw payload:

0B000008006462 25bb5162d2c1b9d3ca1b5bd2afeae5c0d0e2d70529e8c957

Byte	Value	Type	Raw Data	Description
1	Frame ID	uint8	0B	0B is the packet ID.
2~4	event status	uint24	000008	000008 is 0x000008, 0x0000XX is reserved and 0x08 is the event status. This byte has 8 bits, each representing an event. Bit1: Start moving event. Bit2: End movement event. Bit3: Motionless event. Bit4: Shock event. Bit5: Temperature event. Bit6: Light event. Bit7: SOS event. Bit8: Press once event.

				Convert to hexadecimal: 0x000000: no event 0x000001: Start moving event. 0x000002: End movement event. 0x000004: Motionless event. 0x000008: Shock event. 0x000010: Temperature event. 0x000020: Light event. 0x000040: SOS event. 0x000080: Press once event.
5	Motion segment number	uint8	00	00 is 0x00 == 0. When the motion begins, the count increases by 1. Record that this is a movement.
6~9	UTC time	uint32	646225bb	646225bb is 0x646225BB = 1684153787 (DEC) seconds. Convert it to Beijing Time: 2023-05-15 20:29:47
10~15	MAC address 1	-----	5162d2c1b9d3	5162d2c1b9d3 the MAC address (HEX)=51:62:D2:C1:B9:D3
16	The RSSI of MAC address 1, int8	int8	c0	c0 is 0xC0 = -64(DEC), the type is int8 the RSSI = -64
17~22	MAC address 2	-----	1b5bd2afeae5	1b5bd2afeae5 the MAC address (HEX)= 1B:5B:D2:AF:EA:E5
23	The RSSI of MAC address 2, int8	int8	bc	bc is 0xBC = -68(DEC), the type is int8 the RSSI = -68
24~29	MAC address 3	-----	d0e2d70529e8	d0e2d70529e8 the MAC address (HEX)= D0:E2:D7:05:29:E8
30	The RSSI of MAC address 3, int8	int8	c9	c9 is 0xC9 = -55(DEC), the type is int8 the RSSI = -55
31	battery level	uint8	57	57 is 0x57 = 87(DEC) The battery level is 87%

6.2.10 Positioning Timeout and Error Code Packet-0x0D

When the device cannot locate due to poor GNSS/ Wi-Fi/Bluetooth signal, the positioning timeout packet is uploaded.

The raw payload:
0D00000000

Byte	Value	Type	Raw Data	Description
1	Frame ID	uint8	0D	0D is the packet ID.
2~4	Error code	uint32	00000000	00000000 is 0x00000000 0x00000000: The GNSS scan timed out and failed to obtain the location. 0x00000001: The Wi-Fi scan timed out and failed to obtain the location. 0x00000002: The Wi-Fi + GNSS scan timed out and failed to obtain the location. 0x00000003: The GNSS + Wi-Fi scan timed out and failed to obtain the location. 0x00000004: The Bluetooth scan timed out and failed to obtain the location. 0x00000005: The Bluetooth + Wi-Fi scan timed out and failed to obtain the location. 0x00000006: The Bluetooth + GNSS scan timed out and failed to obtain the location. 0x00000007: The Bluetooth + Wi-Fi + GNSS scan timed out and failed to obtain the location.

6.3 Downlink Packet, FPort=5

The tracker supports LoRaWAN to downlink some commands to adjust parameters. If the device is hibernated, the downlink command takes effect the next time the device wakes up to upload data.

Note: FPort=5

6.3.1 Setting the SOS Mode -0x80

0x80	Byte2
ID	SOS mode 0: single mode 1: continuous mode

8001: set SOS to single mode.
8002: set SOS to continuous mode.

