Making Custom BLE Sensor configuration and preset

Contents

Disclaimer

If you are not using Bluetooth®, **please consider turning it off** or **change Bluetooth® PIN** to remove potential risks.

If you are using Bluetooth® we strongly recommend **using AES encryption** for enhanced security.

Introduction

The first thing you have to know before configuring a sensor is data protocol.

Without data protocol, you can only attempt to extract raw data from the sensor, by configuring it to save all the data sent by the sensor into IO elements.

Extracting RAW data

In the below examples, we are trying to extract data from two **TOPFLYtech BLE 5.0** sensors:

1. Temperature, humidity, and light sensor.
2. Door, temperature sensor.

Prerequisites:

1. BT radio is enabled in the Bluetooth® section of the configurator.
2. Codec8extedended set in the System section of the configurator.

To save sensor incoming data to IO you should configure:

- MAC = MAC of the sensor -> needed to establish a connection with the sensor.

- Type = FE -> any.
- Data Size = 128B -> maximum available in IO.
- Action = Save -> save to IO element.
- IO = custom -> We do not know the protocol yet, so we use custom that can be used for HEX data.

IO tab of configurator: enable BLE custom X where X is the sensor number in Bluetooth® 4.0 section.

Note: you might have to configure more rows if the sensor is sending more than 128B of data.

Once we save the configuration and observe records made by the device we will see that AVL ID for BLE custom 1 will have raw sensor data:

0x1416FFBF1002140EFEBF9D7A7A4164090E350001000509636F6C64

Parsing Data according to protocol Example 1

We can parse this according to the protocols provided by the vendor/manufacturer of the sensor, if not provided during the purchase please contact the vendor for the protocol. The full protocol document for our example can be found here:File:Protocol.xlsx

Raw data assigned to corresponding protocol parts:

Message Header	Hardware Version	Firmware Version	ID	Battery (%)	Temperature (℃)		Humidity (%)	Ambient Light Status		Alarm	Length	Sesnor Name Header	Sesnor Name
1416FFBF1002	14	0E	FEBF9D7A7A41	64	09	0E	35	00	01	00	05	09	636F6C64

Parsed raw data:

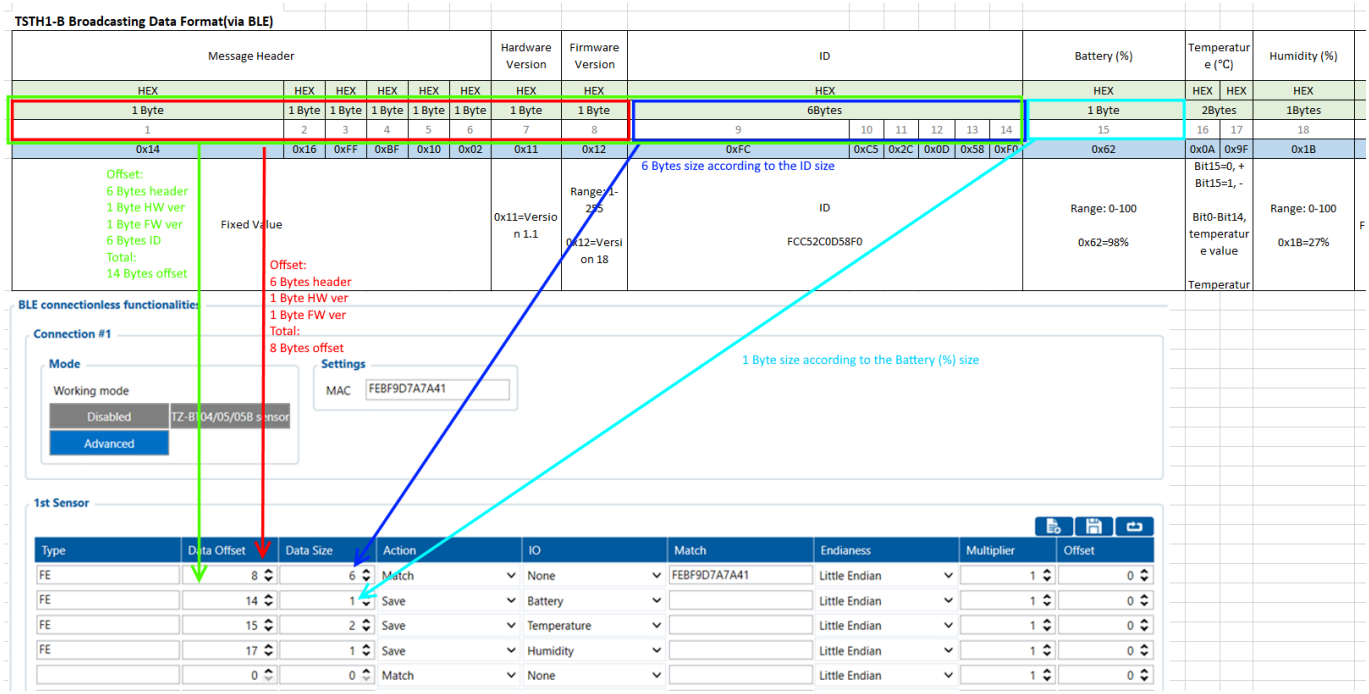
Protocol explanation	Raw data		Parsed Data
Message Header	1416FFBF1002		Fixed value
Hardware Version	14		Version 1.4
Firmware Version	0E		Version 14
ID	FEBF9D7A7A41		ID=MAC=FEBF9D7A7A41
Battery (%)	64		64(Hex)=100(Dec) Then battery percent=100%
Temperature (℃)	09	0E	09 0E(Hex) to BIN: 0000 1001 0000 1110 Bit 15=0, + Bit 15=1, - Bit 15 is 0, so it's a positive temperature Bit 0-Bit14, temperature valueBit 0-14 convert to DEC is 2318 Then 2318/100=23.18 The temperature is +23.18℃
Humidity (%)	35		35(Hex)=53(DEC) The humidity is 53%

