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# **GloT Femto Cell User Guide**

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# GloT Femto Cell - Product Introduction

## Product Design

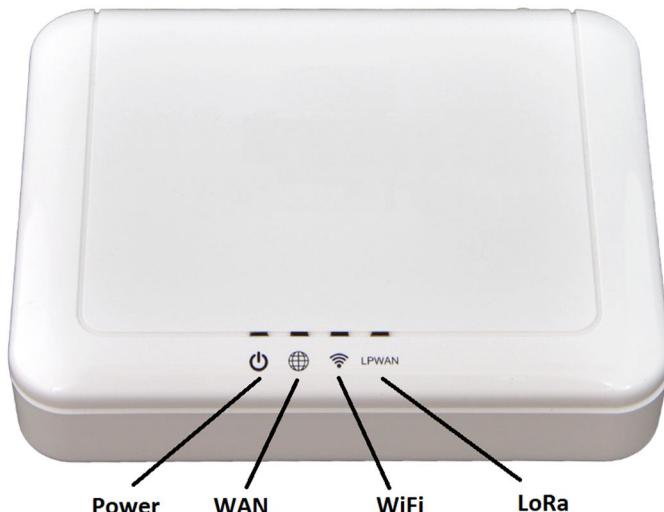
The dimension of the GloT Femto Gateway WLRGFM-100 is 116 x 91 x 27 mm, which it comes with one external LoRa antenna, one WAN port and one USB 2.0 connector.



## Product Features

- In compliance with the latest LoRaWAN specification v1.0.2 and Regional Parameters v1.0.2
- Wide frequency range from 470MHz to 928MHz in different SKU
- Up to 8 concurrent channels for LoRa transmission
- Works with GloT network server (GloT mode) by default
- Embedded network server or packet forward mode to work with 3<sup>rd</sup> 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, 3G/4G dongle (via USB port)
- Non-Line-of-Sight (NLOS) coverage
- Self-installation and easy deployment
- Superior receiving sensitivity

## Product Details

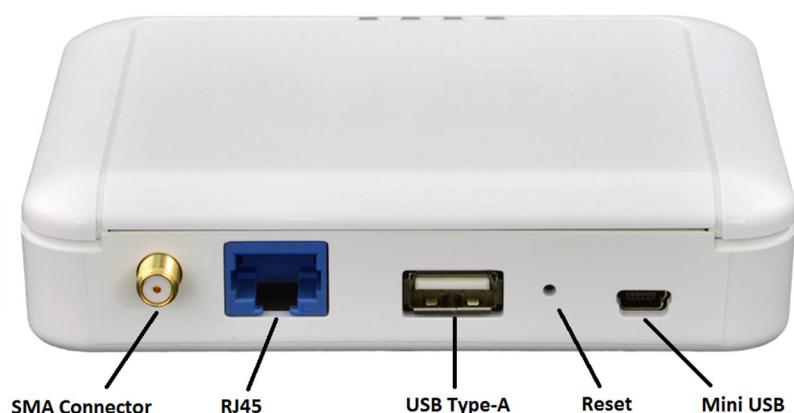


**Giot Femto Cell**  
– LED Indicators

### LED Indicators

LED	Color	Status	Description
Power	Green	Off	Power on
		On	Power off
		Blinking	Booting
	Orange	Off	N/A
		On	System Error (no provision)
		Blinking	System is upgrading
WAN	Green	Off	Unplugged
		On	- 3G/4G dongle plugged-in - 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

LED	Color	Status	Description
Orange			inactivated
		On	LoRa network server connected or activated
		Blinking	N/A
		Off	N/A
		On	N/A
		Blinking	N/A



**GloT Femto Cell**  
– 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 external 3G/4G dongle or 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 - India 865~867 MHz - AS 923 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 - SX1301 with SX1255 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, Auto-sensing, Auto-MDIX
9	Transmit Power	RF 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 external 3G/4G dongle or 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	<ul style="list-style-type: none"> <li>- thru WAN port with fixed IP/ DHCP client/ PPPoE</li> <li>- thru 3G/4G USB dongle</li> <li>- thru WiFi repeater mode</li> </ul>
2	WiFi Configuration	SSID/ Encryption/ Channels
3	Network Configuration	<ul style="list-style-type: none"> <li>- DHCP server for IP leasing</li> <li>- Diagnostics with Ping, TraceRoute and NSlookup</li> </ul>
4	System Status	<ul style="list-style-type: none"> <li>- Overview with system, software version, memory usage and wireless configuration</li> <li>- System Log shows system console information</li> <li>- Kernel Log shows kernel information</li> <li>- Processes shows running process information</li> <li>- Real-time graphs shows system load, inbound/outbound traffic and IP connections</li> </ul>
5	LoRa Information	<ul style="list-style-type: none"> <li>- Current LoRa channel configuration and Gateway ID</li> <li>- Supported spreading factors</li> <li>- Provision code</li> <li>- External network server configuration and logs</li> <li>- Channel scan</li> </ul>
6	LoRaWAN Configuration (LoRaWAN mode with embedded network server)	<ul style="list-style-type: none"> <li>- Current OTAA end-node list</li> <li>- Detailed end-node logs at Gateway</li> <li>- ABP table for managing end-node device with ABP mode (user-defined DevAddr/ NwkSKey/ NwkSKey/ AppSKey)</li> <li>- OTAA table for managing end-node with OTAA mode (user-defined AppEUI/ DevEUI/ AppKey/ DevAddr Start Counts/ Aging Out time)</li> </ul>
7	Provisioning	Auto/manual provisioning with area code/customer code for configuring regional frequency bands and switch over between GIoT mode, LoRaWAN mode or packet forward mode
8	Channel Scan	The gateway can scan all supported channels based on ISM band regulation
9	Time Sync	<ul style="list-style-type: none"> <li>- Support Network Time Protocol (NTP)</li> <li>- Sync up with browser's time</li> </ul>
10	Firmware Upgrade	<ol style="list-style-type: none"> <li>1. Over-the-air (OTA) upgrade</li> <li>2. Thru USB port</li> </ol>
11	Remote Management	<ul style="list-style-type: none"> <li>- Managed and configured by GIoT Network Management System (GNMS) at GIoT mode</li> <li>- Auto-provisioning with public and private data model</li> <li>- Keepalive with CPU load, memory usage and in/out traffic</li> </ul>

No.	Item	Description
12	LoRa Uplink Message Format (LoRaWAN mode with external MQTT broker)	<p>Uplink Message (to network server) includes:</p> <ol style="list-style-type: none"> <li>1. Channel info</li> <li>2. Spreading factor</li> <li>3. Received time</li> <li>4. Gateway IP</li> <li>5. Gateway ID</li> <li>6. Received RSSI</li> <li>7. Received SNR</li> <li>8. Device address of end-node</li> <li>9. Uplink data</li> <li>10. Frame count</li> <li>11. F-port</li> </ol>
13	LoRa Downlink Message Format (LoRaWAN mode with external MQTT broker)	<p>Downlink Message (from network server) includes:</p> <ol style="list-style-type: none"> <li>1. Device address of end-node</li> <li>2. Downlink data</li> <li>3. Gateway ID</li> <li>4. Any string ID (for tracking purpose)</li> <li>5. Un-confirmed or confirmed data</li> </ol>

### LoRa Specification

No.	Item	Description
1	Standard	LoRaWAN v1.0.2
2	LoRa Classes	<ul style="list-style-type: none"> <li>- Class A: supported</li> <li>- Class B: to be supported in later release</li> <li>- Class C: supported</li> </ul>
3	ADR	Adaptive data rate is supported to control the spreading factor of nodes
4	Activation	Both Activation-by-Personalization (ABP) and Over-the-Air-Activation (OTAA) are supported
5	MAC Commands	LoRaWAN v1.0.2

### LoRa RF Specification

No	Item	Capability				Remarks
		Min	Typ	Max	Units	
1	Frequency Range	- EU 862~870 MHz	- US 902~928 MHz	- India 865~867 MHz	MHz	Separated SKU
2	Channel Band	125/500		KHz	8 uplink + 2 downlink	

No	Item	Capability				Remarks
		Min	Typ	Max	Units	
	Width					
3	Output Power (TX)			27	dBm	
4	Sensitivity (RX)		-136	-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	Pending
2	Telec	Pending
3	CE	Pending
4	NCC	Pending

### Reliability Specification

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

# GloT Femto Cell - WebUI User Guide

GloT Femto Cell provides 6 types of mode options: GloT mode, LoRaWAN mode, Education mode, LoRaWAN Bridge mode, GloT (CN) mode and Packet Forward mode. This User Guide will assist you in navigating the system with the following comprehensive guidelines.

## 1. GloT mode

### 1.1 Open Admin GUI

Connect to Femto Cell via wifi (**SSID: AP-last 6 digits of mac address**)

Access Femto Cell WebUI via IP address “192.168.55.1”.

Default username is “*admin*” and password is “*admin*”.

Figure 1.1-A

The screenshot shows a web browser window with a light blue header bar. The main content area has a white background with a thin blue border. At the top center, the text "Authorization Required" is displayed in a large, bold, black font. Below it, a smaller gray text message reads "Please enter your username and password." There are two input fields: one for "Username" and one for "Password", both preceded by their respective labels in a dark blue font. At the bottom right of the form, there are two buttons: a blue "LOGIN" button and an orange "RESET" button.

## 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-b44000
Model	GIOT InDoor FemtoCell
Firmware Version	Version 3.00.16 Thu Sep 7 16:27:20 CST 2017
Kernel Version	3.10.14
Local Time	Sat Sep 16 16:16:14 2017
Uptime	16h 26m 4s
Load Average	1.40, 0.93, 0.83

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	<b>Type:</b> dhcp <b>Address:</b> 192.168.31.167  <b>Netmask:</b> 255.255.255.0 <b>eth0.2 Gateway:</b> 192.168.31.1 <b>DNS 1:</b> 192.168.31.1 <b>Connected:</b> 16h 29m 52s
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 <i>Wireless is disabled or not associated</i>
---	---

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

UNSAVED CHANGES: 2 AUTO REFRESH ON

### Status

#### System

Hostname	Femto-b44000
Model	GIOT InDoor FemtoCell
Firmware Version	Version 3.00.16 Thu Sep 7 16:27:20 CST 2017
Kernel Version	3.10.14
Local Time	Sat Sep 16 16:29:23 2017
Uptime	16h 39m 14s
Load Average	0.99, 1.34, 1.30

Click "AUTO REFRESH ON/OFF" button to enable/ disable auto refresh.

Figure 1.2.1-E Status

UNSAVED CHANGES: 2 AUTO REFRESH OFF

## Status

**System**

Hostname	Femto-b44000
Model	GIOT InDoor FemtoCell
Firmware Version	Version 3.00.16 Thu Sep 7 16:27:20 CST 2017
Kernel Version	3.10.14
Local Time	Sat Sep 16 16:30:04 2017
Uptime	16h 39m 54s
Load Average	0.94, 1.29, 1.29

## 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=810000c8
Fri Sep 15 19:17:10 2017 user.emerg syslog: switch reg write offset=2110, value=810000c8
Fri Sep 15 19:17:10 2017 user.emerg syslog: switch reg write offset=2210, value=810000c8
Fri Sep 15 19:17:10 2017 user.emerg syslog: switch reg write offset=2310, value=810000c8
Fri Sep 15 19:17:10 2017 user.emerg syslog: switch reg write offset=2410, value=810000c8
Fri Sep 15 19:17:10 2017 user.emerg syslog: switch reg write offset=2510, value=810000c8
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_ESW_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_OF
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 option?

```

## 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 frequency set to 580 MHz
[ 0.000000] PCIE: bypass PCIe DLL.
[ 0.000000] PCIE: Elastic buffer control: Addr:0x68 -> 0xB4
[ 0.000000] disable all power over 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 0x00000000-0x07fffffff]
[ 0.000000] Movable zone start for each node
[ 0.000000] Early memory node ranges
[ 0.000000]   node  0: [mem 0x00000000-0x07fffffff]
[ 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_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 Femto Cell item.

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%	<span>HANG UP</span>	<span>TERMINATE</span>	<span>KILL</span>
2	root	[kthreadd]	0%	0%	<span>HANG UP</span>	<span>TERMINATE</span>	<span>KILL</span>
3	root	[ksoftirqd/0]	0%	0%	<span>HANG UP</span>	<span>TERMINATE</span>	<span>KILL</span>
4	root	[kworker/0:0]	0%	0%	<span>HANG UP</span>	<span>TERMINATE</span>	<span>KILL</span>
5	root	[kworker/0:0H]	0%	0%	<span>HANG UP</span>	<span>TERMINATE</span>	<span>KILL</span>
6	root	[kworker/u2:0]	0%	0%	<span>HANG UP</span>	<span>TERMINATE</span>	<span>KILL</span>
7	root	[watchdog/0]	0%	0%	<span>HANG UP</span>	<span>TERMINATE</span>	<span>KILL</span>

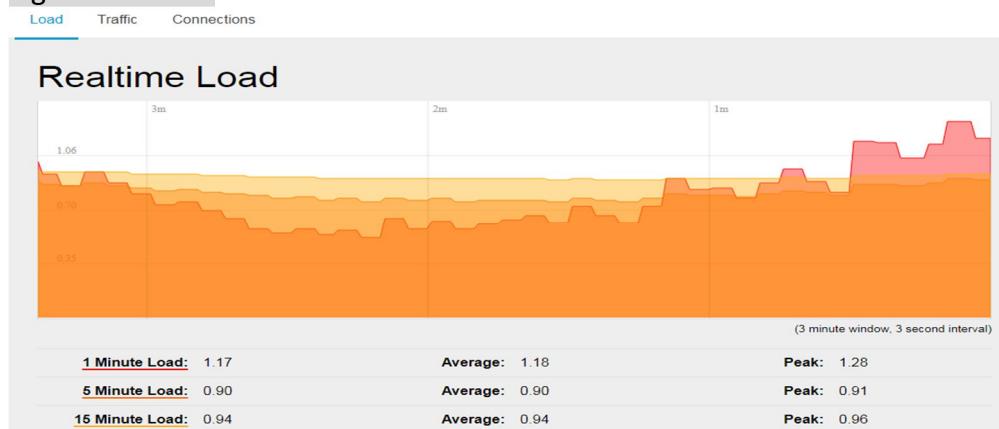
## 1.2.6 Realtime Graphs

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.

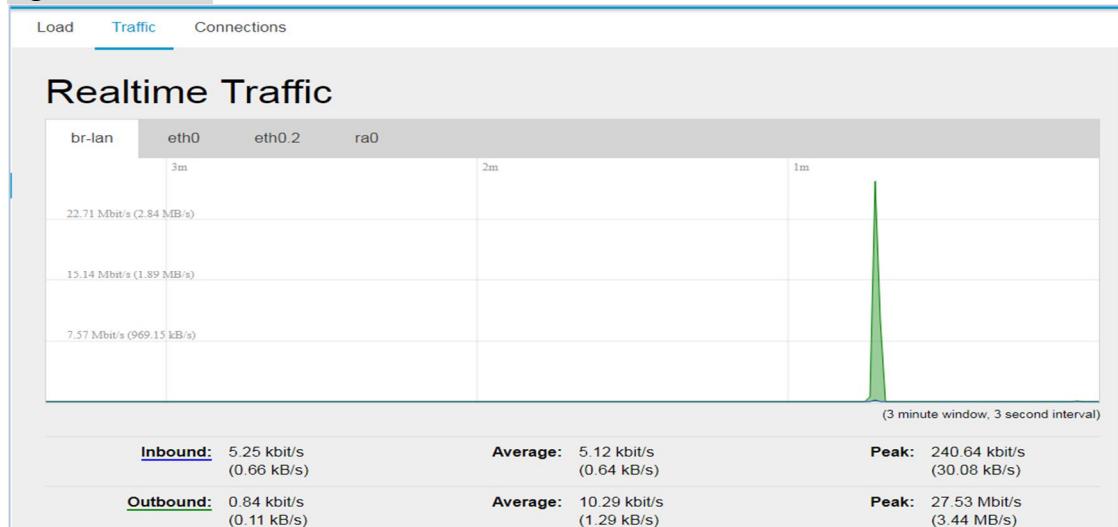
Figure 1.2.6.1-A Realtime Load



### 1.2.6.2 Realtime Traffic

To view the network traffic of each interface.

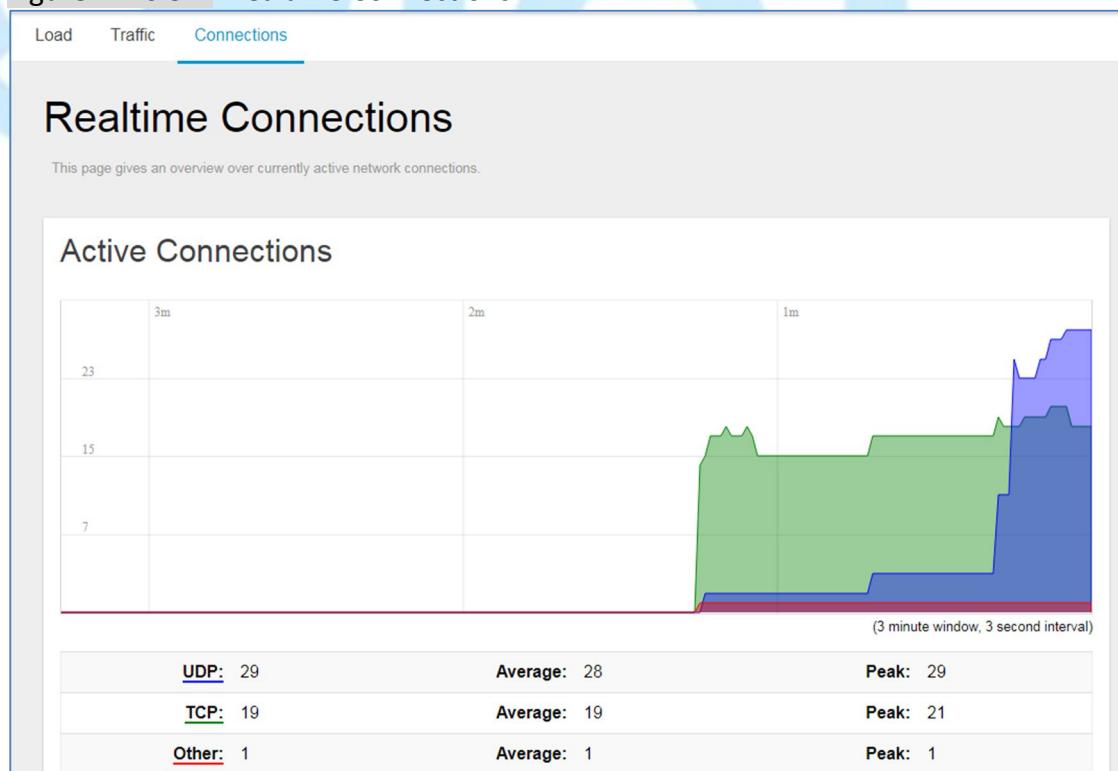
Figure 1.2.6.2-A Realtime Traffic



### 1.2.6.3 Realtime Connections

To view the currently active network connections.

Figure 1.2.6.3-A Realtime Connections



## 1.3 GloT

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

### 1.3.1 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 1.3.1-A GloT Info

#### GloT Status

##### GloT Info

Provisioning Code	80001840 (Provision)
Area Code	80001840
Gateway Type	Femto
LoRa Module	ON
Gateway ID	1c497baaade6
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	0x00 0x01 0x04 0x05 0x0a 0x0d 0x14
GloT Connect	Online
Spreading Factor	uplink: 7 8 9 10 11 12, downlink: 12
GPS	Latitude:(Not Config), Longitude:(Not Config)

### 1.3.2 Provision

GloT provision code can be setup on this page.

Figure 1.3.2-A Provision Code

The screenshot shows a configuration interface titled "Provision Code". It includes a note stating "System will reboot if activate Provision Code succeed". Below this is a text input field labeled "Code" containing the value "80001840". A blue "APPLY" button is located in the bottom right corner.

### 1.3.3 Configuration

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

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 1.3.3-A GloT Management  
GloT Management

The screenshot displays the "GloT Management" page. The "LoRa Management" section contains a "LoRa Restart" button with a "PERFORM RESTART" label. The "GPS Location" section features fields for "Latitude" and "Longitude", both currently set to "Not Config". Below these fields are two buttons: "SAVE LOCATION" and "SELECT ON MAP".

### 1.3.4 Channel Scan

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

**Figure 1.3.4-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

### 1.3.5 Channel Setting

To setup Lora channel frequency.

**Figure 1.3.5-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

### 1.3.6 GPS MAP

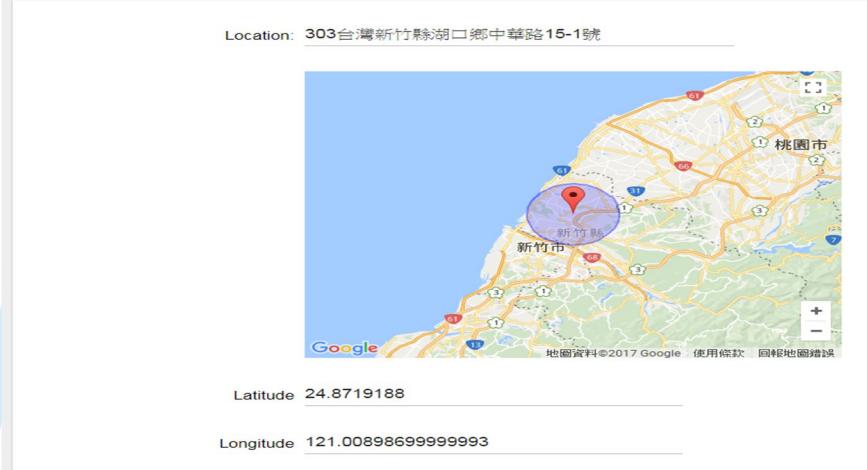
To setup the GPS location, simply input your address location in the “Location” text field above the map or pinpoint your location on the map by dragging the red marker  to the correct spot.

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

Figure 1.3.6-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.



## 1.4 System

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

### 1.4.1 System

Hostname and Timezone can be customized in the system properties.

Click “Sync with Browser” button to adjust the local time.

Place a checkmark next to “Enable NTP Client” to synchronize the time with NTP server.

If you choose to use another NTP server, please place a checkmark next to “Provide NTP server” and fill out the “NTP server candidates” text field.

**Figure 1.4.1-A System Properties  
System**

Here you can configure the basic aspects of your device like its hostname or the timezone.

### System Properties

Local Time Sat Sep 16 19:53:12 2017 **SYNC WITH BROWSER**

Hostname

Timezone

**Figure 1.4.1-B Time Synchronization**

### Time Synchronization

Enable NTP client

Provide NTP server

NTP server candidates    
   
   
 

## 1.4.2 Administration

Femto login password can be configured in this page.

Different languages can be applied according to usage (supports English and Simplified Chinese).

Figure 1.4.2-A Router Password

### Router Password

Changes the administrator password for accessing the device

The screenshot shows a form titled "Router Password". Below it is a sub-instruction: "Changes the administrator password for accessing the device". There are two input fields: "Password" and "Confirmation", each accompanied by a small green icon with a checkmark.

Figure 1.4.2-B Language and Style

### Language and Style

Language: English

APPLY

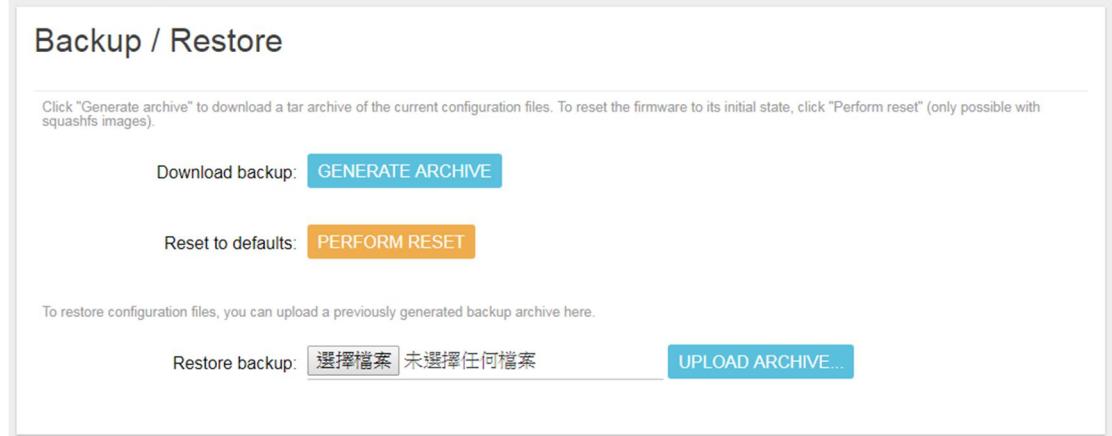
## 1.4.3 Backup and Restore

Femto configuration can be restored and reset to default on this page.

Click “GENERATE ARCHIVE” button to download the configuration file with the current gateway settings.

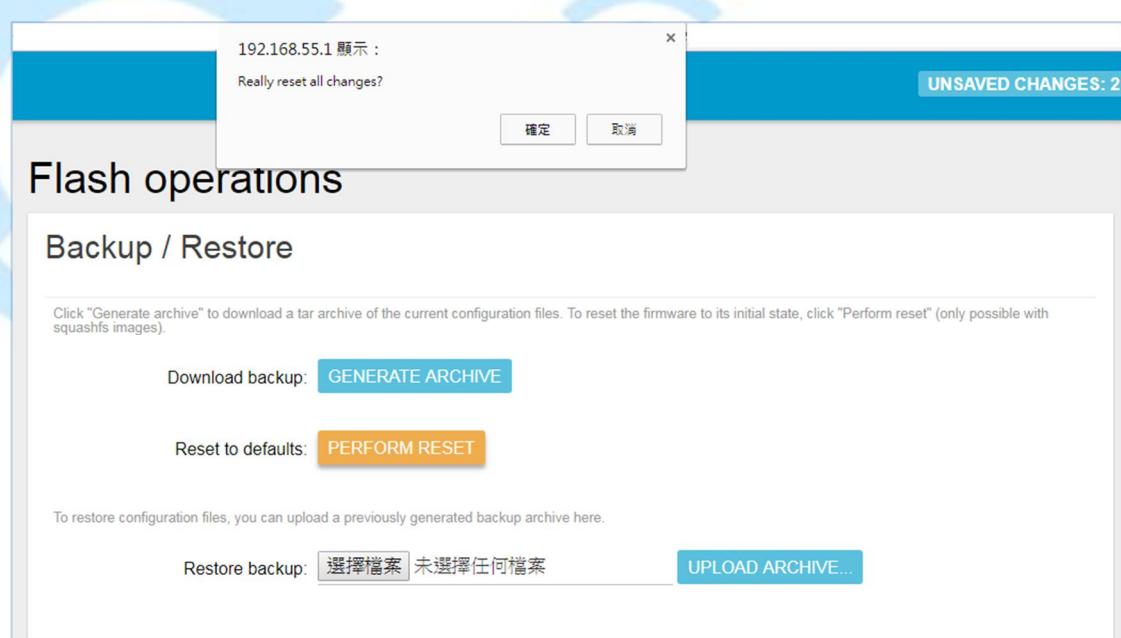
Note: LoRa configuration cannot be restored and reset to default on this page.

**Figure 1.4.3-A Backup/Restore  
Flash operations**



Click "**PERFORM RESET**" button to reset the firmware to its initial state.  
Please note that the LoRa provision settings will NOT be reset by this action.

**Figure 1.4.3-B Backup/Restore**



Choose the most recent backup file and click "**UPLOAD ARCHIVE**" to restore the configuration file.

#### 1.4.4 System Firmware

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.

Figure 1.4.4-A System Firmware  
**System Firmware**

##### Firmware Information

Click “Check New Firmware” to check new firmware from OTA server.

Primary Firmware: 3.00.16

Secondary Firmware: 3.00.16

Version of OTA Server: 3.00.04

**CHECK NEW FIRMWARE**

#### 1.4.5 Reboot

Click “*PERFORM REBOOT*” to reboot Femto.

Figure 1.4.5-A Reboot

##### Reboot

Reboots the operating system of your device

**PERFORM REBOOT**

## 1.5 Network

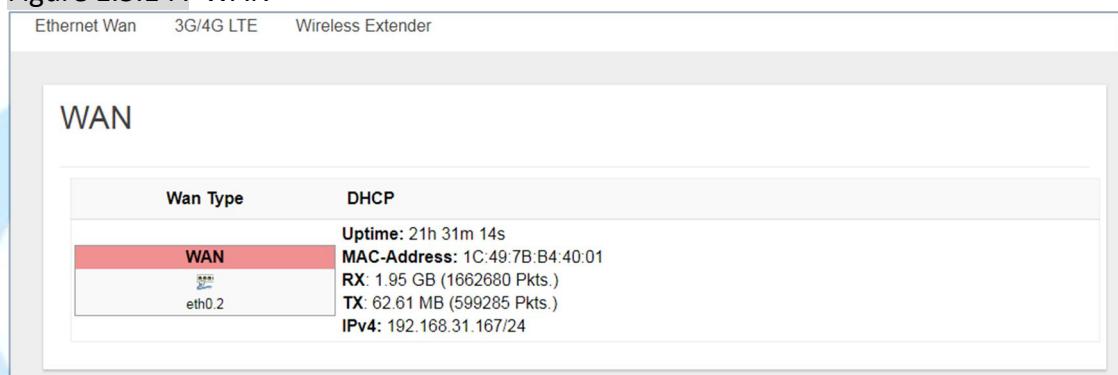
The System menu consists of the following categories: WAN, Wireless, LAN, DHCP, and Diagnostics. Introduction and input procedures for each category are described in the following paragraphs.

### 1.5.1 WAN

The purpose of this category is to view current WAN settings.

This category is further divided into three sectors: Ethernet Wan, 3G/4G LTE and Wireless Extender. These individual options are lodged and labeled above the main content panel.

Figure 1.5.1-A WAN



#### 1.5.1.1 Ethernet WAN

This page is to setup 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 “*Wan Type*”. Please fill in the respective fields exhibited under each selection. Please make sure the Ethernet cable is connected to a WAN port.

Figure 1.5.1.1-A Static IP

The screenshot shows a configuration interface for a network device. At the top, there are three tabs: 'Ethernet Wan' (which is selected), '3G/4G LTE', and 'Wireless Extender'. Below the tabs, there is a dropdown menu labeled 'wantype' with the value 'Static IP'. Underneath this are several input fields: 'IP Address' set to '192.168.31.155', 'Subnet Mask' set to '255.255.255.0', 'Gateway' set to '192.168.31.1', 'DNS Server' set to '8.8.8.8', and 'MAC Address' set to '1c:49:7b:b4:40:01'. There is also a note '(optional)' next to the DNS server field.

Figure 1.5.1.1-B DHCP Client

The screenshot shows a configuration interface for a network device. At the top, there are three tabs: 'Ethernet Wan' (selected), '3G/4G LTE', and 'Wireless Extender'. Below the tabs, there is a dropdown menu labeled 'wantype' with the value 'DHCP Client'. Underneath this is an input field for 'MAC Address' set to '1c:49:7b:b4:40:01'.

Figure 1.5.1.1-C PPPoE

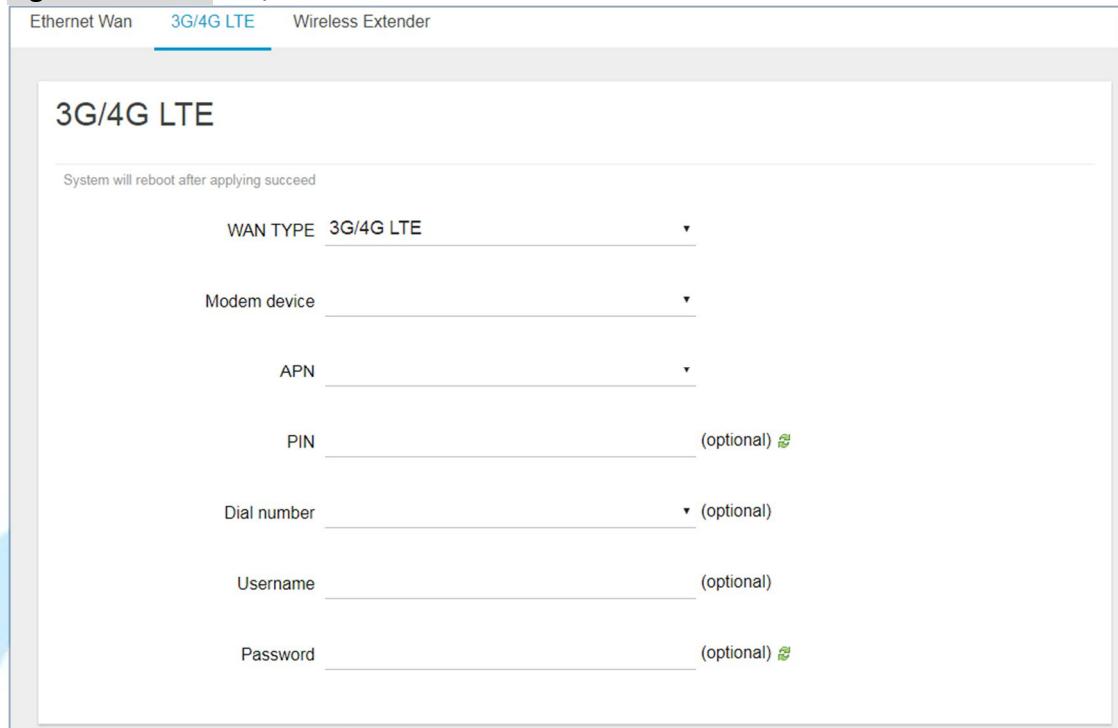
The screenshot shows a configuration interface for a network device. At the top, there are three tabs: 'Ethernet Wan' (selected), '3G/4G LTE', and 'Wireless Extender'. Below the tabs, there is a dropdown menu labeled 'wantype' with the value 'PPPoE'. Underneath this are input fields for 'Username' and 'Password', both of which are currently empty. There is also a note '(optional)' next to the password field. At the bottom, there is an input field for 'MAC Address' set to '1c:49:7b:b4:40:01'.

### 1.5.1.2 3G/4G LTE

This page is to setup required information.

**Note:** Make sure the SIM card is installed.

Figure 1.5.1.2-A 3G/4G LTE

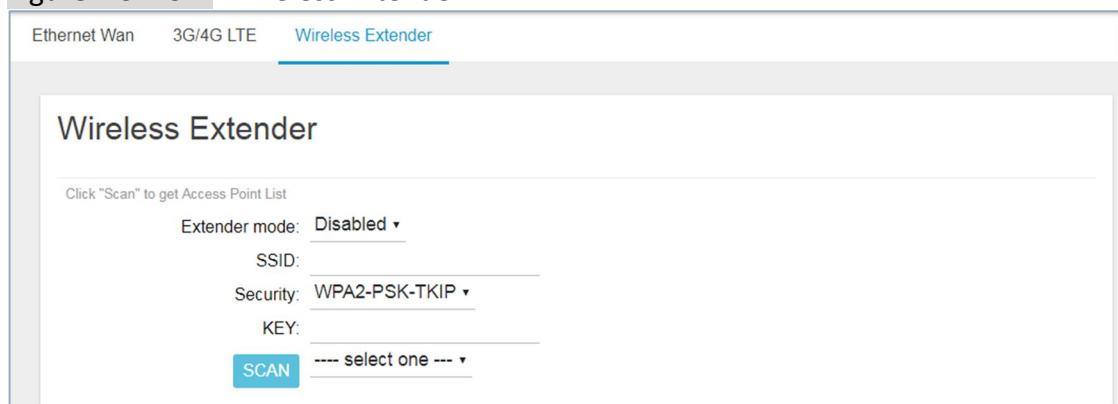


### 1.5.1.3 Wireless Extender

This page is to setup 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 1.5.1.3-A Wireless Extender



## 1.5.2 Wireless

2.4G Interface Configuration to setup 2.4G Wireless. SSID, Encryption Type, and Channels can be lodged within this sector.

Figure 1.5.2-A Wireless Setting

### Wireless Setting

#### 2.4G Interface Configuration

SSID AP-b44000

Hidden Broadcast

encryption WPAWPA2-PSK

Key ..... 

#### 2.4G Interface Channel

Channel auto

## 1.5.3 LAN

LAN IP can be setup in this page.

Figure 1.5.3-A LAN

### LAN

#### Local Network

IP Address 192.168.55.1

## 1.5.4 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 1.5.4-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

## 1.5.5 Diagnostic

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

### 1.5.5.1 PING

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

Figure 1.5.5.1-A PING

## Diagnostics

### Network Utilities

openwrt.org

IPv4 ▾ PING

openwrt.org

TRACEROUTE

openwrt.org

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
```

