KBeacon configuration in different scenarios

OUTLINE

- **BLE 5.0 new feature**
- **Use Un-Connectable mode**
- **Find Beacon on iOS/Android**
- **Hybrid advertisement**
- **Trigger application**
- **Long range**

BLE 5.0 features

4X range

8X broadcast capacity

2X speed

App configuration UI:

- Support BLE5.0 PHY code advertisement
- > 300 meters range

(BLE4.0 80~100meters)

- Support extend advertisement (255 Byte)

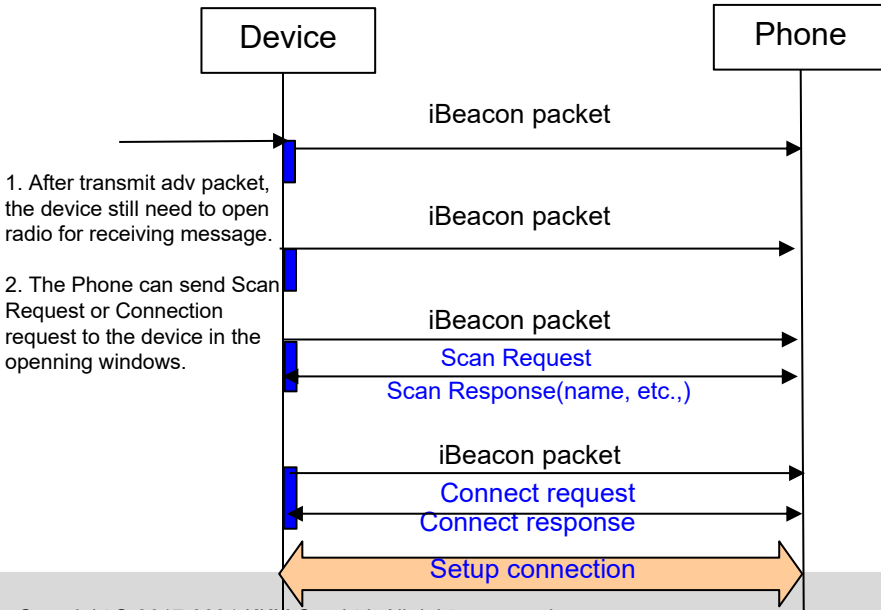*BLE 4.0(31Byte)*

- Support 2MBps advertisement

BLE4.0 1Mbps

← Adv Mode	SAVE
Legacy	◉
PHY Code(Long range)	○
PHY 2Mbps	○

Notes: Legacy refers to the BLE4.0 advertisement. PHY Code refers to the BLE5.0 long range feature, which can increase the distance by 4 times. PHY 2Mbps refers to BLE5.0 broadcasting at a rate of 2Mbps, which can carry a maximum of 255 bytes.
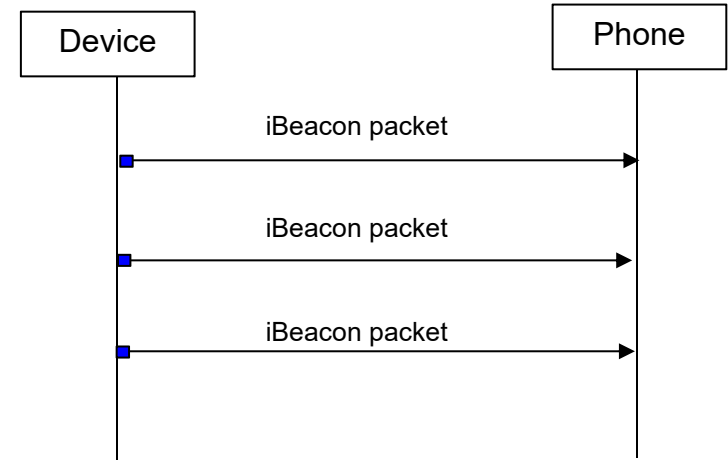
1.1 Un-Connectable mode

In un-connectable mode, the Beacon only broadcast advertisement and doesn't respond to the scanning and connection requests, so the power consumption is lower.

1. Connectable mode

1. After transmit adv packet, the device still need to open radio for receiving message.

2. The Phone can send Scan Request or Connection request to the device in the openning windows.

2. Unconnectable mode

After transmit adv packet, the device shut down radio for saving power.

1.2 Un-Connectable mode for BLE 4.0 advertisement

1. Setting unconnectable mode can reduce the power consumption, also it can prevent maliciously connection from other devices.

