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KBeaconPro App Instruction

Revision History

Version	Date	Change Description	Author
V1.0	2017/11/12	Initial draft for KBeaconTools	Adam
V1.2	2018/02/23	Name updating	Elaine
V1.3	2022/11/2	Adding Power Profiler function	Elaine

C O N F I D E N T I A L

Contents

1. Download KBeaconPro App

Download the App 'KBeaconPro' from iOS App Store or Android Google Play or scan the QR code below to down the App.

iOS APP

Android APP

Minimum requirements

A mobile phone with Bluetooth 4.0 support is needed. For Android devices, Android version 5.1 or newer. For iOS devices, iOS version 10.0 or newer.

Reminder: This instruction uses Android App to demonstrate. The iOS App interface is slightly different from Android App.

2. How to Connect KBeacon Device to KBeaconPro App

Kindly note: Please make sure your KBeacon device is with battery already.

Enable your smart phone Bluetooth and run the App 'KBeaconPro'.

2.1 Turn on KBeacon

● **KBeacon with external or internal button (Including model K1/K11/K21/K23/K3/K4/K41/K4P/K5/K51/K5P/K6/K61/K6P/K7/K71/K8/K81/W59/F1/W3/W52/B1/B2/S1/C2/S3/S4)**

The factory setting of KBeacon with button is power OFF.

✧ Turn ON the device: Hold the button for 3 seconds, the LED starts flashing and the flashing lasts for 30 seconds.

✧ Turn OFF the device: Hold the button for 5 seconds, the LED starts flashing and flash 8 times.

● **KBeacon without button (Including model K12/K15/K15A/K15L/W4/U1/K9/K91/K9P/W7/S2/P1)**

The factory setting of KBeacon without button is ON. K12/K15/K9/P1/W7 does not support turning off the power.

| K1/K11 | K21/K23 | K12 | K3 |

K4/K41/K4P	K5/51/K5p	K6p/K6pt/K6pb	K7/K71
K8/K81	K9/K9p/K91	W4	W59
U1	F1	W51	W52
W3	W7	B1	B2
S1	S2	P1	W8
K15/K15A/K15L	C2	K16	

2.1 KBeacon capability matrix

2.1.1 Trigger Capability

Model	Trigger type	Trigger action			
		Advertisement	Record	Report to App	Alarm
K11	Button(single click/double/triple/long press)	yes	no	yes	yes

K15a	Motion	yes	no	yes	no
K16a	Motion	yes	no	yes	no
K21	Motion	yes	no	yes	yes
	Button(single click/double/triple/long press)	yes	no	yes	yes
K3	Motion	yes	no	yes	no
K4/K4p	Motion	yes	no	yes	no
K4pt	Motion	yes	no	yes	no
	humidity above trigger humidity below trigger	yes	yes	yes	no
K5/K5p	Motion	yes	no	yes	no
K5pt	Motion	yes	no	yes	no
	humidity above trigger humidity below trigger	yes	yes	yes	no
K6p/K6pb	Motion	yes	no	yes	no
	humidity above trigger humidity below trigger	yes	yes	yes	no
	temperature above trigger temperature below trigger	yes	yes	yes	no
K6pt	Motion	yes	no	yes	no
	temperature above trigger temperature below trigger	yes	yes	yes	no
S1	Cutoff trigger(Door open/close)	yes	yes	yes	no
S2	PIR trigger	yes	yes	yes	no
S3	PIR trigger	yes	yes	yes	no
	light level above/below trigger	yes	yes	yes	no
	Motion	yes	no	yes	no
S4	Cutoff trigger(water trigger)	yes	no	yes	no
S5	Motion	yes	no	yes	no

	humidity above trigger humidity below trigger	yes	yes	yes	no
	temperature above trigger temperature below trigger	yes	yes	yes	no
W9	Motion	yes	no	yes	yes
	Button(single click/double/triple/long press)	yes	no	yes	yes
B1/B2/B3	Button(single click/double/triple/long press)	yes	no	yes	no
P1	Motion	yes	no	yes	no

2.2 Connect KBeacon

Let's use a K9P (MAC: DD3311000588) to demonstrate, the MAC ID is printed on the device:

● **Method 1: Scan QR code to connect**

Run KBeaconPro App, Find 'Scan QR code' on the App, and then scan the QR code on the device to find this KBeacon device quickly.
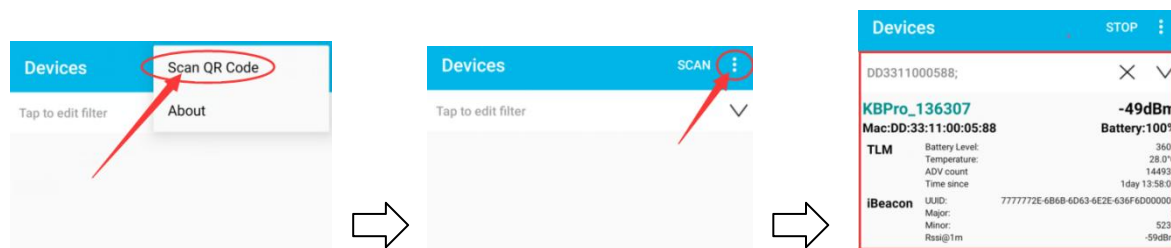
Reminder: iOS App filter the device by Device Name when use the 'Scan QR code' method. If the device name is not KBPro, the device can not be found on iOS App when scan the QR code.

● **Method 2: Scan the Bluetooth signal to connect**

Run KBeaconPro App and tap 'SCAN' in the top right corner, the App can scan the device's Bluetooth signal, then the Beacon device will be displayed on the scan page.

Find the corresponding KBeacon device on the App according to its MAC ID, Tap it, it will start connecting and jump to the configuration page (see pictures below).
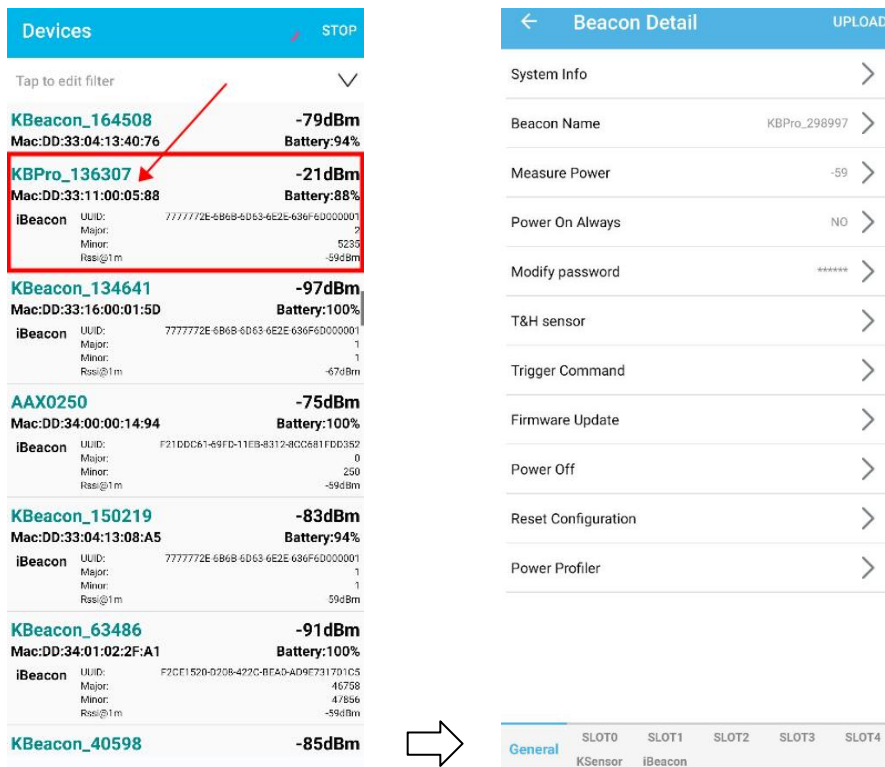
If there are too many devices found , filter by RSSI to find a certain Beacon quickly.

