Coex 评估测试

使用手册

版本：*1.0*

www.bouffalolab.com

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1 准备

1. 硬件：芯片模块一个，Windows PC 一台，USB 转串口线一根。

2. 软件：烧写工具，烧录 bl602_demo_event.bin 文件，路径：bouffalolab_release_bl_iot_sdk.zip/App_Demos/bl602_-demo_event/build_out/bl602_demo_event.bin , 选择任意一款串口工具

3. 手机上下载任意一款蓝牙调试 APP.

2 烧录

2.1 连接

芯片模块的相关引脚连接如下图所示，其中图 1 是模块的正面图，其标号 1 处用跳线帽短接，标号 2 处将左边两根排针短接，标号 3 处将上面的两根排针短接；图 2 是模块的背面图，烧录时将 IO8 和 HI 两根排针短接，烧录完成后将 IO8 和 LOW 两根排针短接并重新上电。用 USB 线连接 PC 和模块，此时模块上的电源灯常亮，表明模块通电正常。

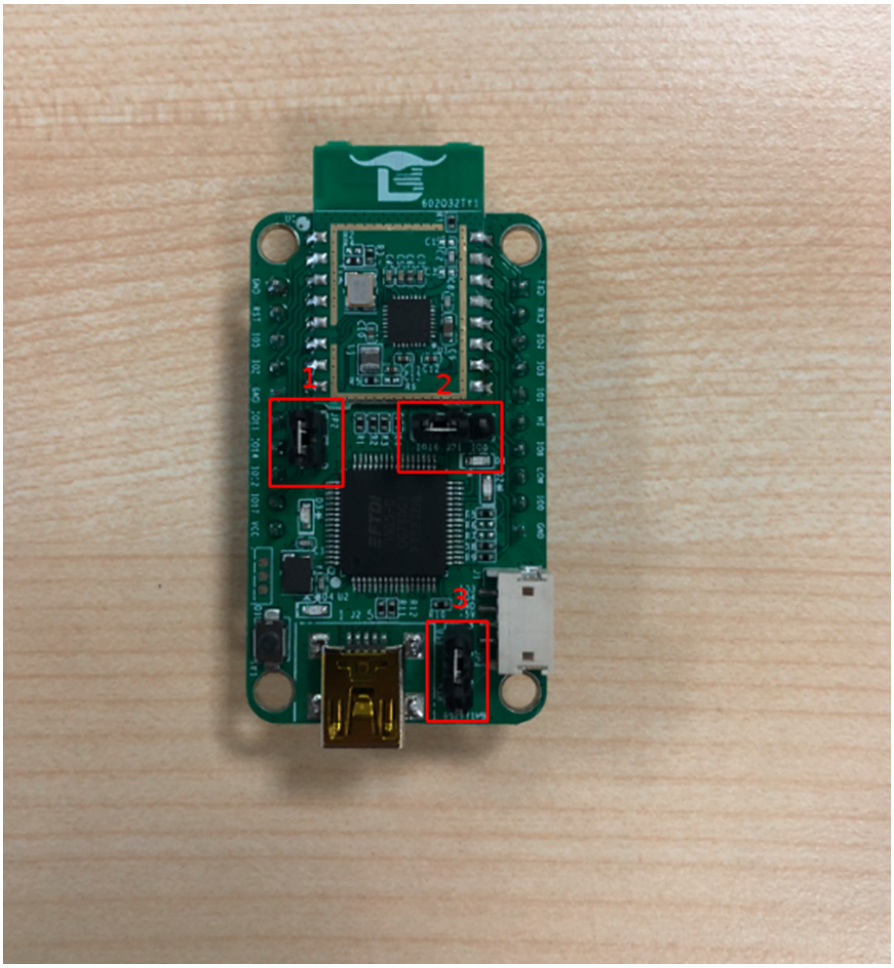


图 2.1: 正面

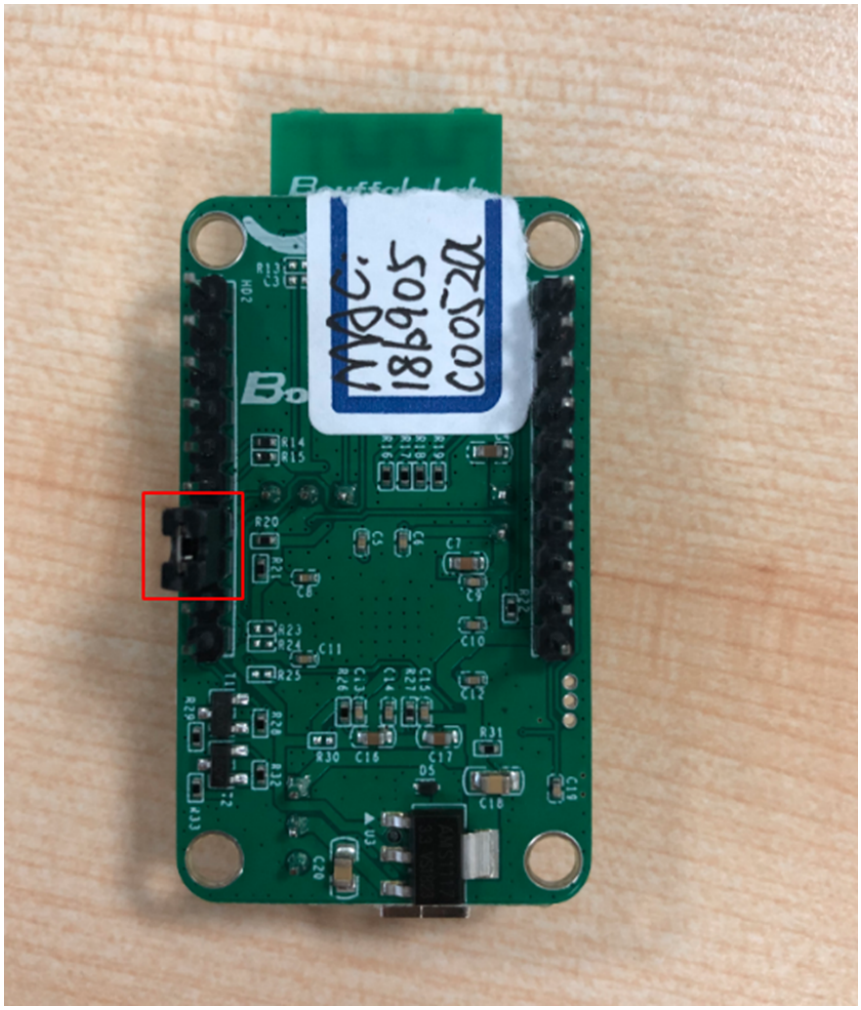


图 2.2: 背面

2.2 软件下载

打开解压后文件中的烧写工具 flash_tool 目录，双击 BLDevCube.exe，chip type 选择对应的芯片类型，打开后界面参数参考下图配置：

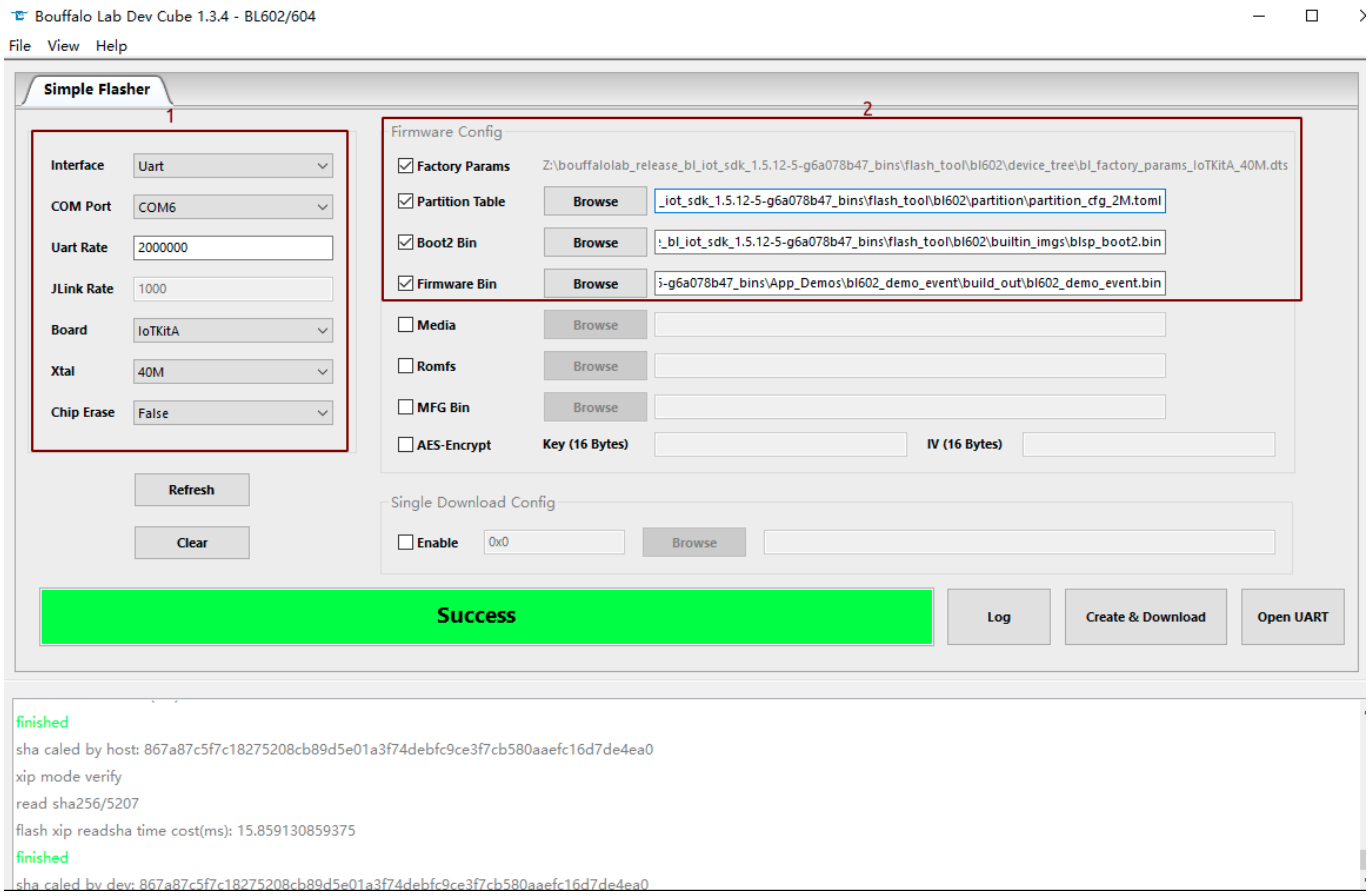


图 2.3: 烧写工具界面

其中图 3 的框 1 中 COM Port 选项根据实际串口情况选择（右击我的电脑-> 管理-> 设备管理器-> 端口，查看端口号，模块是双串口，选择端口号较小的），框 2 中的相关路径依据实际情况选择。配置完成后点击 Download 按钮下载。

