BGA100 User Guide

v1.1.0

FONNCENT
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Content

1 Overview

BGA100 is a compact indoor Bluetooth gateway with WIFI as backhaul.

Key features

- Compliant with Bluetooth 5.0 protocol
- WIFI: 802.11b/g/n (2.4GHz)
- Powered by USB Type-C
- Keys*2 and LEDs*4 for user interaction
- Bluetooth RF front-end module (FEM) included
- Mounting kit included
- Heat dissipation design
- Two workmode (Standalone, Cloud)
- Two format API (JSON string, Raw binary)
- Self developed BLE protocol stack
- High Bluetooth performance: good interoperability and scalable capacity
- Good WiFi compatibility with various routers

BGA100 can be integrated into various IoT projects and used in many application scenarios.

2 Hardware Description

Top view

Back view

Hardware interface description:

#	Interface	Description
1	SYS	LED
2	WIFI	LED
3	BLE1	LED
4	BLE2	LED
5	RESTORE	KEY
6	RESET	KEY
7	POWER	USB-C

2.1 Power

BGA100 is powered by a USB-Type C interface (DC 5V 2A).

2.2 LEDs

LEDs definition:

LED	Status	Description
SYS	on off	System initialization ok System initialization failed
WIFI	on off	WIFI connected WIFI disconnected
BLE1	on off flash slowly flash fast	Bluetooth initialization ok Bluetooth initialization failed Bluetooth scanning state Bluetooth advertising state
BLE2	on off	Bluetooth connection state Bluetooth disconnection state

2.3 Keys

Keys definition:

KEY	Action	Description
RESET	click	reset system
RESTORE	press for 3s	restore manufacturer configuration and reset

3 Functional Description

3.1 Setup

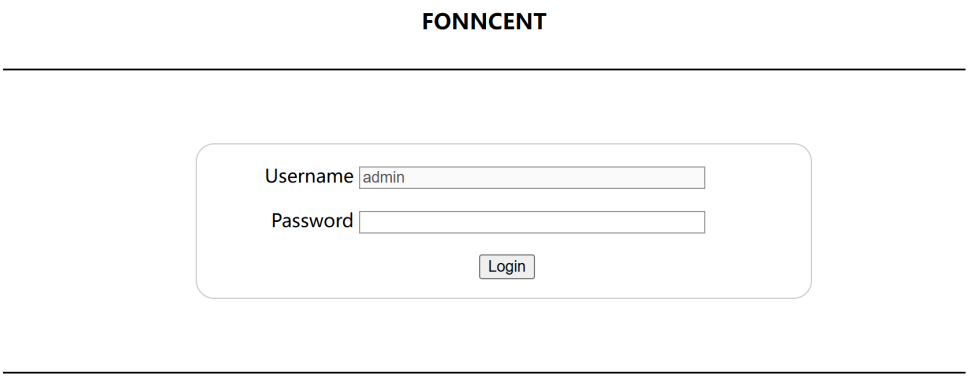
BGA100 provides a WIFI hotspot and runs a web server for initial setup.

The hotspot SSID is FC-XXXXXX, where XXXXXX is the last 6 hexadecimal digits of gateway AP MAC, and the password is “12345678”.

The server IP address is 192.168.4.1, and the default account is admin/000000.

