



**Browan Communications Inc.**

No.15-1, Zhonghua Rd.,  
Hsinchu Industrial Park,  
Hukou, Hsinchu,  
Taiwan, R.O.C. 30352  
Tel: +886-3-6006899  
Fax: +886-3-5972970

Document Number	BQW_02_0018.002
-----------------	-----------------

# IoT Femto Gateway User Guide

## Revision History

Revision	Date	Description
.001	May. 13, 2020	Browan first release
.002	Aug. 7, 2020	Modified Company Address Modified Copy Right 2020

## Copyright

© 2020 BROWAN COMMUNICATIONS INC.

This document is copyrighted with all rights reserved. No part of this publication may be reproduced, transmitted, transcribed, stored in a retrieval system, or translated into any language in any form by any means without the written permission of BROWAN COMMUNICATIONS INC.

## Notice

BROWAN COMMUNICATIONS INC. reserves the right to change specifications without prior notice.

While the information in this manual has been compiled with great care, it may not be deemed an assurance of product characteristics. BROWAN COMMUNICATIONS INC. shall be liable only to the degree specified in the terms of sale and delivery.

The reproduction and distribution of the documentation and software supplied with this product and the use of its contents is subject to written authorization from BROWAN COMMUNICATIONS INC.

## Trademark

The product described in this document is a licensed product of BROWAN COMMUNICATIONS INC.

# Table of Contents

<b>REVISION HISTORY</b> .....	<b>1</b>
<b>COPYRIGHT</b> .....	<b>2</b>
<b>NOTICE</b> .....	<b>2</b>
<b>TRADEMARK</b> .....	<b>2</b>
<b>IOT FEMTO CELL - PRODUCT INTRODUCTION</b> .....	<b>5</b>
<i>LED Indicators</i> .....	7
<i>I/O Ports</i> .....	8
<i>Hardware Specification</i> .....	9
<i>Software Specification</i> .....	10
<i>LoRa Specification</i> .....	11
<i>LoRa RF Specification</i> .....	11
<i>Regulatory Specification</i> .....	12
<i>Reliability Specification</i> .....	12
<b>1. LORAWAN MODE</b> .....	<b>13</b>
1.1 OPEN ADMIN GUI .....	13
1.2 STATUS .....	14
1.2.1 <i>Overview</i> .....	14
1.2.2 <i>Routes</i> .....	16
1.2.3 <i>System Log</i> .....	17
1.2.4 <i>Kernel log</i> .....	17
1.2.5 <i>Processes</i> .....	18
1.2.6 <i>Realtime Graphs</i> .....	18
1.3 SYSTEM .....	20
1.3.1 <i>System</i> .....	20
1.3.2 <i>Administration</i> .....	21
1.3.3 <i>System Firmware</i> .....	21
1.3.4 <i>Reboot</i> .....	22
1.3.5 <i>Support</i> .....	22
1.4 GIoT .....	22
1.4.1 <i>Status</i> .....	23
1.4.2 <i>Provision</i> .....	23
1.4.3 <i>Configuration</i> .....	23
1.4.4 <i>Network Server</i> .....	24
1.4.5 <i>Network Server Log</i> .....	25
1.4.6 <i>Channel Scan</i> .....	25
1.4.7 <i>Channel Setting</i> .....	26



# BROWAN

1.4.8	GMS Setting.....	26
1.4.9	Antenna Gain.....	27
1.4.10	GPS MAP.....	27
1.5	LoRAWAN.....	28
1.5.1	OTAA Status.....	28
1.5.2	Node Parameters.....	29
1.5.3	OTAA.....	30
1.5.4	ABP.....	32
1.6	NETWORK.....	36
1.6.1	WAN.....	36
1.6.2	Wireless.....	38
1.6.3	LAN.....	39
1.6.4	DHCP.....	39
1.6.5	Diagnostic.....	41
<b>2.</b>	<b>PACKET FORWARD MODE.....</b>	<b>43</b>
2.1	OPEN ADMIN GUI.....	43
2.2	STATUS.....	44
2.2.1	Overview.....	44
2.2.2	Routes.....	46
2.2.3	System Log.....	47
2.2.4	Kernel log.....	47
2.2.5	Processes.....	48
2.3	SYSTEM.....	50
2.4	GIOT.....	52
2.4.3	GPS MAP.....	53
2.5	PACKET FORWARD.....	54
2.5.1	Settings.....	54
2.5.1.1	Gateway Info.....	54
2.5.1.2	Gain.....	55
2.5.1.3	Radio and Channel Settings.....	55
2.5.1.4	LBT Settings.....	56
2.5.2	Log.....	57
2.6	NETWORK.....	57
2.6.1	WAN.....	58
2.6.2	Wireless.....	60
2.6.3	LAN.....	60
2.6.4	DHCP.....	61
2.6.5	Diagnostic.....	61

## IoT Femto Cell - Product Introduction

### Product Design

The dimension of the IoT Femto Gateway (WLRGFM-100) is 116 x 91 x 27 mm, and it comes with one external LoRa antenna, one WAN port and one USB 2.0 port.

**IoT Femto Gateway  
-Product Image**

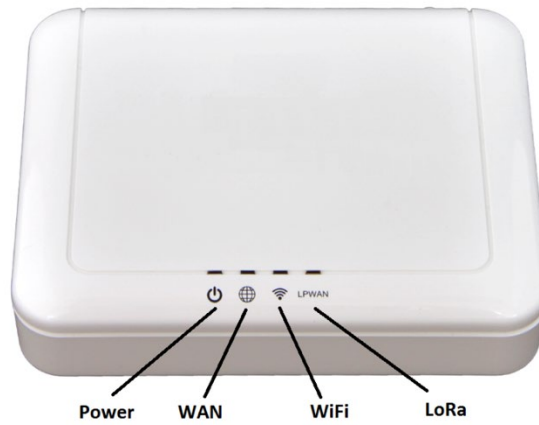




## Product Features

- In compliance with the latest LoRaWAN specification v1.0.3 and Regional Parameters v1.0.3
- Wide frequency range from 470MHz to 928MHz in different SKU
- Up to 8 concurrent channels for LoRa transmission
- Works with Browan embedded network server (LoRaWAN Standalone Mode) by default, customer can specify the MQTT broker's address and it will direct data to your specified MQTT broker.
- Supports packet forward mode to work with 3rd party network server that uses UDP protocol, such as TTN, *ChirpStack*.
- Embedded network server or packet forward mode to work with 3rd party network server
- Two classes of LoRa end-device are supported- Class A and Class C
- Two activation methods- ABP and OTAA
- Active scan for channel availability with RSSI levels
- Supports Listen-Before-Talk (LBT) for downlink
- Built-in 2.4GHz 802.11b/g/n Wireless LAN, as AP or repeater mode
- Firmware can be upgraded via OTA or USB port
- Heart beat for monitoring real time status
- Various Internet connections: Ethernet, WiFi
- Support 3G/4G USB dongle as backhaul connection (customized SKU)
- Non-Line-of-Sight (NLOS) coverage
- Self-installation and easy deployment
- Superior receiving sensitivity

## Product Details

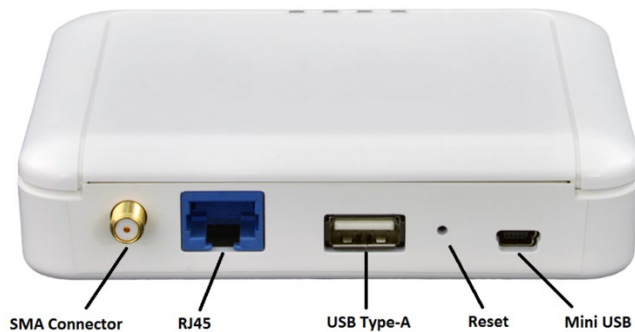


## IoT Femto Gateway – LED Indicators

### LED Indicators

LED	Color	Status	Description
Power	Green	Off	Power off
		On	Power on
		Blinking	Booting
	Orange	Off	N/A
		On	System Error (no provision)
		Blinking	System is upgrading
WAN	Green	Off	Failed to obtain IP address
		On	- Ethernet cable attached, and IP address obtained - WiFi repeater mode enabled and IP address obtained
		Blinking	N/A
	Orange	Off	N/A
		On	N/A
		Blinking	N/A
WiFi	Green	Off	WiFi radio disabled
		On	WiFi radio enabled
		Blinking	N/A
	Orange	Off	N/A
		On	N/A
		Blinking	N/A
LoRa	Green	Off	LoRa network server disconnected or inactivated
		On	LoRa network server connected or activated
		Blinking	N/A
	Orange	Off	N/A
		On	N/A
		Blinking	N/A





## IoT Femto Gateway - I/O Ports

### I/O Ports

Port	Count	Description
SMA connector	1	External LoRa antenna
RJ45	1	WAN port of the device
USB Type-A	1	For firmware upgrade
Reset	1	Reset to default (5 seconds to reset settings to factory default)
Mini USB	1	Connected with USB power adapter

## Product Specifications

### Hardware Specification

No.	Item	Description
1	Model Name	WLRGFM-100
2	Frequency Band	The following configuration is supported by different SKU: - EU 862~870 MHz - US 902~928 MHz - IN 865~867 MHz - AS 920~928 MHz - CN 470~510 MHz
3	CPU	Network SOC with 580MHz MIPS CPU Core
4	RAM/Flash	2Gbit/ 4Gbit
5	RF Transceiver	- SX1301 with SX1257 & SX1276 (channel scanning) - SX1301 with SX1255 & SX1276 (channel scanning) for CN-470 SKU
6	Number of Channels	8 concurrent channels
7	WiFi	802.11 b/g/n 2.4GHz
8	WAN Port	One RJ-45 10/100Base-T/TX, Autosensing, Auto-MDIX
9	Transmit RF Power	0.5W (up to 27 dBm)
10	Receive Sensitivity	Down to -142 dBm
11	Modulation	Based on LoRaWAN
12	Security	AES 128
13	USB Port	One USB 2.0 port for firmware upgrade
14	Working Temperature	Operating: -10°C ~ 55°C Storage: -10°C ~ 60°C
15	Working Humidity	Operating: 10 ~ 85% (Non-Condensing) Storage: 5 ~ 90% (Non-Condensing)
16	Power Supply	5VDC/2A via mini-USB port
17	Antenna Type	Built-in Wi-Fi antenna and one (1) external SMA LoRa antenna
18	Indicators	4 LED indicators
19	Dimensions	L:116 x W:91 x H:27 mm
20	Weight	160 g

## Software Specification

No.	Item	Description
1	Internet Connectivity	- thru WAN port with fixed IP/ DHCP client/ PPPoE - thru WiFi repeater mode
2	WiFi Configuration	SSID/ Encryption/ Channels
3	Network Configuration	- DHCP server for IP leasing - Diagnostics with Ping, TraceRoute and NSlookup
4	System Status	- Overview with system, software version, memory usage and wireless configuration - System Log shows system console information - Kernel Log shows kernel information - Processes shows running process information - Real-time graphs shows system load, inbound/outbound traffic and IP connections
5	LoRa Information	- Current LoRa channel configuration and Gateway ID - Supported spreading factors - Provision code - External network server configuration and logs - Channel scan
6	LoRaWAN Configuration (LoRaWAN mode with embedded network server)	- Current OTAA end-node list - Detailed end-node logs at Gateway - ABP table for managing end-node device with ABP mode (user-defined DevAddr/ NwkSKey/ AppSKey) - OTAA table for managing end-node with OTAA mode (user-defined AppEUI/ DevEUI/ AppKey/ DevAddr Start Counts/ Aging Out time)
7	Provisioning	Auto/manual provisioning with area code/customer code for configuring regional frequency bands and switch over between LoRaWAN Standalone mode or packet forward mode
8	Channel Scan	The gateway can scan all supported channels based on ISM band regulation
9	Time Sync	- Support Network Time Protocol (NTP) - Sync up with browser's time
10	Firmware Upgrade	1. Over-the-air (OTA) upgrade 2. Thru USB port
11	Remote Management	- Managed and configured by Browan Network Management System (DCMS) at LoRaWAN Standalone mode - Auto-provisioning with public and private data model - Keepalive with CPU load, memory usage and in/out traffic
12	LoRa Uplink Message Format (LoRaWAN mode with external MQTT broker)	Uplink Message (to network server) includes: 1. Channel info 2. Spreading factor 3. Received time 4. Gateway IP 5. Gateway ID 6. Received RSSI 7. Received SNR

No.	Item	Description
		8. Device address of end-node 9. Uplink data 10. Frame count 11. F-port
13	LoRa Downlink Message Format (LoRaWAN mode with external MQTT broker)	Downlink Message (from network server) includes: 1. Device address of end-node 2. Downlink data 3. Gateway ID 4. Any string ID (for tracking purpose) 5. Un-confirmed or confirmed data

### LoRa Specification

No.	Item	Description
1	Standard	LoRaWAN v1.0.3
2	LoRa Classes	- Class A: supported - Class B: to be supported in later release - Class C: supported
3	ADR	Adaptive data rate is supported to control spreading factor of nodes
4	Activation	Both Activation-by-Personalization (ABP) and Over-the-Air-Activation (OTAA) are supported
5	MAC Commands	LoRaWAN v1.0.3

### LoRa RF Specification

No.	Item	Capability	Remarks
1	Frequency Range	- EU 862~870 MHz - US 902~928 MHz - IN 865~867 MHz - AS 920~928 MHz - CN 470~510 MHz	Separated SKU
2	Channel Band Width	125/250/500 kHz	8 uplinks + 1 downlink
3	Maximum Output Power	27 dBm	
4	Sensitivity	-142 dBm	BW=125KHz with SF=10

