Mesh Device Firmware Update Model (DFUM)

***Bluetooth*® Test Suite**

- **Revision:** DFUM.TS.p1
- **Revision Date:** 2024-07-01
- **Prepared By:** Mesh Working Group
- **Published during TCRL:** TCRL.2024-1

Contents

1 Scope

This Bluetooth document contains the Test Suite Structure (TSS) and test cases to test the implementation of the Bluetooth Mesh Device Firmware Update Model 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], [2], and [3].

[1] Mesh Protocol Specification, Version 1.1 or later

[2] Test Strategy and Terminology Overview

[3] Mesh Device Firmware Update Model Specification

[4] ICS Proforma for Mesh Device Firmware Update Model

[5] IXIT Proforma for Mesh Device Firmware Update Model

[6] Appropriate Language Mapping Tables document

[7] Document Naming and Marking Document

[8] Mesh BLOB Transfer Model Test Suite

[9] Mesh BLOB Transfer Model Specification

2.2 Definitions

In this Bluetooth document, the definitions from [1], [2], and [3] apply.

Certain terms that were identified as inappropriate have been replaced. For a list of the original terms and their replacement terms, see the Appropriate Language Mapping Tables document [6].

2.3 Acronyms and abbreviations

In this Bluetooth document, the definitions, acronyms, and abbreviations from [1], [2], and [3] apply.

3 Test Suite Structure (TSS)

3.1 Overview

As the Mesh Device Firmware Update Model Specification is a collection of several client and server models, testing is performed by pairing the IUT acting in each of the tested models against a Lower Tester acting in the corresponding peer model. The model pairs defined by the specification are:

- Firmware Distribution Server model and Firmware Distribution Client model.
- Firmware Update Server model and Firmware Update Client model.

3.2 Test Strategy

The test objectives are to verify the functionality of the Mesh Device Firmware Update Model and enable the distribution of new firmware images between mesh nodes and the firmware update procedure on the receiving nodes. 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 Bluetooth Core and Bluetooth Mesh Profile implementations 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.

When testing firmware distribution, two Lower Testers are needed in some of the test cases. One of them exchanges the firmware with the IUT using the Firmware Distribution Client/Server models, and the other one simulates a node that receives the firmware to perform the update.

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

3.3 Test groups

The following test groups have been defined:

- General Tests
- Firmware Distribution Server
- Firmware Update Server
- Firmware Distribution Client
- Firmware Update Client

4 Test cases (TC)

4.1 Introduction

4.1.1 Test case Identification conventions

Test cases are assigned unique identifiers per the conventions in [2]. The convention used here is: **<spec abbreviation>/<IUT role/model type>/<model identifier>/<xx>-<nn>-<y>**.

Identifier Abbreviation	**Spec Identifier <spec abbreviation>**
DFUM	Device Firmware Update Model Specification
Identifier Abbreviation	**Role Identifier <IUT role >**
CL	Client Role
SR	Server Role
Identifier Abbreviation	**Model Identifier <model identifier>**
FD	Firmware Distribution
FU	Firmware Update
GEN	General

Table 4.1: DFUM 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, the outcome of the test is a Fail verdict.

4.2 Setup preambles

At the end of some preambles, but also generically throughout this Test Suite, the tester sometimes needs to generate unique, valid values for some parameters that are to be reused in multiple test procedures. The names of these parameters start with “Test”. Unless otherwise stated explicitly, the values of these parameters are generated by the tester at their first appearance and retained to be reused for the rest of the test cases.

4.2.1 IUT in Idle Upload Phase

- Preamble Procedure

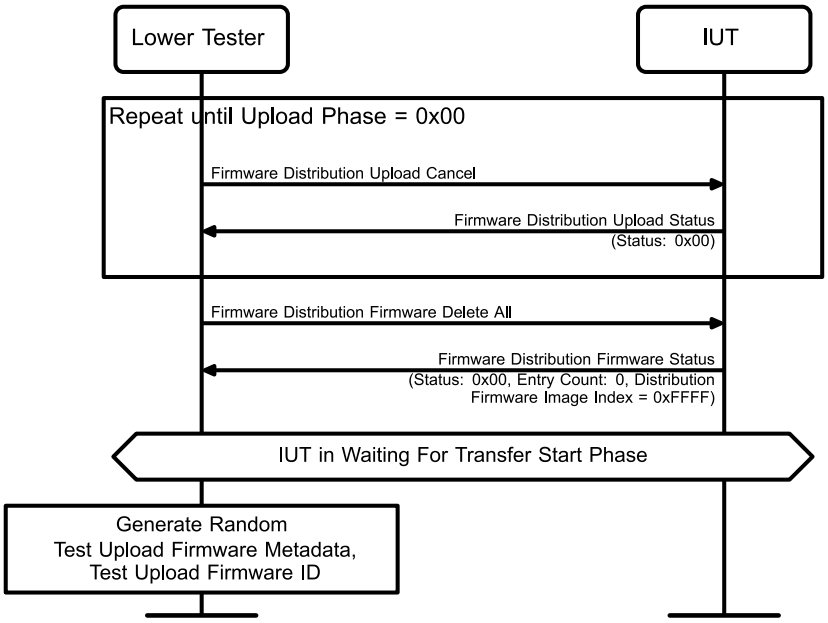

Figure 4.1: Test Procedure for IUT in Idle Upload Phase

1. Repeat the following sequence every 5 s until the Upload Phase is 0x00: the Lower Tester sends a Firmware Distribution Upload Cancel message and the IUT responds with a Firmware Distribution Upload Status message with the Status field set to 0x00.
2. The Lower Tester sends a Firmware Distribution Firmware Delete All message.
3. The IUT responds with a Firmware Distribution Firmware Status message with Status set to 0x00 (Success), Entry Count set to 0, Distribution Firmware Image Index set to 0xFFFF, and no other parameters.
4. The Lower Tester generates a new BLOB identified by Test Upload BLOB ID by running the MBTM preamble [8] 4.2.1 IUT in Waiting For Transfer Start Phase; the size of the BLOB is identified by Test Upload Firmware Size; the Lower Tester generates a random Test Upload Firmware Metadata octet array (which can also be an empty array) and a Test Upload Firmware ID identifier.

4.2.2 IUT in Transfer Active Upload Phase

- Preamble Procedure

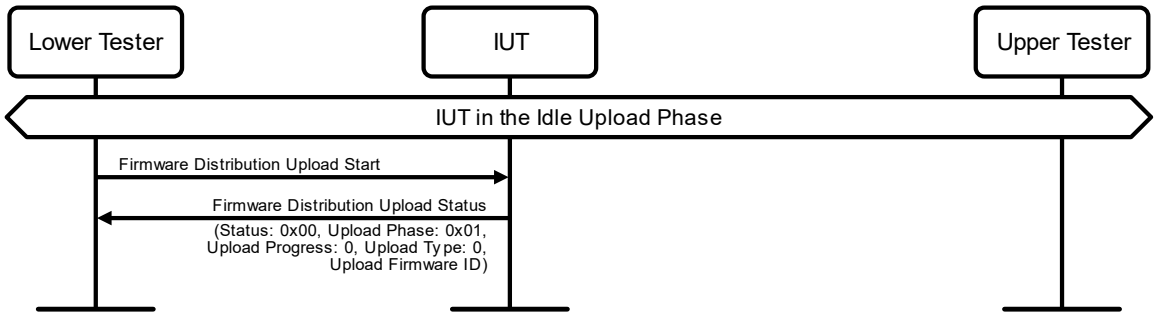

Figure 4.2: Preamble Procedure for IUT in Transfer Active Upload Phase

1. The Lower Tester prepares the IUT to receive a new firmware by executing the preamble procedure from Section 4.2.1.
2. The Lower Tester sends a Firmware Distribution Upload Start message with Upload TTL set to Test Upload TTL, Upload Timeout Base set to Test Upload Timeout Base, Upload BLOB ID set to Test Upload BLOB ID, Upload Firmware Size set to Test Upload Firmware Size, Upload Firmware Metadata Length set to the size in bytes of the Test Upload Firmware Metadata array, Upload Firmware Metadata set to Test Upload Firmware Metadata, Upload Firmware ID set to Test Upload Firmware ID.
3. The IUT responds with a Firmware Distribution Upload Status message with Status set to 0x00 (Success), Upload Phase set to 0x01 (Transfer Active), Upload Progress set to 0, Upload Type set to 0 (In-band) and Upload Firmware ID set to Test Upload Firmware ID.

4.2.3 IUT in Transfer Error Upload Phase

- Preamble Procedure

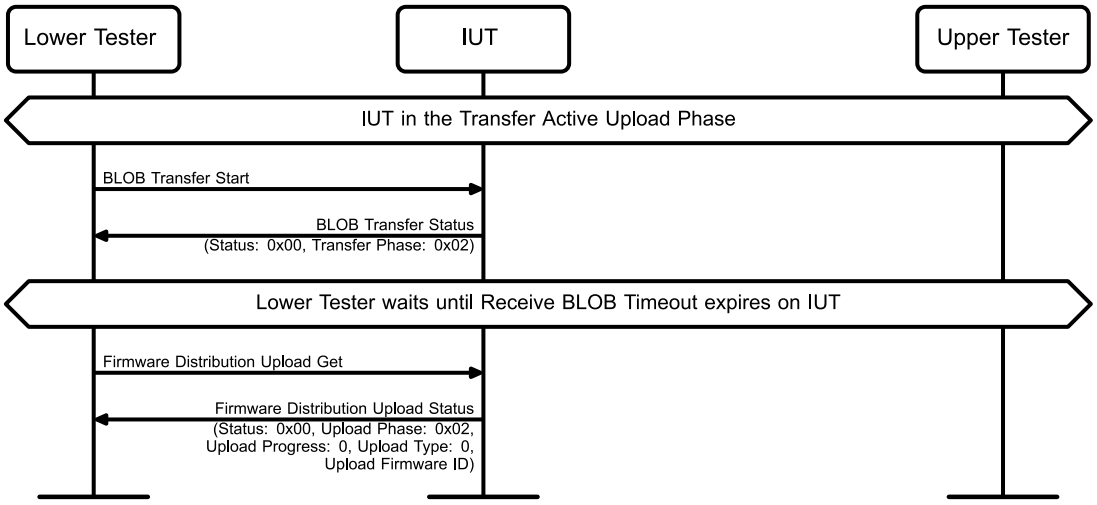

Figure 4.3: Test Procedure for IUT in Transfer Error Upload Phase

1. The Lower Tester sets the IUT in the 'Transfer Active' Upload Phase by executing the preamble procedure from Section 4.2.2.
2. The Lower Tester sends a BLOB Transfer Start message to the IUT with BLOB ID set to Test Upload BLOB ID, BLOB Size set to a value less than Max BLOB Size, Block Size Log set to Test Block Size Log, Client MTU Size set to 0xFFFF. All RFU field bits are set to 0 (zero).

3. The IUT sends a BLOB Transfer Status message with the Status field set to 0x00 (Success) and the Transfer Phase field set to 0x02 (Waiting For Next Block).
4. After the Receive BLOB Timeout (see [9]) expires, the Lower Tester sends a Firmware Distribution Upload Get message.
5. The IUT responds with a Firmware Distribution Upload Status message with Status set to 0x00 (Success), Upload Phase set to 0x02 (Transfer Error), Upload Progress set to 0, Upload Type set to 0 (In-band), and Upload Firmware ID set to Test Upload Firmware ID.

4.2.4 IUT in Transfer Success Upload Phase

- Preamble Procedure

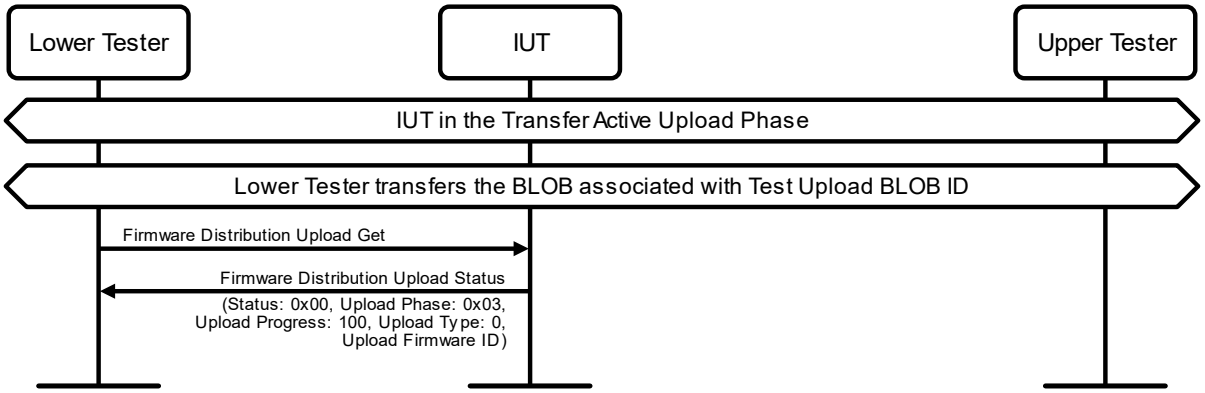

Figure 4.4: Preamble Procedure for IUT in Transfer Success Upload Phase

1. The Lower Tester sets the IUT in the 'Transfer Active' Upload Phase by executing the preamble procedure from Section 4.2.2.
2. The Lower Tester transfers the BLOB associated with Test Upload BLOB ID by running an MBTM test procedure, [8] MBTM/SR/BT/BV-01-C or MBTM/SR/BT/BV-02-C.
3. The Lower Tester sends a Firmware Distribution Upload Get message.
4. The IUT responds with a Firmware Distribution Upload Status message with Status set to 0x00 (Success), Upload Phase set to 0x03 (Transfer Success), Upload Progress set to 100, Upload Type set to 0 (In-band), and Upload Firmware ID set to Test Upload Firmware ID.

4.2.5 IUT in Transfer Active Upload Phase, OOB Transfer

- Preamble Procedure

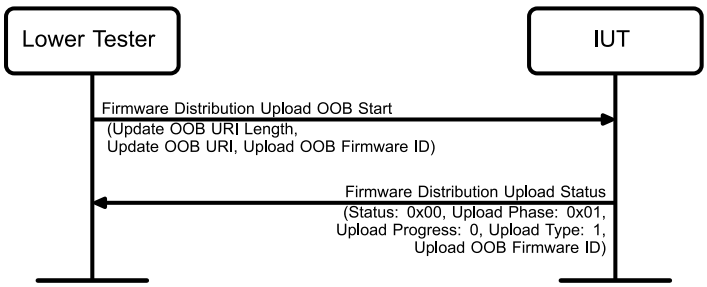

Figure 4.5: Preamble Procedure for IUT in Transfer Active Upload Phase, OOB Transfer

1. The Lower Tester sends a Firmware Distribution Upload OOB Start message with Upload OOB URI Length set to Test Upload URI Length, Upload OOB URI set to Test Update URI and Upload OOB Firmware ID set to Test Current Firmware ID.

2. The IUT responds with a Firmware Distribution Upload Status message with Status set to 0x00 (Success), Upload Phase set to 0x01 (Transfer Active), Upload Progress set to 0, Upload Type set to 1 (Out-of-band) and Upload OOB Firmware ID set to Test Current Firmware ID.

4.2.6 IUT in Idle Distribution Phase

- Preamble Procedure

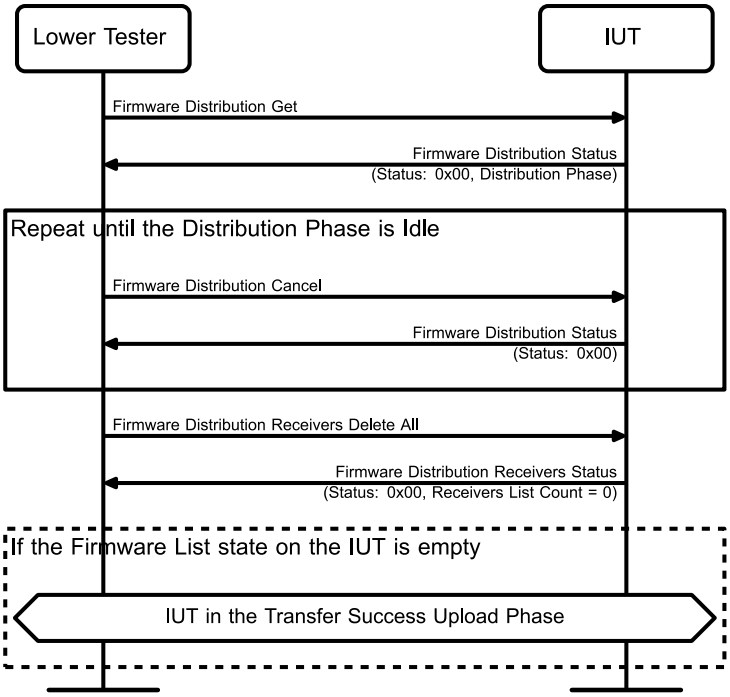

Figure 4.6: Preamble Procedure for IUT in Idle Distribution Phase

1. The Lower Tester sends a Firmware Distribution Get message.
2. The IUT responds with a Firmware Distribution Status message with Status set to 0x00 (Success) and Distribution Phase set to a valid value. The message may contain additional fields. All RFU field bits are set to 0 (zero).
3. If the Distribution Phase is not 0x00 (Idle), repeat the following sequence every 5 s until the Distribution Phase is 0x00: the Lower Tester sends a Firmware Distribution Cancel message and the IUT responds with a Firmware Distribution Status message with the Status field set to 0x00.
4. The Lower Tester sends a Firmware Distribution Receivers Delete All message without parameters.
5. The IUT responds with a Firmware Distribution Receivers Status message with Status field set to 0x00 (Success) and Receivers List Count field set to 0.
6. If the Firmware List state on the IUT is empty, the Lower Tester uploads a firmware to the IUT by running the preamble procedure from Section 4.2.4. The firmware is identified by Test Distribution Firmware Image Index.

4.2.7 IUT in Transfer Active Distribution Phase

- Preamble Procedure

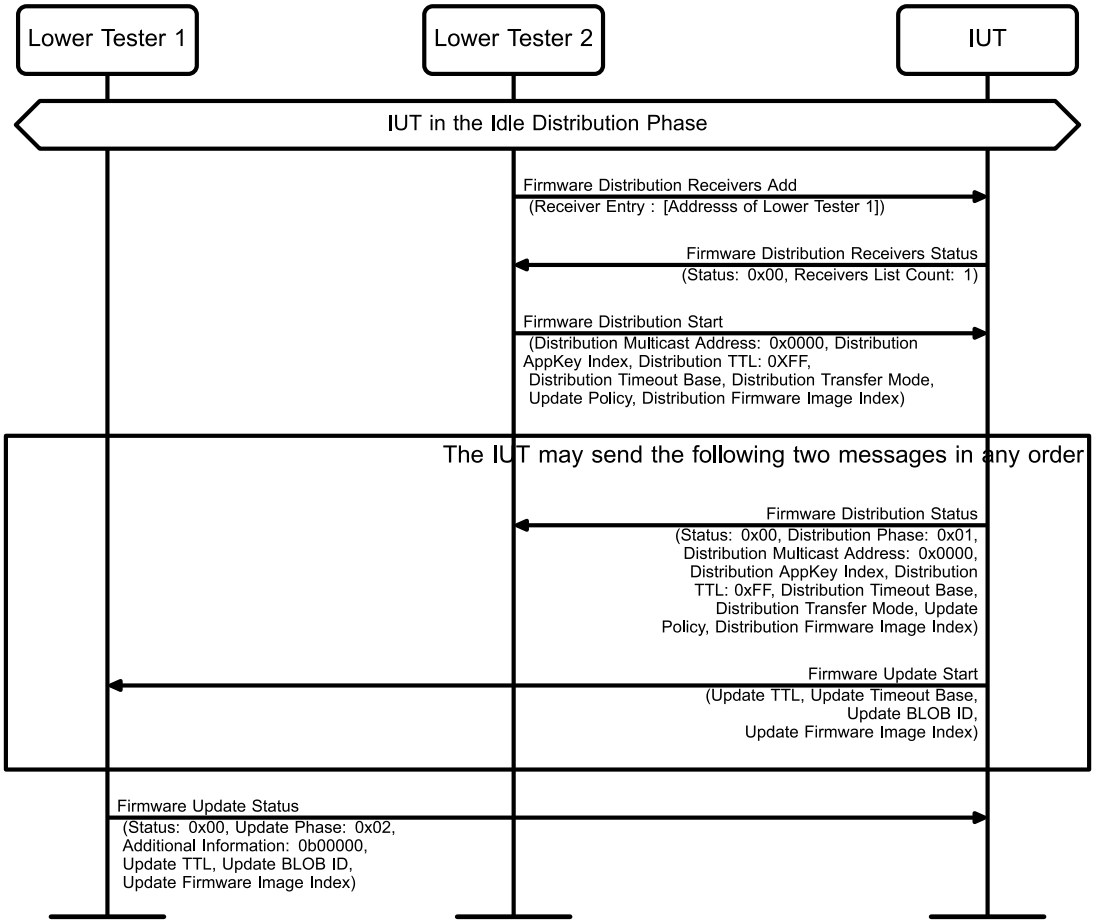

*Figure 4.7: **Preamble** Procedure for IUT in Transfer Active Distribution Phase*

1. Lower Tester 2 prepares the IUT to start firmware distribution to Lower Tester 1 by executing the preamble procedure from Section 4.2.6.
2. Lower Tester 2 sends a Firmware Distribution Receivers Add message with a single Receiver Entry with the Address field set to the unicast address assigned to Lower Tester 1.
3. The IUT responds with a Firmware Distribution Receivers Status message with Status field set to 0x00 (Success) and Receivers List Count field set to 1.
4. Lower Tester 2 sends a Firmware Distribution Start message with Distribution Multicast Address set to 0x0000, Distribution AppKey Index set to an AppKey Index bound to BLOB client and Firmware Update client on the IUT, Distribution TTL set to 0xFF, Distribution Timeout Base set to TSPX_Distribution_Timeout_Base, Distribution Transfer Mode set to TSPX_Distribution_Transfer_Mode, Update Policy set to 0x00 (Verify Only), and Distribution Firmware Image Index set to TSPX_Distribution_Firmware_Image_Index.

For steps 5 and 6, the order of messages sent by the IUT does not matter.

5. The IUT responds with a Firmware Distribution Status message with Status set to 0x00 (Success), Distribution Phase set to 0x01 (Transfer Active) and the remaining parameters set as in step 4.
6. The Firmware Update client on the IUT sends a Firmware Update Start message to Lower Tester 1 with Update TTL set to a valid value, Update Timeout Base set to TSPX_Update_Timeout_Base, Update BLOB ID set to a random valid value, Incoming Firmware

Metadata set to the metadata from the entry in the Firmware List state, and Update Firmware Image Index set to TSPX_Update_Firmware_Image_Index.

7. Lower Tester 1 responds with a Firmware Update Status message with Status set to 0x00 (Success), Update Phase set to 0x2 (Transfer Active), Additional Information set to 0b00000, Update TTL, Update BLOB ID set to the values from step 6, Update Firmware Image Index set to TSPX_Update_Firmware_Image_Index.

- Notes

  A test case using this preamble may specify (and thus override) the value of the Update Policy parameter in step 4.

4.2.8 IUT in Transfer Success Distribution Phase

- Preamble Procedure

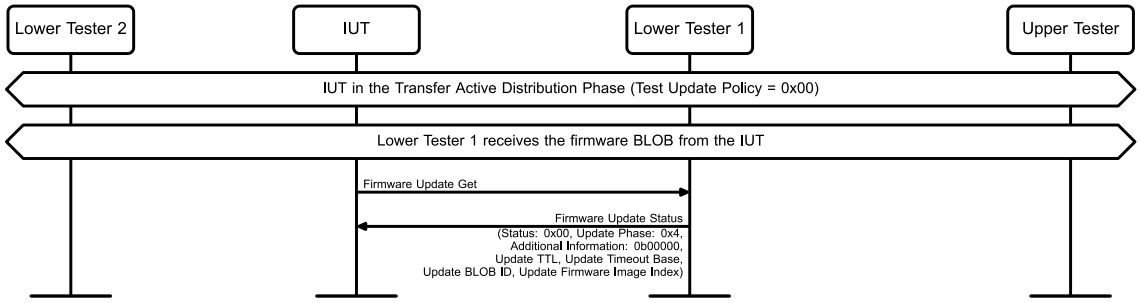

Figure 4.8: Preamble Procedure for IUT in Transfer Success Distribution Phase

1. Lower Tester 2 starts firmware distribution from IUT to Lower Tester 1 by executing the preamble procedure from Section 4.2.7.
2. Lower Tester 1 receives the firmware BLOB from the IUT by running an MBTM test procedure, [8] MBTM/CL/BT/BV-01-C or MBTM/CL/BT/BV-02-C, using as test BLOB the BLOB associated with the firmware identified by Test Update Firmware Image Index and Update BLOB ID sent by the IUT in the Firmware Update Start message.
3. The Firmware Update client on the IUT sends a Firmware Update Get message to Lower Tester 1.
4. Lower Tester 1 responds with a Firmware Update Status message with Status set to 0x00 (Success), Update Phase set to 0x4 (Verification Succeeded), Additional Information set to 0b00000, Update TTL, Update Timeout Base set to a valid value, Update BLOB ID set to the values from step 2, Update Firmware Image Index set to Test Update Firmware Image Index. If Update Phase is set to 0x3 (Verifying Update), repeat steps 3–4.

4.2.9 IUT in Completed Distribution Phase

- Preamble Procedure

1. Lower Tester 2 starts firmware distribution from IUT to Lower Tester 1 by executing the preamble procedure from Section 4.2.7 with Update Policy set to 0x01 (Verify And Apply).
2. Lower Tester 1 receives the firmware BLOB from the IUT by running an MBTM test procedure, [8] MBTM/CL/BT/BV-01-C or MBTM/CL/BT/BV-02-C, using as test BLOB the BLOB associated with the firmware identified by Test Update Firmware Image Index and Update BLOB ID sent by the IUT in the Firmware Update Start message.
3. The Firmware Update client on the IUT sends a Firmware Update Get message to Lower Tester 1.
4. Lower Tester 1 responds with a Firmware Update Status message with Status set to 0x00 (Success), Update Phase set to 0x4 (Verification Succeeded), Additional Information set to

0b00000, Update TTL, Update Timeout Base set to a valid value, Update BLOB ID set to the values from step 2, Update Firmware Image Index set to Test Update Firmware Image Index. If Update Phase is set to 0x3 (Verifying Update), repeat steps 3–4.

5. The Firmware Update client on the IUT sends a Firmware Update Apply message to Lower Tester 1.
6. Lower Tester 1 responds with a Firmware Update Status message with Status set to 0x00 (Success), Update Phase set to 0x06 (Applying Update) and all other fields set to valid values.
7. The IUT determines that Lower Tester 1 has rebooted, either by requesting and receiving an indication from the Upper Tester, or by sending further Firmware Update Apply messages.
8. The Firmware Update client on the IUT sends a Firmware Update Information Get message to Lower Tester 1 with First Index set to Test Update Firmware Image Index and Entries Limit set to 0x01.
9. Lower Tester 1 responds with a Firmware Update Information Status message with the Firmware Information List Count field set to 0x0001, First Index field set to the requested value, and only one Firmware Information Entry with Current Firmware ID set to the Firmware ID of the image transferred in step 1.
10. Lower Tester 2 sends a Firmware Distribution Get message to the IUT.
11. The IUT sends a Firmware Distribution Status message to Lower Tester 2 with the Status field set to 0x00.
12. If the Distribution Phase field in the Firmware Distribution Status message received by Lower Tester 2 in step 11 equals 0x00 (Idle), 0x05 (Failed), or 0x06 (Canceling Update), then the preamble has failed.
13. If the Distribution Phase field in the Firmware Distribution Status message received by Lower Tester 2 in step 11 does not equal 0x04 (Completed), then repeat steps 5–9.