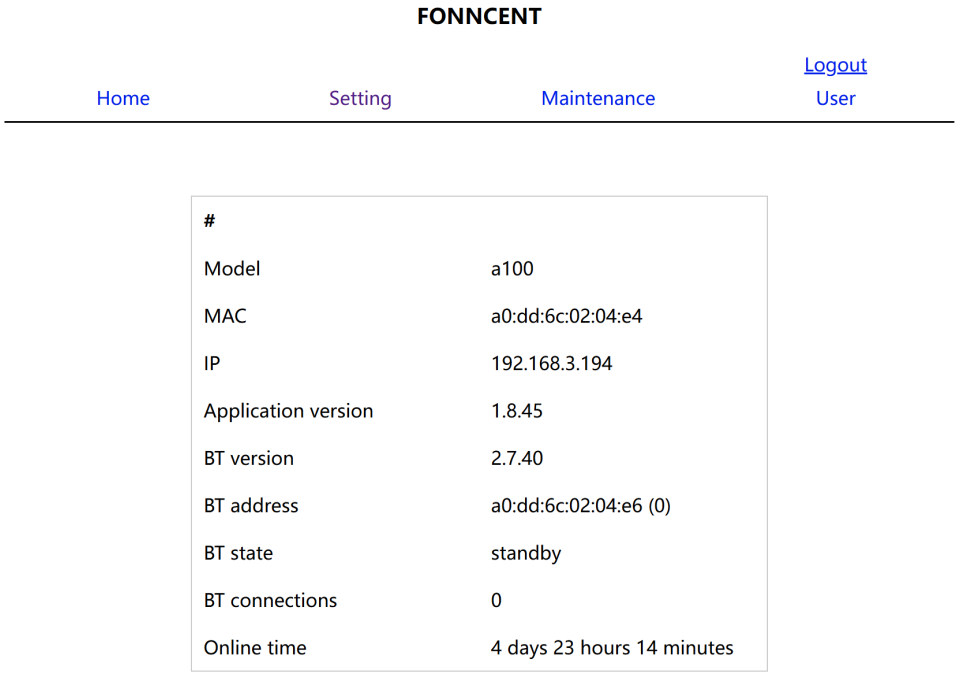
The web pages are explained as following.

3.1.1 Login



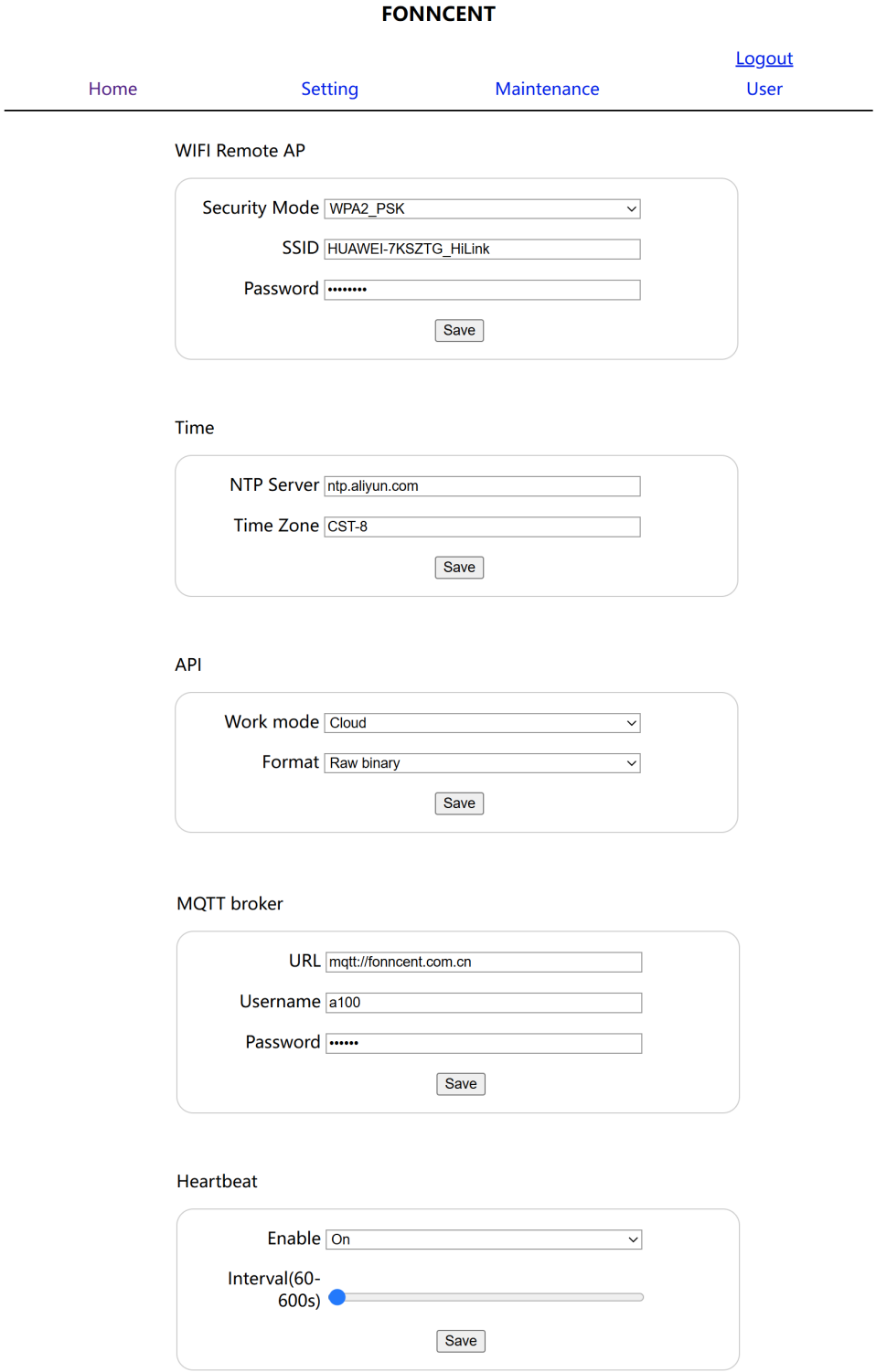
The default account is admin/000000. After logging in, a user should first update the password.

