LoRaWAN Gateway Embedded with NS User Manual	Ver.	Class
	V1. 0. 5	
	Product: LoRaWAN Gateway	
	Embedded with NS	

LoRaWAN Gateway Embedded with NS User Manual



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Preface

Overview

This user manual suits F8926-GW/F8L10GW embedded with NS version. F8926-GW/F8L10GW embedded with NS version can be configured as a common LoRaWAN gateway to transparently transmit data to an external NS server, or set as an embedded NS to directly connect to the customer platform, or set as multiple gateways , using one of the gateways as the NS server, the others as general gateway, and finally forms a gateway group from its web configuration page. Combined with LoRaWAN standard products, including LoRaWAN module, LoRaWAN terminal, LoRaWAN gateway and base station.

You can quickly understand the architecture and functions of the embedded NS, and quickly build a LoRaWAN network using the embedded NS by reading this document.

Readers

This manual is mainly intended for the following engineers:

- System Design Engineer
- Software Engineer
- Test Engineer
- Technical Support Engineer
- Customer

Brief Introduction

This document includes 4 chapters, as followings:

Chapter	Content
1. Product Introduction	Graphical overall architecture, including interfaces, etc.
2. Page Introduction	Each web page function introduction
3. Common operations	Common setting steps
4.Data Format	Various data formats for docking clients



1 Product Introduction



Data Topology

As shown in the figure above, LoRa data receiving and forwarding is the data transfer processing program in the original gateway, this program is to transmit LoRa uplink and downlink data transparently. It receives and packs data simply then forward to NS, or receives NS downlink data and sends to LoRa concentrator, then sends to device. Now the program is modified to communicate with the embedded NS (UDP port is 1699 by default); The data flow direction can be configured in the embedded NS. It will be the same as the traditional mode if the flow is to the external NS, the embedded NS is only for data forwarding and statistical information function. Greatly facilitates



customers to observe the nearby LoRa network environment, so that channel conflicts can be avoided by modifying the frequency grouping. The data will be transferred to embedded NS for processing if it is configured as a embedded NS, and the data will communicate with external clients through the following MQTT or HTTP. The data format is exactly the same as the original Four-Faith external NS.

Embedded NS is used as the LoRaWAN core network. The product can theoretically support a large number of gateways and nodes to access, it manages LoRaWAN equipment network addition, data encryption and decryption, data uplink and downlink, and data push. The uplink data is decrypted by LoRaWAN and establishes a relationship with the client through the interface, and the uplink data is sent to the client platform. Users can download data through MQTT and send it to devices after being encrypted by LoRaWAN.

This document describes the functions of LoRaWAN gateway embedded NS in detail , the meaning of each function module, and the related operations and parameter meanings.

1.1 Embedded NS location in LoRaWAN network

Four-Faith LoRaWAN gateway Embedded NS is safe and reliable. It supports ADR(Auto Data Rate) feature. It uses UDP to communicate between embedded NS and base station, and the protocol is LoRa Alliance Standard protocol. Users don't need external NS if use this LoRaWAN gateway Embedded NS.

1.2 Features

- Can switch to embedded NS or external NS at any time
- Statistics on the data reported from gateway, and compares the uplink data and data rate
- View gateway real-time data report
- View system operation log and set log level
- View and configure wan port, WiFi, firewall parameters
- Check network connection, configure the gateway's uplink and downlink frequency points, and choose the default group or custom frequency point
- LoRa network server adopts a hierarchical management mechanism, which is convenient for device management. It's divided into applications and devices to meet different application scenarios from different industries
- Support ClassA, ClassC
- Support LoRaWAN version (V1.0.2)
- Support to modify the device communication rate range, such as set to SF7-SF12
- Support to modify the downlink transmit power
- Support OTAA method



- Add devices automatically, no need to add in advance
- Real-time view of the device uplink and downlink data
- Multi-gateway can be added, and judge gateway real- time online status
- Provide HTTP push or MQTT subscription and publishing externally to achieve data uplink and downlink
- Support to switch between Chinese and English
- WIFI IP is fixed for easy configuration management
- Node data packet loss rate statistics
- Support a large number of nodes, up to 1000 for one single embedded NS
- Support multiple gateways to form a gateway group, where the main gateway opens the embedded NS, and other data flows to the main gateway, the number of main gateways can be up to 10



2 page introduction

Note: The order of introduction on following pages is from left to right, top to bottom

2.1 Open the web

1) Method 1:

After the gateway is powered on, the default wifi name: Four-Faith-LoRaWAN, the default password is 123456, after connected, open the browser: http://192.168.240.1:8080

2) Method 2:

The gateway WAN address (if set to static IP-192.168.1.88), you can directly visit http://192.168.1.88:8080

 If the page is abnormal or you cannot log in (such as modifying the gateway IP, network connection type, etc.), try to refresh page by CTRL+F5 or use the incognito mode to browse

Note: Please use Google Chrome, other browsers may have compatibility issues

2.2 Login

In the upper right corner, you can switch between Chinese and English. After entering the user name and password, click Login. Default user name: admin, password: 123456

	Four-Faith LoRaWAN Gateway	″ <mark>A</mark> ≭
*	admin	
ô		~ ~
	Login	
		77



2.2.1 Menu directory

D	Status		■ Dashbo	ard / Status / Overview	N				
8	Network		Overview ×						
	LoRa Gateway		7	Receive Count			Send Count	<u></u>	Active Node
8	LoRa Network Serv	er		0			0	**	0
	Svstem								
			LoRa Chan	inel Occupancy Statist	ics			LoRa Rate Occu	pancy Statistics
			-O- chan0		-O- chan3	-O- chan4		-0-	sf7 -O- sf8 -O- sf9
			-Ò- chan7						

