



## **QTool User Manual**

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**Version 1.0**

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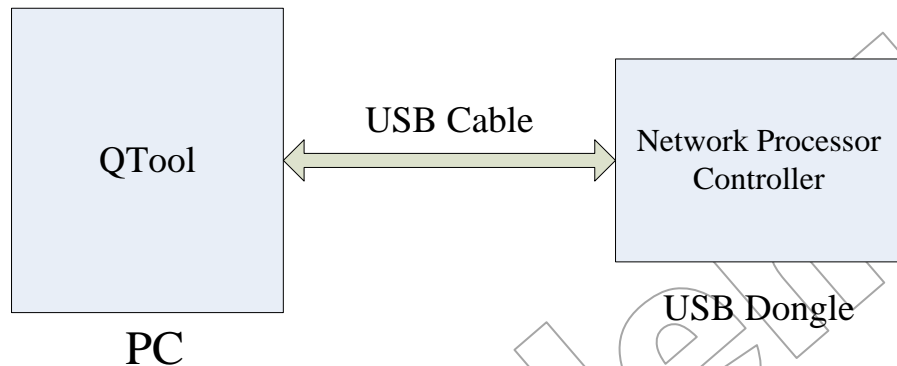
# 1. Overview

QTool is a visual PC based application that allows a user to form a connection between two BLE devices. It helps the developers to evaluate Quintic's BLE devices. QTool works by communicating with the BLE devices through a serial port, acting as a network processor by using Quintic ACI commands.

## 1.1 Getting Started

Before you start QTool, please do the following preparations:

1. Insert the Quintic's BLE USB dongle in the computer's USB port.
2. If the BLE chip's version is B0, then download the "np\_controller\_v18.bin" file (in the directory: QBlue installation path \BinFiles) to Quintic's BLE USB dongle by using QnISPStudio tool. If the BLE chip's version is B1, please download the "np\_controller\_v20.bin" file. More information of QnISPStudio tool, please refer to "ISP Studio Manual v0.6.pdf".



**Figure 1 Connection**

## 2. Main Window Description

The main window consists of following components as shown in Figure 2.

1. Menu bar
2. Toolbar
3. Central window, including Device window, trace window and setting window.
4. Status bar

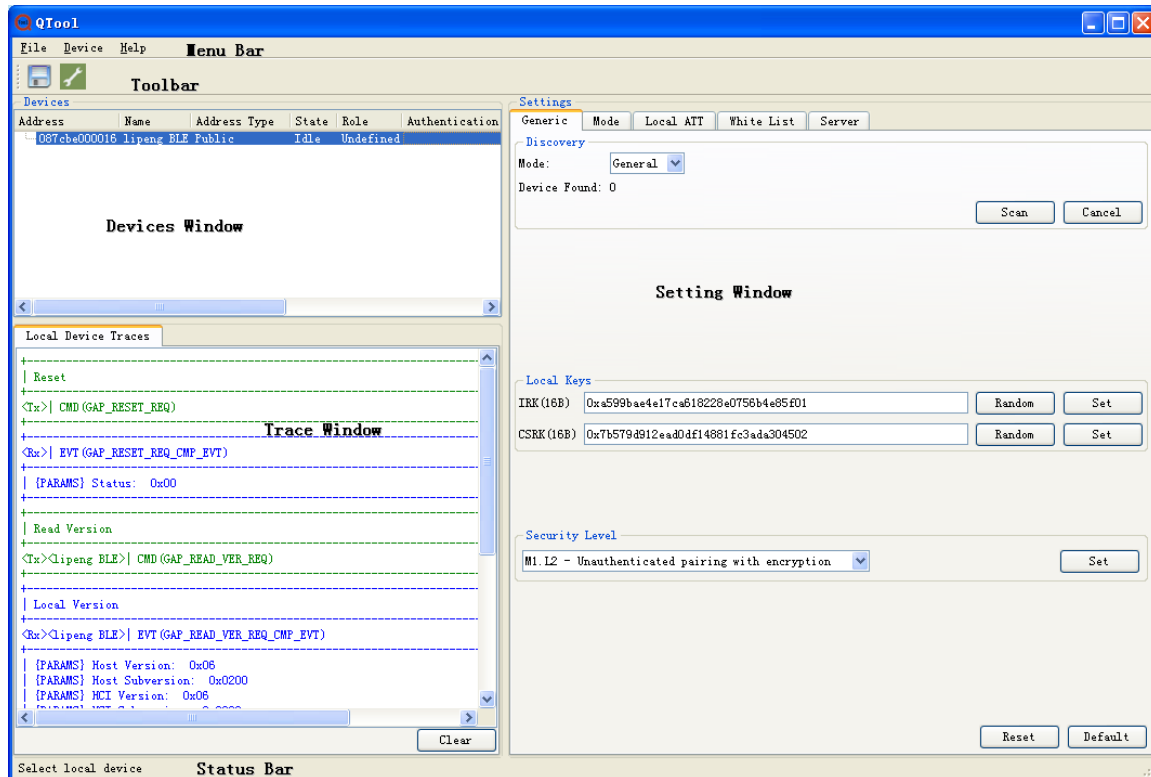
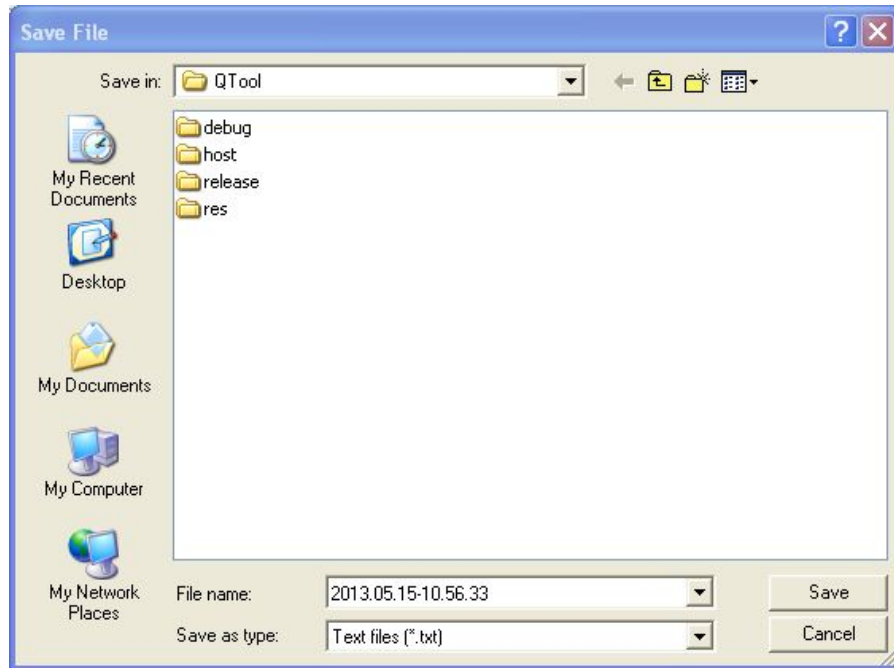


Figure 2 Main Window

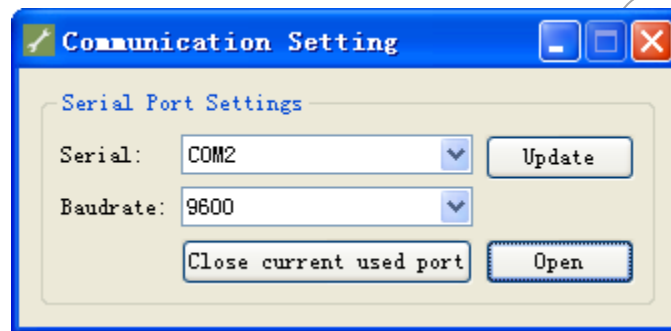
### 2.1 Menu Bar

In the "File" menu, selecting "Save As", you can save the current Trace information as shown in Figure 3.



**Figure 3 Save As Dialog**

In the “Device” menu, selecting “Setting”, it pops up a dialog as shown in Figure 4.



**Figure 4 Serial Setting Dialog**

[Name]: BLE local device name, shown in Device Window as well.

[Serial]: The current available serial ports.

[Baud rate]: Serial’s baud rate, default value is 9600.

[Update]: refresh the available serials.

[Close]: Close the current opened serial.

## 2.2 Toolbar

The first icon in the tool bar is used to save the trace information, as same as the “Save As” menu.

The second icon is used for setting serial ports, as same as the “Setting” in the “Device” menu.

## 2.3 Central Window

On the central window you could see three sub windows: Devices Window, Trace Window and Setting Window.

The devices window is used to show the all the devices (both local devices and remote devices). When you click on a device item, you will see its Setting Window.

The trace window shows the information parsed from the original data devices sending and receiving.

The setting window is used to show and change the setting information of devices, as well as the work modes and parameters.

## 2.4 Status bar

The status bar shows the current operation's status or results.

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### 3. Devices Window

The devices window is shown in Figure 5 below.

| Address      | Name        | Address Type | State       | Role      |
|--------------|-------------|--------------|-------------|-----------|
| 087cbe001003 | Quintic BLE | Public       | Connected   | Master    |
| 087cbeba0000 | Quintic BLE | Public       | Advertising | Undefined |
| 087cbe000016 |             | Public       | Connected   | Slave     |

Figure 5 Devices Window

The first item shows the information about the local device. And the other items (max 8) are the remote devices.

[Address]: Bluetooth address

[Name]: Local device: setting name, remote device: adv name (friendly name)

[Address Type]: Public or Random

[State]: Idle, Scanning, Connecting, Connected, Bonding, Bonded, Advertising.

[Role]: Master or Slave

[Authentication]: Enable or Disable

[Encrypt]: Enable or Disable



## 4. Setting Window

There are two kinds of setting window: the local device setting window and the remote device setting Window.

### 4.1 Local Device Setting Window

There are five kinds of local device setting tab: the “Generic” tab, the “Mode” tab, the “Local ATT” tab, the “White List” tab, and the “Server” tab.

#### 4.1.1 Generic Tab

The “Generic” tab as the figure 6 shows:

**Settings**

Generic Mode Local ATT White List Server

**Discovery**

Mode: General

Device Found: 0

Scan Cancel

**Local Keys**

|            |                                    |        |     |
|------------|------------------------------------|--------|-----|
| IRK (16B)  | 0xa599bae4e17ca618228e0756b4e85f01 | Random | Set |
| CSRK (16B) | 0x7b579d912ead0df14881fc3ada304502 | Random | Set |

**Security Level**

M1.L2 - Unauthenticated pairing with encryption

Set

Reset Default

**Figure 6 Local Devices Setting Window**

Three groups (Discovery, Local Keys and Security Level) and two buttons (the “Reset” button and the “Default” button) are in the “Generic” tab.

[Reset]: This button used for GAP reset.

[Default]: Click this button to reset the configurations in this tab to default values.

#### **4.1.1.1 Discovery Group**

[Mode]: Scan mode

[Scan]: Click this button to search devices.

[Cancel]: Click this button to stop the current inquiry.

#### **4.1.1.2 Local Keys Group**

[IRK]: Identity Resolving Key (IRK) is a 128-bit key used to generate and resolve random addresses.

[CSRK]: Connection Signature Resolving Key (CSRK) is a 128-bit key used to sign data and verify signatures on the receiving device.

[Random]: Create a random number.

[Set]: Set the IRK or CSRK.

#### **4.1.1.3 Security Group**

[Set]: Click this button to set the Security Level.

### **4.1.2 Mode Tab**

The “Mode” tab, as the figure 7 shows:

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The screenshot shows the 'Settings' window with the 'Mode' tab selected. The 'Modes' section contains three sub-sections: 'Discoverability Modes' with radio buttons for 'Non-discoverable', 'Limited Discoverable', and 'General Discoverable' (selected); 'Connectability Modes' with radio buttons for 'Non-connectable' and 'Connectable' (selected); and 'Bondable Modes' with radio buttons for 'Non-bondable' and 'Bondable' (selected). A 'Set' button is located to the right of the 'Bondable Modes' section. The 'Advertising' section includes a 'Type' group with radio buttons for 'Connectable Undirected' (selected), 'Connectable Directed', 'Scannable Undirected', and 'Non-connectable Undirected'. To the right of the 'Type' group are two spinners for 'Interval Min(ms):' and 'Interval Max(ms):', both set to 100. Below these is a 'Direct Address' section with radio buttons for 'Public' (selected) and 'Random', and a text field containing '0x887cbe000101'. The 'Channel Map' section has a list of channels: 'Channel 37', 'Channel 38', and 'Channel 39', each with a checked checkbox. Below the channel map are two text fields: 'Advertising Data' with '0x020106' and 'Scan Response' with '0x'. At the bottom right of the 'Advertising' section are 'Advertising' and 'Stop' buttons. A 'Default' button is located at the bottom right of the entire window.

Figure 7 Mode Tab

Two Groups (the Modes Group and the Advertising Group) and a “Default” button are in this tab. [Default]: Click this button if you want to reset the configurations in this tab to default values.

#### 4.1.2.1 Modes Group

[Non-discoverable]: Non-discoverable Mode. The Bluetooth device shall never be discovered.

[Limited Discoverable]: Limited Discoverable Mode: Discoverable only for a limited period of time.

[General Discoverable]: General Discoverable Mode: Discoverable continuously.

[Non-connectable]: A device in the non-connectable mode shall not allow a connection to be established. Two advertising type: Scannable Undirected and Non-connectable Directed

[Connectable]: A device in the directed connectable mode shall accept a connection request. Two advertising type: Connectable Undirected and Connectable Directed

[Non-bondable]: A device in the non-bondable mode does not allow a bond to be created with a peer device.

[Bondable]: A device in the bondable mode allows a bond to be created with a peer device in the bondable mode.

[Set]: Set Bondable mode.

#### 4.1.2.2 Advertising Group

[Connectable Undirected]: Connectable undirected advertising

[Connectable Directed]: Connectable directed advertising

[Scannable Undirected]: Scannable undirected advertising

[Non-connectable Undirected]: Non connectable undirected advertising

[Interval Min(ms)]: Minimum advertising interval for non-directed advertising.

[Interval Max(ms)]: Maximum advertising interval for non-directed advertising.

[Public]: Public Device Address (default).

[Random]: Random Device Address

[Channel 37]: Enable channel 37 use.

[Channel 38]: Enable channel 38 use.

[Channel 39]: Enable channel 39 use.

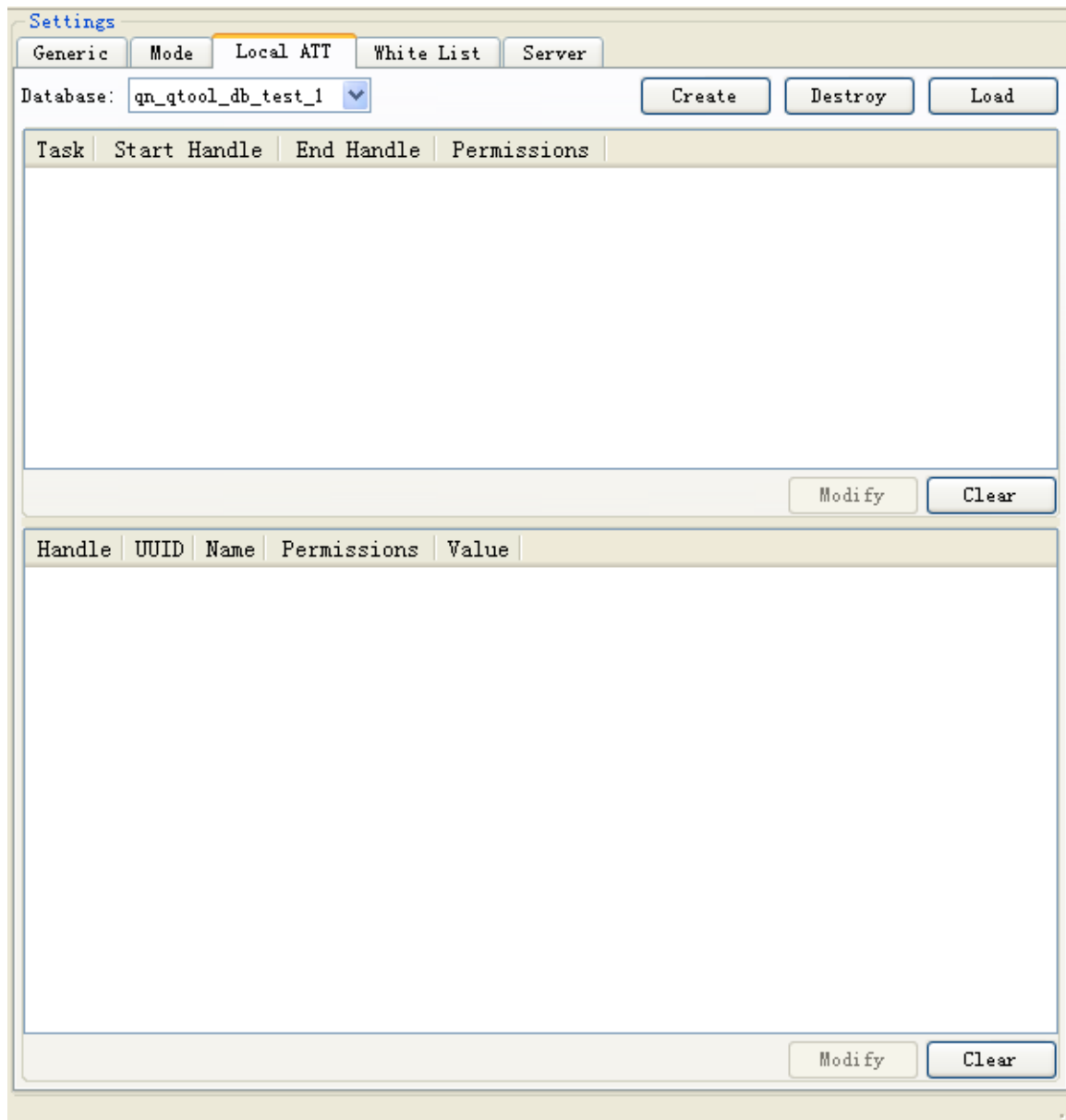
[Adv. Data]: Set advertising data.

[Scan Resp.]: Set scan response data.

[Advertising]: Start advertising.

[Stop]: Stop advertising.

#### 4.1.3 Local ATT Tab



**Figure 8 Local ATT Tab**

[Database]: Choose a service database.

[Create]: Create the current selected database.

[Destroy]: Destroy the current selected service database.

[Load]: Load the current selected service database.

The service table widget:

[Task]: Task id: TASK\_GAP/ TASK\_GATT

[Start Handle]: Start handler

[End Handle]: End handler

[Permissions]: Disable access / Enable access.

The attribute table widget:

[Handle]: Attribute handler.

[UUID]: Attribute UUID.

[Name]: Attribute name.

[Permission]: Attribute access types: Read Access, Write Access, Indication Access, Notification Access

[Value]: Attribute value.

#### 4.1.4 White List Tab

Settings

Generic Mode Local ATT **White List** Server

| BD Address Type | BD Address |
|-----------------|------------|
|-----------------|------------|

White List Size:

Add Device to White List

BD Address Type: ☒ Public ☐ Random

BD Address:

Remove Device from White List

**Figure 9 White List Tab**

[White List Size]: White list size.

[Read]: Read white list size.

[BD Address Type]: Bluetooth device address type. Public Device Address (default)/ Random Device Address

[Add]: Add a Bluetooth device to white list.

[Remove]: Remove the current selected Bluetooth device from white list item.

### 4.1.5 Server Tab

On the “Server” tab, there are all the GATT Servers that could be created. By operate on each sub tab, the GATT Servers could be tested.

The screenshot displays the 'Server' tab within the QTool application. The interface includes a top navigation bar with tabs for 'Generic', 'Mode', 'Local ATT', 'White List', and 'Server'. Below this, a row of sub-tabs lists various protocols: 'DISS', 'BASS', 'BLPS', 'FINDT', 'GLPS', 'HRPS', 'HTPT', 'PROXR', 'SCPPS', 'TIPS', and 'ANPS'. The 'DISS' sub-tab is currently selected. A 'Create DB' button is located in the top right corner of the main panel.

The main panel is divided into two sections. The first section, 'Service Management', contains a checkbox for 'Auto Enable' (which is checked) and an 'Enable' button. The second section, 'Device Information Service Characteristics', contains a list of fields, each with a checked checkbox and a corresponding text input field:

- Manufacturer Name String: Quintic
- Module Number String: QN-BLE-B2
- Serial Number String: 000001
- Hardware Revision String: 6.4.0
- Firmware Revision String: 0.2.0
- Software Revision String: 0.9.7
- System ID: 0x087cbeffffe000000
- IEEE Certification: 0x000000000201
- PnP ID: 0x00000000000403

An 'Update' button is located at the bottom right of the 'Device Information Service Characteristics' section.

Figure 10 Server Tab

## 4.2 Remote Device Setting Tabs

There are four kinds of remote device setting tab: the “Connection to Peer” tab, the “Peer ATT” tab, the “Security” tab, and the “Client” tab.

### 4.2.1 Connection to Peer Tab

The “Connection to peer” tab as the figure 11 shows:

**Settings**

Connection to peer | Peer ATT | Security | Client

**Connection Settings**

Min Connection Interval (6-3200): 24 \* 1.25ms = 30.00ms

Max Connection Interval (6-3200): 40 \* 1.25ms = 50.00ms

Slave Latency (0-499): 0

Supervision Timeout (10-3200): 2000 \* 10ms = 20000.00ms

Update

**Establish Link**

☐ White List

Connect Cancel

**Terminate Link**

Connection Handle: 0x0000

Disconnect

**Remote Information**

Version:

Company ID:

Features:

Read

Default

**Figure 11 Connection to Peer Tab**



Four Groups (the Connection Setting Group, the Establish Link Group, the Terminate Link Group, the Remote Information Group ) and a "Default" button are in this tab.

[Default]: Click this button if you want to reset the configurations in this tab to default values.

#### 4.2.1.1 Connection Settings Group

[Min Connection Interval]: minimum connection interval, value range: 7.5ms~4000 ms

[Max Connection Interval]: maximum connection interval, value range: 7.5ms ~4000ms

[Slave Latency]: slave latency (connSlaveLatency).value range: 0~499

[Supervision Timeout]: Supervision Timeout. Value range: 100ms~3200ms

[Update]: Update a set of new connection parameters

#### 4.2.1.2 Establish Link Group

[Connect]: Click this button to connect device.

[Cancel]: Click this button to stop the current connects operation.

[White List]: Connect the devices in the white list only.

#### 4.2.1.3 Terminate Link Group

[Disconnect]: Click this button if you want to disconnect the connection between this remote devices and the local devices.

#### 4.2.1.4 Remote Information Group

[Read]: Click this button to get the remote device's version and company id.

### 4.2.2 Peer ATT Tab

The "Peer ATT" tab as Figure 12 shows:

**Settings**

Connection to peer | **Peer ATT** | Security | Client

Start Handle: 0x0001 | End Handle: 0xffff | Offset: 0x0000

**Service Discovery**

Type: ALL | Short UUID: Don't Care | Long UUID: 0000180100001000800000805f9b34fb | Discover

**Characteristic Discovery**

Type: All | Short UUID: Don't Care | Long UUID: 00002a0200001000800000805f9b34fb | Discover

**Read Characteristic**

Read Type: Simple | Handle(s): 0x | Expect Size(s): 2 | Value: 0x | Multiple Format: 0xXXXX, 0xXXXX | Read

**Write Characteristic**

Write Type: No Response | Handle(s): 0x | Value: 0x | Auto-execute: ☒ | Execute | Cancel | Write

| Handle | Range | Type | UUID | Property | Value |
|--------|-------|------|------|----------|-------|
|--------|-------|------|------|----------|-------|

Clear | Default

Figure 12 Peer ATT Tab

#### 4.2.2.1 Service Discovery Group

[Type]: There three kinds of service discovery type: ALL, UUID, Include

ALL: Discovery all services.

By UUID: Discovery services by UUID. There are two kinds of UUID: 16bit UUID, 128bit UUID.

[Short UUID]: Also called “16bit UUID”. Selected by the “Short UUID” combo box or you could write the short UUID value directly in the “Short UUID” combo box.

[Long UUID]: Also called “128 bit UUID”. Write the value in the “Long UUID” line edit.

Include: Discover services within the Handle range from start Handle value to the end Handle value.

You could set the start Handle value in the “Start Handle” line edit, and the end Handle value in the “end Handle” line edit.

#### 4.2.2.2 Characteristics Discovery Group

[Type]: Three Characteristics discovery types: ALL, By UUID, Descriptor.

ALL: Discover all Characteristics.

By UUID: Discovery Characteristics by UUID.

Descriptor: Discover Characteristics within the Handle range from start Handle value to the end Handle value.

You could set the start Handle value in the Start Handle line edit, and the end Handle value in the end Handle line edit.

#### 4.2.2.3 Read Characteristics Group

[Read Type]:

“Simple”: Read Characteristic Value.

“By UUID”: Read Using Characteristic UUID.

“Long”: Read Long Characteristic Value.

“Multiple Long”: Read Multiple Characteristic Values.

“Descriptor”: Read Characteristic Descriptors.

“Long Descriptor”: Read Long Characteristic Descriptor.

