O3 Sensor Hub 2.0

Bluetooth Low Energy GATT API Reference Guide

Document version: 1.0

Contents

Overview

The O3 Sensor Hub 2.0 provides a Bluetooth® Low Energy (BLE) interface for mobile app development. This document explains the Bluetooth LE API services that the sensor hub offers to an Android or Apple mobile app.

The main audience of this document is a mobile phone app developer who uses the Bluetooth LE API to interact with the O3 Sensor Hub 2.0.

Note: This API is only compatible with the O3-HUB2 sensor hub hardware devices.

About the O3 Sensor Hub 2.0

The O3 Sensor Hub 2.0 provides occupant-based and location-based control for a modern office or meeting space. The device contains an enhanced sensor array and uses logic to combine multiple temperature sensors, humidity measurement, and occupancy detection.

The sensor hub is an Ethernet device that can also communicate using BACnet over UDP/IP or BACnet over Ethernet. In addition, it is designed as an open platform IoT device that supports MQTT and Bluetooth LE protocols, allowing the hub to integrate with almost any system.

The O3 Sensor Hub 2.0 is compatible with enteliWEB 4.16 or later.

About the Bluetooth LE GATT API

The Bluetooth LE GATT API allows you to:

- Read sensor data (see Sensor Data Service).
- Read and write to specific setpoints (see Setpoint Service).
- Configure the device's network settings (see Network Configuration Service).
- Configure the device's light ring, audio and universal points (see I/O and Indicator Service).
- Configure device settings (see Sensor Configuration Service).
- View device information (see System Configuration Service).
- Troubleshoot and calibrate the device.

Related Documents

The following documents are available on support.o3hub.com:

- Quick Start and Installation Guide
- O3 Sensor Hub 2.0 Catalog Sheet
- BACnet Application Guide
- Bluetooth Low Energy GATT API Reference Guide (this document)
- MQTT API Reference Guide

Getting Started

This section describes how to start working with the Bluetooth LE API and the O3 Sensor Hub 2.0.

Before You Begin

Power up the sensor hub. The hub requires a 24 VDC (20–28 VDC) power source.

Connecting to the O3 Sensor Hub over Bluetooth LE

Communicating with the sensor hub using the Bluetooth LE interface involves the following steps:

1. Ensure your application or device has adequate permissions.
2. Discover the sensor hub.
3. Present a 6-digit PIN before performing a write to the sensor hub.

Note: Without entering a PIN, you can read values from the hub.

Step 1: Obtain the Correct Permissions

In addition to standard Bluetooth permissions, some operating systems explicitly require enabled location permissions and location services on the user's device.

Step 2: Discover the Sensor Hub

GAP Advertising Data

Use the sensor hub's Generic Access Profile (GAP) advertising data to discover the sensor hub.

Data Type	Data
Eddystone-UID	5C8E6B8BF66A4AB7A359
Service UUID	4822
Service Name	Sensor Hub II-xxxxxx/xxxx where the x represents the hardware ID that is unique to each hub. For example, SensorHub II-103001/0010
Manufacturer Data	Each sensor hub's unique hexadecimal MAC address is contained in the manufacturer data.

BLE Location Beacon

The O3-HUB2 device has a Bluetooth 5.0 Low Energy beacon that is configured to transmit an Eddystone-UID.

Note: The Bluetooth beacon on the O3 Sensor Hub 2.0 does not stop advertising after a connection is made.

Step 3: Writing to the Sensor Hub

Before you can write any values to the sensor hub, you must complete a pairing process to establish a secure connection. This involves presenting a 6-digit PIN. The factory default PIN on the sensor hub is 000000.

Presenting the PIN

Present the PIN using the PIN characteristic.

Verifying the PIN

The hub returns the result of the PIN verification using the Last Operation Result characteristic. If PIN is incorrect, the hub will reject any write.

Connection Time Out

The connection times out after 20 minutes of inactivity.

Resetting the PIN

There are 2 ways to reset the PIN.

- The PIN can be reset back to factory default by writing to the MQTT topic setting/ble/pin on the hub's internal MQTT broker. MQTT write credentials are required to write to this topic. See the O3 Sensor Hub 2.0 MQTT API Reference Guide for more details.
- In the sensor hub's BACnet object database, set in the new PIN in the CSV45 object.

Disconnecting the Mobile Device

Use the Disconnect Mobile Device characteristic to disconnect the mobile device from the sensor hub.

GATT Services and Characteristics

This section lists the GATT services, characteristics, and their associated vendor UUIDs on the O3 Sensor Hub 2.0 GATT server.

Note: Send all values written to the hub as strings in byte array format.

System Management Service

Defines how access to the sensor hub is managed.

Service Definition	
Name	System Mangement
Service UUID	EFB39360-A7E3-438F-A20D-E9F00E0E22B1

System Management Service Characteristics

Last Operation Result Characteristic	SYSTEM MANAGEMENT SERVICE
Name	Last Operation Result
Characteristic UUID	BE5C2FF9-5D6D-4DE1-8F1D-1D2570F79D72
Description	Returns the result of the PIN verification.
Format	Integer
Properties	Read
Value	0: OK, 102: wrong PIN, 101: general error

PIN Characteristic	SYSTEM MANAGEMENT SERVICE
Name	PIN
Characteristic UUID	839118E2-6975-4A09-99E1-14D5D4776178
Description	Writes the PIN to the sensor hub for the purpose of PIN verification. During the verification, the sensor hub compares this PIN to the one saved on the hub and generates a last operation result.
Format	A string of 6 numbers
Properties	Write
Value Range	0 to 9

New PIN Characteristic	SYSTEM MANAGEMENT SERVICE
Name	New PIN
Characteristic UUID	3E11BB74-A208-479D-B9C7-B1DDFBB079B7
Description	Writes a new PIN to the sensor hub and saves it. Note: You can only write a new PIN after successfully entering the original PIN first.
Format	A string of 6 numbers
Properties	Write
Value Range	0 to 9

Sensor Data Service

The following tables explain the sensor data characteristics available from the sensor hub.

