HTTP Proxy Service (HPS)

*Bluetooth*® Test Suite

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- **Group Prepared By**: Internet Working Group
- **Feedback Email**: int-main@bluetooth.org
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1 Scope

This Bluetooth HPS Test document contains the Test Suite Structure (TSS) and Test Cases (TC) to test the HTTP Proxy Service (HPS) v1.0.

The objective of this test suite is to provide a basis for interoperability 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 Version 4.0 or later
[3] HTTP Proxy Service v1.0
[4] HTTP Proxy Service ICS Proforma
[5] GATT Test Suite GATT.TS
[6] IETF RFC 2616 Hypertext Transfer Protocol -- HTTP/1.1
   http://www.ietf.org/rfc/rfc2616.txt
[7] IETF RFC 2818 HTTP Over TLS
   http://www.ietf.org/rfc/rfc2818.txt
[8] HTTP Proxy Service IXIT Proforma

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 Test Strategy

The test objectives are to verify functionality of the HTTP Proxy Service within a Bluetooth GATT Server and enable interoperability through Bluetooth Internet gateways to Internet HTTP servers.

The testing approach is to cover mandatory and optional requirements in the service specification (within scope of the Bluetooth SIG) and to match these to the support of the IUT as described in the HPS ICS Proforma [4].

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

3.2 Test Groups

The test suite structure is a tree with the first level representing protocol groups.

3.2.1 HPS Support

Verify the HPS Service definition.

3.2.2 HPS characteristics and descriptors

Verify the presence and contents of characteristic declarations.

Verify the presence and contents of characteristic descriptors.

3.2.3 Characteristic Read and Write

Verify characteristics which support reading can be read. Verify the format and value of characteristic values, including those received from a (simulated) remote HTTP Server.

Verify characteristics which support writing can be written. Verify that the format and values of the written characteristics are delivered to a (simulated) remote HTTP Server.

3.2.4 Characteristic Notifications

Verify characteristics (HTTP Status Code) which support notification can be correctly configured, and can execute the notification operation.

3.2.5 Service Procedure

Verify end of procedures requested by writing to the control point are notified to the client using the HTTP Status characteristic.

3.2.6 SDP Record

Verify the SDP record for the service.
3.2.7 LE Connection Procedure

Verify that an HPS Server includes the HPS UUID in advertising, and connects to HPS Clients which include the HPS UUID in Service Solicitation AD type fields.

Verify that HPS Servers support Direct and Undirected Connectable modes.
4 Test Cases (TC)

4.1 Introduction

4.1.1 TC Naming Conventions

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

<table>
<thead>
<tr>
<th>Identifier Abbreviation</th>
<th>Spec Identifier &lt;spec abbreviation&gt;</th>
</tr>
</thead>
<tbody>
<tr>
<td>HPS</td>
<td>HTTP Proxy Service</td>
</tr>
<tr>
<td>Identifier Abbreviation</td>
<td>Role Identifier &lt;IUT role&gt;</td>
</tr>
<tr>
<td>SR</td>
<td>Server role</td>
</tr>
<tr>
<td>Identifier Abbreviation</td>
<td>Feature Identifier &lt;feat&gt;</td>
</tr>
<tr>
<td>ADV</td>
<td>LE Connection Procedures</td>
</tr>
<tr>
<td>CN</td>
<td>Characteristic Notification</td>
</tr>
<tr>
<td>CON</td>
<td>Configure Notification</td>
</tr>
<tr>
<td>CR</td>
<td>Characteristic Read</td>
</tr>
<tr>
<td>CW</td>
<td>Characteristic Write</td>
</tr>
<tr>
<td>DEC</td>
<td>Characteristic Declaration</td>
</tr>
<tr>
<td>DES</td>
<td>Characteristic Descriptors</td>
</tr>
<tr>
<td>SD</td>
<td>Service Definition</td>
</tr>
<tr>
<td>SDP</td>
<td>SDP Record</td>
</tr>
<tr>
<td>SP</td>
<td>Service Procedures</td>
</tr>
</tbody>
</table>

Table 4.1 HPS TC Feature 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 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 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 is 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. If 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 BR/EDR Transport

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

4.2.2 ATT Bearer on LE Transport

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

Verify the HPS Service definition.

4.3.1 HPS/SR/SD/BV-01-C [HPS Service Definition]

• Test Purpose
  Verify that the IUT has one instantiation of the HTTP Proxy Service as a primary service.

• Reference
  [3] 2

• Initial Condition
  Establish an ATT Bearer connection between the Lower Tester as described in Section 4.2.1 if using a BR/EDR transport or Section 4.2.2 if using an LE transport.