#### 4.2.2.4 Write Characteristics Group

[Write type]

“No response”: Write without response

“Signed”: Signed Write Characteristic value

“Simple”: Write Characteristic value

“Long”: Write Long Characteristic value

“Reliable”: Characteristic Value Reliable Write

“Descriptor”: Write Characteristic Descriptors

“Long Descriptor”: Write Long Characteristic Descriptors

### 4.2.3 Security Tab

**Settings**

Connection to peer | Peer ATT | **Security** | Client

**Keys**

EDIV (2B):  Random Number (8B):

LTK (16B):

TK (16B):  ☒ Digital

If modify those parameters, please set before security procedure start

**Bond Parameters**

**Out of Band Data Present**

☒ No  
☐ From Remote Device

**Authentication Requirements**

☐ No MITM No Bonding  
☒ No MITM Bonding  
☐ MITM No Bonding  
☐ MITM and Bonding

**Input/Output Capabilities**

☐ No Input No Output  
☐ Display Yes/No  
☐ Display Only  
☐ Keyboard Only  
☒ Keyboard Display

Key Size (7 ~ 16):

**Initiator Key Distribution**

☒ Encryption Key  
☒ Identity Key  
☒ Signing Key

**Responder Key Distribution**

☒ Encryption Key  
☒ Identity Key  
☒ Signing Key

If modify those parameters, please set before security procedure start

**Figure 13 Security Tab**

[Bond]: Bond the local device with the remote BLE device.

[Encrypt]: Directly encrypt a link with a peer using known bonding information from a previous connection when pairing or bonding occurred.

[Clear Bond]: Clear local bond information.

#### 4.2.3.1 Keys Group

[EDIV]: Encrypted Diversifier (EDIV) is a 16-bit stored value used to identify the LTK.

[Random Number]: Random Number (Rand) is a 64-bit stored valued used to identify the LTK.

[LTK]: Long Term Key (LTK) is a 128-bit key used to generate the contributory session key for an encrypted connection.

[TK]: Temporary Key

#### 4.2.3.2 Bond Parameters Group

Five sub groups are in the “Bond Parameters” group: the “Out of Band Data Present” group, the “Input / Output Capabilities” group, the “Authentication Requirements” group, the “Initiator Key Distribution” group, the “Responder Key Distribution” group.

#### 4.2.4 Client Tab

On the “Client” tab, there are all the GATT Clients that could be created. By operate on each sub tab, the GATT clients could be tested.

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Settings

Connection to peer Peer ATT Security Client

DISC BASC BLPC FINDL GLPC HRPC HTPC PROXM SCPPC TIPC ANP

Device Information Service Collector

Enable

Service Characteristics

Manufacturer Name String:

Model Number String:

Serial Number String:

Hardware Revision String:

Firmware Revision String:

Software Revision String:

System ID:

IEEE Certification:

PnP ID:

Read

Figure 14 Client Tab

## 5. Trace Window

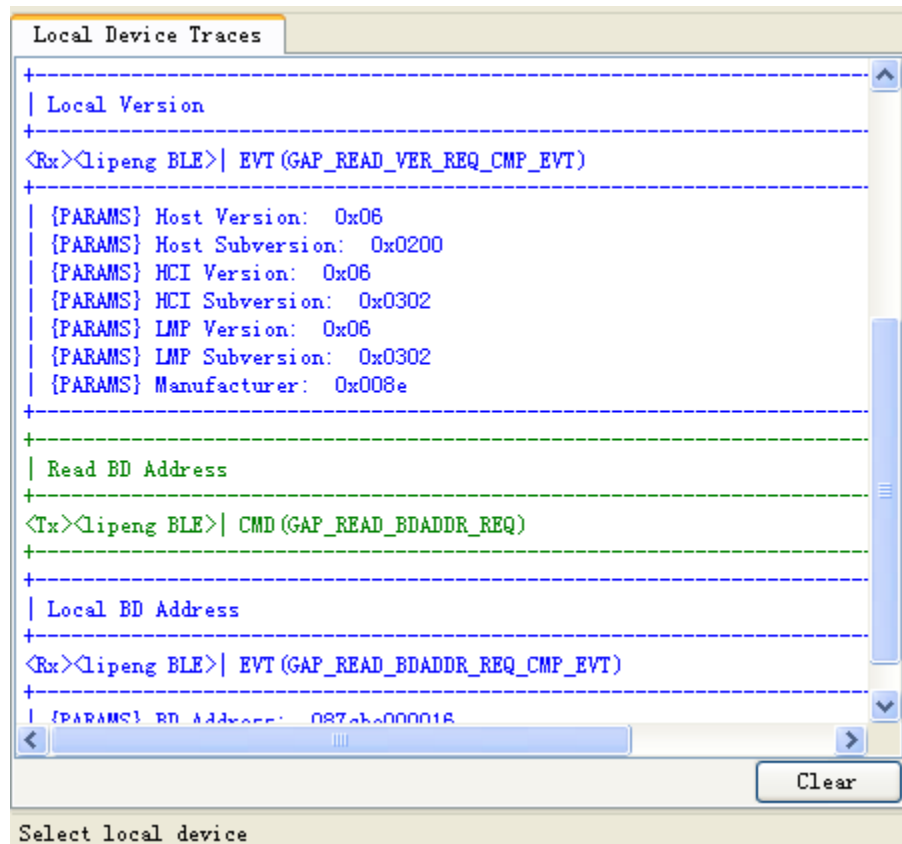


Figure 15 Trace Window

The Trace Window shows the information that the local device sends and receives. The state information of the current operation is shown below the “Local Device Traces” text edit.

## 6. Operation Examples

### 6.1 Scan

First, select a local BLE device item in the Devices Window.

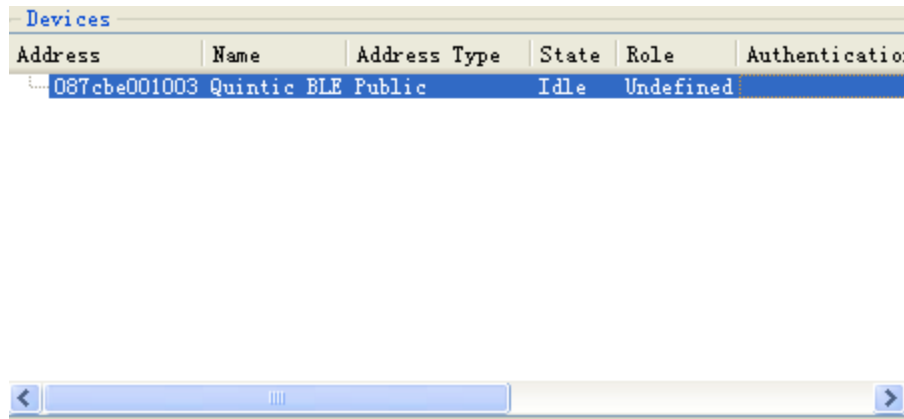


Figure 16 Select a Device

Second, click the "Scan" button in the Discovery Group of this device's Setting Window.



Figure 17 Scan

After about 10 seconds or you clicked the "Cancel" button while scanning, the status bar shows "Scan complete". You will see all Discovered BLE Devices shows in the Devices Window.



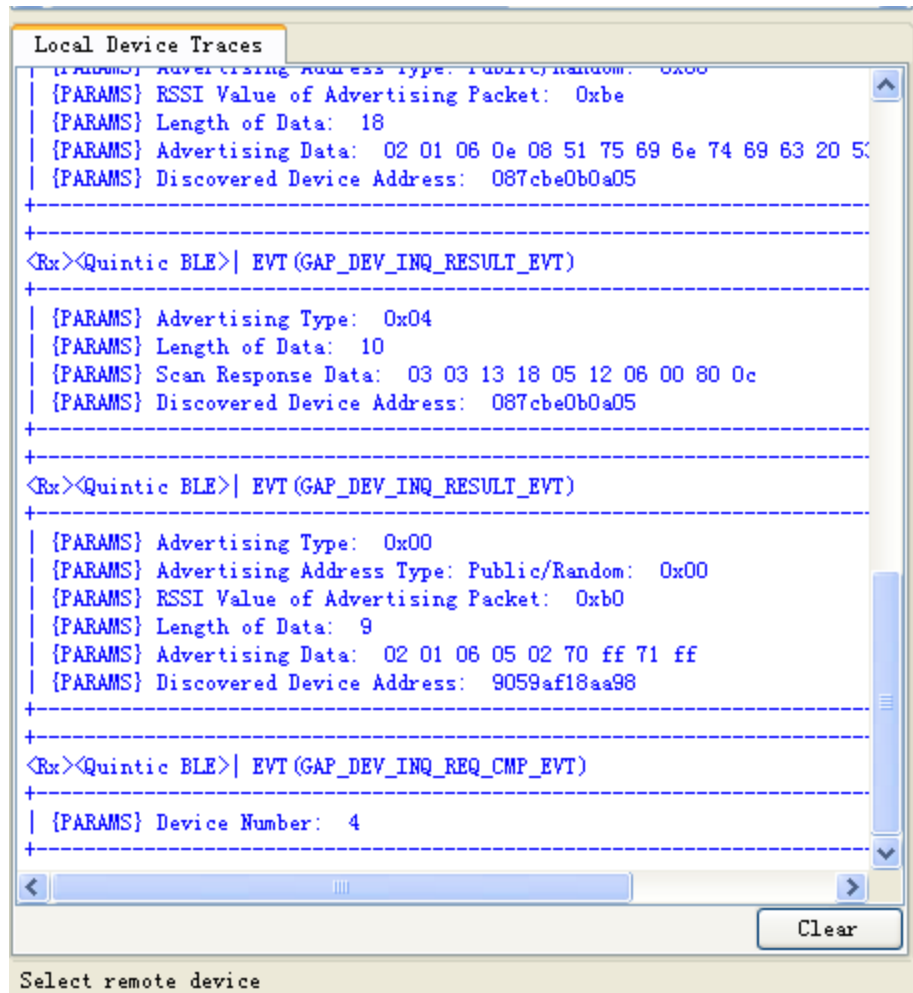


Figure 18 Trace Information

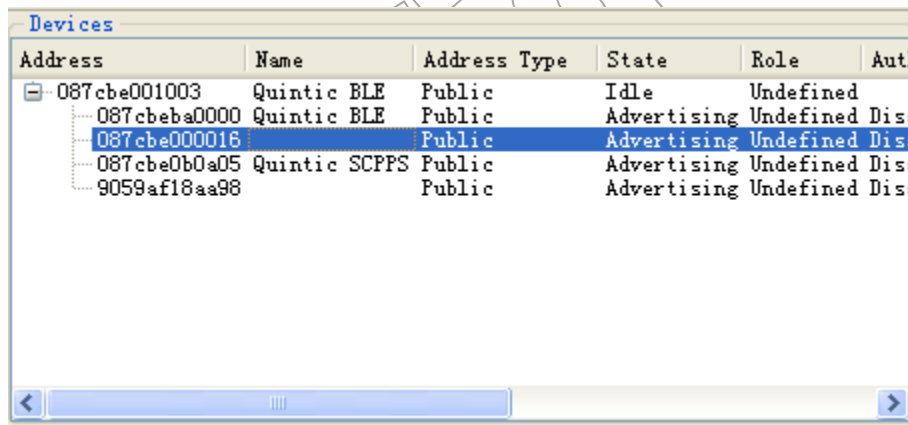


Figure 19 Scan Result

## 6.2 Connection

### 6.2.1 Establish a link

After finished scanning, we could connect the local devices with a remote device.

First, select a remote BLE device item in the Devices Window.

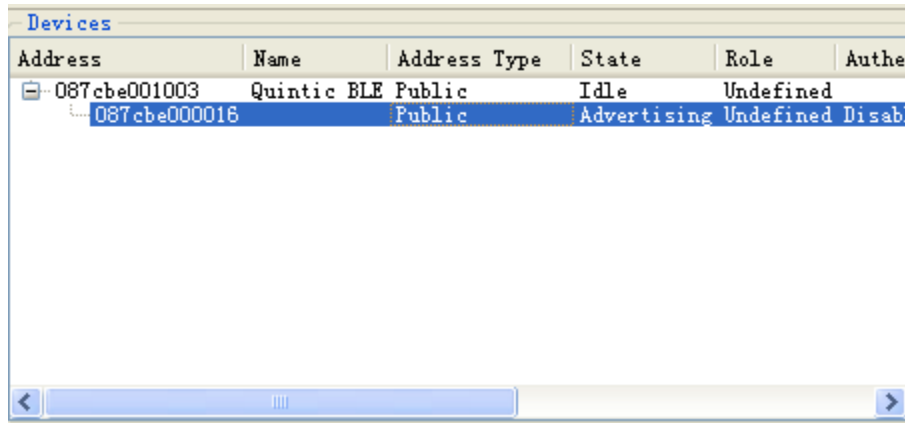


Figure 20 Establish Connection

Second Click the “Connect” button in the Establish Link Group of this device’s Connect to pair tab.

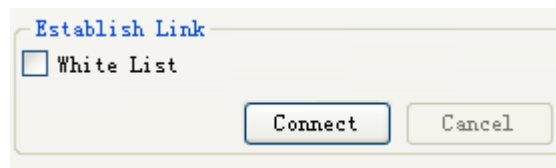


Figure 21 Connect

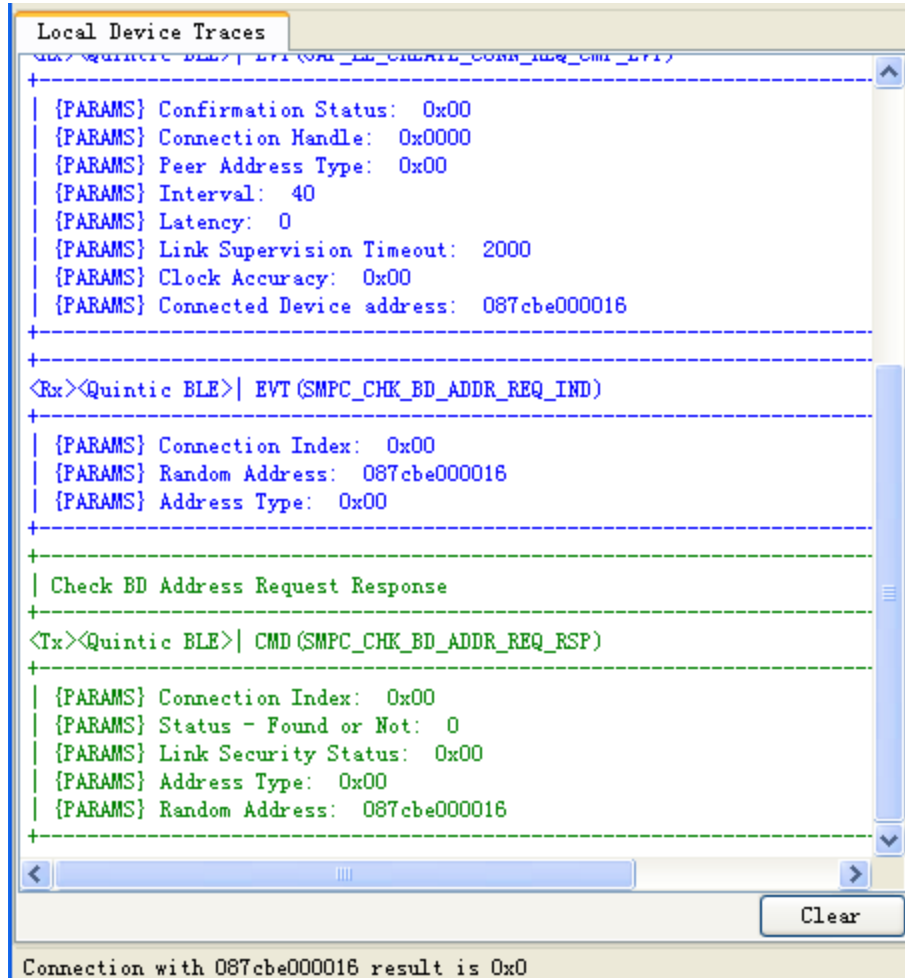


Figure 22 Connect Trace Information

## 6.2.2 Terminate a link

First, select a connected remote device in the “Devices” window.

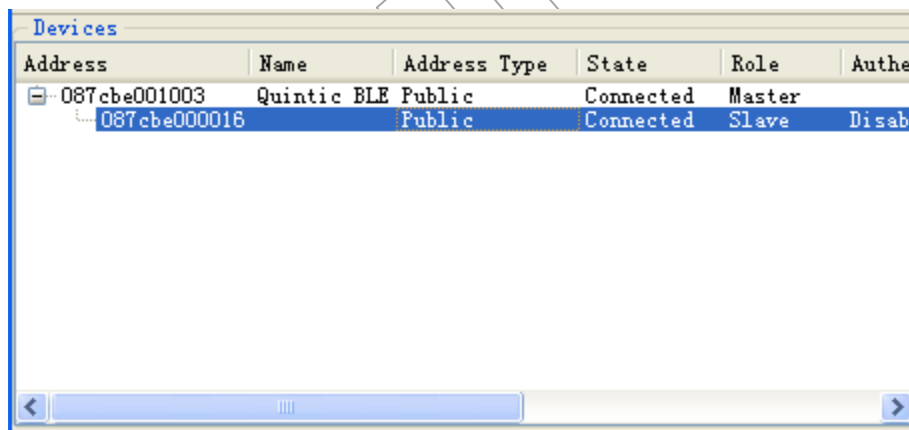


Figure 23 Select Device

Second, click the “Disconnect” button in the “Terminate Link” group of this device.

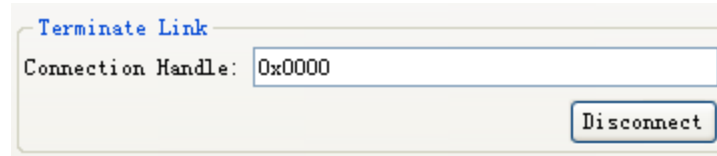


Figure 24 Disconnect

The remote device's state becomes "Disconnected", meaning this operation succeeds.

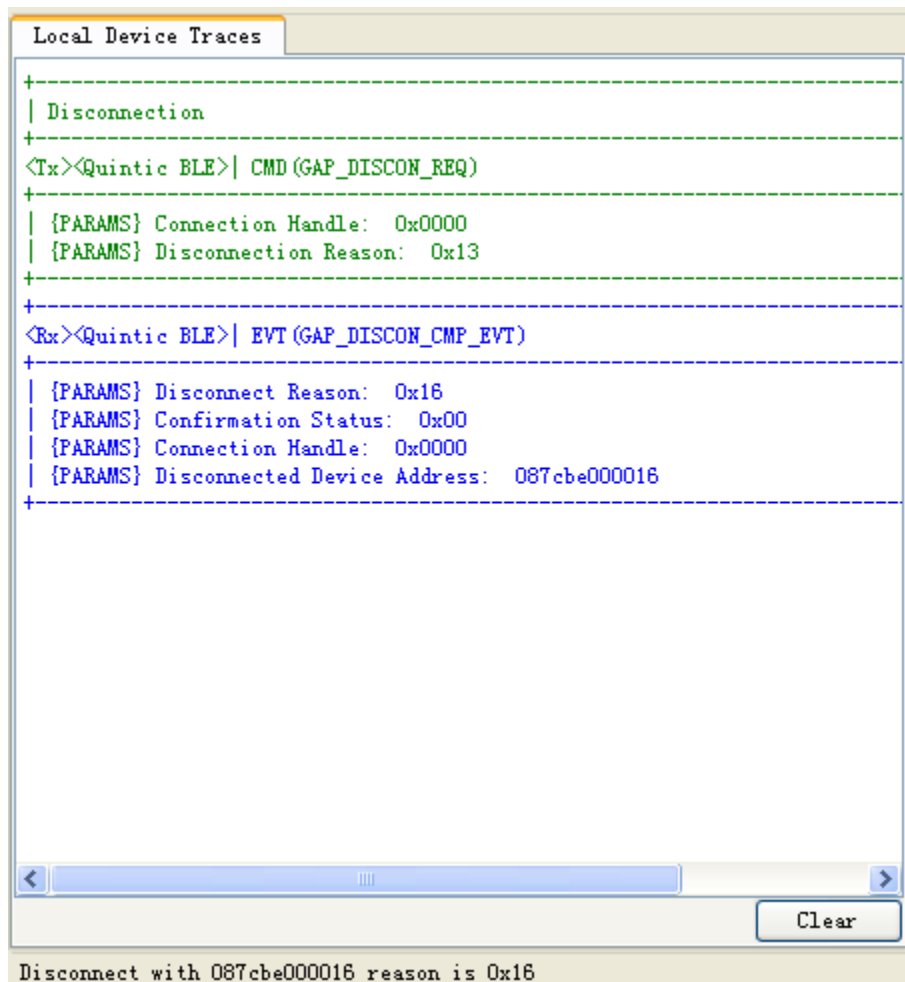
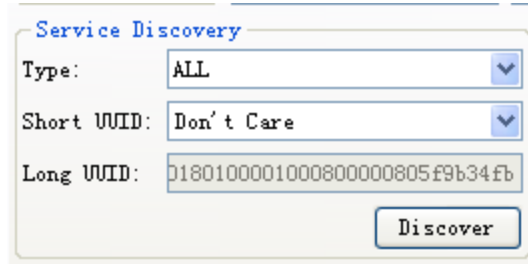


Figure 25 Terminate Connection Trace Information

## 6.3 Discovery Services

Example 1:

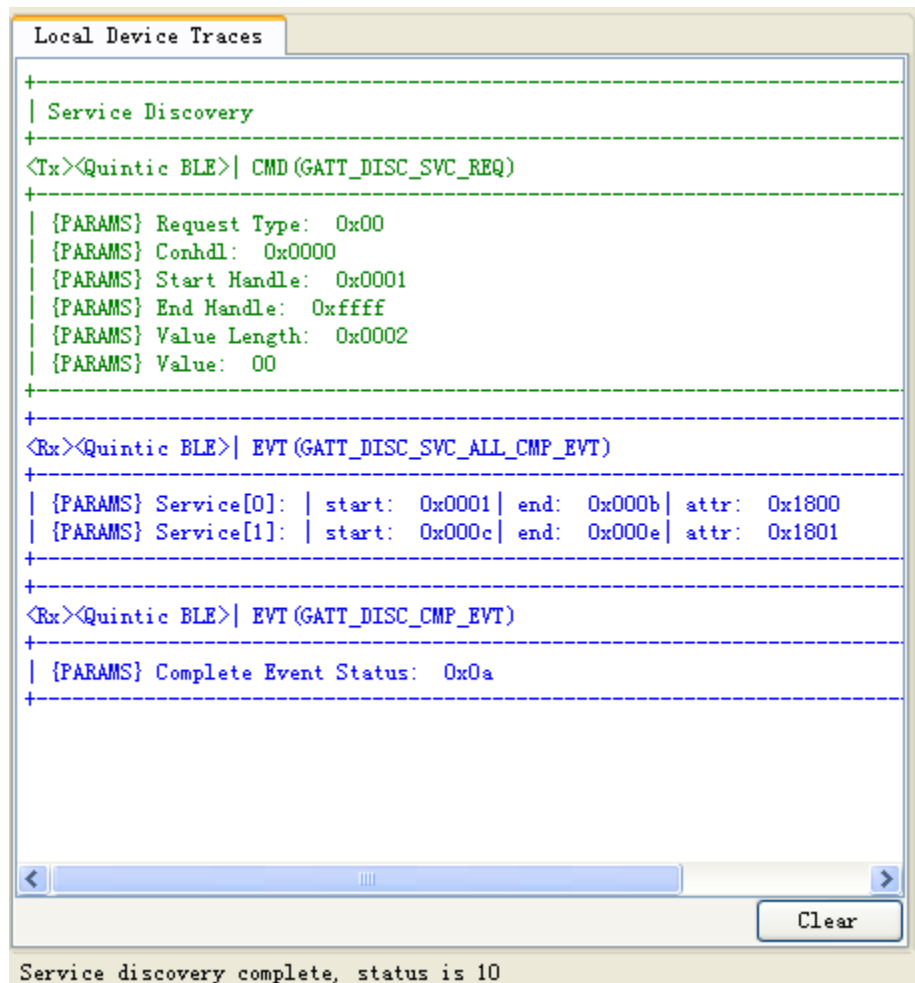
First, click on the "Type" combo box, and choose the "ALL" option.



The 'Service Discovery' dialog box contains three input fields and a button. The 'Type' field is a dropdown menu set to 'ALL'. The 'Short UUID' field is a dropdown menu set to 'Don't Care'. The 'Long UUID' field is a text box containing the value '01801000010008000000805f9b34fb'. A 'Discover' button is located at the bottom right of the dialog.

Figure 26 Service Discovery

Second, click on the “Discover” button, this application will search out all the services that will be listed in the table widget on the bottom of the tab.




The 'Local Device Traces' window displays a list of Bluetooth communication events. The events are as follows:

- Service Discovery**
- <Tx><Quintic BLE>| CMD (GATT\_DISC\_SVC\_REQ)**
  - {PARAMS} Request Type: 0x00
  - {PARAMS} Conhdl: 0x0000
  - {PARAMS} Start Handle: 0x0001
  - {PARAMS} End Handle: 0xffff
  - {PARAMS} Value Length: 0x0002
  - {PARAMS} Value: 00
- <Rx><Quintic BLE>| EVT (GATT\_DISC\_SVC\_ALL\_CMP\_EVT)**

|                      |               |             |              |
|----------------------|---------------|-------------|--------------|
| {PARAMS} Service[0]: | start: 0x0001 | end: 0x000b | attr: 0x1800 |
| {PARAMS} Service[1]: | start: 0x000c | end: 0x000e | attr: 0x1801 |
- <Rx><Quintic BLE>| EVT (GATT\_DISC\_CMP\_EVT)**
  - {PARAMS} Complete Event Status: 0x0a

At the bottom of the window, there is a 'Clear' button and a status message: 'Service discovery complete, status is 10'.

Figure 27 Trace Information

|   | Handle  | Range         | Type              | UUID   | Property | Value |
|---|--|---------------|-------------------|--------|----------|-------|
| 1 | 0x0001   | 0x0001-0x000b | Generic Access    | 0x1800 |          |       |
| 2 | 0x000c   | 0x000c-0x000e | Generic Attribute | 0x1801 |          |       |

Clear

Default

### Figure 28 Discovery Result

## 6.4 Discovery Characteristics

First, click on the “Type” combo box, and choose the “All” option.

Characteristics Discovery

Type:

Short UUID:

Long UUID:

### Figure 29 Characteristics Discovery

Second, click on the “Discover” button, this application will search out all the characteristics that will be listed in the table widget on the bottom of the peer tab.

