

LoRaWAN Gateway User Guide

Version: V1.4



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1 Product Introduction



SenseCAP is an industrial wireless sensor network that integrates easy-to-deploy hardware and data API services, enabling low-power, long-distance environmental data collection. SenseCAP includes several versions, such as LoRaWAN, LoRaPP, etc.

SenseCAP LoRaWAN Gateways is based on the LoRaWAN protocol, it can realize one-to-many, long-distance networking and bilateral communication. The LoRaWAN Gateway supports Ethernet and 4G.

Main Features:

- High-performance Cortex A8 1GHz processor
- Multiple methods to connect to the Internet: 4G, Wi-Fi and Ethernet

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- Supports third-party TTN account and server
- Super long-distance communication: 10km in the line-of-sight scenario, 2km in the urban scenario
- Industrial protection rating IP66-rated enclosure, suitable for the outdoor environment at -40°C~70°C
- Easy-to-deploy, enabling people without engineering background to install the devices quickly

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LoRaWAN Outdoor Gateway:



Ethernet Port · Power Connector · LED



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2 Gateway Network Configuration

2.1 The gateway connects to the Internet

2.1.1 Installing Antenna

Screw clockwise to install the 4G and LoRa antennas onto the gateway.



2.1.2 Connecting to the Internet

There are two ways to connect to the Internet. Choose the one that works for you .

(1) Connecting to Ethernet Cable

Unscrew to open the protection cap, plug the Ethernet cable through the cap and then into the Ethernet port. Screw to fasten this part.





(2) Connecting to 4G

Use the hex key (included in the package) to unscrew the 6 screws and open the lid.



Swipe downward to open the SIM card socket, insert the Micro SIM card and swipe upward to lock the SIM card socket. Make sure it is installed correctly and close the lid with the screws.





2.1.3 Connecting to Power Cable

Unscrew to take off the power cap, plug in the extension cord and screw to fasten it onto the gateway. The other end of the extension cord is connected to the power adapter.



Notice: Make sure all antennas are correctly installed before powering on the gateway. Please note the device should be POWERED OFF when installing the antenna, or the antenna circuits might be damaged.

2.1.4 The Function of the Red LED

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2.2 Setting the APN

Prepare a router, and the network connection is shown in the figure:

	Wi-Fi		<i>ò</i> ,
Ethernet cable Gateway	Ethernet cable	PC	

- (1) Check the IP of "sensecap" in the background of the router.
- (2) Enter IP in the browser: IP:8000 If the IP is 192.168.1.1, enter 192.168.1.1:8000

Se	nseCAP LoRa Gateway	
	User	
-	sensecap	
6	Password	
	1 03541010	
	LOGIN	

(3) User: sensecap

Password: sensecap!!!

(4) Click the "Cellular" button.

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-	Dashboard	≡ Seeed LoRaWAN Gateway	Ð	I Í
ŝ	Wi-Fi	APN Settings	Cellular Diagnosis	
Ŷ	LoRa	Cellular Mode		
	Cellular		1	
	Lora Server	· · · · · · · · · · · · · · · · · · ·		
		3G/2G APN Settings		
		APN		
		Username	2	
		Password		
		4G APN Settings (Optional)		
		APN	CHECK CONNECTION	
		Username	3	
		Password		
		APPLY		,

- ① Cellular Mode: AUTO(default), Gateway automatically selects mode.
- ② 3G/2G APN Settings: when the mode is 3G/2G, the APN information of SIM card operator needs to be filled in.
- 3 4G APN Settings: optional.
- (5) Click "APPLY". Then "CHECK CONNECTION", if return "cellular technology powered and connected", it means ok.

	Dashboard	≡ Seeed LoRaWAN Gateway	E)
ŝ	Wi-Fi	APN Settings	Cellular Diagnosis	
Ŷ	LoRa	Cellular Mode		
al	Cellular		# network test cellular technology powered and connected check service	
	Lora Server	Auto *	found ready cellular service /net/connman/service/cellular_460046670507416_context1 the interface is wwan0, test ping via this interface	
		3G/2G APN Settings	ping sensecap seeed.cc.w.cdngslb.com OK, the avg latency is 153ms.	
		APN ctite		
		Username		
		Password		
		4G APN Settings (Optional)		
		APN	CHECK CONNECTION	
		000		-
		Usemame		
		Password		
		APPLY		
		APPL		

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3 Add Gateway to User's TTN Server

The SenseCAP LoRaWAN Gateway supports connecting to the user's own The Things Network account and server.

Learn more about TTN: https://www.thethingsindustries.com/docs/





3.1 Gateway Network Configuration

3.1.1 Installing Antenna

Screw clockwise to install the 4G and LoRa antennas onto the gateway.



3.1.2 Connecting to the Internet

There are two ways to connect to the Internet. Choose the one that works for you.

(3) Connecting to Ethernet Cable

Unscrew to open the protection cap, plug the Ethernet cable through the cap and then into the Ethernet port. Screw to fasten this part.



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(4) Connecting to 4G

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Swipe downward to open the SIM card socket, insert the Micro SIM card and swipe upward to lock the SIM card socket. Make sure it is installed correctly and close the lid with the screws.



3.1.3 Connecting to Power Cable

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Unscrew to take off the power cap, plug in the extension cord and screw to fasten it onto the gateway. The other end of the extension cord is connected to the power adapter.





Notice: Make sure all antennas are correctly installed before powering on the gateway. Please note the device should be POWERED OFF when installing the antenna, or the antenna circuits might be damaged.

