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1 About this Document

This document provides comprehensive instructions on how to configure LW002-TH, join the LoRa network, payload, and APP application.

This document is suitable for different frequency bands of LW002-TH which can be configured through APP.

2 Product Introduction

2.1 Overview

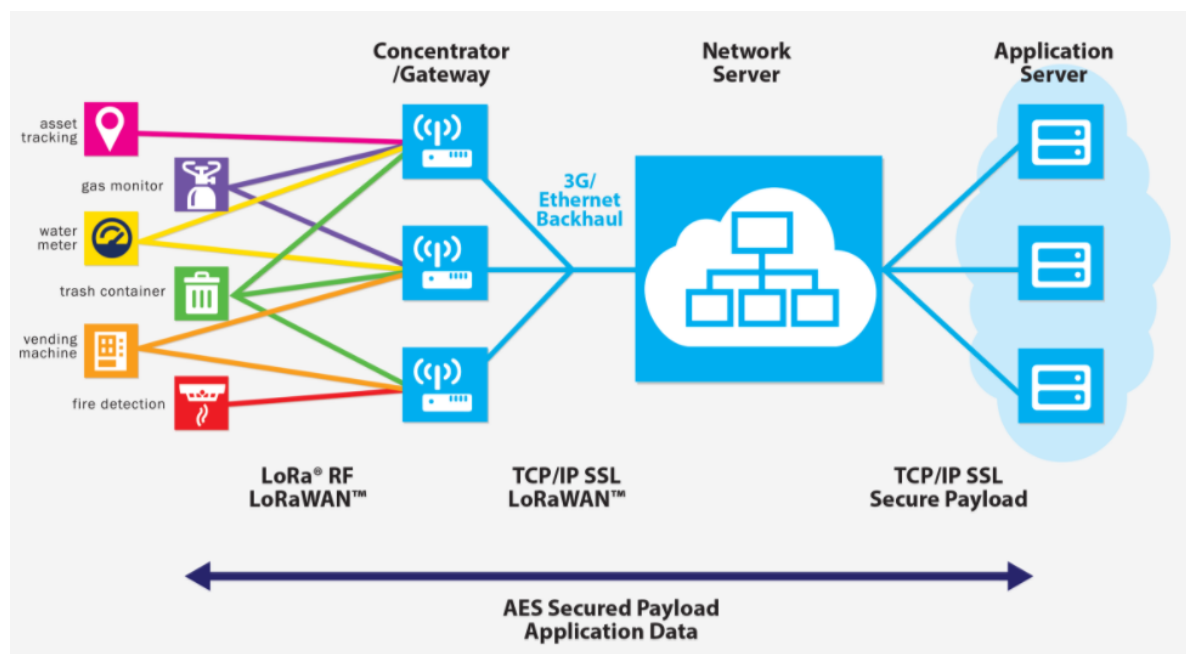
LW002-TH is a LoRaWAN temperature and humidity sensor for measuring indoor and outdoor environment, and it is easily deployed and configured. It adopts dedicated digital module acquisition technology and temperature and humidity sensing technology to ensure high reliability and long-term stability of products. LW002-TH is powered by 12000mAh non-chargeable battery. The Battery life is estimated to be up to 5 years but depends on sample interval, transmit interval, data rate and environmental factors. LW002-TH could be applied to any type of environment, and ideally suited for a wide range of applications such as Intelligent agriculture, urban monitoring, air quality, industrial, environmental or farming projects.

2.2 Product Specification

The product specification please refer to the datasheet:

2.3 LoRa Architecture

LoRa network architecture see below picture, LW002-TH belongs to the end device. LW002-TH collect the temperature and humidity data and transmit to LoRaWAN gateway then to the server.



3 Product Operation Introduction

3.1 Turn On The Device

Press the button and hold on 5s, the blue will light on about 3s, it indicates device turn on.

3.2 Connect To LoRa Server

The LoRa end device should be registered on server before connecting to server. The required ID and keys are different for different activation mode in different LoRa server. These informations can be get and configure from Moko LoRa APP.

User can get the APP download link from below QR code,or search "MokoLora" in your phone APP store:



More details function instruction of the APP please refer to below chapter 4 MokoLoRa APP.