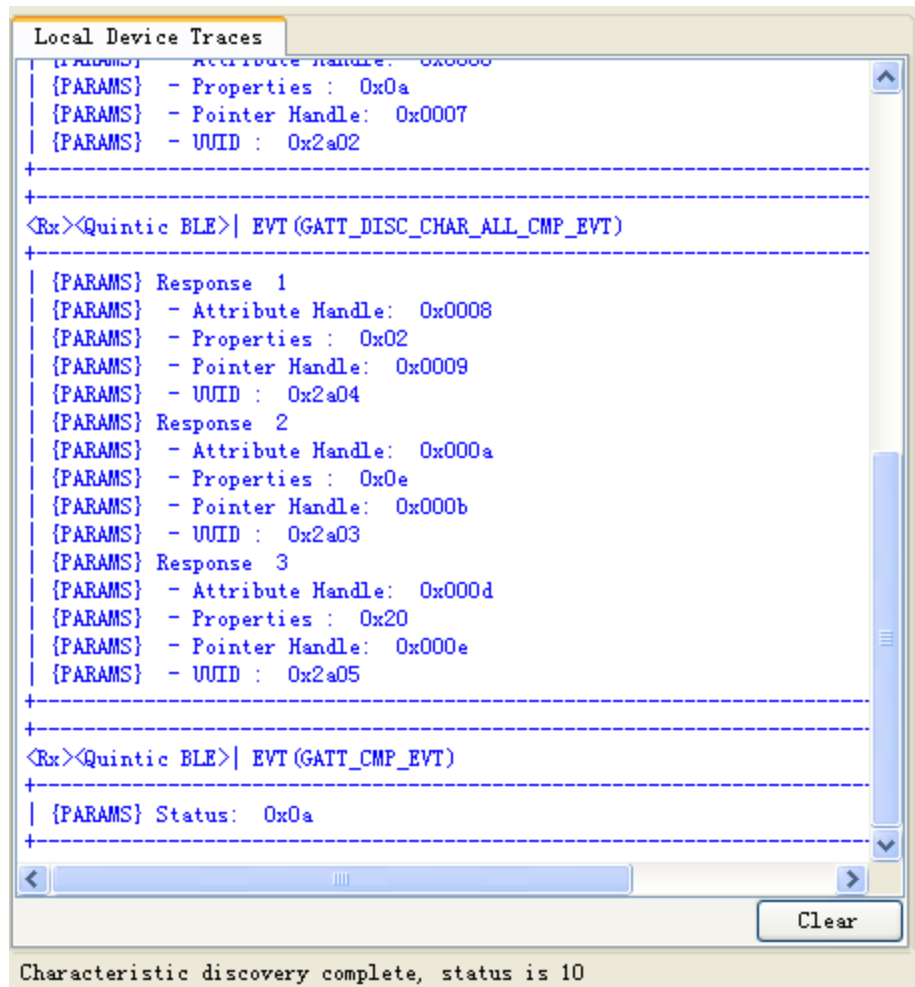


Figure 30 Characteristics Discovery Trace Information

|   | Handle | Range         | Type                                       | UUID   | Property |
|---|--------|---------------|--|--------|----------|
| 1 | 0x0001 | 0x0001-0x000b | Generic Access                             | 0x1800 |          |
| 2 | 0x0002 | -             | Device Name                                | 0x2a00 | R        |
| 3 | 0x0004 | -             | Appearance                                 | 0x2a01 | R        |
| 4 | 0x0006 | -             | Peripheral Privacy Flag                    | 0x2a02 | R/W      |
| 5 | 0x0008 | -             | Peripheral Preferred Connection Parameters | 0x2a04 | R        |
| 6 | 0x000a | -             | Reconnection Address                       | 0x2a03 | R/WNR/W  |
| 7 | 0x000c | 0x000c-0x000e | Generic Attribute                          | 0x1801 |          |
| 8 | 0x000d | -             | Service Changed                            | 0x2a05 | I        |

Figure 31 Discovery Characteristics Result

## 6.5 Read Characteristics

First, click on the “Read Type” combo box, and choose the “Simple” option or “long” option. Second, write the handle number (for example 0x0011) in the “Handle(s)” line edit. Third, the value size you expected should be written in the “Expect Size(s)” line edit.

**Read Characteristic**

Read Type: Simple

Handle(s): 0x0003

Expect Size(s): 2

Value:

Multiple Format: 0xXXXX, 0xXXXX

Read

Figure 32 Read Characteristics

When you clicked on the “Read” button, then this application will read the characteristic by the handle number and shows it in the “Value” line edit.



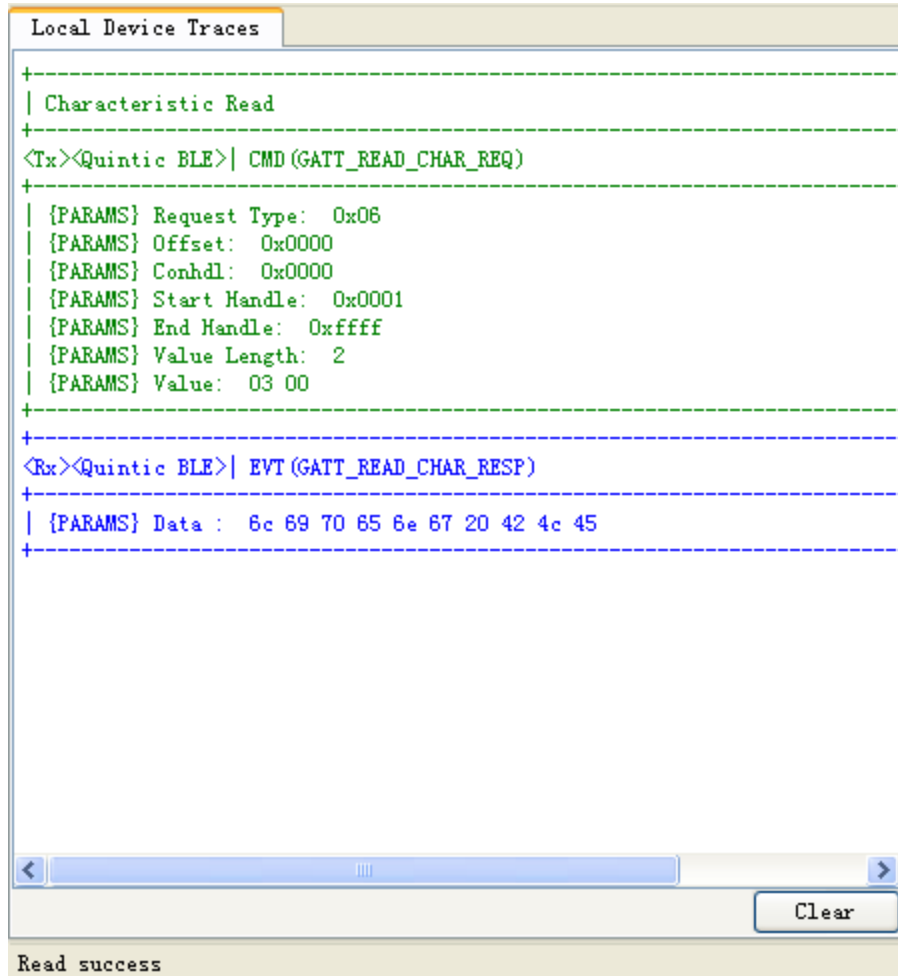


Figure 33 Read Characteristics Trace Information

|   | Handle ^ | Range | Type | UUID | Property | Value                  |
|---|----------|-------|------|------|----------|------------------------|
| 1 | 0x0003   | -     |      |      |          | 0x454c4220676e6570696c |

Clear Default

Figure 34 Read Characteristics Result

## 6.6 Write Characteristics

First, Click on the “Write Type” combo box, and choose the “Simple” option or the “Long” option: Then write a handle number (for example 0x12) in the “Handle(s)” line edit. Write the value you want to set in the “Value” line edit.

Write Characteristic

Write Type: Simple

Handle(s): 0x0012

Value: 0x01

Auto-execute: ☒

Execute Cancel Write

### Figure 35 Write Characteristics Examples

At last, click on the “Write” button. This application will write the value to the character of this remote device.

The screenshot displays the 'Local Device Traces' window. The top section, titled 'Tx', shows a 'Characteristic Write' command from 'lipeng BLE'. The parameters are: Request Type: 0x0e, Conhdl: 0x00000, Characteristic Handle: 0x0012, Offset: 0x0000, Auto exec: 0x01, Value length: 0x0001, and Value: 01. The bottom section, titled 'Rx', shows the corresponding 'EVT (GATT\_WRITE\_CHAR\_RESP)' event with a Status of 0x00. A scrollbar at the bottom indicates the trace continues. A 'Clear' button is located in the bottom right corner. The status bar at the very bottom shows 'Write success'.

Local Device Traces

+-----+  
| Characteristic Write  
+-----+  
<Tx><lipeng BLE>| CMD (GATT\_WRITE\_CHAR\_REQ)  
+-----+  
| {PARAMS} Request Type: 0x0e  
| {PARAMS} Conhdl: 0x00000  
| {PARAMS} Characteristic Handle: 0x0012  
| {PARAMS} Offset: 0x0000  
| {PARAMS} Auto exec: 0x01  
| {PARAMS} Value length: 0x0001  
| {PARAMS} Value: 01  
+-----+  
+-----+  
<Rx><lipeng BLE>| EVT (GATT\_WRITE\_CHAR\_RESP)  
+-----+  
| {PARAMS} Status: 0x00  
+-----+

< [Progress Bar] >

Clear

Write success

### Figure 36 Trace Information

## 6.7 Bond a Device

To bond this remote device with the local device after “Connection”, usually you should do the three following steps.

Step 1: Set the bond information in the “Bond Information” Group in the Security tab of this device.

Step 2: Click the “Set” button.

Step 3: Click the “Bond” button. If you did not do step 1 and step 2, it will use the default values.

Confidential

Settings

Connection to peer Peer ATT Security Client

Keys

EDIV (2B): 0x4321 Random Number (8B): 0x7766554433221100

LTK (16B): 0x4c68384139f574d836bcf34e9dfb01bf Random

TK (16B): 111111 ☒ Digital Random

If modify those parameters, please set before security procedure start Set

Bond Parameters

Out of Band Data Present

☒ No

☐ From Remote Device

Key Size (7 ~ 16): 16

Initiator Key Distribution

☒ Encryption Key

☒ Identity Key

☒ Signing Key

Responder Key Distribution

☒ Encryption Key

☒ Identity Key

☒ Signing Key

Authentication Requirements

☐ No MITM No Bonding

☒ No MITM Bonding

☐ MITM No Bonding

☐ MITM and Bonding

Input/Output Capabilities

☐ No Input No Output

☐ Display Yes/No

☐ Display Only

☐ Keyboard Only

☒ Keyboard Display

If modify those parameters, please set before security procedure start Set

Bond Encrypt Clear Bond

Default

Figure 37 Pair a device

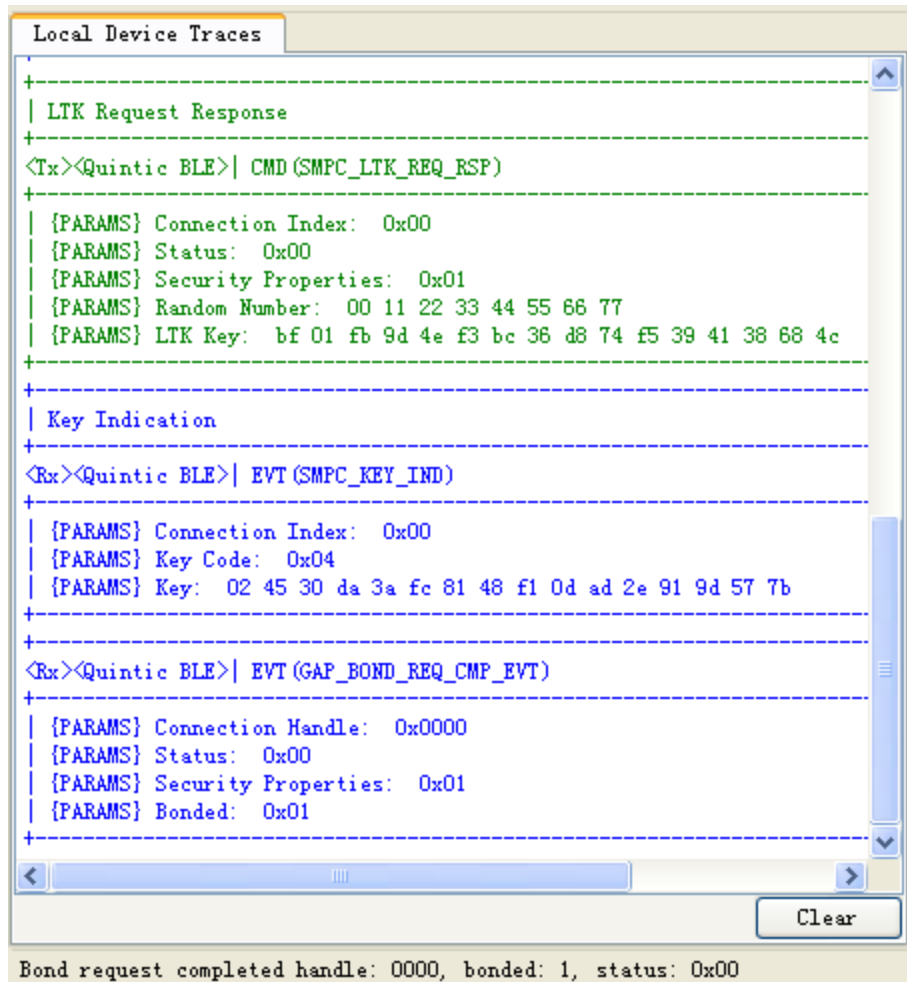


Figure 38 Pair Device Trace Information

## 6.8 Advertising

The screenshot shows the 'Settings' window with the 'Mode' tab selected. The 'Advertising' section is expanded, showing various configuration options. The 'Modes' section includes 'Discoverability Modes' (General Discoverable is selected), 'Connectability Modes' (Connectable is selected), and 'Bondable Modes' (Bondable is selected). The 'Advertising' section includes 'Type' (Connectable Undirected is selected), 'Interval Min(ms)' (100), 'Interval Max(ms)' (100), 'Direct Address' (Public is selected, address is 0x887cbe000101), 'Channel Map' (Channel 37, 38, and 39 are checked), 'Advertising Data' (0x0201050c095175696e74696320424c45), and 'Scan Response' (0x). There are 'Advertising' and 'Stop' buttons at the bottom right of the section, and a 'Default' button at the bottom right of the entire window.

**Figure 39 Advertising Configuration**

To advertising, please do the follow steps:

Step 1: Select the discoverable-modes. For example, select the “General Discoverable” radio button.

Step 2: Select the connectability modes. For example, select the “Connectable” radio button.

Step 3: Select the advertising type. For example, select the “Connectable Undirected” radio button.

Step 4: Set the advertising intervals.

Step 5: Select the channel map. For example, select the “Channel 37” check button, the “Channel 38” check button and the “Channel 39” check button.

Step 6: Set the advertising data. First, click on the “Adv.Data” button. Then you will see the dialog as Figure 38 shows.

Second, choose advertising type, for example, select “Flags”. Then enter the value in the “Value” line edit, for example 0x05.

Third, click on the “add” button.

Four, select an AD type, for example, select “Complete Local Name”. Then enter the value in the “Value” line edit, for example, “Quintic BLE”, as Figure 39 shows.

Five, click on the “add” button.

At last, click on the “ok” button.

Figure 40 Set Advertising Data

Figure 41 Set Advertising Data

Step 8: Set the scan response data. This is an optional operation. Click on the “Scan Resp.” button, and operate reference to Step 7.

At last, click on the “Advertising” button.

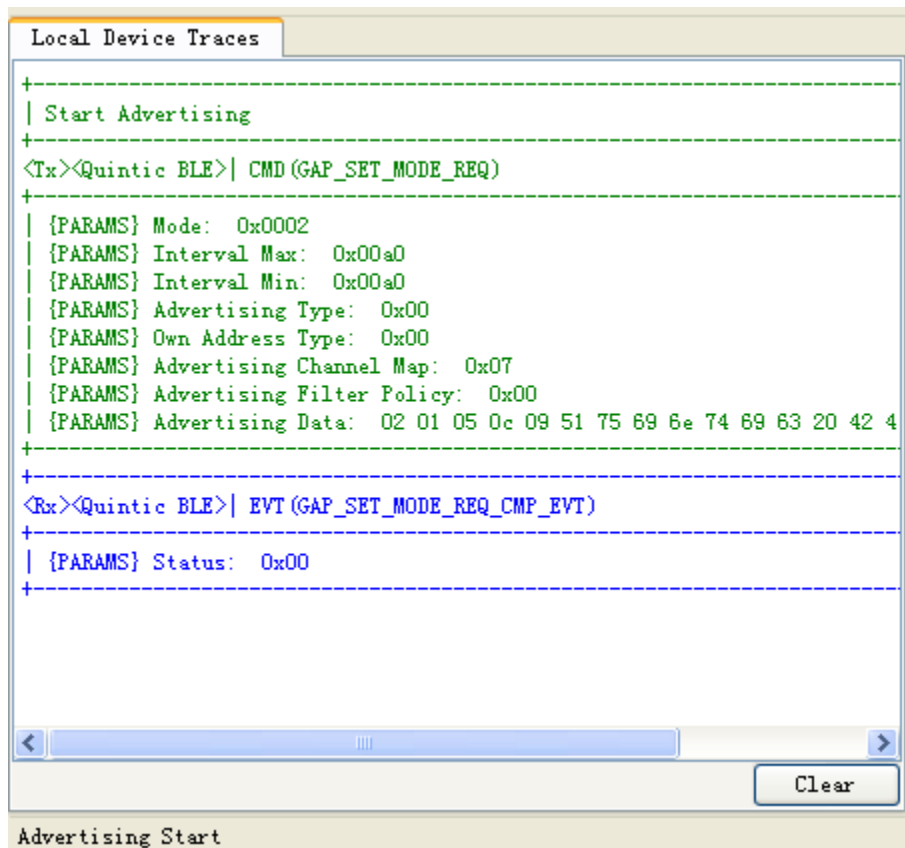
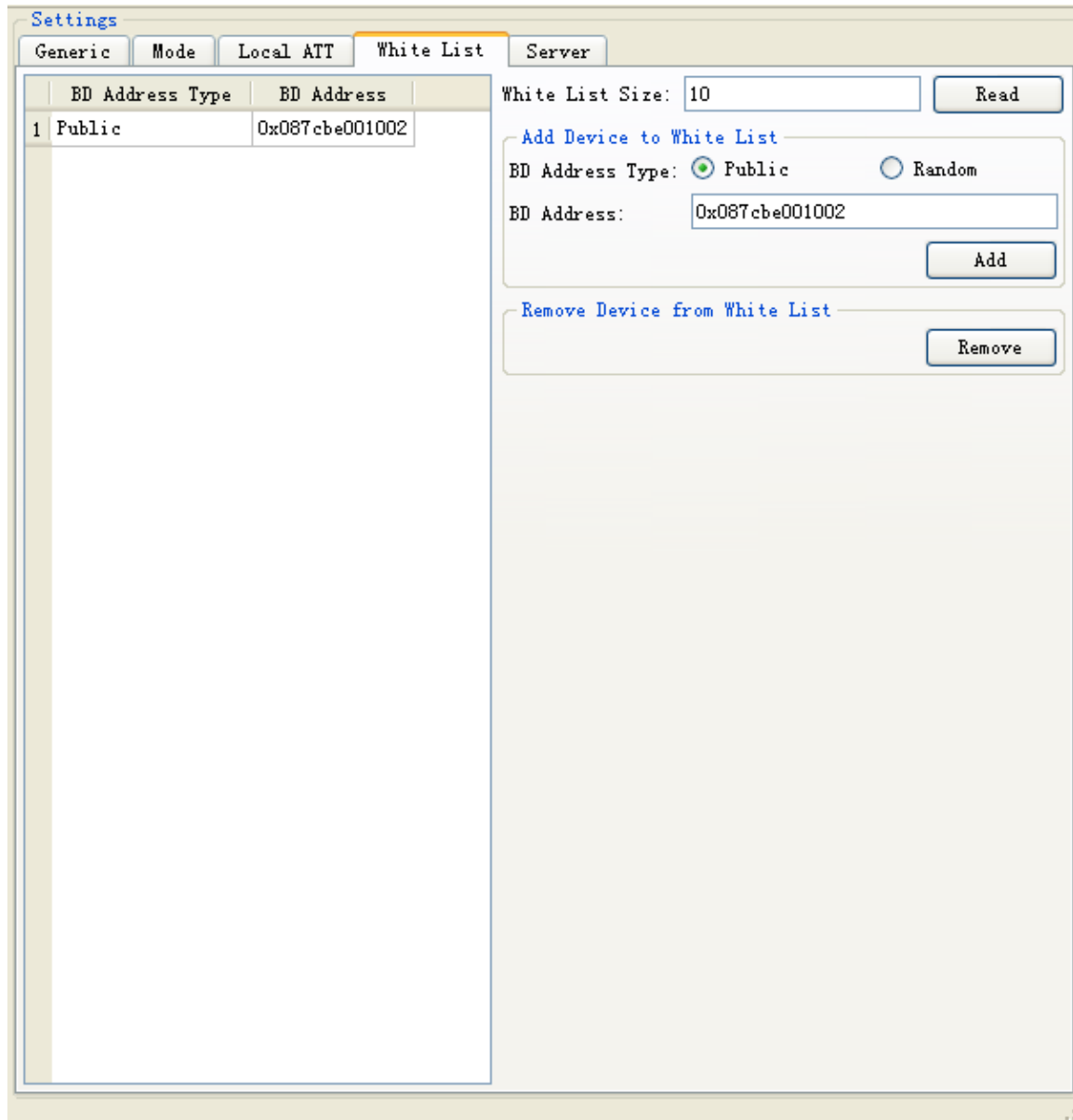


Figure 42 Trace Information

## 6.9 Add a Bluetooth Device to White List





**Figure 43 Add a Bluetooth Device to White List**

To add a Bluetooth device to white list, please do the following steps:

Step 1: Click on the “Read” button.

Step 2: Select Bluetooth device address type.

Step 3: Enter the Bluetooth device address in the “BD address” line edit.

Step 4: Click on the “Add” button.

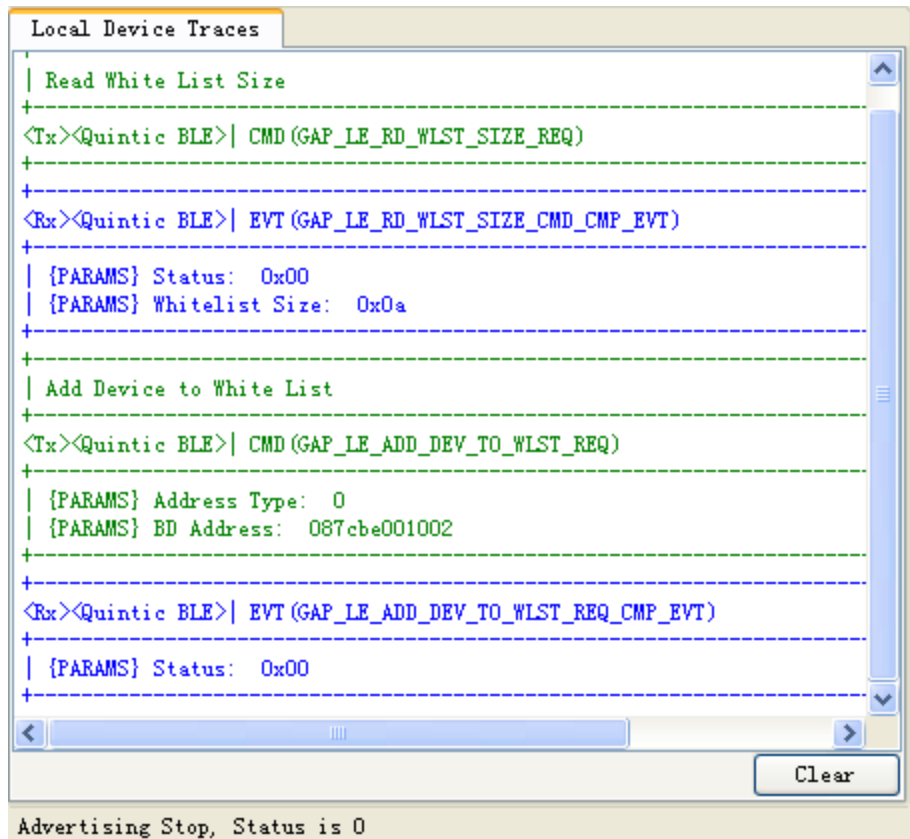


Figure 44 Trace Information

## 6.10 Create the Selected Service Database

**Settings**

Generic Mode **Local ATT** White List

Database: qn\_qtool\_db\_test\_4 Create Destroy Load

|   | Task      | Start Handle | End Handle | Permissions |
|---|-----------|--------------|------------|-------------|
| 1 | TASK_GATT | 0x0001       | 0x0005     | Enable      |
| 2 | TASK_GATT | 0x0010       | 0x0012     | Enable      |
| 3 | TASK_GATT | 0x0020       | 0x0028     | Enable      |
| 4 | TASK_GATT | 0x0030       | 0x0032     | Enable      |
| 5 | TASK_GAP  | 0x0040       | 0x0046     | Enable      |
| 6 | TASK_GATT | 0x0050       | 0x0052     | Enable      |
| 7 | TASK_GATT | 0x0060       | 0x0062     | Enable      |
| 8 | TASK_GATT | 0x0070       | 0x0076     | Enable      |
| 9 | TASK_GATT | 0x0080       | 0x0082     | Enable      |

Modify Clear

|   | Handle | UUID                               | Name              | Permissions |
|---|--------|------------------------------------|-------------------|-------------|
| 1 | 0x0001 | 0x2801                             | Secondary Service | R           |
| 2 | 0x0002 | 0x2803                             | Characteristic    | R           |
| 3 | 0x0003 | 0xb00c                             |                   | R           |
| 4 | 0x0004 | 0x2803                             | Characteristic    | R           |
| 5 | 0x0005 | 0x0000b00b000000000123456789abcdef |                   | R           |
| 6 | 0x0010 | 0x2800                             | Primary Service   | R           |
| 7 | 0x0011 | 0x2803                             | Characteristic    | R           |

Modify Clear

**Figure 45 Create the Selected Service Database**

To create the services in the database that you selected, please do the following steps:

Step 1: Click on the Database combobox to select a service database. For example, select the "qn\_qtool\_db\_test\_4" service database. All the service databases are in the directory: Install directory/qdb, and they are editable.