- As shown in the figure above, the menu on the left is briefly introduced from top to bottom as follows
- Status: Display the data reported by the gateway, display the channel occupancy and data rate of the reported data, view the real-time log of the uplink and downlink, and view the system log
- You can view and set routing related parameters, and also detect the current network environment
- LoRa Gateway: Built-in or external NS can be configured, and the uplink frequency of the gateway can be configured
- LoRa network server: When the data is configured as the built-in NS, When the device is added to the network, the parameters can be automatically added after the successful verification, without adding the device list in advance
- System: View and configure system related parameters, modify user password and restart the system, etc.
- Upper right corner-Right 1: Click the drop down to log out
- Upper right corner-right 2: switch between Chinese and English
- Upper right corner-right 3: Full screen, click to restore normal screen after full screen
- The middle button on the right: display the theme and other settings



2.3 Status

2.3.1 Overview

Status	E Dashboard / Status / Overview	50 📧 🎴
Overview	Overview ×	
LoRa Packet Logger System Log	Receive Count Send Count	Active Node Busy Nod
⊠ Network ∽		
🕅 LoRa Gateway	LoRa Channel Occupancy Statistics -O- chan0 -O- chan1 -O- chan2 -O- chan3 -O- chan4 -O- chan5 -O- chan6	LoRa Rate Occupancy Statistics
LoRa Network Server	-O- chan/	
☺ System ∽	0.8	0.8
	0.6	0.6
	0.4	0.4
	0.2	0.2
	0 16h 18h 20h 22h 0h 2h 4h 6h 8h 10h 12h 14h	0 16h 18h 20h 22h 0h 2h 4h 6h 8h 10h 12h 14

As shown in the figure above: It mainly contains some statistical information (statistical information will be re-stated after the gateway restarts). The following details are introduced:

- > Receive Count: the number of messages received since the system started
- > Send Count: the number of messages sent when the system starts
- > Active Node: the number of uplink nodes received by the gateway
- Busy node: the node is regarded as a busy node if it is sending twice data in 10 seconds, and the number in the past 1 hour is counted here
- LoRa Channel Occupancy: channel occupancy in each period in the past 24 hours
- LoRa Rate Occupancy Statistics: the rate occupancy of each period in the past 24 hours
- LoRa network server: system startup time, LoRa protocol, number of devices, number of NS devices uplink, number of NS devices downlink, NS MQTT connection status
- System: host name, lan mac, wan mac, wireless mac, wan ip, lan ip, wan protocol respectively
- Wireless: wireless switch, mode, network mode, name, channel, transmission power respectively



2.3.2 LoRa Packet Logger

Status	Dashboard / Statu	is / LoRa Packet Logger						
Overview	Overview × • LoRa Par	cket Logger ×						
LoRa Packet Logger	All	×	devAddr			Clear	Export	
System Log	Time	Data Type	Freq.	RSSI	SNR	TxPwr	Modu	CR
፼ Network ∽								
⁽) LoRa Gateway								
国 LoRa Network Server								
☺ System ∽								

As shown above: The main function is to display the data reported by the gateway in real time. The details are as follows:

- Switch: open by default, can be paused, data is only stored in the background for 10s, will be deleted when it expires
- Type Selection: include ALL/Join Request/Join Accept/Unconfirmed Data Up/Unconfirmed Data Down/Confirmed Data Up/Confirmed Data Down
- devAddr: Enter the short address allocated by the network, then only the relevant data information of the address will be displayed
- > Clear: clear the displayed data
- > Export: Export the data to excel

2.3.3 System Log

Status	Dashboard / Status / System Log
Overview	Overview × LoRa Packet Logger × • System Log ×
LoRa Packet Logger	System Log
System Log	time="2020-11-23 15:57:55" level=DEBUG msg="send to gateway,addr="127.0.0.1:43821",type="PullACK"" time="2020-11-23 15:57:55" level=DEBUG msg="rcv from gateway,addr="127.0.0.1:43821",type="PullData""
🔞 Network 🗸 🗸	
쎻 LoRa Gateway	
LoRa Network Server	
ூ System ∽	

As shown in the figure above: The main function is to display the real-time log of the system running, which is convenient for checking the running status. The details are as follows:

- Switch: open by default, can be paused
- > Copy: Copy all the displayed logs and paste them on the notepad by



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pressing CTRL+V

Clear: clear all current logs

2.4 Network

2.4.1 WAN interface

🖵 Status 🗠	⊒ Dashb	ooard / Network / WAN	I Interface	
Overview	Overview ×	LoRa Packet Logger ×	System Log ×	WAN Interface ×
LoRa Packet Logger			Connection 1	Type Automatic Configuration - DHCP V
System Log			Wan	Nat Disable C Enable
⊠ Network ∧				STP Disable Enable
WAN Interface				Save & Modify
Wi-Fi				
Diagnose				
Firewall				

> network configuration, such as static IP or DHCP



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2.4.2 Wi-Fi

Status	Dashboard / Network / Wi-Fi	
Oveniew	Overview × LoRa Packet Logger × System Log × WAN Interface × • Wi-Fi ×	
LoRa Packet Logger	Basic Wireless Security	
System Log	Wireless Network Disable C Enable	
🕺 Network 🔗	Wireless Mode AP ~	
WAN Interface	Wireless Network Mode Mixed ~	
Wi-Fi	Wireless Network Name (SSID) Four-Faith-LoRaWAN	
Diagnose	Wireless Channel Auto	
Firewall	Channel Width Auto	
👾 LoRa Gateway	Wireless SSID Broadcast Disable C Enable	
III LoRa Network Server	Save & Modify	

- Configure wireless parameters, including mode selection and wireless security settings
- After the parameter is modified here, the wifi will restart, and device need to reconnect to the wifi to use it

