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ZigBee Cluster Library OTA Cluster (0x0019) Test Specification Version 0.9

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Abstract This document describes the certification tests for devices
which implement the ZCL OTA cluster.

Keywords ZCL, OTA, cluster

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Revision history

Revision	Date	Details	Editor
000	July 13 th , 2016	Created from OTA test specification.	Phil Jamieson
001	July 13 th , 2016	Updated with the document number.	Phil Jamieson
002	April 19 th , 2017	Added a new PICS item (OUPC12) for downgrading (see CCB #2342) and incorporated it in test case OTA-TC-06C.	Phil Jamieson
003	May 9 th , 2017	Changed OTA-TC-06C so that update end request is sent with a status of ABORT is the client cannot accept the downgrade.	Phil Jamieson
004	August 4 th , 2017	Modified test case OTA-TC-10C in line with CCB #2073 and OTA-TC-13C in line with CCB #2072.	Phil Jamieson
005	October 6 th , 2017	Addressed CCBs #2456, #2457 & #2458.	Phil Jamieson
006	October 24 th , 2017	Addressed CCBs #2398 & #2448.	Phil Jamieson
007	December 15 th , 2017	Addressed CCB #2506.	Phil Jamieson

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1 Introduction

This document contains the PICS, test specification and PICS/test case cross reference for the ZCL *OTA* cluster.

1.1 Conformance levels

The key words "SHALL", "SHALL NOT", "SHOULD", "SHOULD NOT", "RECOMMENDED" and "MAY" in this document are to be interpreted as described in [R4].

2 References

2.1 ZigBee Alliance documents

- [R1] ZigBee Core Specification, ZigBee Alliance document 05-3474.
- [R2] ZigBee Cluster Library Specification, ZigBee Alliance document 07-5123.
- [R3] ZCL OTA Cluster XML PICS, ZigBee Alliance document 16-02822.

2.2 IETF documents

- [R4] S. Bradner, Key words for use in RFCs to Indicate Requirement Levels, IETF RFC 2119, March 1997.

3 PICS

All references are for the ZigBee Cluster Library specification [R1] unless otherwise indicated.
An XML version of these PICS is also available in [R3].

Where legacy PICS items have been changed to match the ZigBee 3.0 format, the old item is shown in red in parenthesis for completeness, e.g. (*OUDC1*).

3.1 General

3.1.1 ZigBee device type

Item number	Feature	Reference	Status	Support
ZDC1	Is the device capable of acting as a ZigBee Coordinator (ZC) or a ZigBee Router (ZR)?	[R1]	O	No

3.1.2 OTA upgrade image

Item number	Feature	Reference	Status	Support
OUI1	Is the OTA upgrade file format supported?	11.4	M	Yes
OUI2a	Is the OTA upgrade file format supported with the ECDSA Crypto Suite 1 signature tag?	11.4.6	O	No
OUI2b	Is the OTA upgrade file format supported with the ECDSA Crypto Suite 2 signature tag?	11.4.9	O	No

3.1.3 Usage

Item number	Feature	Reference	Status	Support
OTA.S (<i>OUDC1</i>)	Does the device implement the <i>OTA</i> cluster as a server?	11.8.1	O	No
OTA.C (<i>OUDC2</i>)	Does the device implement the <i>OTA</i> cluster as a client?	11.8.1	O	Yes

3.2 Server

3.2.1 Attributes

Item number	Feature	Reference	Status	Support
OTA.S.Afffd	Does the device implement the <i>ClusterRevision</i> global attribute?	Table 2-1, 2.3.5.1.1	OTA.S: M	Yes/No
OTA.S.Afffe	Does the device implement the <i>AttributeReportingStatus</i> global attribute?	Table 2-1, 2.3.5.1.2	OTA.S: O	Yes/No

3.2.2 Commands received

Item number	Feature	Reference	Status	Support
OTA.S.C01.Rsp (OIMPS1)	Does the device implement receiving the <i>Query Next Image Request</i> command?	Table 11.14, 11.13.4	OTA.S: M	Yes/No
OTA.S.C03.Rsp (OIMPS2)	Does the device implement receiving the <i>Image Block Request</i> command?	Table 11.14, 11.13.6	OTA.S: M	Yes/No
OTA.S.C04.Rsp (OIMPS4)	Does the device implement receiving the <i>Image page Request</i> command?	Table 11.14, 11.13.7	OTA.S: O	Yes/No
OTA.S.C06.Rsp (OIMPS3)	Does the device implement receiving the <i>Update End Request</i> command?	Table 11.14, 11.13.9	OTA.S: M	Yes/No
OTA.S.C08.Rsp (OIMPS5)	Does the device implement receiving the <i>Query Device Specific File Request</i> command?	Table 11.14, 11.13.10	OTA.S: O	Yes/No

3.2.3 Commands generated

Item number	Feature	Reference	Status	Support
OTA.S.C00.Tx (OOMTS1)	Does the device implement sending the <i>Image Notify</i> command?	Table 11.14, 11.13.3	OTA.S: O	Yes/No
OTA.S.C02.Tx (OOMTS2)	Does the device implement sending the <i>Query Next Image Response</i> command?	Table 11.14, 11.13.5	OTA.S: M	Yes/No
OTA.S.C05.Tx (OOMTS3)	Does the device implement sending the <i>Image Block Response</i> command?	Table 11.14, 11.13.8	OTA.S: M	Yes/No

Item number	Feature	Reference	Status	Support
OTA.S.C07.Tx (OOMTS4)	Does the device implement sending the <i>Upgrade End Response</i> command?	Table 11.14, 11.13.9.6	OTA.S: M	Yes/No
OTA.S.C09.Tx (OOMTS5)	Does the device implement sending the <i>Query Device Specific File Response</i> command?	Table 11.14, 11.13.11	OTA.S: O	Yes/No
OOMTS6	Does the device send all supported OTA messages using APS encryption (except broadcast messages)?		OTA.S: O	Yes/No

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149 **3.2.4 OTA upgrade policies**

Item number	Feature	Reference	Status	Support
OUPS1	Does the server support responding to a Query Next Image Request with a response that has a version number higher than in the request (upgrade)?	11.13.5	OTA.S: M	Yes/No
OUPS2	Does the server support responding to a Query Next Image Request with a response that has a version number lower than in the request (downgrade)?	11.13.5	OTA.S: O	Yes/No
OUPS3	Does the server support responding to a Query Next Image Request with a response that has a version number the same as in the request (re-install)?	11.13.5	OTA.S: O	Yes/No
OUPS4	Does the server support sending a Default Response with status of NO_IMAGE_AVAILABLE when it receives an Image Block Request for a file that it does not have?	11.13.6.5.2	OTA.S: M	Yes/No
OUPS5	Does the server support the Rate Limiting feature	11.15.3	OUDC2: O	Yes/No

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151 **3.2.5 Image notify payload types**

Item number	Feature	Reference	Status	Support
INPT01	Does the server support sending an Image Notify command frame with a payload type of 0x01 (Query jitter and manufacturer code)?	11.13.3.2.1	OTA.S: O	Yes/No

Item number	Feature	Reference	Status	Support
INPT02	Does the server support sending an Image Notify command frame with a payload type of 0x02 (Query jitter, manufacturer code and image type)?	11.13.3.2.1	OTA.S: O	Yes/No
INPT03	Does the server support sending an Image Notify command frame with a payload type of 0x03 (Query jitter, manufacturer code, image type and new file version)?	11.13.3.2.1	OTA.S: O	Yes/No

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153 **3.3 Client**154 **3.3.1 Attributes**

Item number	Feature	Reference	Status	Support
OTA.C.A0000 (OUA1)	Does the device implement the <i>UpgradeServerID</i> attribute?	Table 11.10, 11.10.1	OTA.C: M	Yes
OTA.C.A0001 (OUA2)	Does the device implement the <i>FileOffset</i> attribute?	Table 11.10, 11.10.2	OTA.C: O	No
OTA.C.A0002 (OUA3)	Does the device implement the <i>CurrentFileVersion</i> attribute?	Table 11.10, 11.10.3	OTA.C: O	No
OTA.C.A0003 (OUA4)	Does the device implement the <i>CurrentZigBeeStackVersion</i> attribute?	Table 11.10, 11.10.4	OTA.C: O	No
OTA.C.A0004 (OUA5)	Does the device implement the <i>DownloadedFileVersion</i> attribute?	Table 11.10, 11.10.5	OTA.C: O	No
OTA.C.A0005 (OUA6)	Does the device implement the <i>DownloadedZigBeeStackVersion</i> attribute?	Table 11.10, 11.10.6	OTA.C: O	No
OTA.C.A0006 (OUA7)	Does the device implement the <i>ImageUpgradeStatus</i> attribute?	Table 11.10, 11.10.7	OTA.C: M	Yes
OTA.C.A0007 (OUA8)	Does the device implement the <i>ManufacturerID</i> attribute?	Table 11.10, 11.10.8	OTA.C: O	No
OTA.C.A0008 (OUA9)	Does the device implement the <i>ImageTypeID</i> attribute?	Table 11.10, 11.10.9	OTA.C: O	No

Item number	Feature	Reference	Status	Support
OTA.C.A0009 (OUI10)	Does the device implement the <i>MinimumBlockPeriod</i> attribute?	Table 11.10, 11.10.10	OTA.C: O	No
OTA.C.A000a (OUI11)	Does the device implement the <i>ImageStamp</i> attribute?	Table 11.10, 11.10.11	OTA.C: O	No
OTA.C.A000b (OUI12)	Does the device implement the <i>UpgradeActivationPolicy</i> attribute?	Table 11.10, 11.10.12	OTA.C: O	No
OTA.C.A000c (OUI13)	Does the device implement the <i>UpgradeTimeoutPolicy</i> attribute?	Table 11.10, 11.10.13	OTA.C: O	No
OTA.C.Afffd	Does the device implement the <i>ClusterRevision</i> global attribute?	Table 2-1, 2.3.5.1.1	OTA.C: M	Yes
OTA.C.Afffe	Does the device implement the <i>AttributeReportingStatus</i> global attribute?	Table 2-1, 2.3.5.1.2	OTA.C: O	No

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157 3.3.2 Commands received

Item number	Feature	Reference	Status	Support
OTA.C.C00.Rsp (OIMPC1)	Does the device implement receiving the <i>Image Notify</i> command?	Table 11.14, 11.13.3	OTA.C: O	Yes
OTA.C.C02.Rsp (OIMPC2)	Does the device implement receiving the <i>Query Next Image Response</i> command?	Table 11.14, 11.13.5	OTA.C: M	Yes
OTA.C.C05.Rsp (OIMPC3)	Does the device implement receiving the <i>Image Block Response</i> command?	Table 11.14, 11.13.8	OTA.C: M	Yes
OTA.C.C07.Rsp (OIMPC4)	Does the device implement receiving the <i>Update End Response</i> command?	Table 11.14, 11.13.9.6	OTA.C: M	Yes
OTA.C.C09.Rsp (OIMPC5)	Does the device implement receiving the <i>Query Device Specific File Response</i> command?	Table 11.14, 11.13.11	OTA.C: O	No

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159 **3.3.3 Commands generated**

Item number	Feature	Reference	Status	Support
OTA.C.C01.Tx (OOMTC1)	Does the device implement sending the <i>Query Next Image Request</i> command?	Table 11.14, 11.13.4	OTA.C: M	Yes
OTA.C.C03.Tx (OOMTC2)	Does the device implement sending the <i>Image Block Request</i> command?	Table 11.14, 11.13.6	OTA.C: M	Yes
OTA.C.C04.Tx (OOMTC4)	Does the device implement sending the <i>Image Page Request</i> command?	Table 11.14, 11.13.7	OTA.C: O	No
OTA.C.C06.Tx (OOMTC3)	Does the device implement sending the <i>Upgrade End Request</i> command?	Table 11.14, 11.13.9	OTA.C: M	Yes
OTA.C.C08.Tx (OOMTC5)	Does the device implement sending the <i>Query Device Specific File Request</i> command?	Table 11.14, 11.13.10	OTA.C: O	No
OOMTC6	Does the device send all supported OTA messages using APS encryption (except broadcast messages)?		OTA.C: O	No

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161 **3.3.4 OTA upgrade policies**

Item number	Feature	Reference	Status	Support
OUPC0a	Does the device support an in-band mechanism for image activation	11.10.12	OTA.C: O.2	Yes
OUPC0b	Does the device support an out-of-scope mechanism for image activation	11.10.12	OTA.C: O.2	No
OUPC1	Does the device support cryptographic verification of images signed using ECDSA?		OTA.C: O	No
OUPC2	Does the device support aborting an active download on reception of an Image Block Response with a status of ABORT?	11.13.8	OTA.C: M	Yes
OUPC3	Does the device support an abort after a file has been downloaded on reception of a Default Response with a status of ABORT in response to an Upgrade End Request?	11.13.9.4	OTA.C: M	Yes
OUPC4	Does the device support processing an Image Block Response with a status of WAIT_FOR_DATA?	11.13.8.4	OTA.C: M	Yes

Item number	Feature	Reference	Status	Support
OUPC5	Does the device support sending REQUIRE_MORE_IMAGE in the Upgrade End Request after it has finished a download (i.e. does it require multiple images to upgrade)?	11.13.9.3	OTA.C: O	No
OUPC6	Does the device support a time delayed upgrade sent back from the server in the Upgrade End Response message?	11.13.9.6.8	OUPC0a: O	No
OUPC7	Does the device support waiting for a separate Upgrade End response command from the OTA server at a later time? (i.e. the server initially sends an Upgrade End Response with a UpgradeTime value of 0xFFFFFFFF and later sends an Upgrade End Response with a UpgradeTime value other than 0xFFFFFFFF)	11.11.4	OUPC0a: O	No
OUPC8	Does the device always respond to a unicast Image Notification message from the OTA server?	11.13.3.4	(ZDC1 & OTA.C): M	Yes
OUPC9	Does the device support periodic discovery of an OTA server if it has not found one previous in the network, at a rate of at least once per day?		OTA.C: O	Yes
OUPC10	Does the device support periodic query for a new upgrade image at a rate of at least once per day?		OTA.C: O	Yes
OUPC11	Does the device support sending new Image Block Request commands when it is downloading a new image at a rate of at least once per hour?		OTA.C: O	Yes
OUPC12	Does the device accept images with a lower version number (downgrade)?		OTA.C: O	No

Notes:

O.2 A device SHALL support OUPC0a or OUPC0b.

4 Test specification

4.1 Introduction

4.1.1 Test case overview

The following test cases are available for the *OTA* cluster:

Test ID	Description	Reference
Global tests		
OTA-TC-01G	Global attributes	4.2.1
Client side tests		
OTA-TC-01C	Attributes with client as DUT	4.3.1
OTA-TC-02C	Unknown upgrade server	4.3.2
OTA-TC-03C	Query upgrade server when no image is available	4.3.3
OTA-TC-04C	Image notification with matching parameters	4.3.4
OTA-TC-05C	Simple download (upgrade)	4.3.5
OTA-TC-06C	Simple download (downgrade)	4.3.6
OTA-TC-07C	File download with immediate upgrade	4.3.7
OTA-TC-08C	Simple download with delayed upgrade	4.3.8
OTA-TC-09C	Simple download with wait for run upgrade command	4.3.9
OTA-TC-10C	Cryptographically invalid file	4.3.10
OTA-TC-11C	Require more image	4.3.11
OTA-TC-12C	Wait for data	4.3.12
OTA-TC-13C	Aborted download	4.3.13
OTA-TC-14C	Aborted upgrade	4.3.14
OTA-TC-15C	Image page request	4.3.15
OTA-TC-16C	Device specific upgrade files	4.3.16
OTA-TC-17C	Rate limiting	4.3.17
Server side tests		
OTA-TC-01S	Query upgrade server when no image is available	4.4.1
OTA-TC-02S	Image notification with matching parameters	4.4.2
OTA-TC-03S	Simple download (upgrade)	4.4.3
OTA-TC-04S	File download with immediate upgrade	4.4.4
OTA-TC-05S	Simple download with wait for run upgrade command	4.4.5
OTA-TC-06S	Simple download with out-of-scope activation	4.4.6

Test ID	Description	Reference
OTA-TC-07S	Missing file	4.4.7
OTA-TC-08S	Image page request	4.4.8
OTA-TC-09S	Device specific upgrade files	4.4.9
OTA-TC-10S	Rate limiting	4.4.10

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170 4.1.2 Testing tolerances

171 In test cases where a change in an attribute value is tested over time, it is permitted for the
 172 devices involved in the test to be within a tolerance of $\pm 15\%$ of the expected value. As such,
 173 these test cases indicate that the attribute value must be approximately equal to an expected
 174 value, to which the $\pm 15\%$ tolerance should then be applied. All other attribute values presented
 175 are expected to be exact.

176 4.1.3 Test steps manipulating attributes

177 In test case steps that require more than one attribute to be manipulated (e.g. read), the tester
 178 may decide whether it is appropriate or practical to send a single attribute manipulation
 179 command, containing multiple attributes, or multiple attribute manipulation commands, each
 180 containing a single attribute. The test case is designed to verify the behavior of the device
 181 supporting the attribute rather than verifying the attribute manipulation command in question.

182 4.1.4 Upgrade Files

183 In order to facilitate testing there are two main considerations with regard to the upgrade files.

184 4.1.4.1 NULL Upgrade Files

185 All devices shall be able to handle a NULL upgrade file. A NULL upgrade is a valid OTA file
 186 that has an image body without any real upgrade data inside of it. The image data contained
 187 inside may be considered invalid and should not be parsed by the manufacturer specific
 188 bootloader.

189 The NULL file is used for testing only. It decreases the testing time since these smaller files
 190 do not require as much time to download. Devices do not have to act upon the image data
 191 within the NULL file but they are required to act upon all fields in the OTA header
 192 accordingly.

193 A device that performs a “run upgrade” using the NULL file does not have to do anything. It
 194 can continue operating in the network without a reset, and it does not need to change the
 195 *CurrentFileVersion* attribute with the version contained in the NULL upgrade file.

196 Devices must be able to download NULL upgrade files but do not need to act on them. After
 197 successfully completing the download of a NULL file, a device must send back an Upgrade
 198 End request command. The status value of the command may be either SUCCESS or
 199 INVALID_IMAGE.

4.1.4.2 Manufacturer Specific Upgrade file

In order to facilitate testing all devices must provide a manufacturer specific file that contains an actual upgrade image that the device under test can run. That image must contain a version number different than the version number of the software under test.

4.1.5 Polling

In the case of battery-powered ZigBee end devices that poll infrequently and are otherwise inaccessible, device manufacturers shall employ a mode in which those devices execute a MAC data poll more frequently than would normally be expected in order to support timely execution of test cases. This poll timing shall be 2-3 seconds.

4.1.6 Query and Download Rates

The profile specification normally specifies the rates at which the OTA client shall send query request commands and how often it will send image block requests. However for the purposes of testing the rates must be fast enough to allow tests to complete in a reasonable amount of time. Therefore the test specification will take precedence over the values in the profile as follows:

- The rate of the query next image request shall be once every 5 minutes.
- The rate for sending an image block request after receiving a successful image block response shall be less than 250 ms.

4.2 Generic test cases

4.2.1 OTA-TC-01G: Global attributes

This test case verifies the behavior of the global attributes of the *OTA* cluster client and server.

In this test, the PICS notation *OTA.S.Agm* and *OTA.C.Agm* represents the list of global attributes that are specified as being mandatory for either the server or client, respectively. Similarly, the PICS notation *OTA.S.Ago* and *OTA.C.Ago* represents the list of global attributes that are specified as being optional for either the server or client, respectively.

4.2.1.1 Scope

General:

- *Read attributes* command (0x00)
- *Read attributes response* command (0x01)
- *Write attributes* command (0x02)
- *Write attributes response* command (0x04)



OTA cluster (0x0019):

- All global attributes

PICS:

- *OTA.S*, *OTA.C*
- *OTA.S.Agm*, *OTA.C.Agm*, *OTA.S.Ago*, *OTA.C.Ago*

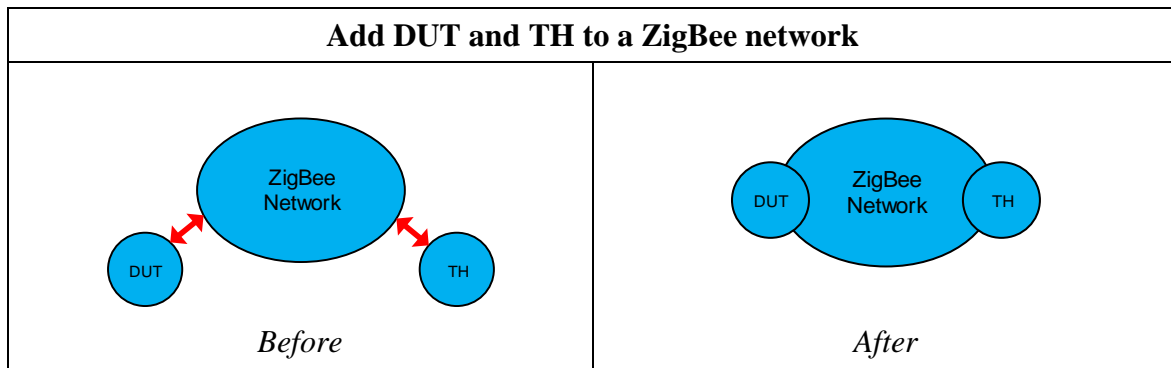
4.2.1.2 Required devices

Designation	Symbol	Description
DUT		Device under test implementing: <ul style="list-style-type: none"> • The <i>OTA</i> cluster server or client.
TH		Test harness implementing: <ul style="list-style-type: none"> • The <i>OTA</i> cluster client or server, i.e. the opposite cluster instantiation as implemented on the DUT.

