Serial Port Profile (SPP)

Bluetooth® Test Suite

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Contents

1 Scope

This Bluetooth document contains the Test Suite Structure (TSS) and Test Cases (TC) to test the Bluetooth Serial Port Profile.

The objective of this document is to provide a basis for interoperability for Bluetooth devices giving a high probability of air interface interoperability between different manufacturers' Bluetooth devices.

The general concepts and conformance testing principles as defined in ISO/IEC 9646-1 and ISO/IEC 9646-2, which are part of the OSI Conformance Testing Methodology and Framework (CTMF), are used as a basis for the testing of Bluetooth protocol and profile implementation.

2 References, Definitions, and Abbreviations

2.1 References

This Bluetooth document incorporates, by dated or undated reference, provisions from other publications. These normative references are cited at the appropriate places in the text and the publications are listed hereafter.

[1] Serial Port Profile v1.1 or later

[2] Specification of the Bluetooth System; Generic Access Profile

[3] Specification of the Bluetooth System; Service Discovery Protocol

[4] GAP Test Suite, GAP.TS

[5] Bluetooth Core Specification v2.0 or later

[6] SDP Test Suite, SDP.TS

[7] Test Strategy and Terminology Overview, TSTO

[8] ICS Proforma for Serial Port Profile, SPP.ICS

[9] SPP Implementation eXtra Information for Testing (IXIT)

2.2 Definitions

For the purpose of this Bluetooth document, the definitions from [5] and [7] apply.

2.3 Acronyms and Abbreviations

For the purpose of this Bluetooth document, the abbreviations from [5] and [7] apply.

3   Test Suite Structure (TSS)

3.1   Overview

The Serial Port Profile defines the protocols and procedures that shall be used by devices using Bluetooth for setting up a virtual serial cable emulation (like RS232) using RFCOMM between two peer devices.

The SPP depends on the GAP [2].

Figure 3.1 shows the protocol stack covered by the SPP.
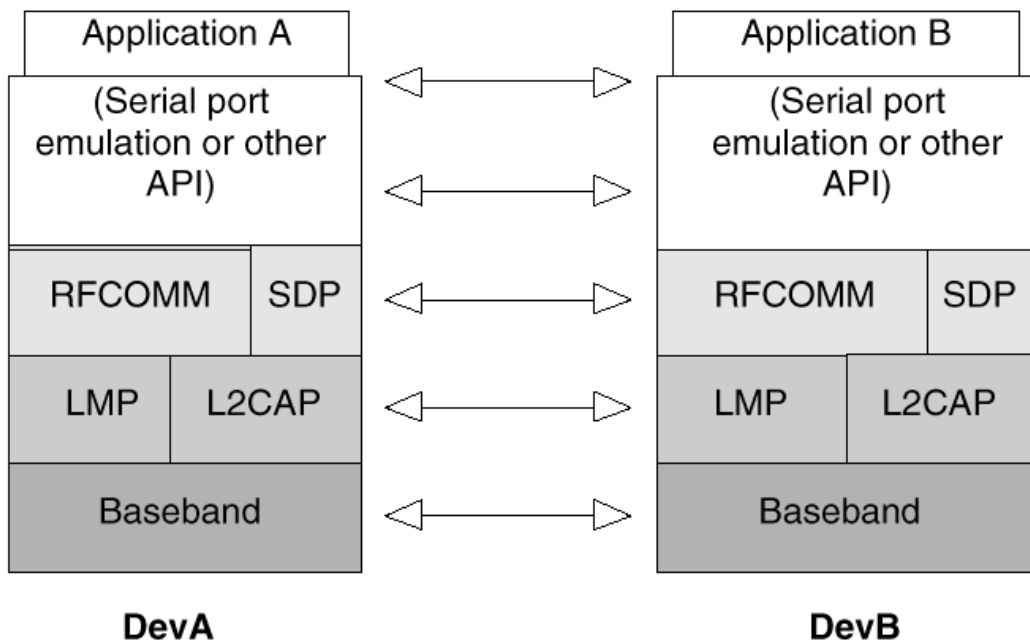
Figure 3.1: Protocol Stack for SPP

3.2   Test Suite Structure

The test suite is structured as a tree with a first level defined as SPP representing the protocol groups: Application, and SDP The test groups are organized in 3 levels. The first level defines the profile protocol groups representing the layers of the profile. The second level separates the protocol services in functional modules. The last level in each branch contains the standard ISO subgroups BV and BI.