3.2.1 Get And Configure Device Parameter

Device and APP communicate with Bluetooth, LW002-TH BLE is not always open. User need press the button to open the BLE after turn on the device, the blue light will flicker every 3S that indicate the BLE is open. The default BLE opening time is 5min every time, it can be change by APP or downlink.

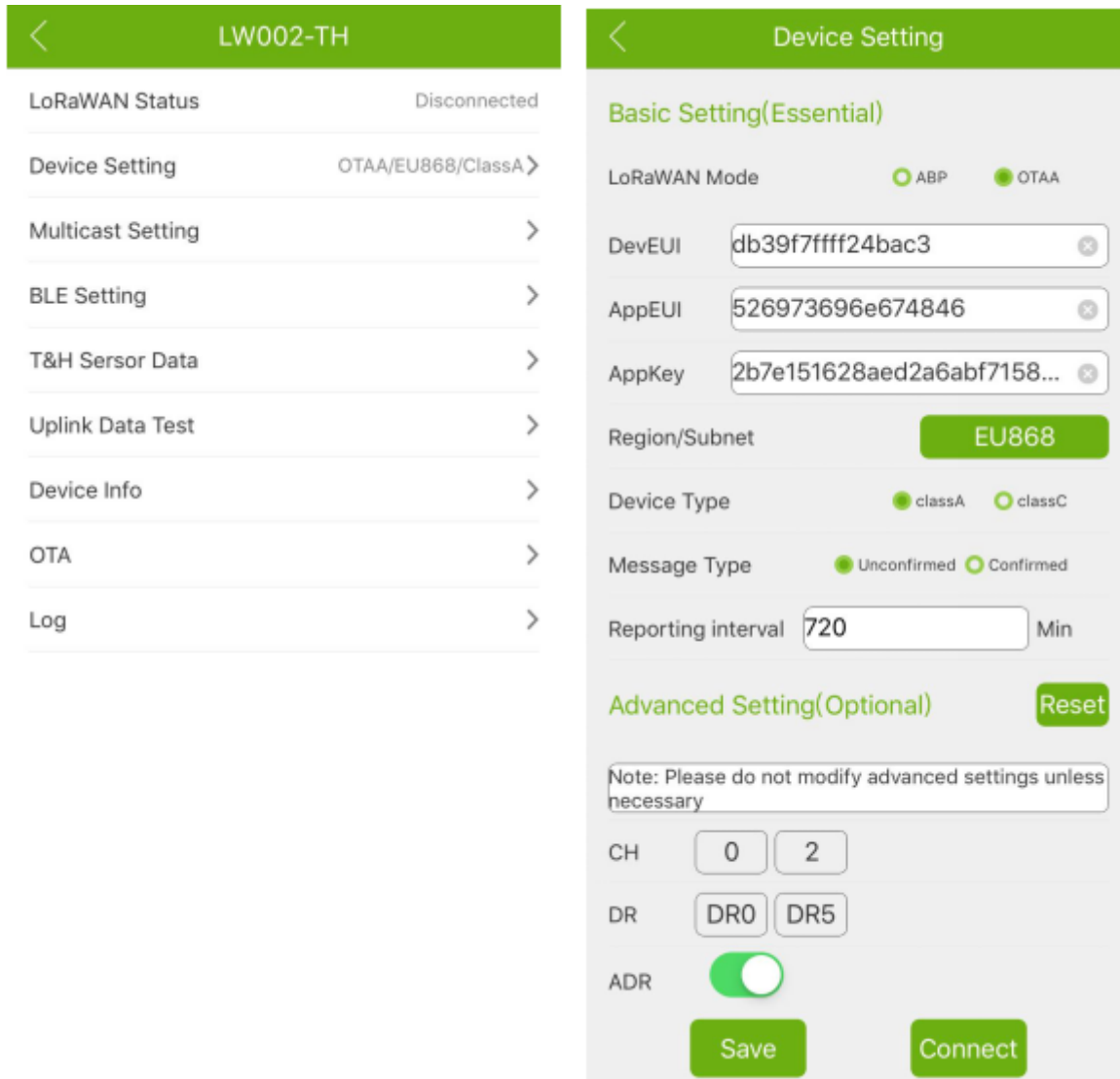
The factory default configure parameter of the device as below:

NO.	Type	Default value	Description
1	LoRaWAN Mode	OTAA	ABP is optional, it can be changed to by Moralora APP or downlink command
2	DevEUI	BLE MAC+ FFFF	Unique number of device in server, it is best not to change it
3	AppEUI	526973696e674846	Configurable by Moralora APP or downlink command, the data length must be 8 bytes
4	AppKey	2b7e151628aed2a6abf7158809cf4f3c	Configurable by Moralora APP or downlink command, the data length must be 16 bytes

NO.	Type	Default value	Description
5	DevAddr	01959CF3	Configurable by Moralora APP or downlink command, the data length must be 4 bytes
6	AppSKey	2b7e151628aed2a6abf7158809cf4f3c	Configurable by Moralora APP or downlink command, the data length must be 16 bytes
7	NwkSkey	2b7e151628aed2a6abf7158809cf4f3c	Configurable by Moralora APP or downlink command, the data length must be 16 bytes
8	Region/Subnet	EU868	Configurable by Moralora APP or downlink command
9	Device Type	ClassA	Class C is optional, it can be changed to by Moralora APP or downlink command
10	Reporting Interval	12 hours	Range: 1-14400min, it is reporting interval for the device information
11	Message type	Unconfirmed	It is the uplink message type, configurable by Moralora APP or downlink command
12	CH	CH 0-7	Different frequency has different default value and it follows up the LoRaWAN standard. It also can be changed to by Moralora APP or downlink command

NO.	Type	Default value	Description
13	DR	DR 0-2	Different frequency has different default value and it follows up the LoRaWAN standard. It also can be changed to by Moralora APP or downlink command
14	ADR	Enable	It can be changed to by Moralora APP or downlink command
15	BLE Opening Time	5min	It can be changed to by Moralora APP or downlink command
16	Sensor report interval	60s	range: 10-65535 s. it can be changed to by Moralora APP or downlink command

The device configuration information can be read or changed from the APP or downlink command, APP screen see below.



3.2.2 Register The Device On The LoRa Server

After obtaining the device information through the APP, and register the device in your lora server.

Note: For bulk purchases order can customized the default information and provide the excel document with device information for each batch that will convenient to bulk register device in server.

3.2.3 Join Network

Before device join the network success,user need make sure there is online LoRaWAN gateway. For the different activation way,the join network process is different. OTAA mode will send join request after the device turn on until the server accept the join.

ABP mode directly ties an end-device to a specific network by-passing the join request- join accept procedure.

3.4 Uplink Payload

After device join the network success, the device will upload data to server. There are two different types notification will be upload to server: device Information payload and sensor data payload.

3.4.1 Device Information Payload

The device information payload will be the first uplink notification send to the server in the every time when it joins network success.

- **Format**

Byte Index	Type	Data Type	Value	Description
1	Payload Type	uint	0X01	The header of the device information payload message
2	Battery Level	uint	0X00-0X01	00: battery normal 01: low battery
3-4	Battery Voltage	uint	0X0000-0XFFFF	The voltage value of battery,the byte order is Little-endian, the actual voltage need divide 1000 after the hexadecimal data convert to decimal. Example: 3C 0E (the real byte order should be 0E 3C) convert to decimal is 3644, the actual voltage is 3.644V
5-7	Firmware Version	uint	0X000000-0XFFFFFF	Example:01 01 00 ,it means firmware version is V1.1.0
8	Frequency Plan	uint	0X00-0X0C	00:EU868 01:US915 02:US915HYBRID 03:CN779 04:EU433 05:AU915 06:AU915OLD 07:CN470 08:AS923 09:KR920 0A:IN865 0B:CN470PREQEL 0C:STE920
9-10	BLE Opening Time	uint	0X0000-0XFFFF	The byte order is Little-endian

```
Example:01 00 10 10 01 03 01 00 FF 00
01: device information payload
00: battery level is normal
10 10: battery voltage 4.112V
01 03 01: firmware version v1.3.1
00: frequency EU868
FF 00: BLE opening time 255 min every time
```

3.4.2 Sensor Data Payload

Sensor data will be uploaded per 60s by default after the device start to scan beacon, and the report interval can be changed by Mokolora APP or downlink. One beacon data packet will less than 100bytes.