Service Definition	
Name	Sensor Data
Service UUID	F57793C9-9544-46DC-BFA0-5FD149953C86

Sensor Data Service Characteristics

Color Temperature Characteristic	SENSOR DATA SERVICE
Name	Color Temperature
Characteristic UUID	71AEE317-F805-4C58-B069-13D08B12D75B
Description	Reads the color temperature of ambient light (K).
Format	Float
Properties	Read, Notify
Value Range	0 to 65535
Mapped BACnet Object	AI13

Internal Humidity Characteristic	SENSOR DATA SERVICE
Name	Internal Humidity
Characteristic UUID	12CE7390-C4BA-407E-B1CF-E248F84DC398
Description	Reads the humidity at ceiling height.
Format	Float
Properties	Read, Notify
Value Range	0 to 100
Mapped BACnet Object	AI7

Internal Temperature Characteristic	SENSOR DATA SERVICE
Name	Internal Temperature
Characteristic UUID	ECC9A665-6AF4-4144-9D42-35EEFC2E4D49
Description	Reads the temperature at ceiling height.
Format	Float

Internal Temperature Characteristic	SENSOR DATA SERVICE
Properties	Read, Notify
Value Range	-81 to 257
Mapped BACnet Object	AI5

IR Temperature Characteristic	SENSOR DATA SERVICE
Name	IR Temperature
Characteristic UUID	C789F9C6-1224-4670-9375-13D097C08478
Description	Reads the average temperature of surfaces in the sensor hub's field of view, as determined from the hub's IR temperature sensor.
Format	Float
Properties	Read, Notify
Value Range	-81 to 257
Mapped BACnet Object	AI4

Light Level Characteristic	SENSOR DATA SERVICE
Name	Light Level
Characteristic UUID	EA74FAB1-E7A7-40FA-8EDC-38868EE8BD92
Description	Reads the brightness of ambient light (lx or ft-candle).
Format	Float
Properties	Read, Notify
Value Range	0 to 65535
Mapped BACnet Object	AI12

Light Sensor Blue Component Characteristic	SENSOR DATA SERVICE
Name	Light Sensor Blue Component
Characteristic UUID	7E7458F1-35B2-4AB5-BAE1-2694B6E91794
Description	Reads the blue component of ambient light with no units but scaled from 0 to 65535.
Format	Float
Properties	Read, Notify
Value Range	0 to 65535
Mapped BACnet Object	AI16

Light Sensor Green Component Characteristic	SENSOR DATA SERVICE
Name	Light Sensor Green Component
Characteristic UUID	C1302CA8-6AAE-4F32-ABBB-23D522DD8774
Description	Reads the green component of ambient light with no units but scaled from 0 to 65535.
Format	Float
Properties	Read, Notify
Value Range	0 to 65535
Mapped BACnet Object	AI15

Light Sensor Red Component Characteristic	SENSOR DATA SERVICE
Name	Light Sensor Red Component
Characteristic UUID	FF17A806-154A-4E74-81F0-FE0CE1DDAC47
Description	Reads the red component of ambient light with no units but scaled from 0 to 65535.
Format	Float

Light Sensor Red Component Characteristic	SENSOR DATA SERVICE
Properties	Read, Notify
Value Range	0 to 65535
Mapped BACnet Object	AI14

Motion Sensor Characteristic	SENSOR DATA SERVICE
Name	Motion Sensor
Characteristic UUID	292ABE4D-F45B-4AF0-B464-796F09DF41DB
Description	Reads the motion occupancy signal. Active state when motion is detected. See "Occupancy States Explained" on page 47 below for more details about how occupancy is determined.
Format	Integer
Properties	Read, Notify
Value	0: false, 1: true
Mapped BACnet Object	BI9

Occupant Humidity Characteristic	SENSOR DATA SERVICE
Name	Occupant Humidity
Characteristic UUID	D6A10DF9-7AF1-4CAA-8380-7FB618373397
Description	Reads the calculated humidity at 1 m (3 ft) above the floor.
Format	Float
Properties	Read, Notify
Value Range	0 to 100
Mapped BACnet Object	AI6

Occupancy Status Characteristic	SENSOR DATA SERVICE
Name	Occupancy Status
Characteristic UUID	72B7F5DE-A24F-4FAB-B0CD-78F0582BDD00
Description	Reads the combined (motion + sound) occupancy signal. Active state when motion and sound is detected. See "Occupancy States Explained" on page 47 below for more details about how occupancy is determined.
Format	Integer
Properties	Read, Notify
Value	0: unoccupied, 1: occupied
Mapped BACnet Object	BI8

Occupant Temperature Characteristic	SENSOR DATA SERVICE
Name	Occupant Temperature
Characteristic UUID	287B7C85-C471-4146-B678-59832B6B4121
Description	Reads the calculated temperature at 1 m (3 ft) above the floor.
Format	Float
Properties	Read, Notify
Value Range	-81 to 257
Mapped BACnet Object	AI3

Sound Level Characteristic	SENSOR DATA SERVICE
Name	Sound Level
Characteristic UUID	1CC2B5DA-9F5F-4307-9544-2EF5464F1FA4
Description	Reads the level of ambient noise (dB SPL). Unfiltered audio level across the entire spectrum.
Format	Integer
Properties	Read, Notify
Value Range	0 to 120
Mapped BACnet Object	AI17

Thermal Load Characteristic	SENSOR DATA SERVICE
Name	Thermal Load
Characteristic UUID	6B291913-8382-4663-B407-B1E78DE23AB8
Description	This feature is currently not supported.
Format	Integer
Properties	Read, Notify
Value Range	0 to 100
Mapped BACnet Object	AI18

Setpoint Service

The following tables explain the setpoint characteristics available from the sensor hub.