Test Suite Structure for the Serial Port Profile Conformance Testing

Application
- Establish link and set up virtual serial connection
- Accept link and virtual serial connection
- No release of RFCOMM/L2CAP in Sniff or Hold mode

3.2.1   Profile Protocol Groups

The profile protocol groups identify the Bluetooth Serial Port Profile as defined in [1].

3.2.1.1   Application

This group handles testing of application procedures. The test cases found in this group are based on the Serial Port Profile.

3.2.2   Main Test Groups

The main test groups are the capability group, the valid behavior group and the invalid behavior group.

3.2.2.1   Valid Behavior Tests (BV)

This type of testing provides testing to verify that the IUT reacts in conformity with the Bluetooth standard and profile specification, after receipt or exchange of a valid PDU. Valid PDUs means that the exchange of messages and the content of the exchanged messages are considered as valid.

3.2.2.2   Invalid Behavior Tests (BI)

This type of testing provides testing to verify that the IUT reacts in conformity with the Bluetooth standard, after receipt of a syntactically or semantically invalid PDU.

4   Test Cases (TC)

4.1   Introduction

4.1.1   Test Case Identification Conventions

Test cases shall be assigned unique identifiers per the conventions in [7]. The convention used here is **<spec abbreviation>/<IUT role>/**<class>/<feat>/<func>/<subfunc>**/<cap>/<xx>-<nn>-<y>**.

Bolded ID parts shall appear in the order prescribed. Non-bolded ID parts (if applicable) shall appear between the bolded parts. The order of the non-bolded parts may vary from test suite to test suite, but shall be consistent within each individual test suite.

Identifier Abbreviation	Spec Abbreviation <spec abbreviation>
SPP	Serial Port Profile
Identifier Abbreviation	**Role Identifier <IUT role>**
DEVA	Device A (Initiator) Role
DEVB	Device B (Acceptor) Role
Identifier Abbreviation	**Feature Identifier <feat>**
APP	Application

Table 4.1: Serial Port Profile TC Feature Naming Conventions

4.1.2   Conformance

When conformance is claimed, all capabilities indicated as mandatory for this Specification shall be supported in the specified manner (process-mandatory).This also applies for all optional and conditional capabilities for which support is indicated. All mandatory capabilities, and optional and conditional capabilities for which support is indicated, are subject to verification as part of the Bluetooth Qualification Program.

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 that is not excluded by the Specification, OR

- That capabilities enabled by the implementations are sustained over durations expected by the use case, OR

- That the implementation gracefully handles any quantity of data expected by the use case, OR

- That in cases where more than one valid interpretation of the Specification exist, the implementation complies with at least one interpretation and gracefully handles other interpretations OR

- That the implementation is immune to attempted security exploits.

A single execution of each of the required tests is required in order to constitute a pass verdict. However, it is noted that in order 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 Generator, 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 errata request such that the issue may be addressed.

4.1.3   General Assumptions

No more than one ACL link exists between the Lower Tester and the IUT. Only one connection at a time and consequently only a point-to-point configuration is considered.

Support of one-slot packets is required to ensure data rates up to 128 kbps. The SPP is built upon the GAP, which means all tests defined in [4] have to be performed beforehand.

There are no fixed master slave roles.

DevA and DevB can be either a Data Circuit Endpoint (DCE) or a Data Terminal Endpoint (DTE).

The role of DevA/DevB taken on by the IUT does not matter to achieve a pass verdict for some test cases for this Profile as indicated in the test purpose and is specified in the test case identifier for role agnostic tests as detailed in Table 4.1: Serial Port Profile TC Feature Naming Conventions. The role of the IUT/Lower Tester for these tests is specified in the IXIT [9] in order to enable the correct test environment conditions to provoke the Lower Tester.

4.1.4   Pass/Fail Verdict Conventions

Each test case has an Expected Outcome section, which outlines all the detailed pass criteria conditions that shall be met by the IUT to merit a Pass Verdict.