- **Format**

Byte Index	Type	Data Type	Value	Description
1	Payload Type	uint	0X10	The header of the sensor data payload message
2	Sensor Type	uint	0X01	I2C temperature and humidity sensor
3-4	Temperature Value	uint	0X0000-0XFFFF	Data format is Little-endian, convert to decimal need minus 4500, then divide 100
5	Temperature Alarm	uint	0X00-0x01	00: no alarm, 01:alarm,the temperature is off-limits
6-7	Humidity Value	uint	0X0000-0XFFFF	Data format is Little-endian, convert to decimal need divide 100
8	Humidity Alarm	uint	0X00-0X01	00: no alarm, 01:alarm,the humidity is off-limits
9-12	Report Interval	uint	0X00000000-0XFFFFFFFF	
13-14	Timestamp_Year	uint	0X0000-0XFFFF	Data format is little-endian
15	Timestamp_Month	uint	0X00-0XFF	
16	Timestamp_Date	uint	0X00-0XFF	
17	Timestamp_Time	uint	0X00-0XFF	
18	Timestamp_Minute	uint	0X00-0XFF	
19	Timestamp_Second	uint	0X00-0XFF	

Example: 10 01 3D 1C 00 83 17 00 3C 00 00 00 E4 07 05 15 10 15 2C
 10: sensor data payload
 01: temperature and humidity sensor
 3D 1C: temperature value, Little-endian format. Convert to decimal is 7229, the real temperature : $(7229-4500)/100=27.29$ °C
 00: no temperature alarm
 83 17: humidity value,Little-endian format. Convert to decimal is 6019, the real humidity: $6019/100=60.19$ %RH
 00:no humidity alarm
 E4 07 05 15 10 15 2C:Timestamp,2020-5-15 16:21:44

3.5 Downlink

LW002-TH supports APP and LoRa server configuration device parameter. Configurable parameter please refer to below list. LoRa sever remote to get(read) and configure(write) device information by downlink. The details protocol please refer to the LoRa Protocol document from below link:

http://doc.mokotechnology.com/index.php?s=/2&page_id=255

Type	Read	Write
BLE Firmware Version	√	
LoRa Firmware Version	√	
DevAddr	√	√
NwkSKey	√	√
AppSKey	√	√
DevEUI	√	√
AppEUI	√	√
AppKey	√	√
Frequency plan	√	√
LoRaWAN Class	√	√
Activation mode	√	√
Sensor Report interval	√	√
Network connection status	√	
Channel	√	√
DR	√	√
ADR status	√	√
Temperature	√	√
Humidity	√	√
BLE Opening Time	√	√
Battery Level	√	
RTC time	√	√
Multicast Switch Status	√	√
Multicast Address	√	√
Multicast NwkSKey	√	√
Multicast AppSKey	√	√

4 MokoLoRa APP

4.1 APP Overview

MokoLoRa APP is a simple configuration tool for MOKO's LoRaWAN series end device. Users can read and configure device parameters, device information, network connection status detection, firmware upgrade, etc.

4.2 APP Install


User can get the APP download link from below QR code, or search "MokoLora" in your phone APP store: Please allow bluetooth to be enabled during the installation process. This APP communicates with the device through bluetooth, and it only supports above android 4.4 and IOS 9.0 system.



4.3 Connect Device And Sync Time

After the device is turned on, the device Bluetooth starts broadcasting. Open the APP, and you can search the LW002-TH device by pulling down the APP screen. The distance between the phone and the device should be kept within 10m without wall obstruction. Otherwise, the device will not be searched. After searching for the device, click the device name to connect the device. The default broadcast name of the device: LW002-TH-XXXX, XXXX is the last 4 bits of device MAC addresses.

When the APP connect with the device success the phone system time also sync to the device.

Moko LoRaWAN 	
LW002-TH-3ADD	-71

4.4 Main Page

The APP main page will be display as below after the APP connect with the device success. Click "<" will exit the main page and disconnect the device.

