Device Time Profile (DTP)

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 Device Time Profile with the objective to provide a high probability of air interface interoperability between the tested implementation and other manufacturers' Bluetooth devices.

2 References, definitions, and abbreviations

2.1 References

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

[1]   Bluetooth Core Specification, Version 4.2 or later

[2]   Test Strategy and Terminology Overview

[3]   Device Time Profile (DTP), Version 1.0

[4]   Device Time Service (DTS), Version 1.0

[5]   ICS Proforma for Device Time Profile, DTP.ICS

[6]   Characteristic and Descriptor descriptions are accessible via the Bluetooth SIG Assigned Numbers

[7]   GATT Test Suite, GATT.TS

[8]   IXIT Proforma for Device Time Profile (DTP)

2.2 Definitions

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

2.3 Acronyms and abbreviations

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

3   Test Suite Structure (TSS)

3.1   Overview

The DTP requires GAP, SM (for LE), SDP (for BR/EDR), and GATT. This is illustrated in Figure 3.1.

Device Time Profile Client Role			
GATT			
ATT	**GAP**	**SM** (LE)	**SDP** (BR/EDR)
L2CAP			
CONTROLLER			

Device Time Profile Server Role			
Device Time Service			
GATT			
ATT	**GAP**	**SM** (LE)	**SDP** (BR/EDR)
L2CAP			
CONTROLLER			
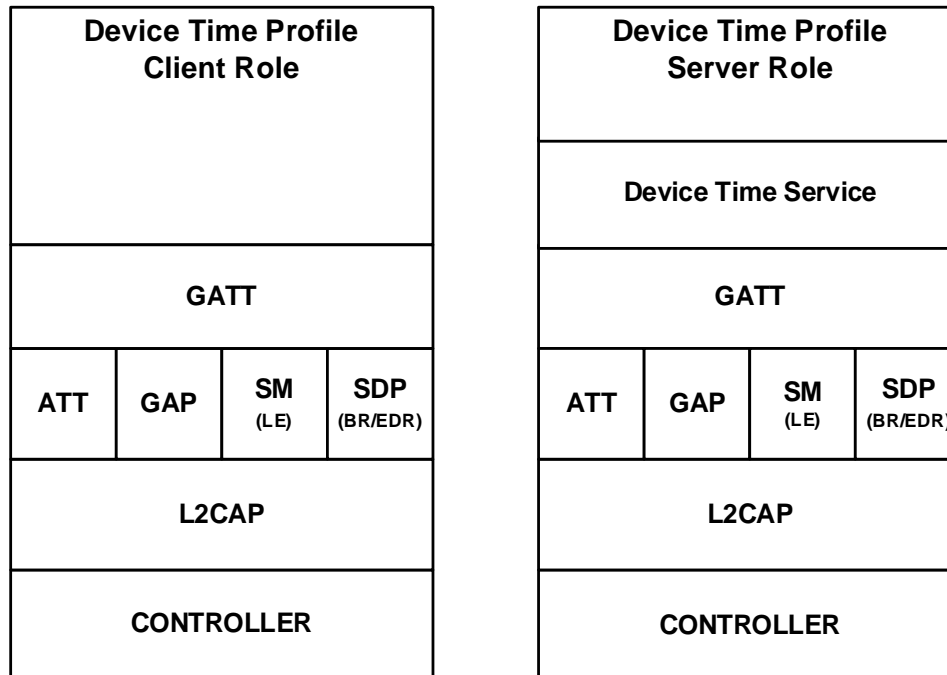
Figure 3.1: Device Time Profile Test Model

3.2   Test Strategy

The test objectives are to verify the functionality of the Device Time Profile within a Bluetooth Host and enable interoperability between Bluetooth Hosts on different devices. The testing approach covers mandatory and optional requirements in the service 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 GATT Integrated Tests

- Configure Indication and Notification

- Receive Indications

- Device Time Control Point (DTCP)

- Record Access Control Point (RACP)

- General Error Handling

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 GATT Test Suite [7] referred to as Generic GATT Integrated Tests (GGIT); when used, the test cases in GGIT are referred to through a TCID string using the following convention:
<spec abbreviation>/<IUT role>/<GGIT test group>/< GGIT class >/<xx>-<nn>-<y>.

Identifier Abbreviation	Spec Identifier <spec abbreviation>
DTP	Device Time Profile
Identifier Abbreviation	**Role Identifier <IUT role>**
CL	Client Role
SR	Server Role
Identifier Abbreviation	**Reference Identifier <GGIT test group>**
CGGIT	Client Generic GATT Integrated Tests
Identifier Abbreviation	**Reference Identifier <GGIT class>**
CHA	Characteristic
SDPNF	SDP Record Not Found
SER	Service
Identifier Abbreviation	**Feature Identifier <feat>**
CI	Characteristic Indications
DTC	Configure DTS characteristics for Indication or Notification
GEH	General Error handling
RAA	RACP – Abort procedure
RAC	RACP – Combined Report procedure
RAE	RACP – Error Handling
RAN	RACP – Report Number of Stored Records procedure
RAR	RACP – Report Stored Records procedure
SPE	Service Procedure – Error handling
SPT	Service Procedure – Device Time Control Point

Table 4.1: DTP 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.

4.2   Setup preambles

4.2.1   ATT Bearer on LE transport

- Preamble Procedure

    1. Establish an LE transport connection between the IUT (operating in the Central role) and the Lower Tester.
    2. Establish an L2CAP channel 0x0004 between the IUT and the Lower Tester over that LE transport.

4.2.2   ATT Bearer on BR/EDR transport

- Preamble Procedure

    1. Establish a BR/EDR transport connection between the IUT and the Lower Tester.
    2. Establish an L2CAP channel (PSM 0x001F) between the IUT and the Lower Tester over that BR/EDR transport.

4.2.3   Configure Server for use with Control Points

- Preamble Purpose

    This preamble procedure enables the IUT to configure the Lower Tester (Server) for use with required <Control Point Characteristic> and <Corresponding Mandatory Characteristic>, as described in Table 4.2.

- Preamble Procedure

    1. If a connection exists, it is disconnected.
    2. Establish an ATT Bearer connection between the Lower Tester and the IUT as described in Section 4.2.1, if using an LE transport, or Section 4.2.2, if using a BR/EDR transport.
    3. If the IUT supports bonding, then perform a bonding procedure.
    4. The handles of the <Control Point Characteristic>, the <Corresponding Mandatory Characteristic>, and the Client Characteristic Configuration Descriptors (CCCD), have been previously discovered by the Upper Tester during the test procedures in Section 4.3 or are known to the Upper Tester by other means.
    5. The <Control Point Characteristic> is configured for indications, and <Corresponding Mandatory Characteristic> is configured as defined in Table 4.2.