4.2.10 IUT in Failed Distribution Phase

- Preamble Procedure

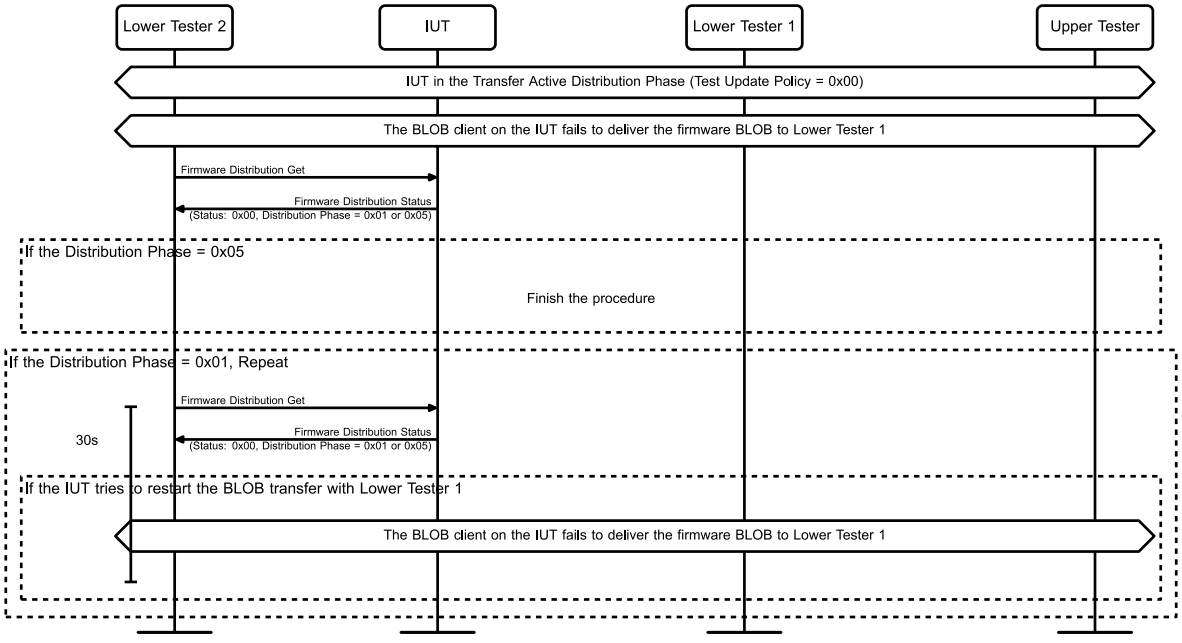

Figure 4.9: Preamble Procedure for IUT in Failed Distribution Phase

1. Lower Tester 2 starts firmware distribution from IUT to Lower Tester 1 by executing the preamble procedure from Section 4.2.7.

2. The BLOB client on the IUT fails to deliver the firmware BLOB to Lower Tester 1 by running an MBTM test procedure, [8] MBTM/CL/BT/BV-03-C or MBTM/CL/BT/BV-04-C, using the BLOB associated with the firmware identified by the Test Update Firmware Image Index and Update BLOB ID sent by the Firmware Update client on the IUT in the Firmware Update Start message.
3. Lower Tester 2 sends a Firmware Distribution Get message.
4. The IUT responds with a Firmware Distribution Status message with Status set to 0x00 (Success) and Distribution Phase set to either 0x01 (Transfer Active) or 0x05 (Failed).
5. If the Distribution Phase received in step 4 is 0x05, finish the procedure. Otherwise, once per second, repeat steps 3–4 for 30s. During this time period, if the IUT tries to restart the BLOB transfer with Lower Tester 1, repeat step 2.

4.2.11 IUT as Firmware Update Server in Idle Update Phase

- Preamble Procedure

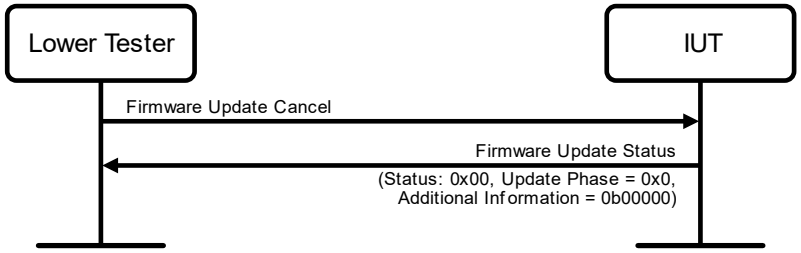

Figure 4.10: Test Procedure for IUT as Firmware Update Server in Idle Update Phase

1. The Lower Tester sends a Firmware Update Cancel message to the IUT.
2. The IUT responds with a Firmware Update Status message with Status set to 0x00 (Success), Update Phase set to 0x0 (Idle), and all RFU field bits set to 0 (zero).

4.2.12 IUT as Target Node in Transfer Active Update Phase

- Preamble Procedure

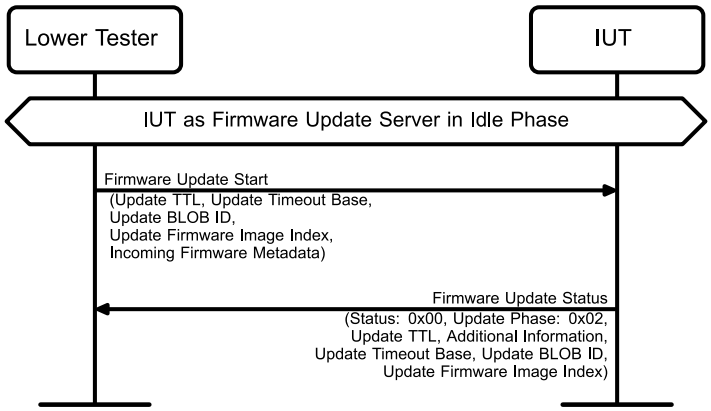

Figure 4.11: Preamble Procedure for IUT as Target Node in Transfer Active Update Phase

1. The Lower Tester sets the IUT in the Idle Update Phase by executing the preamble procedure from Section 4.2.11.
2. The Lower Tester sends a Firmware Update Start message to the IUT with Update TTL and Update BLOB ID set to random valid values, Update Timeout Base set to a non-zero value, Incoming Firmware Metadata set to the metadata defined in the IXIT [5], Update Firmware Image Index set to the new firmware identified defined in the IXIT [5].

3. The IUT responds with a Firmware Update Status message with Status set to 0x00 (Success), Update Phase set to 0x2 (Transfer Active), Additional Information set to a valid value, Update TTL, Update BLOB ID set to the values from step 1, Update Firmware Image Index set to the new firmware identified defined in the IXIT [5]. All RFU field values are set to 0 (zero).

4.2.13 IUT in Canceling Update Distribution Phase

- Preamble Procedure

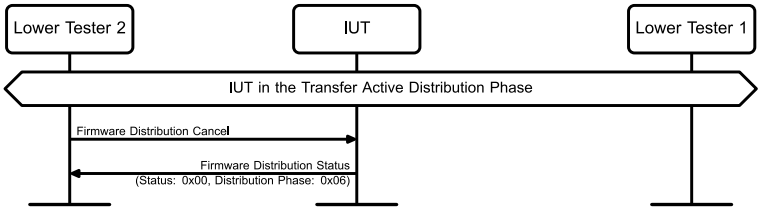

*Figure 4.12: **Preamble** Procedure for IUT in Canceling Update Distribution Phase*

1. Lower Tester 2 starts firmware distribution from IUT to Lower Tester 1 by executing the preamble procedure from Section 4.2.7.
2. Lower Tester 1 stops communicating with the IUT and Lower Tester 2 sends a Firmware Distribution Cancel message.
3. The IUT responds with a Firmware Distribution Status message with Status set to 0x00 (Success) and Distribution Phase field set to 0x06 (Canceling Update).

4.2.14 IUT in Transfer Suspended Distribution Phase

- Preamble Procedure

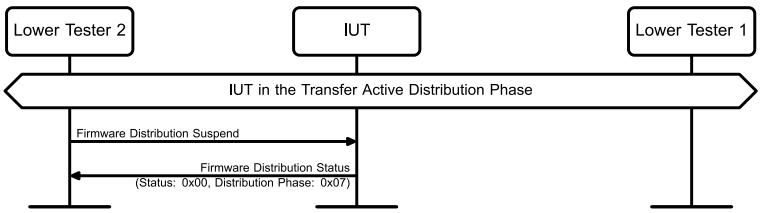

Figure 4.13: Preamble Procedure for IUT in Transfer Suspended Distribution Phase

1. Lower Tester 2 starts firmware distribution from IUT to Lower Tester 1 by executing the preamble procedure from Section 4.2.7.
2. The IUT starts sending the first block of the firmware image.
3. After Lower Tester 1 has received at least one chunk of the first block, Lower Tester 2 sends a Firmware Distribution Suspend message.
4. The IUT responds with a Firmware Distribution Status message with Status set to 0x00 (Success) and Distribution Phase field set to 0x07 (Transfer Suspended).

4.3 General Tests

DFUM/SR-CL/GEN/BV-01-C [Models Supported Per Element]

- Test Purpose

  Verify that the IUT's Composition Data state reflects a correct MBTM/DFUM model distribution on each element.

- References

  [3] 2.1.1

- Initial Condition
  - The IUT has been provisioned by the Lower Tester.
- Test Procedure
  1. The Lower Tester reads the Composition Data state of the IUT.
  2. If any element instantiates any DFUM models, verify that each such element on the IUT contains a combination of MBTM and DFUM models as required by the DFUM specification.
- Expected Outcome

  Pass verdict

  Each element contains a valid MBTM/DFUM model combination as defined in [3] Section 2.1.1.

4.4 Firmware Distribution Server

DFUM/SR/FD/BV-01-C [Receive Firmware Distribution Capabilities Get]

- Test Purpose

  Verify that the IUT acting as Distributor receives a Firmware Distribution Capabilities Get message and sends a Firmware Distribution Capabilities Status message with valid fields.
- References

  [3] 6.2.3.6, 6.2.3.7
- Initial Condition
  - The Lower Tester is a Firmware Distribution Client supporting the Initiator role.
  - The IUT and Lower Tester share the same application security credentials.
- Test Procedure

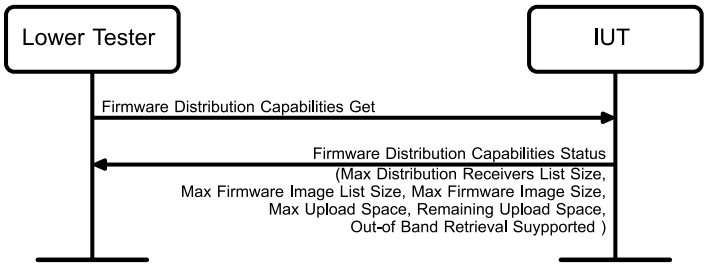

Figure 4.14: Test Procedure for DFUM/SR/FD/BV-01-C [Receive Firmware Distribution Capabilities Get]

  1. The Lower Tester sends a Firmware Distribution Capabilities Get message with no parameters.
  2. The IUT responds with a Firmware Distribution Capabilities Status message with Max Distribution Receivers List Size, Max Firmware Images List Size, Max Firmware Image Size, Max Upload Space, Remaining Upload Space, Out-of-Band Retrieval Supported set to valid values.
- Expected Outcome

  Pass verdict

  In step 2, the IUT responds with a message with valid values indicating the values of the corresponding states. The value of the Remaining Upload Space field is lower than or equal to the value of Max Upload Space field. If the Out-of-Band Retrieval Supported field is set to 0x01 (OOB Supported), then the status message also contains the encoded Supported URI Scheme Names.

DFUM/SR/FD/BV-02-C [Receive Firmware Distribution Receivers List messages]

- Test Purpose

  Verify that the IUT acting as Distributor updates the Distribution Receivers List state when an Initiator adds nodes or clears the list.

- References

  [3] 6.2.3.1, 6.2.3.2, 6.2.3.3

- Initial Condition
  - The IUT and Lower Tester share the same application security credentials.
  - The Lower Tester is a Firmware Distribution Client supporting the Initiator role.
  - The Lower Tester sets the IUT in the ‘Idle’ Distribution Phase by executing steps 1–3 of the procedure in Section 4.2.6.
  - The Lower Tester has read the capabilities of the IUT and saved Maximum Distribution Receivers List Size state as MAX DISTRIBUTION RECEIVERS LIST SIZE.

- Test Procedure

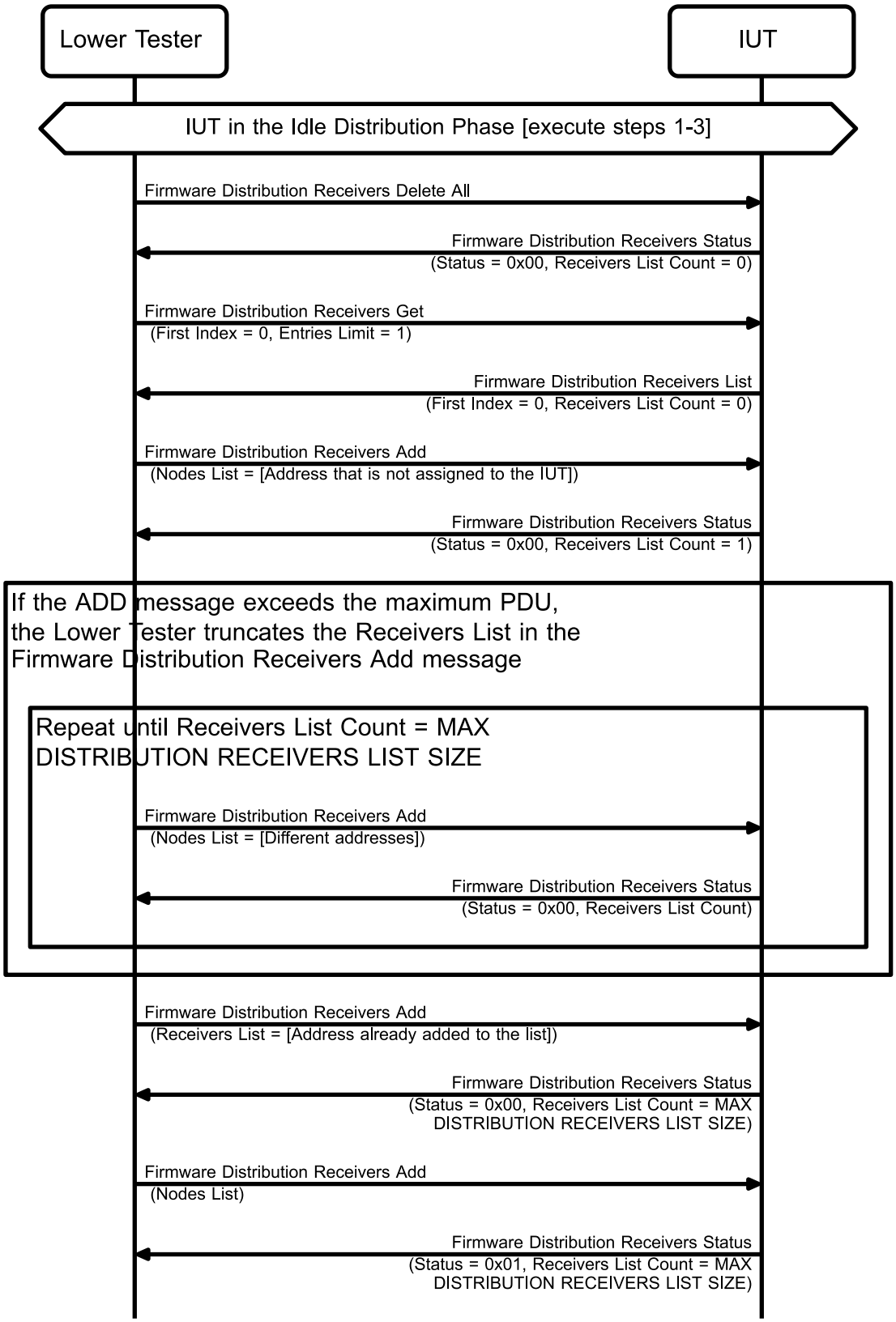

Figure 4.15: Test Procedure for DFUM/SR/FD/BV-02-C [Receive Firmware Distribution Receivers List messages] – Page 1 of 2

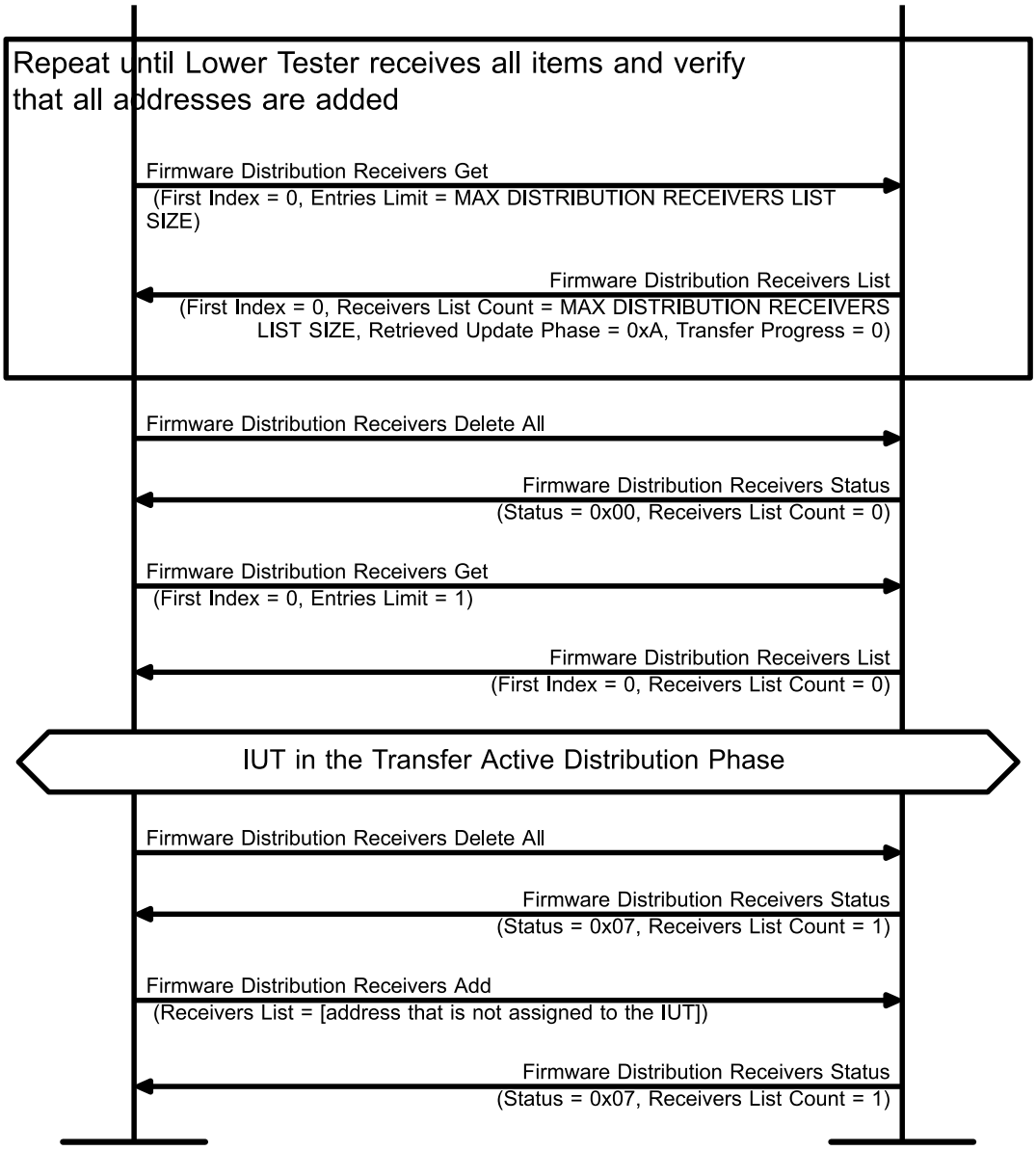

Figure 4.16: Test Procedure for DFUM/SR/FD/BV-02-C [Receive Firmware Distribution Receivers List messages] – Part 2 of 2

1. The Lower Tester sends a Firmware Distribution Receivers Delete All message without parameters.
2. The IUT responds with a Firmware Distribution Receivers Status message with Status field set to 0x00 (Success) and Receivers List Count field set to 0.
3. The Lower Tester sends a Firmware Distribution Receivers Get message with First Index field set to 0 and Entries Limit field set to 1.
4. The IUT responds with a Firmware Distribution Receivers List message with First Index field set to 0, Receivers List Count field set to 0 and no other parameters.
5. The Lower Tester sends a Firmware Distribution Receivers Add message with a single Receiver Entry with the Address field set to a unicast address not assigned to the IUT.
6. The IUT responds with a Firmware Distribution Receivers Status message with Status field set to 0x00 (Success) and Receivers List Count field set to 1.
7. Repeat steps 5–6 using, in step 5, a number of different unicast addresses equal to MAX DISTRIBUTION RECEIVERS LIST SIZE – 1; If the message exceeds the maximum PDU, the

Lower Tester truncates the list and repeats adding nodes to the list until, in step 6, the Receivers List Count field is equal to MAX DISTRIBUTION RECEIVERS LIST SIZE.

8. Repeat steps 5–6 using, in step 5, an address that has already been added to the list. The IUT's response has Status set to 0x00 and Receivers List Count field set to MAX DISTRIBUTION RECEIVERS LIST SIZE.
9. Repeat steps 5–6, but in step 6, the IUT sets the Status field to 0x01 (Insufficient Resources) and Receivers List Count field set to MAX DISTRIBUTION RECEIVERS LIST SIZE.
10. The Lower Tester sends a Firmware Distribution Receivers Get message with First Index field set to 0 and Entries Limit field set to MAX DISTRIBUTION RECEIVERS LIST SIZE.
11. The IUT responds with a Firmware Distribution Receivers List message with First Index field set as in step 10, the Receivers List Count field set to MAX DISTRIBUTION RECEIVERS LIST SIZE and a list of Target Node Entry fields; each item has the Address field set to one of the addresses added by the Lower Tester, the Retrieved Update Phase field set to 0xA (Unknown) and the Transfer Progress field set to 0.
12. If the number of items returned is less than MAX DISTRIBUTION RECEIVERS LIST SIZE, keep repeating steps 10–11 using, in step 10, an Index field set to the one previously used + the number of items returned by the IUT in step 11, until the Lower Tester receives all the items and verifies that all the addresses have been added.
13. Repeat steps 1–4.
14. The Lower Tester puts the IUT in the Transfer Active Distribution Phase by running preamble 4.2.7.
15. Repeat steps 1–2 and 5–6, but in steps 1 and 6, the IUT sets the Status field to 0x07 (Busy With Distribution) and the Receivers List Count field set to 1.

- Expected Outcome

  Pass verdict

  The IUT responds correctly to all messages.

  The IUT returns the complete list of addresses added by the Lower Tester.

  The Index field value returned in the Firmware Distribution Receivers List message is the same as in the Firmware Distribution Receivers Get message sent by the Lower Tester.

  In step 12, the Lower Tester successfully retrieves all distribution receivers list addresses.

  In the Firmware Distribution Receivers List message, the IUT does not return more addresses than required in the Entries Limit field of the Firmware Distribution Receivers Get message.

4.4.1 Receive Firmware Distribution Receivers Delete All

- Test Purpose

  Verify that the IUT acting as Distributor receives a Firmware Distribution Receivers Delete All message, clears the Distribution Receivers List state and responds with a Firmware Distribution Receivers Status.

- References

  [3] 6.2.3.2

- Initial Condition

  - The IUT and Lower Tester share the same application security credentials.
  - The Lower Tester is a Firmware Distribution Client supporting the Initiator role.
  - Additional initial conditions are specified in Table 4.2.

- Test Procedure

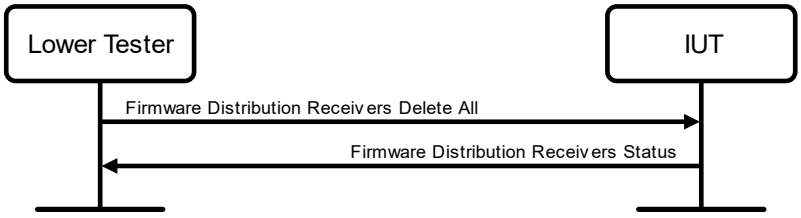

Figure 4.17: Test Procedure for Receive Firmware Distribution Receivers Delete All

1. The Lower Tester sends a Firmware Distribution Receivers Delete All message with no parameters.
2. The IUT responds with a Firmware Distribution Receivers Status message with Status field set to 0x00 (Success) and Receivers List Count field set to 0.

- Test Case Configuration

Test Case	Additional Initial Condition
DFUM/SR/FD/BV-03-C [Receive Firmware Distribution Receivers Delete All-Failed Distribution Phase]	Run preamble from Section 4.2.10.
DFUM/SR/FD/BV-04-C [Receive Firmware Distribution Receivers Delete All-Completed Distribution Phase]	Run preamble from Section 4.2.9 with Update Policy set to 0x00 (Verify Only)

Table 4.2: Receive Firmware Distribution Receivers Delete All test cases

- Expected Outcome

  Pass verdict

  The IUT responds correctly to all messages.

DFUM/SR/FD/BV-05-C [Upload Firmware – BLOB Transfer]

- Test Purpose

  Verify that the IUT acting as Distributor accepts a new firmware using the Transfer BLOB procedure from an Initiator.

- References

  [3] 6.2.3.13, 6.2.3.14

- Initial Condition

  - The Lower Tester sets the IUT in the ‘Transfer Active’ Upload Phase with Upload Type set to ‘In-band’ by executing the procedure in Section 4.2.2.
  - The Lower Tester is a Firmware Distribution Client supporting the Initiator role.
  - The BLOB associated to Test Upload Firmware ID contains at least two blocks.