3.1.4 The Function of the Red LED





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3.2 Setting the Gateway Service Address

Prepare a router, and the network connection is shown in the figure:

	Wi-Fi		ò
Ethernet cable Gateway	Ethernet cable	PC	

- (6) Check the IP of "sensecap" in the background of the router.
- (7) Enter IP in the browser: IP:8000

If the IP is 192.168.1.1, enter 192.168.1.1:8000

	SenseCAP LoRa Gateway
	User Sensecap
	Password
	LOGIN
(8) User: sensecap	
Password: sensecap!!!	

(9) LoRa→Use Seeed's Server→Off Button



(10)

Dashboard	≡ Seeed LoRaWAN Gateway		Ð
Image: Winfi Image: LoRa	LoRaWAN Radio Configuration	Packet Dispatch Configu	ation
,11 Cellular	Use LoRaWAN Tx Power	Use Seeed's Server	
	APPLY		APPLY
(10)			
(10)			
📑 Dashboard 🔶 Wi-Fi	≡ Seeed LoRaWAN Gateway		Ð
P LORE	LoRaWAN Radio Configuration	Packet Dispatch Configuration	on
, I Cellular	Use LoRaWAN Tx Power	Use Seeed's Server	
	APPLY	seeed.thethings.industries	0
		1700 Downlink Port 1700	2
			APPLY
 Server Address: F 	Please input your Server Address.		*
Refer to the websi			
Version info	Component status		
v3.13.2	• Application Server eu1.cloud.thethings		way Server .oud.thethings.network
V3.13.Z	• Identity Server eu1.cloud.thethings	.network	Server .oud.thethings.network
	•••••• Network Server		STRUCTURE STRUCT
	eu1.cloud.thethings	network	

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Uplink / Downlink Port (default): 1700

(11) APPLY.

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3.3 Gateway Registration on TTN

TTN website: https://www.thethingsnetwork.org

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

Tip: v2 will be discontinued and v3 is recommended.

(1) Follow the instruction to create your account, and access "Console".

Welcome to the Co	onsole!
Get started right away by creating an application	n or registering a gateway.
Need help? Have a look at our 📓 Documentati	on [©] or <u>Get Support</u> [©] .
(2) Register Gateway	Register a gateway

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Gateway ID ⑦*

iateway EUI ⑦	
2C F7 F1 10 22 50 00 19	1

SenseCAP Gateway

Gateway description ③

SenseCAP Gateway Demo

Optional gateway description; can also be used to save notes about the gateway

Gateway Server address

eu1.cloud.thethings.network

The address of the Gateway Server to connect to

Require authenticated connection ③

Enabled

Controls whether this gateway may only connect if it uses an authenticated Basic Station or MQTT connection

Gateway status 🕐

Public

The status of this gateway may be visible to other users

Gateway location ②

Public

- Gateway EUI: View the labels on the gateway. Select 'I'm using the legacy packet forwarder'.
- ② Frequency Plan: View the labels on the gateway.

EU868	Europe 863-870 MHz (SF9 for RX2 -recommended)
US915	United States 902-928 MHz, FSB 2 (used by TTN)
AU915	Australia 915-928 MHz, FSB 2 (used by TTN)
AS923-1	Asia 920-923 MHz
AS923-2	Asia 923-925 MHz



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LoRaWAN options

Frequency plan 🕲
Europe 863-870 MHz (SF9 for RX2 - recommended)
Schedule downlink late ③
Enabled
Enable server-side buffer of downlink messages
Enforce duty cycle ③
Enabled
Recommended for all gateways in order to respect spectrum regulations
Schedule any time delay ③*
530 milliseconds V
Configure gateway delay (minimum: 130ms, default: 530ms)
③ Other use default.
(4) Create Gateway.
Gateway Status displays connected, indicating successful registration.

SenseCAP	Gateway		
• Last seen 18 seconds ago	↑0 ↓0 🚉 1 Collaborator 📴 0 API keys		Created 2 minutes ago
General information			• Live data See all activity →
Gateway ID	demo-gw	5	${\cal P}$ 18:44:50 Receive gateway status Metrics: { ackr: 0, rxfw: 0, rxin: 0,
Gateway EUI	2C F7 F1 10 22 50 00 19	↔ 📭	 18:44:41 Connect gateway 18:42:56 Create gateway
Gateway description	SenseCAP Gateway Demo		
Created at	Jul 2, 2021 18:42:56		
Last updated at	Jul 2, 2021 18:42:56		
Gateway Server address	eu1.cloud.thethings.network	5	Location Change location settings →
LoRaWAN information Frequency plan Global configuration	EU_863_870_TTN Download global_conf.json		



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4 Add Gateway to ChirpStack LoRaWAN Network Server Stack

ChirpStack provides open-source components for LoRaWAN networks. Together they form a ready-to-use solution including an user-friendly web-interface for device management and APIs for integration.

SenseCAP LoRaWAN Gateway has already integrated with ChirpStack LoRaWAN Network Server stack (hereinafter called the "ChirpStack LoRa Server"). The following LoRa Server components are accessible and configurable in Gateway: ChirpStack Gateway Bridge, ChirpStack Network Server and ChirpStack Application Server.

4.1 Turn on ChirpStack LoRa Server Mode



Prepare a router, and the network connection is shown in the figure:

- (1) Check the IP of "sensecap" in the background of the router.
- (2) Enter IP in the browser: IP:8000 If the IP is 192.168.1.1, enter 192.168.1.1:8000

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36	enseCAP LoRa Gateway
•	User sensecap
Ô	Password
Ô	Password

(3) User: sensecap

Password: sensecap!!!

(4) Turn off the "Use Seeed's Server", and turn on "Use Local LoRa Server".