2.3 串口工具配置

将 IO8 和 LOW 两根排针短接并重新上电，打开串口工具，设置对应的端口号，波特率设定为 2000000 bps。

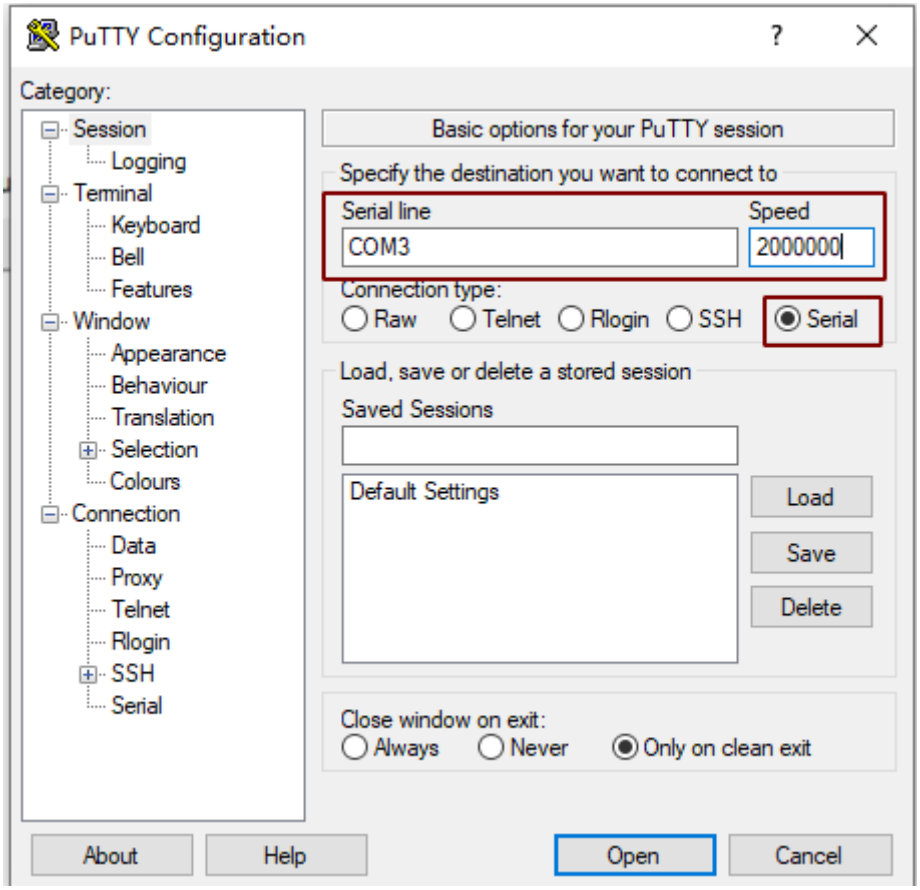

PuTTY Configuration
Category:
Session
Logging
Terminal
Keyboard
Bell
Features
Window
Appearance
Behaviour
Translation
Selection
Colours
Connection
Data
Proxy
Telnet
Rlogin
SSH
Serial
Basic options for your PuTTY session
Specify the destination you want to connect to
Serial line
Speed
COM3
2000000
Connection type:
Raw
Telnet
Rlogin
SSH
Serial
Load, save or delete a stored session
Saved Sessions
Default Settings
Load
Save
Delete
Close window on exit:
Always
Never
Only on clean exit
About
Help
Open
Cancel

图 2.4: 串口工具

3 测试评估一

3.1 wifi ping + ble adv

重启板子，chip 作为 client，PC 作为 server，APP 以 nRF Master Control Panel / nRF Connect 为例

1. router ssid: bl_test_081，passwd: 12345678
2. 在串口中运行 wifi 相关命令：

   #stack_wifi

   #wifi_sta_connect bl_test_081 12345678 (连接成功后会获取 IP 地址)

```
[lwip] netif status callback
 IP: 192.168.8.193
 MK: 255.255.255.0
 GW: 192.168.8.1
[WF][SM] Exiting wifiConnected_ipObtaining state
[WF][SM] IP GOT IP:192.168.8.193, MASK: 255.255.255.0, Gateway: 192.168.8.1, dns1: 192.16
8.8.1, dns2: 0.0.0.0
[WF][SM] State Action ###wifiConnected_ipObtaining### --->>> ###wifiConnected_IPOK###
[WF][SM] Entering wifiConnected_IPOK state
[APP] [EVT] GOT IP 24583
[SYS] Memory left is 132664 Bytes
```

图 3.1: 模块成功连接 WiFi

3. 在 PC 的 cmd 界面运行命令：$ping 192.168.81.103 -t (默认 1s ping 一次,192.168.81.103 是设备端获取的 IP 地址)

```
C:\Users\paul>
C:\Users\paul>ping 192.168.81.103 -t

正在 Ping 192.168.81.103 具有 32 字节的数据:
来自 192.168.81.103 的回复: 字节=32 时间=3ms TTL=255
来自 192.168.81.103 的回复: 字节=32 时间=4ms TTL=255
来自 192.168.81.103 的回复: 字节=32 时间=2ms TTL=255
来自 192.168.81.103 的回复: 字节=32 时间=3ms TTL=255
来自 192.168.81.103 的回复: 字节=32 时间=3ms TTL=255
来自 192.168.81.103 的回复: 字节=32 时间=5ms TTL=255
来自 192.168.81.103 的回复: 字节=32 时间=3ms TTL=255
来自 192.168.81.103 的回复: 字节=32 时间=2ms TTL=255
来自 192.168.81.103 的回复: 字节=32 时间=2ms TTL=255
来自 192.168.81.103 的回复: 字节=32 时间=6ms TTL=255
来自 192.168.81.103 的回复: 字节=32 时间=3ms TTL=255
来自 192.168.81.103 的回复: 字节=32 时间=3ms TTL=255
来自 192.168.81.103 的回复: 字节=32 时间=5ms TTL=255
来自 192.168.81.103 的回复: 字节=32 时间=3ms TTL=255
来自 192.168.81.103 的回复: 字节=32 时间=26ms TTL=255
```