• Test Procedure
  The Lower Tester sends an ATT_Read_By_Group_Type_Request (0x0001, 0xFFFF) with the Attribute Type parameter set to the UUID for «Primary Service» or an ATT_Find_By_Type_Value_Request (0x0001, 0xFFFF) to the IUT, with type set to «Primary Service» and Value set to «HTTP Proxy Service». Verify one attribute handle range is returned, containing the starting handle and the ending handle of the service definition.

• Expected Outcome
  Pass verdict
  One attribute handle range is returned containing the starting handle and the ending handle of the HTTP Proxy Service definition. The Attribute Type in that service declaration is «Primary Service».

4.3.2 HPS/SR/SDP/BV-01-C [SDP Record]

• Test Purpose
  Verify the SDP record for the HTTP Proxy Service. This test only applies if the HPS is using BR/EDR transport.

• Reference
  [3] 2, 3.7

• Initial Condition
  An ACL connection over BR/EDR is established between the Lower Tester and the IUT as described in 4.2.1.

• 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 HTTP Proxy Service.
• Expected Outcome
  
  Pass verdict

  The SDP record for the service is found.

  All attributes, which are mandatory 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.

4.4 Characteristic Declaration

• Test Purpose

  This test group contains test cases to verify that the characteristic property field of the characteristic declaration meets the requirements of the service. The verification is performed one property at a time, as enumerated in the test cases in Table 4.2 HPS Characteristic Declaration Tests using this generic test procedure.

<table>
<thead>
<tr>
<th>Test Case</th>
<th>Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>4.4.1 HPS/SR/DEC/BV-01-C [Characteristic Declaration – URI]</td>
<td>[3] 3.1</td>
</tr>
<tr>
<td>4.4.2 HPS/SR/DEC/BV-02-C [Characteristic Declaration – HTTP Headers]</td>
<td>[3] 3.2</td>
</tr>
<tr>
<td>4.4.3 HPS/SR/DEC/BV-03-C [Characteristic Declaration – HTTP Entity Body]</td>
<td>[3] 3.3</td>
</tr>
<tr>
<td>4.4.4 HPS/SR/DEC/BV-04-C [Characteristic Declaration – HTTP Control Point]</td>
<td>[3] 3.4</td>
</tr>
</tbody>
</table>

Table 4.2 HPS Characteristic Declaration Tests

• Reference
  
  See Table 4.2

• Initial Condition

  The handle range of the service has been previously discovered by the Lower Tester in test case HPS/SR/SD/BV-01-C [HPS Service Definition] or HPS/SR/SDP/BV-01-C [SDP Record] above.

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

• Test Procedure

  The following test procedure applies to the test cases listed in Table 4.2.
1. Discover all characteristics of the service by executing the test procedure of GATT test case GATT/SR/GAD/BV-04-C and/or GATT/SR/GAD/BV-05-C in [5].

2. For a discovered characteristic that is listed in Table 4.2, verify the characteristic properties field of the characteristic declaration meets the requirements of the service.

   • Expected Outcome
     
     Pass verdict

     The characteristic is discovered and the characteristic properties field of the characteristic declaration meets the requirements of the service.

4.5 Characteristic Descriptors

This test group contains test cases to verify that the characteristic descriptors meet the requirements of the HTTP Proxy Service.

4.5.1 HPS/SR/DES/BV-01-C [HTTP Status Code - Client Characteristic Configuration Descriptor]

   • Test Purpose
     
     To verify that the characteristic descriptor declaration for HTTP Status code Client Configuration Descriptor meets the requirements of the service.

   • Reference
     
     [3] 3.5

   • Initial Condition
     
     The handle range of HTTP Status Code characteristic 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 if using a BR/EDR transport or Section 4.2.2 if using an LE transport.

   • Test Procedure
     
     The following test procedure applies to the HTTP Status Code characteristic

     1. Discover all characteristic descriptors of the characteristic by executing the test procedure of GATT test case GATT/SR/GAD/BV-06-C in [5] using the handle range of the characteristic. The IUT returns at least one handle-UUID pair.

     2. If the UUID in a handle-UUID pair is for a characteristic descriptor referenced in the test case above, read the characteristic descriptor by executing the test procedure of GATT test case GATT/SR/GAR/BV-06-C in [5].

   • Expected Outcome
     
     Pass verdict

     The characteristic descriptor for the HTTP Status code is discovered, the characteristic descriptor is read, and the value of the characteristic descriptor supports notification.
4.6 Characteristic Read

- Test Purpose

This test group contains test cases to read and verify that the characteristic values required by the service are compliant. The verification is done one value at a time, as enumerated in the test cases in Table 4.3, using this generic test procedure. Note that for URI, HTTP Header and Message body that GATT long read characteristic value sub-procedure should be used.