Ambient Light Status	00	01	Fixed Value=0 01=light on It means the sensor environment has light
Alarm	00		00 = this is not an alarm message. 00: no alarm 01: alarm 02: high-temperature alarm 04: low-temperature alarm 06: low battery alarm
Length	05		05=there are 5 bytes from byte 23 the length will be changed depending on the sensor name. The sensor name is max 8 bytes. So the max length value is 09
Sesnor Name Header	09		Fixed Value
Sesnor Name	636F6C64		Convert Hex to ASCII 63=C 6F=O 6C=L 64=D So the sensor name is cold

According to the data from the sensor, and available IO elements, you can create a preset for the sensor.

In our case, we are interested in battery level, humidity, and temperature.

We select all type fields to be FE, and data offset and size are calculated according to the protocol, visual example below:



***Note:** *Match field is not necessary for every sensor, it's used when the sensor sends a few different structure packets to match the packet needed.*

If you specify the match field, make sure that sensor does not have dynamic (variable) information in protocols for matched data otherwise it might be filtered until it matches the exact value specified in the match field.

Protocol explanation	Raw data	Type	Offset	Size	Action	IO
Message Header	1416FFBF1002		6	6		
Hardware Version	14		1	1		
Firmware Version	0E		1	1		
ID	FEBF9D7A7A41	FE	6+1+1=8	6	Match	None
Battery (%)	64	FE	8+6=14	1	Save	Battery
Temperature (℃)	09 0E	FE	15	2	Save	Temperature
Humidity (%)	35	FE	17	1	Save	Humidity
Ambient Light Status	00 01					
Alarm	00					
Length	05					
Sesnor Name Header	09					
Sesnor Name	636F6C64					

Once everything is configured it should look as follows:

Pictures of the sensor being read in the sensor app and configurator:

In app:

In configurator:

Parsing Data according to protocol Example 2

Raw sensor data:

0x1216FFBF0E04120EFF779695EE4B640A7301000809545344543 12D42

Raw data assigned to corresponding protocol parts:

Message Header	Hardware Version	Firmware Version	ID	Battery (%)	Temperature (℃)	Door Status	Alarm	Length	Sesnor Name Header	Sesnor Name
1216FFBF0E04	12	0E	FF779695EE4B	64	0A73	01	00	08	09	54534454312D42

Parsed raw data:

Protocol explanation	Raw data	Parsed Data
Message Header	1216FFBF0E04	Fixed value
Hardware Version	12	Version 1.2
Firmware Version	0E	Version 14
ID	FF779695EE4B	ID=MAC=FF779695EE4B

Battery (%)	64		64(Hex)=100(Dec) Then battery percent=100%
Temperature (℃)	0A	73	09 0E(Hex) to BIN: 0000 1010 0111 0011 Bit 15=0, + Bit 15=1, - Bit 15 is 0, so it's a positive temperature Bit 0 - Bit 14, temperature valueBit 0 - Bit 14 convert to DEC is 2675 Then 2775/100=26.75 The temperature is +26.75℃
Door Status	01		01 = Door open 0x00 = Door Closed 0x01 = Door Open
Alarm	00		00 = this is not an alarm message. 00: no alarm 01: alarm 02: high-temperature alarm 04: low-temperature alarm 06: low battery alarm
Length	08		05=there are 5 bytes from byte 23 the length will be changed depending on the sensor name. The sensor name is max 8 bytes. So the max length value is 09
Sesnor Name Header	09		Fixed Value
Sesnor Name	54534454312D42		Convert Hex to ASCII So the sensor name is TSDT1-B

Once everything is configured it should look as follows:

Pictures of the sensor being read in the sensor app and configurator:

In app:

in configurator:

Door open:

Door closed:

Creating Presets

After the configuration is finished you can save the preset, using the save button:

Saved presets are found at:

C:\Users\<your username>\Documents\Presets

They can be shared with other engineers, they just have to save the received preset to same location C:\Users\<your username>\Documents\Presets to be able to load it in the configurator.

Including Presets in the next base configurator release

On the client's request or based on TPS insights about the client's use case, it might be needed to add the sensors to our available presets with the next configurator release. Check with your sales manager about the conditions and information needed to include the preset on the next release.