\* All the radio performance is validated from 0 to 40 °C

### Regulatory Specification

No.	Item	Standard
1	FCC	ID: MXF-WLRGFM100
2	Telec	No.: 201-170417 / 01
3	CE	EN 62311:2008 EN 50385:2017 EN 55032:2015/AC:2016, Class B EN 61000-3-2:2014, Class A EN 61000-3-3:2013 EN 55024:2010/A1:2015 IEC 61000-4-2:2008 ED 2.0 IEC 61000-4-3:2010 ED 3.2 IEC 61000-4-4:2012 ED 3.0 IEC 61000-4-5:2014 ED 3.0 IEC 61000-4-6:2013 ED 4.0 IEC 61000-4-8:2009 ED 2.0 IEC 61000-4-11:2004 ED 2.0 EN 300 220-2 V3.1.1 (2017-02) EN 300 220-1 V3.1.1 (2017-02) EN 300 328 V2.1.1 (2016-11) EN 301 489-1 V2.2.0 (2017-03) EN 301 489-3 V2.1.1 (2017-03) EN 301 489-17 V3.2.0 (2017-03) EN 60950-1:2006+A11:2009+A1:2010+A12:2011+A2:2013
4	Anatel	No.: 04133-19-12264

### Reliability Specification

No	Item	Specification
1	MTBF	300,000 @ 40 °C

# IoT Femto Cell - WebUI User Guide

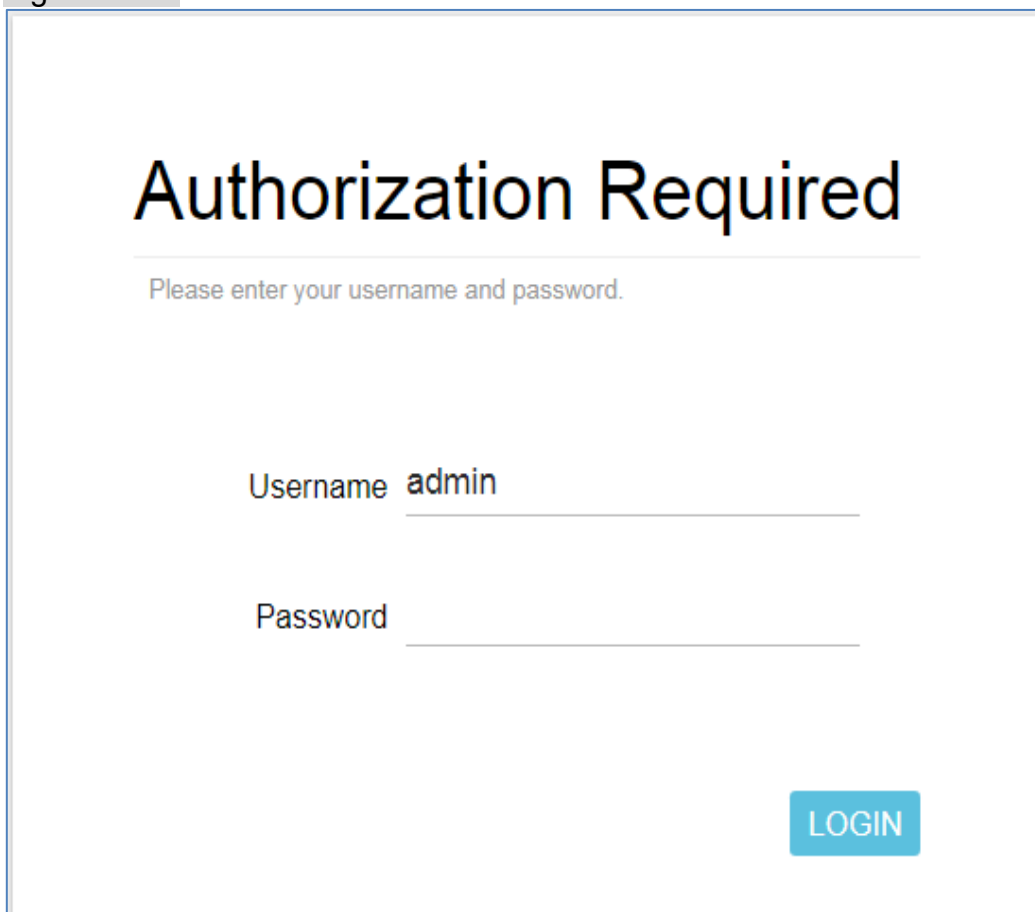
IoT Femto Cell provides 2 types of mode options: LoRaWAN mode and Packet Forward mode. This User Guide will assist you in navigating the system with the following comprehensive guidelines.

## 1. LoRaWAN mode

### 1.1 Open Admin GUI

Connect to IoT Femto Gateway via wifi (SSID: AP-last 6 digits of mac address)  
Access IoT Femto Cell WebUI via IP address "192.168.55.1".  
Default username is "admin" and password is "admin".

Figure 1.1-A



**Authorization Required**

---

Please enter your username and password.

Username

Password

**LOGIN**

## 1.2 Status

The Status menu consists of the following categories: Overview, Routes, System Log, Kernel Log, Processes and Realtime Graphs. An introduction of each category will be distinctly stated in individual paragraphs.

### 1.2.1 Overview

The purpose of this category is to view the following contents: System Status, Memory Usage and Network Settings.

The contents are exhibited in one single page. Please scroll down the Status page to obtain an overall view.

Figure 1.2.1-A System Status

System	
Hostname	Femto-F3CF0D
Model	GIOT InDoor FemtoCell
Firmware Version	Version 3.04.27 Fri Feb 21 14:40:41 CST 2020
Kernel Version	3.10.14
Local Time	05/11/20 14:47:31
Uptime	72h 46m 4s
Load Average	0.58, 0.36, 0.34

Figure 1.2.1-B Memory Usage and Network Settings

Memory	
Total Available	95992 kB / 125384 kB (76%)
Free	59716 kB / 125384 kB (47%)
Cached	30740 kB / 125384 kB (24%)
Buffered	5536 kB / 125384 kB (4%)

Network	
IPv4 WAN Status	<p>Type: dhcp            Address: 192.168.31.167            Netmask: 255.255.255.0            eth0.2 Gateway: 192.168.31.1            DNS 1: 192.168.31.1            Connected: 16h 29m 52s</p>
Active Connections	25 / 16384 (0%)

Figure 1.2.1-C DHCP Leases and Wireless Status

### DHCP Leases

Hostname	IPv4-Address	MAC-Address	Leasetime remaining
LENOVO-PC	192.168.55.196	a4:db:30:a2:ae:51	7h 29m 22s

### Wireless

Generic 802.11 Wireless Controller (mt7620)

- SSID: AP-b44000
- Mode: ap
- Channel: 3
- Bitrate: 144 Mbit/s
- BSSID: 1C:49:7B:B4:40:00
- Encryption: psk-mixed+tkip+ccmp
- SSID: undefined
- Mode: sta
- Channel: 3
- Bitrate: 144 Mbit/s

Wireless is disabled or not associated

An “*AUTO REFRESH ON/OFF*” button is lodged on the top right of the panel. This function enables the status data to be refreshed every 5 seconds. Status will auto refresh in 5 secs if “*Auto Refresh ON*” button is on.

Figure 1.2.1-D Status

AUTO REFRESH ON

## Status

### System

Hostname	Femto-F3CF0D
Model	GIOT InDoor FemtoCell
Firmware Version	Version 3.04.27 Fri Feb 21 14:40:41 CST 2020
Kernel Version	3.10.14
Local Time	05/11/20 14:49:35
Uptime	72h 48m 8s
Load Average	1.68, 0.86, 0.52



Click “*AUTO REFRESH ON/OFF*” button to enable/ disable auto refresh.

Figure 1.2.1-E Status

AUTO REFRESH OFF

## Status

System

Hostname	Femto-F3CF0D
Model	GIOT InDoor FemtoCell
Firmware Version	Version 3.04.27 Fri Feb 21 14:40:41 CST 2020
Kernel Version	3.10.14
Local Time	05/11/20 14:50:16
Uptime	72h 48m 49s
Load Average	1.48, 0.90, 0.55

## 1.2.2 Routes

The purpose of this category is to view the ARP table and active IPv4 routes information.

Figure 1.2.2-A ARP table and Active IPv4 Routes

## Routes

The following rules are currently active on this system.

### ARP

IPv4-Address	MAC-Address	Interface
192.168.31.1	28:6c:07:5f:2a:52	eth0.2
192.168.55.196	a4:db:30:a2:ae:51	br-lan

### Active IPv4-Routes

Network	Target	IPv4-Gateway	Metric
wan	0.0.0.0/0	192.168.31.1	0
wan	192.168.31.0/24	0.0.0.0	0
lan	192.168.55.0/24	0.0.0.0	0



## 1.2.3 System Log

This category is to view system log information.

Figure 1.2.3-A System Log

### System Log

```
Fri Sep 15 19:17:10 2017 user.emerg syslog: switch reg write offset=2004, value=ff0003
Fri Sep 15 19:17:10 2017 user.emerg syslog: switch reg write offset=2104, value=ff0003
Fri Sep 15 19:17:10 2017 user.emerg syslog: switch reg write offset=2204, value=ff0003
Fri Sep 15 19:17:10 2017 user.emerg syslog: switch reg write offset=2304, value=ff0003
Fri Sep 15 19:17:10 2017 user.emerg syslog: switch reg write offset=2404, value=ff0003
Fri Sep 15 19:17:10 2017 user.emerg syslog: switch reg write offset=2504, value=ff0003
Fri Sep 15 19:17:10 2017 user.emerg syslog: switch reg write offset=2010, value=810000c0
Fri Sep 15 19:17:10 2017 user.emerg syslog: switch reg write offset=2110, value=810000c0
Fri Sep 15 19:17:10 2017 user.emerg syslog: switch reg write offset=2210, value=810000c0
Fri Sep 15 19:17:10 2017 user.emerg syslog: switch reg write offset=2310, value=810000c0
Fri Sep 15 19:17:10 2017 user.emerg syslog: switch reg write offset=2410, value=810000c0
Fri Sep 15 19:17:10 2017 user.emerg syslog: switch reg write offset=2510, value=810000c0
Fri Sep 15 19:17:10 2017 user.emerg syslog: switch reg write offset=2610, value=81000000
Fri Sep 15 19:17:10 2017 user.emerg syslog: switch reg write offset=2710, value=81000000
Fri Sep 15 19:17:10 2017 user.emerg syslog: switch reg write offset=2604, value=20ff0003
Fri Sep 15 19:17:10 2017 user.emerg syslog: switch reg write offset=2704, value=20ff0003
Fri Sep 15 19:17:10 2017 user.emerg syslog: Special Tag Disabled
Fri Sep 15 19:17:10 2017 user.emerg syslog: switch reg write offset=2610, value=81000000
Fri Sep 15 19:17:10 2017 user.emerg syslog: switch reg write offset=2014, value=10001
Fri Sep 15 19:17:10 2017 user.emerg syslog: switch reg write offset=2114, value=10001
Fri Sep 15 19:17:10 2017 user.emerg syslog: switch reg write offset=2214, value=10001
Fri Sep 15 19:17:10 2017 user.emerg syslog: switch reg write offset=2314, value=10001
Fri Sep 15 19:17:10 2017 user.emerg syslog: switch reg write offset=2414, value=10002
Fri Sep 15 19:17:10 2017 user.emerg syslog: switch reg write offset=2514, value=10002
Fri Sep 15 19:17:10 2017 user.emerg syslog: REG_ESH_WT_MAC_ATC is 0x7ff0002
Fri Sep 15 19:17:10 2017 user.emerg syslog:
done.
Fri Sep 15 19:17:11 2017 user.emerg syslog: uci: Entry not found
Fri Sep 15 19:17:11 2017 user.emerg syslog: 2.4G disabled=0, 5G disabled=0
Fri Sep 15 19:17:11 2017 user.emerg syslog: mknod: /dev/gpio: File exists
Fri Sep 15 19:17:11 2017 user.emerg syslog: [debug] scenario: WSEC_OFF
Fri Sep 15 19:17:11 2017 user.emerg syslog: [debug] LED:[wlan] Act:[on] GPIO:[8]
Fri Sep 15 19:17:11 2017 kern.warn kernel: [ 31.500000] led=8, on=4000, off=1, blinks=1, reset=1, time=1
Fri Sep 15 19:17:11 2017 user.emerg syslog: [debug] LED:[wsec] Act:[off] GPIO:[10]
Fri Sep 15 19:17:11 2017 kern.warn kernel: [ 31.630000] led=10, on=1, off=4000, blinks=1, reset=1, time=1
Fri Sep 15 19:17:12 2017 user.emerg syslog: rm: can't remove '/tmp/first_chk.tmp': No such file or directory
Fri Sep 15 19:17:12 2017 cron.info crond[1398]: crond: crond (busybox 1.22.1) started, log level 5
Fri Sep 15 19:17:13 2017 daemon.warn netifd: You have delegated IPv6-prefixes but haven't assigned them to any interface. Did you forget to set optio
```

## 1.2.4 Kernel log

This category is to view kernel log information.