4.2.1.3 Initial conditions

Item	Initial Conditions
1	A packet sniffer shall be observing the communication over the air interface.
2	All devices are factory new and powered off until used.

4.2.1.4 Test preparation



OTA-TC-01G: Global attributes		
Item	Preparation Step	Observation
P1	Form a ZigBee network.	Observe appropriate command frame to form the network.
P2	Power on TH and DUT.	TH and DUT are powered on.
P3	Join TH and DUT to a ZigBee network.	Observe appropriate communication between TH, DUT and any other relevant node on the ZigBee network.

--- End of test case OTA-TC-01G preparation ---

244 **4.2.1.5 Test procedure**

OTA-TC-01G: Global attributes			
Item	PICS	Test Harness Step	DUT pass Verification
1	OTA.S.Agm, OTA.C.Agm	TH unicasts a ZCL <i>read attributes</i> command frame to DUT to read each mandatory global attribute of this cluster one at a time.	DUT unicasts a ZCL <i>read attributes response</i> command frame to TH containing each requested attribute. The data type in each command must match the value listed in the specification(s). The data value in each command for the attribute must fall within the valid range described in the specification(s).
2a	OTA.S.Agm, OTA.C.Agm	TH unicasts a ZCL <i>write attributes</i> command frame to DUT to write the respective default value to each mandatory global attribute of this cluster one at a time.	DUT unicasts a ZCL <i>write attributes response</i> command frame to TH for each attribute. If the access control of DUT is set to READ, the DUT response will indicate that the attribute write command was not a SUCCESS. If the access control of DUT is set to READ/WRITE, the DUT response will indicate that the write command was a SUCCESS.
2b	OTA.S.Agm, OTA.C.Agm	TH unicasts a ZCL <i>read attributes</i> command frame to DUT to read back each attribute written in step 2a.	DUT unicasts a ZCL <i>read attributes response</i> command frame to TH containing the requested attribute. If the <i>Status</i> field of the <i>write attributes response</i> command frame was equal to SUCCESS, the updated value is read back. If the <i>Status</i> field of the <i>write attributes response</i> command frame was not equal to SUCCESS the value is not updated when read back.

Continued...

OTA-TC-01G: Global attributes			
Item	PICS	Test Harness Step	DUT pass Verification
3	OTA.S.Ago, OTA.C.Ago	TH unicasts a ZCL <i>read attributes</i> command frame to DUT to read each optional global attribute of this cluster one at a time.	DUT unicasts a ZCL <i>read attributes response</i> command frame to TH containing each attribute. If the DUT implements the attribute, the <i>Status</i> field will be equal to SUCCESS and the command will contain the requested attribute. If the DUT does not implement the attribute, the <i>Status</i> field will not be equal to SUCCESS. The data type in each command must match the value listed in the specification(s). The data value in each command for the attribute must fall within the valid range described in the specification(s).
4a	OTA.S.Ago, OTA.C.Ago	TH unicasts a ZCL <i>write attributes</i> command frame to DUT to write the respective default value to each optional global attribute of this cluster one at a time.	DUT unicasts a ZCL <i>write attributes response</i> command frame to TH for each attribute. If the attribute is not implemented or the access control of DUT is set to READ, the DUT response will indicate that the attribute write command was not a SUCCESS. If the attribute is implemented and the access control of DUT is set to READ/WRITE, the DUT response will indicate that the write command was a SUCCESS.
4b	OTA.S.Ago, OTA.C.Ago	TH unicasts a ZCL <i>read attributes</i> command frame to DUT to read back each attribute written in step 4a.	DUT unicasts a ZCL <i>read attributes response</i> command frame to TH containing the requested attribute. If the <i>Status</i> field of the <i>write attributes response</i> command frame was equal to SUCCESS, the updated value is read back. If the <i>Status</i> field of the <i>write attributes response</i> command frame was not equal to SUCCESS the value is not updated when read back.

--- End of test case OTA-TC-01G ---

4.3 Client test cases

4.3.1 OTA-TC-01C: Attributes with client as DUT

This test case verifies the behavior of the attributes of the *OTA* cluster client.

In this test, the PICS notation *OTA.C.Am* represents the list of non-global attributes that are specified as being mandatory. Similarly, the PICS notation *OTA.C.Ao* represents the list of non-global attributes that are specified as being optional.

4.3.1.1 Scope

General:

- *Read attributes* command (0x00)
- *Read attributes response* command (0x01)
- *Write attributes* command (0x02)
- *Write attributes response* command (0x04)



OTA cluster (0x0019):

- All non-global attributes

PICS:

- *OTA.C*,
- *OTA.C.Am*, *OTA.C.Ao*

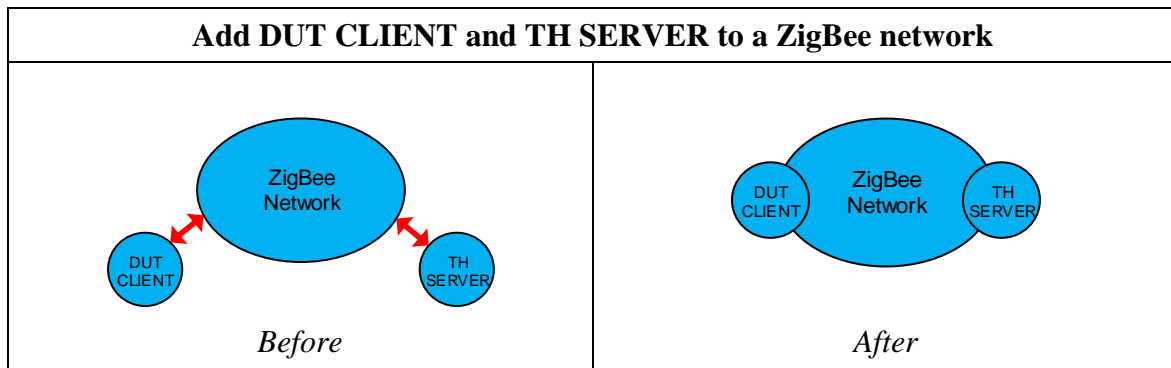
4.3.1.2 Required devices

Designation	Symbol	Description
DUT CLIENT		Device under test client implementing: <ul style="list-style-type: none"> • The <i>OTA</i> cluster client.
TH SERVER		Test harness server implementing: <ul style="list-style-type: none"> • The <i>OTA</i> cluster server.

4.3.1.3 Initial conditions

Item	Initial Conditions
1	A packet sniffer shall be observing the communication over the air interface.
2	All devices are factory new and powered off until used.

4.3.1.4 Test preparation



OTA-TC-01C: Attributes with client as DUT		
Item	Preparation Step	Observation
P1	Form a ZigBee network.	Observe appropriate command frame to form the network.
P2	Power on TH SERVER and DUT CLIENT.	TH SERVER and DUT CLIENT are powered on.
P3	Join TH SERVER and DUT CLIENT to a ZigBee network.	Observe appropriate communication between TH SERVER, DUT CLIENT and any other relevant node on the ZigBee network.

--- End of test case OTA-TC-01C preparation ---

272 **4.3.1.5 Test procedure**

OTA-TC-01C: Attributes with client as DUT			
Item	PICS	Test Harness Step	DUT pass Verification
1	OTA.C.Am	TH SERVER unicasts a ZCL <i>read attributes</i> command frame to DUT CLIENT to read each mandatory attribute of this cluster one at a time.	DUT CLIENT unicasts a ZCL <i>read attributes response</i> command frame to TH SERVER containing each requested attribute. The data type in each command must match the value listed in the specification(s). The data value in each command for the attribute must fall within the valid range described in the specification(s).
2a	OTA.C.Am	TH SERVER unicasts a ZCL <i>write attributes</i> command frame to DUT CLIENT to write the respective default value to each mandatory attribute of this cluster one at a time.	DUT CLIENT unicasts a ZCL <i>write attributes response</i> command frame to TH SERVER for each attribute. If the access control of DUT CLIENT is set to READ, the DUT CLIENT response will indicate that the attribute write command was not a SUCCESS. If the access control of DUT CLIENT is set to READ/WRITE, the DUT CLIENT response will indicate that the write command was a SUCCESS.
2b	OTA.C.Am	TH SERVER unicasts a ZCL <i>read attributes</i> command frame to DUT CLIENT to read back each attribute written in step 2a.	DUT CLIENT unicasts a ZCL <i>read attributes response</i> command frame to TH SERVER containing the requested attribute. If the <i>Status</i> field of the <i>write attributes response</i> command frame was equal to SUCCESS, the updated value is read back. If the <i>Status</i> field of the <i>write attributes response</i> command frame was not equal to SUCCESS the value is not updated when read back.

Continued...

OTA-TC-01C: Attributes with client as DUT			
Item	PICS	Test Harness Step	DUT pass Verification
3	OTA.C.Ao	TH SERVER unicasts a ZCL <i>read attributes</i> command frame to DUT CLIENT to read each optional attribute of this cluster one at a time.	<p>DUT CLIENT unicasts a ZCL <i>read attributes response</i> command frame to TH SERVER containing each attribute.</p> <p>If the DUT CLIENT implements the attribute, the <i>Status</i> field will be equal to SUCCESS and the command will contain the requested attribute. If the DUT CLIENT does not implement the attribute, the <i>Status</i> field will not be equal to SUCCESS.</p> <p>The data type in each command must match the value listed in the specification(s). The data value in each command for the attribute must fall within the valid range described in the specification(s).</p>
4a	OTA.C.Ao	TH SERVER unicasts a ZCL <i>write attributes</i> command frame to DUT CLIENT to write the respective default value to each optional attribute of this cluster one at a time.	<p>DUT CLIENT unicasts a ZCL <i>write attributes response</i> command frame to TH SERVER for each attribute.</p> <p>If the attribute is not implemented or the access control of DUT CLIENT is set to READ, the DUT CLIENT response will indicate that the attribute write command was not a SUCCESS. If the attribute is implemented and the access control of DUT CLIENT is set to READ/WRITE, the DUT response will indicate that the write command was a SUCCESS.</p>

Continued...

OTA-TC-01C: Attributes with client as DUT			
Item	PICS	Test Harness Step	DUT pass Verification
4b	OTA.C.Ao	TH SERVER unicasts a ZCL <i>read attributes</i> command frame to DUT CLIENT to read back each attribute written in step 4a.	DUT CLIENT unicasts a ZCL <i>read attributes response</i> command frame to TH SERVER containing the requested attribute. If the <i>Status</i> field of the <i>write attributes response</i> command frame was equal to SUCCESS, the updated value is read back. If the <i>Status</i> field of the <i>write attributes response</i> command frame was not equal to SUCCESS the value is not updated when read back.

--- End of test case OTA-TC-01C ---

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4.3.2 OTA-TC-02C: Unknown upgrade server

This test verifies that an OTA upgrade client (the DUT), which does not have the address of the OTA upgrade server (the TH) pre-programmed, properly performs to query the OTA upgrade server.

4.3.2.1 Scope

General:

- *Read attributes* command (0x00)
- *Read attributes response* command (0x01)



OTA cluster (0x0019):

- *UpgradeServerId* attribute (0x0000)

PICS:

- OTA.C
- OTA.C.A0000

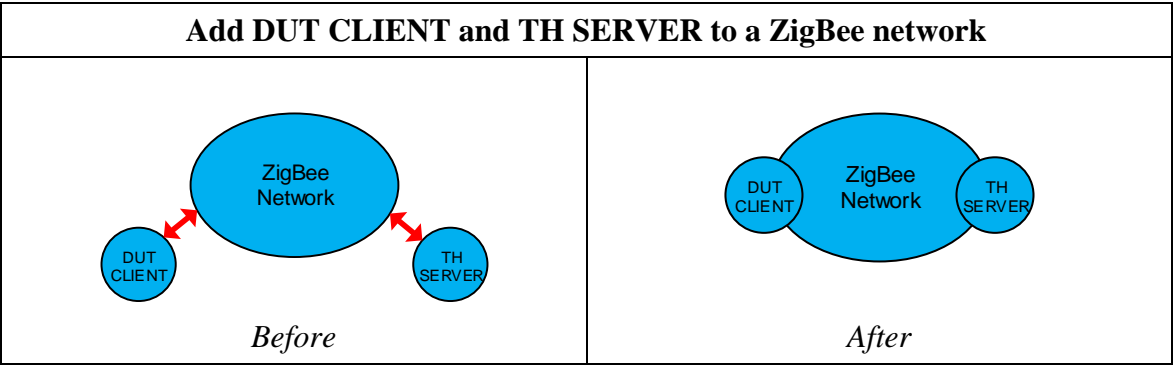
4.3.2.2 Required devices

Designation	Symbol	Description
DUT CLIENT		Device under test client implementing: <ul style="list-style-type: none"> • The <i>OTA</i> cluster client.
TH SERVER		Test harness server implementing: <ul style="list-style-type: none"> • The <i>OTA</i> cluster server.

4.3.2.3 Initial conditions

Item	Initial Conditions
1	A packet sniffer shall be observing the communication over the air interface.
2	All devices are factory new and powered off until used.
3	The test requires an OTA upgrade client setup as a ZR, ZC, or ZED. The OTA upgrade server must be setup as the TH.
4	The OTA upgrade client is not pre-programmed with the IEEE address of the OTA upgrade server (<i>UpgradeServerID</i> attribute).

294 **4.3.2.4 Test preparation**



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OTA-TC-02C: Unknown upgrade server		
Item	Preparation Step	Observation
P1	Form a ZigBee network.	Observe appropriate command frame to form the network.
P2	Power on TH SERVER and DUT CLIENT.	TH SERVER and DUT CLIENT are powered on.
P3	Join TH SERVER and DUT CLIENT to a ZigBee network.	Observe appropriate communication between TH SERVER, DUT CLIENT and any other relevant node on the ZigBee network.

--- End of test case OTA-TC-02C preparation ---

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297 **4.3.2.5 Test procedure**

OTA-TC-02C: Unknown upgrade server			
Item	PICS	Test Harness Step	DUT pass Verification
1a	-	-	DUT CLIENT (OTA upgrade client) initiates the process to search for the OTA upgrade server, by issuing a match descriptor request.
1b	-	TH SERVER (OTA upgrade server) responds with a match descriptor response.	Upon receiving a response from TH SERVER, DUT CLIENT may optionally issue an IEEE address request to the device to obtain its long address. <i>Devices may determine the IEEE address of the OTA upgrade server via the neighbor table or other internal records.</i>
1c	-	Conditional on step 1b (DUT): TH SERVER responds with an IEEE address response.	NOTE: DUT updates the value of the <i>UpgradeServerId</i> attribute with the obtained IEEE address of the OTA upgrade server.
2	OTA.C.A0000	TH SERVER unicasts a ZCL <i>read attributes</i> command frame to DUT CLIENT to read the <i>UpgradeServerId</i> attribute.	DUT CLIENT unicasts a ZCL <i>read attributes response</i> command frame to TH SERVER. <i>UpgradeServerId</i> attribute has a value equal to TH SERVER (OTA upgrade server).

--- End of test case OTA-TC-02C ---

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4.3.3 OTA-TC-03C: Query upgrade server when no image is available

This tests that the OTA upgrade client (the DUT) sends a correctly formatted request to the OTA upgrade server (the TH).

4.3.3.1 Scope

General:

- *Default response* command (0x0b)



OTA cluster (0x0019):

- *Query Next Image Request* command (0x01)
- *Query Next Image Response* command (0x02)

PICS:

- OTA.C
- OTA.C.C02.Rsp
- OTA.C.C01.Tx

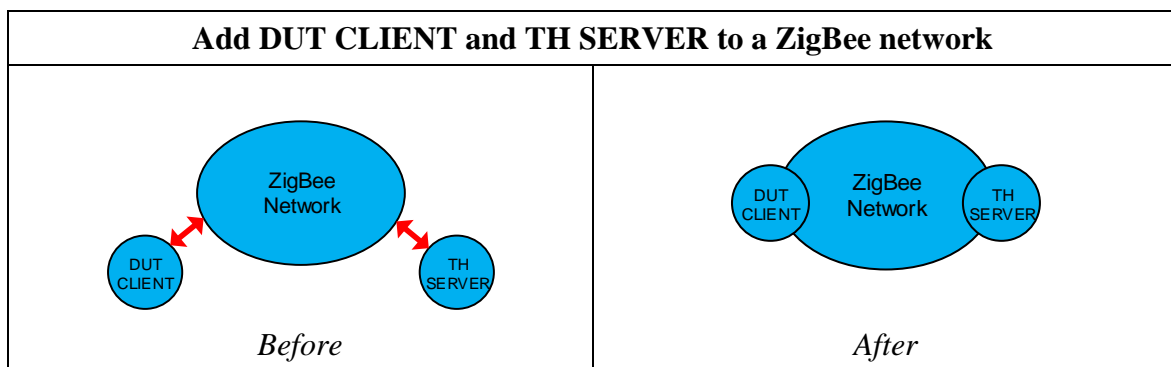
4.3.3.2 Required devices

Designation	Symbol	Description
DUT CLIENT		Device under test client implementing: <ul style="list-style-type: none"> • The <i>OTA</i> cluster client.
TH SERVER		Test harness server implementing: <ul style="list-style-type: none"> • The <i>OTA</i> cluster server.

4.3.3.3 Initial conditions

Item	Initial Conditions
1	A packet sniffer shall be observing the communication over the air interface.
2	All devices are factory new and powered off until used.
3	The test requires an OTA upgrade client setup as a ZR, ZC, or ZED. The OTA upgrade server must be setup as the TH.
4	The manufacturer must prepare a NULL upgrade file for their OTA client device that has no vendor firmware, just an OTA header. There should be no optional fields.
5	The OTA upgrade server shall be setup so that no new upgrade image is available for the client.
6	The OTA upgrade client shall discover the upgrade server's identity and be setup to periodically query the upgrade server

4.3.3.4 Test preparation



OTA-TC-03C: Query upgrade server when no image is available		
Item	Preparation Step	Observation
P1	Form a ZigBee network.	Observe appropriate command frame to form the network.
P2	Power on TH SERVER and DUT CLIENT.	TH SERVER and DUT CLIENT are powered on.
P3	Join TH SERVER and DUT CLIENT to a ZigBee network.	Observe appropriate communication between TH SERVER, DUT CLIENT and any other relevant node on the ZigBee network.

--- End of test case OTA-TC-03C preparation ---

321 **4.3.3.5 Test procedure**

OTA-TC-03C: Query upgrade server when no image is available			
Item	PICS	Test Harness Step	DUT pass Verification
1a	OTA.C.C01.Tx	-	DUT CLIENT unicasts a ZCL <i>Query Next Image Request</i> command frame to TH SERVER. The <i>Manufacturer Code</i> , <i>Image Type</i> and <i>Current File Version</i> fields depend on the configuration of the DUT.
1b	OTA.C.C02.Rsp	TH SERVER unicasts a ZCL <i>Query Next Image Response</i> command frame to DUT CLIENT with the <i>Status</i> field set to 0x98 (NO_IMAGE_AVAILABLE).	If requested, DUT CLIENT unicasts a ZCL <i>default response</i> command frame to TH SERVER with the <i>status</i> field equal to 0x00 (SUCCESS). DUT CLIENT does nothing.
2a	OTA.C.C01.Tx	-	After 10s, DUT CLIENT unicasts a ZCL <i>Query Next Image Request</i> command frame to TH SERVER. The <i>Manufacturer Code</i> , <i>Image Type</i> and <i>Current File Version</i> fields depend on the configuration of the DUT.
2b	OTA.C.C02.Rsp	TH SERVER unicasts a ZCL <i>Query Next Image Response</i> command frame to DUT CLIENT with the <i>Status</i> field set to 0x98 (NO_IMAGE_AVAILABLE).	If requested, DUT CLIENT unicasts a ZCL <i>default response</i> command frame to TH SERVER with the <i>status</i> field equal to 0x00 (SUCCESS). DUT CLIENT does nothing.

