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## BATTERY SERVICE SPECIFICATION

### Abstract:

The Battery Service exposes the state of a battery within a device.

## Revision History

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*Battery Service Specification*

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## Document Terminology

The Bluetooth SIG has adopted Section 13.1 of the IEEE Standards Style Manual, which dictates use of the words ``shall'', ``should'', ``may'', and ``can'' in the development of documentation, as follows:

The word *shall* is used to indicate mandatory requirements strictly to be followed in order to conform to the standard and from which no deviation is permitted (*shall* equals *is required to*).

The use of the word *must* is deprecated and shall not be used when stating mandatory requirements; *must* is used only to describe unavoidable situations.

The use of the word *will* is deprecated and shall not be used when stating mandatory requirements; *will* is only used in statements of fact.

The word *should* is used to indicate that among several possibilities one is recommended as particularly suitable, without mentioning or excluding others; or that a certain course of action is preferred but not necessarily required; or that (in the negative form) a certain course of action is deprecated but not prohibited (*should* equals *is recommended that*).

The word *may* is used to indicate a course of action permissible within the limits of the standard (*may* equals *is permitted*).

The word *can* is used for statements of possibility and capability, whether material, physical, or causal (*can* equals *is able to*).

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# 1 Introduction

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The Battery Service exposes the Battery Level of a single battery or set of batteries in a device.

## 1.1 Conformance

If a device claims conformance to this service, all capabilities indicated as mandatory for this service shall be supported in the specified manner (process-mandatory). This also applies for all optional and conditional capabilities for which support is indicated. All mandatory capabilities, and optional and conditional capabilities for which support is indicated, are subject to verification as part of the *Bluetooth* qualification program.

## 1.2 Service Dependency

This service has no dependencies on other GATT-based services.

## 1.3 *Bluetooth* Specification Release Compatibility

This service is compatible with any *Bluetooth* core specification host [1] that includes the Generic Attribute Profile (GATT).

## 1.4 GATT Sub-Procedure Requirements

Additional GATT Sub-Procedures requirements beyond those required by the GATT are indicated Table 1.1.

GATT Sub-Procedure	Requirements
Read Characteristic Descriptors	M
Notifications	C1
Write Characteristic Descriptors	C1
C1: Mandatory if the Battery Level characteristic properties supports notification, otherwise excluded.	

Table 1.1: GATT Sub-Procedure Requirements

## 1.5 Transport Dependencies

This service may operate over LE and BR/EDR transports.

## 1.6 Error Codes

This service does not define any application error codes that are used in Attribute Protocol.

## 1.7 Byte Transmission Order

All characteristics used with this service shall be transmitted with the least significant octet first (i.e. little endian). The least significant octet is identified in the characteristic definitions in [2].

## **2 Service Declaration**

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The service UUID shall be set to «Battery Service». The UUID value assigned to «Battery Service» is defined in [\[2\]](#).

### 3 Service Characteristics

Characteristic	Ref.	Mandatory / Optional
Battery Level	3.1	M

Table 3.1: Service Characteristics

In [Table 3.1](#), characteristics that are mandatory or characteristics that are optional that are implemented shall comply with the properties in [Table 3.2](#):

	Broadcast	Read	Write without Response	Write	Notify	Indicate	Signed Write	Reliable Write	Writable Auxiliaries
Battery Level	X	M	X	X	O	X	X	X	X

Table 3.2: Characteristic properties

Requirements marked with ‘M’ are mandatory, ‘O’ are optional and ‘X’ are excluded (not permitted).

This service defines no security requirements for these characteristics.

#### 3.1 Battery Level

##### 3.1.1 Characteristic Behavior

The Battery Level characteristic is read using the GATT *Read Characteristic Value* sub-procedure and returns the current battery level as a percentage from 0% to 100%; 0% represents a battery that is fully discharged, 100% represents a battery that is fully charged.

For many devices, the battery level value will not change frequently; therefore it is recommended not to poll this characteristic value at a high frequency. For example, if the expected battery life is in the order of years, reading the battery level value more frequently than once a week is not recommended.

This characteristic can be configured for notification using the GATT *Write Characteristic Descriptors* sub-procedure on the *Client Characteristic Configuration* descriptor. When configured for notification, this characteristic can be notified while in a connection; see section [4.1.1](#).

The value of the *Client Characteristic Configuration* descriptor is persistent for bonded devices when not in a connection.



### **3.1.2 Characteristic Descriptors**

#### **3.1.2.1 Characteristic Presentation Format**

When a device has more than one instance of the Battery service, each Battery Level characteristic shall include a *Characteristic Presentation Format* descriptor that has a namespace/description value that is unique for that instance of the Battery service.

This descriptor shall be readable.

This descriptor shall be read using the GATT *Read Characteristic Descriptors* sub-procedure.

#### **3.1.2.2 Client Characteristic Configuration Descriptor**

If the characteristic properties of this characteristic allow notification, then the *Client Characteristic Configuration* descriptor shall be included in this characteristic; otherwise, this descriptor shall not be included.

If included, this descriptor shall be readable and writable.

This descriptor can be read using the GATT *Read Characteristic Descriptors* sub-procedure.

This descriptor can be written using the GATT *Write Characteristic Descriptors* sub-procedure.

## **4 Service Behaviors**

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### **4.1.1 Notification Behavior**

If a client has configured notification on the Battery Level characteristic, no notifications of this characteristic shall be sent when disconnected. The Battery service shall not initiate a connection if a notification would have been sent when connected.

Upon reconnection, the server shall send a notification if the value of the Battery Level characteristic has changed while the service has been disconnected from a bonded client.

If a client has configured notification on the Battery Level characteristic and the Battery Level characteristic value changes while in a connection, then the characteristic shall be notified.

## 5 SDP Interoperability

If this service is exposed over BR/EDR then it shall have the following SDP record:

Item	Definition	Type	Value	Status
Service Class ID List				M
Service Class #0		UUID	«Battery Service»	M
Protocol Descriptor List				M
Protocol #0		UUID	L2CAP	M
Parameter #0 for Protocol #0	PSM	Uint16	PSM = ATT	M
Protocol #1		UUID	ATT	M
Parameter #0 for Protocol #1	GATT Start Handle	Uint16		M
Parameter #1 for Protocol #1	GATT End Handle	Uint16		M
BrowseGroupList			PublicBrowseRoot	M

Table 5.1: SDP records

## 6 Acronyms and Abbreviations

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Acronyms and Abbreviations	Meaning
AD	Advertising Data
BR/EDR	Basic Rate / Enhanced Data Rate
GATT	Generic Attribute Profile
LE	Low Energy
UUID	Universally Unique Identifier
L2CAP	Logical Link Control and Adaption Protocol
PSM	Protocol Service Multiplex
ATT	Attribute Protocol
SDP	Service Discovery Protocol

*Table 6.1: Acronyms and Abbreviations*

## 7 References

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- [1] *Bluetooth v4.0 Core Specification*
- [2] Characteristic and Descriptor descriptions are accessible via the [Bluetooth SIG Assigned Numbers](#).