2. Power current(uA) test for K9 in connectable mode and un-connectable mode

tx power /adv period	1000ms (un-connectable)	1000ms	500ms (un-connectable)	500ms	300ms (un-connectable)	300ms	100ms (un-connectable)	100ms
-8	0.0098	0.011	0.0164	0.0211	0.0259	0.0321	0.0681	0.1041
-4	0.0102	0.0135	0.0171	0.0221	0.0271	0.0351	0.0717	0.1051
0	0.0124	0.0142	0.0212	0.0291	0.0318	0.0411	0.0883	0.1311
4	0.0143	0.0172	0.0261	0.0375	0.0404	0.0606	0.118	0.1451

Remark: Tx power unit is dBm, the current unit is uA.

Compared with connectable mode, the un-connectable mode can reduce power consumption by 15~30% .

1.3 Un-Connectable mode for BLE 5.0 extended advertisement

1. BLE 5.0 supports extended advertisement that can support 2Mbps rate. Because of the faster transmit rate, the broadcast transmission time can be reduced, the power consumption is lower.

2. Power current(uA) test for K9p in connectable mode and un-connectable mode

tx power /adv period	1000ms (un-connectable)	1000ms	500ms (un-connectable)	500ms	300ms (un-connectable)	300ms	100ms (un-connectable)	100ms
-8	0.0084	0.0085	0.0132	0.0145	0.0224	0.0231	0.0605	0.0585
-4	0.0096	0.0088	0.0152	0.0159	0.0231	0.0245	0.0625	0.0615
0	0.0104	0.0098	0.0173	0.0171	0.0261	0.0254	0.0724	0.713
4	0.0139	0.0135	0.0253	0.0234	0.0401	0.0376	0.1101	0.1051
8	0.0186	0.0171	0.0336	0.0315	0.0501	0.0482	0.1491	0.1371

Remark: Tx power unit is dBm, the current unit is uA.

- The BLE 5.0 protocol improves connectable mode, **so the power consumption of the un-connectable mode increases a little compared with the connectable mode.**
- The connectable mode of BLE 5.0 can **reduce the power consumption by 30% compared with BLE 4.0.**
- The unconnectable mode of BLE 5.0 can **reduce power consumption by 5% compared with BLE 4.0.**

2.1 Connect to device by QR code(Android)

DD3418001485
ID: 1895

Background:
- Each device comes with a QR Code. The QR Code contains the MAC address and the serial ID of the device.
- The default name of the device is KBPro_xx, where xx is the ID. For example. The device name of the left picture is KBPro_1895

For Android devices:
- Users can scan QR Code, and then connect to the corresponding device based on the MAC address.

2.2 Connect to device by QR code(IOS)

As iOS phones cannot scan the MAC address of the device, we cannot directly connect the device based on the MAC address like Android does.

We provide the following two solutions for iOS.

Solution 1: Find the device by BLE name

- If the device is in connectable mode, the device name can be scanned.
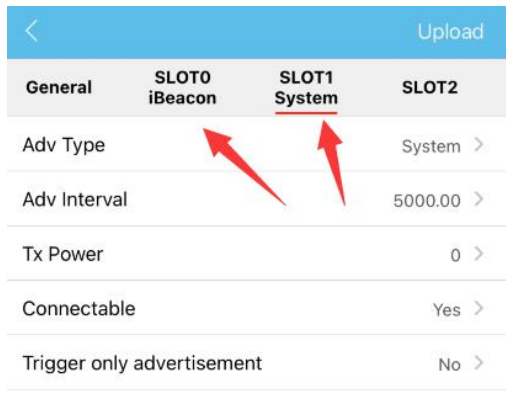- Since the device name is unique from KKM and the name can be found from QR Code, so the app can connect the device according to the name.
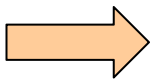
Device name:
KBPro_1895

DD3418001485
ID: 1895

2.3 Connect to device by QR code(IOS)

Solution 2: get mac address from System advertisement

1. Set the Beacon to broadcast 2 slots, iBeacon and System
2. To reduce power consumption, it is recommended to configure the Adv Interval of the System to 4~6 seconds.
3. After the iOS phone finds the device, the App save the UUID and MAC address relationship. Then the phone can get MAC address directly from UUID from next scanning.

3.1 Hybrid advertisement

Scenario:

1. The device uses iBeacon broadcasting to push advertisements to people nearby about 3 to 5 meters.
2. The battery power and operating status information of the deployed device can be collected through the gateway or inspection personnel.