图 3.2: 模块开启 ping

4. 在串口中运行 ble 相关命令：

   #stack_ble

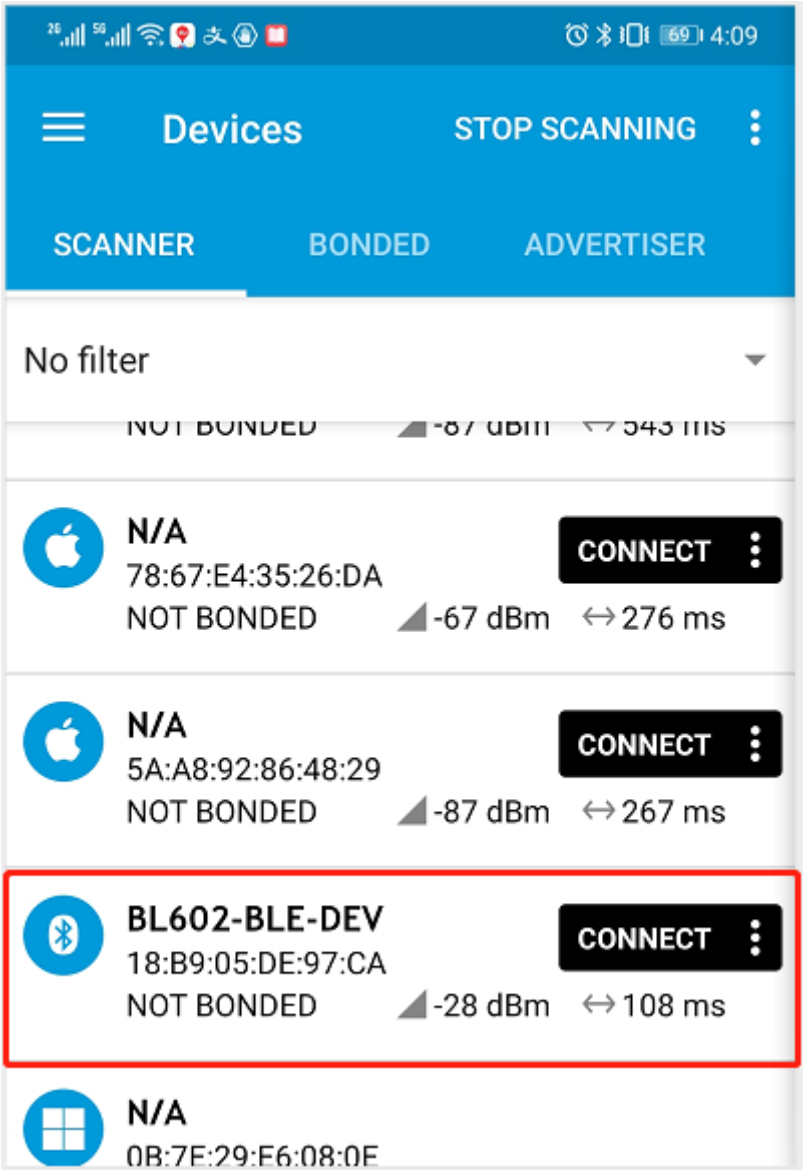
   #ble_init

   #ble_start_adv 0 0 0xa0 0xa0 (发起 adv,interval 为 100ms)

```
Advertising started

# [   4064829][□[32mINFO  □[0m: b1_sec.c: 126] random number is 7ed9292f
[   4065655][□[32mINFO  □[0m: b1_sec.c: 126] random number is 8730dad4
[   4066496][□[32mINFO  □[0m: b1_sec.c: 126] random number is 1d81e61b
[   4067362][□[32mINFO  □[0m: b1_sec.c: 126] random number is b00a72db
[   4068204][□[32mINFO  □[0m: b1_sec.c: 126] random number is 9b23dbc6
[   4069035][□[32mINFO  □[0m: b1_sec.c: 126] random number is 017665d8
[   4069887][□[32mINFO  □[0m: b1_sec.c: 126] random number is 0e7aabc0
proc_hellow_entry: RISC-V rv32imafc
[   4070710][□[32mINFO  □[0m: b1_sec.c: 126] random number is a53d5ec9
```

5. 手机端打开 APP, 查看是否扫描到设备 BL602-BLE-DEV, 如果扫描到说明测试成功：


4:09
Devices
STOP SCANNING
SCANNER
BONDED
ADVERTISER
No filter
N/A
78:67:E4:35:26:DA
NOT BONDED
-67 dBm
276 ms
CONNECT
N/A
5A:A8:92:86:48:29
NOT BONDED
-87 dBm
267 ms
CONNECT
BL602-BLE-DEV
18:B9:05:DE:97:CA
NOT BONDED
-28 dBm
108 ms
CONNECT
N/A

4 测试准备

1.PC 与路由器通过有线连接。

5 测试评估二

5.1 wifi ping + ble connect(1s 发送 5 次数据包，长度为 23byte)

重启板子，chip 作为 client，PC 作为 server，APP 以 BLE 调试助手为例。

1-3. 步骤如同测试评估一中所示:

4. 在串口中运行 ble 相关命令:

   #stack_ble

   #ble_init

   #ble_start_adv 0 0 0xa0 0xa0 (发起 adv,interval 为 100ms)

5. 打开 APP, 扫描到 BL602-BLE-DEV 并连接:

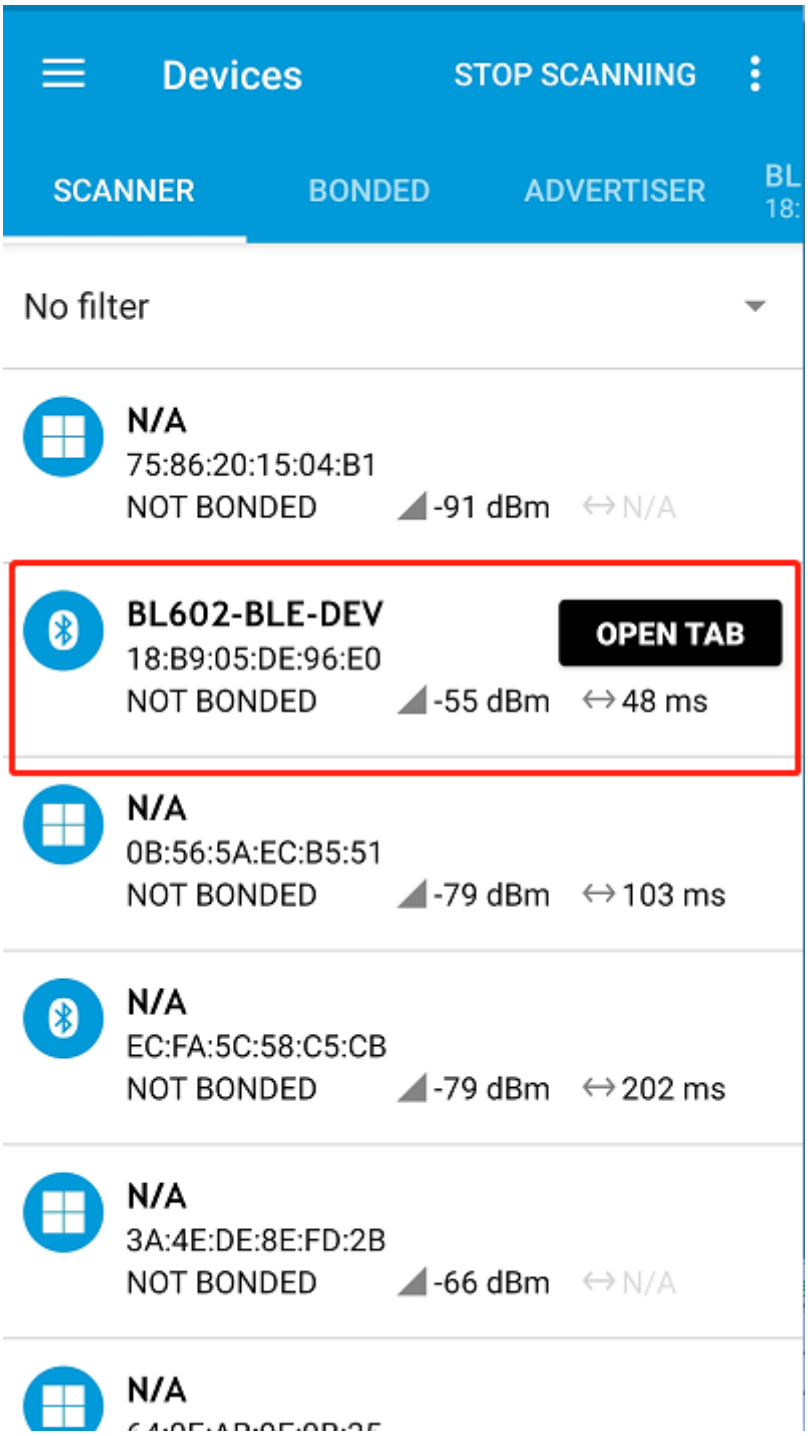


图 5.1: APP 扫描到 BLE

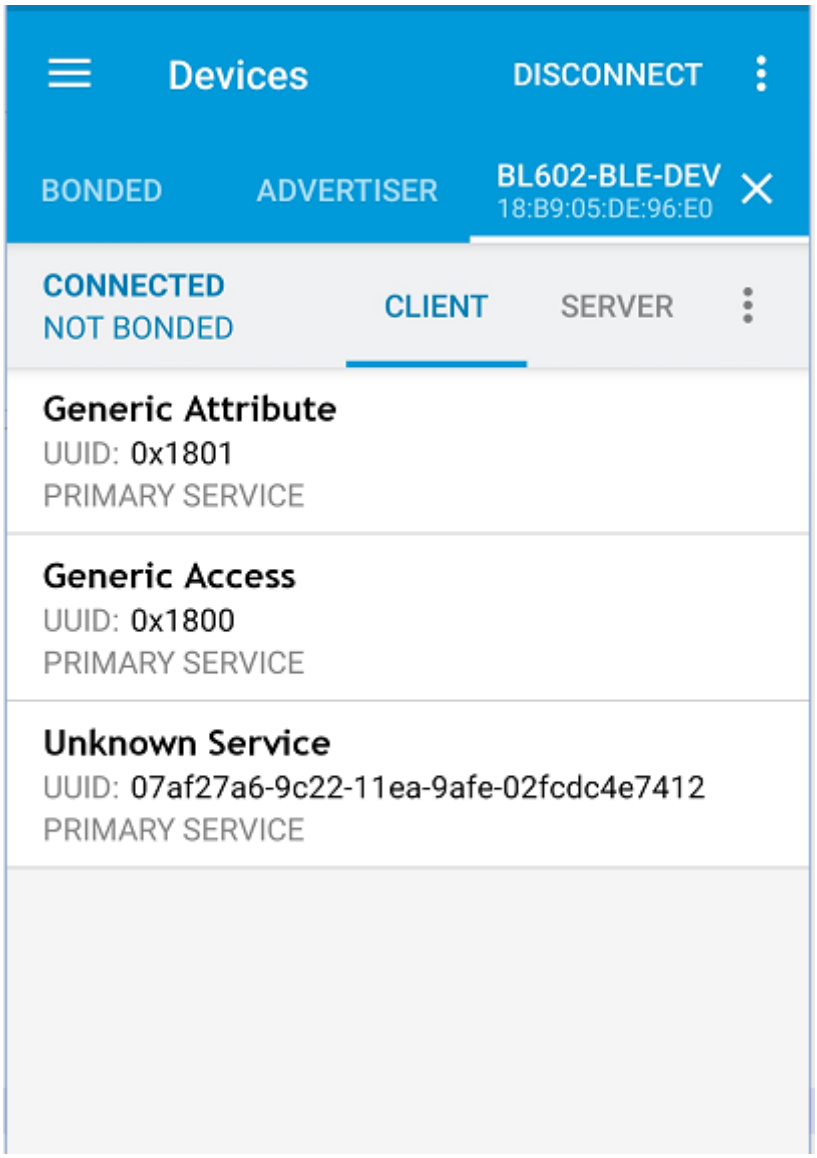


图 5.2: BLE 连接成功

6. 在串口中运行 ble 相关命令:

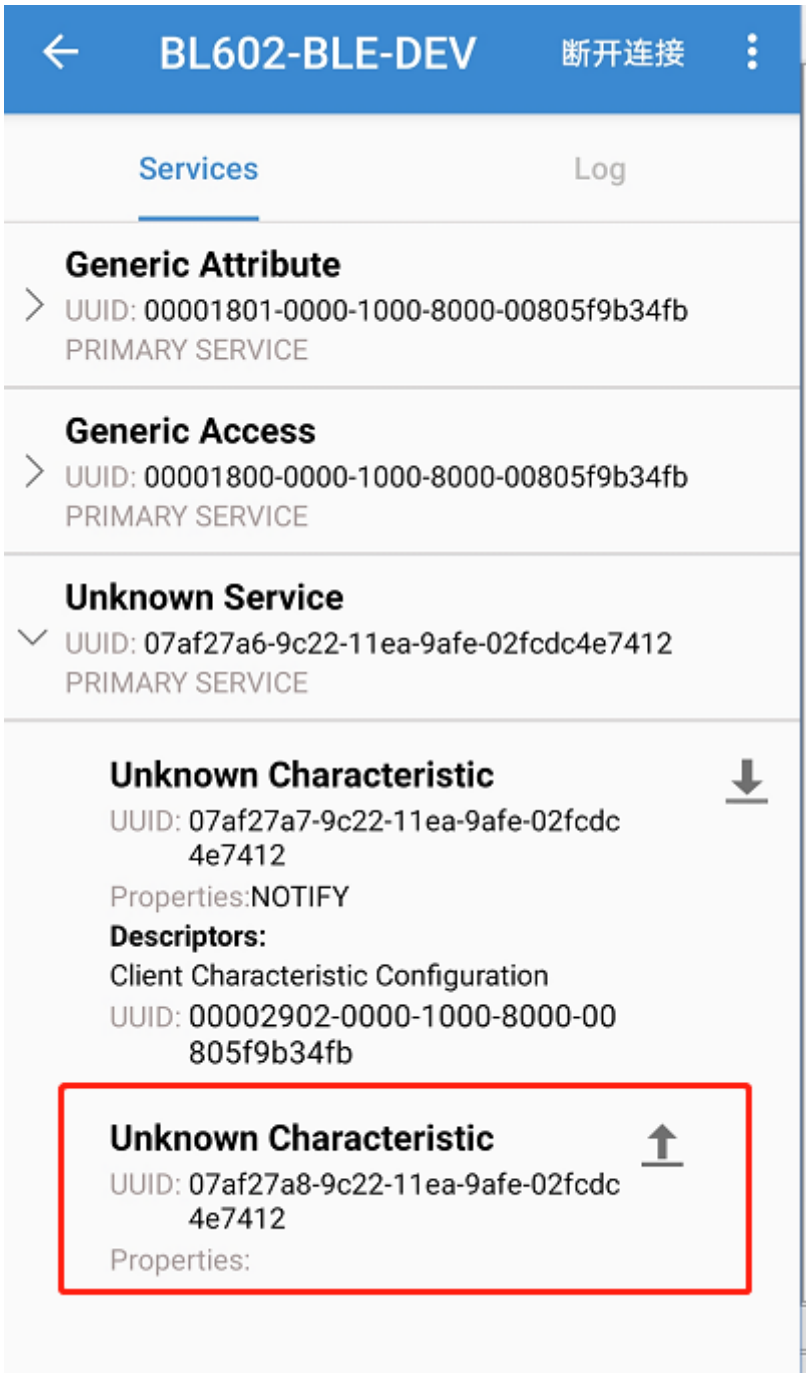
   #ble_conn_update 0x6 0x6 0x0 0x1f4 (连接 interval 为 7.5ms)