Step 2: Click on the "Create" button.

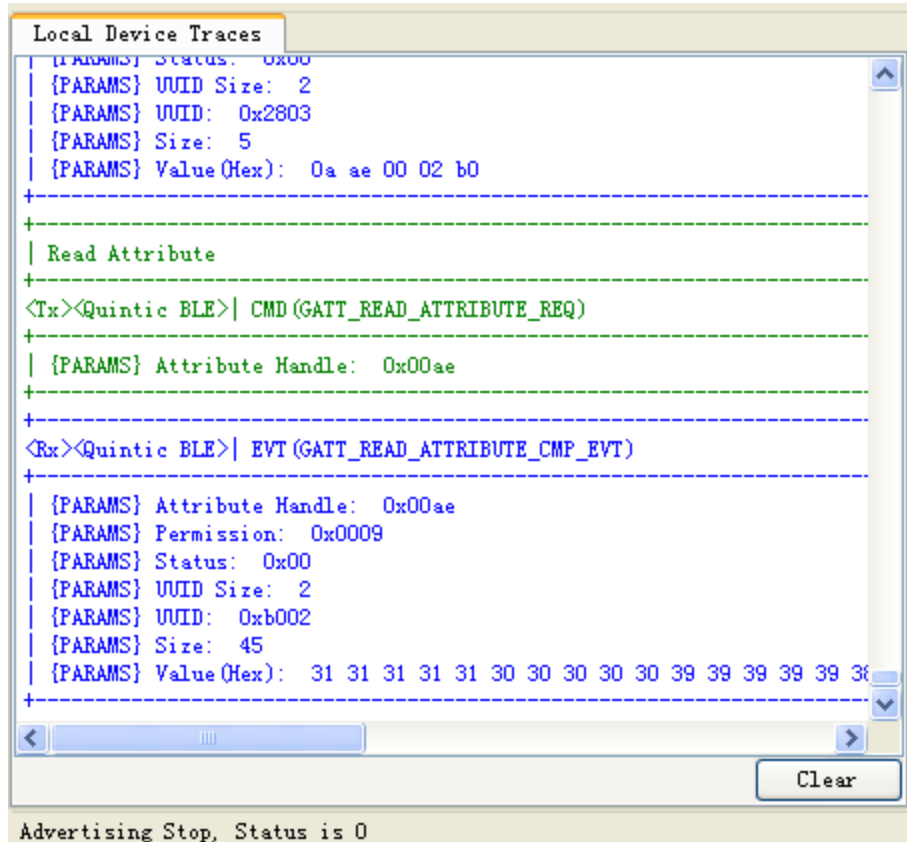


Figure 46 Trace Information

Step 3: Set the local Bluetooth device to advertising. Please references to chapter” 6.8 advertising”.

Step 4: The remote device discovers the local device and establish a connection with it. Please reference to chapter “6.1 Scan” and “6.2 Connection”

Step 5: The remote device discovers all the service that we created in Step 2.Please reference to chapter “6.3 Discovery Services”

|    | Handle ▲ | Range | Type                                       | UUID ▲             |
|----|----------|-------|--|--------------------|
| 1  | 0x0002   | -     | Characteristic                             | 0xb00c             |
| 2  | 0x0004   | -     | Characteristic                             | 0x0000b00b00000000 |
| 3  | 0x0011   | -     | Characteristic                             | 0xb006             |
| 4  | 0x0023   | -     | Characteristic                             | 0xb001             |
| 5  | 0x0025   | -     | Characteristic                             | 0xb002             |
| 6  | 0x0027   | -     | Characteristic                             | 0xb003             |
| 7  | 0x0031   | -     | Characteristic                             | 0xb007             |
| 8  | 0x0041   | -     | Device Name                                | 0x2a00             |
| 9  | 0x0043   | -     | Appearance                                 | 0x2a01             |
| 10 | 0x0045   | -     | Peripheral Preferred Connection Parameters | 0x2a04             |
| 11 | 0x0051   | -     | Service Changed                            | 0x2a05             |
| 12 | 0x0061   | -     | Characteristic                             | 0xb004             |

Figure 47 Services That the Remote Device Find

## 7. Profile

### 7.1 Services Table

|     | Services                          |
|-----|-----------------------------------|
| 1.  | Device Information Service        |
| 2.  | Battery Service                   |
| 3.  | Blood Pressure Service            |
| 4.  | Immediate Alert Service           |
| 5.  | Glucose Service                   |
| 6.  | Heart Rate Service                |
| 7.  | Health Thermometer Service        |
| 8.  | Link Loss Service                 |
| 9.  | Immediate Alert Service           |
| 10. | Tx Power Service                  |
| 11. | Current Time Service              |
| 12. | Next DST Change Service           |
| 13. | Reference Time Update Service     |
| 14. | Scan Parameters Service           |
| 15. | Alert Notification Service        |
| 16. | Phone Alert Status Service        |
| 17. | Cycling Speed and Cadence Service |
| 18. | Running Speed and Cadence Service |

**Table 7.1: Services**

### 7.2 Profile Table

|    | Profiles                   | Services  |
|----|----------------------------|---|
| 1. | Blood Pressure Profile     | 1.Blood Pressure Service<br>2.Device Information Service      |
| 2. | Find me Profile            | Immediate Alert Service                                       |
| 3. | Glucose Profile            | 1.Glucose Service<br>2.Device Information Service             |
| 4. | Heart Rate Profile         | 1.Heart Rate Service<br>2.Device Information Service          |
| 5. | Health Thermometer Profile | 1.Health Thermometer Service<br>2. Device Information Service |

|     |                                   |  |
|-----|-----------------------------------|--|
| 6.  | Proximity Profile                 | 1.Link Loss Service<br>2. Immediate Alert Service<br>3.Tx Power Service                |
| 7.  | Time Profile                      | 1.Current Time Service<br>2.Next DST Change Service<br>3.Reference Time Update Service |
| 8.  | Scan Parameters Profile           | Scan Parameters Service  |
| 9.  | Alert Notification Profile        | Alert Notification Service   |
| 10. | Phone Alert Status Profile        | Phone Alert Status Service   |
| 11. | Cycling Speed and Cadence Profile | 1.Cycling Speed and Cadence Service<br>2.Device Information Service                    |
| 12  | Running Speed and Cadence Profile | 1.Running Speed and Cadence Service<br>2.Device Information Service                    |

**Table 7.2: Profiles and Services**

## 7.3 Overview

### 7.3.1 Device Information Service

The Device Information Service exposes manufacturer and/or vendor information about a device.

**Settings**

Generic Mode Local ATT White List **Server**

**DISS** BASS BLPS FINDT GLPS HRPS HTPT PROXR TIPS SCPPS

Create DB

**Service Management**

☒ Auto Enable Enable

**Device Information Service Characteristics**

☒ Manufacturer Name String: Quintic

☒ Module Number String: QN-BLE-B0

☒ Serial Number String: 0.9.0-LE

☒ Hardware Revision String: 6.3.2

☒ Firmware Revision String: 0.1.8

☒ Software Revision String: 6.2.0

☒ System ID: 0x087cbeffffe000000

☒ IEEE Certification: 0x000000000201

☒ PnP ID: 0x00000000000403

Update

Figure 48 User Interface of Device Information Service



The screenshot displays the 'Settings' window in QTool. The 'Client' tab is selected, and within it, the 'DISC' sub-tab is active. The 'Device Information Service Collector' section has an 'Enable' button. The 'Service Characteristics' section contains the following fields:

- Manufacturer Name String:
- Model Number String:
- Serial Number String:
- Hardware Revision String:
- Firmware Revision String:
- Software Revision String:
- System ID:
- IEEE Certification:
- PnP ID:

A 'Read' button is located at the bottom right of the Service Characteristics section.

Figure 49 User Interface of Device Information Client

### 7.3.2 Battery Service

The Battery Service exposes the state of a battery within a device.

**Settings**

Generic Mode Local ATT White List **Server**

DISS **BASS** BLPS FINDT GLPS HRPS HTPT PROXR TIPS SCPPS

Create DB

**Service Management**

☒ Auto Enable Enable

**Battery Service Configuration**

Number of BAS: 1

Configure BAS: BAS 1

**Service Characteristics**

Battery Level: 100 ☒ Allow Notification Update

**Characteristic Presentation Format**

Format: uint8

Exponent: 0

Unit: 0x27AD (percentage)

Namespace: 0x01 (Bluetooth SIG)

Description: 0x0001

Figure 50 User Interface of Battery Service

The screenshot shows the 'Settings' window with the 'Client' tab selected. Under the 'Client' tab, the 'BASC' (Battery Service Client) sub-tab is active. The 'Battery Service Client' section has an 'Enable' button. Below it is a 'Select BAS:' dropdown menu. The 'Service Characteristics' section includes a 'Battery Level:' input field, a 'Notification Allowed' checkbox, and a 'Read' button. The 'Characteristic Presentation Format' section has input fields for 'Format:', 'Exponent:', 'Unit:', 'Namespace:', and 'Description:', with a 'Read' button at the bottom right.

**Figure 51 User Interface of Battery Client**

### 7.3.3 Blood Pressure Profile

The Blood Pressure Profile is used to enable a device to obtain blood pressure measurement and other data from a non-invasive blood pressure sensor that exposes the Blood Pressure Service.

The profile defines two roles: Blood Pressure Sensor and Collector. A Blood Pressure Sensor instantiates the Blood Pressure Service and the Device Information Service.

Settings

Generic Mode Local ATT White List **Server**

DISS BASS **BLPS** FINDT GLPS HRPS HTPT PROXR TIPS SCPPS

☒ Intermediary Cuff Pressure Supported Create DB

Service Management

☒ Auto Enable Enable

Features

☐ Body Movement Detection Feature ☐ Cuff Fit Detection feature

☐ Irregular Pulse Detection feature ☐ Pulse Rate Range Detection feature

☐ Measurement Position Detection feature ☐ Multiple Bonds

Measurement

Type: ☒ Stable Blood Pressure ☐ Intermediary Cuff Pressure

Unit: ☒ mmHg ☐ kPa

Systolic:  mmHg

Diastolic:  mmHg

Mean Pres:  mmHg

☒ Pulse Rate:  bpm

☒ Date:

☒ User Id:

☒ Measure Status:

No body movement

Cuff fits properly

No irregular pulse detected

Pulse rate is within the range

Proper measurement position

Indicate

Figure 52 User Interface of Blood Pressure Sensor

**Settings**

Connection to peer | Peer ATT | Security | **Client**

DISC | BASC | **BLPC** | FINDL | GLPC | HRPC | HTPC | PROXM | SCPPC | TIPC

**Blood Pressure Collector** Enable

**Features**

☐ Body Movement Detection Feature ☐ Cuff Fit Detection feature

☐ Irregular Pulse Detection feature ☐ Pulse Rate Range Detection feature

☐ Measurement Position Detection feature ☐ Multiple Bonds Read

☐ Blood Pressure Measurement Indication Allowed

☐ Intermediate Cuff Pressure Measurement Notification Allowed

**Measurement**

Type: ☒ Stable Blood Pressure ☐ Intermediary Cuff Pressure

Unit: ☒ mmHg ☐ kPa

Systolic:  mmHg

Diastolic:  mmHg

Mean Pres:  mmHg

☐ Pulse Rate:  bpm

☐ Date:

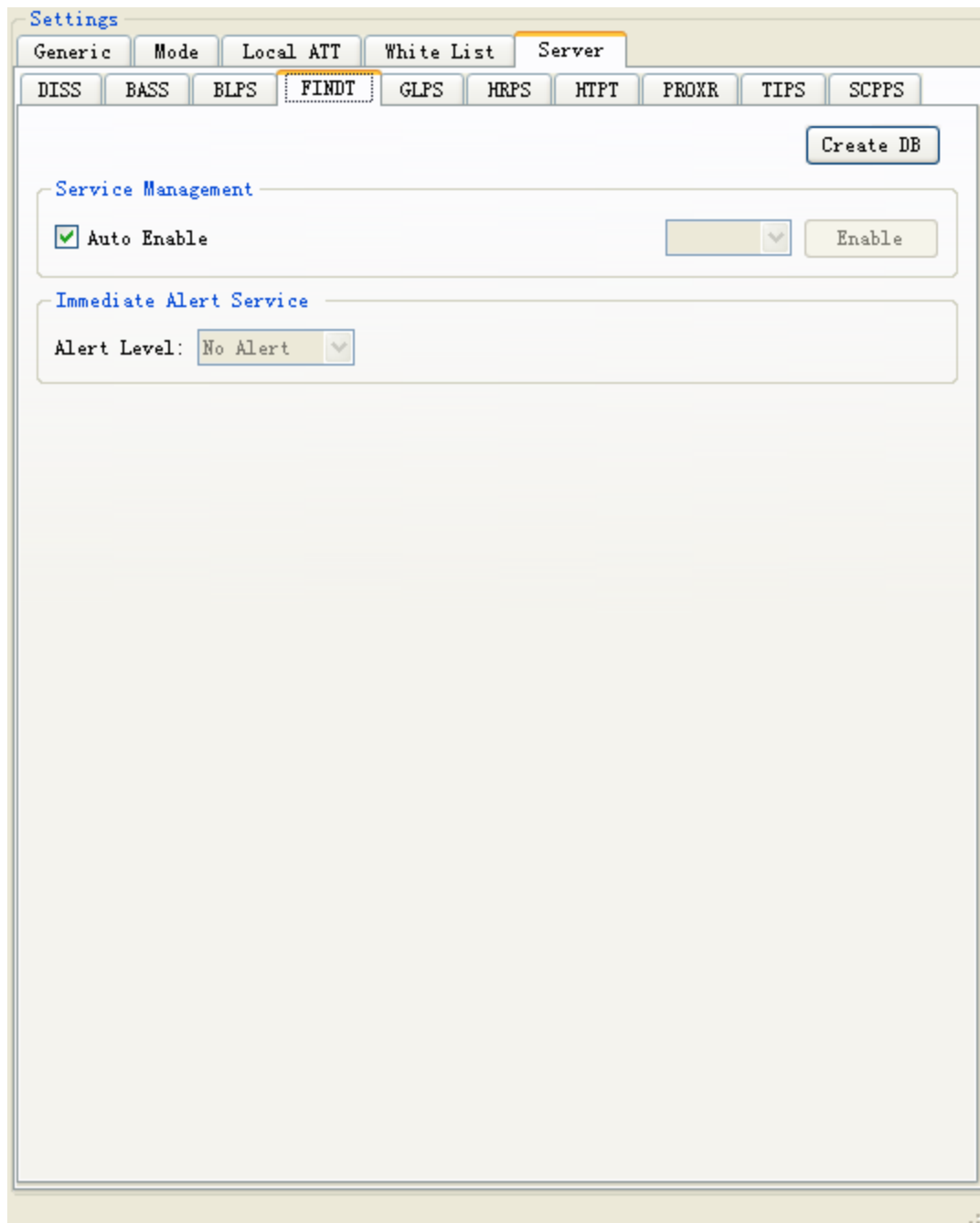
☐ User Id:

☐ Measure Status:

Figure 53 User Interface of Blood Pressure Collector

### 7.3.4 Find Me Profile

The Find Me profile defines the behavior when a button is pressed on one device to cause an alerting signal on a peer device. The profile defines two roles: Find Me Locator and Find Me Target. The Find Me Target has an instance of the Immediate Alert service.



**Figure 54 User Interface of Find Me Target**

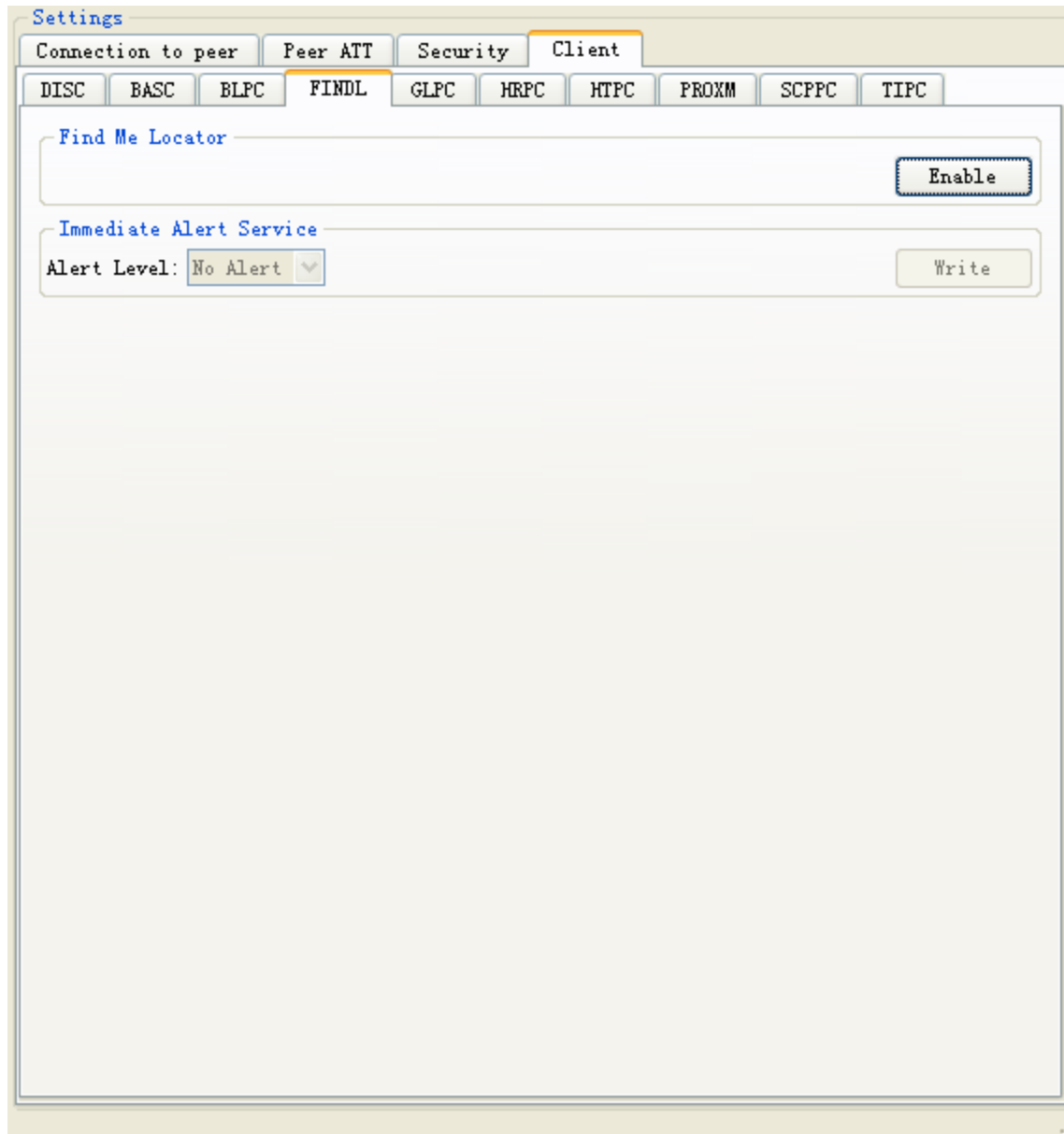


Figure 55 User Interface of Find Me Locator

### 7.3.5 Glucose Profile

The Glucose Profile is used to enable a device to obtain glucose measurement and other data from a Glucose Sensor that exposes the Glucose Service. The profile defines two roles: Glucose Sensor and Collector. A Glucose Sensor instantiates the Glucose Service and the Device Information Service.

Settings

Generic Mode Local ATT White List **Server**

DISS BASS BLPS FINDT **GLPS** HRPS HTPT PROXR TIPS SCPPS

☒ Context Support Create DB

Service Management

☒ Auto Enable Enable

Glucose Measurement

☒ Time Offset Present

☒ Glucose Concentration, Type and Sample Location Present

☒ Sensor Status Annunciation Present

☒ Context Information Follows

Sequence Number: 0x0000

Base Time: 201 Jan 10 15 h 10 min 0 sec

Time Offset: 0x0000

Glucose Concentration: 6.5 kg/L mol/L

Type: Capillary Whole blood

Sample Location: Finger

Sensor Status Annunciation: 0x0000 Edit

Record Notify

Glucose Measurement Context

☒ Carbohydrate ID And Carbohydrate Pres ☒ Medication ID And Medication Present

☒ Meal Present ☒ HbA1c Present

☒ Tester-Health Present ☒ Extended Flags Present

☒ Exercise Duration And Exercise Intensity Present

Extended Flags: 0x0

Carbohydrate ID: 0

Carbohydrate: 6.5 kilograms

Meal: Preprandial (before meal)

Tester: Self

Health: Minor health issues

Exercise Duration: 0x00aa

Figure 56 User Interface of Glucose Sensor





**Settings**

Generic Mode Local ATT White List **Server**

DISS BASS BLPS FINDT GLPS **HRPS** HTPT PROXR TIPS SCPPS

**Features**

☒ Energy Expanded Supported ☒ Body Sensor Location Supported

Create DB

**Service Management**

☒ Auto Enable ▼ Enable

Location: Other ▼

**Measurement**

Length: ☒ 16Bits ☐ 8Bits

Heart Rate: 0 bpm

☐ Sensor Contact: ☒ Contact detected ☐ Contact not detected

☐ Energy Expanded: 0 KJ

☐ RR Intervals: + -

Notify

Figure 58 User Interface of Heart Rate Sensor

Settings

Connection to peer Peer ATT Security Client

DISC BASC BLPC FINDL GLPC HRPC HTPC PROXM SCPPC TIPC

Heart Rate Collector

Enable

☐ Heart Rate Measurement Notification Allowed

Measurement

Length: ☒ 16Bits ☐ 8Bits

Heart Rate: 0 bpm

☐ Sensor Contact: ☒ Contact detected ☐ Contact not detected

☐ Energy Expanded: 0 KJ

☐ RR Intervals:

|   |         |
|---|---------|
| 0 | 1/1024s |
| 0 | 1/1024s |
| 0 | 1/1024s |
| 0 | 1/1024s |

Body Sensor Location: Other

Reset

Read

Figure 59 User Interface of Heart Rate Collector

### 7.3.7 Health Thermometer Profile

The Health Thermometer Profile is used to enable a data collection device to obtain data from a thermometer sensor that exposes the Health Thermometer Service. The profile defines two roles: Thermometer and Collector. A Thermometer instantiates one and only one Health Thermometer Service and instantiates one Device Information Service.

**Settings**

Generic Mode Local ATT White List **Server**

DISS BASS BLPS FINDT GLPS HRPS **HTPT** PROXR TIPS SCPPS

**Features**

- ☒ Temperature Type Supported
- ☒ Intermediate Temperature Supported
- ☒ Measurement Interval Supported
- ☒ Measurement Interval is Writeable
- ☒ Measurement Interval Supports Indications

Create DB

**Service Management**

☒ Auto Enable Enable

Temperature Type: Armpit Update

Measurement Interval: 0 Update

Measurement Interval Range: Min: 0 Max: 10

**Measurement**

Temperature Unite: ☒ Celcius ☐ Fahrenheit

Temperature Measurement Type: ☐ Intermediate ☒ Stable

Temperature Value: 0.00

☐ Temperature Type: Armpit

☐ Time Stamp

Indicate

Figure 60 User Interface of Thermometer

The screenshot shows the 'Settings' window in QTool. The 'Client' tab is selected, and the 'HTPC' sub-tab is active. The 'Thermometer Collector' section is expanded, showing an 'Enable' button and three unchecked checkboxes: 'Temperature Measurement Indication Allowed', 'Immediate Temperature Notification Allowed', and 'Measurement Interval Indication Allowed'. Below this is the 'Measurement' section, which includes 'Temperature Unite' (set to 'Celcius'), 'Temperature Measurement Type' (set to 'Stable'), 'Temperature Value' (0.00), 'Temperature Type' (Armpit), and 'Time Stamp'. The 'Temperature Type' dropdown is set to 'Armpit'. The 'Measurement Interval' section shows 'Value' (0) and 'Range' (Min: 0, Max: 10). There are 'Read' and 'Write' buttons at the bottom right of the 'Measurement Interval' section.

Figure 61 User Interface of Collector

### 7.3.8 Proximity Profile

The Proximity profile defines the behavior when a device moves away from a peer device so that the connection is dropped or the path loss increases above a preset level, causing an immediate alert. The profile defines two roles: Proximity Monitor and Proximity Reporter. The Proximity Reporter has an instance of the Link Loss service, and optionally both the Immediate Alert and the Tx Power service.

Settings

Generic Mode Local ATT White List **Server**

DISS BASS BLPS FINDT GLPS HRPS HTPT **PROXR** TIPS SCPPS

☒ Immediate Alert Service/Tx Power Service Support Create DB

**Service Management**

☒ Auto Enable Enable

**Link Loss Service**

Alert Level: No Alert Update

**Tx Power Service**

Tx Power Value: 0 Update

**Immediate Alert Service**

Alert Level: No Alert

Figure 62 User Interface of Proximity Reporter

The screenshot shows the 'Settings' window in QTool, with the 'Client' tab selected. The 'PROXM' sub-tab is active. The 'Proximity Monitor' section has an 'Enable' button. The 'Link Loss Service' section has an 'Alert Level' dropdown set to 'No Alert' and 'Read' and 'Write' buttons. The 'Tx Power Service' section has a 'Tx Power Value' spinner set to 0 and a 'Read' button. The 'Immediate ALert Service' section has an 'Alert Level' dropdown set to 'No Alert' and a 'Write' button.

