BGA300 User Guide

v1.0.0

FONNCENT
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Content

1 Overview

BGA300 is an indoor bluetooth gateway with WIFI and Ethernet as backhaul.

Key features

• Compliant with Bluetooth 5.0 protocol

• WIFI: 802.11b/g/n (2.4GHz)

• Ethernet: 802.3 802.3u, 10M/100Mbps

• Powered by USB Type-C

• Keys*2 and LEDs*4 for user interaction

• Bluetooth RF front-end module (FEM) included

• External antenna (Bluetooth*1, WIFI*1)

• 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

BGA300 can be integrated into various IoT projects and used in many application scenarios.

2 Hardware Description
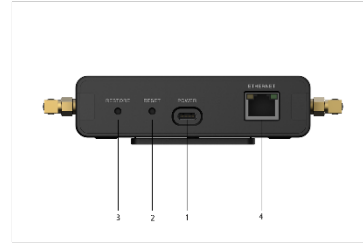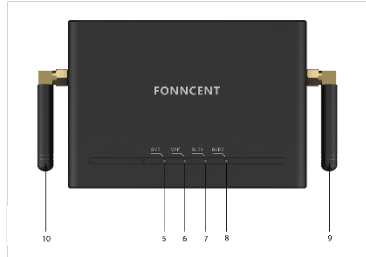
Hardware interface description:

#	Description
1	USB Type-C Power
2	Reset Key
3	Restore Key
4	Ethernet RJ45
5	SYS LED, green
6	WIFI LED, green
7	Bluetooth LED 1, blue
8	Bluetooth LED 2, blue
9	Bluetooth Antenna
10	WIFI Antenna

2.1 Power

BGA300 is powered by a USB-Type C interface (DC 5V 2A).

2.2 LEDs

LEDs definition:

LED	Status	Descripton
SYS	on	System init ok
	off	System init failed
WIFI	on	WIFI connected
	off	WIFI unconnected
BLE1	on	Bluetooth init ok
	off	Bluetooth init failed
	flash slowly	scanning state
	flash fast	advertising state
BLE2	on	connetion state
	off	disconnection state

Ethernet Yellow	on	connection
	off	disconnection
Ethernet Green	on	Link has established
	blink	Tx/Rx state

2.3 Keys

Keys definition:

Key	Action	Descripton
RESET	click	reset system
RESTORE	press on 3s	restore manufacture configuration and reset

2.4 Antennas

Bluetooth antenna and WIFI antenna's specification:
• SMA format
• 2.4GHz
• +3dBi gain
• 50mm length

2.5 Ethernet

Ethernet RJ45 interface specification:
• IEEE 802.3/802.3u
• 10Mbps/100Mbps
• link status LEDs: 2*LED（yellow*1，green*1）
• multi power saving mode

3   Functional Description

3.1   Setup

BGA300 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 MAC, and the password is "12345678". The server IP address is 192.168.4.1.

BGA300 provides an ethernet interface. Alternatively, a user can access web server by ethernet. When connecting to a router with an ethernet cable, gateway will run a DHCP client and get an IP address automatically. A user can get the IP address from the router's management page or other utility.

The web server's pages are explained as following.

3.1.1   Login

Welcome to A300

Username admin

Password

Login

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

3.1.2 Home

Welcome to A300

Home   Setting   Maintenance   User

#	
Model	a300
MAC	a0:dd:6c:02:04:b0
MAC(Ethernet)	a0:dd:6c:02:04:b3
IP	0.0.0.0
IP(Ethernet)	192.168.3.117
Application version	1.7.10
BT version	1.1.0
BT address	a0:dd:6c:02:04:b2 (0)
BT state	standby
BT connections	0
Online time	16 days 8 hours 15 minutes

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

Welcome to A300

Home	Setting	Maintenance	User

Networks

Networks [Ethernet ▼]

[Save]

WIFI Remote AP

Security Mode [WPA2_PSK ▼]

SSID [HUAWEI-7KSZTG_HiLink]

Password [••••••••]

[Save]

Time

NTP Server [ntp.aliyun.com]

Time Zone [CST-8]

[Save]

API

Work mode [Cloud ▼]

Format [JSON string ▼]

[Save]

MQTT broker

URL [mqtt://fonncent.com.cn]

Username [a300]

Password [••••••]

[Save]

Heartbeat

Enable [On ▼]

Interval(60-600s) [●————————]

[Save]

The page updates the settings of the gateway.