Put the KBeacon device close to your phone (within 10cm range). Slide the RSSI bar to set the RSSI value at -30~-40dBm, tap the arrow on the top right corner, then the nearest KBeacon can be found
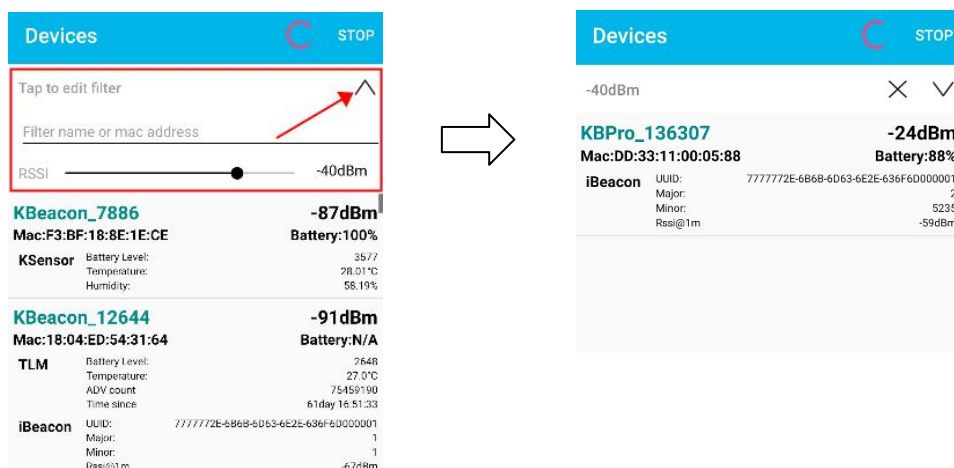
3. How to Configure KBeacon

3.1 SLOT Definition

KBeacon supports total 5 SLOTs (SLOT0 to SLOT4). Each SLOT is independent and configurable. The Beacon type can be set for each SLOT. Beacon parameters such as Adv interval, Tx Power, Connectable enable/disable etc can be configured separately for each SLOT. They are independent of each other.

Each SLOT can be set to one Beacon type ONLY. For example, if you set SLOT0 to be iBeacon, set SLOT1 to be URL, set SLOT2 to be TLM, then the KBeacon device will broadcast iBeacon, URL and TLM simultaneously.

KBeacon supports the following Beacon types:

- **iBeacon**
- **Eddystone URL**
- **Eddystone UID**
- **Eddystone TLM**
- **KSensor:**   KKM self-defined protocol, includes battery level and sensor information
- **System:**   Including the KBeacon device info such as System ID (ie.MAC ID), Model name.
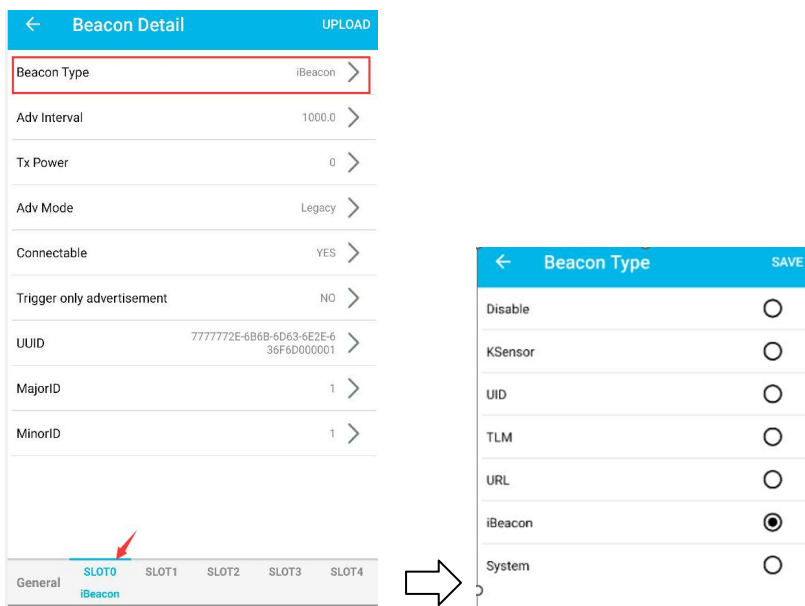
3.2 How to configure iBeacon and Eddystone

Take iBeacon as an example:

Tap: Beacon Type—> iBeacon—> Save—> Return
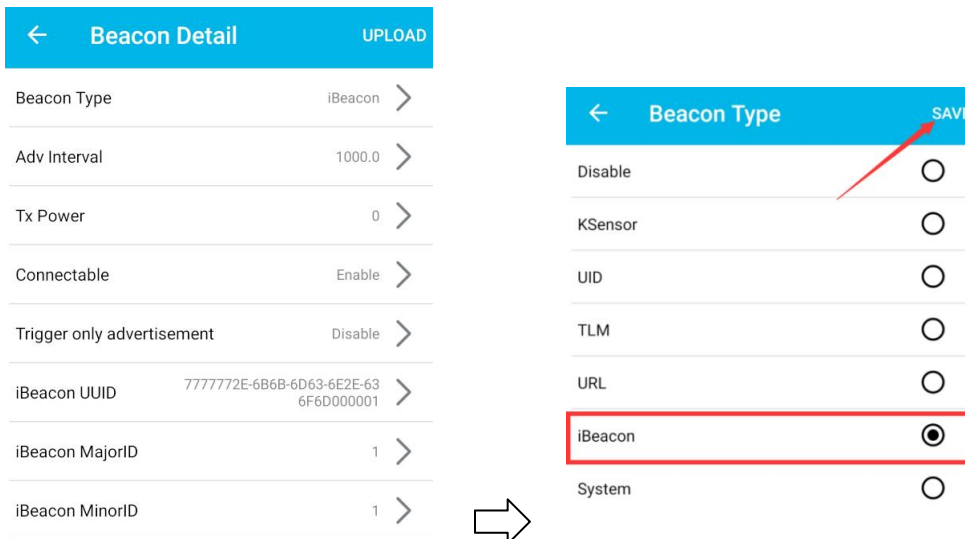
iBeacon parameters (UUID, Major ID, Minor ID, Adv Interval, TX power etc.) can also be configured in the App. Eddystone URL, UID, TLM, can be configured by the same steps above.