	Dashboard	≡ Seeed LoRaWAN Gateway	Ð
Ŷ	Wi-Fi		
Ŷ		LoRaWAN Radio Configuration	Packet Dispatch Configuration
.ıl	Cellular	Use LoRaWAN Tx Power	Use Seeed's Server
•	Lora Server		Use Local LoRa Server

(5) Turn on the "Use LoRa Server" button, and apply. ("LoRa Server" is the name of ChirpStack LoRa Server)





#	Dashboard	≡ Seeed LoRaWAN Gateway		Ð
÷	Wi-Fi			
Ŷ	LoRa	LoRa Server Configuration		
al	Cellular			
		Use LoRa Server		
				APPLY
-	Dashboard	≡ Seeed LoRaWAN Gateway		Ð
(î	Wi-Fi			
Ŷ	LoRa	LoRa Server Configuration		
al	Cellular			
		Use LoRa Server		
				APPLY
		LoRa Server Status		
		Gateway Bridge Status Active: inactive (dead)		
		Network Server Status Active: inactive (dead)		
		Application Server Status Active: inactive (dead)		
		Start LoRa Server on system startup false		
				START CHECK STATUS
		Gateway Bridge Configuration	Network Server Configuration	Application Server Configuration



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4.2 ChirpStack LoRa Server Configuration

First, click the "Start" button to start the service.



(1) ChirpStack Gateway Bridge:

Refer to: https://www.chirpstack.io/gateway-bridge/

It converts LoRa® Packet Forwarder protocols into a ChirpStack Network Server common data-format (JSON and Protobuf).

For security reasons, this file is read-only.

Dashboard	≡ Seeed LoRaWAN Gateway		Ð
Wi-Fi	Application Server Status Active: inactive (dead)		
LoRa			
Cellular	Start LoRa Server on system startup false		
	-	r -	START CHECK STATUS
	Gateway Bridge Configuration	Network Server Configuration	Application Server Configuration
	[general] # debug=5, info=4, warning=3, error=2, fatal=1, paric=0 log_level=4 # Log to syslog. # # When set to true, log messages are being written to syslog. log_to_syslog=false	[general] # Log level # # debug=5, info=4, warning=3, error=2, fatal=1, paric=0 log_level=4 # Log to syslog; # # When set to true, log messages are being witten to syslog.	[general] # Log level # # debug=5, info=4, warning=3, error=2, fatal=1, panic=0 log_level=4 # Log to syslog; # # When set to true, log messages are being written to syslog;
	# Filters. # # These can be used to filter LORAWAN frames to reduce bandwith usage between # the gateway and ChirpStack Gateway Bridge. Depending the used backend, filtering # will be performed by the Packet Forwarder or ChirpStack Gateway Bridge.	log_to_syslog=false # PostgreSQL settings. # # Please note that PostgreSQL 9.5+ is required. [postgres/] # Postgres/Userpassword@hostname/databas	log_to_syslog=false # The number of times passwords must be hashed. A higher number is safer as # an attackase more time to perform. password_hash_iterations=100000 # PostgreSQL settings.
	For security reasons, this file is read-only.	RESET APPLY	RESET APPLY

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(2) ChirpStack Network Server:

Refer to: https://www.chirpstack.io/network-server/

The responsibility of the Network Server component is the de-duplication of received LoRaWAN frames by the LoRa® gateways and for the collected frames handle the: Authentication; LoRaWAN mac-layer (and mac-commands); Communication with the ChirpStack Application Server; Scheduling of downlink frames.

In general, the default configuration is used. Please refer to the official tutorial before making any modifications.

Click "APPLY" to save the configuration after making changes.

Then, click "STOP" in "Application Server Status" and finally click "START" to make the configuration take effect.



(3) ChirpStack Application Server:

Refer to: https://www.chirpstack.io/application-server/

It is responsible for the device "inventory" part of a LoRaWAN infrastructure, handling of join-request and the handling and encryption of application payloads.

In general, the default configuration is used. Please refer to the official tutorial before making any modifications.

Click "APPLY" to save the configuration after making changes.

Then, click "STOP" in "Application Server Status" and finally click "START" to make the configuration take effect.

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(4) If you have the wrong configuration, click "RESET" to restore the default configuration.





4.3 MQTT Bridge Configuration

The MQTT Bridge is able to publish all the uplink data from devices to your remote MQTT broker, and also subscribe downlink topic. Please visit ChirpStack(https://www.chirpstack.io/application-server/integrations/mqtt/) for more information about scheduling downlink data.

4.3.1 Gateway Configuration

(1) Click "Use MQTT Bridge".

shboard	≡ Seeed LoRaWAN Gateway		
Fi	# Log to syslog.	log_level=4	log_level=4
ła	" When set to true, log messages are being written to syslog. log_to_syslog=false	# Log to syslog. # # When set to true, log messages are being	# Log to syslog. # # When set to true, log messages are being
lular	# Filters.	written to syslog. log_to_syslog=false	written to syslog. log_to_syslog=false
	# Filters. # # These can be used to filter LoRaWAN frames to reduce bandwith usage between # the gateway and ChirpStack Gateway Bridge. Depending the used backend, filtering # will be performed by the Packet Forwarder or	# PostgreSQL settings. # Please note that PostgreSQL 9.5+ is required. [postgresq] # PostgreSQL dan (e.g.:	# The number of times passwords must be hashed. A higher number is safer as # an attack takes more time to perform. password_hash_iterations=100000
	ChirpStack Gateway Bridge.	postgres://user:password@hostname/databas	# PostgreSQL settings.
		ata from devices to your remote MQTT broker, and also su	bscribe downlink topic. Please visit <u>chirpstack</u>
	The MQTT Bridge is able to publish all the uplink d for more information about scheduling downlink d		bscribe downlink topic. Please visit <u>chirpstack</u>
	The MQTT Bridge is able to publish all the uplink d		bsoribe downlink topic. Please visit <u>chirpstack</u>
	The MQTT Bridge is able to publish all the uplink d for more information about scheduling downlink d Connect Status		bsoribe downlink topic. Please visit <u>chirpstack</u>
	The MQTT Bridge is able to publish all the uplink d for more information about scheduling downlink d Connect Status		bsoribe downlink topic. Please visit <u>chirpstack</u>

(2) After filling in each parameter, click "APPLY".