6.3.2 Setting the Uplink Interval -0x81

0x81	Byte2~3	Byte4~5	Byte6~7
ID	Heartbeat uplink interval 0000: Keep current configuration Unit: minutes	Periodic mode uplink interval 0000: Keep current configuration Unit: minutes	Event mode uplink interval 0000: Keep current configuration Unit: minutes

Example: set the periodic mode interval to 30 minutes
Command: 810000001E0000

6.3.3 Open the buzzer -0x82

After sending this command, a buzzer alarm tone will be turned on after the device wakes up and will continue to sound for 1 minute.

0x82	Byte2
ID	Open the buzzer. 00: close 01: open

8200: close the buzzer
8201: open the buzzer

6.3.4 Setting the Work Mode -0x83

0x83	Byte2
ID	Open the buzzer. 00: standby mode 01: periodic mode 02: event mode

8300: set work mode to standby mode
8301: set work mode to periodic mode
8302: set work mode to event mode

6.3.5 Setting the Work Mode -0x84

0x84	Byte2	Byte3~4	Byte5~6	Byte7	Byte8~9
ID	enable motion event	3-Axis motion threshold	motion start interval	enable motionless event	motionless timeout

Byte10	Byte11~12	Byte13	Byte14~15	Byte16~17	Byte18~19
enable shock event	3-Axis shock threshold	enable temperature event	temperature event uplink interval	temperature sample interval	temperature threshold max

Byte20~21	Byte22	Byte23	Byte24~25	Byte26~27	Byte28~29
Temperature threshold min	Temperature warning type	Enable light event	light event uplink interval	light sample interval	light threshold max

Byte30~31	Byte32
light threshold min	light warning type

The command:

84000001e000500016801012c00000500 1e0258000000000005000100640000 00

Byte	Value	Type	Raw Data	Description
1	Frame ID	uint8	84	84 is the packet ID.
2	Enable motion event	uint8	00	00 means disable Event mode. 00: disable Event mode. 01: enable Event mode.
3~4	3-Axis motion threshold	uint16	001e	001e is 0x001E=30(DEC) mg When the acceleration exceeds 30mg, determine that the device is in motion, when it is 2 minutes below this value, determine that the device is in motionless.
5~6	Motion start interval	uint16	0005	0005 is 0x0005 = 5(DEC), when device is on motion, the interval is 5 minutes.
7	Enable motionless event	uint8	00	00 means disable motionless event. 00: disable motionless event. 01: enable motionless event.
8~9	Motionless timeout	uint16	0168	0168 is 0x0168 = 360(DEC), when the device is stationary in a location for more than 360 minutes, a motionless timeout event is triggered.
10	Enable shock event	uint8	01	01 means enable shock event. 00: disable shock event. 01: enable shock event.
11~12	3-Axis shock threshold	uint16	012c	012c is 0x012C=300(DEC) mg When the acceleration exceeds 300mg, the shock event is triggered.
13	Enable temperature event	uint8	00	00 means enable shock event. 00: disable shock event. 01: enable shock event.
14~15	Temperature event uplink interval	uint16	0005	0005 is 0x0005 = 5(DEC), when the temperature exceeds the threshold, the location and sensor data will upload every 5 minutes.
16~17	Temperature sample interval	uint16	001e	001e is 0x001E=30(DEC) seconds The temperature is detected every 30 seconds. When the threshold is triggered, upload location and sensor data.