The convention in this test suite is that, unless there are 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 the outcome of the test shall be the Fail Verdict.

4.2   Application

Test group objectives:

- To verify the correct implementation of the Application services.

- The A-party of GAP is equivalent to DevA and the B-party is equivalent to DevB.

- There are no fixed master slave roles.

4.2.1   Establish Link and Set Up Virtual Serial Connection

Test subgroup objectives:

- To verify the correct handling of setting up a virtual serial connection in the Bluetooth Serial Port Profile.

4.2.1.1   SPP/DEVA/APP/BV-01-C [Initiate a serial cable emulation]

- Test Purpose

  Verify that the IUT establishes a connection to an emulated serial port in the Lower Tester. The IUT is a device taking on the role as DevA. The Lower Tester is Acceptor and DevB.

- Reference

  [1] 3.1.1

- Initial Condition

  An ACL link shall be set up completed between the IUT and the Lower Tester.

  The Lower Tester is the SDP server and has all its services placed in the root browse group. The root browse group contains the service record for SerialPortProfile with the ServiceName "COM5". The BrowseGroupList attribute is therefore embedded in the Lower Tester's service record.
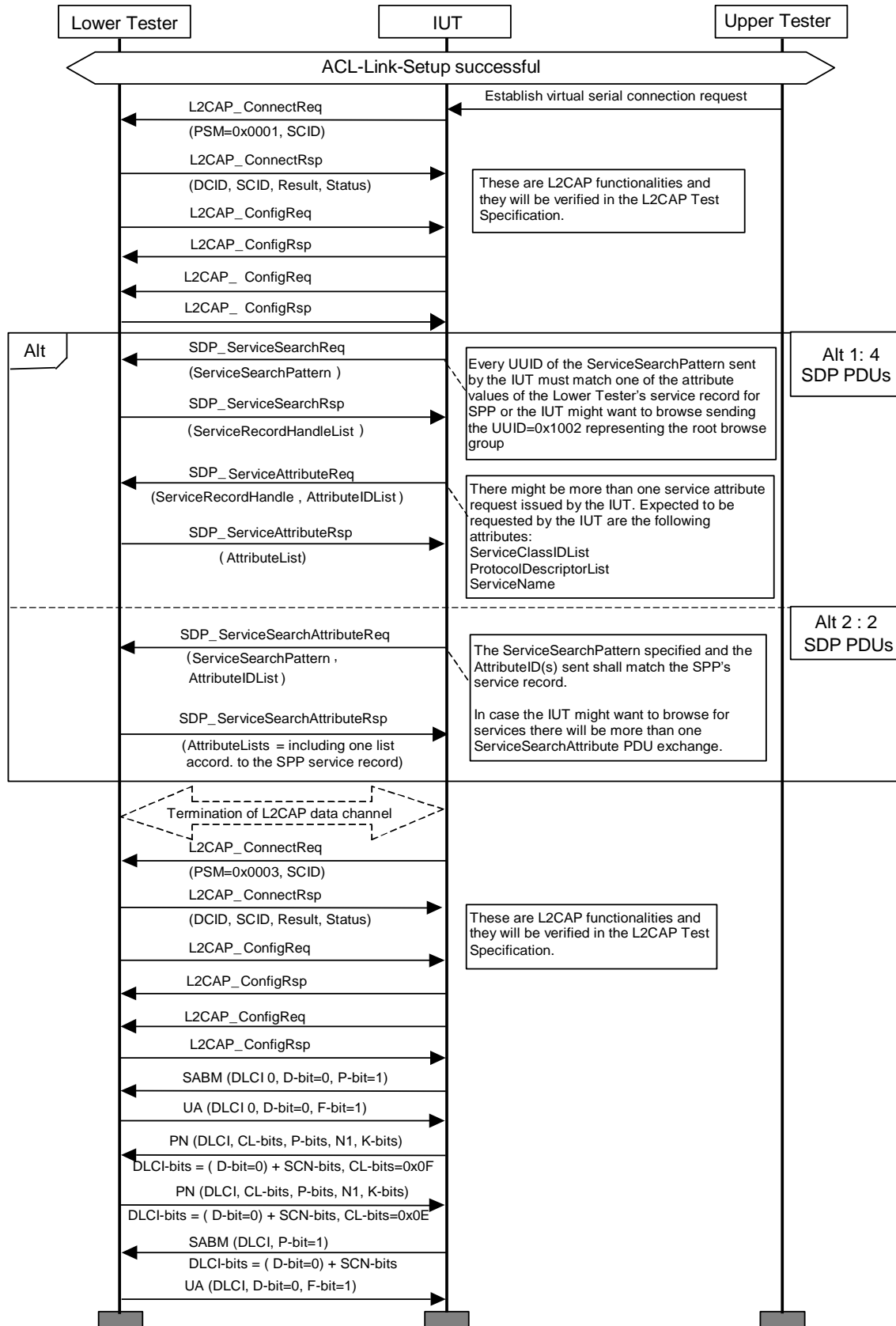
- Test Procedure