Figure 63 User Interface of Proximity Monitor

### 7.3.9 Time Profile

The Time profile is used to obtain the date and time, and related information such as time zone as exposed by the Current Time service in the peer device. The profile defines two roles: Time Server and Time Client. The Time Server has an instance of the Current Time Service, and optionally an instance of the Next DST Change Service and an instance of the Reference Update Time Service.

Settings

Generic Mode Local ATT White List **Server**

DISS BASS BLPS FINDT GLPS HRPS HTPT PROXR **TIPS** SCPFS

**Features**

☒ Local Time Information Supported ☒ NDCS Support

☒ Reference Time Information Supported ☒ RTUS Support

Create DB

**Service Management**

☒ Auto Enable Enable

**Current Time Service**

**Current Time**

2013 April 10 15 h 10 min 0 sec 1/256s

☐ Manual Time Update ☐ External Reference Time Update Monday

☐ Change of Time Zone ☐ Change of DST Update

**Local Time Information**

Time Zone: 0

DST Offset: Standard Time Update

**Reference Time Information**

Time Source: Unknown

Time Accuracy: 0

Days Update: 0

Hours Update: 0 Update

**Next DST Change Service**

**Time With DST**

2013 January 10 15 h 10 min 0 sec

DST Offset: Standard Time Update

**Reference Time Update Service**

**Time Update Control Point**

Get Reference Update

**Time Update State**

Current State: Idle

Result: Successful Update

Figure 64 User Interface of the Time Server



**Settings**

Connection to peer Peer ATT Security **Client**

DISC BASC BLPC FINDL GLPC HRPC HTPC PROXM SCPPC **TIPC**

**Time Client** Enable

**Current Time Service**

**Current Time**  
 2013 January 10 15:10:00 1/256s Monday  
☐ Manual Time Update ☐ External Reference Time Update ☐ Notify Allowed  
☐ Change of Time Zone ☐ Change of DST Read

**Local Time Information** **Reference Time Information**

Time Zone: 0 Time Source: Unknown  
 DST Offset: Standard Time Time Accuracy: 0  
 Days Update: 0  
 Hours Update: 0  
Read Read

**Next DST Change Service**

**Time With DST**  
 2013 January 10 15:10:00  
 DST Offset: Standard Time Read

**Reference Time Update Service**

**Time Update Control Point** **Time Update State**  
 Get Reference Update Current State: Idle  
 Result: Successful  
Write Read

Figure 65 User Interface of the Time Client

### 7.3.10 Scan Parameter Profile

The Scan Parameters Profile is used to provide devices with information to assist them in managing their connection idle timeout and advertising parameters to optimize for power consumption and/or reconnection latency. This profile defines two roles: Scan Client and Scan Server. The Scan Server has a single instance of the Scan Parameters Service.

The screenshot displays the 'Settings' window of QTool, specifically the 'Server' tab and the 'SCPPS' sub-tab. The interface includes several configuration sections:

- Top Navigation:** Tabs for 'Generic', 'Mode', 'Local ATT', 'White List', and 'Server' (selected). Below these are sub-tabs: 'DISS', 'BASS', 'BLPS', 'FINDT', 'GLPS', 'HRPS', 'HTPT', 'PROXR', 'TIPS', and 'SCPPS' (selected).
- Scan Refresh:** A checkbox labeled 'Scan Refresh' is checked. A 'Create DB' button is located to its right.
- Service Management:** A section containing a checked 'Auto Enable' checkbox, a dropdown menu, and an 'Enable' button.
- Scan Interval Value:** A section with two input fields: 'Scan Interval:' and 'Scan Window:'.
- Scan Refresh:** A section at the bottom with a 'Notify' button.

Figure 66 User Interface of the Scan Server

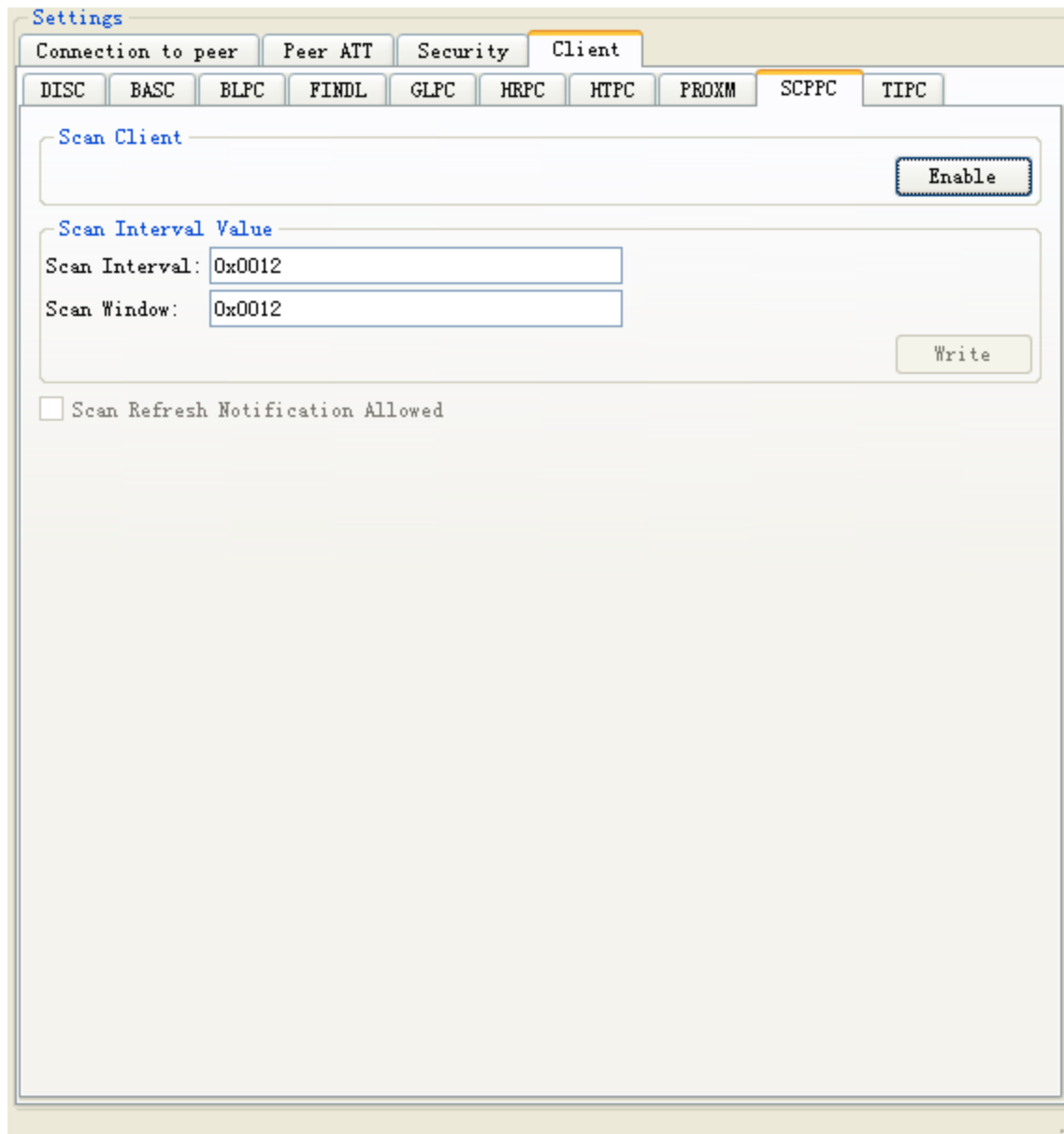


Figure 67 User Interface of the Scan Client

### 7.3.11 Alert Notification Profile

The Alert Notification profile allows a device like a watch to obtain information from a cellphone about incoming calls, missed calls and SMS/MMS messages. The profile defines two roles: the Alert Notification Server and the Alert Notification Client.

Settings

Generic Mode Local ATT White List **Server**

BLPS FINDT GLPS HRPS HTPT PROXR SCPPS TIPS **ANPS** CSCPS PASPS

Create DB

**Service Management**

☒ Auto Enable 087cbe000102 Enable

**Supported New Alert Category**

☒ Simple Alert Supported ☒ Missed Call Supported ☐ High Prioritized Alert Supported  
☐ Email Supported ☐ SMS/MMS Supported ☒ Instant Message Supported  
☒ News Supported ☐ Voice Mail Supported  
☐ Call Supported ☒ Schedule Supported

**New Alert**

Category ID: Simple Alert Number of New Alert: 2  
☒ Text String Information: sdafa Notify

**Supported Unread Alert Category**

☒ Simple Alert Supported ☒ Missed Call Supported ☒ High Prioritized Alert Supported  
☐ Email Supported ☐ SMS/MMS Supported ☐ Instant Message Supported  
☐ News Supported ☐ Voice Mail Supported  
☒ Call Supported ☒ Schedule Supported

**Unread Alert Status**

Category ID: High Prioritized AL Unread Count: 2 Notify

**Alert Notification Control Point**

Command ID:   
 Category ID:

Figure 68 User Interface of the Alert Notification Server

**Settings**

Connection to peer | Peer ATT | Security | **Client**

ISC | BASC | BLPC | FINDL | GLPC | HRPC | HTPC | PROXM | SCPFC | TIPC | **ANPC**

**Alert Notification Client** Enable

**Supported New Alert Category**

☒ Simple Alert Supported   
 ☒ Missed Call Supported   
 ☐ High Prioritized Alert Supported  
☐ Email Supported   
 ☐ SMS/MMS Supported   
 ☒ Instant Message Supported  
☒ News Supported   
 ☐ Voice Mail Supported  
☐ Call Supported   
 ☒ Schedule Supported

☒ **New Alert Notification Allowed**

**New Alert**

Category ID:  Number of New Alert:

☐ Text String Information:

**Supported Unread Alert Category**

☒ Simple Alert Supported   
 ☒ Missed Call Supported   
 ☒ High Prioritized Alert Supported  
☐ Email Supported   
 ☐ SMS/MMS Supported   
 ☐ Instant Message Supported  
☐ News Supported   
 ☐ Voice Mail Supported  
☒ Call Supported   
 ☒ Schedule Supported

☒ **Unread Alert Notification Allowed**

**Unread Alert Status**

Category ID:  Unread Count:

**Alert Notification Control Point**

Command ID:  Enable New Incoming Alert Notification

Category ID:  Simple Alert

Write

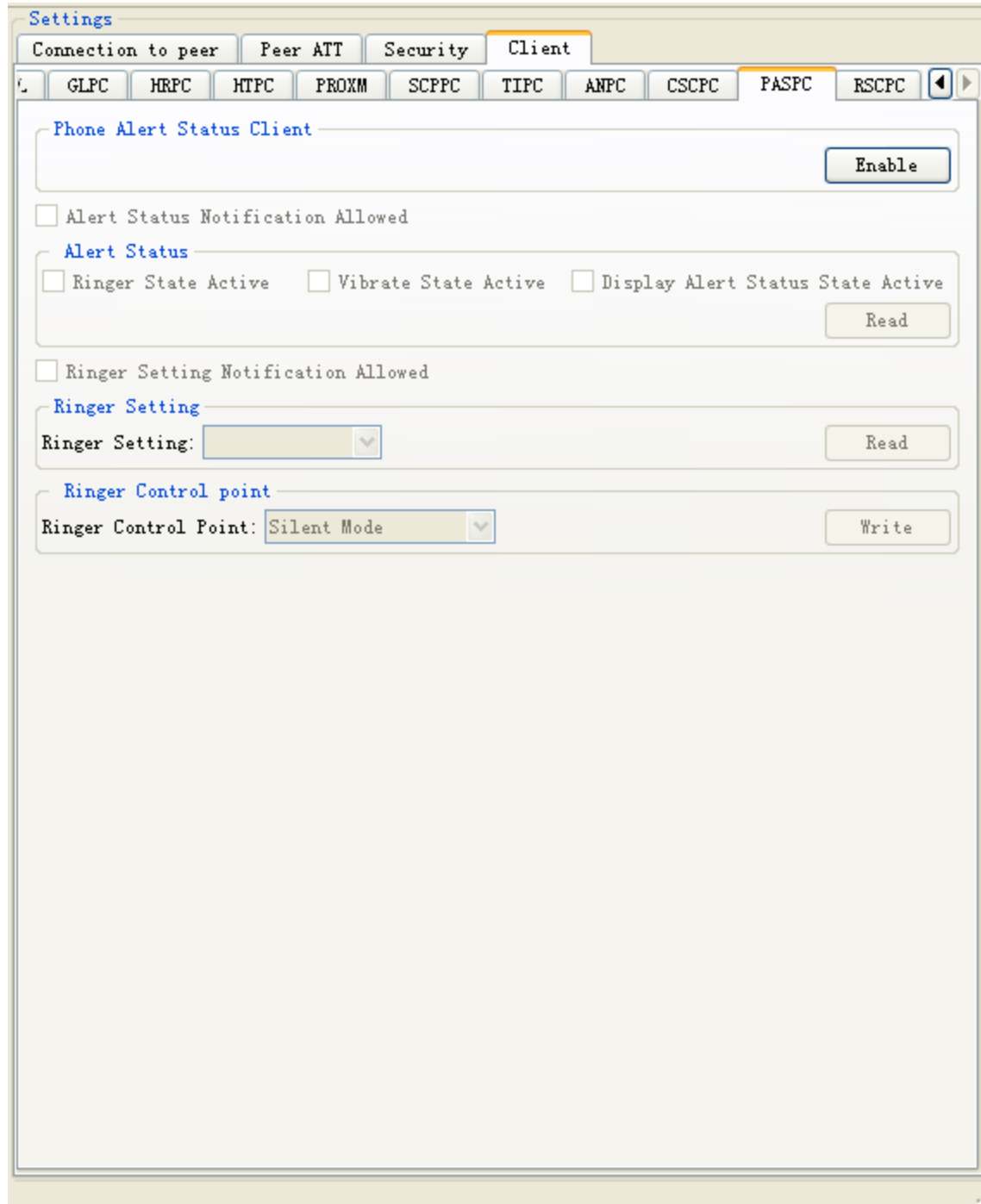
**Figure 69 User Interface of the Alert Notification Client**

### 7.3.12 Phone Alert Status Profile

The Phone Alert Status profile is used to obtain the Phone Alert Status exposed by the Phone Alert Status service in the peer device. The Profile defines two roles Phone Alert Server and Phone Alert Client.

The screenshot shows the 'Settings' window with the 'Server' tab selected. The 'PASPS' sub-tab is also active. The interface includes several sections: 'Ringer Control Point Supported' with a checked checkbox and a 'Create DB' button; 'Service Management' with 'Auto Enable' checked, a dropdown menu showing '087cbe000102', and an 'Enable' button; 'Alert Status' with three checked checkboxes ('Ringer State Active', 'Vibrate State Active', 'Display Alert Status State Active') and an 'Update' button; 'Ringer Setting' with a dropdown menu set to 'Ringer Silent' and an 'Update' button; and 'Ringer Control point' with a text field and a dropdown menu.

Figure 70 User Interface of the Phone Alert Server



**Figure 71 User Interface of the Phone Alert Client**

### 7.3.13 Cycling Speed and Cadence Profile

The Cycling Speed and Cadence Profile is used to enable a data collection device to obtain data from a Cycling Speed and Cadence Sensor (CSC Sensor) that exposes the Cycling Speed and Cadence Service. The profile defines two roles: CSC Sensor and Collector.

Settings

Generic Mode Local ATT White List **Server**

BLPS FINDT GLPS HRPS HTPT PROXR SCPPS TIPS ANPS **CSCPS** PASPS

**CSC Feature**

☒ Wheel Revolution Data Supported ☒ Crank Revolution Data Supported

☒ Multiple Sensor Locations Supported

☒ Sensor Location Supported Create DB

**Service Management**

☒ Auto Enable 087cbe000102 Enable

**CSC Measurement**

☒ Wheel Revolution Data Present ☐ Crank Revolution Data Present

Cumulative Wheel Revolutions: 0

Last Wheel Event Time: 0 1/1024s

Cumulative Crank Revolutions: 0

Last Crank Event Time: 0 1/1024s Notify

**Sensor Location**

Supported Sensor Locations:

|                                       |                                      |                                     |                                      |                                      |
|---------------------------------------|--------------------------------------|-------------------------------------|--------------------------------------|--------------------------------------|
| <input type="checkbox"/> Other        | <input type="checkbox"/> Top of shoe | <input type="checkbox"/> In shoe    | <input type="checkbox"/> Hip         | <input type="checkbox"/> Front Wheel |
| <input type="checkbox"/> Left Crank   | <input type="checkbox"/> Right Crank | <input type="checkbox"/> Left Pedal | <input type="checkbox"/> Right Pedal | <input type="checkbox"/> Front Hub   |
| <input type="checkbox"/> Rear Dropout | <input type="checkbox"/> Chainstay   | <input type="checkbox"/> Rear Wheel | <input type="checkbox"/> Rear Hub    | <input type="checkbox"/> Chest       |

Sensor Location:

**SC Control Point**

Op Code: Reserved

Figure 72 User Interface of the CSC Sensor



Settings

Connection to peer Peer ATT Security Client

GLPC HRPC HTPC PROXM SCPPC TIPC ANPC CSCPC PASPC RSCPC

Cycling Speed and Cadence Collector

Enable

CSC Feature

☐ Crank Revolution Data Supported

☐ Wheel Revolution Data Supported

☐ Multiple Sensor Locations Supported

Read

☐ Measurement Notification Allowed

☐ SC Control Point Indication Allowed

CSC Measurement

☐ Wheel Revolution Data Present

☐ Crank Revolution Data Present

Cumulative Wheel Revolutions:

Last Wheel Event Time: 1/1024s

Cumulative Crank Revolutions:

Last Crank Event Time: 1/1024s

Sensor Location

Supported Sensor Locations:

☐ Other ☐ Top of shoe ☐ In shoe ☐ Hip ☐ Front Wheel

☐ Left Crank ☐ Right Crank ☐ Left Pedal ☐ Right Pedal ☐ Front Hub

☐ Rear Dropout ☐ Chainstay ☐ Rear Wheel ☐ Rear Hub ☐ Chest

Sensor Location:

Read

SC Control Point

Op Code: Set Cumulative Value

Write

Figure 73 User Interface of the CSC Collector

### 7.3.14 Running Speed and Cadence Profile

The Running Speed and Cadence Profile is used to enable a data collection device to obtain data from a Running Speed and Cadence Sensor (RSC Sensor) that exposes the Running Speed and Cadence Service. The profile defines two roles: RSC Sensor and Collector.

Settings

Generic Mode Local ATT White List **Server**

FINDT GLPS HRPS HTPT PROXR SCPPS TIPS ANPS CSCPS PASPS **RSCPS**

**RSC Feature**

☐ Instantaneous Stride Length Measurement Supported ☐ Total Distance Measurement Supported

☐ Walking or Running Status Supported ☐ Multiple Sensor Locations Supported

☐ Calibration Procedure Supported

☐ Sensor Location Supported Create DB

**Service Management**

☒ Auto Enable 087cbe000102 Enable

**RSC Measurement**

☐ Instantaneous Stride Length Present ☐ Total Distance Present

Walking or Running Status: ☒ Walking ☐ Running

Instantaneous Speed: 0.00 m/s

Instantaneous Cadence: 0 1/minute

Instantaneous Stride Length: 0.00 m

Total Distance: 0.0 m Notify

**Sensor Location**

Supported Sensor Locations:

☐ Other ☐ Top of shoe ☐ In shoe ☐ Hip ☐ Front Wheel

☐ Left Crank ☐ Right Crank ☐ Left Pedal ☐ Right Pedal ☐ Front Hub

☐ Rear Dropout ☐ Chainstay ☐ Rear Wheel ☐ Rear Hub ☐ Chest

Sensor Location:

**SC Control Point**

Op Code: Reserved

Figure 74 User Interface of the RSC Sensor

**Settings**

Connection to peer | Peer ATT | Security | **Client**

GLPC | HRPC | HTPC | PROXM | SCPPC | TIPC | ANPC | CSCPC | PASPC | **RSCPC**

**Running Speed and Cadence Collector**

**RSC Feature**

☐ Instantaneous Stride Length Measurement Supported

☐ Walking or Running Status Supported

☐ Calibration Procedure Supported

☐ Total Distance Measurement Supported

☐ Multiple Sensor Locations Supported

☐ RSC Measurement Notification Allowed

☐ SC Control Point Indication Allowed

**RSC Measurement**

☐ Instantaneous Stride Length Present

☐ Total Distance Present

Walking or Running Status: ☒ Walking ☐ Running

Instantaneous Speed:  m/s

Instantaneous Cadence:  1/minute

Instantaneous Stride Length:  m

Total Distance:  m

**Sensor Location**

Supported Sensor Locations:

|                                       |                                      |                                     |                                      |                                      |
|---------------------------------------|--------------------------------------|-------------------------------------|--------------------------------------|--------------------------------------|
| <input type="checkbox"/> Other        | <input type="checkbox"/> Top of shoe | <input type="checkbox"/> In shoe    | <input type="checkbox"/> Hip         | <input type="checkbox"/> Front Wheel |
| <input type="checkbox"/> Left Crank   | <input type="checkbox"/> Right Crank | <input type="checkbox"/> Left Pedal | <input type="checkbox"/> Right Pedal | <input type="checkbox"/> Front Hub   |
| <input type="checkbox"/> Rear Dropout | <input type="checkbox"/> Chainstay   | <input type="checkbox"/> Rear Wheel | <input type="checkbox"/> Rear Hub    | <input type="checkbox"/> Chest       |

Sensor Location:

**SC Control Point**

Op Code:

Figure 75 User Interface of the RSC Collector

## 7.4 Operations

### 7.4.1 Create

First, select the services and features that are optional. And then click the “Create DB” button.

### 7.4.2 Enable

There are two ways of enable all the services that a GATT Server instantiates: auto enables and manual enable.

Auto enable all the services .First, please check the “Auto Enable” checkbox before create all the services. And after the connection with a GATT Client is established, all the services will be auto enabled.

Manual enable all the services. First, create all the services. Second, advertising and establish a connection with a GATT Client. At last, choose one of the devices that the local device connected, and then click the “Enable” pushbutton.

### 7.4.3 Read

If a characteristic is readable, maybe it is updatable except for some read only features. If set a new characteristic value on the user interface of the GATT Server, and click the corresponding “Update” pushbutton. When read the characteristic again by the GATT Client, the characteristic value changes.

Before reading the character value, please make sure that the service of the characteristic is enabled.

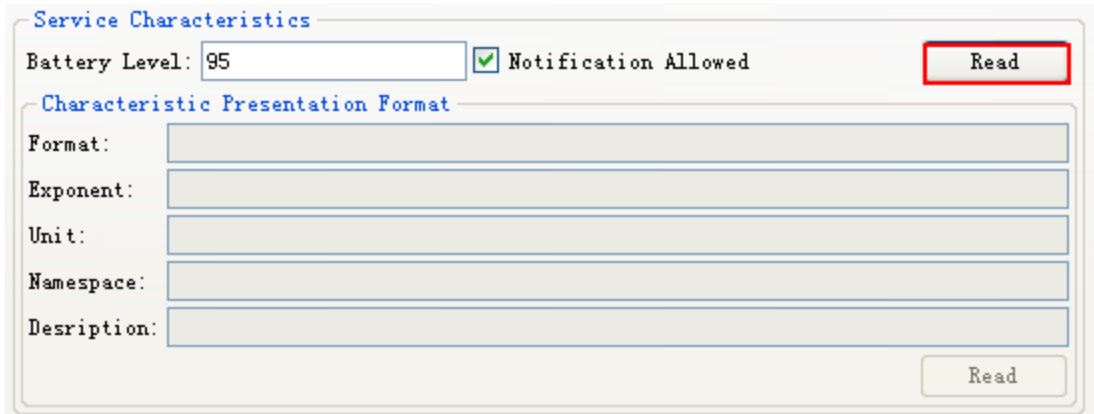
For example:

1. Set the battery level and click the “Update” button, on the user interface of battery service. As Figure 74 shows:

The screenshot shows a dialog box titled "Service Characteristics". At the top, it says "Battery Level: 94" with a spin button. To the right is a checkbox labeled "Allow Notification" which is checked. A red rectangular box highlights the "Update" button. Below this is a section titled "Characteristic Presentation Format" which contains several input fields: "Format:" with a dropdown menu showing "uint8", "Exponent:" with a spin button showing "0", "Unit:" with a text field showing "0x27AD (percentage)", "Namespace:" with a dropdown menu showing "0x01 (Bluetooth SIG)", and "Description:" with a text field showing "0x0001".