Parameters	Defaults	Describe
Beacon Type	iBeacon	Disable: Slot does not broadcast KSensor: KKM sensor data, see Section 6.3 for details UID/TLM/URL: Google Eddystone, see Section6.2 for details iBeacon: Apple iBeacon, , see Section 6.1 for details System: KKM System data, see Section 6.4 for details
Adv Interval	1000.0	Advertisement period is expressed in decimal and the unit is ms. If you need to use it on Apple devices, it is recommended to follow Apple's specifications. Apple has some suggestions that make the device more easily discovered by IOS phones. (The suggest value was: 152.5 ms; 211.25 ms; 318.75 ms; 417.5 ms; 546.25 ms; 760 ms; 852.5 ms; 1022.5 ms; 1285 ms). For more information, please refer to Section 3.5 in "Bluetooth Accessory Design Guidelines for Apple Products". https://developer.apple.com/accessories/Accessory-Design-Guidelines.pdf.
Tx power	-40 ~ 8?	Beacon TX power. The value range depends on the support capability of the device, some devices are -40~4dBm, some devices are -40~8dBm.
Connectable	Yes	Whether the device can be connected. For detailed description, please refer to Section 5.1.
Trigger only advertisement	No	When this feature is set to be 'YES', this slot will be broadcasted only when the trigger happens. For example, if you set 'Trigger Adv Slot' of 'Button single click' to be SLOT0 and SLOT0 is iBeacon, then iBeacon will be broadcasted only when the button single click happens.
iBeacon parameters (UUID/Major/Minor)	NA	Configuration parameters of iBeacon

After the parameters are modified, you need to tap: UPLOAD—> OK, then all the parameters configured can be loaded to the device successfully.
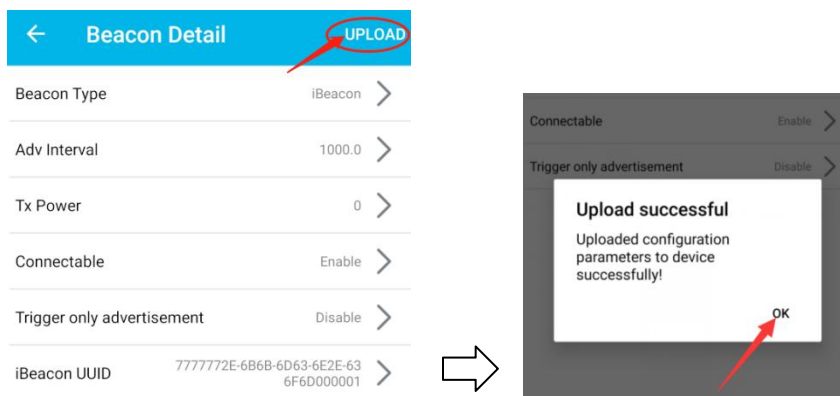
3.3 How to configure KSensor and System

KSensor is KKM defined protocol, it includes battery level and sensor information (for example temperature&humidity sensor, acceleration sensor etc).

   Tap: Beacon Type—> KSensor—> Save—> Return
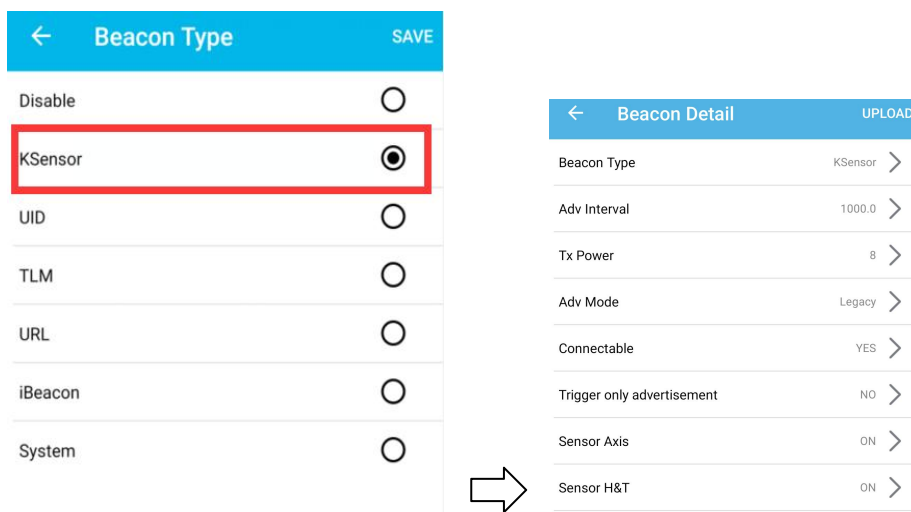
Parameters	Defaults	Describe
Sensor Axis	Yes	When KBeacon supports accelerometer sensor, whether to include 3-axis information in KSensor broadcasts.
Sensor H&T	Yes	When KBeacon supports temperature and humidity sensor, whether to include temperature and humidity information in KSensor broadcasts.
Sensor Light	Yes	When KBeacon supports light sensor, whether to include light level in KSensor broadcasts.
Sensor PIR	Yes	When KBeacon supports light sensor, whether to include PIR

		events in KSensor broadcasts.
Sensor VOC	Yes	When KBeacon supports VOC sensor, whether to include VOC in KSensor broadcasts.
Sensor CO2	Yes	When KBeacon supports CO2 sensor, whether to include CO2 in KSensor broadcasts.
New Log Count	Yes	When KBeacon supports record sensor history, whether to include New Log Count in KSensor broadcasts.

"System" can also be configured by the same steps above.

3.4 View KSensor advertisement data

When we configure KSensor to broadcast sensor information in section 3.3, we can scan sensor data through app.

Devices	STOP ⋮		Devices	STOP ⋮
BC5729006234; ✕ ⌄			BC572904F050;-38dBm ✕ ⌄	
KBPro_274249	**-37dBm**		**KBPro_426323**	**-36dBm**
Mac:BC:57:29:00:62:34	**Battery:100%**		**Mac:BC:57:29:04:F0:50**	**Battery:100%**
KSensor Battery Level: Temperature: Acc: Tamperproof Alert:	3162 25.25°C x:15; y:0; z:964 0		**KSensor** Battery Level: Temperature: PIR Alert:	3210 24.25°C 1

Devices	STOP ⋮		Devices	STOP ⋮
BC5729038F4B;-35dBm ✕ ⌄			BC572900B9E0; ✕ ⌄	
KBPro_393164	**-35dBm**		**KBPro_296910**	**-40dBm**
Mac:BC:57:29:03:8F:4B	**Battery:100%**		**Mac:BC:57:29:00:B9:E0**	**Battery:73%**
KSensor Battery Level: Temperature: Acc: PIR Alert: Light Level:	3637 28.55°C x:-735; y:76; z:-382 1 101		**KSensor** Battery Level: Temperature: Humidity:	2867 27.64°C 60.78%

The broadcast content of different sensors is displayed differently on the APP.

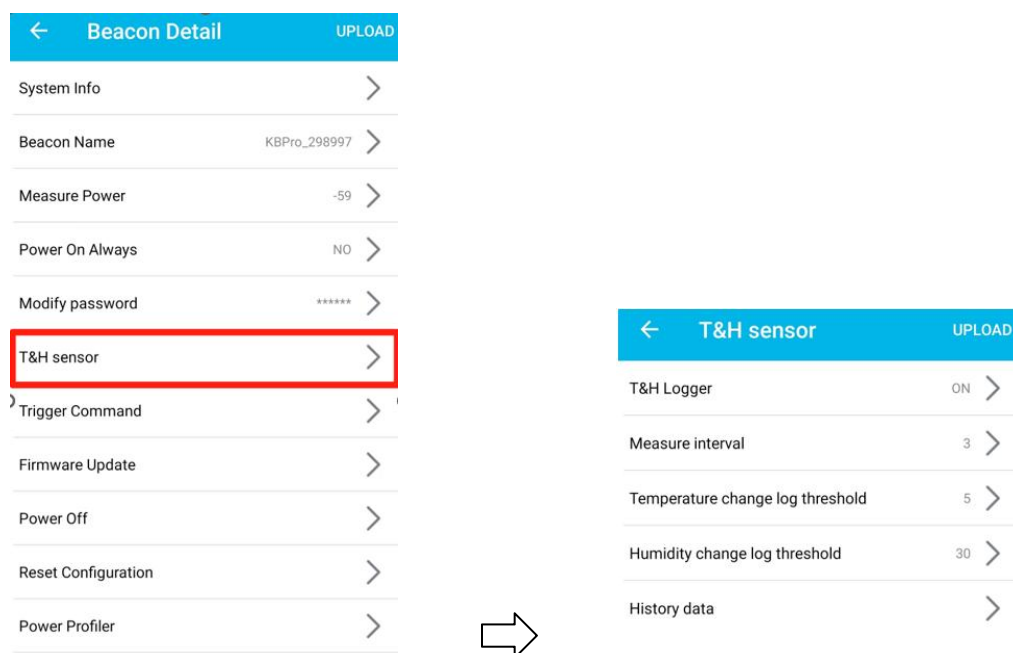| Type	Describe
Battery Level	The unit of battery level is mV. For example, if it is 3210, it means the battery voltage is 3210mV.
Temperature	The unit of temperature is °C. For example, if it is 25°C, it means that the current temperature detected by the beacon is 25°C.
Humidity	The unit of humidity is %. For example, if it is 60%, it means that the current humidity detected by the beacon is 60%.