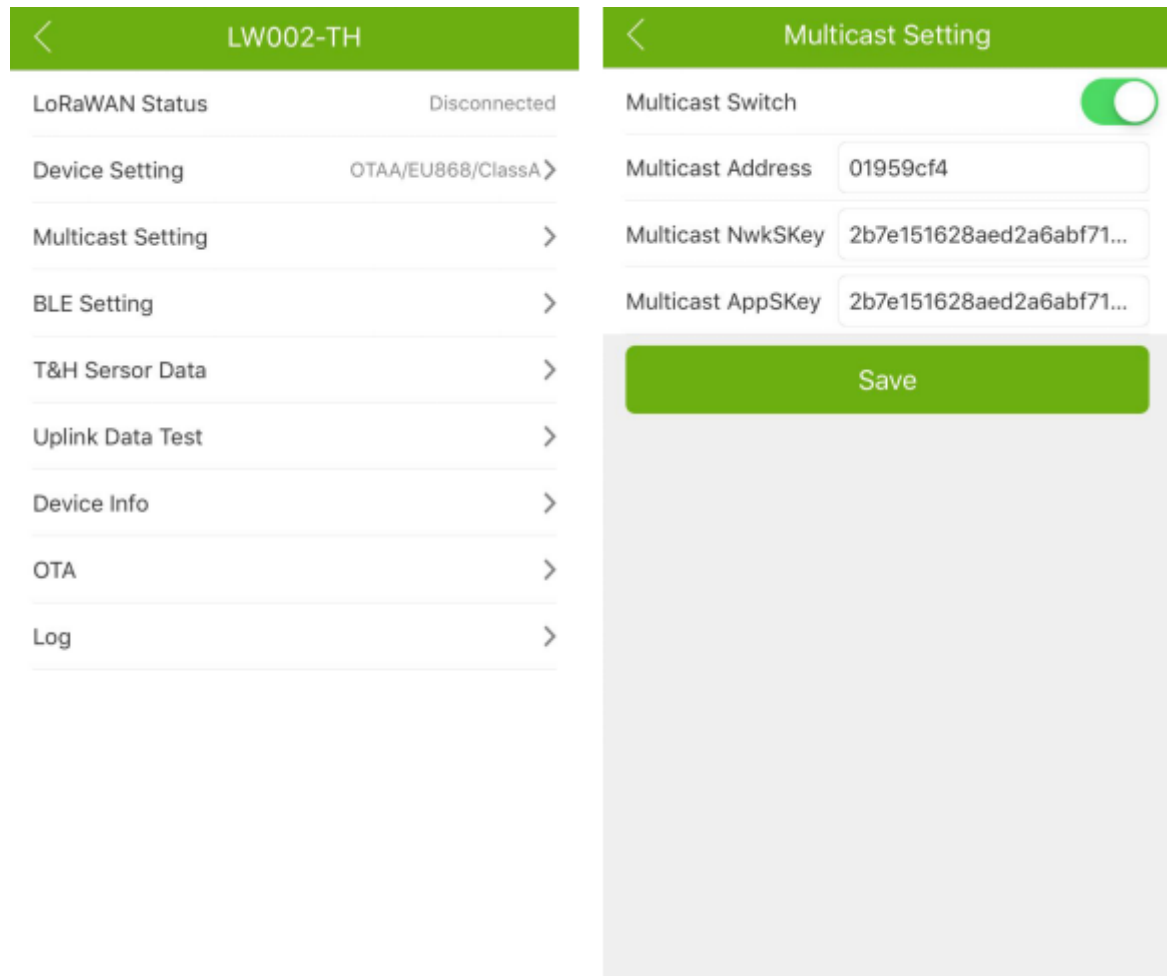
LW002-TH	
LoRaWAN Status	Disconnected
Device Setting	OTAA/EU868/ClassA >
Multicast Setting	>
BLE Setting	>
T&H Sersor Data	>
Uplink Data Test	>
Device Info	>
OTA	>
Log	>

4.5 Device Setting

Click the "Device Setting" from the main page to read and change the device's configuration parameters:

4.6 Multicast Setting

Click the "Multicast Setting" from the main page to read and change the device's multicast parameters. Multicast function is used for server remote control a lot of device, and the device should be worked on Class C mode.