## 1.5.5.2 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 1.5.5.2-A TRACEROUTE

## Diagnostics

### Network Utilities

openwrt.org

IPv4 ▾ PING

openwrt.org

TRACEROUTE

openwrt.org

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
```

### 1.5.5.3 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 1.5.5.3-A NSLOOKUP

#### Diagnostics

##### Network Utilities

openwrt.org

IPv4 ▾ PING

openwrt.org

TRACEROUTE

openwrt.org

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

## 2. LoRaWAN mode

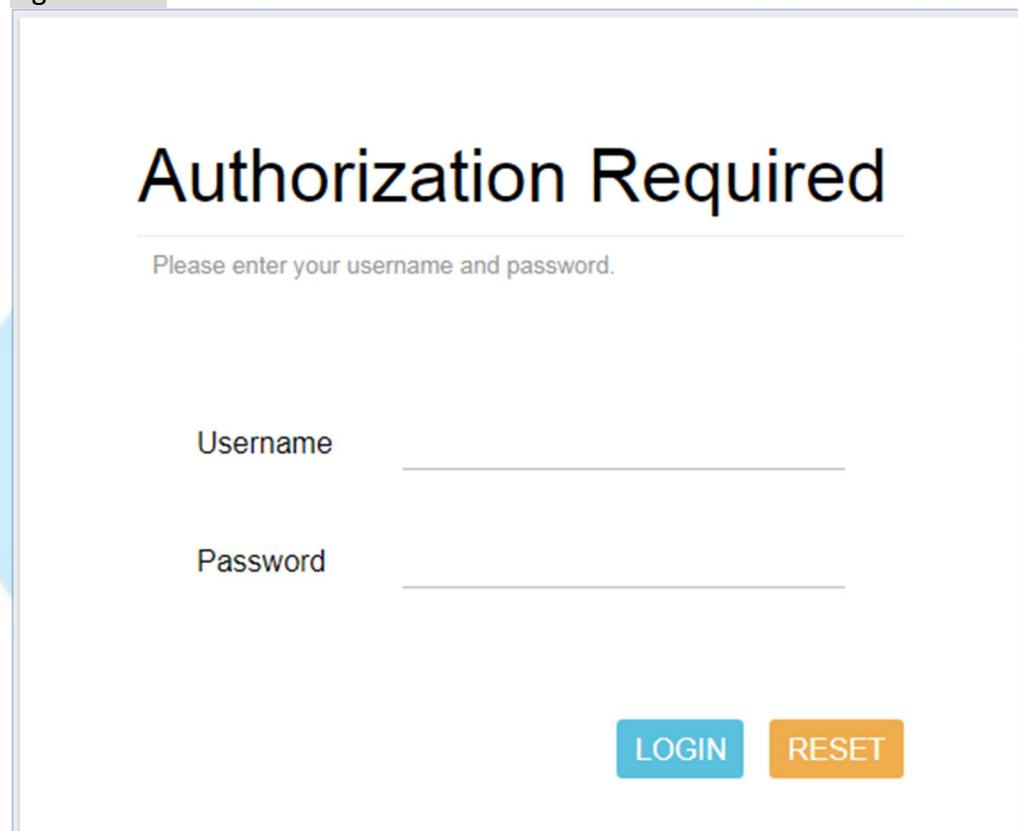
### 2.1 Open Admin GUI

Connect to Femto Cell via wifi (**SSID: AP-last 6 digits of mac address**)

Access Femto Cell WebUI via IP address “192.168.55.1”.

Default username is “*admin*” and password is “*admin*”.

Figure 2.1-A



## 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.

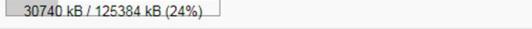
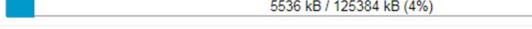
**Figure 2.2.1-A System Status**

#### System

Hostname	Femto-b44000
Model	GIOT InDoor FemtoCell
Firmware Version	Version 3.00.16 Thu Sep 7 16:27:20 CST 2017
Kernel Version	3.10.14
Local Time	Sat Sep 16 16:16:14 2017
Uptime	16h 26m 4s
Load Average	1.40, 0.93, 0.83

**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

UNSAVED CHANGES: 2 AUTO REFRESH ON

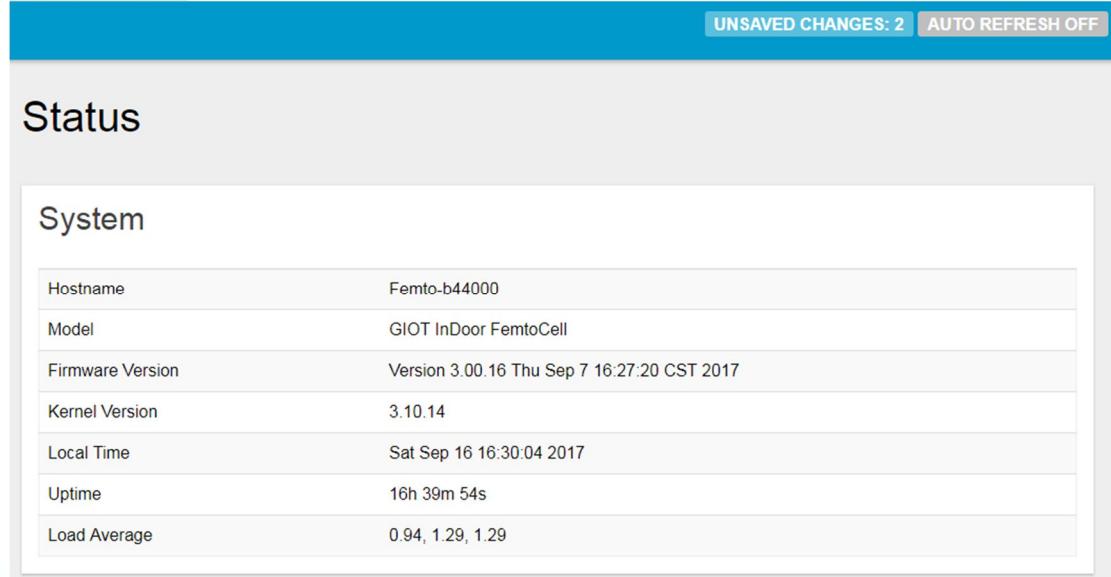
### Status

#### System

Hostname	Femto-b44000
Model	GIOT InDoor FemtoCell
Firmware Version	Version 3.00.16 Thu Sep 7 16:27:20 CST 2017
Kernel Version	3.10.14
Local Time	Sat Sep 16 16:29:23 2017
Uptime	16h 39m 14s
Load Average	0.99, 1.34, 1.30

Click "AUTO REFRESH ON/OFF" button to enable/ disable auto refresh.

Figure 2.2.1-E Status



The screenshot shows the 'Status' section of the Gemtek interface. At the top, there are buttons for 'UNSAVED CHANGES: 2' and 'AUTO REFRESH OFF'. Below this, the word 'Status' is displayed. Under 'System', there is a table with the following data:

Hostname	Femto-b44000
Model	GIOT InDoor FemtoCell
Firmware Version	Version 3.00.16 Thu Sep 7 16:27:20 CST 2017
Kernel Version	3.10.14
Local Time	Sat Sep 16 16:30:04 2017
Uptime	16h 39m 54s
Load Average	0.94, 1.29, 1.29

## 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=f00003
Fri Sep 15 19:17:10 2017 user.emerg syslog: switch reg write offset=2204, value=f00003
Fri Sep 15 19:17:10 2017 user.emerg syslog: switch reg write offset=2304, value=f00003
Fri Sep 15 19:17:10 2017 user.emerg syslog: switch reg write offset=2404, value=f00003
Fri Sep 15 19:17:10 2017 user.emerg syslog: switch reg write offset=2504, value=f00003
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=2804, value=20f00003
Fri Sep 15 19:17:10 2017 user.emerg syslog: switch reg write offset=2704, value=20f00003
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_ESM_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] led8, 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] led10, 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 option?

```

## 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 frequency set to 580 MHz
[ 0.000000] PCIE: bypass PCIE DLL.
[ 0.000000] PCIE: 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 0x00000000-0x07fffffff]
[ 0.000000] Movable zone start for each node
[ 0.000000] Early memory node ranges
[ 0.000000]   node  0: [mem 0x00000000-0x07fffffff]
[ 0.000000] On node 0 totalpages: 32768
[ 0.000000] free_area_init_node: node 0, pgdat 80428880, node_mem_map 8100000
[ 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_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: Mhwalign=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 Femto Cell item.

Figure 2.2.5-A Processes

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

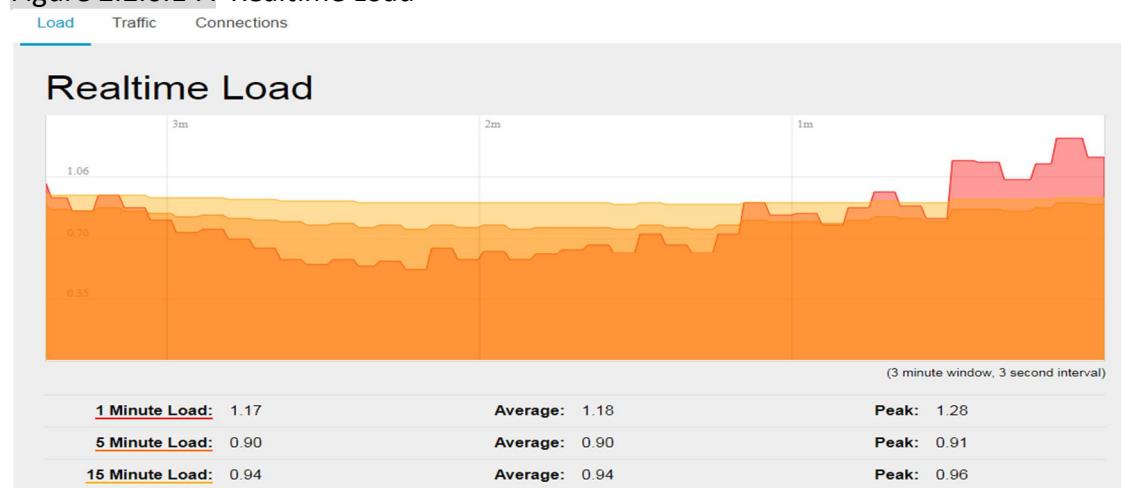
## 2.2.6 Realtime Graphs

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.

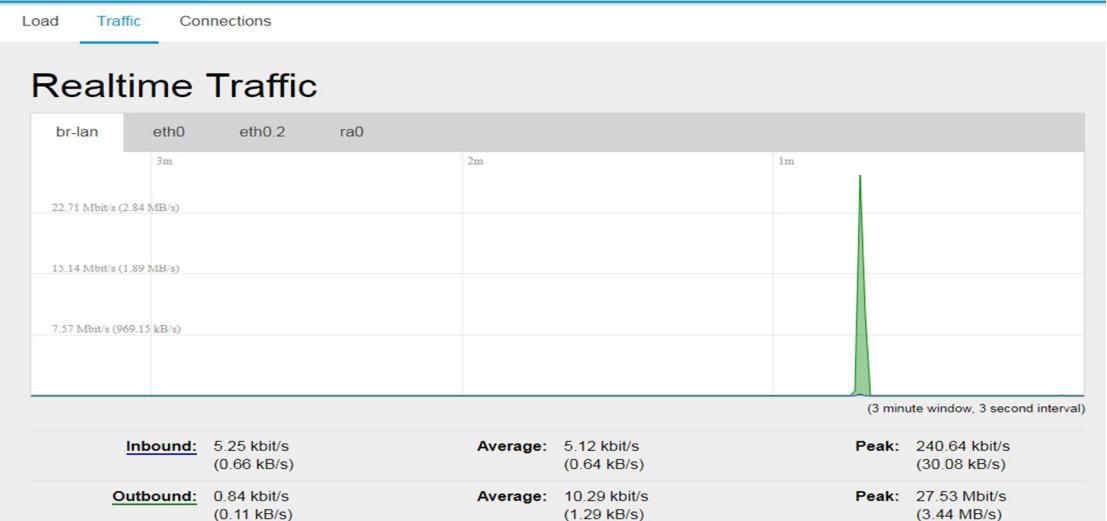
Figure 2.2.6.1-A Realtime Load



### 2.2.6.2 Realtime Traffic

To view the network traffic of each interface.

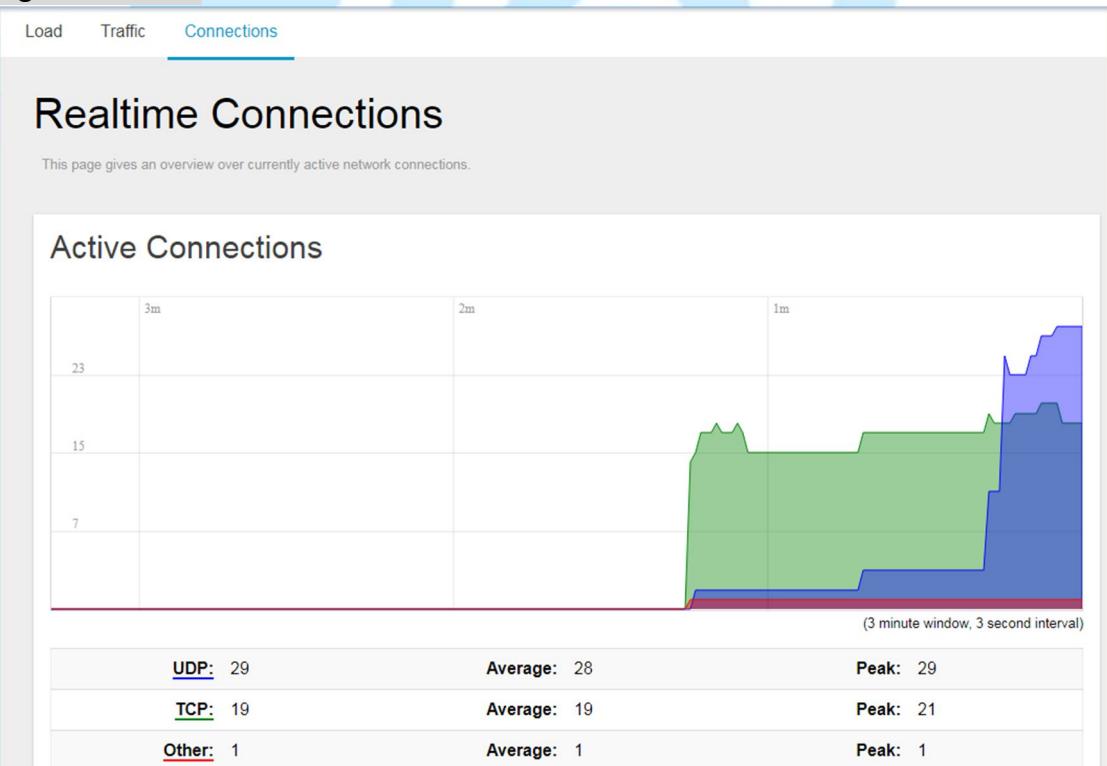
**Figure 2.2.6.2-A Realtime Traffic**



### 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, Backup and Restore, System Firmware and Reboot. 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.

Place a checkmark next to “Enable NTP Client” to synchronize the time with NTP server.

If you choose to use another NTP server, please place a checkmark next to “Provide NTP server” and fill out the “NTP server candidates” text field.

Figure 2.3.1-A System Properties

#### System

Here you can configure the basic aspects of your device like its hostname or the timezone.

#### System Properties

Local Time Sat Sep 16 19:53:12 2017 **SYNC WITH BROWSER**

Hostname

Timezone

Figure 2.3.1-B Time Synchronization

#### Time Synchronization

Enable NTP client

Provide NTP server

NTP server candidates    
   
   
 

### 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

Changes the administrator password for accessing the device

Password \_\_\_\_\_

Confirmation \_\_\_\_\_

Figure 2.3.2-B Language and Style

#### Language and Style

Language: English

APPLY

### 2.3.3 Backup and Restore

Femto configuration can be restored and reset to default on this page.  
Click “GENERATE ARCHIVE” button to download the configuration file with the current gateway settings.

**Note: LoRa configuration cannot be restored and reset to default on this page.**

Figure 2.3.3-A Backup/Restore  
Flash operations

Backup / Restore

Click "Generate archive" to download a tar archive of the current configuration files. To reset the firmware to its initial state, click "Perform reset" (only possible with squashfs images).

Download backup: **GENERATE ARCHIVE**

Reset to defaults: **PERFORM RESET**

To restore configuration files, you can upload a previously generated backup archive here.

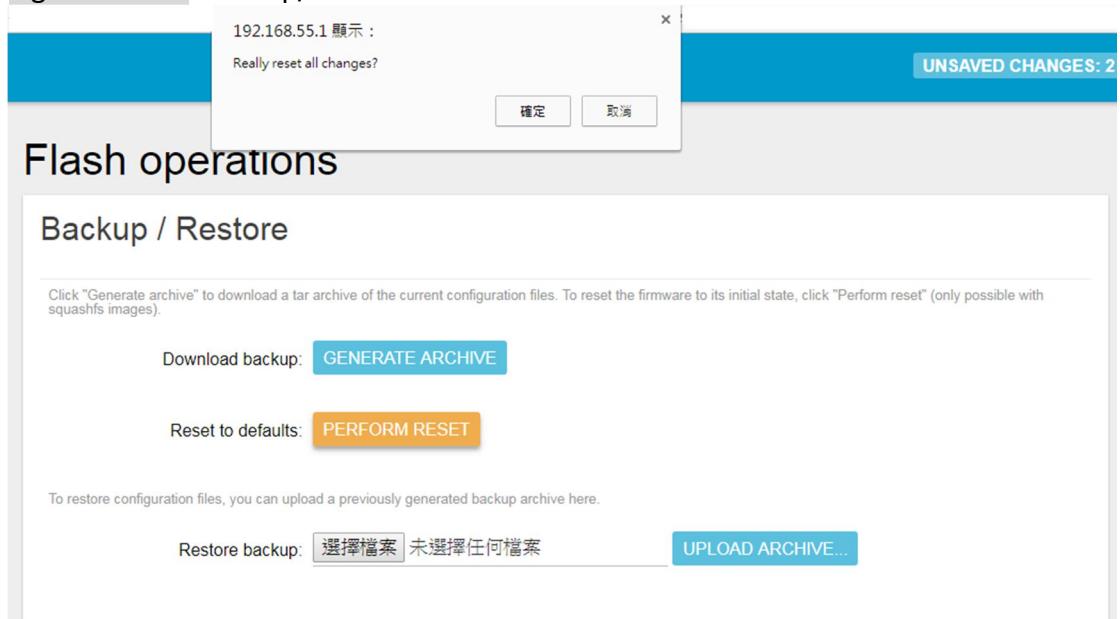
Restore backup:  未選擇任何檔案

**UPLOAD ARCHIVE...**

Click "**PERFORM RESET**" button to reset the firmware to its initial state.  
Please note that the LoRa provision settings will NOT be reset by this action.



Figure 2.3.3-B Backup/Restore



Choose the most recent backup file and click “*UPLOAD ARCHIVE*” to restore the configuration file.

## 2.3.4 System Firmware

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.

Figure 2.3.4-A System Firmware

## System Firmware

### Firmware Information

Click “Check New Firmware” to check new firmware from OTA server.

Primary Firmware: 3.00.16

Secondary Firmware: 3.00.16

Version of OTA Server: 3.00.04

**CHECK NEW FIRMWARE**

### 2.3.5 Reboot

Click “*PERFORM REBOOT*” to reboot Femto.

Figure 2.3.5-A Reboot

#### Reboot

Reboots the operating system of your device

**PERFORM REBOOT**

## 2.4 GloT

The GloT menu consists of the following categories: Status, Provision, Configuration, Network Server, Network Server Log, Channel Scan and GPS MAP.

### 2.4.1 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 2.4.1-A GloT Info

#### GloT Status

##### GloT Info

Provisioning Code	80001840 (Provision)
Area Code	80001840
Gateway Type	Femto
LoRa Module	ON
Gateway ID	1c497baaade6
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	0x00 0x01 0x04 0x05 0x0a 0x0d 0x14
GloT Connect	Online
Spreading Factor	uplink: 7 8 9 10 11 12, downlink: 12
GPS	Latitude:(Not Config), Longitude:(Not Config)

## 2.4.2 Provision

GloT provision code can be setup on this page.

Figure 2.4.2-A Provision Code

The screenshot shows a configuration page titled "Provision Code". A note at the top states: "System will reboot if activate Provision Code succeed". Below this is a text input field labeled "Code" containing the value "80001840". At the bottom right is a blue "APPLY" button.

## 2.4.3 Configuration

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

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 2.4.3-A GloT Management  
GloT Management

The screenshot shows a configuration page with two main sections: "LoRa Management" and "GPS Location". In the "LoRa Management" section, there is a "LoRa Restart" button. In the "GPS Location" section, there are fields for "Latitude" and "Longitude", both currently set to "Not Config". Below these fields are two buttons: "SAVE LOCATION" and "SELECT ON MAP".

## 2.4.4 Network Server

The user can configure Network Server settings on this page.

The 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.

**Username:** The username for the cloud server.

**Password:** The password for the cloud server.

**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. (read only)

Figure 2.4.4-A Network Server

### Network Server

The description for the Network Server.