2.4.3 Network Diagnose

☐ Status ^	Dashboard / Network / Di	agnose		
Overview	Overview × LoRa Packet Logger	System Log × WAN Interface ×	Wi-Fi × • Diagnose ×	
LoRa Packet Logger	Network Tool			
System Log	120.42.46.98	120.42.46.	98	120.42.46.98
⊠ Network ^	Ping	S Tracero	oute	Nslookup
WAN Interface				
Wi-Fi				
Firewall				

As shown in the figure above: The function is to diagnose the current network environment of the router. The execution commands are as follows: Ping: ping -c 4 120.42.46.98



- Traceroute: traceroute -n -m 4 -q 3 -w 2 120.42.46.98
- Nslookup: nslookup 120.42.46.98
- Copy: copy log
- Clear: Clear the log

2.4.4 Firewall

Status ^	Dashboard / Network /	Firewall					
Overview	Overview × LoRa Packet Log	er × System Log ×	WAN Interface ×	Wi-Fi ×	Diagnose ×	● Firewall ×	
LoRa Packet Logger	Security						
System Log	Firewall Protection						
🗟 Network 🗠	SPI Firewall						
WAN Interface	Additional Filters						
W6 E1	Filter Proxy						
VVI-FI	Filter Cookies						
Diagnose	Filter Java Applets						
Firewall	Filter ActiveX						

- > Configure firewall related parameters
- ۶

2.5 LoRa Gateway

2.5.1 LoRa gateway

ē	Status	Ξ Dashb	oard / LoRa Gateway /	LoRa Gateway						
1	Network ~	Overview ×	LoRa Packet Logger ×	System Log ×	WAN II	nterface ×	Wi-Fi ×	Diagnose ×	Firewall ×	● LoRa Gateway ×
		Basic	Frequency Band Set							
8	LoRa Network Server			* Gateway	MAC	54D0B4F	FFE3AB6CI	E		
	System 🗸			* Internal UDP	Port	1699				
				Prot	tocol	Build-in L	.oRa Serve	r		~
				Keepalive Interv	al (s)	10				
						Save 🤡	& Modify			

- > Currently is external NS mode, it can be modified to built-in NS
- When configured as gateway cascade, the internal communication port and server port (UDP) cannot be the same
- Device information (including network information) when switching between internal and external NSs is different on different NS, and devices

	® LoRaWA	N Gateway Embeded with NS User Manual
generally ne	eed to be re-joined	
🖵 Status 🗸 🗸	Dashboard / LoRa Gateway / LoRa Gateway	
🕲 Network 🛛 🗡	Overview × LoRa Packet Logger × System Log × WAN	Interface × Wi-Fi × Diagnose × Firewall × • LoRa Gateway
🖗 LoRa Gateway	Basic Frequency Band Set	
LoRa Network Server	Is Customize	
Status	Working Area (Frequency Band MHz)	CN_470_510 ~
Basic	LoRaWAN Public	
Gateway	Erequency Sub Band	channel 0 channel 7 (470 2MUz 471 7MUs)
Application	Frequency Sub-Band	
Global Integration		Save & Modify
ூ System ∽		

- > Support to choose between custom and non-custom modes
- Non-custom mode (recommended)-select the frequency band (such as CN470), select the corresponding group (the group contains the start-end value of the frequency point, a total of 8 frequency points, 0.2MHz interval)
- Custom mode-can manually modify the center frequency point and frequency point offset (as shown below)
- The frequency band and frequency parameters set here are lora radio frequency transceiver parameters. After modification, the gateway's receiving frequency of lora signal and other information will be adjusted

		ls Cu	stomize	0						
	Radio 0 C	enter Freque	ency(Hz)	170600000						
	Radio 1 C	enter Freque	ency(Hz)	471400000						
	Minimu	ım Tx Freque	ency(Hz)	\$70000000						
	Maximu	ım Tx Freque	ncy(Hz)	510000000						
		LoRaWAI	N Public	D						
chan.ID	MultiSF 0	MultiSF 1	MultiSF 2	MultiSF 3	MultiSF 4	MultiSF 5	MultiSF 6	MultiSF 7	LoRa std	FSK
Enable										
Radio	Radio 0	Radio 0	Radio 0	Radio 0	Radio 1	Radio 1	Radio 1	Radio 1	Radio 1	Radio 1
lf(Hz)	-300000	-100000	100000	300000	-300000	-100000	100000	300000	-200000	300000
Freq.	470.3MHz	470.5MHz	470.7MHz	470.9MHz	471.1MHz	471.3MHz	471.5MHz	471.7MHz	-	-
Pandwidth	125KH7	125KH7	125KH7	125KH7	125KH7	125KHz	125KH7	125KHz	1	

The custom mode is mainly to meet the special frequency needs of customers





Each parameter in the picture can be modified, but due to the limitation of the radio frequency board hardware, it still needs to be configured according to the LoRaWAN specification

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2.6 LoRa Network Server

LoRa network server: As the LoRa core network, it carries the encryption,

decryption and network operations of LoRaWAN data

2.6.1 Status

D	Status ~	≣ Da	shboard / LoRa Net	work Serve	er / Status										25	A≍	
8	Network	Overview	× LoRa Packet Log	ger × S	System Log 🛛	WAN Inter	face ×	Wi-Fi ×	Diagnose >	Firewall ×	LoRa Ga	teway ×	Status	×			
°A0	LoRa Gateway	Basic	Infomation														
		Star	Time	2020-1	1-23 14:53:4	1 Dev	vice Num	nber	0		Gat	eway N	umber	1			
	LORA NETWORK SERVER	Total	Uplink	0		Tota	al Downl	ink	0								
3																	
	Basic	RSS	I distributed			S	NR distr	ibuted			1	DataRa	te distribut	ed			
	Gateway		>-40		120			5		- <-15			cf7			f12	
	Application																
	Global Integration						0					sf8					sf
\$	System													Y			
		2	-80~-60		100~-80		-5~1						sf9		1	sf10	