1)

MQTT Server address: mqtt://xxx.xx or mqtts://xxx.xx

If xxx.xx (IP) is 111.230.200.102, the address is mqtt://111.230.200.102 or mqtts://111.230.200.102 If xxx.xx (url) is mybroker.com, the address is mqtt:// mybroker.com or mqtts:// mybroker.com

2

MQTT Server 's Port.

In general, mqtt corresponds to port 1883 and mqtts to port 8883.





3

Keepalive:

60 is default value. When the MQTT connection between the Gateway and the Server is disconnected over 60 seconds, it determines that the client is offline.

0 means turn off the keepalive function.

4

CleanSession:

true: the gateway reconnects to the network after a power outage or disconnection, and cannot receive data from MQTTpub to the gateway for that period.

false: the gateway reconnects to the network after a power outage or disconnection, and can receive data from MQTTpub to the gateway for that period.

5

Username: Null if none, depending on the server configuration.

6

Password: Null if none, depending on the server configuration.

 \overline{O}

Client ID: Custom the name, and each Client ID is unique to the same MQTT server.

8

Publish QoS: 0, 1 or 2. (refer to the MQTT rules)

9

Subscribe QoS: 0, 1 or 2. (refer to the MQTT rules)

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#	Dashboard	≡ Seeed LoRaWAN Gateway		Ð
(î:	Wi-Fi	🥌 Use MQTT Bridge		
<u>ج</u> ۱۱	LoRa Cellular	Remote MQTT Broker URL, support 'mqtt' and 'mqtts', (e.g. mqtt://mybroker.com)	0	
 <u> </u>	Lora Server	Port 0	2	
		Keepalive, default to 60, set 0 to disable . 60	3	
		CleanSession, default to true, set false to receive QoS 1 and 2 messages while offline true	4	
		Username	5	
		Password	6	
		Client ID	Ø	.
		Publish QoS 0	8	.
		Subscribe QoS 0	9	
		Verify server certificate		
#	Dashboard	≡ Seeed LoRaWAN Gateway		Ð
(î~	Wi-Fi	Remote MOTT Broker URL, support 'mqtt' and 'mqtts', (e.g. mqtt://mybroker.com) mqtt://111.230.200.102		_
۲ ۱۱	LoRa Cellular	Port 1883		
	Lora Server	Keepalive, default to 60, set 0 to disable 60		
		CleanSession, default to true, set false to receive QoS 1 and 2 messages while offline true		_
		Username		
		Password		
		Client ID Test		_
		Publish QoS O		- Q
		Subscribe QoS		
		Verify server certificate	Т	
			CHECK STATUS	┓╿

(3) It is off by default and can generally be ignored: Verify server certificate.If true, the server certificate is verified against the list of supplied CAs.If false, the server certificate is verified against your self-signed certificate.



	Dashboard	≡ Seeed LoRaWAN Gateway	Ð
(îr	Wi-Fi		
Ŷ	LoRa	Password	
al	Cellular	Client ID Test	
	Lora Server	Publish QoS 0	
		Subscribe QoS O	
		Verify server certificate	1
		Use self signed CA certificate	
		#	
		CHECK STATUS APPL	Y

(4) Check Status: Disconnected / Reconnecting / Connected.

-	Dashboard	≡ Seeed LoRaWAN Gateway	Ð
(î	Wi-Fi	For security reasons, this file is read-only.	
Ŷ	LoRa	RESET APPLY RESET APP	<u>×</u>
al	Cellular	MQTT Bridge Configuration	
•	Lora Server	The MQTT Bridge is able to publish all the uplink data from devices to your remote MQTT broker, and also subscribe downlink topic. Please visit <u>chirpstack</u> for more information about scheduling downlink data. Connect Status connected Image: Use MQTT Bridge Remote MQTT Broker URL, support mqtf and 'mqtts', (e.g. mqtt.//mybroker.com) mqtt://111.230.200.102 Port 1883 Keepalive, default to 60, set 0 to disable 60 CleanSession, default to true, set false to receive QoS 1 and 2 messages while offline true Username Password	

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4.3.2 MQTT Client Configuration

For details, please refer to: https://www.chirpstack.io/application-server/integrations/events/#ack

ApplicationID: the Application ID.

	ChirpStack			Q Search organizatio		? 🕑 admin
^	Dashboard Network-servers	Applications				+ CREATE
® E	Gateway-profiles Organizations	ID	Name	Service-profile	Description	
•	All users	1	test-app	test-service-profile	testing	
٩	API keys				Rows per page: 10 💌	1-1 of 1 < >
chirp	stack 👻					
Dev	EUI: Device El	UI.				
Ар	plications / test-	арр				DELETE
	DEVICES	APPLICATION CONFIGUR	ATION INTEGRATION	S FUOTA		
						+ CREATE
	Last seen	Device name	Device EUI	Device profile	Link margin	Battery
	an hour ago	868-node	2cf7f1202100029b	test-device-profile	n/a	n/a
-				R	ows per page: 10 👻 1-1 o	f1 < >

(1) Device data subscription

application/[ApplicationID]/device/[DevEUI]/event/up

e.g. application/1/device/ 2cf7f1202100029b/event/up

(2) Join packet subscription

application/[ApplicationID]/device/[DevEUI]/event/join

e.g. application/1/device/ 2cf7f1202100029b/event/join

(3) Status packet subscription

application/[ApplicationID]/device/[DevEUI]/event/status

e.g. application/1/device/ 2cf7f1202100029b/event/ status





4.3.3 Scheduling a Downlink

The default topic for scheduling downlink payloads is:

```
application/[ApplicationID]/device/[DevEUI]/command/down
```

