Object Transfer Profile (OTP)

***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 Object Transfer Profile Specification 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] Test Strategy and Terminology Overview

[2] Bluetooth Core Specification, Version 4.0 or later

[3] Object Transfer Profile Specification, Version 1.0

[4] ICS Proforma for Object Transfer Profile

[5] GATT Test Suite, GATT.TS

[6] Object Transfer Service Specification, Version 1.0

[7] IXIT Proforma for Object Transfer Profile

[8] Characteristic and Descriptor descriptions and Protocol Service Multiplexer values are accessible via the Bluetooth SIG Assigned Numbers

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 Object Transfer Profile requires the presence of GAP, SM (for LE), SDP (for BR/EDR), ATT, and GATT. This is illustrated in Figure 3.1. “L2CAP CoC” in this diagram denotes an L2CAP connection-oriented channel, hereinafter referred to as the “Object Transfer Channel”, which is used for the transfer of object contents from one device to the other. The fixed Protocol Service Multiplexer (PSM) value used for the Object Transfer protocol, «PSM_OTS», is accessible via Bluetooth Assigned Numbers [8].

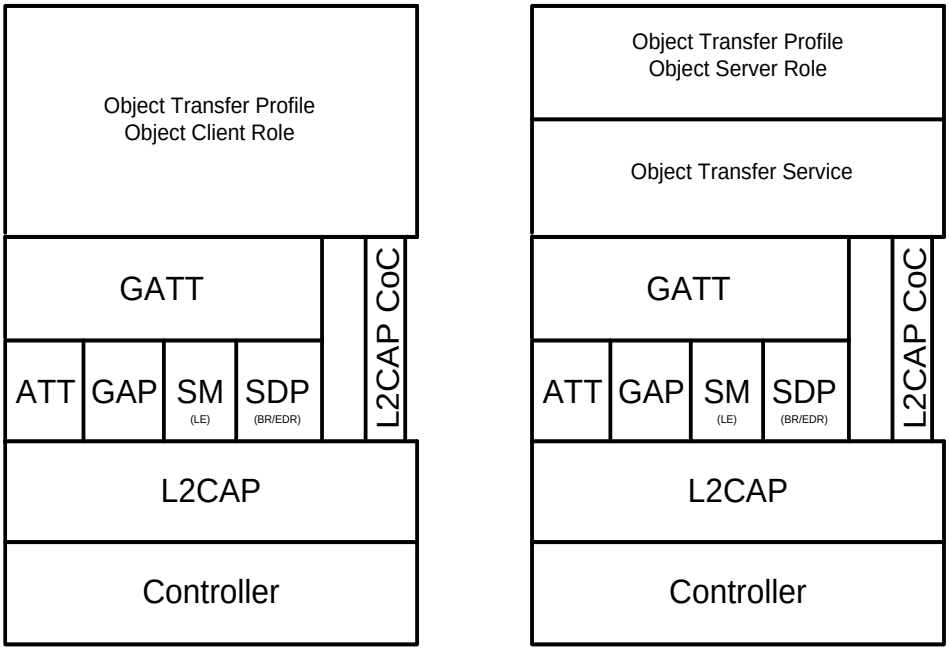

Figure 3.1: Object Transfer test model

3.2 Test Strategy

The test objectives are to verify the functionality of the Object Transfer Profile within a Bluetooth Host and enable interoperability between Bluetooth Hosts on different devices. The testing approach covers mandatory and optional requirements in the specification and matches these to the support of the IUT as described in the ICS. Any defined test herein is applicable to the IUT if the ICS logical expression defined in the Test Case Mapping Table (TCMT) evaluates to true.

The test equipment provides an implementation of the Radio Controller and the parts of the Host needed to perform the test cases defined in this Test Suite. A Lower Tester acts as the IUT’s peer device and interacts with the IUT over-the-air interface. The configuration, including the IUT, needs to implement similar capabilities to communicate with the test equipment. For some test cases, it is necessary to stimulate the IUT from an Upper Tester. In practice, this could be implemented as a special test interface, a Man Machine Interface (MMI), or another interface supported by the IUT.

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

Certain tests in this Test Suite require two independent Lower Testers to be run concurrently against the IUT.

3.2.1 Test database requirements

The following requirements apply to the set of databases used by the Lower Tester for testing of GATT Client functionality:

- The Lower Tester includes one instantiation of each of the services used by this profile, including all defined characteristics.
- Each service instantiation also contains two «future» characteristics.
  - If possible, with one inserted before the first characteristic defined
  - If possible, with one appended after the last characteristic defined
- Each «future» characteristic has a 16-bit UUID randomly selected from unassigned UUIDs at the time of the test.

3.3 Test groups

The following test groups have been defined.

- Generic GATT Integrated Tests
- Discovery of Services and Characteristics
- Features
- Service Procedures
- 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 [1]. 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 [5] 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>**
OTP	Object Transfer Profile
Identifier Abbreviation	**Role Identifier <IUT role>**
CL	Object Client Role
SR	Object Server Role
Identifier Abbreviation	**Reference Identifier <GGIT test group>**
CGGIT	Client Generic GATT Integrated Tests
SGGIT	Server Generic GATT Integrated Tests
Identifier Abbreviation	**Reference Identifier <GGIT class>**
CHA	Characteristic
SDPNF	SDP Record Not Found
SER	Service
Identifier Abbreviation	**Feature Identifier <feat>**
APE	Application Error Handling
OAE	OACP Error Handling
OLE	OLCP Error Handling
OTCD	Discovery of Characteristics and Descriptors
OTF	OTS Features
OTI	Object Transfer Indications
OTPP	Object Transfer Procedures
OTR	Reading of Characteristics and Descriptors
OTSD	Discovery of Services
OTW	Writing of Characteristics and Descriptors

Table 4.1: OTP 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

The procedures defined in this Section are provided for information as they are used by test equipment in achieving the initial conditions in certain tests.

4.2.1 ATT Bearer on LE Transport

- Preamble Procedure
  1. Establish an LE transport connection between the IUT 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 several L2CAP channels (PSM 0x001F) between the IUT and the Lower Tester over that BR/EDR transport.

4.2.3 Setup Object Transfer Channel

The Protocol Service Multiplexer (PSM) value «PSM_OTS» used in the following procedures represents the fixed PSM value for the Object Transfer protocol, as defined in [8].

4.2.3.1 Setup Object Transfer Channel over LE

- Preamble procedure

1. The Upper Tester induces the IUT to open an Object Transfer Channel.
2. The IUT sends a LE_Credit_Based_Connection_Request with the PSM parameter set to «PSM_OTS» and other parameters set to valid values.
3. After receiving the LE_Credit_Based_Connection_Request, the Lower Tester sends a LE_Credit_Based_Connection_Rsp.

4.2.3.2 Setup Object Transfer Channel over BR/EDR

- Preamble procedure

1. The Upper Tester induces the IUT to open an Object Transfer Channel.
2. The IUT sends an L2CAP_ConnectReq with the PSM parameter set to «PSM_OTS» and other parameters set to valid values for Enhanced Retransmission Mode (ERTM).
3. After receiving the L2CAP_ConnectReq, the Lower Tester sends an L2CAP_ConnectRsp.

4.3 Generic GATT Integrated Tests

Execute the Generic GATT Integrated Tests defined in Section 6.3, Server test procedures (SGGIT), and Section 6.4, Client test procedures (CGGIT), in [5] using Table 4.2 below as input:

TCID	Service / Characteristic / Descriptor	Reference	Properties	Value Length (Octets)	Service Type
OTP/CL/CGGIT/SER/BV-01-C [Service GGIT – Object Transfer]	Object Transfer Service	[3] 4.2	-	-	Primary or Secondary Service
OTP/CL/CGGIT/CHA/BV-01-C [Characteristic GGIT – OTS Feature]	OTS Feature Characteristic	[3] 4.3	0x02 (Read)	Skip	-
OTP/CL/CGGIT/CHA/BV-02-C [Characteristic GGIT – Object Name]	Object Name Characteristic	[3] 4.3	0x0A (Read, Write)	Skip	-
OTP/CL/CGGIT/CHA/BV-03-C [Characteristic GGIT – Object Type]	Object Type Characteristic	[3] 4.3	0x02 (Read)	Skip	-
OTP/CL/CGGIT/CHA/BV-04-C [Characteristic GGIT – Object Size]	Object Size Characteristic	[3] 4.3	0x02 (Read)	Skip	-
OTP/CL/CGGIT/CHA/BV-05-C [Characteristic GGIT – Object First-Created]	Object First-Created Characteristic	[3] 4.3	0x0A (Read, Write)	Skip	-
OTP/CL/CGGIT/CHA/BV-06-C [Characteristic GGIT – Object Last-Modified]	Object Last-Modified Characteristic	[3] 4.3	0x0A (Read, Write)	Skip	-
OTP/CL/CGGIT/CHA/BV-07-C [Characteristic GGIT – Object ID]	Object ID Characteristic	[3] 4.3	0x02 (Read)	Skip	-
OTP/CL/CGGIT/CHA/BV-08-C [Characteristic GGIT – Object Properties]	Object Properties Characteristic	[3] 4.3	0x0A (Read, Write)	Skip	-
OTP/CL/CGGIT/CHA/BV-09-C [Characteristic GGIT – Object Action Control Point (OACP)]	Object Action Control Point (OACP) Characteristic	[3] 4.3	0x28 (Write, Indicate)	Skip	-
OTP/CL/CGGIT/CHA/BV-10-C [Characteristic GGIT – Object List Control Point (OLCP)]	Object List Control Point (OLCP) Characteristic	[3] 4.3	0x28 (Write, Indicate)	Skip	-
OTP/CL/CGGIT/CHA/BV-11-C [Characteristic GGIT – Object Changed]	Object Changed Characteristic	[3] 4.3	0x20 (Indicate)	Skip	-

TCID	Service / Characteristic / Descriptor	Reference	Properties	Value Length (Octets)	Service Type
OTP/SR/SGGIT/SDPNF/BV-01-C [Not discoverable over BR/EDR – Object Transfer Service]	Object Transfer Service	[3] 4.2	-	-	-

Table 4.2: Input for the GGIT Server test procedure

4.4 Service Discovery

Verify the IUT's ability to discover the services exposed by an Object Server (Lower Tester).

OTP/SR/OTSD/BV-05-C [Object Transfer Service UUID in AD]

- Test Purpose

  Verify that the Object Transfer Service UUID is included in AD (Advertising Data) from the Object Server IUT when using the LE Transport.

- Reference

  [3] 3.1.1

- Initial Condition

  - The IUT is powered on in GAP Discoverable Mode.
  - The IUT is induced to generate Advertising Packets.

- Test Procedure

  The Lower Tester listens for Advertising Packets from the IUT.

- Expected Outcome

  Pass verdict

  At least one received Advertising Packet contains the defined Service UUID for «Object Transfer Service».

4.5 Characteristic and Descriptor Discovery

OTP/CL/OTCD/BV-11-C [Discover Object List Filter Characteristic]

- Test Purpose

  Verify that an Object Client IUT can discover all instances of the Object List Filter characteristic.

- Reference

  [3] 4.3

- Initial Condition

  - Run the preamble procedure to enable the Object Client to initiate connection to an Object Server included in the Section 4.2.1, if using an LE transport, or Section 4.2.2 if using a BR/EDR transport.
  - The Lower Tester includes one instantiation of the Object Transfer Service [6] including all defined characteristics. This instantiation also contains two "future" characteristics. Each "future" characteristic has a 16-bit UUID randomly selected from unassigned UUIDs at the time of the test.
  - The IUT has executed OTP/CL/CGGIT/SER/BV-01-C [Service GGIT – Object Transfer] and has saved the handle range for an instantiation of the Object Transfer Service. That instantiation contains an instantiation of the claimed OTS characteristic.

- Test Procedure

  1. The Upper Tester issues a command to the IUT to Discover the OTS characteristic represented in the test case.
  2. The IUT executes either alternative 2A or 2B.

  Alternative 2A (Discover All Characteristics of a Service sub-procedure):
  2A: Discover All Characteristics of a Service using the specified handle range, with the Lower Tester instantiating the database specified in Section 3.2.1.
  Alternative 2B (Discover Characteristics by UUID sub-procedure):
  2B: Discover Characteristics by UUID using each of the UUIDs for the characteristics of the Object Transfer Service supported by the IUT, with the Lower Tester instantiating the database specified in Section 3.2.1.

- Expected Outcome

  Pass verdict

  Verify that three attribute handle/value pairs are received by the IUT containing the UUIDs associated with the Object List Filter characteristic.

  It is acceptable for additional handle/value pairs for other supported characteristics to be received (and ignored for the purposes of the test case).

4.6 Characteristic Read

- Test Purpose

  This test group contains test cases to verify that the characteristics that are readable and claimed in the ICS [4] can be read by the Object Client. The verification is performed one at a time, as enumerated in the test cases in Table 4.3, using this generic test procedure.

- Reference

  [3] 4.4

- Initial Condition

  - All characteristics of OTS supported by the IUT are specified in the ICS [4].
  - Run the preamble procedure to enable the Object Client to initiate connection to an Object Server included in the Section 4.2.1, if using an LE transport, or Section 4.2.2 if using a BR/EDR transport.
  - The Lower Tester includes one instantiation of the Object Transfer Service [6] including all defined characteristics.
  - Each characteristic contains valid data. The test values used for UTF-8 based characteristics are non-zero length strings and do not include any ASCII control character.
  - The IUT has previously executed the procedure included in Section 4.3 or Section 4.5, so it has the handle/value pairs for all characteristics of the Object Transfer Service exposed by the Lower Tester that are supported by the IUT.
  - The length of each characteristic used in this test case is such that its value can be read in its entirety in a GATT Read transaction when the default ATT_MTU size is used.

- Test Case Configuration

Test Case	Additional Test Requirements
OTP/CL/OTR/BV-01-C [Read OTS Feature Characteristic]	None.
OTP/CL/OTR/BV-02-C [Read Object Name Characteristic]	None.
OTP/CL/OTR/BV-03-C [Read Object Type Characteristic]	None.
OTP/CL/OTR/BV-04-C [Read Object Size Characteristic]	None.
OTP/CL/OTR/BV-05-C [Read Object First-Created Characteristic]	None.
OTP/CL/OTR/BV-06-C [Read Object Last-Modified Characteristic]	None.
OTP/CL/OTR/BV-07-C [Read Object ID Characteristic]	None.
OTP/CL/OTR/BV-08-C [Read Object Properties Characteristic]	None.
OTP/CL/OTR/BV-09-C [Read Object List Filter Characteristic]	The Lower Tester contains a valid combination of values for the three Object List Filter characteristics.

Table 4.3: Characteristic Read test cases

- Test Procedure

1. The Upper Tester issues a command to the IUT to read the supported characteristic represented 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. After receipt of the ATT_Read_Response (0x0B) from the Lower Tester, the IUT sends the value of the supported characteristic to the Upper Tester.

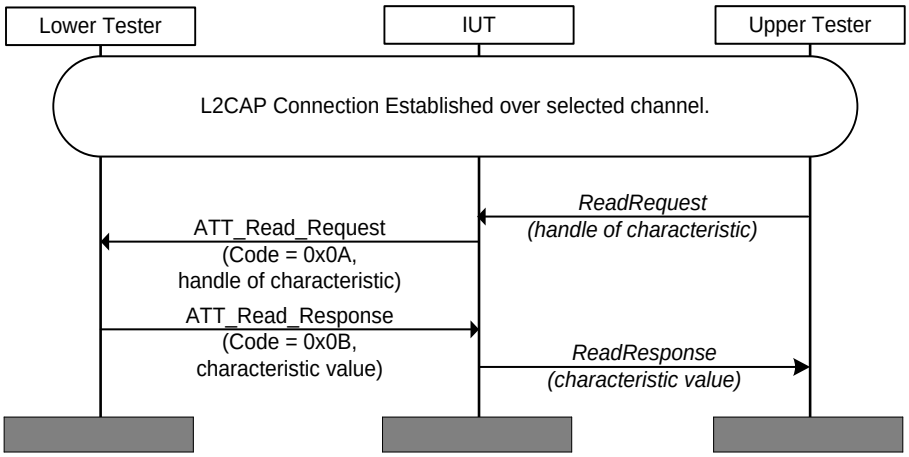

Figure 4.1: Characteristic Read

- Expected Outcome

Pass verdict

The IUT sends a correctly formatted ATT_Read_Request (0x0A) to the Lower Tester, containing the handle specified by the Upper Tester for each supported characteristic.

The IUT receives the response from the Lower Tester and sends the ReadResponse containing the correct characteristic value to the Upper Tester.

OTP/CL/OTR/BV-10-C [Read Long Object Name Characteristic]

- Test Purpose

  Verify that an Object Client IUT can use the GATT Read Long sub-procedure successfully to read the Object Name characteristic that contains a value in UTF-8 format that exceeds the capacity of default ATT_MTU size.