If any setting has changed, it will not take effect until next startup.

Function	Parameters	Description
Networks	Networks	WIFI, Ethernet, WIFI+Ethernet
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

Welcome to A300

Reset

Reset

File

Local   选择文件   未选择任何文件

Remote   mqtt_broker.pem

Upload

Log

Download

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

3.1.5 User

Welcome to A300

User

Username	admin
Password	
New Password	
New Password(2)	

Save

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

3.2 Workmode

BGA300 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:
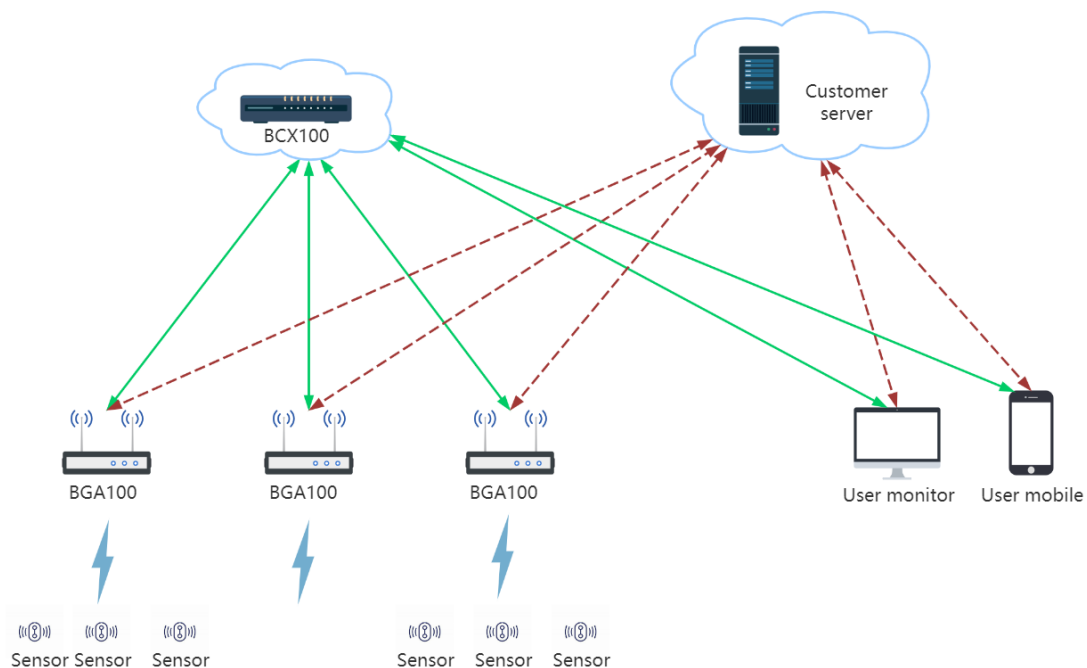
where：
MQTT broker is delpoyed in BCX100, FONNCENT cloud platform, or a customer server.
Sensor represents a bluetooth device.
User monitor, User mobile represents user applications.

3.3 API

BGA300 doesn't choose SDK format but data format API to interact with user application. The advantage of this format is the regardless of the platform or language on which user application is developed, as long as the interaction data meets the API standards.
Two data formats are supported: 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	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 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

BGA300 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, BGA300 is designed as unidirectional authentication, that is only the broker's certificate is authenticated by gateway.

BGA300 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.