The ApplicationID and DevEUI of the device will be taken from the topic. Example payload:

{		
	"confirmed": true,	// whether the payload must be sent as confirmed data down or not
	"fPort": 10,	// FPort to use (must be > 0)
	"data": ""	// base64 encoded data (plaintext, will be encrypted by ChirpStack
Net	work Server)	
	"object": {	// decoded object (when application coded has been configured)
		ensor": {"1": 25}, // when providing the 'object', you can omit 'data'
	"humiditySens	or": {"1": 32}
	}	
}		XO*





4.4 ChirpStack Application Server

4.4.1 Log on to the background

According to the Gateway IP obtained in Section 4.1, log in the Web UI. The login address: IP:8080 (if IP is 192.168.8.100, enter 192.168.8.100:8080) Username(default): admin Password(default): admin

	LOGIN
Password *	
admin	
Username / email *	
ChirpStack Login	

4.4.2 Add the Network-servers

€	ChirpStack			٩	Search organizati	on, application, gatev	vay or device	?	e admin
A	Dashboard	Network-servers						[+ ADD
CIUNER CIUNER CIUNER	Network-servers							L.	
R	Gateway-profiles	Name			Server				
	Organizations								
•	All users					Rows per	page: 10 🔻	0-0 of 0	< >
٩	API keys								
chirp	ostack 👻								
A	Org. dashboard								
•	Org. users								
٩	Org. API keys								
*==	Service-profiles								
H	Device-profiles								
R	Gateways								
	Applications								
2	Multicast-groups								
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€	ChirpStack	Q Search	organization, application, gateway or device ?	\rm adn
÷	Dashboard			
COMM COMM COMM	Network-servers	Network-servers / Add		
R	Gateway-profiles			
	Organizations	GENERAL GATEWAY DISCOVERY TLS CERTIFICATES		
•	All users	Network-server anne * test-network-server		
٩	API keys	A name to identify the network-server.		
chirn	stack 👻	Network-server server * localhost:8005 The 'bostname port' of the network-server e.g. 'localhost:8000'		
↑	Org. dashboard Org. users	The 'hostname.port' of the network-server, e.g. Tocalhost:8000'.	ADD NETWORK-5	SERVER
٩	Org. API keys			
	Service-profiles			
	Device-profiles			
R	Gateways			
	Applications			
2	Multicast-groups			
D	Network-serve	er name: custom name.		

Network-server server: the default value is localhost:8005
 Refer to: <u>https://www.chirpstack.io/network-server/install/config/</u>. You can modify it in the "Network Server Configuration".

Network Server Introduction Downloads Changelog Install Configuration	Ť	<pre># after a preceeding downlink tx (per device). downlink_lock_duration="2s" # Multicast gateway delay. # In case of a multi-gateway multicast downlink, this delay will added to # the transmission time of each downlink to avoid collisions between overlappin # gateways. multicast_gateway_delay="2s"</pre>	Table of contents Configuration file Securing the Network Server API Join Server API configuration Environment variables
Debian / Ubuntu ins Requirements Backends Features Integrate Metrics Community	stallation > > > >	<pre># Network-server API # This is the network-server API that is used by ChirpStack Application Server o f custom components interacting with ChirpStack Network Server. [network_server.api] f ip:port to bind the api server bind="0.0.0.80800" f ca certificate used by the api server (optional) ca_cert="" f tls certificate used by the api server (optional) tls_cert="" f tls key used by the api server (optional) tls_key=""</pre>	
		<pre># Gateway settings. [network_server.gateway] # CA certificate and key file (optional). # # When setting the CA certificate and key file options, ChirpStack Network Serve # will generate client certificates which can be used by the gateway for # authentication and authorization. The Common Name of the certificate will # be set to the Gateway ID. ca_cert="" ca_key=""</pre>	

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4.4.3 Create the Gateway-profiles

 Enabled channels: 0, 1, 2 EU channels: 0, 1, 2 34 / 46 Seeed Studio ©2008-2020 Seeed Technology Co., Ltd. All rights reserve 	€	ChirpStack				Q Sea	arch organizati	on, application, ga	iteway or devic	e	admin
 Network-servers Gateway-profiles All users All users All users All users All users Org.API keys Service-profiles Gateways Applications Multicast-groups 10 Name: custom name. 20 Name: custom name. 20 Name: custom name. 20 Name: custom name. 21 Name: custom name. 22 Enabled channels: 0, 1, 2 EU channels: 0, 1, 2 Secced Studio ©2008-2020 Seeed Technology Co., Ltd. All rights reserve	A	Dashboard	Cat	owov profiles						+ CREATE	() HELP
Name Secced studio ©2008-2020 Seceed Studio ©2008-2020 Seceed Studio ©2008-2020 Seceed Studio Part Name Name Name Seceed Studio		Network-servers	Gat	eway-promes							
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 All users API keys Org. dashboard Org. users Org. API keys Service-profiles Gateways Applications Multicest-groups P Name: custom name. 2 Enabled channels: 0, 1, 2 EU channels: 0, 1, 2 Secect Studio © 2008-2020 Seeed Technology Co., Ltd. All rights reserved		Organizations	1.1					-			
thirpstack forg. dashboard Org. users Torg. API keys Service-profiles Device-profiles @ Gateways Hulttcast-groups P. Name: custom name. P. Name: custom name. P. Name: custom name. P. Name: custom name. Enabled channels: 0, 1, 2 EU channels: 0, 1, 2 Secect Studio ©2008-2020 Seeed Technology Co., Ltd. All rights reserved	•	All users						Rows	per page: 10 👻	0-0 of 0	< >
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 Name: custom name. Enabled channels: 0, 1, 2 EU channels: 0, 1, 2 34 / 46 Seeed studio ©2008-2020 Seeed Technology Co., Ltd. All rights reserve 		Applications									
 Enabled channels: 0, 1, 2 EU channels: 0, 1, 2 34 / 46 Seeed Studio ©2008-2020 Seeed Technology Co., Ltd. All rights reserve 	2	Multicast-groups	•								
Seeed Studio ©2008-2020 Seeed Technology Co., Ltd. All rights reserve	1) 2	Enabled chan	nels:	0, 1, 2							
	SP		lio	©2008-2020	Seeed		Co.,	Ltd.	All	riahts	reserved
olution.seeedstudio.com							/				