--- End of test case OTA-TC-03C ---

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4.3.4 OTA-TC-04C: Image notification with matching parameters

This tests the server's ability to send out image notifications (optional). Testing that the client responds to them is not required behavior, so we will not have test cases.

NOTE: Clients that do not support receiving the **broadcast** image notification may skip those steps where the server is sending a broadcast message; they do not have to respond to broadcast notifications. However, clients must run the steps related to receiving a **unicast** image notification message and meet the pass criteria as detailed below.

4.3.4.1 Scope

General:

- *Read attributes* command (0x00)
- *Read attributes response* command (0x01)
- *Default response* command (0x0b)



OTA cluster (0x0019):

- *Image Notify* command (0x00)
- *Query Next Image Request* command (0x01)
- *Query Next Image Response* command (0x02)

PICS:

- OTA.C
- OTA.C.C00.Rsp, OTA.C.C02.Rsp
- OTA.C.C01.Tx

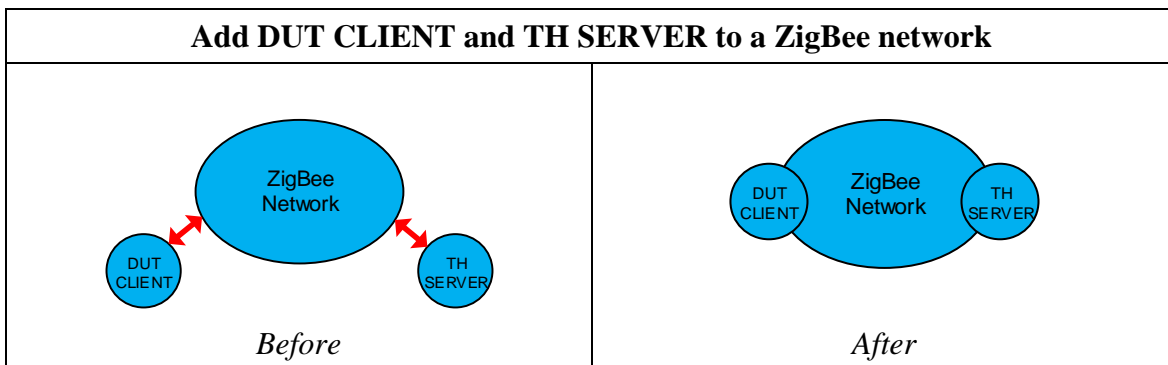
4.3.4.2 Required devices

Designation	Symbol	Description
DUT CLIENT		Device under test client implementing: <ul style="list-style-type: none"> • The <i>OTA</i> cluster client.
TH SERVER		Test harness server implementing: <ul style="list-style-type: none"> • The <i>OTA</i> cluster server.

4.3.4.3 Initial conditions

Item	Initial Conditions
1	A packet sniffer shall be observing the communication over the air interface.
2	All devices are factory new and powered off until used.
3	The test requires an OTA upgrade client setup as a ZR, ZC, or ZED. The OTA upgrade server must be setup as the TH.
4	The OTA upgrade server shall have NO images available for the client to download.

4.3.4.4 Test preparation



OTA-TC-04C: Image notification with matching parameters

Item	Preparation Step	Observation
P1	Form a ZigBee network.	Observe appropriate command frame to form the network.
P2	Power on TH SERVER and DUT CLIENT.	TH SERVER and DUT CLIENT are powered on.
P3	Join TH SERVER and DUT CLIENT to a ZigBee network.	Observe appropriate communication between TH SERVER, DUT CLIENT and any other relevant node on the ZigBee network.

--- End of test case OTA-TC-04C preparation ---

352 **4.3.4.5 Test procedure**

OTA-TC-04C: Image notification with matching parameters			
Item	PICS	Test Harness Step	DUT pass Verification
1	OTA.C.C00.Rsp	TH SERVER broadcasts a ZCL <i>Image Notify</i> command frame to all devices, indicating that an upgrade image is available, with the <i>Payload Type</i> field set to 0x00 (<i>Query jitter</i> only) and the <i>Query Jitter</i> field set to 0x00 (0%). The other fields in the <i>Image Notify</i> command frame shall be omitted.	If requested, DUT CLIENT unicasts a ZCL <i>default response</i> command frame to TH SERVER with the <i>status</i> field equal to 0x00 (SUCCESS). DUT CLIENT does nothing. NOTE: DUT CLIENT shall NOT respond with a <i>Query Next Image Request</i> command frame.
2a	OTA.C.C00.Rsp OTA.C.C01.Tx	TH SERVER broadcasts a ZCL <i>Image Notify</i> command frame to all devices, indicating that a new image is available, with the <i>Payload Type</i> field set to 0x01 (<i>Query jitter and manufacturer code</i>), the <i>Query Jitter</i> field set to 0x64 (100) and the <i>Manufacturer Code</i> field set according to the value that the OTA client device is using. NOTE: The manufacturer code will vary based on the OTA upgrade file that the server was informed about.	DUT CLIENT unicasts a ZCL <i>Query Next Image Request</i> command frame using its parameters for the <i>Manufacturer Code</i> , <i>Image Type</i> , and <i>Current File Version</i> fields.
2b	OTA.C.C02.Rsp	TH SERVER unicasts a ZCL <i>Query Next Image Response</i> command frame with the <i>Status</i> field set to 0x98 (NO_IMAGE_AVAILABLE).	If requested, DUT CLIENT unicasts a ZCL <i>default response</i> command frame to TH SERVER with the <i>status</i> field equal to 0x00 (SUCCESS). DUT CLIENT does nothing.

Continued...

OTA-TC-04C: Image notification with matching parameters			
Item	PICS	Test Harness Step	DUT pass Verification
3a	OTA.C.C00.Rsp OTA.C.01.Tx	<p>TH SERVER broadcasts a <i>ZCL Image Notify</i> command frame to all devices, indicating that a new image is available, with the <i>Payload Type</i> field set to 0x02 (<i>Query jitter, manufacture code and image type</i>), the <i>Query Jitter</i> field set to 0x64 (100) and the <i>Manufacturer Code</i> and <i>Image Type</i> fields set according to the values of the OTA client.</p> <p>NOTE: <i>The manufacturer code and image type will vary based on the OTA upgrade file that the server was informed about.</i></p>	DUT CLIENT unicasts a <i>ZCL Query Next Image Request</i> command frame using its parameters for the <i>Manufacturer Code</i> , <i>Image Type</i> and <i>Current File Version</i> fields.
3b	OTA.C.C02.Rsp	TH SERVER unicasts a <i>ZCL Query Next Image Response</i> command frame with the <i>Status</i> field set to 0x98 (NO_IMAGE_AVAILABLE).	<p>If requested, DUT CLIENT unicasts a <i>ZCL default response</i> command frame to TH SERVER with the <i>status</i> field equal to 0x00 (SUCCESS).</p> <p>DUT CLIENT does nothing.</p>
4a	OTA.C.C00.Rsp OTA.C.01.Tx	<p>TH SERVER broadcasts a <i>ZCL Image Notify</i> command frame to all devices, indicating that the new image is available, with the <i>Payload Type</i> field set to 0x03 (<i>Query jitter, manufacture code, image type and new file version</i>), the <i>Query Jitter</i> field set to 0x64 (100) and the <i>Manufacturer Code</i>, <i>Image Type</i> and <i>New File Version</i> fields set according to the values of the OTA client.</p> <p>NOTE: <i>The manufacturer code and image type will vary based on the OTA upgrade file that the server was informed about.</i></p>	DUT CLIENT unicasts a <i>ZCL Query Next Image Request</i> command frame using its parameters for the <i>Manufacturer Code</i> , <i>Image Type</i> and <i>Current File Version</i> fields.

Continued...

OTA-TC-04C: Image notification with matching parameters			
Item	PICS	Test Harness Step	DUT pass Verification
4b	OTA.C.C02.Rsp	TH SERVER unicasts a ZCL <i>Query Next Image Response</i> command frame with the <i>Status</i> field set to 0x98 (NO_IMAGE_AVAILABLE).	If requested, DUT CLIENT unicasts a ZCL <i>default response</i> command frame to TH SERVER with the <i>status</i> field equal to 0x00 (SUCCESS). DUT CLIENT does nothing.
6	OTA.C.C00.Rsp	TH SERVER broadcasts a ZCL <i>Image Notify</i> command frame to all devices, indicating that a new image is available, with the <i>Payload Type</i> field set to 0x01 (<i>Query jitter and manufacturer code</i>), the <i>Query Jitter</i> field set to 0x64 (100) and the <i>Manufacturer Code</i> set to a value that is DIFFERENT from the OTA client device's value.	If requested, DUT CLIENT unicasts a ZCL <i>default response</i> command frame to TH SERVER with the <i>status</i> field equal to 0x00 (SUCCESS). DUT CLIENT does nothing.

--- End of test case OTA-TC-04C ---

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4.3.5 OTA-TC-05C: Simple download (upgrade)

This will test the server and the client's ability to download a simple OTA upgrade file.

4.3.5.1 Scope

General:

- *Read attributes* command (0x00)
- *Read attributes response* command (0x01)
- *Default response* command (0x0b)



OTA cluster (0x0019):

- *UpgradeActivationPolicy* attribute (0x000b)
- *Query Next Image Request* command (0x01)
- *Query Next Image Response* command (0x02)
- *Image Block Request* command (0x03)
- *Image Block Response* command (0x05)
- *Upgrade End Request* command (0x06)
- *Upgrade End Response* command (0x07)

PICS:

- OTA.C
- OTA.C.A000b
- OTA.C.C02.Rsp, OTA.C.C05.Rsp, OTA.C.C07.Rsp
- OTA.C.C01.Tx, OTA.C.C03.Tx, OTA.C.C06.Tx

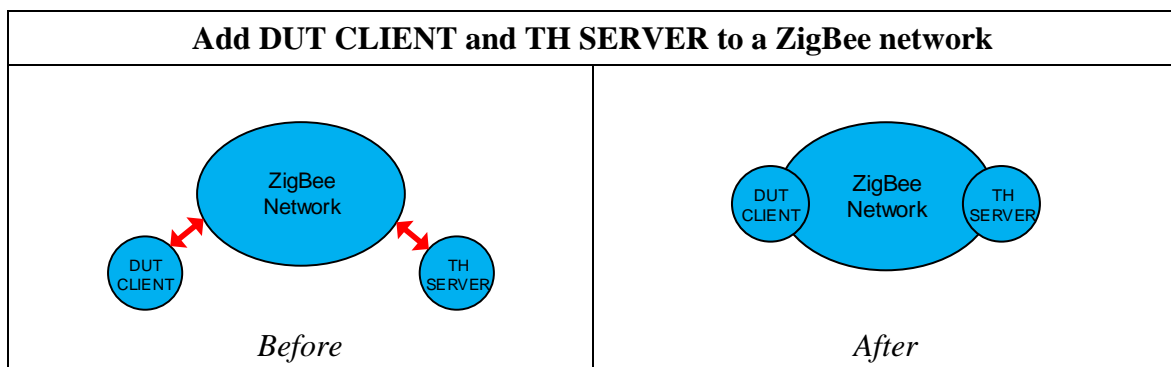
4.3.5.2 Required devices

Designation	Symbol	Description
DUT CLIENT		Device under test client implementing: <ul style="list-style-type: none"> • The <i>OTA</i> cluster client.
TH SERVER		Test harness server implementing: <ul style="list-style-type: none"> • The <i>OTA</i> cluster server.

4.3.5.3 Initial conditions

Item	Initial Conditions
1	A packet sniffer shall be observing the communication over the air interface.
2	All devices are factory new and powered off until used.
3	The test requires an OTA upgrade client setup as a ZR, ZC, or ZED. The OTA upgrade server must be setup as the TH.
4	The manufacturer must prepare a NULL upgrade file for their OTA client device that has no vendor firmware, just an OTA header. There should be no optional fields. The version in the file shall be greater than the version currently installed on the OTA client (i.e. an upgrade).
5	The OTA upgrade server shall be setup so that no new upgrade image is available for the client.
6	The OTA upgrade client shall discover the upgrade server's identity and be setup to periodically query the upgrade server

4.3.5.4 Test preparation



OTA-TC-05C: Simple download (upgrade)		
Item	Preparation Step	Observation
P1	Form a ZigBee network.	Observe appropriate command frame to form the network.
P2	Power on TH SERVER and DUT CLIENT.	TH SERVER and DUT CLIENT are powered on.
P3	Join TH SERVER and DUT CLIENT to a ZigBee network.	Observe appropriate communication between TH SERVER, DUT CLIENT and any other relevant node on the ZigBee network.

--- End of test case OTA-TC-05C preparation ---

382 **4.3.5.5 Test procedure**

OTA-TC-05C: Simple download (upgrade)			
Item	PICS	Test Harness Step	DUT pass Verification
1	OTA.C.A000b	TH SERVER unicasts a ZCL <i>read attributes</i> command frame to DUT CLIENT to read the <i>UpgradeActivationPolicy</i> attribute.	DUT CLIENT unicasts a ZCL <i>read attributes response</i> command frame to TH SERVER. Note the value of the <i>UpgradeActivationPolicy</i> attribute. NOTE: If the attribute cannot be read from DUT CLIENT (e.g., from a sleeping battery-powered device), the value of the selected PICS document item OUPC0a or OUPC0b shall imply a value of 0x00 or 0x01 respectively.
2	-	TH SERVER shall be informed of the NULL upgrade file for the OTA client indicating that it is the <i>next</i> upgrade file for the corresponding manufacturer ID and Image Type ID. This shall be done via a manufacturer specific process.	-
3a	OTA.C.C01.Tx	-	DUT CLIENT unicasts a ZCL <i>Query Next Image request</i> command frame to TH SERVER with the <i>Manufacturer Code</i> , <i>Image Type</i> , and <i>Current File Version</i> fields equal to appropriate values for the DUT.
3b	OTA.C.C02.Rsp OTA.C.C03.Tx	TH SERVER unicasts a ZCL <i>Query Next Image response</i> command frame to DUT CLIENT with the <i>Status</i> field set to 0x00 (SUCCESS) and the <i>Manufacturer Code</i> , <i>Image Type</i> , <i>File Version</i> , and <i>Image Size</i> fields set according to the OTA upgrade file prepared as part of the initial conditions.	DUT CLIENT unicasts a ZCL <i>Image Block Request</i> command frame to TH SERVER with the <i>Manufacturer Code</i> , <i>Image Type</i> and <i>File Version</i> fields equal to the values of the previous request, the <i>File Offset</i> field equal to zero and the <i>Maximum Data Size</i> field equal to a suitable value for the DUT.

Continued...

OTA-TC-05C: Simple download (upgrade)			
Item	PICS	Test Harness Step	DUT pass Verification
3c	OTA.C.C05.Rsp OTA.C.C06.Tz	TH SERVER unicasts a ZCL <i>Image Block Response</i> command frame to DUT CLIENT with the <i>Manufacturer Code</i> , <i>Image Type</i> and <i>File Version</i> fields set according to the values of the OTA upgrade file, the <i>File Offset</i> field set to the value in the previous request and the <i>Data Size</i> field set to a value suitable for the TH.	DUT CLIENT unicasts a ZCL <i>Upgrade End Request</i> command frame to TH SERVER with the <i>Status</i> field equal to either 0x00 (SUCCESS) or 0x96 (INVALID_IMAGE) and the <i>Manufacturer Code</i> , <i>Image Type</i> and <i>File Version</i> fields equal to values according to the file that was downloaded. <i>NOTE: The value of the Status field depends on how DUT CLIENT processes the NULL file. This is vendor specific and not critical to passing the test.</i>
3d	OTA.C.C07.Rsp	TH SERVER unicasts a ZCL <i>Upgrade End Response</i> command frame to DUT CLIENT with the <i>Manufacturer Code</i> , <i>Image Type</i> and <i>File Version</i> matching the values in the <i>Upgrade End Request</i> command frame from DUT CLIENT. If the noted <i>Upgrade-ActivationPolicy</i> attribute was set to 0x00, the <i>Current Time</i> and <i>Upgrade Time</i> fields are both set to the current clock time (upgrade now). If the noted <i>Upgrade-ActivationPolicy</i> attribute was set to 0x01, the <i>Current Time</i> field is set to any value and the <i>Upgrade Time</i> field is set to 0xffffffff.	If requested, DUT CLIENT unicasts a ZCL <i>default response</i> command frame to TH SERVER with the <i>status</i> field equal to 0x00 (SUCCESS). DUT CLIENT does nothing.

--- End of test case OTA-TC-05C ---

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4.3.6 OTA-TC-06C: Simple download (downgrade)

This will test the client's ability to download a simple OTA upgrade file with a lower version number than it is currently running.

4.3.6.1 Scope

General:

- *Read attributes* command (0x00)
- *Read attributes response* command (0x01)
- *Default response* command (0x0b)



OTA cluster (0x0019):

- *UpgradeActivationPolicy* attribute (0x000b)
- *Query Next Image Request* command (0x01)
- *Query Next Image Response* command (0x02)
- *Image Block Request* command (0x03)
- *Image Block Response* command (0x05)
- *Upgrade End Request* command (0x06)
- *Upgrade End Response* command (0x07)

PICS:

- OTA.C
- OTA.C.A000b
- OTA.C.C02.Rsp, OTA.C.C05.Rsp, OTA.C.C07.Rsp
- OTA.C.C01.Tx, OTA.C.C03.Tx, OTA.C.C06.Tx
- OUPC12

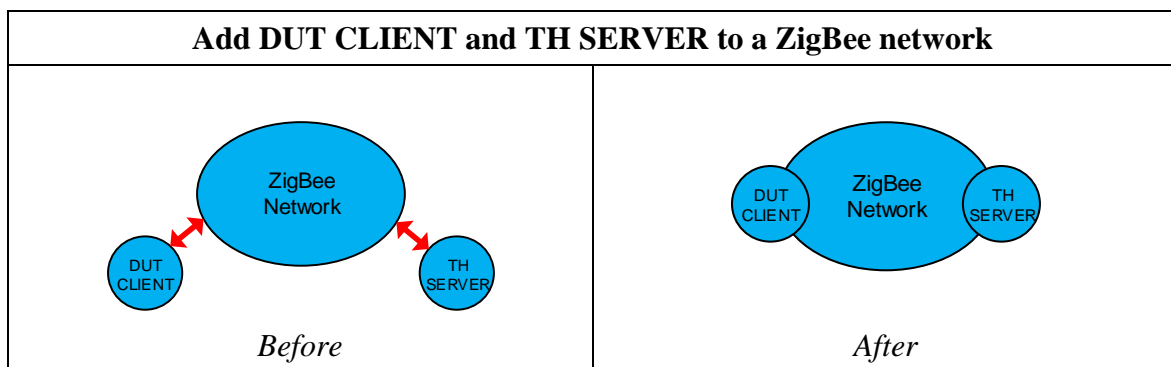
4.3.6.2 Required devices

Designation	Symbol	Description
DUT CLIENT		Device under test client implementing: <ul style="list-style-type: none"> • The <i>OTA</i> cluster client.
TH SERVER		Test harness server implementing: <ul style="list-style-type: none"> • The <i>OTA</i> cluster server.

4.3.6.3 Initial conditions

Item	Initial Conditions
1	A packet sniffer shall be observing the communication over the air interface.
2	All devices are factory new and powered off until used.
3	The test requires an OTA upgrade client setup as a ZR, ZC, or ZED. The OTA upgrade server must be setup as the TH.
4	The manufacturer must prepare a NULL upgrade file for their OTA client device that has no vendor firmware, just an OTA header. There should be no optional fields. The version in the file shall be less than the version currently installed on the OTA client (i.e. a downgrade).
5	The OTA upgrade server shall be setup so that no new upgrade image is available for the client.
6	The OTA upgrade client shall discover the upgrade server's identity and be setup to periodically query the upgrade server.

4.3.6.4 Test preparation



OTA-TC-06C: Simple download (downgrade)		
Item	Preparation Step	Observation
P1	Form a ZigBee network.	Observe appropriate command frame to form the network.
P2	Power on TH SERVER and DUT CLIENT.	TH SERVER and DUT CLIENT are powered on.
P3	Join TH SERVER and DUT CLIENT to a ZigBee network.	Observe appropriate communication between TH SERVER, DUT CLIENT and any other relevant node on the ZigBee network.