- Test Procedure

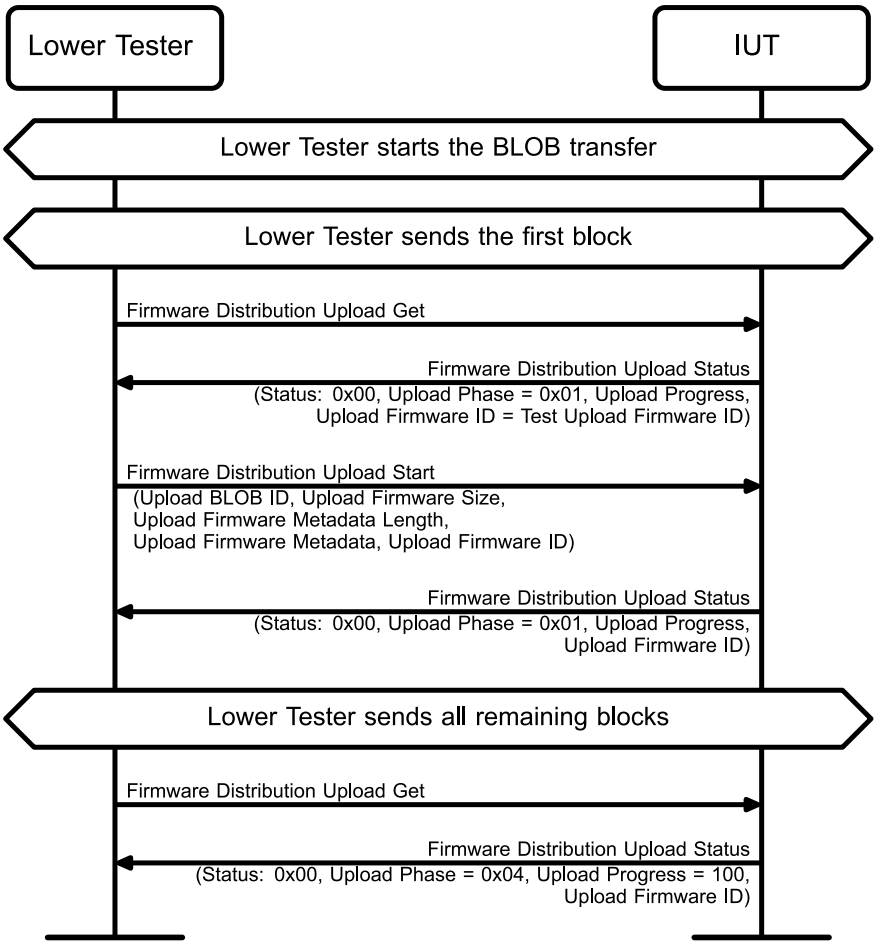

Figure 4.18: Test procedure for DFUM/SR/FD/BV-05-C [Upload Firmware – BLOB Transfer]

1. The Lower Tester starts the BLOB transfer by running the MBTM preamble [8] 4.2.2 IUT in Waiting for Next Block Phase.
2. The Lower Tester sends the first block by running an MBTM test procedure, [8] MBTM/SR/BT/BV-01-C or MBTM/SR/BT/BV-02-C.
3. The Lower Tester verifies progress on the IUT by sending a Firmware Distribution Upload Get message.
4. The IUT responds with a Firmware Distribution Upload Status message with Status set to 0x00 (Success), Upload Phase set to 0x01 (Transfer Active), Upload Progress set to a value between 0 and 99, Upload Type set to 0 (In-band), and Upload Firmware ID set to Test Upload Firmware ID.
5. The Lower Tester sends a Firmware Distribution Upload Start message with Upload BLOB ID set to Test Upload BLOB ID, Upload Firmware Size set to Test Upload Firmware Size, Upload Firmware Metadata Length set to the size in bytes of the Test Upload Firmware Metadata array, Upload Firmware Metadata set to Test Upload Firmware Metadata, Upload Firmware ID set to Test Upload Firmware ID.
6. The IUT responds with a Firmware Distribution Upload Status message with Status set to 0x00 (Success), Upload Phase set to 0x01 (Transfer Active), Upload Progress set to the one sent in step 4, Upload Type set to 0 (In-band) and Upload Firmware ID set to Test Upload Firmware ID.

7. Repeat step 2 for the remaining blocks.
8. Repeat steps 3–4, but in step 4, the IUT sets Upload Phase to 0x03 (Transfer Success) and Upload Progress to 100.

- Expected Outcome

  Pass verdict

  In step 4, the Upload Firmware ID field is formatted as a Firmware ID field.

  In step 5, the IUT does not restart reception upon receiving a Firmware Distribution Upload Start message with the same parameters as the initial request.

  The IUT successfully receives the firmware BLOB, showing correct upload progress.

DFUM/SR/FD/BV-06-C [Upload Firmware – OOB]

- Test Purpose

  Verify that the IUT acting as Distributor downloads a new firmware using an OOB mechanism using the URI provided by an Initiator. The firmware ID of the downloaded firmware is Test OOB Retrieved Firmware ID.

- References

  [3] 6.2.3.15

- Initial Condition

  - The Lower Tester is a Firmware Distribution Client supporting the Initiator role.
  - The Lower Tester sets the IUT in the ‘Transfer Active’ Upload Phase with Upload Type set to Out-of-band by executing the procedure in Section 4.2.5.

- Test Procedure

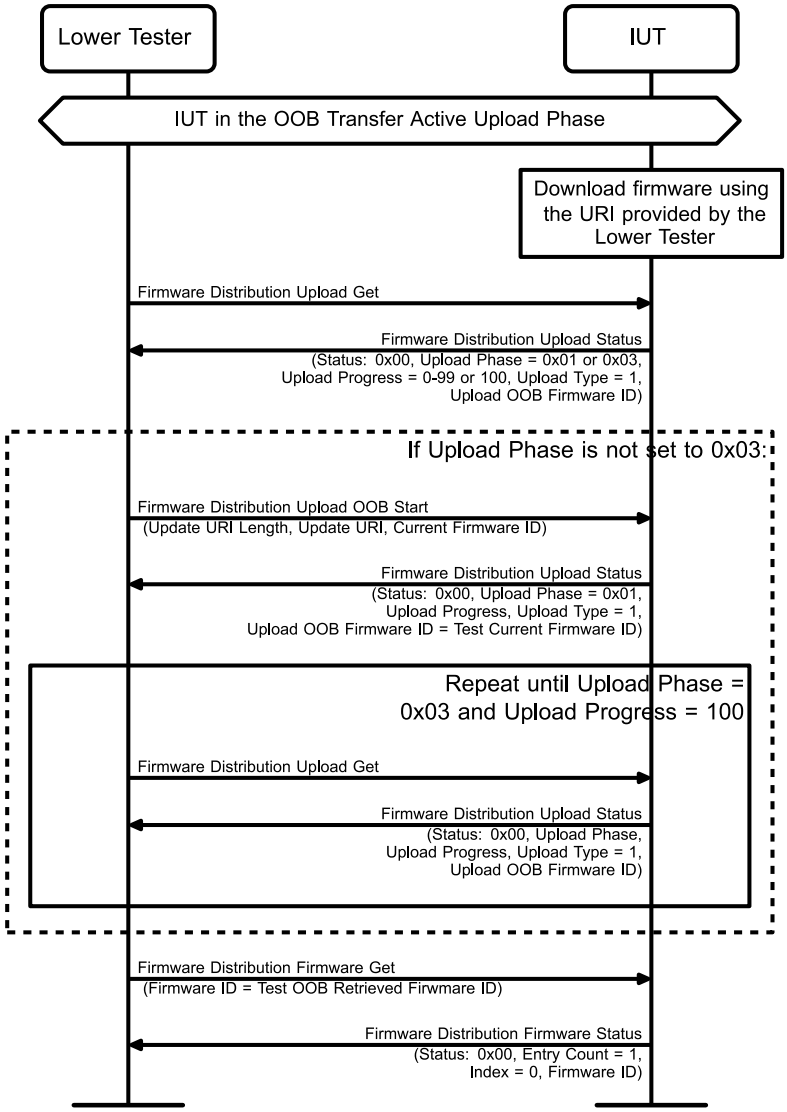

Figure 4.19: Test procedure for DFUM/SR/FD/BV-06-C [Upload Firmware – OOB]

1. The IUT begins downloading the firmware using the URI provided by the Lower Tester in the request.
2. The Lower Tester verifies progress on the IUT by sending a Firmware Distribution Upload Get message.
3. The IUT responds with a Firmware Distribution Upload Status message with Status set to 0x00 (Success) and Upload Phase set to 0x01 (Transfer Active) or 0x03(Transfer Success), Upload Type set to 1 (Out-of-band), and Upload OOB Firmware ID set to Test Current Firmware ID. If Upload Phase is set to 0x01 (Transfer Active), Upload Progress is set to a value between 0 and 99. If Upload Phase is set to 0x03 (Transfer Success), Upload Progress is set to 100.
4. If Upload Phase is not set to 0x03 (Transfer Success):
    a. The Lower Tester sends a Firmware Distribution Upload OOB Start message with the same fields used to start the OOB transfer.
    b. The IUT responds with a Firmware Distribution Upload Status message with Status set to 0x00 (Success), Upload Phase set to 0x01 (Transfer Active), Upload Progress set to a

value greater than or equal to the one sent in step 3 and Upload OOB Firmware ID set to Test Current Firmware ID.

c. Repeat steps 2–3 until Upload Phase is set to 0x03 (Transfer Success) and Upload Progress is set to 100.

5. The Lower Tester sends a Firmware Distribution Firmware Get message with Firmware ID set to Test OOB Retrieved Firmware ID.
6. The IUT responds with a Firmware Distribution Firmware Status message with Status set to 0x00 (Success), Entry Count set to 1, Index set to 0, and the Firmware ID set to Test OOB Retrieved Firmware ID.

- Expected Outcome

  Pass verdict

  The IUT successfully receives the firmware using OOB mechanisms, showing correct upload progress.

  In step 4b, the IUT responds with a Firmware Distribution Upload Status message with Status set to 0x00 (Success) and does not restart the firmware upload.

4.4.2 Receive Firmware Distribution Upload Start messages

- Test Purpose

  Verify the behavior of the IUT acting as Distributor when an Initiator sends Firmware Distribution Upload Start messages in different states or with unacceptable parameters.

- References

  [3] 6.2.3.14

- Initial Condition

  - The Lower Tester is a Firmware Distribution Client supporting the Initiator role.
  - The Lower Tester has read and cached the capabilities of the IUT. In addition, use the initial condition as described in Table 4.3.

- Test Procedure

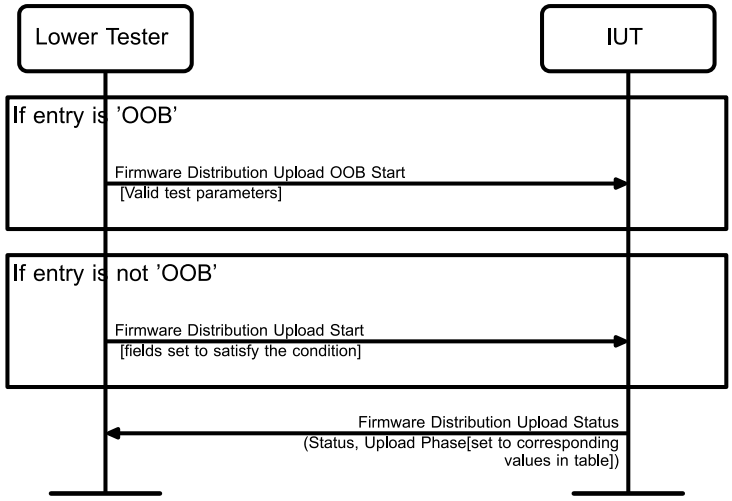

Figure 4.20: Test Procedure for Receive Firmware Distribution Upload Start messages

1. Read the Condition column in Table 4.3:
    a. If entry is 'OOB', the Lower Tester sends a Firmware Distribution Upload OOB Start message to the IUT with valid test parameters.
    b. Otherwise, the Lower Tester sends a Firmware Distribution Upload Start message to the IUT with fields set to satisfy the condition.
2. The IUT responds with a Firmware Distribution Upload Status message with the Status field and Upload Phase field set to the corresponding values in Table 4.3, and the Upload Type field set to 0 (In-band), if present.

- Expected Outcome

  Pass verdict

  The IUT responds to the messages with the appropriate field values.

Test Case	Initial Condition	Condition	Status	Upload Phase
DFUM/SR/FD/BV-07-C [Firmware Distribution Upload Start – Transfer Error]	Run preamble from Section 4.2.3	Valid fields	0x00 (Success)	0x01 (Transfer Active)
DFUM/SR/FD/BV-08-C [Firmware Distribution Upload Start – Transfer Success]	Run preamble from Section 4.2.4	Valid fields, same Firmware ID as in the completed upload	0x00 (Success)	0x03 (Transfer Success)
DFUM/SR/FD/BV-09-C [Firmware Distribution Upload Start – Unsupported Size]	Run preamble from Section 4.2.1	Upload Firmware Size greater than Maximum Firmware Size state (If max size is 0xFFFFFFFF skip test)	0x01 (Insufficient Resources)	0x00 (Idle)
DFUM/SR/FD/BV-10-C [Firmware Distribution Upload Start – Ongoing Transfer]	Run preamble from Section 4.2.2	Valid fields, different than the ones used to start the transfer	0x08 (Busy With Upload)	0x01 (Transfer Active)
DFUM/SR/FD/BV-11-C [Firmware Distribution Upload Start – New OOB Request]	Run preamble from Section 4.2.2	OOB	0x08 (Busy With Upload)	0x01 (Transfer Active)
DFUM/SR/FD/BV-12-C [Firmware Distribution Upload Start – No Upload Space]	Run preamble from Section 4.2.1	Upload Firmware Size greater than Remaining Upload Space state	0x01 (Insufficient Resources)	0x00 (Idle)

Table 4.3: Receive Firmware Distribution Upload Start messages test cases

4.4.3 Receive Firmware Distribution Upload OOB Start messages

- Test Purpose

  Verify the behavior of the IUT acting as Distributor when an Initiator sends Firmware Distribution Upload OOB Start messages in different states or with unacceptable parameters.

- References

  [3] 6.2.3.15

- Initial Condition
  - The Lower Tester has read and cached the capabilities of the IUT.
  - The Lower Tester is a Firmware Distribution Client supporting the Initiator role.
  - The IUT supports OOB firmware upload.
  - In addition, use the initial condition as described in Table 4.4.
- Test Procedure

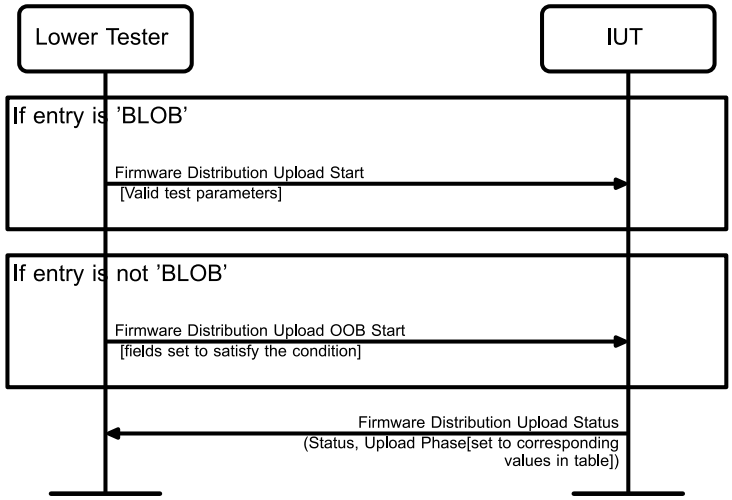

Figure 4.21: Test Procedure for Receive Firmware Distribution Upload OOB Start messages

1. Read the Condition column in Table 4.4:
   a. If entry is 'BLOB', the Lower Tester sends a Firmware Distribution Upload Start message to the IUT with valid test parameters.
   b. Otherwise, the Lower Tester sends a Firmware Distribution Upload OOB Start message to the IUT with fields set to satisfy the condition.
2. The IUT responds with a Firmware Distribution Upload Status message with the Status field and Upload Phase field set to the corresponding values in Table 4.4, and the Upload Type field set to 1 (Out-of-band), if present.

- Expected Outcome

  Pass verdict

  The IUT responds to the messages with the appropriate field values.

Test Case	Initial Condition	Condition	Status	Upload Phase
DFUM/SR/FD/BV-13-C [Firmware Distribution Upload OOB Start – Transfer Error]	Run preamble from Section 4.2.3	Valid fields	0x00 (Success)	0x01 (Transfer Active)
DFUM/SR/FD/BV-14-C [Firmware Distribution Upload OOB Start – Transfer Success]	Run preamble from Section 4.2.4	Valid fields, different than the ones used for the completed upload	0x00 (Success)	0x01 (Transfer Active)

Test Case	Initial Condition	Condition	Status	Upload Phase
DFUM/SR/FD/BV-15-C [Firmware Distribution Upload OOB Start – Unsupported URI]	Run steps 1–3 of preamble from Section 4.2.1	Update URI not following supported schemas.	0x09 (URI Not Supported)	0x00 (Idle)
DFUM/SR/FD/BV-16-C [Firmware Distribution Upload OOB Start – Malformed URI]	Run steps 1–3 of preamble from Section 4.2.1	Update URI not formatted correctly.	0x0A (URI Malformed)	0x00 (Idle)
DFUM/SR/FD/BV-17-C [Firmware Distribution Upload OOB Start – Ongoing Transfer]	Run preamble from Section 4.2.5	Valid fields, different than the ones used to start the transfer	0x08 (Busy With Upload)	0x01 (Transfer Active)
DFUM/SR/FD/BV-18-C [Firmware Distribution Upload OOB Start – New BLOB Upload Request]	Run preamble from Section 4.2.5	BLOB	0x08 (Busy With Upload)	0x01 (Transfer Active)

Table 4.4: Receive Firmware Distribution Upload OOB Start messages test cases

4.4.4 Receive Firmware Distribution Upload Cancel

- Test Purpose

  Verify the behavior of the IUT acting as Distributor when an Initiator sends Firmware Distribution Upload Cancel messages in different states or with unacceptable parameters.

- References

  [3] 6.2.3.16

- Initial Condition

  - The Lower Tester is a Firmware Distribution Client supporting the Initiator role.
  - Use the initial condition as described in Table 4.5.

- Test Procedure

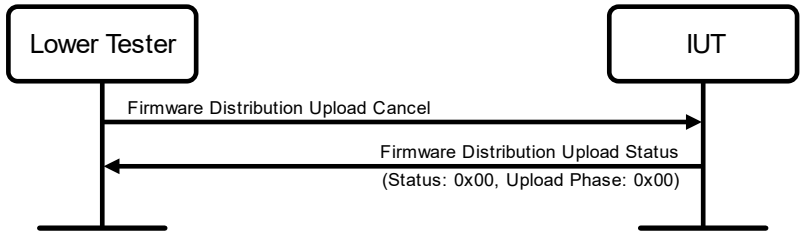

Figure 4.22: Test Procedure for Receive Firmware Distribution Upload Cancel

1. The Lower Tester sends a Firmware Distribution Upload Cancel message to the IUT.
2. The IUT responds with a Firmware Distribution Upload Status message with the Status set to 0x00 (Success) and Upload Phase set to Idle (0x00).

- Expected Outcome

  Pass verdict

  The IUT responds to the messages with the appropriate field values.

Test Case	Initial Condition
DFUM/SR/FD/BV-19-C [Firmware Distribution Upload Cancel – Transfer Error]	Run preamble from Section 4.2.3
DFUM/SR/FD/BV-20-C [Firmware Distribution Upload Cancel – Transfer Success]	Run preamble from Section 4.2.4
DFUM/SR/FD/BV-21-C [Firmware Distribution Upload Cancel – Transfer Active]	Run preamble from Section 4.2.2
DFUM/SR/FD/BV-22-C [Firmware Distribution Upload Cancel – OOB Transfer Active]	Run preamble from Section 4.2.5

Table 4.5: Receive Firmware Distribution Upload Cancel test cases

DFUM/SR/FD/BV-23-C [Receive Firmware List state messages]

- Test Purpose

  Verify that the IUT acting as Distributor behaves appropriately when an Initiator reads or modifies the Firmware List state.

- References

  [3] 6.2.3.18, 6.2.3.19, 6.2.3.20, 6.2.3.21

- Initial Condition

  - The Lower Tester is a Firmware Distribution Client supporting the Initiator role.
  - The Lower Tester has uploaded two firmware images, identified by Test Upload Firmware ID[0] and Test Upload Firmware ID[1] to the IUT by running the preamble in Section 4.2.4 for each firmware.

- Test Procedure

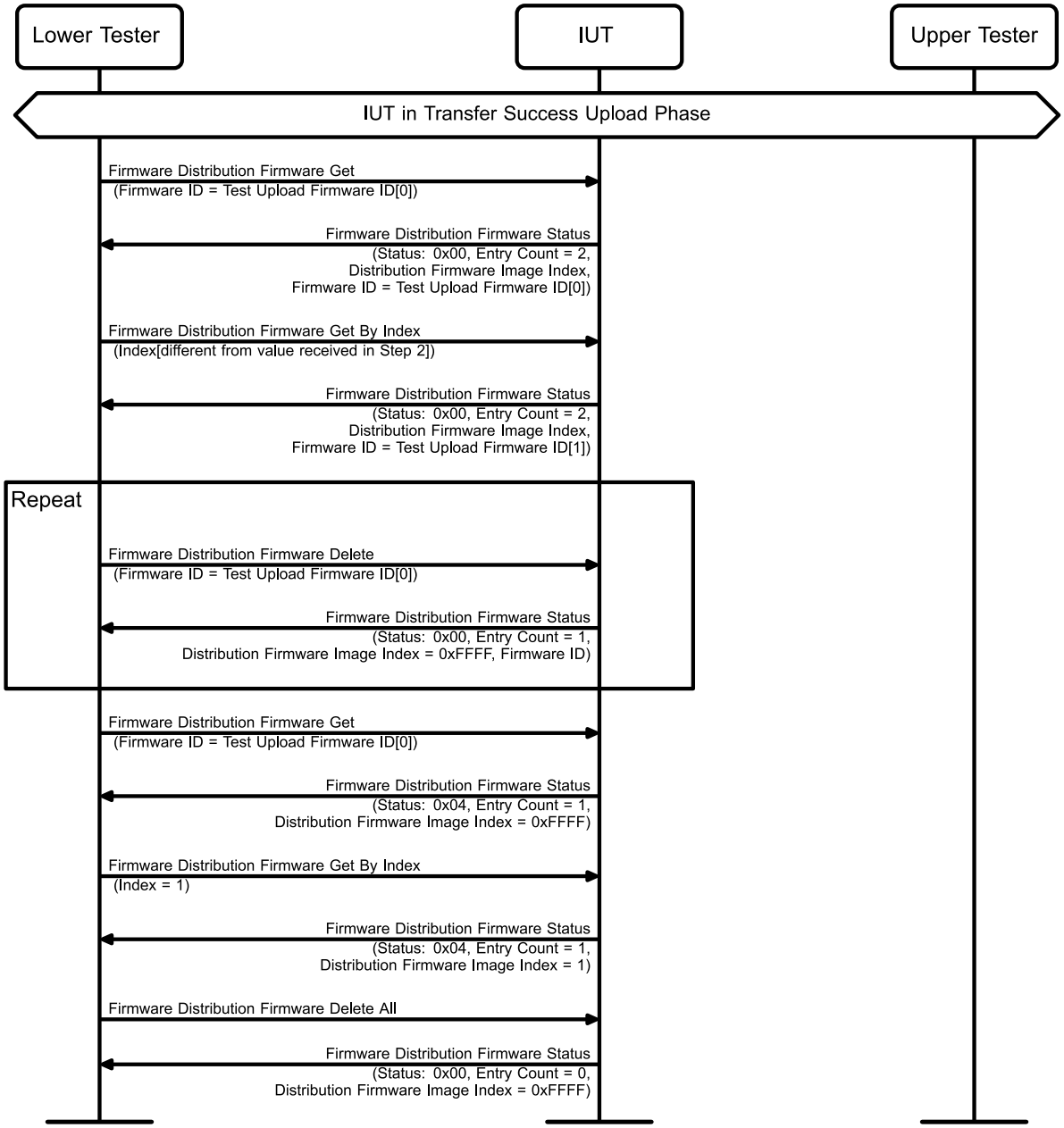

Figure 4.23: Test procedure for DFUM/SR/FD/BV-23-C [Receive Firmware List state messages]

1. The Lower Tester sends a Firmware Distribution Firmware Get message with Firmware ID set to Test Upload Firmware ID[0].
2. The IUT responds with a Firmware Distribution Firmware Status message with Status set to 0x00 (Success), Entry Count set to 2, Distribution Firmware Image Index set to either 0 or 1 and Firmware ID set to Test Upload Firmware ID[0].
3. The Lower Tester sends a Firmware Distribution Firmware Get By Index message with Distribution Firmware Image Index set to either 1 or 0, but different from value received in step 2.
4. The IUT responds with a Firmware Distribution Firmware Status message with Status set to 0x00 (Success), Entry Count set to 2, Distribution Firmware Image Index set as in step 3 and Firmware ID set to Test Upload Firmware ID[1].

5. The Lower Tester sends a Firmware Distribution Firmware Delete message with Firmware ID set to Test Upload Firmware ID[0].
6. The IUT responds with a Firmware Distribution Firmware Status message with Status set to 0x00 (Success), Entry Count set to 1, Distribution Firmware Image Index set to 0xFFFF and Firmware ID set as in step 5.
7. Repeat steps 5 and 6.
8. Repeat steps 1 and 2, but in step 2, the IUT's response contains Status set to 0x04 (Firmware Not Found), Entry Count set to 1, Distribution Firmware Image Index set to 0xFFFF and Firmware ID set to Test Upload Firmware ID[0].
9. Repeat steps 3 and 4, using in step 3 Index set to 1; in step 4, the IUT's response contains Status set to 0x04 (Firmware Not Found), Entry Count set to 1, Distribution Firmware Image Index field set to 1, and no other parameters.
10. The Lower Tester sends a Firmware Distribution Firmware Delete All message.
11. The IUT responds with a Firmware Distribution Firmware Status message with Status set to 0x00 (Success), Entry Count set to 0, Distribution Firmware Image Index set to 0xFFFF, and no other parameters.

- Expected Outcome

  Pass verdict

  The IUT responds to the messages with the appropriate field values.

  In step 2, the Firmware ID field is set to the value of Firmware ID field in the received Firmware Distribution Firmware Get message and indicates the Firmware ID in the Firmware List state of the server and Index is set to the Index value on the Firmware List state indicated by the Firmware ID field.

DFUM/SR/FD/BV-24-C [Receive Firmware Distribution Firmware Delete messages – Distributor Busy]

- Test Purpose

  Verify the behavior of the IUT acting as Distributor when an Initiator sends Firmware Distribution Firmware Delete and Firmware Distribution Firmware Delete All messages while the IUT is in Transfer Active phase.

- References

  [3] 6.2.3.20

- Initial Condition

  - The Lower Tester is a Firmware Distribution Client supporting the Initiator role.
  - The Lower Tester has uploaded one firmware image, identified by Test Upload Firmware ID[0] to the IUT by running the preamble in Section 4.2.4.

- Test Procedure

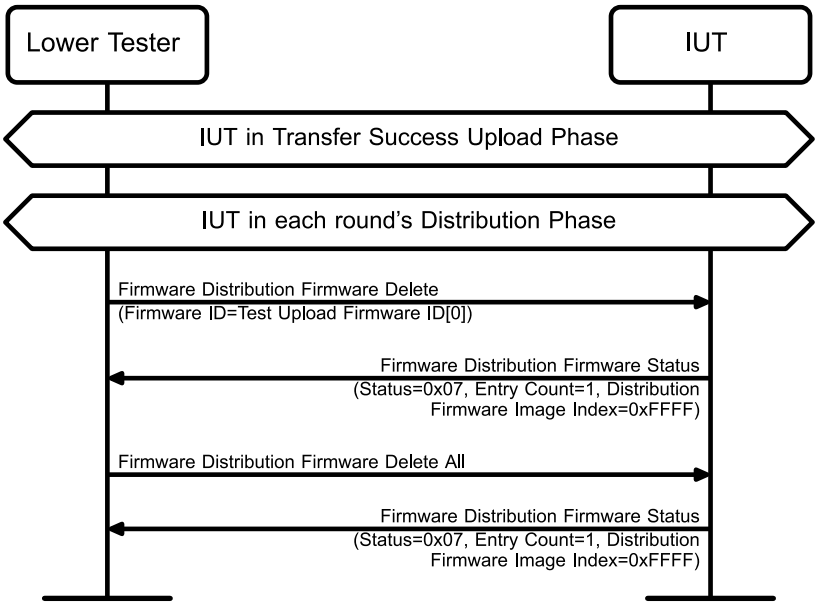

Figure 4.24: Test Procedure for DFUM/SR/FD/BV-24-C [Receive Firmware Distribution Firmware Delete messages – Distributor Busy]

Execute steps 1–4 for each round described in Table 4.6, setting the initial condition for each round as indicated.

1. The Lower Tester sends a Firmware Distribution Firmware Delete message with Firmware ID set to Test Upload Firmware ID[0].
2. The IUT responds with a Firmware Distribution Firmware Status message with Status set to 0x07 (Busy With Distribution), Entry Count set to 1, Distribution Firmware Image Index set to 0xFFFF, and Firmware ID field not present.
3. The Lower Tester sends a Firmware Distribution Firmware Delete All message.
4. The IUT responds with the same Firmware Distribution Firmware Status message as in step 2.

