Health Device Profile (HDP)

Bluetooth® Test Suite

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Contents

1   Scope

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

The HDP is dependent upon the Multi-Channel Adaptation Protocol (MCAP) [4] and Data Exchange Specifications referenced by the HDP. To test HDP procedures, it is sometimes necessary to initiate a part of the MCAP procedures as part of this specification. Conformance tests for MCAP procedures are defined in [6].

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 hereafter. Additional definitions and abbreviations can be found in [1], [2], and [3].

[1]   Specification of the Bluetooth System, Core System, 2.0 + EDR or 2.1 + EDR with Volume 3, Part A of Core Specification Addendum 1 or later versions of the Bluetooth Core Specification

[2]   Test Strategy and Terminology Overview

[3]   Health Device Profile (HDP) Specification

[4]   Multi-Channel Adaptation Protocol (MCAP) Specification

[5]   ICS Proforma for Health Device Profile (HDP)

[6]   ICS Proforma for Multi-Channel Adaptation Protocol (MCAP)

[7]   IEEE Std 11073-20601 ™- 2008 Health Informatics - Personal Health Device Communication - Application Profile - Optimized Exchange Protocol - version 1.0 or later

[8]   Bluetooth SIG, Bluetooth Assigned Numbers

[9]   IEEE Standards Style Manual, http://standards.ieee.org/guides/style/2000Style.pdf

[10]   SDP Test Suite, SDP.TS

2.2   Definitions

In this Bluetooth document, the definitions from [1], [2], and [3] apply.

Term	Definition
DCmax	Maximum number of simultaneously supported Data Channels. Refer to the identification of this term in the ICS [5].

Table 2.1: HDP definitions

2.3   Acronyms and abbreviations

In this Bluetooth document, the definitions, acronyms, and abbreviations from [1], [2], and [3] apply.

Acronyms and abbreviations	Definition
CSP	Clock Synchronization Protocol
HDP	Health Device Profile
MCAP	Multi-Channel Adaptation Protocol
MCL	MCAP Communications Link
MDL	MCAP Data Link
MDEP	MCAP Data End Point

Table 2.2: Acronyms and abbreviations

3   Test Suite Structure (TSS)

3.1   Overview

This section defines the tree structure of the tests specified for the HDP also referred to as the Test Suite Structure (TSS). The TSS is composed of nested test groups organized in a top down approach.

3.2   Test Strategy

The test objectives are to verify the functionality of the Health Device Profile 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.

3.3   Test groups

The following test groups have been defined:

- Generic SDP Integrated Tests

- HDP Connection Setup

- L2CAP Channel Configuration

- HDP Connection Tests

- HDP Data Exchange Tests

- Data Exchange Protocol Tests

4 Test cases (TC)

4.1 Introduction

4.1.1 Test case identification conventions

Test cases are assigned unique identifiers per the conventions in [2]. 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 SDP Test Suite [10] referred to as Generic SDP Integrated Tests (GSIT); when used, the test cases in GSIT are referred to through a TCID string using the following convention:
<spec abbreviation>/<IUT role>/<GSIT test group>/<GSIT class>/<xx>-<nn>-<y>.

Identifier Abbreviation	Spec Identifier <spec abbreviation>
HDP	Health Device Profile
Identifier Abbreviation	**Role Identifier <IUT role>**
SNK	Sink
SRC	Source
Identifier Abbreviation	**Reference Identifier <GSIT test group>**
CGSIT	Client Generic SDP Integrated Tests
SGSIT	Server Generic SDP Integrated Tests
Identifier Abbreviation	**Reference Identifier <GSIT class>**
ATTR	Attribute
OFFS	Attribute ID Offset String
SERR	Service Record
SFC	SDP Future Compatibility
Identifier Abbreviation	**Feature Identifier <feat>**
CC	Channel Configuration
CON	HDP Connection Setup
DE	General Data Exchange Tests
DEP	Data Exchange Protocol Tests
HCT	HDP Connection Tests

Table 4.1: HDP 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 the Bluetooth SIG qualification tool, 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.

4.1.4   General Assumptions

Unless otherwise specified, the following assumptions apply to this document:

- Only a single ACL link exists between two HDP devices.

- A point-to-point connection is used for all test cases.

- The HDP IUT may be a Source or Sink unless specified otherwise in a test case.

4.1.5   Common Initial Conditions

- The Lower Tester supports all device types (indicated by MDEP Data Type) that are also supported by the IUT.

- A valid SDP record for HDP exists both at the Lower Tester and the IUT.

4.2 Generic SDP Integrated Tests

4.2.1 Server Generic SDP Integrated Tests

4.2.1.1 Health Device Profile – Source

Execute the Generic SDP Integrated Tests defined in Section 6.3, Server test procedures (SGSIT), in [10] using Table 4.2 below as input:

TCID	Reference	Attribute ID Name	Attribute ID definition source (Universal, Profile)	Value/ Secondary Value	Attribute presence (Present/Present for [role], Optionally present, TCMT defined)
HDP/SRC/SGSIT/SERR/BV-01-C [Service record GSIT – HDP SRC]	[3] 3.3, 3.4, 5.1, 5.2.2	ServiceClassIDList	Universal	"HDP Source" (UUID)	Present for SRC
HDP/SRC/SGSIT/ATTR/BV-01-C [Attribute GSIT – Service Record State]	[3] 5.1	ServiceRecordState	Universal	skip (Uint32)	TCMT defined
HDP/SRC/SGSIT/ATTR/BV-02-C [Attribute GSIT – Protocol Descriptor List]	[3] 5.1, 5.2.3	ProtocolDescriptorList	Universal	"L2CAP" (UUID): Control Channel PSM – skip (Uint16), "MCAP" (UUID): Version – "0x0100" (Uint16)	Present for SRC
HDP/SRC/SGSIT/ATTR/BV-03-C [Attribute GSIT – Bluetooth Profile Descriptor List]	[3] 5.1, 5.2.4	BluetoothProfileDescriptorList	Universal	"HDP" (UUID): Version – "0x0101" (Uint16)	Present for SRC
HDP/SRC/SGSIT/ATTR/BV-04-C [Attribute GSIT – Additional Protocol Descriptor Lists]	[3] 5.1, 5.2.5	AdditionalProtocolDescriptorLists	Universal	"L2CAP" (UUID): Data Channel PSM – skip (Uint16), "MCAP" (UUID)	Present for SRC
HDP/SRC/SGSIT/ATTR/BV-05-C [Attribute GSIT – Supported Features]	[3] 5.1, 5.2.9	Supported Features	Profile	skip (Sequence)	Present for SRC
HDP/SRC/SGSIT/ATTR/BV-06-C [Attribute GSIT – Data Exchange Specification]	[3] 5.1, 5.2.10	Data Exchange Specification	Profile	"0x01" (Uint8)	Present for SRC

TCID	Reference	Attribute ID Name	Attribute ID definition source (Universal, Profile)	Value/ Secondary Value	Attribute presence (Present/Present for [role], Optionally present, TCMT defined)
HDP/SRC/SGSIT/ATTR/BV-07-C [Attribute GSIT – MCAP Supported Procedures]	[3] 5.1, 5.2.11	MCAP Supported Procedures	Profile	skip (Uint8)	Present for SRC

Table 4.2: Input for the Health Device Profile Source SGSIT SDP test procedure

4.2.1.2 Health Device Profile – Sink

Execute the Generic SDP Integrated Tests defined in Section 6.3, Server test procedures (SGSIT), in [10] using Table 4.3 below as input:

TCID	Reference	Attribute ID Name	Attribute ID definition source (Universal, Profile)	Value/ Secondary Value	Attribute presence (Present/Present for [role], Optionally present, TCMT defined)
HDP/SNK/SGSIT/SERR/BV-01-C [Service record GSIT – HDP SRC]	[3] 3.3, 3.4, 5.1, 5.2.2	ServiceClassIDList	Universal	"HDP Sink" (UUID)	Present for SNK
HDP/SNK/SGSIT/ATTR/BV-01-C [Attribute GSIT – Service Record State]	[3] 5.1	ServiceRecordState	Universal	skip (Uint32)	TCMT defined
HDP/SNK/SGSIT/ATTR/BV-02-C [Attribute GSIT – Protocol Descriptor List]	[3] 5.1, 5.2.3	ProtocolDescriptorList	Universal	"L2CAP" (UUID): Control Channel PSM – skip (Uint16), "MCAP" (UUID): Version – "0x0100" (Uint16)	Present for SNK
HDP/SNK/SGSIT/ATTR/BV-03-C [Attribute GSIT – Bluetooth Profile Descriptor List]	[3] 5.1, 5.2.4	BluetoothProfileDescriptorList	Universal	"HDP" (UUID): Version – "0x0101" (Uint16)	Present for SNK
HDP/SNK/SGSIT/ATTR/BV-04-C [Attribute GSIT – Additional Protocol Descriptor Lists]	[3] 5.1, 5.2.5	AdditionalProtocolDescriptorLists	Universal	"L2CAP" (UUID): Data Channel PSM – skip (Uint16), "MCAP" (UUID)	Present for SNK
HDP/SNK/SGSIT/ATTR/BV-05-C [Attribute GSIT – Supported Features]	[3] 5.1, 5.2.9	Supported Features	Profile	skip (Sequence)	Present for SNK