Configuration:

1. Configure the device to broadcast 2 Slots;
2. Slot0 broadcasts iBeacon signal, TX power is set to -20dBm
3. Slot1 broadcasts the TLM signal, and the TX power is set to 0dBm, which is convenient for the gateway or inspectors to check the device status.
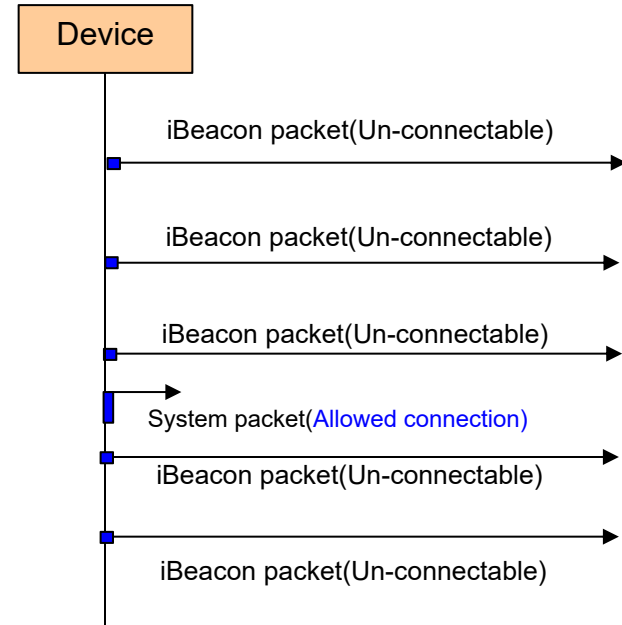
3.2 Hybrid advertisement scenario

Scenario：

1. The device can be connected only when it is close to the device within 1 meter.
2. The device need advertisement iBeacon signal which can be received at a long distance

Configuration：

1. Configure the device to broadcast 2 Slots;
2. Slot 0 is configured to broadcast iBeacon signals, the Tx power is set to 0 dBm, and the connection mode is unconnectable.
3. Slot 1 is configured to broadcast System signals, the Tx power is set to -40 dBm, and the connection mode is connectable.

Device

iBeacon packet(Un-connectable)

iBeacon packet(Un-connectable)

iBeacon packet(Un-connectable)

System packet(Allowed connection)

iBeacon packet(Un-connectable)

iBeacon packet(Un-connectable)

4.1 How to use Trigger

Scenario example: SOS button

1. Deploy a gateway system within the scope of nursing homes.
2. When the elderly encounters an emergency, such as a fall, they can press the button. At this time, Beacon will send a special broadcast.
3. After the gateway receives this special broadcast, it will immediately send the message to the cloud.
4. The cloud can notify security personnel for manual intervention.
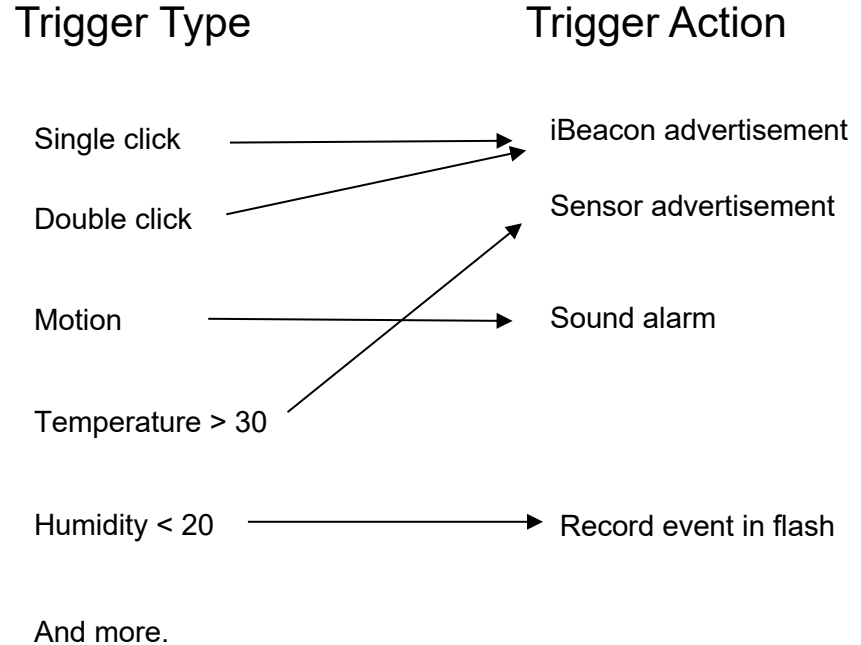
Configuration：