- Reference

  [3] 4.1

- Initial Condition

  - Run the preamble procedure defined in Section 4.2.1, if using an LE transport, or Section 4.2.2, if using a BR/EDR transport, to set up the transport and initiate connection to an Object Server.
  - The Lower Tester includes one instantiation of the Object Transfer Service [6] including all defined characteristics.
  - The IUT has previously executed the procedure included in Section 4.3, so it has the handle/value pairs for all characteristics of the Object Transfer Service exposed by the Lower Tester that are supported by the IUT.
  - The Lower Tester does not permit an ATT_MTU size larger than the default ATT_MTU size to be negotiated.
  - The length of the Object Name characteristic used in this test case is sufficiently long that its value cannot be read in its entirety in a GATT Read transaction when the default ATT_MTU size is used and therefore requires the GATT Read Long sub-procedure to be used.
  - The UTF-8 string used in the Object Name value is a non-zero length string and does not include any ASCII control character.

- Test Procedure

  1. The Upper Tester issues a command to the IUT to read the Object Name characteristic.
  2. The IUT executes the GATT Read Long Characteristic Values sub-procedure.

- Expected Outcome

  Pass verdict

  The IUT reports the Object Name characteristic value correctly, in its entirety.

OTP/CL/OTR/BV-11-C [Read Long Object List Filter Characteristic]

- Test Purpose

  Verify that an Object Client IUT can use the GATT Read Long sub-procedure successfully to read an Object List Filter characteristic that contains a value with a length that exceeds the capacity of the default ATT_MTU size.

- Reference

  [3] 4.5.2.2

- Initial Condition

  - Run the preamble procedure defined in Section 4.2.1, if using an LE transport, or Section 4.2.2, if using a BR/EDR transport, to set up the transport and initiate connection to an Object Server.

- The Lower Tester includes one instantiation of the Object Transfer Service [6] including all defined characteristics.
- The IUT has previously executed the procedure included in Section 4.3 or Section 4.5, so it has the handle/value pairs for all characteristics of the Object Transfer Service exposed by the Lower Tester that are supported by the IUT.
- The Lower Tester does not permit an ATT_MTU size larger than the default ATT_MTU size to be negotiated.
- The Lower Tester contains a valid combination of values for the three Object List Filter characteristics.
- The length of at least one of the Object List Filter characteristics used in this test case is sufficiently long that its value cannot be read in its entirety in a GATT Read transaction when the default ATT_MTU size is used and therefore requires the GATT Read Long sub-procedure to be used. Therefore, the test value used is more than (ATT_MTU-1) octets in length. This is achieved by including a sufficiently long string value in the parameter field.
- The filter condition used in the Object List Filter characteristic that contains the long attribute value is ‘Name Starts With’, ‘Name Ends With’, ‘Name Contains’ or ‘Name is Exactly’. The UTF-8 string used in the parameter of the Object List Filter characteristic value is a non-zero length string and does not include any ASCII control character.

- Test Procedure

  1. The Upper Tester issues a command to the IUT to read the Object List Filter characteristic(s).
  2. For the long attribute value(s), the IUT executes the GATT Read Long Characteristic Values sub-procedure. Otherwise, the IUT sends an ATT_Read_Request to the Lower Tester containing the handle specified by the Upper Tester and after receiving the ATT_Read_Response, reports the value to the Upper Tester.
  3. The IUT repeats step 2 until all three Object List Filter characteristics have been read.

- Expected Outcome

  Pass verdict

  Even though three instances of the Object List Filter characteristic are exposed, it is sufficient for the purposes of this test case if the IUT reads the value of one instance, provided that at least one long attribute value is read during the test.

  In step 2, the IUT detects when the attribute value to be read is long and executes the GATT Read Long sub-procedure. The IUT reads the entire value of the Object List Filter characteristic successfully.

OTP/CL/OTR/BI-01-C [Read OTS Feature Characteristic with Reserved Value]

- Test Purpose

  Verify that the Object Client IUT is tolerant to the presence of RFU values for the OTS Feature characteristic.

- Reference

  [3] 4.6

- Initial Condition

  - Run the preamble procedure defined in Section 4.2.1, if using an LE transport, or Section 4.2.2, if using a BR/EDR transport, to set up the transport and initiate connection to an Object Server.

- The IUT knows the handle of the OTS Feature characteristic contained in the Lower Tester.
- For the purposes of this test case, a valid OTS Feature characteristic value is used, but also with at least one RFU bit from each field set to 1.

- Test Procedure

1. Send a command from Upper Tester to request the IUT to read the OTS Feature Characteristic from the Lower Tester.
2. After receipt of the expected result by the Lower Tester from the IUT, send an ATT_Read_Response (0x0B) from the Lower Tester to the IUT containing a value in which at least two RFU bits are non-zero.

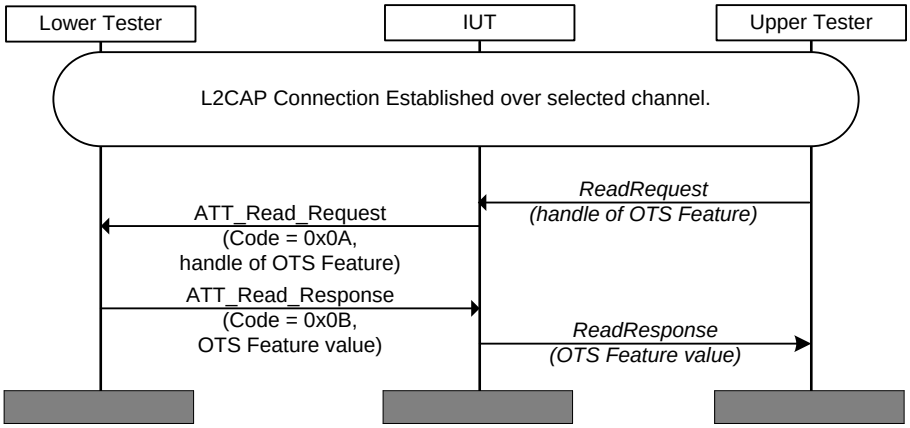

Figure 4.2: OTP/CL/OTR/BI-01-C [Read OTS Feature Characteristic with Reserved Value]

- Expected Outcome

Pass verdict

The IUT sends a correctly formatted ATT_Read_Request (0x0A) to the Lower Tester, containing the handle specified by the Upper Tester.

The IUT receives the response from the Lower Tester, ignores the RFU values and continues to function in accordance with the requirements of the profile.

OTP/CL/OTR/BI-02-C [Read Object Properties Characteristic with Reserved Value]

- Test Purpose

Verify that the Object Client IUT is tolerant to the presence of RFU values for the Object Properties characteristic.

- Reference

[3] 4.6

- Initial Condition

- Run the preamble procedure defined in Section 4.2.1, if using an LE transport, or Section 4.2.2, if using a BR/EDR transport, to set up the transport and initiate connection to an Object Server.
- The IUT knows the handle of the Object Properties characteristic contained in the Lower Tester.
- For the purposes of this test case, a valid Object Properties characteristic value is used, but also with at least one RFU bit set to 1.

- Test Procedure

  1. Send a command from Upper Tester to request the IUT to read the Object Properties Characteristic from the Lower Tester.
  2. After receipt of the expected result by the Lower Tester from the IUT, send an ATT_Read_Response (0x0B) from the Lower Tester to the IUT containing a value in which at least one RFU bit is non-zero.

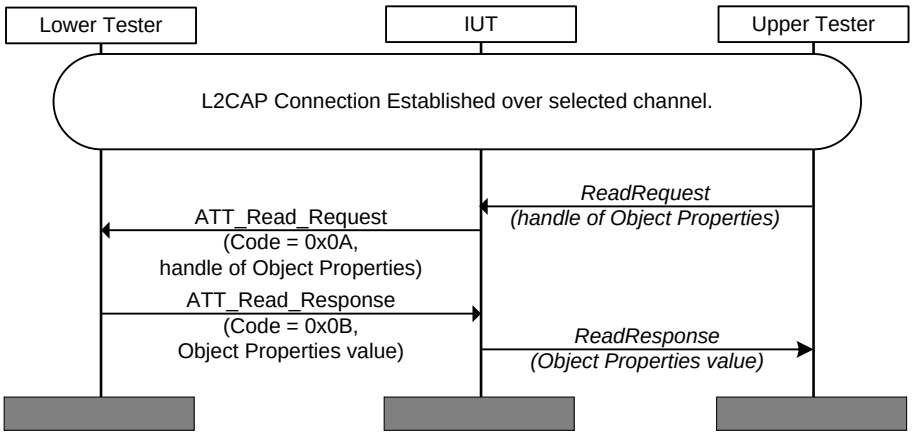

Figure 4.3: OTP/CL/OTR/BI-02-C [Read Object Properties Characteristic with Reserved Value]

- Expected Outcome

  Pass verdict

  The IUT sends a correctly formatted ATT_Read_Request (0x0A) to the Lower Tester, containing the handle specified by the Upper Tester.

  The IUT receives the response from the Lower Tester, ignores the RFU value(s) and continues to function in accordance with the requirements of the profile.

OTP/CL/OTR/BI-03-C [Read Object List Filter Characteristic with Reserved Value]

- Test Purpose

  Verify that the Object Client IUT is tolerant to the presence of RFU values for at least one Object List Filter characteristic.

- Reference

  [3] 4.6

- Initial Condition

  - Run the preamble procedure defined in Section 4.2.1, if using an LE transport, or Section 4.2.2, if using a BR/EDR transport, to set up the transport and initiate connection to an Object Server.
  - The IUT knows the handle of all Object List Filter characteristics contained in the Lower Tester.
  - For the purposes of this test case, valid Object List Filter characteristic values are used, but with at least one from the pool of RFU values, the characteristic(s) with the RFU value, also includes a Parameter that is 1–20 octets in length.

- Test Procedure

  1. Send a command from Upper Tester to request the IUT to read all Object List Filter characteristics from the Lower Tester.
  2. After receipt of each expected result by the Lower Tester from the IUT, send an ATT_Read_Response (0x0B) from the Lower Tester to the IUT containing an RFU value in at least one of the Object List Filter characteristics.

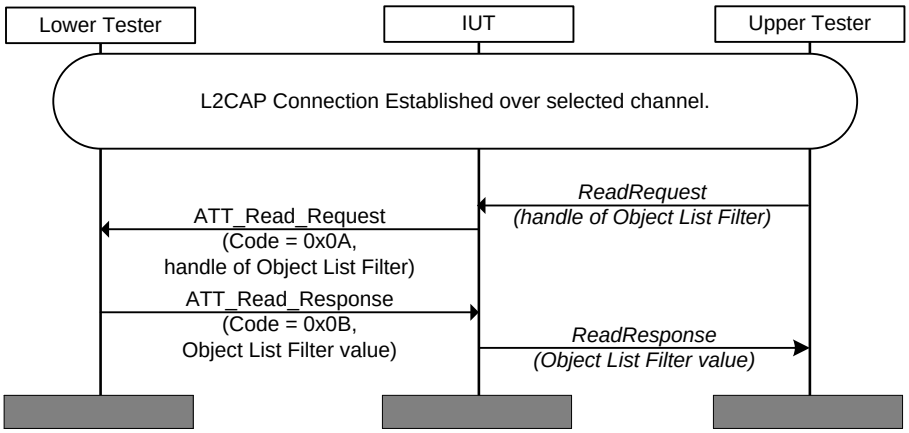

Figure 4.4: OTP/CL/OTR/BI-03-C [Read Object List Filter Characteristic with Reserved Value]

- Expected Outcome

  Pass verdict

  The IUT sends a correctly formatted ATT_Read_Request (0x0A) to the Lower Tester for each of the three characteristics, containing the handle specified by the Upper Tester.

  The IUT receives the response from the Lower Tester, ignores the RFU value(s) and corresponding parameters(s) and continues to function in accordance with the requirements of the profile.

4.7 Characteristic Write

- Test Purpose

  This test group contains test cases to verify that the characteristics that are writable and claimed in the ICS [4] can be written to by the Object Client. The verification is performed one at a time, as enumerated in the test cases in Table 4.4, using this generic test procedure.

- Reference

  [3] 4.5.5.1

- Initial Condition

  - All characteristics of OTS for which writing is supported by the IUT are specified in the ICS [4].
  - Run the preamble procedure to enable the Object Client to initiate connection to an Object Server included in the Section 4.2.1, if using an LE transport, or Section 4.2.2 if using a BR/EDR transport.
  - The Lower Tester includes one instantiation of the Object Transfer Service [6] including all defined characteristics. Each characteristic that supports writing includes the object properties metadata with the ‘Write’ bit set to 1.

- The IUT has previously executed the procedure included in Section 4.3 or Section 4.5, so it has the handle/value pairs for all characteristics of the Object Transfer Service exposed by the Lower Tester that are supported by the IUT.
- The IUT may need to perform a re-discovery of characteristics prior to performing this test group in case the database has changed since previous tests were performed.
- The length of the test value to be written is such that it can be written in its entirety in a GATT Write transaction, using the default minimum ATT_MTU size.

- Test Case Configuration

Test Case	Additional Test Requirements
OTP/CL/OTW/BV-01-C [Write Object Name Characteristic]	The IUT writes a non-zero length value that does not include any ASCII control character.
OTP/CL/OTW/BV-02-C [Write Object First-Created Characteristic]	The IUT writes a valid date and time value.
OTP/CL/OTW/BV-03-C [Write Object Last-Modified Characteristic]	The IUT writes a valid date and time value.
OTP/CL/OTW/BV-04-C [Write Object Properties Characteristic]	The IUT writes a valid property value.
OTP/CL/OTW/BV-05-C [Write Object List Filter Characteristic]	The IUT writes a valid combination of values to the three Object List Filter characteristics.

Table 4.4: Characteristic Write test cases

- Test Procedure

1. The Upper Tester issues a command to the IUT to read (one at a time) the supported characteristics from the Lower Tester.
2. The Upper Tester issues a command to the IUT to write a new value to the supported characteristics.
3. For each characteristic of the Object Transfer Service supported by the IUT, the IUT sends an ATT_Write_Request command to the Lower Tester with the value specified in step 2.

- Expected Outcome

  Pass verdict

  The IUT writes a correctly formatted characteristic value to the Lower Tester.

OTP/CL/OTW/BV-06-C [Write Long Object Name Characteristic]

- Test Purpose

  Verify that an Object Client IUT can use the GATT Write Long sub-procedure successfully to write to an Object Name characteristic that contains a value in UTF-8 format when the length of the value to be written exceeds the capacity of default ATT_MTU size.

- Reference

  [3] 4.5.5.1

- Initial Condition

  - Run the preamble procedure defined in Section 4.2.1, if using an LE transport, or Section 4.2.2, if using a BR/EDR transport, to set up the transport and initiate connection to an Object Server.

- The Lower Tester includes one instantiation of the Object Transfer Service [6] including all defined characteristics. The object properties metadata of the Object Name characteristic has the 'Write' bit set to 1.
- The IUT has previously executed the procedure included in Section 4.3, so it has the handle/value pairs for all characteristics of the Object Transfer Service exposed by the Lower Tester that are supported by the IUT.
- The Lower Tester does not permit an ATT_MTU size larger than the default ATT_MTU size to be negotiated.
- The length of the Object Name characteristic used in this test case is such that its value cannot be written in its entirety in a GATT Write transaction when the default ATT_MTU size is used and therefore requires the GATT Write Long procedure to be used.

- Test Procedure

  1. The Upper Tester issues a command to the IUT to write a new value to the Object Name characteristic.
  2. The IUT executes the GATT Write Long Characteristic Values sub-procedure.

- Expected Outcome

  Pass verdict

  The IUT writes the correct Object Name characteristic value to the Lower Tester in its entirety by using the GATT Write Long sub-procedure.

  The value written is a non-zero length string and does not include any ASCII control character.

OTP/CL/OTW/BV-07-C [Write Long Object List Filter Characteristic]

- Test Purpose

  Verify that an Object Client IUT can use the GATT Write Long sub-procedure successfully to write to an Object List Filter characteristic when the length of the value to be written exceeds the capacity of default ATT_MTU size.

- Reference

  [3] 4.5.2.2

- Initial Condition
  - Run the preamble procedure defined in Section 4.2.1, if using an LE transport, or Section 4.2.2, if using a BR/EDR transport, to set up the transport and initiate connection to an Object Server.
  - The Lower Tester does not permit an ATT_MTU size larger than the default ATT_MTU size to be negotiated.
  - The Lower Tester includes one instantiation of the Object Transfer Service [6] including all defined characteristics. The Lower Tester exposes three Object List Filter characteristics.
  - The IUT has previously executed the procedure included in Section 4.3 or Section 4.5, so it has the handle/value pairs for all characteristics of the Object Transfer Service exposed by the Lower Tester that are supported by the IUT.
  - The filter condition to be written to the Object List Filter characteristic is 'Name Starts With', 'Name Ends With', 'Name Contains' or 'Name is Exactly'. The UTF-8 string used in the parameter of the Object List Filter characteristic value is a non-zero length string and does not include any ASCII control character.