Control Point Characteristic	Corresponding Mandatory Characteristic	Corresponding Mandatory Characteristic configured for
Device Time Control Point (DTCP)	N/A	N/A
Record Access Control Point (RACP)	Time Change Log Data	Notification

Table 4.2: Configuration Preamble for DTCP and RACP

4.3 Generic GATT Integrated Tests

Execute the Generic GATT Integrated Tests defined in Section 6.4 [7] Client Test Procedures using Table 4.3 below as input:

TCID	Service / Characteristic / Descriptor	Reference	Properties	Value Length (Octets)	Service Type
DTP/CL/CGGIT/SER/BV-01-C [Service GGIT – Device Time]	Device Time Service	[3] 4, 4.2	-	-	Primary Service
DTP/CL/CGGIT/CHA/BV-02-C [Characteristic GGIT – Device Time Feature]	Device Time Feature (DT Feature) characteristic	[3] 4, 4.3.1.1	0x02 (Read) or 0x22 (Read, Indicate)	4	-
DTP/CL/CGGIT/CHA/BV-03-C [Characteristic GGIT – Device Time Parameters]	Device Time Parameters (DT Parameters) characteristic	[3] 4, 4.3.1.2	0x02 (Read) or 0x22 (Read, Indicate)	2 - 12	-
DTP/CL/CGGIT/CHA/BV-04-C [Characteristic GGIT – Device Time]	Device Time (DT) characteristic	[3] 4, 4.3.1.3	0x22 (Read, Indicate)	8 - 20	-
DTP/CL/CGGIT/CHA/BV-05-C [Characteristic GGIT – Device Time Control Point]	Device Time Control Point (DTCP) characteristic	[3] 4, 4.3.1.4	0x28 (Write, Indicate)	Skip	-
DTP/CL/CGGIT/CHA/BV-06-C [Characteristic GGIT – Time Change Log Data]	Time Change Log Data characteristic	[3] 4, 4.3.1.5	0x10 (Notify)	Skip	-
DTP/CL/CGGIT/CHA/BV-07-C [Characteristic GGIT – Record Access Control Point]	Record Access Control Point (RACP) characteristic	[3] 4, 4.3.1.6	0x28 (Write, Indicate)	Skip	-
DTP/SR/SGGIT/SDPNF/BV-01-C [Not discoverable over BR/EDR – Device Time Service]	Device Time Service	[3] 4, 4.2	-	-	-

Table 4.3: Input for the GGIT Server test procedure

4.4   Configure indication and notification

- Test Purpose

  This generic use test group contains test cases to verify that the IUT can configure a Lower Tester to indicate or to notify characteristics of the Device Time Service and reading of the CCCD value. The verification is done one value at a time, as enumerated in the test cases in Table 4.4 below, using this generic test procedure.

- Reference

  [3] 4

- Initial Condition

  - The handle of each characteristic value referenced in the test cases below has been previously discovered by the IUT during the test procedure in Section 4.3 or is known to the IUT by other means.

  - The handle of the CCCD of each characteristic referenced in the test cases below has been previously discovered by the IUT during the test procedure in Section 4.3 or is known to the IUT by other means.

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

- Test Case Configuration

TCID	Reference	Characteristic	Value
DTP/CL/DTC/BV-01-C [Configure DT Parameters characteristic for Indication]	[3] 4.6	DT Parameters	0x0002
DTP/CL/DTC/BV-02-C [Configure DT characteristic for Indication]	[3] 4.7	DT	0x0002
DTP/CL/DTC/BV-03-C [Configure DTCP for Indication]	[3] 4.9	Device Time Control Point (DTCP)	0x0002
DTP/CL/DTC/BV-04-C [Configure Time Change Log Data characteristic for Notification]	[3] 4.8	Time Change Log Data	0x0001
DTP/CL/DTC/BV-05-C [Configure RACP for Indication]	[3] 4.10	Record Access Control Point (RACP)	0x0002
DTP/CL/DTC/BV-06-C [Configure DT Feature characteristic for Indication]	[3] 4.5.2	DT Feature	0x0002

Table 4.4: Configure Indication and Notification test cases

- Test Procedure

  1. The Upper Tester sends a command to the IUT to send a correctly formatted ATT_Write_Request (0x12) with the handle of the CCCD and the value from Table 4.4 to the Lower Tester.
  2. If either DTP/CL/DTC/BV-01-C [Configure DT Parameters characteristic for Indication] or DTP/CL/DTC/BV-02-C [Configure DT characteristic for Indication] is executed, after configuring the CCCD for indication, the IUT receives an indication of the DT Parameters and DT characteristics. The IUT reports the DT Parameters and DT characteristics value to the Upper Tester.

   i. For each received DT Parameters or DT characteristic indication, the IUT sends an ATT_Handle_Value_Confirmation to the Lower Tester.

 3. The Upper Tester sends a command to the IUT to read the value of the CCCD.

 4. The IUT sends an ATT_Read_Request (0x0A) to the Lower Tester.

 5. The IUT receives an ATT_Read_Response (0x0B) from the Lower Tester.

- Expected Outcome

 Pass verdict

 The IUT successfully writes to the CCCD.

 For test cases DTP/CL/DTC/BV-01-C [Configure DT Parameters characteristic for Indication] and DTP/CL/DTC/BV-02-C [Configure DT characteristic for Indication], the IUT receives an indication of the DT Parameters and DT characteristics and reports the value to the Upper Tester.

 The IUT successfully reads the value of the CCCD and reports the value to the Upper Tester.

4.5 Receive indications

The test cases defined in this test group verify the ability of the IUT, acting in the Client role, to receive indications for the characteristics exposed by DT Service on the Server when enabled.

4.5.1 Receive DT Feature, DT Parameters and DT characteristics indication

- Test Purpose

 For each test case in Table 4.5, verify that the IUT can receive an indication of the <Characteristic> with the updated <Characteristic field> as described.

- Reference

 [3] 4

- Initial Condition

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

 - The IUT has performed the Generic GATT Integrated Tests defined in Section 4.3 and has acquired the DT Features flags of the Lower Tester.

 - The IUT, as described in Section 4.4, has configured the DT Feature, DT Parameters, and DT characteristics for indication.

- Test Case Configuration

TCID	Reference	Characteristic	Characteristic field
DTP/CL/CI/BV-01-C [Receive DT Parameters characteristic indication – Non-Logged Time Adjustment Limit change]	[3] 4.6.5	DT Parameters	Non_Logged_Time_ Adjustment_Limit
DTP/CL/CI/BV-02-C [Receive DT Parameters characteristic indication – Displayed Formats change]	[3] 4.6.6	DT Parameters	Displayed_Formats
DTP/CL/CI/BV-03-C [Receive DT characteristic indication – Base Time change]	[3] 4.7	Device Time	Base_Time

TCID	Reference	Characteristic	Characteristic field
DTP/CL/CI/BV-04-C [Receive DT characteristic indication – Time Zone change]	[3] 4.7	Device Time	Time_Zone
DTP/CL/CI/BV-05-C [Receive DT characteristic indication – DST Offset change]	[3] 4.7	Device Time	DST_Offset
DTP/CL/CI/BV-06-C [Receive DT characteristic indication – DT Status change]	[3] 4.7.2	Device Time	DT_Status
DTP/CL/CI/BV-07-C [Receive DT characteristic indication – User Time change]	[3] 4.7.3	Device Time	User_Time
DTP/CL/CI/BV-08-C [Receive DT Feature characteristic indication]	[3] 4.5.2	DT Feature	DT_Features

Table 4.5: Test Cases for indications of the DT Feature, DT Parameters and DT characteristics fields

- Test Procedure

  1. The Lower Tester sends an indication of the <Characteristic> with the updated <Characteristic field> as described in Table 4.5.
  2. The IUT receives an ATT_Handle_Value_Indication, from the Lower Tester, containing the <Characteristic> handle and value, with the updated <Characteristic field>, listed in Table 4.5 and reports the values to the Upper Tester.
  3. The IUT sends an ATT_Handle_Value_Confirmation to the Lower Tester.
  4. Verify that the characteristic value meets the requirements of the service.