US902-923 channels (sub-band 2): 8, 9, 10, 11, 12, 13, 14, 15, 65

③ Network-server: select the Network-server you created earlier.

€	ChirpStack		Q Search organization, application, gateway or device	? 🕒 admin
A	Dashboard	Gateway-profiles / Create		
	Network-servers			
R	Gateway-profiles	Name *		
	Organizations	test-gateway-profiles	1	
•	All users	A short name identifying the gateway-profile.		
٩	API keys	Enabled channels * 0, 1, 2	2	
chirr	ostack 👻	The channels active in this gateway-profile as specified in the LoRaWAN Reg in this list.	ional Parameters specification. Separate channels by comma, e.g. 0, 1, 2. Extra chan	tels must not be included
A	Org. dashboard	Network-server * test-network-server	3	· ·
•	Org. users		ADD EXTRA CHANNEL CREA	TE GATEWAY-PROFILE
٩	Org. API keys			
•===	Service-profiles			
11 11	Device-profiles			
R	Gateways			
	Applications			
2	Multicast-groups			
Clic	k the "GREATE	GATEWAY-PROFILE".		
∉	ChirpStack		Q Search organization, application, gateway or device	? S admin
ń	Dashboard	Gateway-profiles		CREATE Ø HELP

4.4.4 Create the Service-profiles





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- ① Service-profile name: custom name.
- ② Network-server: select the Network-server you created earlier.

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- 3 Add gateway meta-data: select it.
- (4) Default values are usually used.

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4.4.5 Create the Device-profiles

€	ChirpStack	Q Search organization, application, gateway or device ? each admin
^	Dashboard Network-servers	Device-profiles + CREATE
R	Gateway-profiles	Name Network Server
	Organizations	Rows per page: 10 0-0 of 0 < >
-	All users	nows per page. 10 + 00010 + 7
٩	API keys	
chirp	stack 👻	
A	Org. dashboard	
•	Org. users	
٩	Org. API keys	
۳	Service-profiles	
코는	Device-profiles	
R	Gateways	
	Applications	
2	Multicast-groups	
€	ChirpStack	Q Search organization, application, gateway or device ? early admin
A	Dashboard	GENERAL JOIN (OTAA / ABP) CLASS-B CLASS-C CODEC TAGS
	Network-servers	Device-profile name *
R	Gateway-profiles	test-device-profile 1
	Organizations	A name to identify the device-profile.
-	All users	Network-server* test-network-server 2
٩	API keys	The network-server on which this device-profile will be previsioned. After creating the device-profile, this value can't be changed.
ohim	stack 👻	1.0.2 3
cum	stack 👻	The LoRaWAN MAC version supported by the device.
A	Org. dashboard	B (4)
•	Org. users	Revision of the Regional Parameters specification supported by the device. Max EIRP *
٩	Org. API keys	0 (5)
	Service-profiles	Maximum EIRP supported by the device.
H	Device-profiles	Uplink interval (seconds) * 3600 6
\bigcirc	Gateways	The expected interval in seconds in which the device sends uplink messages. This is used to determine if a device is active or inactive.
	Applications	CREATE DEVICE-PROFILE
2	Multicast-groups	

- 1 Device-profile name: custom name.
- O Network-server: select the Network-server you created earlier.
- ③ LoRaWAN MAC version: 1.0.2 (only for SenseCAP Node)
- (a) LoRaWAN Regional Parameters revision: B (only for SenseCAP Node)



5 Max EIRP: 0

G Uplink interval (seconds): 3600Be consistent with the node's upload interval.

Click the "JOIN(OTAA/ABP)", and select "Device supports OTAA".

€	ChirpStack		Q Search organization	ı, application, gateway	/ or device	? e admin
^	Dashboard Network-servers	Device-profiles / Create				
® == •	Gateway-profiles Organizations All users	GENERAL JOIN (OTAA / ABP) CLASS-B	CLASS-C	CODEC	TAGS	
℃ chirp	API keys ostack -				CREA	ATE DEVICE-PROFILE

To get a SenseCAP Sensor Node on quick decoding, we provide a piece of code.

Click the "CODEC", and select "Custom JavaScript codec functions".

Then view <u>https://github.com/Seeed-Solution/TTN-Payload-Decoder/blob/master/decoder.js</u>, please copy the code to "function decode" FUNC.

```
function Decoder (bytes, port) {
    // init
    var bytesString = bytes2HexString(bytes)
        .toLocaleUpperCase();
.....
return binaryData.toString()
        .replace(/,/g, "");
}
```