- The length of the value to be written to the Object List Filter characteristic is sufficiently long that it cannot be written in its entirety in a GATT Write transaction when the default ATT_MTU size is used and therefore requires the GATT Write Long sub-procedure to be used. Therefore, the test value used is more than (ATT_MTU-3) octets in length. This is achieved by including a sufficiently long string value in the parameter field.

- Test Procedure

  1. The Upper Tester issues a command to the IUT to write a new value to at least one of the Object List Filter characteristics.
  2. The IUT executes the GATT Write Long Characteristic Values sub-procedure.

- Expected Outcome

  Pass verdict

  The IUT writes the correct Object List Filter characteristic value to the Lower Tester in its entirety by using the GATT Write Long sub-procedure.

  The value written is a non-zero length string and does not include any ASCII control character.

  Note: Although three instances of the Object List Filter characteristic are exposed, verifying that a long attribute value can be written to at least one instance of the characteristic is sufficient for the purposes of this test case.

4.8 Characteristic Indications

Verify that an Object Client IUT can configure an Object Server for indications and receive indications.

OTP/CL/OTI/BV-01-C [Configure Object Changed characteristic for Indication]

- Test Purpose

  Verify that the Object Client IUT can configure an Object Server (Lower Tester) to indicate the Object Changed characteristic.

- Reference

  [3] 4.4.3

- Initial Condition

  - Run the preamble procedure defined in Section 4.2.1, if using an LE transport, or Section 4.2.2, if using a BR/EDR transport, to set up the transport and initiate connection to an Object Server.
  - The Lower Tester includes one instantiation of the Object Transfer Service [6] including all defined characteristics.
  - The IUT knows the handle of the Object Changed characteristic.
  - The IUT has discovered the Client Characteristic Configuration Descriptor for the Object Changed characteristic contained in the Lower Tester.

- Test Procedure

  1. The Upper Tester sends a command to the IUT to configure the Object Server to send Object Changed characteristics.
  2. IUT sends a correctly formatted ATT_Write_Request (0x12) to the Lower Tester, with the handle set to that of the Client Characteristic Configuration descriptor for the Object Changed characteristic with the value set to “Indication”.
  3. The Lower Tester sends an ATT_Write_Response (0x13) to the IUT.

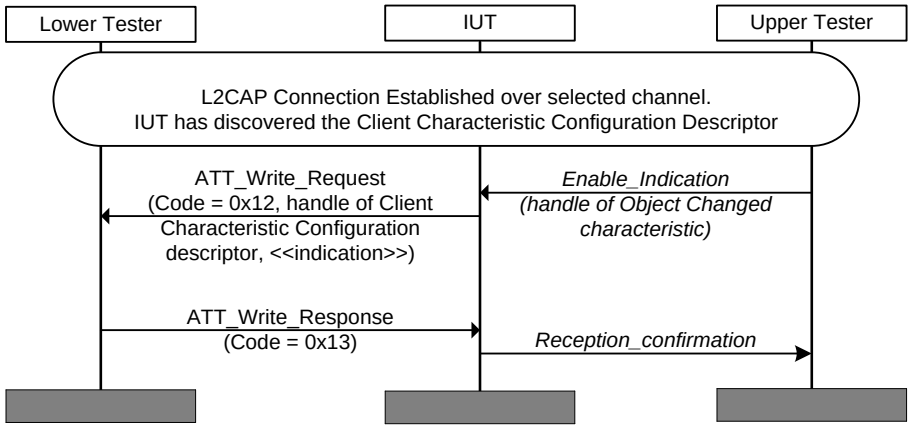

Figure 4.5: OTP/CL/OTI/BV-01-C [Configure Object Changed characteristic for Indication]

- Expected Outcome

  Pass verdict

  In step 2, the IUT configures the Client Characteristic Configuration descriptor of the Object Changed characteristic for indications.

OTP/CL/OTI/BV-02-C [Receive Object Changed Indications]

- Test Purpose

  Verify that the Object Client IUT can receive indications of the Object Changed characteristic, including variants.

- Reference

  [3] 4.4.3

- Initial Condition

  - Run the preamble procedure defined in Section 4.2.1, if using an LE transport, or Section 4.2.2, if using a BR/EDR transport, to set up the transport and initiate connection to an Object Server.
  - The Lower Tester includes one instantiation of the Object Transfer Service [6] including all defined characteristics.
  - The IUT has discovered the Client Characteristic Configuration Descriptor of the Object Changed characteristic contained in the Lower Tester.
  - The IUT is put into a state in which it is prepared to receive Object Changed indications, by executing the procedure described in OTP/CL/OTI/BV-01-C [Configure Object Changed characteristic for Indication] or by other means.
  - The IUT knows the handle of the Object Changed characteristic.

- Test Procedure

  1. For each Test Pattern shown in Table 4.5, the Lower Tester sends an ATT_Handle_Value_Indication containing an Object Changed characteristic value to the IUT. The test values for the Flags field and the corresponding pass criteria are shown for each test pattern. The value of the Object ID field is a 48-bit integer randomly selected from pool of non-RFU values.

For each case, the IUT receives the indication and sends a Handle Value Confirmation.

Test Pattern	Flags Field Value (bit7..bit0)	Pass Criteria
1	0000 0110	Source of Change: Server Change occurred to the object contents: True Change occurred to the object metadata: True Object Creation: False Object Deletion: False
2	0000 0111	Source of Change: Client Change occurred to the object contents: True Change occurred to the object metadata: True Object Creation: False Object Deletion: False
3	0000 1000	Source of Change: Server Change occurred to the object contents: False Change occurred to the object metadata: False Object Creation: True Object Deletion: False
4	0000 1001	Source of Change: Client Change occurred to the object contents: False Change occurred to the object metadata: False Object Creation: True Object Deletion: False
5	0001 0000	Source of Change: Server Change occurred to the object contents: False Change occurred to the object metadata: False Object Creation: False Object Deletion: True
6	0001 0001	Source of Change: Client Change occurred to the object contents: False Change occurred to the object metadata: False Object Creation: False Object Deletion: True

Table 4.5: Object Changed test patterns

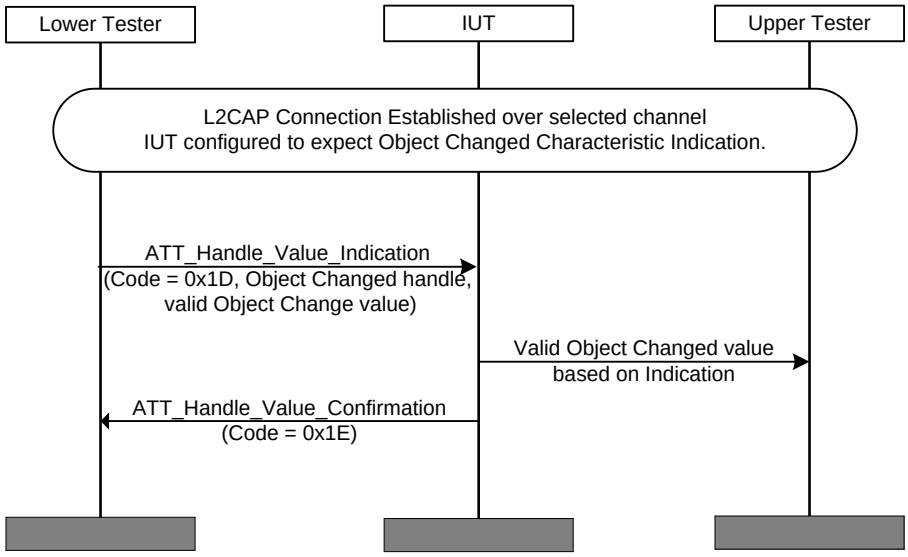

Figure 4.6: OTP/CL/OTI/BV-02-C [Receive Object Changed Indications]

- Expected Outcome

  Pass verdict

  The IUT is able to correctly parse the received Object Changed values according to the pass criteria in Table 4.5.

  The reported Flags and Object ID field values match the ones sent by the Lower Tester.

  In all cases, the IUT continues to process commands and to receive data normally.

OTP/CL/OTI/BV-03-C [Receive Object Changed Indications with Reserved Flags]

- Test Purpose

  Verify that the Object Client IUT can receive indications of the Object Changed characteristic from an Object Server including reserved flags.

- Reference

  [3] 4.4.3

- Initial Condition

  - Run the preamble procedure defined in Section 4.2.1, if using an LE transport, or Section 4.2.2, if using a BR/EDR transport, to set up the transport and initiate connection to an Object Server.
  - The Lower Tester includes one instantiation of the Object Transfer Service [6] including all defined characteristics.
  - The IUT is put into a state in which it is prepared to receive Object Changed indications, by executing the procedure described in OTP/CL/OTI/BV-01-C [Configure Object Changed characteristic for Indication] or by other means.
  - The IUT knows the handle of the Object Changed characteristic.

- Test Procedure

  The Lower Tester sends an ATT_Handle_Value_Indication to the IUT containing a valid Object Changed characteristic value and at least one RFU flag set to 1.

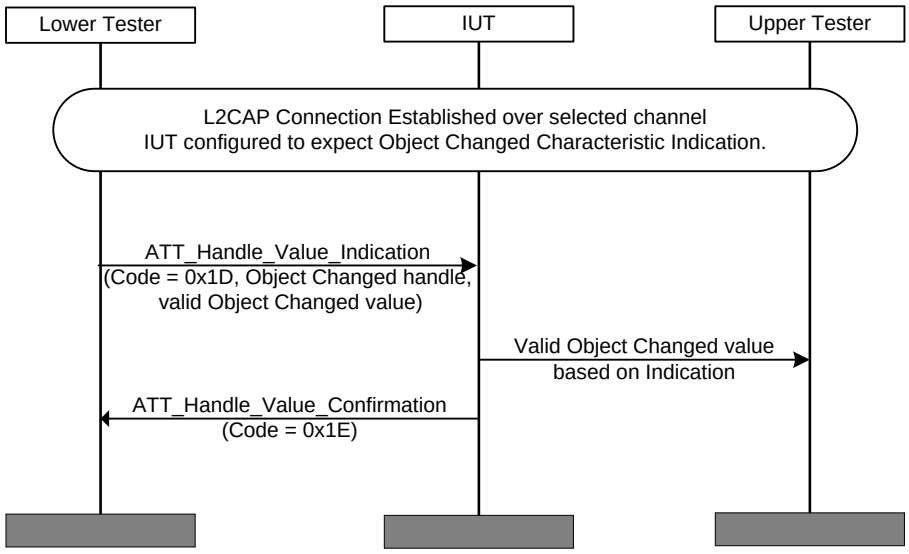

Figure 4.7: OTP/CL/OTI/BV-03-C [Receive Object Changed Indications with Reserved Flags]

- Expected Outcome

  Pass verdict

  The IUT reports the received Object Changed characteristic value to the Upper Tester. The reported Object Changed value matches the value sent by the Lower Tester.

  The IUT ignores the RFU value(s) and continues to function in accordance with the requirements of the profile.

OTP/CL/OTI/BV-04-C [Service Changed]

- Test Purpose

  Verify that the Object Client IUT re-performs service and characteristic discovery following receipt of a Serviced Changed indication from an Object Server with which it has a trusted relationship and that it refreshes cached values.

- Reference

  [3] 4.6

- Initial Condition

  - The IUT and the Lower Tester have previously bonded and have a trusted relationship.
  - The IUT has previously read the OTS Feature characteristic as described in OTP/CL/OTR/BV-01-C [Read OTS Feature Characteristic].
  - The Lower Tester has the Service Changed characteristic.
  - The IUT has configured the Service Changed characteristic for indications as defined in GATT.TS [5] Section 4.2.2.2 [Characteristic Configuration for Indication].
  - No connection is established between the IUT and Lower Tester.

- Test Procedure

  1. Run the preamble procedure to enable the Object Client to initiate connection to an Object Server included in the Section 4.2.1, if using an LE transport, or Section 4.2.2 if using a BR/EDR transport.
  2. The Lower Tester indicates the Service Changed characteristic. The characteristic value contains the beginning and ending attribute handles for the service definition including the Object Transfer Service.
  3. The IUT sends an ATT_Handle_Value_Confirmation to the Lower Tester.
  4. The IUT re-performs service and characteristic discovery.

- Expected Outcome

  Pass verdict

  The IUT successfully re-discovers all of the supported characteristics and characteristic descriptors of the Object Transfer Service.

  The IUT re-reads the OTS Feature characteristic by sending a correctly formatted ATT_Read_Request (0x0A) to the Lower Tester, containing the refreshed handle value for the OTS Feature characteristic.

  The IUT receives the response from the Lower Tester and sends the ReadResponse containing the correct OTS Feature value to the Upper Tester.

4.9 Generic Object Transfer Procedures

OTP/CL/OTPP/BV-01-C [Object Discovery – Discover All Objects]

- Test Purpose

  Verify that the Object Client IUT can perform the Discover All Objects sub-procedure.

- Reference

  [3] 4.5.2.1

- Initial Condition

  - Run the preamble procedure defined in Section 4.2.1, if using an LE transport, or Section 4.2.2, if using a BR/EDR transport, to set up the transport and initiate connection to an Object Server.
  - The Lower Tester includes one instantiation of the Object Transfer Service [6] including all defined characteristics.
  - The IUT knows the handle of the Object Transfer Service characteristics contained in the Lower Tester from running the test procedures in Section 4.3 or Section 4.5 or by other means.
  - Run the preamble procedure defined in GATT.TS [5] Section 4.2.2.2 [Characteristic Configuration for Indication] to configure the OLCP for indications.
  - The Lower Tester contains at least three valid objects.
  - The Current Object is other than the first object in the list of objects.
  - The IUT may initially set the List Sort Order so that the object discovery process described in the following steps occurs in an order as specified by the IUT.

- Test Procedure

  1. The IUT writes a value of 0x00 (“No Filter”) to all three instances of the Object List Filter characteristic.
  2. The IUT writes the OLCP First Op Code (0x01) to the OLCP without a Parameter Value to select the first object.
  3. The Lower Tester, after sending a Write Response to acknowledge the write to the OLCP, sends an indication of the OLCP characteristic containing the Response Code Op Code (0x70), the Request Op Code (0x01) followed by the Result Code for ‘Success’ (0x01) without a Response Parameter.
  4. The IUT reads at least one of the Object Metadata characteristics such as the Object Name or Object ID or Object Type.
  5. The IUT writes the OLCP Next Op Code (0x04) to the OLCP without a Parameter Value to select the next object.
  6. The Lower Tester, after sending a Write Response to acknowledge the write to the OLCP, sends an indication of the OLCP characteristic containing the Response Code Op Code (0x70), the Request Op Code (0x04) followed by the Result Code for ‘Success’ (0x01) without a Response Parameter.

     The IUT repeats steps 4, 5, and 6 until receiving an Error Response with the Result Code set to ‘Out of Bounds’ (0x05).

- Expected Outcome

  Pass verdict

  The IUT writes a correctly formatted First op code to the OLCP.

  The IUT reads at least one Object Metadata characteristic each time a new object is selected.

  The IUT writes a correctly formatted Next op code to the OLCP until all objects have been discovered.

  After receiving each indication of the OLCP, the IUT sends an ATT_Handle_Value_Confirmation to the Lower Tester.

OTP/CL/OTPP/BV-02-C [Object Discovery – Search for Specific Object]

- Test Purpose

  Verify that the Object Client IUT can perform the Search for Specific Object sub-procedure.

- Reference

  [3] 4.5.2.3

- Initial Condition

  - Run the preamble procedure defined in Section 4.2.1, if using an LE transport, or Section 4.2.2, if using a BR/EDR transport, to set up the transport and initiate connection to an Object Server.
  - The Lower Tester includes one instantiation of the Object Transfer Service [6] including all defined characteristics.
  - The IUT knows the handles of the Object Transfer Service characteristics contained in the Lower Tester from running the test procedures in Section 4.3 or Section 4.5 or by other means.
  - Run the preamble procedure defined in GATT.TS [5] Section 4.2.2.2 [Characteristic Configuration for Indication] to configure the OLCP for indications.

- The Lower Tester contains at least three valid objects.
- The object which the Upper Tester will specify as the target object to be found is not the first object in the list of objects.
- Each object contains valid metadata. Where used, the object name metadata is set to a non-zero length value and does not include any ASCII control character.
- The IUT may initially set the List Sort Order so that the object discovery process described in the following steps occurs in an order as specified by the IUT.