Acc	Acc means the acceleration sensor. It includes the value of Axis X, Axis Y and Axis Z, and the unit is mg.
Tamperproof Alert	For door sensor(S1): ● 0: no alert ● 1: door was open ● 2: KBeacon was unplug ● 3: KBeacon was unplug and door was open For door sensor(W7/W3): ● 0: no alert ● 1: device was cutoff For water sensor (S4): ● 0: no detected water ● 4: detected water
PIR Alert	0: no PIR alert 1: PIR alert
Light Level	The unit of light level is lux. Value range: 1 ~ 65535 For example, if it is 101, it means that the current light level detected by the beacon is 101 lux.
New log count	The number of newly generated records since the last time the App or gateway read the records. The App or gateway can decide to connect devices and read new records based on the New log count.

3.5 How to configure sensor parameters

For some KBeacon models with sensor. We need to configure some sensor parameters. Such as the interval of sensor detection. Whether to record events to Flash. Whether the detection is not performed at a specific time, such as the sensor enters a sleep state at night.

●   Temperature & Humidity Sensor (K23/K6P/K6PS/K6PB/K6PT)

●   PIR sensor(S1)

●   VOC and CO_2 sensor

3.5.1 Temperature & Humidity Sensor

Type	Describe
T&H Logger	When this feature is on, the device will record when temperature/humidity change exceeds the follow threshold you set.
Temperature change log threshold	If you set a value (take 5 as an example, it means 0.5 degrees Celsius), the device will save the record if the difference between the current temperature and the last saved temperature greater or equal than 0.5 degrees Celsius.
Humidity change log threshold	If you set a value (take 20 as an example, it means 2%), the device will save the record if the difference between the current humidity and the last saved humidity greater or equal than 2%.
Measure interval	Time interval for measuring temperature and humidity.
History data	Tap to view history data

Reminder: If the Temperature change log threshold is set to 0, a temperature and humidity record is recorded for each measurement interval.

History data: The data can be loaded or cleared.

3.5.2 Door/PIR sensor

For door sensor, you can configure when the sensor works.

Type	Describe
Disable Period0/1/2	When this feature is on, you can set the time period for sleep mode by turning the hour hand and minute hand, or input the time through the keyboard.
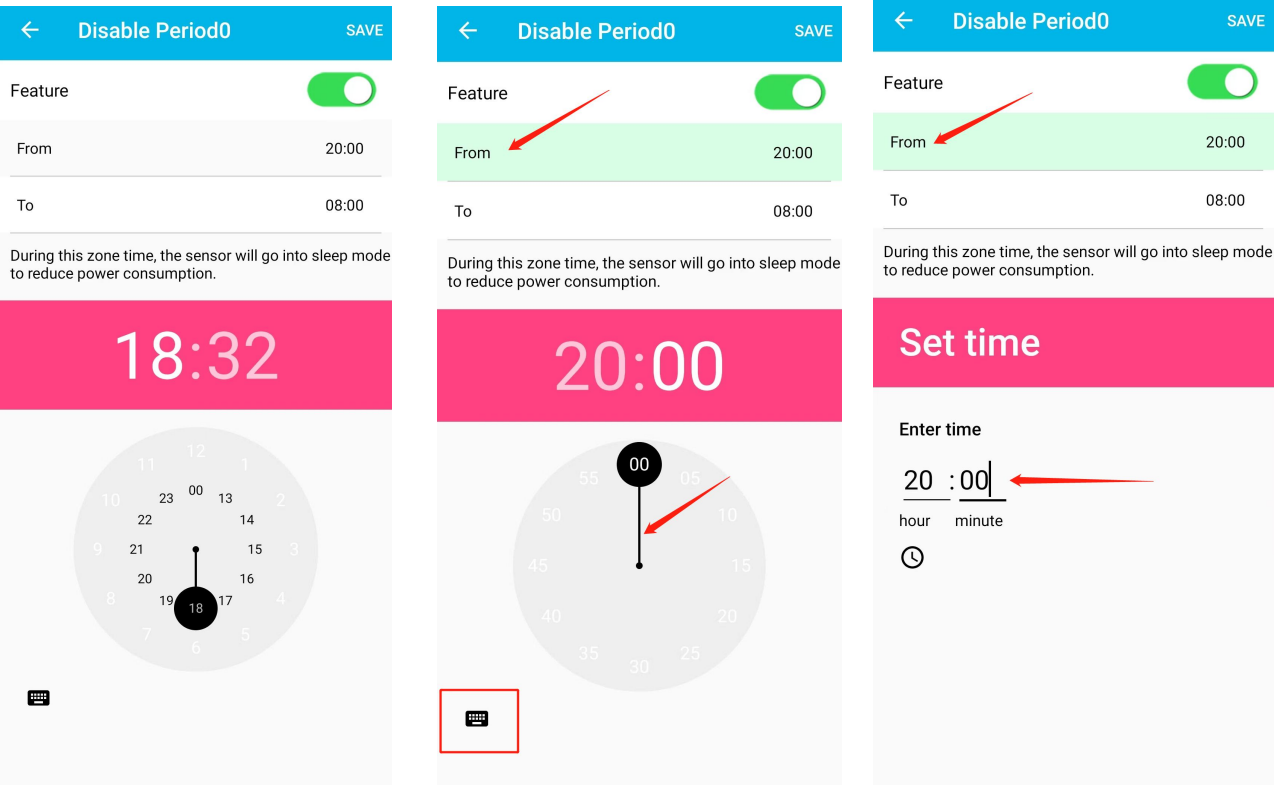
3.6 How to evaluate battery life

KBeaconPro supports evaluating the battery life of beacon according to the configured parameters.

| Type	Describe
Adv standby	When the device is in standby mode, it also consumes a certain amount of power. This power consumption is usually between 1~4uA.
Adv slot: 0	When a slot broadcast is enabled, the slot will periodically send broadcast messages, which will generate a certain power consumption.
Acc standby	When the device has an acceleration sensor, even if the acceleration sensor is not working, there will be about 0.9uA of power consumption.
Acc Axis Adv	If you set KSensor to broadcast 3-axis information, the accelerator will start measuring. If the broadcast interval is shorter, the power consumption will be higher.
H&T standby	When the device has an humidity sensor, even if the sensor is not working, there is about 1uA of power consumption.
H&T measure (Interval:3)	Indicates the power consumption when the temperature and humidity sensor measures once every 3 seconds. The shorter the measurement interval, the higher the power consumption.
Average current	The average current of the device is based on the current configuration parameters, and calculated after the device is powered on for 30 seconds for current stabilizes. The average current does not include power consumption by trigger broadcasting. Also, it does not include the power consumption when the device is connected.
Battery efficiency	Usually the battery capacity is based on the ideal 1mA discharge model at room temperature. In actual use, the capacity of the battery is related to temperature, current and self-discharge. We recommend 75%.
Estimated battery life	= Battery capacity * Battery efficiency/ Average current/24(hours)/30(days)

3.7 How to configure advertisement mode

For some KBeacon models that support BLE5.0 long range feature, 'Adv Mode' can be configured.