<table>
<thead>
<tr>
<th>Test Case</th>
<th>Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>4.6.1 HPS/SR/CR/BV-01-C [Characteristic Read Long – HTTP Headers]</td>
<td>[3] 3.2</td>
</tr>
<tr>
<td>4.6.2 HPS/SR/CR/BV-02-C [Characteristic Read Long – HTTP Entity Body]</td>
<td>[3] 3.3</td>
</tr>
<tr>
<td>4.6.3 HPS/SR/CR/BV-03-C [Characteristic Read – HTTPS Security]</td>
<td>[3] 3.6</td>
</tr>
</tbody>
</table>

Table 4.3 HPS Characteristic Read Tests

- Reference

See Table 4.3

- 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 procedures 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 if using a BR/EDR transport or Section 4.2.2 if using an LE transport.

- Test Procedure

The following test procedure applies to the test cases listed in Table 4.3.

1. Read the characteristic value by executing the test procedure of GATT test case GATT/SR/GAR/BV-01-C or GATT/SR/GAR/BV-04-C in [5].
2. Verify the characteristic value meets the requirements of the service.

- Expected Outcome

Pass verdict

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

4.7 Characteristic Write

- Test Purpose

This test group contains test cases to write and verify that the characteristic values required by the service are compliant. The verification is done one value at a time, as enumerated in the test cases in
Table 4.4, using this generic test procedure. Note that for URI, HTTP Header and Message body that long writes may be used. HTTP Control Point uses Write Characteristic Value GATT sub-procedure.

<table>
<thead>
<tr>
<th>Test Case</th>
<th>Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>4.7.1 HPS/SR/CW/BV-01-C [Characteristic Write Characteristic Value – URI]</td>
<td>[3] 3.1</td>
</tr>
<tr>
<td>4.7.2 HPS/SR/CW/BV-02-C [Characteristic Write Characteristic Value – HTTP Headers]</td>
<td>[3] 3.2</td>
</tr>
<tr>
<td>4.7.3 HPS/SR/CW/BV-03-C [Characteristic Write Characteristic Value – HTTP Entity Body]</td>
<td>[3] 3.3</td>
</tr>
<tr>
<td>4.7.4 HPS/SR/CW/BV-04-C [Characteristic Write Characteristic Value – HTTP Control Point]</td>
<td>[3] 3.4</td>
</tr>
<tr>
<td>4.7.5 HPS/SR/CW/BV-05-C [Characteristic Write Long Characteristic Value – URI]</td>
<td>[3] 3.1</td>
</tr>
<tr>
<td>4.7.6 HPS/SR/CW/BV-05-C [Characteristic Write Long Characteristic Value – HTTP Headers]</td>
<td>[3] 3.2</td>
</tr>
<tr>
<td>4.7.7 HPS/SR/CW/BV-07-C [Characteristic Write Long Characteristic Value – HTTP Entity Body]</td>
<td>[3] 3.3</td>
</tr>
</tbody>
</table>

Table 4.4 HPS Characteristic Write Tests

• Reference
  See Table 4.4

• 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 if using a BR/EDR transport or Section 4.2.2 if using an LE transport.

• Test Procedure
  1. Write the characteristic value by executing the test procedure of GATT test case GATT/SR/GAW/BV-03-C or GATT/SR/GAW/BV-05-C in [5].
  2. Verify the characteristic value meets the requirements of the service.

• Expected Outcome
  Pass verdict

  The characteristic is successfully written and the characteristic value meets the requirements of the service.
4.8 Configure Notification

4.8.1 HPS/SR/CON/BV-01-C [Configure Notification – HTTP Status Code]

- Test Purpose
  
  Verify that the Server can configure the HTTP Status Code characteristic for notification.

- Reference
  
  [3] 3.5.1

- Initial Condition
  
  The handle of the HTTP Status Code characteristic and the HTTP Status Code client characteristic configuration descriptor has been previously discovered by the Lower Tester during the test procedure in Section 4.5 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 if using a BR/EDR transport or Section 4.2.2 if using an LE transport.

- Test Procedure
  
  1. Disable notification by writing value 0x0000 to the client characteristic configuration descriptor of the characteristic using the test procedure of GATT test case GATT/SR/GAW/BV-08-C in [5].
  2. Enable notification by writing value 0x0001 to the client characteristic configuration descriptor of the HTTP Status Code characteristic.
  3. The Lower Tester reads the value of the client characteristic configuration descriptor.

- Expected Outcome
  
  Pass verdict

  The characteristic descriptor is successfully written and the value returned when read is consistent with the value written.

4.9 Characteristic Notification

4.9.1 HPS/SR/CN/BV-01-C [Characteristic Notification – HTTP Status Code]

- Test Purpose
  
  Verify that the Server can notify the HTTP Status Code characteristic.

- Reference
  
  [3] 3.5

- Initial Condition
  
  The HTTP Status Code characteristic is configured for notification.