18~19	Temperature threshold max	int16	0258	0258 is 0x0258 = 600(DEC), Maximum threshold =600/10=60.0 ℃
20~21	Temperature threshold min	int16	0000	0000 is 0x0000 = 0(DEC), Minimum threshold=0/10=0.0 ℃
22	Temperature threshold rule	uint8	00	00 means when temperature ⩽ min threshold, device will upload location and temperature event. 00: temp ⩽ min threshold 01: temp ⩾ max threshold 02: temp ⩽ min threshold and temp ⩾ max threshold 03: min threshold⩽ temp ⩽max threshold
23	Enable light event	uint8	00	00 means disable light event. 00: disable light event. 01: enable light event.
24~25	Light event uplink interval	uint16	0005	0005 is 0x0005 = 5(DEC), when the light exceeds the threshold, the location and sensor data will upload every 5 minutes.
26~27	Light sample interval	uint16	0001	0001is 0x0001=1(DEC) seconds The temperature is detected every 1 seconds. When the threshold is triggered, upload location and sensor data.
28~29	Light threshold max	uint16	0064	0064 is 0x0064 = 100(DEC) % Maximum threshold =100%
30~31	Light threshold min	uint16	0000	0000 is 0x0000 = 0(DEC) % Minimum threshold=0%
32	Light warning type	uint8	00	00 means when light ⩽ min threshold, device will upload location and light event. 00: light ⩽ min threshold 01: light ⩾ max threshold 02: light ⩽ min threshold and light ⩾ max threshold 03: min threshold⩽ light ⩽max threshold

6.3.6 Request Location -0x85

The request tracker initiates location and uploads based on the current configuration. It is usually used in standby mode.

0x85
ID

Example:
85: request location.

6.3.7 Setting Positioning strategy -0x86

0x86	Byte2
ID	Positioning strategy 00: Only GNSS 01: Only Wi-Fi 02: Wi-Fi+GNSS 03: GNSS + Wi-Fi 04: Only Bluetooth 05: Bluetooth + Wi-Fi 06: Bluetooth + GNSS 07: Bluetooth + Wi-Fi + GNSS

Example:
8600: Set the positioning strategy to “Only GNSS”.

6.3.8 Request Event Parameters -0x87

0x87
ID

Example:
85: request event parameters.

6.3.9 Request Device Status Packet -0x88

0x88
ID

Example:
88: request Device Status packet(0x01 or 0x02).

6.3.10 Reboot Device -0x89

0x89
ID

Example:
89: After the command is sent, the device reboots and join the network again. Please use this command with caution.

6.3.11 Enable Temperature and Light Sensor -0x8C

Enable data collection and upload for the temperature and light sensor.

0x83	Byte2
ID	Open the temperature and light sensor. 00: Close the temperature and light sensor. 01: Open the temperature and light sensor.

Example:
8300: Close the temperature and light sensor.
8301: Open the temperature and light sensor.

6.3.12 Enable SOS Alarm -0x8D

Enable SOS continuous mode, upload positioning quickly, once every minute, stop after 30 consecutive times, accompanied by sound and light alarm.

Turn off SOS by closing the command or by double clicking the key.

0x8D	Byte2
ID	Open the SOS. 00: Close. 01: Open.

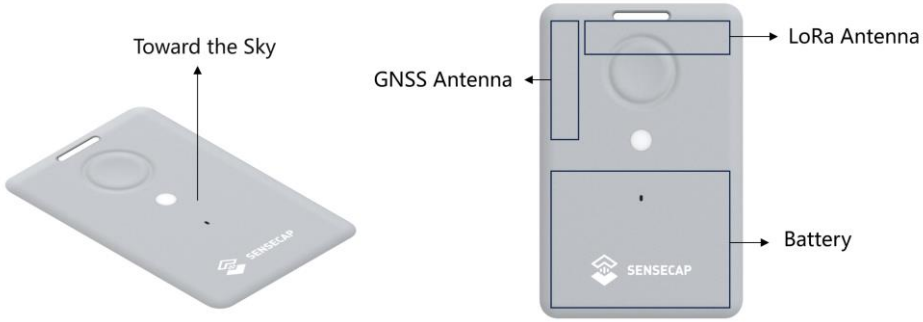
Example:
8D00: Close the SOS alarm.
8D01: Open the SOS alarm.

7. FAQ

7.1 Location Issues

7.1.1 Why is there no GPS location data

1) The tracker is indoor. Check whether the device is indoors. If the device is indoors, the GPS location times out. In this case, the location transmission status is uploaded, and the location cannot be obtained. GNSS positioning needs to be used outdoors.
2) The installation position of the device affects antenna positioning. When installing the antenna, do not block the position of the antenna.