- Expected Outcome

  Pass verdict

  The IUT receives an indication of the <Characteristic> with the updated <Characteristic field> and reports the values to the Upper Tester.

DTP/CL/CI/BV-09-C [Receive DT characteristic indication upon reconnection]

- Test Purpose

  Verify that, upon reconnection, the IUT can receive an indication of the DT characteristic with the DT Status field values as described in Table 4.6.

- Reference

  [3] 4.7, 4.7.2

- Initial Condition

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

  - The IUT has bonded with the Lower Tester.

  - The IUT has discovered the handle range of the DT characteristic.

- Test Procedure

  1. The Upper Tester commands the IUT to configure the DT characteristic for indication.

2. The IUT configures the DT characteristic for indication as described in Section 4.4.
3. The Lower Tester sends an ATT_Handle_Value_Indication of the DT characteristic with at least the mandatory fields.
4. The IUT receives an ATT_Handle_Value_Indication, from the Lower Tester, containing the DT characteristic with at least the mandatory fields and reports the values to the Upper Tester.
5. The IUT sends an ATT_Handle_Value_Confirmation to the Lower Tester.
6. The Upper Tester commands the IUT to disconnect from the Lower Tester.
7. The IUT disconnects from the Lower Tester.
8. The Upper Tester commands the IUT to reconnect with the Lower Tester.
9. The IUT establishes an ATT Bearer connection with the Lower Tester as described in Section 4.2.1, if using an LE transport, or Section 4.2.2 if using a BR/EDR transport.
10. The Lower Tester sends an ATT_Handle_Value_Indication of the DT characteristic with the DT Status field values as described in Table 4.6.
11. The IUT receives an ATT_Handle_Value_Indication, from the Lower Tester, containing the DT characteristic handle and value along with the DT Status field values as described in Table 4.6 and reports the values to the Upper Tester.
12. The IUT sends an ATT_Handle_Value_Confirmation to the Lower Tester.

- Expected Outcome

  <u>Pass verdict</u>

  The IUT receives an indication of the DT characteristic with at least the mandatory fields and reports the values to the Upper Tester.

  After reconnecting with the Lower Tester, the IUT receives an indication of the DT characteristic with the DT Status field values as described in Table 4.6 and reports the values to the Upper Tester.

  The values of the DT Status field meet the requirements of the service.

Characteristic	DT Status		
DT characteristic	**Flag Name**	**Bit Position**	**Bit Value**
	Time Fault	0	1
	UTC Aligned	1	0
	Qualified Local Time Synchronized	2	0
	Propose Time Update Request	3	1
	Epoch Year 2000	4	As supported
	Non-Logged Time Change Active	5	As supported
	Log Consolidation Active	6	As supported

Table 4.6: Receive Device Time Indication upon reconnection

4.6   Device Time Control Point

This test group contains test cases to verify the IUT's ability to configure, conduct compliant operation, and interpret values of the Device Time Control Point (DTCP) characteristic.

Table 4.4 in [3] and Table 3.15 in [4] define the opcodes and Time Update operand used in the DTCP procedure test cases in this section.

4.6.1   Propose Time Update

- Test Purpose

  For each test case in Table 4.7, verify that the IUT executes the Propose Time Update procedure.

- Reference

  [3] 4.9.4

- Initial Condition

  - Perform the preamble described in Section 4.2.3 with the required <Control Point Characteristic> set to DTCP characteristic.

  - The IUT is authorized to execute the Propose Time Update procedure.

  - The IUT has discovered the handle range of the DT Feature and DT characteristic.

  - The Upper Tester knows the Lower Tester's DT Features, time quality, and synchronization state.

  - The Lower Tester's Propose Time Update Request flag of the DT_Status field is set to 1.

- Test Case Configuration

TCID	Time Update operand
DTP/CL/SPT/BV-01-C [Propose Time Update]	The Base_Time_Second_Fractions_Update field is set to 0x0000. The Second-Fractions Not Valid flag of the Time_Update_Flags field is set to 1.
DTP/CL/SPT/BV-02-C [Propose Time Update with Base Time Second-Fractions]	With a valid Base_Time_Second_Fractions_Update field value. The Second-Fractions Not Valid flag of the Time_Update_Flags field is set to 0.
DTP/CL/SPT/BV-03-C [Propose Time Update – Base Time Second-Fractions not supported by Server]	Exclude Base_Time_Second_Fractions_Update field. The Second-Fractions Not Valid flag of the Time_Update_Flags field is set to 0.

Table 4.7: DTCP Propose Time Update test cases

- Test Procedure

  1. The Upper Tester sends a command to the IUT to write the Propose Time Update Opcode (0x02) to the DTCP characteristic with a Time Update operand with valid mandatory fields, the Base_Time_Second_Fractions_Update field and the Second-Fractions Not Valid flag set as described in Table 4.7.
  2. The IUT sends an ATT_Write_Request with the instruction from step 1 to the Lower Tester.
  3. The Lower Tester sends an ATT_Handle_Value_Indication of the DTCP characteristic with the DTCP Response Opcode (0x09) and an operand representing the Request Opcode (0x02) followed by the Response Value for Success (0x01).
  4. The IUT receives an ATT_Handle_Value_Indication from the Lower Tester containing the DTCP characteristic handle and value and reports it to the Upper Tester.
  5. The IUT sends an ATT_Handle_Value_Confirmation to the Lower Tester.

- Expected Outcome

  Pass verdict

  The IUT sends an ATT_Write_Request with the Propose Time Update Opcode (0x02) to the DTCP characteristic with a Time Update operand.

  The IUT receives an indication of the DTCP characteristic with the Response Value for Success (0x01) and reports it to the Upper Tester.

4.6.2   Force Time Update

- Test Purpose

  For each test case in Table 4.8, verify that the IUT executes the Force Time Update procedure.

- Reference

  [3] 4.9.5

- Initial Condition

  - Perform the preamble described in Section 4.2.3 with the required <Control Point Characteristic> set to DTCP characteristic.

  - The IUT is authorized to execute the Force Time Update procedure.

  - The IUT has discovered the handle range of the DT Feature and DT characteristic.

  - The Upper Tester knows the Lower Tester's DT Features, time quality, and synchronization state.

- Test Case Configuration

TCID	Time Update operand
DTP/CL/SPT/BV-04-C [Force Time Update]	The Base_Time_Second_Fractions_Update field is set to 0x0000. The Second-Fractions Not Valid flag of the Time_Update_Flags field is set to 1.
DTP/CL/SPT/BV-05-C [Force Time Update with Base Time Second-Fractions]	With a valid Base_Time_Second_Fractions_Update field value. The Second-Fractions Not Valid flag of the Time_Update_Flags field is set to 0.