  Establish an ATT Bearer connection between the Lower Tester and IUT as described in Section 4.2.1 if using a BR/EDR transport or Section 4.2.2 if using an LE transport.
• **Test Procedure**

1. A connection is established between the Lower Tester and IUT.
2. Configure the HTTP Proxy data characteristics: URI, HTTP Header and HTTP Entity Body, conditioned by the IXIT [8], and write a value to the HTTP Control Point characteristic, so that the IUT will send one notification of the HTTP Status characteristic.
3. The Lower Tester receives one `ATT_Handle_Value_Notification` from the IUT containing the HTTP Status code value (uint16), received HTTP header size in octets, and received HTTP entity body size (1 octet) in Data Status field.
4. Verify the characteristic value meets the requirements of the service.

• **Expected Outcome**

**Pass verdict**

The IUT indicates a value in HTTP Status Code characteristic appropriate to the requirements in the Service.

### 4.10 Service Procedures

#### 4.10.1 Supported Control Point Procedure Request

• **Test Purpose**

Verify when the HTTP configuration characteristics are configured, and one of the valid op-codes defined for the HTTP control point in [3] Table 3.2 is requested by writing to the control point, a notification on HTTP Status Code characteristic is sent to the HPS client, marking the end of the requested procedure.

<table>
<thead>
<tr>
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<th></th>
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<tr>
<td><strong>4.10.1.1 HPS/SR/SP/BV-01-C [HTTP GET]</strong></td>
<td>Write: URI</td>
<td>Write: Header</td>
<td>Write: Body</td>
<td>Write: HTTP GET</td>
<td>N/A</td>
<td>200</td>
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<tr>
<td></td>
<td>Read: Header</td>
<td>Read: Body</td>
<td></td>
<td></td>
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<tr>
<td><strong>4.10.1.2 HPS/SR/SP/BV-02-C [HTTP HEAD]</strong></td>
<td>Write: URI</td>
<td>Write: Header</td>
<td>Write: Body</td>
<td>Write: HTTP HEAD</td>
<td>N/A</td>
<td>200</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Read: Header</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>4.10.1.3 HPS/SR/SP/BV-03-C [HTTP POST]</strong></td>
<td>Write: URI</td>
<td>Write: Header</td>
<td>Write: Body</td>
<td>Write: HTTP POST</td>
<td>N/A</td>
<td>200</td>
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<td>4.10.1.4 HPS/SR/SP/BV-04-C [HTTP PUT]</td>
<td>Write: URI Write: Header Write: Body Write: HTTP PUT</td>
<td>N/A</td>
<td>200</td>
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<tr>
<td>4.10.1.5 HPS/SR/SP/BV-05-C [HTTP DELETE]</td>
<td>Write: URI Write: Header Write: Body Write: HTTP DELETE</td>
<td>N/A</td>
<td>200</td>
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<tr>
<td>4.10.1.8 HPS/SR/SP/BV-08-C [HTTPS POST]</td>
<td>Write: URI Write: Header Write: Body Write: HTTPS POST</td>
<td>TRUE</td>
<td>200</td>
<td></td>
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<td></td>
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<tr>
<td>4.10.1.9 HPS/SR/SP/BV-09-C [HTTPS PUT]</td>
<td>Write: URI Write: Header Write: Body Write HTTPS PUT</td>
<td>TRUE</td>
<td>200</td>
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<td>4.10.1.10 HPS/SR/SP/BV-10-C [HTTPS DELETE]</td>
<td>Write: URI Write: Header Write: Body Write HTTPS DELETE</td>
<td>TRUE</td>
<td>200</td>
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<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 4.5 HTTPS valid command test

- Reference
  
  [3] 3.5, 3.6, Appendix B

  [6], [7], [8]

- Initial Condition

  Establish an ATT Bearer connection between the Lower Tester and IUT as described in Section 4.2.1 if using a BR/EDR transport or Section 4.2.2 if using an LE transport.
The HTTP Status Code characteristic is configured for notification.

The Lower Tester configures the URI, HTTP Headers and HTTP Entity Body Characteristics with valid values, conditioned by information in the IXIT [8]. If no entity body will be sent, the Lower Tester configures the Entity Body Characteristic by writing a zero length value; GET, HEAD and DELETE.

The IUT is connected to an Upper Tester which emulates an HTTP Server.

- Test Procedure
  1. The Lower Tester performs a Write Characteristic Value to the HTTP Control Point characteristic, with a corresponding command chosen from [3] Table 3.2.
  2. The IUT conducts HTTP operations with the ‘Upper Tester’.
  3. The ‘Upper Tester’ responds with an HTTP response code.
  4. The IUT captures that HTTP response code, and the sizes of the received header and message body, if any.
  5. The IUT notifies the Lower Tester with the HTTP Status Code characteristic, from the previous step.
  6. If an HTTPS command was written to the HTTP Control Point characteristic, the IUT (HPS Client) will read the HTTP Security characteristic.

