Weight Scale Service

***Bluetooth*® Service Specification**

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- **Group Prepared By:** SF WG

Abstract:

This service exposes weight and related data from a weight scale intended for consumer healthcare and sports/fitness applications.

Revision History

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V1.0.0	2014-10-21	Adopted by the Bluetooth SIG BoD
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Version History

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Document Terminology

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*).

The term *Reserved for Future Use (RFU)* is used to indicate Bluetooth SIG assigned values that are reserved by the Bluetooth SIG and are not otherwise available for use by implementations.

Contents

1 Introduction

The Weight Scale (WS) Service exposes weight and related data from a weight scale (Server) intended for consumer healthcare as well as sports/fitness applications.

1.1 Conformance

Each capability of this specification shall be supported in the specified manner. This specification may provide options for design flexibility, because, for example, some products do not implement every portion of the specification. For each implementation option that is supported, it shall be supported as specified.

1.2 Service Dependency

This service is not dependent upon any other services.

1.3 Bluetooth Specification Release Compatibility

This specification is compatible with Bluetooth Core Specification 4.2 or later [1].

1.4 GATT Sub-Procedure Requirements

Requirements in this section represent a minimum set of requirements for a Server. Other GATT sub-procedures may be used if supported by both Client and Server.

Table 1.1 summarizes *additional* GATT sub-procedure requirements beyond those required by all GATT Servers.

GATT Sub-Procedure	Requirements
Indications	M
Read Characteristic Descriptors	M
Write Characteristic Descriptors	M

Table 1.1: GATT Sub-procedure Requirements

There are no transport restrictions imposed by this service specification.

Where the term BR/EDR is used throughout this document, this also includes the optional use of AMP.

1.5 Error Codes

This service does not define any Attribute Protocol Application Error codes.

1.6 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 [1].

2 Service Declaration

In most cases, the Weight Scale Service should be instantiated as a «Primary Service»; however this is defined in a higher-level specification.

The service UUID shall be set to «Weight Scale Service» defined in [3].

3 Service Characteristics

The following characteristics are exposed in the Weight Scale Service. Only one instance of each characteristic is permitted within this service. The characteristic formats and UUIDs are defined in [3].

Where a characteristic can be indicated, a Client Characteristic Configuration descriptor shall be included in that characteristic as required by the Core Specification [1].

Characteristic Name	Requirement	Mandatory Properties	Optional Properties	Security Permissions
Weight Scale Feature	M	Read	Indicate C.1	None
Weight Measurement	M	Indicate		None

Table 3.1: Weight Scale Service Characteristics

C.1: The Indicate property shall be supported for the Weight Scale Feature characteristic if the device supports bonding and the value of the Weight Scale Feature characteristic can change over the lifetime of the device, otherwise excluded for this service.

Notes:

- Properties not listed as Mandatory or Optional are excluded for this version of this service.
- Security Permissions of “None” means that this service does not impose any requirements.

3.1 Weight Scale Feature

The Weight Scale Feature characteristic shall be used to describe the supported features of the Server.

Reserved for Future Use (RFU) bits in the Weight Scale Feature characteristic value shall be set to 0.

3.1.1 Characteristic Behavior

When read or indicated, the Weight Scale Feature characteristic returns a value that is used by a Client to determine the supported features of the Server.

The bits of the Weight Scale Feature characteristic may either be static for the lifetime of the device or guaranteed to be static only during a connection. This requirement is defined in the table below on a bit-by-bit basis. Although all defined bits in this version of this specification are required to be static during the lifetime of a device, it is possible that some future bits will be defined as being static only during a connection.

Bit	Weight Scale Feature Bit	Static Requirement
0 to 9	Various	Lifetime
10-31	Reserved for Future Use	Not defined.

Table 3.2: Static Requirements for Weight Scale Feature Bits

When the Client Characteristic Configuration descriptor is configured for indications and the supported features of the Server have changed, the Weight Scale Feature characteristic shall be indicated to any bonded Collectors after reconnection.

When the Server supports a feature, the associated bit of the Weight Scale Feature characteristic shall be set to 1 (Feature supported), otherwise, the associated bit shall be set to 0 (Feature not supported). The feature bits are defined in [3].