Service Definition	
Name	Setpoint
Service UUID	5040556B-340F-4C6F-B411-448089694628

Setpoint Service Characteristics

Light Level Setpoint Characteristic	SETPOINT SERVICE
Name	Light Level Setpoint
Characteristic UUID	725D3560-BBD3-47BE-920E-7843AEDFB0D5
Description	User-entered light level setpoint. Measured by user when the lighting in the space is set to the desired brightness.
Format	Float
Properties	Read, Write, Notify
Value Range	0 to 65535
Mapped BACnet Object	AV34

Temperature Setpoint Characteristic	SETPOINT SERVICE
Name	Temperature Setpoint
Characteristic UUID	32E4381B-1F1D-47AC-AE97-58959678967F
Description	User-entered temperature setpoint. Measured by user at occupant height. Offset calculated by the mobile app.
Format	Float
Properties	Read, Write, Notify
Value Range	-81 to 257
Mapped BACnet Object	AV33

User-Defined Setpoint 1 Characteristic	SETPOINT SERVICE
Name	User-Defined Setpoint 1
Characteristic UUID	85897295-F88A-4883-A068-BBC5935D1412
Description	Not currently supported. Can be used as a general-purpose BACnet variable.
Format	Float
Properties	Read, Write, Notify
Value Range	0 to 100
Mapped BACnet Object	AV35

User-Defined Setpoint 2 Characteristic	SETPOINT SERVICE
Name	User-Defined Setpoint 2
Characteristic UUID	8347707C-0001-427C-9588-D4133244F7EF
Description	Not currently supported. Can be used as a general-purpose BACnet variable.
Format	Float
Properties	Read, Write, Notify
Value Range	0 to 65535
Mapped BACnet Object	AV36

User-Defined Setpoint 3 Characteristic	SETPOINT SERVICE
Name	User-Defined Setpoint 3
Characteristic UUID	6B5BDBBC-52D1-422A-92ED-0CFF25DCB460
Description	Not currently supported. Can be used as a general-purpose BACnet variable.
Format	Float
Properties	Read, Write, Notify
Value Range	0 to 100
Mapped BACnet Object	AV37

I/O and Indicator Service

This service grouping includes light ring and the sensor hub's audio settings. Additional characteristics are also included in these tables which are used to configure the hub's input/output channels.

Service Definition	
Name	I/O and Indicator
Service UUID	E05AD2AC-9A01-45F5-A56D-9C3C889D4DC6

I/O and Indicator Service Characteristics

Activate Custom Light Ring Colors Characteristic	I/O AND INDICATOR SERVICE
Name	Activate Custom Light Ring Colors
Characteristic UUID	16C58089-CA5C-45FA-BA85-3A3B1AD3E9ED
Description	Activates custom light ring color defined by Light Ring Custom Color Red, Light Ring Custom Color Green, and Light Ring Custom Color Blue. When set to On, it overrides Play Light Ring Pattern (see previous table).
Format	Integer
Properties	Read, Write, Notify
Value	0: off, 1: on
Mapped BACnet Object	BV7

Light Ring Custom Color Blue Characteristic	I/O AND INDICATOR SERVICE
Name	Light Ring Custom Color Blue
Characteristic UUID	05AE6EFC-84EC-4093-AA98-ECC198F968FD
Description	Sets blue component of light ring RGB value. Range: 0% to 100%. Only valid if Activate Custom Light Ring Colors is set to On.
Format	Integer
Properties	Read, Write, Notify
Value Range	0 to 100
Mapped BACnet Object	AV5

Light Ring Custom Color Green Characteristic	I/O AND INDICATOR SERVICE
Name	Light Ring Custom Color Green
Characteristic UUID	232B1A5D-6E51-470F-9C06-245297856415
Description	Sets green component of light ring RGB value. Range: 0% to 100%. Only valid if Activate Custom Light Ring Colors is set to On.
Format	Integer
Properties	Read, Write, Notify
Value Range	0 to 100
Mapped BACnet Object	AV4

Light Ring Custom Color Red Characteristic	I/O AND INDICATOR SERVICE
Name	Light Ring Custom Color Red
Characteristic UUID	B42BAC5D-1051-41E6-AFB4-1E16B31574CE
Description	Sets red component of light ring RGB value. Range: 0% to 100%. Only valid if Activate Custom Light Ring Colors is set to On.
Format	Integer
Properties	Read, Write, Notify
Value Range	0 to 100
Mapped BACnet Object	AV3

Play Light Ring Pattern Characteristic	I/O AND INDICATOR SERVICE
Name	Play Light Ring Pattern
Characteristic UUID	2E2CEFB0-D026-4EC7-8856-8BDD05F9B62E
Description	Plays light ring pattern, numbered 1 to 13. Default value is 1 (Off). Writing an On value to Activate Custom Light Ring Colors characteristic overrides this Play Light Ring Pattern characteristic. See the "Sensor Hub Light Ring Pattern States Explained" on page 47 table for the complete list of light ring patterns.
Format	Integer
Properties	Read, Write, Notify
Value Range	1 to 13
Mapped BACnet Object	MV1