As shown in the figure above: To use this function, you need to configure the protocol in the LoRa gateway as Build-in LoRa Server, and the data will flow to the LoRa network server. The functions are described as follows:

- Start-up time: system start-up time
- > Number of devices: the number of devices that have been added
- > Number of gateways: the number of gateways that have been added
- Total Uplink: The total number of uplink packets of the added device since the system starts
- Total Downlink: The total number of downlink packets of the added device since the system starts
- RSSI distributed: Upstream data RSSI distribution of all devices in the past 24 hours
- SNR distributed: SNR distribution of uplink data of all devices in the past 24 hours
- DataRate distributed: DataRate distribution of uplink data of all devices in the past 24 hours
- > Communication distributed: the distribution of the uplink and downlink data



of each time period in the past 24 hours

2.6.2 Basic setting

🖵 Status 🛛 🔿	Dashboard / LoRa Network Server / Basic		
Overview	首页 × Overview × Status × Basic ×		
LoRa Packet Logger	Working Area (Frequency Band MHz)	CN_470_510 ~	
System Log	0		
⊠ Network ∨	Open ADR		
🕅 LoRa Gateway	Minimum Rate	LoRa:SF12/125kHz \lor	Used for ADR. Minimum data rate allowed.
LoRa Network Server	Maximum Rate	LoRa:SF7/125kHz 🗸	Used for ADR. Maximum data rate allowed.
Status	ADR Margin (dB)	10	
Basic	Network ID	The larger the value, the smaller the adjustment range, the I	ess likely it is to lose packets.
Gateway			
Application	Rx 1 Delay (sec)	1	
Global Integration	Rx 1 DataRate Offset	0	
☺ System ∽	Rx 2 Frequency (Hz)	505300000	
	Rx 2 Datarate	LoRa:SF12/125kHz \vee	
	Downlink Tx Power (dBm)	20	

- Working Area :the frequency of lora network server,after modifying the frequency band, parameters such as RX2 Frequency will be adjusted to the default values along with it.
- ADR: auto-adjust datarate, include minimum rate, maximum rate and ADR Margin

2.6.3 Gateway

🖵 Status 🛛 🗠	■ Dashb	oard / LoRa Network Ser	ver / Galeway							X 🛛 🏠
Overview	首页 × (Overview × Status ×	Basic × • Gateway	×						
LoRa Packet Logger	+ Add	Export								
System Log	ID	Gateway MAC	Name	FirstSeenAt	LastSeenAT	Latitude	Longitude	Altitude(m)	在线情况	Operrate
⊠ Network ∨	2	54d0b4fffe3ab6ce	54d0b4fffe3ab6ce	2020-11-18 09:49:20	2020-11-24 14:47:24	0	0	0	true	🖉 Edit 💼 Delete
₩ LoRa Gateway										
LoRa Network Server										
Status										
Basic										
Gateway										
Application										
Global Integration										
⊙ System ∨										

- > Add or delete lorawan gateway, can monitor gateway online or not.
- > When the gateway reports data to the platform, the gateway will be added automatically, no need to add manually.



2.6.4 Application

🖵 Status 🛛 🔿	Ē Das	hboard / LoRa	Network Se	erver / App	lication				20 AT
Overview	首页 ×	Overview ×	Status ×	Basic ×	Gateway ×	Application ×			
LoRa Packet Logger	Appl	ication Name		+ Add					
System Log	ID		Name		Device Numb	e CreateAt	Allow Auto Join	Description	Operate
🖾 Network \sim	1		APP1		0	2020-11-23 15:59:13	true	Test	© View 🗊 Delete
🕅 LoRa Gateway									
LoRa Network Server									
Status									
Basic									
Gateway									
Application									
Global Integration									
⊙ System ∨									

As shown above: The function is to display the existing applications, enter or delete operations, as follows:

- Application name: click "Add" to create an application, and jump to the application setting interface
- > View: View application configuration and device list under application, etc.
- Delete: delete the current application, it cannot be deleted when there is a device under the application, you need to delete the device first

2.6.4.1 Application-Application detail-Device manage

🖵 Status 🛛 🗠	≣ Da	shboard / L	oRa Network Server / Applicat	ion Detail						20 🔤 🔮
Overview	首页 ×	Overview	× Gateway × Application	n × • Application De	ail × Device ×					
LoRa Packet Logger	Applicat	ion: APP1								
System Log	Devic	ce Manage	Application Set Integra	tions						
⊠ Network ∨	Plea	se Input De	vEui Q Search	+ Add •	Add In Bulk 🔯 Del	ite In Bull	c 🖉 Ex	port		
¹ X ⁰ LoRa Gateway		ID	LastSeenAT 🖨	Name	DevEui	Clas s	Join Mod e	Device Addres s	Description	Operate
LoRa Network Server		1	never	dev_ff00112233445 566	ff00112233445566	A	OTAA	-		S View 💼 Delete
Status	Tota	11 10/		Pata 1						
Basic	1018	10/pa	age - C	30 10 1						
Gateway										
Global Integration										
⊕ System ∨										

As the figure shown:

- Please input DevEui: here you can enter the complete DevEui and click "Add" to add a new device. It can also be used as a search condition to find the corresponding device
- Search: Fuzzy search device based on DevEui content
- Add: add new DeviceEUI
- > Add in bulk: A continuous number of devices can be added in batches, for



example: start devEui=ff00000000000001,number=2, then two devices will be added, namely ff0000000000001 and ff000000000002

- Delete in bulk: Check the box on the left side of the device to be deleted, you can delete it in batches
- > Export: export the device list with excel
- > View: the detail parameters for device
- > Delete: delete this device