Figure 4.1: SPP/DEVA/APP/BV-01-C

1. The IUT requests an L2CAP channel to the Tester's SDP server database.
2. The IUT submits a query using SDP to find out the RFCOMM Server Channel number. Therefore the client may browse the SDP server's services.
3. The IUT requests a new L2CAP channel to the Tester's RFCOMM entity.
4. The IUT initiates an RFCOMM session.
5. The IUT initiates parameter negotiation before starting a new data link connection.
6. The IUT starts a new data link connection on the RFCOMM session using the server channel number.

- Test Condition

There must be an indication to the MMI in case a virtual serial connection is ready to be used for communication.

The value of K bits indicates the initial credits issued by the IUT and should be taken from the Profile IXIT.

- Expected Outcome

Pass verdict

The IUT submits a query using SDP.

And the IUT transmits an SABM command to initiate an RFCOMM session.

And the IUT transmits a PN command to negotiate DLC parameters with CL-bits set to 0x0F and I-bits, T-bits and NA-bits all set to zero.

And the IUT transmits a SABM command to start a new data link connection. K bits indicate the initial credits issued by the IUT.

- Notes

Upon the SDP PDU are exchanged the IUT could terminate the existing L2CAP data channel and an L2CA_DisconnectInd event arises at the Lower Tester. In that case the Lower Tester has to reply a disconnect response. If the IUT requests encryption the Lower Tester shall accept.

The IUT should initiate the baseband link unless already established.

4.2.2 Accept Link and Virtual Serial Connection Establishment

Test subgroup objectives:

- To verify the correct handling of setting up a virtual serial connection in the Bluetooth Serial Port Profile.

4.2.2.1 SPP/DEVB/APP/BV-02-C [Accept initiation of a serial cable emulation]

- Test Purpose

Verify that the IUT accepts a connection request from the Lower Tester to its emulated serial port. The IUT is a device taking on the role as DevB. The Lower Tester is Initiator.