TCID	Reference	Attribute ID Name	Attribute ID definition source (Universal, Profile)	Value/ Secondary Value	Attribute presence (Present/Present for [role], Optionally present, TCMT defined)
HDP/SNK/SGSIT/ATTR/BV-06-C [Attribute GSIT – Data Exchange Specification]	[3] 5.1, 5.2.10	Data Exchange Specification	Profile	"0x01" (Uint8)	Present for SNK
HDP/SNK/SGSIT/ATTR/BV-07-C [Attribute GSIT – MCAP Supported Procedures]	[3] 5.1, 5.2.11	MCAP Supported Procedures	Profile	skip (Uint8)	Present for SNK

Table 4.3: Input for the Health Device Profile Sink SGSIT SDP test procedure

4.2.1.3   Health Device Profile – Attribute ID Offset String tests

Execute the Generic SDP Integrated Tests defined in Section 6.3, Server test procedures (SGSIT), in [10] using Table 4.4 below as input:

TCID	Reference	ServiceSearchPattern	Attribute ID name	Attribute ID Offset	Attribute presence (Present/Present for [role], Optionally present, TCMT defined)
HDP/SRC/SGSIT/OFFS/BV-01-C [Attribute ID Offset String GSIT – Service Name]	[3] 5.1, 5.2.6	HDP Source	ServiceName	0x0000	TCMT defined
HDP/SRC/SGSIT/OFFS/BV-02-C [Attribute ID Offset String GSIT – Service Description]	[3] 5.1, 5.2.7	HDP Source	ServiceDescription	0x0001	TCMT defined
HDP/SRC/SGSIT/OFFS/BV-03-C [Attribute ID Offset String GSIT – Provider Name]	[3] 5.1, 5.2.8	HDP Source	ProviderName	0x0002	TCMT defined
HDP/SNK/SGSIT/OFFS/BV-01-C [Attribute ID Offset String GSIT – Service Name]	[3] 5.1, 5.2.6	HDP Sink	ServiceName	0x0000	TCMT defined
HDP/SNK/SGSIT/OFFS/BV-02-C [Attribute ID Offset String GSIT – Service Description]	[3] 5.1, 5.2.7	HDP Sink	ServiceDescription	0x0001	TCMT defined

TCID	Reference	ServiceSearchPattern	Attribute ID name	Attribute ID Offset	Attribute presence (Present/Present for [role], Optionally present, TCMT defined)
HDP/SNK/SGSIT/OFFS/BV-03-C [Attribute ID Offset String GSIT – Provider Name]	[3] 5.1, 5.2.8	HDP Sink	ProviderName	0x0002	TCMT defined

Table 4.4: Input for the Health Device Profile SGSIT Attribute ID Offset String tests

4.2.2 Client Generic SDP Integrated Tests

Execute the Generic SDP Future Compatibility Tests defined in Section 6.4, Client test procedures (CGSIT), in [10] using Table 4.5 below as input:

TCID	Reference	Service Record Service Class UUID description	Lower Tester SDP record initial conditions
HDP/SRC/CGSIT/SFC/BV-01-C [SDP Future Compatibility – IUT is HDP SRC]	[3] 3.3, 3.4, 5.1, 5.2.2	HDP Sink	The Lower Tester exposes an HDP Sink SDP record. The version in the Bluetooth Profile Descriptor List is greater than the most recently adopted version. All bits are set in the MCAP Supported Procedures attribute including Reserved bits.
HDP/SNK/CGSIT/SFC/BV-01-C [SDP Future Compatibility – IUT is HDP SNK]	[3] 3.3, 3.4, 5.1, 5.2.2	HDP Source	The Lower Tester exposes an HDP Source SDP record. The version in the Bluetooth Profile Descriptor List is greater than the most recently adopted version. All bits are set in the MCAP Supported Procedures attribute including Reserved bits.

Table 4.5: Input for the Client CGSIT SDP future compatibility tests

4.3   HDP Connection Setup

Verify that required HDP connection setup (GAP) features are properly configured.

4.3.1   Discoverable Modes

Verify proper configuration of Discoverable Modes.

4.3.1.1   IUT support for General Discoverable Mode

- Test Purpose

  Verify proper support for General Discoverable mode.

- Test Case Configuration

Test Case
HDP/SRC/CON/BV-02-C [IUT support for General Discoverable Mode]
HDP/SNK/CON/BV-02-C [IUT support for General Discoverable Mode]

Table 4.6: IUT support for General Discoverable Mode test cases

- Reference

  [2] 3.1.1

- Initial Condition

  - As defined in Section 4.1.5.

  - Additionally, the IUT is in General Discoverable mode.

- Test Procedure

  1. The Lower Tester performs device discovery on the IUT.
  2. The IUT responds.

- Expected Outcome

  Pass verdict

  General discoverable mode is supported.

  The IUT responds to a General Inquiry request.

4.3.2   Authentication and Encryption

Verify proper configuration of Authentication and Encryption.

4.3.2.1   IUT response to Authentication request

- Test Purpose

  Verify proper support for Response to Authentication request.

- Test Case Configuration

Test Case
HDP/SRC/CON/BV-03-C [IUT support for Response to Authentication request]
HDP/SNK/CON/BV-03-C [IUT support for Response to Authentication request]

Table 4.7: IUT response to Authentication request test cases

- Reference

  [2] 3.1.2

- Initial Condition

  - As defined in Section 4.1.5.

  - Additionally, the IUT is in Connectable mode and the Lower Tester is in Idle mode.

- Test Procedure

  1. The Lower Tester initiates an authenticated link to the IUT.
  2. The IUT responds.

- Expected Outcome

  Pass verdict

  Authenticated connection is established.

4.3.2.2 IUT initiates Authentication

- Test Purpose

  Verify proper support for Initiation of Authentication.

- Test Case Configuration

Test Case
HDP/SRC/CON/BV-04-C [IUT support for Initiation of Authentication]
HDP/SNK/CON/BV-04-C [IUT support for Initiation of Authentication]

Table 4.8: IUT initiates Authentication test cases

- Reference

  [2] 3.1.2

- Initial Condition

  - As defined in Section 4.1.5.

  - Additionally, the IUT is Idle mode and the Lower Tester is in Connectable mode.

- Test Procedure

  1. The IUT initiates an authenticated link to the Lower Tester.
  2. The Lower Tester responds.

- Expected Outcome

  Pass verdict

  Authenticated connection is established.

4.3.2.3 IUT accepts Encryption request

- Test Purpose

  Verify proper support for acceptance of Encryption request.

- Test Case Configuration

Test Case
HDP/SRC/CON/BV-05-C [IUT support for Acceptance of Encryption request]
HDP/SNK/CON/BV-05-C [IUT support for Acceptance of Encryption request]

Table 4.9: IUT accepts Encryption request test cases

- Reference

  [2] 3.1.2

- Initial Condition

  - As defined in Section 4.1.5.

  - Additionally, the IUT is in Connectable mode and the Lower Tester is in Idle mode.

- Test Procedure

  1. The Lower Tester initiates connection with the IUT and requests for link encryption to the IUT.
  2. The IUT responds.

- Expected Outcome

  Pass verdict

  Encrypted connection is established.

4.3.2.4 IUT initiates Encryption

- Test Purpose

  Verify proper support for Initiation of Encryption.

- Test Case Configuration

Test Case
HDP/SRC/CON/BV-06-C [IUT support for Initiation of Encryption]
HDP/SNK/CON/BV-06-C [IUT support for Initiation of Encryption]

Table 4.10: IUT initiates Encryption test cases

- Reference

  [2] 3.1.2

- Initial Condition

  - As defined in Section 4.1.5.

  - Additionally, the IUT is in Idle mode and the Lower Tester is in Connectable mode.

- Test Procedure

  1. The IUT initiates a connection to the Lower Tester and requests for link encryption to the Lower Tester.
  2. The Lower Tester responds.

- Expected Outcome

Pass verdict

Encrypted connection is established.

4.3.3 General Inquiry

Verify proper configuration of General Inquiry.

4.3.3.1 IUT support for General Inquiry

- Test Purpose

Verify proper support for General Inquiry.