Play Light Ring Repeat Characteristic	I/O AND INDICATOR SERVICE
Name	Play Light Ring Repeat
Characteristic UUID	49AC79E5-6E7E-404F-A1A2-FACB501BD9E9
Description	Sets number of times light ring pattern repeats.
Format	Integer
Properties	Read, Write
Value Range	0 to 999999
Mapped BACnet Object	AV2

Play Sound Characteristic	I/O AND INDICATOR SERVICE
Name	Play Sound
Characteristic UUID	ED4B8FAD-9922-4B51-BB20-A77A2592E51F
Description	Plays a sound. There are 25 default sounds on the sensor hub.
Format	Integer
Properties	Read, Write
Value Range	1 to 26 (default sounds), 27 to 52 (custom sounds set up in the sensor hub using enteliWEB software)
Mapped BACnet Object	MV28

Read Input Channel 1 Characteristic	I/O AND INDICATOR SERVICE
Name	Read Input Channel 1
Characteristic UUID	2C67EEEE-393E-4C77-9204-83C2F487F8D0
Description	Channel 1 is a universal input or output point on the sensor hub. Reads the present value of the input point on Channel 1.
Format	Float
Properties	Read
Value Range	0 to 65535
Mapped BACnet Object	AI1 or BI1 (depending on how the point is configured)

Read Input Channel 2 Characteristic	I/O AND INDICATOR SERVICE
Name	Read Input Channel 2
Characteristic UUID	C3412BA0-B1CB-4951-9E97-8A3DD2A23431
Description	Channel 2 is a universal input or output point on the sensor hub. Reads the present value of the input point on Channel 2.
Format	Float
Properties	Read
Value Range	0 to 65535
Mapped BACnet Object	AI2 or BI2 (depending on how the point is configured)

Set Light Ring Brightness Characteristic	I/O AND INDICATOR SERVICE
Name	Set Light Ring Brightness
Characteristic UUID	46640823-D37E-4510-BE8E-AF0BF6E0273E
Description	Sets overall brightness of light ring. Range: 0% to 100%. Default value is 50%.
Format	Integer
Properties	Read, Write, Notify
Value Range	0 to 100
Mapped BACnet Object	AV6

Set Output Channel 1 Characteristic	I/O AND INDICATOR SERVICE
Name	Set Output Channel 1
Characteristic UUID	5D4E8DF4-87DD-48DB-BB26-25946D936A32
Description	Channel 1 is a universal input or output point on the sensor hub. Writes the present value of the output point on Channel 1.
Format	Float
Properties	Write
Value Range	0 to 65535
Mapped BACnet Object	AO1 or BO1 (depending on how the point is configured)

Set Output Channel 2 Characteristic	I/O AND INDICATOR SERVICE
Name	Set Output Channel 2
Characteristic UUID	D14C4967-9540-42EC-AF2F-CF17E6FCC5B5
Description	Channel 2 is a universal input/output point on the sensor hub. Writes the present value of the output point on Channel 2.
Format	Float
Properties	Write
Value Range	0 to 65535
Mapped BACnet Object	AO2 or BO2 (depending on how the point is configured)

Set and Play Custom Audio File Characteristic	I/O AND INDICATOR SERVICE
Name	Set and Play Custom Audio File
Characteristic UUID	A2895C02-905E-4822-A711-29482675F501
Description	Defines the custom audio file to be played, and then plays it. Enter the file name, including the file extension. For example: Acknowledge.wav Note: The custom audio file must be uploaded to the sensor hub using enteliWEB software. See the *O3 Sensor Hub 2.0 BACnet Application Guide* for more details about loading custom sound files.
Format	String
Properties	Read, Write
Value	<string>

Sound Repeat Characteristic	I/O AND INDICATOR SERVICE
Name	Sound Repeat
Characteristic UUID	E5421778-0829-4EA1-A1D1-318124EBE6B0
Description	Sets the number of times a sound is played.
Format	Integer
Properties	Read, Write
Value Range	0 to 999999
Mapped BACnet Object	AV29

Speaker Volume Characteristic	I/O AND INDICATOR SERVICE
Name	Speaker Volume
Characteristic UUID	FC09FC9A-23ED-4867-9C4C-4F34C274F41A
Description	Sets the speaker volume in the range 0-100. Default value is 0 (Off).
Format	Integer
Properties	Read, Write, Notify
Value Range	0 to 100
Mapped BACnet Object	AV30

Sensor Configuration Service

This service grouping includes the device and sensor configuration settings.

Service Definition	
Name	Sensor Configuration
Service UUID	51E16FF1-20D3-45EC-915C-F18290A893C5

Sensor Configuration Service Characteristics

Assign BACnet Device ID Characteristic	SENSOR CONFIGURATION SERVICE
Name	Assign BACnet Device ID
Characteristic UUID	AE79CA8F-A333-4850-84EA-1AD9710FB5A7
Description	If the sensor hub is on a BACnet network, this characteristic defines the BACnet device address of the hub. For example: 4100080. Ensure the BACnet device address is unique for each hub.
Format	String

Assign BACnet Device ID Characteristic	SENSOR CONFIGURATION SERVICE
Properties	Read, Write
Value	<string>

Assign BACnet Network Number Characteristic	SENSOR CONFIGURATION SERVICE
Name	Assign BACnet Network Number
Characteristic UUID	0C36266F-1667-4B69-95FF-6F55947589E5
Description	If the sensor hub is on a BACnet network, this characteristic defines the BACnet network number for the hub. For example: 50001. Ensure all hubs and other BACnet devices on the same network segment use the same network number.
Format	String
Properties	Read, Write
Value	<string>