- **Legacy:** BLE 4.0 advertisement
- **PHY Code:** BLE 5.0 long range feature
- **PHY 2Mbps:** BLE5.0 broadcasting at a rate of 2Mbps

KBeaconPro App can detect which Adv Mode your phone support (Only supported on Android phones).
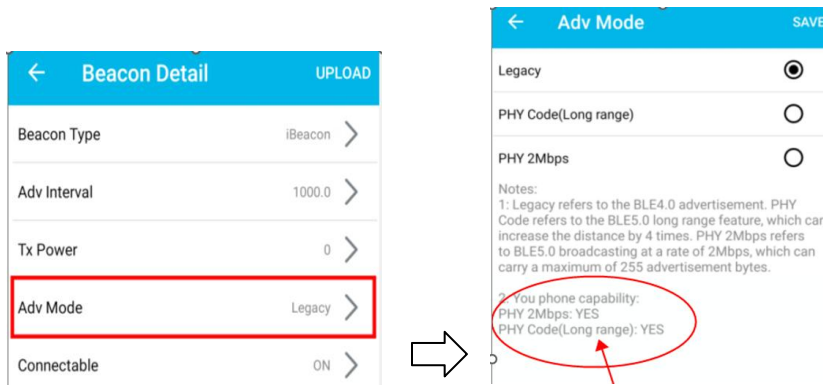
Reminder:

Please make sure that your phone supports BLE 5.0 PHY Code (Long range) 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.

4. How to Configure Trigger

For some KBeacon device that has some motion sensor, temperature&humidity sensor, push button, etc., The application can configure the KBeacon to monitor some trigger event. For example, button was pressed, the temperature is too high, or device was motion. The KBeacon can do some action when the trigger condition was met.

When the conditions of the Trigger are met, we can trigger a specific advertisement, or trigger the event to be recorded in memory, or report an event to the App.

Tap: Trigger Command—>Trigger Type

The following example is based on the K21 device
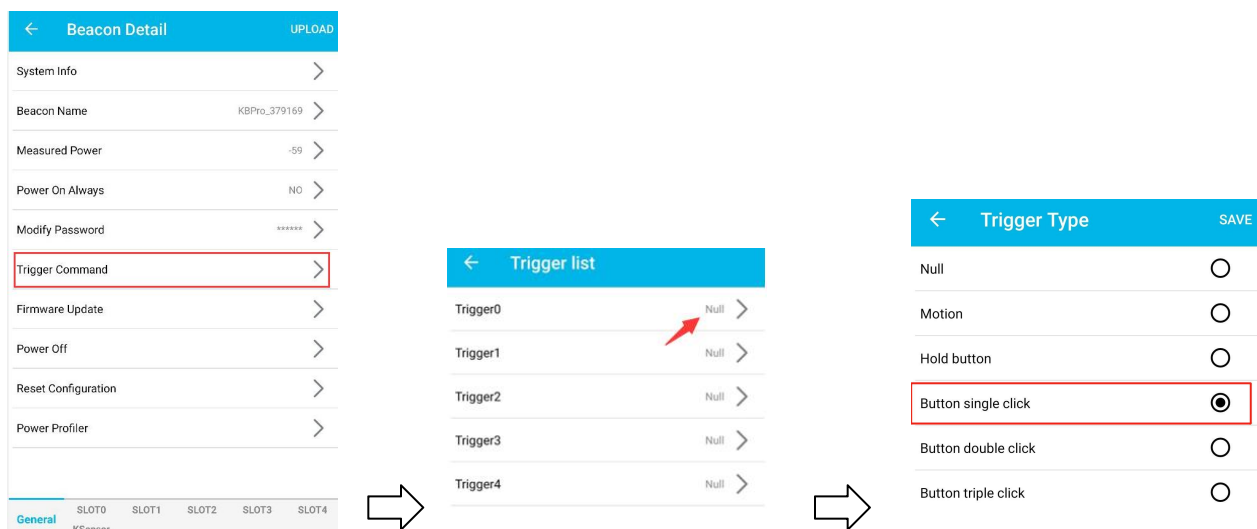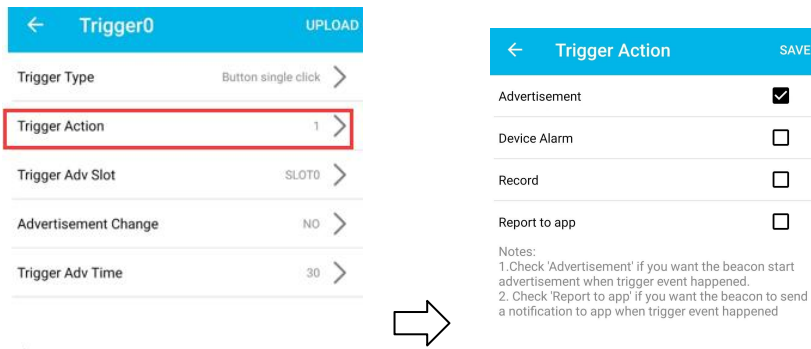
4.1 Trigger event to advertisement

The trigger advertisement has follow parameters:

- Trigger No: Trigger instance number, the device supports up to 5 Triggers by default, the No is 0 ~ 4.

- Trigger type: Trigger event type

- Trigger action: Action when trigger event happened. For example: start broadcast, make a sound, or send a notification to the connected App.

- Trigger Adv slot: When the Trigger event happened, which advertisement Slot starts to broadcasting

- Trigger parameters: For motion trigger, the parameter is acceleration sensitivity. For temperature above trigger, you can set to the temperature threshold.

- Trigger Adv duration: The advertisement duration when trigger event happened. Unit is second.

- Trigger Adv TX power: The advertisement TX power when trigger event happened. Unit is dBm.

- Trigger Adv interval: The advertisement interval when trigger event happened. Unit is ms.

4.1.1 Trigger only advertisement

The device usually does not broadcast by default, and we want to trigger the broadcast when the trigger event happened.

Example:

1. Setting slot 0 to iBeacon advertisement(adv period = 211.25ms, trigger only adv = true).

2. Add a single button trigger(Trigger No = 0, Trigger type = Btn single click, Action = advertisement, Adv slot = 0, Adv duration = 20).
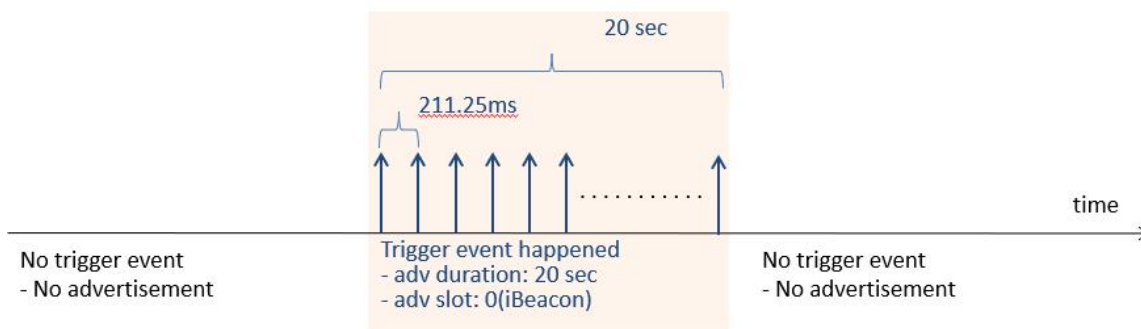
4.1.2 Trigger to an exist advertisement

For some scenario, we need to continuously monitor the KBeacon to ensure that the device was alive. The device usually broadcasting iBeacon1 (UUID=xxx1) , and we want to trigger the broadcast iBeacon2 (UUID=xxx2) when the button is pressed.