- Test Procedure

  1. The Upper Tester instructs the IUT to search for a specific object, providing the IUT with the name of one of the objects that is available from the Lower Tester.
  2. The IUT writes a value of 0x00 (“No Filter”) to all three instances of the Object List Filter characteristic.
  3. The IUT writes the OLCP First Op Code (0x01) to the OLCP without a Parameter Value to select the first object.
  4. The Lower Tester, after sending a Write Response to acknowledge the write to the OLCP, sends an indication of the OLCP characteristic containing the Response Code Op Code (0x70), the Request Op Code (0x01) followed by the Result Code for ‘Success’ (0x01) without a Response Parameter.
  5. The IUT reads at least the Object Name characteristic.
  6. The IUT writes the OLCP Next Op Code (0x04) to the OLCP without a Parameter Value to select the next object.
  7. The Lower Tester, after sending a Write Response to acknowledge the write to the OLCP, sends an indication of the OLCP characteristic containing the Response Code Op Code (0x70), the Request Op Code (0x04) followed by the Result Code for ‘Success’ (0x01) without a Response Parameter.
  8. The IUT repeats steps 5, 6, and 7 until the object specified by the Upper Tester in step 1 has been discovered.

     The IUT informs the Upper Tester that an object has been discovered as specified by the search criteria.

- Expected Outcome

  Pass verdict

  The IUT writes “No Filter” to all three instances of the Object List Filter characteristic.

  The IUT writes a correctly formatted First op code to the OLCP.

  The IUT reads at least one Object Metadata characteristic each time a new object is selected.

  The IUT writes a correctly formatted Next op code to the OLCP until the specific object has been discovered. At the end of the procedure, the object that was specified by the Upper Tester has become the Current Object.

  After receiving each indication of the OLCP, the IUT sends an ATT_Handle_Value_Confirmation to the Lower Tester.

4.9.1 Object Discovery – Discover by Filter

- Test Purpose

  This test group contains test cases to verify compliant operation when using the Discover by Filter sub-procedure for different filter conditions that are claimed in the ICS [4]. The verification is performed one at a time, as enumerated in the test cases in Table 4.6, using this generic test procedure.

- Reference

  [3] 4.5.2.2

- Initial Condition

  - Run the preamble procedure defined in Section 4.2.1, if using an LE transport, or Section 4.2.2, if using a BR/EDR transport, to set up the transport and initiate connection to an Object Server.
  - The IUT knows the handles of the Object Transfer Service characteristics contained in the Lower Tester from running the test procedures in Section 4.3 or Section 4.5 or by other means.
  - Run the preamble procedure defined in GATT.TS [5] Section 4.2.2.2 [Characteristic Configuration for Indication] to configure the OLCP for indications.
  - The Lower Tester contains at least three valid objects.
  - Each object contains valid metadata. Where used, the object name metadata is set to a non-zero length value and does not include any ASCII control character.
  - The IUT may initially set the List Sort Order so that the object discovery process described in the following steps occurs in an order as specified by the IUT.

- Test Case Configuration

Test Case	Additional Test Requirements
OTP/CL/OTPP/BV-03-C [Object Discovery - Discover by Filter - Name Starts With]	Set the Filter Value to 0x01 (Name Starts With)
OTP/CL/OTPP/BV-04-C [Object Discovery - Discover by Filter - Name Ends With]	Set the Filter Value to 0x02 (Name Ends With)
OTP/CL/OTPP/BV-05-C [Object Discovery - Discover by Filter - Name Contains]	Set the Filter Value to 0x03 (Name Contains)
OTP/CL/OTPP/BV-06-C [Object Discovery - Discover by Filter - Name is Exactly]	Set the Filter Value to 0x04 (Name is Exactly)
OTP/CL/OTPP/BV-07-C [Object Discovery - Discover by Filter - Object Type]	Set the Filter Value to 0x05 (Object Type])
OTP/CL/OTPP/BV-08-C [Object Discovery - Discover by Filter - Created between]	Set the Filter Value to 0x06 (Created between)
OTP/CL/OTPP/BV-09-C [Object Discovery - Discover by Filter - Modified between]	Set the Filter Value to 0x07 (Modified between)
OTP/CL/OTPP/BV-10-C [Object Discovery - Discover by Filter - Current Size between]	Set the Filter Value to 0x08 (Current Size between)
OTP/CL/OTPP/BV-11-C [Object Discovery - Discover by Filter - Allocated Size between]	Set the Filter Value to 0x09 (Allocated Size between)

Test Case	Additional Test Requirements
OTP/CL/OTPP/BV-12-C [Object Discovery - Discover by Filter - Marked Objects]	Set the Filter Value to 0x0A (Marked Objects) Lower Tester contains at least one object with the 'Mark' bit of the 'object properties' metadata set to 1.

Table 4.6: Object Discovery by Filter test cases

- Test Procedure

  1. The Upper Tester instructs the IUT to search for all objects whose metadata satisfy specified filter conditions.
  2. The IUT writes a valid value (Filter Value and Parameter) to at least one of the Object List Filter characteristics according to the test in Table 4.6.
  3. The IUT writes the OLCP First Op Code (0x01) to the OLCP without a Parameter Value to select the first object.
  4. The Lower Tester, after sending a Write Response to acknowledge the write to the OLCP, sends an indication of the OLCP characteristic containing the Response Code Op Code (0x70), the Request Op Code (0x01) followed by the Result Code for 'Success' (0x01) without a Response Parameter.
  5. The IUT reads at least the Object Name characteristic.
  6. The IUT writes the OLCP Next Op Code (0x04) to the OLCP without a Parameter Value to select the next object.
  7. The Lower Tester, after sending a Write Response to acknowledge the write to the OLCP, sends an indication of the OLCP characteristic containing the Response Code Op Code (0x70), the Request Op Code (0x04) followed by the Result Code for 'Success' (0x01) without a Response Parameter.
  8. The IUT repeats steps 5, 6 and 7 until receiving an Error Response with the Result Code set to 'Out of Bounds' (0x05).

     The IUT informs the Upper Tester that an object has been discovered as specified by the search criteria.

- Expected Outcome

  Pass verdict

  The IUT writes a valid value (Filter Value and Parameter) to at least one of the Object List Filter characteristics and the combination of values established in the three Object List Filter characteristics matches the filter requirements specified by the Upper Tester.

  The IUT writes a correctly formatted First op code to the OLCP.

  The IUT reads at least one Object Metadata characteristic each time a new object is selected.

  The IUT writes a correctly formatted Next op code to the OLCP until all the objects in the filtered list of objects have been discovered.

  After receiving each indication of the OLCP, the IUT sends an ATT_Handle_Value_Confirmation to the Lower Tester.

OTP/CL/OTPP/BV-13-C [Object Discovery - Discover by Directory Listing Object]

- Test Purpose

  Verify that the Object Client IUT can perform the Discover by Directory Listing Object sub-procedure.

- Reference

  [3] 4.5.2.4

- Initial Condition

  - Run the preamble procedure defined in Section 4.2.1, if using an LE transport, or Section 4.2.2, if using a BR/EDR transport, to set up the transport and initiate connection to an Object Server.
  - The Lower Tester includes one instantiation of the Object Transfer Service [6] including all defined characteristics.
  - The IUT knows the handles of the Object Transfer Service characteristics contained in the Lower Tester from running the test procedures in Section 4.3 or Section 4.5 or by other means.
  - Run the preamble procedure defined in GATT.TS [5] Section 4.2.2.2 [Characteristic Configuration for Indication] to configure the OACP and OLCP for indications.
  - The Lower Tester contains the Directory Listing Object.
  - The Lower Tester contains at least three valid objects other than the Directory Listing Object.
  - At least the first Object Record contained within the Directory Listing Object has one of the RFU bits of its Flags field set to one and also has more than one Extension octet present.

- Test Procedure

  1. The Upper Tester induces the IUT to read the Directory Listing Object.
  2. The IUT selects the Directory Listing Object using the Select by Object ID sub-procedure (see OTP/CL/OTPP/BV-14-C [Select Object - Select by Object ID]) using the Object ID of the Directory Listing Object (i.e., 0x000000000000) as the parameter.
  3. The IUT reads the Current Object using the Read Object Content sub-procedure (see OTP/CL/OTPP/BV-15-C [Read Object - Read Object Contents]).

- Expected Outcome

  Pass verdict

  The IUT writes a correctly formatted Go To Op Code to the OLCP with the Directory Listing Object ID (i.e., 0x000000000000) as the parameter.

  After receiving indication of the OLCP, the IUT sends an ATT_Handle_Value_Confirmation to the Lower Tester.

  The IUT correctly receives the Directory Listing Object via the Object Transfer Channel and correctly parses the contents of the Directory Listing Object in accordance with the service.

OTP/CL/OTPP/BV-14-C [Select Object - Select by Object ID]

- Test Purpose

  Verify that the Object Client IUT can perform the Select by Object ID sub-procedure.

- Reference

  [3] 4.5.3.2

- Initial Condition
  - Run the preamble procedure defined in Section 4.2.1, if using an LE transport, or Section 4.2.2, if using a BR/EDR transport, to set up the transport and initiate connection to an Object Server.
  - The Lower Tester includes one instantiation of the Object Transfer Service [6] including all defined characteristics.
  - The IUT knows the handles of the Object Transfer Service characteristics contained in the Lower Tester from running the test procedures in Section 4.3 or Section 4.5 or by other means.
  - Run the preamble procedure defined in GATT.TS [5] Section 4.2.2.2 [Characteristic Configuration for Indication] to configure the OACP or the OLCP for indications.
  - The Lower Tester contains at least one valid object with object ID set to Object ID 1 (for example 0x000000000002).
- Test Procedure
  1. The IUT writes the OLCP Go To Op Code (0x05) to the OLCP with Object ID 1 as the parameter (for example 0x000000000002).
  2. The Lower Tester, after sending a Write Response to acknowledge the write to the OLCP, sends an indication of the OLCP characteristic containing the Response Code Op Code (0x70), the Request Op Code (0x05) followed by the Result Code for ‘Success’ (0x01) without a Response Parameter.
  3. The IUT sends an ATT_Handle_Value_Confirmation.
- Expected Outcome

  Pass verdict

  The IUT writes a correctly formatted Go To Op Code with the Object ID 1 as the parameter.

  After indication of the OLCP, the IUT sends an ATT_Handle_Value_Confirmation to the Lower Tester.

OTP/CL/OTPP/BV-15-C [Read Object - Read Object Contents]

- Test Purpose

  Verify that the Object Client IUT can perform the Read Object Contents sub-procedure.
- Reference

  [3] 4.5.4.2
- Initial Condition
  - Run the preamble procedure defined in Section 4.2.1, if using an LE transport, or Section 4.2.2, if using a BR/EDR transport, to set up the transport and initiate connection to an Object Server.
  - The Lower Tester includes one instantiation of the Object Transfer Service [6] including all defined characteristics.
  - The IUT knows the handles of the Object Transfer Service characteristics contained in the Lower Tester from running the test procedures in Section 4.3 or Section 4.5 or by other means.
  - Run the preamble procedure defined in GATT.TS [5] Section 4.2.2.2 [Characteristic Configuration for Indication] to configure the OACP indications.

- Run the preamble procedure defined in Section 4.2.3 to open an Object Transfer Channel.
- The Lower Tester contains at least one valid object with valid content that supports the Read property, and this object is selected.

- Test Procedure

  1. The Upper Tester induces the IUT to read the part or the whole of the contents of the Current Object.
  2. The IUT reads the Object Size characteristic (see OTP/CL/OTR/BV-04-C [Read Object Size Characteristic]).
  3. The IUT writes the OACP Read Op Code (0x05) to the OACP with the Offset parameter set to a value less than the Current Size field read in step 2 and the Length Parameter set to a value such that the sum of the Length and Offset parameters is less than or equal to the Current Size field read in step 2.
  4. The Lower Tester, after sending a Write Response to acknowledge the write to the OACP, sends an indication of the OACP characteristic containing the Response Code Op Code (0x60), the Request Op Code (0x05) followed by the Result Code for ‘Success’ (0x01) without a Response Parameter.
  5. The IUT sends an ATT_Handle_Value_Confirmation.
  6. The Lower Tester sends data consisting of the number of octets specified in the Length parameter (see step 3) starting from the offset specified in the Offset Parameter (see step 3) to the IUT via the Object Transfer Channel.

- Expected Outcome

  Pass verdict

  The IUT writes a correctly formatted Read Op Code (0x05) with the Offset parameter less than the Current Size field read in step 2 and a Length parameter such that the sum of the Length and the Offset parameters is less than or equal to the Current Size field read in step 2.

  The Offset and Length values written by the IUT are consistent with the request made by the Upper Tester.

  After indication of the OACP, the IUT sends an ATT_Handle_Value_Confirmation to the Lower Tester.

  The specified object contents are correctly received via the Object Transfer Channel by the IUT.

4.9.2 Object Write

OTP/CL/OTPP/BV-16-C [Write Object - Write Object Metadata]

- Test Purpose

  Verify the aspects of the Write Object Metadata sub-procedure that are not exercised by performing the individual test cases in the ‘Writing of Characteristics and Descriptors’ (OTW) test group.

  Verify that the Object Client IUT can perform the Write Object Metadata sub-procedure when it attempts to write a long attribute value and the request is not supported by the Server.

- Reference

  [3] 4.5.5.1

- Initial Condition
  - Run the preamble procedure defined in Section 4.2.1, if using an LE transport, or Section 4.2.2, if using a BR/EDR transport, to set up the transport and initiate connection to an Object Server.
  - The Lower Tester includes one instantiation of the Object Transfer Service [6] including the Object Name characteristic. The object properties metadata of the Object Name characteristic has the 'Write' bit set to 1.
  - The IUT has previously discovered the handle/value pairs for all characteristics used in the following test procedure.
  - The Lower Tester does not permit an ATT_MTU size larger than the default ATT_MTU size to be negotiated.
  - The length of the Object Name string value initially used in this test case is such that its value cannot be written in its entirety in a single GATT Write transaction when the default ATT_MTU size is used and therefore requires the GATT Write Long procedure to be used. The string does not include any ASCII control character.
- Test Procedure
  1. The Upper Tester issues a command to the IUT to write a new value to the Object Name characteristic. The value requested in this step induces the IUT to attempt the GATT Write Long procedure.
  2. The IUT sends a correctly formatted ATT_Prepare_Write_Request as described in the GATT Write Long Characteristic Values sub-procedure.
  3. The Lower Tester rejects the ATT_Prepare_Write_Request by responding with the ATT Error Response ATT_Request_Not_Supported.
  4. If requested by the IUT, the Upper Tester provides a shorter name that is short enough to be written without requiring the GATT Write Long procedure to be used.
  5. The IUT writes the shorter object name to the Object Name characteristic by sending an ATT_Write_Request command to the Lower Tester.
- Expected Outcome

  Pass verdict

  After receiving the error response in step 3, the IUT returns to a stable state and can process commands normally.

  In step 4, it is acceptable for the IUT either to generate a shorter name automatically (e.g., by truncating the longer name) or to request input from the Upper Tester.

  In step 5, the IUT successfully writes the shorter object name to the Object Name characteristic.

OTP/CL/OTPP/BV-17-C [Write Object - Write Object Contents]

- Test Purpose

  Verify that the Object Client IUT can perform the Write Object Contents sub-procedure without truncation.

- Reference

  [3] 4.5.5.2

- Initial Condition

  - Run the preamble procedure defined in Section 4.2.1, if using an LE transport, or Section 4.2.2, if using a BR/EDR transport, to set up the transport and initiate connection to an Object Server.
  - The Lower Tester includes one instantiation of the Object Transfer Service [6] including all defined characteristics.
  - The IUT knows the handles of the Object Transfer Service characteristics contained in the Lower Tester from running the test procedures in Section 4.3 or Section 4.5 or by other means.
  - Run the preamble procedure defined in GATT.TS [5] Section 4.2.2.2 [Characteristic Configuration for Indication] to configure the OACP for indications.
  - Run the preamble procedure defined in Section 4.2.3 to open an Object Transfer Channel.
  - The Lower Tester contains at least one valid object that supports the Write and Patch properties, and this object is selected.

- Test Procedure

  1. The Upper Tester induces the IUT to write to the Current Object.
  2. The IUT reads the Object Size characteristic (see OTP/CL/OTR/BV-04-C [Read Object Size Characteristic]) and the Object Properties characteristic (see OTP/CL/OTR/BV-08-C [Read Object Properties Characteristic]).
  3. The IUT writes the OACP Write Op Code (0x06) to the OACP with the Offset parameter set to a value less than or equal to the Current Size read in step 2 and the Length Parameter set to a value such that the sum of the Length and Offset parameters is less than or equal to the Allocated Size read in step 2 and the Mode parameter value set to not truncate (bit 1 is set to 0).
  4. The Lower Tester, after sending a Write Response to acknowledge the write to the OACP, sends an indication of the OACP characteristic containing the Response Code Op Code (0x60), the Request Op Code (0x06) followed by the Result Code for ‘Success’ (0x01) without a Response Parameter.
  5. The IUT sends an ATT_Handle_Value_Confirmation.
  6. The IUT sends data to the Lower Tester via the Object Transfer Channel.
  7. The Lower Tester waits for the object transfer operation to complete.