Protocol: MQTTS ▾

Hostname: routing-emq00.giotgateway.i

Username: admin

Password: admin

Publish topic: GIOT-GW/DL/

Subscribe topic: GIOT-GW/UL/

Downlink ACK: GIOT-GW/DL-report/

Port: 8883

## 2.4.5 Network Server Log

Displays the log that is connected to the broker.

Figure 2.4.5-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.
```

## 2.4.6 Channel Scan

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

Figure 2.4.6-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

## 2.4.7 Channel Setting

To setup LoRa channel frequency.

**Figure 2.4.7-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

## 2.4.8 GPS MAP

To setup 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 2.4.8-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: 303台灣新竹縣湖口鄉中華路15-1號



Latitude 24.8719188

Longitude 121.00898699999993

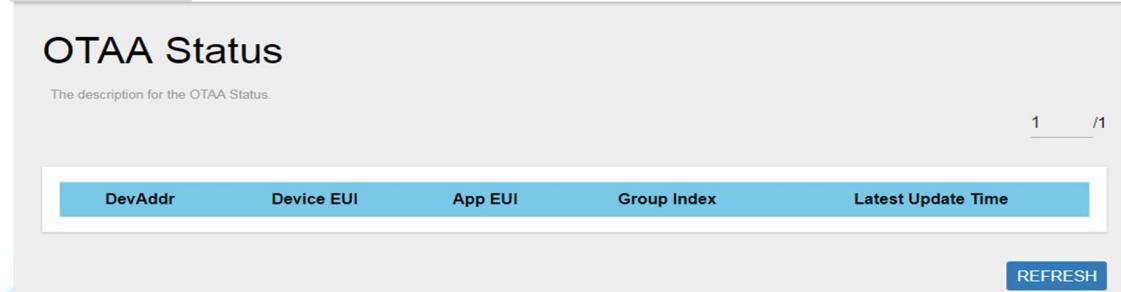
## 2.5 LoRaWAN

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

### 2.5.1 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 2.5.1-A OTAA Status



DevAddr	Device EUI	App EUI	Group Index	Latest Update Time

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.

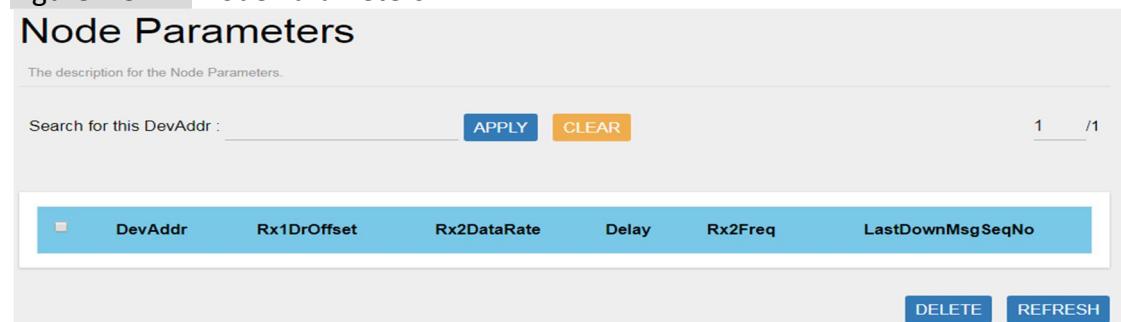
**Group Index:** The unique index of the OTAA EUID group.

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

### 2.5.2 Node Parameters

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

Figure 2.5.2-A Node Parameters



DevAddr	Rx1DrOffset	Rx2DataRate	Delay	Rx2Freq	LastDownMsgSeqNo

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.

### 2.5.3 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:** The Aging Out Time must be at least 60 minutes.

### Figure 2.5.3-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 2.5.3-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

<input checked="" type="checkbox"/>	Group Index	AppEUI Start	AppEUI Counts	DevEUI Start	DevEUI Counts	DevAddr Start	DevAddr Counts	AppKey	Aging Out Time (Minutes)
<input checked="" type="checkbox"/>	1	11111111 11111111	1	11111111 11111111	1	1111 1111	1	11111111 11111111 11111111 11111111	60 <b>EDIT</b>
<input checked="" type="checkbox"/>	2	22222222 22222222	2	22222222 22222222	2	2222 2222	2	22222222 22222222 22222222 22222222	60 <b>EDIT</b>

**DELETE** **ADD**

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 2.5.3-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	111111111111111111111111
Aging Out Time	Minute (60~65535, 0 for disable)	60

**SAVE**   **CANCEL**

## 2.5.4 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.

### 2.5.4.1 INDIVIDUAL

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

**Figure 2.5.4.1-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

<input type="checkbox"/> DevAddr	NwkSKey	NwkSKey CRC	AppSKey	AppSKey CRC	
<input type="checkbox"/> 33333333	333333333333333333 333333333333	9ABE	333333333333333333 333333333333	9ABE	<b>EDIT</b>
<input type="checkbox"/> 44444444	444444444444444444 444444444444	59AA	444444444444444444 444444444444	59AA	<b>EDIT</b>

**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.

Figure 2.5.4.1-B INDIVIDUAL Add  
Individual-Update/Add

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

Parameter	Format
DevAddr	8 HEX digits
NwkSKey	32 HEX digits
AppSKey	32 HEX digits

SAVE CANCEL

To delete entries, select one or more ABP (INDIVIDUAL) rule entries and click “DELETE” button.

Figure 2.5.4.1-C INDIVIDUAL Delete  
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

	DevAddr	NwkSKey	NwkSKey CRC	AppSKey	AppSKey CRC	
<input checked="" type="checkbox"/>	33333333	3333333333333333 333333333333	9ABE	3333333333333333 333333333333	9ABE	<span>EDIT</span>
<input checked="" type="checkbox"/>	44444444	4444444444444444 444444444444	59AA	4444444444444444 444444444444	59AA	<span>EDIT</span>

DELETE ADD

To edit an entry, select a rule entry and click “**EDIT**” button to proceed.  
 Edit NwkSKey and AppSKey, then click “**SAVE**” to edit the ABP  
 (INDIVIDUAL).  
 User will leave ABP Edit page after clicking “**CANCEL**”.

**Figure 2.5.4.1-D INDIVIDUAL Edit**

### Individual-Update/Add

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**

Parameter	Format
DevAddr	8 HEX digits
NwkSKey	32 HEX digits
AppSKey	32 HEX digits

**SAVE** **CANCEL**

### 2.5.4.2 NETID GROUP

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

**Figure 2.5.4.2-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

<input type="checkbox"/>	NwkID	NwkAddr Start	Total number	NwkSKey	NwkSKey CRC	AppSKey	AppSKey CRC	
<input checked="" type="checkbox"/>	10	10000000	1	10000000000000000000 000000000000	CC0D	10000000000000000000 000000000000	CC0D	<b>EDIT</b>

**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 2.5.4.2-B NETID GROUP Add  
**NetID-Update/Add**

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

Parameter	Format
NwkID	0x0~0xFF
NwkAddr Start	6 HEX digits
NwkAddr Total Number	Digits
NwkSKey	32 HEX digits
AppSKey	32 HEX digits

**SAVE**    **CANCEL**

To delete entries, select one or more ABP (NETID GROUP) rule entries and click “DELETE” button.

Figure 2.5.4.2-C NETID GROUP Delete  
**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

NwkID	NwkAddr Start	Total number	NwkSKey	NwkSKey CRC	AppSKey	AppSKey CRC
<input checked="" type="checkbox"/> 10	10000000	1	10000000000000000000 000000000000	CC0D	10000000000000000000 000000000000	CC0D

**DELETE**    **ADD**

To edit an entry, select a rule entry and click “*EDIT*” button to proceed.  
 Edit NwkAddr Start, NwkAddr ,NwkSKey and AppSKey, then click  
 “*SAVE*” to edit the ABP (NETID GROUP).  
 User will leave ABP edit page after clicking “*CANCEL*”.

**Figure 2.5.4.2-D** NETID GROUP Edit

### NetID-Update/Add

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**

Parameter	Format
NwkID	0x0~0xFE
NwkAddr Start	6 HEX digits
NwkAddr Total Number	Digits
NwkSKey	32 HEX digits
AppSKey	32 HEX digits

**SAVE**    **CANCEL**

## 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 three sectors: Ethernet Wan, 3G/4G LTE and Wireless Extender. These individual options are lodged and labeled above the main content panel.

**Figure 2.6.1-A** WAN

Ethernet Wan    3G/4G LTE    Wireless Extender

#### WAN

##### Wan Type

##### DHCP

**WAN**

**Uptime:** 21h 31m 14s  
**MAC-Address:** 1C:49:7B:B4:40:01  
**RX:** 1.95 GB (1662680 Pkts.)  
**TX:** 62.61 MB (599285 Pkts.)  
**IPv4:** 192.168.31.167/24

### 2.6.1.1 Ethernet WAN

This page is to setup 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 2.6.1.1-A Static IP**

Ethernet Wan    3G/4G LTE    Wireless Extender

---

wantype **Static IP**

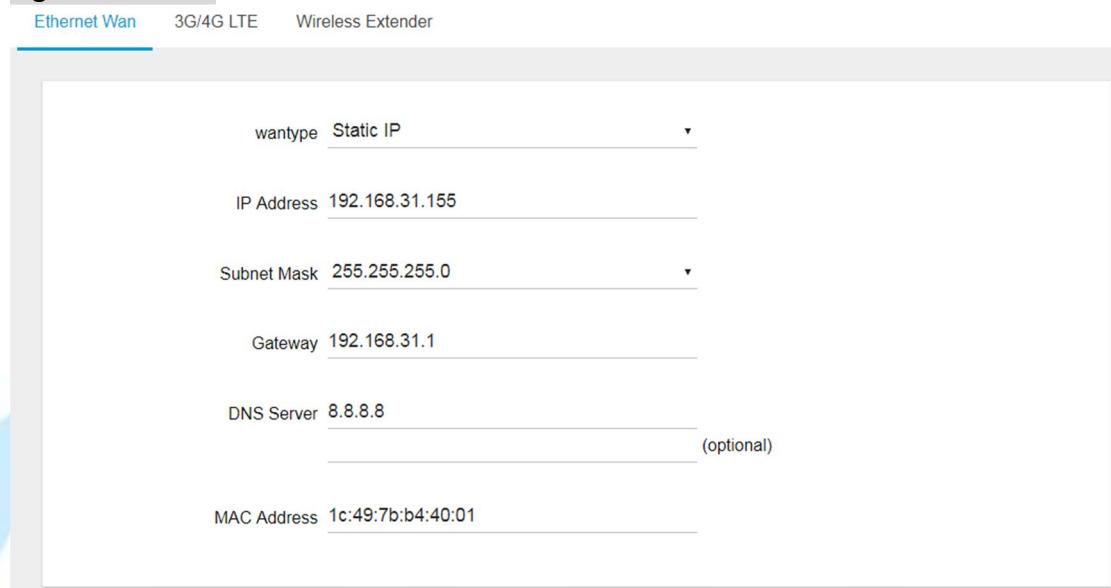
IP Address **192.168.31.155**

Subnet Mask **255.255.255.0**

Gateway **192.168.31.1**

DNS Server **8.8.8.8**  
(optional)

MAC Address **1c:49:7b:b4:40:01**



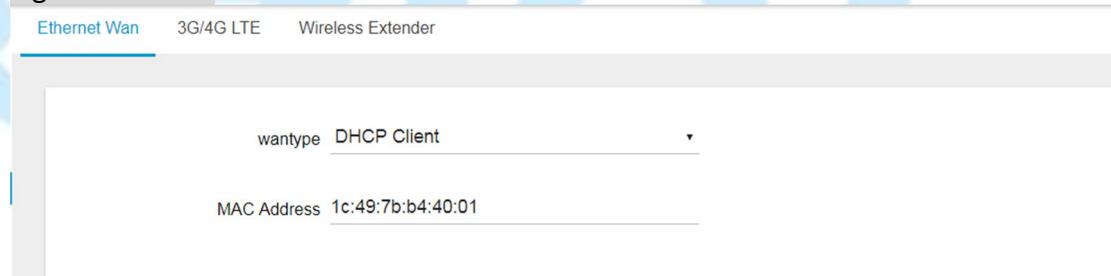
**Figure 2.6.1.1-B DHCP Client**

Ethernet Wan    3G/4G LTE    Wireless Extender

---

wantype **DHCP Client**

MAC Address **1c:49:7b:b4:40:01**



**Figure 2.6.1.1-C PPPoE**

Ethernet Wan    3G/4G LTE    Wireless Extender

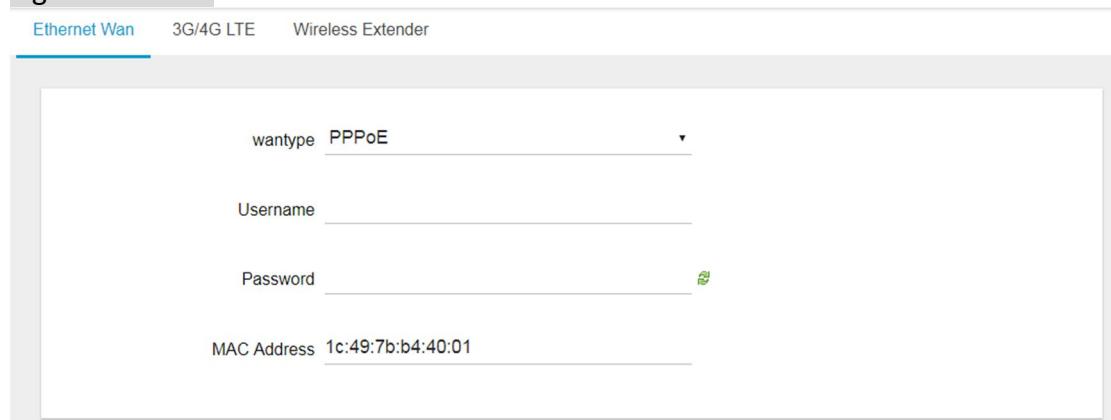
---

wantype **PPPoE**

Username

Password

MAC Address **1c:49:7b:b4:40:01**

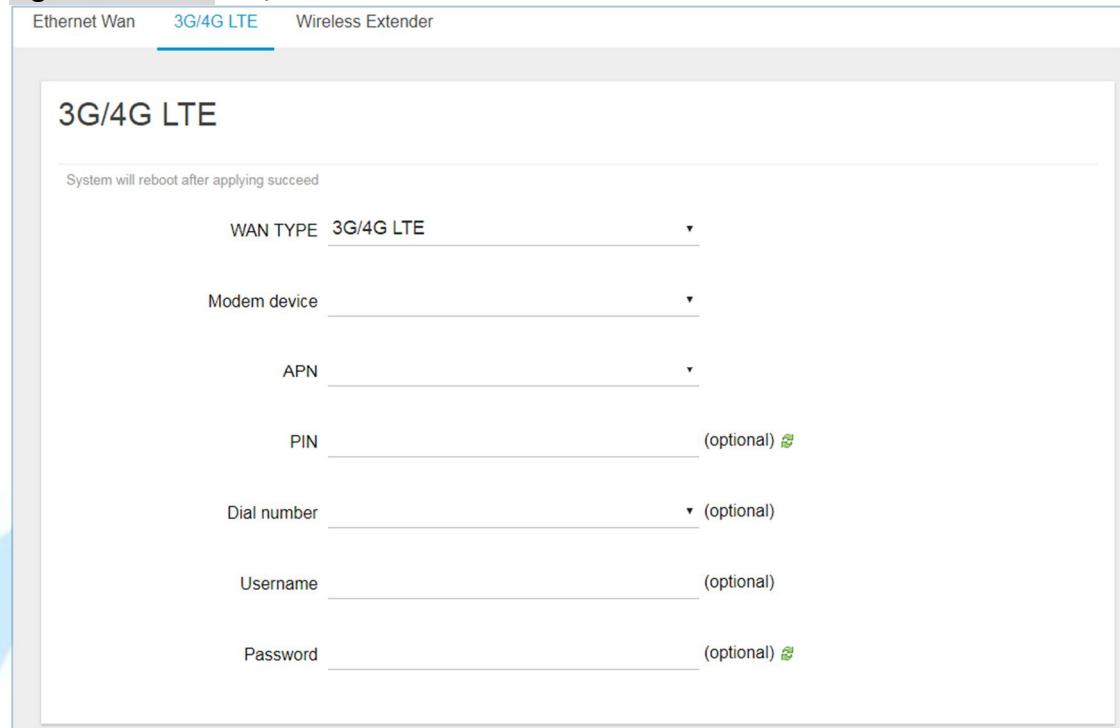


### 2.6.1.2 3G/4G LTE

This page is to setup required information.

**Note:** Make sure the SIM card is installed.

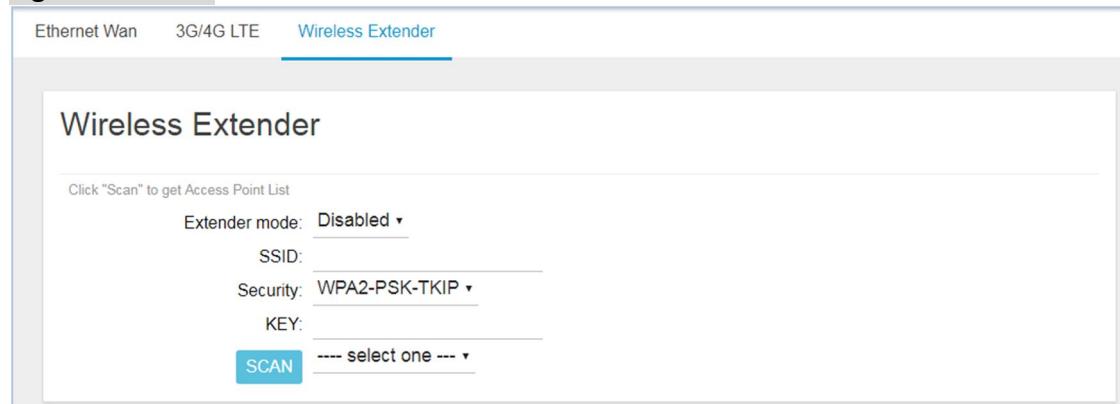
Figure 2.6.1.2-A 3G/4G LTE



### 2.6.1.3 Wireless Extender

This page is to setup 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



## 2.6.2 Wireless

2.4G Interface Configuration to setup 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-b44000

Hidden Broadcast

encryption WPAWPA2-PSK

Key

2.4G Interface Channel

Channel auto

## 2.6.3 LAN

LAN IP can be set up in this page.

Figure 2.6.3-A LAN

### LAN

Local Network

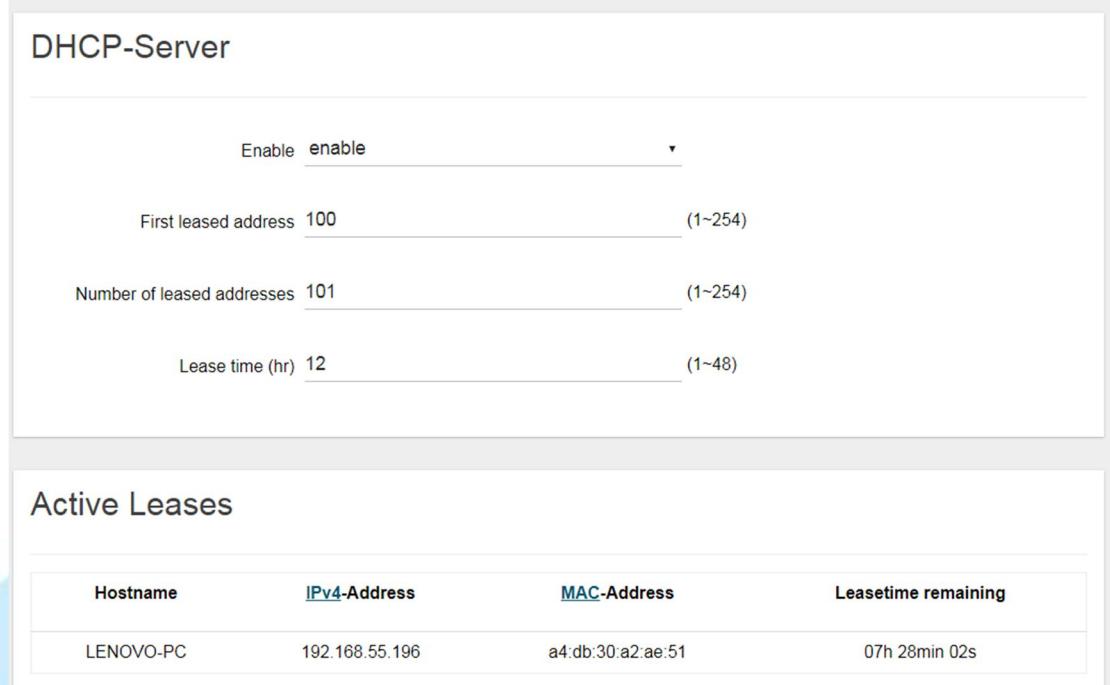
IP Address 192.168.55.1

## 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

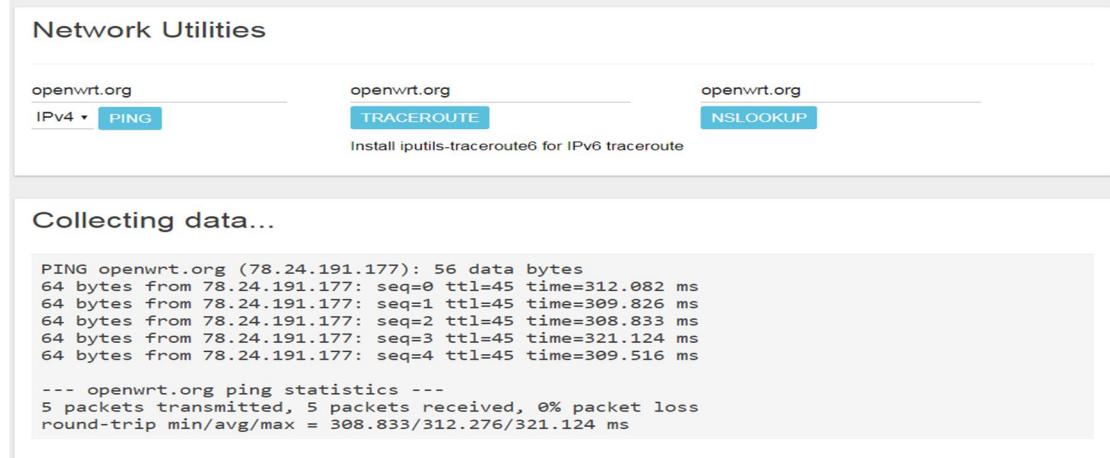
## 2.6.5 Diagnostic

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 IPV4 ▾	PING	openwrt.org TRACEROUTE	openwrt.org 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
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
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
```

## 3. Education mode

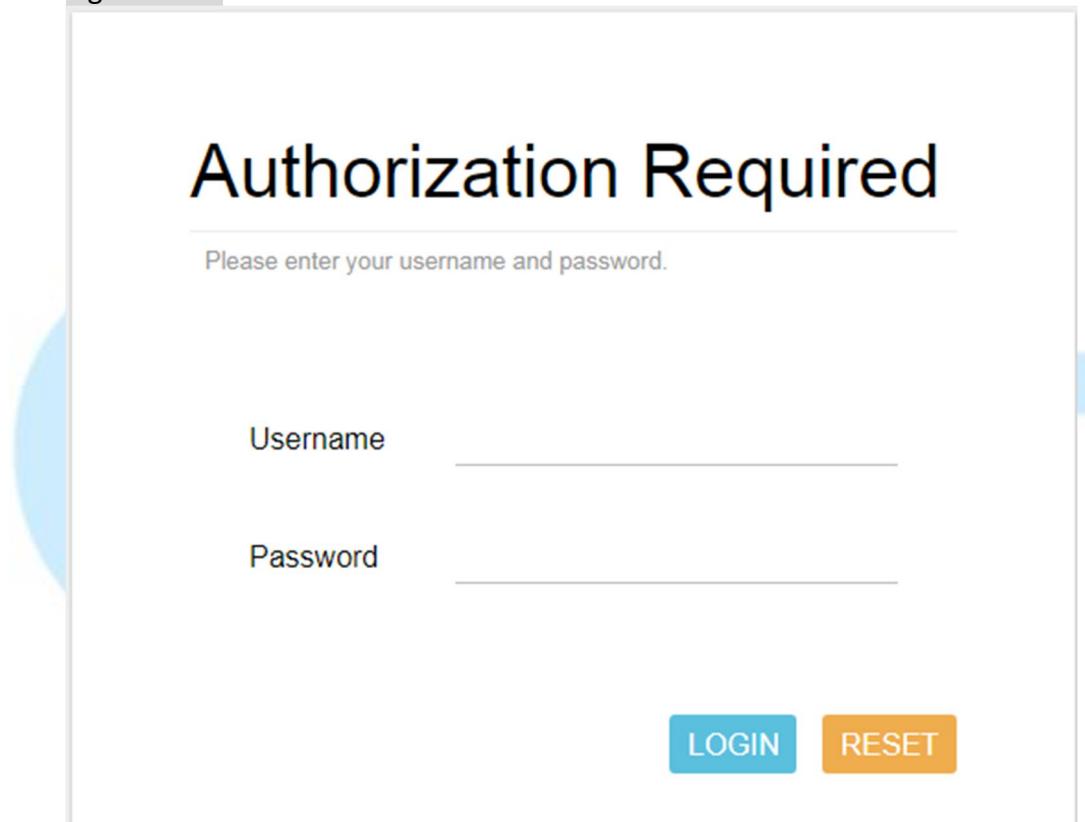
### 3.1 Open Admin GUI

Connect to Femto Cell via wifi (**SSID: AP-last 6 digits of mac address**)

Access Femto Cell WebUI via IP address “192.168.55.1”.

Default username is “*admin*” and password is “*admin*”.

Figure 3.1-A



## 3.2 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.

### 3.2.1 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.

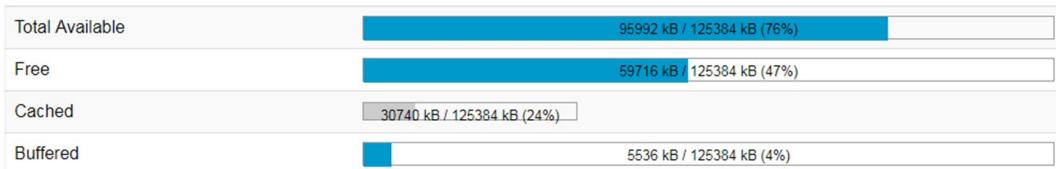
**Figure 3.2.1-A System Status**

#### System

Hostname	Femto-b44000
Model	GIOT InDoor FemtoCell
Firmware Version	Version 3.00.16 Thu Sep 7 16:27:20 CST 2017
Kernel Version	3.10.14
Local Time	Sat Sep 16 16:16:14 2017
Uptime	16h 26m 4s
Load Average	1.40, 0.93, 0.83

**Figure 3.2.1-B Memory Usage and Network Settings**

#### Memory



#### 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 3.2.1-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. The status will auto refresh in 5 secs if “Auto Refresh ON” button is on.

Figure 3.2.1-D Status

UNSAVED CHANGES: 2 AUTO REFRESH ON

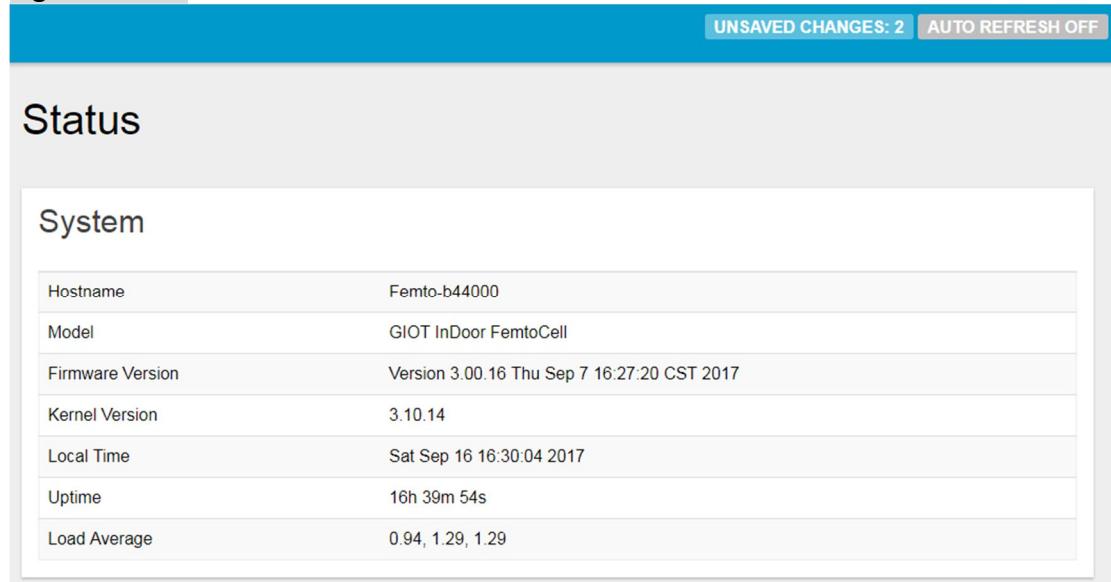
### Status

#### System

Hostname	Femto-b44000
Model	GIOT InDoor FemtoCell
Firmware Version	Version 3.00.16 Thu Sep 7 16:27:20 CST 2017
Kernel Version	3.10.14
Local Time	Sat Sep 16 16:29:23 2017
Uptime	16h 39m 14s
Load Average	0.99, 1.34, 1.30

Click "AUTO REFRESH ON/OFF" button to enable/ disable auto refresh.