Table 4.8: DTCP Force Time Update test cases

- Test Procedure

  1. The Upper Tester sends a command to the IUT to write the Force Time Update Opcode (0x03) to the DTCP characteristic with a Time Update operand with valid mandatory fields, the Base_Time_Second_Fractions_Update field and the Second-Fractions Not Valid flag set as described in Table 4.8.
  2. The IUT sends an ATT_Write_Request with the instruction from step 1 to the Lower Tester.
  3. The Lower Tester sends an ATT_Handle_Value_Indication of the DTCP characteristic with the DTCP Response Opcode (0x09) and an operand representing the Request Opcode (0x03) followed by the Response Value for Success (0x01).
  4. The IUT receives an ATT_Handle_Value_Indication from the Lower Tester containing the DTCP characteristic handle and value and reports it to the Upper Tester.
  5. The IUT sends an ATT_Handle_Value_Confirmation to the Lower Tester.

- Expected Outcome

  Pass verdict

  The IUT sends an ATT_Write_Request with the Force Time Update Opcode (0x03) to the DTCP characteristic with a Time Update operand.

  The IUT receives an indication of the DTCP characteristic with the Response Value for Success (0x01) and reports it to the Upper Tester.

4.6.3 Propose Non-Logged Time Adjustment Limit

- Test Purpose

  For each test case in Table 4.9, verify that the IUT executes the Propose Non-Logged Time Adjustment Limit procedure.

- Reference

  [3] 4.9.7

- Initial Condition

  - Perform the preamble described in Section 4.2.3 with the required <Control Point Characteristic> set to DTCP characteristic.

  - The IUT is authorized to execute the Propose Non-Logged Time Adjustment Limit procedure.

  - The IUT has discovered the handle range of the DT Feature and DT Parameters characteristic.

  - The Upper Tester knows the Non-Logged Time Adjustment Limit value implemented by the Lower Tester and the supported range.

- Test Case Configuration

TCID	Non-Logged Time Adjustment Limit New field value
DTP/CL/SPT/BV-06-C [Propose Non-Logged Time Adjustment Limit with the Operand value set to zero]	0x0000
DTP/CL/SPT/BV-07-C [Propose Non-Logged Time Adjustment Limit with the Operand value set to a non-zero value]	A valid value which is not zero

Table 4.9: DTCP Write to a DT Parameter test cases

- Test Procedure

  1. The Upper Tester sends a command to the IUT to write the Propose Non-Logged Time Adjustment Limit Opcode (0x04) to the DTCP characteristic with an Operand Non_Logged_Time_Adjustment_Limit_New value set as described in Table 4.9.
  2. The IUT sends an ATT_Write_Request with the instruction from step 1 to the Lower Tester.
  3. The Lower Tester sends an ATT_Handle_Value_Indication of the DTCP characteristic with the DTCP Response Opcode (0x09) and an operand representing the Request Opcode (0x04) followed by the Response Value for Success (0x01).
  4. The IUT receives an ATT_Handle_Value_Indication from the Lower Tester containing the DTCP characteristic handle and value and reports it to the Upper Tester.
  5. The IUT sends an ATT_Handle_Value_Confirmation to the Lower Tester.

- Expected Outcome

  Pass verdict

  The IUT sends an ATT_Write_Request with the Propose Non-Logged Time Adjustment Limit Opcode (0x04) to the DTCP characteristic with an Operand Non_Logged_Time_Adjustment_Limit_New value set as described in Table 4.9.

  The IUT receives an indication of the DTCP characteristic with the Response Value for Success (0x01) and reports it to the Upper Tester.

DTP/CL/SPT/BV-08-C [Retrieve Active Time Adjustments]

- Test Purpose

  Verify that the IUT executes the Retrieve Active Time Adjustments procedure.

- Reference

  [3] 4.9.8

- Initial Condition

  - Perform the preamble described in Section 4.2.3 with the required <Control Point Characteristic> set to DTCP characteristic.

  - The IUT has discovered the handle range of the DT Feature and DT characteristic.

  - The Upper Tester knows the Lower Tester's DT Features and synchronization state.

  - The Lower Tester has accumulated base time adjustments due to either consolidated logging and/or Non-Logged Time Adjustments.

- Test Procedure

  1. The Upper Tester sends a command to the IUT to write the Retrieve Active Time Adjustments Opcode (0x05) to the DTCP characteristic with no operand.
  2. The IUT sends an ATT_Write_Request with the instruction from step 1 to the Lower Tester.
  3. The Lower Tester sends an ATT_Handle_Value_Indication of the DTCP characteristic with the Report Active Time Adjustments Opcode (0x07) and an operand comprising the Base_Time, Active_Time_Adjustments, and, if supported, Base_Time_Second_Fractions fields.
  4. The IUT receives an ATT_Handle_Value_Indication from the Lower Tester containing the DTCP characteristic handle and value and reports it to the Upper Tester.
  5. The IUT sends an ATT_Handle_Value_Confirmation to the Lower Tester.

- Expected Outcome

  Pass verdict

  The IUT sends an ATT_Write_Request with the Retrieve Active Time Adjustments Opcode (0x05) to the DTCP characteristic with no operand.

  The IUT receives an indication of the DTCP characteristic with the Report Active Time Adjustments Opcode (0x07) and an operand comprising the Base_Time, Active_Time_Adjustments, and, if supported, Base_Time_Second_Fractions fields and reports it to the Upper Tester.

4.6.4   Device Time Control Point – Error Handling

This test group contains test cases to verify the IUT behavior when a Device Time Control Point error is received from the Server (Lower Tester).

DTP/CL/SPE/BI-01-C [Time Update Rejected]

- Test Purpose

  Verify that the IUT responds appropriately when it receives a DTCP Response Value of Procedure Rejected with at least one of the Rejection Flags listed in Table 4.10.

- Reference

  [3] 4.9.4

- Initial Condition

  - Perform the preamble described in Section 4.2.3 with the required <Control Point Characteristic> set to DTCP characteristic.

  - The IUT is authorized to execute a Time Update procedure.

  - The IUT has discovered the handle range of the DT Feature and DT characteristic.

  - The Upper Tester knows the Lower Tester's DT Features.

- Test Procedure

  1. The Upper Tester sends a command to the IUT to write the Propose Time Update Opcode (0x02) to the DTCP characteristic with a Time Update operand.
  2. The IUT sends an ATT_Write_Request with the instruction from step 1 to the Lower Tester.
  3. The Lower Tester sends an ATT_Handle_Value_Indication of the DTCP characteristic with the DTCP Response Opcode (0x09) and an operand representing the Request Opcode followed by the Response Value for Procedure Rejected (0x05) with at least one of the Rejection Flags listed in Table 4.10.
  4. The IUT receives an ATT_Handle_Value_Indication from the Lower Tester containing the DTCP characteristic handle and value and reports it to the Upper Tester.
  5. The IUT sends an ATT_Handle_Value_Confirmation to the Lower Tester.

- Expected Outcome

  Pass verdict

  The IUT sends an ATT_Write_Request with the Propose Time Update Opcode to the DTCP characteristic with a Time Update operand.

  The IUT receives an ATT_Handle_Value_Indication of the DTCP characteristic with the DTCP Response Value for Procedure Rejected (0x05) with at least one of the Rejection Flags listed in Table 4.10, and reports it to the Upper Tester.

Rejection Flags	
Bit Position	**Bit Value**
Bit 0	1
Bit 3	1
Bit 4	1
Bit 5	1
Bit 6	1
Bit 9	1
Bit 10	1

Table 4.10: Propose Time Update procedure - Time Update Rejection flags

4.6.4.1   Propose Non-Logged Time Adjustment Limit rejected

- Test Purpose

  For each test case in Table 4.11, verify that the IUT responds appropriately when it receives a DTCP Response Value of Procedure Rejected with the Rejection Flags as described in Table 4.11.