- Expected Outcome
  Pass verdict

An appropriate HTTP or HTTPS response code is notified to the Lower Tester. If an HTTPS command was written to HTTP Control Point, the result of reading the HTTP Security Characteristic will be TRUE.

4.10.2 HPS/SR/SP/BV-11-C [HTTP Request Cancel]

- Test Purpose
  To verify that an HTTP Cancel request message received from the HPS Client is processed properly by the IUT.

- Reference
  [3] 3.4, 3.5, 3.6, Appendix B, [6], [7], [8]

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

  The HTTP Status Code characteristic is configured for notification.

  The Lower Tester configures the URI, HTTP Headers and HTTP Entity Body Characteristics with valid values, conditioned by information in the IXIT [8].

  The IUT is connected to an Upper Tester which emulates an HTTP Server.
• Test Procedure

1. The Lower Tester performs a Write Characteristic Value to the HTTP Control Point characteristic, with a corresponding command chosen from [3] Table 3.2, except HTTP Cancel.
2. The IUT accepts the control point command, enters the ER state, and begins conducting HTTP operations with the ‘Upper Tester’.
3. While the IUT is in ER state, the Lower Tester performs a Write Characteristic Value to the HTTP Control Point with a HTTP Request Cancel code.

• Expected Outcome

Pass verdict

The IUT accepts the second write with the HTTP Cancel command.

4.10.3 HPS/SR/SP/BV-12-C [Unsupported Control Point Procedure Request]

• Test Purpose

Verify when a control point op-code that is not supported by the server is requested, a notification on HTTP Status characteristic with status ‘Invalid PDU’ is sent to client.

• Reference

[3] 3.5, Appendix B

• Initial Condition

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

The HTTP Status Code characteristic is configured for notification.

The Lower Tester configures the URI, HTTP Header and HTTP Entity Body Characteristics with valid values.

The IUT is connected to an Upper Tester which emulates an HTTP Server.

• Test Procedure

1. The Lower Tester performs a Write Characteristic Value to the HTTP Control Point characteristic, with a command not defined in [3] Table 3.2.
2. The IUT determines that the command is not supported.

• Expected Outcome

Pass verdict

The IUT sends an “Invalid Request” error response to the Lower Tester.

4.10.4 HPS/SR/SP/BI-01-C [Control Point Request without HTTP Status configuration]

• Test Purpose

If a control point procedure is requested without configuring the HTTP Status Characteristic for notification, the request is answered with an error code ‘Client Characteristic Configuration Descriptor Improperly Configured’.
• Reference
  [3] 3.5, 3.6, Appendix B
  [6], [7], [8]

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

  The HTTP Status Code characteristic is configured to inhibit notification; 0x0000 written to HTTP Proxy characteristic client characteristic configuration descriptor.

  The Lower Tester configures the URI, HTTP Headers and HTTP Entity Body Characteristics with valid values, conditioned by information in the IXIT [8]; see 4.10.1.

  The IUT is connected to an Upper Tester which emulates an HTTP Server.

• Test Procedure
  1. The Lower Tester performs a Write with Response to the HTTP Control Point characteristics, with a command chosen from [3] Table 3.2.

• Expected Outcome
  Pass verdict

  The HPS will respond with the error code “Client Characteristic Configuration Descriptor Improperly Configured”.

4.10.5 HPS/SR/SP/BI-02-C [No network available]

• Test Purpose
  Verify if an HPS is disconnected from the internet, a write to the HTTP Control Point is answered with an error code.

• Reference
  [3] 1.6, 3.4, [8]

• Initial Condition
  The Lower Tester configures the URI, HTTP Header and HTTP Entity Body Characteristics with valid values, conditioned by information in the IXIT [8].

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

  The IUT is logically disconnected to an Upper Tester which emulates an HTTP Server. Example conditions: network disconnected, connection to a router not established.
**Test Procedure**

1. The Lower Tester performs a Write Characteristic Value to the HTTP Control Point characteristics, with a command chosen from [3] Table 3.2.
2. The IUT determines that the network connection is not available.

**Expected Outcome**

*Pass verdict*

The IUT sends an “ATT Network Not Available” error code to the Lower Tester.

### 4.10.6 HPS/SR/SP/BI-03-C [Received HTTP Header is too large]

**Test Purpose**

Verify that the IUT can detect an incoming HTTP header size which is too large for the HTTP Headers characteristic, and indicate this size in the HTTP Status Code notification.

**Reference**

[3] 3.5, Appendix B

[6], [7], [8].

**Initial Condition**

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

The HTTP Status Code characteristic is configured for notification.