If the Height field of the Weight Measurement characteristic is not supported, then the corresponding resolution bits shall be set to 0.

3.2 Weight Measurement

The Weight Measurement characteristic is used to send weight-related data to the Client. Included in the characteristic value are a Flags field (for showing the presence of optional fields and measurement units), a Weight field, and depending upon the contents of the Flags field, may include one or more optional fields defined in [3].

3.2.1 Characteristic Behavior

When the Weight Measurement characteristic is configured for indications via the *Client Characteristic Configuration* descriptor the following applies:

> If a connection to a Client is not established and a new value for the Weight Measurement characteristic becomes available for this Client, the Server shall become connectable to allow the Client to create a link. Once connected, the Server shall indicate this characteristic and other unsent stored characteristic values to the Client.
>
> If a connection to a Client is established and a new value for the Weight Measurement characteristic becomes available for this Client, the Server shall indicate this characteristic to the Client.

Once transfer of a measurement is successful, the measurement shall not be retransmitted. As such, the design of this Service is only suited to sending indications to a single Client for a given user.

The Weight Measurement characteristic contains time-sensitive data, thus the requirements for time-sensitive data and data storage defined in Section 3.3 apply.

3.2.1.1 Flags Field

The Flags field shall be included in the Weight Measurement characteristic.

Reserved for Future Use (RFU) bits in the Flags fields shall be set to 0.

The bits of the Flags field, their function, and relationship to bits in the Weight Scale Feature characteristic are shown in Table 3.3.

Flags Bit Name	When Set to 0	When Set to 1	Corresponding Weight Scale Feature Support bit (see Section 3.1)
Measurement Units (bit 0), see Sections 3.2.1.2 and 3.2.1.5	SI (Weight and Mass in units of kilogram (kg) and Height in units of meter)	Imperial (Weight and Mass in units of pound (lb) and Height in units of inch (in))	Weight Measurement Resolution bits (bits 3-6) and Height Measurement Resolution bits (bits 7-9)
Time Stamp Present (bit 1), see Section 3.2.1.3	Corresponding field not present	Corresponding field present	Time Stamp Supported (bit 0)

Flags Bit Name	When Set to 0	When Set to 1	Corresponding Weight Scale Feature Support bit (see Section 3.1)
User ID Present (bit 2), see Section 3.2.1.4	Corresponding field not present	Corresponding field present	Multiple Users Supported (bit 1)
BMI and Height Present (bit 3), see Section 3.2.1.5	Corresponding field pair not present	Corresponding field pair present	BMI Supported (bit 2)

Table 3.3: Bit Definitions for the Weight Measurement Characteristic

The BMI and Height Present bit in the table above may change during a connection if the corresponding support bit in the Weight Scale Feature characteristic is set to 1, indicating that the feature is supported. However, if the corresponding Weight Scale Feature support bit is set to 0, then the corresponding Flags bit shall also be set to 0 since the feature is not supported.

The Weight Measurement Resolution bits and Height Measurement Resolution bits are only for the purpose of allowing the Client to determine the resolution of the Weight and Height measurements respectively. The use of these bits may be required by some Clients that need to know the approximate precision of the data. Note that the value of these bits has no impact on the value of 1 bit of the Weight and Height fields.

3.2.1.2 Weight Field

The Weight field shall be included in the Weight Measurement characteristic.

See Table 3.3 for details on the relation between the unit of weight, and bit 0 of the Flags field.

The special value of 0xFFFF can be used to indicate ‘Measurement Unsuccessful’ to the Client. If this is used, all optional fields other than the Time Stamp field and the User ID field shall be disabled.

3.2.1.3 Time Stamp Field

The Time Stamp field is optional, but shall be included in the Weight Measurement characteristic if the Server supports the Time Stamp feature (see Table 3.3). The Time Stamp feature shall be supported if the device supports the storing of data.

The Time Stamp field is defined to use the same format as the Date Time characteristic defined in [3]. However, a value of 0 for the year, month or day fields (meaning unknown) shall not be used for this service. It is left to the implementation to ensure the user sets the correct date and time before the Server is used.