--- End of test case OTA-TC-06C preparation ---

414 **4.3.6.5 Test procedure**

OTA-TC-06C: Simple download (downgrade)			
Item	PICS	Test Harness Step	DUT pass Verification
1	OTA.C.A000b	TH SERVER unicasts a ZCL <i>read attributes</i> command frame to DUT CLIENT to read the <i>UpgradeActivationPolicy</i> attribute.	DUT CLIENT unicasts a ZCL <i>read attributes response</i> command frame to TH SERVER. Note the value of the <i>UpgradeActivationPolicy</i> attribute. NOTE: If the attribute cannot be read from DUT CLIENT (e.g., from a sleeping battery-powered device), the value of the selected PICS document item OUPC0a or OUPC0b shall imply a value of 0x00 or 0x01 respectively.
2	-	TH SERVER shall be informed of the NULL upgrade file for the OTA client indicating that it is the <i>next</i> upgrade file for the corresponding manufacturer ID and Image Type ID. This shall be done via a manufacturer specific process.	-
3a	OTA.C.C01.Tx	-	DUT CLIENT unicasts a ZCL <i>Query Next Image Request</i> command frame to TH SERVER with the <i>Manufacturer Code</i> , <i>Image Type</i> and <i>Current File Version</i> fields equal to appropriate values for the DUT.

Continued...

OTA-TC-06C: Simple download (downgrade)			
Item	PICS	Test Harness Step	DUT pass Verification
3b	OTA.C.C02.Rsp OTA.C.C03.Tx OUPC12	TH SERVER unicasts a ZCL <i>Query Next Image Response</i> command frame to DUT CLIENT with the <i>Status</i> field set to 0x00 (SUCCESS) and the <i>Manufacturer Code</i> , <i>Image Type</i> , <i>File Version</i> and <i>Image Size</i> fields set according to the OTA upgrade file prepared as part of the initial conditions.	<p>If DUT CLIENT supports downgrading (OUPC12), DUT CLIENT unicasts a ZCL <i>Image Block Request</i> command frame to TH SERVER with the <i>Manufacturer Code</i>, <i>Image Type</i> and <i>File Version</i> fields equal to the values of the previous request, the <i>File Offset</i> field equal to zero and the <i>Maximum Data Size</i> field equal to a suitable value for the DUT.</p> <p>If DUT CLIENT does not support downgrading (OUPC12), DUT CLIENT unicasts a ZCL <i>Upgrade End Request</i> command frame to TH SERVER with the <i>Status</i> field equal to 0x95 (ABORT) and halts the upgrade process, playing no further role in this test case.</p>
3c	OTA.C.C05.Rsp OTA.C.C06.Tx	TH SERVER unicasts a ZCL <i>Image Block Response</i> command frame to DUT CLIENT with the <i>Manufacturer Code</i> , <i>Image Type</i> and <i>File Version</i> fields set according to the values of the OTA upgrade file, the <i>File Offset</i> field set to the value in the previous request and the <i>Data Size</i> field set to a value suitable for the TH.	DUT CLIENT unicasts a ZCL <i>Upgrade End Request</i> command frame to TH SERVER with the <i>Status</i> field equal to 0x00 (SUCCESS) and the <i>Manufacturer Code</i> , <i>Image Type</i> and <i>File Version</i> fields equal to values according to the file that was downloaded.

Continued...

OTA-TC-06C: Simple download (downgrade)			
Item	PICS	Test Harness Step	DUT pass Verification
3d	OTA.C.C07.Rsp	<p>TH SERVER unicasts a ZCL <i>Upgrade End Response</i> command frame to DUT CLIENT with the <i>Manufacturer Code</i>, <i>Image Type</i> and <i>File Version</i> fields matching the values in the <i>Upgrade End Request</i> command frame from DUT CLIENT.</p> <p>If the noted <i>Upgrade-ActivationPolicy</i> attribute was set to 0x00, the <i>Current Time</i> and <i>Upgrade Time</i> fields are both set to the current clock time (upgrade now).</p> <p>If the noted <i>Upgrade-ActivationPolicy</i> attribute was set to 0x01, the <i>Current Time</i> field is set to any value and the <i>Upgrade Time</i> field shall be set to 0xffffffff.</p>	<p>If requested, DUT CLIENT unicasts a ZCL <i>default response</i> command frame to TH SERVER with the <i>status</i> field equal to 0x00 (SUCCESS).</p> <p>DUT CLIENT does nothing.</p>

--- End of test case OTA-TC-06C ---

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4.3.7 OTA-TC-07C: File download with immediate upgrade

This will test the client's ability to download a FULL, valid OTA upgrade file, and immediately upgrade once that download is complete (depending on the status of the client's *UpgradeActivationPolicy* attribute).

4.3.7.1 Scope

General:

- *Read attributes* command (0x00)
- *Read attributes response* command (0x01)
- *Default response* command (0x0b)



OTA cluster (0x0019):

- *CurrentFileVersion* attribute (0x0002)
- *ImageUpgradeStatus* attribute (0x0006)
- *UpgradeActivationPolicy* attribute (0x000b)
- *Query Next Image Request* command (0x01)
- *Query Next Image Response* command (0x02)
- *Image Block Request* command (0x03)
- *Image Block Response* command (0x05)
- *Upgrade End Request* command (0x06)
- *Upgrade End Response* command (0x07)

PICS:

- OTA.C
- OTA.C.A0002, OTA.C.A0006, OTA.C.A000b
- OTA.C.C02.Rsp, OTA.C.C05.Rsp, OTA.C.C07.Rsp
- OTA.C.C01.Tx, OTA.C.C03.Tx, OTA.C.C06.Tx

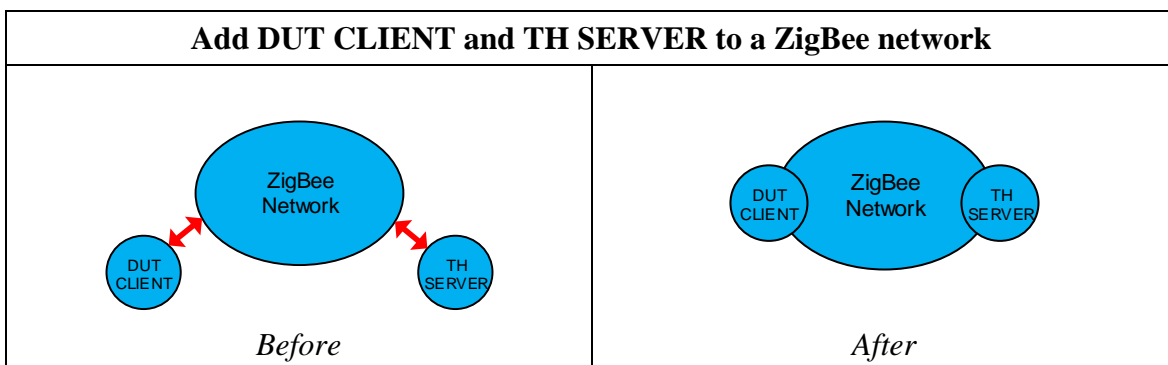
4.3.7.2 Required devices

Designation	Symbol	Description
DUT CLIENT		Device under test client implementing: <ul style="list-style-type: none"> • The <i>OTA</i> cluster client.
TH SERVER		Test harness server implementing: <ul style="list-style-type: none"> • The <i>OTA</i> cluster server.

443 **4.3.7.3 Initial conditions**

Item	Initial Conditions
1	A packet sniffer shall be observing the communication over the air interface.
2	All devices are factory new and powered off until used.
3	The test requires an OTA upgrade client setup as a ZR, ZC, or ZED. The OTA upgrade server must be setup as the TH.
4	The manufacturer must prepare a FULL upgrade file for their OTA client device that contains their vendor firmware.
5	The OTA upgrade server shall be setup so that no new upgrade image is available for the client.
6	The OTA upgrade client shall discover the upgrade server's identity and be setup to periodically query the upgrade server
7	Using platform specific means, verify the current running version of software the client is using.

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445 **4.3.7.4 Test preparation**

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OTA-TC-07C: File download with immediate upgrade		
Item	Preparation Step	Observation
P1	Form a ZigBee network.	Observe appropriate command frame to form the network.
P2	Power on TH SERVER and DUT CLIENT.	TH SERVER and DUT CLIENT are powered on.
P3	Join TH SERVER and DUT CLIENT to a ZigBee network.	Observe appropriate communication between TH SERVER, DUT CLIENT and any other relevant node on the ZigBee network.

--- End of test case OTA-TC-07C preparation ---

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448 **4.3.7.5 Test procedure**

OTA-TC-07C: File download with immediate upgrade			
Item	PICS	Test Harness Step	DUT pass Verification
1	OTA.C.A000b	TH SERVER unicasts a ZCL <i>read attributes</i> command frame to DUT CLIENT to read the <i>UpgradeActivationPolicy</i> attribute.	DUT CLIENT unicasts a ZCL <i>read attributes response</i> command frame to TH SERVER. Note the value of the <i>UpgradeActivationPolicy</i> attribute. NOTE: If the attribute cannot be read from DUT CLIENT (e.g., from a sleeping battery-powered device), the value of the selected PICS document item OUPC0a or OUPC0b shall imply a value of 0x00 or 0x01 respectively.
2	-	TH SERVER shall be informed of the upgrade file for the OTA client indicating that it is the <i>next</i> upgrade file for the corresponding manufacturer ID and Image Type ID. This shall be done via a manufacturer specific process.	-
3a	OTA.C.C01.Tx	-	DUT CLIENT unicasts a ZCL <i>Query Next Image Request</i> command frame to TH SERVER with the <i>Manufacturer Core</i> , <i>Image Type</i> and <i>Current File Version</i> fields equal to appropriate values for the DUT.
3b	OTA.C.C02.Rsp OTA.C.C03.Tx	TH SERVER unicasts a ZCL <i>Query Next Image Response</i> command frame to DUT CLIENT with the <i>Status</i> field set to 0x00 (SUCCESS) and the <i>Manufacturer Code</i> , <i>Image Type</i> , <i>File Version</i> and <i>Image Size</i> fields set according to the OTA upgrade file prepared as part of the initial conditions.	DUT CLIENT unicasts a ZCL <i>Image Block Request</i> command frame to TH SERVER with the <i>Manufacturer Code</i> , <i>Image Type</i> and <i>File Version</i> fields equal to the values of the previous request, the <i>File Offset</i> field equal to zero and the <i>Maximum Data Size</i> field equal to a suitable value for the DUT.

Continued...

OTA-TC-07C: File download with immediate upgrade			
Item	PICS	Test Harness Step	DUT pass Verification
3c	OTA.C.C05.Rsp	TH SERVER unicasts a ZCL <i>Image Block Response</i> command frame to DUT CLIENT with the <i>Manufacturer Code</i> , <i>Image Type</i> and <i>File Version</i> fields set according to the values of the OTA upgrade file, the <i>File Offset</i> field set to the value in the previous request and the <i>Data Size</i> field set to a value suitable for the TH.	If requested, DUT CLIENT unicasts a ZCL <i>default response</i> command frame to TH SERVER with the <i>status</i> field equal to 0x00 (SUCCESS).
4	OTA.C.A0006	TH SERVER unicasts a ZCL <i>read attributes</i> command frame to DUT CLIENT to read the <i>ImageUpgradeStatus</i> attribute.	DUT CLIENT unicasts a ZCL <i>read attributes response</i> command frame to TH SERVER. If DUT CLIENT does not support the attribute, it shall respond with a status of UNSUPPORTED_-ATTRIBUTE. If it does support the attribute, it shall respond with a status of SUCCESS and a value equal to 0x01 (<i>Download in Progress</i>).
5a	OTA.C.C03.Tx	-	DUT CLIENT unicasts a ZCL <i>Image Block Request</i> command frame to TH SERVER with the <i>Manufacturer Code</i> , <i>Image Type</i> and <i>File Version</i> fields equal to the values of the previous request, the <i>File Offset</i> field commensurate with the next block and the <i>Maximum Data Size</i> field equal to a suitable value for the DUT.

Continued...

OTA-TC-07C: File download with immediate upgrade			
Item	PICS	Test Harness Step	DUT pass Verification
5b	OTA.C.C05.Rsp	TH SERVER unicasts a ZCL <i>Image Block Response</i> command frame to DUT CLIENT with the <i>Manufacturer Code</i> , <i>Image Type</i> and <i>File Version</i> fields set according to the values of the OTA upgrade file, the <i>File Offset</i> field set to the value in the previous request and the <i>Data Size</i> field set to a value suitable for the TH.	If requested, DUT CLIENT unicasts a ZCL <i>default response</i> command frame to TH SERVER with the <i>status</i> field equal to 0x00 (SUCCESS). The test shall repeat from step 5a, until the complete file has been downloaded.
6	OTA.C.C06.Tx	-	DUT CLIENT unicasts a ZCL <i>Upgrade End Request</i> command frame to TH SERVER with the <i>Status</i> field equal to 0x00 (SUCCESS) and the <i>Manufacturer Code</i> , <i>Image Type</i> and <i>File Version</i> fields equal to values according to the file that was downloaded.
If the value of the <i>UpgradeActivationPolicy</i> attribute obtained in step 1 is equal to 0x00:			
7a	OTA.C.C07.Rsp	TH SERVER unicasts a ZCL <i>Upgrade End Response</i> command frame to DUT CLIENT with the <i>Manufacturer Code</i> , <i>Image Type</i> and <i>File Version</i> fields matching the values in the <i>Upgrade End Request</i> command frame from DUT CLIENT and the <i>Current Time</i> and <i>Upgrade Time</i> fields are both set to the current clock time (upgrade now).	If requested, DUT CLIENT unicasts a ZCL <i>default response</i> command frame to TH SERVER with the <i>status</i> field equal to 0x00 (SUCCESS). DUT CLIENT shall initiate the upgrade according to the device vendor's specific bootloader process. NOTE: <i>The OTA client may require a variable amount of time to complete the upgrade and return to the network.</i>

Continued...

OTA-TC-07C: File download with immediate upgrade			
Item	PICS	Test Harness Step	DUT pass Verification
7b	OTA.C.A0002	TH SERVER unicasts a ZCL <i>read attributes</i> command frame to DUT CLIENT to read the <i>CurrentFileVersion</i> attribute.	DUT CLIENT unicasts a ZCL <i>read attributes response</i> command frame to TH SERVER. If DUT CLIENT does not support the attribute, it shall respond with a status of UNSUPPORTED_ATTRIBUTE . If it does support the attribute, it shall respond with a status of SUCCESS and a value equal to the version of the OTA file that was downloaded.
7c	-		Verify via platform specific means that the device is running the version of software that it download and installed.
If the value of the <i>UpgradeActivationPolicy</i> attribute obtained in step 1 is equal to 0x01:			
8a	OTA.C.C07.Rsp	TH SERVER unicasts a ZCL <i>Upgrade End Response</i> command frame to DUT CLIENT with the <i>Manufacturer Code</i> , <i>Image Type</i> and <i>File Version</i> fields matching the values in the <i>Upgrade End Request</i> command frame from DUT CLIENT, the <i>Current Time</i> field set to any value and the <i>Upgrade Time</i> field set to 0xffffffff.	If requested, DUT CLIENT unicasts a ZCL <i>default response</i> command frame to TH SERVER with the <i>status</i> field equal to 0x00 (SUCCESS). DUT CLIENT does nothing. NOTE: <i>Activation of the image is done via out-of-band mechanisms. Attempts by the OTA server to tell the client to install the image will be rejected.</i>
8b	OTA.C.A0002	TH SERVER unicasts a ZCL <i>read attributes</i> command frame to DUT CLIENT to read the <i>CurrentFileVersion</i> attribute.	DUT CLIENT unicasts a ZCL <i>read attributes response</i> command frame to TH SERVER. If DUT CLIENT does not support the attribute, it shall respond with a status of UNSUPPORTED_ATTRIBUTE . If it does support the attribute, it shall respond with a status of SUCCESS and a value equal to the EXISTING version of the OTA file (i.e. the downloaded file has NOT been activated).

Continued...

OTA-TC-07C: File download with immediate upgrade			
Item	PICS	Test Harness Step	DUT pass Verification
8c	OTA.C.A0006	TH SERVER unicasts a ZCL <i>read attributes</i> command frame to DUT CLIENT to read the <i>ImageUpgradeStatus</i> attribute.	DUT CLIENT unicasts a ZCL <i>read attributes response</i> command frame to TH SERVER. If DUT CLIENT does not support the attribute, it shall respond with a status of UNSUPPORTED_ATTRIBUTE. If it does support the attribute, it shall respond with a status of SUCCESS and a value equal to 0x06 (<i>Waiting to Upgrade via External Event</i>).

--- End of test case OTA-TC-07C ---

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4.3.8 OTA-TC-08C: Simple download with delayed upgrade

This will test the client's ability to download a valid OTA upgrade file and, if its *UpgradeActivationPolicy* attribute is set to 0x00, wait before applying the upgrade. If the client's *UpgradeActivationPolicy* attribute is set to 0x01, the client shall reject an attempt by the server to activate the upgrade via conventional means.

4.3.8.1 Scope

General:

- *Read attributes* command (0x00)
- *Read attributes response* command (0x01)
- *Default response* command (0x0b)



OTA cluster (0x0019):

- *ImageUpgradeStatus* attribute (0x0006)
- *UpgradeActivationPolicy* attribute (0x000b)
- *Query Next Image Request* command (0x01)
- *Query Next Image Response* command (0x02)
- *Image Block Request* command (0x03)
- *Image Block Response* command (0x05)
- *Upgrade End Request* command (0x06)
- *Upgrade End Response* command (0x07)

PICS:

- OTA.C
- OTA.C.A0006, OTA.C.A000b
- OTA.C.C02.Rsp, OTA.C.C05.Rsp, OTA.C.C07.Rsp
- OTA.C.C01.Tx, OTA.C.C03.Tx, OTA.C.C06.Tx

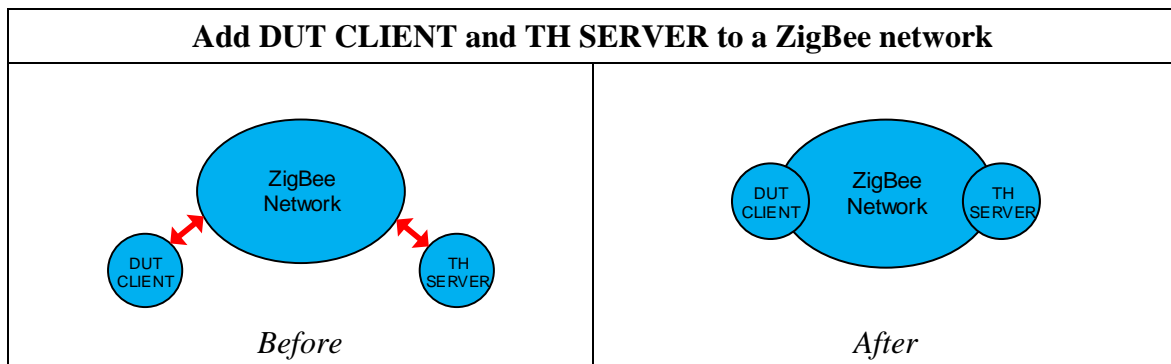
4.3.8.2 Required devices

Designation	Symbol	Description
DUT CLIENT		Device under test client implementing: <ul style="list-style-type: none"> • The <i>OTA</i> cluster client.
TH SERVER		Test harness server implementing: <ul style="list-style-type: none"> • The <i>OTA</i> cluster server.

4.3.8.3 Initial conditions

Item	Initial Conditions
1	A packet sniffer shall be observing the communication over the air interface.
2	All devices are factory new and powered off until used.
3	The test requires an OTA upgrade client setup as a ZR, ZC, or ZED. The OTA upgrade server must be setup as the TH.
4	The manufacturer must prepare a FULL upgrade file for their OTA client device that contains their vendor firmware.
5	The OTA upgrade server shall be setup so that no new upgrade image is available for the client.
6	The OTA upgrade client shall discover the upgrade server's identity and be setup to periodically query the upgrade server

4.3.8.4 Test preparation



OTA-TC-08C: Simple download with delayed upgrade		
Item	Preparation Step	Observation
P1	Form a ZigBee network.	Observe appropriate command frame to form the network.
P2	Power on TH SERVER and DUT CLIENT.	TH SERVER and DUT CLIENT are powered on.
P3	Join TH SERVER and DUT CLIENT to a ZigBee network.	Observe appropriate communication between TH SERVER, DUT CLIENT and any other relevant node on the ZigBee network.