Example:

1. Setting slot 0 to iBeacon advertisement (UUID=xxx1, adv period = 1280ms, trigger only adv = false).

2. Setting slot 1 to iBeacon advertisement (UUID=xxx2, adv period = 211.25ms, trigger only adv = true).

   We set an larger advertisement interval during alive advertisement and a short advertisement interval when trigger event happened, so we can achieve a balance between power consumption and triggers advertisement be easily detected.

3. Add a single button trigger(Trigger No = 0, Trigger type = Btn single click, Action = advertisement, Adv slot = 1, Adv duration = 20).
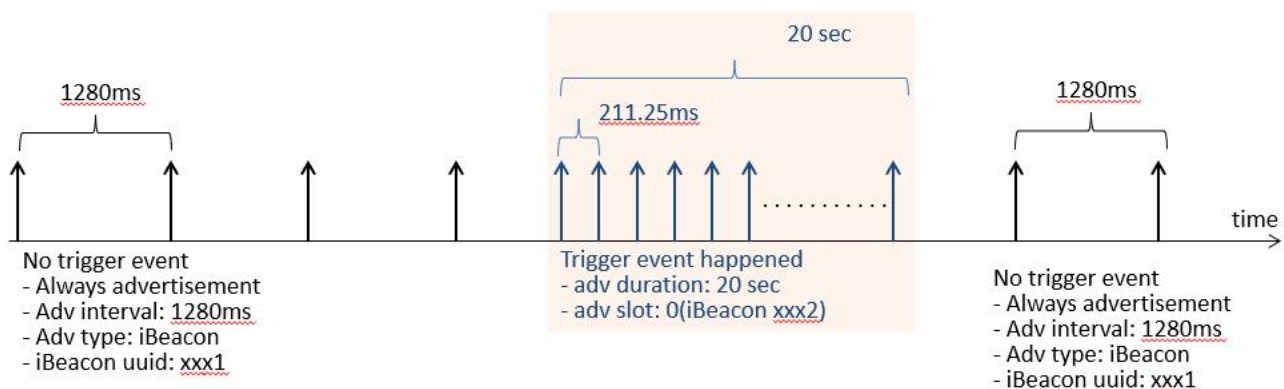
4.2 Trigger event to record

For some Triggers, the device supports recording the Trigger events. For more information, see 2.1.1 Trigger capability.

For the Trigger event, we can set the Trigger Action to "Record". After setting, when the trigger event is triggered, KBeacon will record the Trigger event.

Reminder: Currently, only some devices support recording Trigger events, including:

Example:

1. We assume that the current ambient humidity is 60%, and we set an trigger event to be logged when the humidity exceeds 70%.

2. Put the KBeacon in an environment with a humidity over 70%.

3. Observe whether the event is logged.

In order to verify that the record is generate by the Trigger, we can turn off the T&H Logger during the test, which means that when the temperature and humidity change exceeds the specified threshold, the recording will not be performed. It will only be logged when the Trigger event happened.
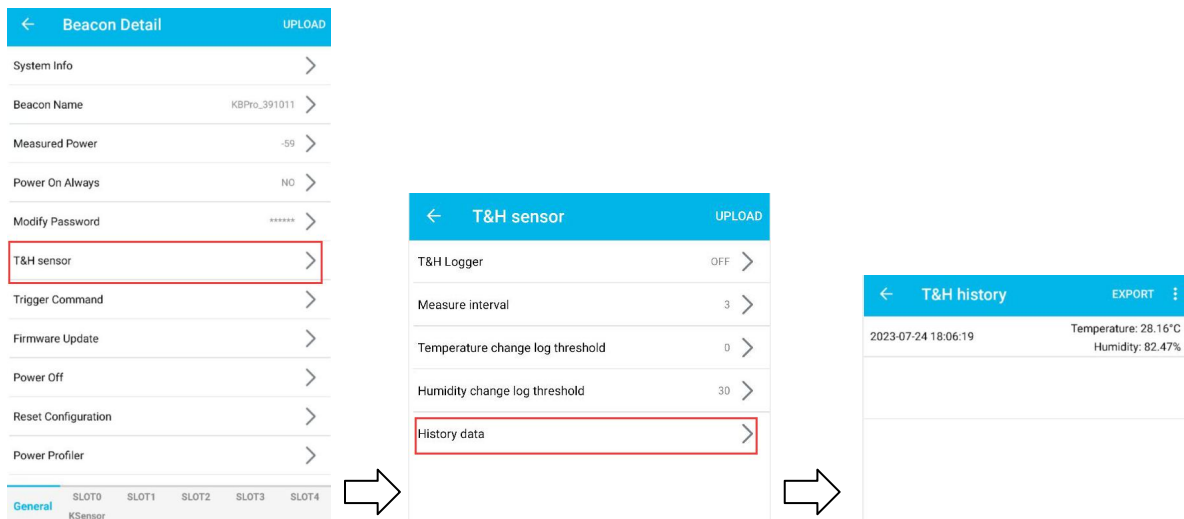
4.3 Trigger event to App

We can also set KBeacon to send an event message to the App when the Trigger is happened.
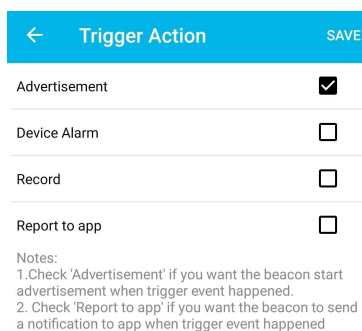
If set "Report to App", there will be a message notification displayed on the cell phone when the trigger event happens.

5. Other Settings

5.1 Unconnectable mode

Each SLOT has two different advertising status, connectable mode and unconnectable mode. Only when the advertising status is connectable, the KBeacon is configurable. But the unconnectable mode saves about 20% -30% power consumption than connectable mode.

After the KBeacon is deployed, we recommend setting the KBeacon to be unconnectable mode. This can lower battery power consumption and the Beacon also have better security performance.
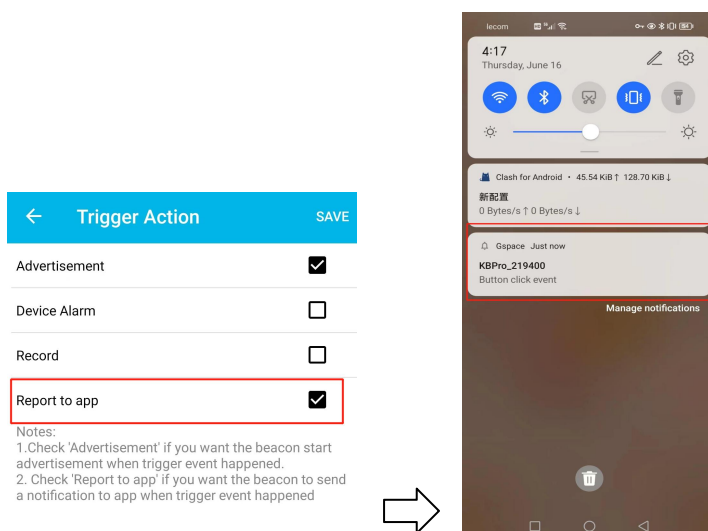
Reminder: For the KBeacon device that doesn't have button and whose battery can not be re-installed, once the device was set to unconnectable mode, it can not be confirgured any more!