 Dashboard Network-servers Gateway-profiles Organizations All users All users API keys Chirpstack Org. dashboard Org. dashboard Org. dashboard Org. users Org. users Org. API keys Favice-profiles Org. users Org. API keys Service-profiles Org. API keys Favice-profiles Org. dashboard Org. dashboard	? adn
Network-servers Gateway-profiles General JOIN (OTA / ABP) CLASS-8 CLASS-C CODEC TAGS Profiles Custom JavaScript codec functions By defining a payload codec, ChipStack Application Server can encode and decode the binary device payload for you. API keys i// Drug dashboard org. users org. API keys i// Charles for the data for the string in object, e.g. (TSS, TBM, TSS, TSS, TBM, TSS, TSS, TSS, TSS, TSS, TSS, TSS, TS	DELE
GENERAL JOIN (OTAA / ABP) CLASS-B CLASS-C CODEC TAGS Organizations Payload codec All users By defining a payload codec, ChirpStack Application Server can encode and decode the binary device payload for you. API keys I// Decode decodes an array of bytes into an object. Importance I// Decode decodes an array of bytes into an object. Importance I// Decode decodes an array of bytes, tags (TG, 200, 205, 0) Importance I// Decode decodes an array of bytes, tags (TG, 200, 205, 0) Importance I// Decode decodes (ffort, bytes, variables) (TG, 200, 205, 0) Importance Importance may of bytes, tags (TG, 200, 205, 0) Importance Importance may of bytes, tags (TG, 200, 205, 0) Importance Importance may of bytes, tags (TG, 200, 205, 0) Importance Importance may of bytes, tags (TG, 200, 205, 0) Importance Importance may of bytes, tags (TG, 200, 205, 0) Importance Importance may of bytes, tags (TG, 200, 200, 0) Importance Importance may of bytes, tags (TG, 200, 200, 0) Importance Importance may of bytes, tags (TG, 200, 200, 0) Importance Importance may of bytes, tags (TG, 200, 200, 0) Importance Importance may	
All users Device-profiles Org. API keys 1 // Exote decide (fort, bytes, port) (// valid true, general decide (fort, bytes) and must return an object. ChirpStack Application Server will convert this object to JSON.	
All users By defining a payload codec, ChirpStack Application Server can encode and decode the binary device payload for you. API keys 1 // Decode decodes an array of bytes into an object. birpstack 7 // The function must have to function be device variables e.g. (Calibration": "3.5") (both the key / value are of type string) Org. dashboard 7 // The function must return an object, e.g. (Temperature": 22.5) Org. users 10 // The function must return an object, e.g. (Temperature": 22.5) Org. API keys 11 // valid Service-profiles 12 // valid Device-profiles 13 // breating.finance 14 // Encode encodes the given object into an array of bytes. 17 // Ford contains the device variables e.g. (Tableration": "3.5") (both the key / value are of type string) 18 // breat 10 // valid 19 // valid valid: true, e.g. (Temperature": 22.6) 10 // breat 14 // valid 11 // breat 16 // valid 12 // breat 17 // valid 13 // valid: 18 // breat 14 // breat 18 // breat 15 // breat 18 // breat 16 // breat 18 // breat 17 // breat 19 // breat 18 // breat 19 // breat <td></td>	
API keys irpstack 0rg. dashboard Org. dashboard 0rg. users 0rg. API keys Service-profiles Device-profiles 0 10 10 11 12 13 14 14 15 16 17 18 19 19 19 10 10	
impstack i// - brets is an array of bytes, e.g. (228, 230, 03, 258, 01 Org. dashboard i// - brets is an array of bytes, e.g. ("calibration": "3.5") (both the ker / value are of type string) Org. dashboard i// The function must return an object, e.g. ("temperature": 22.5) Org. users i// init Org. API keys i// init Service-profiles i// brets Device-profiles i// brets I// brets is an object into an array of bytes, e.g. ("temperature": 22.5) Org. API keys ii// valid iii iii/ valid: valid: valid: iii	
Org. users init Org. API keys init Org. API keys init Service-profiles init Device-profiles init Device-profiles init J // matiat J // said J // said J // said J // wild: true, in // matiat J	
Org. API keys 13 // valid Service-profiles 14 valid: true, err, 0, // bytes Device-profiles 16 // messaces array Device-profiles 18 // messaces array The function must have the signature function Decode(fPort, bytes) and must return an object. ChirpStack Application Server will convert this object to JSON. Gateways 1 1 Applications 1 -ffort contains the LoRAWAN forto an array of bytes. 3 Applications 3 1 odd is an object, e.g. ("calibration": "3.8") (both the key / value are of type string) 5 5	
Service-profiles 10 // breas pariod: breastring. // apsages array Device-profiles 17 // apsages array Gateways 1 // Ford encodes the given object into an array of bytes. 2// - Ford encodes the given object into an array of bytes. 2// - Ford encodes the lob/8X (Fort number // - organise the lob/8X (Fort number)	
Device-profiles 18 // messaces arter Gateways The function must have the signature function Decode(fPort, bytes) and must return an object. ChirpStack Application Server will convert this object to JSON. Gateways 1 // Encode encodes the given object into an array of bytes. 2 // - FPort contains the LofaWN FPort number 2 // - FPort contains the LofaWN FPort number 3 // - arables contains the dotice variables e.g. ("featDration": "3.8") (both the key / value are of type string) 4 // - variables contains the dotice variables e.g. (25, 330, 355, 0)	
Applications 1 // Encode encodes the given object into an array of bytes. 2 // - fbut contains the LoBAWA fbut number 3 // - obj is an object, e.g. ("temperature": 22.5, 330, 255, 0] 5 // The function must return an array of bytes, e.g. ("Calibration": "3.5") (both the key / value are of type string)	
Applications 3 // - obj is an object, e.g. ("temperature": 22.5] 4 // - variables contains the device variables e.g. ("calibration": "3.5") (both the key / value are of type string) 5 // The function must return an array of bytes, e.g. [225, 230, 255, 0]	
viniteast-groups	

Add the return value at the end:

return Decoder(bytes, fPort);