3.1.2 Home



The page displays the gateway information, such as model, MAC address, IP address, application version, Bluetooth version, Bluetooth address, Bluetooth state, online time, etc.

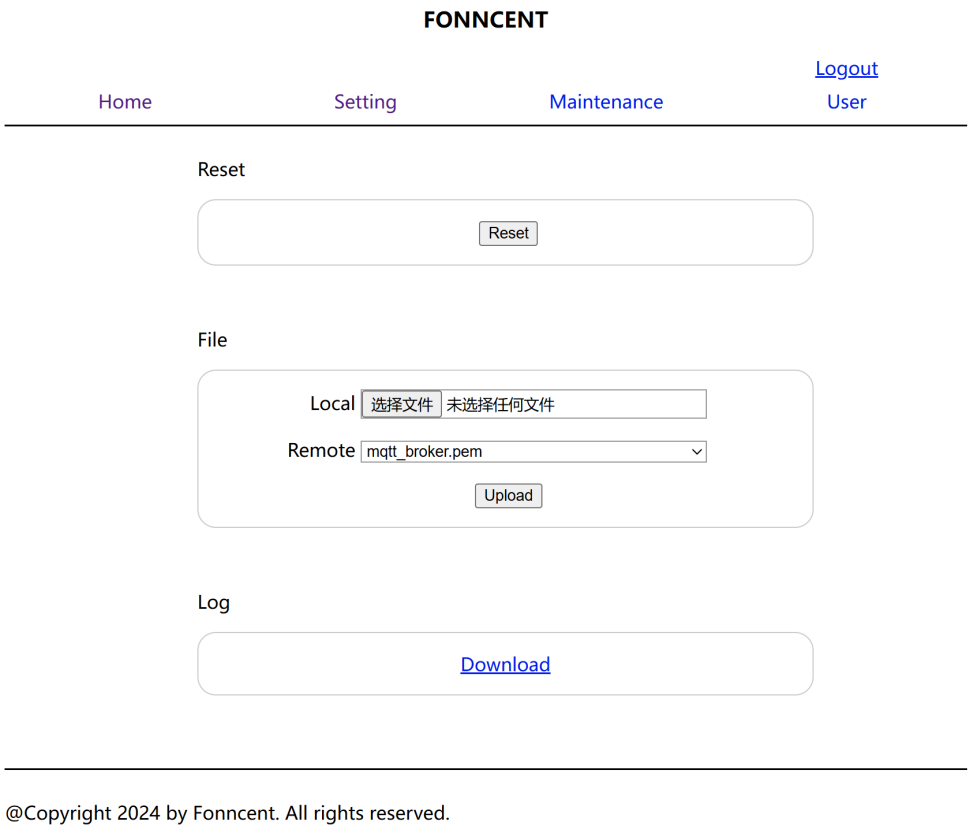
3.1.3 Setting



The page updates the settings of the gateway.
If any setting has changed, it will not take effect until next startup.