- Reference

  [3] 4.9.7

- Initial Condition

    - Perform the preamble described in Section 4.2.3 with the required <Control Point Characteristic> set to DTCP characteristic.

    - The IUT has discovered the handle range of the DT Feature and DT characteristic.

    - The IUT's authorization to initiate a Propose Non-Logged Time Adjustment Limit procedure is described in Table 4.11.

- Test Case Configuration

TCID	Authorization	Rejection Flags
DTP/CL/SPE/BI-02-C [Propose Non-Logged Time Adjustment Limit rejected – Not authorized]	Not authorized	Bit 1 is set to 1 - Requested procedure is not authorized.
DTP/CL/SPE/BI-03-C [Propose Non-Logged Time Adjustment Limit rejected – Proposed value is out of range]	Authorized	Bit 2 is set to 1 - Operand is out of range.

Table 4.11: Propose Non-Logged Time Adjustment Limit rejected test cases

- Test Procedure

    1. The Upper Tester sends a command to the IUT to write the Propose Non-Logged Time Adjustment Limit Opcode (0x04) to the DTCP characteristic with an Operand Non_Logged_Time_Adjustment_Limit_New value.
    2. The IUT sends an ATT_Write_Request with the instruction from step 1 to the Lower Tester.
    3. The Lower Tester sends an ATT_Handle_Value_Indication of the DTCP characteristic with the DTCP Response Opcode (0x09) and an operand representing the Request Opcode (0x04) followed by the Response Value for Procedure Rejected (0x05) with the Rejection Flags set as described in Table 4.11.
    4. The IUT receives an ATT_Handle_Value_Indication from the Lower Tester containing the DTCP characteristic handle and value and reports it to the Upper Tester.
    5. The IUT sends an ATT_Handle_Value_Confirmation to the Lower Tester.

- Expected Outcome

    Pass verdict

    The IUT sends an ATT_Write_Request with the Propose Non-Logged Time Adjustment Limit Opcode (0x04) to the DTCP characteristic with an Operand Non_Logged_Time_Adjustment_Limit_New value.

    The IUT receives an ATT_Handle_Value_Indication of the DTCP characteristic with the DTCP Response Value for Procedure Rejected (0x05) with the Rejection Flags set as described in Table 4.11 and reports it to the Upper Tester.

4.7   Record Access Control Point

This test group contains test cases to verify the IUT's ability to configure, conduct compliant operation, and interpret values of the Record Access Control Point and Time Change Log Data characteristics.

Table 4.5 in [3] defines the opcodes used in the Record Access Control Point procedure test cases in this section. Table 3.24 in [4] defines the combination of opcodes and operand used in the Record Access Control Point procedures.

4.7.1   Combined Report

• Test Purpose

For each test case in Table 4.12, verify that the IUT can perform the Combined Report procedure with the listed <Operator>, and, if applicable, Operand Sequence Number and <Filter Value(s)>.

• Reference

[3] 4.10.3, 4.10.4.2

• Initial Condition

- The Lower Tester does not permit an ATT_MTU size larger than the default ATT_MTU size for LE to be negotiated.

- The IUT knows the handle range of the DT characteristic.

- The Upper Tester knows the Next_Sequence_Number field value or sends a command to the IUT to read the DT characteristic in order to acquire the Next Sequence Number.

- Perform the preamble described in Section 4.2.3 with the required <Control Point Characteristic> set to RACP characteristic.

• Test Case Configuration

TCID	Operator	Filter Value(s)
DTP/CL/RAC/BV-01-C [Combined Report procedure with All records Operator]	All records	No filter parameter
DTP/CL/RAC/BV-02-C [Combined Report procedure with First record Operator]	First record	No filter parameter
DTP/CL/RAC/BV-03-C [Combined Report procedure with Last record Operator]	Last record	No filter parameter
DTP/CL/RAC/BV-04-C [Combined Report procedure with Greater than or equal to Operator]	Greater than or equal to	<Min filter value>
DTP/CL/RAC/BV-05-C [Combined Report procedure with Less than or equal to Operator]	Less than or equal to	<Max filter value>
DTP/CL/RAC/BV-06-C [Combined Report with Within range of (inclusive) Operator]	Within range of (inclusive)	<Min filter value>, <Max filter value>

Table 4.12: Combined Report test cases

• Test Procedure

1. Perform an action on the Lower Tester to induce it to generate at least 4 records.
2. The Upper Tester sends a command to the IUT to write the Combined Report Opcode (0x07) to the RACP characteristic using the selected <Operator>, and, if applicable, Operand Sequence Number (0x01) and <Filter Value(s)> as described in Table 4.12.
3. The IUT sends an ATT_Write_Request with the instruction from step 2 to the Lower Tester.
4. The Lower Tester, using the segmentation procedure described in Section 3.4.1.2.1 of [4], sends one or more ATT_Handle_Value_Notification of the Time Change Log Data characteristic containing the Time Change Log Data characteristic handle and values.
5. When needed, the IUT first concatenates the multiple messages, preserving the same order as indicated by the Rolling Segment Counters, to extract the records. The IUT reports the records to the Upper Tester.

6. The Lower Tester sends an ATT_Handle_Value_Indication of the RACP characteristic with the Combined Report Response Opcode (0x08), an operator of Null (0x00), and an operand representing the number of records that were sent.
7. The IUT receives the ATT_Handle_Value_Indication from the Lower Tester containing the RACP characteristic handle and value and reports it to the Upper Tester.
8. The IUT sends an ATT_Handle_Value_Confirmation to the Lower Tester.

- Expected Outcome

  Pass verdict

  The IUT, by reversing the segmentation procedure described in Section 3.4.1.2.1 of [4], reconstructs and reports the complete records to the Upper Tester.

  The IUT receives an indication with the Combined Report Response Opcode (0x08) and the number of records that were sent and reports the value to the Upper Tester.

4.7.2 Report Stored Records

- Test Purpose

  For each test case in Table 4.13, verify that the IUT can perform the Report Stored Records procedure with the listed <Operator>, and if applicable, Operand Sequence Number and <Filter Value(s)>.

- Reference

  [3] 4.10.3, 4.10.4.3

- Initial Condition

  - The Lower Tester does not permit an ATT_MTU size larger than the default ATT_MTU size for LE to be negotiated.

  - The IUT knows the handle range of the DT characteristic.

  - The Upper Tester knows the Next_Sequence_Number field value or sends a command to the IUT to read the DT characteristic in order to acquire the Next Sequence Number.

  - Perform the preamble described in Section 4.2.3 with the required <Control Point Characteristic> set to RACP characteristic.