Figure 3.2.1-E Status



The screenshot shows the 'Status' section of the Gemtek interface. At the top, there are buttons for 'UNSAVED CHANGES: 2' and 'AUTO REFRESH OFF'. Below this, the word 'Status' is displayed. Under the 'System' heading, there is a table with the following data:

Hostname	Femto-b44000
Model	GIOT InDoor FemtoCell
Firmware Version	Version 3.00.16 Thu Sep 7 16:27:20 CST 2017
Kernel Version	3.10.14
Local Time	Sat Sep 16 16:30:04 2017
Uptime	16h 39m 54s
Load Average	0.94, 1.29, 1.29

## 3.2.2 Routes

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

Figure 3.2.2-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

### 3.2.3 System Log

This category is to view System Log information.

**Figure 3.2.3-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=f00003
Fri Sep 15 19:17:10 2017 user.emerg syslog: switch reg write offset=2204, value=f00003
Fri Sep 15 19:17:10 2017 user.emerg syslog: switch reg write offset=2304, value=f00003
Fri Sep 15 19:17:10 2017 user.emerg syslog: switch reg write offset=2404, value=f00003
Fri Sep 15 19:17:10 2017 user.emerg syslog: switch reg write offset=2504, value=f00003
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=2804, value=20f00003
Fri Sep 15 19:17:10 2017 user.emerg syslog: switch reg write offset=2704, value=20f00003
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_ESM_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 option?
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 option?
```

### 3.2.4 Kernel Log

This category is to view Kernel Log information.

**Figure 3.2.4-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 frequency set to 580 MHz
[ 0.000000] PCIE: bypass PCIe DLL.
[ 0.000000] PCIE: Elastic buffer control: Addr:0x68 -> 0x84
[ 0.000000] disable all power about PCIe
[ 0.000000] CPU revision is: 00019650 (MIPS 24KEc)
[ 0.000000] Software DMA cache coherency
[ 0.000000] Determined physical RAM map:
[ 0.000000]   memory: 00000000 @ 00000000 (usable)
[ 0.000000] Initrd not found or empty - disabling initrd
[ 0.000000] Zone ranges:
[ 0.000000]   Normal [mem 0x00000000-0xffffffff]
[ 0.000000]   Movable zone start for each node
[ 0.000000] Early memory node ranges
[ 0.000000]   node 0: [mem 0x00000000-0x07fffffff]
[ 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_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
```

### 3.2.5 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 Femto Cell item.

**Figure 3.2.5-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%	<b>HANG UP</b>	<b>TERMINATE</b>	<b>KILL</b>
2	root	[kthreadd]	0%	0%	<b>HANG UP</b>	<b>TERMINATE</b>	<b>KILL</b>
3	root	[ksoftirqd/0]	0%	0%	<b>HANG UP</b>	<b>TERMINATE</b>	<b>KILL</b>
4	root	[kworker/0:0]	0%	0%	<b>HANG UP</b>	<b>TERMINATE</b>	<b>KILL</b>
5	root	[kworker/0:0H]	0%	0%	<b>HANG UP</b>	<b>TERMINATE</b>	<b>KILL</b>
6	root	[kworker/u2:0]	0%	0%	<b>HANG UP</b>	<b>TERMINATE</b>	<b>KILL</b>
7	root	[watchdog/0]	0%	0%	<b>HANG UP</b>	<b>TERMINATE</b>	<b>KILL</b>

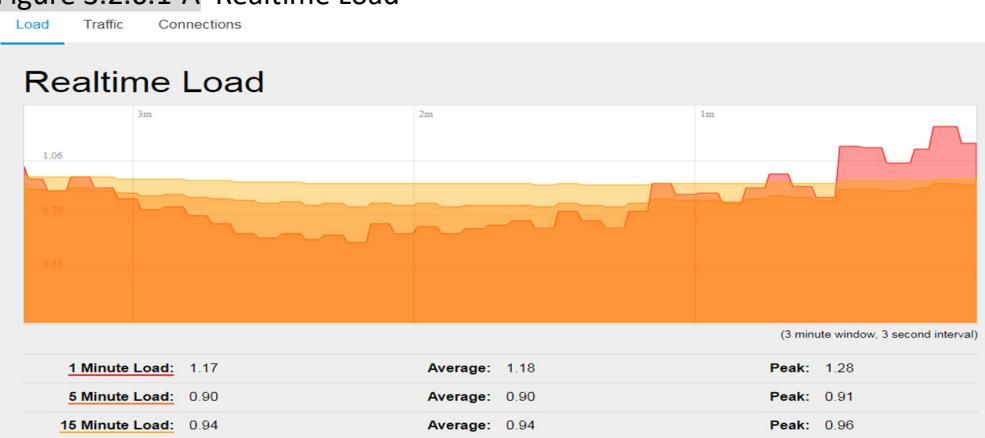
### 3.2.6 Realtime Graphs

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

#### 3.2.6.1 Realtime Load

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

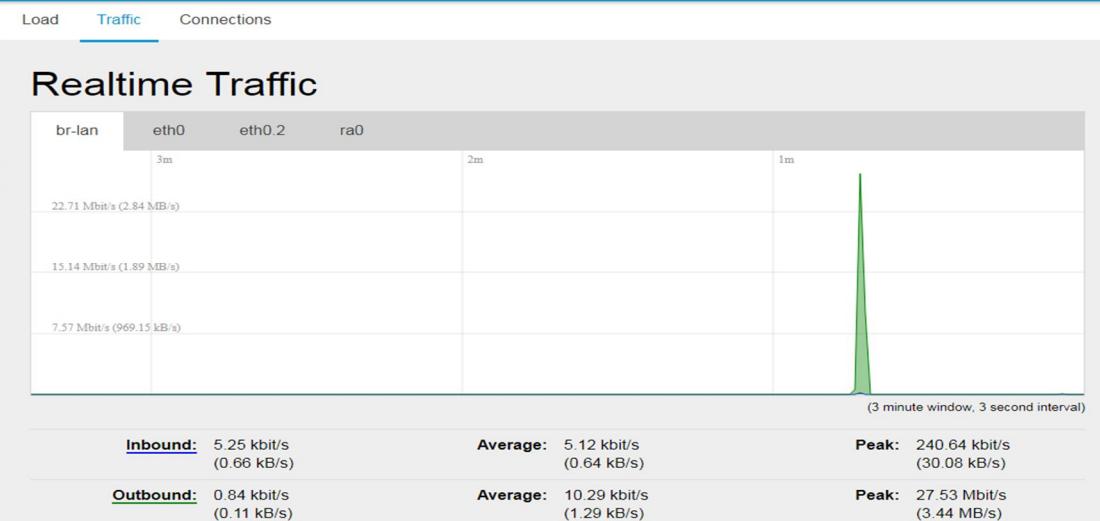
**Figure 3.2.6.1-A Realtime Load**



### 3.2.6.2 Realtime Traffic

To view the network traffic of each interface.

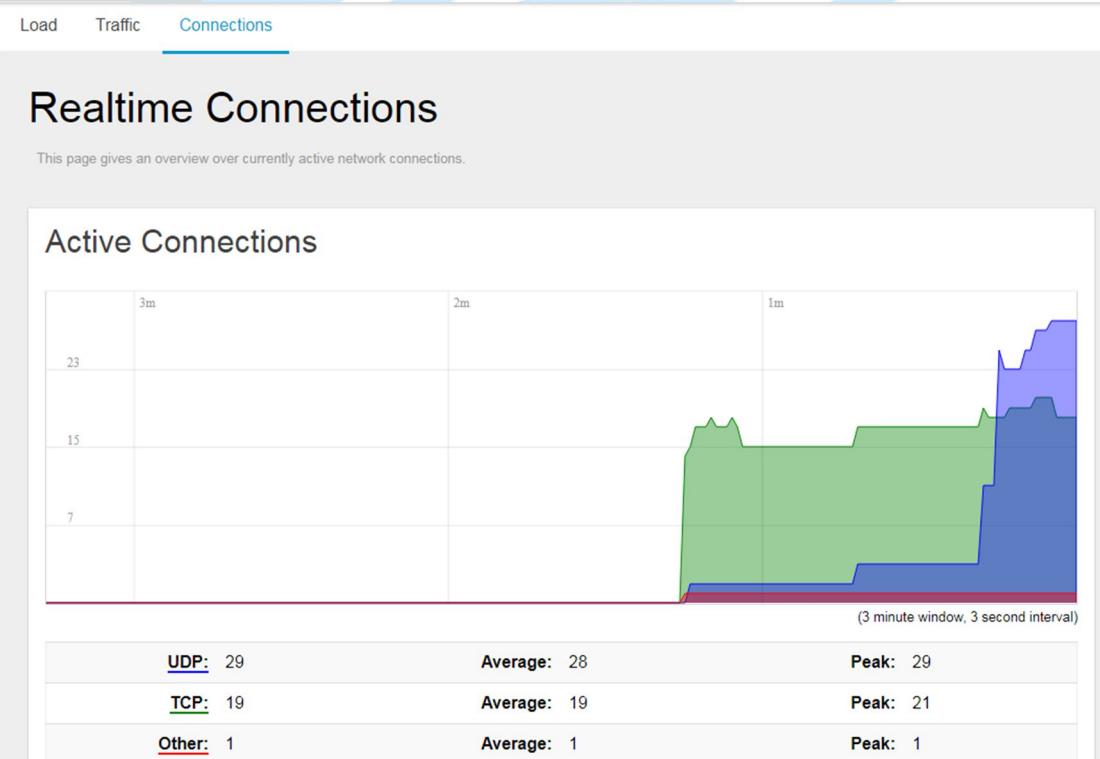
**Figure 3.2.6.2-A** Realtime Traffic



### 3.2.6.3 Realtime Connections

To view the currently active network connections.

**Figure 3.2.6.3-A** Realtime Connections



## 3.3 System

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

### 3.3.1 System

Hostname and Timezone can be customized in the system properties.

Click “Sync with Browser” button to adjust the local time.

Place a checkmark next to “Enable NTP Client” to synchronize the time with NTP server.

If you choose to use another NTP server, please place a checkmark next to “Provide NTP server” and fill out the “NTP server candidates” text field.

Figure 3.3.1-A System Properties

#### System

Here you can configure the basic aspects of your device like its hostname or the timezone.

#### System Properties

Local Time Sat Sep 16 19:53:12 2017 **SYNC WITH BROWSER**

Hostname **Femto-b44000**

Timezone **Asia/Taipei**

Figure 3.3.1-B Time Synchronization

#### Time Synchronization

Enable NTP client

Provide NTP server

NTP server candidates **0.openwrt.pool.ntp.org**



**1.openwrt.pool.ntp.org**



**2.openwrt.pool.ntp.org**



**3.openwrt.pool.ntp.org**



### 3.3.2 Administration

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

Figure 3.3.2-A Router Password

#### Router Password

Changes the administrator password for accessing the device

Password \_\_\_\_\_ 

Confirmation \_\_\_\_\_ 

Figure 3.3.2-B Language and Style

#### Language and Style

Language: English

APPLY

### 3.3.3 Backup and Restore

Femto configuration can be restored and reset to default on this page.  
Click “GENERATE ARCHIVE” button to download the configuration file with the current gateway settings.

Note: LoRa configuration cannot be restored and reset to default on this page.

Figure 3.3.3-A Backup/Restore

#### Flash operations

##### Backup / Restore

Click "Generate archive" to download a tar archive of the current configuration files. To reset the firmware to its initial state, click "Perform reset" (only possible with squashfs images).

Download backup: **GENERATE ARCHIVE**

Reset to defaults: **PERFORM RESET**

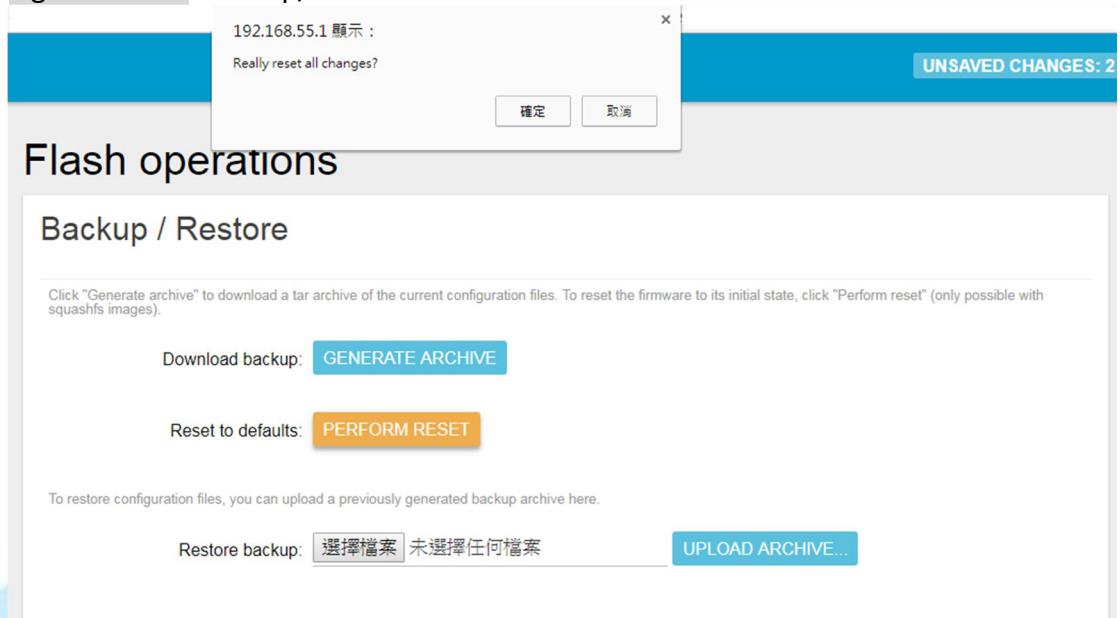
To restore configuration files, you can upload a previously generated backup archive here.

Restore backup: **選擇檔案** 未選擇任何檔案

**UPLOAD ARCHIVE...**

Click “*PERFORM RESET*” button to reset the firmware to its initial state.  
Please note that the LoRa provision settings will NOT be reset by this action.

Figure 3.3.3-B Backup/Restore



Choose the most recent backup file and click “*UPLOAD ARCHIVE*” to restore the configuration file.

### 3.3.4 Reboot

Click “*PERFORM REBOOT*” to reboot Femto.

Figure 3.3.4-A Reboot

### Reboot

Reboots the operating system of your device

**PERFORM REBOOT**

## 3.4 GloT

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

### 3.4.1 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 3.4.1-A** GloT Info

#### GloT Status

##### GloT Info

Provisioning Code	80001840 (Provision)
Area Code	80001840
Gateway Type	Femto
LoRa Module	ON
Gateway ID	1c497baaade6
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	0x00 0x01 0x04 0x05 0x0a 0x0d 0x14
GloT Connect	Online
Spreading Factor	uplink: 7 8 9 10 11 12, downlink: 12
GPS	Latitude:(Not Config), Longitude:(Not Config)

### 3.4.2 Provision

GloT provision code can be set up on this page.

**Figure 3.4.2-A** Provision Code

##### Provision Code

System will reboot if activate Provision Code succeed

Code

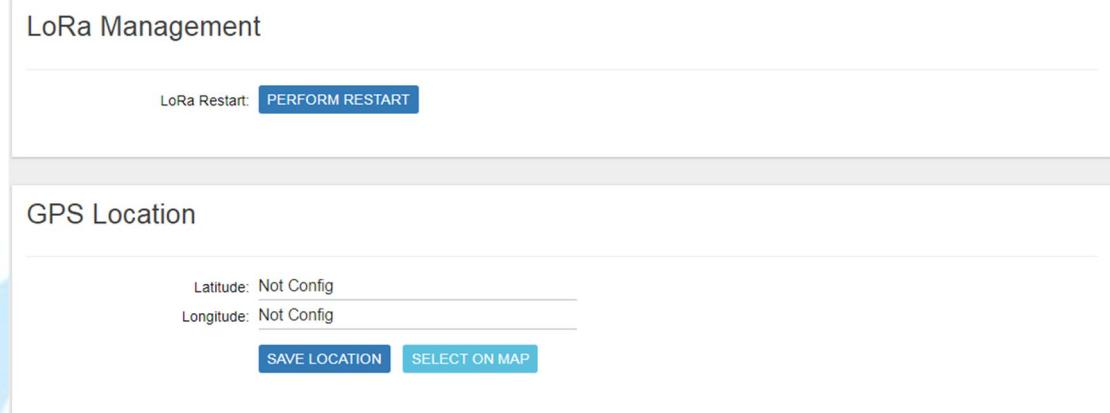
**APPLY**

### 3.4.3 Configuration

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

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 3.4.3-A** GloT Management  
GloT Management



### 3.4.4 Network Server

The user can configure Network Server settings on this page. The 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.

**Username:** The username for the cloud server.

**Password:** The password for the cloud server.

**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. (read only)

### Figure 3.4.4-A Network Server Network Server

The description for the Network Server.

Protocol: MQTTS ▾  
Hostname: routing-emq00.giotgateway.i...  
Username: admin  
Password: admin  
Publish topic: GIOT-GW/DL/  
Subscribe topic: GIOT-GW/UL/  
Downlink ACK: GIOT-GW/DL-report/  
Port: 8883

### 3.4.5 Network Server Log

Displays the log that is connected to the broker.

### Figure 3.4.5-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.
```

### 3.4.6 Channel Scan

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

Figure 3.4.6-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

### 3.4.7 Channel Setting

To setup the Center Frequency for LoRa on this page.

Figure 3.4.7-A Channel Setting

#### Center Frequency

Gateway Module	1c497baaade6
Center Frequency of Radio 0	923.1(922.8, 923.0, 923.2, 923.4) *
	Ch0: 922.8MHz Ch1: 923.0MHz Ch2: 923.2MHz Ch3: 923.4MHz
Center Frequency of Radio 1	923900000 Hz (915000000 ~ 928000000 Hz)
	Ch4: 923.6MHz Ch5: 923.8MHz Ch6: 924MHz Ch7: 924.2MHz

APPLY

### 3.4.8 GPS MAP

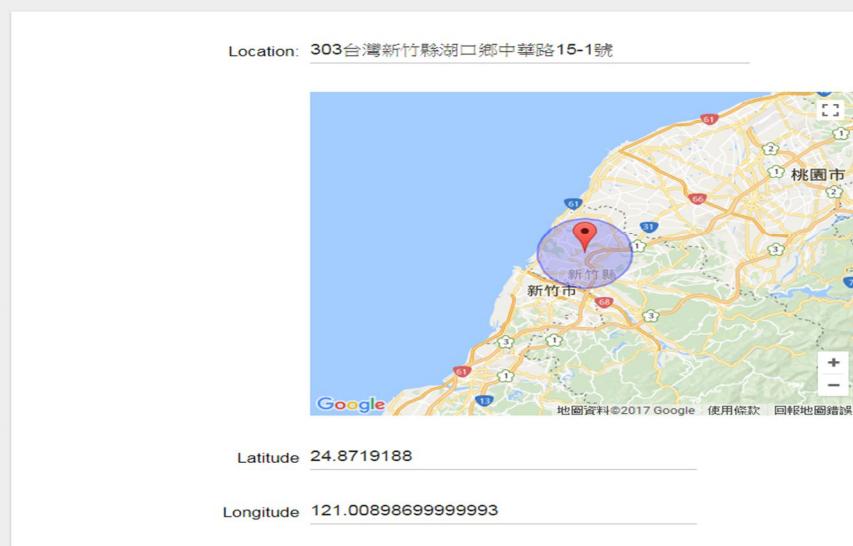
To setup the GPS location, simply input your address location in the “Location” text field above the map or pinpoint your location on the map by dragging the red marker to the correct spot.

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

**Figure 3.4.8-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.



## 3.5 LoraWAN

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

### 3.5.1 OTAA Status

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

**Figure 3.5.1-A OTAA Status**

#### OTAA Status

The description for the OTAA Status.

1 /1

DevAddr	Device EUI	App EUI	Group Index	Latest Update Time
---------	------------	---------	-------------	--------------------

REFRESH

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.

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

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

### 3.5.2 Node Parameters

The purpose of this category is to view node parameters, which include

DevAddr, Rx1DrOffset, Rx2DataRate, Delay, Rx2Freq and

LastDownMsgSeqNo.

Figure 3.5.2-A Node Parameters

#### Node Parameters

The description for the Node Parameters.

Search for this DevAddr : \_\_\_\_\_

**APPLY**

**CLEAR**

1 /1

<input type="checkbox"/> DevAddr	Rx1DrOffset	Rx2DataRate	Delay	Rx2Freq	LastDownMsgSeqNo
----------------------------------	-------------	-------------	-------	---------	------------------

**DELETE**

**REFRESH**

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.

### 3.5.3 OTAA

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

Figure 3.5.3-A OTAA

#### 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: 20

1 /1

Group Index	AppEUI Start	AppEUI Counts	DevEUI Start	DevEUI Counts	DevAddr Start	DevAddr Counts	AppKey	Aging Out Time (Minutes)
0	1c497b00 01ad28c0	-	e8e1e100 01000001	-	-	20	cd28a875 b0698292 1e7f946f 2a546a61	70

[DELETE](#) [ADD](#)

**Note:** Please note that there is a default OTAA rule which cannot be deleted or edited.

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:** The Aging Out Time must be at least 60 minutes.

**Figure 3.5.3-B 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 3.5.3-C 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	Aging Out Time (Minutes)	
<input checked="" type="checkbox"/>	1	11111111 11111111	1	11111111 11111111	1	1111 1111	1	11111111 11111111 11111111 11111111	60	<b>EDIT</b>
<input checked="" type="checkbox"/>	2	22222222 22222222	2	22222222 22222222	2	2222 2222	2	22222222 22222222 22222222 22222222	60	<b>EDIT</b>

**DELETE**   **ADD**

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 3.5.3-D 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	111111111111111111111111
Aging Out Time	Minute (60~65535, 0 for disable)	60

SAVE CANCEL

### 3.5.4 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.

#### 3.5.4.1 INDIVIDUAL

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

**Figure 3.5.4.1-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	3333333333333333 333333333333	9ABE	3333333333333333 333333333333	9ABE	<b>EDIT</b>
44444444	4444444444444444 444444444444	59AA	4444444444444444 444444444444	59AA	<b>EDIT</b>

**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.

Figure 3.5.4.1-B INDIVIDUAL Add  
**Individual-Update/Add**

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**

Parameter	Format
DevAddr	8 HEX digits
NwkSKey	32 HEX digits
AppSKey	32 HEX digits

**SAVE** **CANCEL**

To delete entries, select one or more ABP (INDIVIDUAL) rule entries and click "DELETE" button.

Figure 3.5.4.1-C INDIVIDUAL Delete  
**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

<input checked="" type="checkbox"/>	DevAddr	NwkSKey	NwkSKey CRC	AppSKey	AppSKey CRC	
<input checked="" type="checkbox"/>	33333333	3333333333333333 333333333333	9ABE	3333333333333333 333333333333	9ABE	<b>EDIT</b>
<input checked="" type="checkbox"/>	44444444	4444444444444444 444444444444	59AA	4444444444444444 444444444444	59AA	<b>EDIT</b>

**DELETE** **ADD**

To edit an entry, select a rule entry and click “*EDIT*” button to proceed.  
 Edit NwkSKey and AppSKey, then click “*SAVE*” to edit the ABP (INDIVIDUAL).  
 User will leave ABP Edit page after clicking “*CANCEL*”.

**Figure 3.5.4.1-D INDIVIDUAL Edit**

### Individual-Update/Add

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**

Parameter	Format
DevAddr	8 HEX digits
NwkSKey	32 HEX digits
AppSKey	32 HEX digits

**SAVE** **CANCEL**

### 3.5.4.2 NETID GROUP

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

**Figure 3.5.4.2-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: 20

**INDIVIDUAL** **NETID GROUP**

1 /1

<input type="checkbox"/> NwkID	NwkAddr Start	Total number	NwkSKey	NwkSKey CRC	AppSKey	AppSKey CRC
b6	b6000000	-	-	68AC	-	4DEA

**DELETE** **ADD**

**Note:** Please note that there is a default ABP (NETID GROUP) rule which cannot be deleted or edited.

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 3.5.4.2-B NETID GROUP Add

### NetID-Update/Add

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

Parameter	Format
NwkID	0x0~0xFE
NwkAddr Start	6 HEX digits
NwkAddr Total Number	Digits
NwkSKey	32 HEX digits
AppSKey	32 HEX digits

SAVE

CANCEL

To delete entries, select one or more ABP (NETID GROUP) rule entries and click “DELETE” button.

**Figure 3.5.4.2-C NETID GROUP Delete**
**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

NwkID	NwkAddr Start	Total number	NwkSKey	NwkSKey CRC	AppSKey	AppSKey CRC	
<input checked="" type="checkbox"/> 10	10000000	1	10000000000000000000 000000000000	CC0D	10000000000000000000 000000000000	CC0D	<b>EDIT</b>

**DELETE** **ADD**

To edit an entry, select a rule entry and click “**EDIT**” button to proceed.

Edit NwkAddr Start, NwkAddr ,NwkSKey and AppSKey, then click

“**SAVE**” to edit the ABP (NETID GROUP).

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

**Figure 3.5.4.2-D NETID GROUP Edit**
**NetID-Update/Add**

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

Parameter	Format	
NwkID	0x0~0xFE	<input type="text" value="10"/>
NwkAddr Start	6 HEX digits	<input type="text" value="10 000000"/>
NwkAddr Total Number	Digits	<input type="text" value="1"/>
NwkSKey	32 HEX digits	<input type="text" value="10000000000000000000000000000000"/>
AppSKey	32 HEX digits	<input type="text" value="10000000000000000000000000000000"/>

**SAVE** **CANCEL**

## 3.6 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.

### 3.6.1 WAN

The purpose of this category is to view current WAN settings. This category is further divided into three sectors: Ethernet Wan, 3G/4G LTE and Wireless Extender. These individual options are lodged and labeled above the main content panel.

**Figure 3.6.1-A WAN**

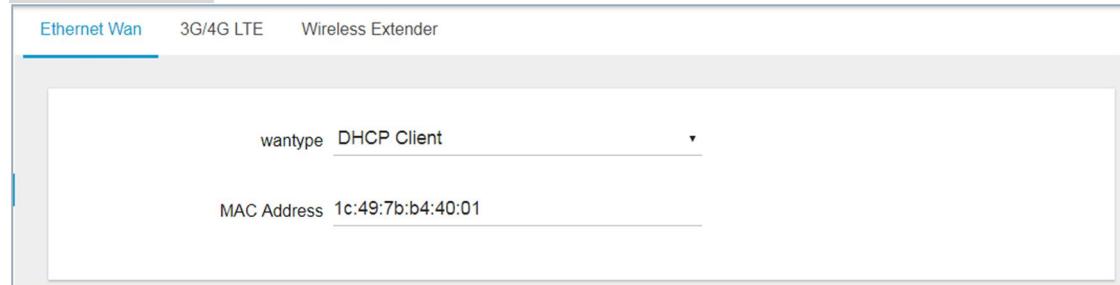
Ethernet Wan	3G/4G LTE	Wireless Extender						
<b>WAN</b> <table border="1"> <thead> <tr> <th>Wan Type</th> <th>DHCP</th> </tr> </thead> <tbody> <tr> <td><b>WAN</b></td> <td>           Uptime: 21h 31m 14s            MAC-Address: 1C:49:7B:B4:40:01            RX: 1.95 GB (1662680 Pkts.)            TX: 62.61 MB (599285 Pkts.)            IPv4: 192.168.31.167/24         </td> </tr> <tr> <td> eth.02</td> <td></td> </tr> </tbody> </table>			Wan Type	DHCP	<b>WAN</b>	Uptime: 21h 31m 14s MAC-Address: 1C:49:7B:B4:40:01 RX: 1.95 GB (1662680 Pkts.) TX: 62.61 MB (599285 Pkts.) IPv4: 192.168.31.167/24	 eth.02	
Wan Type	DHCP							
<b>WAN</b>	Uptime: 21h 31m 14s MAC-Address: 1C:49:7B:B4:40:01 RX: 1.95 GB (1662680 Pkts.) TX: 62.61 MB (599285 Pkts.) IPv4: 192.168.31.167/24							
 eth.02								

#### 3.6.1.1 Ethernet WAN

This page is to setup 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 3.6.1.1-A Static IP**

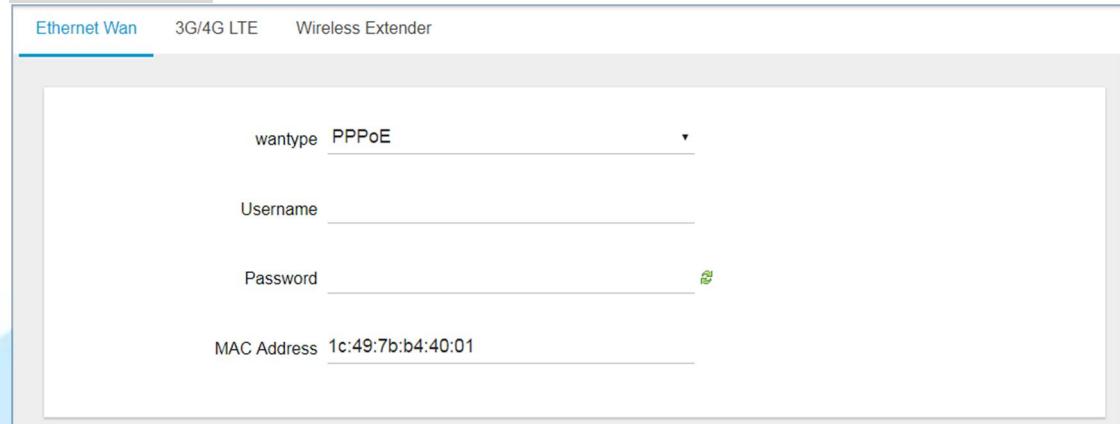
Ethernet Wan	3G/4G LTE	Wireless Extender
<div style="border: 1px solid #ccc; padding: 10px;"> <p>wantype <b>Static IP</b></p> <p>IP Address <b>192.168.31.155</b></p> <p>Subnet Mask <b>255.255.255.0</b></p> <p>Gateway <b>192.168.31.1</b></p> <p>DNS Server <b>8.8.8.8</b> (optional)</p> <p>MAC Address <b>1c:49:7b:b4:40:01</b></p> </div>		

**Figure 3.6.1.1-B DHCP Client**


Ethernet Wan    3G/4G LTE    Wireless Extender

wantype

MAC Address

**Figure 3.6.1.1-C PPPoE**


Ethernet Wan    3G/4G LTE    Wireless Extender

wantype

Username

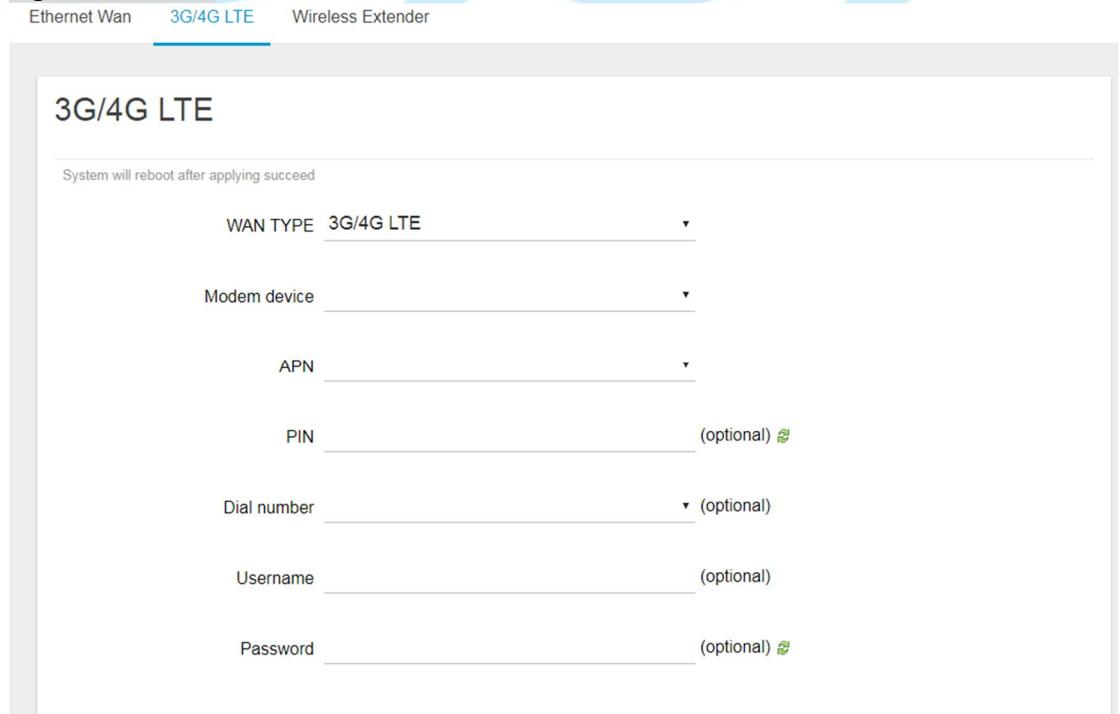
Password

MAC Address

### 3.6.1.2 3G/4G LTE

This page is to setup required information.

**Note: Make sure the SIM card is installed.**

**Figure 3.6.1.2-A 3G/4G LTE**


Ethernet Wan    3G/4G LTE    Wireless Extender

### 3G/4G LTE

System will reboot after applying succeed

WAN TYPE

Modem device

APN

PIN  (optional)

Dial number  (optional)

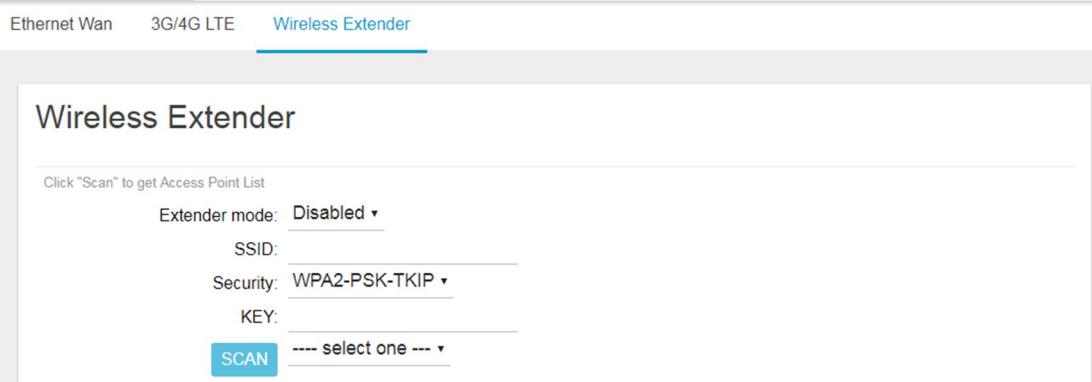
Username  (optional)

Password  (optional)

### 3.6.1.3 Wireless Extender

This page is to setup 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 3.6.1.3-A** Wireless Extender



Ethernet Wan    3G/4G LTE    **Wireless Extender**

---

Wireless Extender

Click "Scan" to get Access Point List

Extender mode: **Disabled** ▾

SSID: \_\_\_\_\_

Security: **WPA2-PSK-TKIP** ▾

KEY: \_\_\_\_\_

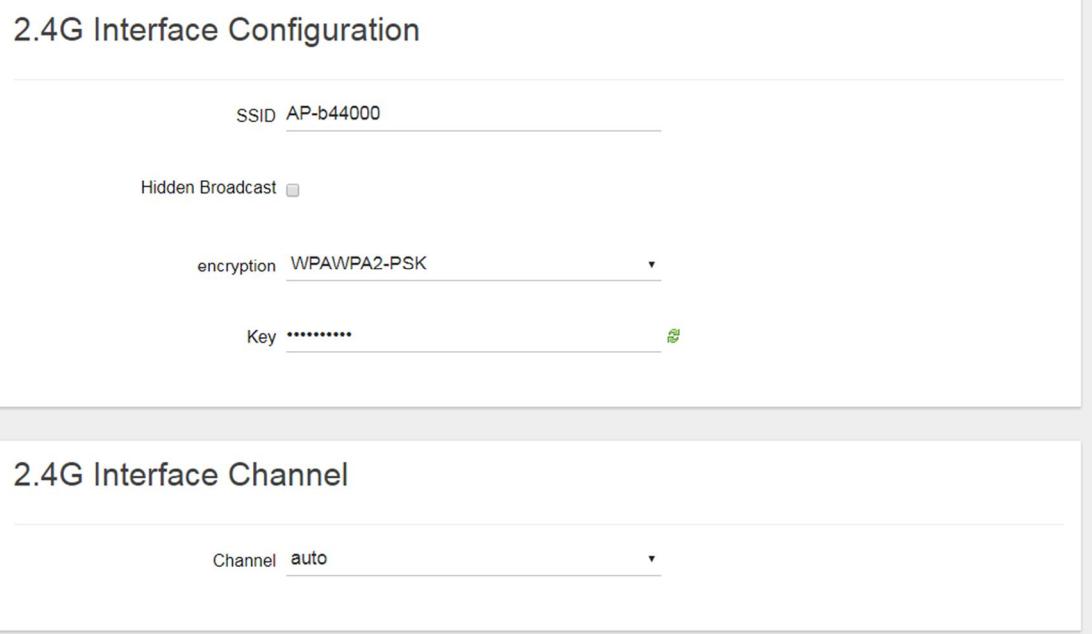
**SCAN**    ----- select one --- ▾

## 3.6.2 Wireless

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

**Figure 3.6.2-A** Wireless Setting

### Wireless Setting



2.4G Interface Configuration

SSID **AP-b44000**

Hidden Broadcast

encryption **WPAWPA2-PSK** ▾

Key ..... 

2.4G Interface Channel

Channel **auto**

### 3.6.3 LAN

LAN IP can be set up in this page.

Figure 3.6.3-A LAN

#### LAN

##### Local Network

IP Address

### 3.6.4 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 3.6.4-A DHCP

#### DHCP

##### DHCP-Server

Enable

First leased address  (1~254)

Number of leased addresses  (1~254)

Lease time (hr)  (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

### 3.6.5 Diagnostic

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

### 3.6.5.1 PING

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

Figure 3.6.5.1-A PING

## Diagnostics

### Network Utilities

openwrt.org

IPv4 ▾ **PING**

openwrt.org

**TRACEROUTE**

openwrt.org

**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
```

