Device Information Service

Bluetooth® Test Specification

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- **Group Prepared by**: BTI
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- **Abstract**

  This document defines test structures and procedures for conformance test of products implementing the Device Information Service specification.
Revision History

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<td>Converted to new Test Case ID conventions as defined in TSTO v4.1.0.</td>
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### 4.5 Characteristic Read

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Bluetooth SIG Proprietary & Confidential
1 Scope

This Bluetooth document contains the Test Suite Structure (TSS) and Test Cases (TC) to test the Bluetooth Device Information Service Specification.

The objective of this test specification is to provide a basis for interoperability tests for Bluetooth devices giving a high probability of air interface interoperability between different manufacturers’ Bluetooth devices.
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] Bluetooth Test Strategy and Terminology Overview
[2] Bluetooth Core Specification, v4.0 or later
[6] Characteristic and Descriptor descriptions are accessible via the Bluetooth SIG Assigned Numbers.

2.2 Definitions

For the purpose of this Bluetooth document, the definitions in [1] and [2] apply.

2.3 Abbreviations

For the purpose of this Bluetooth document, the abbreviations in [1] and [2] apply.
3 Test Suite Structure (TSS)

3.1 Overview
The Device Information Service requires the presence of GAP and GATT. This is illustrated in Figure 3.1.

The Device Information Service Test Model

3.2 Test Strategy
The test objectives are to verify functionality of the Device Information Service within a Bluetooth Host and enable interoperability between Bluetooth Hosts on different devices. The testing approach is to cover mandatory and optional requirements in the service specification and to match these to the support of the IUT as described in the ICS proforma.

The test equipment shall provide an implementation of the Radio Controller and the parts of the Host needed to perform the test cases defined in the Device Information Service Test Specification. 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, an MMI, or another interface supported by the IUT.

The Device Information Service 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.

The test suite structure is a tree with the first level representing the protocol groups, see section 3.3.
3.3 Test Groups

The following test groups have been defined.

3.3.1 Service Definition
Verify the service definition.

3.3.2 Characteristic Declaration
Verify the presence and contents of characteristic declarations.

3.3.3 Characteristic Read
Verify characteristics which support reading can be read. Verify the format and value of characteristic values.

3.3.4 SDP Record
Verify the SDP record for the service.
4 Test Cases

4.1 Introduction

4.1.1 Test Case Identification Conventions

Test cases shall be assigned unique identifiers per the conventions in [1]. The convention used here is <spec abbreviation>/<IUT role>/<class>/<xx>-<nn>-<y>.

Test group abbreviations for class, feature, function, sub-function or capability (as applicable to this test specification) are defined in Table 4.1.

<table>
<thead>
<tr>
<th>Identifier</th>
<th>Class Identifier &lt;class&gt;</th>
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<td>Service Definition</td>
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<tr>
<td>DEC</td>
<td>Characteristic Declaration</td>
</tr>
<tr>
<td>CR</td>
<td>Characteristic Read</td>
</tr>
<tr>
<td>SDP</td>
<td>SDP Record</td>
</tr>
</tbody>
</table>

*Table 4.1: DIS TC Class Naming Convention*

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 certification 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 Specification, 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 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 specification is that, unless there are a specific set of fail conditions outlined in the test case, the IUT fails the test case as soon one of the pass criteria conditions cannot be met and in case this occurs the outcome of the test shall be the 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.

4.2.2 ATT Bearer on BR/EDR Transport

Follow the preamble procedure described in [5] Section 4.2.1.1.

4.3 Service Definition

Verify the service definition.

4.3.1.1 DIS/SR/SD/BV-01-C [Service Definition - LE]

- Test Purpose
  
  Verify the IUT has one and only one instantiation of the Device Information Service as a primary service.

- Reference
  
  [3] 2

- Initial Condition
  
  Establish an ATT Bearer connection between the Lower Tester and IUT as described in Section 4.2.1 for an LE transport.

- Test Procedure
Discover primary services by service UUID with the service UUID set to "Device Information" i.e. execute GATT test case GATT/SR/GAD/BV-02-C in [5].

Verify that only one attribute handle range is returned, containing the starting handle and the ending handle of the service definition.

- **Expected Outcome**
  - **Pass verdict**
    - Only one attribute handle range is returned, containing the starting handle and the ending handle of the service definition.

### 4.4 Characteristic Declaration

- **Test Purpose**
  Verify the presence of and contents of characteristic declarations specified by the service.

- **Reference**
  [3] 3

- **Initial Condition**
  The handle range of the service has been previously discovered by the Lower Tester in test case DIS/SR/SD/BV-01-C when using LE as a transport and DIS/SR/SDP/BV-01-C in when using BR/EDR as a transport.

Establish an ATT Bearer connection between the Lower Tester and IUT as described in Section 4.2.1 for an LE transport or Section 4.2.2 for a BR/EDR transport.

- **Test Procedure**
  For each supported transport, the following test procedure applies to the test cases listed in the table below:

  1. Discover all characteristics of the service by executing GATT test case GATT/SR/GAD/BV-04-C in [5].
  2. For a discovered characteristic that is listed in the table below, verify the characteristic properties field of the characteristic declaration meets the requirements of the service.

- **Expected Outcome**
  The following pass and fail verdicts apply to the test cases listed in the table below:

  - **Pass verdict**
    - The characteristic is discovered and the characteristic properties field of the characteristic declaration meets the requirements of the service.
If DIS is exposed over both LE and BR/EDR transports, only one instance of the characteristic is detected per transport.