7.1.2 Why is Wi-Fi or Bluetooth location not displayed on the App map?

1) Wi-Fi location requires the use of a third-party map parsing service, which requires users to invoke the interface for parsing. Currently, Mate App only supports GNSS positioning display.
2) Bluetooth positioning needs to determine the location according to the location of the beacon and needs to cooperate with the beacon.

7.2 How to use Bluetooth to position?

To use Bluetooth location, you need the Bluetooth beacon, Bluetooth positioning algorithm, and a custom map.

7.2.1 Deploy Bluetooth beacons

A Bluetooth beacon is a small and wireless battery-powered radio transmitter that uses BLE as its transmission protocol. This mini-radio transmission device can be “discovered” and seen by all BLE scanners within a certain radius. The Bluetooth beacon, however, cannot “see” anyone back.

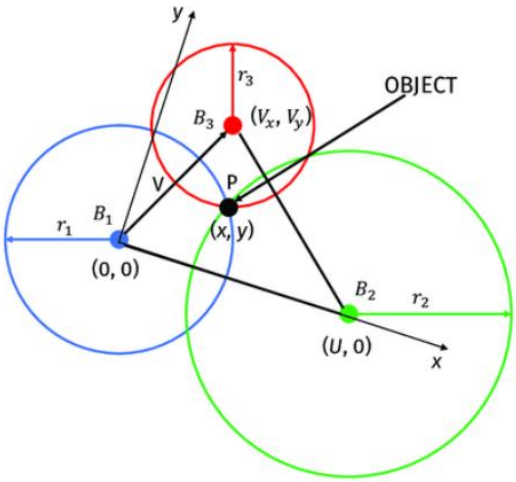
Bluetooth beacons work by transmitting packets of data that are picked up by the tracker via radio waves. **The tracker periodically scans around up to 8 Bluetooth beacons and sorts according to RSSI, uploading the UUID and RSSI of the 3 Bluetooth beacons with the best signal strength via LoRa.**

A Bluetooth beacon has a theoretical maximum radius distance of less than 100m. Most Bluetooth beacons can reliably transmit up to approximately 30 meters without any physical obstructions. A typical operating range is around 2 to 5 meters, depending on the transmit power. The higher the range, the higher the battery consumption.

It is necessary to consider the density of the beacon deployment according to the indoor situation, such as whether there is shelter, which also determines the accuracy of the Bluetooth positioning. There are plenty of tutorials on YouTube or Google on how to install and use beacons.

7.2.2 Bluetooth positioning algorithm and map

There are many experts have provided Bluetooth based positioning calculation methods, the most common is trilateral positioning method, refer to the article: A Comparison Analysis of BLE-Based Algorithms for Localization in Industrial Environments. The SenseCAP tracker provides the UUID and RSSI required by the algorithm, and then calculates the final target location based on the actual deployment location of the user.



7.3 Battery Issues

7.3.1 Battery Life

Battery life depends on a variety of factors such as uplink interval, whether the sensor is turned on and used, LoRa transmission distance, operating temperature, etc. Therefore, we use the typical working environment(25℃) to predict the battery life, for reference only, and the final life is subject to the actual test.

Please download the excel:
https://files.seeedstudio.com/products/SenseCAP/SenseCAP_Tracker/Trcaker_Battery_Life_Calculation_T1000_AB.xlsx

7.3.2 Why can't I charge the battery?

Charging	The LED will flash once every 3 seconds.
Fully charged	The LED will stay always on.
Charging anomaly	When the device is charged below 0 ° C or above 45 ° C, the device will enter the charge protection state and cannot be charged. The LED will flash rapidly.

8. Document Version

Version	Date	Description	Editor
V1.0	5/18/2023	First edition	Jenkin Lu
V1.1	6/30/2023	Modify some description.	Jenkin Lu
V1.1	6/30/2023	Add FAQ and feature description.	Jenkin Lu