Figure 1.2.4-A Kernel Log

### Kernel Log

```
[ 0.000000] Linux version 3.10.14 (alex@ubuntu) (gcc version 4.8.3 (OpenWrt/Linaro GCC 4.8-2014.04 unknown) ) #3 Thu Sep 7 16:33:51 CST 2017
[ 0.000000]
[ 0.000000] The CPU feqence set to 580 MHz
[ 0.000000] PCI: bypass PCIe DLL.
[ 0.000000] PCI: Elastic buffer control: Addr:0x68 -> 0xB4
[ 0.000000] disable all power about PCIe
[ 0.000000] CPU0 revision is: 00019650 (MIPS 24KEc)
[ 0.000000] Software DMA cache coherency
[ 0.000000] Determined physical RAM map:
[ 0.000000] memory: 08000000 @ 00000000 (usable)
[ 0.000000] Initrd not found or empty - disabling initrd
[ 0.000000] Zone ranges:
[ 0.000000] Normal [mem 0x00000000-0x07ffffff]
[ 0.000000] Movable zone start for each node
[ 0.000000] Early memory node ranges
[ 0.000000] node 0: [mem 0x00000000-0x07ffffff]
[ 0.000000] On node 0 totalpages: 32768
[ 0.000000] free_area_init_node: node 0, pgdat 80428880, node_mem_map 81000000
[ 0.000000] Normal zone: 256 pages used for memmap
[ 0.000000] Normal zone: 0 pages reserved
[ 0.000000] Normal zone: 32768 pages, LIFO batch:7
[ 0.000000] Primary instruction cache 64kB, 4-way, VIPT, linesize 32 bytes.
[ 0.000000] Primary data cache 32kB, 4-way, PIPT, no aliases, linesize 32 bytes
[ 0.000000] pcpu-alloc: s0 r0 d32768 u32768 alloc=1*32768
[ 0.000000] pcpu-alloc: [0] 0
[ 0.000000] Built 1 zonelists in Zone order, mobility grouping on. Total pages: 32512
[ 0.000000] Kernel command line: console=ttyS1,57600n8 root=/dev/mtdblock6 rootfstype=squashfs,jffs2 running_fw=firmware2
[ 0.000000] PID hash table entries: 512 (order: -1, 2048 bytes)
[ 0.000000] Dentry cache hash table entries: 16384 (order: 4, 65536 bytes)
[ 0.000000] Inode-cache hash table entries: 8192 (order: 3, 32768 bytes)
[ 0.000000] Writing ErrCtl register=0000257a
[ 0.000000] Readback ErrCtl register=0000257a
[ 0.000000] Memory: 125164K/131072k available (3412k kernel code, 5908k reserved, 847k data, 220k init, 0k highmem)
[ 0.000000] SLUB: Hwalign=32, Order=0-3, MinObjects=0, CPUs=1, Nodes=1
[ 0.000000] NR_IRQS=128
```

## 1.2.5 Processes

The purpose of this category is to view the system processes that are in progress. Processes can be hung up, terminated, and killed for each individual IoT Femto Gateway.

Figure 1.2.5-A Processes

**Processes**

This list gives an overview over currently running system processes and their status.

PID	Owner	Command	CPU usage (%)	Memory usage (%)	Hang Up	Terminate	Kill
1	root	/sbin/procd	0%	1%	HANG UP	TERMINATE	KILL
2	root	[kthreadd]	0%	0%	HANG UP	TERMINATE	KILL
3	root	[ksoftirqd/0]	0%	0%	HANG UP	TERMINATE	KILL
4	root	[kworker/0:0]	0%	0%	HANG UP	TERMINATE	KILL
5	root	[kworker/0:0H]	0%	0%	HANG UP	TERMINATE	KILL
6	root	[kworker/u2:0]	0%	0%	HANG UP	TERMINATE	KILL
7	root	[watchdog/0]	0%	0%	HANG UP	TERMINATE	KILL

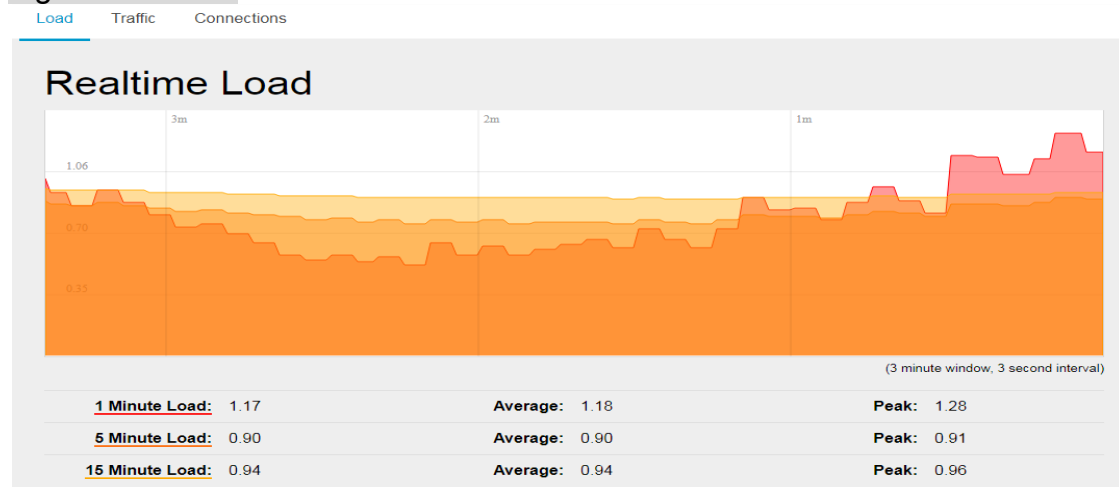
## 1.2.6 Realtime Graphs

This category is further divided into the following sectors: Load, Traffic, and Connections. These options are lodged and labeled above the graph.

### 1.2.6.1 Realtime Load

To view the current load value and average of different time intervals.

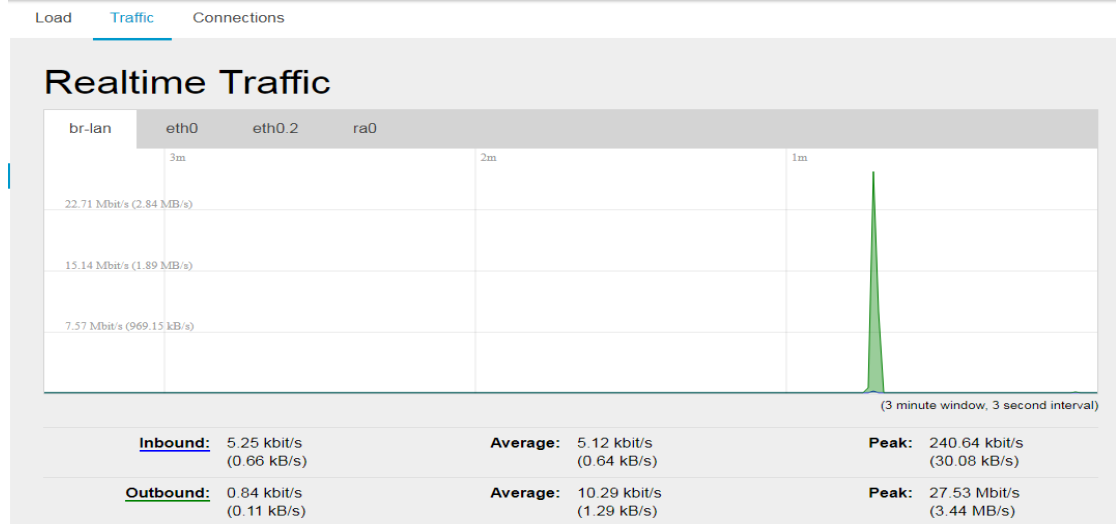
Figure 1.2.6.1-A Realtime Load



## 1.2.6.2 Realtime Traffic

To view the network traffic of each interface.

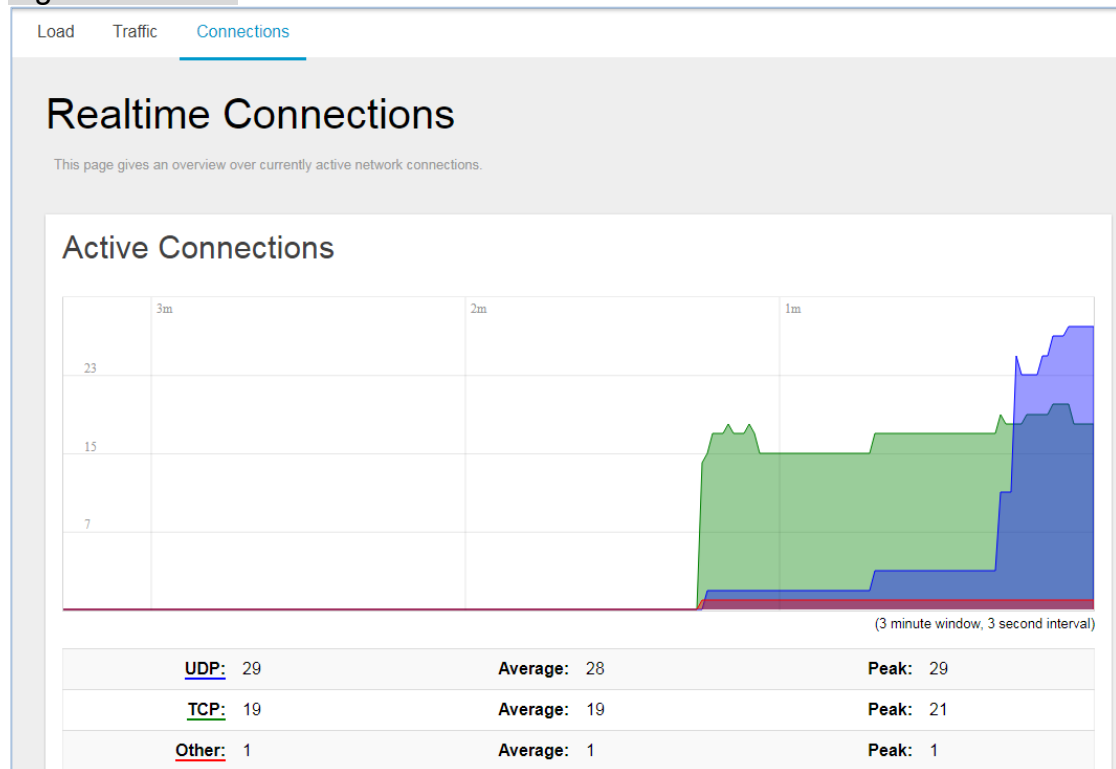
Figure 1.2.6.2-A Realtime Traffic



## 1.2.6.3 Realtime Connections

To view the currently active network connections.

Figure 1.2.6.3-A Realtime Connections



## 1.3 System

The System menu consists of the following categories: System, Administration, System Firmware, Reboot and Support. Introduction and input procedures for each category are described in the following paragraphs.

### 1.3.1 System

Hostname and Timezone can be customized in the system properties. Click “*Sync with Browser*” button to adjust the local time.

Figure 1.3.1-A System Properties

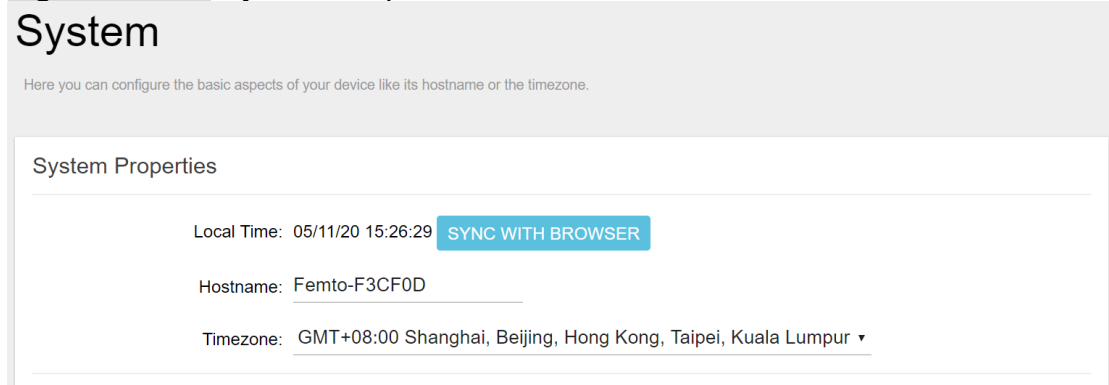


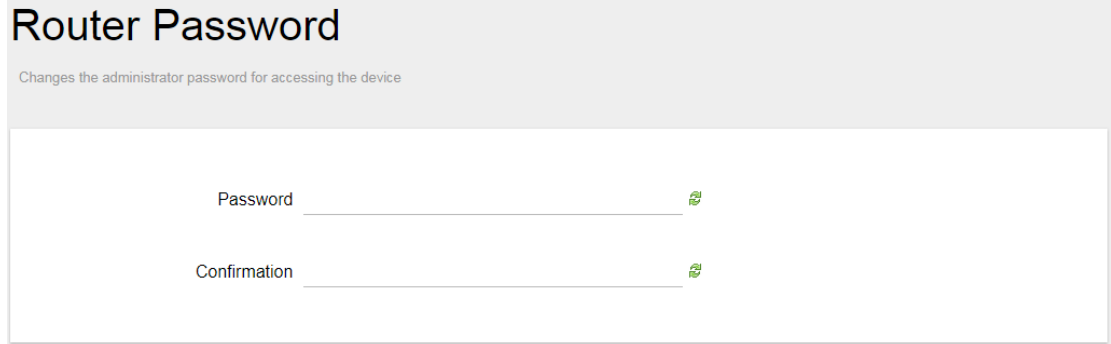
Figure 1.3.1-B Time Synchronization



## 1.3.2 Administration


Femto login password can be configured in this page. Different languages can be applied according to usage (supports English and Simplified Chinese).

Figure 1.3.2-A Router Password



**Router Password**

Changes the administrator password for accessing the device

Password  


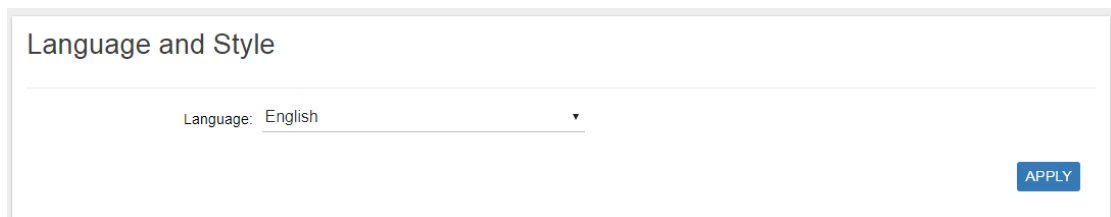

Confirmation  

Figure 1.3.2-B Language and Style



**Language and Style**

Language: English 

[APPLY](#)

## 1.3.3 System Firmware

IoT Femto Gateway supports 2 different upgrade methods: Online OTA Upgrade and Local OTA Upgrade.

### Online OTA Upgrade

Click “CHECK NEW FIRMWARE” button to search the OTA server for the latest version of the new system firmware. Once a new system firmware version is detected on the OTA server, click “UPGRADE NOW” button to upgrade the newest system firmware from OTA server.