€	ChirpStack	Q Search organization, application, gateway or device	😫 admin
A	Dashboard	GENERAL JOIN (OTAA / ABP) CLASS-B CLASS-C CODEC TAGS	
	Network-servers	Payload codec	
R	Gateway-profiles	Custom JavaScript codec functions By defining a payload codec, ChirpStack Application Server can encode and decode the binary device payload for you.	•
	Organizations	317 var item = arriforArr]; 318 var data = parseInt(item, 16)	
•	All users	319 .toSpring(2): 320 var datalenath = data.length: 321 if (data.length = 36) {	
٩	API keys	321 if (data: engin (o) t 322 for(var i = 0) i < 8 - datalength; i++) { 323 data = "0" + data; 324 }	
chirp	stack 👻	323) 326 binaryData.push(data): 327 }	
A	Org. dashboard	328 return binarData.toString() 329 .replace(/,/g, %); 330()	
•	Org. users	331 332 333 return Decoder(bytes, fPort):	
٩	Org. API keys	334] The function must have the signature function Decode(fPort, bytes) and must return an object. ChirpStack Application Server will convert this object to JSON.	*
∰	Service-profiles	1 /// Encode encodes the given object into an array of bytes. 2 /// -fPort contains the LoEARAM fPort number	
표	Device-profiles	3 // ' - obj is an object, e.g. ("temperature": 22.5) 4 // - variables contains the device variables e.g. ("calibration": "3.5") (both the key / value are of type string)	
\bigcirc	Gateways	6 /// The function must return an array of bytes, e.g. [225, 230, 255, 0] 6 function Encode(fPort, obj, variables) (7 return [];	
	Applications	8]	
Ψ	Multicast-groups		

Finally, click "Create".





5 Device Installation

In this chapter, we will introduce the gateway,its respective installation processes, as well as the dos and don'ts. Before installing, please check the part list to ensure nothing is missing.

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5.1 Part List

5.1.1 Gateway Part List



The LoRa Gateway comes with a standard antenna. If you need ultra-long-distance communication, you will need to purchase a high-gain fiberglass antenna.

ltem	Name	Quantity
1	LoRa Gateway	1
2	LoRa Antenna	1
3	4G Antenna	1
4	Allen Hex Key	1
5	Mounts	4
6	Power Adapter	1
7	Power Extension Cable (5M)	1
8	Ferrules / Aluminum piece	2/2
9	M5 Self-drilling Screw	8
10	Antenna Lightning Protector (*Optional)	1
11	LoRa Fiberglass Omni Antenna (*Optional)	1
12	LoRa Antenna Brackets (*Optional)	1

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5.2 Gateway Installation

5.2.1 Gateway Installation Methods

• Installing on a pole (Use the Mounts)

Firstly, use M5 self-drilling screws (included in the package) to fasten the 4 brackets onto the gateway. And then use cable ties to fasten the gateway onto the pole. The recommended pole diameter is 70mm.



Put cable ties through the holes of the bracket and pull to fasten onto the pole. To get a better communication range, it is recommended to mount the gateway 3 meters above the ground. If there are tall buildings around, the gateway should be kept away from the building or mounted on top of the tall building.



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• Installing on a pole (Use the Ferrules and Aluminum pieces)

Firstly, use M5 self-drilling screws (included in the package) to fasten the 2 Aluminum pieces onto the gateway. And then use ferrules to fasten the gateway onto the pole. The recommended pole diameter is 76mm.



Note: If the pole is made of metal, the antenna should be pulled higher than the metallic part of the pole, or the communication signal will have interfered.

• Installing on the Wall

Firstly, use M5 self-drilling screws (included) to fasten the 4 brackets onto the enclosure of the gateway (refer to the image below for directions). And then fasten the gateway onto the wall with screws.





Note: The screws (that fasten gateway onto the wall) are not included in the package. Please prepare screws according to the wall materials (recommended screw diameter: 6mm).

5.2.2 Installation Precautions

- 1) In mountainous or thunderstorm-stricken areas, please take lightening protection measures. For the fiberglass LoRa antenna, you will need to install a lightening arrester and make sure it is connected to the ground. Besides, the gateway should be mounted lower than the lightening rod.
- 2) When installing the gateway in the outdoor environment, the connected part should be protected with waterproof tape, to enhance waterproof performance and lengthen device lifespan. As shown below, use self-adhesive tape to protect the connection. Take a rubber tape at the length of 10cm ~ 15cm, pull it to twice of that length



wind the tape clockwise to the connected part of the antenna.







Note: The tape must be wound clockwise because the antenna is fastened clockwise. Otherwise, the antenna may loosen.

If the sensor has wires, install threaded tubes:



5.2.3 Installing Fiberglass LoRa Antenna

There are two kinds of LoRa antennas: the normal LoRa antenna (included in the package), and the fiberglass LoRa antenna (to be purchased separately). We will introduce how to install the fiberglass LoRa antenna.

1) Fasten the lightening arrester onto the antenna port.

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- 2) As shown in the image below, please fasten the fiberglass antenna onto the base part, and then fasten the whole part onto the vertical cylinder (maximum cylinder diameter: 50mm).
- 3) Use a 1-meter antenna feed line to connect the lightening arrester with the fiberglass antenna.



5.2.4 Installing Ground Cable

Here we will connect the lightening arrester to the GND screw port on the gateway with a ground cable, and then connect the whole device to the ground. The image below shows the location of the GND port at the backside of the gateway.

- 1) Prepare two copper cables, a shorter one (approx. 30cm) for connecting the lightening arrester with the GND screw port (on the gateway), and a longer one for connecting the device to the ground.
- 2) Fasten the lightening arrester to the short copper cable with screws, and then connect the two copper cables to the GND screw port. Use the screw to connect and fasten them.
- 3) Once the two cables are connected, connect the other end of the long cable to the ground. Depending on your actual installation environment, you can connect it to the ground directly or connect it to the copper ground bars.