- Expected Outcome

  Pass verdict

  The IUT writes a correctly formatted Write Op Code (0x06) with the Offset parameter less than or equal to the Current Size read in step 2 and a length parameter such that the sum of the length and the offset is less than or equal to the Allocated Size read in step 2.

  The Offset and Length values written by the IUT are consistent with the request made by the Upper Tester.

After indication of the OACP, the IUT sends an ATT_Handle_Value_Confirmation to the Lower Tester.

The specified object contents are received by the Lower Tester via the Object Transfer Channel.

The IUT sends the expected number of octets to the Lower Tester.

OTP/CL/OTPP/BV-18-C [Write Object - Write Object Contents - Truncate]

- Test Purpose

  Verify that the Object Client IUT can perform the Write Object Contents sub-procedure with truncation.

- Reference

  [3] 4.5.5.2

- Initial Condition

  - Run the preamble procedure defined in Section 4.2.1, if using an LE transport, or Section 4.2.2, if using a BR/EDR transport, to set up the transport and initiate connection to an Object Server.
  - The Lower Tester includes one instantiation of the Object Transfer Service [6] including all defined characteristics.
  - The IUT knows the handles of the Object Transfer Service characteristics contained in the Lower Tester from running the test procedures in Section 4.3 or Section 4.5 or by other means.
  - Run the preamble procedure defined in GATT.TS [5] Section 4.2.2.2 [Characteristic Configuration for Indication] to configure the OACP for indications.
  - Run the preamble procedure defined in Section 4.2.3 to open an Object Transfer Channel.
  - The Lower Tester contains at least one valid object that supports the Write, Patch and Truncate properties, and this object is selected.

- Test Procedure

  1. The Upper Tester induces the IUT to truncate the Current Object.
  2. The IUT reads the Object Size characteristic (see OTP/CL/OTR/BV-04-C [Read Object Size Characteristic]).
  3. The IUT writes the OACP Write Op Code (0x06) to the OACP with the Offset parameter set to a value less than the Current Size read in step 2 and the Length Parameter set to a value such that the sum of the Length and Offset parameters is less than the Current Size read in step 2 and the Mode parameter value set to truncate (bit 1 is set to 1).
  4. The Lower Tester, after sending a Write Response to acknowledge the write to the OACP, sends an indication of the OACP characteristic containing the Response Code Op Code (0x60), the Request Op Code (0x06) followed by the Result Code for ‘Success’ (0x01) without a Response Parameter.
  5. The IUT sends an ATT_Handle_Value_Confirmation.
  6. The IUT sends data to the Lower Tester via the Object Transfer Channel.
  7. The Lower Tester waits for the object transfer operation to complete.

- Expected Outcome

  Pass verdict

  The IUT writes correctly formatted Write Op Code (0x06) with the Offset parameter value less than the Current Size value read in step 2 and a length parameter such that the sum of the Length and

Offset parameter values is less than the Current Size value read in step 2 and the Mode parameter value set to truncate (bit 1 is set to 1).

The Offset and Length values written by the IUT are consistent with the request made by the Upper Tester.

After indication of the OACP, the IUT sends an ATT_Handle_Value_Confirmation to the Lower Tester.

The specified object contents are received by the Lower Tester via the Object Transfer Channel.

The IUT sends the expected number of octets to the Lower Tester.

4.9.3 Resume Read or Write Operations

OTP/CL/OTPP/BV-19-C [Resume Reading Object Contents]

- Test Purpose

  Verify that the Object Client IUT can perform the Resume Reading Object Contents sub-procedure.

- Reference

  [3] 4.5.6.1

- Initial Condition

  - Run the preamble procedure defined in Section 4.2.1, if using an LE transport, or Section 4.2.2, if using a BR/EDR transport, to set up the transport and initiate connection to an Object Server.
  - The Lower Tester includes one instantiation of the Object Transfer Service [6] including all defined characteristics.
  - The IUT knows the handles of the Object Transfer Service characteristics contained in the Lower Tester from running the test procedures in Section 4.3 or Section 4.5 or by other means.
  - Run the preamble procedure defined in GATT.TS [5] Section 4.2.2.2 [Characteristic Configuration for Indication] to configure the OACP for indications.
  - Run the preamble procedure defined in Section 4.2.3 to open an Object Transfer Channel.
  - The Lower Tester contains at least one valid object with valid content that supports the Read property, and this object is selected.

- Test Procedure

  1. The Upper Tester induces the IUT to read the part or the whole of the contents of the Current Object.
  2. The IUT reads the Object Size characteristic (see OTP/CL/OTR/BV-04-C [Read Object Size Characteristic]) and the Object Properties characteristic (see OTP/CL/OTR/BV-08-C [Read Object Properties Characteristic]).
  3. The IUT writes the OACP Read Op Code (0x05) to the OACP with the Offset parameter set to a value less than the Current Size read in step 2 and the Length Parameter set to a value such that the sum of the Length and Offset parameters is less than or equal to the Current Size read in step 2.
  4. The Lower Tester, after sending a Write Response to acknowledge the write to the OACP, sends an indication of the OACP characteristic containing the Response Code Op Code (0x60), the Request Op Code (0x05) followed by the Result Code for ‘Success’ (0x01) without a Response Parameter.
  5. The IUT sends an ATT_Handle_Value_Confirmation.

6. The Lower Tester sends data consisting of a number of octets less than specified in the Length parameter (see step 3) starting from the offset specified in the Offset parameter (see step 3) to the IUT via the Object Transfer Channel.
7. The Lower Tester disconnects before the object transfer is able to complete.
8. The Upper Tester induces the IUT to resume the interrupted transfer, unless resumption is automatic.
9. A new connection is established.
10. The IUT selects the object (using one of the Select Object Sub-procedures).
11. The IUT writes the OACP Calculate Checksum Op Code (0x03) with the Offset parameter set to the same value as in step 3 and a Length parameter less than the length value used in step 3 (this value should be consistent with the number of octets received by the IUT before the disconnection).
12. The Lower Tester, after sending a Write Response to acknowledge the write to the OACP, sends an indication of the OACP characteristic containing the Response Code Op Code (0x60), the Request Op Code (0x03) followed by the Result Code for 'Success' (0x01) and the Checksum parameter set to a value equal to the checksum calculated on the data for the length received in step 11.
13. The IUT writes the OACP Read Op Code (0x05) to the OACP with the Offset parameter set to a value equal to the sum of the length and offset used in step 11 and the Length Parameter set to a value such that the sum of Length and Offset parameter is equal to the sum of the length and offset parameters used in step 3.
14. The Lower Tester, after sending a Write Response to acknowledge the write to the OACP, sends an indication of the OACP characteristic containing the Response Code Op Code (0x60), the Request Op Code (0x05) followed by the Result Code for 'Success' (0x01) without a Response Parameter.
15. The IUT sends an ATT_Handle_Value_Confirmation.
16. The Lower Tester sends data consisting of the number of octets specified in the Length parameter used in step 13 starting from the offset specified in the Offset parameter used in step 13 to the IUT via the Object Transfer Channel.

- Expected Outcome

  Pass verdict

  In step 11, the IUT sets the Offset parameter to the same value as in step 3 and the Length parameter to a value less than or equal to the number of bytes sent by the Lower Tester prior to the disconnection.

  In step 13, the IUT sets the Offset parameter to a value equal to the sum of the Offset and Length parameters used in step 11 and a Length parameter such that the sum of this length and of the offset is equal to the sum of the Length and Offset parameters used in step 3.

  After step 16, the IUT has received all of the object contents that were specified by the Offset and Length parameters in step 3 and has correctly reassembled these contents in one object.

OTP/CL/OTPP/BV-20-C [Resume Writing Object Contents - Current Size Method]

- Test Purpose

  Verify that the Object Client IUT can perform the Resume Writing Object Contents sub-procedure.

- Reference

  [3] 4.5.6.2

- Initial Condition
  - Run the preamble procedure defined in Section 4.2.1, if using an LE transport, or Section 4.2.2, if using a BR/EDR transport, to set up the transport and initiate connection to an Object Server.
  - The Lower Tester includes one instantiation of the Object Transfer Service [6] including all defined characteristics.
  - The IUT knows the handles of the Object Transfer Service characteristics contained in the Lower Tester from running the test procedures in Section 4.3 or Section 4.5 or by other means.
  - Run the preamble procedure defined in GATT.TS [5] Section 4.2.2.2 [Characteristic Configuration for Indication] to configure the OACP for indications.
  - Run the preamble procedure defined in Section 4.2.3 to open an Object Transfer Channel.
  - The Lower Tester contains at least one valid object with valid content that supports the Write and Patch properties, and this object is selected. A small or empty object is used so that its size increases as required by the test procedure.
- Test Procedure
  1. The Upper Tester induces the IUT to write to the Current Object, without truncation.
  2. The IUT reads the Object Size characteristic (see OTP/CL/OTR/BV-04-C [Read Object Size Characteristic]) and the Object Properties characteristic (see OTP/CL/OTR/BV-08-C [Read Object Properties Characteristic]).
  3. The IUT writes the OACP Write Op Code (0x06) to the OACP with the Offset parameter set to a value less than or equal to the Current Size read in step 2 and the Length Parameter set to a value such that the sum of the Length and Offset parameters is less than or equal to the Allocated Size read in step 2 and the Mode parameter value set to not truncate (bit 1 is set to 0).
  4. The Lower Tester, after sending a Write Response to acknowledge the write to the OACP, sends an indication of the OACP characteristic containing the Response Code Op Code (0x60), the Request Op Code (0x06) followed by the Result Code for ‘Success’ (0x01) without a Response Parameter.
  5. The IUT sends an ATT_Handle_Value_Confirmation.
  6. The IUT starts sending data to the IUT via the Object Transfer Channel.
  7. Once the current size of the object has started increasing, the Lower Tester disconnects before the object transfer is able to complete.
  8. The Upper Tester induces the IUT to resume the interrupted transfer, unless resumption is automatic.
  9. A new connection is established.
  10. The IUT selects the object (using one of the Select Object Sub-procedures).
  11. The IUT reads the Object Size characteristic (see OTP/CL/OTR/BV-04-C [Read Object Size Characteristic]).
  12. The IUT writes the OACP Write Op Code (0x06) to the OACP with the Offset parameter set to a value equal to the Current Size read in step 11 and the Length Parameter set to a value such that the sum of the Length and Offset parameters is equal to the sum of the Length and Offset parameters used in step 3 and the Mode parameter value set to not truncate (bit 1 is set to 0).
  13. The Lower Tester, after sending a Write Response to acknowledge the write to the OACP, sends an indication of the OACP characteristic containing the Response Code Op Code (0x60), the Request Op Code (0x06) followed by the Result Code for ‘Success’ (0x01) without a Response Parameter.
  14. The IUT sends an ATT_Handle_Value_Confirmation.

15. The Lower Tester receives data consisting of the number of octets specified in the Length parameter used in step 12 starting from the offset specified in the Offset parameter used in step 12 from the IUT via the Object Transfer Channel.

- Expected Outcome

  Pass verdict

  In step 11, the IUT reads the Object Size characteristic

  In step 12, the IUT sets the Offset parameter to a value equal to the Current Size read in step 11 and a Length parameter such that the sum of this length and of the offset is equal to the sum of the Length and Offset parameters used in step 3.

  In step 15, the number of octets received by the Lower Tester is equal to the length used in step 12.

OTP/CL/OTPP/BV-21-C [Resume Writing Object Contents - Data Integrity Method]

- Test Purpose

  Verify that the Object Client IUT can perform the Resume Writing Object Contents sub-procedure.

- Reference

  [3] 4.5.6.2

- Initial Condition

  - Run the preamble procedure defined in Section 4.2.1, if using an LE transport, or Section 4.2.2, if using a BR/EDR transport, to set up the transport and initiate connection to an Object Server.
  - The Lower Tester includes one instantiation of the Object Transfer Service [6] including all defined characteristics.
  - The IUT knows the handles of the Object Transfer Service characteristics contained in the Lower Tester from running the test procedures in Section 4.3 or Section 4.5 or by other means.
  - Run the preamble procedure defined in GATT.TS [5] Section 4.2.2.2 [Characteristic Configuration for Indication] to configure the OACP for indications.
  - Run the preamble procedure defined in Section 4.2.3 to open an Object Transfer Channel.
  - The Lower Tester contains at least one valid object with valid content that supports the Write and Patch properties, and this object is selected.

- Test Procedure

  1. The Upper Tester induces the IUT to write to the Current Object, without truncation.
  2. The IUT reads the Object Size characteristic (see OTP/CL/OTR/BV-04-C [Read Object Size Characteristic]) and the Object Properties characteristic (see OTP/CL/OTR/BV-08-C [Read Object Properties Characteristic]).
  3. The IUT writes the OACP Write Op Code (0x06) to the OACP with the Offset parameter set to a value less than or equal to the Current Size read in step 2 and the Length Parameter set to a value such that the sum of the Length and Offset parameters is less than or equal to the Allocated Size read in step 2 and the Mode parameter value set to not truncate (bit 1 is set to 0).
  4. The Lower Tester, after sending a Write Response to acknowledge the write to the OACP, sends an indication of the OACP characteristic containing the Response Code Op Code (0x60), the Request Op Code (0x06) followed by the Result Code for ‘Success’ (0x01) without a Response Parameter.
  5. The IUT sends an ATT_Handle_Value_Confirmation.

6. The IUT starts sending data to the IUT via the Object Transfer Channel.
7. The Lower Tester disconnects before the object transfer is able to complete.
8. The Upper Tester induces the IUT to resume the interrupted transfer, unless resumption is automatic.
9. A new connection is established.
10. The IUT selects the object (using one of the Select Object Sub-procedures).
11. The IUT reads the Object Size characteristic (see OTP/CL/OTR/BV-04-C [Read Object Size Characteristic]).
12. The IUT writes the OACP Calculate Checksum Op Code (0x03) with the Offset parameter set to the same value as in step 3 and a Length parameter less than or equal to the Current Size read in step 11.
13. The Lower Tester, after sending a Write Response to acknowledge the write to the OACP, sends an indication of the OACP characteristic containing the Response Code Op Code (0x60), the Request Op Code (0x03) followed by the Result Code for ‘Success’ (0x01) and the Checksum parameter set to a value not matching the checksum for the data covered by the used length and offset.
14. The IUT writes the OACP Calculate Checksum Op Code (0x03) again with updated parameter values.
15. The Lower Tester, after sending a Write Response to acknowledge the write to the OACP, sends an indication of the OACP characteristic containing the Response Code Op Code (0x60), the Request Op Code (0x03) followed by the Result Code for ‘Success’ (0x01) and the Checksum parameter set to a value matching the checksum for the data covered by the used length and offset.
16. The IUT may repeat steps 14 and 15 multiple times while it is checking the data integrity of the object contents that have already been written to the Lower Tester, according to its own method.
17. The IUT writes the OACP Write Op Code (0x06) to the OACP with the Offset parameter set to a value greater than the Offset parameter value used in step 3 and the Length Parameter set to a value such that the sum of the Length and Offset parameters is equal to the sum of the length and offset parameters used in step 3 and the Mode parameter value set to not truncate (bit 1 is set to 0).
18. The Lower Tester, after sending a Write Response to acknowledge the write to the OACP, sends an indication of the OACP characteristic containing the Response Code Op Code (0x60), the Request Op Code (0x06) followed by the Result Code for ‘Success’ (0x01) without a Response Parameter.
19. The IUT sends an ATT_Handle_Value_Confirmation.
20. The Lower Tester receives data consisting of the number of octets specified in the Length parameter used in step 17 starting from the offset specified in the Offset parameter used in step 17 from the IUT via the Object Transfer Channel.

- Expected Outcome

  Pass verdict

  In step 11, the IUT reads the Object Size characteristic

  In step 12, the IUT sends a correctly formatted Calculate Checksum Op Code to the OACP with the Offset parameter to the same value as in step 3 and a Length parameter less than or equal to the Current Size read in step 11.

  In step 14, the IUT sends a correctly formatted Calculate Checksum Op Code to the OACP with valid parameter values.

  In step 17, the IUT sets the Offset parameter to a value greater than the Offset parameter value used in step 3 and the Length Parameter set to a value such that the sum of the Length and Offset

parameters is equal to the sum of the length and offset parameters used in step 3 and the Mode parameter value set to not truncate (bit 1 is set to 0).

In step 20, the number of octets received by the Lower Tester is equal to the length used in step 17.

OTP/CL/OTPP/BV-22-C [Create Object]

- Test Purpose

  Verify that the Object Client IUT can perform the Create Object procedure.

- Reference

  [3] 4.5.7

- Initial Condition

  - Run the preamble procedure defined in Section 4.2.1, if using an LE transport, or Section 4.2.2, if using a BR/EDR transport, to set up the transport and initiate connection to an Object Server.
  - The Lower Tester includes one instantiation of the Object Transfer Service [6] including all defined characteristics.
  - The IUT knows the handles of the Object Transfer Service characteristics contained in the Lower Tester from running the test procedures in Section 4.3 or Section 4.5 or by other means.
  - Run the preamble procedure defined in GATT.TS [5] Section 4.2.2.2 [Characteristic Configuration for Indication] to configure the OACP for indications.

