

Internet Protocol Support Profile (IPSP)

Bluetooth® Test Suite

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1 Scope

This Bluetooth document contains the Test Suite Structure (TSS) and test cases to test the implementation of the Internet Protocol Support Profile (IPSP) with the objective to provide a high probability of air interface interoperability between the tested implementation and other manufacturers' Bluetooth devices.



2 References, definitions, and abbreviations

2.1 References

This document incorporates provisions from other publications by dated or undated reference. These references are cited at the appropriate places in the text, and the publications are listed hereinafter. Additional definitions and abbreviations can be found in [1] and [2].

- [1] Test Strategy and Terminology Overview
- [2] Bluetooth Core Specification, Version 4.1 or later
- [3] Internet Protocol Support Profile, Version 1.0
- [4] Internet Protocol Support Profile ICS Proforma, IPSP.ICS
- [5] GATT Test Suite, GATT.TS
- [6] L2CAP Test Suite, L2CAP.TS
- [7] IETF RFC, Transmission of IPv6 packets over Bluetooth Low Energy
<https://datatracker.ietf.org/doc/draft-ietf-6lo-btle/>

2.2 Definitions

In this Bluetooth document, the definitions from [1] and [2] apply.

2.3 Abbreviations

In this Bluetooth document, the definitions, acronyms, and abbreviations from [1] and [2] apply.

3 Test Suite Structure (TSS)

3.1 Test Strategy

The test objectives are to verify the functionality of the Internet Protocol Support Profile (IPSP) within a Bluetooth Host and enable interoperability between Bluetooth Hosts on different devices. The testing approach covers mandatory and optional requirements in the specification and matches these to the support of the IUT as described in the ICS. Any defined test herein is applicable to the IUT if the ICS logical expression defined in the Test Case Mapping Table (TCMT) evaluates to true.

The test equipment provides an implementation of the Radio Controller and the parts of the Host needed to perform the test cases defined in this Test Suite. A Lower Tester acts as the IUT's peer device and interacts with the IUT over-the-air interface. The configuration, including the IUT, needs to implement similar capabilities to communicate with the test equipment. For some test cases, it is necessary to stimulate the IUT from an Upper Tester. In practice, this could be implemented as a special test interface, a Man Machine Interface (MMI), or another interface supported by the IUT.

This Test Suite contains Valid Behavior (BV) tests complemented with Invalid Behavior (BI) tests where required. The test coverage mirrored in the Test Suite Structure is the result of a process that started with catalogued specification requirements that were logically grouped and assessed for testability enabling coverage in defined test purposes.

3.2 Test groups

The following test groups have been defined:

- Generic GATT Integrated Tests
- L2CAP Connection Oriented Channels

4 Test cases (TC)

4.1 Introduction

4.1.1 Test case identification conventions

Test cases are assigned unique identifiers per the conventions in [1]. The convention used here is: **<spec abbreviation>/<IUT role>/<class>/<feat>/<func>/<subfunc>/<cap>/<xx>-<nn>-<y>**.

Additionally, testing of this specification includes tests from the GATT Test Suite [5] referred to as Generic GATT Integrated Tests (GGIT); when used, the GGIT tests are referred to through a TCID string using the following convention:

<spec abbreviation>/<IUT role>/<GGIT test group>/< GGIT class >/<xx>-<nn>-<y>.

Identifier Abbreviation	Spec Identifier <spec abbreviation>
IPSP	Internet Protocol Support Profile
Identifier Abbreviation	Role Identifier <IUT role>
NOD	Node Role
ROU	Router Role
Identifier Abbreviation	Reference Identifier <GGIT test group>
CGGIT	Client Generic GATT Integrated Tests
SGGIT	Server Generic GATT Integrated Tests
Identifier Abbreviation	Reference Identifier <GGIT class>
SER	Service
Identifier Abbreviation	Feature Identifier <feat>
COC	L2CAP Configuration

Table 4.1: IPSP TC feature naming conventions

4.1.2 Conformance

When conformance is claimed for a particular specification, all capabilities are to be supported in the specified manner. The mandated tests from this Test Suite depend on the capabilities to which conformance is claimed.