### Local OTA Upgrade

The user may choose to upload and upgrade the system offline with the latest firmware provided by our service team.

Figure 1.3.3-A System Firmware

Firmware Information

---

**Online OTA Upgrade**  
Click "Check New Firmware" to check new firmware from OTA server.

Primary Firmware: 3.04.27

Secondary Firmware: 3.05.01

Version of OTA Server: 3.04.27

**CHECK NEW FIRMWARE**

**Local OTA Upgrade**  
Upload a firmware file here to replace the running firmware.

Firmware file:  No file chosen

## 1.3.4 Reboot

Click "*PERFORM REBOOT*" to reboot IoT Femto Gateway.

Figure 1.3.4-A Reboot

### Reboot

Reboots the operating system of your device

**PERFORM REBOOT**

## 1.3.5 Support

Here you can export the gateway log. When you got some issue, it could help our support team to analyze the gateway status.

Figure 1.3.5-A Export Logs

Export Logs

Click "Export" button to download the log file.

## 1.4 Glot

The Glot menu consists of the following categories: Status, Provision, Configuration, Network Server, Network Server Log, Channel Scan, Channel Setting, GMS Setting, Antenna Gain and GPS MAP.

## 1.4.1 Status

The purpose of this category is to view GloT information as in its Provision Code, Gateway Type, Gateway ID or LoRa Modules, Channels, Spreading Factor, and GPS Status.

Figure 1.4.1-A GloT Info

### GloT Status

GloT Info	
Provisioning Code	F0FFE840 (Provision)
Area Code	F0FFE840
Gateway Type	Femto
LoRa Module	ON
Gateway ID	80029cee2a32
Radio 0	Ch0: ON 902.3MHz Ch1: ON 902.5MHz Ch2: ON 902.7MHz Ch3: ON 902.9MHz
Radio 1	Ch4: ON 903.1MHz Ch5: ON 903.3MHz Ch6: ON 903.5MHz Ch7: ON 903.7MHz
GloT key Status	
GloT Connect	Online
Spreading Factor	uplink: 7 8 9 10 11 12, downlink: 12
GPS	Latitude24.87173082179602, Longitude121.00902218682265 <a href="#">SHOW ON MAP</a>

## 1.4.2 Provision

GloT provision code can be set up on this page.

Figure 1.4.2-A Provision Code

### Provision Code

System will reboot if activate Provision Code succeed

Code

[APPLY](#)

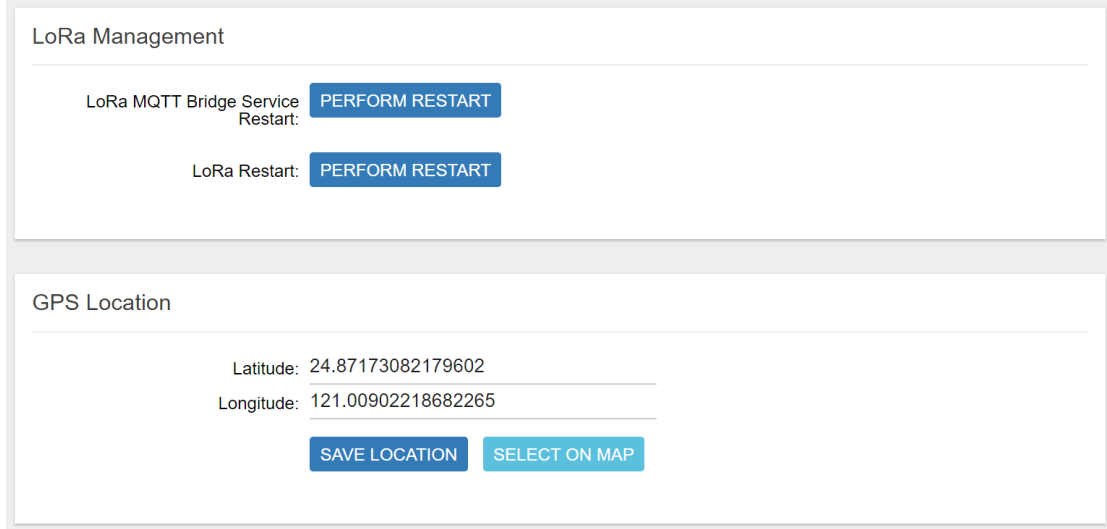
## 1.4.3 Configuration

Click “*PERFORM RESTART*” button to restart LoRa server or MQTT Bridge.

The latitude and longitude coordinates can be manually embedded in this page. Click “*SAVE LOCATION*” button after inserting the coordinates or click “*SELECT ON MAP*” button to be redirected to the map in GPS Settings.



Figure 1.4.3-A GloT Management  
GloT Management



The screenshot displays the 'GloT Management' interface. It is divided into two main sections: 'LoRa Management' and 'GPS Location'.  
The 'LoRa Management' section contains two rows of controls. The first row is labeled 'LoRa MQTT Bridge Service Restart:' and has a blue button labeled 'PERFORM RESTART'. The second row is labeled 'LoRa Restart:' and also has a blue button labeled 'PERFORM RESTART'.  
The 'GPS Location' section contains two input fields. The first is labeled 'Latitude:' with the value '24.87173082179602'. The second is labeled 'Longitude:' with the value '121.00902218682265'. Below these fields are two buttons: a blue 'SAVE LOCATION' button and a light blue 'SELECT ON MAP' button.

## 1.4.4 Network Server

The user can configure Network Server settings on this page.  
The IoT Femto Cell can connect to the broker via MQTTS or MQTT.

Definitions for Cloud Protocol Settings are listed as follows:

**Protocol:** Displays the protocol that is used to connect to the lora data center.

**MQTT ACK:** Enable/disable MQTT ACK.

**Hostname:** The IP/domain name address of where the cloud server is located.

**QoS:** The MQTT QoS Setting.

**Authentication Mode:** The MQTT authentication mode.

**Username:** The username for the cloud server. (Depend on Authentication mode)

**Password:** The password for the cloud server. (Depend on Authentication mode)

**Root CA:** The MQTT credential file. (Depend on Authentication mode)

**Private Key:** The MQTT credential file. (Depend on Authentication mode)

**Certificate:** The MQTT credential file. (Depend on Authentication mode)

**Publish topic:** The publishing topic of the broker established for downlink. (read only)

**Subscribe topic:** The subscription topic of the broker established for uplink. (read only)

**Downlink ACK:** The subscription topic of the broker established for downlink ack. (read only)

**Port:** Displays the port number that is being used.

Figure 1.4.4-A Network Server

Protocol:

MQTT ACK:

Hostname:

QoS:

Authentication mode:

Username:

Password:

Publish topic:

Subscribe topic:

Downlink ACK:

Port:

[APPLY](#)

## 1.4.5 Network Server Log

Displays the log that is connected to the broker.

Figure 1.4.5-A Network Server Log

### Network Server Log

```

2017-9-16 Sat 19:08:22 Info: Connecting MQTT Host= routing-emq00.giotgateway.com, Port= 8883 ...
2017-9-16 Sat 19:08:23 Info: Connecting MQTT Host= routing-emq00.giotgateway.com, Port= 8883 ...
2017-9-16 Sat 19:08:24 Info: Got a CONNACK message from Broker in response to a connection.

r9-8 Fri 08:09:16 Info: A message initiated with mosquitto_publish has been sent to the broker successfully.
2017-9-8 Fri 08:09:25 Info: A message initiated with mosquitto_publish has been sent to the broker successfully.
2017-9-8 Fri 08:09:26 Info: A message initiated with mosquitto_publish has been sent to the broker successfully.
2017-9-8 Fri 08:09:45 Info: A message initiated with mosquitto_publish has been sent to the broker successfully.
2017-9-8 Fri 08:10:08 Info: A message initiated with mosquitto_publish has been sent to the broker successfully.
2017-9-8 Fri 08:10:15 Info: A message initiated with mosquitto_publish has been sent to the broker successfully.
2017-9-8 Fri 08:10:45 Info: A message initiated with mosquitto_publish has been sent to the broker successfully.
2017-9-8 Fri 08:11:15 Info: A message initiated with mosquitto_publish has been sent to the broker successfully.

```

## 1.4.6 Channel Scan

To scan LoRa channel based on ISM regulation and export the result after the scan is completed.

Figure 1.4.6-A Channel Scan

## Channel Scan

The device can scan all supported channels based on ISM band regulation.  
 Note: The scanning process may take few minutes to complete, please wait until the end of process.

Channel Index	Channel Frequency	Noise indication
Channel 1	902300000	-95.660
Channel 2	902500000	-96.300
Channel 3	902700000	-96.300
Channel 4	902900000	-96.640
Channel 5	903100000	-95.860
Channel 6	903300000	-96.460
Channel 7	903500000	-96.740
Channel 8	903700000	-96.350
Channel 9	903900000	-96.830
Channel 10	904100000	-96.340
Channel 11	904300000	-96.560

## 1.4.7 Channel Setting

To set up LoRa channel frequency.

Figure 1.4.7-A Channel Setting

### Channel Setting

Note: Please confirm your end node supports the NEW channel assignment.

#### Center Frequency

Gateway Module	1c497bb44c54
Center Frequency of Radio 0	902600000 Hz ▼
	Ch0: 902.3MHz Ch1: 902.5MHz Ch2: 902.7MHz Ch3: 902.9MHz
Center Frequency of Radio 1	903400000 Hz ▼
	Ch4: 903.1MHz Ch5: 903.3MHz Ch6: 903.5MHz Ch7: 903.7MHz

## 1.4.8 GMS Setting

To set up gateway network management server.

Figure 1.4.8-A Gateway Network Management Server Setting

### Gateway Network Management Server Setting

Here you can switch MQTT mode or CWMP mode to manage the device.

- Disable : Disable CWMP and MQTT mode

Status: CWMP ▾

## 1.4.9 Antenna Gain


Lora antenna gain can be set up on this page.

Figure 1.4.9-A Antenna Gain

### Antenna Gain

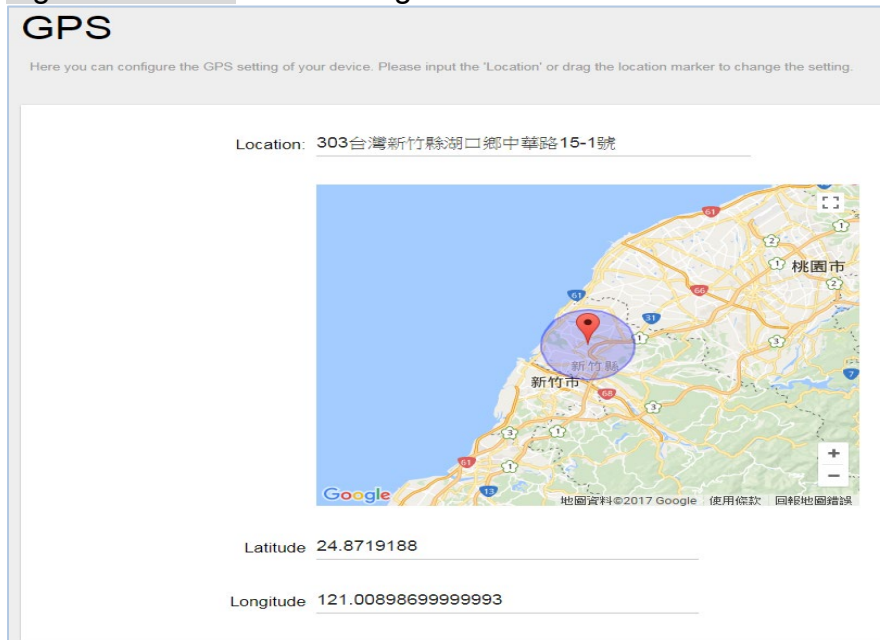
Antenna Gain:  (0 - 15)

## 1.4.10 GPS MAP

To set up the GPS location, simply input your address location in the “*Location*” text field above the map or pinpoint your location on the map by dragging the red marker  to the correct spot.

Once the location is confirmed, the system will verify and apply the new Latitude/Longitude coordinates into its GPS setting.

Figure 1.4.10-A GPS Setting



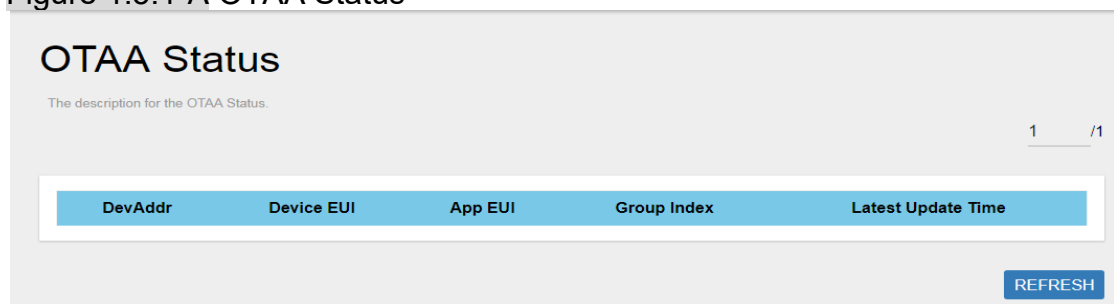
## 1.5 LoRaWAN

The LoRaWAN menu consists of the following categories: OTAA Status, Node Parameters, OTAA and ABP.

### 1.5.1 OTAA Status

The purpose of this category is to view the process status of a node joining Network Server via OTAA, which include DevAddr, Device EUI, App EUI, OTAA Group Index and Latest Update Time.

Figure 1.5.1-A OTAA Status



Click “REFRESH” to renew OTAA Status information.

When there are over 20 OTAA Status entries on the page, users can click on the page number on the upper-right corner to move on to the next page.