- Reference

[1] 3.1.2, 3.1.3

- Initial Condition

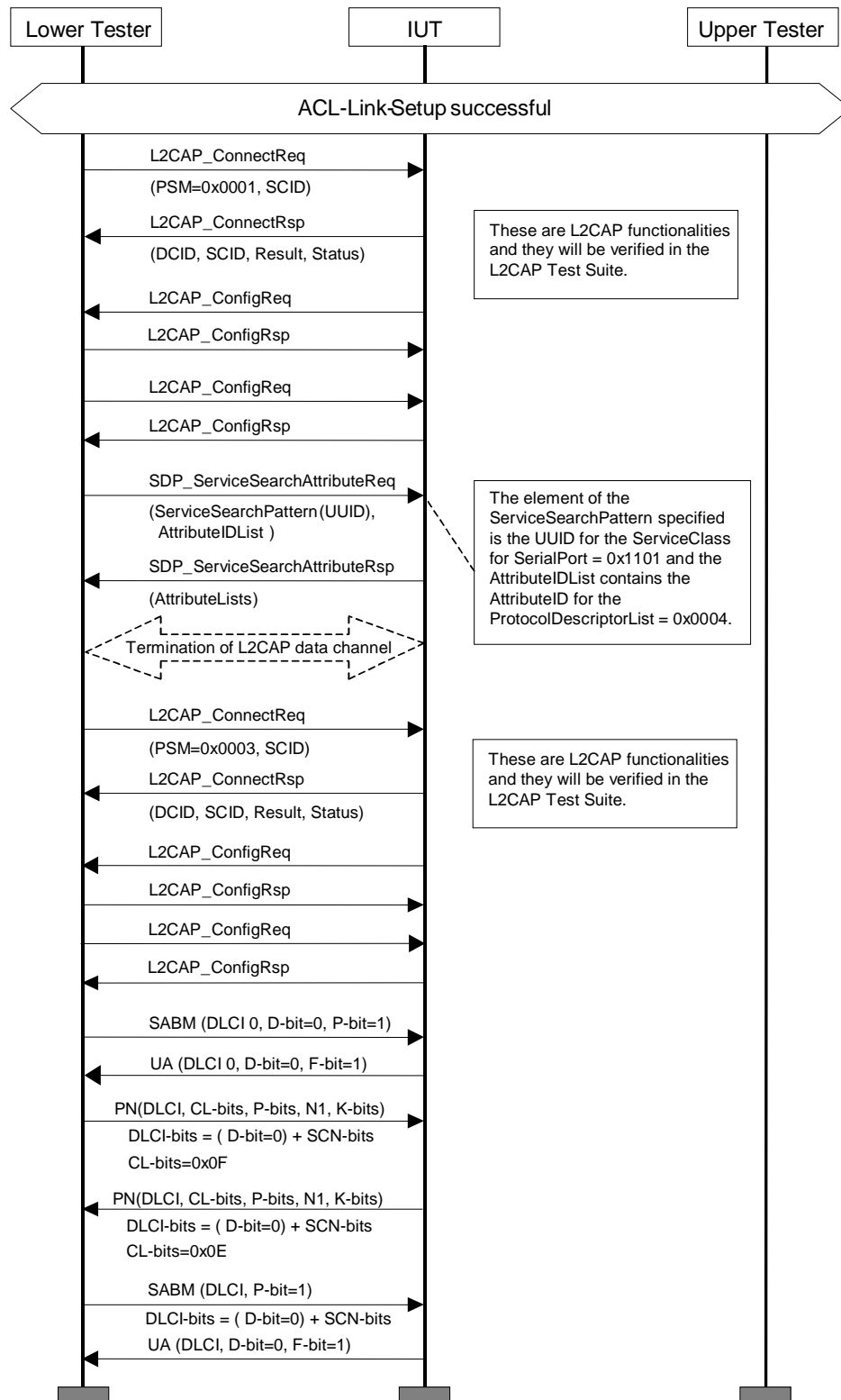 An ACL link shall be set up completed between the IUT and the Lower Tester.

- Test Procedure

Figure 4.2: SPP/DEVB/APP/BV-02-C

1. The Lower Tester requests an L2CAP channel to the IUT's SDP server database.
2. The Lower Tester submits a query to the IUT using SDP to find the SPP service record with the associated RFCOMM Server Channel number.
3. The Lower Tester requests a new L2CAP channel to the IUT's RFCOMM entity.
4. The Lower Tester initiates an RFCOMM session.
5. The Lower Tester initiates parameter negotiation before starting a new data link connection.
6. The Lower Tester starts a new data link connection on the RFCOMM session using the server channel number.

- Test Condition

The value of K bits indicates the initial credits issued by the IUT and should be taken from the Profile IXIT.

- Expected Outcome

Pass verdict

The IUT responds to a query from the Lower Tester using SDP.

And the IUT transmits a UA response to initiate an RFCOMM session.

And the IUT transmits a PN response to negotiate DLC parameters with CL-bits set to 0x0E and I-bits, T-bits and NA-bits all set to zero.

And the IUT transmits a UA response to start a new data link connection. K bits indicate the initial credits issued by the IUT.

- Notes

Upon the SDP PDU are exchanged the IUT could terminate the existing L2CAP data channel and an L2CAP_DisconnectInd event arises at the Lower Tester. In that case the Lower Tester has to reply a disconnect response. If the IUT requests encryption the Lower Tester shall accept.

The Lower Tester should initiate the baseband link unless already established.