### 3.6.5.2 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 3.6.5.2-A TRACEROUTE

## Diagnostics

### Network Utilities

openwrt.org

IPv4 ▾ **PING**

openwrt.org

**TRACEROUTE**

openwrt.org

**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
```

### 3.6.5.3 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 3.6.5.3-A NSLOOKUP

#### Diagnostics

##### Network Utilities

openwrt.org

IPv4 ▾ PING

openwrt.org

TRACEROUTE

openwrt.org

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
```

## 4. LoRaWAN Bridge Mode

### 4.1 Open Admin GUI

Connect to Femto Cell via wifi (**SSID: AP-last 6 digits of mac address**)

Access Femto Cell WebUI via IP address “192.168.55.1”.

Default username is “*admin*” and password is “*admin*”.

Figure 4.1-A

The screenshot shows a web-based login interface titled "Authorization Required". A message at the top says "Please enter your username and password." Below this are two input fields: "Username" and "Password", each preceded by a label and followed by a horizontal line for input. At the bottom right are two buttons: a blue "LOGIN" button and an orange "RESET" button.

## 4.2 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.

### 4.2.1 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.

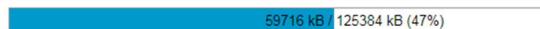
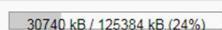
**Figure 4.2.1-A System Status**

#### System

Hostname	Femto-b44000
Model	GIOT InDoor FemtoCell
Firmware Version	Version 3.00.16 Thu Sep 7 16:27:20 CST 2017
Kernel Version	3.10.14
Local Time	Sat Sep 16 16:16:14 2017
Uptime	16h 26m 4s
Load Average	1.40, 0.93, 0.83

**Figure 4.2.1-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 4.2.1-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
<i>Wireless is disabled or not associated</i>

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 4.2.1-D Status**
UNSAVED CHANGES: 2
AUTO REFRESH ON

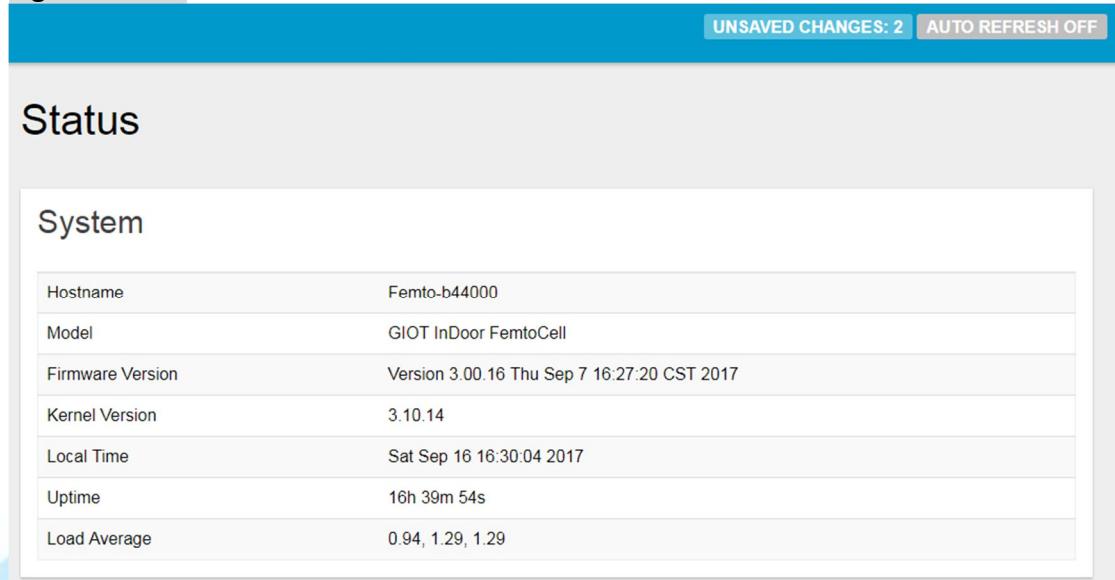
### Status

#### System

Hostname	Femto-b44000
Model	GIOT InDoor FemtoCell
Firmware Version	Version 3.00.16 Thu Sep 7 16:27:20 CST 2017
Kernel Version	3.10.14
Local Time	Sat Sep 16 16:29:23 2017
Uptime	16h 39m 14s
Load Average	0.99, 1.34, 1.30

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

Figure 4.2.1-E Status



The screenshot shows the 'Status' section of the Gemtek interface. At the top, there are buttons for 'UNSAVED CHANGES: 2' and 'AUTO REFRESH OFF'. Below this, the 'System' tab is selected, displaying the following information:

Hostname	Femto-b44000
Model	GIOT InDoor FemtoCell
Firmware Version	Version 3.00.16 Thu Sep 7 16:27:20 CST 2017
Kernel Version	3.10.14
Local Time	Sat Sep 16 16:30:04 2017
Uptime	16h 39m 54s
Load Average	0.94, 1.29, 1.29

## 4.2.2 Routes

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

Figure 4.2.2-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

### 4.2.3 System Log

This category is to view system log information.

**Figure 4.2.3-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=f00003
Fri Sep 15 19:17:10 2017 user.emerg syslog: switch reg write offset=2204, value=f00003
Fri Sep 15 19:17:10 2017 user.emerg syslog: switch reg write offset=2304, value=f00003
Fri Sep 15 19:17:10 2017 user.emerg syslog: switch reg write offset=2404, value=f00003
Fri Sep 15 19:17:10 2017 user.emerg syslog: switch reg write offset=2504, value=f00003
Fri Sep 15 19:17:10 2017 user.emerg syslog: switch reg write offset=2604, value=810000c0
Fri Sep 15 19:17:10 2017 user.emerg syslog: switch reg write offset=2704, value=20f00003
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_ESM_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] led8, 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] led10, 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 option?
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 option?
```

### 4.2.4 Kernel log

This category is to view kernel log information.

**Figure 4.2.4-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 frequency set to 580 MHz
[ 0.000000] PCIE: bypass PCIe DLL.
[ 0.000000] PCIE: Elastic buffer control: Addr:0x68 -> 0xB4
[ 0.000000] disable all power about PCIe
[ 0.000000] CPU0 revision is: 00019650 (MIPS 24Kc)
[ 0.000000] Software DMA cache coherency
[ 0.000000] Determined physical RAM map:
[ 0.000000]   memory: 00000000 @ 00000000 (usable)
[ 0.000000]   Initrd not found or empty - disabling initrd
[ 0.000000] Zone ranges:
[ 0.000000]   Normal [mem 0x00000000-0x07fffffff]
[ 0.000000] Movable zone start for each node
[ 0.000000] Early memory node ranges
[ 0.000000]   node 0: [mem 0x00000000-0x07fffffff]
[ 0.000000]   0 nodes 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] ppu-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_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
```

## 4.2.5 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 Femto Cell item.

**Figure 4.2.5-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%	<b>HANG UP</b>	<b>TERMINATE</b>	<b>KILL</b>
2	root	[kthreadd]	0%	0%	<b>HANG UP</b>	<b>TERMINATE</b>	<b>KILL</b>
3	root	[ksoftirqd/0]	0%	0%	<b>HANG UP</b>	<b>TERMINATE</b>	<b>KILL</b>
4	root	[kworker/0:0]	0%	0%	<b>HANG UP</b>	<b>TERMINATE</b>	<b>KILL</b>
5	root	[kworker/0:0H]	0%	0%	<b>HANG UP</b>	<b>TERMINATE</b>	<b>KILL</b>
6	root	[kworker/u2:0]	0%	0%	<b>HANG UP</b>	<b>TERMINATE</b>	<b>KILL</b>
7	root	[watchdog/0]	0%	0%	<b>HANG UP</b>	<b>TERMINATE</b>	<b>KILL</b>

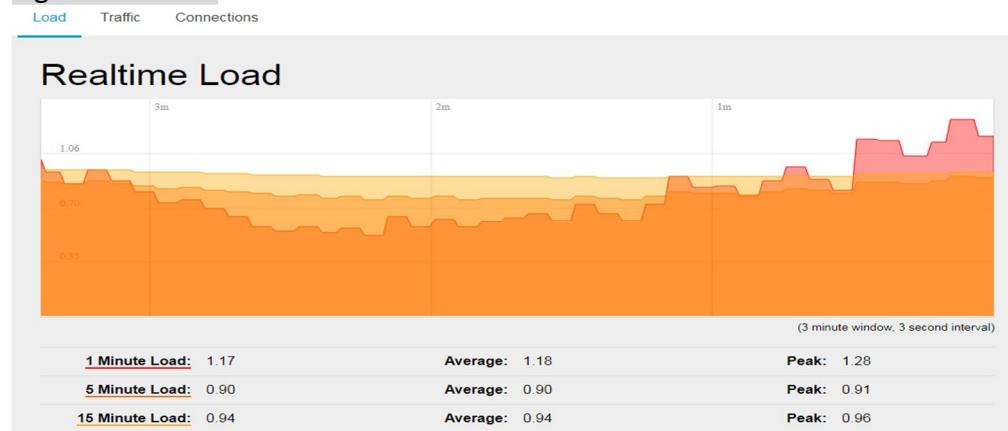
## 4.2.6 Realtime Graphs

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

### 4.2.6.1 Realtime Load

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

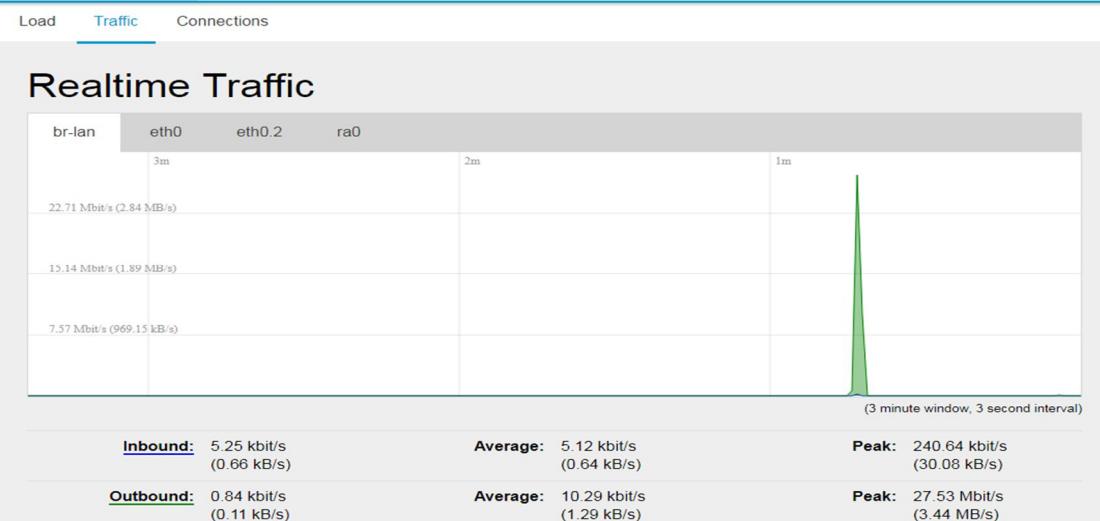
**Figure 4.2.6.1-A Realtime Load**



#### 4.2.6.2 Realtime Traffic

To view the network traffic of each interface.

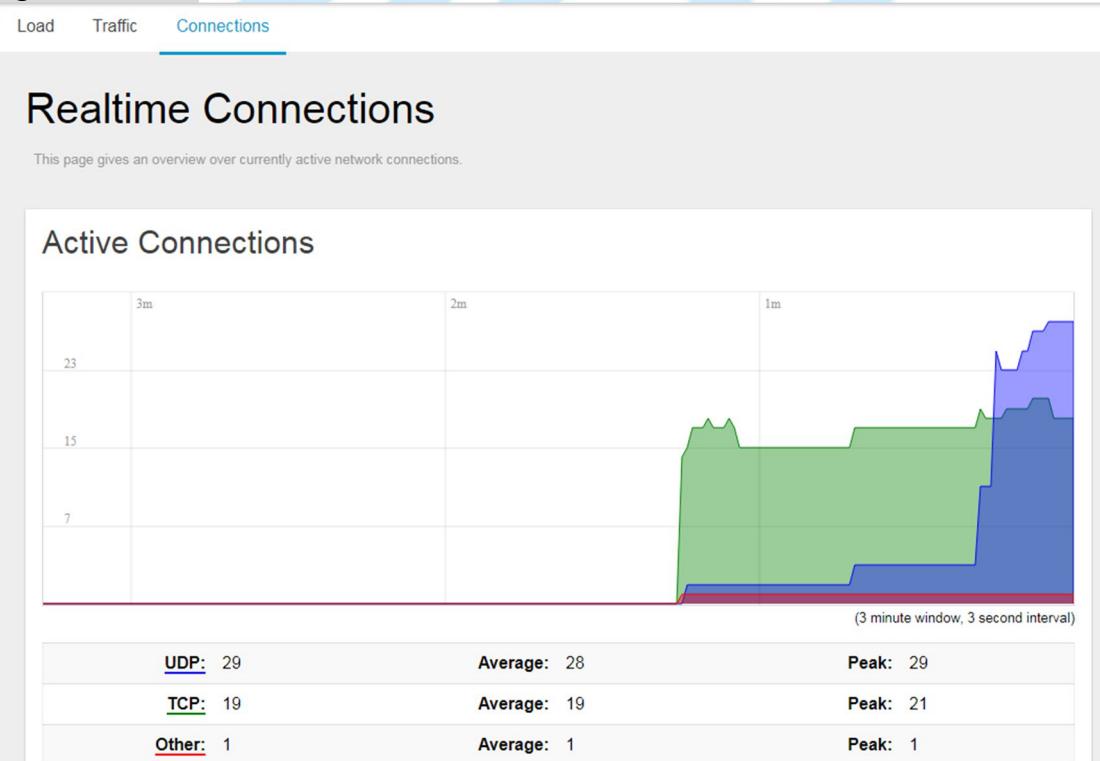
Figure 4.2.6.2-A Realtime Traffic



#### 4.2.6.3 Realtime Connections

To view the currently active network connections.

Figure 4.2.6.3-A Realtime Connections



## 4.3 GloT

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

### 4.3.1 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 4.3.1-A GloT Info

#### GloT Status

##### GloT Info

Provisioning Code	80001840 (Provision)
Area Code	80001840
Gateway Type	Femto
LoRa Module	ON
Gateway ID	1c497baaade6
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	0x00 0x01 0x04 0x05 0x0a 0x0d 0x14
GloT Connect	Online
Spreading Factor	uplink: 7 8 9 10 11 12, downlink: 12
GPS	Latitude:(Not Config), Longitude:(Not Config)

### 4.3.2 Provision

GloT provision code can be set up on this page.

Figure 4.3.2-A Provision Code

The screenshot shows a configuration page titled "Provision Code". It contains a note: "System will reboot if activate Provision Code succeed". Below this is a text input field labeled "Code" containing the value "80001840". At the bottom right is a blue "APPLY" button.

### 4.3.3 Configuration

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

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.

User can select Repeater-AP and Repeater on LoRa Configurations.

Figure 4.3.3-A GloT Management

The screenshot shows a configuration page titled "GloT Management". It has three main sections: "LoRa Management", "GPS Location", and "LoRa Configurations".

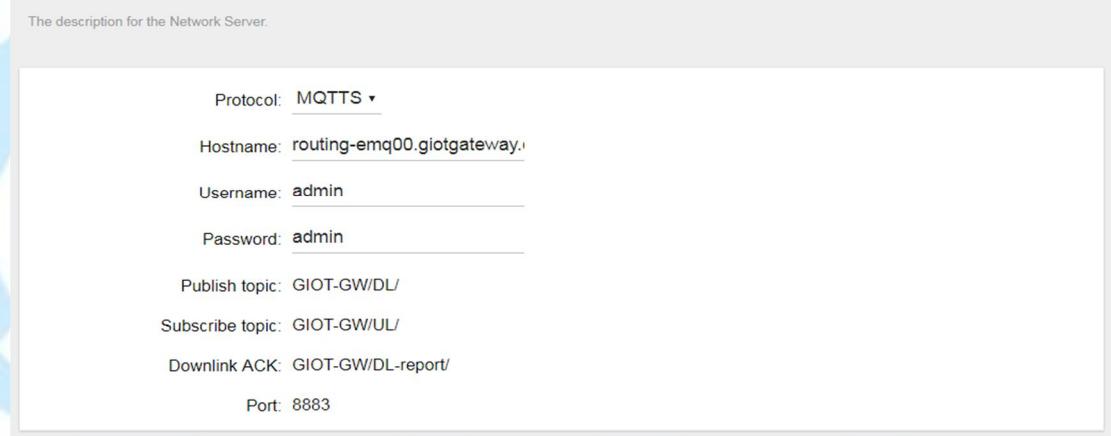
- LoRa Management:** Contains a "LoRa Restart" section with a "PERFORM RESTART" button.
- GPS Location:** Contains fields for "Latitude" and "Longitude", both currently showing "Not Config". It includes "SAVE LOCATION" and "SELECT ON MAP" buttons.
- LoRa Configurations:** Contains a dropdown menu for "Repeater Mode" set to "Normal-AP" and an "APPLY" button.

#### 4.3.4 Network Server

The user can configure Network Server settings on this page.  
 The 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.  
**Hostname:** The IP/domain name address of where the cloud server is located.  
**Username:** The username for the cloud server.  
**Password:** The password for the cloud server.  
**Publish topic:** The publishing topic of the broker set for downlink. (read only)  
**Subscribe topic:** The subscription topic of the broker set for uplink. (read only)  
**Downlink ACK:** The subscription topic of the broker set for downlink ack. (read only)  
**Port:** Displays the port number that is being used. (read only)

Figure 4.3.4-A Network Server  
**Network Server**



#### 4.3.5 Network Server Log

Displays the log that is connected to the broker.

Figure 4.3.5-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.