- Test Case Configuration

Test Case
HDP/SRC/CON/BV-07-C [IUT support for General Inquiry]
HDP/SNK/CON/BV-07-C [IUT support for General Inquiry]

Table 4.11: IUT support for General Inquiry test cases

- Reference

[2] 3.1.3

- Initial Condition

  - As defined in Section 4.1.5.

  - Additionally, the IUT is in Idle mode and the Lower Tester is in General Discoverable mode.

- Test Procedure

  1. The IUT performs General Inquiry to discover the Lower Tester.
  2. The Lower Tester responds.

- Expected Outcome

Pass verdict

The IUT sends General Inquiry requests.

The Lower Tester responds to the General Inquiry and IUT is able to discover the Lower Tester.

4.3.4 Bonding

Verify that the IUT can create a relation to the Lower Tester based on a common link key.

4.3.4.1 IUT accepts Bonding request

- Test Purpose

Verify proper support for Acceptance of Bonding request.

- Test Case Configuration

Test Case
HDP/SRC/CON/BV-08-C [IUT support for Acceptance of Bonding request]
HDP/SNK/CON/BV-08-C [IUT support for Acceptance of Bonding request]

Table 4.12: IUT accepts Bonding request test cases

- Reference

  [2] 3.1.3

- Initial Condition

  - As defined in Section 4.1.5.

  - Additionally, the IUT is ready to accept Bonding request.

- Test Procedure

  1. The Lower Tester initiates Bonding with the IUT.
  2. The IUT completes Bonding.

- Expected Outcome

  Pass verdict

  The bonding procedure is successfully completed.

  The link key is created.

  The IUT completes Bonding with Lower Tester.

  After the Bonding procedure an MCAP connection can successfully be established with the IUT.

- Notes

  In some devices it is not possible to verify creation of a link key at this stage. In that case, verify that Bonding has happened between the devices by whatever test means available.

4.3.4.2   IUT initiates Bonding

- Test Purpose

  Verify proper support for Initiation of Bonding.

- Test Case Configuration

Test Case
HDP/SRC/CON/BV-09-C [IUT support for Initiation of Bonding]
HDP/SNK/CON/BV-09-C [IUT support for Initiation of Bonding]

Table 4.13: IUT initiates Bonding test cases

- Reference

  [2] 3.1.3

- Initial Condition

  - As defined in Section 4.1.5.

  - Additionally, the IUT is ready to initiate Bonding.

- Test Procedure

    1. The IUT initiates Bonding with Lower Tester.
    2. The Lower Tester completes Bonding.

- Expected Outcome

    Pass verdict

    The bonding procedure is successfully completed.

    The link key is created.

    The Lower Tester completes Bonding with IUT.

    After the Bonding procedure an MCAP connection can successfully be established with the IUT.

- Notes

    In some devices it is not possible to verify creation of a link key at this stage. In that case, verify that Bonding has happened between the devices by whatever test means available.

4.3.5   Health Class of Device

Verify that if the Major Class of Device has been indicated to be "Health", it has been properly implemented.

4.3.5.1   IUT support for Health Class of Device

- Test Purpose

    Verify proper implementation of "Health" as Major Class of Device.

- Test Case Configuration

Test Case
HDP/SRC/CON/BV-10-C [IUT support for Health Class of Device]
HDP/SNK/CON/BV-10-C [IUT support for Health Class of Device]

Table 4.14: IUT support for Health Class of Device test cases

- Reference

    [2] 3.1.5

- Initial Condition

    - As defined in Section 4.1.5.

    - Additionally, the IUT is in General Discoverable mode or Connectable Mode.

- Test Procedure

    Capture FHS Packet (e.g., during General Inquiry or Paging).

- Expected Outcome

    Pass verdict

    Major Class of Device is "Health."

    Appropriate Minor Class of Device for "Health" is indicated as specified in the Bluetooth Assigned Numbers [8].

4.4   L2CAP Channel Configuration

Verify that required L2CAP features are properly configured for the Control Channel and any Data Channels.

4.4.1   Control Channel Configuration

Verify proper configuration of L2CAP Control Channels.

4.4.1.1   IUT initiates L2CAP Control Channel

- Test Purpose

  Verify proper configuration of L2CAP Control Channel for case where IUT initiates the connection.

- Test Case Configuration

Test Case
HDP/SRC/CC/BV-01-C [IUT initiates L2CAP Control Channel]
HDP/SNK/CC/BV-01-C [IUT initiates L2CAP Control Channel]

Table 4.15: IUT initiates L2CAP Control Channel test cases

- Reference

  [2] 3.3.1

  [4] 3.2, 4.1

- Initial Condition

  - As defined in Section 4.1.5.

  - Additionally, an ACL Link has been established between the IUT and the Lower Tester.

- Test Procedure

  The IUT initiates L2CAP Control Channel connection on the Control Channel PSM advertised by the Lower Tester.

- Expected Outcome

  Pass verdict

  The Control Channel is configured to use Enhanced Retransmission Mode.

  The Control Channel is configured to use FCS.

4.4.1.2   IUT accepts L2CAP Control Channel

- Test Purpose

  Verify proper configuration of L2CAP Control Channel for case where IUT accepts the connection.

- Test Case Configuration

Test Case
HDP/SRC/CC/BV-02-C [IUT accepts L2CAP Control Channel]
HDP/SNK/CC/BV-02-C [IUT accept L2CAP Control Channel]

Table 4.16: IUT accepts L2CAP Control Channel test cases

- Reference

  [2] 3.3.1

  [4] 3.2, 4.1

- Initial Condition

  - As defined in Section 4.1.5.

  - Additionally, an ACL Link has been established between the IUT and the Lower Tester.

- Test Procedure

  The IUT accepts L2CAP Control Channel connection on the Control Channel PSM advertised in its SDP record.

- Expected Outcome

  <u>Pass verdict</u>

  The Control Channel is configured to use Enhanced Retransmission Mode.

  The Control Channel is configured to use FCS.

4.4.2 Reliable Data Channel Configuration

Verify proper configuration of Reliable Data Channels.

HDP/SRC/CC/BV-03-C [IUT as Source initiates Reliable L2CAP Data Channel]

- Test Purpose

  Verify proper configuration of all L2CAP Data Channels configured to be "reliable" for case where IUT initiates the connection and is the Source.

- Reference

  [2] 3.4, 3.4.1

  [4] 3.3, 4.2

- Initial Condition

  - As defined in Section 4.1.5.

  - Additionally, a Control Channel connection has been established by the IUT.

- Test Procedure

  The IUT configures one or more Reliable L2CAP Data Channels.

- Expected Outcome

  <u>Pass verdict</u>

  The Reliable Data Channel is the first Data Channel to be opened.

  All Reliable Data Channels are configured to use Enhanced Retransmission Mode.

  The IUT indicates Data Channel Configuration of "Reliable Data Channel" (0x01) in the Configuration field.

  The Lower Tester sends "Success" with Data Channel Configuration of "Reliable Data Channel" (0x01) in the Response Parameter field.

HDP/SNK/CC/BV-04-C [IUT as Sink initiates Reliable L2CAP Data Channel]

- Test Purpose

  Verify proper configuration of all L2CAP Data Channels configured to be "reliable" for case where IUT initiates the connection and is the Sink.

- Reference

  [2] 3.4, 3.4.1

  [4] 3.3, 4.2

- Initial Condition

  - As defined in Section 4.1.5.

  - Additionally, a Control Channel connection has been established by the IUT.

- Test Procedure

  The IUT configures one or more Reliable L2CAP Data Channels.

- Expected Outcome

  Pass verdict

  The Reliable Data Channel is the first Data Channel to be opened.

  All Reliable Data Channels are configured to use Enhanced Retransmission Mode.

  The IUT indicates Data Channel Configuration of "no preference" (0x00) in the Configuration field.

  The Lower Tester sends "Success" with Data Channel Configuration of "Reliable Data Channel" (0x01) in the Response Parameter field.

  The IUT does not indicate a Data Channel Configuration preference.

HDP/SRC/CC/BV-05-C [IUT as Source accepts Reliable L2CAP Data Channel]

- Test Purpose

  Verify proper configuration of all L2CAP Data Channels configured to be "reliable" for case where IUT accepts the connection and is the Source.

- Reference

  [2] 3.4, 3.4.1

  [4] 3.3, 4.2

- Initial Condition

  - As defined in Section 4.1.5.

  - Additionally, a Control Channel connection has been established by the Lower Tester.

- Test Procedure

  The Lower Tester configures one or more Reliable L2CAP Data Channels.

- Expected Outcome

  Pass verdict

  The Reliable Data Channel is the first Data Channel to be opened.

All Reliable Data Channels are configured to use Enhanced Retransmission Mode.

The Lower Tester indicates Data Channel Configuration of "no preference" (0x00) in the Configuration field.