Figure 76 Update

2. Click the “Read” button on the user interface of battery client. As Figure 75 shows:



**Service Characteristics**

Battery Level: 95 ☒ Notification Allowed Read

**Characteristic Presentation Format**

Format:

Exponent:

Unit:

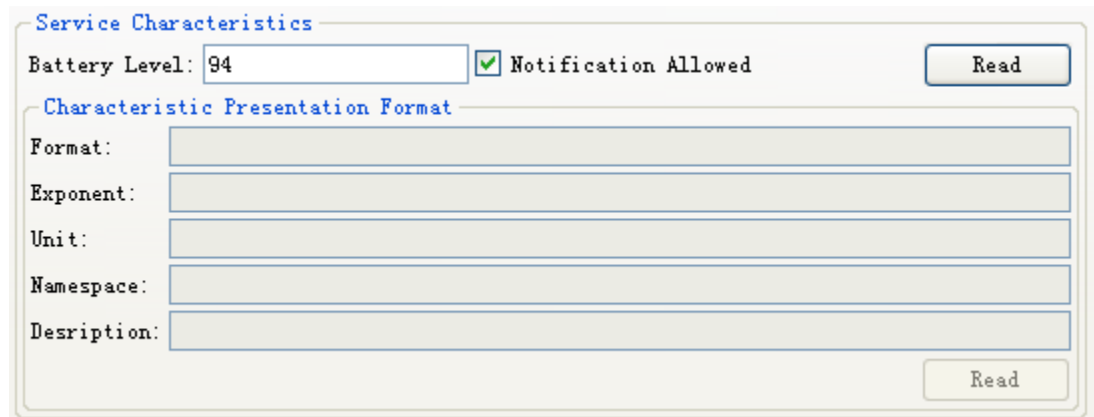
Namespace:

Description:

Read

**Figure 77 Read Operation**

### 3. Result



**Service Characteristics**

Battery Level: 94 ☒ Notification Allowed Read

**Characteristic Presentation Format**

Format:

Exponent:

Unit:

Namespace:

Description:

Read

**Figure 78 Result**

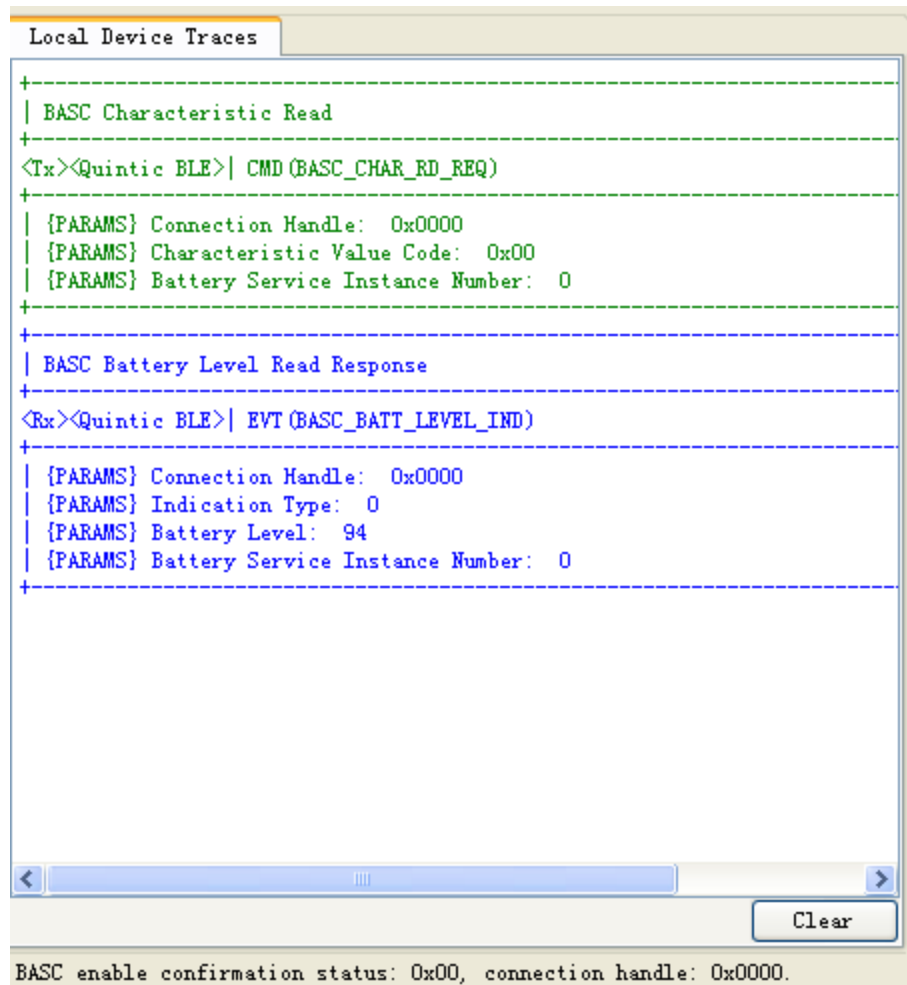


Figure 79 Trace Information

#### 7.4.4 Write

If a characteristic is writable, and when write a new value to the characteristic, the result of the operation is shown on the user interface of the GATT Server.

For example:

1. Set the alert level and click the “Write” button on the user interface of the find me locator.

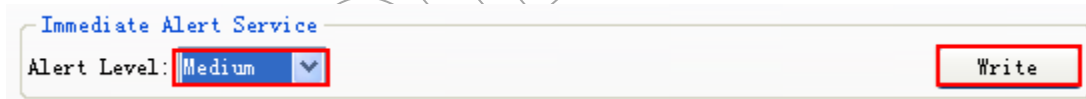


Figure 80 Write Operation

2. Result

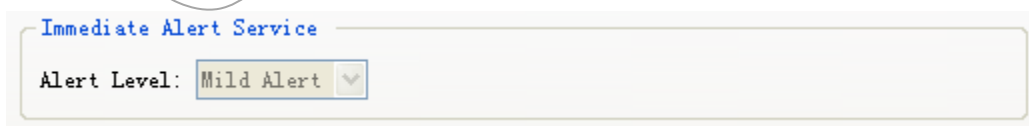


Figure 81 Result

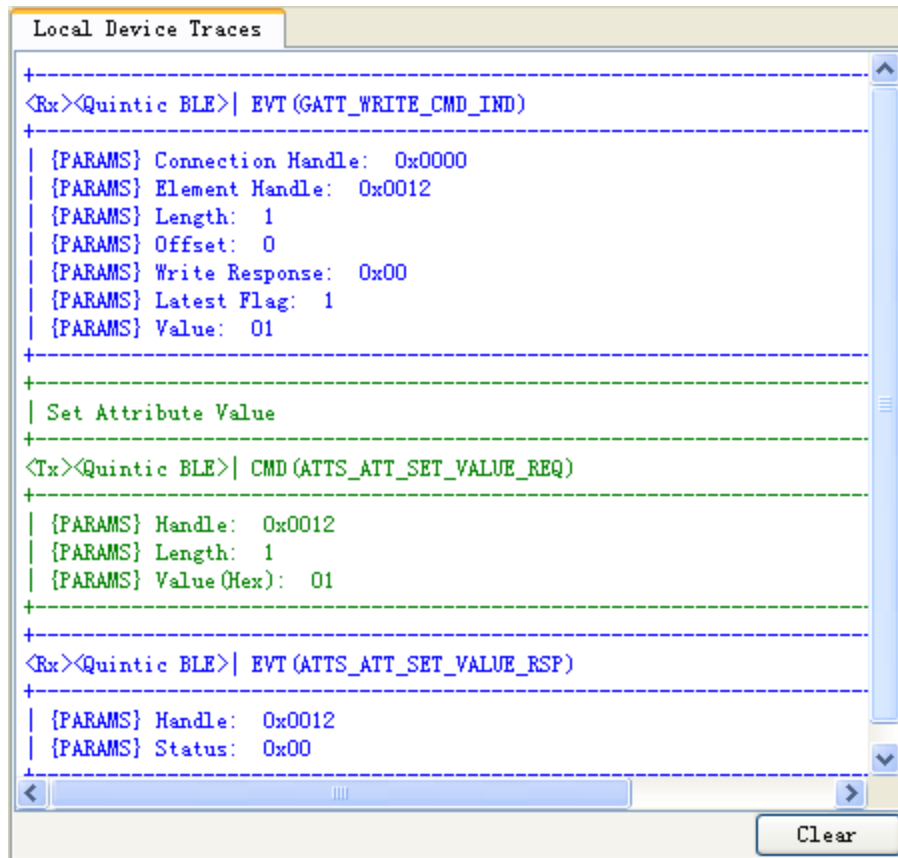


Figure 82 Trace Information

#### 7.4.5 Indicate

If a characteristic has the property of indicate, the GATT Client should write a value to the GATT Server to enable the indication property of the characteristic. And then click the corresponding “Indicate” pushbutton on the user interface of the GATT Server. The GATT Server will indicate the characteristic value to the GATT Client.

For example:

1. Check the “Blood Pressure Measurement Allowed” checkbox on the user interface of the blood pressure collector.

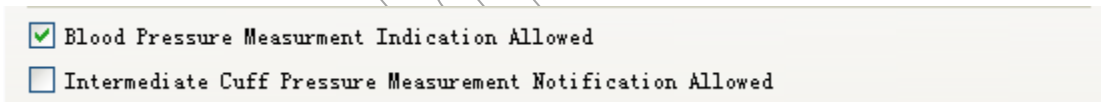


Figure 83 Enable Blood Pressure Measurement Indications

2. Set the blood pressure measurement and click the “Indicate” pushbutton on the user interface of the blood pressure sensor.

The screenshot shows the 'Measurement' window in the QTool software. The window contains several input fields and checkboxes. The 'Type' field has two radio buttons: 'Stable Blood Pressure' (selected) and 'Intermediary Cuff Pressure'. The 'Unit' field has two radio buttons: 'mmHg' (selected) and 'kPa'. The 'Systolic' field is set to 100.00 mmHg, 'Diastolic' is 70.00 mmHg, and 'Mean Pres' is 120.00 mmHg. The 'Pulse Rate' is 80 bpm, 'Time Stamp' is 2013/12/16 16:29:48, 'User Id' is 0, and 'Measure Status' is 'No body movement'. There are five other status options: 'Cuff fits properly', 'No irregular pulse detected', 'Pulse rate is within the range', and 'Proper measurement position'. The 'Indicate' button is highlighted with a red box.

Figure 84 Indicate Operation

### 3. Result

The screenshot shows the 'Measurement' window in the QTool software, displaying the 'Result' screen. The window contains several input fields and checkboxes. The 'Type' field has two radio buttons: 'Stable Blood Pressure' (selected) and 'Intermediary Cuff Pressure'. The 'Unit' field has two radio buttons: 'mmHg' (selected) and 'kPa'. The 'Systolic' field is set to 100.00 mmHg, 'Diastolic' is 70.00 mmHg, and 'Mean Pres' is 120.00 mmHg. The 'Pulse Rate' is 80 bpm, 'Time Stamp' is 2013/12/16 16:29:48, 'User Id' is 0, and 'Measure Status' is 'No body movement'. There are five other status options: 'Cuff fits properly', 'No irregular pulse detected', 'Pulse rate is within the range', and 'Proper measurement position'.

Figure 85 Result



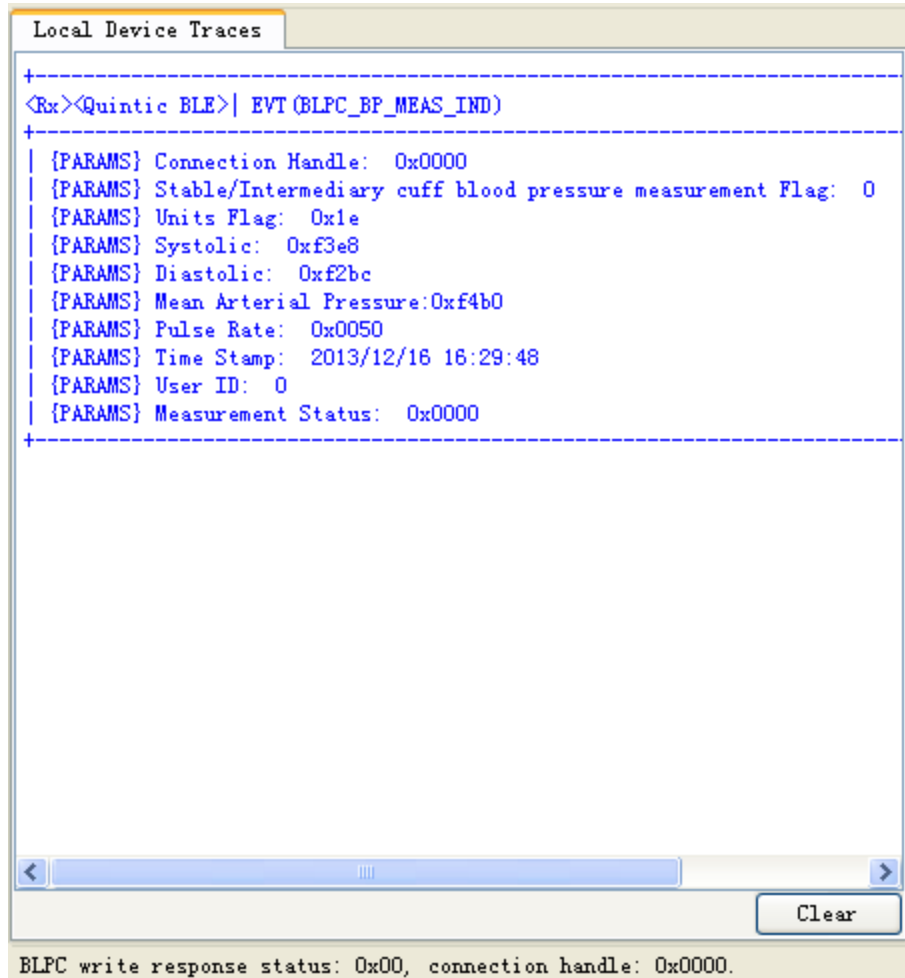


Figure 86 Trace Information

#### 7.4.6 Notify

If a characteristic has the property of notify, the GATT Client should write a value to the GATT Server to enable the notification property of the characteristic. And then click the corresponding "Notify" pushbutton on the user interface of the GATT Server. The GATT Server will Notify the GATT Client of characteristic value .

For example:

1. Check the "Notification Allowed" checkbox on the user interface of battery client.

The image shows a dialog box titled "Service Characteristics". It has two main sections. The top section, "Service Characteristics", contains a "Battery Level:" label followed by an empty text input field. To the right of the input field is a checkbox labeled "Notification Allowed" which is checked. Further right is a "Read" button. The bottom section, "Characteristic Presentation Format", contains five labels with corresponding input fields: "Format:", "Exponent:", "Unit:", "Namespace:", and "Description:". All these input fields are empty. A "Read" button is located at the bottom right of this section.

Figure 87 Allow Notification

2. Set the battery level and click the "Notify" pushbutton on the user interface of the battery client.

The image shows the same "Service Characteristics" dialog box. In the "Service Characteristics" section, the "Battery Level:" input field now contains the value "95". The "Notification Allowed" checkbox remains checked. The "Notify" button, located to the right of the checkbox, is now highlighted with a red border. In the "Characteristic Presentation Format" section, the input fields are now filled: "Format:" is "uint8", "Exponent:" is "0", "Unit:" is "0x2TAD (percentage)", "Namespace:" is "0x01 (Bluetooth SIG)", and "Description:" is "0x0001".

Figure 88 Notify Operation

3. Result

The image shows the "Service Characteristics" dialog box after the notification operation. The "Battery Level:" input field still contains "95". The "Notification Allowed" checkbox is checked. The "Read" button is now highlighted with a red border. The "Characteristic Presentation Format" section remains unchanged from the previous state, with all fields filled: "Format:" is "uint8", "Exponent:" is "0", "Unit:" is "0x2TAD (percentage)", "Namespace:" is "0x01 (Bluetooth SIG)", and "Description:" is "0x0001".

Figure 89 Result

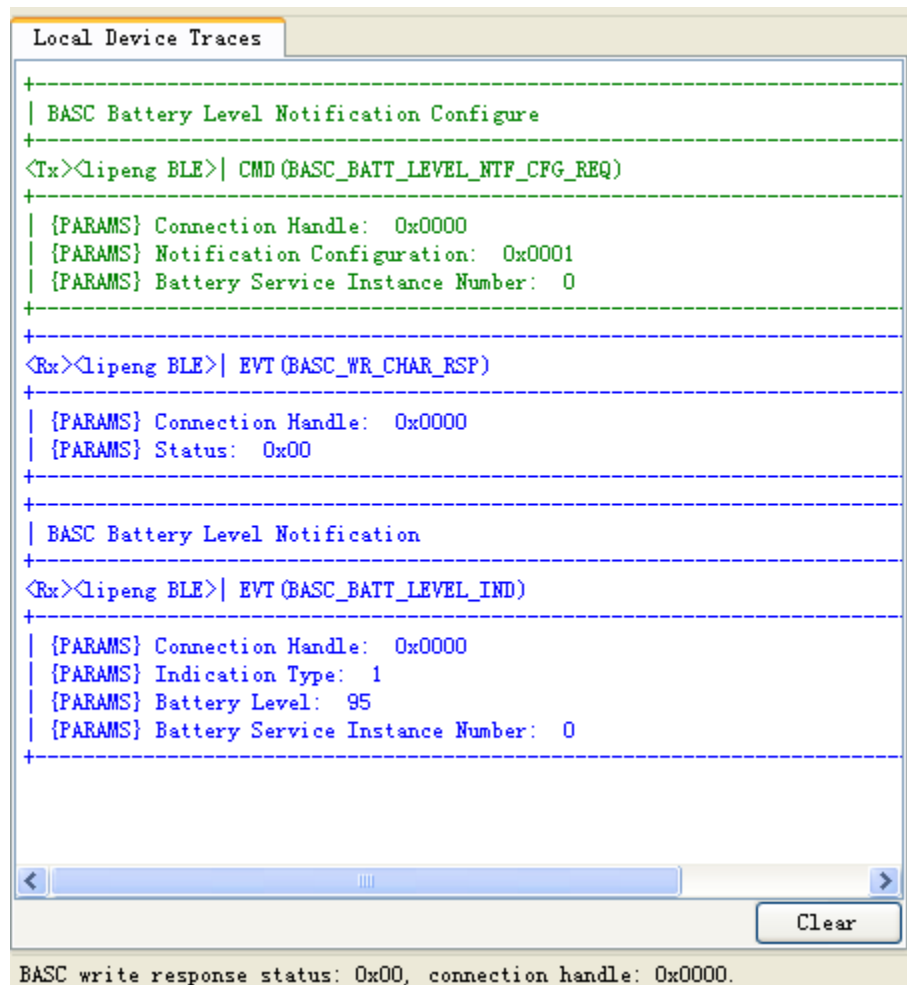


Figure 90 Trace Information

## 7.5 Profile Test Operation

### 7.5.1 Proximity Profile

1. Click the "Create DB" pushbutton on the user interface of the proximity reporter.

The screenshot shows the 'Settings' window with the 'Server' tab selected. Under the 'PROXR' sub-tab, the 'Immediate Alert Service/Tx Power Service Support' checkbox is checked. The 'Create DB' button is highlighted with a red box. Below this, the 'Service Management' section has 'Auto Enable' checked. The 'Link Loss Service' section has 'Alert Level' set to 'No Alert'. The 'Tx Power Service' section has 'Tx Power Value' set to '0'. The 'Immediate ALert Service' section has 'Alert Level' set to 'No Alert'.

Figure 91 Create DB

2. Set the “Tx Power Value” and Click the “Update” pushbutton.

The screenshot shows the same 'Settings' window as Figure 91, but the 'Tx Power Value' in the 'Tx Power Service' section is now set to '4'. The 'Update' button next to it is highlighted with a red box. The 'Create DB' button is still visible in the top right.

Figure 92 Set Tx Power Value

3. Click the “Advertising” pushbutton.

Settings

Generic Mode Local ATT White List Server

Modes

Discoverability Modes

☐ Non-discoverable

☐ Limited Discoverable

☒ General Discoverable

Connectability Modes

☐ Non-connectable

☒ Connectable

Bondable Modes

☐ Non-bondable

☒ Bondable

Set

Advertising

Type

☒ Connectable Undirected

☐ Connectable Directed

☐ Scannable Undirected

☐ Non-connectable Undirected

Interval Min(ms): 100

Interval Max(ms): 100

Direct Address

☒ Public ☐ Random 0x887cbe000101

Channel Map

☒ Channel 37

☒ Channel 38

☒ Channel 39

Advertising Data 0x020106

Scan Response 0x

Advertising Stop

Default

Figure 93 Advertising

4. Start a new QTool, and Click the “Scan” pushbutton on the “Generic” tab of the client.

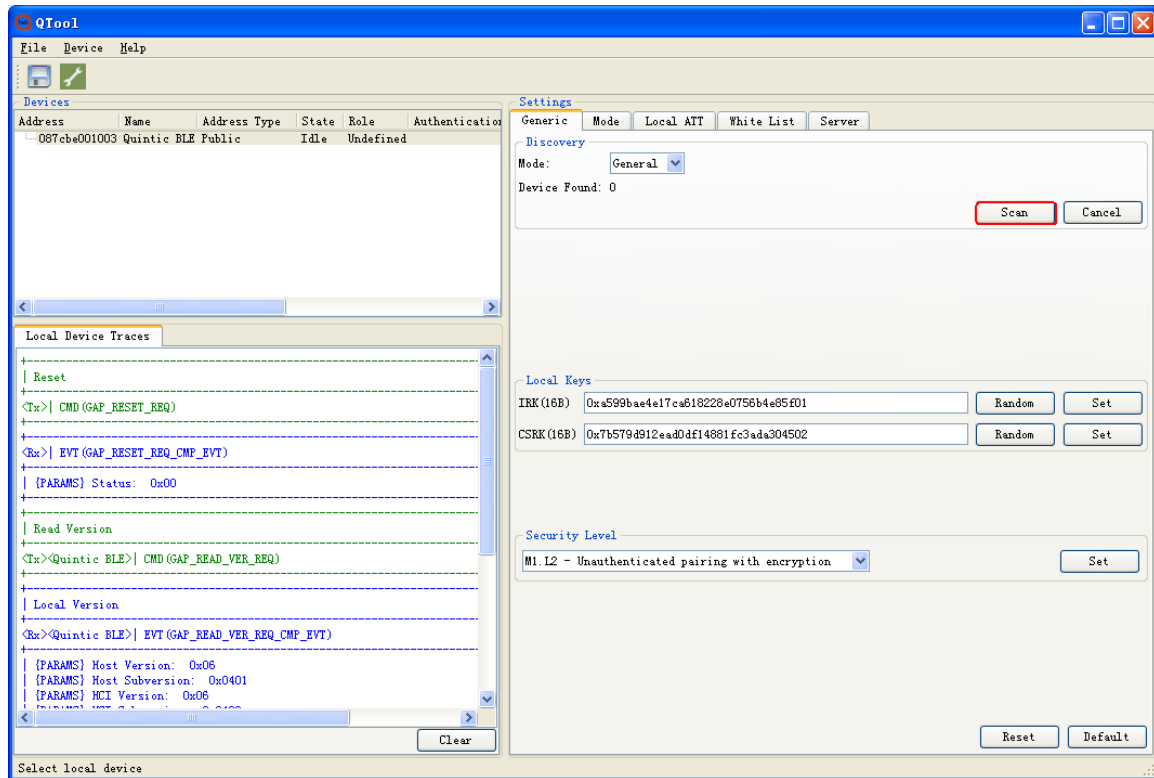


Figure 94 Scan

5. Select the device that we created services of the proximity reporter. And then click the “Connect” pushbutton.

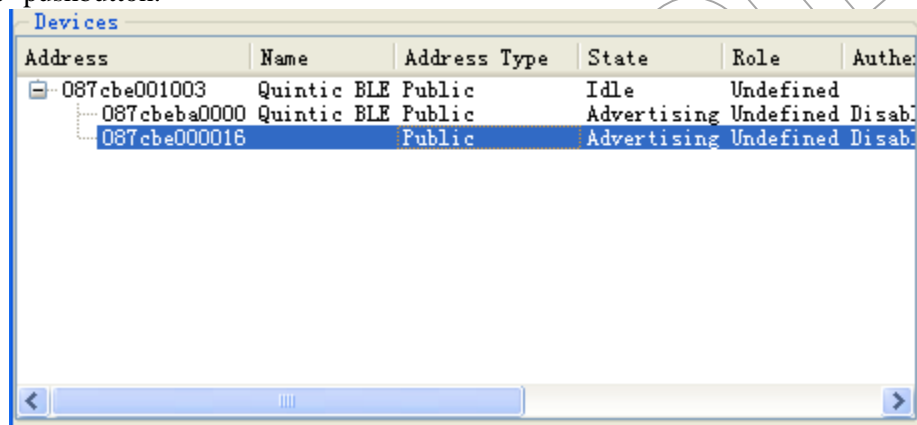


Figure 95 Select device

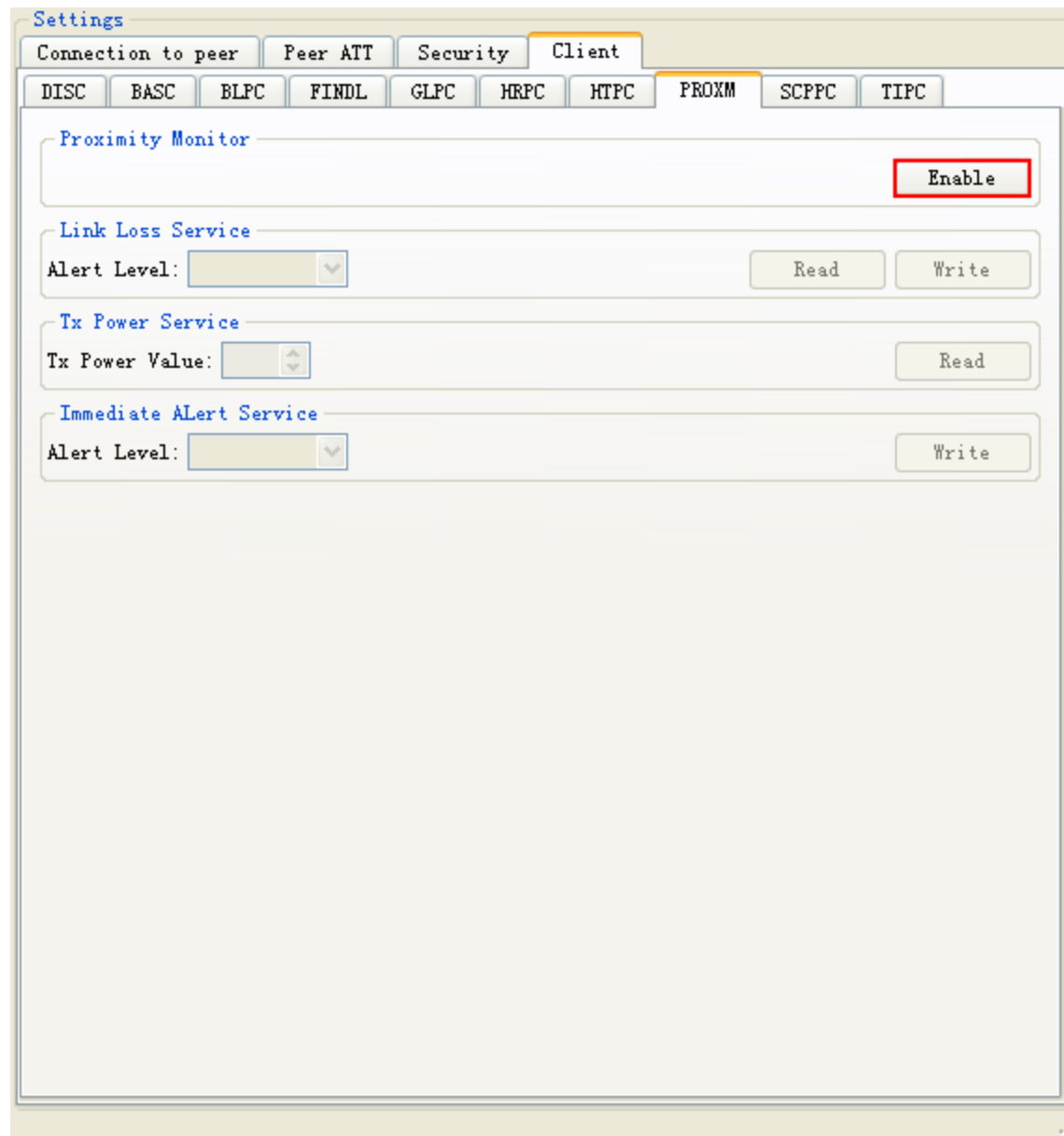
The screenshot shows the 'Settings' window with the 'Client' tab selected. The 'Connection Settings' section includes:
 

- Min Connection Interval (6-3200): 24 \* 1.25ms = 30.00ms
- Max Connection Interval (6-3200): 40 \* 1.25ms = 50.00ms
- Slave Latency (0-499): 0
- Supervision Timeout (10-3200): 2000 \* 10ms = 20000.00ms

 An 'Update' button is at the bottom right of this section.
   