The Lower Tester configures the URI, HTTP Headers and HTTP Entity Body Characteristics with valid values, conditioned by information in the IXIT for an HTTP HEAD Request.

The IUT is connected to an Upper Tester which emulates an HTTP Server.

The ‘Upper Tester’ is conditioned to return an HTTP Header larger than 512 octets.

**Test Procedure**

1. The Lower Tester performs a Write Characteristic Value to the HTTP Control Point characteristic, with an HTTP Head request from [3] Table 3.2.
2. The IUT conducts HTTP Head Request with the ‘Upper Tester’.
3. The ‘Upper Tester’ responds with an HTTP response code.
4. The IUT captures that HTTP response code and the size of the received header.
5. An appropriate HTTP response code is notified to the Lower Tester in the HTTP Status Code.

**Expected Outcome**

*Pass verdict*

The HTTP Headers size notified in the HTTP Status Code is larger than 512 octets by setting bit 1 in the Data Status octet.

The first 512 octets of the HTTP header are present in the HTTP Headers characteristic.
4.10.7 HPS/SR/SP/BI-04-C [Received HTTP Message Body is too large]

- **Test Purpose**
  
  Verify that the IUT can detect an incoming HTTP message body size which is too large for the HTTP Message Body characteristic, and indicate this size in the HTTP Status Code notification.

- **Reference**
  
  [3] 3.5, Appendix B
  
  [6], [7], [8].

- **Initial Condition**
  
  Establish an ATT Bearer connection between the Lower Tester and IUT as described in Section 4.2.1 if using a BR/EDR transport or Section 4.2.2 if using an LE transport.

  The HTTP Status Code characteristic is configured for notification.

  The Lower Tester configures the URI, HTTP Headers and HTTP Entity Body Characteristics with valid values, conditioned by information in the IXIT for an HTTP GET Request.

  The IUT is connected to an Upper Tester which emulates an Upper Tester.

  The ‘Upper Tester’ is conditioned to return an HTTP Message Body larger than 512 octets.

- **Test Procedure**
  
  1. The Lower Tester performs a Write Characteristic Value to the HTTP Control Point characteristic, with an HTTP Head request from [3] Table 3.2.
  2. The IUT conducts HTTP GET Request with the ‘Upper Tester’.
  3. The ‘Upper Tester’ responds with an HTTP response code
  4. The IUT captures that HTTP response code and the size of the received message body.
  5. An appropriate HTTP response code is notified to the Lower Tester in the HTTP Status Code

- **Expected Outcome**
  
  **Pass verdict**

  The HTTP Message Body size notified in the HTTP Status Code is larger than 512 octets, by setting bit 3 in the Data Status octet.

  The first 512 octets of the HTTP message body are present in the HTTP Entity Body Characteristic.

4.10.8 HPS/SR/SP/BI-05-C [Request already in progress]

- **Test Purpose**
  
  Verify if an HPS client writes a command other than ‘HTTP Request Cancel’ to an HPS server while the HPS server is in ER state, the HPS server response with a ‘Request already in Progress’ error code.

- **Reference**
  
  [3] 1.6, 3.4, [8]
• Initial Condition
The Lower Tester configures the URI, HTTP Headers and HTTP Entity Body Characteristics with valid values, conditioned by information in the IXIT [8]. The command can be any valid value except HTTP CANCEL.

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

The IUT is logically connected to an Upper Tester which emulates an HTTP Server.

• Test Procedure
1. The Lower Tester performs a Write Characteristic Value to the HTTP Control Point characteristics, with a command chosen from [3] Table 3.2, except for HTTP Cancel Request.
2. The Lower Tester waits for a Write Response from the IUT.
3. The Lower tester performs another Write Characteristic Value to the HTTP Control Point characteristic, with a valid new command chosen from [3] Table 3.2, except for HTTP Cancel Request.

• Expected Outcome
Pass verdict

The IUT sends an “ATT Request Already in Progress” error code to the Lower Tester.

4.10.9 HPS/SR/SP/BI-06-C [Invalid Request]

• Test Purpose
Verify if an HPS client writes a command to an HPS server while the HPS server but omits one of the essential characteristics (URI, HTTP Headers, HTTP Message Body), the HPS replies with an Invalid Request error code.

• Reference
[3] 1.6, 3.4, [8]

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

The IUT is logically connected to an Upper Tester which emulates an Upper Tester.

• Test Procedure
1. The Lower Tester configures some of the URI, HTTP Headers and HTTP Entity Body Characteristics with valid values, conditioned by information in the IXIT [8] for an HTTP PUT command. The Lower Tester must omit one or more of these characteristics.
2. The Lower Tester performs a Write Characteristic Value to the HTTP Control Point characteristics, with an HTTP PUT command.
• Expected Outcome
  Pass verdict

  The IUT sends an “Invalid Request” error code to the Lower Tester.