Round	Initial Condition
1	The Lower Tester puts the IUT in the Transfer Active distribution phase by running preamble 4.2.7.
2	The Lower Tester puts the IUT in the Completed distribution phase by running preamble 4.2.9.
3	The Lower Tester puts the IUT in the Failed distribution phase by running preamble 4.2.10.

Table 4.6: Rounds for receiving Firmware Distribution Firmware Delete when busy

- Expected Outcome

  Pass verdict

  The IUT sends Firmware Distribution Firmware Status messages with the appropriate field values.

DFUM/SR/FD/BV-25-C [Firmware Distribution Procedure]

- Test Purpose

  Verify that the IUT acting as Distributor updates the firmware on a Target node when the procedure is initiated by an Initiator.

- References

  [3] 6.2.2.4

- Initial Condition
  - Lower Tester 2 is a Firmware Distribution Client supporting the Initiator role.
  - Lower Tester 1 is a Firmware Update Server.
  - Lower Tester 2 sets the IUT in the 'Idle' Distribution Phase by executing the procedure in Section 4.2.6.

- Test Procedure

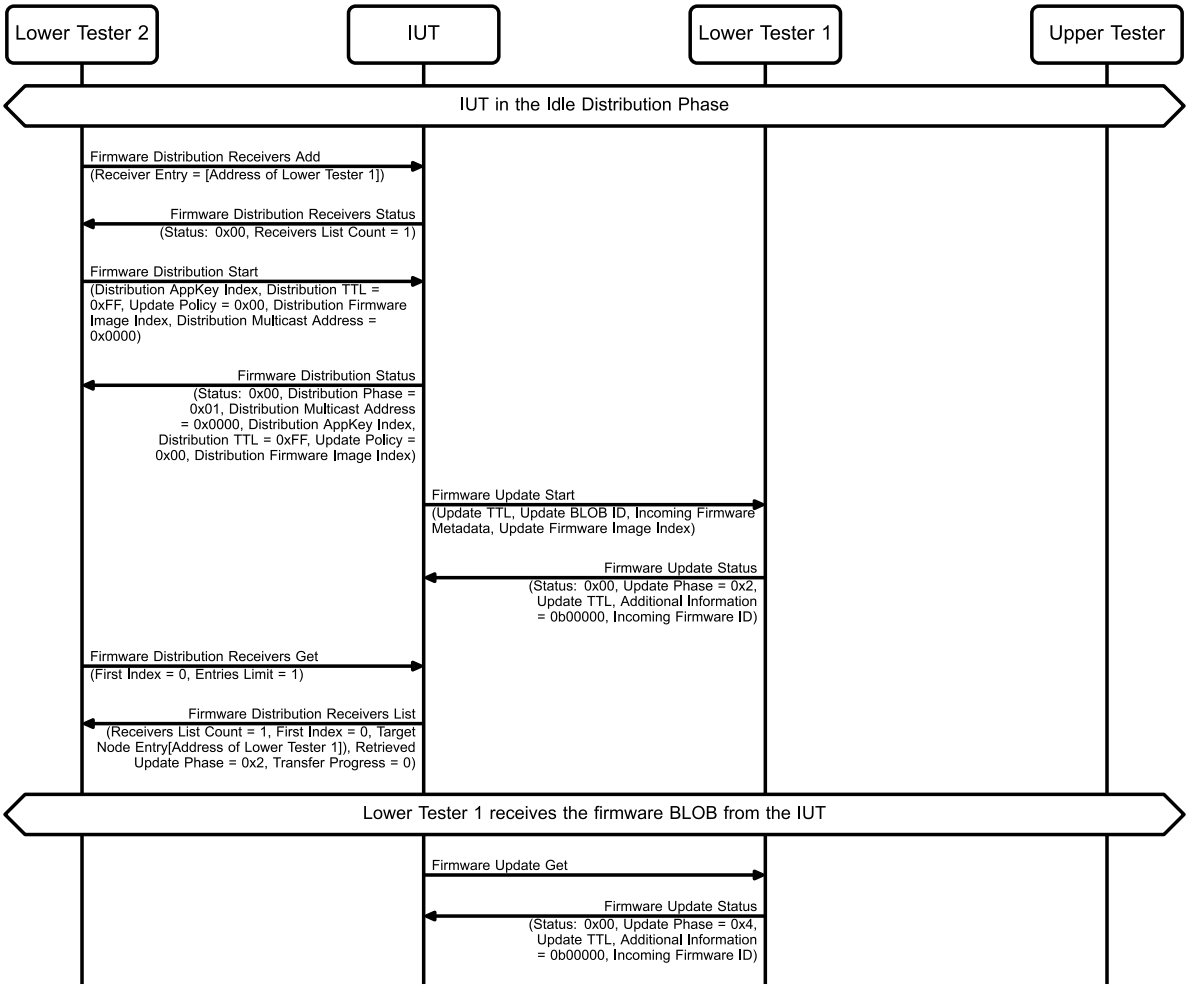

Figure 4.25: Test Procedure for DFUM/SR/FD/BV-25-C [Firmware Distribution Procedure] – Page 1 of 2

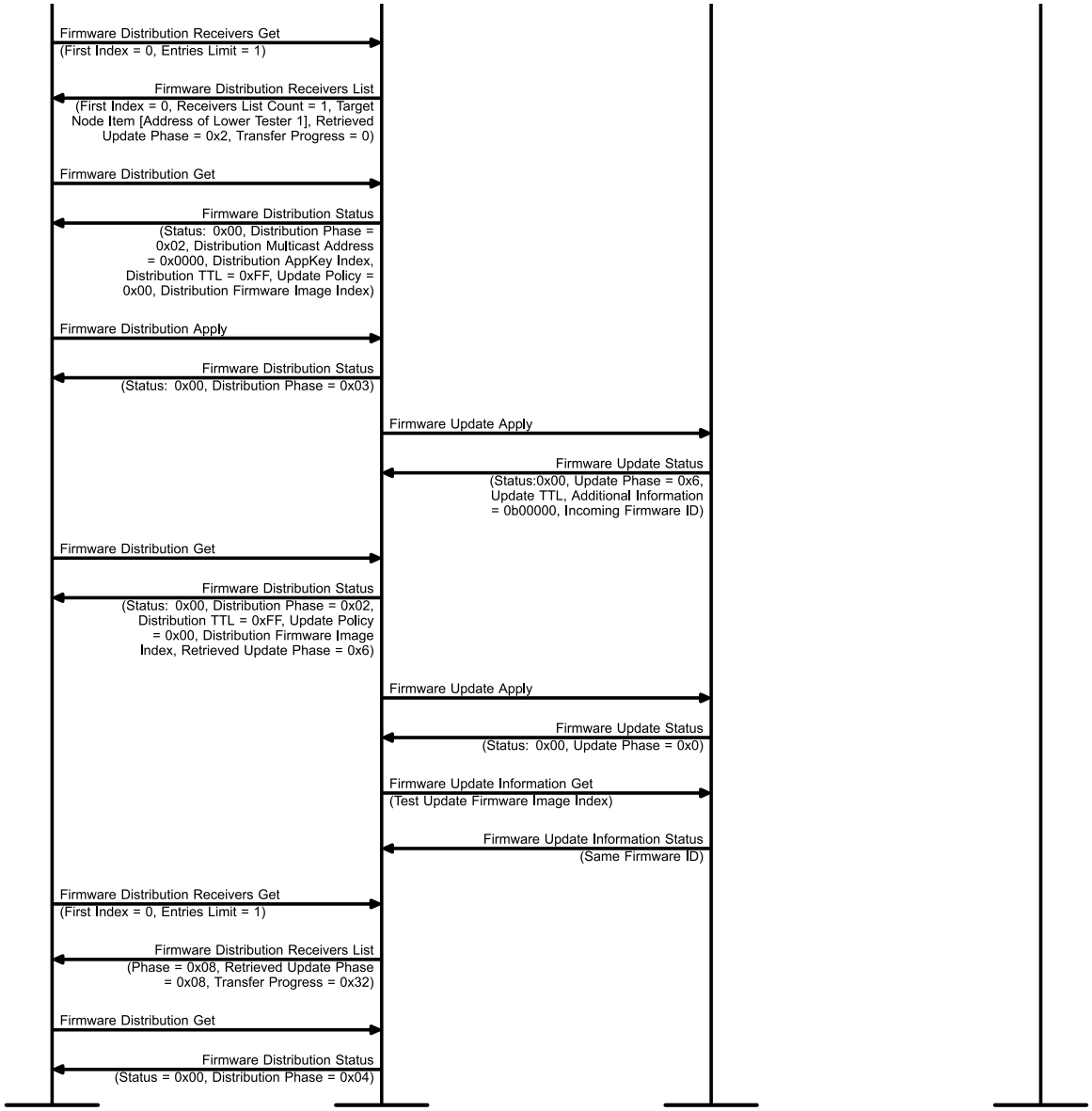

Figure 4.26: Test procedure for DFUM/SR/FD/BV-25-C [Firmware Distribution Procedure] – Page 2 of 2

1. Lower Tester 2 sends a Firmware Distribution Receivers Add message with a single Receiver Entry with the Address field set to the unicast address assigned to Lower Tester 1.
2. The IUT responds with a Firmware Distribution Receivers Status message with Status field set to 0x00 (Success) and Receivers List Count field set to 1.
3. Lower Tester 2 sends a Firmware Distribution Start message with Distribution AppKey Index set to an AppKey Index bound to BLOB client and Firmware Update client on the IUT, Distribution TTL set to 0xFF, Update Policy set to 0x00 (Verify Only), Distribution Firmware Image Index set to Test Distribution Firmware Image Index, and Distribution Multicast Address set to 0x0000.
4. The IUT responds with a Firmware Distribution Status message with Status set to 0x00 (Success), Distribution Phase set to 0x01 (Transfer Active) and the remaining parameters set as in step 3.
5. The Firmware Update client on the IUT sends a Firmware Update Start message to Lower Tester 1 with Update TTL set to a valid value, Update BLOB ID set to a random valid value, Incoming Firmware Metadata set to the length of and the metadata from the entry in the Firmware List state and Update Firmware Image Index set to Test Distribution Firmware Image Index.

6. Lower Tester 1 responds with a Firmware Update Status message with Status set to 0x00 (Success), Update Phase set to 0x2 (Transfer Active), Additional Information set to 0b00000, Update TTL, Update BLOB ID set to the values from step 5, Update Firmware Image Index set to Test Distribution Firmware Image Index.
7. Lower Tester 2 sends a Firmware Distribution Receivers Get message with First Index field set to 0 and Entries Limit field set to 1.
8. The IUT responds with a Firmware Distribution Receivers List message with First Index field set to 0, the Receivers List Count field set to 1 and one Target Node Entry field having Address set to the address of Lower Tester 1, Retrieved Update Phase set to 0x2 (Transfer Active) and the Transfer Progress field set to 0.
9. Lower Tester 1 receives the firmware BLOB from the IUT by executing DFUM/CL/BT/BV-01-C [BLOB Transfer Procedure] using as test BLOB the BLOB associated with the firmware identified by Test Distribution Firmware Image Index and BLOB ID used in step 5.
10. The Firmware Update client on the IUT sends a Firmware Update Get message to Lower Tester 1.
11. Repeat step 6, but Lower Tester 1 sets Update Phase to 0x4 (Verification Succeeded).
12. Repeat steps 7–8, but in step 8, the IUT sets the Retrieved Update Phase field of the Target Node Entry field to 0x4 (Verification Succeeded).
13. Lower Tester 2 sends a Firmware Distribution Get message.
14. The IUT responds with a Firmware Distribution Status message with Status set to 0x00 (Success), Distribution Phase set to 0x02 (Transfer Success) and the remaining parameters set as in step 3.
15. Lower Tester 2 sends a Firmware Distribution Apply message.
16. The IUT responds with a Firmware Distribution Status message with Status set to 0x00 (Success), Distribution Phase set to 0x03 (Applying) and the remaining parameters set as in step 3.
17. The Firmware Update client on the IUT sends a Firmware Update Apply message to Lower Tester 1.
18. Repeat step 6, but Lower Tester 1 sets Update Phase to 0x6 (Applying Update).
19. Repeat steps 7–8, but in step 8, the IUT sets the Retrieved Update Phase to 0x6 (Applying Update).
20. After Lower Tester 1 has finished applying the new firmware, trigger the IUT to determine the status of the operation, either by repeating the Firmware Update Apply message, or by other out-of-band means. If the IUT sends one of the two messages, Lower Tester 1 replies with the appropriate status message, with the Update Phase field set to 0x0 (Idle) and all other fields set to the correct values.
21. The IUT sends a Firmware Update Information Get message to Lower Tester 1 for the Test Update Firmware Image Index.
22. Lower Tester 1 responds with a Firmware Update Information Status message indicating that the current Firmware ID is the one that has been previously transferred.
23. Repeat steps 7–8, but in step 8 the IUT sets the Retrieved Update Phase to 0x08 (Apply Success). The Transfer Progress field is set to 0x32 (100%).
24. Repeat steps 13–14, but in step 14, the IUT sets the Distribution Phase to 0x04 (Completed).

- Expected Outcome

  Pass verdict

  The IUT responds to the Firmware Distribution Start message and executes the Firmware Distribution Procedure using the Distribution AppKey Index field.

  The IUT updates and applies the firmware to Lower Tester 1.

The IUT reports the correct values for the Node List state to Lower Tester 2 in all phases of the distribution.

In step 8, the Transfer Status field of the Target Node Entry field corresponding to Lower Tester 1 indicates the status of the last operation between the BLOB Transfer Server on Lower Tester 1 and the BLOB Transfer Client on the IUT.

All RFU field bits are set to 0 (zero) in Firmware Distribution Status messages sent by the IUT.

DFUM/SR/FD/BV-26-C [Reject Firmware Distribution Start]

- Test Purpose

  Verify that the IUT acting as Distributor rejects Firmware Distribution Start messages with unacceptable parameters from an Initiator.

- References

  [3] 6.2.3.9

- Initial Condition

  - The Lower Tester sets the IUT in the 'Idle' Distribution Phase by executing the procedure in Section 4.2.6.
  - The Lower Tester is a Firmware Distribution Client supporting the Initiator role.

- Test Procedure

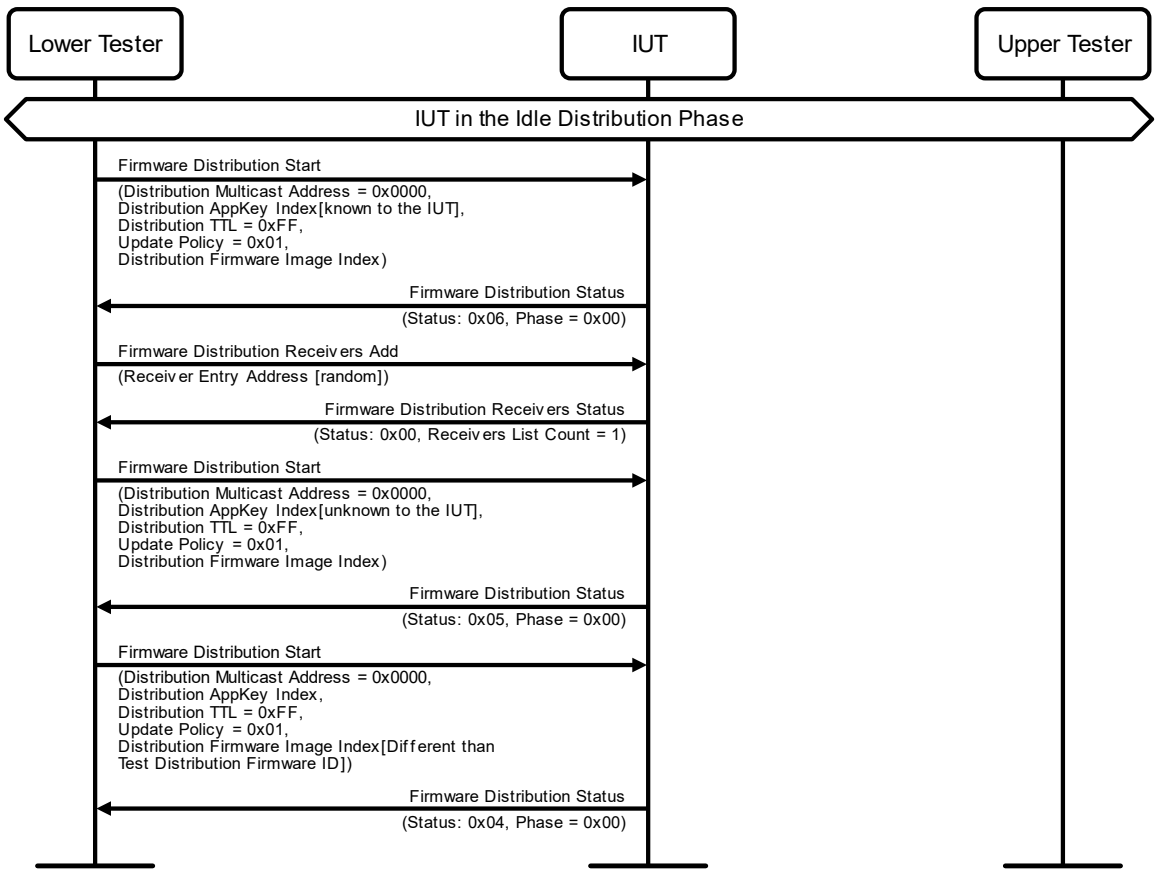

Figure 4.27: Test Procedure for DFUM/SR/FD/BV-26-C [Reject Firmware Distribution Start]

1. The Lower Tester sends a Firmware Distribution Start message with Distribution Multicast Address set to 0x0000, Distribution AppKey Index set to an AppKey Index bound to BLOB client and Firmware Update client on the IUT, Distribution TTL set to 0xFF, Update Policy set to 0x01 (Verify And Apply) and Distribution Firmware Image Index set to Test Distribution Firmware Image Index.
2. The IUT responds with a Firmware Distribution Status message with Status set to 0x06 (Receivers List Empty), Distribution Phase set to 0x00 (Idle) and no other parameters.
3. The Lower Tester sends a Firmware Distribution Receivers Add message with a single Receiver Entry with the Address field set to a random unicast address not assigned to the IUT.
4. The IUT responds with a Firmware Distribution Receivers Status message with Status field set to 0x00 (Success) and Receivers List Count field set to 1.
5. Repeat steps 1–2, using in step 1, Distribution AppKey Index set to an AppKey Index unknown to the IUT; in step 2, the IUT's response sets Status to 0x05 (Invalid AppKey Index).
6. Repeat steps 1–2, using in step 1, Distribution Firmware Image Index set to a value different than Test Distribution Firmware Image Index; in step 2, the IUT's response sets Status to 0x04 (Firmware Not Found).

- Expected Outcome

  Pass verdict

  The IUT sends Firmware Distribution Status messages with the appropriate status.

  The IUT does not transition from Idle.

4.4.5 Receive Firmware Distribution Start messages

- Test Purpose

  Verify the behavior of the IUT acting as Distributor when the Initiator sends Firmware Distribution Start messages in different states.

- References

  [3] 6.2.3.9

- Initial Condition

  - Use the initial condition as described in Table 4.7.
  - Lower Tester 1 is acting as a Target node.
  - Lower Tester 2 is a Firmware Distribution Client supporting the Initiator role.

- Test Procedure

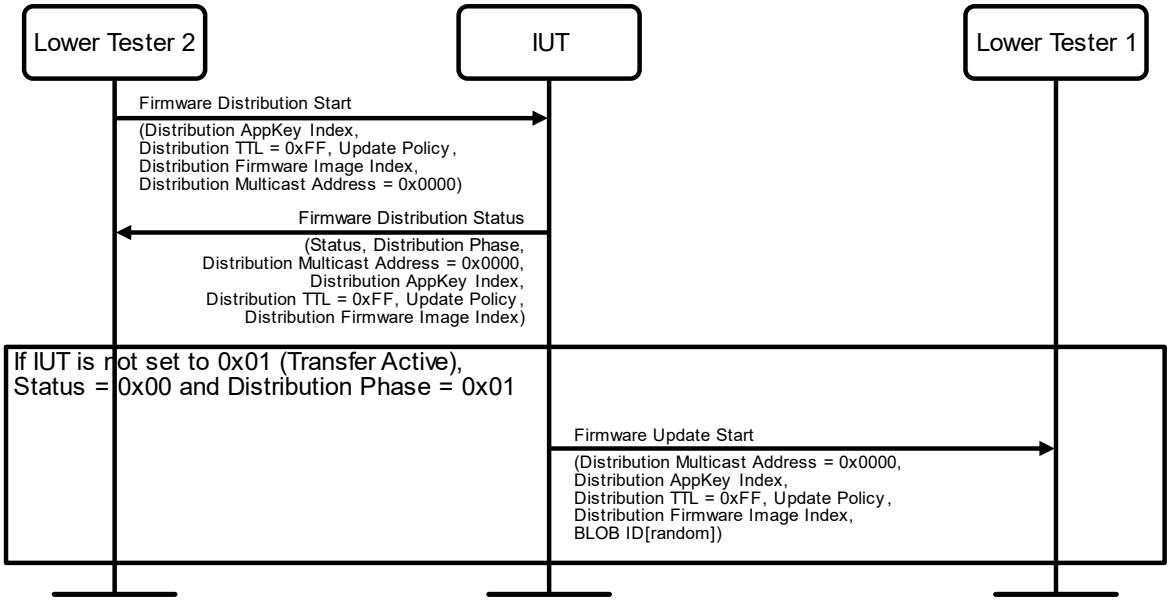

Figure 4.28: Test Procedure for Receive Firmware Distribution Start messages

1. Lower Tester 2 sends a Firmware Distribution Start message with Distribution Multicast Address set to 0x0000, Distribution AppKey Index set to an AppKey Index bound to BLOB client and Firmware Update client on the IUT, Distribution TTL set to 0xFF, Update Policy set to the corresponding entry in Table 4.7 and Distribution Firmware Image Index set to Test Distribution Firmware Image Index.
2. The IUT responds with a Firmware Distribution Status message with Status field and Distribution Phase field set to the corresponding values in Table 4.7 and the remaining fields set as in step 1.
3. If the initial condition for the test does not set the IUT in 0x01 (Transfer Active) and the Status field in step 2 is 0x00 (Success) and Distribution Phase field in step 2 is 0x01 (Transfer Active), the Firmware Update client on the IUT sends a Firmware Update Start message to Lower Tester 1 using the parameters in step 1 and a random BLOB ID.

- Expected Outcome

Pass verdict

The IUT sends messages with the appropriate field values. In the Firmware Distribution Status message, all RFU field bits are set to 0 (zero).

Test Case	Initial Condition	Update Policy	Status	Distribution Phase
DFUM/SR/FD/BV-27-C [Firmware Distribution Start – Completed Distribution Phase, Different Request]	Run preamble from Section 4.2.9	0x00 (Verify Only)	0x00 (Success)	0x01 (Transfer Active)
DFUM/SR/FD/BV-28-C [Firmware Distribution Start – Completed Distribution Phase, Same Request]	Run preamble from Section 4.2.9	0x01 (Verify And Apply)	0x00 (Success)	0x04 (Completed)

Test Case	Initial Condition	Update Policy	Status	Distribution Phase
DFUM/SR/FD/BV-29-C [Firmware Distribution Start – Distribution Phase Failed]	Run preamble from Section 4.2.10	0x00 (Verify Only)	0x00 (Success)	0x01 (Transfer Active)
DFUM/SR/FD/BV-30-C [Firmware Distribution Start – Transfer Active Distribution Phase, Same Request]	Run preamble from Section 4.2.7	0x00 (Verify Only)	0x00 (Success)	0x01 (Transfer Active)
DFUM/SR/FD/BV-31-C [Firmware Distribution Start – Transfer Active Distribution Phase, Different Request]	Run preamble from Section 4.2.7	0x01 (Verify And Apply)	0x07 (Busy With Distribution)	0x01 (Transfer Active)
DFUM/SR/FD/BV-32-C [Firmware Distribution Start – Transfer Success Distribution Phase, Same Request]	Run preamble from Section 4.2.8	0x00 (Verify Only)	0x00 (Success)	0x02 (Transfer Success)
DFUM/SR/FD/BV-33-C [Firmware Distribution Start – Transfer Success Distribution Phase, Different Request]	Run preamble from Section 4.2.8	0x01 (Verify And Apply)	0x07 (Busy With Distribution)	0x02 (Transfer Success)
DFUM/SR/FD/BV-34-C [Firmware Distribution Start – Canceling Update Distribution Phase, Different Request]	Run preamble from Section 4.2.13	0x00 (Verify Only)	0x07 (Busy With Distribution)	0x06 (Canceling Update)
DFUM/SR/FD/BV-35-C [Firmware Distribution Start – Transfer Suspended Phase, Same Request]	Run preamble from Section 4.2.14	0x00 (Verify Only)	0x00 (Success)	0x01 (Transfer Active)
DFUM/SR/FD/BV-36-C [Firmware Distribution Start – Transfer Suspended Phase, Different Request]	Run preamble from Section 4.2.14	0x01 (Verify And Apply)	0x07 (Busy With Distribution)	0x07 (Transfer Suspended)

Table 4.7: Receive Firmware Distribution Start messages test cases

4.4.6 Receive Firmware Distribution Cancel messages

- Test Purpose

  Verify the behavior of the IUT acting as Distributor when an Initiator sends Firmware Distribution Cancel messages in different states.

- References

  [3] 6.2.3.16

- Initial Condition

  - Use the initial condition as described in Table 4.8.

- Lower Tester 1 is a Target node.
- Lower Tester 2 is a Firmware Distribution Client supporting the Initiator role.

- Test Procedure

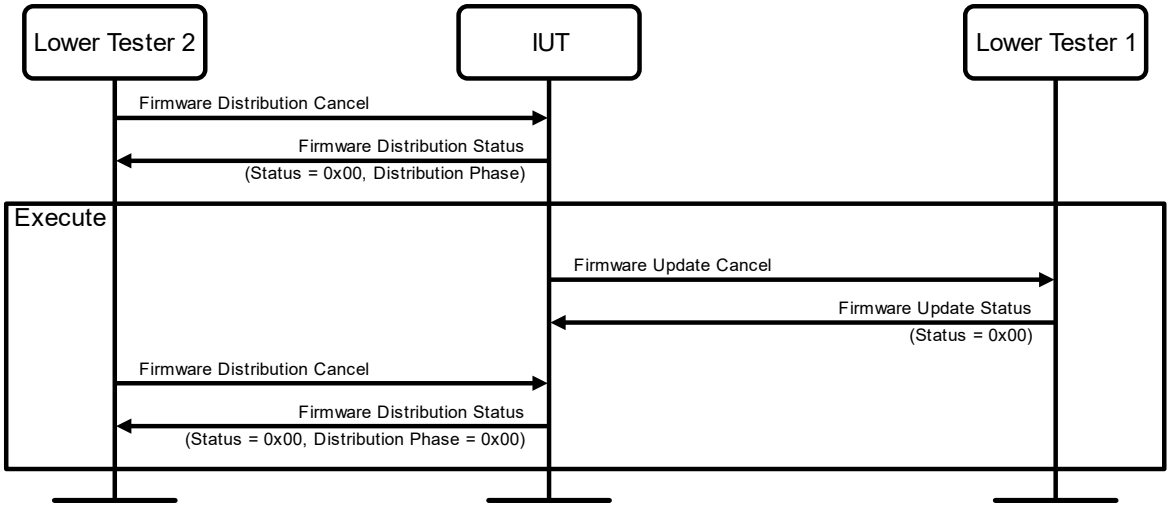

Figure 4.29: Test Procedure for Receive Firmware Distribution Cancel messages

1. Lower Tester 2 sends a Firmware Distribution Cancel message.
2. The IUT responds with a Firmware Distribution Status message with Status set to 0x00 (Success) and Distribution Phase set according to Table 4.8.
3. If column Firmware Update Client Actions in Table 4.8 specifies “N/A”, skip steps 4–6. If it specifies “Execute”, execute steps 4–6.
4. The IUT sends a Firmware Update Cancel to Lower Tester 1.
5. Lower Tester 1 responds with a Firmware Update Status message with Status set to 0x00 (Success).
6. Repeat steps 1 and 2 using in step 2 the Distribution Phase set to 0x00 (Idle).