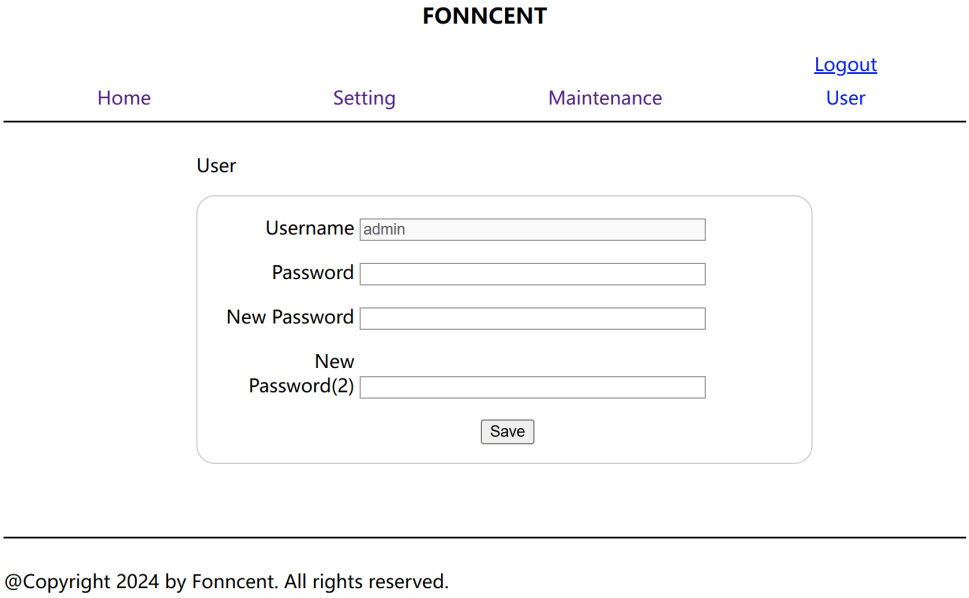
Function	Parameters	Description
WIFI remote AP	Security mode	authentication method, e.g. OPEN, WPA, WPA2 …
	SSID	remote AP's SSID
	Password	remote AP's Password
Time	NTP server	NTP server, e.g. ntp.aliyun.com
	Time Zone	a time zone string, e.g. "GMT0", "CST6", "CST-8"…
API	Work mode	standalone mode, cloud mode
	Format	JSON string format, Raw binary format
MQTT broker	URL	mqtt://broker-ip:port mqtts://broker-ip:port
	Username	client username used by broker
	Password	client password used by broker
Heartbeat	Enable	on, off
	Interval	interval time in seconds

3.1.4 Maintenance



The page supports to reset the gateway, upload files (mqtt broker certificate, http server certificate), and download log file.

3.1.5 User



The gateway creates a fixed default user, admin. Only password can be updated here.

3.2 Workmode

BGA100 supports two workmode: standalone mode and cloud mode. Both workmodes share a common API.

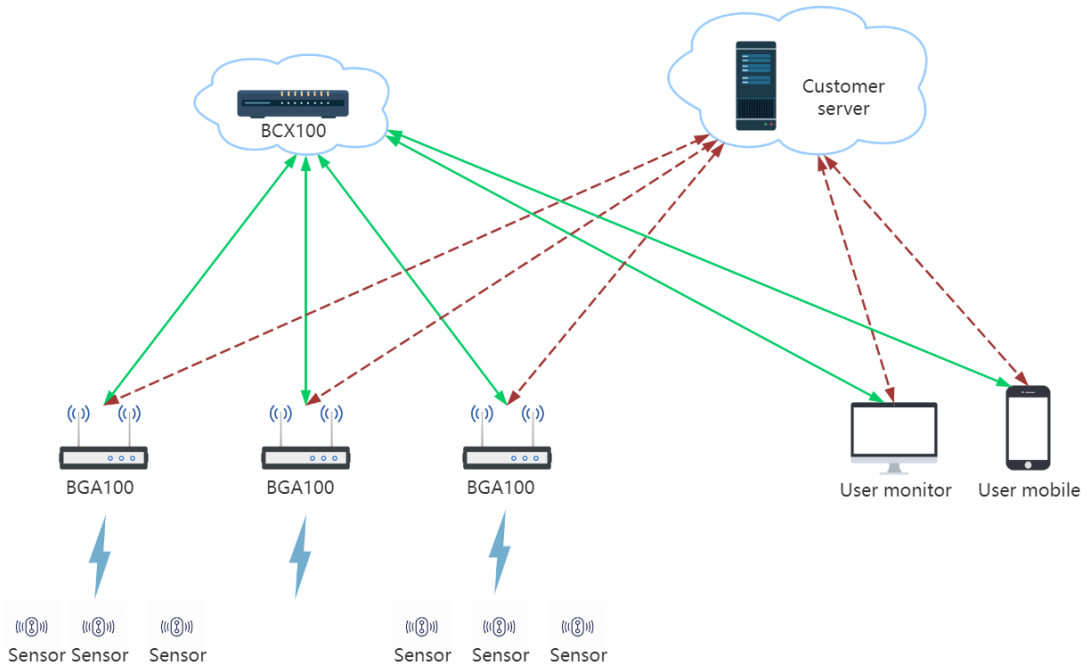
3.2.1 Standalone mode

The gateway runs a websocket server with URL, ws://gateway-ip/chat，where gateway-ip is the actual IP address. A user can access the server using any websocket client tool.