4.11 LE Connection Procedure

4.11.1 HPS/SR/ADV/BV-01-C [Advertise HPS UUID in AD type field]

• Test Purpose
  Verify that an HPS Server IUT includes the HPS UUID in the AD type field.

• Reference
  [2] GAP 11.1.1

• Initial Condition
  The HPS Server IUT is in Link Layer State “standby”.

• Test Procedure
  The Upper Tester orders the IUT to start advertising; the IUT enters a discoverable mode.

• Test Condition
  It must be possible to order IUT to start advertising.

• Expected Outcome
  Pass Verdict

  The advertising type field contains the HPS Service UUID.

4.11.2 HPS/SR/ADV/BV-02-C [Connect with HPS Clients that include the HPS UUID in the AD type field]

• Test Purpose
  Verify that an HPS Server IUT will detect and connect with lower tester which includes the HPS UUID in a Service Solicitation AD type field.

• Reference
  [2] GAP 11.1.9

• Initial Condition
  The HPS Server IUT is in Link Layer State “standby”.

• Test Procedure
  The IUT enters a discoverable mode.

  The Lower Tester starts advertising with a Service Solicitation data type. The AD type includes the HPS UUID.
• Expected Outcome
  
  Pass Verdict
  
  The IUT sends a connect request packet to the Lower Tester.
5 Test Case Mapping

The Test Case Mapping Table (TCMT) maps test cases to specific capabilities in the ICS. Profiles, protocols and services may define multiple roles, and it is possible that a product may implement more than one role. 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 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 the HTTP Proxy Service (HPS) [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.

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>
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<td>Service Supported over BR/EDR</td>
<td>HPS/SR/SDP/BV-01-C</td>
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<td>HPS 1/2</td>
<td>Service Supported over LE</td>
<td>HPS/SR/SD/BV-01-C</td>
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<td>HPS/SR/CW/BV-05-C</td>
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<td>HTTP Headers Characteristic</td>
<td>HPS/SR/DEC/BV-02-C, HPS/SR/CR/BV-01-C,</td>
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<td>HPS/SR/CW/BV-02-C, HPS/SR/CW/BV-06-C</td>
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<td>HTTP CANCEL</td>
<td>HPS/SR/SP/BV-11-C</td>
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<td>HPS 2/19</td>
<td>HPS Advertising includes HPS UUID in AD type field</td>
<td>HPS/SR/ADV/BV-01-C</td>
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<tr>
<td>HPS 2/10</td>
<td>HPS Server connects with HPS client including HPS UUID in AD type field</td>
<td>HPS/SR/ADV/BV-02-C</td>
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*Table 5.1: Test Case Mapping*
# 6 Revision History and Contributors