2.6.4.2 Application-Application detail-Application set

Status ~	E Dashboard / LoRa Network Server / Application Defail		51
Overview	首页 × Overview × Gateway × Application × • Application Det	tail × Device ×	
LoRa Packet Logger	Application: APP1		
System Log	Device Manage Application Set Integrations		
⊠ Network ∨	* Name	APP1	
¹²¹ LoRa Gateway	AppEUI	1A2B3C4D5E6F7G8H	default
LoRa Network Server	* АррКЕҮ	1A2B3C4D5E6F7G8H1A2B3C4D5E6F70	default
Status	Allow Auto Join 🧲	If enabled, LoRaWAN Device will be add	ed automatically after Application EUI and Application Key pass verification.
Basic	Description	Tast	
Gateway	Description	Test	
Application		Save & Modify	
Global Integration			

- Name: application name
- AppEUI: used to verify when auto join network, default:click defaul it will switch to Four-Faith value
- AppKEY: used to verify when auto join network, default:click defaul it will switch to Four-Faith value
- Allow auto join: no need to add the device in advance, the first time when device try join network , if the Application EUI and the application key are consistent with the device side, the device will be allowed to network and automatically add the device
- > Description: to describle the APP



🖵 Status 🔷 🕺	E Dashboard / Lo	DRa Network Server	/ Application Detail		
Overview	Application: APP1	× Gateway ×	Application Detail ×		
LoRa Packet Logger	Device Manage	Application Set	Integrations		
System Log			Data Encode/Decode Type	Base64	U.
⊠ Network ∨					
⁴⁰ LoRa Gateway			Uplink Data URL	Example: http://192.168.1.1:8080/uplink	
LoRa Network Server			Join Notification URL	Example: http://192.168.1.1:8080/join	
Status				Save & Modify	
Basic					
Gateway					
Application					
Global Integration					
∋ System 🗸 🗸					

2.6.4.3 Application-Application detail-Integrations

As above shown, can use HTTP POST to push data, only work as http client:

- > Data Encode/Decode Type: the data format to push
- > Uplink data URL: the address of uplink data
- > Join notification URL: the pushing address of join package

2.6.5 Global integration

2.6.5.1 Basic set

E Status A E Dashboard / LoRa Network Server / Global Integration				
Overview	首页 × Overview × Gateway × Application Detail × Glob	al Integration ×		
LoRa Packet Logger	Basic Set MQTT Topic Template Setup			
System Log	MQTT Switch			
🖾 Network 🗸 🗸	MQTT Server Address			
🕅 LoRa Gateway	MOTT Server Port	1883		
LoRa Network Server				
Status	Client ID	5qFOTpWx		
Basic	Clean Session			
Gateway	Qos	0-Almost Once		
Application	keepalive	10		
Global Integration	Turn on user authentication			
ົ System ∨				
		Save & Modify		

MQTT server address: the address of mqtt broker MQTT server port: port of your mqtt broker Client ID:define by user



Turne on user authentication: fill in the username and password when MQTT broker require it

Other setting pls keep consistant with server side

2.6.5.2 MQTT Topic Template Setup

🖵 Status 🛛 🔿	🗉 Dashboard / LoRa Network Server / Global Integration
Overview	首页 × Overview × Gateway × Application Detail × • Global Integration ×
LoRa Packet Logger	Basic Set MQTT Topic Template Setup
System Log	
🖾 Network 🗸 🗸	Value to the complex application zero complex index of the complex index of the only complex application zero complex application zero complex index of the only complex index of the o
🕅 LoRa Gateway	Join Topic application/[(application_ID])/device/[(device_EUJ])/join
LoRa Network Server	Uplink Topic application/[(application_ID)]/device/[(device_EU])]/re
Status	Downlink Topic application/[[application_ID]]/device/[[device_EU]]/tx
Basic	Save & Modify
Gateway	
Application	
Global Integration	
0.000	

- > Join Topic: application/2/device/ff0000000000001/join
- > Uplink Topic: application/2/device/ff0000000000001/rx
- Subscrible total Topic: application/2/#
- Downlink Topic: application/2/device/ff0000000000001/tx,The format of the downlink data is as follows: (where the data content is base64 encoded data)

}

LoRaWAN Gateway Embeded with NS User Manual

2.7 Device

Note: the device page entry is in section 2.6.4.1, click the button on the right

side of the device-view

2.7.1 Overview

C Status	Overview Configure Activation Downlink Live Device Data					
Overview						
LoRa Packet Logger	Basic Infomation					
System Log	LastSeenAT	never	Device Address	(2)	Total Uplink	0
⊠ Network ∨	Total Downlink	0				
% LoRa Gateway	RSSI distributed		SNR distributed		DataRate distributed	
LoRa Network Server						
Status	>-40	- «-120	*5	- *-15	sl7	sfi2
Basic	-6040	-120100	0-5	-15=-10	sf8	sf11
Gateway						
Application	-8060	-10080		-105	- 912	sf10
Global Integration						
⊙ System ∽	<-120 -120~-100 -60~-40 >-40	-100~-80 -80~-60	<-15 -15~-10	-10~-5 🛑 -5~0 🛑 0~5	sf12 📰 sf11 💼	sf10 🗾 sf9 🧱 sf8 📰 sf7

Communication distributed	
	-O- uplink -O- downlink
0.8	
0.6	
0.4	
0.2	
0	

Statistics will be re-stated after the statistics gateway restarts:

- > LastseenAT: The time of last uplink for this device
- > Device Address: the short ID when device join network
- Total Uplink: The number of uplink packets of the device after system is started
- Total Downlink: The number of downlink packets of the device after system is started
- RSSI distributed: RSSI distribution of the device's uplink data in the past 24 hours
- SNR distributed: SNR distribution of the device's uplink data in the past 24 hours
- DataRate distributed: Datarate distribution of the device's uplink data in the past 24 hours