The IUT sends "Success" with Data Channel Configuration of "Reliable Data Channel" (0x01) in the Response Parameter field.

HDP/SNK/CC/BV-06-C [IUT as Sink accepts Reliable L2CAP Data Channel]

- Test Purpose

  Verify proper configuration of all L2CAP Data Channels configured to be "reliable" for case where IUT accepts the connection and is the Sink.

- Reference

  [2] 3.4, 3.4.1

  [4] 3.3, 4.2

- Initial Condition

  - As defined in Section 4.1.5.

  - Additionally, a Control Channel connection has been established by the Lower Tester.

- Test Procedure

  The Lower Tester configures one or more Reliable L2CAP Data Channels.

- Expected Outcome

  Pass verdict

  The Reliable Data Channel is the first Data Channel to be opened.

  All Reliable Data Channels are configured to use Enhanced Retransmission Mode.

  The Lower Tester indicates Data Channel Configuration of "Reliable Data Channel" (0x01) in the Configuration field.

  The IUT sends "Success" with Data Channel Configuration of "Reliable Data Channel" (0x01) in the Response Parameter field.

4.4.3   Streaming Data Channel Configuration

Verify proper configuration of Streaming Data Channels.

HDP/SRC/CC/BV-07-C [IUT as Source initiates Streaming L2CAP Data Channel]

- Test Purpose

  Verify proper configuration of all L2CAP Data Channels configured to be "streaming" for case where IUT initiates the connection and is the Source.

- Reference

  [2] 3.4, 3.4.2

  [4] 3.3, 4.2

- Initial Condition

  - As defined in Section 4.1.5.

  - Additionally, a Control Channel connection has been established by the IUT.

- Test Procedure

  The IUT configures one or more Streaming L2CAP Data Channels.

- Test Condition

  The test is performed under normal condition. (Note that after creation of first reliable Data Channel, IUT may optionally perform IEEE association and configuration prior to creation of additional Data Channels.)

- Expected Outcome

  Pass verdict

  The Reliable Data Channel is the first Data Channel to be opened.

  All Streaming Data Channels are configured to use Streaming Mode.

  The IUT indicates Data Channel Configuration of "Streaming Data Channel" (0x02) in the Configuration field.

  The Lower Tester sends "Success" with Data Channel Configuration of "Streaming Data Channel" (0x02) in the Response Parameter field.

HDP/SNK/CC/BV-08-C [IUT as Sink initiates Streaming L2CAP Data Channel]

- Test Purpose

  Verify proper configuration of all L2CAP Data Channels configured to be "streaming" for case where IUT initiates the connection and is the Sink.

- Reference

  [2] 3.4, 3.4.2

  [4] 3.3, 4.2

- Initial Condition

  - As defined in Section 4.1.5.

  - Additionally, a Control Channel connection has been established by the IUT.

- Test Procedure

  The IUT configures one or more Streaming L2CAP Data Channels. (Note that after creation of first reliable Data Channel, IUT may optionally perform IEEE association and configuration prior to creation of additional Data Channels.)

- Expected Outcome

  Pass verdict

  The Reliable Data Channel is the first Data Channel to be opened.

  All Streaming Data Channels are configured to use Streaming Mode.

  The IUT indicates Data Channel Configuration of "no preference" (0x00) in the Configuration field.

The Lower Tester sends "Success" with Data Channel Configuration of "Streaming Data Channel" (0x02) in the Response Parameter field.

The IUT does not indicate a Data Channel Configuration preference.

HDP/SRC/CC/BV-09-C [IUT as Source accepts Streaming L2CAP Data Channel]

- Test Purpose

  Verify proper configuration of all L2CAP Data Channels configured to be "streaming" for case where IUT accepts the connection and is the Source.

- Reference

  [2] 3.4, 3.4.2

  [4] 3.3, 4.2

- Initial Condition

  - As defined in Section 4.1.5.

  - Additionally, a Control Channel connection has been established by the Lower Tester.

- Test Procedure

  The Lower Tester configures one or more Streaming L2CAP Data Channels.

- Test Condition

  The test is performed under normal condition. (Note that after creation of first reliable Data Channel, the Lower Tester may optionally perform IEEE association and configuration prior to creation of additional Data Channels.)

- Expected Outcome

  Pass verdict

  The Reliable Data Channel is the first Data Channel to be opened.

  All Streaming Data Channels are configured to use Streaming Mode.

  The Lower Tester indicates Data Channel Configuration of "no preference" (0x00) in the Configuration field.

  The IUT sends "Success" with Data Channel Configuration of "Streaming Data Channel" (0x02) in the Response Parameter field.

HDP/SNK/CC/BV-10-C [IUT as Sink accepts Streaming L2CAP Data Channel]

- Test Purpose

  Verify proper configuration of all L2CAP Data Channels configured to be "streaming" for case where IUT accepts the connection and is the Sink.

- Reference

  [2] 3.4, 3.4.2

  [4] 3.3, 4.2

- Initial Condition

  - As defined in Section 4.1.5.

  - Additionally, a Control Channel connection has been established by the Lower Tester.

- Test Procedure

  The Lower Tester configures one or more Streaming L2CAP Data Channels. (Note that after creation of first reliable Data Channel, the Lower Tester may optionally perform IEEE association and configuration prior to creation of additional Data Channels.)

- Expected Outcome

  <u>Pass verdict</u>

  The Reliable Data Channel is the first Data Channel to be opened.

  All Streaming Data Channels are configured to use Streaming Mode.

  The Lower Tester indicates Data Channel Configuration of "Streaming Data Channel" (0x02) in the Configuration field.

  The IUT sends "Success" with Data Channel Configuration of "Streaming Data Channel" (0x02) in the Response Parameter field.

4.4.4   Data Channel Configuration Error Handling

Verify that an IUT can properly respond to a request for invalid configuration of L2CAP Data Channels.

HDP/SNK/CC/BI-11-C [IUT as Sink receives invalid L2CAP Data Channel configuration]

- Test Purpose

  Verify proper response when IUT as Sink receives request for invalid L2CAP Data Channel configuration.

- Reference

  [2] 3.4

- Initial Condition

  - As defined in Section 4.1.5.

  - Additionally, a Control Channel connection has been established by the Lower Tester.

- Test Procedure

  The Lower Tester as Source sends create request with Data Channel Configuration of "no preference" (0x00) in the Configuration field.

- Expected Outcome

  <u>Pass verdict</u>

  The IUT responds with "Configuration Rejected" Response Code.

HDP/SRC/CC/BI-12-C [IUT as Source receives invalid L2CAP Data Channel configuration]

- Test Purpose

  Verify proper response when IUT as Source receives request for invalid L2CAP Data Channel configuration.

- Reference

    [2] 3.4

- Initial Condition

    - As defined in Section 4.1.5.

    - Additionally, a Control Channel connection has been established by the Lower Tester.

- Test Procedure

    1. The Lower Tester as Sink sends create request with Data Channel Configuration of "Reliable Data Channel" (0x01) in the Configuration field.
    2. For Sources that support Streaming Data Channels, the Lower Tester as Sink sends create request with Data Channel Configuration of "Streaming Data Channel" (0x02) in the Configuration field.

- Expected Outcome

    Pass verdict

    The IUT responds with "Configuration Rejected" Response Code for each of the above steps as applicable.

4.5   HDP Connection Tests

Verify complete HDP implementations to ensure that basic system functionality. This includes the basic operation of two HDP implementations in their ability to establish a connection, disconnect and reconnect.

For some tests in this series, the maximum number of simultaneously supported Data Channels that an IUT has declared in the ICS [5] will be tested. Table 5 item 4 and Table 11 item 4 of the ICS define DCmax to represent this quantity.

4.5.1   Connection Establishment

Verify that two HDP devices can discover each other's services and connect Control and Data Channels.

4.5.1.1   IUT initiates Control and Data Channel Connection

- Test Purpose

    Verify that an IUT can initiate and establish a Control Channel connection and at least one Data Channel connection.

- Test Case Configuration

Test Case
HDP/SRC/HCT/BV-01-C [IUT initiates Control and Data Channel Connection]
HDP/SNK/HCT/BV-01-C [IUT initiates Control and Data Channel Connection]

Table 4.17: IUT initiates Control and Data Channel Connection test cases

- Reference

    [2] 3, 3.3, 3.4

    [4] 4.1, 4.2, 4.3

- Initial Condition

    - As defined in Section 4.1.5.

    - Additionally, the Lower Tester is in Connectable Mode.

- Test Procedure

    1. The IUT performs an SDP query to determine the Control and Data Channel PSMs of the Lower Tester.
    2. Using the Control Channel PSM of the Lower Tester, the IUT establishes a Control Channel connection.
    3. Using the Data Channel PSM of the Lower Tester, the IUT establishes at least one Reliable Data Channel connection.
    4. Data is exchanged on each of the established Data Channels.

