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BLE GATT Profile 数据通信示例说明

(v0.0.1)



1. BLE 相关接口(以 Watch SDK 示例说明,其他 SDK 类似)

1.1 BLE 原始数据获取:

1.1.1 BLE 命令数据获取:

<u>static void cbk_packet_handler(uint8_t packet_type, uint16_t channel, uint8_t *packet, uint16_t size)</u>, 如下图1所示:此函数包括了建立连接处理(HCI_SUBEVENT_LE_CONNECTION_COMPLETE)、断开连 接处理(HCI_EVENT_DISCONNECTION_COMPLETE)、还有 MTU(ATT_EVENT_MTU_EXCHANGE_COMPLETE) 设置等命令。

board_701n_demo	o_cfg.h × le_smartbox_multi_client.c × le_smartbox_module.c ×	
298 299 300 301	* - send a notification when the requested ATT_EVENT_CAN_SEND_NOW is received */	
302	/* LISTING START(packetHandler) : Packet Handler */	
303	static void cbk_packet_handler (uint8_t packet_type, uint16_t chargel, uint8_t *packet, uint16_t size)	
304 📮		
305	int mtu	
306	u32 tmp	
307 308	const char attribute_name	
309 白	switch packet_type	
310	case HCI_EVENT_PACKET	
311 🕀	switch hci_event_packet_get_type packet	
312		
313	/* case DAEMON_EVENT_HC1_PACKET_SENT: */	
314	/* Dreak, */	
216	CERCE ALL_DEVENT_HARDLD_VALUE_INDICATION_COMPLETED	
317	Ing Into All BURK ANDEL WEDE INFORTON CONFERENCE	
318	can be send now wake milli	
319	break	
320		
321	Case HCI_EVENT_LE_META	
322 自	switch hci_event_le_meta_get_subevent_code packet)	
323 印	case HCI_SUBEVENT_LE_CONNECTION_COMPLETE	
324	set_app_connect_type TYPE_BLE	
325	app_change_key_is_press 0 //更新模式为非app切换模式	
326	con nancie - little endian read lo packet. 4	
220	comparing into the subproving because house the subproving contrained	
320	connection_update_complete_success packet = or, ble urgent and program BLE CMD_ATT_SEND_NUTeon handle_ att nam huffer _ATT_RAM_BURGIZE_ATT_LOCAL_DAVIOAD_SIZE	
330	set ble work state BIR ST CONNECT	
331		
332	BURN(0)==(ETCOMBECTION, VERIET)	

图 1

回调注册:在 void ble_profile_init(void)函数中完成了注册,如下图 2 所示:分别把 att_server、 hci_event、l2cap、ancs_client 的消息回调都注册成了 <u>cbk_packet_handler</u>。





1.1.2 BLE 对传数据获取:

<u>static uint16 t att read callback(hci con handle t connection handle, uint16 t att handle,</u> <u>uint16 t offset, uint8 t *buffer, uint16 t buffer size)</u>, 主机所有对从机读(read)的服务都是这里处理。 回调注册在,在 void ble_profile_init(void)函数中完成了注册,如下图 3 所示:



图 3

<u>static int att_write callback(hci_con_handle_t_connection_handle, uint16_t_att_handle, uint16_t</u> <u>transaction_mode, uint16_t offset, uint8_t *buffer, uint16_t buffer_size)</u>, 主机所有对从机写(write)的服务都是这里处理。

回调注册在,在 void ble_profile_init(void)函数中完成了注册,如下图 4 所示:

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1.1.3 BLE 对传数据流程



为方便客户理解 att read callback、att write callback 作用,客户可参考下图 5 理解。



2 新建一个 BLE 服务以 Watch SDK 示例说明,其他 SDK 类似

2.1 了解什么是公用 UUID、私有 UUID? 对应服务(service)下的角色(characteristic) 应该设置什么功能?

2.1.1 公用 UUID、私有 UUID?