2017-9-8 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.
```

### 4.3.6 Channel Scan

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

**Figure 4.3.6-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

### 4.3.7 Channel Setting

To set up LoRa channel frequency.

**Figure 4.3.7-A Channel Setting**

#### Channel Setting

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

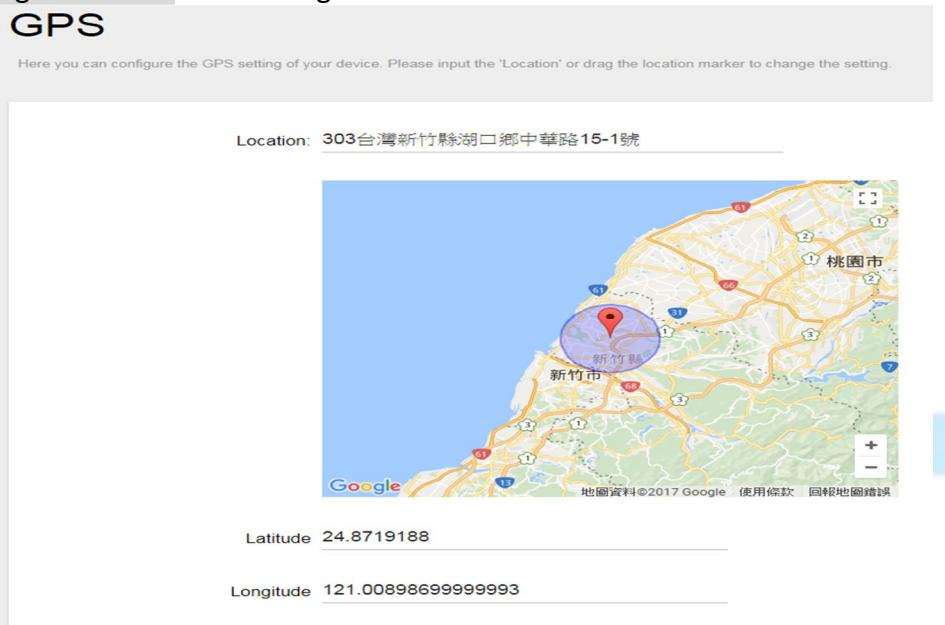
#### Center Frequency

Gateway Module	1c497bb44c54
Center Frequency of Radio 0	915500000 Hz ▾
	Ch0: 915.2MHz Ch1: 915.4MHz Ch2: 915.6MHz Ch3: 915.8MHz
Center Frequency of Radio 1	916300000 Hz ▾
	Ch4: 916MHz Ch5: 916.2MHz Ch6: 916.4MHz Ch7: 916.6MHz

### 4.3.8 GPS MAP

To setup 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 4.3.8-A GPS Setting



## 4.4 System

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

### 4.4.1 System

Hostname and Timezone can be customized in the system properties. Click “Sync with Browser” button to adjust the local time. Place a checkmark next to “Enable NTP Client” to synchronize the time with NTP server. If you choose to use another NTP server, please place a checkmark next to “Provide NTP server” and fill out the “NTP server candidates” text field.

Figure 4.4.1-A System Properties

## System

Here you can configure the basic aspects of your device like its hostname or the timezone.

### System Properties

Local Time Sat Sep 16 19:53:12 2017 **SYNC WITH BROWSER**

Hostname Femto-b44000

Timezone Asia/Taipei ▾

Figure 4.4.1-B Time Synchronization

### Time Synchronization

Enable NTP client

Provide NTP server

NTP server candidates  
0.openwrt.pool.ntp.org   
1.openwrt.pool.ntp.org   
2.openwrt.pool.ntp.org   
3.openwrt.pool.ntp.org

## 4.4.2 Administration

Femto login password can be configured in this page.

Different languages can be applied according to usage (supports English and Simplified Chinese).

Figure 4.4.2-A Router Password

## Router Password

Changes the administrator password for accessing the device

Password  

Confirmation  

Figure 4.4.2-B Language and Style

Language and Style

Language: English

APPLY

### 4.4.3 Backup and Restore

Femto configuration can be restored and reset to default on this page.  
Click “*GENERATE ARCHIVE*” button to download the configuration file with the current gateway settings.

Note: LoRa configuration cannot be restored and reset to default on this page.

Figure 4.4.3-A Backup/Restore

### Flash operations

#### Backup / Restore

Click “Generate archive” to download a tar archive of the current configuration files. To reset the firmware to its initial state, click “Perform reset” (only possible with squashfs images).

Download backup: **GENERATE ARCHIVE**

Reset to defaults: **PERFORM RESET**

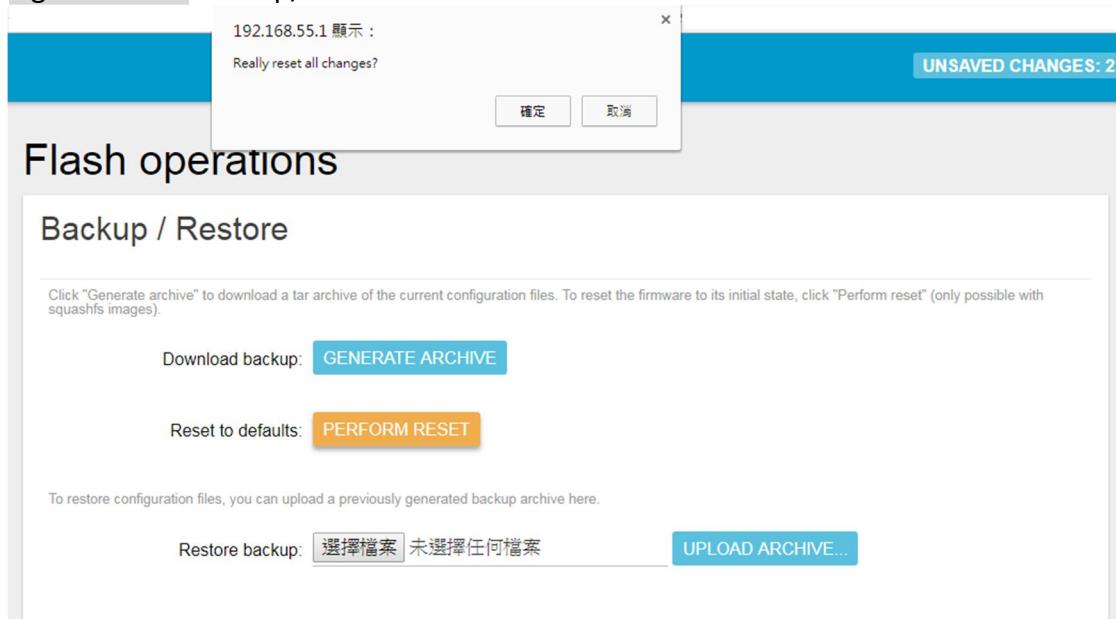
To restore configuration files, you can upload a previously generated backup archive here.

Restore backup:  未選擇任何檔案

**UPLOAD ARCHIVE...**

Click “*PERFORM RESET*” button to reset the firmware to its initial state.  
Please note that the LoRa provision settings will NOT be reset by this action.

Figure 4.4.3-B Backup/Restore



Choose the most recent backup file and click “*UPLOAD ARCHIVE*” to restore the configuration file.

#### 4.4.4 Reboot

Click “*PERFORM REBOOT*” to reboot Femto.

Figure 4.4.4-A Reboot

#### Reboot

Reboots the operating system of your device

**PERFORM REBOOT**

### 4.5 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.

#### 4.5.1 WAN

The purpose of this category is to view current WAN settings. This category is further divided into three sectors: Ethernet Wan, 3G/4G LTE and Wireless Extender. These individual options are lodged and labeled above the main content panel.

**Figure 4.5.1-A WAN**

Ethernet Wan    3G/4G LTE    Wireless Extender

**WAN**

Wan Type	DHCP
<b>WAN</b>  eth0.2	<b>Uptime:</b> 21h 31m 14s <b>MAC-Address:</b> 1c:49:7b:b4:40:01 <b>RX:</b> 1.95 GB (1662680 Pkts.) <b>TX:</b> 62.61 MB (599285 Pkts.) <b>IPv4:</b> 192.168.31.167/24

#### 4.5.1.1 Ethernet WAN

This page is to setup 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 4.5.1.1-A Static IP**

Ethernet Wan    3G/4G LTE    Wireless Extender

wantype **Static IP**

IP Address **192.168.31.155**

Subnet Mask **255.255.255.0**

Gateway **192.168.31.1**

DNS Server **8.8.8.8**  
(optional)

MAC Address **1c:49:7b:b4:40:01**

**Figure 4.5.1.1-B DHCP Client**

Ethernet Wan    3G/4G LTE    Wireless Extender

wantype **DHCP Client**

MAC Address **1c:49:7b:b4:40:01**

Figure 4.5.1.1-C PPPoE

Ethernet Wan    3G/4G LTE    Wireless Extender

wantype PPPoE

Username \_\_\_\_\_

Password \_\_\_\_\_

MAC Address 1c:49:7b:b4:40:01

#### 4.5.1.2 3G/4G LTE

This page is to setup required information.

**Note: Make sure the SIM card is installed.**

Figure 4.5.1.2-A 3G/4G LTE

Ethernet Wan    3G/4G LTE    Wireless Extender



#### 3G/4G LTE

System will reboot after applying succeed

WAN TYPE 3G/4G LTE

Modem device \_\_\_\_\_

APN \_\_\_\_\_

PIN \_\_\_\_\_

(optional)

Dial number \_\_\_\_\_

(optional)

Username \_\_\_\_\_

(optional)

Password \_\_\_\_\_

(optional)

#### 4.5.1.3 Wireless Extender

This page is to setup 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 4.5.1.3-A Wireless Extender

Ethernet Wan    3G/4G LTE    **Wireless Extender**

Wireless Extender

Click "Scan" to get Access Point List

Extender mode: **Disabled** ▾

SSID: \_\_\_\_\_

Security: **WPA2-PSK-TKIP** ▾

KEY: \_\_\_\_\_

**SCAN**    **---- select one ---**

#### 4.5.2 Wireless

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

Figure 4.5.2-A Wireless Setting

Wireless Setting

2.4G Interface Configuration

SSID **AP-b44000**

Hidden Broadcast

encryption **WPAWPA2-PSK** ▾

Key .....

2.4G Interface Channel

Channel **auto**

### 4.5.3 LAN

LAN IP can be setup in this page.

Figure 4.5.3-A LAN

#### LAN

##### Local Network

IP Address

### 4.5.4 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 4.5.4-A DHCP

#### DHCP

##### DHCP-Server

Enable

First leased address  (1~254)

Number of leased addresses  (1~254)

Lease time (hr)  (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

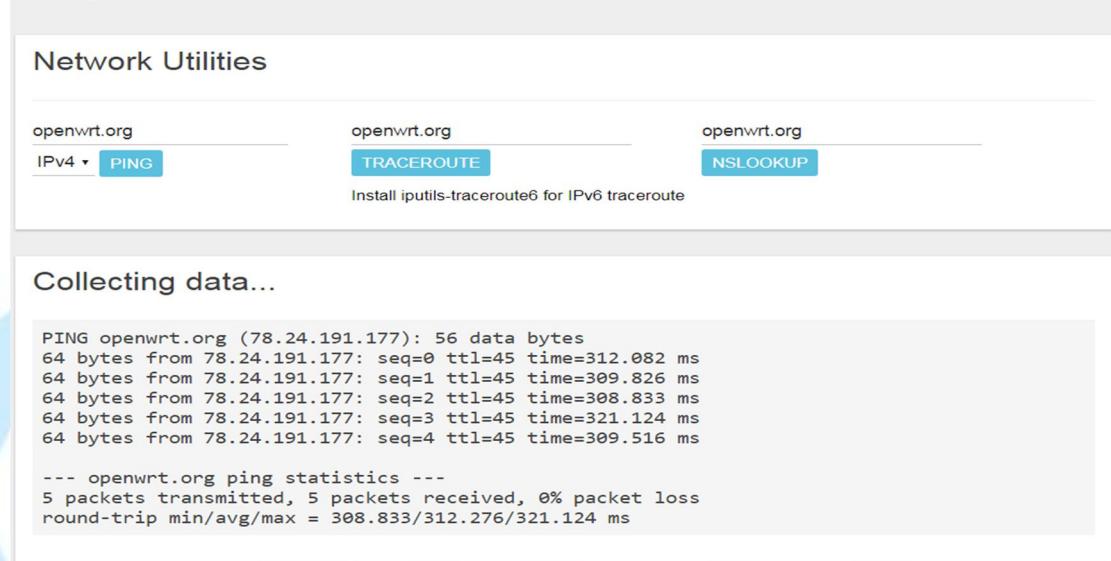
## 4.5.5 Diagnostic

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

### 4.5.5.1 PING

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

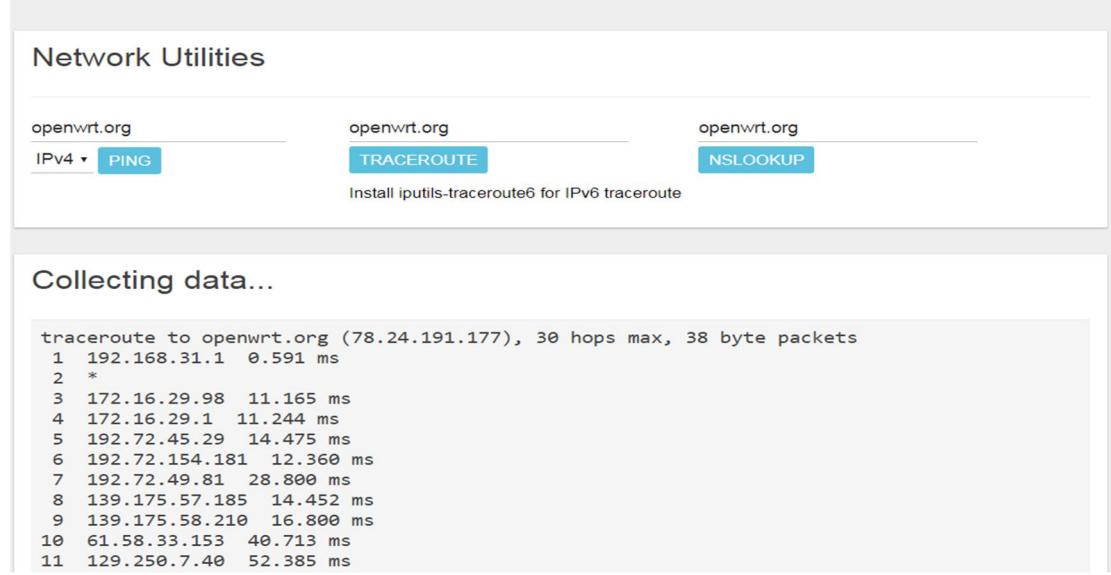
Figure 4.5.5.1-A PING  
Diagnostics



### 4.5.5.2 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 4.5.5.2-A TRACEROUTE  
Diagnostics



#### 4.5.5.3 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 4.5.5.3-A NSLOOKUP

#### Diagnostics

##### Network Utilities

openwrt.org

IPv4 ▾ PING

openwrt.org

TRACEROUTE

openwrt.org

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

## 5. GloT (CN) Mode

### 5.1 Open Admin GUI

Access Femto WebUI via WAN IP address assigned by dhcp.  
Default username is "admin" and password is "admin".

Figure 5.1-A

The screenshot shows a web-based login interface. At the top center, the text "Authorization Required" is displayed in a large, bold, dark font. Below it, a smaller line of text reads "Please enter your username and password." There are two input fields: one for "Username" and one for "Password", both represented by horizontal lines. At the bottom right of the form, there are two buttons: a blue "LOGIN" button and an orange "RESET" button.

## 5.2 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.

### 5.2.1 Overview

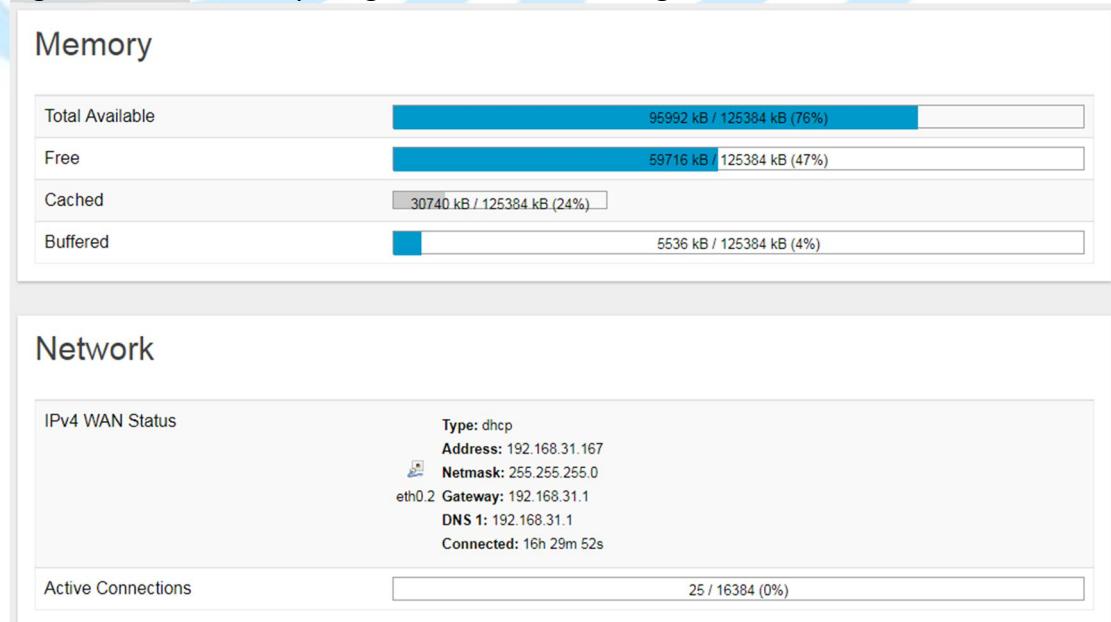
The purpose of this category is to view the following contents: system status, memory usage and network settings.

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

**Figure 5.2.1-A System Status**

System	
Hostname	Femto-b44000
Model	GIOT InDoor FemtoCell
Firmware Version	Version 3.00.16 Thu Sep 7 16:27:20 CST 2017
Kernel Version	3.10.14
Local Time	Sat Sep 16 16:16:14 2017
Uptime	16h 26m 4s
Load Average	1.40, 0.93, 0.83

**Figure 5.2.1-B Memory Usage and Network Settings**



**Figure 5.2.1-C DHCP Leases**

### DHCP Leases

Hostname	IPv4-Address	MAC-Address	Leasetime remaining
There are no active leases.			

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 5.2.1-D Status**

UNSAVED CHANGES: 2
**AUTO REFRESH ON**

### Status

#### System

Hostname	Femto-b44000
Model	GIOT InDoor FemtoCell
Firmware Version	Version 3.00.16 Thu Sep 7 16:27:20 CST 2017
Kernel Version	3.10.14
Local Time	Sat Sep 16 16:29:23 2017
Uptime	16h 39m 14s
Load Average	0.99, 1.34, 1.30

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

**Figure 5.2.1-E Status**

UNSAVED CHANGES: 2
**AUTO REFRESH OFF**

### Status

#### System

Hostname	Femto-b44000
Model	GIOT InDoor FemtoCell
Firmware Version	Version 3.00.16 Thu Sep 7 16:27:20 CST 2017
Kernel Version	3.10.14
Local Time	Sat Sep 16 16:30:04 2017
Uptime	16h 39m 54s
Load Average	0.94, 1.29, 1.29

## 5.2.2 Routes

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

Figure 5.2.2-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

## 5.2.3 System Log

This category is to view system log information.

Figure 5.2.3-A System Log

### System Log

```
Fri Sep 15 19:17:10 2017 user.emerg syslog: switch reg write offset=2094, 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=2610, 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=2044, 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_ESU_WT_MAC_ATC is 0x7ff0002
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_OF
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 option
```

## 5.2.4 Kernel log

This category is to view kernel log information.

Figure 5.2.4-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 frequency set to 580 MHz
[ 0.000000] PCIE: bypass PCIe DLL.
[ 0.000000] PCIE: 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 0x00000000-0x07fffffff]
[ 0.000000] Movable zone start for each node
[ 0.000000] Early memory node ranges
[ 0.000000]   node  0: [mem 0x00000000-0x07fffffff]
[ 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_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
```

## 5.2.5 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 Femto Cell item.

Figure 5.2.5-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%	<span>HANG UP</span>	<span>TERMINATE</span>	<span>KILL</span>
2	root	[kthreadd]	0%	0%	<span>HANG UP</span>	<span>TERMINATE</span>	<span>KILL</span>
3	root	[ksoftirqd/0]	0%	0%	<span>HANG UP</span>	<span>TERMINATE</span>	<span>KILL</span>
4	root	[kworker/0:0]	0%	0%	<span>HANG UP</span>	<span>TERMINATE</span>	<span>KILL</span>
5	root	[kworker/0:0H]	0%	0%	<span>HANG UP</span>	<span>TERMINATE</span>	<span>KILL</span>
6	root	[kworker/u2:0]	0%	0%	<span>HANG UP</span>	<span>TERMINATE</span>	<span>KILL</span>
7	root	[watchdog/0]	0%	0%	<span>HANG UP</span>	<span>TERMINATE</span>	<span>KILL</span>

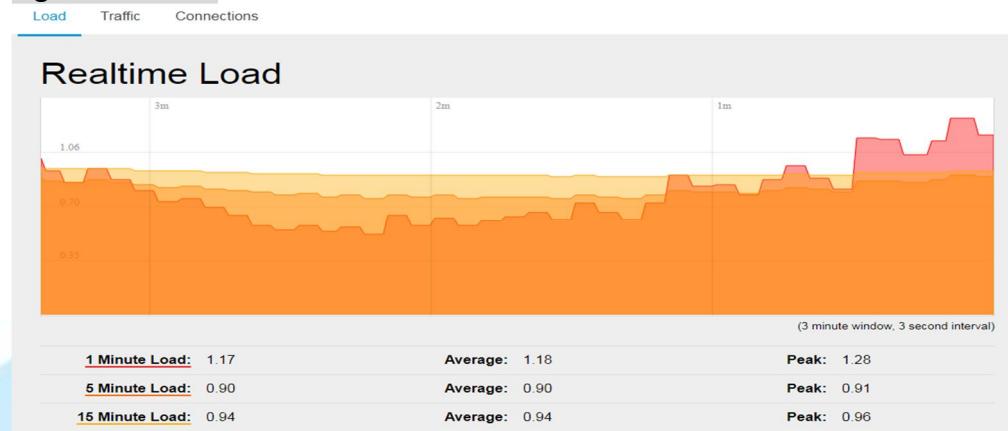
## 5.2.6 Realtime Graphs

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

### 5.2.6.1 Realtime Load

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

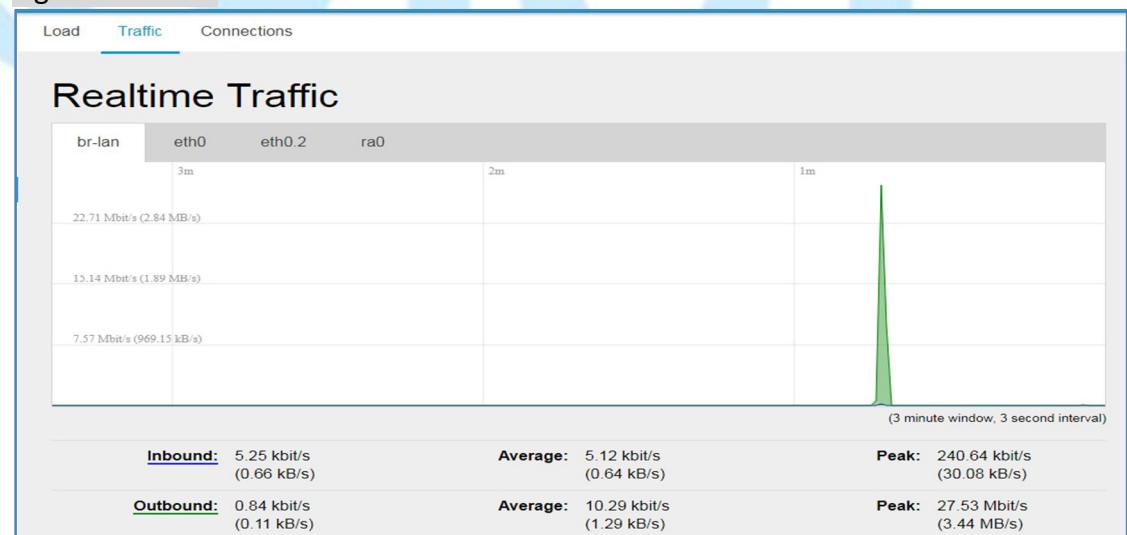
Figure 5.2.6.1-A Realtime Load



### 5.2.6.2 Realtime Traffic

To view the network traffic of each interface.

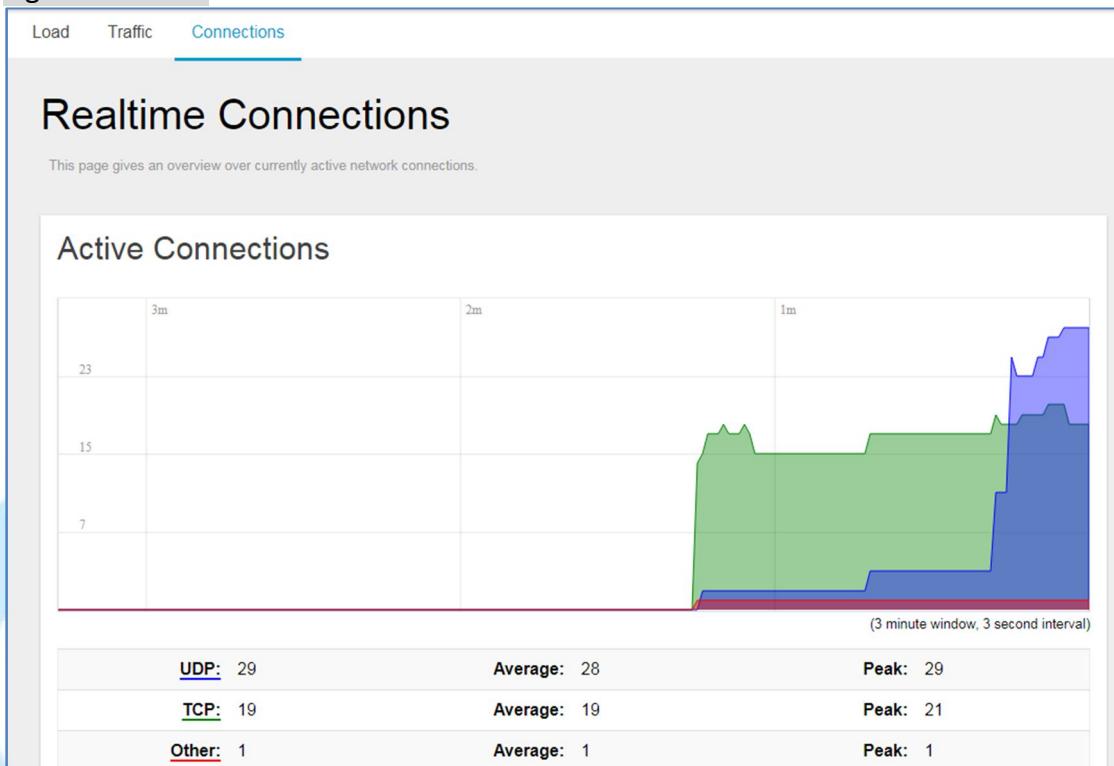
Figure 5.2.6.2-A Realtime Traffic



### 5.2.6.3 Realtime Connections

To view the currently active network connections.

Figure 5.2.6.3-A Realtime Connections



## 5.3 GloT

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

### 5.3.1 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 5.3.1-A GloT Info

#### GloT Status

GloT Info	
Provisioning Code	80001840 (Provision)
Area Code	80001840
Gateway Type	Femto
LoRa Module	ON
Gateway ID	1c497baaade6
Radio 0	Ch0: ON 902.3MHz
	Ch1: ON 902.5MHz
	Ch2: ON 902.7MHz
	Ch3: ON 902.9MHz
	Ch4: ON 903.1MHz
Radio 1	Ch5: ON 903.3MHz
	Ch6: ON 903.5MHz
	Ch7: ON 903.7MHz
GloT key Status	0x00 0x01 0x04 0x05 0x0a 0x0d 0x14
GloT Connect	Online
Spreading Factor	uplink: 7 8 9 10 11 12, downlink: 12
GPS	Latitude:(Not Config), Longitude:(Not Config)

### 5.3.2 Provision

GloT provision code can be setup on this page.

Figure 5.3.2-A Provision Code

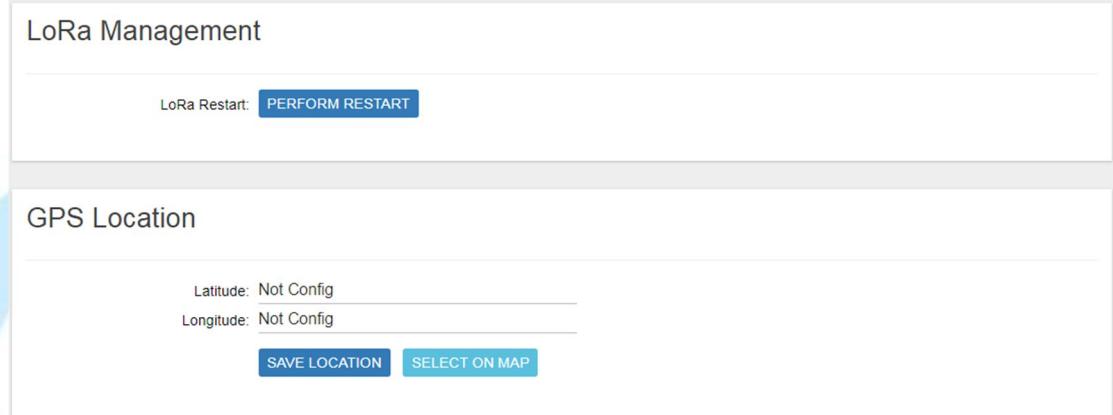
Provision Code
<small>System will reboot if activate Provision Code succeed</small> <input type="text" value="Code 80001840"/>
<input type="button" value="APPLY"/>

### 5.3.3 Configuration

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

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 5.3.3-A** GloT Management  
**GloT Management**



### 5.3.4 Network Server

The user can configure Network Server settings on this page.

The 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.