The Bluetooth Qualification Program may employ tests to verify implementation robustness. The level of implementation robustness that is verified varies from one specification to another and may be revised for cause based on interoperability issues found in the market.

Such tests may verify:

- That claimed capabilities may be used in any order and any number of repetitions not excluded by the specification
- That capabilities enabled by the implementations are sustained over durations expected by the use case
- That the implementation gracefully handles any quantity of data expected by the use case
- That in cases where more than one valid interpretation of the specification exists, the implementation complies with at least one interpretation and gracefully handles other interpretations
- That the implementation is immune to attempted security exploits



A single execution of each of the required tests is required to constitute a Pass verdict. However, it is noted that to provide a foundation for interoperability, it is necessary that a qualified implementation consistently and repeatedly pass any of the applicable tests.

In any case, where a member finds an issue with the test plan generated by Launch Studio, with the test case as described in the Test Suite, or with the test system utilized, the member is required to notify the responsible party via an erratum request such that the issue may be addressed.

4.1.3 Pass/Fail verdict conventions

Each test case has an Expected Outcome section. The IUT is granted the Pass verdict when all the detailed pass criteria conditions within the Expected Outcome section are met.

The convention in this Test Suite is that, unless there is a specific set of fail conditions outlined in the test case, the IUT fails the test case as soon as one of the pass criteria conditions cannot be met. If this occurs, then the outcome of the test is a Fail verdict.

4.2 Setup preambles

The procedures defined in this section are provided for information, as they are used by test equipment in achieving the initial conditions in certain tests.

4.2.1 ATT Bearer on LE Transport

Follow the preamble procedure described in [5] Section 4.2.1.2.

Note that some test cases do not require use this preamble, rather specifies that an LE-U logical link is established, possibly also requiring a specific link layer role (Master/Slave) for the IUT.

4.3 Generic GATT Integrated Tests

Execute the Generic GATT Integrated Tests defined in [5] Section 6.3, Service test procedures, and Section 6.4, Client test procedures, using Table 4.2 below as input:

TCID	Service / Characteristic	Reference	Properties	Value Length (Octets)	Service Type
IPSP/NOD/SGGIT/SER/BV-01-C [Service GGIT – Internet Protocol Support]	Internet Protocol Support Service	[3] 4.1	-	-	Primary Service
IPSP/ROU/CGGIT/SER/BV-01-C [Service GGIT – Internet Protocol Support]	Internet Protocol Support Service	[3] 4.1	-	-	Primary Service

Table 4.2: Input for the GGIT Server and Client test procedure



4.4 L2CAP Connection Oriented Channels

IPSP/NOD/COC/BV-01-C [Connection Oriented Channel Accept – Node]

- Test Purpose

Verify that the Node can accept a Connection Oriented Channel with MTU size of 1280 octets or higher.
- Reference

[3] 4.2
[7]
- Initial Condition
 - LE–U logical link exists between the IUT and the Lower Tester, with the IUT acting in the link layer slave role.
- Test Procedure

The Lower Tester sends an *LE_Credit_Based_Connection_Request* with PSM field set to LE_IPSP_PSM and MTU field set to 1280.
- Expected outcome

Pass verdict

The IUT sends an *LE_Credit_Based_Connection_Response* with a valid result code other than “Connection Refused – PSM not supported”.

If the result code is “Connection Successful”, the MTU field contains a value ≥ 1280 .

IPSP/ROU/COC/BV-02-C [Connection Oriented Channel Initiate – Router]

- Test Purpose

Verify that the Router can initiate a Connection Oriented Channel with MTU size of 1280 octets or higher from the Node.
- Reference

[3] 4.2
[7]
- Initial Condition
 - The Lower Tester has a GATT database that contains one instance of the Internet Protocol Support Service as a primary service.
 - The IUT and the Lower Tester do not have a link layer connection.
- Test Procedure

Establish an LE–U logical link between the IUT and the Lower Tester and wait for the IUT L2CAP setup.