- Expected Outcome

    Pass verdict

    The Control Channel is established using the PSM retrieved from the SDP Query.

    At least one Reliable Data Channel was successfully opened.

    Data was successfully exchanged on each established Data Channel.

- Notes

    It is recommended for the Lower Tester to use non-standard PSMs (i.e. not 0x1001 and 0x1003) in order to make sure that IUT does not make assumptions regarding these values.

4.5.1.2   IUT accepts Control and Data Channel Connection

- Test Purpose

    Verify that an IUT can accept connection of a Control Channel and at least one Data Channel connection.

- Test Case Configuration

Test Case
HDP/SRC/HCT/BV-02-C [IUT accepts Control and Data Channel Connection]
HDP/SNK/HCT/BV-02-C [IUT accepts Control and Data Channel Connection]

Table 4.18: IUT accepts Control and Data Channel Connection test cases

- Reference

    [2] 3, 3.3, 3.4

    [4] 4.1, 4.2, 4.3

- Initial Condition

    - As defined in Section 4.1.5.

    - Additionally, the IUT is in Connectable Mode.

- Test Procedure

    1. The Lower Tester performs an SDP query to determine the Control and Data Channel PSMs of the IUT.

2. Using the Control Channel PSM of the IUT, the Lower Tester establishes a Control Channel connection.
3. Using the Data Channel PSM of the IUT, the Lower Tester establishes at least one Reliable Data Channel connection.
4. Data is exchanged on each of the established Data Channels.

- Expected Outcome

  Pass verdict

  The Control Channel is established using the PSM retrieved from the SDP Query.

  At least one Reliable Data Channel was successfully opened.

  Data was successfully exchanged on each established Data Channel.

4.6 HDP Data Exchange Tests

Verify basic data exchange capabilities of the HDP such as the Echo Test Function.

4.6.1 Disconnection and Reconnection

Verify that two HDP devices can disconnect and later reconnect.

4.6.1.1 IUT initiates Control Channel disconnect and MDL Reconnect

- Test Purpose

  Verify that an IUT can initiate disconnection of the Control Channel and Reconnection of MDLs after recreating the Control Channel.

- Test Case Configuration

Test Case
HDP/SRC/HCT/BV-03-C [IUT initiates Control Channel disconnect and MDL Reconnect]
HDP/SNK/HCT/BV-03-C [IUT initiates Control Channel disconnect and MDL Reconnect]

Table 4.19: IUT initiates Control Channel disconnect and MDL Reconnect test cases

- Reference

  [2] 3.4, 3.5

  [4] 4.1.1

- Initial Condition

  - As defined in Section 4.1.5.

  - Additionally, a Control Channel and the maximum number of simultaneously supported Data Channel connections (DCmax) have been established and data has been exchanged on each Data Channel.

- Test Procedure

  1. All Data Channels are gracefully disconnected by IUT followed by the disconnection of the Control Channel (e.g., disconnect request before IUT powers down).
  2. Conditions change to facilitate reconnection (e.g., IUT is powered back on).
  3. The Control Channel connection is recreated by IUT.

4. The IUT initiates MDL Reconnection of at least one Data Channel and the Lower Tester accepts (one reconnection request for each restored Channel).
5. Data is exchanged on each of the restored Data Channels.

- Expected Outcome

  <u>Pass verdict</u>

  All associated Data Channels were disconnected by IUT followed by the disconnection of the Control Channel.

  Control Channel and at least one of the associated Data Channels were successfully restored by the IUT.

  L2CAP configuration of all restored Data Channels is the same as before they were disconnected including, but not limited to, L2CAP Modes, and parameters (e.g., Streaming Mode or Enhanced Retransmission Mode, FCS, MTU, Flush Timeout, etc.).

  Data was successfully exchanged on each restored Data Channel.

- Notes

  In order to test that the L2CAP configuration parameters are not assumed to be default values upon reconnection, it is recommended that non-default values are used (e.g., L2CAP MTU) prior to disconnection.

4.6.1.2   IUT accepts Control Channel disconnect and MDL Reconnect

- Test Purpose

  Verify that an IUT can accept disconnection of the Control Channel and Reconnection of MDLs after the Lower Tester recreates the Control Channel.

- Test Case Configuration

Test Case
HDP/SRC/HCT/BV-04-C [IUT accepts Control Channel disconnect and MDL Reconnect]
HDP/SNK/HCT/BV-04-C [IUT accepts Control Channel disconnect and MDL Reconnect]

Table 4.20: IUT accepts Control Channel disconnect and MDL Reconnect test cases

- Reference

  [2] 3.4, 3.5

  [4] 4.1.1

- Initial Condition

  - As defined in Section 4.1.5.

  - Additionally, a Control Channel and the maximum number of simultaneously supported Data Channel connections (DCmax) have been established and data has been exchanged on each Data Channel.

- Test Procedure

  1. All Data Channels are gracefully disconnected by the Lower Tester followed by the disconnection of the Control Channel (e.g., disconnect request before the Lower Tester powers down).
  2. Conditions change to facilitate reconnection (e.g., the Lower Tester is powered back on).
  3. The Control Channel connection is recreated by the Lower Tester.

4. The Lower Tester initiates MDL Reconnection of at least one Data Channel and IUT accepts (one reconnection request for each restored Channel).
5. Data is exchanged on each of the restored Data Channels.

- Expected Outcome

    Pass verdict

    All associated Data Channels were disconnected by the Lower Tester followed by the disconnection of the Control Channel.

    The Control Channel and at least one of the associated Data Channels were successfully restored by the Lower Tester.

    L2CAP configuration of all restored Data Channels is the same as before they were disconnected including, but not limited to, L2CAP Modes, and parameters (e.g., Streaming Mode or Enhanced Retransmission Mode), FCS, MTU, Flush Timeout, etc.

    Data was successfully exchanged on each restored Data Channel.

- Notes

    In order to test that the L2CAP configuration parameters are not assumed to be default values upon reconnection, it is recommended that non-default values are used (e.g., L2CAP MTU size) prior to disconnection.

4.6.1.3   IUT initiates MDL Disconnect and Reconnect

- Test Purpose

    Verify that an IUT can initiate MDL Disconnect and Reconnect.

- Test Case Configuration

Test Case
HDP/SRC/HCT/BV-05-C [IUT initiates MDL Disconnect and Reconnect]
HDP/SNK/HCT/BV-05-C [IUT initiates MDL Disconnect and Reconnect]

Table 4.21: IUT initiates MDL Disconnect and Reconnect test cases

- Reference

    [2] 3.4, 3.5

    [4] 4.1.1

- Initial Condition

    -   As defined in Section 4.1.5.

    -   Additionally, a Control Channel and the maximum number of simultaneously supported Data Channel connections (DCmax) have been established and data has been exchanged on each Data Channel.

- Test Procedure

    1. One or more Data Channels is gracefully disconnected by IUT by disconnecting the underlying L2CAP channels. For implementations that close all MDLs, the Control Channel may optionally be closed by the IUT.
    2. Once the IUT is prepared to reconnect, (after several seconds), the IUT initiates MDL Reconnection of one or more Data Channels and the Lower Tester accepts (one reconnection

request for each restored Channel). If the Control Channel was disconnected by the IUT in the previous step, the IUT would need to re-establish the Control Channel before the MDL Reconnect.

3. Data is exchanged on each of the restored Data Channels.

- Expected Outcome

  Pass verdict

  One or more Data Channels were disconnected by the IUT.

  One or more Data Channels were successfully reconnected by the IUT.

  L2CAP configuration of all reconnected Data Channels is the same as before they were disconnected including, but not limited to, L2CAP Modes, and parameters (e.g., Streaming Mode or Enhanced Retransmission Mode), FCS, MTU, Flush Timeout, etc.

  Data was successfully exchanged on each restored Data Channel.

- Notes

  In order to test that the L2CAP configuration parameters are not assumed to be default values upon reconnection, it is recommended that non-default values are used (e.g., L2CAP MTU size) prior to disconnection.

4.6.1.4 IUT accepts MDL Disconnect and Reconnect

- Test Purpose

  Verify that an IUT can accept MDL Disconnect and Reconnect

- Test Case Configuration

Test Case
HDP/SRC/HCT/BV-06-C [IUT accepts MDL Disconnect and Reconnect]
HDP/SNK/HCT/BV-06-C [IUT accepts MDL Disconnect and Reconnect]

Table 4.22: IUT accepts MDL Disconnect and Reconnect test cases

- Reference

  [2] 3.4, 3.5

  [4] 4.1.1

- Initial Condition

  - As defined in Section 4.1.5.