Change TCP/IP Settings Characteristic	SENSOR CONFIGURATION SERVICE
Name	Change TCP/IP Settings
Characteristic UUID	055FA816-E26E-4D82-BB77-456D5DA0D9EE
Description	Sets the sensor hub's IP address, which can either be static or assigned by a DHCP server. If a static address is used, ensure the IP address is unique for each hub.
Format	String
Properties	Read, Write
Value	<string>

Read Device Serial Number Characteristic	SENSOR CONFIGURATION SERVICE
Name	Read Device Serial Number
Characteristic UUID	2E888D3C-AEC5-4193-B0F1-4735CAB9AFBD
Description	Reads the sensor hub's serial number.
Format	String
Properties	Read
Value	<string>

Set Device Name Characteristic	SENSOR CONFIGURATION SERVICE
Name	Set Device Name
Characteristic UUID	45E7570D-A13A-456E-B8B9-7B4EF6989DB2
Description	Defines the sensor hub's device name on a BACnet network.
Format	String
Properties	Read, Write
Value	<string>

Set Light Unit Characteristic	SENSOR CONFIGURATION SERVICE
Name	Set Light Unit
Characteristic UUID	4A3B5382-2453-46A1-94CA-7F898122E35C
Description	Set the unit used for light readings. The supported units are lux or foot-candles.
Format	String
Properties	Read
Value	lux or cd

Set Temperature Unit Characteristic	SENSOR CONFIGURATION SERVICE
Name	Set Temperature Unit
Characteristic UUID	9BBA2752-A586-433D-98CF-888A5B8B09FC
Description	Sets the unit used for temperature readings.
Format	String
Properties	Read, Write
Value	C or F

Set Web Server URL Characteristic	SENSOR CONFIGURATION SERVICE
Name	Set Web Server URL
Characteristic UUID	0C36266F-1667-4B69-95FF-6F55947589E5
Description	Defines the web server that the sensor hub communicates with. By default, this is https://staging.o3hub.com/ though this web site is not currently supported.
Format	String
Properties	Read
Value	<string>

TCP/IP Subnet Mask Characteristic	SENSOR CONFIGURATION SERVICE
Name	TCP/IP Subnet Mask
Characteristic UUID	3923BA42-1269-4BF0-9E4C-855182372280
Description	Sets the sensor hub's subnet mask.
Format	String
Properties	Read, Write
Value	<string>

Network Configuration Service

This table contains characteristics related to establishing an Ethernet or BACnet over IP connection.

Service Definition	
Name	Network Configuration
Service UUID	E03D645C-3F2B-4693-A2FB-99840EE2581D

Network Configuration Service Characteristics

BACnet Ethernet Enable Characteristic	NETWORK CONFIGURATION SERVICE
Name	BACnet Ethernet Enable
Characteristic UUID	E0B25FF2-E97E-4D77-B4DC-7DEAD4A4AADF
Description	Enables or disables BACnet/Ethernet protocol support on the sensor hub.
Format	Boolean
Properties	Read, Write
Value Range	False or True

BACnet IP Mode Characteristic	NETWORK CONFIGURATION SERVICE
Name	BACnet IP Mode
Characteristic UUID	0C33C8F1-86E8-4CA5-A4DF-F1BDB6B96E22
Description	Reads how the sensor hub is set up as a BACnet/IP device. Currently, the hub can only be set up as a foreign device using enteliWEB software.
Format	String
Properties	Read, Notify
Value Range	normal or foreign

BACnet Protocol Characteristic	NETWORK CONFIGURATION SERVICE
Name	BACnet Protocol
Characteristic UUID	61ABFC55-7A00-4B9B-93C9-1770356EDC8F
Description	Enables or disables the sensor hub's ability to communicate using the BACnet protocol.
Format	Boolean
Properties	Read, Write
Value	False or True

BACnet UDP Number Characteristic	NETWORK CONFIGURATION SERVICE
Name	BACnet UDP Number
Characteristic UUID	67358E4B-C841-4E6F-9822-EC92E388A4A3
Description	Sets the UDP port number used by the sensor hub to communicate over BACnet/IP.
Format	Integer
Properties	Read, Write
Value Range	0 to 65535

Connectivity Characteristic	NETWORK CONFIGURATION SERVICE
Name	Connectivity
Characteristic UUID	56456172-DDD7-4E75-83D7-C2D0D6B796EE
Description	Reads the online status of the sensor hub.
Format	Integer

Connectivity Characteristic	NETWORK CONFIGURATION SERVICE
Properties	Read
Value Range	0: Up and Running 1: Up and Not Running 2: Down and Not Running 3: Error Getting Link Status

DNS IP Characteristic	NETWORK CONFIGURATION SERVICE
Name	DNS IP
Characteristic UUID	D1035EB0-C93D-4C20-A4B2-C2E44D91C903
Description	Sets the Domain Name Server IP address used by the sensor hub if DHCP is not used.
Format	String
Properties	Read, Write
Value	<string>

Ethernet MAC Address 1 Characteristic	NETWORK CONFIGURATION SERVICE
Name	Ethernet MAC Address 1
Characteristic UUID	D7AE5B6F-C8DD-4ADD-A75A-28F4038528FA
Description	Reads the MAC address used on Ethernet port 1 on the sensor hub.
Format	String
Properties	Read
Value	<string>

Ethernet MAC Address 2 Characteristic	NETWORK CONFIGURATION SERVICE
Name	Ethernet MAC Address 2
Characteristic UUID	C417C455-C003-445A-ADA4-F203F0DA2F2A
Description	Reads the MAC address used on Ethernet port 2 on the sensor hub.
Format	String
Properties	Read
Value Range	<string>