### Characteristic Declaration Test Cases

<table>
<thead>
<tr>
<th>Test Case</th>
<th>Property Requirements</th>
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<tbody>
<tr>
<td>4.4.1 DIS/SR/DEC/BV-01-C [Characteristic Declaration - Manufacturer Name String]</td>
<td>0x02 [3] Section 3</td>
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<td>4.4.2 DIS/SR/DEC/BV-02-C [Characteristic Declaration - Model Number String]</td>
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<td>4.4.3 DIS/SR/DEC/BV-03-C [Characteristic Declaration - Serial Number String]</td>
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<td>4.4.4 DIS/SR/DEC/BV-04-C [Characteristic Declaration - Hardware Revision String]</td>
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<td>4.4.5 DIS/SR/DEC/BV-05-C [Characteristic Declaration - Firmware Revision String]</td>
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<td>4.4.6 DIS/SR/DEC/BV-06-C [Characteristic Declaration - Software Revision String]</td>
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<td>4.4.7 DIS/SR/DEC/BV-07-C [Characteristic Declaration - System ID]</td>
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<tr>
<td>4.4.8 DIS/SR/DEC/BV-08-C [Characteristic Declaration - IEEE 11073-20601 Regulatory Certification Data List]</td>
<td></td>
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<tr>
<td>4.4.9 DIS/SR/DEC/BV-09-C [Characteristic Declaration – PnP ID]</td>
<td></td>
</tr>
</tbody>
</table>

*Table 4.2: Characteristic Declaration Test Cases*

### 4.5 Characteristic Read

- **Test Purpose**

  Read and verify characteristic values.

- **Reference**

  [3] 3.1, 3.3, 3.5

- **Initial Condition**
The handle of each characteristic value referenced in the test cases below has been previously discovered by the Lower Tester during the test procedure in Section 4.4 or is known to the Lower Tester by other means.

Establish an ATT Bearer connection between the Lower Tester and IUT as described in Section 4.2.1 for an LE transport or Section 4.2.2 for a BR/EDR transport.

- Test Procedure

For each supported transport, the following test procedure applies to the test cases listed in the table below:

1. Read the characteristic value by executing the test procedure of GATT test case GATT/SR/GAR/BV-01-C in [5]. If the read value’s length is smaller than a full MTU packet, proceed directly to step 3, otherwise continue with step 2.

2. Read the characteristic value by executing the test procedure of GATT test case GATT/SR/GAR/BV-04-C in [5].

3. Verify the longer of the two characteristic values obtained in steps 1 and 2 meet the requirements of the service.

- Expected Outcome

The following pass and fail verdicts apply to the test cases listed in Table 4.3.

Pass verdict
The characteristic is successfully read and the characteristic value meets the requirements of the service.

- Notes

The ATT_Error_Responses “Request Not Supported” or “Attribute Not Long” are acceptable outcomes in response to step 2.
Table 4.3: Characteristic Read Test Cases

<table>
<thead>
<tr>
<th>Test Case</th>
<th>Property Requirements</th>
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<tr>
<td>4.5.1 DIS/SR/CR/BV-01-C [Characteristic Read - Manufacturer Name String]</td>
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<td>4.5.2 DIS/SR/CR/BV-02-C [Characteristic Read - Model Number String]</td>
<td>[3] Section 3.2, [6] Device Information Service 1.1</td>
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<td>4.5.3 DIS/SR/CR/BV-03-C [Characteristic Read - Serial Number String]</td>
<td>[3] Section 3.3, [6] Device Information Service 1.1</td>
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<td>4.5.4 DIS/SR/CR/BV-04-C [Characteristic Read - Hardware Revision String]</td>
<td>[3] Section 3.4, [6] Device Information Service 1.1</td>
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<td>4.5.5 DIS/SR/CR/BV-05-C [Characteristic Read - Firmware Revision String]</td>
<td>[3] Section 3.5, [6] Device Information Service 1.1</td>
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<td>4.5.6 DIS/SR/CR/BV-06-C [Characteristic Read - Software Revision String]</td>
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<td>4.5.8 DIS/SR/CR/BV-08-C [Characteristic Read - IEEE 11073-20601 Regulatory Certification Data List]</td>
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<tr>
<td>4.5.9 DIS/SR/CR/BV-09-C [Characteristic Read – PnP ID]</td>
<td>[3] Section 3.9, [6] Device Information Service 1.1</td>
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</tbody>
</table>

4.6 Service Discovery

Verify the SDP record for the DIS service.

4.6.1.1 DIS/SR/SDP/BV-01-C [SDP Record]

- Test Purpose
  
  Verify the SDP records for the Device Information Service.

- Reference
  
  [3] 4

- Initial Condition
An ACL connection over BR/EDR is established between the Lower Tester and IUT.

- **Test Procedure**
  1. The Lower Tester establishes an SDP connection to the IUT.
  2. The Lower Tester sends SDP requests to retrieve all attributes of the SDP record for the Device Information service.

- **Expected Outcome**
  
  **Pass verdict**
  
  The SDP record for the service is found.
  
  All attributes which are mandatory for the service are present in the SDP record.
  
  The values of all attributes in the SDP record meet the requirements of the service.
  
  The GATT Start Handle and GATT End Handle parameters in the SDP record match the start handle and end handle of the service.
# 5 Test Case Mapping

The Test Case Mapping Table (TCMT) maps test cases to specific capabilities in the ICS.

The columns for the TCMT are defined as follows:

**Item:** contains an y/x reference, where y corresponds to the table number and x corresponds to the feature number as defined in the ICS Proforma for Device Information Service (DIS) [4]. 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.

**Test Case Applicable:** may be used to note if a test is required based on the supported features.

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.

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<th>Item</th>
<th>Feature</th>
<th>Test Case(s)</th>
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<td>PnP ID</td>
<td>DIS/SR/DEC/BV-09-C</td>
<td>DIS/SR/CR/BV-09-C</td>
</tr>
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*Table 5.1: Test Case Mapping*