- Test Procedure

  1. The Upper Tester induces the IUT to create a new object.
  2. The IUT writes the OACP Create Op Code (0x01) to the OACP with the Type parameter set to valid object type (e.g., the UUID “Firmware”) and the Size Parameter set to a valid value (e.g., 0x00000400, representing an allocated object size of 1024 octets).
  3. The Lower Tester, after sending a Write Response to acknowledge the write to the OACP, sends an indication of the OACP characteristic containing the Response Code Op Code (0x60), the Request Op Code (0x01) followed by the Result Code for ‘Success’ (0x01) without a Response Parameter.
  4. The IUT sends an ATT_Handle_Value_Confirmation.
  5. The IUT writes the Object Name characteristic with a non-zero length UTF-8 string (see OTP/CL/OTW/BV-01-C [Write Object Name Characteristic]).
  6. The Lower Tester sends a Write Response to acknowledge the write to the Object Name.

- Expected Outcome

  Pass verdict

  The IUT writes correctly formatted Create Op Code to the OACP.

  After receiving indication of the OACP, the IUT sends an ATT_Handle_Value_Confirmation to the Lower Tester.

  The IUT writes a non-zero length string to the Object Name characteristic. In addition, the IUT may also write values to other writable Object Metadata characteristics.

OTP/CL/OTPP/BV-23-C [Delete Object]

- Test Purpose

  Verify that the Object Client IUT can perform the Delete Object procedure.

- Reference

  [3] 4.5.8

- Initial Condition

  - Run the preamble procedure defined in Section 4.2.1, if using an LE transport, or Section 4.2.2, if using a BR/EDR transport, to set up the transport and initiate connection to an Object Server.
  - The Lower Tester includes one instantiation of the Object Transfer Service [6] including all defined characteristics.
  - The IUT knows the handles of the Object Transfer Service characteristics contained in the Lower Tester from running the test procedures in Section 4.3 or Section 4.5 or by other means.
  - Run the preamble procedure defined in GATT.TS [5] Section 4.2.2.2 [Characteristic Configuration for Indication] to configure the OACP for indications.
  - The Lower Tester contains at least one valid object with valid content that supports the Delete property, and this object is selected.

- Test Procedure

  1. The Upper Tester induces the IUT to Delete the current object.
  2. The IUT writes the OACP Delete Op Code (0x02) to the OACP without any parameter.
  3. The Lower Tester, after sending a Write Response to acknowledge the write to the OACP, sends an indication of the OACP characteristic containing the Response Code Op Code (0x60), the Request Op Code (0x02) followed by the Result Code for ‘Success’ (0x01) without a Response Parameter.
  4. The IUT sends an ATT_Handle_Value_Confirmation.

- Expected Outcome

  Pass verdict

  The IUT writes correctly formatted Delete Op Code to the OACP.

  After receiving indication of the OACP, the IUT sends an ATT_Handle_Value_Confirmation to the Lower Tester.

OTP/CL/OTPP/BV-24-C [Execute Object]

- Test Purpose

  Verify that the Object Client IUT can perform the Execute Object procedure.

- Reference

  [3] 4.5.9

- Initial Condition

  - Run the preamble procedure defined in Section 4.2.1, if using an LE transport, or Section 4.2.2, if using a BR/EDR transport, to set up the transport and initiate connection to an Object Server.

- The Lower Tester includes one instantiation of the Object Transfer Service [6] including all defined characteristics.
- The IUT knows the handles of the Object Transfer Service characteristics contained in the Lower Tester from running the test procedures in Section 4.3 or Section 4.5 or by other means.
- Run the preamble procedure defined in GATT.TS [5] Section 4.2.2.2 [Characteristic Configuration for Indication] to configure the OACP for indications.
- The Lower Tester contains at least one valid object with valid content that supports the Execute property, and this object is selected.

- Test Procedure

  1. The Upper Tester induces the IUT to Execute the current object.
  2. The IUT writes the OACP Execute Op Code (0x04) to the OACP without any parameter.
  3. The Lower Tester, after sending a Write Response to acknowledge the write to the OACP, sends an indication of the OACP characteristic containing the Response Code Op Code (0x60), the Request Op Code (0x04) followed by the Result Code for 'Success' (0x01) without a Response Parameter.
  4. The IUT sends an ATT_Handle_Value_Confirmation.

- Expected Outcome

  Pass verdict

  The IUT writes correctly formatted Execute Op Code to the OACP.

  After receiving indication of the OACP, the IUT sends an ATT_Handle_Value_Confirmation to the Lower Tester.

4.9.4 Open Object Transfer Channel

OTP/CL/OTPP/BV-25-C [Open Object Transfer Channel - LE transport]

- Test Purpose

  Verify that the Object Client IUT can perform the Open Object Transfer Channel procedure over LE transport.

- Reference

  [3] 4.5.10

- Initial Condition

  - Run the preamble procedure defined in Section 4.2.1 to set up the transport and initiate connection to an Object Server.

- Test Procedure

  1. The Upper Tester induces the IUT to open an Object Transfer Channel.
  2. The IUT sends a LE_Credit_Based_Connection_Request with the PSM parameter set to «PSM_OTS» and other parameters set to valid values.
  3. After receiving the LE_Credit_Based_Connection_Request, the Lower Tester sends a LE_Credit_Based_Connection_Rsp.

- Expected Outcome

  Pass verdict

  The IUT sends a correctly formatted LE_Credit_Based_Connection_Request with the PSM set to «PSM_OTS».

OTP/CL/OTPP/BV-26-C [Open Object Transfer Channel - BR/EDR transport]

- Test Purpose

  Verify that the Object Client IUT can perform the Open Object Transfer Channel procedure over BR/EDR transport.

- Reference

  [3] 4.5.10

- Initial Condition

  - Run the preamble procedure defined in Section 4.2.2 to set up the transport and initiate connection to an Object Server.

- Test Procedure

  1. The Upper Tester induces the IUT to open an Object Transfer Channel.
  2. The IUT sends an L2CAP_ConnectReq with the PSM parameter set to «PSM_OTS» and other parameters set to valid values for Enhanced Retransmission Mode (ERTM).
  3. After receiving the L2CAP_ConnectReq, the Lower Tester sends an L2CAP_ConnectRsp.

- Expected Outcome

  Pass verdict

  The IUT sends a correctly formatted L2CAP_ConnectReq with the PSM set to «PSM_OTS».

OTP/CL/OTPP/BV-27-C [Read Object – Abort Read Object Contents]

- Test Purpose

  Verify that the Object Client IUT can perform an abort after initiating the Read Object Contents sub-procedure.

- Reference

  [3] 4.5.4.2

- Initial Condition

  - Run the preamble procedure defined in Section 4.2.1, if using an LE transport, or Section 4.2.2, if using a BR/EDR transport, to set up the transport and initiate connection to an Object Server.
  - The Lower Tester includes one instantiation of the Object Transfer Service [6] including all defined characteristics.
  - The IUT knows the handles of the Object Transfer Service characteristics contained in the Lower Tester from running the test procedures in Section 4.3 or Section 4.5 or by other means.
  - Run the preamble procedure defined in GATT.TS [5] Section 4.2.2.2 [Characteristic Configuration for Indication] to configure the OACP for indications.

- Run the preamble procedure defined in Section 4.2.3 to open an Object Transfer Channel.
- The Lower Tester contains at least one valid object with valid content that supports the Read property, and this object is selected.

- Test Procedure

  1. The Upper Tester induces the IUT to read the part or the whole of the contents of the Current Object.
  2. The IUT reads the Object Size characteristic (see OTP/CL/OTR/BV-04-C [Read Object Size Characteristic]).
  3. The IUT writes the OACP Read Op Code (0x05) to the OACP with the Offset parameter set to a value less than the Current Size field read in step 2 and the Length Parameter set to a value such that the sum of the Length and Offset parameters is less than or equal to the Current Size field read in step 2.
  4. The Lower Tester, after sending a Write Response to acknowledge the write to the OACP, sends an indication of the OACP characteristic containing the Response Code Op Code (0x60), the Request Op Code (0x05) followed by the Result Code for ‘Success’ (0x01) without a Response Parameter.
  5. The IUT sends an ATT_Handle_Value_Confirmation.
  6. The Lower Tester begins to send the requested object contents via the Object Transfer Channel.
  7. Before the object transfer has completed, the Lower Tester closes the Object Transfer Channel in order to induce the IUT to abort the object transfer.
  8. The IUT writes the OACP Abort Op Code (0x07) to the OACP with no parameter.
  9. The Lower Tester, after sending a Write Response to acknowledge the write to the OACP, sends an indication of the OACP characteristic containing the Response Code Op Code (0x60), the Request Op Code (0x07) followed by the Result Code for ‘Success’ (0x01) without a Response Parameter.

- Expected Outcome

  Pass verdict

  In step 3, the IUT writes a correctly formatted Read Op Code (0x05) with the Offset parameter less than the Current Size field read in step 2 and a Length parameter such that the sum of the Length and the Offset parameters is less than or equal to the Current Size field read in step 2.

  The Offset and Length values written by the IUT are consistent with the request made by the Upper Tester.

  After indication of the OACP, the IUT sends an ATT_Handle_Value_Confirmation to the Lower Tester.

  At step 8, the IUT writes a correctly formatted Abort Op Code (0x07) to the OACP.

  Part of the specified object contents are correctly received via the Object Transfer Channel by the IUT.

  After the object transfer has been aborted, the IUT returns to a stable state and can process commands normally.

4.10 Error Handling Procedures

Verify compliant operation when a variety of error conditions occur relating to OACP, OLCP, ATT, and other operations.

4.10.1 OACP Error Handling Procedures

Verify compliant operation when an OACP error is reported by the Object Server.

OTP/CL/OAE/BI-01-C [OACP Error - Op Code Not Supported]

- Test Purpose

  Verify that the Object Client IUT behaves appropriately when it receives an ‘Op Code Not Supported’ OACP Result Code.

- Reference

  [3] 4.6

- Initial Condition

  - Run the preamble procedure defined in Section 4.2.1, if using an LE transport, or Section 4.2.2, if using a BR/EDR transport, to set up the transport and initiate connection to an Object Server.
  - The Lower Tester includes one instantiation of the Object Transfer Service [6] including all defined characteristics.
  - The IUT knows the handles of the Object Transfer Service characteristics contained in the Lower Tester from running the test procedures in Section 4.3 or Section 4.5 or by other means.
  - The OTS Feature characteristic exposed by the Lower Tester has a value that indicates that the OACP Op Code used in the test procedure is supported. This is done for test cases so that the IUT can be induced to use the Op Code.
  - Run the preamble procedure defined in GATT.TS [5] Section 4.2.2.2 [Characteristic Configuration for Indication] to configure the OACP for indications.

- Test Procedure

  1. The Upper Tester induces the IUT to write any optional Op Code to the OACP.
  2. The Lower Tester sends an indication of the OACP characteristic with the Response Code Op Code (0x60) and a Parameter representing the Request Op Code followed by the Result Code value for ‘Op Code Not Supported’ (0x02) (i.e., the Lower Tester simulates that it does not support the Op Code).
  3. The IUT sends an ATT_Handle_Value_Confirmation.

- Expected Outcome

  Pass verdict

  After receiving the error response, the IUT returns to a stable state and can process commands normally.

OTP/CL/OAE/BI-02-C [OACP Error – Insufficient Resources]

- Test Purpose

  Verify that the Object Client IUT behaves appropriately when it receives an ‘Insufficient Resources’ OACP Result Code.

- Reference

  [3] 4.6

- Initial Condition

  - Run the preamble procedure defined in Section 4.2.1, if using an LE transport, or Section 4.2.2, if using a BR/EDR transport, to set up the transport and initiate connection to an Object Server.
  - The Lower Tester includes one instantiation of the Object Transfer Service [6] including all defined characteristics.
  - The IUT knows the handles of the Object Transfer Service characteristics contained in the Lower Tester from running the test procedures in Section 4.3 or Section 4.5 or by other means.
  - The Lower Tester contains at least one valid object with read and write properties and this object is selected.
  - Run the preamble procedure defined in GATT.TS [5] Section 4.2.2.2 [Characteristic Configuration for Indication] to configure the OACP for indications.

- Test Procedure

  1. The Upper Tester induces the IUT to write the OACP Create (0x01), Read (0x05) or Write (0x06) Op Code to the OACP with valid parameter(s).
  2. The Lower Tester sends an indication of the OACP Control Point characteristic with the Response Code Op Code (0x60) and a Parameter representing the Request Op Code followed by the Result Code value for ‘Insufficient resources’ (0x04) (i.e., the Lower Tester simulates that it does not have sufficient resources to service the request).
  3. The IUT sends an ATT_Handle_Value_Confirmation.

- Expected Outcome

  Pass verdict

  If the OACP Op Code used in the test procedure is OACP Read or OACP Write, the IUT opens an Object Transfer Channel before writing the Op Code to the OACP during step 1.

  After receiving the error response, the IUT returns to a stable state and can process commands normally.

OTP/CL/OAE/BI-03-C [OACP Error – Invalid Object]

- Test Purpose

  Verify that the Object Client IUT behaves appropriately when it receives an ‘Invalid Object’ OACP Result Code.

- Reference

  [3] 4.6

- Initial Condition
  - Run the preamble procedure defined in Section 4.2.1, if using an LE transport, or Section 4.2.2, if using a BR/EDR transport, to set up the transport and initiate connection to an Object Server.
  - The Lower Tester includes one instantiation of the Object Transfer Service [6] including all defined characteristics.
  - The IUT knows the handles of the Object Transfer Service characteristics contained in the Lower Tester from running the test procedures in Section 4.3 or Section 4.5 or by other means.
  - Run the preamble procedure defined in GATT.TS [5] Section 4.2.2.2 [Characteristic Configuration for Indication] to configure the OACP for indications.
- Test Procedure
  1. The Upper Tester induces the IUT to write the OACP Delete (0x02), Calculate Checksum (0x03), Execute (0x04), Read (0x05) or Write (0x06) Op Code to the OACP.
  2. The Lower Tester sends an indication of the OACP Control Point characteristic with the Response Code Op Code (0x60) and a Parameter representing the Request Op Code followed by the Result Code value for 'Invalid Object' (0x05) (i.e., the Lower Tester simulates that the Current Object is an Invalid Object).
  3. The IUT sends an ATT_Handle_Value_Confirmation.
- Expected Outcome

  Pass verdict

  If the OACP Op Code used in the test procedure is OACP Read or OACP Write, the IUT opens an Object Transfer Channel before writing the Op Code to the OACP during step 1.

  After receiving the error response, the IUT returns to a stable state and can process commands normally.

OTP/CL/OAE/BI-04-C [OACP Error – Channel Unavailable]

- Test Purpose

  Verify that the Object Client IUT behaves appropriately when it receives a 'Channel Unavailable' OACP Result Code.
- Reference

  [3] 4.6
- Initial Condition
  - Run the preamble procedure defined in Section 4.2.1, if using an LE transport, or Section 4.2.2, if using a BR/EDR transport, to set up the transport and initiate connection to an Object Server.
  - The Lower Tester includes one instantiation of the Object Transfer Service [6] including all defined characteristics.
  - The IUT knows the handles of the Object Transfer Service characteristics contained in the Lower Tester from running the test procedures in Section 4.3 or Section 4.5 or by other means.
  - The Lower Tester contains at least one valid object with read and write properties and this object is selected.
  - Run the preamble procedure defined in GATT.TS [5] Section 4.2.2.2 [Characteristic Configuration for Indication] to configure the OACP for indications.

- Test Procedure

  1. The Upper Tester induces the IUT to write the Read (0x05) or Write (0x06) Op Code to the OACP with valid parameter(s).
  2. The Lower Tester closes any Object Transfer Channel that is open.
  3. The Lower Tester sends an indication of the OACP Control Point characteristic with the Response Code Op Code (0x60) and a Parameter representing the Request Op Code followed by the Result Code value for ‘Channel Unavailable’ (0x06) (i.e., the Lower Tester responds that there is no Object Transfer Channel open).
  4. The IUT sends an ATT_Handle_Value_Confirmation.

- Expected Outcome

  Pass verdict

  The IUT opens an Object Transfer Channel before writing the Op Code to the OACP during step 1.

  After receiving the error response, the IUT returns to a stable state and can process commands normally.

OTP/CL/OAE/BI-05-C [OACP Error – Unsupported Type]

- Test Purpose

  Verify that the Object Client IUT behaves appropriately when it receives an ‘Unsupported Type’ OACP Result Code.