Ethernet 1 Status Characteristic	NETWORK CONFIGURATION SERVICE
Name	Ethernet 1 Status
Characteristic UUID	73678CA9-B639-459E-890A-6E3B38962B2F
Description	Reads the status of the Ethernet port 1 on the sensor hub.
Format	Integer
Properties	Read
Value	0: Up and Running 1: Up and Not Running 2: Down and Not Running 3: Error Getting Link Status

Ethernet 2 Status Characteristic	NETWORK CONFIGURATION SERVICE
Name	Ethernet 2 Status
Characteristic UUID	ECD1CC9F-7A8E-4B4F-8BD2-8E7B13258F87
Description	Reads the status of the Ethernet port 2 on the sensor hub.
Format	Integer

Ethernet 2 Status Characteristic	NETWORK CONFIGURATION SERVICE
Properties	Read
Value Range	0: Up and Running 1: Up and Not Running 2: Down and Not Running 3: Error Getting Link Status

Gateway IP Characteristic	NETWORK CONFIGURATION SERVICE
Name	Gateway IP
Characteristic UUID	265D3029-4B73-444A-B48D-5016AB25A659
Description	Sets the Gateway IP address used by the sensor hub.
Format	String
Properties	Read, Write
Value	<string>

MQTT Broker IP/URL Characteristic	NETWORK CONFIGURATION SERVICE
Name	MQTT Broker IP/URL
Characteristic UUID	E7592CDA-46EE-4D87-9D0D-9BB25B2C3059
Description	If communicating with an external MQTT broker other than the default Delta broker, set the URL of this custom broker. Not currently supported. Also see the MQTT Broker Type characteristic.
Format	String
Properties	Read, Write
Value	<URL string>

MQTT Port Characteristic	NETWORK CONFIGURATION SERVICE
Name	MQTT Port
Characteristic UUID	1850B75D-4299-4E9D-896E-D19B1E2183C2
Description	The port number used for MQTT communication. Default port number is 8883.
Format	Integer
Properties	Read, Write
Value Range	0 to 65535

MQTT Status Characteristic	NETWORK CONFIGURATION SERVICE
Name	MQTT Status
Characteristic UUID	0457F00C-87E1-45F0-85E1-EFDD7AB7DFF4
Description	Enables or disables the ability to connect to an MQTT Broker.
Format	Integer
Properties	Read, Write
Value	0: disable, 1: enable

Network Type Characteristic	NETWORK CONFIGURATION SERVICE
Name	Network Type
Characteristic UUID	5E4E0A08-C27F-430D-8D8D-4993D38A1004
Description	Defines if the sensor hub's IP address is static or assigned by a DHCP server.
Format	String
Properties	Read, Write
Value	Static or DHCP

Calibration Configuration Service

This table contains characteristics related to calibration of the temperature reading and configuration of acoustic, motion and occupancy settings.

Service Definition	
Name	Calibration Configuration
Service UUID	5526A99E-7975-42FF-A27B-94D5A1AD9986

Calibration Configuration Service Characteristics

Acoustic Activity Level Characteristic	CALIBRATION CONFIGURATION SERVICE
Name	Acoustic Activity Level
Characteristic UUID	8A22BEA5-F786-4E1A-8454-B1A373D1F8E2
Description	Reads the audio level in the space after certain frequencies are filtered out. The higher the value, the noisier the environment.
Format	Float
Properties	Read, Notify
Value Range	0 to 65535
Mapped BACnet Object	AI10

Acoustic Occupancy Characteristic	CALIBRATION CONFIGURATION SERVICE
Name	Acoustic Occupancy
Characteristic UUID	5953C91C-8ECB-4991-AE13-6E619B005DF3
Description	Reads the occupancy state of the space based on the space's acoustic activity level. The characteristic reads true if the sound level in the space is high enough to indicate occupancy.
Format	Integer

Acoustic Occupancy Characteristic	CALIBRATION CONFIGURATION SERVICE
Properties	Read
Value	0: unoccupied because sound level below expected threshold 1: occupied because sound level above expected threshold
Mapped BACnet Object	BI11

Acoustic Sensitivity Characteristic	CALIBRATION CONFIGURATION SERVICE
Name	Acoustic Sensitivity
Characteristic UUID	88456249-05F8-4434-9C7C-61E1A9A0D5B0
Description	Sets how much the sound level (loudness) in the room must exceed the background level before the room is considered occupied. This parameter is the sensitivity of the audio portion of the occupancy algorithm, expressed as a percentage (0–100%), with 100% = maximum sensitivity, and 0% = minimum sensitivity. Default value is 80%.
Format	Integer
Properties	Read, Write
Value Range	0 to 100
Mapped BACnet Object	AV24

Motion Sensitivity Characteristic	CALIBRATION CONFIGURATION SERVICE
Name	Motion Sensitivity
Characteristic UUID	CCDCE4F9-F8AD-40A4-97C5-43D895981814
Description	Sets the amount of movement needed to set the Motion Sensor to True. PIR motion sensor sensitivity is expressed as a percentage (0–100%), with 100% = maximum sensitivity, and 0% = minimum sensitivity. Default value is 80%. May need adjusting based on room size and layout.
Format	Integer
Properties	Read, Write
Value Range	0 to 100
Mapped BACnet Object	AV23