3.2.2 Cloud mode

The gateway runs a mqtt client connected to a remote mqtt broker. User applications interact with gateway through the romete borker. Any mqtt broker, e.g. EMQX, Mosquitto, can be used. This mode is the main usage.

A simplified application diagram is showed below:



where：
MQTT broker is deployed in BCX100, FONNCENT cloud platform, or a customer server.
Sensor represents a Bluetooth device.
User monitor, User mobile represents user applications.

3.3 API

BGA100 supports two data formats: JSON string format and raw binary format.

3.3.1 JSON string format

The format is easy to structure and process, and is used in system domain data and Bluetooth domain data.

Please refer to the API document.

3.3.2 Raw binary format

The format is very efficient, and is only used in Bluetooth domain data. For some applications where data throughput is more concerned, the format is very suitable.

Please refer to the API document.

3.4 MQTT broker

3.4.1 Requirement

Any mqtt broker can act as the bridge between gateway and user application, as long as it meets the following requirement:

#	Function	Description
1	version	support 3.1.1
2	transport over TCP	support url: mqtt://broker-ip:port
3	transport over SSL	support url: mqtts://broker-ip:port
4	security	support TLS1.2, X.509 certificate

3.4.2 Topic

Two types of channel is defined:

- Public channel:

/home/bgw/00:00:00:00:00:00/downlink
/home/bgw/00:00:00:00:00:00/uplink

- Private channel:

/home/bgw/xx:xx:xx:xx:xx:xx/downlink
/home/bgw/xx:xx:xx:xx:xx:xx/uplink

Description:

1. public channel is used in operation on all gateways, e.g. discovering gateways, batch operation on all gateways, etc
2. private channel is used in operation on a specific gateway, e.g. system setting, Bluetooth operation, etc. xx:xx:xx:xx:xx:xx is the gateway's STA MAC address
3. each channel includes two topics: downlink topic and uplink topic
4. channel selection is related to specific API data
5. user applications publish on downlink topic, and subscribe on uplink topic, while gateway does the opposite

3.4.3 Security

BGA100 supports two types of transport:

- transport over TCP

URL: mqtt://broker-ip:port

- transport over SSL

URL: mqtts://broker-ip:port

In the first case, the data are transported in plaintext and could be sniffed or intercepted. The transport should only be used in test.

In the latter case, the transport is encrypted and authenticated, that ensures the security of data and the trust of remote servers. In the transport layer, BGA100 is designed as unidirectional authentication, that is only the broker's certificate is authenticated by gateway.

BGA100 doesn't store CA root certificates, so a user should import the broker's X509 certificate to gateway manually. There are two options to do:

- by local web server

A user can upload certificate through the maintenance page of web server, please refer to chapter 3.1.4.

- by BCX100

A more convenient way is through FONNCENT cloud platform, BCX100.
please refer to BCX100 user guide.

[Note]
1. Only PEM format certificate is supported.
2. MQTT broker’s certificate name is fixed to mqtt_broker.pem

In the application layer, the server can choose to authenticate a gateway by the gateway's username/password.
Please refer to chapter 3.1.3.
please refer to BCX100 user guide.

3.5 Log

There are two ways to export gateway's application log.

- by local web server

A user can download the log file through the maintenance page of web server.
Please refer to chapter 3.1.4.

- by BCX100

Through FONNCENT cloud platform, BCX100, a user can view、manage and download a gateway log.
Please refer to BCX100 user guide.

[Note]: The log file is fixed to app.log

3.6 Application OTA

Application OTA (Over The Air) is done by FONNCENT cloud platform, BCX100.
Please refer to BCX100 user guide.

3.7 Bluetooth DFU

Bluetooth DFU(Device Firmware Update) is done by FONNCENT cloud platform, BCX100. Please refer to BCX100 user guide.