- Reference

  [3] 4.6

- Initial Condition

  - Run the preamble procedure defined in Section 4.2.1, if using an LE transport, or Section 4.2.2, if using a BR/EDR transport, to set up the transport and initiate connection to an Object Server.
  - The Lower Tester includes one instantiation of the Object Transfer Service [6] including all defined characteristics.
  - The IUT knows the handles of the Object Transfer Service characteristics contained in the Lower Tester from running the test procedures in Section 4.3 or Section 4.5 or by other means.
  - Run the preamble procedure defined in GATT.TS [5] Section 4.2.2.2 [Characteristic Configuration for Indication] to configure the OACP for indications.

- Test Procedure

  1. The Upper Tester induces the IUT to write the OACP Create (0x01) Op Code to the OACP with valid parameter(s).
  2. The Lower Tester sends an indication of the OACP Control Point characteristic with the Response Code Op Code (0x60) and a Parameter representing the Request Op Code followed by the Result Code value for ‘Unsupported Type’ (0x07) (i.e., the Lower Tester simulates that it does not support this object type).
  3. The IUT sends an ATT_Handle_Value_Confirmation.

- Expected Outcome

  Pass verdict

  After receiving the error response, the IUT returns to a stable state and can process commands normally.

OTP/CL/OAE/BI-06-C [OACP Error – Procedure Not Permitted]

- Test Purpose

  Verify that the Object Client IUT behaves appropriately when it receives a ‘Procedure Not Permitted’ OACP Result Code.

- Reference

  [3] 4.6

- Initial Condition

  - Run the preamble procedure defined in Section 4.2.1, if using an LE transport, or Section 4.2.2, if using a BR/EDR transport, to set up the transport and initiate connection to an Object Server.
  - The Lower Tester includes one instantiation of the Object Transfer Service [6] including all defined characteristics.
  - The IUT knows the handles of the Object Transfer Service characteristics contained in the Lower Tester from running the test procedures in Section 4.3 or Section 4.5 or by other means.
  - The Lower Tester contains at least one valid object with read and write, delete and execute properties supported and this object is selected.
  - Run the preamble procedure defined in GATT.TS [5] Section 4.2.2.2 [Characteristic Configuration for Indication] to configure the OACP for indications.

- Test Procedure

  1. The Upper Tester induces the IUT write the OACP Delete (0x02), Execute (0x04), Read (0x05) or Write (0x06) Op Code to the OACP with valid parameter(s).
  2. The Lower Tester sends an indication of the OACP Control Point characteristic with the Response Code Op Code (0x60) and a Parameter representing the Request Op Code followed by the Result Code value for ‘Procedure Not Permitted’ (0x08) (i.e., the Lower Tester simulates that the object’s properties does not permit the given operation).
  3. The IUT sends an ATT_Handle_Value_Confirmation.

- Expected Outcome

  Pass verdict

  If the OACP Op Code used in the test procedure is OACP Read or OACP Write, the IUT opens an Object Transfer Channel before writing the Op Code to the OACP during step 1.

  After receiving the error response, the IUT returns to a stable state and can process commands normally.

OTP/CL/OAE/BI-07-C [OACP Error – Object Locked]

- Test Purpose

  Verify that the Object Client IUT behaves appropriately when it receives an ‘Object Locked’ OACP Result Code.

- Reference

  [3] 4.6

- Initial Condition

  - Run the preamble procedure defined in Section 4.2.1, if using an LE transport, or Section 4.2.2, if using a BR/EDR transport, to set up the transport and initiate connection to an Object Server.
  - The Lower Tester includes one instantiation of the Object Transfer Service [6] including all defined characteristics.
  - The IUT knows the handles of the Object Transfer Service characteristics contained in the Lower Tester from running the test procedures in Section 4.3 or Section 4.5 or by other means.
  - The Lower Tester contains at least one valid object with read and write properties supported and this object is selected.
  - Run the preamble procedure defined in GATT.TS [5] Section 4.2.2.2 [Characteristic Configuration for Indication] to configure the OACP for indications.

- Test Procedure

  1. The Upper Tester induces the IUT write the OACP Read (0x05), Write (0x06), Execute (0x04), Delete (0x02) or Calculate Checksum (0x03) Op Code to the OACP with valid parameter(s).
  2. The Lower Tester sends an indication of the OACP Control Point characteristic with the Response Code Op Code (0x60) and a Parameter representing the Request Op Code followed by the Result Code value for ‘Object Locked’ (0x09) (i.e., the Lower Tester simulates that the object is locked).
  3. The IUT sends an ATT_Handle_Value_Confirmation.

- Expected Outcome

  Pass verdict

  If the OACP Op Code used in the test procedure is OACP Read or OACP Write, the IUT opens an Object Transfer Channel before writing the Op Code to the OACP during step 1.

  After receiving the error response, the IUT returns to a stable state and can process commands normally.

OTP/CL/OAE/BI-08-C [OACP Error – Operation Failed]

- Test Purpose

  Verify that the Object Client IUT behaves appropriately when it receives an ‘Operation Failed’ OACP Result Code.

- Reference

  [3] 4.6

- Initial Condition
  - Run the preamble procedure defined in Section 4.2.1, if using an LE transport, or Section 4.2.2, if using a BR/EDR transport, to set up the transport and initiate connection to an Object Server.
  - The Lower Tester includes one instantiation of the Object Transfer Service [6] including all defined characteristics.
  - The IUT knows the handles of the Object Transfer Service characteristics contained in the Lower Tester from running the test procedures in Section 4.3 or Section 4.5 or by other means.
  - Run the preamble procedure defined in GATT.TS [5] Section 4.2.2.2 [Characteristic Configuration for Indication] to configure the OACP for indications.
- Test Procedure
  1. The Upper Tester induces the IUT write any Op Code to the OACP using an appropriate Parameter for the Op Code.
  2. The Lower Tester sends an indication of the OACP characteristic with the Response Code Op Code (0x60) and a Parameter representing Request Op Code followed by the Response Code Value for ‘Operation Failed’ (0x0A) (i.e., the Lower Tester simulates a failed operation).
- Expected Outcome

  Pass verdict

  After receiving the error response, the IUT returns to a stable state and can process commands normally.

OTP/CL/OAE/BI-09-C [OACP Error – Procedure Timeout]

- Test Purpose

  Verify that when the Object Client IUT does not receive an indication of the OACP characteristic in response to an Op Code, it times out after 30 seconds.
- Reference

  [3] 4.4.4
- Initial Condition
  - Run the preamble procedure defined in Section 4.2.1, if using an LE transport, or Section 4.2.2, if using a BR/EDR transport, to set up the transport and initiate connection to an Object Server.
  - The Lower Tester includes one instantiation of the Object Transfer Service [6] including all defined characteristics.
  - The IUT knows the handles of the Object Transfer Service characteristics contained in the Lower Tester from running the test procedures in Section 4.3 or Section 4.5 or by other means.
  - Run the preamble procedure defined in GATT.TS [5] Section 4.2.2.2 [Characteristic Configuration for Indication] to configure the OACP for indications.
- Test Procedure
  1. The Upper Tester induces the IUT to write any of the supported Op Codes to the control point.
  2. The IUT writes an Op Code to the OACP, along with an appropriate Parameter if one is required by the Op Code.
  3. The Lower Tester does not send an indication of the OACP characteristic for at least 30 seconds.

4. After the specified timeout has expired, the IUT notifies the Upper Tester that the procedure timeout has expired and the IUT considers the procedure to have failed.
5. The Upper Tester attempts to induce the IUT to perform an additional OACP operation.

- Expected Outcome

  Pass verdict

  In step 5, the IUT either does not write to the OACP, or establishes a new ATT Bearer before the operation is performed.

  The IUT returns to a stable state in all cases.

4.10.2 OLCP Error Handling Procedures

Verify compliant operation when an OLCP error is reported by the Object Server.

OTP/CL/OLE/BI-01-C [OLCP Error – Op Code Not Supported]

- Test Purpose

  Verify that the Object Client IUT behaves appropriately when it receives an ‘Op Code Not Supported’ OLCP Result Code.

- Reference

  [3] 4.4.2.1

- Initial Condition

  - Run the preamble procedure defined in Section 4.2.1, if using an LE transport, or Section 4.2.2, if using a BR/EDR transport, to set up the transport and initiate connection to an Object Server.
  - The Lower Tester includes one instantiation of the Object Transfer Service [6] including all defined characteristics.
  - The IUT knows the handles of the Object Transfer Service characteristics contained in the Lower Tester from running the test procedures in Section 4.3 or Section 4.5 or by other means.
  - Run the preamble procedure defined in GATT.TS [5] Section 4.2.2.2 [Characteristic Configuration for Indication] to configure the OLCP for indications.
  - The OTS Feature characteristic exposed by the Lower Tester has a value that indicates that the OLCP Op Code used in the test procedure is supported. This is done for test cases so that the IUT can be induced to use the Op Code.

- Test Procedure

  1. The Upper Tester induces the IUT to write any optional Op Code to the OLCP.
  2. The Lower Tester sends an indication of the OLCP characteristic with the Response Code Op Code (0x70) and a Parameter representing the Request Op Code followed by the Result Code value for ‘Op Code Not Supported’ (0x02) (i.e., the Lower Tester simulates that it does not support the Op Code).
  3. The IUT sends an ATT_Handle_Value_Confirmation.

- Expected Outcome

  Pass verdict

  After receiving the error response, the IUT returns to a stable state and can process commands normally.

OTP/CL/OLE/BI-02-C [OLCP Error – Operation Failed]

- Test Purpose

  Verify that the Object Client IUT behaves appropriately when it receives an ‘Operation Failed’ OLCP Result Code.

- Reference

  [3] 4.4.2.1

- Initial Condition

  - Run the preamble procedure defined in Section 4.2.1, if using an LE transport, or Section 4.2.2, if using a BR/EDR transport, to set up the transport and initiate connection to an Object Server.
  - The Lower Tester includes one instantiation of the Object Transfer Service [6] including all defined characteristics.
  - The IUT knows the handles of the Object Transfer Service characteristics contained in the Lower Tester from running the test procedures in Section 4.3 or Section 4.5 or by other means.
  - Run the preamble procedure defined in GATT.TS [5] Section 4.2.2.2 [Characteristic Configuration for Indication] to configure the OLCP for indications.

- Test Procedure

  1. The Upper Tester induces the IUT to write a valid OLCP Op Code to the OLCP with valid parameter(s).
  2. The Lower Tester sends an indication of the OLCP characteristic with the Response Code Op Code (0x70) and a Parameter representing Request Op Code followed by the Response Code Value for ‘Operation Failed’ (0x04) (i.e., the Lower Tester simulates a failed operation).

- Expected Outcome

  Pass verdict

  The IUT returns to a stable state and can process commands normally.

OTP/CL/OLE/BI-03-C [OLCP Error – Out of Bounds]

- Test Purpose

  Verify that the Object Client IUT behaves appropriately when it receives an ‘Out of Bounds’ OLCP Result Code.

- Reference

  [3] 4.4.2.1

- Initial Condition

  - Run the preamble procedure defined in Section 4.2.1, if using an LE transport, or Section 4.2.2, if using a BR/EDR transport, to set up the transport and initiate connection to an Object Server.
  - The Lower Tester includes one instantiation of the Object Transfer Service [6] including all defined characteristics.
  - The IUT knows the handles of the Object Transfer Service characteristics contained in the Lower Tester from running the test procedures in Section 4.3 or Section 4.5 or by other means.

- Run the preamble procedure defined in GATT.TS [5] Section 4.2.2.2 [Characteristic Configuration for Indication] to configure the OLCP for indications.

- Test Procedure

  1. The Upper Tester induces the IUT to write the OLCP Next (0x04) to the OLCP without parameters.
  2. The Lower Tester sends an indication of the OLCP characteristic with the Response Code Op Code (0x70) and a Parameter representing Request Op Code followed by the Response Code Value for 'Out Of Bounds' (0x05) (i.e., the Lower Tester simulates that the requested procedure attempted to select an object beyond the last object in the current list).

- Expected Outcome

  Pass verdict

  The IUT returns to a stable state and can process commands normally.

OTP/CL/OLE/BI-04-C [OLCP Error – Too Many Objects]

- Test Purpose

  Verify that the Object Client IUT behaves appropriately when it receives a 'Too Many Objects' OLCP Result Code.

- Reference

  [3] 4.4.2.1

- Initial Condition

  - Run the preamble procedure defined in Section 4.2.1, if using an LE transport, or Section 4.2.2, if using a BR/EDR transport, to set up the transport and initiate connection to an Object Server.
  - The Lower Tester includes one instantiation of the Object Transfer Service [6] including all defined characteristics.
  - The IUT knows the handles of the Object Transfer Service characteristics contained in the Lower Tester from running the test procedures in Section 4.3 or Section 4.5 or by other means.
  - Run the preamble procedure defined in GATT.TS [5] Section 4.2.2.2 [Characteristic Configuration for Indication] to configure the OLCP for indications.

- Test Procedure

  1. The Upper Tester induces the IUT to write a valid OLCP Op Code to the OLCP with valid parameter(s).
  2. The Lower Tester sends an indication of the OLCP characteristic with the Response Code Op Code (0x70) and a Parameter representing Request Op Code followed by the Response Code Value for 'Too Many Objects' (0x06) (i.e., the Lower Tester simulates that there are too many objects in the current list).

- Expected Outcome

  Pass verdict

  The IUT returns to a stable state and can process commands normally.

OTP/CL/OLE/BI-05-C [OLCP Error – No Object]

- Test Purpose

  Verify that the Object Client IUT behaves appropriately when it receives a ‘No Object’ OLCP Result Code.

- Reference

  [3] 4.4.2.1

- Initial Condition

  - Run the preamble procedure defined in Section 4.2.1, if using an LE transport, or Section 4.2.2, if using a BR/EDR transport, to set up the transport and initiate connection to an Object Server.
  - The Lower Tester includes one instantiation of the Object Transfer Service [6] including all defined characteristics.
  - The IUT knows the handles of the Object Transfer Service characteristics contained in the Lower Tester from running the test procedures in Section 4.3 or Section 4.5 or by other means.
  - Run the preamble procedure defined in GATT.TS [5] Section 4.2.2.2 [Characteristic Configuration for Indication] to configure the OLCP for indications.

- Test Procedure

  1. The Upper Tester induces the IUT to write a valid OLCP Op Code to the OLCP with valid parameter(s).
  2. The Lower Tester sends an indication of the OLCP characteristic with the Response Code Op Code (0x70) and a Parameter representing Request Op Code followed by the Response Code Value for ‘No Object’ (0x07) (i.e., the Lower Tester simulates that there are no objects in the current list).

- Expected Outcome

  Pass verdict

  The IUT returns to a stable state and can process commands normally.

OTP/CL/OLE/BI-06-C [OLCP Error – Object ID Not Found]

- Test Purpose

  Verify that the Object Client IUT behaves appropriately when it receives an ‘Object ID Not Found’ OLCP Result Code.

- Reference

  [3] 4.4.2.1

- Initial Condition

  - Run the preamble procedure defined in Section 4.2.1, if using an LE transport, or Section 4.2.2, if using a BR/EDR transport, to set up the transport and initiate connection to an Object Server.
  - The Lower Tester includes one instantiation of the Object Transfer Service [6] including all defined characteristics.
  - The IUT knows the handles of the Object Transfer Service characteristics contained in the Lower Tester from running the test procedures in Section 4.3 or Section 4.5 or by other means.

- Run the preamble procedure defined in GATT.TS [5] Section 4.2.2.2 [Characteristic Configuration for Indication] to configure the OLCP for indications.
- The IUT has previously discovered the object IDs of the Lower Tester by performing an Object Discovery procedure (see OTP/CL/OTPP/BV-01-C [Object Discovery – Discover All Objects] or OTP/CL/OTPP/BV-13-C [Object Discovery - Discover by Directory Listing Object]).

- Test Procedure

  1. The Upper Tester induces the IUT to write the OLCP Go To (0x05) Op Code to the OLCP with any object ID (other than a RFU value or 0x000000000000) as parameter.
  2. The Lower Tester sends an indication of the OLCP characteristic with the Response Code Op Code (0x70) and a Parameter representing Request Op Code followed by the Response Code Value for 'Object ID Not Found' (0x08) (i.e., the Lower Tester simulates that the object ID cannot be found).

- Expected Outcome

  Pass verdict

  The IUT returns to a stable state and can process commands normally.

OTP/CL/OLE/BI-07-C [OLCP Error – Procedure Timeout]

- Test Purpose

  Verify that when the Object Client IUT does not receive an indication of the OLCP characteristic in response to an Op Code, it times out after 30 seconds.

- Reference

  [3] 4.4.4

- Initial Condition

  - Run the preamble procedure defined in Section 4.2.1, if using an LE transport, or Section 4.2.2, if using a BR/EDR transport, to set up the transport and initiate connection to an Object Server.
  - The Lower Tester includes one instantiation of the Object Transfer Service [6] including all defined characteristics.
  - The IUT knows the handles of the Object Transfer Service characteristics contained in the Lower Tester from running the test procedures in Section 4.3 or Section 4.5 or by other means.
  - Run the preamble procedure defined in GATT.TS [5] Section 4.2.2.2 [Characteristic Configuration for Indication] to configure the OLCP for indications.