Occupancy Audio Retrigger Period Characteristic	CALIBRATION CONFIGURATION SERVICE
Name	Occupancy Audio Retrigger Period
Characteristic UUID	B06D391E-F793-4295-9BA5-8AB1ACE71457
Description	The amount of time (in seconds) that activity sounds can cause the hub to remain in the occupied state after motion is detected. Default value is 1200 seconds (20 minutes). Measured from most recent motion detection event. If motion is detected, then the count is reset. Acoustic Retrigger Period helps the sensor hub determine the space's occupancy state. See "Occupancy States Explained" on page 47 for more details.
Format	Integer
Properties	Read
Value Range	0 to 65535
Mapped BACnet Object	AV25

Occupancy Audio Update Period Characteristic	CALIBRATION CONFIGURATION SERVICE
Name	Occupancy Audio Update Period
Characteristic UUID	261D878C-1772-4ADD-805F-CDC678E4B384
Description	Update period (in seconds) for the baseline microphone levels to adjust to environmental changes when no occupants are present. Default value is 30 seconds.
Format	Integer
Properties	Read
Value Range	0 to 65535
Mapped BACnet Object	AV27

Occupancy Inactivity Period Characteristic	CALIBRATION CONFIGURATION SERVICE
Name	Occupancy Inactivity Period
Characteristic UUID	8988EEAA-574E-4447-A974-525B877DF4EB
Description	Reads the amount of time (in seconds) it takes the hub to return to the unoccupied state when no motion and no audio activity is detected. Default value is 300 seconds (5 minutes).
Format	Integer
Properties	Read
Value Range	0 to 65535
Mapped BACnet Object	AV26

IR Repeats Characteristic	CALIBRATION CONFIGURATION SERVICE
Name	IR Repeats
Characteristic UUID	0605CDA9-92F6-4FAA-9290-F499F1FB2882
Description	Reads the number of times IR code is sent per transmission. By default, code is sent once per transmission. Not currently supported.
Format	Integer
Properties	Read
Value Range	0 to 100
Mapped BACnet Object	AV10

Programmable IR Code Characteristic	CALIBRATION CONFIGURATION SERVICE
Name	Programmable IR Code 1
Characteristic UUID	FAAB8651-24B2-425D-B098-D4A2A4058154
Description	Contains IR Pronto code. Not currently supported.
Format	String
Properties	Read
Value Range	<string>

Raw Temperature Characteristic	CALIBRATION CONFIGURATION SERVICE
Name	Raw Temperature
Characteristic UUID	EB625F90-DDEA-4723-BEAA-D4B09E6BBEA2
Description	Reads the occupant temperature without any calibration adjustments. For example, if the occupant temperature is 25°C and calibration is 0.5°C, then the raw temperature is 24.5°C.
Format	Float
Properties	Read, Notify
Value Range	-81 to 257

Send IR Code Characteristic	CALIBRATION CONFIGURATION SERVICE
Name	Send IR Code
Characteristic UUID	0F9999E0-A683-437F-ABD3-3A94605E1623
Description	Reads the IR code (1-13) sent by the sensor hub. Default value is 1 (Off). Not currently supported.
Format	Integer
Properties	Read
Value Range	1 to 13
Mapped BACnet Object	MV9

Temperature Calibration Characteristic	CALIBRATION CONFIGURATION SERVICE
Name	Temperature Calibration
Characteristic UUID	B3997D46-DEF4-43DE-B82F-DEB04B059C17
Description	Sets an offset value (positive or negative) used to correct the sensor hub's temperature reading.
Format	Float
Properties	Read, Write
Value Range	-81 to 257
Mapped BACnet Object	Calibration property of AI3

System Configuration Service

This table describes various characteristics related to configuration parameters, model numbers and version numbers.

Service Definition	
Name	System Configuration
Service UUID	D72CE428-BA8C-4061-B6DE-6F682736FE08

System Configuration Service Characteristics

Active POST Status Mode Characteristic	SYSTEM CONFIGURATION SERVICE
Name	Active POST Status Mode
Characteristic UUID	C40793BF-D4D5-425D-92A6-23394309762A
Description	Reads the status of the communication components after the sensor hub powers on.
Format	Integer

Active POST Status Mode Characteristic	SYSTEM CONFIGURATION SERVICE
Properties	Read
Value Range	0: No issues or problems. 1: Ethernet component error. 2: Bluetooth LE component error. 3: Bluetooth LE and Ethernet components are in error. 4: SPI communications in error. 5: SPI and Ethernet components are in error. 6: SPI and Bluetooth LE components are in error. 7: All communication components are in error.

BLE API Version Characteristic	SYSTEM CONFIGURATION SERVICE
Name	BLE API Version
Characteristic UUID	A3BBD5B5-67B9-449E-924A-18DF526C40F1
Description	Reads the version of the Bluetooth API.
Format	String
Properties	Read
Value Range	<string>

BLE Beacon ID Characteristic	SYSTEM CONFIGURATION SERVICE
Name	BLE Beacon ID
Characteristic UUID	038F5653-BE86-4200-8F07-34CDD9D41577
Description	Reads the ID of the Bluetooth LE beacon on the sensor hub.
Format	String

BLE Beacon ID Characteristic	SYSTEM CONFIGURATION SERVICE
Properties	Read
Value Range	<string>

Bluetooth Maximum Transmit Power Characteristic	SYSTEM CONFIGURATION SERVICE
Name	Bluetooth Maximum Transmit Power
Characteristic UUID	F470D1D6-2333-43AD-BC15-89BBAC2669D5
Description	Reads the strength of Bluetooth LE beacon. There are 8 maximum allowable transmit power states. Not valid if Enable BLE is Off.
Format	Integer
Properties	Read
Value Range	1 to 8
Mapped BACnet Object	MV40