1. Configure Beacon to broadcast 2 Slots,
2. Slot 0 is configured to broadcast iBeacon UUID1 and Always advertisement.
3. Slot 1 is configured to iBeacon UUID 2 and trigger only advertisement.
4. The Server can track the user's location in real time based on UUID1.
5. The people will double-click the button if in emergency, and the device will broadcast UUID2

HTTP/MQTT Server
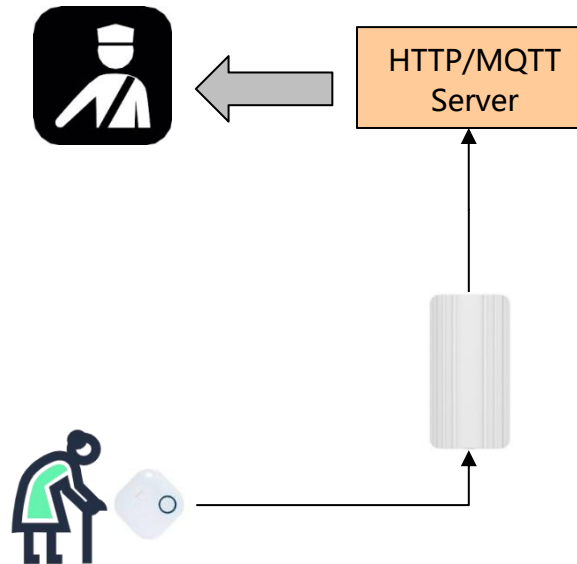
4.2 More trigger option

The Beacon will broadcast a different advertisement when the specific event is triggered, the gateway or App will proceed further action after receiving this trigger event advertisement.

- SOS Button
- Movement detection
- Temperature/humidity monitoring
- Cold chain logistics
- And more.

Trigger Type

Single click

Double click

Motion

Temperature > 30

Humidity < 20

And more.

Trigger Action

iBeacon advertisement

Sensor advertisement

Sound alarm

Record event in flash

5.1 Long range setting—BLE4.0 mode

Device: K9P

Purpose:

 Test the maximum distance of device in Bluetooth 4.0 mode.

Configuration:

1. Set the broadcast type to Legacy
2. Set the Tx Power to 8dBm

← Adv Mode   SAVE

Legacy   ◉

PHY Code(Long range)   ○

PHY 2Mbps   ○

Notes:
1: Legacy refers to the BLE4.0 advertisement. PHY Code refers to the BLE5.0 long range feature, which can increase the distance by 4 times. PHY 2Mbps refers to BLE5.0 broadcasting at a rate of 2Mbps, which can carry a maximum of 255 advertisement bytes.

2. You phone capability:
PHY 2Mbps: YES
PHY Code(Long range): NO

4:15   ∞ ⬥ ▼ 🔋

← Tx Power   SAVE

8_____ dBm

8dBm
Distance: almost 160~200 meters   ◉

4dBm
Distance: almost 100~120 meters   ○

0dBm
Distance: almost 50~80 meters   ○

-4dBm
Distance: almost 26 meters   ○

-8dBm   ○

5.2 Long range setting --- BLE5.0 PHY code

Device: K9P

Purpose: Test BLE5.0 PHY Code(Long range) mode

Configuration:

1. Set the Tx Power to 0dBm or 4dBm. In order to reduce power consumption, it is not recommended to set 8dBm power
2. Set the broadcast type to PHY Code mode

-Please make sure that your phone supports BLE 5.0 PHY Code feature, otherwise you will not be able to scan the PHY code advertisement if the Beacon was set to PHY Code(Long range) Mode.

-If you set the Beacon to PHY code advertisement, and your phone doesn't support PHY Code broadcast. You can force the device to enter the Legacy mode for 30 seconds by single click the button of the device.