 The 'Establish Link' section has a 'White List' checkbox and a 'Connect' button (highlighted with a red rectangle). A 'Cancel' button is also present.
   
 The 'Terminate Link' section has a 'Connection Handle' field with '0xffff' and a 'Disconnect' button.
   
 The 'Remote Information' section has fields for 'Name', 'Version', and 'Company ID', with a 'Read' button at the bottom right.
   
 A 'Default' button is located at the bottom right of the entire window.

Figure 96 Connect

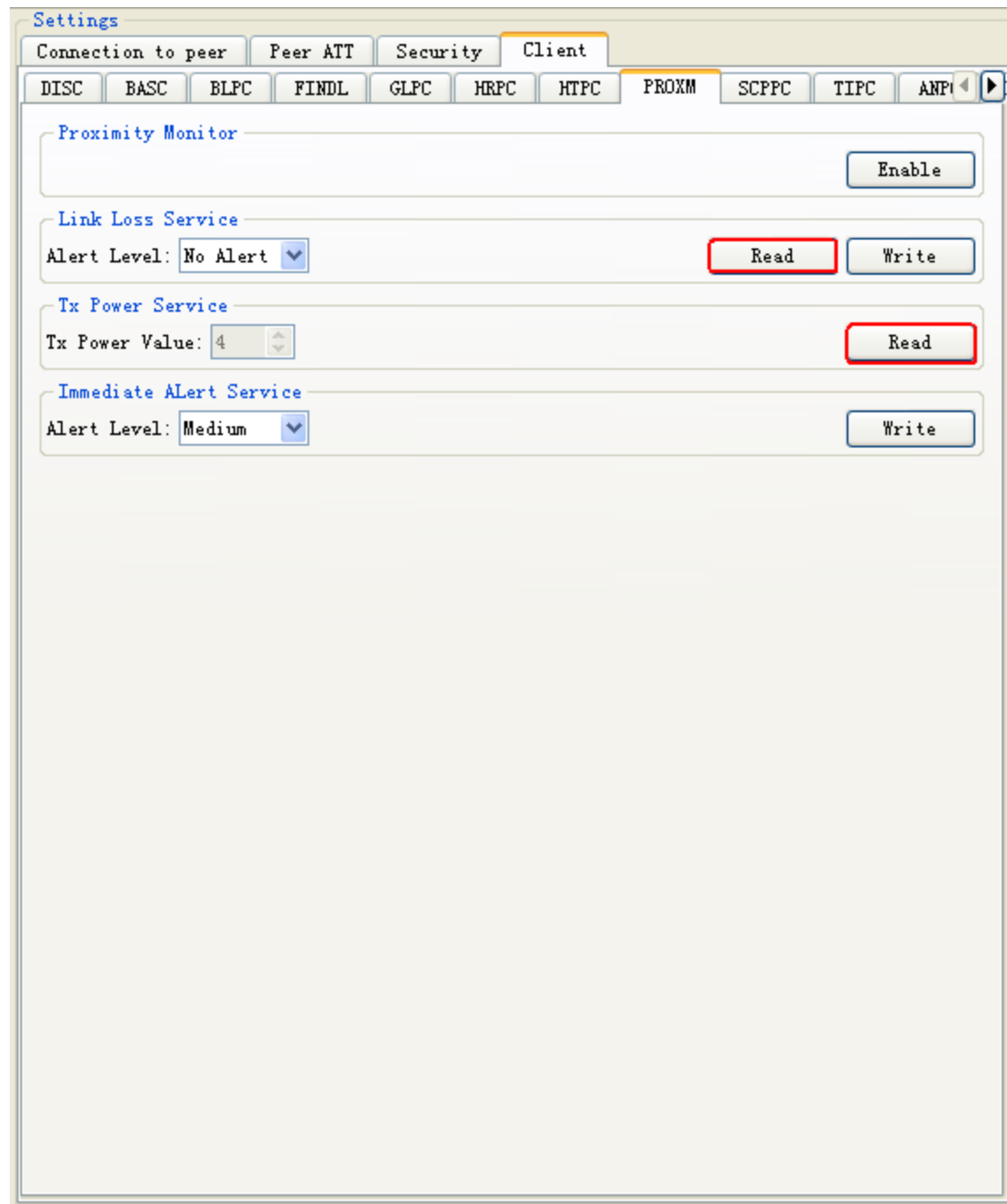
- Click the “Enable” pushbutton on the user interface of the proximity monitor.



**Figure 97 Enable**

7. Click the “Read” button in the “Link Loss Service” group. Click the “Read” button in the “Tx Power Service” group.





**Figure 98 Read**

8. Set the alert level and click the “Write” button both in the “Immediate Alert Service” and “Link Loss Service” group.

The screenshot shows the 'Settings' window with the 'Client' tab selected. The 'PROXM' sub-tab is active. The 'Link Loss Service' section has 'Alert Level' set to 'Medium' and the 'Write' button is highlighted with a red box. The 'Immediate Alert Service' section also has 'Alert Level' set to 'Medium' and its 'Write' button is highlighted with a red box. Other sections like 'Proximity Monitor' and 'Tx Power Service' are visible but not highlighted.

Figure 99 Write

## 9. Result

The screenshot shows the 'Settings' window with the 'Server' tab selected. Under the 'PROXR' sub-tab, there are several service management sections:

- Immediate Alert Service/Tx Power Service Support:** A checkbox is checked. A 'Create DB' button is to the right.
- Service Management:**
  - Auto Enable:** A checkbox is checked. A dropdown menu shows '087cbe000102'. An 'Enable' button is to the right.
- Link Loss Service:**
  - Alert Level:** A dropdown menu shows 'Mild Alert'. An 'Update' button is to the right.
- Tx Power Service:**
  - Tx Power Value:** A numeric input field shows '5'. An 'Update' button is to the right.
- Immediate Alert Service:**
  - Alert Level:** A dropdown menu shows 'Mild Alert'.

Figure 100 Result

## 7.5.2 Glucose Profile

1. Click the "Edit" pushbutton in the "Glucose Features" group and select the supported features.

**Settings**

Generic Mode Local ATT White List **Server**

DISS BASS BLPS FINDT **GLPS** HRPS HTPT PROXR SCPPS TIPS

Exercise Duration: 0x00aa

Exercise Intensity: 0

Medication ID: Rapid acting insulin

Medication: 6 kilograms liters

HbA1c: 7.0

**Record**

| SeqNum | Flags | Base Time | Time Offset | Concentration | Type | Location | Status |
|--------|-------|-----------|-------------|---------------|------|----------|--------|
|--------|-------|-----------|-------------|---------------|------|----------|--------|

Clear Delete

**Glucose Feature**

Features: 0x1 **Edit**

**Record Access Control Point**

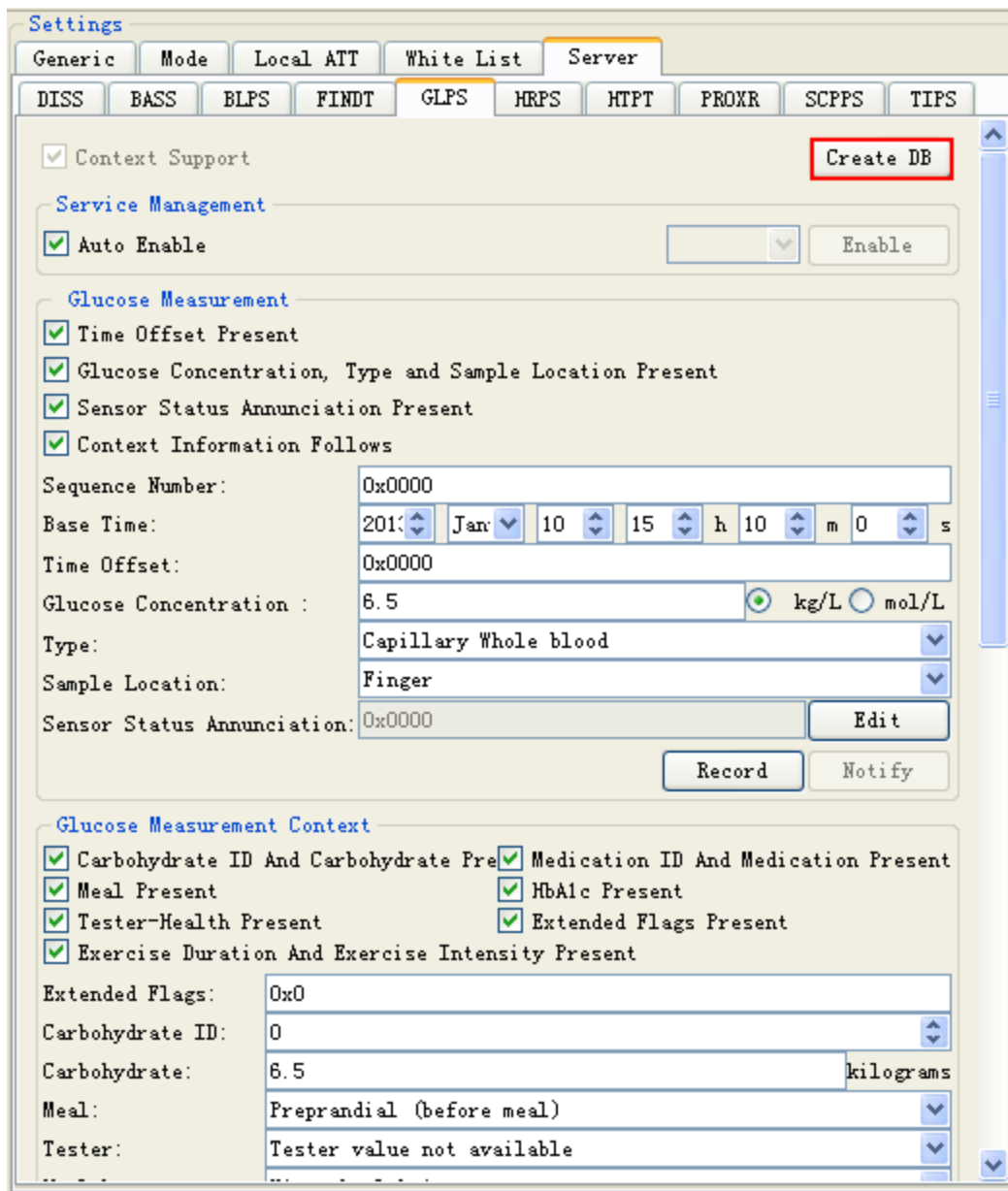
Op Code: N/A

Operator: Null

Operand: No Operand Used

Figure 101 Edit Glucose Feature

2. Click the “Create DB” pushbutton on the user interface of the glucose sensor.



**Settings**

Generic Mode Local ATT White List **Server**

DISS BASS BLPS FINDT **GLPS** HRPS HTPT PROXR SCPPS TIPS

☒ Context Support Create DB

**Service Management**

☒ Auto Enable v Enable

**Glucose Measurement**

☒ Time Offset Present

☒ Glucose Concentration, Type and Sample Location Present

☒ Sensor Status Annunciation Present

☒ Context Information Follows

Sequence Number: 0x0000

Base Time: 2011 Jan 10 15 h 10 m 0 s

Time Offset: 0x0000

Glucose Concentration: 6.5 ☒ kg/L ☐ mol/L

Type: Capillary Whole blood

Sample Location: Finger

Sensor Status Annunciation: 0x0000 Edit

Record Notify

**Glucose Measurement Context**

☒ Carbohydrate ID And Carbohydrate Pre ☒ Medication ID And Medication Present

☒ Meal Present ☒ HbA1c Present

☒ Tester-Health Present ☒ Extended Flags Present

☒ Exercise Duration And Exercise Intensity Present

Extended Flags: 0x0

Carbohydrate ID: 0

Carbohydrate: 6.5 kilograms

Meal: Preprandial (before meal)

Tester: Tester value not available

Figure 102 Create DB

- Click the “Advertising” pushbutton.

The screenshot shows the 'Settings' dialog box with the 'Mode' tab selected. The 'Advertising' section is highlighted with a red box. The 'Advertising' button is also highlighted with a red box.

**Settings**

Generic Mode Local ATT White List Server

**Modes**

**Discoverability Modes**

- ☐ Non-discoverable
- ☐ Limited Discoverable
- ☒ General Discoverable

**Connectability Modes**

- ☐ Non-connectable
- ☒ Connectable

**Bondable Modes**

- ☐ Non-bondable
- ☒ Bondable

**Advertising**

**Type**

- ☒ Connectable Undirected
- ☐ Connectable Directed
- ☐ Scannable Undirected
- ☐ Non-connectable Undirected

Interval Min(ms): 100

Interval Max(ms): 100

**Direct Address**

- ☒ Public
- ☐ Random

0x887cbe000101

**Channel Map**

- ☒ Channel 37
- ☒ Channel 38
- ☒ Channel 39

**Advertising Data** 0x020106

**Scan Response** 0x

**Advertising** Stop

Default

Figure 103 Advertising

4. Start a new QTool, and click the “Scan” pushbutton on the “Generic” tab.

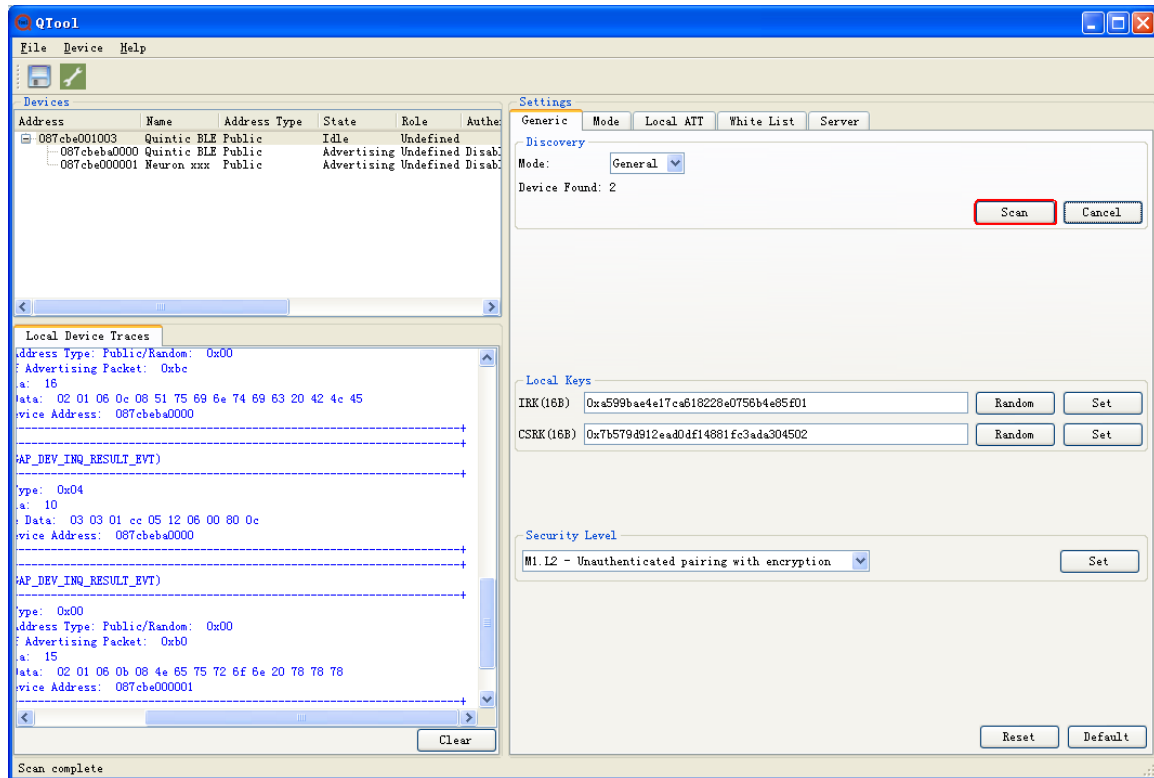


Figure 104 Scan

5. Select the device that we created services of the Glucose Sensor. And then click the “Connect” pushbutton.

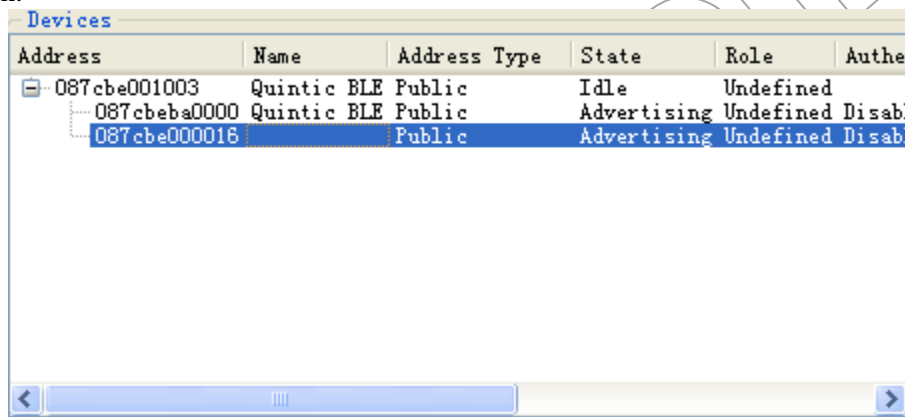


Figure 105 Select device

**Settings**

Connection to peer | Peer ATT | Security | Client

**Connection Settings**

Min Connection Interval (6-3200): 24 \* 1.25ms = 30.00ms

Max Connection Interval (6-3200): 40 \* 1.25ms = 50.00ms

Slave Latency (0-499): 0

Supervision Timeout (10-3200): 2000 \* 10ms = 20000.00ms

Update

**Establish Link**

☐ White List

Connect Cancel

**Terminate Link**

Connection Handle: 0xffff

Disconnect

**Remote Information**

Name:

Version:

Company ID:

Read

Default

**Figure 106 Connect**

- Click the “Enable” button on the user interface of the glucose collector.



Settings

Connection to peerPeer ATTSecurityClient

DISCBASCBLPCFINDLGLPCHRPCHTPCPROXMSCPPCTIPC

Glucose Collector

Enable

Features

☐ Low Battery Detection During Measurement☐ Sensor Temperature High-Low Detection☐ Sensor Malfunction Detection☐ Sensor Read Interrupt Detection☐ Sensor Sample Size Supported☐ General Device Fault☐ Sensor Strip Insertion Error Detection☐ Time Fault☐ Sensor Strip Type Error Detection☐ Multiple Bond☐ Sensor Result High-Low Detection

Read

Indication/Notification registration

☐ Glucose Measurement Context Support

Register

Record Access Control Point

Op Code:N/AOperator:NullOperand:Sequence Number

Max Sequence Number:Min Sequence Number:

Write

Record

Number of stored records:

| SeqNum | Flags | Base Time | Time Offset | Concentration |
|--------|-------|-----------|-------------|---------------|
|--------|-------|-----------|-------------|---------------|

### Figure 107 Enable

7. Set the “Glucose Measurement” group and “Glucose Measurement Context” group. And Click the “Record” pushbutton to add a glucose record.

**Settings**

Generic Mode Local ATT White List **Server**

DISS BASS BLPS FINDT **GLPS** HRPS HTPT PROXR SCPPS TIPS

Base Time: 2013 Mar 10 15 h 10 m 0 s

Time Offset: 0x0002

Glucose Concentration : 6.5 kg/L mol/L

Type: Capillary Whole blood

Sample Location: Finger

Sensor Status Annunciation: 0x0000 Edit

Record Notify

**Glucose Measurement Context**

☒ Carbohydrate ID And Carbohydrate Present ☒ Medication ID And Medication Present

☒ Meal Present ☒ HbA1c Present

☒ Tester-Health Present ☒ Extended Flags Present

☒ Exercise Duration And Exercise Intensity Present

Extended Flags: 0x0

Carbohydrate ID: 0

Carbohydrate: 6.5 kilograms

Meal: Preprandial (before meal)

Tester: Self

Health: Minor health issues

Exercise Duration: 0x00aa

Exercise Intensity: 0

Medication ID: Rapid acting insulin

Medication: 6 kilograms liters

HbA1c: 7.0

**Record**

|   | SeqNum | Flags | Base Time         | Time Offset | Concentration | Type | Loc |
|---|--------|-------|-------------------|-------------|---------------|------|-----|
| 1 | 0000   | 0x1b  | 2013-1-10 15:10:0 | 0x0000      | 6.5           | 1    | 1   |
| 2 | 0001   | 0x1b  | 2013-3-10 15:10:0 | 0x0000      | 6.5           | 1    | 1   |

Figure 108 Add Glucose Record

8. Click the “Read” pushbutton.





**Settings**

Connection to peer | Peer ATT | **Security** | Client

**Keys**

EDIV (2B): 0x4321 Random Number (8B): 0x7766554433221100

LTK (16B): 0x4c68384139f574d836bcf34e9dfb01bf Random

TK (16B): 111111 ☒ Digital Random

If modify those parameters, please set before security procedure start Set

**Bond Parameters**

**Out of Band Data Present**

☒ No ☐ From Remote Device

**Authentication Requirements**

☐ No MITM No Bonding ☒ No MITM Bonding ☐ MITM No Bonding ☐ MITM and Bonding

**Input/Output Capabilities**

☐ No Input No Output ☐ Display Yes/No ☐ Display Only ☐ Keyboard Only ☒ Keyboard Display

**Key Size (7 ~ 16):** 16

**Initiator Key Distribution**

☒ Encryption Key ☒ Identity Key ☒ Signing Key

**Responder Key Distribution**

☒ Encryption Key ☒ Identity Key ☒ Signing Key

If modify those parameters, please set before security procedure start Set

**Bond** Encrypt Clear Bond

Default

Figure 111 Pair

- Set the "Record Access Control Point" group and click the "Write" pushbutton.



Settings

Connection to peer Peer ATT Security Client

DISC BASC BLPC FINDL GLPC HRPC HTPC PROXM SCPPC TIPPC

Features

☐ Low Battery Detection During Measurement ☐ Sensor Temperature High-Low Detection

☐ Sensor Malfunction Detection ☐ Sensor Read Interrupt Detection

☐ Sensor Sample Size Supported ☐ General Device Fault

☐ Sensor Strip Insertion Error Detection ☐ Time Fault

☐ Sensor Strip Type Error Detection ☐ Multiple Bond

☐ Sensor Result High-Low Detection

Read

Indication/Notification registration

☒ Glucose Measurement Context Support

Register

Record Access Control Point

Op Code: Report stored records

Operator: Less than or equal to

Operand: Sequence Number

Max Sequence Number: 0002 Min Sequence Number:

Write

Record

Number of stored records:

|   | SeqNum | Flags | Base Time         | Time Offset | Concentration | Type | Location |   |
|---|--------|-------|-------------------|-------------|---------------|------|----------|---|
| 1 | 0x0000 | 0x1b  | 2013-1-10 15:10:0 | 0x0000      | 6.5           | 2    | 1        | 0 |
| 2 | 0x0001 | 0x1b  | 2013-1-10 15:10:0 | 0x0003      | 6.5           | 2    | 1        | 0 |
| 3 | 0x0002 | 0x1b  | 2013-1-10 15:10:0 | 0x0003      | 6.5           | 1    | 1        | 0 |

Figure 113 Result

### 7.5.3 Alert Notification Profile

1. Set the supported new alert categories and the supported unread alert categories.

Settings

Generic Mode Local ATT White List **Server**

BLPS FINDT GLPS HRPS HTPT PROXR SCPPS TIPS **ANPS** CSCPS PASPS

Create DB

Service Management

☒ Auto Enable

Enable

Supported New Alert Category

☒ Simple Alert Supported ☒ Missed Call Supported ☒ High Prioritized Alert Supported

☐ Email Supported ☐ SMS/MMS Supported ☐ Instant Message Supported

☐ News Supported ☐ Voice Mail Supported

☒ Call Supported ☒ Schedule Supported

New Alert

Category ID:  Number of New Alert:

☐ Text String Information:

Notify

Supported Unread Alert Category

☒ Simple Alert Supported ☒ Missed Call Supported ☐ High Prioritized Alert Supported

☐ Email Supported ☐ SMS/MMS Supported ☒ Instant Message Supported

☐ News Supported ☐ Voice Mail Supported

☒ Call Supported ☒ Schedule Supported

Unread Alert Status

Category ID:  Unread Count:

Notify

Alert Notification Control Point

Command ID:

Category ID:

Figure 114 Set the Supported categories

- Click the “Create DB” pushbutton on the user interface of the Alert Notification Server.