  - Additionally, a Control Channel and the maximum number of simultaneously supported Data Channel connections (DCmax) have been established and data has been exchanged on each Data Channel.

- Test Procedure

  1. One of the open Data Channels is gracefully disconnected by the Lower Tester by disconnecting the underlying L2CAP channel. For single MDL implementations, the Control Channel may optionally be closed by the IUT in reaction to all MDLs being disconnected.

2. The Lower Tester initiates MDL Reconnection of the Data Channel and the IUT. If the Control Channel was disconnected by the IUT in the previous step, the Lower Tester might need to re-establish the Control Channel before the MDL Reconnect.

3. Data is exchanged on the restored Data Channels.

- Expected Outcome

  Pass verdict

  One of the open Data Channels was disconnected by the Lower Tester.

  The Data Channel was successfully reconnected by the Lower Tester.

  L2CAP configuration of the reconnected Data Channels is the same as before they were disconnected including, but not limited to, L2CAP Modes, and parameters (e.g., Streaming Mode or Enhanced Retransmission Mode), FCS, MTU, Flush Timeout, etc.

  Data was successfully exchanged on the restored Data Channel.

- Notes

  In order to test that the L2CAP configuration parameters are not assumed to be default values upon reconnection, it is recommended that non-default values are used (e.g., L2CAP MTU size) prior to disconnection.

4.6.1.5 IUT receives changed L2CAP Data Channel configuration upon Reconnect

- Test Purpose

  Verify that IUT responds properly when the Lower Tester changes L2CAP Data Channel parameters after Disconnect and before Reconnect attempt.

- Test Case Configuration

Test Case
HDP/SRC/HCT/BV-07-C [IUT receives changed L2CAP Data Channel configuration upon Reconnect]
HDP/SNK/HCT/BV-07-C [IUT receives changed L2CAP Data Channel configuration upon Reconnect]

Table 4.23: IUT receives changed L2CAP Data Channel configuration upon Reconnect test cases

- Reference

  [2] 3.5

  [4] 4.1.1

- Initial Condition

  - As defined in Section 4.1.5.

  - Additionally, a Control Channel and the maximum number of simultaneously supported Data Channel connections (DCmax) have been established and data has been exchanged on each Data Channel.

- Test Procedure

  1. All Data Channels are gracefully disconnected by the Lower Tester followed by the disconnection of the Control Channel (e.g., Disconnect request before IUT powers down).

2. The Lower Tester changes one of the negotiated L2CAP configuration parameters for one Reliable Data Channel (e.g., L2CAP MTU size, L2CAP Mode).
3. Conditions change to facilitate reconnection (e.g., IUT is powered back on).
4. The Control Channel connection is recreated by the Lower Tester.
5. The Lower Tester initiates MDL reconnection of the Reliable Data Channel.

- Expected Outcome

  Pass verdict

  The IUT either rejects the L2CAP configuration or disconnects the L2CAP Data Channel. In the case of a disconnection, this operation is allowed to be initiated by the IUT either during or immediately after the L2CAP configuration phase.

4.6.2 Echo Test Function

Verify that support for the Echo Test Function is properly implemented.

4.6.2.1 IUT initiates Echo Test Function

- Test Purpose

  Verify that the IUT can properly initiate the Echo Test function.

- Test Case Configuration

Test Case
HDP/SRC/DE/BV-01-C [IUT initiates Echo Test Function]
HDP/SNK/DE/BV-01-C [IUT initiates Echo Test Function]

Table 4.24: IUT initiates Echo Test Function test cases

- Reference

  [2] 5.2.9.1.1

- Initial Condition

  - As defined in Section 4.1.5.

  - Additionally, the IUT is in Idle Mode. The Lower Tester is active and accepting incoming connections.

- Test Procedure

  1. The IUT initiates Control Channel connection to the Lower Tester.
  2. The IUT establishes MDL for an MDEP ID of 0x00.
  3. The IUT sends single data packet to the Lower Tester.
  4. The Lower Tester responds with copy of data received.
  5. The IUT optionally closes Data Channel and Control Channel.

- Expected Outcome

  Pass verdict

  Control Channel and Data Channel were successfully established.

  The IUT received the same single data packet contents in Step 4 that it sent in Step 3.

4.6.2.2   IUT accepts Echo Test Function

- Test Purpose

  Verify that the IUT can properly accept the Echo Test function.

- Test Case Configuration

Test Case
HDP/SRC/DE/BV-02-C [IUT accepts Echo Test Function]
HDP/SNK/DE/BV-02-C [IUT accepts Echo Test Function]

Table 4.25: IUT accepts Echo Test Function test cases

- Reference

  [2] 5.2.9.1.1

- Initial Condition

  - As defined in Section 4.1.5.

  - Additionally, the IUT is in Idle Mode. The Lower Tester is active and accepting incoming connections.

- Test Procedure

  1. The Lower Tester initiates Control Channel connection to IUT.
  2. The Lower Tester establishes MDL for an MDEP ID of 0x00.
  3. The Lower Tester sends single data packet to IUT.
  4. The IUT responds with copy of data received.
  5. The Lower Tester optionally closes Data Channel and Control Channel.

- Expected Outcome

  Pass verdict

  The Control Channel and Data Channel were successfully established.

  The Lower Tester receives the same single data packet contents in Step 4 that it sent in Step 3.

4.7   Data Exchange Protocol Tests

Verify that the Agent or Manager implementation of Data Exchange Protocol meet a base level of functionality.

4.7.1   IEEE 11073-20601 Data Exchange Protocol - Agent Tests

4.7.1.1   IUT (Agent) associates and transfers configuration and measurements to Lower Tester (Manager)

- Test Purpose

  Verify that an Agent implementation of an IUT can initiate an association request to a Lower Tester acting as Manager and transfer application data.

- Test Case Configuration

Test Case
HDP/SRC/DEP/BV-01-C [IUT (Agent) associates and transfers configuration and measurements to Lower Tester (Manager)]

Table 4.26: IUT (Agent) associates and transfers configuration and measurements to Lower Tester (Manager) test case

- Reference

  [2] 3.4, 5.2.10

  [7] 8.7, 8.8, 8.9

- Initial Condition

  - As defined in Section 4.1.5.

  - Additionally, a Control Channel and Data Channel connections have been established. The Agent and the Manager are in the Data Exchange Protocol's Unassociated state and Manager does not know the Agent's configuration.

- Test Procedure

  1. The IUT (Agent) initiates Association Request and the Lower Tester (Manager) responds with an Association Response accepting the association, but requesting the configuration (accepted-unknown-config result status).
  2. Devices enter Configuring state.
  3. The IUT sends a valid configuration report to the Lower Tester and the Lower Tester approves the configuration.
  4. The IUT transfers application data to the Lower Tester for every MDEP Data Type included in the Supported Features sequence of the IUT SDP record.

- Expected Outcome

  Pass verdict

  The IUT (Agent) sends valid Association Request to the Lower Tester (Manager).

  The IUT sends valid Configuration Report to the Lower Tester.

  The IUT sends valid application data for every MDEP Data Type included in the Supported Features sequence of its SDP record.

  All association traffic and confirmed event traffic was carried on Reliable Data Channel.

- Notes

  For testability, the Lower Tester has to support all Device Data Specializations such that it can connect to any IUT regardless of the supported Device Data Specialization(s).

  Performing this test with Manager-initiated application data transfer is also acceptable.

4.7.1.2   IUT (Agent) initiates association release and re-associates with Lower Tester (Manager)

- Test Purpose

  Verify that an Agent implementation of an IUT can successfully request an association release followed by a re-association and transfer application data to a Lower Tester.

- Test Case Configuration

Test Case
HDP/SRC/DEP/BV-02-C [IUT (Agent) initiates association release and re-associates with Lower Tester (Manager)]

Table 4.27: IUT (Agent) initiates association release and re-associates with Lower Tester (Manager) test case

- Reference

  [2] 3.4, 5.2.10

  [7] 8.7, 8.8, 8.9

- Initial Condition

  - As defined in Section 4.1.5.

  - Additionally, Control Channel and Data Channel connections have been established. Agent and Manager have previously been associated and configured and are both in the Operating state.

- Test Procedure

  1. The IUT (Agent) sends Association Release Request and the Lower Tester (Manager) responds with an Association Release Response. Both devices move to Unassociated state. Any of the devices are allowed to do Bluetooth Channel/Link disconnection.
  2. The IUT initiates Association Request with the same configuration id used during the previous association and the Lower Tester responds with an Association Response accepting the configuration as known (accepted).
  3. Devices re-enter Operating state (no Configuration Report takes place)
  4. The IUT transfers application data to the Lower Tester for every MDEP Data Type included in the Supported Features sequence of the IUT SDP record.