7. 在串口中查看连接参数已更新:

```
proc_hellow_entry: RISC-V rv32imafc
pa 37447893d, ce trk 7.09, action: capcode 46 -> 45
ble_conn_update 0x6 0x6 0x0 0x1f4
[btsnoop]:opcode =[0x2013],len =[0xe],data=[0000060006000000f40100000000]
[btsnoop]:Stop
[btsnoop]:pkt_type =[0x3],len =[0x4],data=[00011320]
[btsnoop]:Stop
conn update initiated

# [btsnoop]:pkt_type =[0x4],len =[0xa],data=[0300000006000000f401]
[btsnoop]:Stop
LE conn param updated: int 0x0006 lat 0 to 500
pa 42670755d, ce trk 6.74, action: capcode 45 -> 44
```

8. 在 APP 中找到服务特性，并且写入相应的数据：


BL602-BLE-DEV
断开连接
Services
Log
Generic Attribute
UUID: 00001801-0000-1000-8000-00805f9b34fb
PRIMARY SERVICE
Generic Access
UUID: 00001800-0000-1000-8000-00805f9b34fb
PRIMARY SERVICE
Unknown Service
UUID: 07af27a6-9c22-11ea-9afe-02fcdc4e7412
PRIMARY SERVICE
Unknown Characteristic
UUID: 07af27a7-9c22-11ea-9afe-02fcdc 4e7412
Properties:NOTIFY
Descriptors:
Client Characteristic Configuration
UUID: 00002902-0000-1000-8000-00 805f9b34fb
Unknown Characteristic
UUID: 07af27a8-9c22-11ea-9afe-02fcdc 4e7412
Properties:

9. 查看 wifi 与 ble 是否稳定连接

6 测试评估三

6.1 wifi running iperf + ble connect(1s 发送 5 次数据包，长度为 23byte)

重启板子，chip 作为 client，PC 作为 server，APP 以 BLE 调试助手为例。

1-2. 步骤如同测试评估一中所示:

3. 在串口中运行命令：$ipc 192.168.81.101 (192.168.81.101 是 PC 的 IP 地址)

```
  MK: 255.255.255.0
  GW: 192.168.81.1
[WF][SM] Exiting wifiConnected_ipObtaining state
[WF][SM] IP GOT IP:192.168.81.105, MASK: 255.255.255.0, Gatewa
[WF][SM] State Action ###wifiConnected_ipObtaining### --->>> #
[WF][SM] Entering wifiConnected_IPOK state
[APP] [EVT] GOT IP 23503
[SYS] Memory left is 85632 Bytes
proc_hellow_entry: RISC-V rv32imafc
ipc 192.168.81.101

# Connect to iperf server successful!
5.0898(5.0898 5.0898 5.0898) Mbps!
 push back
```

4. 在 PC 的 cmd 界面运行命令: $iperf.exe -s -i 1

```
D:\Paul\tools\iperf>iperf -s -i1
------------------------------------------------------------
Server listening on TCP port 5001
TCP window size: 64.0 KByte (default)
------------------------------------------------------------
[380] local 192.168.81.101 port 5001 connected with 192.168.81.103 port 51649
[ ID] Interval       Transfer     Bandwidth
[380]  0.0- 1.0 sec   442 KBytes  3.62 Mbits/sec
[380]  1.0- 2.0 sec   223 KBytes  1.83 Mbits/sec
[380]  2.0- 3.0 sec   523 KBytes  4.28 Mbits/sec
[380]  3.0- 4.0 sec   538 KBytes  4.41 Mbits/sec
[380]  4.0- 5.0 sec   548 KBytes  4.49 Mbits/sec
[380]  5.0- 6.0 sec   574 KBytes  4.70 Mbits/sec
[380]  6.0- 7.0 sec   559 KBytes  4.58 Mbits/sec
[380]  7.0- 8.0 sec   559 KBytes  4.58 Mbits/sec
[380]  8.0- 9.0 sec   524 KBytes  4.29 Mbits/sec
[380]  9.0-10.0 sec   553 KBytes  4.53 Mbits/sec
[380] 10.0-11.0 sec   533 KBytes  4.37 Mbits/sec
[380] 11.0-12.0 sec  5.08 KBytes  41.6 Kbits/sec
[380] 12.0-13.0 sec   452 KBytes  3.70 Mbits/sec
[380] 13.0-14.0 sec   498 KBytes  4.08 Mbits/sec
[380] 14.0-15.0 sec   533 KBytes  4.37 Mbits/sec
[380] 15.0-16.0 sec   574 KBytes  4.71 Mbits/sec
[380] 16.0-17.0 sec   147 KBytes  1.20 Mbits/sec
```

图 6.1: PC 端 Iperf 开启 sever 模式

5. 在串口中运行 ble 相关命令:

   #stack_ble

   #ble_init

   #ble_start_adv 0 0 0xa0 0xa0 (发起 adv,interval 为 100ms)

```
# pa 300603924d, ce trk 6.04, action: capcode 50 -> 49
2.5021(2.2109 26.3032 4.8902) Mbps!
ble_start_adv 0 0 0xa0 0xa0
adv_type 0x0
tmp 0x0
interval min 0xa0
interval max 0xa0
Advertising started

# [    305646][□[32mINFO  □[0m: bl_sec.c: 126] random number is 983611b2
[    306485][□[32mINFO  □[0m: bl_sec.c: 126] random number is 01be97be
pa 304289910d, ce trk 5.78, action: capcode 49 -> 48
[    307336][□[32mINFO  □[0m: bl_sec.c: 126] random number is 7061f56c
[    308171][□[32mINFO  □[0m: bl_sec.c: 126] random number is 58d8b249
[    309010][□[32mINFO  □[0m: bl_sec.c: 126] random number is c7c4d058
4.5207(2.2109 22.0388 4.8902) Mbps!
[    309852][□[32mINFO  □[0m: bl_sec.c: 126] random number is 67a500b0
proc_hellow_entry: RISC-V rv32imafc
[    310689][□[32mINFO  □[0m: bl_sec.c: 126] random number is 507c4047
pa 307669003d, ce trk 5.43, action: capcode 48 -> 47
[    311526][□[32mINFO  □[0m: bl_sec.c: 126] random number is 984f5937
[    312368][□[32mINFO  □[0m: bl_sec.c: 126] random number is 312a29e0
[    313189][□[32mINFO  □[0m: bl_sec.c: 126] random number is 3f238cb7
[    314033][□[32mINFO  □[0m: bl_sec.c: 126] random number is 9be0b04b
 push back
```