Communication distributed: The distribution of the uplink and downlink data of the device in the past 24 hours

2.7.2 Configure

🖵 Status 🛛 🔿	Dashboard / LoRa Network Server / Device		53 B
Overview	首页 × Overview × Gateway × Application Detail × ● Device	×	
LoBa Packet Looger	Device: ff00112233445566		
	Overview Configure Activation Downlink Live Device Date	ata	
System Log			
🕼 Network 🗸 🗸	* Name	dev_ff00112233445566	
🕷 LoRa Gateway			
	Class	ClassA	
LoRa Network Server	Join Mode	отаа ~	
Status			
Basic	Frame-counter Width	32 bit ~	
Gateway	Description		
Аррисации		Save & Modify	
Global Integration			
© System 🗸 🗸			

- > Name: named with deviceEUI
- Class: can choose classA or classC
- Join Mode: OTAA
- > Frame-counter Width: Frame count bits
- Description: to describle this device, if the device auto join network, the default description is "auto join device"

2.7.3 Activiation

🖵 Status 🛛 🔿	Dashboard / LoRa Network Server / Device		
Overview	fit x Overview × Gateway × Application Detail × ● Device × Device: ff00112233445566 explants Pervice ×		
LoRa Packet Logger			
System Log			
⊠ Network ∨	Device address -		
🕅 LoRa Gateway	Application session key 00000000000000000000000000000000000		
LoRa Network Server	Network session key 00000000000000000000000000000000000		
Status	Linlink frame-counter 0		
Basic			
Gateway	Downlink frame-counter 0		
Application	Clear Downlink Frame Count		
Global Integration			
☉ Svstem ∨			

Display the secret key information and frame count value generated when the device is added to the network, can also clear the downlink frame count value



2.7.4 Downlink

🛛 Status 🛛 🔿	E Dashboard / LoRa Network Server / Device
Overview	首页 × Overview × Gateway × Application Detail × ● Device ×
LoRa Packet Logger	Device: ff00112233445566
System Log	Overview Configure Activation Downlink Live Device Data
⊠ Network ∨	Downlink Data
🗏 LoRa Gateway	* FPort 10
LoRa Network Server	* Data
Status	Confirme IsHe
Basic	
Gateway	± Send
Global Integration	
☺ System ∨	

- > FPort: downlink port, default is 10
- > Data: downlink data, you can choose Ascii or Hex format
- > Confirmed: whether confirm the packet or not
- > IsHex: to choose if send downlink data with hex format

Example 1: send string 123456 to device, as the folloing setting:

FPort	10	
Data	123456	
	Confirmed	IsHex

Example 2: send 0x12 0x34 0x56 to device, as the following setting:

FPort	10	
Data	123456	
	Confirmed	IsHex



2.7.5 Live Device Data

□ Status ∧	E Dashboard / LoRa Network Server / Device	
Overview	首页 × Overview × Gateway × Application Detail *	
LoRa Packet Logger	Device: ff00112233445566 Overview Configure Activation Downlink Live Device Data	
System Log		
톏 Network ~	Real-time Log	
[™] LoRa Gateway		
LoRa Network Server	🖹 Clear	
Status		
Basic		
Gateway		
Application		
Global Integration		
⊙ System ∨		

- > Real-time log: enable or disable the real-time logs, defaul is enable
- Clear: Clear logs information
- Export: Export logs information

2.8 System

2.8.1 System information

🖵 Status 🛛 🔿	🧾 Dashboard / System / System
Overview	首页 × Overview × Gateway × Application Detail × Device × • System ×
LoRa Packet Logger	Basic language
System Log	System Params
🖾 Network 🗸 🗸	System Version
왜 LoRa Gateway	Token valid When the token expires, you need to log in again.
LoRa Network Server	time(Sec.)
Status	Time Settings
Basic	NTP Client Disable Disable
Gateway	
Application	Save & Modify
Global Integration	
☺ System ∧	
System	
01	

- > Check the verison of embedded network server
- Set Token valid time: the longer the time, the longer the web page re-login interval longer
- > NTP setting



2.8.2 Change Password

🤮 Change Password - LoRaWA	AN GI × +		- Ø ×
← → C ▲ Not sec	cure 192.168.1.1:8080/#/system/permission		९ 🖈 📵 :
🖵 Status 🗠	E Dashboard / System / Change Password		8 🗷 🤹 ,
Overview	Overview × Ghange Password ×		
LoRa Packet Logger	Change Password		
System Log	* New Password	Not less than 6 bits	
53 Network 🗸 🖓	* Confirm Password	Same as the new password	
∜ LoRa Gateway	L	Save & Modify	
I LoRa Network Server			
⊘ System ^			
System			
Change Password			
Reboot			
Restore Defaults			
	L		

> With this page, you can change password of NS

2.8.3 Reboot

🗯 Reboot - LoRaWAN Gatew	ay x +	- 0 ×
← → C ▲ Not se	cure 192.168.1.1:8080/#/system/reboot	Q 🖈 📵 :
G Status ^	Dashboard / System / Reboot	St 🖬 🤹 🖓
Overview	Overview * Change Password * Reboot *	
LoRa Packet Logger	System Reboot	
System Log	Execute Reboot	
뎺 Network 🗸		
% LoRa Gateway		
LoRa Network Server		
System ^		
System		
Change Password		
Restore Defaults		