How to set unconnectable mode:

Tap: Connectable—> OFF—> Save—>Return —>UPLOAD.
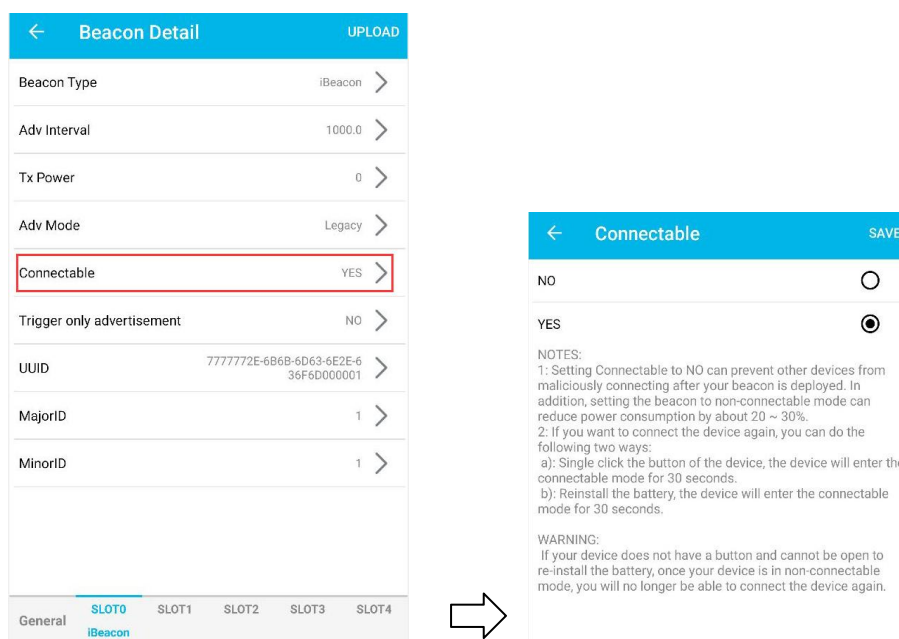
Question: How can I configure KBeacon again if it was set to be unconnectable mode?

● For KBeacon with button: click the button, the Beacon will enter a connectable mode for 30 seconds, users can connect the device within these 30s. Or re-install battery.

● For KBeacon without button: Re-install battery

5.2 Power off

For KBeacon device WITH BUTTON, you can use the App to turn off the device.

Tap: Power Off—> OK
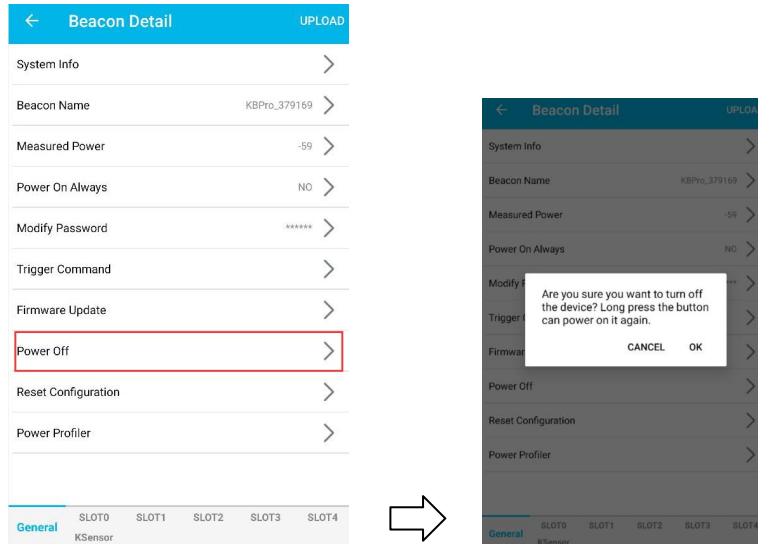
5.3 Reset configuration

You can reset the KBeacons setting to factory default configuration on the App.

Reminder: If you customize some of your own parameters to KKM, such as Trigger parameters, multiple slots broadcast parameters. KKM will configure these parameters for you before leaving the factory. If you perform the "reset configuration" operation, these pre-configured parameters may be lost.

Tap: Reset configuration—> OK
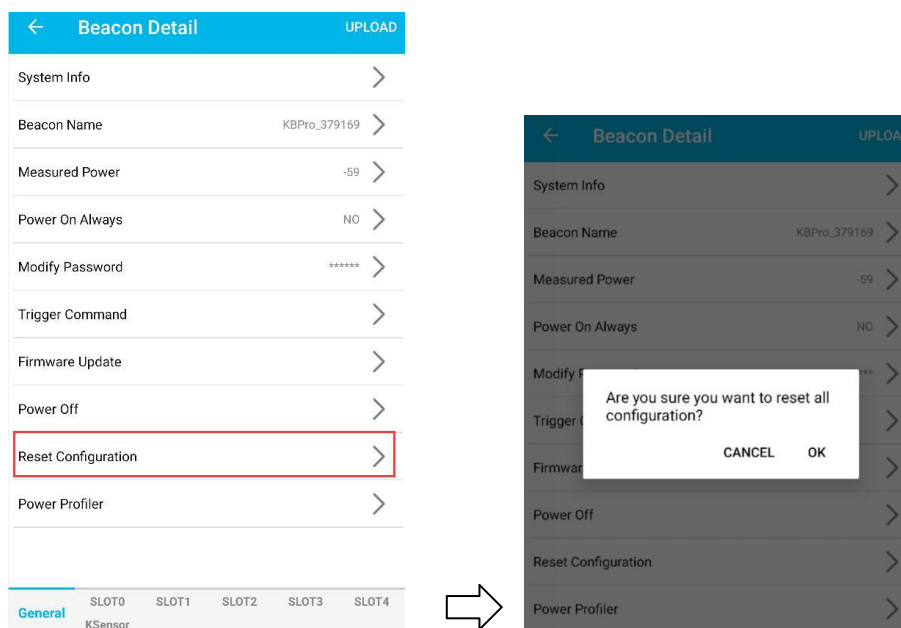
6. KBeacon Payload

6.1 iBeacon payload struct

iBeacon is a BLE broadcast format defined by Apple for Location. For detailed definitions see:

https://developer.apple.com/ibeacon/
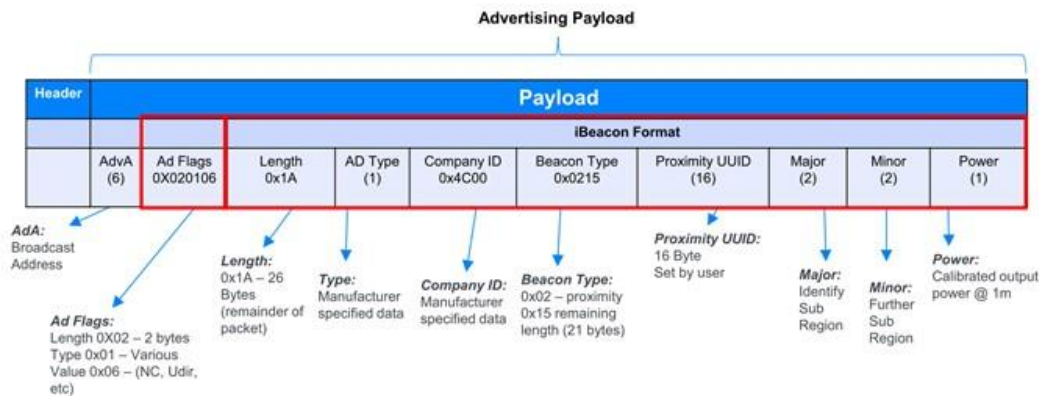
6.2 Eddystone payload struct