Definitions for OTAA Status Fields are listed as follows:

**DevAddr:** The device address of the node assigned by the network server.

**Device EUI:** The unique device EUI of the node.

**App EUI:** The unique app EUI of the node.

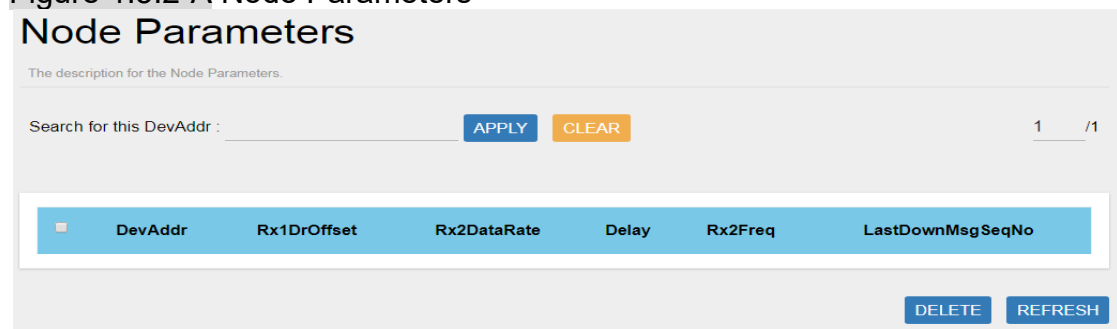
**Group Index:** The unique index of the OTAA EUID group.

**Latest Update Time:** The last time an uplink data was sent (sync per hour)

## 1.5.2 Node Parameters

The purpose of this category is to view node parameters, which include DevAddr, Rx1DrOffset, Rx2DataRate, Delay, Rx2Freq and LastDownMsgSeqNo.

Figure 1.5.2-A Node Parameters



The screenshot shows a web interface for 'Node Parameters'. At the top, there is a search bar labeled 'Search for this DevAddr:' with an 'APPLY' button and a 'CLEAR' button. To the right of the search bar is a page indicator '1 / 1'. Below the search bar is a table with the following headers: DevAddr, Rx1DrOffset, Rx2DataRate, Delay, Rx2Freq, and LastDownMsgSeqNo. At the bottom right of the interface are 'DELETE' and 'REFRESH' buttons.

Users can input a device address in the blank field and click “APPLY” to filter, or click “CLEAR” to cancel filter.

Click “REFRESH” to renew Node Parameters information.

When there are over 20 Node Parameters entries on the page, users can click on the page number on the upper-right corner to move on to the next page.

Users can also select a Node Parameter entry and click “DELETE” to delete its information.

Definitions for Node Parameters Fields are listed as follows:

**DevAddr:** The unique device address of node.

**Rx1DrOffset:** The downlink data rate offset of Rx1.

**Rx2DataRate:** The downlink data rate of Rx2.

**Delay:** The delay between TX and RX.

**Rx2Freq:** The downlink frequency of RX2.

**LastDownMsgSeqNo:** The number of downlink data sent.

## 1.5.3 OTAA

The purpose of this category is to view and configure OTAA rules.

Click “ADD” button to enter OTAA add page and input Group Index, AppEUI Start, AppEUI Counts, DevEUI Start, DevEUI Counts, Devaddr Start, Devaddr Counts, Appkey and Aging Out Time, then click “SAVE” to create an OTAA rule. User will leave OTAA Add page after clicking “CANCEL”.

Definitions for OTAA Fields are listed as follows:

**Group Index:** The unique index of the OTAA EUID group.

**AppEUI Start:** The start number of AppEUI.

**App Counts:** The number of AppEUI in this Group.

**DevEUI Start:** The start number of DevEUI.

**DevEUI Counts:** The number of DevEUI in this Group.

**DevAddr Start:** The start number of DevAddr.

**DevAddr Counts:** The number of DevAddr in this Group.

**AppKey:** Appkey for OTAA join request.

**Aging Out Time (Minutes):** If the Node hasn't sent an uplink message within the aging out time limit, the allocated OTAA DevAddr will become expired and released.

Note: 60~65535; 0 for disable aging out if sensor doesn't have rejoin flow.

Figure 1.5.3-A OTAA Add  
OTAA-Add/Edit

Note: Due to AP's limitation, total DevAddr/NwkAddr counts (OTAA + ABP + NetID) should not over 4096.  
Current count of DevAddr/NwkAddr added is: 0

Parameter	Format
Group Index	INT (0~255)
AppEUI Start	16 HEX digits
AppEUI Counts	Digit (1~4096)
DevEUI Start	16 HEX digits
DevEUI Counts	Digit (1~4096)
DevAddr Start	8 HEX digits
DevAddr Counts	Digit (1~4096)
AppKey	32 HEX digits
Aging Out Time	Minute (60~65535, 0 for disable)

SAVE CANCEL

To delete entries, select one or more OTAA rule entries and click “*DELETE*” button.

Figure 1.5.3-B OTAA Delete  
OTAA

Note: Due to AP's limitation, total DevAddr/NwkAddr counts (OTAA + ABP + NetID) should not over 4096.  
Current count of DevAddr/NwkAddr added is: 3

1 / 1

Group Index	AppEUI Start	AppEUI Counts	DevEUI Start	DevEUI Counts	DevAddr Start	DevAddr Counts	AppKey	AppSKey CRC	Aging Out Time (Minutes)	
<input type="checkbox"/> 1	11111111 11111111	1	11111111 11111111	1	1111 1111	1	11111111 11111111 11111111 11111111	B66B	60	<input type="button" value="EDIT"/>
<input type="checkbox"/> 2	22222222 22222222	2	22222222 22222222	2	2222 2222	2	22222222 22222222 22222222 22222222	2CD5	70	<input type="button" value="EDIT"/>

To edit an entry, select a rule entry and click “*EDIT*” button to proceed. Edit AppEUI Start, AppEUI Counts, DevEUI Start, DevEUI Counts, Devaddr Start, Devaddr Counts, Appkey and Aging Out Time then click “*SAVE*” to edit the OTAA rule.

User will leave OTAA Edit page after clicking “*CANCEL*”.

Figure 1.5.3-C OTAA Edit  
OTAA-Add/Edit

Note: Due to AP's limitation, total DevAddr/NwkAddr counts (OTAA + ABP + NetID) should not over 4096.  
Current count of DevAddr/NwkAddr added is: 3

Parameter	Format	
Group Index	INT (0~255)	1
AppEUI Start	16 HEX digits	1111111111111111
AppEUI Counts	Digit (1~4096)	1
DevEUI Start	16 HEX digits	1111111111111111
DevEUI Counts	Digit (1~4096)	1
DevAddr Start	8 HEX digits	11111111
DevAddr Counts	Digit (1~4096)	1
AppKey	32 HEX digits	11111111111111111111111111111111
Aging Out Time	Minute (60~65535, 0 for disable)	60



## 1.5.4 ABP

The main function of this feature is to add/delete/edit ABP rule entries on this page. The ABP menu consists of the following categories: INDIVIDUAL and NETID GROUP.

### 1.5.4.1 INDIVIDUAL

Click “INDIVIDUAL” button to enter the INDIVIDUAL function page.

Figure 1.5.4.1-A INDIVIDUAL

**ABP**

Note: Due to AP's limitation, total DevAddr/NwkAddr counts (OTAA + ABP + NetID) should not over 4096.  
Current count of DevAddr/NwkAddr added is: 5

INDIVIDUAL NETID GROUP

1 /1

DevAddr	NwksKey	NwksKey CRC	AppSKey	AppSKey CRC	
33333333	33333333333333333333 333333333333	9ABE	33333333333333333333 333333333333	9ABE	EDIT
44444444	44444444444444444444 444444444444	59AA	44444444444444444444 444444444444	59AA	EDIT

DELETE ADD

Click “ADD” button to enter ABP add page and input DevAddr, NwksKey and AppSKey, then click “SAVE” to create an ABP (INDIVIDUAL) rule. User will leave ABP Add page after clicking “CANCEL”.

Definitions for ABP (INDIVIDUAL) Fields are listed as follows:

**DevAddr:** The unique device address of the node.

**NwksKey:** The network session key.

**NwksKey CRC:** The CRC value of network session key.

**AppSKey:** The app session key.

**AppSKey CRC:** The CRC value of app session key.



## 1.5.4.2 NETID GROUP

Click “NETID GROUP” button to enter the NETID GROUP function page.

Figure 1.5.4.2-A NETID GROUP

ABP

Note: Due to AP's limitation, total DevAddr/NwkAddr counts (OTAA + ABP + NetID) should not over 4096.  
Current count of DevAddr/NwkAddr added is: 6

INDIVIDUAL NETID GROUP 1 /1

NwkID	NwkAddr Start	Total number	NwkSKey	NwkSKey CRC	AppSKey	AppSKey CRC	
10	10000000	1	10000000000000000000 000000000000	CC0D	10000000000000000000 000000000000	CC0D	EDIT

DELETE ADD

Click “ADD” button to enter ABP add page and input NwkID, NwkAddr Start, NwkAddr Total Number, NwkSKey and AppSKey, then click “SAVE” to create an ABP (NETID GROUP) rule.

User will leave ABP add page after clicking “CANCEL”.

Definitions for ABP (NETID GROUP) Fields are listed as follows:

**NwkID:** The unique NETID of the ABP group.

**NwkAddr Start:** The start number of ABP device address in the Group.

**NwkAddr Total Number:** The number of ABP device addresses in this Group.

**NwkSKey:** The network session key in the Group.

**NwkSKey CRC:** The CRC value of network session key.

**AppSKey:** The app session key in the Group.

**AppSKey CRC:** The CRC value of app session key.





Figure 1.6.1.1-A WAN Status

WAN Type	DHCP
WAN eth0.2	Uptime: 1h 12m 32s MAC-Address: 1C:49:7B:F3:CF:0E RX: 2.99 MB (10617 Pkts.) TX: 2.12 MB (5694 Pkts.) IPv4: 192.168.11.122/24, 168.168.168.253/24

## 1.6.1.2 Ethernet WAN

This page is to set up the connection type in terms of Static IP, DHCP client or PPPoE. The three different options can be selected in the drop-down menu in “wantype”. Please fill in the respective fields exhibited under each selection. Please make sure the Ethernet cable is connected to a WAN port.

Figure 1.6.1.2-A Static IP

WAN Status [Ethernet WAN](#) Wireless Extender

wantype

IP Address

Subnet Mask

Gateway

DNS Server  (optional)

MAC Address

Figure 1.6.1.2-B DHCP Client

[Ethernet WAN](#) Wireless Extender

wantype

MAC Address

Figure 1.6.1.2-C PPPoE

WAN Status [Ethernet WAN](#) [Wireless Extender](#)

---

wantype

Username

Password

MAC Address

### 1.6.1.3 Wireless Extender

This page is to set up the Wireless Extender Mode for WAN connection. To activate the extended wireless connection, please select “*Enable*” from the Extender mode drop-down menu. Click the “SCAN” button to obtain the list of available Access Points within your surrounding vicinity.

Figure 1.6.1.3-A Wireless Extender

WAN Status [Ethernet WAN](#) [Wireless Extender](#)

---

Wireless Extender

Click “Scan” to get Access Point List

Extender mode:

SSID:

Security:

KEY:

## 1.6.2 Wireless

2.4G Interface Configuration to set up 2.4G wireless SSID, Encryption Type, and Channels can be lodged within this sector.

Figure 1.6.2-A Wireless Setting  
Wireless Setting

2.4G Interface Configuration

---

SSID AP-F3CF0D

Hidden Broadcast

encryption None ▼

2.4G Interface Channel

---

Channel 2432MHz (Channel 5) ▼

### 1.6.3 LAN

LAN IP can be set up in this page.

Figure 1.6.3-A LAN  
LAN

Local Network

---

IP Address 192.168.55.1

### 1.6.4 DHCP

You can manage detailed DHCP server settings, which include First leased address, the allowed Number of leased addresses and Lease time.

Information on Active Leases can be viewed at the bottom of this page.



Figure 1.6.4-A DHCP  
DHCP

### DHCP-Server

Enable	<input type="text" value="enable"/>	▼
First leased address	<input type="text" value="100"/>	(1-254)
Number of leased addresses	<input type="text" value="101"/>	(1-254)
Lease time (hr)	<input type="text" value="12"/>	(1-48)

### Active Leases

Hostname	<a href="#">IPv4-Address</a>	<a href="#">MAC-Address</a>	Leasetime remaining
LENOVO-PC	192.168.55.196	a4:db:30:a2:ae:51	07h 28min 02s



## 1.6.5 Diagnostic

Diagnostics is divided into three parts on the same page: PING, TRACEROUTE and NSLOOKUP. Please see the following for input guidelines.

### 1.6.5.1 PING

Input a specific IP address in the text field above "PING". Click the "PING" button to ping the IP you have specified.

Figure 1.6.5.1-A PING Diagnostics

The screenshot shows the 'Network Utilities' section of a diagnostic tool. It features three input fields, each containing 'openwrt.org'. The first field has a dropdown menu set to 'IPv4' and a 'PING' button. The second field has a 'TRACEROUTE' button. The third field has an 'NSLOOKUP' button. Below these fields is a note: 'Install iputils-traceroute6 for IPv6 traceroute'. The 'Collecting data...' section displays the following output:

```
PING openwrt.org (78.24.191.177): 56 data bytes
64 bytes from 78.24.191.177: seq=0 ttl=45 time=312.082 ms
64 bytes from 78.24.191.177: seq=1 ttl=45 time=309.826 ms
64 bytes from 78.24.191.177: seq=2 ttl=45 time=308.833 ms
64 bytes from 78.24.191.177: seq=3 ttl=45 time=321.124 ms
64 bytes from 78.24.191.177: seq=4 ttl=45 time=309.516 ms

--- openwrt.org ping statistics ---
5 packets transmitted, 5 packets received, 0% packet loss
round-trip min/avg/max = 308.833/312.276/321.124 ms
```

### 1.6.5.2 TRACEROUTE

Input a specific URL or IP address above "TRACEROUTE". Click the "TRACEROUTE" button to trace the URL or IP address you have specified.