The value of the Time Stamp field is derived from a source of date and time within the device at the time of measurement. If the Time Stamp feature is supported, a source of date and time is mandatory. The date and time of the device may be updated by various means such as via a simple user interface on the device, via the Current Time Service [3] or other method. Regardless of the method of updating the date and time, a method should be provided to allow the Client to verify the accuracy of the time base in the Server. This is a requirement for implementations needing to be compliant with guidelines set forth by the Continua Health Alliance (and hence those needing data to be transcoded to a format compliant with IEEE 11073-10415 [4]).

3.2.1.4 User ID Field

The User ID field shall be included in the Weight Measurement characteristic if the device supports the Multiple Users feature (see Table 3.3). This field shall not be included if the Multiple Users feature is not supported.

The values used for User ID shall be unique per Server, but are otherwise left to the implementation. For example, if the Server supports two User IDs to distinguish between two users, the Server may use User ID 1 and 2 or User ID 35 and 97 or other unique combinations.

A special User ID value of 0xFF represents “unknown user”. This can be used for cases where a Weight Scale can be used for Guests.

3.2.1.5 BMI and Height Field Pair

The BMI and Height field pair may be included in the Weight Measurement characteristic if the device supports the BMI feature (see Table 3.3). When present, these fields shall always be present as a pair.

See Table 3.3 for details on the relation between the units of weight and height, and bit 0 of the Flags field.

BMI or Body Mass Index is calculated as Weight in kilograms divided by the square of Height in meters. When only imperial values of weight and height are available, BMI can be calculated by dividing the Weight in pounds by the square of the Height in inches and multiplying this by a factor of approximately 703.07. For Servers that support BMI, this calculation requires the Server to know the height of the user. This information may be entered locally at the Server user interface or by other means and is beyond the scope of this service.

3.3 Requirements for Time-Sensitive Data

The Weight Measurement characteristic contains time-sensitive data (i.e., the Weight value) and is considered a time-sensitive characteristic, thus the following requirements apply:

If the Time Stamp feature *is not* supported:

- The value of a time-sensitive characteristic shall be discarded either if the connection does not get established or if the indication is not successfully acknowledged by the Client in a timely manner as decided by the implementation (e.g., if the Server cannot send the data within 5 minutes of taking the measurement).

If the Time Stamp feature *is* supported:

- It is recommended that the value of a time-sensitive characteristic be stored if either the connection does not get established or if the indication is not successfully acknowledged by the Client during the connection.
- For basic scenarios, the Server should be able to store at least 25 data measurements (i.e., Weight values). Multi-user devices should be able to store that number of measurements per supported user.
- If the maximum storage capacity in the Server is reached, the Server should overwrite the oldest measurement data first when acquiring new measurement data and should inform the user (e.g., via

the UI of the device). For multi-user devices, the Server should purge the oldest data for a given user to make room for the most recent data for that user.

- When transmitting stored data, the oldest data shall be sent first followed by the next oldest data (in FIFO order) until all stored data (as controlled by the Client) has been transferred.

4 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	«Weight Scale»	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
BrowseGroupList			PublicBrowseRoot*	M

Table 4.1: SDP Record

* PublicBrowseRoot shall be present; however, other browse UUIDs may also be included in the list.

5 Acronyms and Abbreviations

Acronyms and Abbreviations	Meaning
AMP	Alternate MAC/PHY
BR/EDR	Basic Rate / Enhanced Data Rate
GAP	Generic Access Profile
GATT	Generic Attribute Profile
LE	Low Energy
RFU	Reserved for Future Use
SDP	Service Discovery Protocol
WS	Weight Scale
UUID	Universally Unique Identifier

Table 5.1: Acronyms and Abbreviations

6 References

[1] Bluetooth Core Specification v4.2 or later

[2] Bluetooth Assigned Numbers, https://www.bluetooth.com/specifications/assigned-numbers/

[3] Current Time Service Specification v1.1 or later

[4] IEEE 11073-10415 - 2008 (Health informatics—Personal health device communication - Part 10415: Device specialization— Weighing Scale)