- Test Case Configuration

TCID	Operator	Filter Value(s)
DTP/CL/RAR/BV-01-C [Report Stored Records procedure with All records Operator]	All records	No filter parameter
DTP/CL/RAR/BV-02-C [Report Stored Records procedure with First record Operator]	First record	No filter parameter
DTP/CL/RAR/BV-03-C [Report Stored Records procedure with Last record Operator]	Last record	No filter parameter
DTP/CL/RAR/BV-04-C [Report Stored Records procedure with Greater than or equal to Operator]	Greater than or equal to	<Min filter value>
DTP/CL/RAR/BV-05-C [Report Stored Records procedure with Less than or equal to Operator]	Less than or equal to	<Max filter value>
DTP/CL/RAR/BV-06-C [Report Stored Records procedure with Within range of (inclusive) Operator]	Within range of (inclusive)	<Min filter value>, <Max filter value>

Table 4.13: Report Stored Records test cases

- Test Procedure

    1. Perform an action on the Lower Tester to induce it to generate at least 4 records.
    2. The Upper Tester sends a command to the IUT to write the Report Stored Records Opcode (0x01) to the RACP characteristic using the selected <Operator>, and, if applicable, Operand Sequence Number (0x01) and <Filter Value(s)> as described in Table 4.13.
    3. The IUT sends an ATT_Write_Request with the instruction from step 2 to the Lower Tester.
    4. The Lower Tester, using the segmentation procedure described in Section 3.4.1.2.1 of [4], sends one or more ATT_Handle_Value_Notification of the Time Change Log Data characteristic containing the Time Change Log Data characteristic handle and values.
    5. When needed, the IUT first concatenates the multiple messages, preserving the same order as indicated by the Rolling Segment Counters, to extract the records. The IUT reports the records to the Upper Tester.
    6. The Lower Tester sends an ATT_Handle_Value_Indication of the RACP characteristic with the Response Code Opcode (0x06), an operator of Null (0x00) and an operand consisting of the Request Opcode (0x01) followed by the Response Value for Success (0x01).
    7. The IUT receives the ATT_Handle_Value_Indication from the Lower Tester containing the RACP characteristic handle and value and reports it to the Upper Tester.
    8. The IUT sends an ATT_Handle_Value_Confirmation to the Lower Tester.

- Expected Outcome

    Pass verdict

    The IUT, by reversing the segmentation procedure described in Section 3.4.1.2.1 of [4], reconstructs and reports the complete records to the Upper Tester.

    The IUT receives the Response Value for Success (0x01) and reports it to the Upper Tester.

4.7.3   Report Number of Stored Records

- Test Purpose

    For each test case in Table 4.14, verify that the IUT can perform the Report Number of Stored Records procedure with the listed <Operator>, if applicable, Operand Sequence Number, and <Filter Value(s)>.

- Reference

    [3] 4.10.3, 4.10.4.4

- Initial Condition

    - Perform the preamble described in Section 4.2.3 with the required <Control Point Characteristic> set to RACP characteristic.

    - The IUT knows the handle range of the DT characteristic.

    - The Upper Tester knows the Next_Sequence_Number field value or sends a command to the IUT to read the DT characteristic in order to acquire the Next Sequence Number.

- Test Case Configuration

Test Case	Operator	Filter Value(s)
DTP/CL/RAN/BV-01-C [Report Number of Stored Records procedure with All records Operator]	All records	No filter parameter
DTP/CL/RAN/BV-02-C [Report Number of Stored Records procedure with First record Operator]	First record	No filter parameter

Test Case	Operator	Filter Value(s)
DTP/CL/RAN/BV-03-C [Report Number of Stored Records procedure with Last record Operator]	Last record	No filter parameter
DTP/CL/RAN/BV-04-C [Report Number of Stored Records procedure with Greater than or equal to Operator]	Greater than or equal to	<Min filter value>
DTP/CL/RAN/BV-05-C [Report Number of Stored Records procedure with Less than or equal to Operator]	Less than or equal to	<Max filter value>
DTP/CL/RAN/BV-06-C [Report Number of Stored Records procedure with Within range of (inclusive) Operator]	Within range of (inclusive)	<Min filter value>, <Max filter value>

Table 4.14: Report Number of Stored Records test cases

- Test Procedure

    1. Perform an action on the Lower Tester to induce it to generate at least 3 records.
    2. The Upper Tester sends a command to the IUT to write the Report Number of Stored Records Opcode (0x04) to the RACP characteristic using the selected <Operator>, if applicable, Operand Sequence Number (0x01) and <Filter Value(s)> as described Table 4.14.
    3. The IUT sends an ATT_Write_Request with the instruction from step 2 to the Lower Tester.
    4. The Lower Tester sends an ATT_Handle_Value_Indication of the RACP characteristic with the Report Number of Stored Records Response Opcode (0x05), an operator of Null (0x00) and an Operand representing the number of requested record(s).
    5. The IUT receives an ATT_Handle_Value_Indication from the Lower Tester containing the RACP characteristic handle and value and reports it to the Upper Tester.
    6. The IUT sends an ATT_Handle_Value_Confirmation to the Lower Tester.

- Expected Outcome

    Pass verdict

    Based on the applied <Operator> and applicable <Filter Value(s)> described in Table 4.14, the IUT receives one indication of the RACP characteristic with the Report Number of Stored Records Response Opcode (0x05) and an operand representing the number of requested records and reports it to the Upper Tester.

DTP/CL/RAA/BV-01-C [Abort Operation procedure]

- Test Purpose

    Verify that the Client IUT can perform the Abort Operation procedure when a Combined Report procedure is being executed by the Device Time RACP characteristic.

- Reference

    [3] 4.10.3, 4.10.4.5

- Initial Condition

    - Perform the preamble described in Section 4.2.3 with the required <Control Point Characteristic> set to RACP characteristic.

- Test Procedure

    1. The Upper Tester sends a command to the IUT to write the Combined Report Opcode (0x07) to the RACP characteristic using an Operator of All records.
    2. The IUT sends an ATT_Write_Request with the instruction from step 1 to the Lower Tester.

3. The Lower Tester, using the segmentation procedure described in Section 3.4.1.2.1 of [4], sends one or more ATT_Handle_Value_Notification of the Time Change Log Data characteristic containing the Time Change Log Data characteristic handle and values.
4. The IUT receives one or more ATT_Handle_Value_Notification from the Lower Tester containing the Time Change Log Data characteristic handle and values.
5. The Upper Tester sends a command to the IUT to write the Abort Operation Opcode (0x03) to the RACP characteristic with an operator of Null (0x00) and no operand.
6. The Lower Tester sends an ATT_Handle_Value_Indication of the RACP characteristic with the Response Code Opcode (0x06), an operator of Null (0x00), and an operand containing a Request Opcode (0x03) followed by the Response Code Value for Success (0x01).
7. The IUT receives an ATT_Handle_Value_Indication from the Lower Tester containing the RACP characteristic handle and value and reports it to the Upper Tester.
8. The IUT sends an ATT_Handle_Value_Confirmation to the Lower Tester.
9. Verify that the Time Change Log Data characteristic notifications stop.

- Expected Outcome

  Pass verdict

  The IUT receives some, but not all, notifications of the Time Change Log Data characteristic and reports the records to the Upper Tester.

  The IUT receives one indication of the RACP characteristic with the Request Opcode (0x03) followed by the Response Code Value for Success (0x01) and reports it to the Upper Tester.

4.7.4   Record Access Control Point – Error Handling

This test group contains test cases to verify compliant operation of the IUT when an RACP error is received from the Server (Lower Tester).

DTP/CL/RAE/BI-01-C [RACP – No records found]

- Test Purpose

  Verify that the IUT responds appropriately to a Combined Report procedure when the Server (Lower Tester) does not locate any records matching the request and responds with an operand set to 0x0000.