- Expected Outcome

Pass verdict

The IUT responds to the messages with the appropriate field values.

The Firmware Update client and/or BLOB client models cancel ongoing procedures with Lower Tester 1 after step 2.

Test Case	Initial Condition	Distribution Phase in Step 2	Firmware Update Client Actions
DFUM/SR/FD/BV-37-C [Firmware Distribution Cancel – Completed Distribution Phase]	Run preamble from Section 4.2.9	0x00 (Idle)	N/A
DFUM/SR/FD/BV-38-C [Firmware Distribution Cancel – Failed Distribution Phase]	Run preamble from Section 4.2.10	0x00 (Idle)	N/A
DFUM/SR/FD/BV-39-C [Firmware Distribution Cancel – Transfer Active Distribution Phase]	Run preamble from Section 4.2.7	0x06 (Canceling Update)	Execute

Test Case	Initial Condition	Distribution Phase in Step 2	Firmware Update Client Actions
DFUM/SR/FD/BV-40-C [Firmware Distribution Cancel – Transfer Success Distribution Phase]	Run preamble from Section 4.2.8	0x06 (Canceling Update)	Execute
DFUM/SR/FD/BV-41-C [Firmware Distribution Cancel – Idle Distribution Phase]	Run preamble from Section 4.2.6	0x00 (Idle)	N/A
DFUM/SR/FD/BV-42-C [Firmware Distribution Cancel – Canceling Update Distribution Phase]	Run preamble from Section 4.2.13	0x06 (Canceling Update)	N/A
DFUM/SR/FD/BV-43-C [Firmware Distribution Cancel – Applying Update Distribution Phase]	Run procedure DFUM/SR/FD/BV-48-C [Firmware Distribution Apply – Transfer Success Distribution Phase] using Lower Tester 1 as Target node	0x06 (Canceling Update).	Execute
DFUM/SR/FD/BV-44-C [Firmware Distribution Cancel – Transfer Suspended Distribution Phase]	Run preamble from Section 4.2.14	0x06 (Canceling Update)	Execute

Table 4.8: Receive Firmware Distribution Cancel messages test cases

4.4.7 Receive Firmware Distribution Apply messages

- Test Purpose

  Verify the behavior of the IUT Server acting as Distributor when an Initiator sends Firmware Distribution Apply messages in different states.

- References

  [3] 6.2.3.11

- Initial Condition

  - The Lower Tester is a Firmware Distribution Client supporting the Initiator role.
  - Use the initial condition as described in Table 4.9.

- Test Procedure

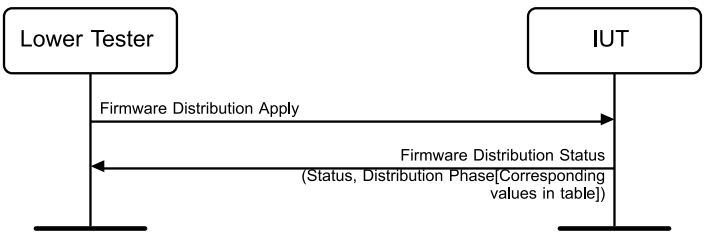

Figure 4.30: Test Procedure for Receive Firmware Distribution Apply messages

1. The Lower Tester sends a Firmware Distribution Apply message.
2. The IUT responds with a Firmware Distribution Status message with Status field and Distribution Phase field set to the corresponding values in Table 4.9.

- Expected Outcome

  Pass verdict

  The IUT responds to the messages with the appropriate field values.

Test Case	Initial Condition	Status	Distribution Phase
DFUM/SR/FD/BV-45-C [Firmware Distribution Apply – Completed Distribution Phase]	Run preamble from Section 4.2.9	0x00 (Success)	0x04 (Completed)
DFUM/SR/FD/BV-46-C [Firmware Distribution Apply – Failed Distribution Phase]	Run preamble from Section 4.2.10	0x02 (Wrong Phase)	0x05 (Failed)
DFUM/SR/FD/BV-47-C [Firmware Distribution Apply – Transfer Active Distribution Phase]	Run preamble from Section 4.2.7	0x02 (Wrong Phase)	0x01 (Transfer Active)
DFUM/SR/FD/BV-48-C [Firmware Distribution Apply – Transfer Success Distribution Phase]	Run preamble from Section 4.2.8	0x00 (Success)	0x03 (Applying Update)
DFUM/SR/FD/BV-49-C [Firmware Distribution Apply – Idle Distribution Phase]	Run preamble from Section 4.2.6	0x02 (Wrong Phase)	0x00 (Idle)
DFUM/SR/FD/BV-50-C [Firmware Distribution Apply – Verifying Update Phase]	Run preamble from Section 4.2.8, but in step 4 of the preamble, Lower Tester 1 responds with the Update Phase set to 0x3 (Verifying Update).	0x02 (Wrong Phase)	0x01 (Transfer Active)
DFUM/SR/FD/BV-51-C [Firmware Distribution Apply – Transfer Suspended Distribution Phase]	Run preamble from Section 4.2.14	0x02 (Wrong Phase)	0x07 (Transfer Suspended)

Table 4.9: Receive Firmware Distribution Apply messages test cases

4.4.8 Receive Firmware Distribution Suspend messages

- Test Purpose

  Verify the behavior of the IUT acting as Distributor when an Initiator sends Firmware Distribution Suspend messages in different states.

- References

  [3] 6.2.3.9.1

- Initial Condition

  - The Lower Tester is a Firmware Distribution Client supporting the Initiator role.
  - Use the initial condition as described in Table 4.10.

- Test Procedure

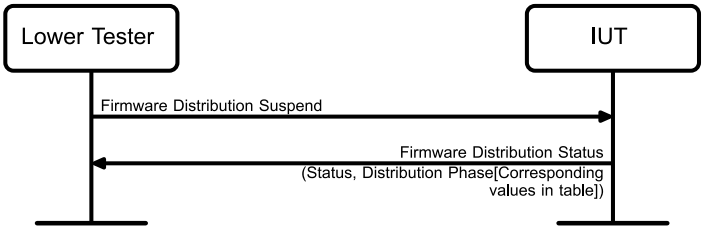

Figure 4.31: Test Procedure for Receive Firmware Distribution Suspend messages

1. The Lower Tester sends a Firmware Distribution Suspend message.
2. The IUT responds with a Firmware Distribution Status message with Status field and Distribution Phase field set to the corresponding values in Table 4.10.

- Expected Outcome

  Pass verdict

  The IUT responds to the messages with the appropriate field values.

Test Case	Initial Condition	Status	Distribution Phase
DFUM/SR/FD/BV-52-C [Firmware Distribution Suspend – Idle Distribution Phase]	Run preamble from Section 4.2.6	0x02 (Wrong Phase)	0x00 (Idle)
DFUM/SR/FD/BV-53-C [Firmware Distribution Suspend – Transfer Active Distribution Phase]	Run preamble from Section 4.2.7 and wait until one chunk has been transferred.	0x00 (Success)	0x07 (Transfer Suspended)
DFUM/SR/FD/BV-54-C [Firmware Distribution Suspend – Transfer Success Distribution Phase]	Run preamble from Section 4.2.8	0x02 (Wrong Phase)	0x02 (Transfer Success)
DFUM/SR/FD/BV-55-C [Firmware Distribution Suspend – Completed Distribution Phase]	Run preamble from Section 4.2.9	0x02 (Wrong Phase)	0x04 (Completed)
DFUM/SR/FD/BV-56-C [Firmware Distribution Suspend – Failed Distribution Phase]	Run preamble from Section 4.2.10	0x02 (Wrong Phase)	0x05 (Failed)
DFUM/SR/FD/BV-57-C [Firmware Distribution Suspend – Transfer Suspended Distribution Phase]	Run preamble from Section 4.2.14	0x00 (Success)	0x07 (Transfer Suspended)

Table 4.10: Receive Firmware Distribution Suspend messages test cases

DFUM/SR/FD/BV-58-C [Upload Firmware – OOB using HTTPS]

- Test Purpose

  Verify that the Server IUT acting as Distributor downloads a new firmware using an OOB mechanism using the URI provided by an Initiator.

- References

  [3] 3.3, 6.2.2.3

- Initial Condition
  - The Lower Tester is a Firmware Distribution Client supporting the Initiator role.
  - Lower Tester constructs Test Request URI from Test Update URI and a different Test Current Firmware ID for each round, denoted as Test FWID Invalid[n], where n is the round number.
  - Upper Tester is an HTTP server that provides valid or invalid firmware archives based on the firmware ID value from the Request URI.
- Test Procedure

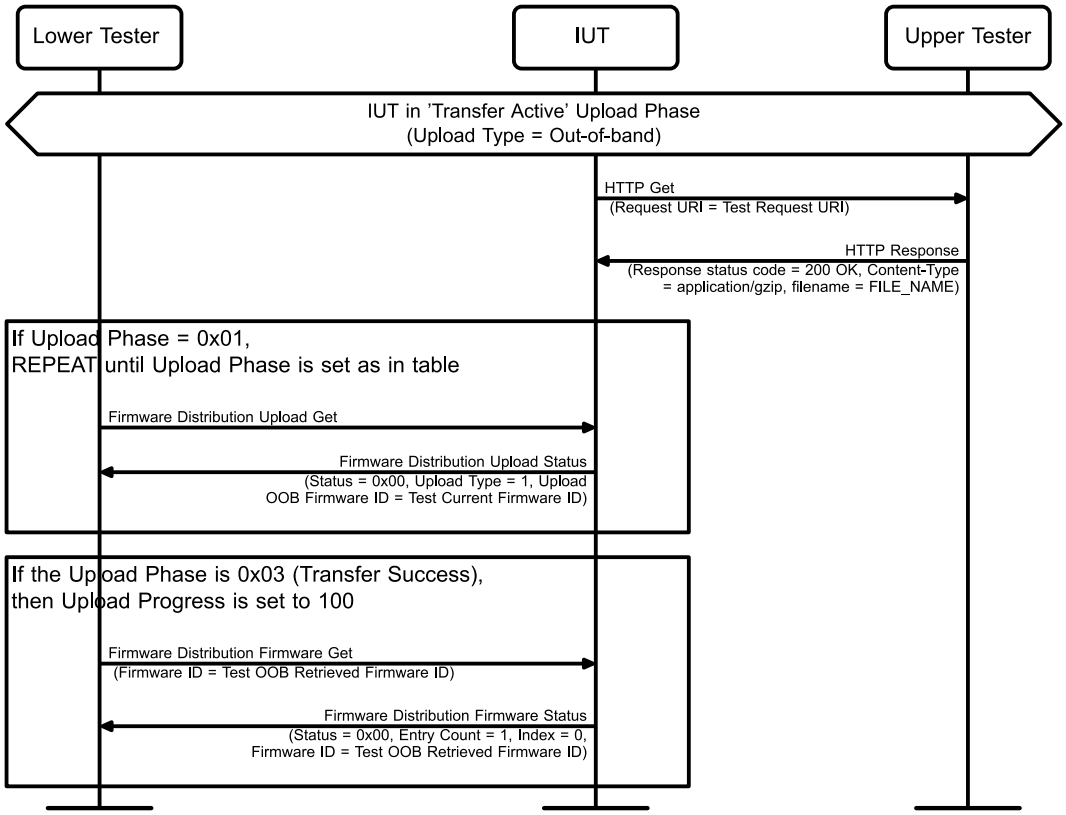

Figure 4.32: Test Procedure for DFUM/SR/FD/BV-58-C [Upload Firmware – OOB using HTTPS]

Repeat steps 1–6 for each round in Table 4.11.

1. The Lower Tester sets the IUT in the 'Transfer Active' Upload Phase with Upload Type set to Out-of-band by executing the procedure in Section 4.2.5.
2. The IUT sends an HTTP Get request to the Upper Tester with a properly formatted Request URI set to Test Request URI with a query key set to "cfwid" and the query key value set to the Test Current Firmware ID.
3. The Upper Tester sends an HTTP Response as described in Table 4.11: in round 1, a valid firmware archive is sent; in all other rounds, the response contains a firmware that is otherwise valid (see next sentence) but with the exception described in the table. The response status code is 200 OK, the Content-Type header is set to "application/gzip" and the Content-Disposition header is set to 'attachment; filename="FILE_NAME", where FILE_NAME is the firmware archive file name. The body of the response contains a firmware archive file.
4. The Lower Tester sends a Firmware Distribution Upload Get message to the IUT.
5. The IUT responds with a Firmware Distribution Upload Status with Status set to 0x00(Success), Upload Type set to 1 (Out-of-band), and Upload OOB Firmware ID set to Test Current Firmware ID. If the Upload Phase is 0x01 (Transfer Active), keep repeating steps 4 and 5 until Upload

Phase is set according to Table 4.11. If Upload Phase is 0x03 (Transfer Success), Upload Progress is set to 100.

6. If the Upload Phase in step 5 is 0x03 (Transfer Success), the Lower Tester sends a Firmware Distribution Firmware Get message with Firmware ID set to Test OOB Retrieved Firmware ID and the IUT responds with a Firmware Distribution Firmware Status message with Status set to 0x00 (Success), Entry Count set to 1, Index set to 0 and the Firmware ID set to Test OOB Retrieved Firmware ID.

Round	Firmware Archive Invalid Condition	Upload Phase in step 4
1	No condition (valid firmware)	0x03 (Transfer Success)
2	Firmware archive file uses another file format (which is not gzip).	0x02 (Transfer Error)
3	The Content-Disposition header is not set to ‘attachment’.	0x02 (Transfer Error)
4	Manifest file is not present in the firmware archive file.	0x02 (Transfer Error)
5	Firmware file named different than in Manifest file.	0x02 (Transfer Error)
6	Metadata file not present in the archive file.	0x02 (Transfer Error)
7	Metadata file uses a different name than the Manifest file.	0x02 (Transfer Error)
8	DFUM chain size item of the new firmware description file does not contain the number of firmware images needed to update the firmware specified.	0x02 (Transfer Error)

Table 4.11: Upload Firmware – OOB using HTTPS test cases

- Expected Outcome

  Pass verdict

  The IUT behaves accordingly and for an HTTP Response with Status code 200 OK, it successfully receives the firmware using OOB mechanisms, showing correct upload progress.

  In step 2, the query string contains one key and the key appears one time in the query string.

DFUM/SR/FD/BV-59-C [Firmware Distribution Update – IUT Updates Itself]

- Test Purpose

  Verify that the Server IUT acting as Distributor and Target node updates its firmware when the procedure is initiated by an Initiator.

- References

  [3] 6.1.3.4

- Initial Condition

  - Lower Tester sets the IUT in the ‘Idle’ Distribution Phase by executing the procedure in Section 4.2.6.
  - The Lower Tester is a Firmware Distribution Client supporting the Initiator role.
  - The Firmware List State already contains the firmware for the IUT. The Lower Tester has obtained the Firmware ID of this firmware image.

- The Lower Tester has obtained the unicast addresses of the IUT's elements where the Firmware Distribution Server model and the Firmware Update Server model have been instantiated (the elements may or may not be different).

- Test Procedure

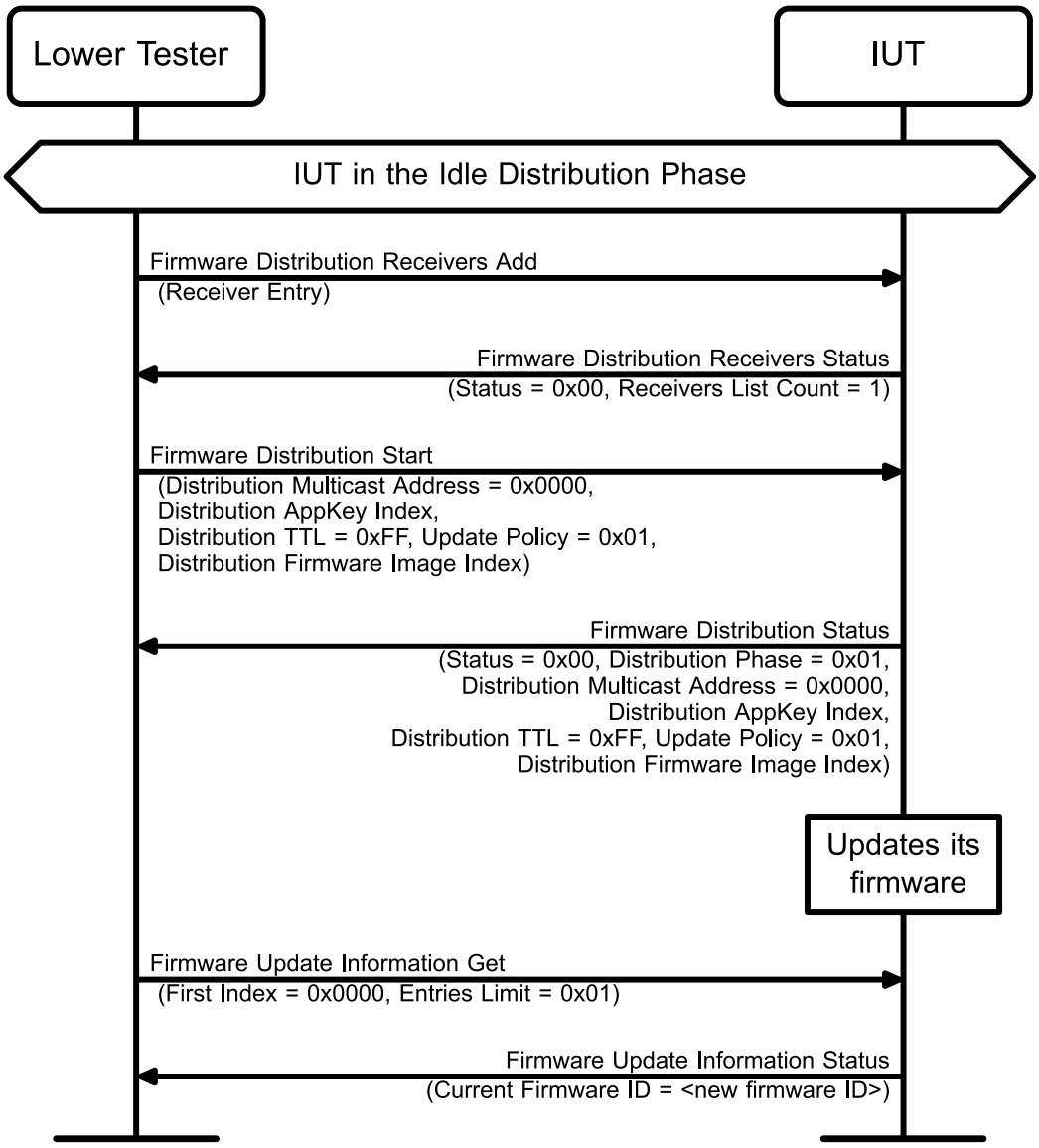

Figure 4.33: Test procedure for DFUM/SR/FD/BV-59-C [Firmware Distribution Update – IUT Updates Itself]

1. Lower Tester sends a Firmware Distribution Receivers Add message with a single Receiver Entry with the Address field set to the unicast address of the IUT element where the instance of the Firmware Update Server model is present.
2. The IUT responds with a Firmware Distribution Receivers Status message with Status field set to 0x00 (Success) and Receivers List Count field set to 1.
3. Lower Tester sends a Firmware Distribution Start message with Distribution Multicast Address set to 0x0000, Distribution AppKey Index set to an AppKey Index bound to BLOB client and Firmware Update client on the IUT, Distribution TTL set to 0xFF, Update Policy set to 0x01 (Verify And Apply) and Distribution Firmware Image Index set to Test Distribution Firmware Image Index.

4. The IUT responds with a Firmware Distribution Status message with Status set to 0x00 (Success), Distribution Phase set to 0x01 (Transfer Active) and the remaining parameters set as in step 3.
5. The IUT updates its firmware and, if required, reboots.
6. Lower Tester sends a Firmware Update Information Get message with First Index set to 0x0000 and Entries Limit set to 0x01.
7. The IUT responds with a Firmware Update Information Status message with Current Firmware ID set to the value of the Firmware ID obtained in the initial conditions, and all other fields set to valid values.

- Expected Outcome

  Pass verdict

  The IUT responds correctly to all messages and updates itself.

  In step 5, the IUT updates itself, skipping the BLOB transfer of the firmware image.

  In step 7, the IUT responds with an updated Firmware ID.

4.5 Firmware Update Server

DFUM/SR/FU/BV-01-C [Receive Firmware Update Information Get, IUT as Target Node]

- Test Purpose

  Verify that the Target node IUT receives a Firmware Update Information Get message and responds with a Firmware Update Information Status message.

- References

  [3] 6.1.3.1, 6.1.3.2

- Initial Condition

  - The Lower Tester is a Firmware Distribution Client supporting the Initiator role.

- Test Procedure

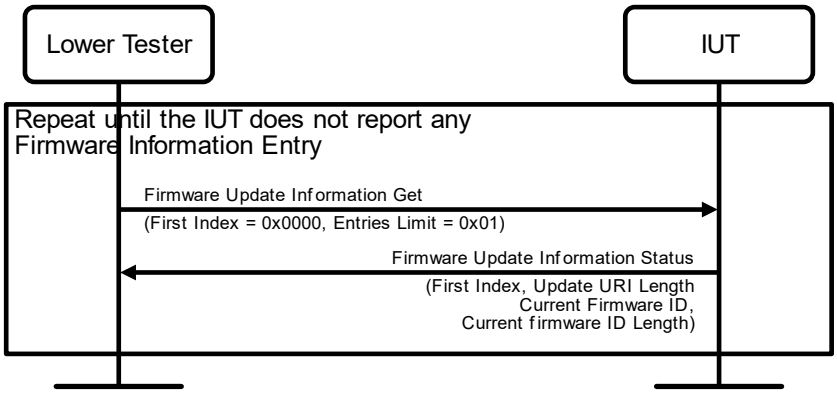

Figure 4.34: Test Procedure for DFUM/SR/FU/BV-01-C [Receive Firmware Update Information Get, IUT as Target Node]

1. The Lower Tester sends a Firmware Update Information Get message to the IUT with First Index set to 0x0000 and Entries Limit set to 0x01.
2. The IUT responds with a Firmware Update Information Status message with the Firmware Information List Count field set to 0x0001, First Index field set to a valid value, and only one

Firmware Information Entry containing Update URI set to a valid random value, Update URI Length set to the length of the Update URI, Current Firmware ID set to a valid random value, Current Firmware ID Length set to the length of the Current Firmware ID. The Lower Tester stores the Firmware Information Entry.

3. Repeat steps 1–2 with First Index from step 1 set to a value incremented above the stored First Index value until the IUT does not report any Firmware Information Entry in step 2.

- Expected Outcome

  Pass verdict

  The IUT sends a Firmware Update Information Status message with the expected values.

  In step 2, the Current Firmware ID field contains a valid Company ID that identifies the company which is the vendor of the firmware. The data contained in the Update URI field is formatted as for the URI data type, uses only https schema, and indicates the URI link to fetch the firmware binary.

DFUM/SR/FU/BV-02-C [Receive Firmware Update Firmware Metadata Check, IUT as Target Node]

- Test Purpose

  Verify that the Target node IUT responds to a Firmware Update Firmware Metadata Check message with a Firmware Update Firmware Metadata Status message.

- References

  [3] 6.1.3.8, 6.1.3.9

- Initial Condition

  - The metadata and new firmware identifier are defined in the IXIT [5] by TSPX_Incoming_Firmware_Metadata and TSPX_Update_Firmware_Image_Index.
  - The Lower Tester is a Firmware Update Server.

- Test Procedure

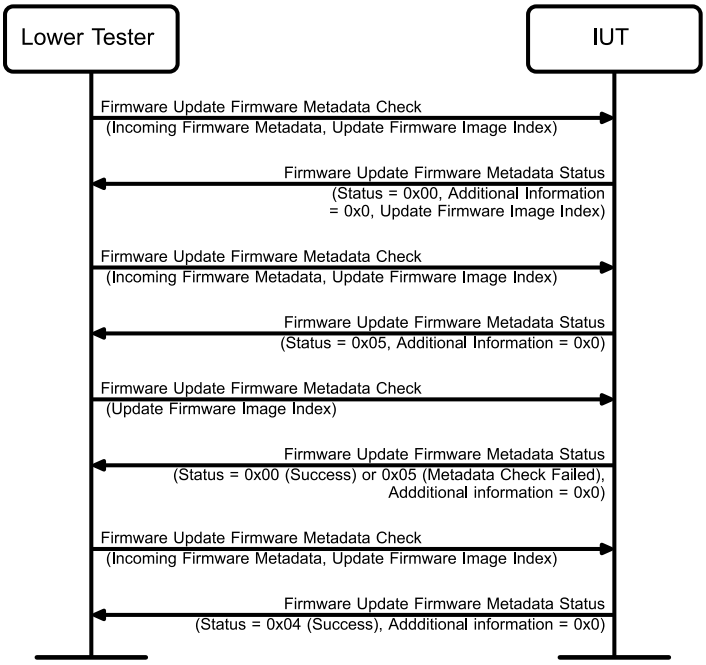

Figure 4.35: Test Procedure for DFUM/SR/FU/BV-02-C [Receive Firmware Update Firmware Metadata Check, IUT as Target Node]

1. The Lower Tester sends a Firmware Update Firmware Metadata Check message to the IUT with Incoming Firmware Metadata set to the metadata defined in the IXIT [5], and Update Firmware Image Index set to the TSPX_Update_Firmware_Image_Index value defined in the IXIT [5].
2. The IUT responds with a Firmware Update Firmware Metadata Status message with Status set to 0x00 (Success), Additional Information set to 0x0, and Update Firmware Image Index set to the value sent in the previous step.
3. The Lower Tester sends a Firmware Update Firmware Metadata Check message to the IUT with Incoming Firmware Metadata set to a random value, Update Firmware Image Index set to the TSPX_Update_Firmware_Image_Index value defined in the IXIT [5].
4. The IUT responds with a Firmware Update Firmware Metadata Status message with Status set to 0x05 (Metadata Check Failed), Additional Information set to 0x0, and Update Firmware Image Index set to the value sent in the previous step.
5. The Lower Tester sends a Firmware Update Firmware Metadata Check message to the IUT with the Incoming Firmware Metadata field omitted and the Update Firmware Image Index set to the TSPX_Update_Firmware_Image_Index value defined in the IXIT [5].
6. The IUT responds with a Firmware Update Firmware Metadata Status message with Status set to 0x00 (Success) or 0x05 (Metadata Check Failed), Additional Information set to 0x0, and Update Firmware Image Index set to the value sent in the previous step.
7. The Lower Tester sends a Firmware Update Firmware Metadata Check message to the IUT with Incoming Firmware Metadata set to the metadata defined in the IXIT [5], and Update Firmware Image Index set to an invalid value.
8. The IUT responds with a Firmware Update Firmware Metadata Status message with Status set to 0x04 (Wrong Firmware Index), Additional Information set to 0x0, and Update Firmware Image Index set to the value sent in the previous step.

- Expected Outcome

  Pass verdict

  The IUT sends a Firmware Update Firmware Metadata Status message with the expected values.