> With this option, you can reboot NS



2.8.4 Restore Default

- Ø ×
९ ☆ 🗈 :
X 🛛 🤹 🖓
۲

> With this option, you can reset the NS to factory settings



3 Common operations

3.1 Enter the management platform

- Power on,Device WIFI is on as default,Laptop connect WIFI,SSID: Four-Faith-LoRaWAN
- Use Chrome open <u>http://192.168.240.1:8080</u> to enter configurations web UI
- Support login via WAN IP:8080, For example: http://192.168.9.50:8080
- ◆ Input user: admin, password: 123456, enter web UI
- If web page open fail, try CTRL+F5 to refresh

3.2 Use Public NS

M LoRa Gateway - LoRaWAN Gate × +			- Ø ×
← → C ▲ Not secure 192.168.1.1:8080/#/	/loragw/lorapf		९ ☆ 🗉 :
Status ~ E Dashboard / LoR	a Gateway / LoRa Gateway		X 🗷 🤹 ,
Overview Change Pa	assword × Reboot * CoRa Gateway ×	Basic × Status × Galeway *	
LoRa Packet Logger Basic Frequenc	y Band Set		
System Log	* Gateway MAC	54D0B4FFFE3AB6CE	
53 Network 🗸	* Internal UDP Port	1699	()
₩ LoRa Gateway	Protocol	Semtech UDP GWMP Protocol	
E LoRa Network Server			
Status	Server Address	47.99.40.19	
Basic	Server Port(UDP)	17470	
Gateway	Server Timeout(ms)	30	
Application	Keepalive Interval (s)	10	
Global Integration			
⊗ System ^		Save & Mouny	
System			

- Go to LoRa gateway ->Basic ->Protocol ->Semtech UDP GWMP Protocol, it will show server IP and port,input correct values,LoRa network serve's is same,only need to input once.
- Click Save&Modify button to apply
- Now the data will not go to Embedded LoRaWAN NS, but LoRa-LoRa package record uplink and downlink data as always



3.3 Use Build-in NS

3.3.1 Basic

🖵 Status 🔷	≣ Dashb	oard / LoRa Gateway	/ LoRa Gat	teway					
Overview	Overview *	Change Password ×	Reboot *	LoRa Gateway ×	Basic ×	Status ×	Gateway *		
LoRa Packet Logger	Basic	Frequency Band Set							
System Log				* Gateway MAC	54D0B4F	FFE3AB6CE			
🖾 Network 🛛 🗠				Internal UDP Port	1699				
🕷 LoRa Gateway				Protocol	Build-in Lo	oRa Server		~	
E LoRa Network Server			le.		40				
Status			Ke	epalive Interval (s)	10				
Basic					Save 🛇	& Modify			

- ♦ Go to LoRa Gateway ->Basic->Protocol-> Build-in LoRa Server
- Save and apply

3.3.2 Application - Device

Status	Dashboard / LoRa Network Server /	Application				X 🖪 🚯
Overview	Overview * Change Password * Reboot	 LoRa Gateway × Bas 	sic · Status · Gateway ·	Application ×		
LoRa Packet Logger	Application Name + Add					
System Log	ID Name	Device Number	CreateAt	Allow Auto Join	Description	Operate
🖾 Network 🗸 🗸			No Data	a		
🕅 LoRa Gateway						
LoRa Network Server						
Status						
Basic						
Gateway						
Application						
Global Integration						
© System ^						

♦ Click add and it will go to next page

Four-Faith	lī≡ ®	LoRaWAN	Gateway Emb	eded with N	S User Manual
🖵 Status 🔷	Dashboard / LoRa Network Server / Application Detail				X 🛛 🤹
Overview	Overview * Change Password * Reboot * LoRa Gateway *	Basic × Status × Gateway ×	Application * Application D	etail ×	
LoRa Packet Logger	Application: APP1				
System Log	Device Manage Application Set Integrations				
3 Network ~	* Name	APP1			
☆ LoRa Gateway	AppEUI	8 bytes, or 16 bits	default		
LoRa Network Server	* AppKEY	16 bytes, or 32 bits	default		
Status	Allow Auto Join	If enabled, LoRaWAN Device	will be added automatically after	Application EUI and Applica	tion Key pass verification.
Basic	Decededar				
Gateway	Description				
Application		Save & Modify			
Global Integration					
ூ System					
System					

 At this time, if you want the device to be added automatically, configure the corresponding settings AppEUI and AppKEY, and the device will be automatically added by sending a network request

← → C ▲ Not sec	ure 192.168.1.1:8080/#/ns/application/detail/1?page=应用设置	Q 🕁 🚺 :
🖵 Status 🔷	E Dashboard / LoRa Network Server / Application Detail	X 🛛 🍫 .
Overview	Overview × Change Password × Reboot × LoRa Gateway × Basic × Status × Gateway × Application ×	
LoRa Packet Logger	Application: APP1	
System Log	Device Manage Application Set Integrations	
ଶ୍ଚି Network 🗸 🗸	ff00000000001 Q. Search + Add • Add in Bulk © Delete in Bulk © Export	
% LoRa Gateway	Device Address Description	Operate
LoRa Network Server	No Data	
Status		
Basic		
Gateway		
Application		
Global Integration		

The device can also be added to the network by adding the device first. At this time, the AppEUI and AppKEY of the application may not be configured.
 If configured, the information will not be verified.