- Reference

  [3] 4.10.3, 4.10.4.2

- Initial Condition

  - Perform the preamble described in Section 4.2.3 with the required <Control Point Characteristic> set to RACP characteristic.

  - The Upper Tester knows the Next Sequence Number or sends a command to the IUT to read the DT characteristic in order to acquire the Next Sequence Number.

- Test Procedure

  1. The Upper Tester sends a command to the IUT to write the Combined Report Opcode (0x07) to the RACP characteristic using a supported operator and Operand Sequence Number (0x01) with filter value(s) of records that do not exist.
  2. The IUT sends an ATT_Write_Request with the instruction from step 1 to the Lower Tester.

3. The Lower Tester sends an ATT_Handle_Value_Indication of the RACP characteristic with the Combined Report Response Opcode (0x08), an operator of Null (0x00), and an operand set to 0x0000 indicating that there are no records matching the request.
4. The IUT receives an ATT_Handle_Value_Indication from the Lower Tester containing the RACP characteristic handle and value and reports it to the Upper Tester.
5. The IUT sends an ATT_Handle_Value_Confirmation to the Lower Tester.

- Expected Outcome

  <u>Pass verdict</u>

  The IUT receives an indication with the Combined Report Response Opcode (0x08) and an operand representing that no records were found (0x0000) and reports it to the Upper Tester.

DTP/CL/RAE/BI-02-C [RACP – Procedure not completed]

- Test Purpose

  Verify that the IUT responds appropriately when it receives a Procedure not completed RACP Response Code.

- Reference

  [3] 4.10.3, 4.10.4.6

- Initial Condition

  - Perform the preamble described in Section 4.2.3 with the required <Control Point Characteristic> set to RACP characteristic.

- Test Procedure

  1. Perform an action on the Lower Tester to induce it to generate at least 3 records.
  2. The Upper Tester sends a command to the IUT to write the Combined Report Opcode (0x07) to the RACP characteristic using an operator of All records.
  3. The IUT sends an ATT_Write_Request with the instruction from step 2 to the Lower Tester.
  4. The Lower Tester sends an ATT_Handle_Value_Indication of the RACP characteristic with the Response Code Opcode (0x06), an operator of Null (0x00), and an operand consisting of the Request Opcode (0x07) followed by the Response Code Value for Procedure not completed (0x08).
  5. The IUT receives an ATT_Handle_Value_Indication from the Lower Tester containing the RACP characteristic handle and value and reports it to the Upper Tester.
  6. The IUT sends an ATT_Handle_Value_Confirmation to the Lower Tester.
  7. Verify that the IUT returns to a stable state and can process commands normally.

- Expected Outcome

  <u>Pass verdict</u>

  The IUT receives the Response Code Value of Procedure not completed (0x08) and reports it to the Upper Tester.

4.8 General Error Handling

This test group contains test cases to verify the IUT error handling behavior for various scenarios.

DTP/CL/GEH/BI-01-C [Client Characteristic Configuration Descriptor Improperly Configured]

- Test Purpose

  Verify that the IUT responds appropriately when it receives a Client Characteristic Configuration Descriptor Improperly Configured ATT error code.

- Reference

  [3] 4.11.2.1

- Initial Condition

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

- Test Procedure

  1. The Upper Tester sends a command to the IUT to write the Propose Time Update Opcode (0x02) to the DTCP characteristic with a Time Update operand.
  2. The IUT sends an ATT_Write_Request with the instruction from step 1 to the Lower Tester.
  3. The Lower Tester sends an ATT_Error_Response with error code Client Characteristic Configuration Descriptor Improperly Configured (0xFD).
  4. The IUT receives an ATT_Error_Response from the Lower Tester and reports its error code to the Upper Tester.
  5. Verify that the IUT returns to a stable state and can process commands normally.

- Expected Outcome

  Pass verdict

  The IUT receives the ATT error code of Client Characteristic Configuration Descriptor Improperly Configured (0xFD) and reports it to the Upper Tester.

DTP/CL/GEH/BI-02-C [DT Feature characteristic with additional octets]

- Test Purpose

  Verify that the IUT can read the DT Feature characteristic from the Lower Tester and ignore additional octets.

- Reference

  [3] 4.5

- Initial Condition

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

  - The Upper Tester knows the handle of the DT Feature characteristic contained in the Lower Tester.

- Test Procedure

  1. The Upper Tester sends a command to the IUT to read the DT Feature characteristic from the Lower Tester.
  2. The IUT sends an ATT_Read_Request to the Lower Tester containing the handle specified by the Upper Tester.
  3. The Lower Tester responds with an ATT_Read_Response to the IUT containing the value of the DT Feature characteristic with additional octets (Feature Extension bit 15 is set to 0).
  4. The IUT receives the ATT_Read_Response and reports the value to the Upper Tester.

- Expected Outcome

  <u>Pass verdict</u>

  The IUT ignores the additional octets and reports the DT Feature characteristic value to the Upper Tester.

DTP/CL/GEH/BI-03-C [DT Feature characteristic with Non-zero RFU bit values]

- Test Purpose

  Verify that the IUT responds appropriately when it receives a non-zero RFU bit value.

- Reference

  [3] 4.5.2

- Initial Condition

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

  - The Upper Tester knows the handle of the DT Feature characteristic contained in the Lower Tester.

- Test Procedure

  1. The Upper Tester sends a command to the IUT to read the DT Feature characteristic from the Lower Tester.
  2. The IUT sends an ATT_Read_Request to the Lower Tester containing the handle specified by the Upper Tester.
  3. The Lower Tester responds with an ATT_Read_Response to the IUT containing the value of the DT Feature characteristic with at least 1 RFU bit of the DT Features set to 1.
  4. The IUT receives the ATT_Read_Response and reports the value to the Upper Tester.

- Expected Outcome

  <u>Pass verdict</u>

  The IUT ignores the RFU bits that are set to 1 and reports the received values to the Upper Tester.

DTP/CL/GEH/BI-04-C [Invalid CRC]

- Test Purpose

  Verify that the IUT responds appropriately when it receives an Invalid CRC ATT application error code.

- Reference

  [3] 4.11.2.4

- Initial Condition

    - Perform the preamble described in Section 4.2.3 with the required <Control Point Characteristic> set to DTCP characteristic.

- Test Procedure

    1. The Upper Tester sends a command to the IUT to write the Propose Time Update Opcode (0x02) to the DTCP characteristic with a Time Update operand and a valid E2E-CRC field value.
    2. The IUT sends an ATT_Write_Request with the instruction from step 1 to the Lower Tester.
    3. The Lower Tester sends an ATT_Error_Response with Error Code Invalid CRC (0x80).
    4. The IUT receives an ATT_Error_Response from the Lower Tester and reports its Error Code to the Upper Tester.
    5. Verify that the IUT returns to a stable state and can process commands normally.

- Expected Outcome

    Pass verdict

    The IUT receives the ATT error code of Invalid CRC (0x80) and reports it to the Upper Tester.