KBeaconPro app setting

5.3 Long range setting --- BLE5.0 PHY code

Use phone to view PHY Code advertisement message:

1. Use 'nRF Connect' App to view PHY code advertisement.
   - The advertisement type is Bluetooth 5 Advertising Extension
   - The Primary PHY and Secondary PHY is LE Coded

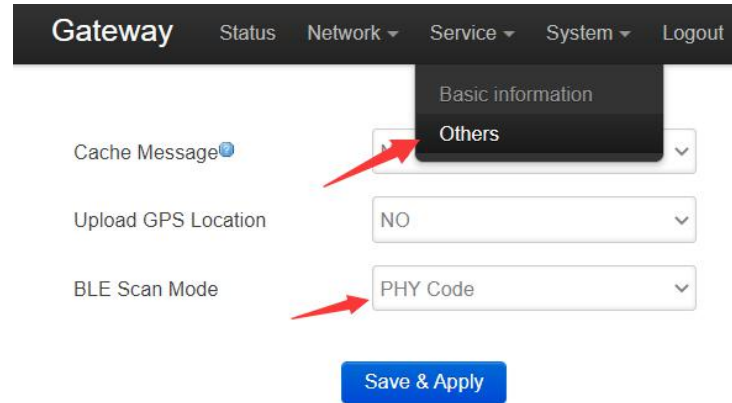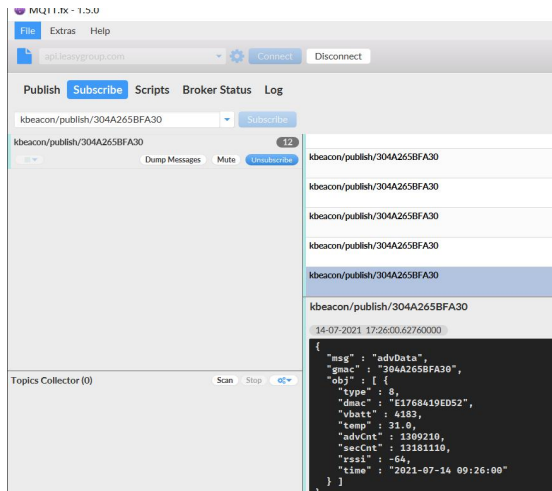2. Use 'KBeaconPro' App to view PHY code advertisement.
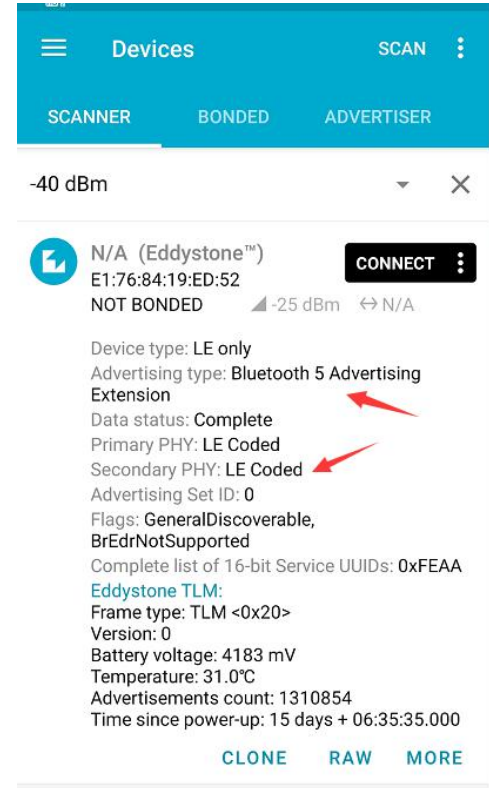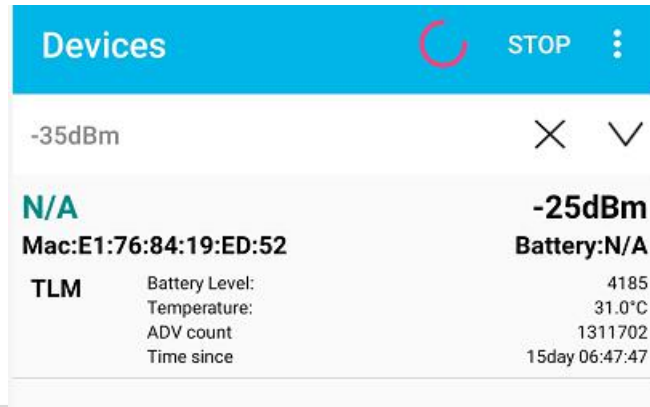
5.4 Long range setting --- BLE5.0 PHY code

Use KKM Gateway to scan PHY Code advertisement message:

-Set the scan mode of the gateway to PHY Code mode.

-Use MQTT.fx to view the beacon advertisement

Thanks

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