Bootloader Version Characteristic	SYSTEM CONFIGURATION SERVICE
Name	Bootloader Version
Characteristic UUID	727924C6-7329-4425-BB81-B77E96AD4E2D
Description	Reads the sensor hub's bootloader version.
Format	String
Properties	Read
Value Range	<string>

Enable BLE Characteristic	SYSTEM CONFIGURATION SERVICE
Name	Enable BLE
Characteristic UUID	20C4C970-151B-4126-9A40-E5789ED9C681
Description	Reads the status of the Bluetooth LE beacon on the sensor hub. A value of 1 means that the beacon is enabled.
Format	Integer
Properties	Read
Value Range	1: enabled, 2: disabled
Mapped BACnet Object	BV31

Firmware Upgrade URL Characteristic	SYSTEM CONFIGURATION SERVICE
Name	Firmware Upgrade URL
Characteristic UUID	8CFA4F33-CBEF-46EC-8D5C-D3DCE95FDB68
Description	The web site address where the firmware upgrade file can be downloaded from.
Format	String
Properties	Read, Write
Value Range	<string>

Firmware Upgrade Version Characteristic	SYSTEM CONFIGURATION SERVICE
Name	Firmware Upgrade Version
Characteristic UUID	BD908AC6-C0B5-4C79-9A2A-E9A556535FE8
Description	The firmware version number that the sensor hub can upgrade to.
Format	String. The format is x.y.z where x is the major version number, y is the minor version number, and z is the revision number.
Properties	Write
Value Range	<string>

Firmware Version Characteristic	SYSTEM CONFIGURATION SERVICE
Name	Firmware Version
Characteristic UUID	9C25EE45-44BE-47B3-B0C4-16DB6EE79799
Description	Reads the sensor hub's firmware version.
Format	String
Properties	Read
Value Range	<string>

Kernel Version Characteristic	SYSTEM CONFIGURATION SERVICE
Name	Kernel Version
Characteristic UUID	6E7BF0B1-B0A6-4AB4-856F-7432A905EFCD
Description	Reads the kernel version of the Linux operating system used to create code on the sensor hub.
Format	String
Properties	Read
Value Range	<string>

Model Name Characteristic	SYSTEM CONFIGURATION SERVICE
Name	Model Name
Characteristic UUID	8050C59A-170E-4206-848A-07EFB78C14BA
Description	Reads the model name of the sensor hub.
Format	String
Properties	Read
Value Range	<string>

Mobile Device Data Service

This table contains characteristics related to mobile devices.

Service Definition	
Name	Mobile Device Data
Service UUID	76A136D4-29FC-4217-B358-9BFF4D6601CE

Mobile Device Data Service Characteristics

Disconnect Mobile Device Characteristic	MOBILE DEVICE DATA SERVICE
Name	Disconnect Mobile Device
Characteristic UUID	5207F99E-5B02-4760-A220-678594939FF0
Description	Disconnects a specific mobile device from the sensor hub. The mobile device is identified by its device name. When the value is written, the device with that name is disconnected.
Format	String
Properties	Write
Value Range	<string>

MQTT Broker Type Characteristic	MOBILE DEVICE DATA SERVICE
Name	MQTT Broker Type
Characteristic UUID	6C479A4C-6AE6-4FB1-BFF1-17D4D7F5B9F2
Description	Defines whether the MQTT broker used is the Delta default MQTT broker or not. Custom broker not currently supported.
Format	String

MQTT Broker Type Characteristic	MOBILE DEVICE DATA SERVICE
Properties	Read, Write
Value	Default or Custom

Reset Hub Characteristic	MOBILE DEVICE DATA SERVICE
Name	Reset Hub
Characteristic UUID	411225B6-82F0-4E5D-B980-E2099E9DD53F
Description	When a value of 1 is written, the sensor hub is reset.
Format	Integer
Properties	Write
Value Range	1: resets sensor hub, 0: no reset action

Occupancy States Explained

A state change from unoccupied to occupied is triggered when motion is detected in the room, or by a combination of motion and sound. Sound alone does not trigger a state change.

When either motion or sound is detected in the room, the occupancy state is extended. This sound level must be above the baseline audio level that the sensor hub has previously established. In addition, new sounds that fall outside of the Occupancy Audio Retrigger Period value are not allowed to extend the occupancy state. This feature reduces artificial extension of the occupancy state due to background noise.

The sensor hub reports a room as unoccupied if no motion or sound is detected after a set amount of time (Occupancy Inactivity Period). This sound level has to be below the baseline audio level that the sensor hub has previously established. You can change the Occupancy Inactivity Period.

Sensor Hub Light Ring Pattern States Explained

This table lists all the light ring patterns offered on the O3 Sensor Hub 2.0.

State	Name	Description	Factory Color
1	Idle (Off)	No pattern is displayed.	None
2	Blue Swirl	Light circles ring once, followed by two short flashes, followed by long flash.	Blue
3	Fast Blue Swirl	Same as above but faster.	Blue
4	Power On	Light circles ring three times.	Green
5	Occupancy Active	Light circles ring three times.	White
6	Got Request	Three short flashes.	Green
7	Heating Active	Light ring fades in and out.	Red
8	Cooling Active	Light ring fades in and out.	Blue
9	Don't Understand	Four short flashes, followed by long flash.	Yellow
10	Error	Eight short flashes.	Red
11	Alarm	Sixteen short flashes on alternating sides of ring.	Red
12	Christmas	Sixteen short flashes in alternating colors.	Red and green
13	Awake and Waiting	Light circles ring once followed by a solid ring, repeats the same sequence, and then light turns off.	Blue

Revision History

Version	Date	Description
1.0	January 2021	First release.