--- End of test case OTA-TC-08C preparation ---

482 **4.3.8.5 Test procedure**

OTA-TC-08C: Simple download with delayed upgrade			
Item	PICS	Test Harness Step	DUT pass Verification
1	OTA.C.A000b	TH SERVER unicasts a ZCL <i>read attributes</i> command frame to DUT CLIENT to read the <i>UpgradeActivationPolicy</i> attribute.	DUT CLIENT unicasts a ZCL <i>read attributes response</i> command frame to TH SERVER. Note the value of the <i>UpgradeActivationPolicy</i> attribute. NOTE: If the attribute cannot be read from DUT CLIENT (e.g., from a sleeping battery-powered device), the value of the selected PICS document item OUPC0a or OUPC0b shall imply a value of 0x00 or 0x01 respectively.
2	-	TH SERVER shall be informed of the upgrade file for the OTA client indicating that it is the <i>next</i> upgrade file for the corresponding manufacturer ID and Image Type ID. This shall be done via a manufacturer specific process.	-
3a	OTA.C.C01.Tx	-	DUT CLIENT unicasts a ZCL <i>Query Next Image Request</i> command frame to TH SERVER with the <i>Manufacturer Code</i> , <i>Image Type</i> and <i>Current File Version</i> fields equal to appropriate values for the DUT.
3b	OTA.C.C02.Rsp OTA.C.C03.Tx	TH SERVER unicasts a ZCL <i>Query Next Image Response</i> command frame to DUT CLIENT with the <i>Status</i> field set to 0x00 (SUCCESS) and the <i>Manufacturer Code</i> , <i>Image Type</i> , <i>File Version</i> and <i>Image Size</i> fields set according to the OTA upgrade file prepared as part of the initial conditions.	DUT CLIENT unicasts a ZCL <i>Image Block Request</i> command frame to TH SERVER with the <i>Manufacturer Code</i> , <i>Image Type</i> and <i>File Version</i> fields equal to the values of the previous request, the <i>File Offset</i> field equal to zero and the <i>Maximum Data Size</i> field equal to a suitable value for the DUT.

Continued...

OTA-TC-08C: Simple download with delayed upgrade			
Item	PICS	Test Harness Step	DUT pass Verification
3c	OTA.C.C05.Rsp	TH SERVER unicasts a ZCL <i>Image Block Response</i> command frame to DUT CLIENT with the <i>Manufacturer Code</i> , <i>Image Type</i> and <i>File Version</i> fields set according to the values of the OTA upgrade file, the <i>File Offset</i> fields set to the value in the previous request and the <i>Data Size</i> field set to a value suitable for the TH.	If requested, DUT CLIENT unicasts a ZCL <i>default response</i> command frame to TH SERVER with the <i>status</i> field equal to 0x00 (SUCCESS).
4	OTA.C.A0006	TH SERVER unicasts a ZCL <i>read attributes</i> command frame to DUT CLIENT to read the <i>ImageUpgradeStatus</i> attribute.	DUT CLIENT unicasts a ZCL <i>read attributes response</i> command frame to TH SERVER. If DUT CLIENT does not support the attribute, it shall respond with a status of UNSUPPORTED_-ATTRIBUTE. If it does support the attribute, it shall respond with a status of SUCCESS and a value equal to 0x01 (<i>Download in Progress</i>).
5a	OTA.C.C03.Tx	-	DUT CLIENT unicasts a ZCL <i>Image Block Request</i> command frame to TH SERVER with the <i>Manufacturer Code</i> , <i>Image Type</i> and <i>File Version</i> fields equal to the values of the previous request, the <i>File Offset</i> field commensurate with the next block and the <i>Maximum Data Size</i> field equal to a suitable value for the DUT.

Continued...

OTA-TC-08C: Simple download with delayed upgrade			
Item	PICS	Test Harness Step	DUT pass Verification
5b	OTA.C.C05.Rsp	TH SERVER unicasts a ZCL <i>Image Block Response</i> command frame to DUT CLIENT with the <i>Manufacturer Code</i> , <i>Image Type</i> and <i>File Version</i> fields set according to the values of the OTA upgrade file, the <i>File Offset</i> field set to the value in the previous request and the <i>Data Size</i> field set to a value suitable for the TH.	If requested, DUT CLIENT unicasts a ZCL <i>default response</i> command frame to TH SERVER with the <i>status</i> field equal to 0x00 (SUCCESS). The test shall repeat from step 5a, until the complete file has been downloaded.
6a	OTA.C.C06.Tx	-	DUT CLIENT unicasts a ZCL <i>Upgrade End Request</i> command frame to TH SERVER with the <i>Status</i> field equal to 0x00 (SUCCESS) and the <i>Manufacturer Code</i> , <i>Image Type</i> and <i>File Version</i> fields equal to values according to the file that was downloaded.
6b	OTA.C.C07.Rsp OUPC6	TH SERVER unicasts a ZCL <i>Upgrade End Response</i> command frame to DUT CLIENT with the <i>Manufacturer Core</i> , <i>Image Type</i> and <i>File Version</i> fields matching the values in the <i>Upgrade End Request</i> command frame from DUT CLIENT, the <i>Current Time</i> field set to the current clock time and the <i>Upgrade Time</i> field set to the current clock time plus 300 (upgrade in 5 minutes).	-

Continued...

OTA-TC-08C: Simple download with delayed upgrade			
Item	PICS	Test Harness Step	DUT pass Verification
If the value of the <i>UpgradeActivationPolicy</i> attribute obtained in step 1 is equal to 0x01:			
7	-	-	DUT CLIENT unicasts a ZCL <i>Default Response</i> command frame with a status of NOT_ - AUTHORIZED (<i>The new downloaded image shall NOT be activated</i>). <i>NOTE: In this case, the image shall only be activated via out-of-scope means.</i>
If the value of the <i>UpgradeActivationPolicy</i> attribute obtained in step 1 is equal to 0x00:			
8a	-	-	If requested, DUT CLIENT unicasts a ZCL <i>default response</i> command frame to TH SERVER with the <i>status</i> field equal to 0x00 (SUCCESS).
8b	OTA.C.A0006	After 30s after step 6b: TH SERVER unicasts a ZCL <i>read attributes</i> command frame to DUT CLIENT to read the <i>ImageUpgradeStatus</i> attribute.	DUT CLIENT unicasts a ZCL <i>read attributes response</i> command frame to TH SERVER. The <i>ImageUpgradeStatus</i> attribute has a value equal to 0x04 (<i>Count down</i>).
8c	-	-	Approximately 5 minutes after step 6b, DUT CLIENT shall perform its manufacturing specific process to apply the upgrade. <i>NOTE: The time it takes to complete the upgrade will vary. The tester should wait a reasonable amount of time before proceeding to the next step.</i>
8d	OTA.C.A0006	TH SERVER unicasts a ZCL <i>read attributes</i> command frame to DUT CLIENT to read the <i>ImageUpgradeStatus</i> attribute.	DUT CLIENT unicasts a ZCL <i>read attributes response</i> command frame to TH SERVER. The <i>ImageUpgradeStatus</i> attribute has a value equal to 0x00 (<i>Normal</i>).

--- End of test case OTA-TC-08C ---

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4.3.9 OTA-TC-09C: Simple download with wait for run upgrade command

This will test the client's ability to download a valid OTA upgrade file, and wait for the run upgrade command from the server before applying the upgrade.

4.3.9.1 Scope

General:

- *Read attributes* command (0x00)
- *Read attributes response* command (0x01)
- *Default response* command (0x0b)



OTA cluster (0x0019):

- *ImageUpgradeStatus* attribute (0x0006)
- *UpgradeActivationPolicy* attribute (0x000b)
- *Query Next Image Request* command (0x01)
- *Query Next Image Response* command (0x02)
- *Image Block Request* command (0x03)
- *Image Block Response* command (0x05)
- *Upgrade End Request* command (0x06)
- *Upgrade End Response* command (0x07)

PICS:

- OTA.C
- OTA.C.A0006, OTA.C.A000b
- OTA.C.C02.Rsp, OTA.C.C05.Rsp, OTA.C.C07.Rsp
- OTA.C.C01.Tx, OTA.C.C03.Tx, OTA.C.C06.Tx

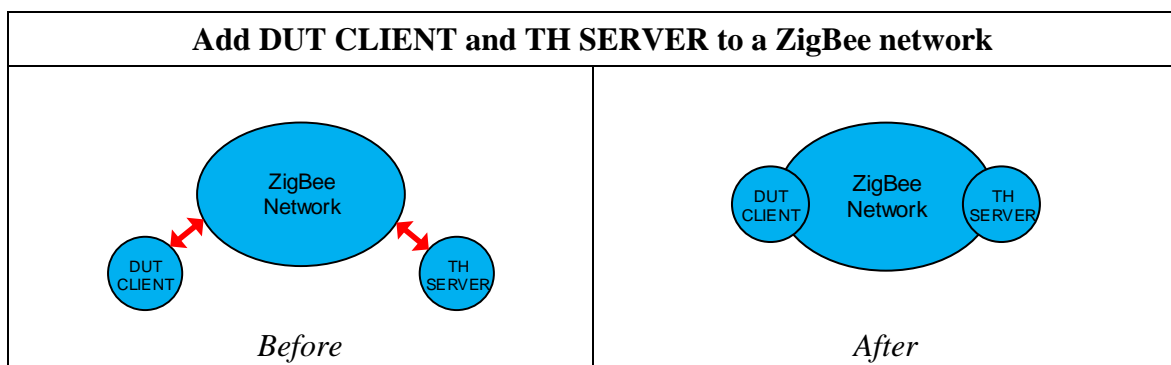
4.3.9.2 Required devices

Designation	Symbol	Description
DUT CLIENT		Device under test client implementing: <ul style="list-style-type: none"> • The <i>OTA</i> cluster client.
TH SERVER		Test harness server implementing: <ul style="list-style-type: none"> • The <i>OTA</i> cluster server.

4.3.9.3 Initial conditions

Item	Initial Conditions
1	A packet sniffer shall be observing the communication over the air interface.
2	All devices are factory new and powered off until used.
3	The test requires an OTA upgrade client setup as a ZR, ZC, or ZED. The OTA upgrade server must be setup as the TH.
4	The manufacturer must prepare a FULL upgrade file for their OTA client device that contains their vendor firmware.
5	The OTA upgrade server shall be setup so that no new upgrade image is available for the client.
6	The OTA upgrade client shall discover the upgrade server's identity and be setup to periodically query the upgrade server

4.3.9.4 Test preparation



OTA-TC-09C: Simple download with wait for run upgrade command		
Item	Preparation Step	Observation
P1	Form a ZigBee network.	Observe appropriate command frame to form the network.
P2	Power on TH SERVER and DUT CLIENT.	TH SERVER and DUT CLIENT are powered on.
P3	Join TH SERVER and DUT CLIENT to a ZigBee network.	Observe appropriate communication between TH SERVER, DUT CLIENT and any other relevant node on the ZigBee network.

--- End of test case OTA-TC-09C preparation ---

514 **4.3.9.5 Test procedure**

OTA-TC-09C: Simple download with wait for run upgrade command			
Item	PICS	Test Harness Step	DUT pass Verification
1	OTA.C.A000b	TH SERVER unicasts a ZCL <i>read attributes</i> command frame to DUT CLIENT to read the <i>UpgradeActivationPolicy</i> attribute.	DUT CLIENT unicasts a ZCL <i>read attributes response</i> command frame to TH SERVER. Note the value of the <i>UpgradeActivationPolicy</i> attribute. NOTE: If the attribute cannot be read from DUT CLIENT (e.g., from a sleeping battery-powered device), the value of the selected PICS document item OUPC0a or OUPC0b shall imply a value of 0x00 or 0x01 respectively.
2	-	TH SERVER shall be informed of the upgrade file for the OTA client indicating that it is the <i>next</i> upgrade file for the corresponding manufacturer ID and Image Type ID. This shall be done via a manufacturer specific process.	-
3a	OTA.C.C01.Tx	-	DUT CLIENT unicasts a ZCL <i>Query Next Image Request</i> command frame to TH SERVER with the <i>Manufacturer Code</i> , <i>Image Type</i> and <i>Current File Version</i> fields equal to appropriate values for the DUT.
3b	OTA.C.C02.Rsp OTA.C.C03.Tx	TH SERVER unicasts a ZCL <i>Query Next Image Response</i> command frame to DUT CLIENT with the <i>Status</i> field set to 0x00 (SUCCESS) and the <i>Manufacturer Code</i> , <i>Image Type</i> , <i>File Version</i> and <i>Image Size</i> fields set according to the OTA upgrade file prepared as part of the initial conditions.	DUT CLIENT unicasts a ZCL <i>Image Block Request</i> command frame to TH SERVER with the <i>Manufacturer Code</i> , <i>Image Type</i> and <i>File Version</i> fields equal to the values of the previous request, the <i>File Offset</i> field equal to zero and the <i>Maximum Data Size</i> field equal to a suitable value for the DUT.

Continued...

OTA-TC-09C: Simple download with wait for run upgrade command			
Item	PICS	Test Harness Step	DUT pass Verification
3c	OTA.C.C05.Rsp	TH SERVER unicasts a ZCL <i>Image Block Response</i> command frame to DUT CLIENT with the <i>Manufacturer Code</i> , <i>Image Type</i> and <i>File Version</i> fields set according to the values of the OTA upgrade file, the <i>File Offset</i> field set to the value in the previous request and the <i>Data Size</i> field set to a value suitable for the TH.	If requested, DUT CLIENT unicasts a ZCL <i>default response</i> command frame to TH SERVER with the <i>status</i> field equal to 0x00 (SUCCESS).
4	OTA.C.A0006	TH SERVER unicasts a ZCL <i>read attributes</i> command frame to DUT CLIENT to read the <i>ImageUpgradeStatus</i> attribute.	DUT CLIENT unicasts a ZCL <i>read attributes response</i> command frame to TH SERVER. If DUT CLIENT does not support the attribute, it shall respond with a status of UNSUPPORTED_-ATTRIBUTE. If it does support the attribute, it shall respond with a status of SUCCESS and a value equal to 0x01 (<i>Download in Progress</i>).
5a	OTA.C.C03.Tx	-	DUT CLIENT unicasts a ZCL <i>Image Block Request</i> command frame to TH SERVER with the <i>Manufacturer Code</i> , <i>Image Type</i> and <i>File Version</i> fields equal to the values of the previous request, the <i>File Offset</i> field commensurate with the next block and the <i>Maximum Data Size</i> field equal to a suitable value for the DUT.

Continued...

OTA-TC-09C: Simple download with wait for run upgrade command			
Item	PICS	Test Harness Step	DUT pass Verification
5b	OTA.C.C05.Rsp	TH SERVER unicasts a ZCL <i>Image Block Response</i> command frame to DUT CLIENT with the <i>Manufacturer Code</i> , <i>Image Type</i> and <i>File Version</i> fields set according to the values of the OTA upgrade file, the <i>File Offset</i> field set to the value in the previous request and the <i>Data Size</i> field set to a value suitable for the TH.	If requested, DUT CLIENT unicasts a ZCL <i>default response</i> command frame to TH SERVER with the <i>status</i> field equal to 0x00 (SUCCESS). The test shall repeat from step 5a, until the complete file has been downloaded.
6a	OTA.C.C06.Tx	-	DUT CLIENT unicasts a ZCL <i>Upgrade End Request</i> command frame to TH SERVER with the <i>Status</i> field equal to 0x00 (SUCCESS) and the <i>Manufacturer Code</i> , <i>Image Type</i> and <i>File Version</i> fields equal to values according to the file that was downloaded.
6b	OTA.C.C07.Rsp OUPC7	TH SERVER unicasts a ZCL <i>Upgrade End Response</i> command frame to DUT CLIENT with the <i>Manufacturer Code</i> , <i>Image Type</i> and <i>File Version</i> fields matching the values in the <i>Upgrade End Request</i> command frame from DUT CLIENT, the <i>Current Time</i> field set to any value and the <i>Upgrade Time</i> field set to 0xffffffff (wait for upgrade command).	If requested, DUT CLIENT unicasts a ZCL <i>default response</i> command frame to TH SERVER with the <i>status</i> field equal to 0x00 (SUCCESS).

Continued...

OTA-TC-09C: Simple download with wait for run upgrade command			
Item	PICS	Test Harness Step	DUT pass Verification
7	OTA.C.A0006	<i>After 10s after step 6b:</i> TH SERVER unicasts a ZCL <i>read attributes</i> command frame to DUT CLIENT to read the <i>ImageUpgradeStatus</i> attribute.	DUT CLIENT unicasts a ZCL <i>read attributes response</i> command frame to TH SERVER. If the <i>UpgradeActivationPolicy</i> attribute is equal to 0x00, the <i>ImageUpgradeStatus</i> attribute has a value equal to 0x03 (<i>Waiting to Upgrade</i>). If the <i>UpgradeActivationPolicy</i> attribute is equal to 0x01, the <i>ImageUpgradeStatus</i> attribute has a value equal to 0x06 (<i>Waiting to Upgrade via External Event</i>).
8	OTA.C.C07.Rsp OUPC7	TH SERVER unicasts a ZCL <i>Upgrade End Response</i> command frame to DUT CLIENT with the <i>Manufacturer Code</i> , <i>Image Type</i> and <i>File Version</i> fields matching the values in the <i>Upgrade End Request</i> command frame from DUT CLIENT and the <i>Current Time</i> and <i>Upgrade Time</i> fields both set to the current clock time (upgrade now).	-
If the value of the <i>UpgradeActivationPolicy</i> attribute obtained in step 1 is equal to 0x01:			
9	-	-	DUT CLIENT unicasts a ZCL <i>Default Response</i> command frame with a status of NOT_AUTHORIZED (<i>The new downloaded image shall NOT be activated</i>). <i>NOTE: In this case, the image shall only be activated via out-of-scope means.</i>

Continued...

OTA-TC-09C: Simple download with wait for run upgrade command			
Item	PICS	Test Harness Step	DUT pass Verification
If the value of the <i>UpgradeActivationPolicy</i> attribute obtained in step 1 is equal to 0x00:			
10a	-	-	<p>If requested, DUT CLIENT unicasts a ZCL <i>default response</i> command frame to TH SERVER with the <i>status</i> field equal to 0x00 (SUCCESS).</p> <p>DUT CLIENT shall initiate the upgrade according to the device vendor's specific bootloader process.</p> <p>NOTE: <i>The OTA client may require a variable amount of time to complete the upgrade and return to the network.</i></p>
8c	OTA.C.A0006	TH SERVER unicasts a ZCL <i>read attributes</i> command frame to DUT CLIENT to read the <i>ImageUpgradeStatus</i> attribute.	<p>DUT CLIENT unicasts a ZCL <i>read attributes response</i> command frame to TH SERVER.</p> <p>The <i>ImageUpgradeStatus</i> attribute has a value equal to 0x00 (<i>Normal</i>).</p>

--- End of test case OTA-TC-09C ---

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4.3.10 OTA-TC-10C: Cryptographically invalid file

This will test the client's ability to cryptographically verify an image file and reject an invalid one.

If the client does not support ECDSA crypto suites (i.e., both OUI2a and OUI2b are not supported), this test case is not required.

4.3.10.1 Scope

General:

- *Default response* command (0x0b)



OTA cluster (0x0019):

- *Query Next Image Request* command (0x01)
- *Query Next Image Response* command (0x02)
- *Image Block Request* command (0x03)
- *Image Block Response* command (0x05)
- *Upgrade End Request* command (0x06)

PICS:

- OTA.C
- OTA.C.C02.Rsp, OTA.C.C05.Rsp
- OTA.C.C01.Tx, OTA.C.C03.Tx, OTA.C.C06.Tx

4.3.10.2 Required devices

Designation	Symbol	Description
DUT CLIENT		Device under test client implementing: <ul style="list-style-type: none"> • The <i>OTA</i> cluster client.
TH SERVER		Test harness server implementing: <ul style="list-style-type: none"> • The <i>OTA</i> cluster server.