公用 UUID 即 SIG 已经规定好了的 UUID,若使用需要按照规定的 characteristic(属性)去添加,如 下图所示的 1800、1801、-----1812、(<u>16-bit UUID Numbers Doc</u>ument.pdf 这个文件有写了的 UUID 都 属于已经规定好了的)。私有 UUID 即没有被上述问价规定的 UUID、比方说 ae00,本次举例我使用 UUID-ae01(即 ae01 服务)。注意:这里 UUID 即代表一个 BLE 服务。

2.1.2 对应服务(service)下的角色(characteristic)主要设置以下功能。

- NOTIFY:从机可以通知主机,不检查使能通知 CCC (不需要对方回应答包,没有流控)。
- INDICATE: 从机可以指示主机,不检查使能通知 CCC (需要对方回应答包,有流控)
- READ: 主机读, 有流控
- 📕 WRITE: 主机写,有流控
- ▶ WRITE_WITHOUT_RESPOND: 主机写了不回应,没有流控 主机-->从机: READ、WRITE、WRITE_WITHOUT_RESPOND。 <u>从机-->主机:NOTIFY、INDICATE。</u> 同时用户需要考虑数据传输是否需要流控。
- 2.1 使用杰理工具生成 profile_data 并验证:
- 使用: 打开 make gatt services v1.0.4 (杰理 profile data 生成软件), 查看 make gatt services 工具说明.pdf 了解工具使用。

例子:比方说我在 gatt_profile.cfg 里面添加了一个 ae10 的私有 UUID,如下图 6 所示:再点击 gatt_inc_generator.exe 执行一下,就会生成的 gatt_profile_cfg.h 文件(即最终的 profile_data 和 handle)



PRIMARY SERVICE, 1800 CHARACTERISTIC, 2a00, READ | WRITE | DYNAMIC,

PRIMARY SERVICE, 1801 CHARACTERISTIC, 2a05, INDICATE,

PRIMARY SERVICE, ae30 CHARACTERISTIC, ae03, WRITE WITHOUT RESPONSE | DYNAMIC, CHARACTERISTIC, ae04, NOTIFY, CHARACTERISTIC, ae05, INDICATE, CHARACTERISTIC, ae10, READ | WRITE | DYNAMIC,

//set handle start 0x0080 GATT HANDLE BEGIN, 0080

PRIMARY SERVICE, ae00 CHARACTERISTIC, ae01, WRITE_WITHOUT_RESPONSE | DYNAMIC, CHARACTERISTIC, ae02, NOTIFY,

添加的服务

PRIMARY SERVICE, ae10 CHARACTERISTIC, ae11, WRITE_WITHOUT_RESPONSE | DYNAMIC CHARACTERISTIC, ae12, NOTIFY,

- 图 6
- 使用:将生成的 gatt_profile_cfg.h 里面的数据替换掉原来代码里面的 profile_data[]数组和对应 handle。如下图 7、8 所示: 替换之后可直接编译(看编译是否通过)。