Eddystone is a BLE broadcast format defined by Google. For detailed definitions see:

https://github.com/google/eddystone
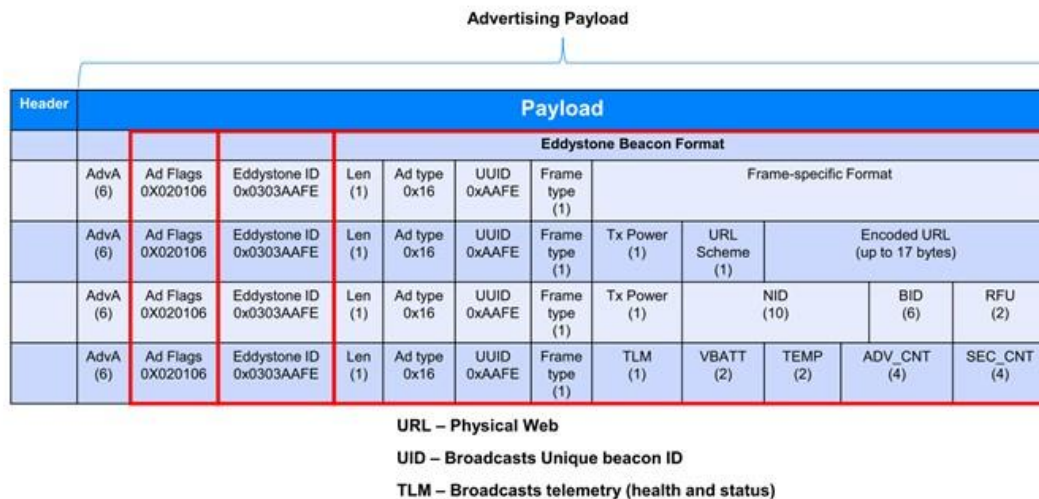
6.3 KSensor payload struct

  The advertising data packet of KSensor is defined by KKM. KSensor is used to broadcast some sensor data, such as temperature and humidity, light intensity, and so on. Please refer to the following table for details.

Length	Type	value	Remark
Head	AdvA (1byte)	0x6	
	AdvFlags (3byte)	0x020106	
	services ID (4byte)	0x0303AAFE	
	Length (1byte)	Variable, the length of all subsequent messages	Services data length.
	Adv type (1byte)	0x16	
	Services UUID (2byte)	0xAAFE	
	Frame Type (1byte)	0x21	
Sensor Mask	Sensor mask (2byte)	0bit: voltage indication; 1bit:temp indication 2bit: humidity indication 3bit: acc indication 4bit: cutoff indication 5bit: PIR indication 6bit: Light indication 7bit: VOC indication 8bit: reserved; 9bit: CO2 indication 10~15bit: reserved	
Voltage	Voltage (2byte)	Battery voltage, unit is mV	
Temperature	Temperature (2byte)	Temperature, Fixed Point 8.8 format	
Humidity	Humidity (2byte)	Temperature, Fixed Point 8.8 format	If the humidity indicator bit is 1, this field is valid, otherwise it is empty
Acc axis	Axis X pos (2byte)	Axis X, unit is mg	If the acc indicator bit is 1, this field is valid, otherwise it is empty
	Axis Y pos (2byte)	Axis Y, unit is mg	
	Axis Z pos	Axis Z, unit is mg	

	(2byte)		
Cutoff	Cutoff alert (1byte)	bit0: 1 : cutoff, 0 normal bit1: 1: device was plug, 0 unplug bit2: 1: detected water, 0, no detected water	If the cutoff indicator bit is 1, this field is valid, otherwise it is empty
PIR	PIR alert (1byte)	bit0: 1 PIR alert, 0 no alert	If the PIR indicator bit is 1, this field is valid, otherwise it is empty
Light	Light level (2byte)	Light level. Unit is lux	If the Light indicator bit is 1, this field is valid, otherwise it is empty

Remark:

- The unit of battery is mV. For example, if the VBATT is 3270, it means the battery voltage is 3270mV;

- Temperature. 2 bytes Fixed Point 8.8. The format is same as temperature in Eddystone TLM.

- Humidity. 2 bytes Fixed Point 8.8. The format is same as temperature in Eddystone TLM.

The Fixed Point 8.8 **format:**

http://people.ece.cornell.edu/land/courses/ece4760/

Example :

View KSensor data by third part NRF connect application(Android version)
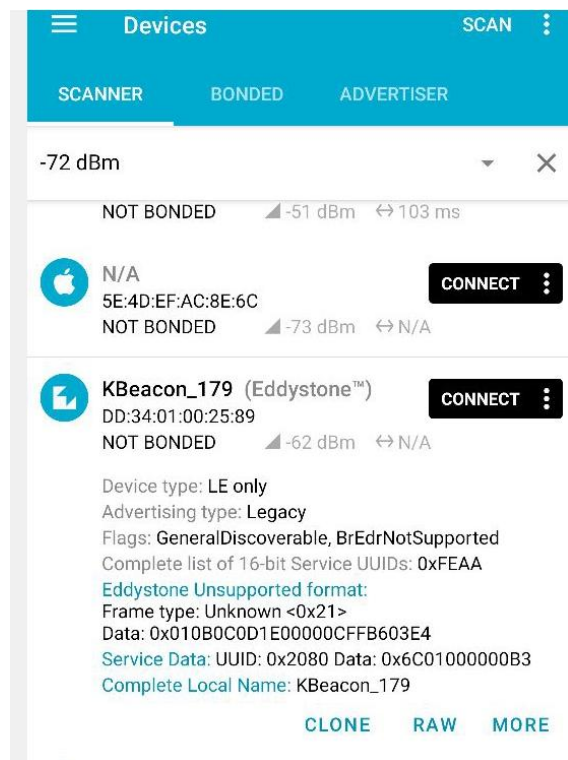
6.4 KKM System payload format

The advertising data packet of System is defined by KKM. The broadcast of the System type is mainly used to broadcast the MAC address of the device and some system parameters of the device, such as the device model and battery level.

Since the IOS system does not allow the application to obtain the MAC address of the BLE device, through System broadcast, the APP can obtain the MAC address of the device without connecting to the device.

Please refer to the following table for details.

Offset	Length	Type	value
0	1byte	AdvA	0x6
1	3byte	AdvFlags	0x020106
4	4byte	ID	0x0303AAFE
8	1byte	Length	
9	1byte	Adv type	0x16
10	2byte	UUID	0xAAFE
12	1byte	Frame Type	0x22
13	1byte	Model ID	Device model ID
14	1byte	Battery	Battery Percent
15	6byte	Mac address	big-endian
21	2byte	Software version	big-endian format. For example if the value is 0x0632, then version is V6.49

Model ID define:
- K1: 10
- K11: 11
- K12: 12
- B1: 13
- U1: 14
- F1: 15
- K15a: 16
- K15:19
- K18: 18
- S1: 17

- K21: 21
- B2: 22
- K21u:25
- S2:26
- K23: 23

- K23p: 24

- K3: 30
- W3: 38
- S3: 36

- K4: 40
- K41:41
- K4u: 45
- K4p: 47
- W4: 48
- K4pt: 49
- S4: 46

- K5: 50
- K51: 51
- W52: 52
- K5p: 57
- K5pt: 58
- S5:59

- K6: 60
- K61: 61
- K6p: 67
- K6pb: 68
- K6ps: 69

- K7: 70
- K71: 71
- K7u: 75
- W7: 78

- K8: 80
- K8u: 85
- W8:86
- W8u:87

- K9: 90
- K91: 91
- K9P: 97
- K9Pb: 98
- K9Pu:99
- W9:92

- P1:101
- B1u:102
- C2: 102
- P2:103
- K16a:104
- K16:105
- K17:106