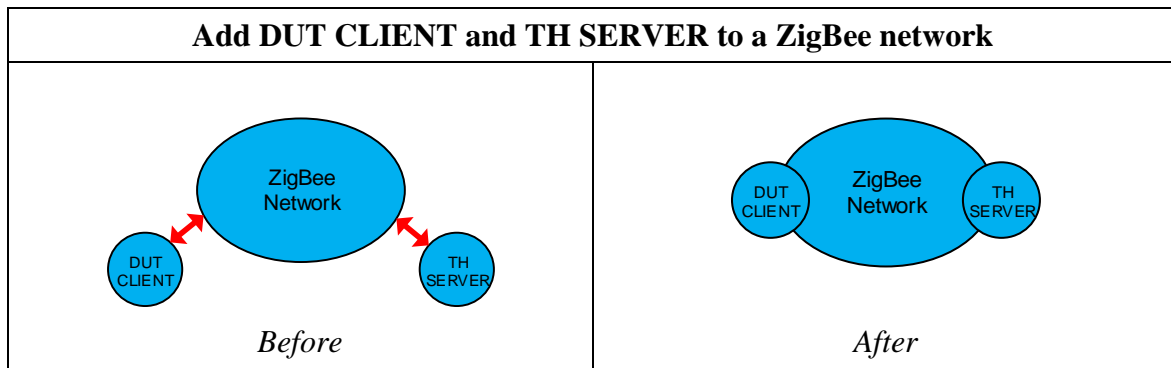
537 **4.3.10.3 Initial conditions**

Item	Initial Conditions
1	A packet sniffer shall be observing the communication over the air interface.
2	All devices are factory new and powered off until used.
3	The test requires an OTA upgrade client setup as a ZR, ZC, or ZED. The OTA upgrade server must be setup as the TH.
4	<p>The manufacturer must prepare a FULL upgrade file for their OTA client device that has an OTA header, vendor firmware, an ECDSA signer certificate sub-element tag, and an ECDSA signature sub-element tag. A single byte of the upgrade file shall be modified so that it is no longer cryptographically valid. This modification shall be made to the header string value that is in the header of the image.</p> <p>NOTE: This test must be run with a full upgrade image instead of a NULL upgrade image. It is not possible to differentiate between a device that detects a signature is invalid and a device that declares that the NULL image is invalid (since it doesn't contain a real upgrade image). In both cases the client will return <i>INVALID_IMAGE</i>.</p>
5	The OTA upgrade server shall be setup so that no new upgrade image is available for the client.
6	The OTA upgrade client shall discover the upgrade server's identity and be setup to periodically query the upgrade server

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4.3.10.4 Test preparation



OTA-TC-10C: Cryptographically invalid file		
Item	Preparation Step	Observation
P1	Form a ZigBee network.	Observe appropriate command frame to form the network.
P2	Power on TH SERVER and DUT CLIENT.	TH SERVER and DUT CLIENT are powered on.
P3	Join TH SERVER and DUT CLIENT to a ZigBee network.	Observe appropriate communication between TH SERVER, DUT CLIENT and any other relevant node on the ZigBee network.

--- End of test case OTA-TC-10C preparation ---

543 **4.3.10.5 Test procedure**

OTA-TC-10C: Cryptographically invalid file			
Item	PICS	Test Harness Step	DUT pass Verification
1	-	TH SERVER shall be informed of the upgrade file for the OTA client indicating that it is the <i>next</i> upgrade file for the corresponding manufacturer ID and Image Type ID. This shall be done via a manufacturer specific process.	-
2a	OTA.C.C01.Tx	-	DUT CLIENT unicasts a ZCL <i>Query Next Image Request</i> command frame to TH SERVER with the <i>Manufacturer Code</i> , <i>Image Type</i> and <i>Current File Version</i> fields equal to appropriate values for the DUT.
2b	OTA.C.C02.Rsp	TH SERVER unicasts a ZCL <i>Query Next Image Response</i> command frame to DUT CLIENT with the <i>Status</i> field set to 0x00 (SUCCESS) and the <i>Manufacturer Code</i> , <i>Image Type</i> , <i>File Version</i> and <i>Image Size</i> fields set according to the OTA upgrade file prepared as part of the initial conditions.	If requested, DUT CLIENT unicasts a ZCL <i>default response</i> command frame to TH SERVER with the <i>status</i> field equal to 0x00 (SUCCESS).
3a	OTA.C.C03.Tx	-	DUT CLIENT unicasts a ZCL <i>Image Block Request</i> command frame to TH SERVER with the <i>Manufacturer Code</i> , <i>Image Type</i> and <i>File Version</i> fields equal to the values of the previous request, the <i>File Offset</i> field commensurate with the next block and the <i>Maximum Data Size</i> field equal to a suitable value for the DUT.

Continued...

OTA-TC-10C: Cryptographically invalid file			
Item	PICS	Test Harness Step	DUT pass Verification
3b	OTA.C.C05.Rsp	TH SERVER unicasts a ZCL <i>Image Block Response</i> command frame to DUT CLIENT with the <i>Manufacturer Code</i> , <i>Image Type</i> and <i>File Version</i> fields set according to the values of the OTA upgrade file, the <i>File Offset</i> field set to the value in the previous request and the <i>Data Size</i> field set to a value suitable for the TH.	If requested, DUT CLIENT unicasts a ZCL <i>default response</i> command frame to TH SERVER with the <i>status</i> field equal to 0x00 (SUCCESS). The test shall repeat from step 3a, until the complete file has been downloaded.
4	OTA.C.C06.Tx	-	DUT CLIENT unicasts a ZCL <i>Upgrade End Request</i> command frame to TH SERVER with the <i>Status</i> field equal to 0x96 (INVALID_IMAGE) and the <i>Manufacturer Code</i> , <i>Image Type</i> and <i>File Version</i> fields equal to values according to the file that was downloaded. NOTE: DUT CLIENT shall not process the upgrade file.

--- End of test case OTA-TC-10C ---

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546 4.3.11 OTA-TC-11C: Require more image

547 This will test the client's ability to retrieve multiple files when they are required for an
 548 upgrade. Only those devices that require multiple files in order to upgrade will run this test.

549 4.3.11.1 Scope



550 *OTA* cluster (0x0019):

- 551 • *Query Next Image Request* command (0x01)
- 552 • *Query Next Image Response* command (0x02)
- 553 • *Image Block Request* command (0x03)
- 554 • *Image Block Response* command (0x05)
- 555 • *Upgrade End Request* command (0x06)

556 PICS:

- 557 • OTA.C
- 558 • OTA.C.C02.Rsp, OTA.C.C05.Rsp
- 559 • OTA.C.C01.Tx, OTA.C.C03.Tx, OTA.C.C06.Tx

560 4.3.11.2 Required devices

Designation	Symbol	Description
DUT CLIENT		Device under test client implementing: <ul style="list-style-type: none"> • The <i>OTA</i> cluster client.
TH SERVER		Test harness server implementing: <ul style="list-style-type: none"> • The <i>OTA</i> cluster server.

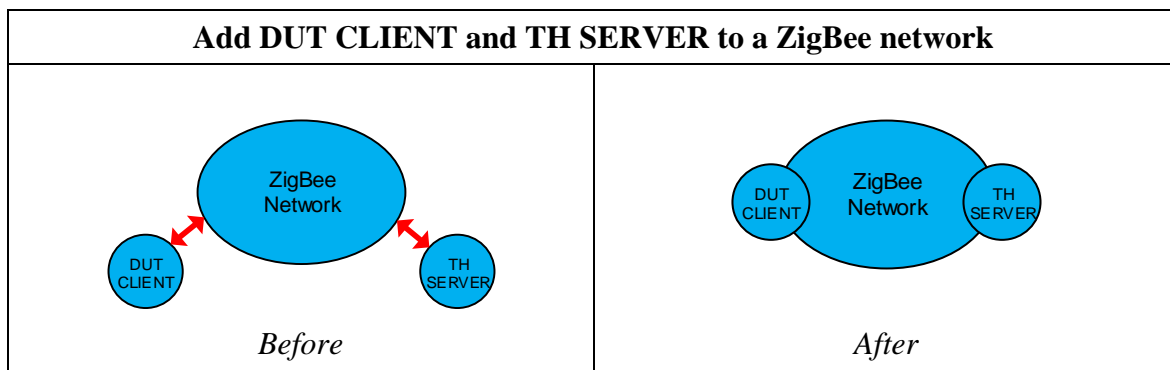
561

562 **4.3.11.3 Initial conditions**

Item	Initial Conditions
1	A packet sniffer shall be observing the communication over the air interface.
2	All devices are factory new and powered off until used.
3	The test requires an OTA upgrade client setup as a ZR, ZC, or ZED. The OTA upgrade server must be setup as the TH.
4	The manufacturer must prepare two NULL upgrade files for their OTA client device that has just an OTA header, without any upgrade firmware in the image. The images shall be labeled with different image type IDs and versions numbers for each component of the system that requires an upgrade image.
5	The OTA upgrade server shall be setup so that no new upgrade image is available for the client.
6	The OTA upgrade client shall discover the upgrade server's identity and be setup to periodically query the upgrade server

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565 **4.3.11.4 Test preparation**

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OTA-TC-11C: Require more image		
Item	Preparation Step	Observation
P1	Form a ZigBee network.	Observe appropriate command frame to form the network.
P2	Power on TH SERVER and DUT CLIENT.	TH SERVER and DUT CLIENT are powered on.
P3	Join TH SERVER and DUT CLIENT to a ZigBee network.	Observe appropriate communication between TH SERVER, DUT CLIENT and any other relevant node on the ZigBee network.

--- End of test case OTA-TC-11C preparation ---

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568 **4.3.11.5 Test procedure**

OTA-TC-11C: Require more image			
Item	PICS	Test Harness Step	DUT pass Verification
1	-	TH SERVER shall be informed of the two NULL upgrade files for the OTA client indicating that they are the <i>next</i> upgrade files for the corresponding manufacturer ID and Image Type ID. This shall be done via a manufacturer specific process.	-
2a	OTA.C.C01.Tx	-	DUT CLIENT unicasts a ZCL <i>Query Next Image Request</i> command frame to TH SERVER with <i>Manufacturer Code</i> , <i>Image Type</i> and <i>Current File Version</i> fields equal to appropriate values for either of the two required images.
2b	OTA.C.C02.Rsp OTA.C.C03.Tx	TH SERVER unicasts a ZCL <i>Query Next Image Response</i> command frame to DUT CLIENT with the <i>Status</i> field set to 0x00 (SUCCESS), the <i>Manufacturer Code</i> , <i>Image Type</i> , <i>File Version</i> and <i>Image Size</i> fields set according to the OTA upgrade file prepared as part of the initial conditions.	DUT CLIENT unicasts a ZCL <i>Image Block Request</i> command frame to TH SERVER with the <i>Manufacturer Code</i> , <i>Image Type</i> and <i>File Version</i> fields equal to the values of the previous request, the <i>File Offset</i> field equal to zero and the <i>Maximum Data Size</i> field equal to a suitable value for the DUT.
2c	OTA.C.C05.Rsp OTA.C.C06.Tx OUPC5	TH SERVER unicasts a ZCL <i>Image Block Response</i> command frame to DUT CLIENT with the <i>Manufacturer Code</i> , <i>Image Type</i> and <i>File Version</i> fields set according to the values of the OTA upgrade file, the <i>File Offset</i> field set to the value in the previous request and the <i>Data Size</i> field set to a value suitable for the TH.	DUT CLIENT unicasts a ZCL <i>Upgrade End Request</i> command frame to TH SERVER with the <i>Status</i> field equal to 0x99 (REQUIRE_MORE_IMAGE) and the <i>Manufacturer Code</i> , <i>Image Type</i> and <i>File Version</i> fields equal to values according to the file that was downloaded.

Continued...

OTA-TC-11C: Require more image			
Item	PICS	Test Harness Step	DUT pass Verification
3a	OTA.C.C01.Tx	-	DUT CLIENT unicasts a ZCL <i>Query Next Image Request</i> command frame to TH SERVER with the <i>Manufacturer Code</i> , <i>Image Type</i> and <i>Current File Version</i> fields equal to values for the other required image that was not queried in step 2a.
3b	OTA.C.C02.Rsp OTA.C.C03.Tx	TH SERVER unicasts a ZCL <i>Query Next Image Response</i> command frame to DUT CLIENT with the <i>Status</i> field set to 0x00 (SUCCESS), the <i>Manufacturer Code</i> , <i>Image Type</i> , <i>File Version</i> and <i>Image Size</i> fields set according to the OTA upgrade file prepared as part of the initial conditions.	DUT CLIENT unicasts a ZCL <i>Image Block Request</i> command frame to TH SERVER with the <i>Manufacturer Code</i> , <i>Image Type</i> and <i>File Version</i> fields equal to the values of the previous request, the <i>File Offset</i> field equal to zero and the <i>Maximum Data Size</i> field equal to a suitable value for the DUT.
3b	OTA.C.C05.Rsp OTA.C.C06.Tx	TH SERVER unicasts a ZCL <i>Image Block Response</i> command frame to DUT CLIENT with the <i>Manufacturer Code</i> , <i>Image Type</i> and <i>File Version</i> fields set according to the values of the OTA upgrade file, the <i>File Offset</i> field set to the value in the previous request and the <i>Data Size</i> field set to a value suitable for the TH.	DUT CLIENT unicasts a ZCL <i>Upgrade End Request</i> command frame to TH SERVER with the <i>Status</i> field equal to 0x00 (SUCCESS) and the <i>Manufacturer Code</i> , <i>Image Type</i> and <i>File Version</i> equal to values according to the file that was downloaded. NOTE: DUT CLIENT shall not process the NULL upgrade files.

--- End of test case OTA-TC-11C ---

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4.3.12 OTA-TC-12C: Wait for data

This will test the client to see if it handles a download where the OTA upgrade file is temporarily unavailable.

4.3.12.1 Scope

General:

- *Read attributes* command (0x00)
- *Read attributes response* command (0x01)
- *Default response* command (0x0b)



OTA cluster (0x0019):

- *ImageUpgradeStatus* attribute (0x0006)
- *UpgradeActivationPolicy* attribute (0x000b)
- *Query Next Image Request* command (0x01)
- *Query Next Image Response* command (0x02)
- *Image Block Request* command (0x03)
- *Image Block Response* command (0x05)
- *Upgrade End Request* command (0x06)
- *Upgrade End Response* command (0x07)

PICS:

- OTA.C
- OTA.C.A0006, OTA.C.A000b
- OTA.C.C02.Rsp, OTA.C.C05.Rsp, OTA.C.C07.Rsp
- OTA.C.C01.Tx, OTA.C.C03.Tx, OTA.C.C06.Tx

4.3.12.2 Required devices

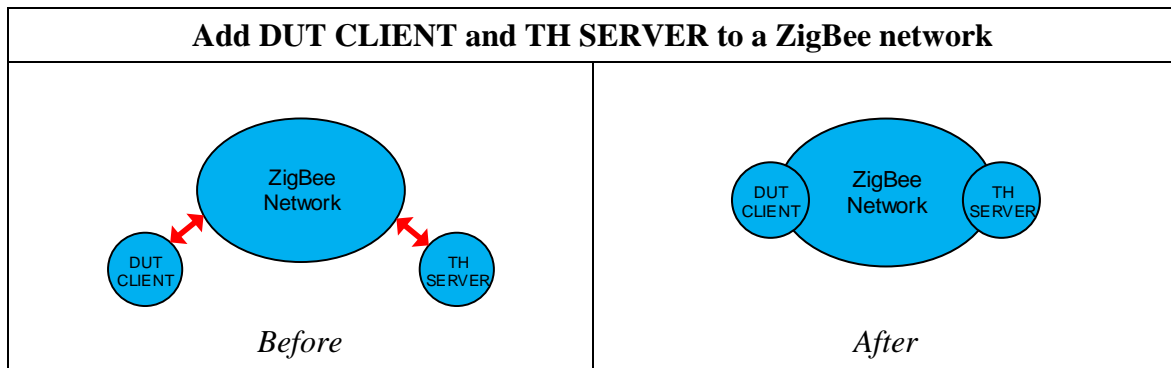
Designation	Symbol	Description
DUT CLIENT		Device under test client implementing: <ul style="list-style-type: none"> • The <i>OTA</i> cluster client.
TH SERVER		Test harness server implementing: <ul style="list-style-type: none"> • The <i>OTA</i> cluster server.

595 **4.3.12.3 Initial conditions**

Item	Initial Conditions
1	A packet sniffer shall be observing the communication over the air interface.
2	All devices are factory new and powered off until used.
3	The test requires an OTA upgrade client setup as a ZR, ZC, or ZED. The OTA upgrade server must be setup as the TH.
4	The manufacturer must prepare a NULL upgrade file for their OTA client device that has no vendor firmware, just an OTA header. There should be no optional fields.
5	The OTA upgrade server shall be setup so that no new upgrade image is available for the client.
6	The OTA upgrade client shall discover the upgrade server's identity and be setup to periodically query the upgrade server
7	The OTA upgrade server shall be setup such that the new upgrade file is not immediately available. The first attempt to request the image shall result in a response of WAIT_FOR_DATA.

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598 **4.3.12.4 Test preparation**

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OTA-TC-12C: Wait for data		
Item	Preparation Step	Observation
P1	Form a ZigBee network.	Observe appropriate command frame to form the network.
P2	Power on TH SERVER and DUT CLIENT.	TH SERVER and DUT CLIENT are powered on.
P3	Join TH SERVER and DUT CLIENT to a ZigBee network.	Observe appropriate communication between TH SERVER, DUT CLIENT and any other relevant node on the ZigBee network.

--- End of test case OTA-TC-12C preparation ---

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601 **4.3.12.5 Test procedure**

OTA-TC-12C: Wait for data			
Item	PICS	Test Harness Step	DUT pass Verification
1	OTA.C.A000b	TH SERVER unicasts a ZCL <i>read attributes</i> command frame to DUT CLIENT to read the <i>UpgradeActivationPolicy</i> attribute.	DUT CLIENT unicasts a ZCL <i>read attributes response</i> command frame to TH SERVER. Note the value of the <i>UpgradeActivationPolicy</i> attribute. NOTE: If the attribute cannot be read from DUT CLIENT (e.g., from a sleeping battery-powered device), the value of the selected PICS document item OUPC0a or OUPC0b shall imply a value of 0x00 or 0x01 respectively.
2	-	TH SERVER shall be informed of the NULL upgrade file for the OTA client indicating that it is the <i>next</i> upgrade file for the corresponding manufacturer ID and Image Type ID. This shall be done via a manufacturer specific process.	-
3a	OTA.C.C01.Tx	-	DUT CLIENT unicasts a ZCL <i>Query Next Image Request</i> command frame to TH SERVER with the <i>Manufacturer Code</i> , <i>Image Type</i> and <i>Current File Version</i> fields equal to appropriate values for the DUT.
3b	OTA.C.C02.Rsp OTA.C.C03.Tx	TH SERVER unicasts a ZCL <i>Query Next Image Response</i> command frame to DUT CLIENT with the <i>Status</i> field set to 0x00 (SUCCESS), the <i>Manufacturer Code</i> , <i>Image Type</i> , <i>File Version</i> and <i>Image Size</i> fields set according to the OTA upgrade file prepared as part of the initial conditions.	DUT CLIENT unicasts a ZCL <i>Image Block Request</i> command frame to TH SERVER with the <i>Manufacturer Code</i> , <i>Image Type</i> and <i>File Version</i> fields equal to the values of the previous request, the <i>File Offset</i> field equal to zero and the <i>Maximum Data Size</i> field equal to a suitable value for the DUT.

Continued...

OTA-TC-12C: Wait for data			
Item	PICS	Test Harness Step	DUT pass Verification
3c	OTA.C.C05.Rsp OUPC4	TH SERVER unicasts a ZCL <i>Image Block Response</i> command frame to DUT CLIENT with the <i>Status</i> field set to 0x97 (WAIT_FOR_DATA), the <i>Current Time</i> field set to the current clock time and the <i>Request Time</i> field set to the current clock time plus 120 (2 minutes).	If requested, DUT CLIENT unicasts a ZCL <i>default response</i> command frame to TH SERVER with the <i>status</i> field equal to 0x00 (SUCCESS).
4	OTA.C.A0006	After 10s, TH SERVER unicasts a ZCL <i>read attributes</i> command frame to DUT CLIENT to read the <i>ImageUpgradeStatus</i> attribute.	DUT CLIENT unicasts a ZCL <i>read attributes response</i> command frame to TH SERVER. If DUT CLIENT does not support the attribute, it shall respond with a status of UNSUPPORTED_ATTRIBUTE. If it does support the attribute, it shall respond with a status of SUCCESS and a value equal to 0x01 (<i>Download in Progress</i>).
5a	OTA.C.C03.Tx	-	After at least 2 minutes after step 3c, DUT CLIENT unicasts a ZCL <i>Image Block Request</i> command frame to TH SERVER with the <i>Manufacturer Code</i> , <i>Image Type</i> and <i>File Version</i> fields equal to the values of the previous request, the <i>File Offset</i> field equal to zero and the <i>Maximum Data Size</i> field equal to a suitable value for the DUT. NOTE: This is the same block that was requested by DUT CLIENT in step 3b.

Continued...