4.5.1 Firmware Update Transfer, IUT as Target Node

- Test Purpose

  Verify that the Target node IUT receives a firmware BLOB from a Firmware Update Server.

- References

  [3] 6.1.2.1, 6.1.3.4

- Initial Condition

  - The firmware metadata and new firmware identifier is defined in the IXIT [5] by TSPX_Incoming_Firmware_Metadata and TSPX_Update_Firmware_Image_Index respectively.
  - The Lower Tester is a Firmware Update Server.
  - The Lower Tester sets the IUT in the Idle Update Phase by running the preamble procedure in Section 4.2.11.

- Test Procedure

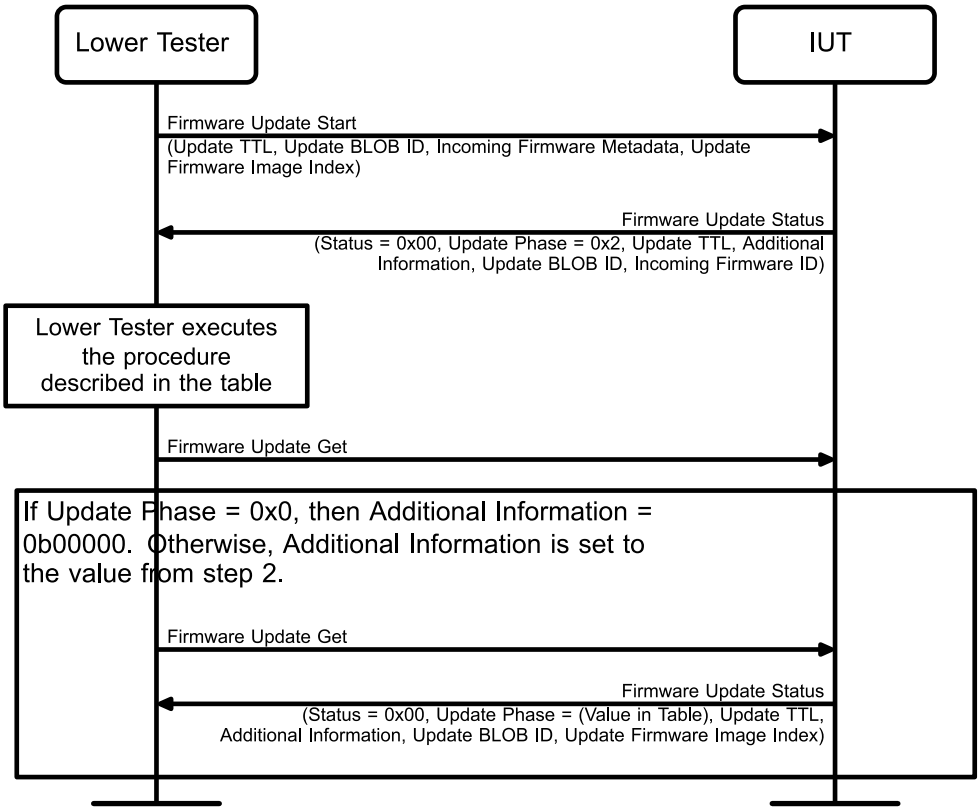

Figure 4.36: Test Procedure for Firmware Update Transfer, IUT as Target Node

1. The Lower Tester sends a Firmware Update Start message to the IUT with Update TTL and Update BLOB ID set to random valid values, Incoming Firmware Metadata set to the TSPX_Incoming_Firmware_Metadata value in the IXIT [5], Update Firmware Image Index set to the TSPX_Update_Firmware_Image_Index value in the IXIT [5].

2. The IUT responds with a Firmware Update Status message with Status set to 0x00 (Success), Update Phase set to 0x2 (Transfer Active), Additional Information set to a valid value, Update TTL, Update BLOB ID set to the values from step 1, Update Firmware Image Index set to the new firmware identified defined in the IXIT [5].
3. The Lower Tester executes the procedure described in Table 4.12 using the BLOB ID set to the value from step 1.
4. The Lower Tester sends a Firmware Update Get message to the IUT.
5. The IUT responds with a Firmware Update Status message with Status set to 0x00 (Success), Update Phase set to the value in Table 4.12. If Update Phase is set to 0x0 (Idle), Additional Information is set to 0b00000, otherwise Additional Information is set to the value from step 2. Update TTL, Update BLOB ID, and Update Firmware Image Index are set to values from step 2.

- Expected Outcome

  Pass verdict

  The IUT responds with a Firmware Update Status message with the expected field values. All RFU field bits are set to 0 (zero).

Test Case	Step 3	Update Phase in Step 5
DFUM/SR/FU/BV-03-C [Firmware Update – Verification Succeeded, IUT as Target Node]	Run the MBTM test case [8] MBTM/SR/BT/BV-04-C with BLOB set to the firmware identifier defined in IXIT [5]	0x4 (Verification Succeeded)
DFUM/SR/FU/BV-04-C [Firmware Update – Transfer Error, IUT as Target Node]	Wait until the Receive BLOB Timeout (see [9]) of the BLOB Transfer Server on the IUT expires	0x1 (Transfer Error)
DFUM/SR/FU/BV-05-C [Firmware Update – Verification Failed, IUT as Target Node]	BLOB is set to a corrupted firmware image	0x5 (Verification Failed)
DFUM/SR/FU/BV-06-C [Firmware Update – Cancel BLOB, IUT as Target Node]	Run the MBTM test case [8] MBTM/SR/BT/BV-09-C with BLOB set to the firmware identifier defined in IXIT [5]	0x01 (Transfer Error)

Table 4.12: Firmware Update Transfer, IUT as Target Node test cases

DFUM/SR/FU/BV-07-C [Receive Firmware Update Start – Transfer Active Update Phase, IUT as Target Node]

- Test Purpose

  Verify that the IUT acting as Target node responds to a Firmware Update Start message triggering an error condition by sending Firmware Update Status message with the appropriate Status value.

- References

  [3] 6.1.3.4

- Initial Condition

  - The metadata, new firmware BLOB and new firmware identifier is defined in the IXIT [5] by TSPX Incoming Firmware Metadata, and TSPX_Update_Firmware_Image_Index respectively.
  - The Lower Tester is a Firmware Update Client.
  - The Lower Tester sets the IUT in the Transfer Active Update Phase by running the preamble procedure in Section 4.2.12.

- Test Procedure

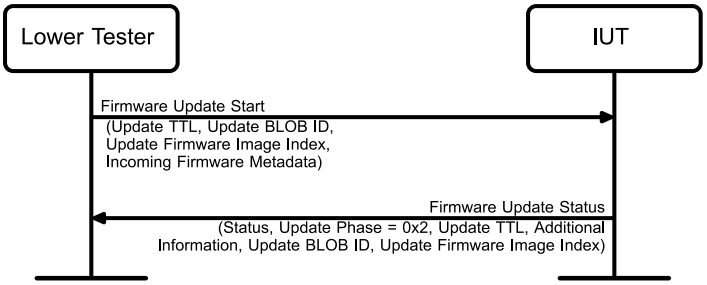

Figure 4.37: Test Procedure for DFUM/SR/FU/BV-07-C [Receive Firmware Update Start – Transfer Active Update Phase, IUT as Target Node]

Repeat steps 1 and 2 for each round in Table 4.13.

1. The Lower Tester sends a Firmware Update Start message to the IUT with the fields set to random values as specified in Table 4.13, otherwise with Update TTL and Update BLOB ID set to the values used in the preamble, and Incoming Firmware Metadata set to the metadata defined in the IXIT [5], Update Firmware Image Index set to the new firmware identified defined in the IXIT [5].
2. The IUT responds with a Firmware Update Status message with Status set to the value from Table 4.13 Update Phase set to 0x2 (Transfer Active), Additional Information set to a valid value, Update TTL, Update BLOB ID set to the values from step 1, Update Firmware Image Index set to the new firmware identified defined in the IXIT [5].

Round	Step 1 Additional Condition	Status
1	No condition	0x00 (Success)
2	Index set to a different value	0x02 (Wrong Phase)
3	Update BLOB ID set to a different value	0x02 (Wrong Phase)
4	Incoming Firmware Metadata set to a different value	0x02 (Wrong Phase)
5	Update TTL set to a different value	0x02 (Wrong Phase)
6	Update Timeout Base set to a different value	0x02 (Wrong Phase)

Table 4.13: Additional test conditions for DFUM/SR/FU/BV-07-C [Receive Firmware Update Start – Transfer Active Update Phase, IUT as Target Node]

- Expected Outcome

  Pass verdict

  The IUT responds with a Firmware Update Status message with the expected field values.

DFUM/SR/FU/BV-08-C [Receive Firmware Update Start – BLOB Transfer Busy, IUT as Target Node]

- Test Purpose

  Verify that the Server IUT acting as Target node receives a Firmware Update Start message with acceptable parameters during the reception of another BLOB data and sends a Firmware Update Status message with the appropriate Status value.

- References

  [3] 6.1.3.4

- Initial Condition

  - The firmware metadata and new firmware identifier is defined in the IXIT [5] by TSPX_Incoming_Firmware-Metadata and TSPX_Update_Firmware_Image_Index respectively.
  - The Lower Tester sets the IUT in the Idle Update Phase by running the preamble procedure in Section 4.2.11.
  - The Lower Tester is a Firmware Update Client.
  - The Lower Tester sets the BLOB Transfer server on the IUT in Waiting for Next Block Phase by running the MBTM preamble [8] 4.2.2 IUT in Waiting for Next Block Phase.

- Test Procedure

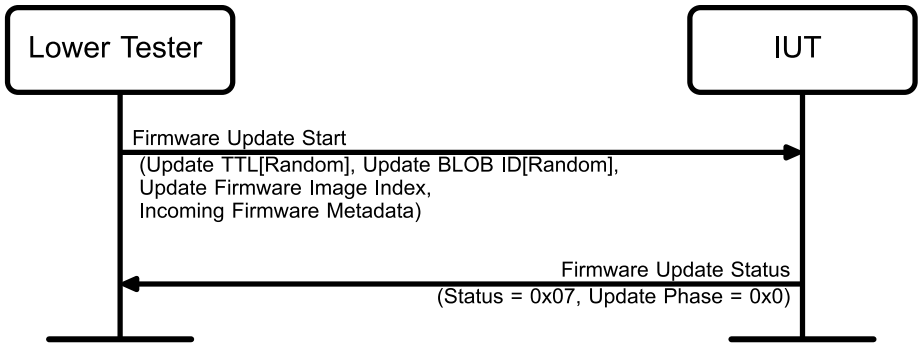

Figure 4.38: Test Procedure for DFUM/SR/FU/BV-08-C [Receive Firmware Update Start – BLOB Transfer Busy, IUT as Target Node]

1. The Lower Tester sends a Firmware Update Start message to the IUT with Update TTL and Update BLOB ID set to random valid values, Incoming Firmware Metadata set to the metadata defined in the IXIT [5], and Update Firmware Image Index set to the new firmware identified defined in the IXIT [5].
2. The IUT responds with a Firmware Update Status message with Status set to 0x07 (BLOB Transfer Busy) and Update Phase set to 0x0 (Idle).

- Expected Outcome

  Pass verdict

  The IUT responds with a Firmware Update Status message with the expected field values.

DFUM/SR/FU/BV-09-C [Firmware Update Apply, IUT as Target Node]

- Test Purpose

  Verify that the Server IUT acting as Target node responds to a Firmware Update Apply message by sending a Firmware Update Status message.

- References

  [3] 6.1.3.6

- Initial Condition
  - The Lower Tester sets the IUT in the Verification Succeeded Update Phase by running DFUM/SR/FU/BV-03-C [Firmware Update – Verification Succeeded, IUT as Target Node].
  - The Lower Tester is a Firmware Update Client.
- Test Procedure

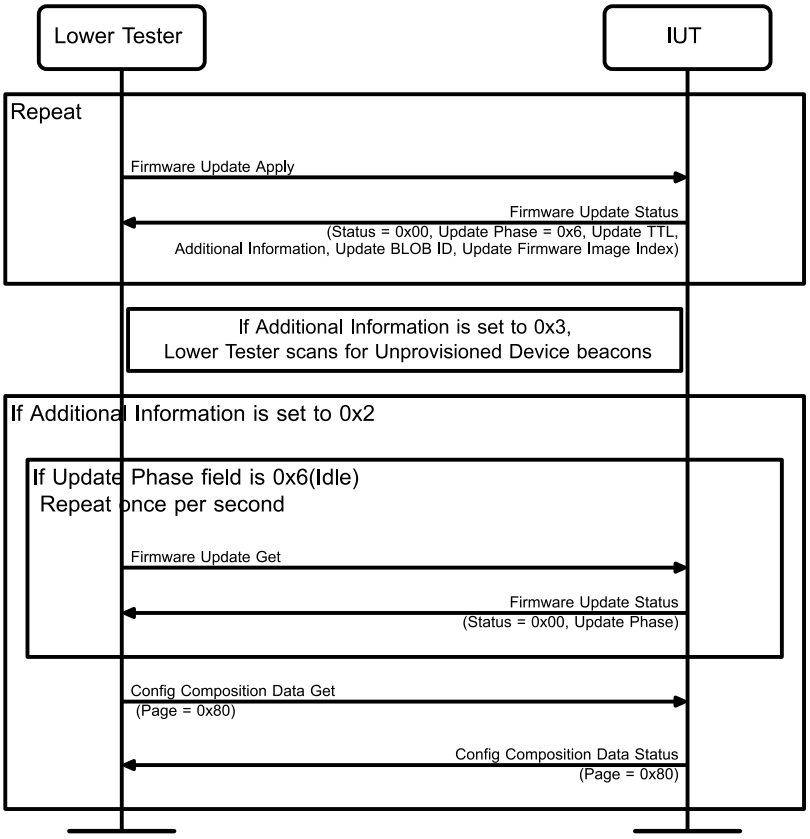

Figure 4.39: Test Procedure for DFUM/SR/FU/BV-09-C [Firmware Update Apply, IUT as Target Node]

1. The Lower Tester sends a Firmware Update Apply message to the IUT.
2. The IUT responds with a Firmware Update Status message with Status set to 0x00 (Success), Update Phase set to 0x6 (Applying Update), Additional Information, Update TTL, Update BLOB ID and Update Firmware Image Index set to the values from the initial condition.
3. Repeat steps 1–2.
4. If the Additional Information field value sent in step 2 is equal to 0x3, the Lower Tester scans for Unprovisioned Device beacons until it receives a beacon matching the Device UUID of the IUT, otherwise skip this step.
5. If the Additional Information field value sent in step 2 is equal to 0x2, execute steps 6–9.
6. The Lower Tester sends a Firmware Update Get message to the IUT.
7. The IUT responds with a Firmware Update Status message with Status set to 0x00 (Success). If Update Phase field is set to 0x6 (Applying Update) repeat steps 6 and 7 once a second. If the Update Phase field is set to 0x0 (Idle), then proceed to the next step.
8. The Lower Tester sends a Config Composition Data Get message to the IUT with the Page field value set to 0x80.
9. The IUT responds with a Config Composition Data Status message with the Page field set to 0x80.

- Expected Outcome

  Pass verdict

  The IUT accepts the Firmware Update Apply message and starts applying the firmware.

  In step 4, if Additional Information is equal to 0x3, the IUT starts sending Unprovisioned Device beacons.

  In step 5, if Additional Information is equal to 0x2, the IUT exposes page 0x80 of the Composition Data state.

4.5.2 Receive Firmware Update Cancel, IUT as Target Node

- Test Purpose

  Verify that the IUT acting as Target node responds to a Firmware Update Cancel message by sending a Firmware Update Status message.

- References

  [3] 6.1.3.5

- Initial Condition

  - The Lower Tester is a Firmware Update Client.
  - Additional test conditions are described in Table 4.14.

- Test Procedure

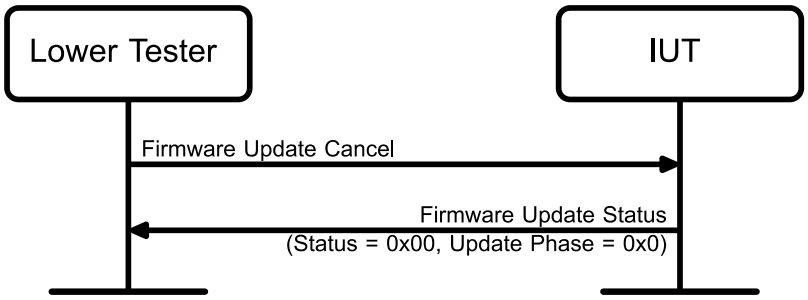

Figure 4.40: Test Procedure for Receive Firmware Update Cancel, IUT as Target Node

1. The Lower Tester sends a Firmware Update Cancel message to the IUT.
2. The Lower Tester responds with a Firmware Update Status message with Status set to 0x00 (Success) and Update Phase set to 0x0 (Idle).

- Expected Outcome

  Pass verdict

  The IUT responds with a Firmware Update Status message with the expected field values.

Test Case	Initial Condition
DFUM/SR/FU/BV-10-C [Receive Firmware Update Cancel – Idle Phase, IUT as Target Node]	Run preamble from Section 4.2.11
DFUM/SR/FU/BV-11-C [Receive Firmware Update Cancel – Transfer Active Phase, IUT as Target Node]	Run preamble from Section 4.2.12
DFUM/SR/FU/BV-12-C [Receive Firmware Update Cancel – Transfer Error Phase, IUT as Target Node]	Run DFUM/SR/FU/BV-04-C [Firmware Update – Transfer Error, IUT as Target Node]

Test Case	Initial Condition
DFUM/SR/FU/BV-13-C [Receive Firmware Update Cancel – Verification Succeeded Update Phase, IUT as Target Node]	Run DFUM/SR/FU/BV-03-C [Firmware Update – Verification Succeeded, IUT as Target Node]
DFUM/SR/FU/BV-14-C [Receive Firmware Update Cancel – Verification Failed Update Phase, IUT as Target Node]	Run DFUM/SR/FU/BV-05-C [Firmware Update – Verification Failed, IUT as Target Node]
DFUM/SR/FU/BV-15-C [Receive Firmware Update Cancel – Applying Update Phase, IUT as Target Node]	Run steps 1–2 of DFUM/SR/FU/BV-09-C [Firmware Update Apply, IUT as Target Node]

Table 4.14: Receive Firmware Update Cancel, IUT as Target Node test cases

4.5.3 Receive Firmware Update Start – Other Phases, IUT as Target Node

- Test Purpose

  Verify that the IUT acting as Target node responds to a Firmware Update Start message by sending a Firmware Update Status message with the appropriate Status value.

- References

  [3] 6.1.3.4

- Initial Condition

  - The metadata, new firmware BLOB and new firmware identifier is defined in the IXIT [5] by TSPX_Incoming_Firmware_Metadata and TSPX_Update_Firmware_Image_Index respectively.
  - The Lower Tester is a Firmware Update Client.
  - Additional test conditions are described in Table 4.15.

- Test Procedure

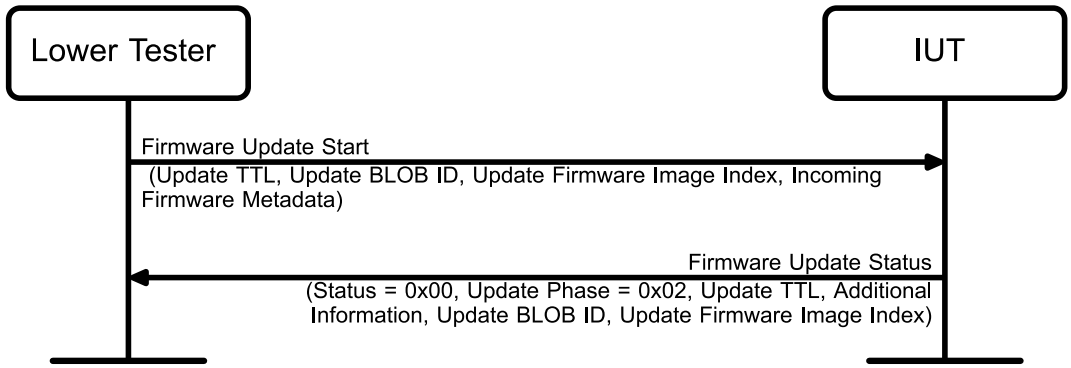

Figure 4.41: Test Procedure for Receive Firmware Update Start – Other Phases, IUT as Target Node

1. The Lower Tester sends a Firmware Update Start message to the IUT with Update TTL and Update BLOB ID set to random valid values different than the ones in the initial condition, Incoming Firmware Metadata set to the metadata defined in the IXIT [5], Update Firmware Image Index set to the new firmware identified defined in the IXIT [5].
2. The IUT responds with a Firmware Update Status message with Status and Update Phase fields set to the values specified in Table 4.15, Additional Information set to a valid value, Update TTL, Update BLOB ID set to the values from step 1 if the Status is 0x00 (Success) or otherwise the values from the initial condition, Update Firmware Image Index set to the new firmware identified defined in the IXIT [5].

- Expected Outcome

  Pass verdict

  The IUT responds with a Firmware Update Status message with the expected field values.

Test Case	Initial Condition	Step 2
DFUM/SR/FU/BV-16-C [Receive Firmware Update Start – Transfer Error Phase, IUT as Target Node]	Run DFUM/SR/FU/BV-04-C [Firmware Update – Transfer Error, IUT as Target Node]	Status = 0x00 (Success) Update Phase = 0x2 (Transfer Active)
DFUM/SR/FU/BV-17-C [Receive Firmware Update Start – Verification Succeeded Phase, IUT as Target Node]	Run DFUM/SR/FU/BV-03-C [Firmware Update – Verification Succeeded, IUT as Target Node]	Status = 0x02 (Wrong Phase) Update Phase = 0x4 (Verification Succeeded)
DFUM/SR/FU/BV-18-C [Receive Firmware Update Start – Verification Failed Phase, IUT as Target Node]	Run DFUM/SR/FU/BV-05-C [Firmware Update – Verification Failed, IUT as Target Node]	Status = 0x00 (Success) Update Phase = 0x2 (Transfer Active)
DFUM/SR/FU/BV-19-C [Receive Firmware Update Start – Applying Update, IUT as Target Node]	Run steps 1–2 of DFUM/SR/FU/BV-09-C [Firmware Update Apply, IUT as Target Node]	Status = 0x02 (Wrong Phase) Update Phase = 0x6 (Applying Update)

Table 4.15: Receive Firmware Update Start – Other Phases, IUT as Target Node test cases

4.5.4 Receive Firmware Update Apply – Other Phases, IUT as Target Node

- Test Purpose

  Verify that the IUT acting as Target node responds to a Firmware Update Apply message by sending a Firmware Update Status message with the appropriate Status value.

- References

  [3] 6.1.3.6

- Initial Condition

  - The update firmware image index value is defined in the IXIT [5] by TSPX_Update_Firmware_Image_Index.
  - The Lower Tester is a Firmware Update Client.
  - Additional test conditions are described in Table 4.16.

- Test Procedure

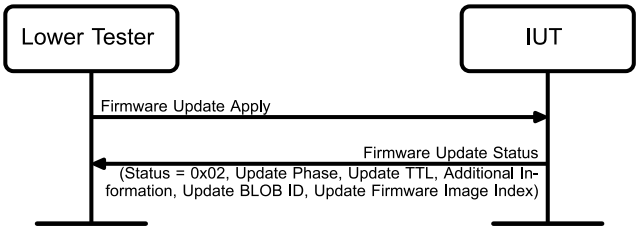

Figure 4.42: Test Procedure for Receive Firmware Update Apply – Other Phases, IUT as Target Node

1. The Lower Tester sends a Firmware Update Apply message to the IUT.
2. The IUT responds with a Firmware Update Status message with Status set to 0x02 (Wrong Phase), Update Phase set to the value in Table 4.16, Additional Information set to a valid value, Update TTL, Update BLOB ID set to the values from step 1, Update Firmware Image Index set to TSPX_Update_Firmware_Image_Index as defined in the IXIT [5].

- Expected Outcome

  Pass verdict

  The IUT responds with a Firmware Update Status message with the expected field values.

Test Case	Initial Condition	Step 2
DFUM/SR/FU/BV-20-C [Receive Firmware Update Apply – Idle Phase, IUT as Target Node]	Run preamble 4.2.11	Update Phase = 0x0 (Idle)
DFUM/SR/FU/BV-21-C [Receive Firmware Update Apply – Transfer Error Phase, IUT as Target Node]	Run DFUM/SR/FU/BV-04-C [Firmware Update – Transfer Error, IUT as Target Node]	Update Phase = 0x1 (Transfer Error)
DFUM/SR/FU/BV-22-C [Receive Firmware Update Apply – Transfer Active Phase, IUT as Target Node]	Run preamble 4.2.12	Update Phase = 0x2 (Transfer Active)
DFUM/SR/FU/BV-23-C [Receive Firmware Update Apply – Verification Failed Phase, IUT as Target Node]	Run DFUM/SR/FU/BV-05-C [Firmware Update – Verification Failed, IUT as Target Node]	Update Phase = 0x5 (Verification Failed)

Table 4.16: Receive Firmware Update Apply – Other Phases, IUT as Target Node test cases

DFUM/SR/FU/BV-24-C [Resume Firmware Transfer, IUT as Target Node]

- Test Purpose

  Verify that the IUT acting as Target node resumes an interrupted firmware transfer correctly.

- References

  [3] 6.1.3.4

- Initial Condition

  - The update firmware image index value is defined in the IXIT [5] by TSPX_Update_Firmware_Image_Index.
  - The update firmware image is large enough to span at least two blocks.
  - The Lower Tester sets the IUT in the Transfer Active Update Phase by running preamble 4.2.12.
  - The Lower Tester is a Firmware Update Client.

- Test Procedure

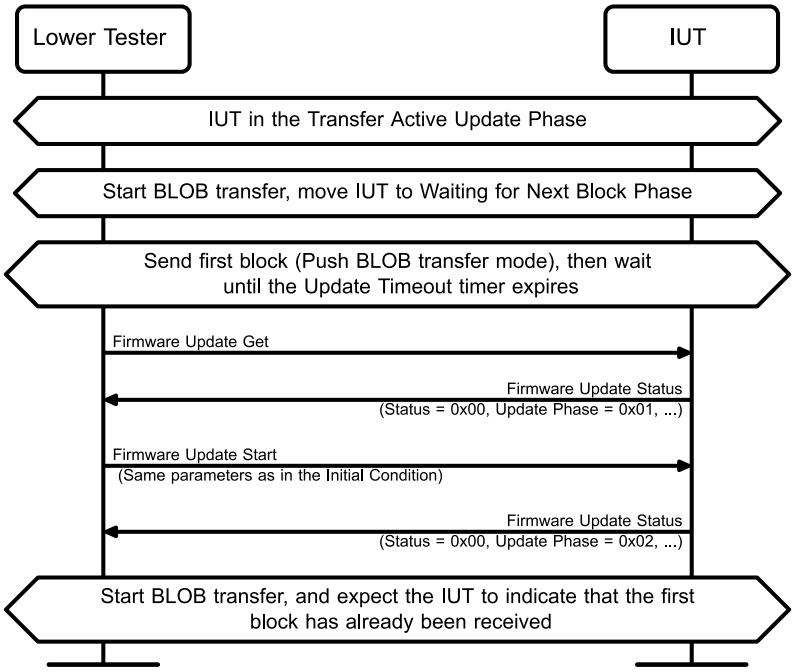

Figure 4.43: Test Procedure for DFUM/SR/FU/BV-24-C [Resume Firmware Transfer, IUT as Target Node]

1. The Lower Tester starts the firmware image BLOB Transfer by running the MBTM preamble [8] 4.2.2 IUT in Waiting for Next Block Phase – except that Step 1 (setting the IUT to Idle Phase) is omitted.
2. The Lower Tester sends the first block of the firmware image by running the MBTM test procedure [8] MBTM/SR/BT/BV-01-C [Transfer Block Sequence, Push BLOB Transfer Mode].
3. The Lower Tester waits for Update Timeout seconds.
4. The Lower Tester sends a Firmware Update Get message to the IUT.
5. The IUT responds with a Firmware Update Status message with Status set to 0x00 (Success), Update Phase set to the value 0x01 (Transfer Error), Additional Information set to a valid value, Update TTL, Update BLOB ID set to the values from the initial conditions, Update Firmware Image Index set to TSPX_Update_Firmware_Image_Index as defined in the IXIT [5].
6. The Lower Tester sends a Firmware Update Start message with the same parameters as in the initial conditions to the IUT.
7. The IUT responds with a Firmware Update Status message with the same field values as in Step 5, except that the Update Phase is set to 0x02 (Transfer Active).
8. The Lower Tester starts the firmware image BLOB Transfer by running the MBTM preamble [8] 4.2.2 IUT in Waiting for Next Block Phase – except that Step 1, setting the IUT to Idle Phase, is omitted.
9. The Lower Tester verifies that the BLOB Transfer Status message received in Step 8 reports that the first block was already received; that is, the first bit of the Blocks Not Received field of the message is 0.