Figure 1.6.5.2-A TRACEROUTE Diagnostics

The screenshot shows the 'Network Utilities' section of a diagnostic tool. It features three input fields, each containing 'openwrt.org'. The first field has a dropdown menu set to 'IPv4' and a 'PING' button. The second field has a 'TRACEROUTE' button. The third field has an 'NSLOOKUP' button. Below these fields is a note: 'Install iputils-traceroute6 for IPv6 traceroute'. The 'Collecting data...' section displays the following output:

```
traceroute to openwrt.org (78.24.191.177), 30 hops max, 38 byte packets
 1  192.168.31.1  0.591 ms
 2  *
 3  172.16.29.98  11.165 ms
 4  172.16.29.1  11.244 ms
 5  192.72.45.29  14.475 ms
 6  192.72.154.181  12.360 ms
 7  192.72.49.81  28.800 ms
 8  139.175.57.185  14.452 ms
 9  139.175.58.210  16.800 ms
10  61.58.33.153  40.713 ms
11  129.250.7.40  52.385 ms
```



### 1.6.5.3 NSLOOKUP

Input a specific URL or IP address above “NSLOOKUP”.

Click the “NSLOOKUP” button to view the DNS server of the URL or IP address you have specified.

Figure 1.6.5.3-A NSLOOKUP Diagnostics

The screenshot shows a web interface for network utilities. At the top, there is a section titled "Network Utilities" with a search bar containing "openwrt.org". Below the search bar are three buttons: "PING", "TRACEROUTE", and "NSLOOKUP". The "NSLOOKUP" button is highlighted. Below the buttons, there is a note: "Install iputils-traceroute6 for IPv6 traceroute".

Below the network utilities section, there is a section titled "Collecting data..." which displays the following output:

```
Server: 127.0.0.1
Address 1: 127.0.0.1 localhost

Name: openwrt.org
Address 1: 78.24.191.177 openwrt.org
```



## 2. Packet Forward mode

### 2.1 Open Admin GUI

Connect to IoT Femto Cell via wifi (SSID: AP-last 6 numbers of mac address)  
Access IoT Femto Cell WebUI via IP address "192.168.55.1".  
Default username is "admin" and password is "admin".

Figure 2.1-A

**Authorization Required**

Please enter your username and password.

Username

Password

**LOGIN**

## 2.2 Status

The Status menu consists of the following categories: Overview, Routes, System Log, Kernel Log, Processes and Realtime Graphs. An introduction of each category will be distinctly stated in individual paragraphs.

### 2.2.1 Overview

The purpose of this category is to view the following contents: System Status, Memory Usage and Network Settings.

The contents are exhibited in one single page. Please scroll down the Status page to obtain an overall view.

Figure 2.2.1-A System Status

System	
Hostname	Femto-F3CF0D
Model	GIOT InDoor FemtoCell
Firmware Version	Version 3.04.27 Fri Feb 21 14:40:41 CST 2020
Kernel Version	3.10.14
Local Time	05/11/20 14:47:31
Uptime	72h 46m 4s
Load Average	0.58, 0.36, 0.34

Figure 2.2.1-B Memory Usage and Network Settings

Memory	
Total Available	95992 kB / 125384 kB (76%)
Free	59716 kB / 125384 kB (47%)
Cached	30740 kB / 125384 kB (24%)
Buffered	5536 kB / 125384 kB (4%)

Network	
IPv4 WAN Status	Type: dhcp Address: 192.168.31.167 Netmask: 255.255.255.0 eth0.2 Gateway: 192.168.31.1 DNS 1: 192.168.31.1 Connected: 16h 29m 52s
Active Connections	25 / 16384 (0%)

Figure 2.2.1-C DHCP Leases and Wireless Status

### DHCP Leases

Hostname	IPv4-Address	MAC-Address	Leasetime remaining
LENOVO-PC	192.168.55.196	a4:db:30:a2:ae:51	7h 29m 22s

### Wireless

Generic 802.11 Wireless Controller (mt7620)

- SSID: AP-b44000
- Mode: ap
- Channel: 3
- Bitrate: 144 Mbit/s
- BSSID: 1C:49:7B:B4:40:00
- Encryption: psk-mixed+tkip+ccmp
- SSID: undefined
- Mode: sta
- Channel: 3
- Bitrate: 144 Mbit/s

*Wireless is disabled or not associated*

An “AUTO REFRESH ON/OFF” button is lodged on the top right of the panel. This function enables the status data to be refreshed every 5 seconds. Status will auto refresh in 5 secs if “Auto Refresh ON” button is on.

Figure 2.2.1-D Status

AUTO REFRESH ON

## Status

### System

Hostname	Femto-F3CF0D
Model	GIOT InDoor FemtoCell
Firmware Version	Version 3.04.27 Fri Feb 21 14:40:41 CST 2020
Kernel Version	3.10.14
Local Time	05/11/20 14:49:35
Uptime	72h 48m 8s
Load Average	1.68, 0.86, 0.52

Click “*AUTO REFRESH ON/OFF*” button to enable/ disable auto refresh.

Figure 4.2.1-E Status

AUTO REFRESH OFF

## Status

**System**

Hostname	Femto-F3CF0D
Model	GIOT InDoor FemtoCell
Firmware Version	Version 3.04.27 Fri Feb 21 14:40:41 CST 2020
Kernel Version	3.10.14
Local Time	05/11/20 14:50:16
Uptime	72h 48m 49s
Load Average	1.48, 0.90, 0.55

## 2.2.2 Routes

The purpose of this category is to view the ARP table and active IPv4 routes information.

Figure 2.2.2-A ARP table and Active IPv4 Routes

## Routes

The following rules are currently active on this system.

### ARP

IPv4-Address	MAC-Address	Interface
192.168.31.1	28:6c:07:5f:2a:52	eth0.2
192.168.55.196	a4:db:30:a2:ae:51	br-lan

### Active IPv4-Routes

Network	Target	IPv4-Gateway	Metric
wan	0.0.0.0/0	192.168.31.1	0
wan	192.168.31.0/24	0.0.0.0	0
lan	192.168.55.0/24	0.0.0.0	0

## 2.2.3 System Log

This category is to view system log information.

Figure 2.2.3-A System Log

```
System Log
Fri Sep 15 19:17:10 2017 user.emerg syslog: switch reg write offset=2004, value=ff0003
Fri Sep 15 19:17:10 2017 user.emerg syslog: switch reg write offset=2104, value=ff0003
Fri Sep 15 19:17:10 2017 user.emerg syslog: switch reg write offset=2204, value=ff0003
Fri Sep 15 19:17:10 2017 user.emerg syslog: switch reg write offset=2304, value=ff0003
Fri Sep 15 19:17:10 2017 user.emerg syslog: switch reg write offset=2404, value=ff0003
Fri Sep 15 19:17:10 2017 user.emerg syslog: switch reg write offset=2504, value=ff0003
Fri Sep 15 19:17:10 2017 user.emerg syslog: switch reg write offset=2010, value=810000c0
Fri Sep 15 19:17:10 2017 user.emerg syslog: switch reg write offset=2110, value=810000c0
Fri Sep 15 19:17:10 2017 user.emerg syslog: switch reg write offset=2210, value=810000c0
Fri Sep 15 19:17:10 2017 user.emerg syslog: switch reg write offset=2310, value=810000c0
Fri Sep 15 19:17:10 2017 user.emerg syslog: switch reg write offset=2410, value=810000c0
Fri Sep 15 19:17:10 2017 user.emerg syslog: switch reg write offset=2510, value=810000c0
Fri Sep 15 19:17:10 2017 user.emerg syslog: switch reg write offset=2610, value=81000000
Fri Sep 15 19:17:10 2017 user.emerg syslog: switch reg write offset=2710, value=81000000
Fri Sep 15 19:17:10 2017 user.emerg syslog: switch reg write offset=2604, value=20fff003
Fri Sep 15 19:17:10 2017 user.emerg syslog: switch reg write offset=2704, value=20fff003
Fri Sep 15 19:17:10 2017 user.emerg syslog: Special Tag Disabled
Fri Sep 15 19:17:10 2017 user.emerg syslog: switch reg write offset=2610, value=81000000
Fri Sep 15 19:17:10 2017 user.emerg syslog: switch reg write offset=2014, value=10001
Fri Sep 15 19:17:10 2017 user.emerg syslog: switch reg write offset=2114, value=10001
Fri Sep 15 19:17:10 2017 user.emerg syslog: switch reg write offset=2214, value=10001
Fri Sep 15 19:17:10 2017 user.emerg syslog: switch reg write offset=2314, value=10001
Fri Sep 15 19:17:10 2017 user.emerg syslog: switch reg write offset=2414, value=10002
Fri Sep 15 19:17:10 2017 user.emerg syslog: switch reg write offset=2514, value=10002
Fri Sep 15 19:17:10 2017 user.emerg syslog: REG_ESH_WT_MAC_ATC is 0x7ff0002
Fri Sep 15 19:17:10 2017 user.emerg syslog:
done.
Fri Sep 15 19:17:11 2017 user.emerg syslog: uci: Entry not found
Fri Sep 15 19:17:11 2017 user.emerg syslog: 2.4G disabled=0, 5G disabled=0
Fri Sep 15 19:17:11 2017 user.emerg syslog: mknod: /dev/gpio: File exists
Fri Sep 15 19:17:11 2017 user.emerg syslog: [debug] scenario: WSEC_OFF
Fri Sep 15 19:17:11 2017 user.emerg syslog: [debug] LED:[wlan] Act:[on] GPIO:[8]
Fri Sep 15 19:17:11 2017 kern.warn kernel: [ 31.500000] led=8, on=4000, off=1, blinks=1, reset=1, time=1
Fri Sep 15 19:17:11 2017 user.emerg syslog: [debug] LED:[wsec] Act:[off] GPIO:[10]
Fri Sep 15 19:17:11 2017 kern.warn kernel: [ 31.630000] led=10, on=1, off=4000, blinks=1, reset=1, time=1
Fri Sep 15 19:17:12 2017 user.emerg syslog: rm: can't remove '/tmp/first_chk.tmp': No such file or directory
Fri Sep 15 19:17:12 2017 cron.info crond[1390]: crond: crond (busybox 1.22.1) started, log level 5
Fri Sep 15 19:17:13 2017 daemon.warn netifd: You have delegated IPv6-prefixes but haven't assigned them to any interface. Did you forget to set optio
```

## 2.2.4 Kernel log

This category is to view kernel log information.

Figure 2.2.4-A Kernel Log

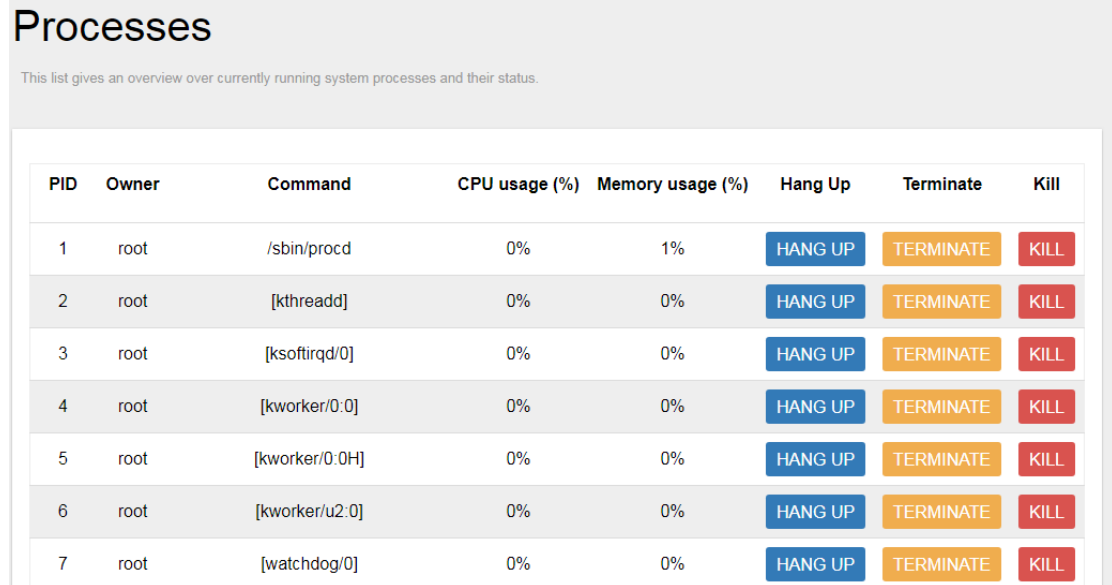
```
Kernel Log
[ 0.000000] Linux version 3.10.14 (alex@ubuntu) (gcc version 4.8.3 (OpenWrt/Linaro GCC 4.8-2014.04 unknown) ) #3 Thu Sep 7 16:33:51 CST 2017
[ 0.000000]
[ 0.000000] The CPU feqence set to 580 Mhz
[ 0.000000] PCI: bypass PCIe DLL.
[ 0.000000] PCI: Elastic buffer control: Addr:0x68 -> 0xB4
[ 0.000000] disable all power about PCIe
[ 0.000000] CPU0 revision is: 00019650 (MIPS 24Kec)
[ 0.000000] Software DMA cache coherency
[ 0.000000] Determined physical RAM map:
[ 0.000000] memory: 08000000 @ 00000000 (usable)
[ 0.000000] Initrd not found or empty - disabling initrd
[ 0.000000] Zone ranges:
[ 0.000000] Normal [mem 0x00000000-0x07ffffff]
[ 0.000000] Movable zone start for each node
[ 0.000000] Early memory node ranges
[ 0.000000] node 0: [mem 0x00000000-0x07ffffff]
[ 0.000000] On node 0 totalpages: 32768
[ 0.000000] free_area_init_node: node 0, pgdat 80428880, node_mem_map 81000000
[ 0.000000] Normal zone: 256 pages used for memmap
[ 0.000000] Normal zone: 0 pages reserved
[ 0.000000] Normal zone: 32768 pages, LIFO batch:7
[ 0.000000] Primary instruction cache 64kB, 4-way, VIPT, linesize 32 bytes.
[ 0.000000] Primary data cache 32kB, 4-way, PIPT, no aliases, linesize 32 bytes
[ 0.000000] pcpu-alloc: s0 r0 d32768 u32768 alloc=1*32768
[ 0.000000] pcpu-alloc: [0] 0
[ 0.000000] Built 1 zonelists in Zone order, mobility grouping on. Total pages: 32512
[ 0.000000] Kernel command line: console=ttyS1,57600n8 root=/dev/mtdblock6 rootfstype=squashfs,jffs2 running_fw=firmware2
[ 0.000000] PID hash table entries: 512 (order: -1, 2048 bytes)
[ 0.000000] Dentry cache hash table entries: 16384 (order: 4, 65536 bytes)
[ 0.000000] Inode-cache hash table entries: 8192 (order: 3, 32768 bytes)
[ 0.000000] Writing ErrCtl register=0000257a
[ 0.000000] Readback ErrCtl register=0000257a
[ 0.000000] Memory: 125164k/131072k available (3412k kernel code, 5908k reserved, 847k data, 220k init, 0k highmem)
[ 0.000000] SLUB: HWalign=32, Order=0-3, MinObjects=0, CPUs=1, Nodes=1
[ 0.000000] NR_IRQS:128
```



## 2.2.5 Processes

The purpose of this category is to view the system processes that are in progress. Processes can be hung up, terminated, and killed for each individual IoT Femto Cell item.