OTA-TC-12C: Wait for data			
Item	PICS	Test Harness Step	DUT pass Verification
5b	OTA.C.C05.Rsp OTA.C.C06.Tx	TH SERVER unicasts a ZCL <i>Image Block Response</i> command frame to DUT CLIENT with the <i>Manufacturer Code</i> , <i>Image Type</i> and <i>File Version</i> fields set according to the values of the OTA upgrade file.	DUT CLIENT unicasts a ZCL <i>Upgrade End Request</i> command frame to TH SERVER with the <i>Status</i> field equal to 0x00 (SUCCESS).
5c	OTA.C.C07.Rsp	<p>TH SERVER unicasts a ZCL <i>Upgrade End Response</i> command frame to DUT CLIENT with the <i>Manufacturer Code</i>, <i>Image Type</i> and <i>File Version</i> fields matching the values in the <i>Upgrade End Request</i> command frame from DUT CLIENT.</p> <p>If the noted <i>Upgrade-ActivationPolicy</i> attribute was set to 0x00, the <i>Current Time</i> and <i>Upgrade Time</i> field both set to the current clock time (upgrade now).</p> <p>If the noted <i>Upgrade-ActivationPolicy</i> attribute was set to 0x01, the <i>Current Time</i> field set to any value and the <i>Upgrade Time</i> field set to 0xffffffff.</p>	<p>If requested, DUT CLIENT unicasts a ZCL <i>default response</i> command frame to TH SERVER with the <i>status</i> field equal to 0x00 (SUCCESS).</p> <p>DUT CLIENT does nothing.</p>

--- End of test case OTA-TC-12C ---

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4.3.13 OTA-TC-13C: Aborted download

This will test the client to see if it handles a download that the server aborts before it is complete.

4.3.13.1 Scope

General:

- *Read attributes* command (0x00)
- *Read attributes response* command (0x01)
- *Default response* command (0x0b)



OTA cluster (0x0019):

- *ImageUpgradeStatus* attribute (0x0006)
- *Query Next Image Request* command (0x01)
- *Query Next Image Response* command (0x02)
- *Image Block Request* command (0x03)
- *Image Block Response* command (0x05)

PICS:

- OTA.C
- OTA.C.A0006
- OTA.C.C02.Rsp, OTA.C.C05.Rsp
- OTA.C.C01.Tx, OTA.C.C03.Tx

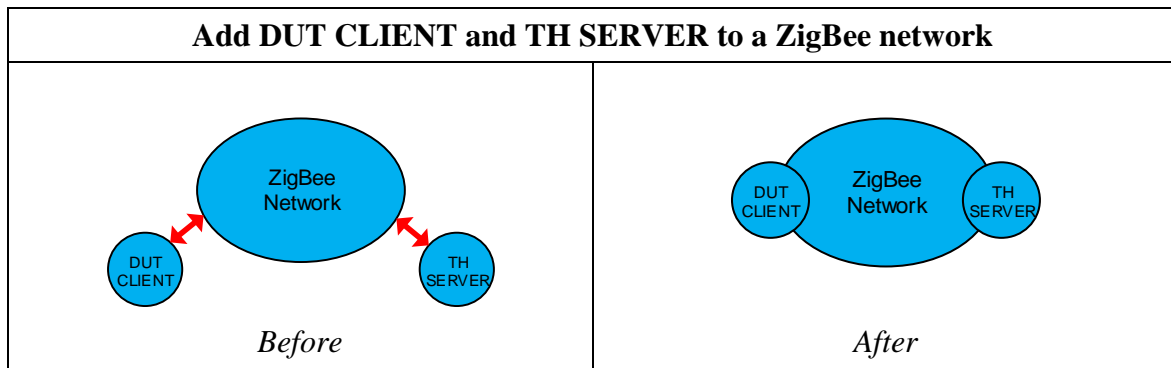
4.3.13.2 Required devices

Designation	Symbol	Description
DUT CLIENT		Device under test client implementing: <ul style="list-style-type: none"> • The <i>OTA</i> cluster client.
TH SERVER		Test harness server implementing: <ul style="list-style-type: none"> • The <i>OTA</i> cluster server.

4.3.13.3 Initial conditions

Item	Initial Conditions
1	A packet sniffer shall be observing the communication over the air interface.
2	All devices are factory new and powered off until used.
3	The test requires an OTA upgrade client setup as a ZR, ZC, or ZED. The OTA upgrade server must be setup as the TH.
4	The manufacturer must prepare a full upgrade file for their OTA client device that has vendor firmware. There should be no optional fields.
5	The OTA upgrade server shall be setup so that no new upgrade image is available for the client.
6	The OTA upgrade client shall discover the upgrade server's identity and be setup to periodically query the upgrade server

4.3.13.4 Test preparation



OTA-TC-13C: Aborted download		
Item	Preparation Step	Observation
P1	Form a ZigBee network.	Observe appropriate command frame to form the network.
P2	Power on TH SERVER and DUT CLIENT.	TH SERVER and DUT CLIENT are powered on.
P3	Join TH SERVER and DUT CLIENT to a ZigBee network.	Observe appropriate communication between TH SERVER, DUT CLIENT and any other relevant node on the ZigBee network.

--- End of test case OTA-TC-13C preparation ---

631 **4.3.13.5 Test procedure**

OTA-TC-13C: Aborted download			
Item	PICS	Test Harness Step	DUT pass Verification
1	-	TH SERVER shall be informed of the upgrade file for the OTA client indicating that it is the <i>next</i> upgrade file for the corresponding manufacturer ID and Image Type ID. This shall be done via a manufacturer specific process.	-
2a	OTA.C.C01.Tx	-	DUT CLIENT unicasts a ZCL <i>Query Next Image Request</i> command frame to TH SERVER with the <i>Manufacturer Code</i> , <i>Image Type</i> and <i>Current File Version</i> fields equal to appropriate values for the DUT.
2b	OTA.C.C02.Rsp OTA.C.C03.Tx	TH SERVER unicasts a ZCL <i>Query Next Image Response</i> command frame to DUT CLIENT with the <i>Status</i> field set to 0x00 (SUCCESS), the <i>Manufacturer Code</i> , <i>Image Type</i> , <i>File Version</i> and <i>Image Size</i> set according to the OTA upgrade file prepared as part of the initial conditions.	DUT CLIENT unicasts a ZCL <i>Image Block Request</i> command frame to TH SERVER with the <i>Manufacturer Code</i> , <i>Image Type</i> and <i>File Version</i> fields equal to the values of the previous request, the <i>File Offset</i> field equal to zero and the <i>Maximum Data Size</i> field equal to a suitable value for the DUT.
2c	OTA.C.C05.Rsp OTA.C.C03.Tx	TH SERVER unicasts a ZCL <i>Image Block Response</i> command frame to DUT CLIENT with the <i>Manufacturer Code</i> , <i>Image Type</i> and <i>File Version</i> fields set according to the values of the OTA upgrade file, the <i>File Offset</i> field set to the value in the previous request and the <i>Data Size</i> field set to a value suitable for the TH.	DUT CLIENT unicasts a ZCL <i>Image Block Request</i> command frame to TH SERVER with the <i>Manufacturer Code</i> , <i>Image Type</i> and <i>File Version</i> field equal to the values of the previous request, the <i>File Offset</i> field equal to a different value from the offset in step 2b and the <i>Maximum Data Size</i> field equal to a suitable value for the DUT.

Continued...

OTA-TC-13C: Aborted download			
Item	PICS	Test Harness Step	DUT pass Verification
2d	OTA.C.C05.Rsp OUPC2	TH SERVER unicasts a ZCL <i>Image Block Response</i> command frame to DUT CLIENT with the <i>Status</i> field set to 0x95 (ABORT).	If requested, DUT CLIENT unicasts a ZCL <i>default response</i> command frame to TH SERVER with the <i>status</i> field equal to 0x00 (SUCCESS). DUT CLIENT does nothing.
3	OTA.C.A0006	TH SERVER unicasts a ZCL <i>read attributes</i> command frame to DUT CLIENT to read the <i>ImageUpgradeStatus</i> attribute.	DUT CLIENT unicasts a ZCL <i>read attributes response</i> command frame to TH SERVER. The <i>ImageUpgradeStatus</i> attribute has a value equal to 0x00 (<i>Normal</i>).

--- End of test case OTA-TC-13C ---

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4.3.14 OTA-TC-14C: Aborted upgrade

This will test the server and the client's ability to abort an upgrade after the download has been completed.

NOTE: This test uses a *FULL* upgrade image since we are trying to note whether the client incorrectly applied the upgrade file (and has a different version) or whether it correctly discarded the file and has the same version as it was running previously. Most devices do not change their version number if a *NULL* upgrade file is received so when using a *NULL* upgrade file it is not possible to tell if the device aborted the upgrade or simply discarded the *NULL* upgrade file.

4.3.14.1 Scope

General:

- *Read attributes* command (0x00)
- *Read attributes response* command (0x01)
- *Default response* command (0x0b)



OTA cluster (0x0019):

- *CurrentFileVersion* attribute (0x0002)
- *ImageUpgradeStatus* attribute (0x0006)
- *Query Next Image Request* command (0x01)
- *Query Next Image Response* command (0x02)
- *Image Block Request* command (0x03)
- *Image Block Response* command (0x05)
- *Upgrade End Request* command (0x06)

PICS:

- OTA.C
- OTA.C.A0002, OTA.C.A000b
- OTA.C.C02.Rsp, OTA.C.C05.Rsp, OTA.C.C07.Rsp
- OTA.C.C01.Tx, OTA.C.C03.Tx, OTA.C.C06.Tx

4.3.14.2 Required devices

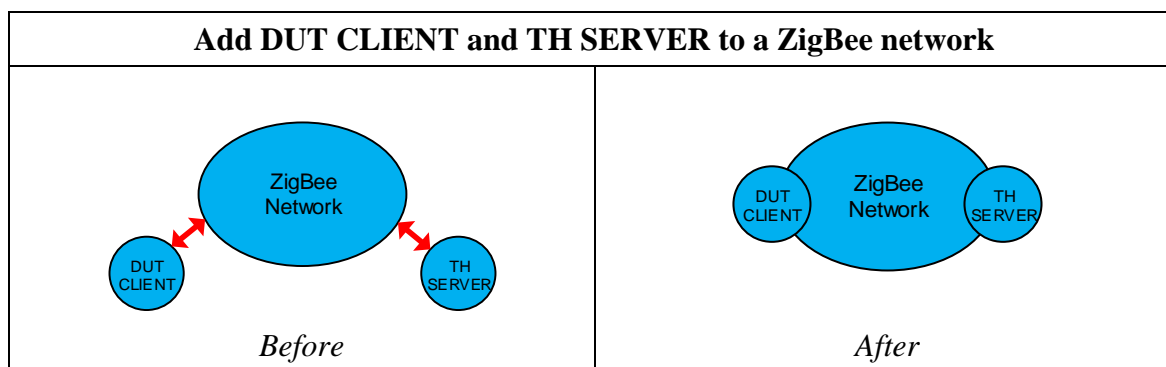
Designation	Symbol	Description
DUT CLIENT		Device under test client implementing: <ul style="list-style-type: none"> • The <i>OTA</i> cluster client.
TH SERVER		Test harness server implementing: <ul style="list-style-type: none"> • The <i>OTA</i> cluster server.

663 **4.3.14.3 Initial conditions**

Item	Initial Conditions
1	A packet sniffer shall be observing the communication over the air interface.
2	All devices are factory new and powered off until used.
3	The test requires an OTA upgrade client setup as a ZR, ZC, or ZED. The OTA upgrade server must be setup as the TH.
4	The manufacturer must prepare a FULL upgrade file for their OTA client device that contains their vendor firmware.
5	The OTA upgrade server shall be setup so that no new upgrade image is available for the client.
6	The OTA upgrade client shall discover the upgrade server's identity and be setup to periodically query the upgrade server

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666 **4.3.14.4 Test preparation**

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OTA-TC-14C: Aborted upgrade		
Item	Preparation Step	Observation
P1	Form a ZigBee network.	Observe appropriate command frame to form the network.
P2	Power on TH SERVER and DUT CLIENT.	TH SERVER and DUT CLIENT are powered on.
P3	Join TH SERVER and DUT CLIENT to a ZigBee network.	Observe appropriate communication between TH SERVER, DUT CLIENT and any other relevant node on the ZigBee network.

--- End of test case OTA-TC-14C preparation ---

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669 **4.3.14.5 Test procedure**

OTA-TC-14C: Aborted upgrade			
Item	PICS	Test Harness Step	DUT pass Verification
1	-	TH SERVER shall be informed of the upgrade file for the OTA client indicating that it is the <i>next</i> upgrade file for the corresponding manufacturer ID and Image Type ID. This shall be done via a manufacturer specific process.	-
2a	OTA.C.C01.Tx	-	DUT CLIENT unicasts a ZCL <i>Query Next Image Request</i> command frame to TH SERVER with the <i>Manufacturer Code</i> , <i>Image Type</i> and <i>Current File Version</i> fields equal to appropriate values for the DUT.
2b	OTA.C.C02.Rsp OTA.C.C03.Tx	TH SERVER unicasts a ZCL <i>Query Next Image Response</i> command frame to DUT CLIENT with the <i>Status</i> field set to 0x00 (SUCCESS), the <i>Manufacturer Code</i> , <i>Image Type</i> , <i>File Version</i> and <i>Image Size</i> set according to the OTA upgrade file prepared as part of the initial conditions.	DUT CLIENT unicasts a ZCL <i>Image Block Request</i> command frame to TH SERVER with the <i>Manufacturer Code</i> , <i>Image Type</i> and <i>File Version</i> fields equal to the values of the previous request, the <i>File Offset</i> field equal to zero and the <i>Maximum Data Size</i> field equal to a suitable value for the DUT.
2c	OTA.C.C05.Rsp	TH SERVER unicasts a ZCL <i>Image Block Response</i> command frame to DUT CLIENT with the <i>Manufacturer Code</i> , <i>Image Type</i> and <i>File Version</i> fields set according to the values of the OTA upgrade file, the <i>File Offset</i> field set to the value in the previous request and the <i>Data Size</i> field set to a value suitable for the TH.	If requested, DUT CLIENT unicasts a ZCL <i>default response</i> command frame to TH SERVER with the <i>status</i> field equal to 0x00 (SUCCESS).

Continued...

OTA-TC-14C: Aborted upgrade			
Item	PICS	Test Harness Step	DUT pass Verification
3	OTA.C.A0006	TH SERVER unicasts a ZCL <i>read attributes</i> command frame to DUT CLIENT to read the <i>ImageUpgradeStatus</i> attribute.	DUT CLIENT unicasts a ZCL <i>read attributes response</i> command frame to TH SERVER. If DUT CLIENT does not support the attribute, it shall respond with a status of <i>UNSUPPORTED_ATTRIBUTE</i> . If it does support the attribute, it shall respond with a status of <i>SUCCESS</i> and a value equal to 0x01 (<i>Download in Progress</i>).
4a	OTA.C.C03.Tx	-	DUT CLIENT unicasts a ZCL <i>Image Block Request</i> command frame to TH SERVER with the <i>Manufacturer Code</i> , <i>Image Type</i> and <i>File Version</i> fields equal to the values of the previous request, the <i>File Offset</i> field commensurate with the next block and the <i>Maximum Data Size</i> field equal to a suitable value for the DUT.
4b	OTA.C.C05.Rsp	TH SERVER unicasts a ZCL <i>Image Block Response</i> command frame to DUT CLIENT with the <i>Manufacturer Code</i> , <i>Image Type</i> and <i>File Version</i> fields set according to the values of the OTA upgrade file, the <i>File Offset</i> field set to the value in the previous request and the <i>Data Size</i> field set to a value suitable for the TH.	If requested, DUT CLIENT unicasts a ZCL <i>default response</i> command frame to TH SERVER with the <i>status</i> field equal to 0x00 (<i>SUCCESS</i>). The test shall repeat from step 4a, until the complete file has been downloaded.
5a	OTA.C.C06.Tx	-	DUT CLIENT unicasts a ZCL <i>Upgrade End Request</i> command frame to TH SERVER with the <i>Status</i> field equal to 0x00 (<i>SUCCESS</i>) and the <i>Manufacturer Code</i> , <i>Image Type</i> and <i>File Version</i> fields equal to values according to the file that was downloaded.

Continued...

OTA-TC-14C: Aborted upgrade			
Item	PICS	Test Harness Step	DUT pass Verification
5b	OUPC3	TH SERVER unicasts a ZCL <i>Default Response</i> command frame to DUT CLIENT with a <i>Status</i> parameter set to 0x95 (ABORT).	DUT CLIENT does nothing. NOTE: The client shall NOT apply the upgrade.
6	OTA.C.A0006	TH SERVER unicasts a ZCL <i>read attributes</i> command frame to DUT CLIENT to read the <i>ImageUpgradeStatus</i> attribute.	DUT CLIENT unicasts a ZCL <i>read attributes response</i> command frame to TH SERVER. The <i>ImageUpgradeStatus</i> attribute has a value equal to 0x00 (<i>Normal</i>).
7	OTA.C.A0002	TH SERVER unicasts a ZCL <i>read attributes</i> command frame to DUT CLIENT to read the <i>CurrentFileVersion</i> attribute.	DUT CLIENT unicasts a ZCL <i>read attributes response</i> command frame to TH SERVER. The <i>CurrentFileVersion</i> attribute has a value equal to the same value as it used in the Firmware Version parameter of the initial Query Image Request command frame in step 2a.

--- End of test case OTA-TC-14C ---

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4.3.15 OTA-TC-15C: Image page request

This will test the server or the client's ability to handle an image page request to receive multiple blocks sent without requesting each one.

NOTE: This test is required only if the device supports the optional feature image page request.

4.3.15.1 Scope

General:

- *Read attributes* command (0x00)
- *Read attributes response* command (0x01)
- *Default response* command (0x0b)



OTA cluster (0x0019):

- *ImageUpgradeStatus* attribute (0x0006)
- *Query Next Image Request* command (0x01)
- *Query Next Image Response* command (0x02)
- *Image Page Request* command (0x04)
- *Image Block Response* command (0x05)
- *Upgrade End Request* command (0x06)
- *Upgrade End Response* command (0x07)

PICS:

- OTA.C
- OTA.C.A000b
- OTA.C.C02.Rsp, OTA.C.C05.Rsp, OTA.C.C07.Rsp
- OTA.C.C01.Tx, OTA.C.C02.Tx, OTA.C.C06.Tx

4.3.15.2 Required devices

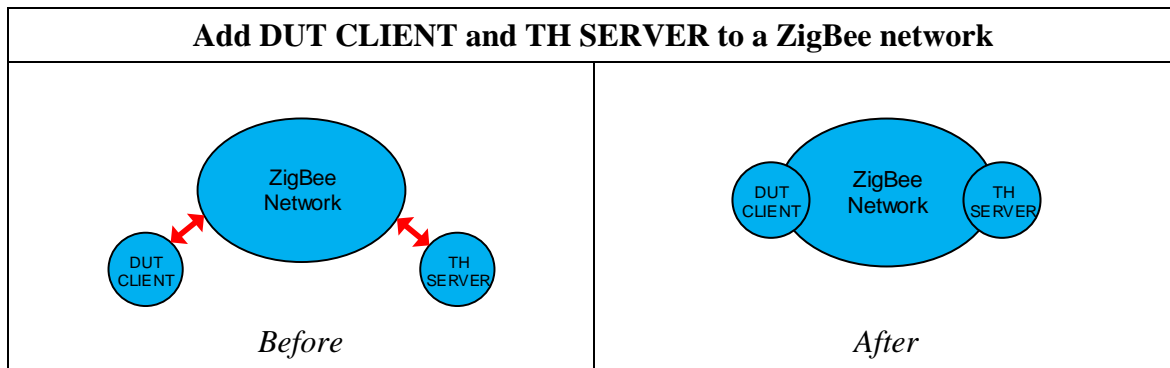
Designation	Symbol	Description
DUT CLIENT		Device under test client implementing: <ul style="list-style-type: none"> • The <i>OTA</i> cluster client.
TH SERVER		Test harness server implementing: <ul style="list-style-type: none"> • The <i>OTA</i> cluster server.

697 **4.3.15.3 Initial conditions**

Item	Initial Conditions
1	A packet sniffer shall be observing the communication over the air interface.
2	All devices are factory new and powered off until used.
3	The test requires an OTA upgrade client setup as a ZR, ZC, or ZED. The OTA upgrade server must be setup as the TH.
4	The manufacturer must prepare a FULL upgrade file for their OTA client device that contains their vendor firmware.
5	The OTA upgrade server shall be setup so that no new upgrade image is available for the client.
6	The OTA upgrade client shall discover the upgrade server's identity and be setup to periodically query the upgrade server

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700 **4.3.15.4 Test preparation**

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OTA-TC-15C: Image page request		
Item	Preparation Step	Observation
P1	Form a ZigBee network.	Observe appropriate command frame to form the network.
P2	Power on TH SERVER and DUT CLIENT.	TH SERVER and DUT CLIENT are powered on.
P3	Join TH SERVER and DUT CLIENT to a ZigBee network.	Observe appropriate communication between TH SERVER, DUT CLIENT and any other relevant node on the ZigBee network.