- Expected Outcome

  Pass verdict

  The IUT successfully resumes the timed-out firmware update and does not discard the previously received block of firmware data.

4.6 Firmware Distribution Client

DFUM/CL/FD/BV-01-C [Retrieve Distributor Receivers List Procedure, IUT as Initiator]

- Test Purpose

  Verify that the Initiator IUT acting as a Firmware Distribution Client can manage the information in the Node List state on a Distributor node acting as a Firmware Distribution Server.

- References

  [3] 7.2.2.4

- Initial Condition

  - _ADDR1_ is a random valid unicast address.
  - The Lower Tester is a Firmware Distribution Server.

- Test Procedure

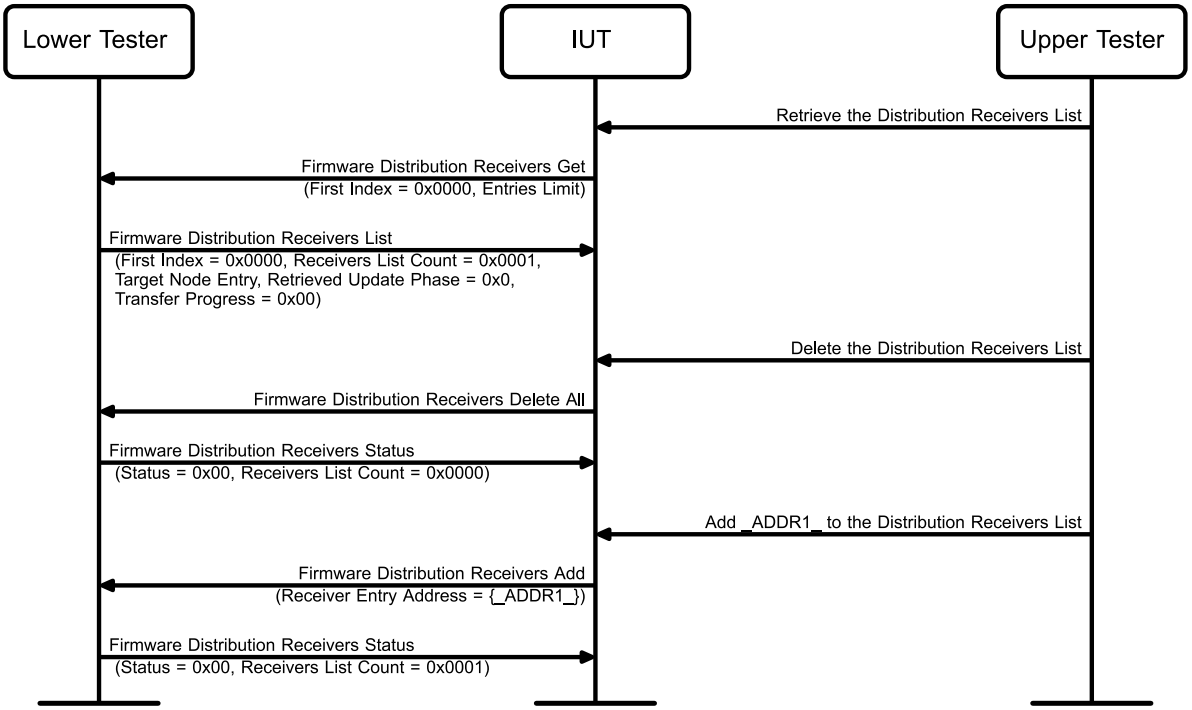

Figure 4.44: Test Procedure for DFUM/CL/FD/BV-01-C [Retrieve Distributor Receivers List Procedure, IUT as Initiator]

1. The Upper Tester orders the IUT to retrieve the Distribution Receivers List on the Lower Tester.
2. The IUT sends a Firmware Distribution Receivers Get message to the Lower Tester with First Index set to 0x0000 and Entries Limit set to a random valid value.
3. The Lower Tester responds with a Firmware Distribution Receivers List message with First Index set to 0x0000, Receivers List Count set to 0x0001 and one Target Node Entry with Address set to a random valid value, Retrieved Update Phase set to 0x0 (Idle), Transfer Progress set to 0x00 and Update Status field set to 0x00.
4. The Upper Tester orders the IUT to delete the Distribution Receivers List on the Lower Tester.
5. The IUT sends a Firmware Distribution Receivers Delete All message to the Lower Tester.
6. The Lower Tester responds with a Firmware Distribution Receivers Status message with Status set to 0x00 (Success), Receivers List Count set to 0x0000.

7. The Upper Tester orders the IUT to add _ADDR1_ to the Distribution Receivers List on the Lower Tester.
8. The IUT sends a Firmware Distribution Receivers Add message to the Lower Tester with Receiver Entry Address field set to {_ADDR1_}.
9. The Lower Tester responds with a Firmware Distribution Receivers Status message with Status set to 0x00 (Success), Receivers List Count set to 0x0001.

- Expected Outcome

  Pass verdict

  The IUT sends a Firmware Distribution Receivers Get, a Firmware Distribution Receivers Get ADD and a Firmware Distribution Receivers Delete All message to the Lower Tester with the expected values.

  In step 2, Entries Limit field is set to a value that does not cause the size of the Firmware Distribution Receivers List message to exceed the maximum usable payload size.

DFUM/CL/FD/BV-02-C [Distributor Capabilities Procedure, IUT as Initiator]

- Test Purpose

  Verify that the IUT acting as a Firmware Distribution Client can query the distributor capabilities on a remote node acting as a Firmware Distribution Server.

- References

  [3] 7.2.2.5

- Initial Condition

  - The Lower Tester is a Firmware Distribution Server.

- Test Procedure

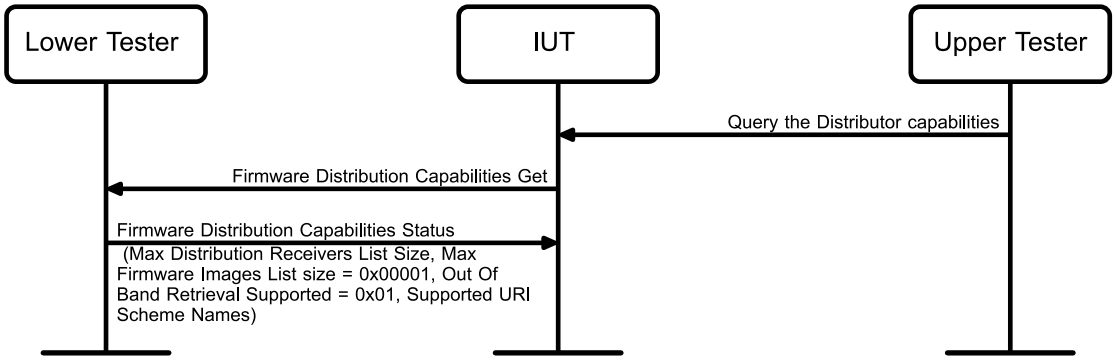

Figure 4.45: Test Procedure for DFUM/CL/FD/BV-02-C [Distributor Capabilities Procedure, IUT as Initiator]

1. The Upper Tester orders the IUT to query the distributor capabilities on the Lower Tester.
2. The IUT sends a Firmware Distribution Receivers Capabilities Get message to the Lower Tester.
3. The Lower Tester responds with a Firmware Distribution Capabilities Status message with Max Distribution Receivers List Size set to 0x0001, Max Firmware Image List Size=0x0001, Out-of-Band Retrieval Supported set to 0x01, Supported URI Scheme Names set to a random value.

- Expected Outcome

  Pass verdict

  The IUT sends a Firmware Distribution Receivers Capabilities Get message to the Lower Tester.

DFUM/CL/FD/BV-03-C [Upload Parameters Procedure – In Band, IUT as Initiator]

- Test Purpose

  Verify that the Initiator IUT acting as a Firmware Distribution Client can transfer the firmware update image on a remote node acting as a Firmware Distribution Server.

- References

  [3] 7.2.2.9

- Initial Condition

  - The Lower Tester is a Firmware Distribution Server.
  - The firmware update image is defined in the IXIT [5] by TSPX_Initiator_Firmware_Image.
  - The metadata is defined in the IXIT [5] by TSPX_Upload_Firmware_Metadata.

- Test Procedure

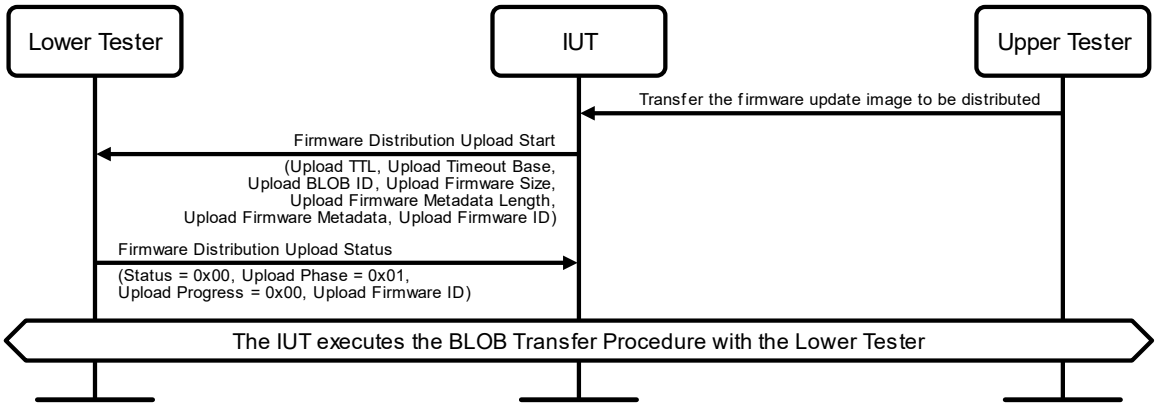

Figure 4.46: Test Procedure for DFUM/CL/FD/BV-03-C [Upload Parameters Procedure – In Band, IUT as Initiator]

1. The Upper Tester orders the IUT to transfer the firmware update image to be distributed on the Lower Tester.
2. The IUT sends a Firmware Distribution Upload Start message to the Lower Tester with Upload TTL set to a valid value, Upload Timeout Base set to a valid value, Upload BLOB ID set to a random value, Upload Firmware Size set to the size of TSPX_Initiator_Firmware_Image, Upload Firmware Metadata Length set to the size of TSPX_Upload_Firmware_Metadata, Upload Firmware Metadata set to TSPX_Upload_Firmware_Metadata, Upload Firmware ID set to a random value.
3. The Lower Tester responds with a Firmware Distribution Upload Status message with Status set to 0x00 (Success), Upload Phase set to 0x01 (Transfer Active), Upload Progress set to 0x00, Upload Type set to 0 (In-band), and Upload Firmware ID set to the value from step 2.
4. The IUT executes the Transfer BLOB Procedure with the Lower Tester by running DFUM/CL/BT/BV-01-C [BLOB Transfer Procedure] with the BLOB set to the TSPX_Initiator_Firmware_Image and the BLOB ID set to the Upload BLOB ID value from step 2.

- Expected Outcome

  Pass verdict

  The IUT sends a Firmware Distribution Upload Start message to the Lower Tester with the expected values.

The IUT successfully transfers the firmware update image to the Lower Tester.

In the Firmware Distribution Upload Status message, the Upload Firmware ID field is formatted as a Firmware ID and the Upload Progress state is set to the output value of Get BLOB Reception Progress procedure.

DFUM/CL/FD/BV-04-C [Upload Parameters Procedure – Out-of-Band, IUT as Initiator]

- Test Purpose

  Verify that an IUT acting as a Firmware Distribution Client can transfer the firmware update image out-of-band on a Firmware Distribution Server.

- References

  [3] 7.2.2.8

- Initial Condition

  - The firmware update image is defined in the IXIT [5] by TSPX_Initiator_Firmware_Image.
  - Lower Tester 1 is a Target node.
  - Lower Tester 2 is a Firmware Distribution Server.

- Test Procedure

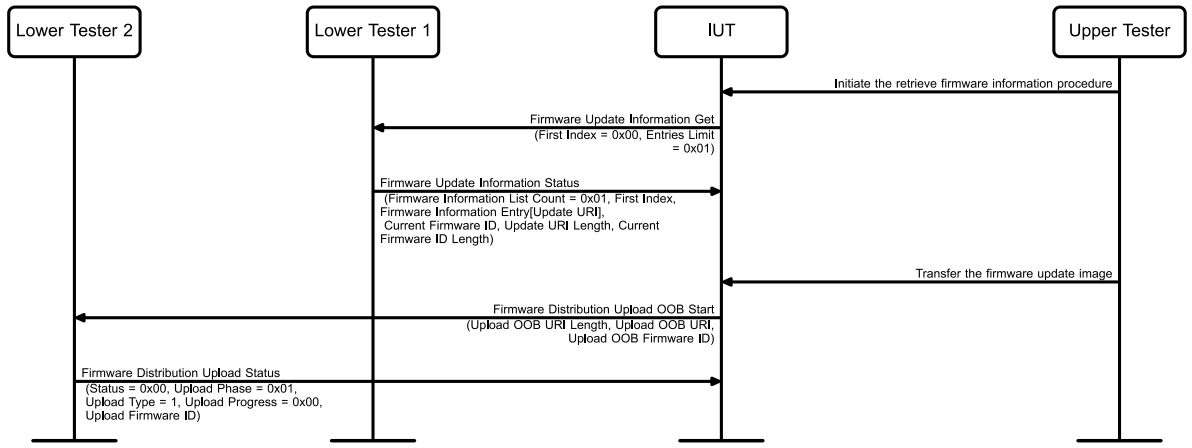

Figure 4.47: Test Procedure for DFUM/CL/FD/BV-04-C [Upload Parameters Procedure – Out-of-Band, IUT as Initiator]

1. The Upper Tester orders the IUT to initiate the retrieve firmware information procedure on Lower Tester 1.
2. The IUT sends a Firmware Update Information Get message to the Lower Tester 1 with First Index set to 0x00 and Entries Limit set to 0x01.
3. Lower Tester 1 responds with a Firmware Update Information Status message with Firmware Information List Count set to 0x01, First Index, and one Firmware Information Entry containing Update URI, and Current Firmware ID set to a random value, Update URI Length set to the length of the Update URI, Current Firmware ID Length set to the length of the Current Firmware ID.
4. The Upper Tester orders the IUT to transfer the firmware update image to be distributed on Lower Tester 2.
5. The IUT sends a Firmware Distribution Upload OOB Start message to Lower Tester 2 with Upload OOB URI Length set to Update URI Length, Upload OOB URI set to Update URI, and Upload OOB Firmware ID set to Current Firmware ID.

6. Lower Tester 2 responds with a Firmware Distribution Upload Status message with Status set to 0x00 (Success), Upload Phase set to 0x01 (Transfer Active), Upload Progress set to 0x00, Upload Type set to 1 (Out-of-band), and Upload Firmware ID set to the value from step 5.

- Expected Outcome

  Pass verdict

  The IUT sends a Firmware Distribution Upload OOB Start and a Firmware Update Information Get message to the Lower Tester with the expected values.

DFUM/CL/FD/BV-05-C [Cancel Upload, IUT as Initiator]

- Test Purpose

  Verify that an IUT acting as a Firmware Distribution Client can query the status and cancel the firmware update image transfer on a remote node acting as a Firmware Distribution Server.

- References

  [3] 7.2.2.9.3

- Initial Condition

  - The Lower Tester is a Firmware Distribution Server.

- Test Procedure

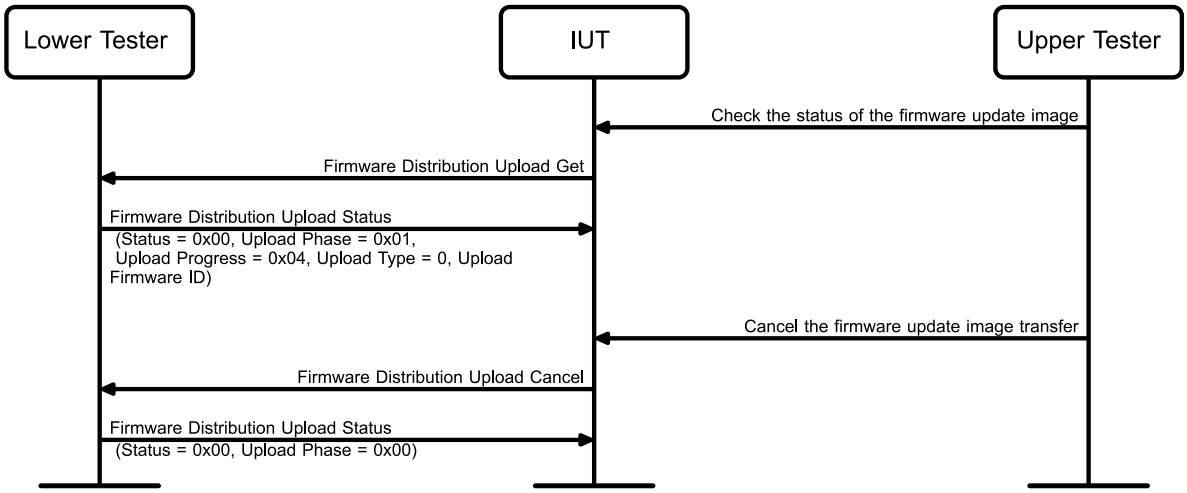

Figure 4.48: Test Procedure for DFUM/CL/FD/BV-05-C [Cancel Upload, IUT as Initiator]

1. The Upper Tester orders the IUT to check the status of the firmware update image to be distributed on the Lower Tester.
2. The IUT sends a Firmware Distribution Upload Get message to the Lower Tester.
3. The Lower Tester responds with a Firmware Distribution Upload Status message with Status set to 0x00 (Success), Upload Phase set to 0x01 (Transfer Active), Upload Progress set to 0x04, Upload Type set to 0 (In-band), and Upload Firmware ID set to a random value.
4. The Upper Tester orders the IUT to cancel the firmware update image transfer on the Lower Tester.
5. The IUT sends a Firmware Distribution Upload Cancel message to the Lower Tester.
6. The Lower Tester responds with a Firmware Distribution Upload Status message with Status set to 0x00 (Success), Upload Phase set to 0x00 (Idle).

- Expected Outcome

  Pass verdict

  The IUT sends a Firmware Distribution Get and a Firmware Distribution Upload Cancel message to the Lower Tester with the expected values.

DFUM/CL/FD/BV-06-C [Firmware List Procedure, IUT as Initiator]

- Test Purpose

  Verify that an IUT acting as a Firmware Distribution Client supporting the Initiator role can manage the information in the Firmware List state on a Distributor node acting as a Firmware Distribution Server.

- References

  [3] 7.2.2.10

- Initial Condition

  - FW ID is a random valid firmware identifier.
  - The Lower Tester is a Firmware Distribution Server.

- Test Procedure

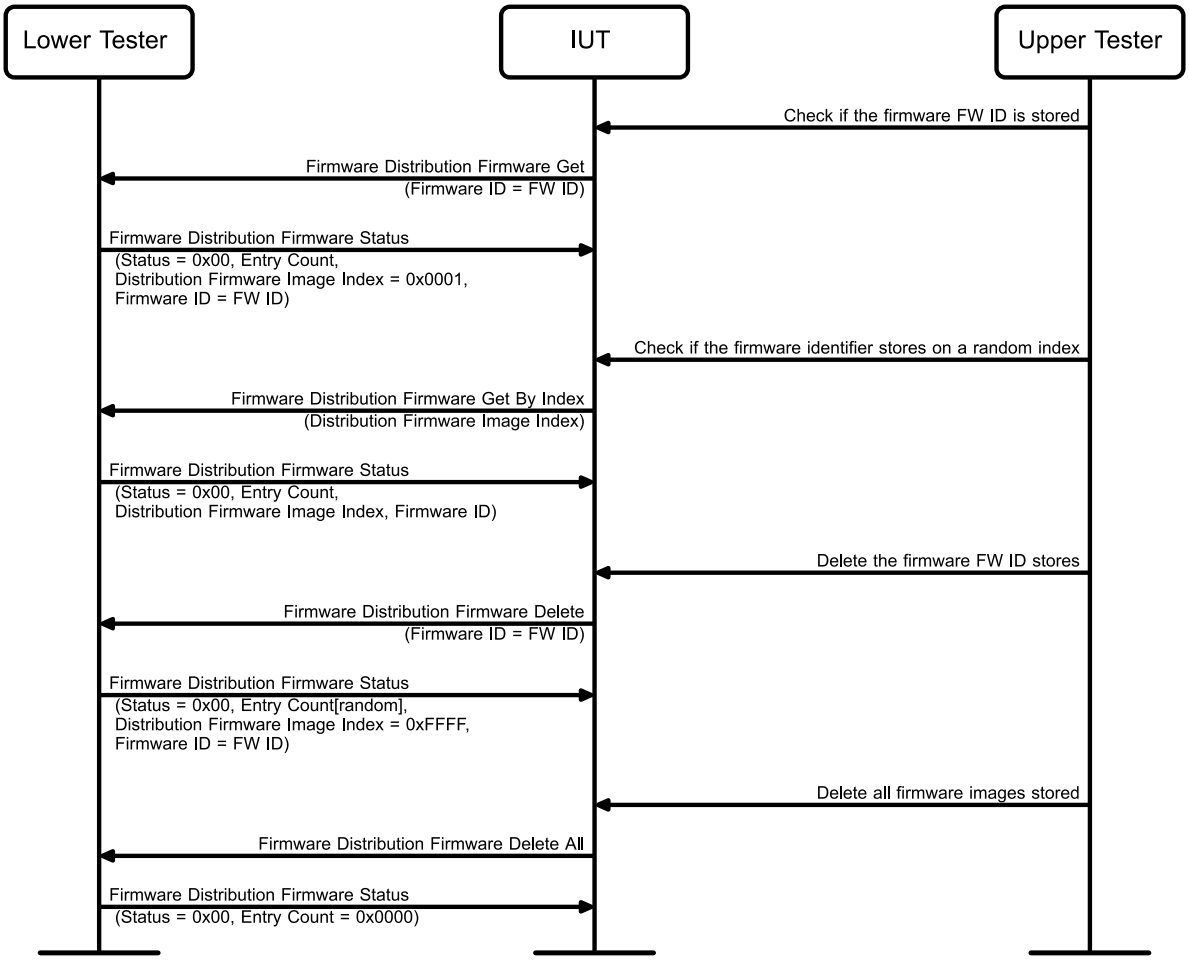

Figure 4.49: Test Procedure for DFUM/CL/FD/BV-06-C [Firmware List Procedure, IUT as Initiator]

1. The Upper Tester orders the IUT to check if the firmware FW ID is stored on the Lower Tester.
2. The IUT sends a Firmware Distribution Firmware Get message to the Lower Tester with Firmware ID set to FW ID.
3. The Lower Tester responds with a Firmware Distribution Firmware Status message with Status set to 0x00 (Success), Entry Count set to a random value, Distribution Firmware Image Index set to 0x0001 and Firmware ID.
4. The Upper Tester orders the IUT to check the firmware identifier stored on a random index on the Lower Tester.
5. The IUT sends a Firmware Distribution Firmware Get By Index message to the Lower Tester with Distribution Firmware Image Index set to the value from step 4.
6. The Lower Tester responds with a Firmware Distribution Firmware Status message with Status set to 0x00 (Success), Entry Count set to the value from step 3, Distribution Firmware Image Index set to the value from step 4, Firmware ID set to a random valid value.
7. The Upper Tester orders the IUT to delete the firmware FW ID stored on the Lower Tester.
8. The IUT sends a Firmware Distribution Firmware Delete message to the Lower Tester with Firmware ID set to FW ID.
9. The Lower Tester responds with a Firmware Distribution Firmware Status message with Status set to 0x00 (Success), Entry Count set to a random value, Distribution Firmware Image Index set to 0xFFFF and Firmware ID set to FW ID.
10. The Upper Tester orders the IUT to delete all the firmware images stored on the Lower Tester.
11. The IUT sends a Firmware Distribution Firmware Delete All message to the Lower Tester.
12. The Lower Tester responds with a Firmware Distribution Firmware Status message with Status set to 0x00 (Success), Entry Count set to 0x0000.

- Expected Outcome

  Pass verdict

  The IUT sends a Firmware Distribution Firmware Get, a Firmware Distribution Firmware Get By Index, a Firmware Distribution Firmware Delete and a Firmware Distribution Firmware Delete All message to the Lower Tester with the expected values. FW ID is a random valid firmware identifier.

DFUM/CL/FD/BV-07-C [Distribution Parameters Procedure, IUT as Initiator]

- Test Purpose

  Verify that the IUT acting as a Firmware Distribution Client can initiate the distribution on a remote node acting as a Firmware Distribution Server.

- References

  [3] 7.2.2.6

- Initial Condition

  - FW IDX is a random valid firmware image index.
  - The Lower Tester is a Firmware Distribution Server.