Figure 2.2.5-A Processes



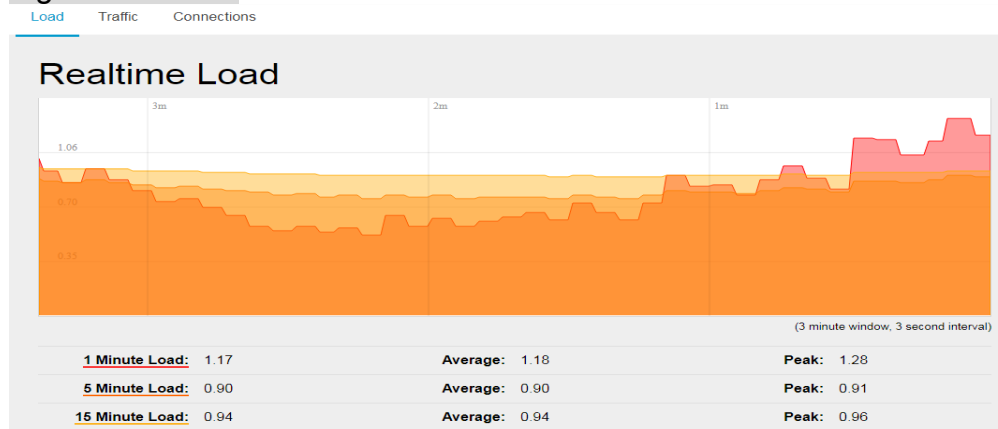
## 2.2.6 Realtime Graphs

This category is further divided into the following sectors: Load, Traffic, and Connections. These options are lodged and labeled above the graph.

### 2.2.6.1 Realtime Load

To view the current load value and average of different time intervals.

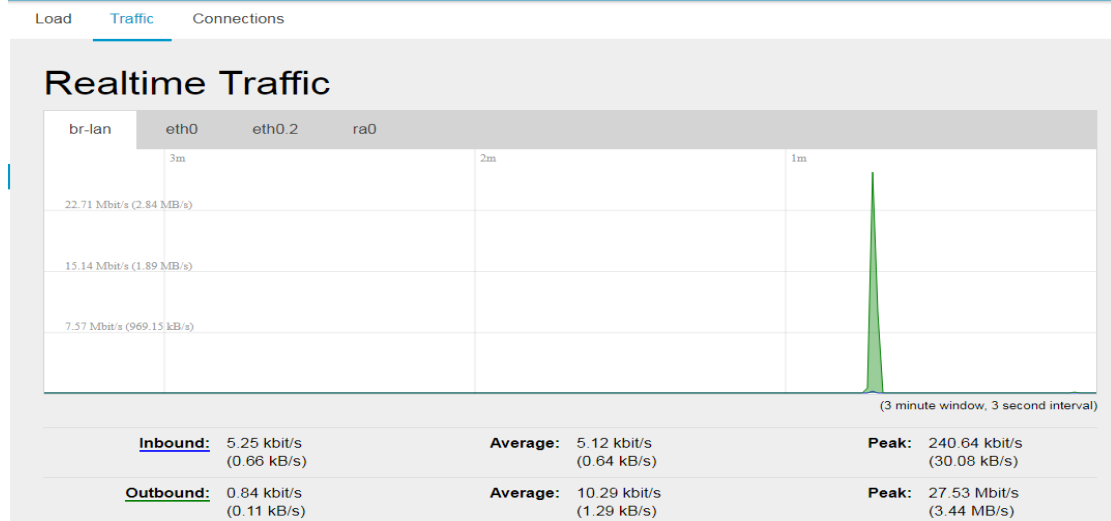
Figure 2.2.6.1-A Realtime Load



## 2.2.6.2 Realtime Traffic

To view the network traffic of each interface.

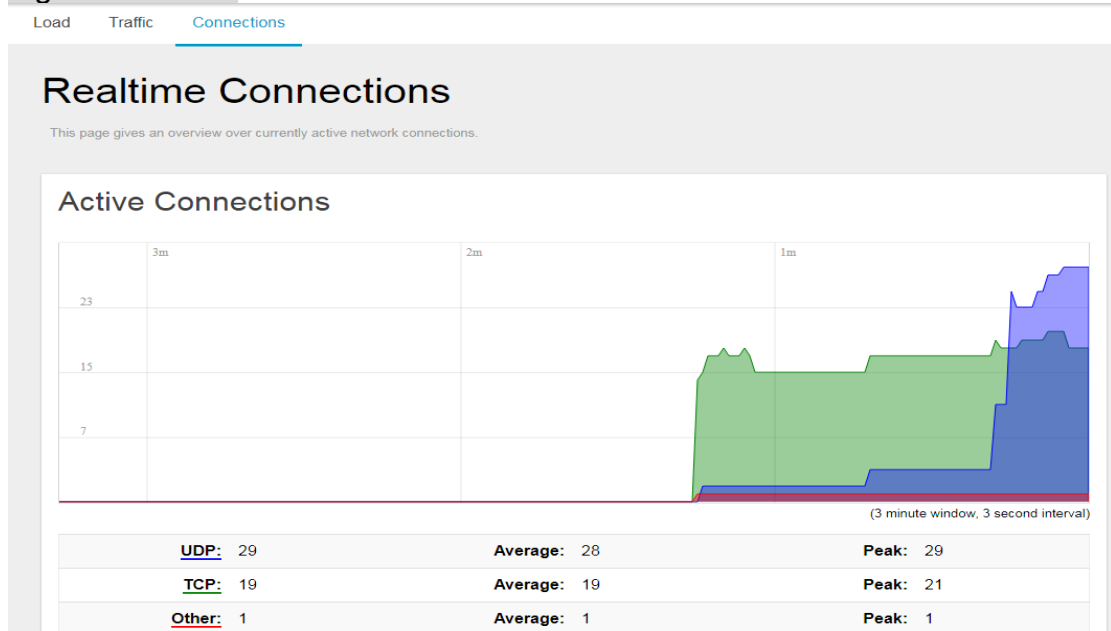
Figure 2.2.6.2-A Realtime Traffic



## 2.2.6.3 Realtime Connections

To view the currently active network connections.

Figure 2.2.6.3-A Realtime Connections



## 2.3 System

The System menu consists of the following categories: System, Administration, System Firmware and Reboot and Support. Introduction and input procedures for each category are described in the following paragraphs.

### 2.3.1 System

Hostname and Timezone can be customized in the system properties. Click “*Sync with Browser*” button to adjust the local time.

Figure 2.3.1-A System Properties

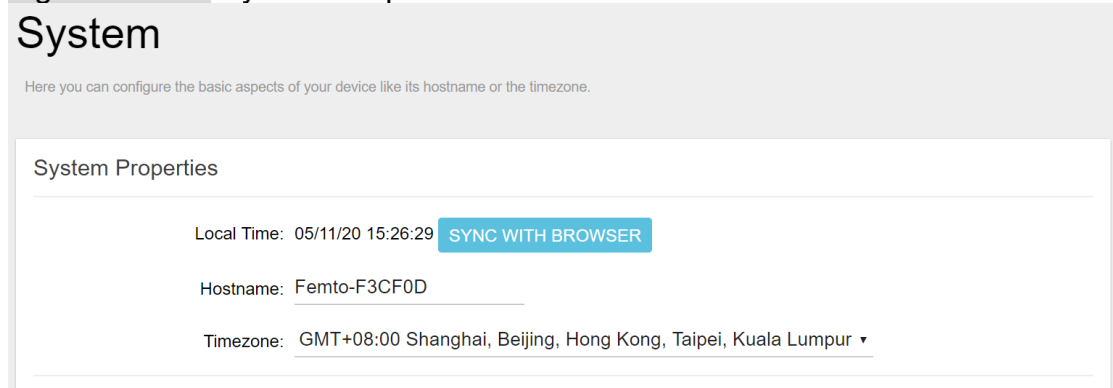


Figure 2.3.1-B Time Synchronization




### 2.3.2 Administration

Femto login password can be configured in this page. Different languages can be applied according to usage (supports English and Simplified Chinese).

Figure 2.3.2-A Router Password

### Router Password

Changes the administrator password for accessing the device

Password  


Confirmation  

Figure 2.3.2-B Language and Style

### Language and Style

Language:  ▼

### 2.3.3 System Firmware

IoT Femto Cell supports 2 different upgrade methods: Online OTA Upgrade and Local OTA Upgrade.

#### Online OTA Upgrade

Click “CHECK NEW FIRMWARE” button to search the OTA server for the latest version of the new system firmware. Once a new system firmware version is detected on the OTA server, click “UPGRADE NOW” button to upgrade the newest system firmware from OTA server.

#### Local OTA Upgrade

The user may choose to upload and upgrade the system offline with the latest firmware provided by our service team.

Figure 2.3.3-A System Firmware

Firmware Information

---

**Online OTA Upgrade**  
Click "Check New Firmware" to check new firmware from OTA server.

Primary Firmware: 3.04.27

Secondary Firmware: 3.05.01

Version of OTA Server: 3.04.27

[CHECK NEW FIRMWARE](#)

**Local OTA Upgrade**  
Upload a firmware file here to replace the running firmware.

Firmware file:  No file chosen [UPGRADE](#)

## 2.3.4 Reboot

Click "*PERFORM REBOOT*" to reboot Femto.

Figure 2.3.4-A Reboot

### Reboot

Reboots the operating system of your device

[PERFORM REBOOT](#)

## 2.3.5 Support

Here you can export the gateway log. When you got some issue, it could help our support team to analyze the gateway status.

Figure 2.3.5-A Export Log

Export Logs

---

Click "Export" button to download the log file. [EXPORT](#)

## 2.4 GloT

The GloT menu consists of the following categories: Provision, Channel Scan and GPS MAP.

### 2.4.1 Provision

GloT provision code can be set up on this page.

Figure 2.4.1-A Provision Code

Provision Code

---

System will reboot if activate Provision Code succeed

Code 20001840

APPLY

## 2.4.2 Channel Scan

To scan LoRa channel based on ISM regulation and export the result after the scan is completed.


Figure 2.4.2-A Channel Scan

**Channel Scan**

The device can scan all supported channels based on ISM band regulation.  
Note: The scanning process may take few minutes to complete, please wait until the end of process.

Channel Index	Channel Frequency	Noise indication
Channel 1	902300000	-95.660
Channel 2	902500000	-96.300
Channel 3	902700000	-96.300
Channel 4	902900000	-96.640
Channel 5	903100000	-95.860
Channel 6	903300000	-96.460
Channel 7	903500000	-96.740
Channel 8	903700000	-96.350
Channel 9	903900000	-96.830
Channel 10	904100000	-96.340
Channel 11	904300000	-96.560

## 2.4.3 GPS MAP

To set up the GPS location, simply input your address location in the “Location” text field above the map or pinpoint your location on the map by dragging the red marker  to the correct spot.

Once the location is confirmed, the system will verify and apply the new Latitude/Longitude coordinates into its GPS setting.

Figure 2.4.3-A GPS Setting

## GPS

Here you can configure the GPS setting of your device. Please input the 'Location' or drag the location marker to change the setting.

Location:



Latitude

Longitude

## 2.5 Packet Forward

The Packet Forward menu consists of the following categories: Module Settings and Log.

### 2.5.1 Settings

The purpose of this category is to view current Packet Forward settings.

This category is further divided into three sectors: “Gateway Info”, “Gain”, “Radio and Channel Settings” and “LBT Settings” (**supports Japan and Korea regions only**). Introduction and input procedures for each category are described in the following paragraphs.

#### 2.5.1.1 Gateway Info

This page is to set up lora configuration, which include: Gateway ID, Server Address, Server Uplink Port, Server Downlink Port, Keep Alive Interval, Statistics display Interval and Push Timeout.

Figure 2.5.1.1-A Gateway Info

## Gateway Info

Gateway ID:	80029cee2a32
Server Address:	<input type="text" value="127.0.0.1"/>
Server Uplink Port:	<input type="text" value="1680"/> (1-65535)
Server Downlink Port:	<input type="text" value="1680"/> (1-65535)
Keep Alive Interval:	<input type="text" value="10"/> (seconds)
Statistics display Interval:	<input type="text" value="30"/> (seconds)
Push Timeout:	<input type="text" value="100"/> (milliseconds)

### 2.5.1.2 Gain

Lora antenna gain can be set up on this page.

Figure 2.5.1.2-A Antenna Gain

## Gain

Antenna Gain:	<input type="text" value="0"/> (0 ~ 15)
---------------	---

APPLY

### 2.5.1.3 Radio and Channel Settings

This page is to set up the radio 0/1 configuration of LoRa, which include: Central Frequency, TX Status, Channel Status, Radio Interface and CenterFreqOffset.