3.4 MQTT data Uplink and Downlink

3.4.1 Configurations

← → C ▲ Not sec	ure 192.168.1.1:8080/#/ns/interface		Q 🖈 📵 :
G Status	Dashboard / LoRa Network Server / Global Integration		X 🛛 🤹 🗸
Overview	Overview * Change Password * Rebool * LoRa Galeway *	Basic × Status × Gateway × Application × Application	Detail · Global Integration ·
LoRa Packet Logger	Basic Set MQTT Topic Template Setup		
System Log	MQTT Switch		
⊠ Network ✓	MQTT Server Address		0
ℜ LoRa Gateway	MQTT Server Port	1883	
LoRa Network Server	Client ID	5gFOTpWx	
Status			
Basic	Clean Session		
Gateway	Qos	0-Almost Once v	
Application	keepalive	10	
Global Integration	Turn on user authentication		
ூ System			
System		Save & Modify	

Go to LoRa Network Server - Globe Integration - configure MQTT server information - Save

Noote: The customer needs to run an MQTT server externally,At this time, both the gateway and client program can be published and subscribed as MQTT clients



3.4.2 Uplink data

File Extras Help		
47.99.40.19	18868 Connect	Disconnect
Publish Subscribe Scripts	Broker Status Log	
application/1/device/ffaabb000000009	Vrx Subscribe	QoS1 QoS2 Autocrol Qv
application/1/device/#	(31)	application/1/device/#abb000000004/rx 26 application/1/device/# 0050
(11)	Dump Messages Mute Unsubscribe	application/1/device/ffaabb00000006/rx 27
application/1/device/ffaabb000000009/rx	0	application/1/device/# QoS 0
	Dump Messages Mute Unsubscribe	application/1/device/ffaabb000000001/rx 28 application/1/device/# QoS 0
		application/1/device/ffaabb000000003/rx 29
		application/J/device/# Qos 0 application/J/device/#faabb000000009/rx 30
		application/1/device/# QoS 0
		application/1/device/ffaabb000000009/rx 31 postcetion/1/device/ffaabb000000009/rx 31
		application/1/device/ffaabb000000009/rx 32
		Retained QoS 0
		application/1/device/ffaabb00000009/rx 32
		30-04-2020 11:36:57.41817515 Retained QoS 0
		<pre>{"applicationID":"1","applicationHame":"APPl","deviceHame":"dev_ffaabb00000000","devEUI":'ffaabb00 00000009","rxInfo":[{"gatewayID":"54d0b4fffe968da8","name":"54d0b4fffe968da8","time":"","rssi":-83," L0RaSNR":10,"location":[}]),"txInfo":[ffrequency":4/1300000,"dr":5},"adr":true,"fCnt":612,"fPort":21 ,"data":"aN86MSxtb2Rl0jIsdmFsdNUGHQ=="}</pre>
Topics Collector (0)	Scan Stop 02+	
		Payload decoded by Plain Text Decoder

As shown in the figure above, the MQTT server address configured by this tool is the same as the gateway. If you subscribe to a single device and the entire application, you can get the device's uplink data.



3.4.3 Downlink data

WADLEY - 1.7.1 File Extras Help	
47.99.40.19 18868 Connect Disconnect	₽ ●
Publish Subscribe Scripts Broker Status Log	
» application/1/device/ff00a00005210001/tx Publish	Qo50 Qo51 Qo52 Retained 08+
["confirmed":false,"fPort":10,"data":"YWJjZA=="]	
ik sscom 3.3	
+RCV:10, abcd	▲ 多条字符串定义 串口资料
	HEX 字符串 友法
	· · · · · · · · 2
	AT+VER 3 AT+RIN 4
	AT+TXA=32, 145963582 5
	AT+TXH=32,00050010 6 AT+MOD=1 7
	AT+MOD? 8
	AT+DBL?
	自动循环发送, 间隔: 1000 ms
打开文件」文件名 <u>发送文件</u> / 停止发送 _ 隗藏 」 □ RTS 串ロ号 □003 ▼ ④ 关闭串ロ 参助 保存斎口 書除斎口 □ μα2元示 □ DTR	
波特率 115200 · 「	
数据位 8 子付甲锏八框: 友法 1424友法	
www.daxia.cor S:0 R:14 COM3已打开 115200bps CTS=1 DSR=0 RLSD=0	

- ♦ Use MQTT tool to publish data
- ♦ Topic: application/1/device/ff00a00005210001/tx
- > Data content: {"confirmed":false,"fPort":10,"data":"YWJjZA=="}
- Device tyep:ClassC,so it receive downlink data directly, if type = classA the data will be sent down the next time the device uplinks



4 DATA Format

Note 1: data after // are comments

Note 2: base64 tool link-https://base64.us/

4.1 Uplink Data

HTTP push or MQTT data are same, as follows:

```
{
  "applicationID":"1",
                                       // Application ID
  "applicationName":"APP1",
                                           // Application name
  "deviceName":"dev_ffaabb000000009", // device name
  "devEUI":"ffaabb000000009",
                                            // device unique id
  "rxInfo":[{
     "gatewayID":"54d0b4fffe968da8", // gateway unique id
     "name":"54d0b4fffe968da8",
                                          // gateway name
     "time":"",
                  // gateway upload time stamp(valid only when there is gps signal)
     "rssi":-83,
                                         // RSSI
     "loRaSNR":6.5,
                                           // SINR
     "location":{
                            // location info(need GPSsignal), if not, it will show{}
         "latitude": 0.0,
         "longitude": 0.0,
         "altitude": 0.0
     }
  }],
  "txInfo":{
    "frequency":470700000,
                                          // uplink frequency
       "dr":5
                                           // data rate
  },
  "adr":true,
                                         // adr enable
  "fCnt":673,
                                          // uplink frame count
  "fPort":21,
                                         // port
  "data":"aW86MSxtb2RlOjIsdmFsdWU6MQ==" // uplink data content, base64 coding
}
```



4.2 Join Notification

```
HTTP push or MQTT subscribe data format are same, as follows:
```

```
"applicationID":"1",
"applicationName":"APP1",
"deviceName":"dev_ff00a00005210001",
"devEui":"ff00a00005210001",
"devAddr":"02648930"
```

```
}
```

{

4.3 Downlink Data

Only supports MQTT publish, format as follows:

```
{
    "confirmed":false, // enable confirm package
    "fPort":10, // port
    "data":"YWJjZA==" // downlink data content,base64 coding
}
```