图 7



0x00, 0x00	// characteristics <> handles
	//
	#define ATT_CHARACTERISTIC_2a00_01_VALUE_HANDLE 0x0003
// characteristics <> handles	#define ATT CHARACTERISTIC 2a05 01 VALUE HANDLE 0x0006
Addine ATT CHARACTERISTIC 2:00 OF VALUE HANDLE 0:0008	#define ATT_CHARACTERISTIC_2a05_01_CLIENT_CONFIGURATION_HANDLE 0x0007
#define ATT CHARACTERISTIC 2005 01 VALUE MANDLE 0x0006	define ATT CHARACTERISTIC ae03 01 VALUE HANDLE 0x000a
#define ATT_CHARACTERISTIC_2#05_01_CLIENT_CONFIGURATION_HANDLE 0	#define ATT_CHARACTERISTIC_ae04_01_VALUE_HANDLE 0x000c
#define ATT_CHARACTERISTIC_ae03_01_VALUE_HANDLE_0x000a	#define ATT_CHARACTERISTIC_ae04_01_CLIENT_CONFIGURATION_HANDLE 0x000d
deFine ATT_CHARACTERUSTIC_ge04_01_VALUE_HAMITLE_0x000c	#define ATT_CHARACTERISTIC ae05_01_VALUE_HANDLE 0x000f
FORTING ATT_VORMATIONED/TIC_REV4_VL_CORENT_CONFIGURATION_ERMEND; V. FORESHED ATT_UNARACTURPICTIC_REV5_01_VENTUR_MANDLE_DAVADAR	#define ATT_CHARACTERISTIC_ae05_01_CLIENT_CONFIGURATION_HANDLE 0x0010
#define ATT CHARACTERISTIC and 5 OL CLIENT CONFIGURATION RANDOLE ()	#define ATT_CHARACTERISTIC_ae10_01_VALUE_HANDLE 0x0012
#define ATT CHARACTERISTIC ae10 01 VALUE HANDLE 0x0012	#define ATT CHARACTERISTIC ae01 01 VALUE HANDLE 0x0082
#define ATT_CHARACTERISTIC_se01_01_VALUE_HANDLE 0z0002	#define ATT_CHARACTERISTIC_ae02_01_VALUE_HANDLE 0x0084
#Geffine ATT_CHARACTERISTIC_a602_01_VALUE_HANDLE_0x0004	#define ATT CHARACTERISTIC ae02 01 CLIENT CONFIGURATION HANDLE 0x0085
#define ATT_CHARACTERISTIC acts_of_CLENT_CONFIGURATION_HANDLE ()	#define ATT_CHARACTERISTIC_ae11_01_VALUE_HANDLE 0x0088
PORTINE ATL VERYAGINGTONIA SELLUL VELUS HANDLE VZVVOO Revenue Voor onkervoorgenoorge velus on value avantet Gevoore	#define ATT_CHARACTERISTIC_ae12_01_VALUE_HANDLE 0x008a
Refine ATT_CHARACTERISTIC_ac12_01_CLIENT_CONFIGURATION_HANDLE 0.	#define ATT_CHARACTERISTIC_ae12_01_CLIENT_CONFIGURATION_HANDLE 0x008b

- <u>简述 nrf 使用</u>:
- 此时再<u>通过连接手机验证新加的 BLE 服务是否能被手机识别(确保添加服务正常)</u>:
 - 1) 、将板子连接手机 nrf
 - 2)、再对比改服务前和后是否新增自己修改的服务:如下图 9 所示就是我添加的 AE10 的服务。



2.2 在 write_callback、read_callback 中新增处理此服务的接口(说明:这两个即服务回 调函数,一般不做更改):

注意:生成的 <u>handle</u>有什么作用呢?说明:设备在连接后想要操作某个服务就直接对它 <u>handle</u> <u>AC63XXN</u> All information provided in this document is subject to legal disclaimers © JL.V. 2019. All rights reserved. **User manual Rev0.0.1—2022/11/11 7**of**18**



操作即可。下面举例也是直接操作 handle 去接收和发送消息(相当于生成的 handle 就是每一个 UUID 的名字/标签)。

NOTIFY: 从机通知主机。 notify 的 handle 有两个 (如下图 10 所示 VALUE HANDLE、 CLIENT_CONFIGURATION_HANDLE),两个 handle 的代码都需要添加。

VALUE_HANDLE: 可调用此接口通知主机(如下图 11 所示使用,这个就是发送接口: 对应 的参数分别是: 服务对应 value handle、发送数据地址、发送数据长度、以什么方式发送《可 <u>以参考 att.h 中 att op type e 结构体,默认可选择 ATT OP NOTIFY</u>)。客户使用即在需要的 地方添加 app send user data(...)。

CLIENT CONFIGURATION_HANDLE: 主机使能 notify, 此 hanle 放到 write_callback、read_callback 中(如下图_12 (att_write_callback)、13 (att_read_callback)所示添加 case 即可(分别只需要 <u>添加 case ATT CHA...HANDLE:一行代码)</u>), 主机使能会调用这个 case 执行 att_set_ccc_config 进行使能、和 att_get_ccc_config 获取 ccc 配置。



app_send_user_data ATT_CHARACTERISTIC_ae12_01_VALUE_HANDLE_data lenv ATT_OP_NOTIFY tatic int app_send_user_data u16 handle, u8 #data, u16 len, u8 handle_type u32 ret - APP BLE NO ERROR if (lcon_handle) | return APP_BLE_OPERATION_ERROR ret = ble_user_cmd_prepare BLE_CMD_ATT_SEND_DATA. 4. handle. data len. handle_type) if (ret == BLE_BUFFER_FULL)
 ret = APP_BLE_BUFF_FULL