5   Test Case Mapping

The Test Case Mapping Table (TCMT) maps test cases to specific requirements in the ICS. The product shall be 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 y/x reference, where y corresponds to the table number and x corresponds to the feature number as defined in the ICS Proforma for Serial Port profile (SPP) [8]. If the item is defined with Protocol, Profile or Service abbreviation before y/x, the table and feature number referenced are defined in the abbreviated ICS Proforma document.

Feature: Recommended to be the primary feature defined in the ICS being tested or may be the test case name.

Test Case(s): The applicable test case identifiers required for Bluetooth Qualification if the corresponding y/x references defined in the Item column are supported.

For purpose and structure of the ICS/IXIT Proforma and instructions for completing the ICS/IXIT Proforma refer to the Bluetooth ICS and IXIT Proforma document.

Item	Feature	Test Case(s)
SPP 1/1 AND SPP 2/1 AND SPP 2/1a AND SPP 3/1	Initiate a serial cable emulation	SPP/DEVA/APP/BV-01-C
SPP 1/2 AND SPP 2/1 AND SPP 2/1b AND SPP 3/2	Accept initiation of a serial cable emulation	SPP/DEVB/APP/BV-02-C

Table 5.1: Test Case Mapping

6   Revision History and Contributors

Revision History

Revision Number	Date	Comments
0.91	02-07-2001	First version for Specification 1.1
0.92	06-05-2002	RFCOMM tests moved to separate test specification
0.93	01-08-2003	Baseband connection establishment clarified
0.94	01-02-2004	Updated TCMT due to update of SPP PICS document Included TSE_451, 452 and 453
0.95r1	12-27-2004	Updated document and changed format.
0.95	01-07-2005	Incorporated review comments
1.1.1	03-21-2005	Corrected document revision number.
1.1.2r0	2006-11-22	Editorial adjustments.
1.1.2r1	2006-12-03	Input Reviewer's comments Formatting: Moved MSCs into test case section Moved Uncertainties into Notes section (Spell checked, updated TOC)
1.1.2r2	2006-12-20	Included TSE 2007 Added section 5.1.4 Conformance
1.1.2	2007-01-08	Prepare for publication.
1.1.3r0	2008-02	TSE 2384: SPP/DEVB/APP/BV-02-C, SPP/NA/APP/BV-03-C (legacy test case IDs TP/APP/BV-02-C, TP/APP/BV-03-C): Correct MSCs
1.1.3	2008-04	Prepare for publication.
1.2.0	2012-06-14 2012-07-24	Update versioning to accommodate SPP_SPEC_v1.2; updated conformance section; prepared for publication.
1.2.1r01	2013-09-30	TSE 5292: Removed SDP test cases (TP/SDP/BV-01-C, TP/SDP/BV-02-C, TP/SDP/BV-03-C), updated TCMT.
1.2.1r03	2013-11-13	Updated Copyright Information BQRB Review: Removed references to SDP Sections
1.2.1	2013-12-03	Prepare for Publication
1.2.2r00	2016-08-29	Converted to new Test Case ID conventions as defined in TSTO v4.1.

Revision Number	Date	Comments
1.2.2r01	2016-11-03	Converted to current template.
1.2.2r02	2016-11-08	TSE 8096: following the deprecation of the PARK feature: remove TP/APP/BV-04-C in its entirety and update test case note applicable to TP/APP/BV-06-C
1.2.2	2016-12-13	Approved by BTI. Prepared for TCRL 2016-2 publication.
1.2.3r00	2018-03-13	TSE 10406 (rating 4): Deleted SPP/DEVA-DEVB/APP/BV-03-C, SPP/DEVA-DEVB/APP/BV-05-C, and SPP/DEVA-DEVB/APP/BV-06-C and their corresponding TCMT entries.
1.2.3	2018-07-01	Approved by BTI. Prepared for TCRL 2018-1 publication.
1.2.4r00–r01	2019-04-15–2019-05-31	TSE 11676 (rating 2): Revised TCMT for newly added ICS 2/1a and 2/1b for test cases SPP/DEVA/APP/BV-01-C and SPP/DEVB/APP/BV-02-C.
1.2.4	2019-07-28	Approved by BTI. Prepared for TCRL 2019-1 publication.

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