- Expected Outcome

  Pass verdict

  The IUT (Agent) sends valid Association Release Request to the Lower Tester (Manager) and receives an Association Release Response.

  The IUT sends a subsequent Association Request (including known ConfigID) to the Lower Tester and receives an Association Response.

  The IUT sends valid application data for every MDEP Data Type included in the Supported Features sequence of its SDP record.

  All association traffic and confirmed event traffic was carried on Reliable Data Channel.

- Notes

  For testability, the Lower Tester has to support all Device Data Specializations such that it can connect to any IUT regardless of the supported Device Data Specialization(s).

4.7.2   IEEE 11073-20601 Data Exchange Protocol - Manager Tests

4.7.2.1   Lower Tester (Agent) associates and transfers configuration and measurements to IUT (Manager)

- Test Purpose

  Verify that a Manager implementation of an IUT can receive an association request from a Lower Tester acting as Agent and receive application data.

- Test Case Configuration

Test Case
HDP/SNK/DEP/BV-03-C [Lower Tester (Agent) associates and transfers configuration and measurements to IUT (Manager)]

  Table 4.28: Lower Tester (Agent) associates and transfers configuration and measurements to IUT (Manager) test cases

- Reference

  [2] 3.4, 5.2.10

  [7] 8.7, 8.8, 8.9

- Initial Condition

  - As defined in Section 4.1.5.

  - Additionally, Control Channel and Data Channel connections have been established. Agent and Manager are in the Data Exchange Protocol's Unassociated state and Manager does not know the Agent's configuration.

- Test Procedure

  1. The Lower Tester (Agent) initiates Association Request with unknown ConfigID and IUT (Manager) responds with an Association Response accepting the association, but requesting the configuration (accepted-unknown-config result status).
  2. Devices enter Configuring state.
  3. The Lower Tester sends a valid configuration report to the IUT, and the IUT approves the configuration.
  4. The Lower Tester transfers application data to IUT for every MDEP Data Type included in the Supported Features sequence of the IUT SDP record.

- Expected Outcome

  Pass verdict

  The IUT (Manager) receives valid Association Request from the Lower Tester (Agent).

  The IUT receives valid Configuration Report from the Lower Tester.

  The IUT receives valid application data for every MDEP Data Type included in the Supported Features sequence of its SDP record.

  All association traffic and confirmed event traffic was carried on Reliable Data Channel.

- Notes

  For testability, the Lower Tester has to support all Device Data Specializations such that it can connect to any IUT regardless of the supported Device Data Specialization(s).

Performing this test with Manager-initiated application data transfer is also acceptable.

4.7.2.2 Lower Tester (Agent) initiates association release and re-associates with IUT (Manager)

- Test Purpose

Verify that a Manager implementation of an IUT can successfully respond to an association release request followed by a re-association and receive application data from a Lower Tester.

- Test Case Configuration

Test Case
HDP/SNK/DEP/BV-04-C [Lower Tester (Agent) initiates association release and re-associates with IUT (Manager)]

Table 4.29: Lower Tester (Agent) initiates association release and re-associates with IUT (Manager) test cases

- Reference

[2] 3.4, 5.2.10

[7] 8.7, 8.8, 8.9

- Initial Condition

  - As defined in Section 4.1.5.

  - Additionally, Control Channel and Data Channel connections have been established. Agent and Manager have previously been associated, configured and are both in the Operating state.

- Test Procedure

  1. The Lower Tester (Agent) sends Association Release Request and IUT (Manager) responds with an Association Release Response. Both devices move to Unassociated state.
  2. The Lower Tester initiates Association Request with the same configuration id used during the previous association and IUT responds with an Association Response accepting the configuration as known (accepted).
  3. Devices re-enter Operating state (no Configuration Report takes place).
  4. The Lower Tester transfers application data to IUT for every MDEP Data Type included in the Supported Features sequence of the IUT SDP record.

- Expected Outcome

Pass verdict

The IUT (Manager) receives valid Association Release Request from the Lower Tester (Agent) and sends an Association Release Response.

The IUT receives a subsequent Association Request (including known ConfigID) from the Lower Tester and sends an Association Response.

The IUT receives valid application data for every MDEP Data Type included in the Supported Features sequence of its SDP record.

All association traffic and confirmed event traffic was carried on Reliable Data Channel.

- Notes

For testability, the Lower Tester has to support all Device Data Specializations such that it can connect to any IUT regardless of the supported Device Data Specialization(s).

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 Health Device Profile (HDP) [5].

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 [2].

For the purpose and structure of the ICS/IXIT, refer to [2].

Item	Feature	Test Case(s)
HDP 4/1	HDP Source SDP Service	HDP/SRC/SGSIT/SERR/BV-01-C HDP/SRC/SGSIT/ATTR/BV-02-C HDP/SRC/SGSIT/ATTR/BV-03-C HDP/SRC/SGSIT/ATTR/BV-04-C HDP/SRC/SGSIT/ATTR/BV-05-C HDP/SRC/SGSIT/ATTR/BV-06-C HDP/SRC/SGSIT/ATTR/BV-07-C
HDP 4/12	HDP Source SDP attribute: Service Record State	HDP/SRC/SGSIT/ATTR/BV-01-C
HDP 4/6	HDP Source SDP attribute: Service Name	HDP/SRC/SGSIT/OFFS/BV-01-C
HDP 4/7	HDP Source SDP attribute: Service Description	HDP/SRC/SGSIT/OFFS/BV-02-C
HDP 4/8	HDP Source SDP attribute: Provider Name	HDP/SRC/SGSIT/OFFS/BV-03-C
HDP 6/2	Successful Connection with future SDP Record value – HDP Source	HDP/SRC/CGSIT/SFC/BV-01-C
HDP 10/1	HDP Sink SDP Service	HDP/SNK/SGSIT/SERR/BV-01-C HDP/SNK/SGSIT/ATTR/BV-02-C HDP/SNK/SGSIT/ATTR/BV-03-C HDP/SNK/SGSIT/ATTR/BV-04-C HDP/SNK/SGSIT/ATTR/BV-05-C HDP/SNK/SGSIT/ATTR/BV-06-C HDP/SNK/SGSIT/ATTR/BV-07-C
HDP 10/12	HDP Sink SDP attribute: Service Record State	HDP/SNK/SGSIT/ATTR/BV-01-C
HDP 10/6	HDP Sink SDP attribute: Service Name	HDP/SNK/SGSIT/OFFS/BV-01-C
HDP 10/7	HDP Sink SDP attribute: Service Description	HDP/SNK/SGSIT/OFFS/BV-02-C
HDP 10/8	HDP Sink SDP attribute: Provider Name	HDP/SNK/SGSIT/OFFS/BV-03-C

Item	Feature	Test Case(s)
HDP 12/2	Successful Connection with future SDP Record value – HDP Sink	HDP/SNK/CGSIT/SFC/BV-01-C
HDP 2/1	HDP Connection Setup	HDP/SRC/CON/BV-02-C
HDP 8/1	HDP Connection Setup	HDP/SNK/CON/BV-02-C
HDP 2/3	HDP Connection Setup	HDP/SRC/CON/BV-03-C
HDP 8/3	HDP Connection Setup	HDP/SNK/CON/BV-03-C
HDP 2/4	HDP Connection Setup	HDP/SRC/CON/BV-04-C
HDP 8/4	HDP Connection Setup	HDP/SNK/CON/BV-04-C
HDP 1/1	HDP Connection Setup	HDP/SRC/CON/BV-05-C
HDP 1/2	HDP Connection Setup	HDP/SNK/CON/BV-05-C
HDP 1/1	HDP Connection Setup	HDP/SRC/CON/BV-06-C
HDP 1/2	HDP Connection Setup	HDP/SNK/CON/BV-06-C
HDP 2/7	HDP Connection Setup	HDP/SRC/CON/BV-07-C
HDP 8/7	HDP Connection Setup	HDP/SNK/CON/BV-07-C
HDP 2/8	HDP Connection Setup	HDP/SRC/CON/BV-08-C
HDP 8/8	HDP Connection Setup	HDP/SNK/CON/BV-08-C
HDP 2/9	HDP Connection Setup	HDP/SRC/CON/BV-09-C
HDP 8/9	HDP Connection Setup	HDP/SNK/CON/BV-09-C
HDP 2/11	HDP Connection Setup	HDP/SRC/CON/BV-10-C
HDP 8/11	HDP Connection Setup	HDP/SNK/CON/BV-10-C
HDP 6/2	L2CAP Channel Configuration - Control Channel	HDP/SRC/CC/BV-01-C
HDP 12/2	L2CAP Channel Configuration - Control Channel	HDP/SNK/CC/BV-01-C
HDP 6/3	L2CAP Channel Configuration - Control Channel	HDP/SRC/CC/BV-02-C
HDP 12/3	L2CAP Channel Configuration - Control Channel	HDP/SNK/CC/BV-02-C
HDP 6/2	L2CAP Channel Configuration - Reliable Data Channel	HDP/SRC/CC/BV-03-C
HDP 12/2 AND HDP 9/3	L2CAP Channel Configuration - Reliable Data Channel	HDP/SNK/CC/BV-04-C
HDP 6/3 AND HDP 3/3	L2CAP Channel Configuration - Reliable Data Channel	HDP/SRC/CC/BV-05-C
HDP 12/3 AND HDP 9/3	L2CAP Channel Configuration - Reliable Data Channel	HDP/SNK/CC/BV-06-C
HDP 6/2 AND HDP 3/7	L2CAP Channel Configuration - Streaming Data Channel	HDP/SRC/CC/BV-07-C
HDP 12/2 AND HDP 9/7	L2CAP Channel Configuration - Streaming Data Channel	HDP/SNK/CC/BV-08-C
HDP 6/3 AND HDP 3/7	L2CAP Channel Configuration - Streaming Data Channel	HDP/SRC/CC/BV-09-C
HDP 12/3 AND HDP 9/7	L2CAP Channel Configuration - Streaming Data Channel	HDP/SNK/CC/BV-10-C