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 DTP [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)
DTP 1/2	Discover Device Time Service and characteristic	DTP/CL/CGGIT/SER/BV-01-C DTP/CL/CGGIT/CHA/BV-02-C DTP/CL/CGGIT/CHA/BV-03-C DTP/CL/CGGIT/CHA/BV-04-C DTP/CL/GEH/BI-02-C DTP/CL/GEH/BI-03-C
DTP 1/1 AND DTP 2/2 AND (NOT DTP 2/1) AND GATT 1a/4	Device Time Service not discoverable over BR/EDR	DTP/SR/SGGIT/SDPNF/BV-01-C
DTP 11/7	Receive DT Feature characteristic indication	DTP/CL/DTC/BV-06-C DTP/CL/CI/BV-08-C
DTP 10/7	Device Time Control Point	DTP/CL/CGGIT/CHA/BV-05-C DTP/CL/DTC/BV-03-C DTP/CL/SPE/BI-01-C DTP/CL/GEH/BI-01-C DTP/CL/GEH/BI-04-C
DTP 10/8	Discover RACP and Device Time Change Log Data	DTP/CL/CGGIT/CHA/BV-06-C DTP/CL/CGGIT/CHA/BV-07-C DTP/CL/DTC/BV-04-C DTP/CL/DTC/BV-05-C
DTP 11/4	Receive DT Parameters characteristic indications	DTP/CL/DTC/BV-01-C DTP/CL/CI/BV-01-C DTP/CL/CI/BV-02-C
DTP 11/6	Receive DT characteristic indications	DTP/CL/DTC/BV-02-C DTP/CL/CI/BV-03-C DTP/CL/CI/BV-04-C DTP/CL/CI/BV-05-C DTP/CL/CI/BV-06-C DTP/CL/CI/BV-07-C

Item	Feature	Test Case(s)
DTP 11/6 AND (DTP 16/2 OR DTP 16/3)	Receive DT characteristic indication upon reconnection	DTP/CL/CI/BV-09-C
DTP 10/7 AND NOT DTP 11/2	Propose Time Update	DTP/CL/SPT/BV-01-C
DTP 10/7 AND DTP 11/2	Propose Time Update - Base Time Second-Fractions supported	DTP/CL/SPT/BV-02-C DTP/CL/SPT/BV-03-C
DTP 12/2 AND NOT DTP 11/2	Force Time Update	DTP/CL/SPT/BV-04-C
DTP 12/2 AND DTP 11/2	Force Time Update with Base Time Second Fractions	DTP/CL/SPT/BV-05-C
DTP 12/3	Propose Non-Logged Time Adjustment Limit procedure	DTP/CL/SPT/BV-06-C DTP/CL/SPT/BV-07-C DTP/CL/SPE/BI-02-C DTP/CL/SPE/BI-03-C
DTP 12/4	Retrieve Active Time Adjustments	DTP/CL/SPT/BV-08-C
DTP 13/1	Combined Report procedure	DTP/CL/RAC/BV-01-C DTP/CL/RAC/BV-02-C DTP/CL/RAC/BV-03-C DTP/CL/RAC/BV-04-C DTP/CL/RAC/BV-05-C DTP/CL/RAC/BV-06-C DTP/CL/RAE/BI-01-C DTP/CL/RAE/BI-02-C
DTP 14/1	Report (Number of) Stored Records procedure with All records Operator	DTP/CL/RAR/BV-01-C DTP/CL/RAN/BV-01-C
DTP 14/2	Report (Number of) Stored Records procedure with First record Operator	DTP/CL/RAR/BV-02-C DTP/CL/RAN/BV-02-C
DTP 14/3	Report (Number of) Stored Records procedure with Last record Operator	DTP/CL/RAR/BV-03-C DTP/CL/RAN/BV-03-C
DTP 14/4	Report (Number of) Stored Records procedure with Greater than or equal to Operator	DTP/CL/RAR/BV-04-C DTP/CL/RAN/BV-04-C
DTP 14/5	Report (Number of) Stored Records procedure with Less than or equal to Operator	DTP/CL/RAR/BV-05-C DTP/CL/RAN/BV-05-C
DTP 14/6	Report (Number of) Stored Records procedure with Within range of (inclusive) Operator	DTP/CL/RAR/BV-06-C DTP/CL/RAN/BV-06-C
DTP 13/4	Abort Operation procedure	DTP/CL/RAA/BV-01-C

Table 5.1: Test case mapping

6   Device Time Control Point Matrix

The following table summarizes the combination of some of the Device Time Control Point Opcodes and the Response Code Values that are tested and not tested. For the table, below, the following key applies:

YES = A test for this combination exists.
NO = A test for this combination does not exist.
N/A = Not a valid combination.

Device Time CP Response Code Values	Device Time CP Opcode			
	Propose Time Update	Force Time Update	Propose Non-Logged Time Adjustment Limit	Retrieve Active Time Adjustments
Success	YES	YES	YES	N/A
Opcode not supported	N/A	N/A	N/A	N/A
Invalid Operand	NO	NO	NO	N/A
Operation failed	NO	NO	NO	NO
Procedure Rejected	YES	YES	YES	NO
Device Busy	NO	NO	NO	NO

Table 6.1: DTCP Response Code test coverage

7   RACP Test Matrix

The following tables summarize the features of RACP and the combinations with other features that are tested and not tested. For the tables, below, the following key applies:

YES = A test for this combination exists.

NO = A test for this combination does not exist.

N/A = Not a valid combination.

RACP Operator	RACP Opcode			
	Combined Report	Report stored records	Report number of stored records	Abort operation
All records	YES	YES	YES	N/A
First record	YES	YES	YES	N/A
Last record	YES	YES	YES	N/A
Greater than or equal to	YES	YES	YES	N/A
Less than or equal to	YES	YES	YES	N/A
Within range of (inclusive)	YES	YES	YES	N/A
Null	N/A	N/A	N/A	YES

Table 7.1: RACP Operator test coverage

RACP Response Code	RACP Opcode			
	Combined Report	Report stored records	Report number of stored records	Abort operation
Success	N/A	YES	N/A	YES
Op Code not supported	N/A	N/A	N/A	N/A
Invalid Operator	NO	NO	NO	NO
Operator not supported	NO	NO	NO	NO
Invalid Operand	NO	NO	NO	N/A
No records found	N/A	NO	N/A	N/A
Abort unsuccessful	NO	NO	NO	NO
Procedure not completed	YES	NO	NO	NO
Operand not supported	NO	NO	NO	N/A
Procedure already in progress	NO	NO	NO	N/A

Table 7.2: RACP Response Code test coverage

RACP Operator	Filter Type
	Sequence Number
All records	N/A
First record	N/A
Last record	N/A
Greater than or equal to	YES
Less than or equal to	YES
Within range of (inclusive)	YES
Null	N/A

Table 7.3: RACP Filter Type test coverage

8   Revision history and acknowledgments

Revision History

Publication Number	Revision Number	Date	Comments
0	p0	2020-12-22	Approved by BTI on 2020-12-02. DTP v1.0 adopted by BoD on 2020-12-15. Prepared for publication.
	p1r00–r01	2023-10-20 – 2023-11-07	TSE 23267 (rating 1): Converted -I tests to -C tests as appropriate; updated the TCMT and TCRL accordingly. Updated the copyright page to align with v2 of the DNMD. Performed editorials to align the document with the latest TS template, including updates to the Test Strategy and Test groups sections. Deleted draft revision history comments prior to p0.
1	p1	2024-07-01	Approved by BTI on 2024-04-21. Prepared for TCRL 2024-1 publication.

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