- Test Procedure

  1. The Upper Tester induces the IUT to write any of the supported Op Codes to the control point.
  2. The IUT writes an Op Code to the OLCP, along with an appropriate Parameter if one is required by the Op Code.
  3. The Lower Tester does not send an indication of the OLCP characteristic for at least 30 seconds.
  4. After the specified timeout has expired, the IUT notifies the Upper Tester that the procedure timeout has expired and the IUT considers the procedure to have failed.
  5. The Upper Tester attempts to induce the IUT to perform an additional OLCP operation.

- Expected Outcome

  Pass verdict

  In step 5, the IUT either does not write to the OLCP, or establishes a new ATT Bearer before the operation is performed.

  The IUT returns to a stable state in all cases.

4.10.3 Application Error Handling Procedures

Verify compliant operation when an Attribute Protocol Application Error Code is reported by the Object Server.

OTP/CL/APE/BI-01-C [Application Error – Concurrency Limit Exceeded]

- Test Purpose

  Verify that the Object Client IUT behaves appropriately when it receives a ‘Concurrency Limit Exceeded’ Attribute Protocol Application Error Code.

- Reference

  [3] 4.6

- Initial Condition

  - Run the preamble procedure defined in Section 4.2.1, if using an LE transport, or Section 4.2.2, if using a BR/EDR transport, to set up the transport and initiate connection to an Object Server.
  - The Lower Tester includes one instantiation of the Object Transfer Service [6] including all defined characteristics.
  - The IUT knows the handles of the Object Transfer Service characteristics contained in the Lower Tester from running the test procedures in Section 4.3 or Section 4.5 or by other means.
  - Run the preamble procedure defined in GATT.TS [5] Section 4.2.2.2 [Characteristic Configuration for Indication] to configure the OACP for indications.
  - The Lower Tester contains at least three valid objects.

- Test Procedure

  1. The Upper Tester induces the IUT to write the OLCP First Op Code (0x01) to the OLCP without a Parameter Value to select the first object.
  2. The Lower Tester responds with a ‘Concurrency Limit Exceeded’ Attribute Protocol Application Error Code.
  3. The Upper Tester again induces the IUT to write the OLCP First Op Code (0x01) to the OLCP without a Parameter Value to select the first object.
  4. The Lower Tester, after sending a Write Response to acknowledge the write to the OLCP, sends an indication of the OLCP characteristic containing the Response Code Op Code (0x70), the Request Op Code (0x01) followed by the Result Code for ‘Success’ (0x01) without a Response Parameter.

- Expected Outcome

  Pass verdict

  In step 2, the IUT returns to a stable state and can process commands normally.

  In step 4, after receiving each indication of the OLCP, the IUT sends an ATT_Handle_Value_Confirmation to the Lower Tester.

OTP/CL/APE/BI-02-C [Application Error – Object Name Already Exists]

- Test Purpose

  Verify that the Object Client IUT behaves appropriately when it receives an ‘Object Name Already Exists’ Attribute Protocol Application Error Code.

- Reference

  [3] 4.6

- Initial Condition

  - Run the preamble procedure defined in Section 4.2.1, if using an LE transport, or Section 4.2.2, if using a BR/EDR transport, to set up the transport and initiate connection to an Object Server.
  - The Lower Tester includes one instantiation of the Object Transfer Service [6] including all defined characteristics.
  - The IUT knows the handles of the Object Transfer Service characteristics contained in the Lower Tester from running the test procedures in Section 4.3 or Section 4.5 or by other means.
  - Run the preamble procedure defined in GATT.TS [5] Section 4.2.2.2 [Characteristic Configuration for Indication] to configure the OACP for indications.
  - The Lower Tester contains at least three valid objects.
  - The Lower Tester does not support the Object Changed characteristic.

- Test Procedure

  1. The Upper Tester induces the IUT to create a new object.
  2. The IUT writes the OACP Create Op Code (0x01) to the OACP with the Type parameter set to valid object type (e.g., the UUID “Firmware”) and the Size Parameter set to a valid value (e.g., 0x00000400, representing an allocated object size of 1024 octets).
  3. The Lower Tester, after sending a Write Response to acknowledge the write to the OACP, sends an indication of the OACP characteristic containing the Response Code Op Code (0x60), the Request Op Code (0x01) followed by the Result Code for ‘Success’ (0x01) without a Response Parameter.
  4. The IUT sends an ATT_Handle_Value_Confirmation.
  5. The IUT writes the Object Name characteristic with a non-zero length UTF-8 string (see OTP/CL/OTW/BV-01-C [Write Object Name Characteristic]).
  6. The Lower Tester creates another object with the same Object Name as the one requested. (This step is included to simulate that the requested name had already been taken by an existing object.)
  7. The Lower Tester responds with an ‘Object Name Already Exists’ Attribute Protocol Application Error Code.
  8. The Upper Tester provides a new name if requested by the IUT.

9. The IUT writes a different Object Name characteristic with a non-zero length UTF-8 string (see OTP/CL/OTW/BV-01-C [Write Object Name Characteristic]). (It is permitted for the IUT to perform other operations between step 7 and this step to e.g., re-discover the database of objects and their metadata.)
10. The Lower Tester sends a Write Response to acknowledge the write to the Object Name.

- Expected Outcome

  Pass verdict

  In step 7, the IUT returns to a stable state and can process commands normally.

  In step 9, the IUT writes a different Object Name than attempted in step 5.

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 OTP [4].

Feature: A brief, informal description of the feature being tested.

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. Further details about the function of the TCMT are elaborated in [1].

For the purpose and structure of the ICS/IXIT, refer to [1].

Item	Feature	Test Case(s)
OTP 5/1	Discover Object Transfer Service	OTP/CL/CGGIT/SER/BV-01-C
(OTP 3/2 AND NOT OTP 3/1) AND OTP 2/1 AND GAP 0/3 AND GATT 1a/4	Object Transfer Service not discoverable over BR/EDR	OTP/SR/SGGIT/SDPNF/BV-01-C
OTP 4/2	Object Transfer Service UUID in AD	OTP/SR/OTSD/BV-05-C
OTP 6/1	Discover OTS Feature Characteristic	OTP/CL/CGGIT/CHA/BV-01-C
OTP 6/2	Discover Object Name Characteristic	OTP/CL/CGGIT/CHA/BV-02-C
OTP 6/3	Discover Object Type Characteristic	OTP/CL/CGGIT/CHA/BV-03-C
OTP 6/4	Discover Object Size Characteristic	OTP/CL/CGGIT/CHA/BV-04-C
OTP 6/5	Discover Object First-Created Characteristic	OTP/CL/CGGIT/CHA/BV-05-C
OTP 6/6	Discover Object Last-Modified Characteristic	OTP/CL/CGGIT/CHA/BV-06-C
OTP 6/7	Discover Object ID Characteristic	OTP/CL/CGGIT/CHA/BV-07-C
OTP 6/8	Discover Object Properties Characteristic	OTP/CL/CGGIT/CHA/BV-08-C
OTP 6/9	Discover Object Action Control Point (OACP) Characteristic	OTP/CL/CGGIT/CHA/BV-09-C
OTP 6/11	Discover Object List Control Point (OLCP) Characteristic	OTP/CL/CGGIT/CHA/BV-10-C
OTP 6/13	Discover Object List Filter Characteristics	OTP/CL/OTCD/BV-11-C
OTP 6/14	Discover Object Changed Characteristic	OTP/CL/CGGIT/CHA/BV-11-C
OTP 7/1	Read OTS Feature Characteristic	OTP/CL/OTR/BV-01-C OTP/CL/OTR/BI-01-C
OTP 7/2	Read Object Name Characteristic	OTP/CL/OTR/BV-02-C
OTP 7/6	Read Object Type Characteristic	OTP/CL/OTR/BV-03-C
OTP 7/7	Read Object Size Characteristic	OTP/CL/OTR/BV-04-C
OTP 7/8	Read Object First-Created Characteristic	OTP/CL/OTR/BV-05-C
OTP 7/10	Read Object Last-Modified Characteristic	OTP/CL/OTR/BV-06-C

Item	Feature	Test Case(s)
OTP 7/12	Read Object ID Characteristic	OTP/CL/OTR/BV-07-C
OTP 7/13	Read Object Properties Characteristic	OTP/CL/OTR/BV-08-C OTP/CL/OTR/BI-02-C
OTP 7/19	Read Object List Filter Characteristic	OTP/CL/OTR/BV-09-C OTP/CL/OTR/BI-03-C
OTP 7/3	Read Long Object Name Characteristic	OTP/CL/OTR/BV-10-C
OTP 7/22	Read Long Object List Filter Characteristic	OTP/CL/OTR/BV-11-C
OTP 7/4	Write Object Name Characteristic	OTP/CL/OTW/BV-01-C
OTP 7/9	Write Object First-Created Characteristic	OTP/CL/OTW/BV-02-C
OTP 7/11	Write Object Last-Modified Characteristic	OTP/CL/OTW/BV-03-C
OTP 7/14	Write Object Properties Characteristic	OTP/CL/OTW/BV-04-C
OTP 7/20	Write Object List Filter Characteristic	OTP/CL/OTW/BV-05-C
OTP 7/5	Write Long Object Name Characteristic	OTP/CL/OTW/BV-06-C
OTP 7/21	Write Long Object List Filter Characteristic	OTP/CL/OTW/BV-07-C
OTP 7/23	Object Changed	OTP/CL/OTI/BV-01-C OTP/CL/OTI/BV-02-C OTP/CL/OTI/BV-03-C
OTP 9/18	Service Changed	OTP/CL/OTI/BV-04-C
OTP 8/2	Object Discovery - Discover All Objects	OTP/CL/OTPP/BV-01-C
OTP 8/3 OR OTP 8/16	Object Discovery - Search for Specific Object	OTP/CL/OTPP/BV-02-C
OTP 8/5	Object Discovery - Discover by Filter - Name Starts With	OTP/CL/OTPP/BV-03-C
OTP 8/6	Object Discovery - Discover by Filter - Name Ends With	OTP/CL/OTPP/BV-04-C
OTP 8/7	Object Discovery - Discover by Filter - Name Contains	OTP/CL/OTPP/BV-05-C
OTP 8/8	Object Discovery - Discover by Filter - Name is Exactly	OTP/CL/OTPP/BV-06-C
OTP 8/9	I Object Discovery - Discover by Filter - Object Type	OTP/CL/OTPP/BV-07-C
OTP 8/10	Object Discovery - Discover by Filter - Created between	OTP/CL/OTPP/BV-08-C
OTP 8/11	Object Discovery - Discover by Filter - Modified between	OTP/CL/OTPP/BV-09-C
OTP 8/12	Object Discovery - Discover by Filter - Current Size between	OTP/CL/OTPP/BV-10-C
OTP 8/13	Object Discovery - Discover by Filter - Allocated Size between	OTP/CL/OTPP/BV-11-C
OTP 8/14	Object Discovery - Discover by Filter - Marked Objects	OTP/CL/OTPP/BV-12-C
OTP 8/15	Object Discovery - Discover by Directory Listing Object	OTP/CL/OTPP/BV-13-C
OTP 8/17	Select Object - Select by Object ID	OTP/CL/OTPP/BV-14-C OTP/CL/OLE/BI-06-C

Item	Feature	Test Case(s)
OTP 8/19	Read Object - Read Object Contents	OTP/CL/OTPP/BV-15-C
OTP 8/19 AND OTP 8/29	Abort Read Object Contents	OTP/CL/OTPP/BV-27-C
OTP 8/20 AND OTP 7/5	Write Object - Write Object Metadata	OTP/CL/OTPP/BV-16-C
OTP 8/21	Write Object - Write Object Contents	OTP/CL/OTPP/BV-17-C
OTP 8/21 AND OTP 8/31	Write Object - Write Object Contents - Truncate	OTP/CL/OTPP/BV-18-C
OTP 8/22 AND OTP 8/27	Resume Reading Object Contents	OTP/CL/OTPP/BV-19-C
OTP 8/23	Resume Writing Object Contents - Current Size Method	OTP/CL/OTPP/BV-20-C
OTP 8/24 AND OTP 8/27	Resume Writing Object Contents - Data Integrity Method	OTP/CL/OTPP/BV-21-C
OTP 8/25	Create Object	OTP/CL/OTPP/BV-22-C
OTP 8/26	Delete Object	OTP/CL/OTPP/BV-23-C
OTP 8/28	Execute Object	OTP/CL/OTPP/BV-24-C
OTP 8/30 AND OTP 3/2	Open Object Transfer Channel LE transport	OTP/CL/OTPP/BV-25-C
OTP 8/30 AND OTP 3/1	Open Object Transfer Channel BR/EDR transport	OTP/CL/OTPP/BV-26-C
OTP 7/15	General OACP Errors	OTP/CL/OAE/BI-01-C OTP/CL/OAE/BI-02-C OTP/CL/OAE/BI-03-C OTP/CL/OAE/BI-04-C OTP/CL/OAE/BI-06-C OTP/CL/OAE/BI-07-C OTP/CL/OAE/BI-08-C OTP/CL/OAE/BI-09-C
OTP 8/25	OACP Create Errors	OTP/CL/OAE/BI-05-C OTP/CL/APE/BI-02-C
OTP 7/17	General OLCP Errors	OTP/CL/OLE/BI-02-C OTP/CL/OLE/BI-03-C OTP/CL/OLE/BI-04-C OTP/CL/OLE/BI-05-C OTP/CL/OLE/BI-07-C OTP/CL/APE/BI-01-C
OTP 7/17 AND OTP 8/7	OLCP Op Code Not Supported	OTP/CL/OLE/BI-01-C

Table 5.1: Test case mapping

6 Revision history and acknowledgments

Revision History

Publication Number	Revision Number	Date	Comments
0	1.0.0	2015-11-17	Specification adopted by BoD; prepared for publication.
	1.0.1r00	2016-05-25	Converted to new Test Case ID conventions as defined in TSTO v4.1.
	1.0.1r01	2016-06-20	Review by Alicia Courtney and Magnus Sommansson
	1.0.1r02	2016-06-22	Updated the Object Transfer Procedures identifier from OTP to OTPP to avoid clashing with the acronym used to refer to the profile.
1	1.0.1	2016-07-14	Prepared for TCRL 2016-1 publication.
	1.0.2r00	2016-10-08	TSE 7642: Updated mapping for OTP/SR/OTSD/BV-04-I to check for BR/EDR/LE configuration.
2	1.0.2	2016-12-13	Approved by BTI. Prepared for TCRL 2016-2 publication.
	1.0.2 edition 2r00	2018-11-29	Editorial changes only. Template updated. Revision History and contributors moved to the end of the document.
	1.0.2 edition 2	2020-01-07	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.
	p3r00–r02	2022-03-23 – 2022-05-18	TSE 17265 (rating 2): Converted tests to GGIT: the new GGIT TCIDs are: OTP/CL/CGGIT/SER/BV-01-C, OTP/CL/CGGIT/CHA/BV-01-C through -11-C, and OTP/SR/SGGIT/SDPNF/BV-01-C and the deleted TCIDs are OTP/CL/OTSD/BV-01-I through -03-I, OTP/SR/OTSD/BV-04-I, and OTP/CL/OTCD/BV-01-I through -10-C and -12-C. Updated the “Test groups” section and added the GGIT material to the TCID conventions section. Updated the Test Purpose, Initial Condition, and the Pass verdict for OTP/CL/OTCD/BV-11-I to cite a GGIT test case. Updated cross-references to point to the new GATT Integrated Tests section globally. Updated the TCMT accordingly. TSE 18419 (rating 1): Removed direct references to GATT test cases in OTP/CL/OTCD/BV-11-I, OTP/CL/OTR/BV-01-I – -11-I, OTP/CL/OTW/BV-01-I – -07-I, and OTP/CL/OTPP/BV-16-I. Removed direct references to GATT TS in ATT Bearer preambles. TSE 18421 (rating 1): Added “Test database requirements” section. TSE 18597 (rating 2): Fixed an incorrect “OTS” referenced in the TCMT for OTP/CL/OTPP/BV-18-I.

Publication Number	Revision Number	Date	Comments
			TSE 18722 (rating 1): Editorials to align the document with the latest TS template in anticipation of a future .Z release. Editorials, including assigning publication number 2 to previous v1.0.2 and aligning the copyright page with v2 of the DNMD.
3	p3	2022-06-28	Approved by BTI on 2022-05-31. Prepared for TCRL 2022-1 publication.
	p4r00	2023-10-31	TSE 23278 (rating 1): Converted -I tests to -C tests as appropriate; updated the TCMT and TCRL accordingly. Performed other editorials to align the document with the latest TS template, including updates to the references, Test Strategy, conformance, Pass/Fail verdict conventions, and TCMT introductory text.
4	p4	2024-07-01	Approved by BTI on 2024-04-21. Prepared for TCRL 2024-1 publication.

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