图 6.2: Ble 开启 ADV

6. 手机打开 APP，扫描到设备 BL602-BLE-DEV 并连接:

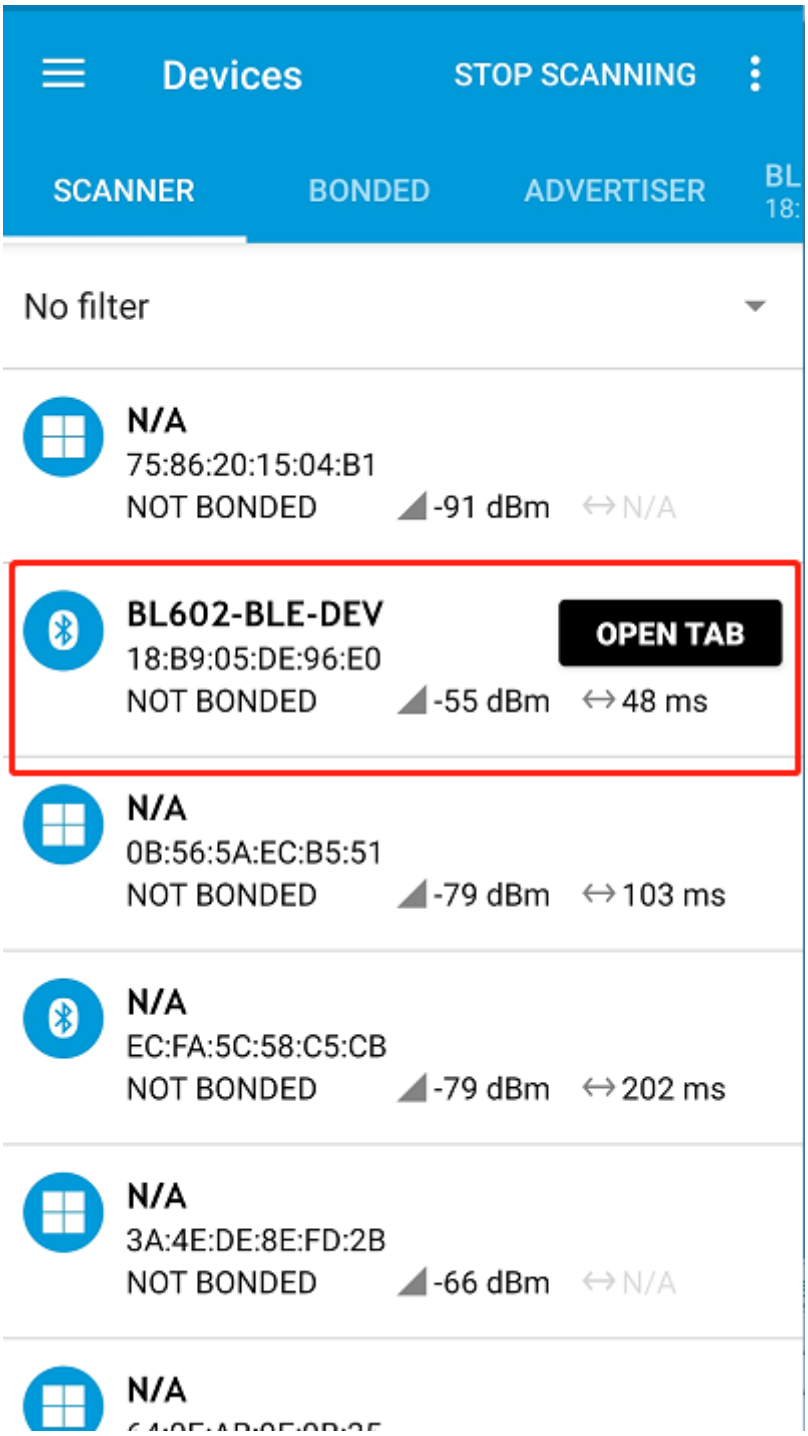


图 6.3: APP 扫描到 BLE

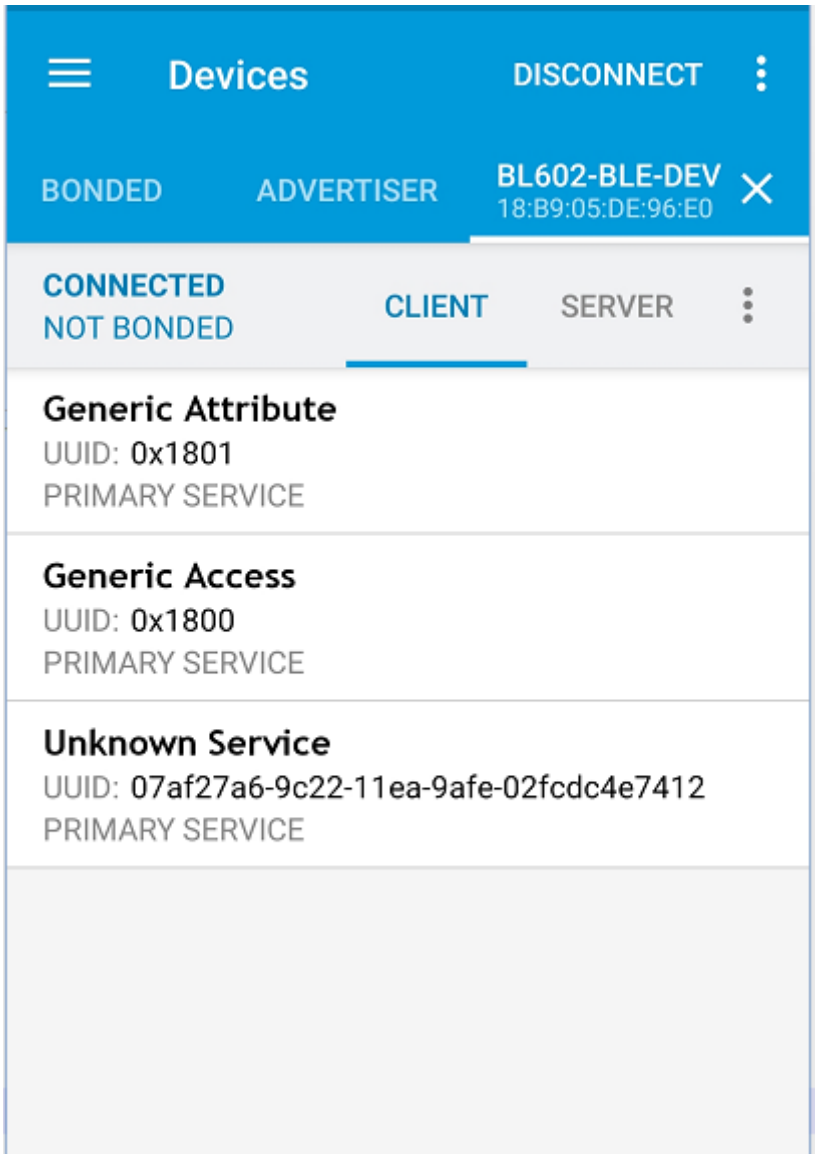


图 6.4: BLE 连接成功

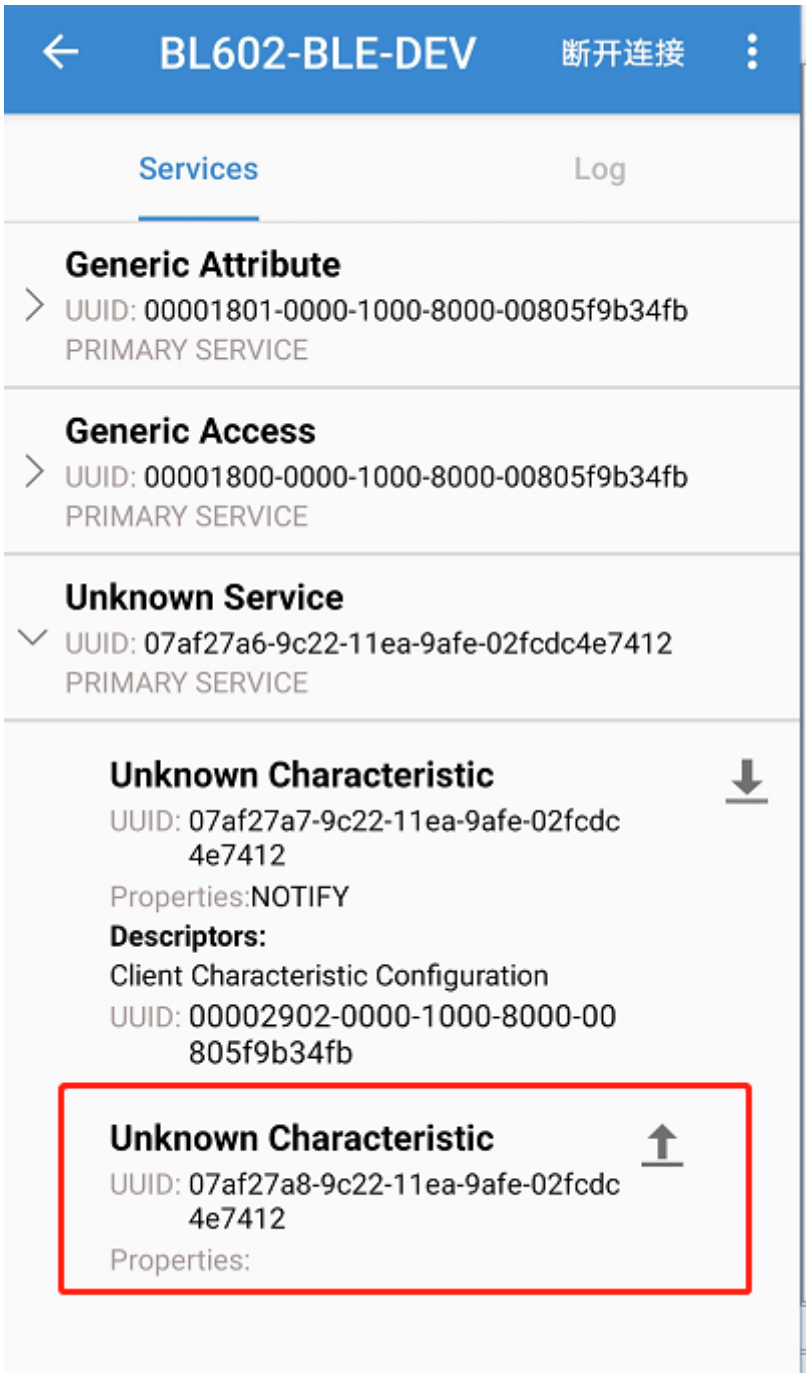
7. 连接成功后，在串口中运行 ble 连接参数更新命令：

#ble_conn_update 0x28 0x28 0x0 0x1f4 (连接 interval 为 50ms)

```
2.6620(2.2109 5.2423 4.8902) Mbps!
ble_conn_update 0x28 0x28 0x0 0x1f4
conn update initiated

# LE conn param updated: int 0x0028 lat 0 to 500
3.9912(2.2109 5.2252 4.8902) Mbps!
proc_hellow_entry: RISC-V rv32imafc
 push back
 push back
 push back
 push back
 push back
```

8. 在 APP 中找到服务特性，并且写入相应的数据：


BL602-BLE-DEV
断开连接
Services
Log
Generic Attribute
UUID: 00001801-0000-1000-8000-00805f9b34fb
PRIMARY SERVICE
Generic Access
UUID: 00001800-0000-1000-8000-00805f9b34fb
PRIMARY SERVICE
Unknown Service
UUID: 07af27a6-9c22-11ea-9afe-02fcdc4e7412
PRIMARY SERVICE
Unknown Characteristic
UUID: 07af27a7-9c22-11ea-9afe-02fcdc 4e7412
Properties:NOTIFY
Descriptors:
Client Characteristic Configuration
UUID: 00002902-0000-1000-8000-00 805f9b34fb
Unknown Characteristic
UUID: 07af27a8-9c22-11ea-9afe-02fcdc 4e7412
Properties:

9. 查看 ble 是否稳定连接，iperf 的速率是否正常