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INDICATE:从机指示主机。它和 NOTIFY 代码添加一致,且也是具有两个 handle。和 NOTIFY 唯 一的不同即 INDICATE 发送数据给主机具有流控。

▶ WRITE: 主机写到从机。

VALUE_HANDLE: 这个 handle 会放到 write_callback 里,如下图 14: 添加在 att_write_callback 函数里: ①添加具有 write 功能的 case (即下图"添加服务 handle")。②添加执行代码,比如下 图代码执行将主机发过来的数据保存在 test_read_write_buf 数组里面 (用户可自行修改)。

4 Charles	JL_rcsp_auth_reset();	
+615E		
	<pre>set_ble_work_state BLE_ST_NOTIFY_I check_connetion_updata_deal log_info '\nwrite coc:%04x, att_set_ccc_config handle buffer can_send_now_wakeup ') break</pre>	DICATE %02x\n", handle, buffer 0]}; . 0]; : # Thundle
cas	ATT_CHARACTERISTIC_ae10_01_VALUE	HANDLE
	if offset tmpl6 offset break off the tmpl6 offset	buffer_size) tmp16 (Cil来的风乐所存在test_read
	memcpy itest_read_write_buf offset	. buffer, buffer_size),



F READ: 主机读取从机。

VALUE_HANDLE: 这个 handle 会放到 read_callback 中,如下图 15 添加在 att_write_callback 函数里: ①添加具有 read 功能的 case(即下图添加服务 handle)。②以及添加执行代码(用户可自行修改)。

log_info ^r read_callback	, handle= 0x%04x,buffer= %08x\n	_ handle, <u>1</u> u32 buffer)	ά.	
switch handle case ATT_CHARACTERISTI att_value_len str	C_2a00_01_VALUE_HANDLE: len gap_device_namelo		d_callback	
if (Poffset >= att <u>.</u> break	value_len offset + buffer_	size) > att_value_len	4	•
if buffer memcpy buffer att_value_len log_info	gap_device_name offset buffe buffer_size read gap_name: %s \n″ gap_d	r_size		v
case ATT_CHARACTERISTI att_value_len si if offset att_ break	2 ae10_01_VALUE HANDIR cool test_read_write_buf value_len offset buffer_	size) att_value_len	ť	
if buffer memcpy buffer att_value_len	test_read_write_buf_offset, b buffer_size	uffer_size		
break				
)		

▶ WRITE_WITHOUT_RESPOND: 主机写了不回应。

VALUE_HANDLE:和 WRITE 一样,不同是 WRITE_WITHOUT_RESPOND 无流控。

图 15



3 nrf 使用

● 自定义的 profile 配情	置如下:
	1800
TRIMARI_SERVICE,	
CHARACTERISTIC,	2a00, READ WRITE DYNAMIC,
PRIMARY_SERVICE,	1801
CHARACTERISTIC,	2a05, INDICATE,
//set_handle_sta	rt_{0x0080}
CATT HANDLE DECL	N 0090
GATT_HANDLE_BEGT	ν, 0080
PRIMARY_SERVICE,	ff00
CHARACTERISTIC,	ff01, READ DYNAMIC,
CHARACTERISTIC,	ff02, READ WRITE DYNAMIC,
CHARACTERISTIC,	ae03, NOTIFY,
● ADD 揭作庙田	
操作时保证目标板	固件程序在运行,并连接上打印信息。
app 为使用第三方的	的软件 nRF Master Control Panel(BLE),可以从应用宝商城下载,
如下图:	



