Proximity Beacon Specification

 Developer

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1. Introduction

1.1 Purpose of This Specification

This document presents requirements and recommendations for the design of Bluetooth Low Energy proximity beacons that are compatible with Apple devices.

1.2 Requirements and Recommendations

The use of the words *must*, *must not*, *required*, *shall*, *shall not*, *should*, *should not*, *recommended*, *not recommended*, *may*, *optional*, and *deprecated* in a statement have the following meanings:

- *must*, *shall*, or *required* means the statement is an absolute requirement.
- *must not*, *shall not* or *prohibited* means the statement is an absolute prohibition.
- *should* or *recommended* means the full implications must be understood before choosing a different course.
- *should not* or *not recommended* means the full implications must be understood before choosing this course.
- *may* or *optional* means the statement is truly optional, and its presence or absence cannot be assumed.
- *deprecated* means the statement is provided for historical purposes only and is equivalent to 'must not'.

1.3 Terminology

Throughout this specification:

- The term *device* is used to refer to an Apple iPhone, iPad, or iPod touch running iOS, Apple's mobile operating system).

- The term *accessory* is used to refer to any product intended to interface with a device or product via the means described in this specification.

2. Proximity Beacon

Accessories that implement the Proximity Beacon (iBeacon) feature may interact with iOS apps that make use of the Core Location framework in iOS 7.0 or above on Apple devices that support Bluetooth Low Energy.

These accessories may provide vendor-specific information to an iOS app concerning the users's current location. It is up to the accessory and/or app developer to specify the nature of the vendor-specific information and how the iOS app will use that information.

2.1 Advertising Packet

All accessories that support the Proximity Beacon feature must incorporate a Bluetooth Low Energy (BLE) radio and implement the Broadcaster role as defined in the *Bluetooth 4.0 specification*, Volume 3, Part C, Section 2.2.2.1. In addition, the accessory must be Bluetooth specification compliant by passing all the relevant tests in Section 5.2.1 of Test Suite Structure (TSS) and Test Purposes (TP) in *Bluetooth Link Layer (LL) Specification 4.0*.

Proximity beacons must use a non connectable undirected Advertising PDU, ADV_NONCONN_IND, and implement a Apple-specific advertising payload. Proximity beacons must broadcast the entire 30 byte advertising packet in all Advertising frequencies using a fixed 100 ms advertising interval.

Table 2-1   Proximity Beacon Advertising Packet

Byte(s)	Name	Value	Notes
0	Flags[0]	0x02	See *Bluetooth 4.0 Core Specification*, Volume 3, Appendix C, 18.1.
1	Flags[1]	0x01	See *Bluetooth 4.0 Core Specification*, Volume 3, Appendix C, 18.1.
2	Flags[2]	0x06	See *Bluetooth 4.0 Core Specification*, Volume 3, Appendix C, 18.1.
3	Length	0x1A	See *Bluetooth 4.0 Core Specification*
4	Type	0xFF	See *Bluetooth 4.0 Core Specification*

Byte(s)	Name	Value	Notes
5	Company ID[0]	0x4C	Must not be used for any purposes not specified by Apple.
6	Company ID[1]	0x00	Must not be used for any purposes not specified by Apple.
7	Beacon Type[0]	0x02	Must be set to 0x02 for all Proximity Beacons
8	Beacon Type[1]	0x15	Must be set to 0x15 for all Proximity Beacons
9-24	Proximity UUID	0xnn..nn	See `CLBeaconRegion` class in iOS Developer Library. Must not be set to all 0s.
25-26	Major	0xnnnn	See `CLBeaconRegion` class in iOS Developer Library. 0x0000 = unset.
27-28	Minor	0xnnnn	See `CLBeaconRegion` class in iOS Developer Library. 0x0000 = unset.
29	Measured Power	0xnn	See Measured Power (page 7)

2.2 Measured Power

Apple devices use the Measured Power value of a Proximity Beacon to help with ranging accuracy.

The Measured Power must be set using the following procedure with an iPhone 5s:

- Hold the iPhone 5s in a portrait orientation with the top half uncovered (this includes cases).

- While the beacon is advertising, repeatedly sample the RSSI at a 1 meter distance for a minimum of 10 seconds.

- Discard the highest 10% of the RSSI samples

- Discard the lowest 20% of the RSSI samples

- Average the remaining samples to obtain the Measured Power value.

2.3 Manufacturing Requirements

Table 2-2   Proximity Beacon Manufacturing Requirements

Description	Requirement
Tx output power from beacon to beacon	should retain a Tx power variation within +/-5dB average relative to "golden device"
Tx output power stability over temperature	shall be within +/-2dB over an operating temperature range of 0-40 deg Centigrade
Tx output power stability over frequency	shall be within +/-2dB average over BTLE advertising channels
Tx output power stability over time	standard deviation over extended periods of time should not exceed 2dB stdev

2.4 Test Procedures

1. Verify that the Proximity Beacon passes all the relevant tests in Section 5.2.1 of Test Suite Structure (TSS) and Test Purposes (TP) Bluetooth Link Layer (LL) Specification 4.0

2. Verify that the Advertising PDU type is non-connectable undirected advertising.

3. Verify that the payload matches the format specified

4. Verify that the Major, Minor and Proximity UUID fields of the payload are programmable.

5. Provide detailed instructions for how the Proximity Beacon will be programmed.

6. Verify that the Measured power field is calculated as specified.

7. Verify that the Advertising rate is 10Hz (100ms Advertising interval) using all ADV frequencies.

8. Provide LE scan logs or Over the Air sniffer logs to show the Advertising packets with valid payload and 10Hz rate.

9. Verify that device advertises at 10Hz (100ms Advertising interval) after 36 hours of continuous operation.

10. If accessory supports ranging function, detail the calibration method used.

11. Verify the stability of Tx power over time and with different battery capacities. Tx power should be stable over time within a standard deviation of 2dB.

12. Verify the stability of Tx power over temperature. Device average Tx power shall be within +/-2dB over an operating temperature range of 0-40 deg C.

13. Verify that the device interoperates correctly with iOS CoreLocation APIs for beacon based region monitoring and ranging.

3. Revision History

This table describes the changes to the Proximity Beacon Specification.

Date	Notes
2015-09-04	*Release R1*
	First Release