## Revision History

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<th>Comments</th>
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<td>2014-07-02</td>
<td>First draft, structure</td>
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<tr>
<td>D09r01</td>
<td>2014-07-09</td>
<td>Add v0.7 level material: TSS, TP, TCMT, not test cases</td>
</tr>
<tr>
<td>D09r02</td>
<td>2014-07-10</td>
<td>Comment resolution at 10 July CC</td>
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<tr>
<td>D09r03</td>
<td>2014-07-15</td>
<td>Added tests for characteristic behavior</td>
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<td>D09r04</td>
<td>2014-07-16</td>
<td>Accepted changes from 10 July CC</td>
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<td>Added SP test cases</td>
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<tr>
<td>D09r05</td>
<td>2014-07-17</td>
<td>Result of discussion at IWG CC 17 July</td>
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<td>Expand Service Procedure test cases</td>
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<td>Expand TCMT to accommodate Service Procedures</td>
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<tr>
<td>D09r07</td>
<td>2014-07-21</td>
<td>Process comments from Victor</td>
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<tr>
<td>D09r08</td>
<td>2014-07-22</td>
<td>TCMT update to align with ICS Table number changes</td>
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<tr>
<td>D09r09</td>
<td>2014-07-24</td>
<td>Assign with decisions made on 24 July CC</td>
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<td>Accept agreed changes</td>
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<td>2014-07-30</td>
<td>Update to track HPS spec D09r11</td>
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<td>Add BI test for “insufficient resources” if network disconnected</td>
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<td>Add BI tests for header and entity body too big</td>
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<td>Rename test for ‘network not found’ error code</td>
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| D09r14           | 2014-08-11 | Accept TE changes  
Update to track latest BARB version:  
Change TP/SP/BV-11-C  
Modify TP/SP/BI-03-C  
Restore TP/SP/BI-04-C, and track the specification  
Add TP/SP/BI-05-C and TP/SP/BI-06-C, ditto |
| D09r15           | 2014-08-12 | More comments from SIG TE and from BTI                                                                                                                                                          |
| D09r16           | 2014-08-14 | CC decisions                                                                                                                                                                                  |
| D09r17           | 2014-08-20 | Accept previous resolved comments  
Propose responses to BTI comments                                                                                                                                                                |
| D09r18           | 2014-08-21 | Process last BTI comments                                                                                                                                                                      |
| D09r19           | 2014-08-22 | Merged in comments and proposed responses to Magnus.  
Renamed file.                                                                                                                                                                                  |
| D09r20           | 2014-08-25 | Final BTI comments                                                                                                                                                                             |
| D09r21           | 2014-09-17 | Amend TP/SP/BI-01-C from IOP feedback                                                                                                                                                           |
| D09r22           | 2014-09-30 | Proposed additions for HPS new section 4: LE Connection Procedures                                                                                                                                            |
| D09r23           | 2014-10-09 | Removed Directed and Undirected Connectable mode TC                                                                                                                                              |
| D09r24           | 2014-10-23 | Replaced redundant use of TP/CON by TP/ADV                                                                                                                                                      |
| D10r00           | 2015-02-18 | Minor updates after IOP                                                                                                                                                                         |
| D10r01           | 2015-02-19 | Accept BTI approved changes                                                                                                                                                                     |
| D10r02           | 2015-02-20 | Addition changes to make URI not readable                                                                                                                                                      |
| D10r03           | 2015-04-13 | Note that the Entity Body characteristic needs to be initialized for all conditions. If it is a GET, it should be initialized with a zero length value                                                  |
| TS 1 0 4         | 2015-06-03 | Update with proposed comment resolutions                                                                                                                                                        |
| TS 1 0 5         | 2015-07-02 | Removed comments                                                                                                                                                                               |
| TS 1 0 6         | 2015-07-15 | Proposed responses to BTI comments                                                                                                                                                              |
| TS 1 0 7         | 2015-08-05 | Revised with BARB permission: replaced error code                                                                                                                                                 |
| TS 1 0 8         | 2015-08-06 | Final revision for BTI                                                                                                                                                                          |
Revision History

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<tr>
<th>Revision</th>
<th>Date</th>
<th>Comments</th>
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<tr>
<td>TS 1 0 9</td>
<td>2015-08-10</td>
<td>Corrected clean version for BTI vote</td>
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<tr>
<td>1.0.0</td>
<td>2015-10-06</td>
<td>Prepared for publication</td>
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<tr>
<td>1.0.1r00</td>
<td>2016-03-01</td>
<td>TSE 6950: Updated pass verdict for test case TP/SP/BI-04-C (now HPS/SR/SP/BI-04-C after ID conversion).</td>
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<td>1.0.1r01</td>
<td>2016-03-10</td>
<td>TSE 6954: Updated test procedure for HTTPS Service Procedures (HPS/SR/SP test group in Section 4.10).</td>
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<td>1.0.1r02</td>
<td>2016-04-13</td>
<td>TSE 6951: Corrected step 3 of test procedure for TP/CN/BV-01-C (now HPS/SR/CN/BV-01-C after ID conversion).</td>
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<td>1.0.1r03</td>
<td>2016-04-13</td>
<td>Converted to new Test Case ID conventions as defined in TSTO v4.1.</td>
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<tr>
<td>1.0.1r04</td>
<td>2016-04-22</td>
<td>Reviewed by Alicia Courtney. Editorial changes, including corrections to new Test Case ID conventions.</td>
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<tr>
<td>1.0.1r05</td>
<td>2016-05-12</td>
<td>Removal of section 4.1.3 Other General Information; the information there was not essential to the document</td>
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<td>1.0.1</td>
<td>2016-07-13</td>
<td>Prepared for TCRL 2016-1 publication.</td>
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<tr>
<td>1.0.1 edition 2r00</td>
<td>2018-11-29</td>
<td>Editorial changes only. Template updated. Revision History and contributors moved to the end of the document.</td>
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<tr>
<td>1.0.1 edition 2</td>
<td>2019-12-13</td>
<td>Updated copyright page and confidentiality markings to support new Documentation Marking Requirements, performed minor formatting updates, and accepted all tracked changes to prepare for edition 2 publication.</td>
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Contributors

<table>
<thead>
<tr>
<th>Name</th>
<th>Company</th>
</tr>
</thead>
<tbody>
<tr>
<td>Meagan Schuver</td>
<td>Bluetooth SIG staff</td>
</tr>
<tr>
<td>Victor Zhodzishsky</td>
<td>Broadcom (editor)</td>
</tr>
<tr>
<td>Joe Decuir</td>
<td>CSR (IWG chair)</td>
</tr>
<tr>
<td>Krishna Shingala</td>
<td>Nordic Semiconductor</td>
</tr>
</tbody>
</table>