Settings

Generic Mode Local ATT White List **Server**

BLPS FINDT GLPS HRPS HTPT PROXR SCPPS TIPS **ANPS** CSCPS PASPS

**Create DB**

**Service Management**

☒ Auto Enable Enable

**Supported New Alert Category**

☒ Simple Alert Supported ☒ Missed Call Supported ☒ High Prioritized Alert Supported  
☐ Email Supported ☐ SMS/MMS Supported ☐ Instant Message Supported  
☐ News Supported ☐ Voice Mail Supported  
☒ Call Supported ☒ Schedule Supported

**New Alert**

Category ID:  Number of New Alert: 0  
☐ Text String Information:  Notify

**Supported Unread Alert Category**

☒ Simple Alert Supported ☒ Missed Call Supported ☐ High Prioritized Alert Supported  
☐ Email Supported ☐ SMS/MMS Supported ☒ Instant Message Supported  
☐ News Supported ☐ Voice Mail Supported  
☒ Call Supported ☒ Schedule Supported

**Unread Alert Status**

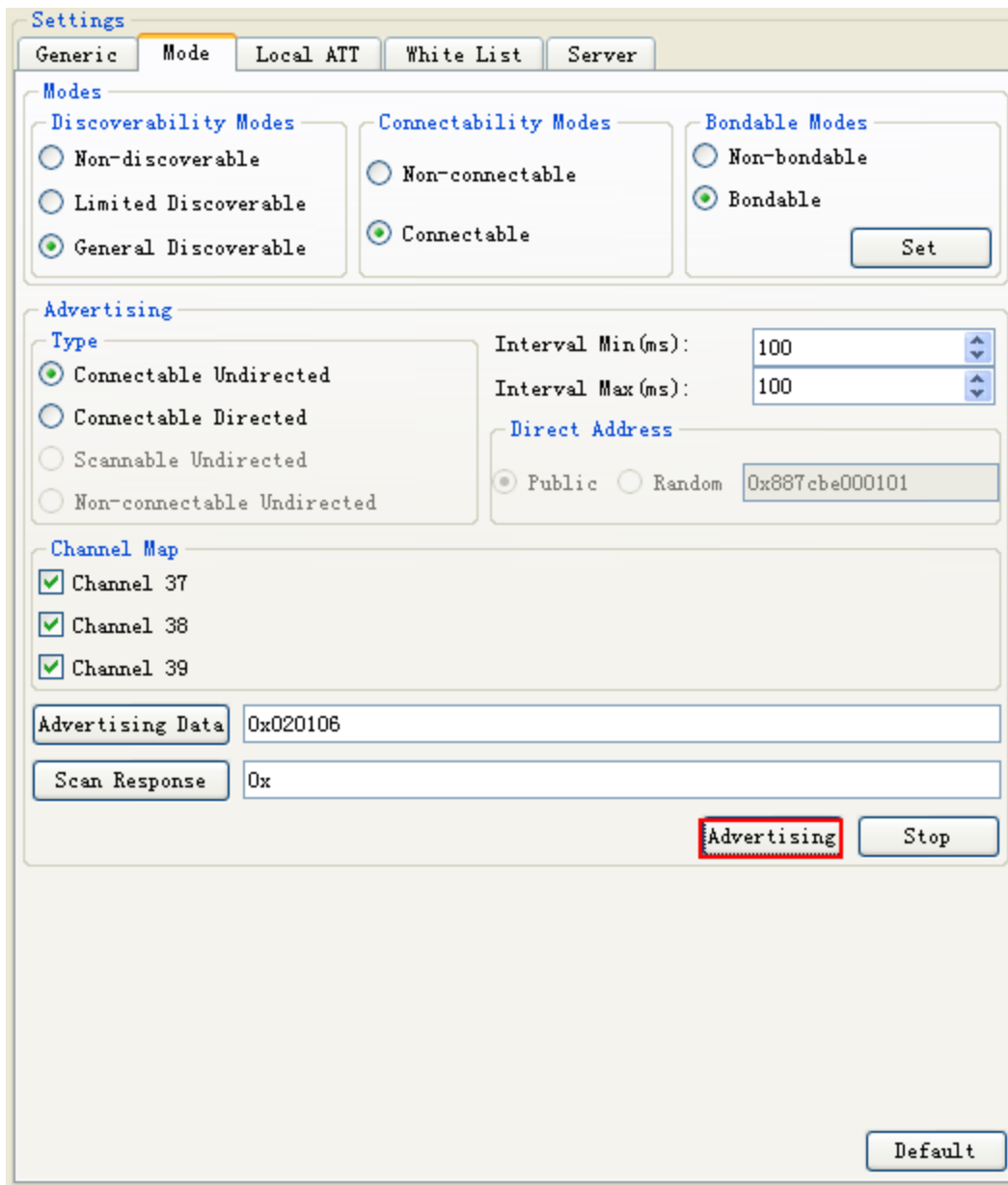
Category ID:  Unread Count: 0 Notify

**Alert Notification Control Point**

Command ID:   
 Category ID:

Figure 115 Create DB

- Click the “Advertising” pushbutton.



The screenshot shows the 'Settings' dialog box with the 'Mode' tab selected. The 'Advertising' section is highlighted with a red box. The 'Advertising' button is also highlighted with a red box.

**Settings**

Generic Mode Local ATT White List Server

**Modes**

**Discoverability Modes**

- ☐ Non-discoverable
- ☐ Limited Discoverable
- ☒ General Discoverable

**Connectability Modes**

- ☐ Non-connectable
- ☒ Connectable

**Bondable Modes**

- ☐ Non-bondable
- ☒ Bondable

**Advertising**

**Type**

- ☒ Connectable Undirected
- ☐ Connectable Directed
- ☐ Scannable Undirected
- ☐ Non-connectable Undirected

Interval Min(ms): 100

Interval Max(ms): 100

**Direct Address**

- ☒ Public
- ☐ Random

0x887cbe000101

**Channel Map**

- ☒ Channel 37
- ☒ Channel 38
- ☒ Channel 39

**Advertising Data** 0x020106

**Scan Response** 0x

**Advertising** Stop

Default

Figure 116 Advertising

4. Start a new QTool. Click the “Scan” pushbutton on the “Generic” tab.

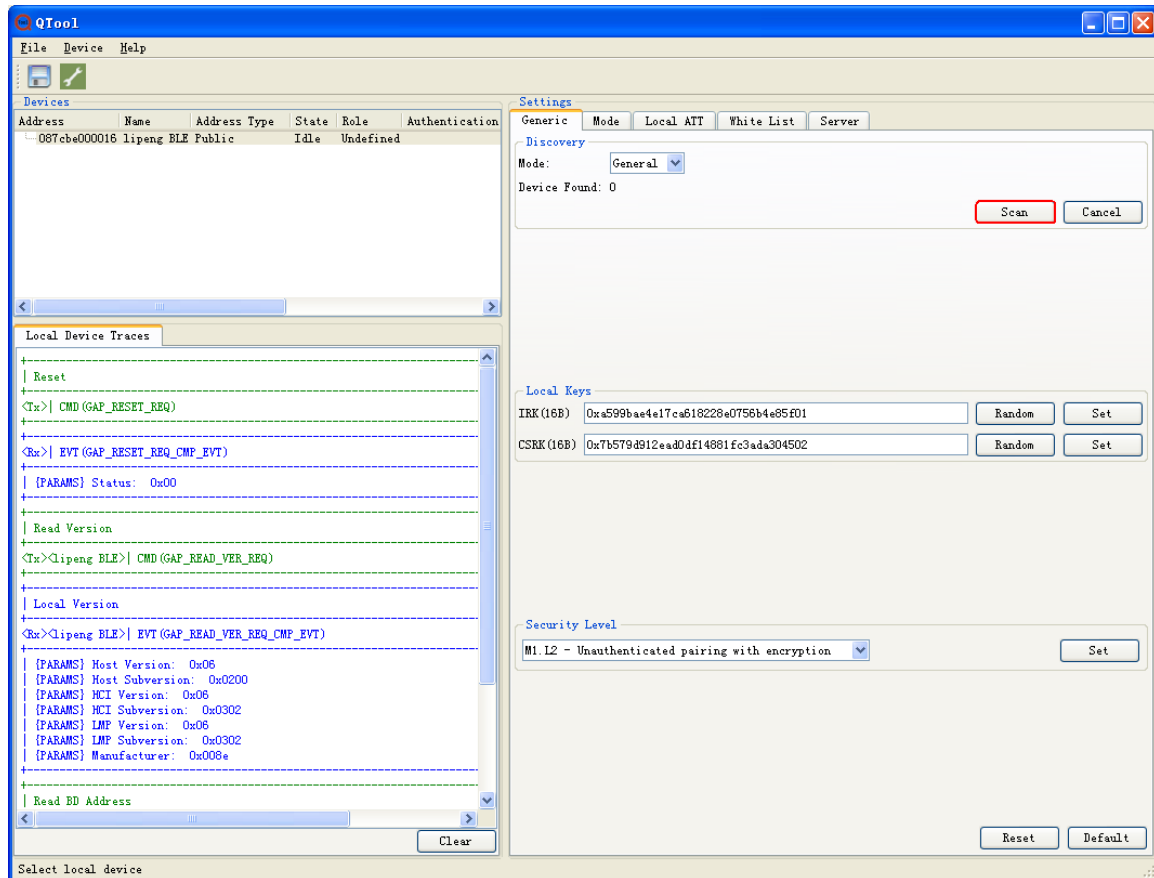


Figure 117 Scan

5. Select the device that we created the Alert Notification Service. And then click the “Connect” pushbutton.

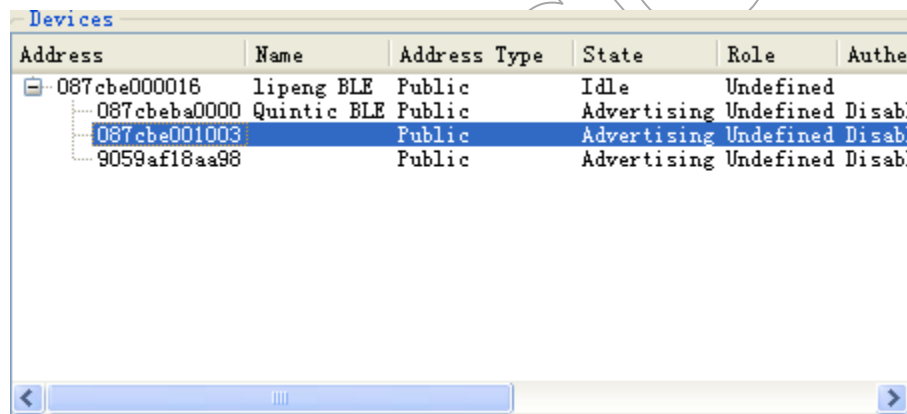


Figure 118 Select device

**Settings**

Connection to peer   Peer ATT   Security   Client

**Connection Settings**

Min Connection Interval (6-3200): 24 \* 1.25ms = 30.00ms

Max Connection Interval (6-3200): 40 \* 1.25ms = 50.00ms

Slave Latency (0-499): 0

Supervision Timeout (10-3200): 2000 \* 10ms = 20000.00ms

Update

**Establish Link**

☐ White List

Connect   Cancel

**Terminate Link**

Connection Handle: 0xffff

Disconnect

**Remote Information**

Name:

Version:

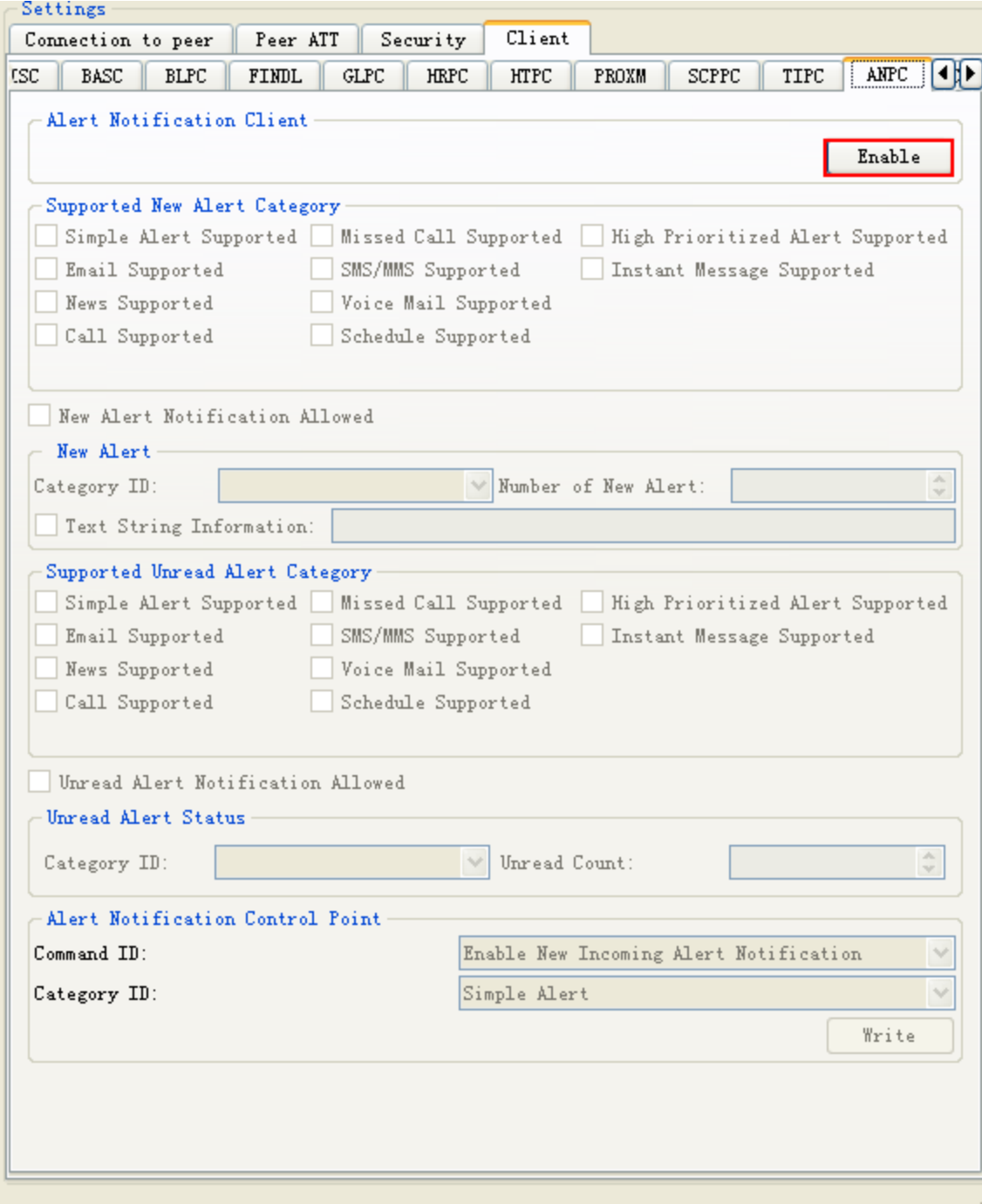
Company ID:

Read

Default

Figure 119 Connect

- Click the “Enable” button on the user interface of the Alert Notification Client.



The screenshot shows the 'Settings' window with the 'Client' tab selected. The 'Alert Notification Client' section is expanded, and the 'Enable' button is highlighted with a red box. Below this, there are sections for 'Supported New Alert Category', 'New Alert', 'Supported Unread Alert Category', 'Unread Alert Status', and 'Alert Notification Control Point'.

**Alert Notification Client**

**Enable**

**Supported New Alert Category**

☐ Simple Alert Supported ☐ Missed Call Supported ☐ High Prioritized Alert Supported  
☐ Email Supported ☐ SMS/MMS Supported ☐ Instant Message Supported  
☐ News Supported ☐ Voice Mail Supported  
☐ Call Supported ☐ Schedule Supported

☐ New Alert Notification Allowed

**New Alert**

Category ID:  Number of New Alert:   
☐ Text String Information:

**Supported Unread Alert Category**

☐ Simple Alert Supported ☐ Missed Call Supported ☐ High Prioritized Alert Supported  
☐ Email Supported ☐ SMS/MMS Supported ☐ Instant Message Supported  
☐ News Supported ☐ Voice Mail Supported  
☐ Call Supported ☐ Schedule Supported

☐ Unread Alert Notification Allowed

**Unread Alert Status**

Category ID:  Unread Count:

**Alert Notification Control Point**

Command ID:  Enable New Incoming Alert Notification  
 Category ID:  Simple Alert  
**Write**

Figure 120 Enable

7. Check the “New Alert Notification Allowed” checkbox.

The screenshot shows the 'Settings' window with the 'Client' tab selected. Under the 'Alert Notification Client' section, the 'Enable' button is present. The 'Supported New Alert Category' section contains several checked options: Simple Alert Supported, Missed Call Supported, High Prioritized Alert Supported, Call Supported, and Schedule Supported. The 'New Alert Notification Allowed' checkbox is checked and highlighted with a red box. Below this, the 'New Alert' section has fields for 'Category ID' and 'Number of New Alert'. The 'Supported Unread Alert Category' section also has several checked options. The 'Unread Alert Notification Allowed' checkbox is unchecked. The 'Unread Alert Status' section has fields for 'Category ID' and 'Unread Count'. The 'Alert Notification Control Point' section has 'Command ID' set to 'Enable New Incoming Alert Notification' and 'Category ID' set to 'Simple Alert'. The 'Write' button is at the bottom right of this section.

Figure 121 Enable New Alert Notification

7. Set the “Alert Notification Control Point” group. Click the “Write” pushbutton.

Settings

Connection to peer Peer ATT Security Client

CSC BASC BLPC FINDL GLPC HRPC HTPC PROXM SCPPC TIPPC ANPC

Alert Notification Client

Enable

Supported New Alert Category

☒ Simple Alert Supported ☒ Missed Call Supported ☒ High Prioritized Alert Supported

☐ Email Supported ☐ SMS/MMS Supported ☐ Instant Message Supported

☐ News Supported ☐ Voice Mail Supported

☒ Call Supported ☒ Schedule Supported

☒ New Alert Notification Allowed

New Alert

Category ID:  Number of New Alert:

☐ Text String Information:

Supported Unread Alert Category

☒ Simple Alert Supported ☒ Missed Call Supported ☐ High Prioritized Alert Supported

☐ Email Supported ☐ SMS/MMS Supported ☒ Instant Message Supported

☐ News Supported ☐ Voice Mail Supported

☒ Call Supported ☒ Schedule Supported

☐ Unread Alert Notification Allowed

Unread Alert Status

Category ID:  Unread Count:

Alert Notification Control Point

Command ID:

Category ID:

Write

Figure 122 Enable New Simple Alert Notification

- Set the “New Alert” group and click the “Notify” pushbutton.

Settings

Generic Mode Local ATT White List **Server**

DISS BASS BLPS FINDT GLPS HRPS HTTP PROXR SCPPS TIPS **ANPS**

Create DB

Service Management

☒ Auto Enable 087cbe000102 Enable

Supported New Alert Category

☒ Simple Alert Supported ☒ Missed Call Supported ☒ High Prioritized Alert Supported  
☐ Email Supported ☐ SMS/MMS Supported ☐ Instant Message Supported  
☐ News Supported ☐ Voice Mail Supported  
☒ Call Supported ☒ Schedule Supported

New Alert

Category ID: Simple Alert Number of New Alert: 1

☒ Text String Information: Quintic ble

Notify

Supported Unread Alert Category

☒ Simple Alert Supported ☒ Missed Call Supported ☐ High Prioritized Alert Supported  
☐ Email Supported ☐ SMS/MMS Supported ☒ Instant Message Supported  
☐ News Supported ☐ Voice Mail Supported  
☒ Call Supported ☒ Schedule Supported

Unread Alert Status

Category ID: Simple Alert Unread Count: 0

Notify

Alert Notification Control Point

Command ID: Enable New Incoming Alert Notification

Category ID: Simple Alert

Figure 123 Notify

## 9. Result



Settings

Connection to peer Peer ATT Security Client

CSC BASC BLPC FINDL GLPC HRPC HTPC PROXM SCPPC TIPC ANPC

Alert Notification Client

Enable

Supported New Alert Category

☒ Simple Alert Supported ☒ Missed Call Supported ☒ High Prioritized Alert Supported

☐ Email Supported ☐ SMS/MMS Supported ☐ Instant Message Supported

☐ News Supported ☐ Voice Mail Supported

☒ Call Supported ☒ Schedule Supported

☒ New Alert Notification Allowed

New Alert

Category ID: Simple Alert Number of New Alert: 1

☒ Text String Information: Quintic ble

Supported Unread Alert Category

☒ Simple Alert Supported ☒ Missed Call Supported ☐ High Prioritized Alert Supported

☐ Email Supported ☐ SMS/MMS Supported ☒ Instant Message Supported

☐ News Supported ☐ Voice Mail Supported

☒ Call Supported ☒ Schedule Supported

☐ Unread Alert Notification Allowed

Unread Alert Status

Category ID: Unread Count:

Alert Notification Control Point

Command ID: Enable New Incoming Alert Notification

Category ID: Simple Alert

Write

Figure 124 Result

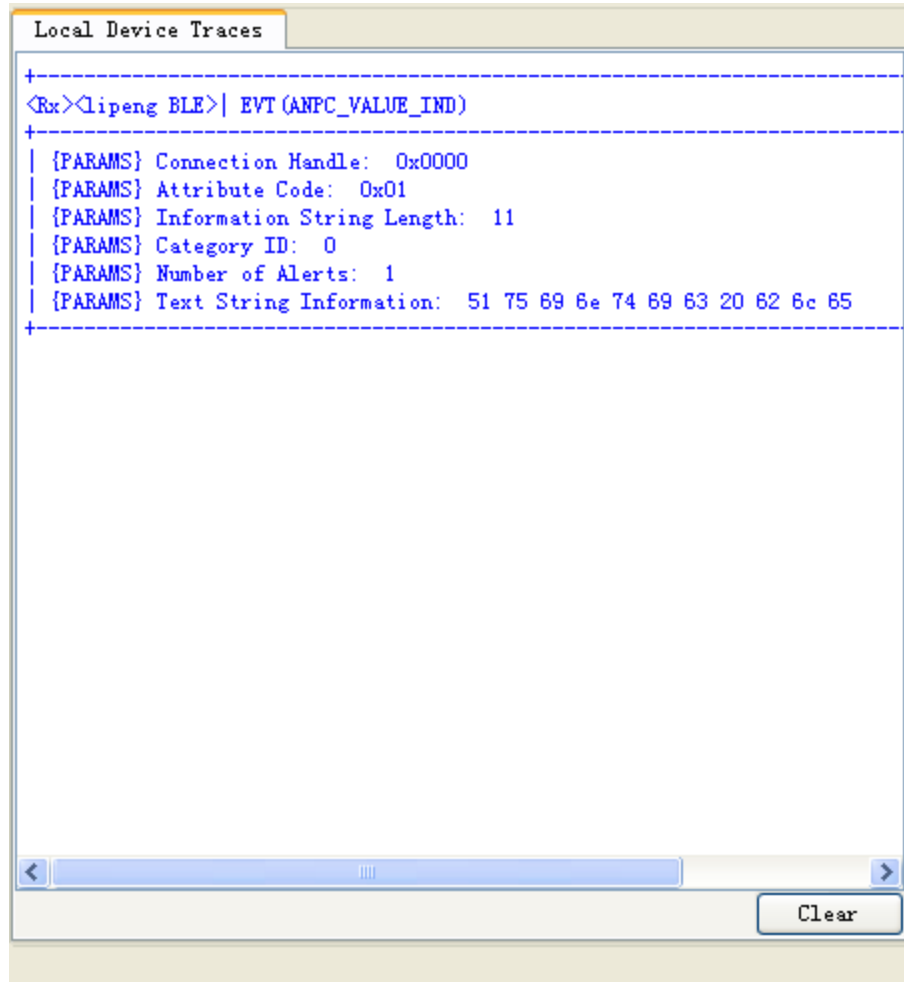


Figure 125 Trace Information

## Release History

| REVISION | CHANGE DESCRIPTION   | DATE       |
|----------|--|------------|
| 0.1      | Initial  | 2013-5-17  |
| 0.2      | Add Getting started description and Figure 1                                 | 2013-5-21  |
| 0.3      | Add “update” button in “Connection Settings” Group                           | 2013-05-30 |
| 0.4      | Add Mode tab, Local ATT tab and White List tab                               | 2013-06-18 |
| 0.5      | Advertising ,add a BD to white list and create the selected service database | 2013-06-19 |
| 0.6      | Update Figure 6 and Figure 7   | 2013-07-11 |
| 0.7      | Add chapter 7  | 2013-08-07 |
| 0.8      | Update chapter 7 and add four new profiles                                   | 2013-08-29 |
| 0.9      | Update UI and trace information  | 2013-12-17 |
| 1.0      | Update Figures to the latest, add 4.1.5 and 4.2.4                            | 2014-01-10 |

Confidential