搜索设备

打开 app,进入搜索 ble 设备的界面,点击 scan 那就可以搜到一个 LE Counter 的设备,如下图:





的广播信息和 server 服务的信息,如下图:







app 看到的是 128bit 长的 UUID,其实等同于 16bit 的 UUID。

转换方法:

其中 ABCD 就是 16bit 的 UUID 的值

♦ server 的服务信息

自定义的服务 UUID 为 0xFF00

点击 0xFF00 服务 展开服务信息

	中国移动 🞯 🗷 🖻	*	ତି ╫ 85% 🔲	11:39
	\equiv Devices		DISCONNECT	:
	BONDED AD	/ERTISER	-E COUNTER 54:36:98:BA:3A:2E	×
	CONNECTED NOT BONDED	CLIENT	SERVER	:
	Unknown Service	e 00-1000-8000-	00805f9b34fb	
	Unknown Char UUID: 0000ff01-0000-1 Properties: READ	- acteristic 000-8000-008	05f9b34fb	+
	Unknown Char UUID: 0000ff02-0000-1 Properties: READ	- acteristic 000-8000-008 , WRITE	● 05f9b34fb	<u>+</u>
	Unknown Char UUID: 0000ff03-0000-1 Properties: NOTII Descriptors:	• acteristic 000-8000-008 =Y	05f9b34fb	<u>+++</u>
	Client Characteris UUID: 0x2902	stic Configurat	ion	+
	\triangleleft	0		
	服务下的属	生		
	UUID 0xFF0)1 扂	昌性 read	
J		All inform	ation provid	ed in i

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UUID 0xFF02 属性 read write

UUID 0xFF03 属性 notify

- ◆ 服务属性的操作
 - ◆ UUID 0xFF01 属性 read

其对应固件程序 handle 值 ATT_CHARACTERISTIC_FF01_01_VALUE_HANDLE 的 read 操作

read 代码操作,如下图:



read 内容值定义,如下图:

static const uint8_t test_read_value[] = {0x01,0x02};

点击 0xFF01 属性项 read, 操作 read, 如下图:

← ■1850 ● ● ■ ●		←■ISAD © ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ●				★ (a), (b), (c), (c), (c), (c), (c), (c), (c), (c		中国移动 ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ●				
■ Devices DISCONNECT : BONDED ADVERTISER LE COUNTER 5436.98 BAJAAZE CONNECTED NOT BONDED CLIENT SERVER : UUID: 0000ff00-0000-1000-8000-00805f9b34fb PRIMARY SERVICE UUID: U000ff01-0000-1000-8000-00805f9b34fb PRIMARY SERVICE ↓ UUID: 0000ff01-0000-1000-8000-00805f9b34fb Properties: READ Value: (0x) 01-02 Unknown Characteristic ↓	■ Devices DISCONNECT : BONDED ADVERTISER LE COUNTER 54/36/98/BA/3A/2E CONNECTED NOT BONDED CLIENT SERVER : UNID: 0000ff00-0000-1000-8000-00805f9b34fb F/MARY SERVICE UND:: 0000ff01-0000-1000-8000-00805f9b34fb ↓ Value: (0x) 01-02 UNKnown Characteristic ↓ UUD:: 0000ff02-0000-1000-8000-00805f9b34fb ↓ ↓ Value: (0x) 01-02 UNKnown Characteristic ↓ ↓ UUD:: 0000ff02-0000-1000-8000-00805f9b34fb ↓ ↓ ↓	E Devices DISCONNECT : BONDED ADVERTISER LE COUNTER 54:36:98:BA:3A:ZE × CONNECTED NOT BONDED CLIENT SERVER : Unknown Service SERVER : : UDID: 0000ff0:0000-1000-8000-00805f9b34fb * : PRIMARY SERVICE Image: Counter Service * : UDID: 0000ff0:0000-1000-8000-00805f9b34fb * : Value: (k) 01-02 Image: Counter Service * * UUID: 0000ff0:20000-1000-8000-00805f9b34fb * * * UUID: 0000ff0:20000-1000-8000-00805f9	■ Devices DISCONNECT : BONDED ADVERTISER LE COUNTER 5436.98.BA3AZE × CONNECTED NOT BONDED CLIENT SERVER : UNIC: 0000ff00-0000-1000-8000-00805f9b34fb : : PRIMARY SERVICE Unic: • • UUID: 0000ff01-0000-1000-8000-00805f9b34fb • • Properties: READ WITE • • UUID: 0000ff01-0000-1000-8000-00805f9b34fb • • Properties: READ • • • UUID: 0000ff01-0000-1000-8000-00805f9b34fb • • Properties: READ, WRITE • • • UUID: 0000ff01-0000-1000-8000-00805f9b34fb • • UUID: 0000ff01-0000-1000-8000-00805f9b34fb • • Properties: READ, WRITE UNROWN Characteristic • • UUID: 0000ff01-000-1000-8000-00805f9b34fb • • UUID: 0000ff01-000-1000-8000-00805f9b34fb • • UUID: • • • • UUID: •	■ Devices DISCONNECT : BONDED ADVERTISER LE COUNTER 5436.988.BAJAAZE × CONNECTED NOT BONDED CLIENT SERVER : UUID: 0000ff00-0000-1000-8000-00805f9b34fb : : PRIMARY SERVICE ✔ . . UUID: 0000ff00-0000-1000-8000-00805f9b34fb ↓ . . Properties: READ ✓ . . . UUID: 0000ff02-0000-1000-8000-00805f9b34fb ✓ . . O000ff02-0000-1000-8000-00805f9b34fb . . . UUID: 0000ff02-0000-1000-8000-00805f9b34fb . . . UUID: 0000ff02-0000-1000-8000-008005f9b34fb . . </td <td>■ Devices DISCONNECT BONDED ADVERTISER LE COUNTER 54/36/98/BAJA/2E CONNECTED NOT BONDED CLIENT SERVER UND: 0000ff00-0000-1000-8000-00805f9b34fb PRIMARY SERVICE ✔ UUD: 0000ff00-0000-1000-8000-00805f9b34fb Properties: READ ✔ Value: (0x) 01-02 ✔ UDD: 0000ff02-0000-1000-8000-00805f9b34fb Properties: READ ✔ UUD: 0000ff02-0000-1000-8000-00805f9b34fb Properties: READ, WRITE ✔ UUD: 0000ff03-0000-1000-8000-00805f9b34fb Properties: NCTIFY ₽ Descriptors: E Contracteristic Configuration ✔</td> <td>Devices DISCONNECT BONDED ADVERTISER LE COUNTER Sadde gue BACGACE CONNECTED NOT BONDED CLIENT Server Unic coondroomoo-tooe-tooe-tooe-tooesosf9b34fb Properties: RADW UID: 0000ff02-0000-1000-8000-00805f9b34fb Properties: Nations Value: (WID: 0000ff22-0000-1000-8000-00805f9b34fb Properties: READ Value: 0000ff22-0000-1000-8000-00805f9b34fb Properties: READ, WRITE: UID: 0000ff23-0000-1000-8000-00805f9b34fb Properties: READ, WRITE: UID: 0000ff23-0000-1000-8000-00805f9b34fb Properties: Nenown Characteristic UID: 0000ff23-0000-1000-8000-00805f9b34fb Properties: Nenown Characteristic UID: 0000ff23-0000-1000-8000-00805f9b34fb Properties: Nenown Characteristic