

External Sensor Trigger Service Description

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Abstract

This service provides interface for receiving and configuration of various event notifications from sensors located on a *Bluetooth® Low Energy* device.

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Introduction

The External Sensor Trigger Service (ESTS) allows clients to monitor and get notified about various events generated based on sensor inputs.

The ESTS uses one characteristic per event (trigger) source on available on the server. The characteristic contains the monitored sensor value and provides descriptors that allow to configure conditions for transmission of notifications based on changes of monitored sensor value.

Service Dependencies

This service is not dependent upon any other services.

GATT Sub-Procedure Requirements

Additional GATT sub-procedures requirements beyond those required by GATT are indicated in table below:

GATT Sub-Procedure	Requirements
Write Characteristic Value	C.1
Write Without Response	C.2
Notifications	C.3
Write Characteristic Descriptors	C.4
Read Characteristic Descriptors	C.5
<p>C.1: Mandatory if the "write" characteristic property is supported for any characteristic.</p> <p>C.2: Mandatory if the "write without response" characteristic property is supported for any characteristic.</p> <p>C.3: Mandatory if the "notify" characteristic property is supported for any characteristic.</p> <p>C.4: Mandatory if the writable characteristic descriptor is supported for any characteristic.</p> <p>C.5: Mandatory if a characteristic descriptor is supported for any characteristic.</p>	

Application Error Codes

This service defines the following Attribute Protocol Application Error codes:

Name	Error Code	Description
Trigger condition value not supported.	0x80	An attempt was made to configure a trigger condition value not supported by this ESTS server. Based on Automation IO Service specification error codes.

Byte Transmission Order

All characteristics used with this service shall be transmitted with the least significant octet first (i.e., little endian).

Service Declaration

The Picture Transfer Service is recommended to be instantiated as a Primary Service.

The Service UUID shall be set to «*External Sensor Trigger Service*» as defined in List of used UUIDs.

Service Characteristics

The triggers are represented in the attribute database as follows:

Characteristic Name	Requirement	Mandatory Properties	Optional Properties	Security Permissions
Value Trigger	C.1	Notify	Read	None
C.1: At least one instance of Value Trigger characteristic shall be supported.				

Note:

- Security permissions set to 'None' means that the service does not impose any requirements.



Value Trigger Characteristic

The characteristic UUID shall be set to «*Value Trigger*» as defined in List of used UUIDs.

Characteristic Behavior

The Value Trigger Characteristic represents output value of an underlying physical or virtual sensor.

The ESTS server allows to read the value and notify the central on any changes of the value based on configured trigger conditions.

Characteristic value has fixed length of 4 octets.

The interpretation of the characteristic value can be provided by optional Characteristic Presentation Format descriptor that allows to specify value type, unit, exponent and description.

The state of the trigger is not preserved across connections.

When connection is established the trigger is in idle state and needs to be activated by either:

- Enabling notifications on the characteristic.
- Reading characteristic value if characteristic supports Read property.
If trigger is enabled by read operation then the first read value shall be considered as invalid as the underlying sensor might not have enough time to sample first value yet.

The sensor trigger gets disabled when either of these events occurs:

- Connection is disconnected.
- Characteristic notifications are disabled.

Characteristic Descriptors

Descriptor Name	Requirement	Mandatory Permissions	Optional Permissions
Client Characteristic Configuration	Mandatory	Read, Write	
Characteristic Presentation Format	C.1	Read	
Characteristic User Description	Optional	Read	
Value Trigger Setting	C.2	Read, Write	
Time Trigger Setting	C.2, C.3	Read, Write	

- C.1 Mandatory if more than one instance of Value Trigger characteristic is supported, otherwise Optional.
- C.2 Excluded if a custom condition is available, otherwise Optional.
- C.3 Excluded if a Value Trigger Setting descriptor is not defined for the characteristic.

Value Trigger Descriptor

This descriptor is used to set value based conditions for transmission of notifications. It is recommended to write the desired value of Value Trigger descriptor before enabling notifications on the characteristic.

The descriptor behavior is described in the **Automation IO Service** Specification listed among [Bluetooth GATT specifications](#).

The descriptor is able to configure one of the following conditions for transmission of notifications:

- On value change
- Value crossed boundary
- Value is on the boundary
- Value has changed more than configured value
- Value is inside or outside of interval boundaries
- Value is on the boundaries of interval
- Value trigger disabled.

The default value of Value Trigger Descriptor after connection is established shall be *Value trigger is disabled*.

Time Trigger Descriptor

This descriptor allows to set time based rules or restrictions for generation of notifications. It is recommended to write the desired value of Time Trigger descriptor before enabling notifications on the characteristic.

The descriptor behavior is described in the **Automation IO Service** Specification listed among [Bluetooth GATT specifications](#).

The descriptor is able to configure one of the following conditions for transmission of notifications:

- No time based triggering
- Notifies unconditionally after settable time
- Do not notify more often than settable time
- Notify after value changed more than settable number of times

The default value of Time Trigger Descriptor after connection is established shall be *No time based triggering*.

List of used custom UUIDs

Service Name	Characteristic Name	UUID
External Sensor Trigger Service		00000005-0001-0362-B5DA-012DD27485F8
	Value Trigger	00000005-0002-0362-B5DA-012DD27485F8