- Expected Outcome

Pass verdict

The IUT sends an *LE_Credit_Based_Connection_Request* with the *LE_PSM* field set to *LE_IPSP_PSM* and the *MTU* field set to a value ≥ 1280 .

IPSP/ROU/COC/BV-03-C [Connection Oriented Channel Reject – Router]

- Test Purpose

Verify that the Router will reject a Connection Oriented Channel request when in the master role.

- Reference

[3] 4.2

[7]

- Initial Condition

- LE-U logical link exists between the IUT and the Lower Tester, with the IUT acting in the link layer master role.

- Test Procedure

The Lower Tester sends an *LE_Credit_Based_Connection_Request* with the *LE_PSM* field set to *LE_IPSP_PSM* and the *MTU* field set to a value ≥ 1280 .

- Expected Outcome

Pass verdict

The IUT sends an *LE_Credit_Based_Connection_Response* with a valid result code other than “Connection Successful”.

5 Test case mapping

The Test Case Mapping Table (TCMT) maps test cases to specific requirements in the ICS. The IUT is tested in all roles for which support is declared in the ICS document.

The columns for the TCMT are defined as follows:

Item: Contains a logical expression based on specific entries from the associated ICS document. Contains a logical expression (using the operators AND, OR, NOT as needed) based on specific entries from the applicable ICS document(s). The entries are in the form of y/x references, where y corresponds to the table number and x corresponds to the feature number as defined in the ICS document for Internet Protocol Support Profile (IPSP) [4].

Feature: A brief, informal description of the feature being tested.

Test Case(s): The applicable test case identifiers are required for Bluetooth Qualification if the corresponding y/x references defined in the Item column are supported. Further details about the function of the TCMT are elaborated in [1].

For the purpose and structure of the ICS/IXIT, refer to [1].

Item	Feature	Test Case(s)
IPSP 3/1	IPSS Service Declaration	IPSP/NOD/SGGIT/SER/BV-01-C
IPSP 8/1	Discovery IPSS	IPSP/ROU/CGGIT/SER/BV-01-C
IPSP 4/1	Accept L2CAP Connection Request	IPSP/NOD/COC/BV-01-C
IPSP 9/1	Initiate L2CAP Connection	IPSP/ROU/COC/BV-02-C
IPSP 9/2	Reject L2CAP Connection Request	IPSP/ROU/COC/BV-03-C

Table 5.1: Test case mapping

6 Revision history and acknowledgments

Revision History

Publication Number	Revision Number	Date	Comments
0	1.0.0	2014-12-22	Prepare for publication
	1.0.1r00	2016-05-25	Converted to new Test Case ID conventions as defined in TSTO v4.1.
1	1.0.1	2016-07-14	Prepared for TCRL 2016-1 publication.
	1.0.2r00	2019-04-02	TSE 11379 (rating 1): Updated template. Corrected the wrong profile name instances from "Internet Profile" to "Internet Protocol." Moved Revision History section to the end of the document. Removed the Abstract section on the title page as duplicate text already in the scope section. TSE 11232 (rating 1): Changed pass verdict for test case IPSP/ROU/COC/BV-02-C to update wording from "Response" to "Request."
2	1.0.2	2019-07-29	Approved by BTI. Prepared for TCRL 2019-1 publication.
	p3r00	2023-05-04	TSE 22815 (rating 2): Converted the following test cases to GGIT: IPSP/NOD/SD/BV-01-C and IPSP/ROU/DIS/BV-01-C. The new GGIT converted TCIDs are: IPSP/NOD/SGGIT/SER/BV-01-C and IPSP/ROU/CGGIT/SER/BV-01-C. Updated the TCMT accordingly. Editorials to align the document with the latest TS template and DNMD, including setting the previous v1.0.2 as p2. Master/Slave language persists since the spec itself is not yet updated.
3	p3	2023-06-29	Approved by BTI on 2023-05-28. Prepared for TCRL 2023-1 publication.

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