UID: 0000ff23-0000-1000-8000-00805f9b34fb Properties: Disconteristic UID: 0000ff23-0000-1000-8000-00805f9b34fb Properties: Disconteristic UID: 0000ff23-0000-1000-8000-00805f9b34fb Properties: Disconteristic UID: 0000ff23-0000-1000-8000-00805f9b34fb</td> <td>■ Devices DISCONNECT : BONDED ADVERTISER LE COUNTER Saddo 988 BAJAAZE CONNECTED CLENT SERVER : DISCONNECTED UUID: 000000000-8000-00805f9b34fb PRIMARY SERVICE UUID: 0000ff00-0000-1000-8000-00805f9b34fb Properties: READ Value: (0x) 01-02 Unknown Characteristic · · · · UUID: 0000ff02-0000-1000-8000-00805f9b34fb Properties: READ Value: (0x) 01-02 Unknown Characteristic · · · · UUID: 0000ff02-0000-1000-8000-00805f9b34fb Properties: READ, WRITE UUID: UUID: 0000ff02-0000-1000-8000-00805f9b34fb Properties: NOTIFY Descriptors: Client Characteristic Configuration · · UUID: 0x2902</td> <td>■ Devices DISCONNECT : BONDED ADVERTISER LE COUNTER Safas gas BAJACE × CONNECTED LIENT SERVER : CONNECTED LIENT SERVER : DISCONNECT: UID: 0000ff00-0000-1000-8000-00805f9b34fb Primary SERVICE UID: 0000ff00-0000-1000-8000-00805f9b34fb Properties: READ Value: (0x) 01-02 Unknown Characteristic</td> <td></td> <td>中国移动 🔘 🗷 🖻</td> <td>\$ © 111 85% 🔲 1</td> <td>11:40</td>	■ Devices DISCONNECT BONDED ADVERTISER LE COUNTER 54/36/98/BAJA/2E CONNECTED NOT BONDED CLIENT SERVER UND: 0000ff00-0000-1000-8000-00805f9b34fb PRIMARY SERVICE ✔ UUD: 0000ff00-0000-1000-8000-00805f9b34fb Properties: READ ✔ Value: (0x) 01-02 ✔ UDD: 0000ff02-0000-1000-8000-00805f9b34fb Properties: READ ✔ UUD: 0000ff02-0000-1000-8000-00805f9b34fb Properties: READ, WRITE ✔ UUD: 0000ff03-0000-1000-8000-00805f9b34fb Properties: NCTIFY ₽ Descriptors: E Contracteristic Configuration ✔	Devices DISCONNECT BONDED ADVERTISER LE COUNTER Sadde gue BACGACE CONNECTED NOT BONDED CLIENT Server Unic coondroomoo-tooe-tooe-tooe-tooesosf9b34fb Properties: RADW UID: 0000ff02-0000-1000-8000-00805f9b34fb Properties: Nations Value: (WID: 0000ff22-0000-1000-8000-00805f9b34fb Properties: READ Value: 0000ff22-0000-1000-8000-00805f9b34fb Properties: READ, WRITE: UID: 0000ff23-0000-1000-8000-00805f9b34fb Properties: READ, WRITE: UID: 0000ff23-0000-1000-8000-00805f9b34fb Properties: Nenown Characteristic UID: 0000ff23-0000-1000-8000-00805f9b34fb Properties: Nenown Characteristic UID: 0000ff23-0000-1000-8000-00805f9b34fb Properties: Nenown Characteristic UID: 0000ff23-0000-1000-8000-00805f9b34fb Properties: Disconteristic UID: 0000ff23-0000-1000-8000-00805f9b34fb Properties: Disconteristic UID: 0000ff23-0000-1000-8000-00805f9b34fb Properties: Disconteristic UID: 0000ff23-0000-1000-8000-00805f9b34fb	■ Devices DISCONNECT : BONDED ADVERTISER LE COUNTER Saddo 988 BAJAAZE CONNECTED CLENT SERVER : DISCONNECTED UUID: 000000000-8000-00805f9b34fb PRIMARY SERVICE UUID: 0000ff00-0000-1000-8000-00805f9b34fb Properties: READ Value: (0x) 01-02 Unknown Characteristic · · · · UUID: 0000ff02-0000-1000-8000-00805f9b34fb Properties: READ Value: (0x) 01-02 Unknown Characteristic · · · · UUID: 0000ff02-0000-1000-8000-00805f9b34fb Properties: READ, WRITE UUID: UUID: 0000ff02-0000-1000-8000-00805f9b34fb Properties: NOTIFY Descriptors: Client Characteristic Configuration · · UUID: 0x2902	■ Devices DISCONNECT : BONDED ADVERTISER LE COUNTER Safas gas BAJACE × CONNECTED LIENT SERVER : CONNECTED LIENT SERVER : DISCONNECT: UID: 0000ff00-0000-1000-8000-00805f9b34fb Primary SERVICE UID: 0000ff00-0000-1000-8000-00805f9b34fb Properties: READ Value: (0x) 01-02 Unknown Characteristic		中国移动 🔘 🗷 🖻	\$ © 1 11 85% 🔲 1	11:40
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read 代码操作,如下图:





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■ Devices		DISCONNECT					
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CONNECTED NOT BONDED	CLIENT	SERVER	* *				
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Unknown Characteristic UID: 0000ff01-0000-1000-8000-00805f9b34fb Properties: READ Value: (0x) 01-02							
Unknown Characteristic ▲ UUID: 0000ff02-0000-1000-8000-00805f9b34fb Properties: READ, WRITE Value: (0x) 61-62-63-64-00-00-00-00-00-00-00-00-00-00-00-00-00							
Unknown Character UUID: 0000ff03-0000-1000-8 Properties: NOTIFY Descriptors:	eristic 3000-008	05f9b34fb	₩				
			+				

如果要更数据内容,就要使用 write 1的操作,点击

进入写入数据界面操作,比如输入2个byte 65535 (0xFFFF),按 SEND 写入,如下图:

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操作写入 0xFFFF, 如下图:



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		LE CO 54:36:9	UNTER 98:BA:3A:2E	×				
CONNECTED NOT BONDED	CLIE	NT S	ERVER	:				
Unknown Service UUID: 0000ff00-0000-1000-8000-00805f9b34fb PRIMARY SERVICE								
Unknown Characteristic UUID: 0000ff01-0000-1000-8000-00805f9b34fb Properties: READ								
Unknown Characteristic UUID: 0000ff02-0000-1000-8000-00805f9b34fb Properties: READ, WRITE Value: (0x) FF-FF								
Unknown Characteristic UUID: 0000ff03-0000-1000-8000-00805f9b34fb Properties: NOTIFY								
Descriptors: Client Chara UUID: 0x290	: cteristic Configu 12	ration		+				
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然后通过 read - 来获取 server 端的数据 ,更新值,如下图::

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Unknown Service UUID: 0000ff00-0000-1000- PRIMARY SERVICE	-8000-00)805f9b34fb		Y
Unknown Characteris UUID: 0000ff01-0000-1000-800 Properties: READ	stic)0-0080!	5f9b34fb	+	
Unknown Characteris UUID: 0000ff02-0000-1000-800 Properties: READ, WRITE Value: (0x) FF-FF-63-64-0 0-00-00-00-00-00-00-00	stic 00-00809 0-00-00	<u>↓</u> 5f9b34fb ∙00-00-00-00	-00-0	
Unknown Characteris UUID: 0000ff03-0000-1000-800 Properties: NOTIFY Descriptors:	stic)0-0080	5f9b34fb	<u> +++</u>	
Client Characteristic Cont UUID: 0x2902	figuratio	n	+	
)			
♦ UUID 0xFF0	3	属性 n	otif	у
notify 是订函和	计通车口	T力台的	작목	围盘

notify 是订阅和通知功能,对应固件程序 handle 值

ATT_CHARACTERISTIC_FF03_01_VALUE_HANDLE

和 ATT_CHARACTERISTIC_FF03_01_CLIENT_CONFIGURATION_HANDLE 的操作。

订阅操作代码,如下图:





定义推送通知操作代码,如下图::



定义内容定义如下:

s <mark>tatic</mark>	<pre>char counter_string[20];</pre>	
static	<pre>int counter_string_len;</pre>	
点击 0xFF	03 属性项,操作 notify,如下	
点击 些,	就打开 notify 的通知订阅功能,获取 server 的通知信息,如下	图:
中国移动 🛛 🗷 🖻	≹ 🛈 ७ तैं।। 92% 💌 14:24 DISCONNECT 🚦	



退出软件的连接界面,就会断开与设备的连接。

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