

BLUETOOTH® DOC	Date / Year-Month-Day 2011-12-27	Approved Adopted	Revision V10r00	Document No BAS_SPEC
Prepared By GPA WG	E-mail Address pa-main@bluetooth.org			N.B.

BATTERY SERVICE SPECIFICATION

Abstract:

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

Revision History

Revision	Date (yyyy-mm-dd)	Comments
D09r00	2010-10-26	Initial Draft
D09r08	2011-01-11	Updated after UCRDD approval to match UCRDD
D09r11	2011-05-26	Updated after review at GPA F2F meeting
D09r13	2011-06-13	Updated after review at GPA F2F meeting
D09r14	2011-06-14	Clean version for BARB review
D09r15	2011-09-28	Updated to add notification to Battery Level
D09r16	2011-10-21	Updated to add notification to Battery State and change Battery Level State to be broadcast only with description:namespace
D09r17	2011-11-23	Removed characteristics that were not IOP'd with sufficient test evidence.
D10r00	2011-12-06	Submitted to BTI as v1.0
V10r00	2011-12-27	Adopted by the Bluetooth SIG Board of Directors

Contributors

Name	Company
Robin Heydon	CSR
Nick Hunn	CSR
Mats Anderson	Connect Blue
David Edwin	Nordic
Rob Hulvey	Broadcom

Disclaimer and Copyright Notice

The copyright in this specification is owned by the Promoter Members of Bluetooth® Special Interest Group (SIG), Inc. ("Bluetooth SIG"). Use of these specifications and any related intellectual property (collectively, the "Specification"), is governed by the Promoters Membership Agreement among the Promoter Members and Bluetooth SIG (the "Promoters Agreement"), certain membership agreements between Bluetooth SIG and its Adopter and Associate Members (the "Membership Agreements") and the Bluetooth Specification Early Adopters Agreements (1.2 Early Adopters Agreements) among Early Adopter members of the unincorporated Bluetooth SIG and the Promoter Members (the "Early Adopters Agreement"). Certain rights and obligations of the Promoter Members under the Early Adopters Agreements have been assigned to Bluetooth SIG by the Promoter Members.

Use of the Specification by anyone who is not a member of Bluetooth SIG or a party to an Early Adopters Agreement (each such person or party, a "Member") is prohibited. The legal rights and obligations of each Member are governed by their applicable Membership Agreement, Early Adopters Agreement or Promoters Agreement. No license, express or implied, by estoppel or otherwise, to any intellectual property rights are granted herein.

Any use of the Specification not in compliance with the terms of the applicable Membership Agreement, Early Adopters Agreement or Promoters Agreement is prohibited and any such prohibited use may result in termination of the applicable Membership Agreement or Early Adopters Agreement and other liability permitted by the applicable agreement or by applicable law to Bluetooth SIG or any of its members for patent, copyright and/or trademark infringement.

THE SPECIFICATION IS PROVIDED "AS IS" WITH NO WARRANTIES WHATSOEVER, INCLUDING ANY WARRANTY OF MERCHANTABILITY, NONINFRINGEMENT, FITNESS FOR ANY PARTICULAR PURPOSE, SATISFACTORY QUALITY, OR REASONABLE SKILL OR CARE, OR ANY WARRANTY ARISING OUT OF ANY COURSE OF DEALING, USAGE, TRADE PRACTICE, PROPOSAL, SPECIFICATION OR SAMPLE.

Battery Service Specification

Each Member hereby acknowledges that products equipped with the *Bluetooth* technology ("*Bluetooth* products") may be subject to various regulatory controls under the laws and regulations of various governments worldwide. Such laws and regulatory controls may govern, among other things, the combination, operation, use, implementation and distribution of *Bluetooth* products. Examples of such laws and regulatory controls include, but are not limited to, airline regulatory controls, telecommunications regulations, technology transfer controls and health and safety regulations. Each Member is solely responsible for the compliance by their Bluetooth Products with any such laws and regulations and for obtaining any and all required authorizations, permits, or licenses for their Bluetooth products related to such regulations within the applicable jurisdictions. Each Member acknowledges that nothing in the Specification provides any information or assistance in connection with securing such compliance, authorizations or licenses. **NOTHING IN THE SPECIFICATION CREATES ANY WARRANTIES, EITHER EXPRESS OR IMPLIED, REGARDING SUCH LAWS OR REGULATIONS.**

ALL LIABILITY, INCLUDING LIABILITY FOR INFRINGEMENT OF ANY INTELLECTUAL PROPERTY RIGHTS OR FOR NONCOMPLIANCE WITH LAWS, RELATING TO USE OF THE SPECIFICATION IS EXPRESSLY DISCLAIMED. BY USE OF THE SPECIFICATION, EACH MEMBER EXPRESSLY WAIVES ANY CLAIM AGAINST BLUETOOTH SIG AND ITS PROMOTER MEMBERS RELATED TO USE OF THE SPECIFICATION.

Bluetooth SIG reserve the right to adopt any changes or alterations to the Specification as it deems necessary or appropriate.

Copyright © 2011. Bluetooth® SIG, Inc. All copyrights in the Bluetooth Specifications themselves are owned by Ericsson AB, Lenovo (Singapore) Pte. Ltd., Intel Corporation, Microsoft Corporation, Motorola Mobility, Inc., Nokia Corporation, and Toshiba Corporation.

***Other third-party brands and names are the property of their respective owners.**

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*).

Table of Contents

1	Introduction	6
1.1	Conformance	6
1.2	Service Dependency	6
1.3	<i>Bluetooth</i> Specification Release Compatibility	6
1.4	GATT Sub-Procedure Requirements	6
1.5	Transport Dependencies	6
1.6	Error Codes	6
1.7	Byte Transmission Order	6
2	Service Declaration	7
3	Service Characteristics	8
3.1	Battery Level	8
3.1.1	Characteristic Behavior	8
3.1.2	Characteristic Descriptors	9
3.1.2.1	Characteristic Presentation Format	9
3.1.2.2	Client Characteristic Configuration Descriptor	9
4	Service Behaviors	10
4.1.1	Notification Behavior	10
5	SDP Interoperability	11
6	Acronyms and Abbreviations	12
7	References	13

1 Introduction

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

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

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

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

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