Figure 2.5.1.3-A Radio and Channel Settings



## Radio Settings

Radio 0	Radio 1
Central Frequency: <input type="text" value="902600000"/> (Hz)	Central Frequency: <input type="text" value="903400000"/> (Hz)
RSSI Offset: <input type="text" value="-160"/> (dBm)	RSSI Offset: <input type="text" value="-160"/> (dBm)
TX Status: <input type="text" value="Enable"/>	TX Status: <input type="text" value="Disable"/>

## Channel Assignment

CH 0 Status: <input type="text" value="Enable"/>	Radio Interface: <input type="text" value="0"/>	CenterFreqOffset: <input type="text" value="-300000"/> (-400000~+400000)
CH 1 Status: <input type="text" value="Enable"/>	Radio Interface: <input type="text" value="0"/>	CenterFreqOffset: <input type="text" value="-100000"/> (-400000~+400000)
CH 2 Status: <input type="text" value="Enable"/>	Radio Interface: <input type="text" value="0"/>	CenterFreqOffset: <input type="text" value="100000"/> (-400000~+400000)
CH 3 Status: <input type="text" value="Enable"/>	Radio Interface: <input type="text" value="0"/>	CenterFreqOffset: <input type="text" value="300000"/> (-400000~+400000)
CH 4 Status: <input type="text" value="Enable"/>	Radio Interface: <input type="text" value="1"/>	CenterFreqOffset: <input type="text" value="-300000"/> (-400000~+400000)
CH 5 Status: <input type="text" value="Enable"/>	Radio Interface: <input type="text" value="1"/>	CenterFreqOffset: <input type="text" value="-100000"/> (-400000~+400000)
CH 6 Status: <input type="text" value="Enable"/>	Radio Interface: <input type="text" value="1"/>	CenterFreqOffset: <input type="text" value="100000"/> (-400000~+400000)
CH 7 Status: <input type="text" value="Enable"/>	Radio Interface: <input type="text" value="1"/>	CenterFreqOffset: <input type="text" value="300000"/> (-400000~+400000)
CH 8 Status: <input type="text" value="Disable"/>	Radio Interface: <input type="text" value="0"/>	CenterFreqOffset: <input type="text" value="0"/> (-300000~+300000)

Bandwidth:  Spr

### 2.5.1.4 LBT Settings

This page is to set up the LBT configuration of LoRa, which include: Status, RSSI Target, and Channel Settings.

Figure 2.5.1.4-A LBT Settings

## LBT Settings

Here you can modify Radio 0/1's Central frequency to change channel frequencies.

LBT Status: Enable ▾

RSSI Target:  (dBm)

Channel settings

Frequency:	<input type="text" value="922800000"/>	(Hz)	Scan Time: <input type="text" value="5000us"/> ▾
Frequency:	<input type="text" value="923000000"/>	(Hz)	Scan Time: <input type="text" value="5000us"/> ▾
Frequency:	<input type="text" value="923200000"/>	(Hz)	Scan Time: <input type="text" value="5000us"/> ▾
Frequency:	<input type="text" value="923400000"/>	(Hz)	Scan Time: <input type="text" value="5000us"/> ▾
Frequency:	<input type="text" value="923600000"/>	(Hz)	Scan Time: <input type="text" value="5000us"/> ▾
Frequency:	<input type="text" value="923800000"/>	(Hz)	Scan Time: <input type="text" value="5000us"/> ▾
Frequency:	<input type="text" value="924000000"/>	(Hz)	Scan Time: <input type="text" value="5000us"/> ▾
Frequency:	<input type="text" value="924200000"/>	(Hz)	Scan Time: <input type="text" value="5000us"/> ▾

APPLY

## 2.5.2 Log

Display the log of packet forward.

### Figure 2.5.2-A Log Packet Forward Log

```
INFO: host/sx1301 time offset=(1537257037s:212061us) - drift=-330us
INFO: Enabling GPS mode for concentrator's counter.

INFO: Received pkt from mote: 0D0101EE (fcnt=3)

JSON up: {"rxpk":[{"tmst":1642560764,"chan":4,"rfch":1,"freq":903.100000,"stat":1,"modu":"LORA","datr":"SF10BW125","codr":"4/5","lsnr":9.0,"lsnr_min":7.5.

#### 2018-09-18 08:18:08 UTC ####
### [UPSTREAM] ###
# RF packets received by concentrator: 3
# CRC_OK: 100.00%, CRC_FAIL: 0.00%, NO_CRC: 0.00%
# RF packets forwarded: killall: loraserver: no process killed
killall: loraserver: no process killed
3 (66 bytes)
# PUSH_DATA datagrams sent: 4 (826 bytes)
# PUSH_DATA acknowledged: 0.00%
### [DOWNSTREAM] ###
# PULL_DATA sent: 3 (0.00% acknowledged)
# PULL_RESP(onse) datagrams received: 0 (0 bytes)
# RF packets sent to concentrator: 0 (0 bytes)
# TX errors: 0
# BEACON queued: 0
# BEACON sent so far: 0
# BEACON rejected: 0
```

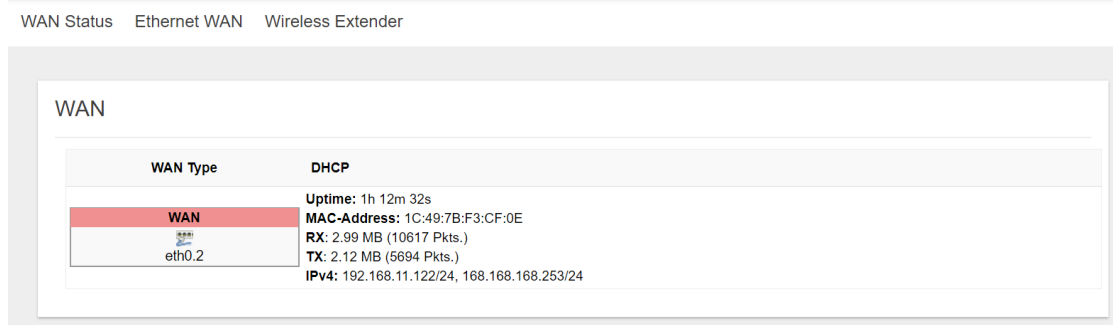
## 2.6 Network

The System menu consists of the following categories: WAN, Wireless, LAN, DHCP and Diagnostics. Introduction and input procedures for each category are described in the following paragraphs.

## 2.6.1 WAN

The purpose of this category is to view current WAN settings. This category is further divided into two sectors: WAN Status, Ethernet Wan and Wireless Extender. These individual options are lodged and labeled above the main content panel.

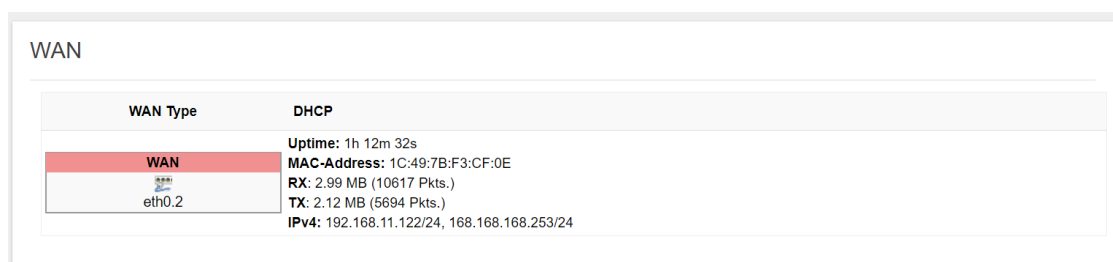
Figure 2.6.1-A WAN



### 2.6.1.1 WAN Status

Here you can view the currently WAN status.

Figure 2.6.1.1-A WAN Status



### 2.6.1.2 Ethernet WAN

This page is to set up the connection type in terms of Static IP, DHCP client or PPPoE. The three different options can be selected in the drop-down menu in “*wantype*”. Please fill in the respective fields exhibited under each selection. Please make sure the Ethernet cable is connected to a WAN port.

**Figure 2.6.1.2-A Static IP**WAN Status [Ethernet WAN](#) [Wireless Extender](#)

wantype	Static IP	▼
IP Address	192.168.11.122	
Subnet Mask	255.255.255.0	
Gateway	192.168.11.244	
DNS Server	192.168.11.244	(optional)
MAC Address	1C:49:7B:f3:cf:0e	

**Figure 2.6.1.2-B DHCP Client**[Ethernet WAN](#) [Wireless Extender](#)

wantype	DHCP Client	▼
MAC Address	1C:49:7B:f3:cf:86	

**Figure 2.6.1.2-C PPPoE**WAN Status [Ethernet WAN](#) [Wireless Extender](#)

wantype	PPPoE	▼
Username		
Password		🔒
MAC Address	1C:49:7B:f3:cf:0e	

### 2.6.1.3 Wireless Extender

This page is to set up the Wireless Extender Mode for WAN connection.

To activate the extended wireless connection, please select “*Enable*” from the Extender mode drop-down menu. Click the “*SCAN*” button to obtain the list of available Access Points within your surrounding vicinity.

**Figure 2.6.1.3-A Wireless Extender**

WAN Status   Ethernet WAN   [Wireless Extender](#)

---

Wireless Extender

Click "Scan" to get Access Point List

Extender mode: enable ▾

SSID: ----2G

Security: WPA2-PSK-TKIP ▾

KEY: .....

--- select one --- ▾

## 2.6.2 Wireless

2.4G Interface Configuration to set up 2.4G wireless. SSID, encryption type, and channels can be lodged within this sector.

**Figure 2.6.2-A Wireless Setting**

### Wireless Setting

---

2.4G Interface Configuration

SSID AP-F3CF0D

Hidden Broadcast

encryption None ▾

---

2.4G Interface Channel

Channel 2432MHz (Channel 5) ▾

## 2.6.3 LAN

LAN IP can be set up in this page.

Figure 2.6.3-A LAN  
LAN

### Local Network

---

IP Address 192.168.55.1

## 2.6.4 DHCP

You can manage detailed DHCP server settings, which include First leased address, the allowed Number of leased addresses and Lease time.

Information on Active Leases can be viewed at the bottom of this page.

Figure 2.6.4-A DHCP  
DHCP

### DHCP-Server

Enable enable ▼

First leased address 100 (1-254)

Number of leased addresses 101 (1-254)

Lease time (hr) 12 (1-48)

---

### Active Leases

Hostname	IPv4-Address	MAC-Address	Leasetime remaining
LENOVO-PC	192.168.55.196	a4.db:30.a2:ae:51	07h 28min 02s

## 2.6.5 Diagnostic

Diagnostics is divided into three parts on the same page: PING, TRACEROUTE and NSLOOKUP. Please see the following for input guidelines.

### 2.6.5.1 PING

Input a specific IP address in the text field above “PING”. Click the “PING” button to ping the IP you have specified.

Figure 2.6.5.1-A PING



## Diagnostics

Network Utilities

openwrt.org      openwrt.org      openwrt.org

IPv4 ▾ **PING**      **TRACEROUTE**      **NSLOOKUP**

Install iputils-traceroute6 for IPv6 traceroute

Collecting data...

```
PING openwrt.org (78.24.191.177): 56 data bytes
64 bytes from 78.24.191.177: seq=0 ttl=45 time=312.082 ms
64 bytes from 78.24.191.177: seq=1 ttl=45 time=309.826 ms
64 bytes from 78.24.191.177: seq=2 ttl=45 time=308.833 ms
64 bytes from 78.24.191.177: seq=3 ttl=45 time=321.124 ms
64 bytes from 78.24.191.177: seq=4 ttl=45 time=309.516 ms

--- openwrt.org ping statistics ---
5 packets transmitted, 5 packets received, 0% packet loss
round-trip min/avg/max = 308.833/312.276/321.124 ms
```

### 2.6.5.2 TRACEROUTE

Input a specific URL or IP address above “*TRACEROUTE*”.  
Click the “*TRACEROUTE*” button to trace the URL or IP address you have specified.

Figure 2.6.5.2-A TRACEROUTE Diagnostics

Network Utilities

openwrt.org      openwrt.org      openwrt.org

IPv4 ▾ **PING**      **TRACEROUTE**      **NSLOOKUP**

Install iputils-traceroute6 for IPv6 traceroute

Collecting data...

```
traceroute to openwrt.org (78.24.191.177), 30 hops max, 38 byte packets
 1 192.168.31.1 0.591 ms
 2 *
 3 172.16.29.98 11.165 ms
 4 172.16.29.1 11.244 ms
 5 192.72.45.29 14.475 ms
 6 192.72.154.181 12.360 ms
 7 192.72.49.81 28.800 ms
 8 139.175.57.185 14.452 ms
 9 139.175.58.210 16.800 ms
10 61.58.33.153 40.713 ms
11 129.250.7.40 52.385 ms
```

### 2.6.5.3 NSLOOKUP

Input a specific URL or IP address above “*NSLOOKUP*”.  
Click the “*NSLOOKUP*” button to view the DNS server of the URL or IP address you have specified.

Figure 2.6.5.3-A NSLOOKUP  
Diagnostics

Network Utilities

openwrt.org      openwrt.org      openwrt.org

IPv4 ▾ PING      TRACEROUTE      NSLOOKUP

Install iputils-traceroute6 for IPv6 traceroute

Collecting data...

```
Server:      127.0.0.1
Address 1:  127.0.0.1 localhost

Name:       openwrt.org
Address 1:  78.24.191.177 openwrt.org
```



# Glossary and References

## Definitions, Acronyms and Abbreviations

Item	Description
LPWAN	Low-Power Wide-Area Network
LoRaWAN™	LoRaWAN™ is a Low Power Wide Area Network (LPWAN) specification intended for wireless battery-operated Things in a regional, national or global network.
ABP	Activation by Personalization
OTAA	Over-The-Air Activation
TBD	To Be Defined

## Reference

Document	Author
LoRaWAN Specification v1.0.3	LoRa Alliance
LoRaWAN Regional Parameters v1.0.3	LoRa Alliance
LoRaWAN Backend Interfaces Specification v1.0	LoRa Alliance