- Test Procedure

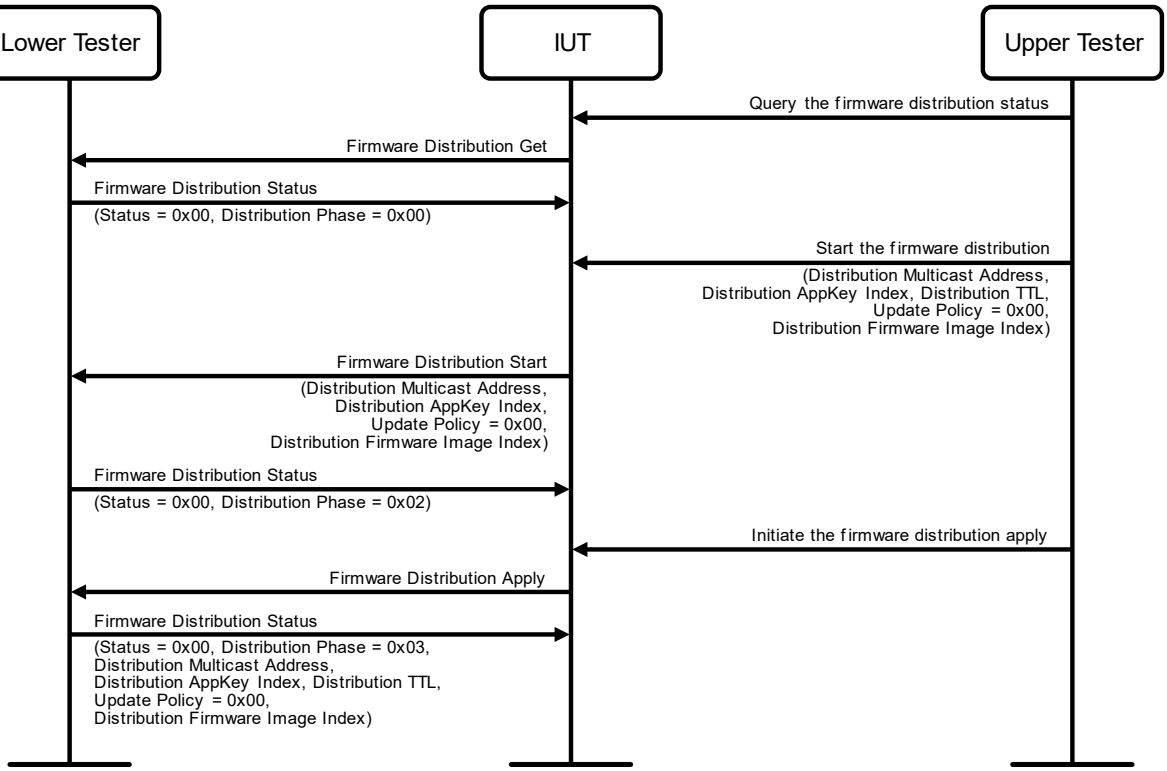

Figure 4.50: Test Procedure for DFUM/CL/FD/BV-07-C [Distribution Parameters Procedure, IUT as Initiator]

1. The Upper Tester orders the IUT to query the firmware distribution status on the Lower Tester.
2. The IUT sends a Firmware Distribution Get message to the Lower Tester.
3. The Lower Tester responds with a Firmware Distribution Status message with Status set to 0x00 (Success), Distribution Phase set to 0x00 (Idle).
4. The Upper Tester orders the IUT to start the firmware distribution on the Lower Tester with Distribution Multicast Address, Distribution AppKey Index, Distribution TTL set to random valid values, Update Policy set to 0x00 (Verify only), Distribution Firmware Image Index set to FW IDX.
5. The IUT sends a Firmware Distribution Start message with the Distribution Multicast Address, Distribution AppKey Index, Distribution TTL, Update Policy and Distribution Firmware Image Index set to the values from step 4. All RFU field bits are set to 0 (zero).
6. The Lower Tester responds with a Firmware Distribution Status message with Status set to 0x00 (Success), Distribution Phase set to 0x02 (Transfer Success).
7. The Upper Tester orders the IUT to initiate the firmware distribution apply on the Lower Tester.
8. The IUT sends a Firmware Distribution Apply message.
9. The Lower Tester responds with a Firmware Distribution Status message with Status set to 0x00 (Success), Distribution Phase set to 0x03 (Applying Update), Distribution Multicast Address, Distribution AppKey Index, Distribution TTL, Update Policy and Distribution Firmware Image Index set to the values from step 4.

- Expected Outcome

  Pass verdict

  The IUT sends a Firmware Distribution Get, a Firmware Distribution Start and a Firmware Distribution Apply message to the Lower Tester with the expected values.

DFUM/CL/FD/BV-08-C [Cancel Distribution, IUT as Initiator]

- Test Purpose

  Verify that the IUT acting as a Firmware Distribution Client can initiate the distribution on a remote node acting as a Firmware Distribution Server.

- References

  [3] 7.2.2.6.3

- Initial Condition

  - The Lower Tester is a Firmware Distribution Server.

- Test Procedure

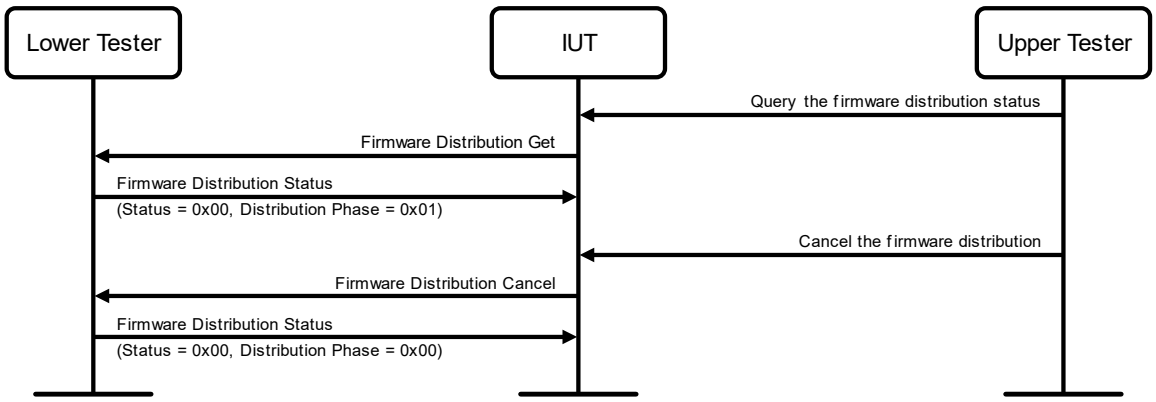

Figure 4.51: Test Procedure for DFUM/CL/FD/BV-08-C [Cancel Distribution, IUT as Initiator]

1. The Upper Tester orders the IUT to query the firmware distribution status on the Lower Tester.
2. The IUT sends a Firmware Distribution Get message to the Lower Tester.
3. The Lower Tester responds with a Firmware Distribution Status message with Status set to 0x00 (Success), Distribution Phase set to 0x01 (Transfer Active).
4. The Upper Tester orders the IUT to cancel the firmware distribution on the Lower Tester.
5. The IUT sends a Firmware Distribution Cancel message.
6. The Lower Tester responds with a Firmware Distribution Status message with Status set to 0x00 (Success), Distribution Phase set to 0x00 (Idle).

- Expected Outcome

  Pass verdict

  The IUT sends a Firmware Distribution Get and a Firmware Distribution Cancel message to the Lower Tester with the expected values.

DFUM/CL/FD/BV-09-C [Suspend and Resume Distribution, IUT as Initiator]

- Test Purpose

  Verify that the IUT acting as a Firmware Distribution Client can suspend and resume the distribution on a remote node acting as a Firmware Distribution Server.

- References

  [3] 7.2.2.6.6, 7.2.2.6.7

- Initial Condition
  - The Lower Tester is a Firmware Distribution Server and the Distribution Phase is Transfer Active.
- Test Procedure

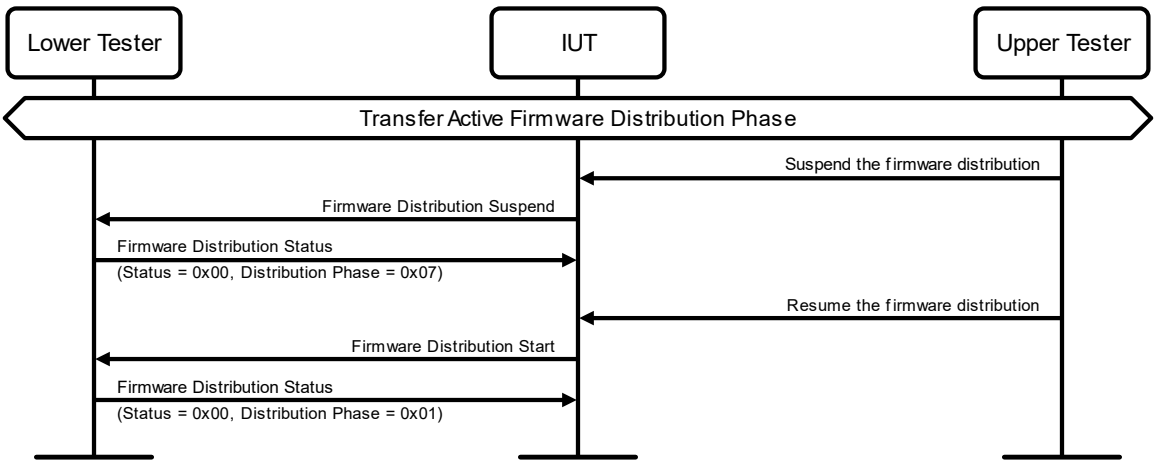

Figure 4.52: Test Procedure for DFUM/CL/FD/BV-09-C [Suspend and Resume Distribution, IUT as Initiator]

1. The Upper Tester orders the IUT to suspend the firmware distribution status on the Lower Tester.
2. The IUT sends a Firmware Distribution Suspend message to the Lower Tester.
3. The Lower Tester responds with a Firmware Distribution Status message with Status set to 0x00 (Success) and Distribution Phase set to 0x07 (Transfer Suspended).
4. The Upper Tester orders the IUT to resume the firmware distribution on the Lower Tester.
5. The IUT sends a Firmware Distribution Start message with the same field values that were used to start the distribution.
6. The Lower Tester responds with a Firmware Distribution Status message with Status set to 0x00 (Success) and Distribution Phase set to 0x01 (Transfer Active).

- Expected Outcome

  Pass verdict

  The IUT sends Firmware Distribution Suspend and Firmware Distribution Start messages to the Lower Tester with the correct parameters.

4.7 Firmware Update Client

DFUM/CL/FU/BV-01-C [Firmware Compatibility Check Procedure, IUT as Initiator]

- Test Purpose

  Verify that an IUT acting as a Firmware Update Client can validate the firmware on a Target node acting as a Firmware Update Server.

- References

  [3] 7.1.2.4

- Initial Condition
  - The metadata is defined in the IXIT [5] by TSPX_Incoming_Firmware_Metadata.

- FW ID is a random valid firmware identifier.
- The Lower Tester is a Firmware Update Server.

- Test Procedure

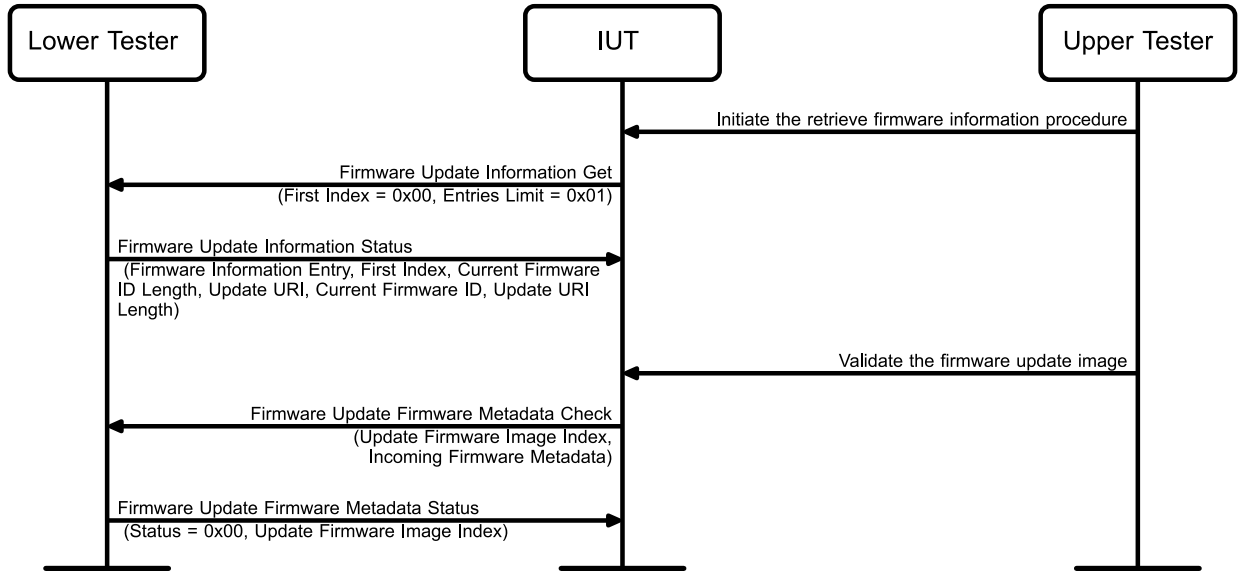

Figure 4.53: Test Procedure for DFUM/CL/FU/BV-01-C [Firmware Compatibility Check Procedure, IUT as Initiator]

1. The Upper Tester orders the IUT to initiate the retrieve firmware information procedure on the Lower Tester.
2. The IUT sends a Firmware Update Information Get message to the Lower Tester with First Index set to 0x00 and Entries Limit set to 0x01.
3. The Lower Tester responds with a Firmware Update Information Status message with only one Firmware Information Entry containing First Index, Update URI, and Current Firmware ID set to a random value, Update URI Length set to the length of the Update URI, Current Firmware ID Length set to the length of the Current Firmware ID.
4. The Upper Tester orders the IUT to validate the firmware update image on the Lower Tester.
5. The IUT sends a Firmware Update Firmware Metadata Check message to the Lower Tester with Incoming Firmware Metadata set to the values defined in the IXIT [5], Update Firmware Image Index set to FW ID.
6. The Lower Tester responds with a Firmware Update Firmware Metadata Status message with Status set to 0x00 (Success), Update Firmware Image Index set to FW ID.

- Expected Outcome

  Pass verdict

  The IUT sends a Firmware Update Firmware Metadata Check and a Firmware Update Information Get message to the Lower Tester with the expected values.

DFUM/CL/FU/BV-02-C [Update and Apply Firmware Procedures, IUT as Distributor]

- Test Purpose

  Verify that an IUT acting as a Firmware Update Client supporting the Distributor role can update the firmware on Target nodes acting as Firmware Update Servers.

- References

  [3] 7.1.2.5, 7.1.2.6

- Initial Condition

  - Lower Testers 1, 2, and 3 are Firmware Update Servers.
  - The firmware update image is defined in the IXIT [5] by TSPX_Initiator_Firmware_Image.
  - FW ID is a random valid firmware identifier.

- Test Procedure

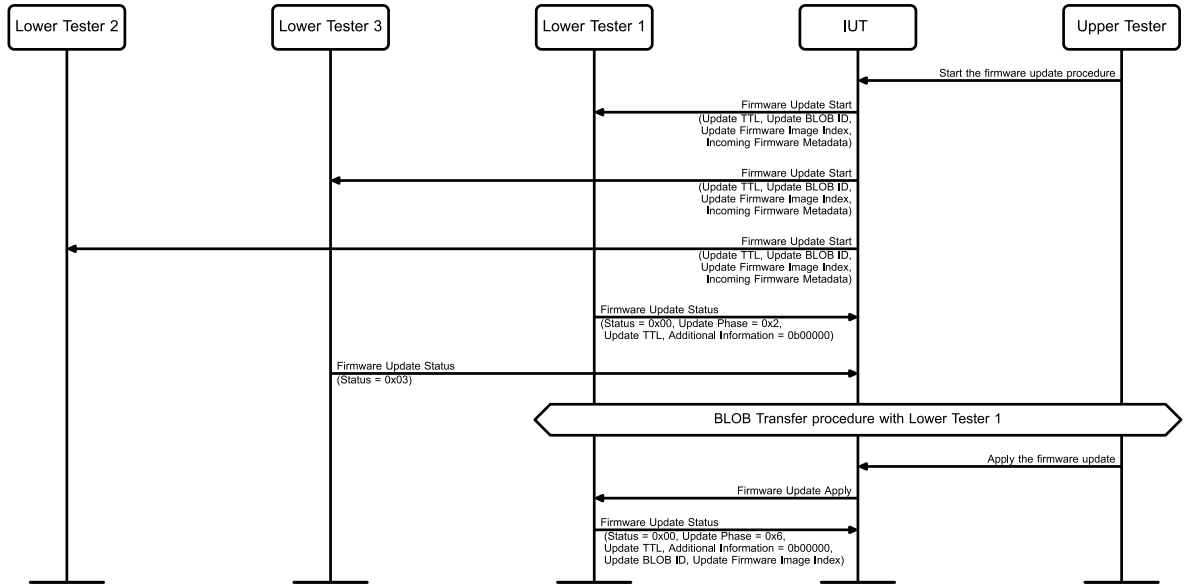

Figure 4.54: Test Procedure for DFUM/CL/FU/BV-02-C [Update and Apply Firmware Procedures, IUT as Distributor]

1. The Upper Tester orders the IUT to start the firmware update procedure on Lower Tester 1, Lower Tester 2, and Lower Tester 3.
2. The IUT sends a Firmware Update Start message to Lower Tester 1, Lower Tester 2 and Lower Tester 3 with Distribution AppKey Index, Update TTL and Update BLOB ID set to a random valid value,], Update Firmware Image Index set to FW ID, and Incoming Firmware Metadata set to the metadata defined in the IXIT [5].
3. The Lower Tester 1 responds with a Firmware Update Status message with Status set to 0x00 (Success), Update Phase set to 0x2 (Transfer Active), Update TTL, Additional Information set to 0b00000, Update Timeout Base, Update BLOB ID set to the values from step 2, and Update Firmware Image Index set to FW ID. Lower Tester 2 doesn't send any message.
4. The Lower Tester 3 responds with a Firmware Update Status message with Status set to 0x03 (Internal Error).
5. The IUT executes the Transfer BLOB Procedure with the Lower Tester 1 by running DFUM/CL/BT/BV-01-C [BLOB Transfer Procedure] with the BLOB set to the TSPX_Initiator_Firmware_Image and the Update BLOB ID set to the value from step 2.

6. The Upper Tester orders the IUT to apply the firmware update on the Lower Tester 1.
7. The IUT sends a Firmware Update Apply message to the Lower Tester 1.
8. The Lower Tester 1 responds with a Firmware Update Status message with Status set to 0x00 (Success), Update Phase set to 0x6 (Applying Update), Additional Information set to 0b00000, Update TTL and Update BLOB ID set to the values from step 2, Update Firmware Image Index set to FW ID.

- Expected Outcome

  Pass verdict

  The IUT sends a Firmware Update Start to Lower Tester 1, Lower Tester 2, and Lower Tester 3 and a Firmware Update Apply message to the Lower Tester 1 with the expected values.

  The IUT successfully transfers the firmware update image to Lower Tester 1.

  The IUT doesn't execute the BLOB Transfer Procedure with Lower Tester 2 and Lower Tester 3.

DFUM/CL/FU/BV-03-C [Cancel Firmware Update Procedures, IUT as Distributor]

- Test Purpose

  Verify that an IUT acting as a Firmware Update Client supporting the Distributor role can query the status and cancel a firmware update on a Target node acting as a Firmware Update Server.

- References

  [3] 7.1.2.7

- Initial Condition

  - The Lower Tester is a Firmware Update Server.

- Test Procedure

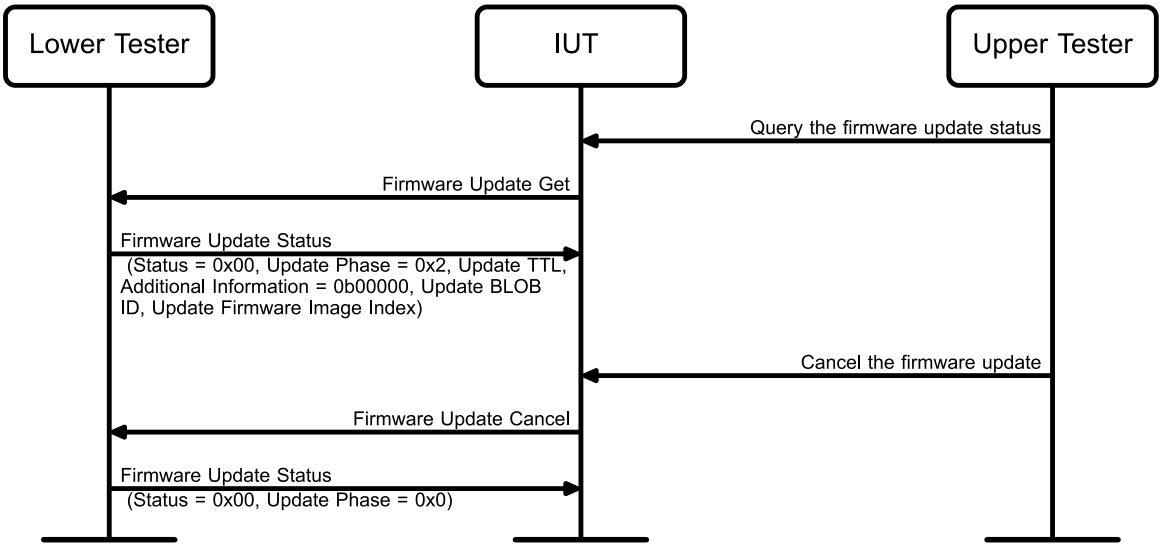

Figure 4.55: Test Procedure for DFUM/CL/FU/BV-03-C [Cancel Firmware Update Procedures, IUT as Distributor]

1. The Upper Tester orders the IUT to query the firmware update status on the Lower Tester.
2. The IUT sends a Firmware Update Get message to the Lower Tester.
3. The Lower Tester responds with a Firmware Update Status message with Status set to 0x00 (Success), Update Phase set to 0x2 (Transfer Active), Additional Information set to 0b00000, Update TTL, Update BLOB ID and Update Firmware Image Index set to random valid values.

4. The Upper Tester orders the IUT to cancel the firmware update on the Lower Tester.
5. The IUT sends a Firmware Update Cancel message to the Lower Tester.
6. The Lower Tester responds with a Firmware Update Status message with Status set to 0x00 (Success) and Update Phase set to 0x0 (Idle).

- Expected Outcome

  Pass verdict

  The IUT sends a Firmware Update Get and a Firmware Update Cancel message to the Lower Tester.

5 Test case mapping

The Test Case Mapping Table (TCMT) maps test cases to specific requirements in the ICS. The IUT is tested in all roles for which support is declared in the ICS document.

The columns for the TCMT are defined as follows:

Item: Contains a logical expression based on specific entries from the associated ICS document. Contains a logical expression (using the operators AND, OR, NOT as needed) based on specific entries from the applicable ICS document(s). The entries are in the form of y/x references, where y corresponds to the table number and x corresponds to the feature number as defined in the ICS document for the Mesh Device Firmware Update Model Specification [4].

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

Test Case(s): The applicable test case identifiers are required for Bluetooth Qualification if the corresponding y/x references defined in the Item column are supported. Further details about the function of the TCMT are elaborated in [2].

For the purpose and structure of the ICS/IXIT, refer to [2].

Item	Feature	Test Case(s)
DFUM 0/1	General Requirements	DFUM/SR-CL/GEN/BV-01-C
DFUM 3/2	Firmware Distribution Server	DFUM/SR/FD/BV-01-C DFUM/SR/FD/BV-02-C DFUM/SR/FD/BV-03-C DFUM/SR/FD/BV-04-C DFUM/SR/FD/BV-05-C DFUM/SR/FD/BV-06-C DFUM/SR/FD/BV-07-C DFUM/SR/FD/BV-08-C DFUM/SR/FD/BV-09-C DFUM/SR/FD/BV-10-C DFUM/SR/FD/BV-11-C DFUM/SR/FD/BV-12-C DFUM/SR/FD/BV-19-C DFUM/SR/FD/BV-20-C DFUM/SR/FD/BV-21-C DFUM/SR/FD/BV-22-C DFUM/SR/FD/BV-24-C DFUM/SR/FD/BV-25-C DFUM/SR/FD/BV-26-C DFUM/SR/FD/BV-27-C DFUM/SR/FD/BV-28-C DFUM/SR/FD/BV-29-C DFUM/SR/FD/BV-30-C DFUM/SR/FD/BV-31-C DFUM/SR/FD/BV-32-C DFUM/SR/FD/BV-33-C DFUM/SR/FD/BV-34-C DFUM/SR/FD/BV-37-C DFUM/SR/FD/BV-38-C

Item	Feature	Test Case(s)
		DFUM/SR/FD/BV-39-C DFUM/SR/FD/BV-40-C DFUM/SR/FD/BV-41-C DFUM/SR/FD/BV-42-C DFUM/SR/FD/BV-43-C DFUM/SR/FD/BV-45-C DFUM/SR/FD/BV-46-C DFUM/SR/FD/BV-47-C DFUM/SR/FD/BV-48-C DFUM/SR/FD/BV-49-C DFUM/SR/FD/BV-50-C DFUM/SR/FD/BV-36-C DFUM/SR/FD/BV-44-C DFUM/SR/FD/BV-51-C DFUM/SR/FD/BV-52-C DFUM/SR/FD/BV-53-C DFUM/SR/FD/BV-54-C DFUM/SR/FD/BV-55-C DFUM/SR/FD/BV-56-C DFUM/SR/FD/BV-57-C DFUM/SR/FD/BV-35-C
DFUM 22/1	Store Firmware OOB on the Distributor	DFUM/SR/FD/BV-13-C DFUM/SR/FD/BV-14-C DFUM/SR/FD/BV-15-C DFUM/SR/FD/BV-16-C DFUM/SR/FD/BV-17-C DFUM/SR/FD/BV-18-C
DFUM 22/3	Multiple Firmware Image Support on the Distributor	DFUM/SR/FD/BV-23-C
DFUM 22/2	Firmware Retrieval Over HTTPS by Distributor	DFUM/SR/FD/BV-58-C
DFUM 3/2 AND DFUM 3/1	Distributor Self-Update	DFUM/SR/FD/BV-59-C
DFUM 3/1	Firmware Update Server	DFUM/SR/FU/BV-01-C DFUM/SR/FU/BV-02-C DFUM/SR/FU/BV-03-C DFUM/SR/FU/BV-04-C DFUM/SR/FU/BV-05-C DFUM/SR/FU/BV-06-C DFUM/SR/FU/BV-07-C DFUM/SR/FU/BV-08-C DFUM/SR/FU/BV-09-C DFUM/SR/FU/BV-10-C DFUM/SR/FU/BV-11-C DFUM/SR/FU/BV-12-C DFUM/SR/FU/BV-13-C DFUM/SR/FU/BV-14-C DFUM/SR/FU/BV-15-C

Item	Feature	Test Case(s)
		DFUM/SR/FU/BV-16-C DFUM/SR/FU/BV-17-C DFUM/SR/FU/BV-18-C DFUM/SR/FU/BV-19-C DFUM/SR/FU/BV-20-C DFUM/SR/FU/BV-21-C DFUM/SR/FU/BV-22-C DFUM/SR/FU/BV-23-C DFUM/SR/FU/BV-24-C
DFUM 3/4	Firmware Distribution Client	DFUM/CL/FD/BV-01-C DFUM/CL/FD/BV-02-C DFUM/CL/FD/BV-03-C DFUM/CL/FD/BV-05-C DFUM/CL/FD/BV-06-C DFUM/CL/FD/BV-07-C DFUM/CL/FD/BV-08-C DFUM/CL/FD/BV-09-C
DFUM 41/1	Upload Firmware OOB procedure	DFUM/CL/FD/BV-04-C
DFUM 3/3	Firmware Update Client	DFUM/CL/FU/BV-01-C DFUM/CL/FU/BV-02-C DFUM/CL/FU/BV-03-C

Table 5.1: Test case mapping

6 Revision history and acknowledgments

Revision History

Publication Number	Revision Number	Date	Comments
0	p0	2023-09-19	Approved by BTI on 2023-08-27. MBT v1.0 adopted by the BoD on 2023-09-12. Prepared for initial publication.
	p1r00–r03	2024-02-02 – 2024-03-27	TSE 23992 (rating 2): Updated step 2 in the preamble procedure for Section 4.2.11, IUT as Firmware Update Server in Idle Update Phase. TSE 24279 (rating 3): Updated the test procedure for DFU/SR-CL/GEN/BV-01-C. TSE 24287 (rating 2): Updated instances of “HTTP” to “HTTPS” in the description for test case DFU/SR/FD/BV-58-C and the expected outcome for DFU/SR/FU/BV-01-C. TSE 25133 (rating 1): Updated all instances of “DFU” to “DFUM” to reflect that the Mesh Device Firmware Update spec is a model spec. TSE 25134 (rating 1): Updated all instances of “MBT” to “MBTM” to reflect that the Mesh Device Firmware Update spec is a model spec. Performed editorial work to align with the current TS template, including updates to the introductory text in the References and Test case mapping sections and the figure captions for multi-page MSC generation.
1	p1	2024-07-01	Approved by BTI on 2024-04-18. Prepared for TCRL 2024-1 publication.

Acknowledgments

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