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

**Username:** The username for the cloud server.

**Password:** The password for the cloud server.

**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)

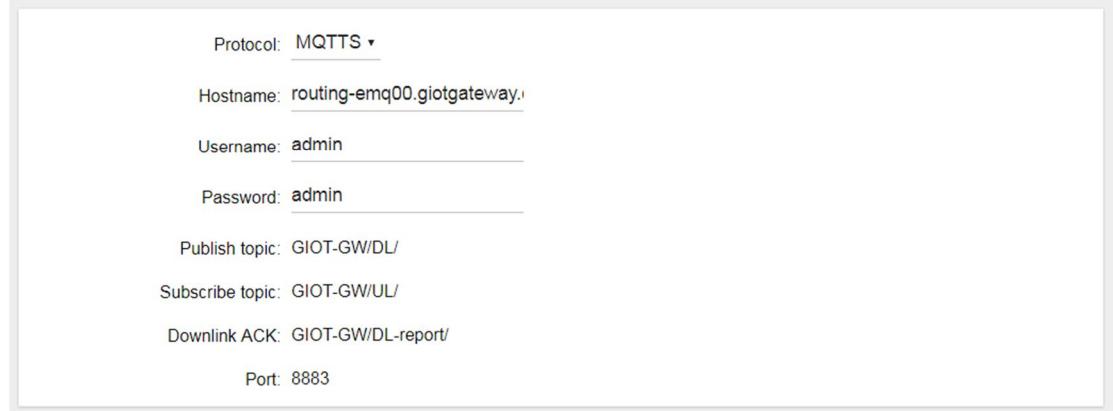
**Downlink ACK:** The subscription topic of the broker established for downlink ack. (read only)

**Port:** Displays the port number that is being used. (read only)

### Figure 5.3.4-A Network Server

## Network Server

The description for the Network Server.



Protocol: MQTTS

Hostname: routing-emq00.giotgateway.com

Username: admin

Password: admin

Publish topic: GIOT-GW/DL/

Subscribe topic: GIOT-GW/UL/

Downlink ACK: GIOT-GW/DL-report/

Port: 8883

### 5.3.5 Network Server Log

Displays the log that is connected to the broker.

### Figure 5.3.5-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.
```

### 5.3.6 Channel Scan

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

Figure 5.3.6-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

## 5.3.7 Channel Setting

To setup the center frequency for LoRa on this page.

Figure 5.3.7-A Channel Setting

### Channel Setting

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

#### Center Frequency

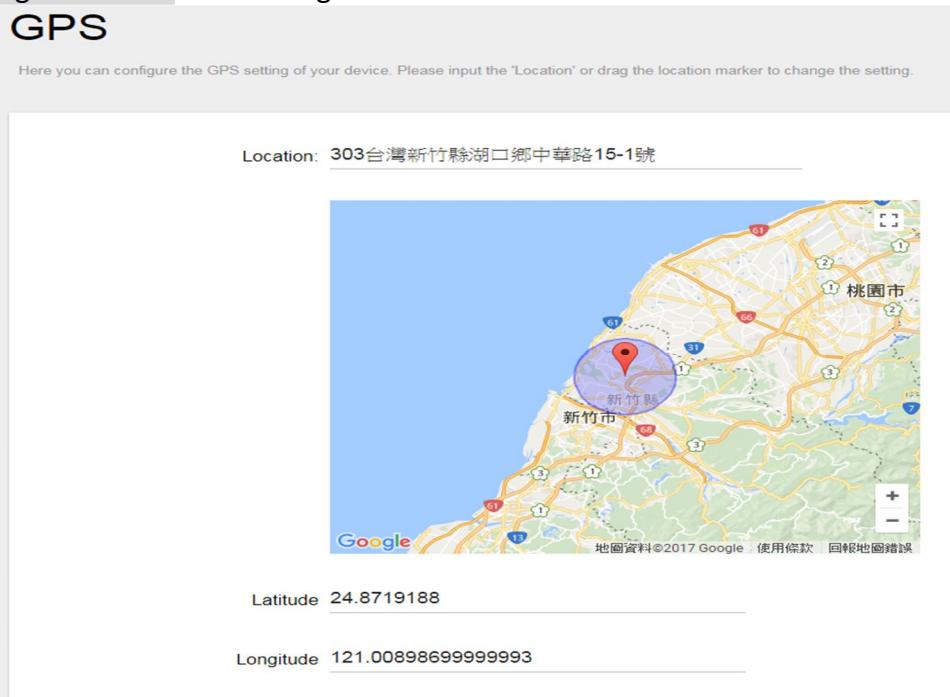
Gateway Module	1c497bb71fdb
Center Frequency of Radio 0	486000000 Hz
	Ch0: 485.7MHz Ch1: 485.9MHz Ch2: 486.1MHz Ch3: 486.3MHz
Center Frequency of Radio 1	486800000 Hz
	Ch4: 486.5MHz Ch5: 486.7MHz Ch6: 486.9MHz Ch7: 487.1MHz

APPLY

### 5.3.8 GPS MAP

To setup 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 5.3.8-A GPS Setting



## 5.4 System

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

### 5.4.1 System

Hostname and Timezone can be customized in the system properties. Click “Sync with Browser” button to adjust the local time. Place a checkmark next to “Enable NTP Client” to synchronize the time with NTP server. If you choose to use another NTP server, please place a checkmark next to “Provide NTP server” and fill out the “NTP server candidates” text field.

Figure 5.4.1-A System Properties

## System

Here you can configure the basic aspects of your device like its hostname or the timezone.

### System Properties

Local Time Sat Sep 16 19:53:12 2017 [SYNC WITH BROWSER](#)

Hostname Femto-b44000

Timezone Asia/Taipei ▾

Figure 5.4.1-B Time Synchronization

### Time Synchronization

Enable NTP client

Provide NTP server

NTP server candidates  
0.openwrt.pool.ntp.org [x](#)  
1.openwrt.pool.ntp.org [x](#)  
2.openwrt.pool.ntp.org [x](#)  
3.openwrt.pool.ntp.org [+](#)

## 5.4.2 Administration

Femto login password can be configured in this page.

Different languages can be applied according to usage (supports English and Simplified Chinese).

Figure 5.4.2-A Router Password

## Router Password

Changes the administrator password for accessing the device

Password  

Confirmation  

Figure 5.4.2-B Language and Style

Language and Style

Language: English

APPLY

### 5.4.3 Backup and Restore

Femto configuration can be restored and reset to default on this page.  
Click “*GENERATE ARCHIVE*” button to download the configuration file with the current gateway settings.

**Note:** LoRa configuration cannot be restored and reset to default on this page.

Figure 5.4.3-A Backup/Restore

### Flash operations

#### Backup / Restore

Click “Generate archive” to download a tar archive of the current configuration files. To reset the firmware to its initial state, click “Perform reset” (only possible with squashfs images).

Download backup: **GENERATE ARCHIVE**

Reset to defaults: **PERFORM RESET**

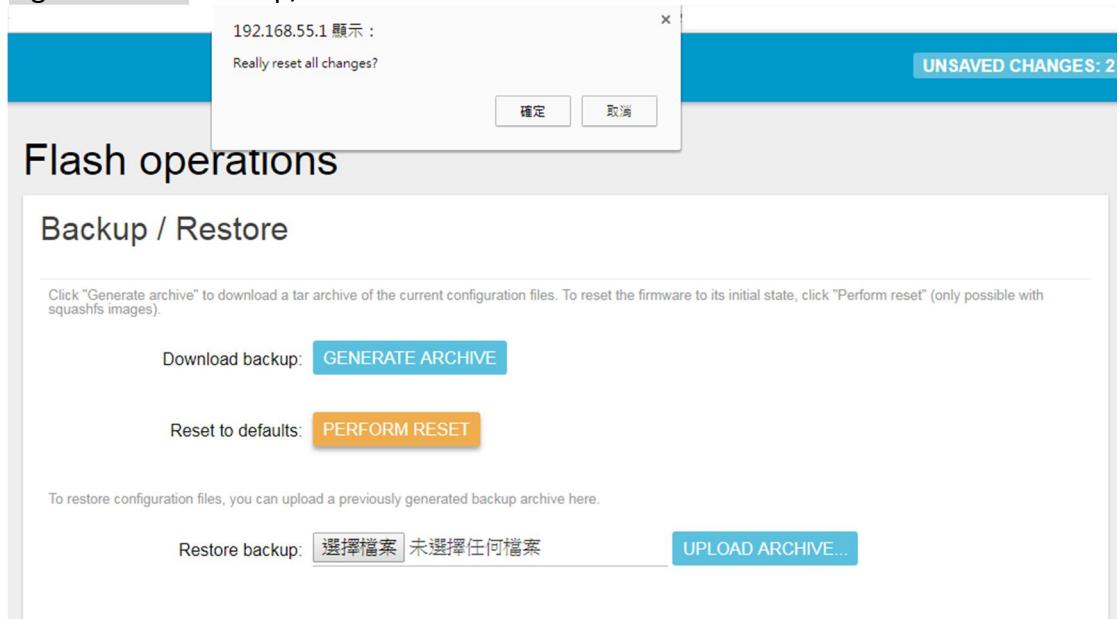
To restore configuration files, you can upload a previously generated backup archive here.

Restore backup:  未選擇任何檔案

**UPLOAD ARCHIVE...**

Click “*PERFORM RESET*” button to reset the firmware to its initial state.  
Please note that the LoRa provision settings will NOT be reset by this action.

Figure 5.4.3-B Backup/Restore



Choose the most recent backup file and click “*UPLOAD ARCHIVE*” to restore the configuration file.

#### 5.4.4 System Firmware

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.

Figure 5.4.4-A System Firmware

#### System Firmware

##### Firmware Information

Click “Check New Firmware” to check new firmware from OTA server.

Primary Firmware: 3.00.16

Secondary Firmware: 3.00.16

Version of OTA Server: 3.00.04

[CHECK NEW FIRMWARE](#)

## 5.4.5 Reboot

Click “*PERFORM REBOOT*” to reboot Femto.

Figure 5.4.5-A Reboot

### Reboot

Reboots the operating system of your device

**PERFORM REBOOT**

## 5.5 Network

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

### 5.5.1 WAN

The purpose of this category is to view current WAN settings.

This category is further divided into three sectors: Ethernet Wan and 3G/4G LTE. These individual options are lodged and labeled above the main content panel.

Figure 5.5.1-A WAN

Ethernet Wan      3G/4G LTE

#### WAN

##### Wan Type

##### DHCP

##### WAN

**Uptime:** 1d 22h 30m 19s  
**MAC-Address:** 1C:49:7B:B4:40:01  
**RX:** 40.54 MB (325852 Pkts.)  
**TX:** 61.75 MB (142581 Pkts.)  
**IPv4:** 192.168.88.167/24

### 5.5.1.1 Ethernet WAN

This page is to setup 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 5.5.1.1-A Static IP

Ethernet Wan    3G/4G LTE

wantype

IP Address

Subnet Mask

Gateway

DNS Server   
(optional)

MAC Address

**APPLY** **RESET**

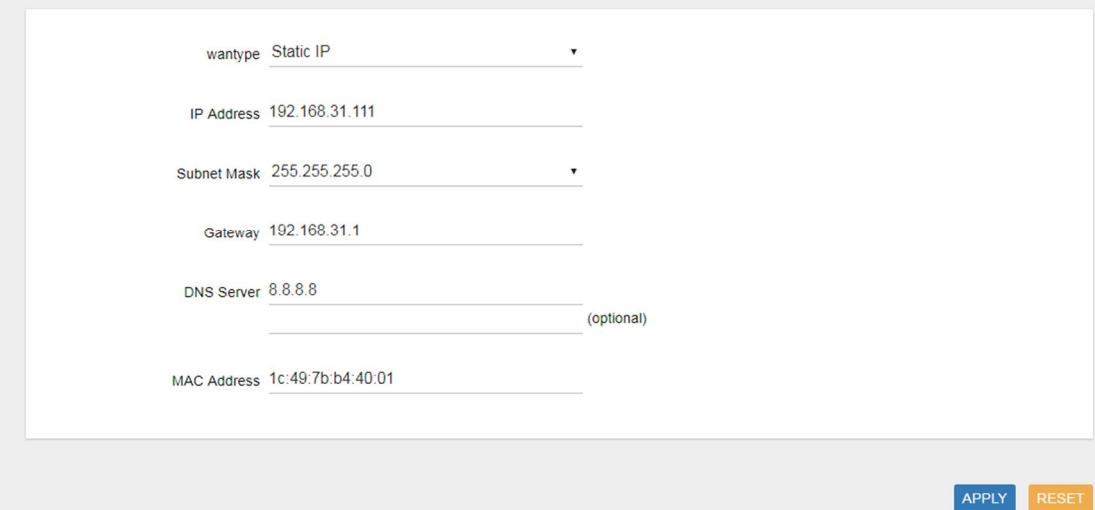


Figure 5.5.1.1-B DHCP Client

Ethernet Wan    3G/4G LTE

wantype

MAC Address

**APPLY** **RESET**

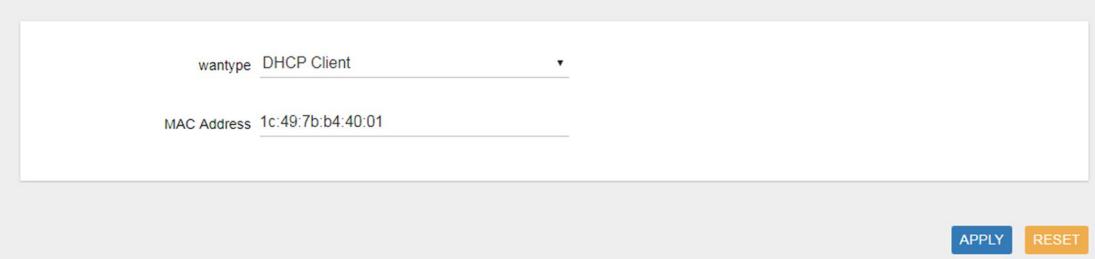


Figure 5.5.1.1-C PPPoE

Ethernet Wan    3G/4G LTE

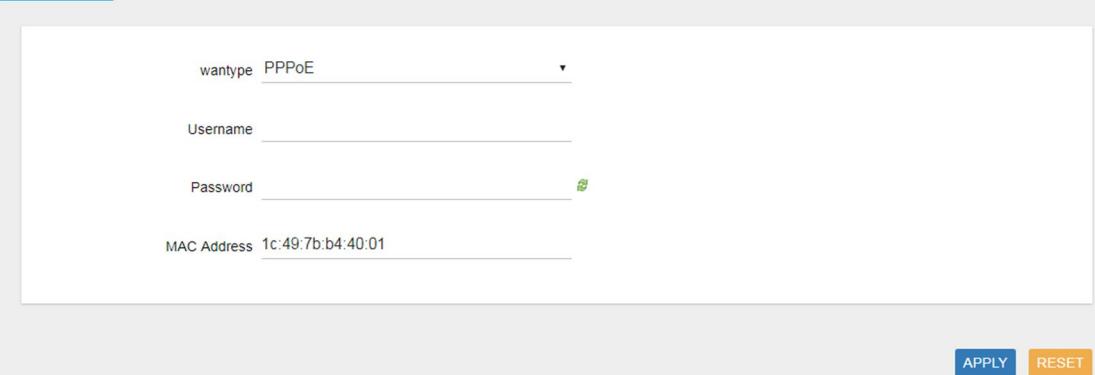
wantype

Username

Password

MAC Address

**APPLY** **RESET**



### 5.5.1.2 3G/4G LTE

This page is to set up required information.

**Note: Make sure the SIM card is installed.**

**Figure 5.5.1.2-A 3G/4G LTE**

Ethernet Wan    **3G/4G LTE**

3G/4G LTE

System will reboot after applying succeed

WAN TYPE    3G/4G LTE

Modem device

APN

PIN    (optional)

Dial number    (optional)

Username    (optional)

Password    (optional)

### 5.5.2 LAN

LAN IP can be set up in this page.

**Figure 5.5.2-A LAN**

### LAN

#### Local Network

IP Address 192.168.55.1

### 5.5.3 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 5.5.3-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	IPv4-Address	MAC-Address	Leasetime remaining
LENOVO-PC	192.168.55.196	a4:db:30:a2:ae:51	07h 28min 02s

## 5.5.4 Diagnostic

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

### 5.5.4.1 PING

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

**Figure 5.5.4.1-A PING**

## Diagnostics

### Network Utilities

<input type="text" value="openwrt.org"/>	<input type="text" value="openwrt.org"/>	<input type="text" value="openwrt.org"/>
<input type="button" value="IPv4 ▾"/>	<input type="button" value="TRACEROUTE"/>	<input type="button" value="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
```

### 5.5.4.2 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 5.5.4.2-A TRACEROUTE  
Diagnostics

#### Network Utilities

openwrt.org

IPv4 ▾ PING

openwrt.org

TRACEROUTE

openwrt.org

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
```

### 5.5.4.3 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 5.5.4.3-A NSLOOKUP  
Diagnostics

#### Network Utilities

openwrt.org

IPv4 ▾ PING

openwrt.org

TRACEROUTE

openwrt.org

NSLOOKUP

Install iputils-traceroute6 for IPv6 traceroute

#### Collecting data...

```
Server:      127.0.0.1
Address 1: 127.0.0.1 localhost

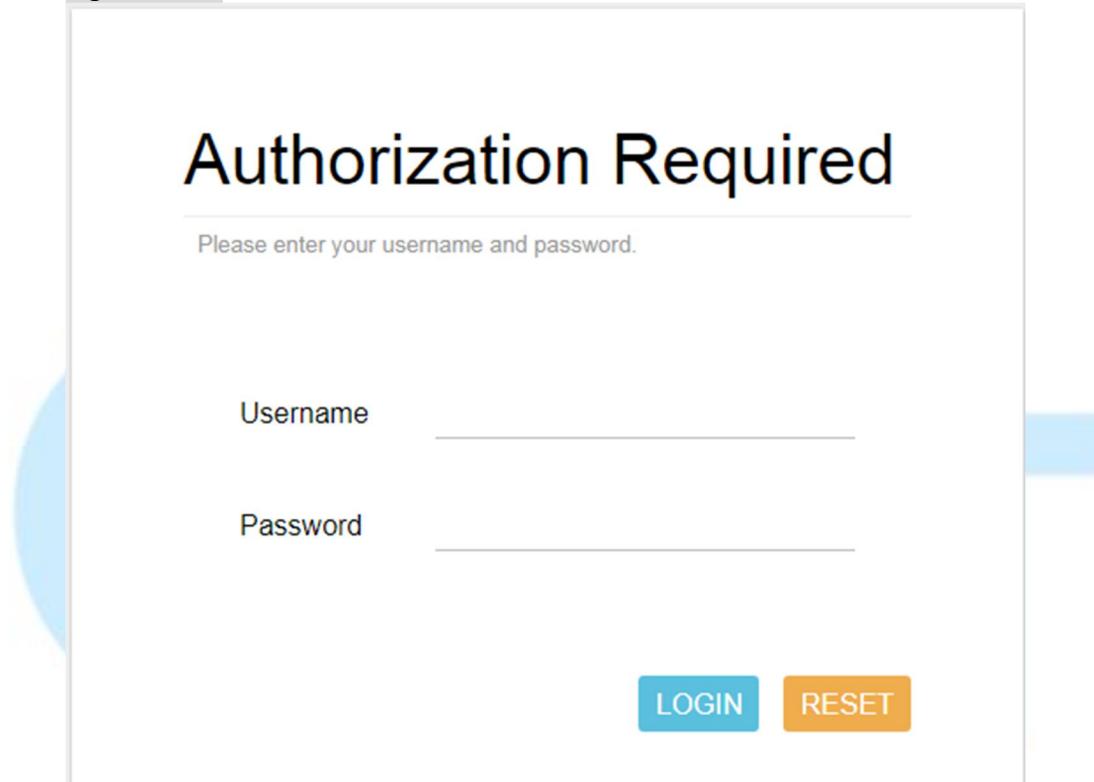
Name:        openwrt.org
Address 1: 78.24.191.177 openwrt.org
```

## 6. Packet Forward mode

### 6.1 Open Admin GUI

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

Figure 6.1-A



### 6.2 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.

#### 6.2.1 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 6.2.1-A System Status**

### System

Hostname	Femto-b44000
Model	Giot InDoor FemtoCell
Firmware Version	Version 3.00.16 Thu Sep 7 16:27:20 CST 2017
Kernel Version	3.10.14
Local Time	Sat Sep 16 16:16:14 2017
Uptime	16h 26m 4s
Load Average	1.40, 0.93, 0.83

**Figure 6.2.1-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 6.2.1-C DHCP Leases and Wireless Status**

### DHCP Leases

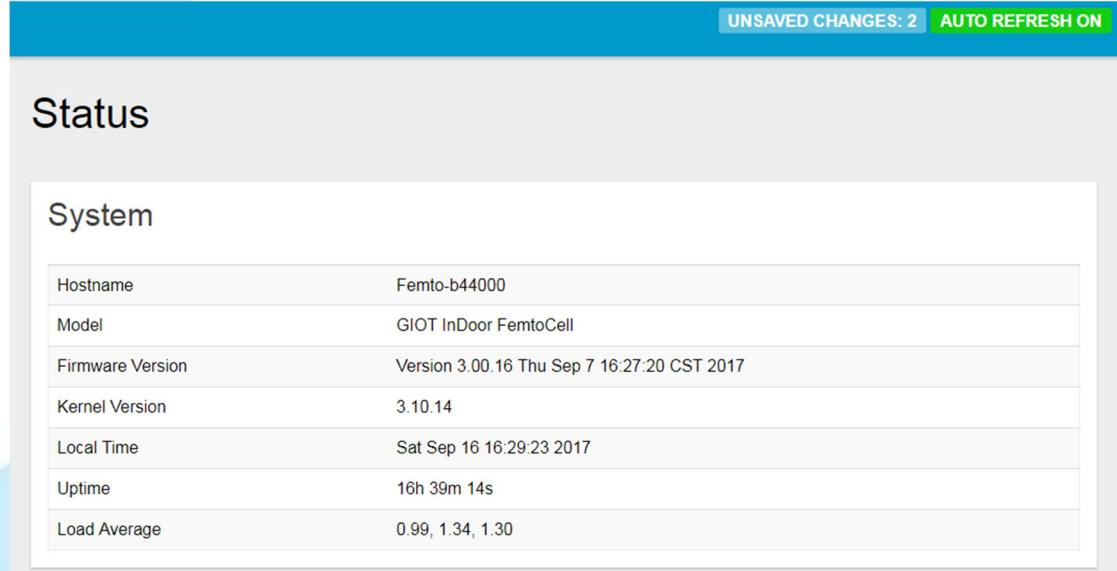
Hostname	IPv4-Address	MAC-Address	Leasetime remaining
LENOVO-PC	192.168.55.196	a4:db:30:a2:ae:51	7h 29m 22s

### 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 6.2.1-D Status

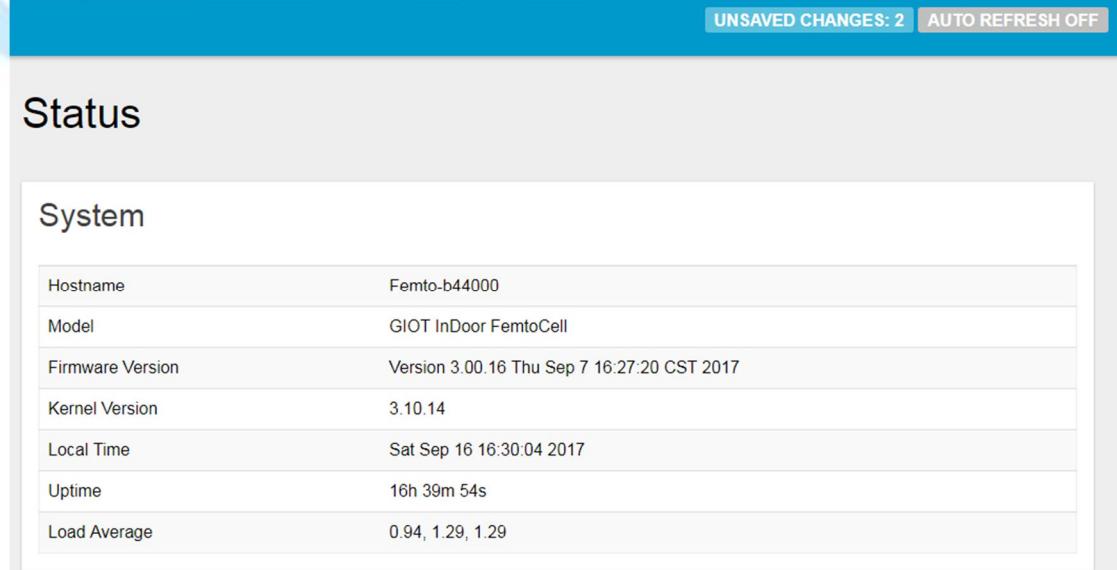


The screenshot shows a web-based status interface for a GIOT InDoor FemtoCell. At the top, there is a blue header bar with the text "UNSAVED CHANGES: 2" and a green button labeled "AUTO REFRESH ON". Below the header, the word "Status" is displayed in large black letters. Underneath, a section titled "System" contains a table with the following data:

Hostname	Femto-b44000
Model	GIOT InDoor FemtoCell
Firmware Version	Version 3.00.16 Thu Sep 7 16:27:20 CST 2017
Kernel Version	3.10.14
Local Time	Sat Sep 16 16:29:23 2017
Uptime	16h 39m 14s
Load Average	0.99, 1.34, 1.30

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

Figure 6.2.1-E Status



The screenshot shows the same web-based status interface as Figure 6.2.1-D, but with the "AUTO REFRESH ON" button now highlighted in orange, indicating it has been disabled. The rest of the interface is identical to Figure 6.2.1-D, including the blue header bar with "UNSAVED CHANGES: 2", the "Status" title, and the "System" table with the same data.

## 6.2.2 Routes

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

Figure 6.2.2-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

## 6.2.3 System Log

This category is to view system log information.

Figure 6.2.3-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=f00003
Fri Sep 15 19:17:10 2017 user.emerg syslog: switch reg write offset=2504, value=f00003
Fri Sep 15 19:17:10 2017 user.emerg syslog: switch reg write offset=2600, 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_ESW_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 option
```

## 6.2.4 Kernel log

This category is to view kernel log information.