4.7 BLE Setting

Click the "BLE Setting" from the main page to read and change the device's BLE Opening Time for each time turn on the BLE:

The image shows two side-by-side screenshots of a mobile application interface. The left screenshot shows a menu for device 'LW002-TH' with options: LoRaWAN Status (Disconnected), Device Setting (OTAA/EU868/ClassA), Multicast Setting, BLE Setting (selected), T&H Sensor Data, Uplink Data Test, Device Info, OTA, and Log. The right screenshot shows the 'BLE Setting' screen with 'BLE Opening Time' set to 5 minutes. A green 'Save' button is located at the bottom right of the interface.

Notes: The max open time can be setted to 255min, it also means the BLE always open.

4.8 T&H Sensor Data

Click the "T&H Sensor Data" from the main page to read sensor data and change sensor settings. User can set the sensor data reporting interval, alarm setting and the threshold value of temperature and humidity. The settable threshold value range of temperature is 0 degree to 65 degree. The settable threshold value range of humidity is 10% to 90%. After the device join network success it will display the real temperature and humidity data in this page.

Sensor Data

Sensor Data

Temperature	0.00	°C
Humidity	0.00	%

Sensor setting

Report Interval S

Temperature Alarm Disable Enable

Humidity Alarm Disable Enable

Save

4.8 Uplink Data Test

When LoRaWAN Status on the main page shows connected, but no Data has been transmitted, a real-time message (the default is the current date and time) can be sent to the server through the Uplink Data Test interface of the APP. If the server fails to receive the message, it indicates that the network connection is abnormal.



Uplink Data Test

Click send button, then you could check the server to see if the uplink data has been received.

2019-05-28 20:01:15 MOKO

Send

4.9 Read Device Information

User can read the device firmware version information in the Device Info page.

Device Info	
Company Name	MOKO
Model Name	LW002-TH
BLE Firmware Version	1.3.1
Lora Firmware Version	3.5.13

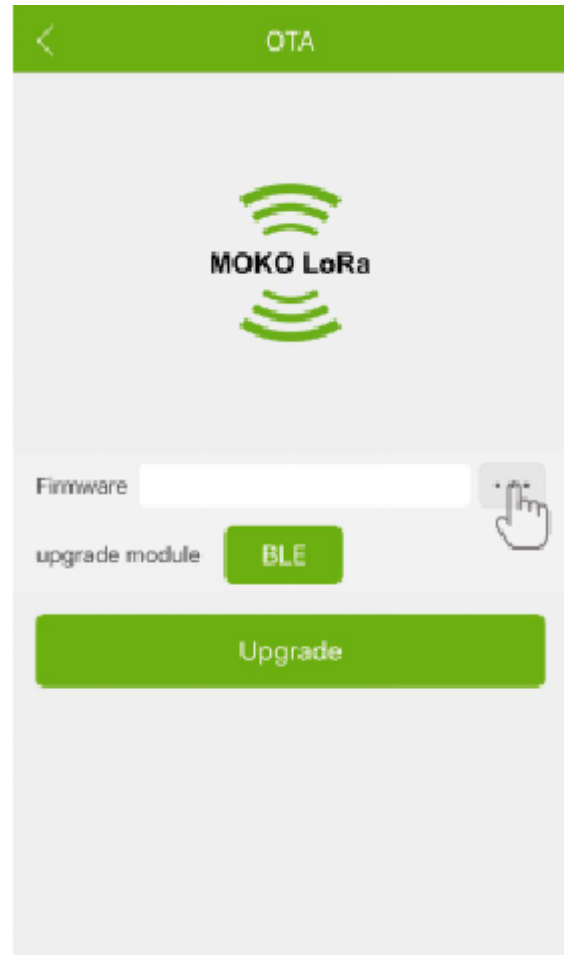
4.10 OTA Firmware Update

To update the firmware via the OTA page should use the upgrade package that MOKO provides with ZIP format.

If use an android phone, place the ZIP file of firmware upgrade package into the phone folder, select the upgrade package file from the OTA page of the APP, and click to upgrade.

IOS phones need to share the upgrade package file with MokoLoRa via computers and iTunes tools.and then select the upgrade package file from the OTA page of the APP, and click to

upgrade.



Note: after the firmware upgrade is successful, the device will restart and the power on indicator will appear. After the firmware upgrade is successful, the updated firmware version can be viewed through the device information page.

4.11 Log

Through the log page, user can send the last join request information of the device to our RD engineer by email in case user need help when there is join network issues.



Send Log