Item	Feature	Test Case(s)
HDP 12/3	Data Channel Configuration Error Handling	HDP/SNK/CC/BI-11-C
HDP 6/3	Data Channel Configuration Error Handling	HDP/SRC/CC/BI-12-C
HDP 6/2	HDP Connection Tests	HDP/SRC/HCT/BV-01-C
HDP 12/2	HDP Connection Tests	HDP/SNK/HCT/BV-01-C
HDP 6/3	HDP Connection Tests	HDP/SRC/HCT/BV-02-C
HDP 12/3	HDP Connection Tests	HDP/SNK/HCT/BV-02-C
HDP 6/4	HDP Connection Tests	HDP/SRC/HCT/BV-03-C
HDP 12/4	HDP Connection Tests	HDP/SNK/HCT/BV-03-C
HDP 6/5	HDP Connection Tests	HDP/SRC/HCT/BV-04-C
HDP 12/5	HDP Connection Tests	HDP/SNK/HCT/BV-04-C
HDP 6/4	HDP Connection Tests	HDP/SRC/HCT/BV-05-C
HDP 12/4	HDP Connection Tests	HDP/SNK/HCT/BV-05-C
HDP 6/5	HDP Connection Tests	HDP/SRC/HCT/BV-06-C
HDP 12/5	HDP Connection Tests	HDP/SNK/HCT/BV-06-C
HDP 6/5	HDP Connection Tests	HDP/SRC/HCT/BV-07-C
HDP 12/5	HDP Connection Tests	HDP/SNK/HCT/BV-07-C
HDP 7/1	HDP Data Exchange Tests	HDP/SRC/DE/BV-01-C
HDP 13/1	HDP Data Exchange Tests	HDP/SNK/DE/BV-01-C
HDP 7/2 AND HDP 6/3	HDP Data Exchange Tests	HDP/SRC/DE/BV-02-C
HDP 13/2	HDP Data Exchange Tests	HDP/SNK/DE/BV-02-C
HDP 7/3 AND HDP 7/4	Data Exchange Protocol tests	HDP/SRC/DEP/BV-01-C
HDP 7/3 AND HDP 7/4 AND HDP 7/6	Data Exchange Protocol tests	HDP/SRC/DEP/BV-02-C
HDP 13/3 AND HDP 13/5 AND HDP 10/10	Data Exchange Protocol tests	HDP/SNK/DEP/BV-03-C
HDP 13/3 AND HDP 13/5 AND HDP 13/6 AND HDP 10/10	Data Exchange Protocol tests	HDP/SNK/DEP/BV-04-C

Table 5.1: Test case mapping

6   Revision history and acknowledgments

Revision History

Publication Number	Revision Number	Date	Comments
0	1.0.0	2008-06-25	Prepare for publication
	1.0.1r0	2008-11-19	TSE 2672: TP/HDP/CC/BV-03-C, TP/HDP/CC/BV-06-C, TP/HDP/CC/BV-07-C and TP/HDP/CC/BV-10-C
	1.0.1r1	2008-11-20	Fixed parameter values for updated test cases
1	1.01.	2008-12-03	Prepare for publication.
2	1.0.2	2009-08-03	TSE 2910 TP/HDP/CC/BI-12-C update test procedure. Added Heading 4 to ToC
3	1.0.3r0	2010-08-10	TSE 3014: TP/HDP/HCT/BV-03-I, TP/HDP/HCT/BV-04-I TP/HDP/HCT/BV-05-C, TP/HDP/HCT/BV-06-C, TP/HDP/HCT/BV-07-C; changes to test procedures and pass verdicts. TSE 3063: TP/HDP/CC/BV-07-C, TP/HDP/CC/BV-08-C, TP/HDP/CC/BV-09-C, TP/HDP/CC/BV-10-C; updates to test procedure
	1.0.4r0-1	2011-11-11	TSE 2970: TP/HDP/DEP/BV-02-I; TCMT update; see PICS update TSE 3075: TP/HDP/DEP/BV-01-I, TP/HDP/DEP/BV-02-I, TP/HDP/DEP/BV-03-I, TP/HDP/DEP/BV-04-I TSE 3174: TP/HDP/DE/BV-02-I: Update TCMT
	1.0.4r2	2012-03-11	Changes to TCMT per AC's review
4	1.0.4	2012-03-30	Prepare for publication.
	1.0.5r0	2012-06-06	TSE 4308: TP/HDP/DEP/BV-02-I Test Procedure update. TSE 4802: Test Case Reference updates.
	1.1.0	2012-06-13	Versioning update to accommodate HDP_SPEC_v1.1
5	1.1.0	2012-07-24	Prepare for publication.
	1.1.1r01	2017-01-25	Converted test specification template.
	1.1.1r02	2017-05-10	Converted to new Test Case ID conventions as defined in TSTO v4.1.
6	1.1.1	2017-07-03	Approved by BTI. Prepared for TCRL 2017-1 publication.
	1.1.2r00	2018-05-09	TSE 10540 (rating 1): Added test case HDP/SRC/CC/BV-03-C to section heading "HDP/SRC/CC/BV-03-C [IUT as Source initiates Reliable L2CAP Data Channel]" and removed test case IDs. Removed test case HDP/SNK/CC/BV-03-C from TCMT and deleted the Test Case Applicable column.
7	1.1.2	2018-07-01	Approved by BTI. Prepared for TCRL 2018-1 publication.

Publication Number	Revision Number	Date	Comments
	1.1.2 edition2r00	2020-02-11	TSE 13488 (rating 1): Removed test cases HDP/SNK/DEP/BV-01-I and -02-I and HDP/SRC/DEP/BV-03-I and -04-I to align with specification. Updated TCMT accordingly. Minor editorials, including moving revision history and contributors sections to the end of the doc.
	1.1.2 edition2	2020-06-01	Performed minor formatting and template updates, rolled back document numbering to reflect an edition release, and accepted all tracked changes. Approved by BTI on 2020-06-01. Prepared for edition 2 publication.
	p8r00–r08	2023-10-13 – 2024-04-25	TSE 23933 (rating 1): Converted -I tests to -C tests as appropriate; updated the TCMT and TCRL accordingly. TSE 24173 (rating 2): Updated TCMT entries to support resolution of ILDs in the HDP ICS. TSE 24527 (rating 4): Added new GSIT section with new TCs HDP/SRC/SGSIT/SERR/BV-01-C, HDP/SRC/SGSIT/ATTR/BV-01-C – -07-C, HDP/SNK/SGSIT/SERR/BV-01-C, HDP/SNK/SGSIT/ATTR/BV-01-C – -07-C, HDP/SRC/SGSIT/OFFS/ BV-01-C – -03-C, HDP/SNK/SGSIT/OFFS/BV-01-C – -03-C, HDP/SRC/CGSIT/SFC/BV-01-C, and HDP/SNK/CGSIT/SFC/BV-01-C. Deleted TCs HDP/SRC/CON/BV-01-I and HDP/SNK/CON/BV-01-I. Updated the TCMT accordingly. Updated the references list, the test groups list, and the TC class naming conventions table. Performed other editorials to align the document with the latest TS template, including updates to the scope, references, Test Strategy, test case identification conventions, conformance, Pass/Fail verdict conventions, and TCMT introductory text and conversion of TCs with common test procedures into the table-driven format. Updated the copyright page to align with the latest DNMD. Deleted draft revision history comments prior to p0.
8	p8	2024-07-01	Approved by BTI on 2024-05-22. Prepared for TCRL 2024-1 publication.

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