Figure 6.2.4-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 frequency set to 580 MHz
[ 0.000000] PCIE: bypass PCIe DLL.
[ 0.000000] PCIE: 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: 00000000 @ 00000000 (usable)
[ 0.000000] Initrd not found or empty - disabling initrd
[ 0.000000] Zone ranges:
[ 0.000000]   Normal [mem 0x00000000-0x07fffffff]
[ 0.000000] Movable zone start for each node
[ 0.000000] Early memory node ranges
[ 0.000000]   node 0: [mem 0x00000000-0x07fffffff]
[ 0.000000] On node 0 totalpages: 32768
[ 0.000000] free_area_init_node: node 0, pgdte 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_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
```

## 6.2.5 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 Femto Cell item.

Figure 6.2.5-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%	<button>HANG UP</button>	<button>TERMINATE</button>	<button>KILL</button>
2	root	[kthreadd]	0%	0%	<button>HANG UP</button>	<button>TERMINATE</button>	<button>KILL</button>
3	root	[ksoftirqd/0]	0%	0%	<button>HANG UP</button>	<button>TERMINATE</button>	<button>KILL</button>
4	root	[kworker/0:0]	0%	0%	<button>HANG UP</button>	<button>TERMINATE</button>	<button>KILL</button>
5	root	[kworker/0:0H]	0%	0%	<button>HANG UP</button>	<button>TERMINATE</button>	<button>KILL</button>
6	root	[kworker/u2:0]	0%	0%	<button>HANG UP</button>	<button>TERMINATE</button>	<button>KILL</button>
7	root	[watchdog/0]	0%	0%	<button>HANG UP</button>	<button>TERMINATE</button>	<button>KILL</button>

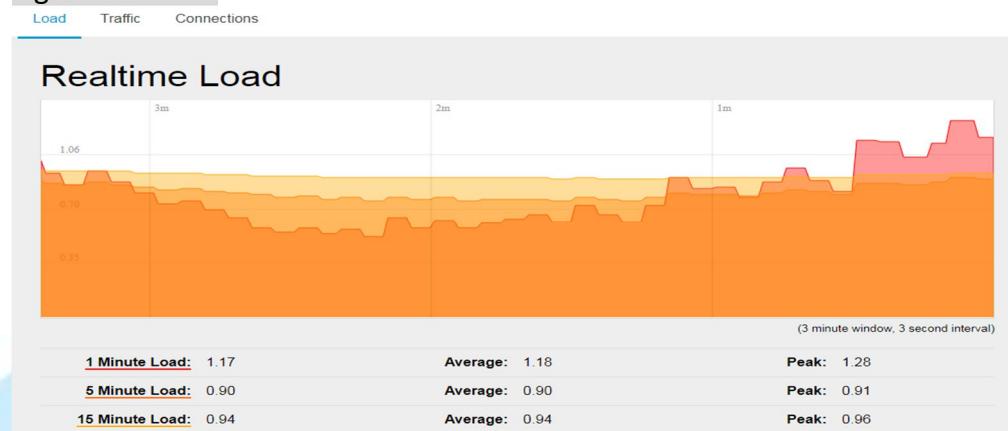
## 6.2.6      Realtime Graphs

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

### 6.2.6.1    Realtime Load

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

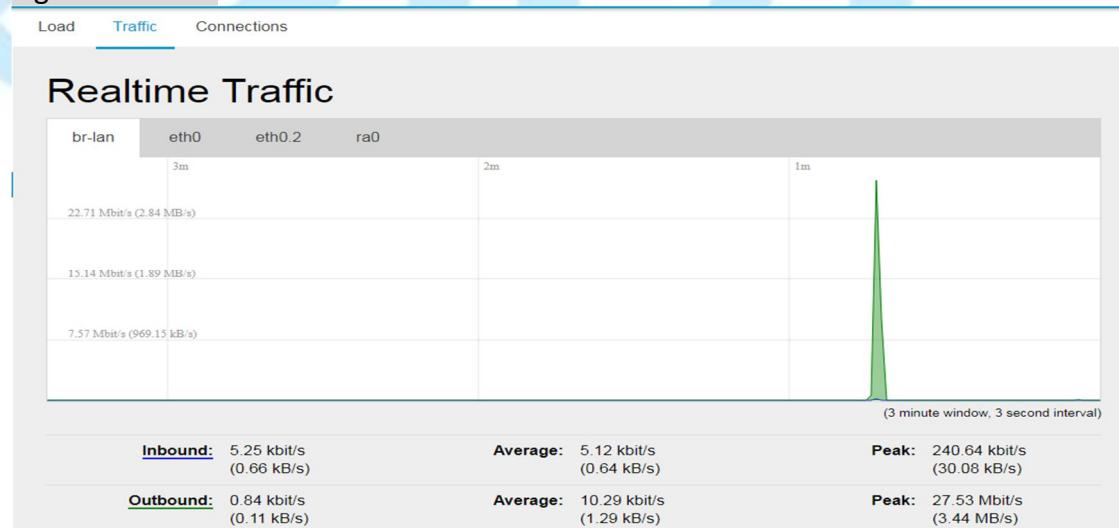
**Figure 6.2.6.1-A** Realtime Load



### 6.2.6.2    Realtime Traffic

To view the network traffic of each interface.

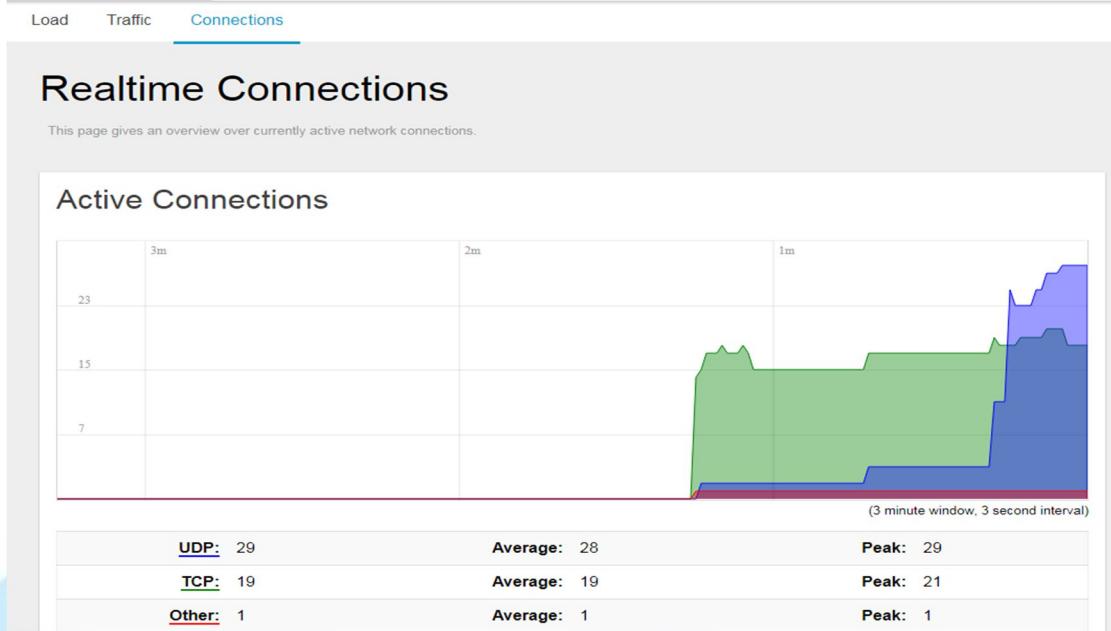
**Figure 6.2.6.2-A** Realtime Traffic



### 6.2.6.3 Realtime Connections

To view the currently active network connections.

**Figure 6.2.6.3-A Realtime Connections**



## 6.3 System

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

### 6.3.1 System

Hostname and Timezone can be customized in the system properties.

Click “Sync with Browser” button to adjust the local time.

Place a checkmark next to “Enable NTP Client” to synchronize the time with NTP server.

If you choose to use another NTP server, please place a checkmark next to “Provide NTP server” and fill out the “NTP server candidates” text field.

**Figure 6.3.1-A System Properties**

### System

Here you can configure the basic aspects of your device like its hostname or the timezone.

#### System Properties

Local Time Sat Sep 16 19:53:12 2017 **SYNC WITH BROWSER**

Hostname Femto-b44000

Timezone Asia/Taipei

Figure 6.3.1-B Time Synchronization

### Time Synchronization

Enable NTP client

Provide NTP server

NTP server candidates 0.openwrt.pool.ntp.org

1.openwrt.pool.ntp.org

2.openwrt.pool.ntp.org

3.openwrt.pool.ntp.org



### 6.3.2 Administration

Femto login password can be configured in this page.

Different languages can be applied according to usage (supports English and Simplified Chinese).

Figure 6.3.2-A Router Password

### Router Password

Changes the administrator password for accessing the device

Password \_\_\_\_\_

Confirmation \_\_\_\_\_

Figure 6.3.2-B Language and Style

### Language and Style

Language: English

**APPLY**

### 6.3.3 Backup and Restore

Femto configuration can be restored and reset to default on this page.

Click “*GENERATE ARCHIVE*” button to download the configuration file with the current gateway settings.

Note: LoRa configuration cannot be restored and reset to default on this page.

### Figure 6.3.3-A Backup/Restore Flash operations

#### Backup / Restore

Click "Generate archive" to download a tar archive of the current configuration files. To reset the firmware to its initial state, click "Perform reset" (only possible with squashfs images).

Download backup: **GENERATE ARCHIVE**

Reset to defaults: **PERFORM RESET**

To restore configuration files, you can upload a previously generated backup archive here.

Restore backup: **選擇檔案** 未選擇任何檔案

**UPLOAD ARCHIVE...**

Click "*PERFORM RESET*" button to reset the firmware to its initial state.  
Please note that the LoRa provision settings will NOT be reset by this action.

### Figure 6.3.3-B Backup/Restore

#### Flash operations

#### Backup / Restore

Click "Generate archive" to download a tar archive of the current configuration files. To reset the firmware to its initial state, click "Perform reset" (only possible with squashfs images).

Download backup: **GENERATE ARCHIVE**

Reset to defaults: **PERFORM RESET**

To restore configuration files, you can upload a previously generated backup archive here.

Restore backup: **選擇檔案** 未選擇任何檔案

**UPLOAD ARCHIVE...**

Choose the most recent backup file and click "*UPLOAD ARCHIVE*" to restore the configuration file.

### 6.3.4 System Firmware

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.

Figure 6.3.4-A System Firmware

#### System Firmware

##### Firmware Information

Click “Check New Firmware” to check new firmware from OTA server.

Primary Firmware: 3.00.16

Secondary Firmware: 3.00.16

Version of OTA Server: 3.00.04

**CHECK NEW FIRMWARE**

### 6.3.5 Reboot

Click “*PERFORM REBOOT*” to reboot Femto.

Figure 6.3.5-A Reboot

#### Reboot

Reboots the operating system of your device

**PERFORM REBOOT**

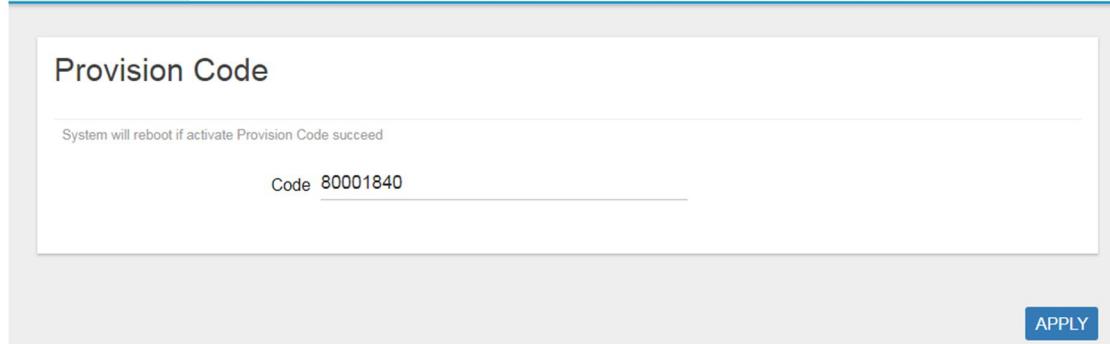
## 6.4 GloT

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

### 6.4.1 Provision

GloT provision code can be setup on this page.

Figure 6.4.1-A Provision Code



**Provision Code**

System will reboot if activate Provision Code succeed

Code

**APPLY**

### 6.4.2 Channel Scan

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

Figure 6.4.2-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

### 6.4.3 GPS MAP

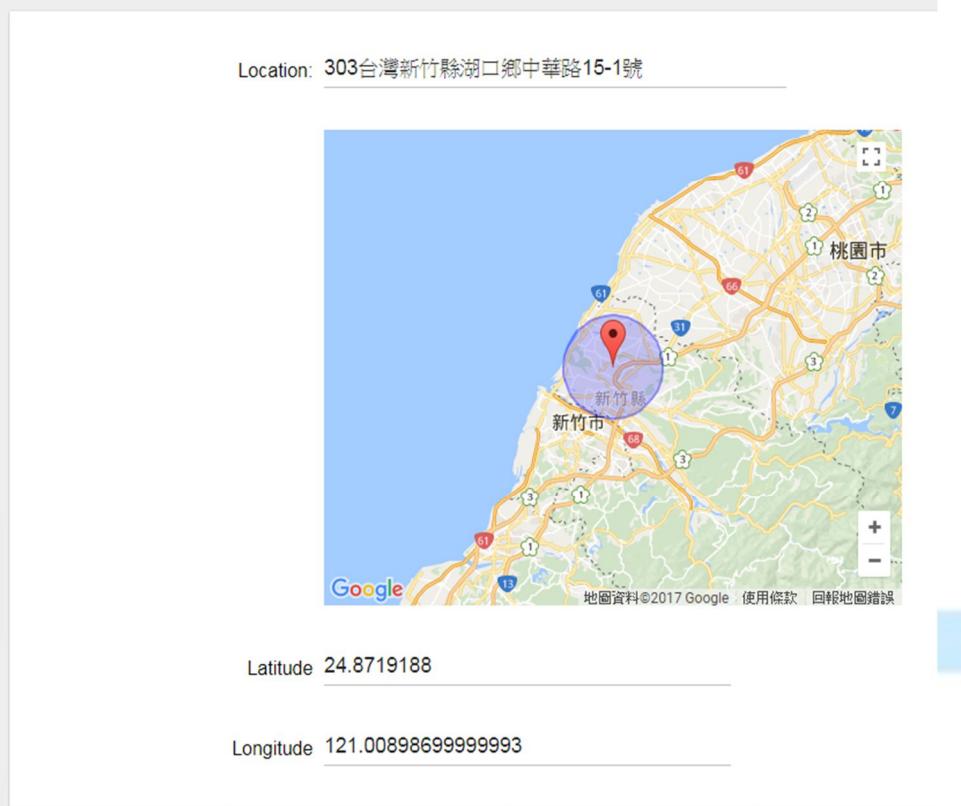
To setup the GPS location, simply input your address location in the “Location” text field above the map or pinpoint your location on the map by dragging the red marker  to the correct spot.

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

Figure 6.4.3-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.



## 6.5 Packet Forward

The purpose of this category is to view current Packet Forward settings. This category is further divided into three sectors: GateWay Info, Radio 0, and Radio 1 and TBL Settings (**supports Japan and Korea only**). Introduction and input procedures for each category are described in the following paragraphs.

### 6.5.1 GateWay Info

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

Figure 6.5.1-A GateWay Info

### Gateway Info

Gateway ID:	1c497bb44c54
Network ID:	000000 (6 HEX digits)
Server Address:	127.0.0.1
Server Uplink Port:	1680 (1~65535)
Server Downlink Port:	1680 (1~65535)
Keep Alive Interval:	10 (seconds)
Statistics display Interval:	30 (seconds)
Push Timeout:	100 (milliseconds)

### 6.5.2 Radio 0

This page is to setup the radio 0 configuration of LoRa, which include:  
 Status, Central Frequency, RSSI Offset, TX Status, Channel Status and  
 Channel offset.

Figure 6.5.2-A Radio 0

### Radio 0

Status:	Enable		
Central Frequency:	902600000 (Hz)		
RSSI Offset:	-166 (dBm)		
TX Status:	Enable ▾		
<b>Channel</b>			
Channel 0 Status:	Enable ▾	CenterFreqOffset:	-300000 (-500000~+500000)
Channel 1 Status:	Enable ▾	CenterFreqOffset:	-100000 (-500000~+500000)
Channel 2 Status:	Enable ▾	CenterFreqOffset:	100000 (-500000~+500000)
Channel 3 Status:	Enable ▾	CenterFreqOffset:	300000 (-500000~+500000)

### 6.5.3 Radio 1

This page is to setup the radio 1 configuration of LoRa, which include:  
 Status, Central Frequency, RSSI Offset, TX Status, Channel Status and  
 Channel offset.

**Figure 6.5.3-A Radio 1**

**Radio 1**

Status:	Enable ▾		
Central Frequency:	903400000 (Hz)		
RSSI Offset:	-166 (dBm)		
TX Status:	Disable		
Channel			
Channel 4 Status:	Enable ▾	CenterFreqOffset:	-300000 (-500000~+500000)
Channel 5 Status:	Enable ▾	CenterFreqOffset:	-100000 (-500000~+500000)
Channel 6 Status:	Enable ▾	CenterFreqOffset:	100000 (-500000~+500000)
Channel 7 Status:	Enable ▾	CenterFreqOffset:	300000 (-500000~+500000)

## 6.5.4 LBT Settings

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

**Figure 6.5.4-A LBT Settings**

**LBT Settings**

LBT Status:	Enable ▾		
RSSI Target:	-160 (dBm)		
Channel settings			
Frequency:	922800000 (Hz)	Scan Time:	5000us ▾
Frequency:	923000000 (Hz)	Scan Time:	5000us ▾
Frequency:	923200000 (Hz)	Scan Time:	5000us ▾
Frequency:	923400000 (Hz)	Scan Time:	5000us ▾
Frequency:	923600000 (Hz)	Scan Time:	5000us ▾
Frequency:	923800000 (Hz)	Scan Time:	5000us ▾
Frequency:	924000000 (Hz)	Scan Time:	5000us ▾
Frequency:	924200000 (Hz)	Scan Time:	5000us ▾

## 6.6 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.

## 6.6.1 WAN

The purpose of this category is to view current WAN settings. This category is further divided into three sectors: Ethernet Wan, 3G/4G LTE and Wireless Extender. These individual options are lodged and labeled above the main content panel.

**Figure 6.6.1-A WAN**

Ethernet Wan    3G/4G LTE    Wireless Extender

Wan Type	DHCP
<b>WAN</b> eth0.2	<b>Uptime:</b> 21h 31m 14s <b>MAC-Address:</b> 1C:49:7B:B4:40:01 <b>RX:</b> 1.95 GB (1662680 Pkts.) <b>TX:</b> 62.61 MB (599285 Pkts.) <b>IPv4:</b> 192.168.31.167/24

### 6.6.1.1 Ethernet WAN

This page is to setup 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 6.6.1.1-A Static IP**

Ethernet Wan    3G/4G LTE    Wireless Extender

wantype **Static IP**

IP Address **192.168.31.155**

Subnet Mask **255.255.255.0**

Gateway **192.168.31.1**

DNS Server **8.8.8.8**  
(optional)

MAC Address **1c:49:7b:b4:40:01**

**Figure 6.6.1.1-B DHCP Client**

Ethernet Wan    3G/4G LTE    Wireless Extender

---

wantype	DHCP Client	▼
MAC Address	1c:49:7b:b4:40:01	

**Figure 6.6.1.1-C PPPoE**

Ethernet Wan    3G/4G LTE    Wireless Extender

---

wantype	PPPoE	▼
Username		
Password		
MAC Address	1c:49:7b:b4:40:01	

### 6.6.1.2 3G/4G LTE

This page is to setup required information.

**Note: Make sure the SIM card is installed.**

**Figure 6.6.1.2-A 3G/4G LTE**

Ethernet Wan    3G/4G LTE    Wireless Extender

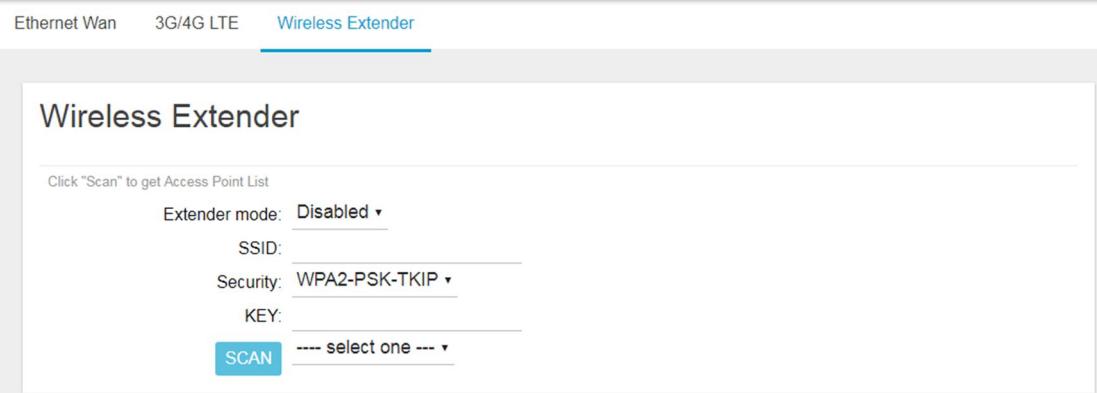
---

<b>3G/4G LTE</b>		
System will reboot after applying succeed		
WAN TYPE	3G/4G LTE	▼
Modem device		
APN		
PIN	(optional) 	
Dial number	(optional)	
Username	(optional)	
Password	(optional) 	

### 6.6.1.3 Wireless Extender

This page is to setup 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 6.6.1.3-A Wireless Extender



Ethernet Wan    3G/4G LTE    Wireless Extender

**Wireless Extender**

Click "Scan" to get Access Point List

Extender mode: Disabled ▾

SSID: \_\_\_\_\_

Security: WPA2-PSK-TKIP ▾

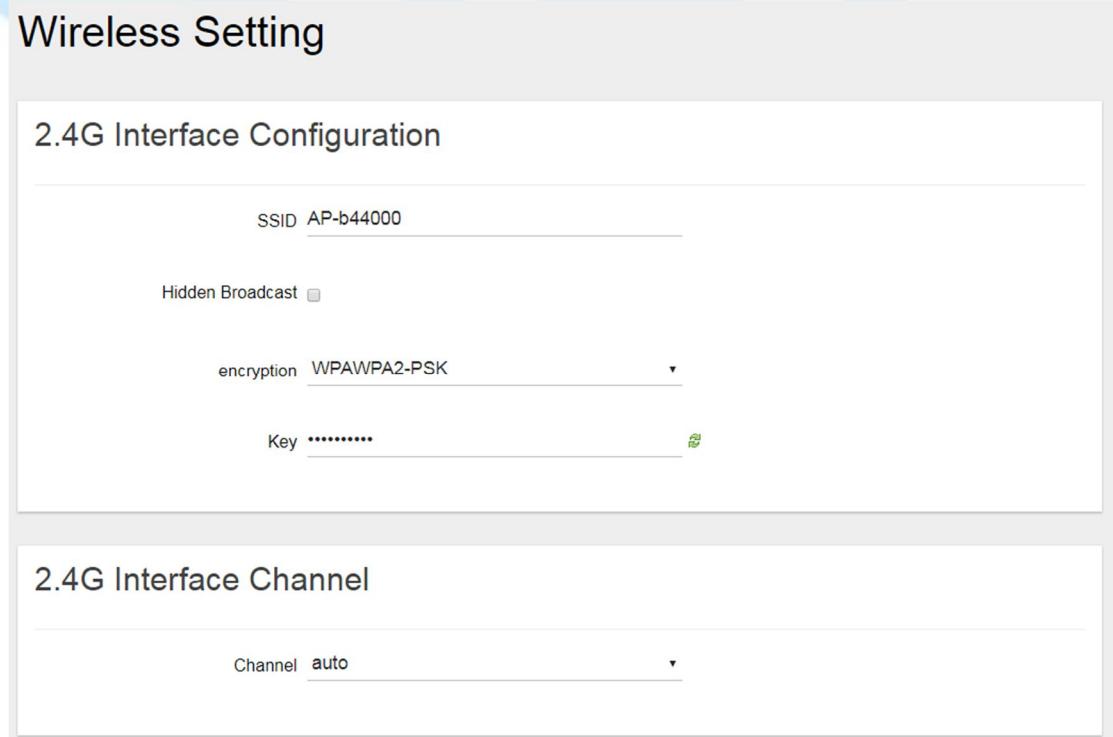
KEY: \_\_\_\_\_

**SCAN**    ---- select one --- ▾

## 6.6.2 Wireless

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

Figure 6.6.2-A Wireless Setting



**Wireless Setting**

**2.4G Interface Configuration**

SSID AP-b44000

Hidden Broadcast

encryption WPAWPA2-PSK ▾

Key \*\*\*\*\* 

**2.4G Interface Channel**

Channel auto ▾

### 6.6.3 LAN

LAN IP can be setup in this page.

Figure 6.6.3-A LAN

#### LAN

##### Local Network

IP Address

### 6.6.4 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 6.6.4-A DHCP

#### DHCP

##### DHCP-Server

Enable

First leased address  (1~254)

Number of leased addresses  (1~254)

Lease time (hr)  (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

## 6.6.5 Diagnostic

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

### 6.6.5.1 PING

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

Figure 6.6.5.1-A PING

## Diagnostics

### Network Utilities

openwrt.org

IPv4 ▾ **PING**

openwrt.org

**TRACEROUTE**

openwrt.org

**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

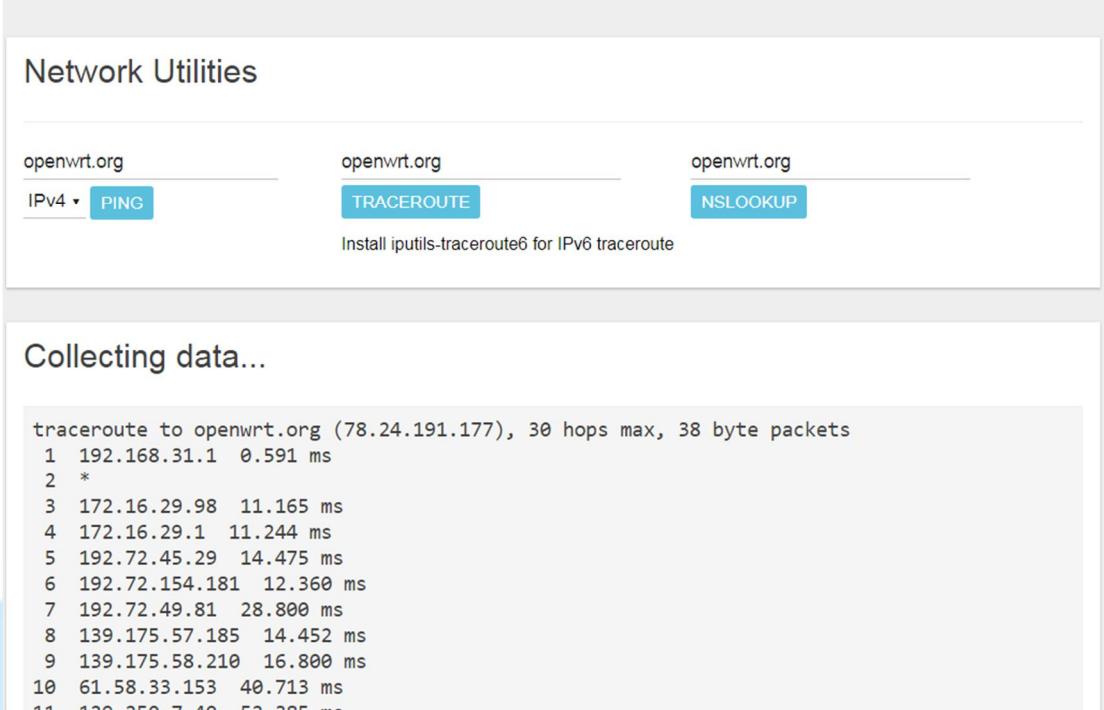
--- openwrt.org ping statistics ---
5 packets transmitted, 5 packets received, 0% packet loss
round-trip min/avg/max = 308.833/312.276/321.124 ms
```

### 6.6.5.2 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 6.6.5.2-A TRACEROUTE  
Diagnostics



**Network Utilities**

<input type="text" value="openwrt.org"/> IPv4 ▾ <span style="border: 1px solid #0070C0; padding: 2px;">PING</span>	<input type="text" value="openwrt.org"/> <span style="border: 1px solid #0070C0; padding: 2px; background-color: #0070C0; color: white; font-weight: bold;">TRACEROUTE</span>	<input type="text" value="openwrt.org"/> <span style="border: 1px solid #0070C0; padding: 2px; background-color: #0070C0; color: white; font-weight: bold;">NSLOOKUP</span>
---	--	--

Install iputils-traceroute6 for IPv6 traceroute

**Collecting data...**

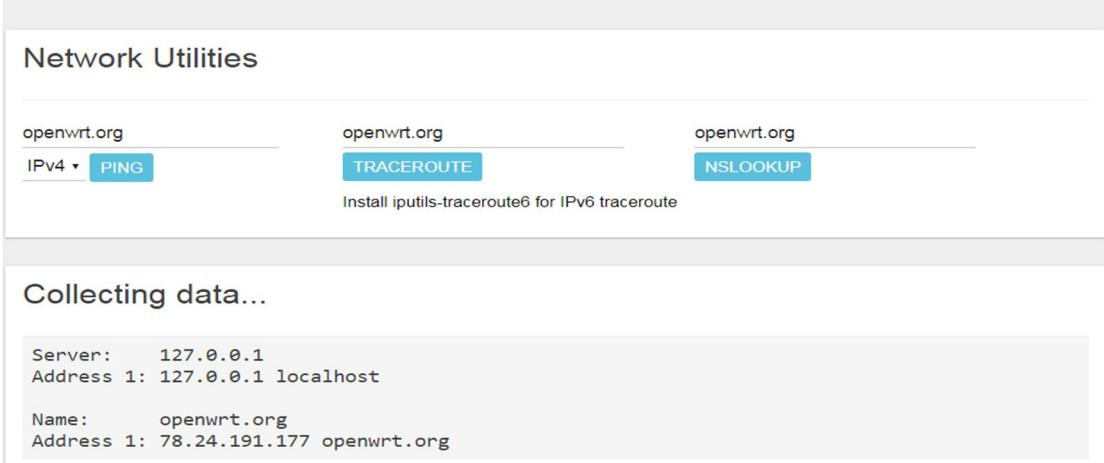
```
traceroute to openwrt.org (78.24.191.177), 30 hops max, 38 byte packets
 1  192.168.31.1  0.591 ms
 2  *
 3  172.16.29.98  11.165 ms
 4  172.16.29.1  11.244 ms
 5  192.72.45.29  14.475 ms
 6  192.72.154.181  12.360 ms
 7  192.72.49.81  28.800 ms
 8  139.175.57.185  14.452 ms
 9  139.175.58.210  16.800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

### 6.6.5.3 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 6.6.5.3-A NSLOOKUP  
Diagnostics



**Network Utilities**

<input type="text" value="openwrt.org"/> IPv4 ▾ <span style="border: 1px solid #0070C0; padding: 2px;">PING</span>	<input type="text" value="openwrt.org"/> <span style="border: 1px solid #0070C0; padding: 2px; background-color: #0070C0; color: white; font-weight: bold;">TRACEROUTE</span>	<input type="text" value="openwrt.org"/> <span style="border: 1px solid #0070C0; padding: 2px; background-color: #0070C0; color: white; font-weight: bold;">NSLOOKUP</span>
---	--	--

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 v1.0.2	LoRa Alliance
LoRaWAN Regional Parameters v1.0.2	LoRa Alliance
LoRaWAN Backend Interfaces Specification v1.0	LoRa Alliance