--- End of test case OTA-TC-15C preparation ---

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703 **4.3.15.5 Test procedure**

OTA-TC-15C: Image page request			
Item	PICS	Test Harness Step	DUT pass Verification
1	-	TH SERVER shall be informed of the upgrade file for the OTA client indicating that it is the <i>next</i> upgrade file for the corresponding manufacturer ID and Image Type ID. This shall be done via a manufacturer specific process.	-
2a	OTA.C.C01.Tx	-	DUT CLIENT unicasts a ZCL <i>Query Next Image Request</i> command frame to TH SERVER with the <i>Manufacturer Code</i> , <i>Image Type</i> and <i>Current File Version</i> fields equal to appropriate values for the DUT.
2b	OTA.C.C02.Rsp OTA.C.C04.Tx	TH SERVER unicasts a ZCL <i>Query Next Image Response</i> command frame to DUT CLIENT with the <i>Status</i> field set to 0x00 (SUCCESS), the <i>Manufacturer Code</i> , <i>Image Type</i> , <i>File Version</i> and <i>Image Size</i> fields set according to the OTA upgrade file prepared as part of the initial conditions.	DUT CLIENT unicasts a ZCL <i>Image Page Request</i> command frame to TH SERVER with the <i>Manufacturer Code</i> , <i>Image Type</i> and <i>File Version</i> fields equal to the values of the previous request, the <i>File Offset</i> field equal to zero and the <i>Maximum Data Size</i> , <i>Page Size</i> and <i>Response Spacing</i> fields equal to suitable values for the DUT.

Continued...

OTA-TC-15C: Image page request			
Item	PICS	Test Harness Step	DUT pass Verification
2c	OTA.C.C05.Rsp	<p>TH SERVER unicasts multiple <i>ZCL Image Block Response</i> command frames to DUT CLIENT with the <i>Manufacturer Code</i>, <i>Image Type</i> and <i>File Version</i> fields set according to the values of the OTA upgrade file, the <i>File Offset</i> field set to the value in the original query request, incremented by the server's maximum data size for each subsequent image block response, and the <i>Data Size</i> field set to a value suitable for the TH.</p> <p>Each <i>Image Block Response</i> command frame corresponds to the maximum data size of the TH and the page size value sent by DUT CLIENT in the previous request.</p>	If requested, DUT CLIENT unicasts a <i>ZCL default response</i> command frame to TH SERVER with the <i>status</i> field equal to 0x00 (SUCCESS).
3	OTA.C.A0006	TH SERVER unicasts a <i>ZCL read attributes</i> command frame to DUT CLIENT to read the <i>ImageUpgradeStatus</i> attribute.	<p>DUT CLIENT unicasts a <i>ZCL read attributes response</i> command frame to TH SERVER.</p> <p>If DUT CLIENT does not support the attribute, it shall respond with a status of UNSUPPORTED_-ATTRIBUTE. If it does support the attribute, it shall respond with a status of SUCCESS and a value equal to 0x01 (<i>Download in Progress</i>).</p>

Continued...

OTA-TC-15C: Image page request			
Item	PICS	Test Harness Step	DUT pass Verification
4a	OTA.C.C04.Tx	-	DUT CLIENT unicasts a ZCL <i>Image Page Request</i> command frame to TH SERVER with the <i>Manufacturer Code</i> , <i>Image Type</i> and <i>File Version</i> fields equal to the values of the previous request, the <i>File Offset</i> field commensurate with the next page and the <i>Maximum Data Size</i> , <i>Page Size</i> and <i>Response Spacing</i> fields equal to suitable values for the DUT.
4b	OTA.C.C05.Rsp	<p>TH SERVER unicasts multiple ZCL <i>Image Block Response</i> command frames to DUT CLIENT with the <i>Manufacturer Code</i>, <i>Image Type</i> and <i>File Version</i> fields set according to the values of the OTA upgrade file, the <i>File Offset</i> field set to the value in the original query request, incremented by the server's maximum data size for each subsequent image block response, and the <i>Data Size</i> field set to a value suitable for the TH.</p> <p>Each <i>Image Block Response</i> command frame corresponds to the maximum data size of the TH and the page size value sent by DUT CLIENT in the previous request.</p>	<p>If requested, DUT CLIENT unicasts a ZCL <i>default response</i> command frame to TH SERVER with the <i>status</i> field equal to 0x00 (SUCCESS).</p> <p>The test shall repeat from step 4a, until the complete file has been downloaded.</p>
5a	OTA.C.C06.Tx	-	DUT CLIENT unicasts a ZCL <i>Upgrade End Request</i> command frame to TH SERVER with the <i>Status</i> field equal to 0x00 (SUCCESS) and the <i>Manufacturer Code</i> , <i>Image Type</i> and <i>File Version</i> fields equal to values according to the file that was downloaded.

Continued...

OTA-TC-15C: Image page request			
Item	PICS	Test Harness Step	DUT pass Verification
5b	OTA.C.C07.Rsp	TH SERVER unicasts a ZCL <i>Upgrade End Response</i> command frame to DUT CLIENT with the <i>Manufacturer Code</i> , <i>Image Type</i> and <i>File Version</i> fields matching the values in the <i>Upgrade End Request</i> command frame from DUT CLIENT and the <i>Current Time</i> and <i>Upgrade Time</i> fields both set to the current clock time (upgrade now).	If requested, DUT CLIENT unicasts a ZCL <i>default response</i> command frame to TH SERVER with the <i>status</i> field equal to 0x00 (SUCCESS). DUT CLIENT does nothing.

--- End of test case OTA-TC-15C ---

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4.3.16 OTA-TC-16C: Device specific upgrade files

This will test the server and the client's ability to download a simple OTA upgrade file that is intended for a specific device.

NOTE: This test is required only if the device supports the optional feature device specific file request.

4.3.16.1 Scope

General:

- *Default response* command (0x0b)



OTA cluster (0x0019):

- *Image Page Request* command (0x04)
- *Image Block Response* command (0x05)
- *Upgrade End Request* command (0x06)
- *Upgrade End Response* command (0x07)
- *Query Device Specific File Request* command (0x08)
- *Query Device Specific File Response* command (0x09)

PICS:

- OTA.C
- OTA.C.C05.Rsp, OTA.C.C07.Rsp, OTA.C.C09.Rsp
- OTA.C.C02.Tx, OTA.C.C06.Tx, OTA.C.C08.Tx

4.3.16.2 Required devices

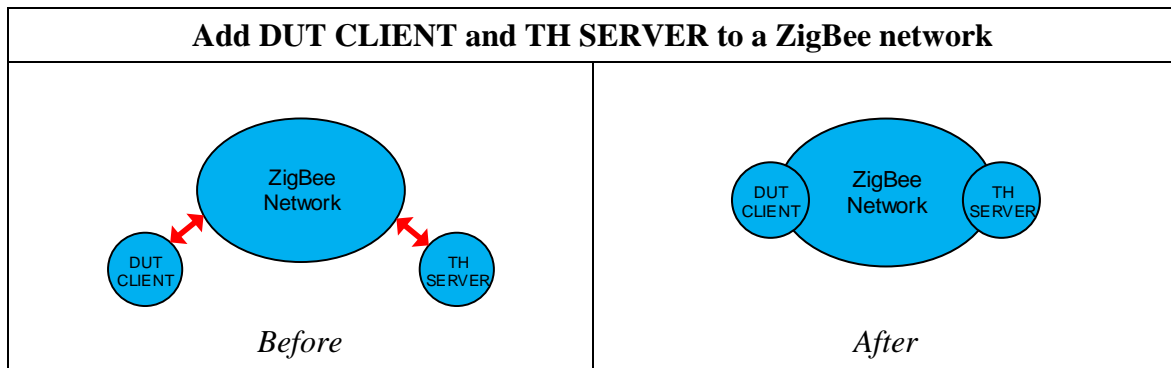
Designation	Symbol	Description
DUT CLIENT		Device under test client implementing: <ul style="list-style-type: none"> • The <i>OTA</i> cluster client.
TH SERVER		Test harness server implementing: <ul style="list-style-type: none"> • The <i>OTA</i> cluster server.

727 **4.3.16.3 Initial conditions**

Item	Initial Conditions
1	A packet sniffer shall be observing the communication over the air interface.
2	All devices are factory new and powered off until used.
3	The test requires an OTA upgrade client setup as a ZR, ZC, or ZED. The OTA upgrade server must be setup as the TH.
4	The manufacturer must prepare <u>two</u> NULL upgrade files for their OTA client device that has no vendor firmware, just an OTA header. These upgrade files should include the <i>Upgrade file destination</i> field. The upgrade file destination of one file shall be set to the IEEE address of the OTA client. The second file shall be set to the IEEE address of (>) 0000000001.
5	The OTA upgrade server shall be setup so that no new upgrade image is available for the client.
6	The OTA upgrade client shall discover the upgrade server's identity and be setup to periodically query the upgrade server

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730 **4.3.16.4 Test preparation**

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OTA-TC-16C: Device specific upgrade files		
Item	Preparation Step	Observation
P1	Form a ZigBee network.	Observe appropriate command frame to form the network.
P2	Power on TH SERVER and DUT CLIENT.	TH SERVER and DUT CLIENT are powered on.
P3	Join TH SERVER and DUT CLIENT to a ZigBee network.	Observe appropriate communication between TH SERVER, DUT CLIENT and any other relevant node on the ZigBee network.

--- End of test case OTA-TC-16C preparation ---

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733 **4.3.16.5 Test procedure**

OTA-TC-16C: Device specific upgrade files			
Item	PICS	Test Harness Step	DUT pass Verification
1	-	TH SERVER shall be informed of the two NULL upgrade file for the OTA client indicating that they are the <i>next</i> upgrade files for the corresponding manufacturer ID and Image Type ID. This shall be done via a manufacturer specific process.	-
2a	OTA.C.C08.Tx	-	DUT CLIENT unicasts a ZCL <i>Query Device Specific File Request</i> command frame to TH SERVER with the <i>Request Node Address</i> , <i>Manufacturer Code</i> , <i>Image Type</i> , <i>File Version</i> and <i>Current ZigBee Stack Version</i> fields equal to appropriate values for the DUT.
2b	OTA.C.C09.Rsp OTA.C.C03.Tx	TH SERVER unicasts a ZCL <i>Query Device Specific File Response</i> command frame to DUT CLIENT with the <i>Status</i> field set to 0x00 (SUCCESS) and the <i>Manufacturer Code</i> , <i>Image Type</i> , <i>File Version</i> and <i>Image Size</i> fields set according to the OTA upgrade file prepared as part of the initial conditions.	DUT CLIENT unicasts a ZCL <i>Image Block Request</i> command frame to TH SERVER with the <i>Manufacturer Code</i> , <i>Image Type</i> , <i>File Version</i> and <i>Request Node Address</i> fields equal to the values of the previous request, the <i>File Offset</i> field equal to zero and the <i>Maximum Data Size</i> field equal to a suitable value for the DUT.
2c	OTA.C.C05.Rsp OTA.C.C06.Tx	TH SERVER unicasts a ZCL <i>Image Block Response</i> command frame to DUT CLIENT with the <i>Manufacturer Code</i> , <i>Image Type</i> and <i>File Version</i> set according to the values of the OTA upgrade file, the <i>File Offset</i> field set to the value in the previous request and the <i>Data Size</i> field set to a value suitable for the TH.	DUT CLIENT unicasts a ZCL <i>Upgrade End Request</i> command frame to TH SERVER with the <i>Status</i> field equal to 0x00 (SUCCESS), the <i>Manufacturer Code</i> , <i>Image Type</i> and <i>File Version</i> fields equal to values according to the file that was downloaded.

Continued...

OTA-TC-16C: Device specific upgrade files			
Item	PICS	Test Harness Step	DUT pass Verification
2d	OTA.C.C07.Rsp	TH SERVER unicasts a ZCL <i>Upgrade End Response</i> command frame to DUT CLIENT with the <i>Manufacturer Code</i> , <i>Image Type</i> and <i>File Version</i> fields matching the values in the <i>Upgrade End Request</i> command frame from DUT CLIENT and the <i>Current Time</i> and <i>Upgrade Time</i> fields both set to the current clock time (upgrade now).	If requested, DUT CLIENT unicasts a ZCL <i>default response</i> command frame to TH SERVER with the <i>status</i> field equal to 0x00 (SUCCESS). DUT CLIENT does nothing. NOTE: <i>The client shall not process the NULL upgrade file.</i>

--- End of test case OTA-TC-16C ---

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736 4.3.17 OTA-TC-17C: Rate limiting

737 This test verifies that the server can rate limit a client. This test is optional, depending on the
738 PICS for the device (if it supports rate limiting).

739 4.3.17.1 Scope

740 General:

- 741 • *Default response* command (0x0b)



742 *OTA* cluster (0x0019):

- 743 • *Query Next Image Request* command (0x01)
- 744 • *Query Next Image Response* command (0x02)
- 745 • *Image Block Request* command (0x03)
- 746 • *Image Block Response* command (0x05)
- 747 • *Upgrade End Request* command (0x06)
- 748 • *Upgrade End Response* command (0x07)

749 PICS:

- 750 • OTA.C
- 751 • OTA.C.C02.Rsp, OTA.C.C05.Rsp, OTA.C.C07.Rsp
- 752 • OTA.C.C01.Tx, OTA.C.C03.Tx, OTA.C.C06.Tx

753 4.3.17.2 Required devices

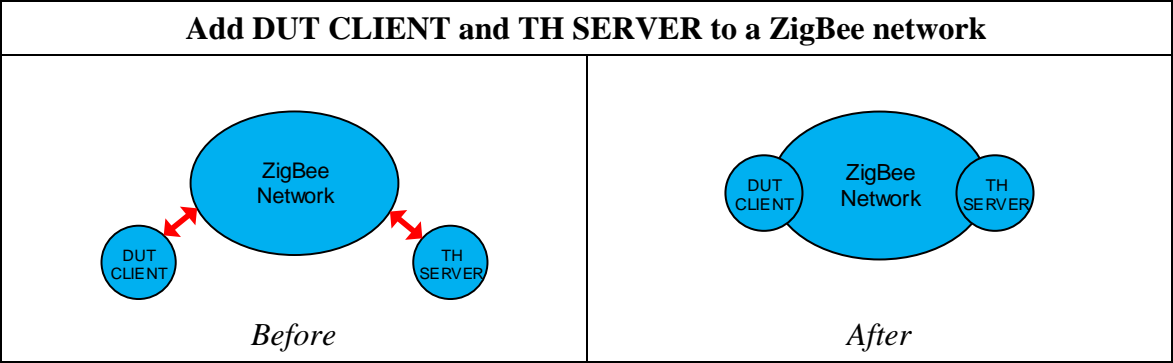
Designation	Symbol	Description
DUT CLIENT		Device under test client implementing: <ul style="list-style-type: none"> • The <i>OTA</i> cluster client.
TH SERVER		Test harness server implementing: <ul style="list-style-type: none"> • The <i>OTA</i> cluster server.

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4.3.17.3 Initial conditions

Item	Initial Conditions
1	A packet sniffer shall be observing the communication over the air interface.
2	All devices are factory new and powered off until used.
3	The test requires an OTA upgrade client setup as a ZR, ZC, or ZED. The OTA upgrade server must be setup as the TH.
4	The manufacturer must prepare a NULL upgrade file for their OTA client device that has no vendor firmware, just an OTA header. There should be no optional fields. The version in the file shall be greater than the version currently installed on the OTA client (i.e. an upgrade).
5	The OTA upgrade server shall be setup so that no new upgrade image is available for the client.
6	The OTA upgrade client shall discover the upgrade server's identity and be setup to periodically query the upgrade server
7	The client shall be configured with its production MinimumBlockPeriod value, which may be zero or another value.

758 **4.3.17.4 Test preparation**



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OTA-TC-17C: Rate limiting		
Item	Preparation Step	Observation
P1	Form a ZigBee network.	Observe appropriate command frame to form the network.
P2	Power on TH SERVER and DUT CLIENT.	TH SERVER and DUT CLIENT are powered on.
P3	Join TH SERVER and DUT CLIENT to a ZigBee network.	Observe appropriate communication between TH SERVER, DUT CLIENT and any other relevant node on the ZigBee network.

--- End of test case OTA-TC-17C preparation ---

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761 **4.3.17.5 Test procedure**

OTA-TC-17C: Rate limiting			
Item	PICS	Test Harness Step	DUT pass Verification
1	-	TH SERVER shall be informed of the NULL upgrade file for the OTA client indicating that it is the <i>next</i> upgrade file for the corresponding manufacturer ID and Image Type ID. This shall be done via a manufacturer specific process.	-
2a	OTA.C.C01.Tx	-	DUT CLIENT unicasts a ZCL <i>Query Next Image Request</i> command frame to TH SERVER with the <i>Manufacturer Code</i> , <i>Image Type</i> and <i>Current File Version</i> fields equal to appropriate values for the DUT.
2b	OTA.C.C02.Rsp OTA.C.C03.Tx	TH SERVER unicasts a ZCL <i>Query Next Image Response</i> command frame to DUT CLIENT with the <i>Status</i> field set to 0x00 (SUCCESS), the <i>Manufacturer Code</i> , <i>Image Type</i> , <i>File Version</i> and <i>Image Size</i> fields set according to the OTA upgrade file prepared as part of the initial conditions.	DUT CLIENT unicasts a ZCL <i>Image Block Request</i> command frame to TH SERVER with bit 1 of the <i>Field Control</i> field set to 1 (<i>MinimumBlockPeriod</i> present), the <i>Manufacturer Code</i> , <i>Image Type</i> and <i>File Version</i> fields equal to the values of the previous request, the <i>File Offset</i> field equal to zero, the <i>Maximum Data Size</i> field equal to a suitable value for the DUT and the <i>MinimumBlockPeriod</i> field equal to the current value of DUT CLIENT's <i>MinimumBlockPeriod</i> attribute.

Continued...

OTA-TC-17C: Rate limiting			
Item	PICS	Test Harness Step	DUT pass Verification
2c	OTA.C.C05.Rsp OUPC4	TH SERVER unicasts a ZCL <i>Image Block Response</i> command frame to DUT CLIENT with the <i>Status</i> field set to 0x97 (WAIT_FOR_DATA), the <i>Current Time</i> and <i>Request Time</i> fields both set to 0 and the <i>MinimumBlockPeriod</i> field set to a value other than the client's current value.	If requested, DUT CLIENT unicasts a ZCL <i>default response</i> command frame to TH SERVER with the <i>status</i> field equal to 0x00 (SUCCESS).
3a	OTA.C.C03.Tx	-	After a delay of <i>MinimumBlockPeriod</i> milliseconds after step 2c, DUT CLIENT unicasts a ZCL <i>Image Block Request</i> command frame to TH SERVER with bit 1 of the <i>Field Control</i> field set to 1 (<i>MinimumBlockPeriod</i> present), the <i>Manufacturer Code</i> , <i>Image Type</i> and <i>File Version</i> fields equal to the values of the previous request, the <i>File Offset</i> field equal to zero, the <i>Maximum Data Size</i> field equal to a suitable value for the DUT and the <i>MinimumBlockPeriod</i> field equal to the value provided by TH SERVER in the <i>Image Block Response</i> command frame.
3b	OTA.C.C05.Rsp	TH SERVER unicasts a ZCL <i>Image Block Response</i> command frame to DUT CLIENT with the <i>Status</i> field set to SUCCESS, the <i>Manufacturer Code</i> , <i>Image Type</i> and <i>File Version</i> fields set according to the values of the OTA upgrade file, the <i>File Offset</i> field set to the value in the previous request and the <i>Data Size</i> field set to a value suitable for the TH.	If requested, DUT CLIENT unicasts a ZCL <i>default response</i> command frame to TH SERVER with the <i>status</i> field equal to 0x00 (SUCCESS). The test shall repeat from step 3a, until DUT CLIENT has fetched all of the parts of the file.

Continued...

OTA-TC-17C: Rate limiting			
Item	PICS	Test Harness Step	DUT pass Verification
4a	OTA.C.C06.Tx	-	<p>DUT CLIENT unicasts a ZCL <i>Upgrade End Request</i> command frame to TH SERVER with the <i>Status</i> field equal to either 0x00 (SUCCESS) or 0x96 (INVALID_IMAGE) and the <i>Manufacturer Code</i>, <i>Image Type</i> and <i>File Version</i> fields equal to values according to the file that was downloaded.</p> <p>NOTE: Depending on how the device processes the NULL file shall determine the status code. This is vendor specific and not critical to passing the test.</p>
2d	OTA.C.C07.Rsp	<p>TH SERVER unicasts a ZCL <i>Upgrade End Response</i> command frame to DUT CLIENT with the <i>Manufacturer Code</i>, <i>Image Type</i> and <i>File Version</i> fields matching the values in the <i>Upgrade End Request</i> command frame from DUT CLIENT and the <i>Current Time</i> and <i>Upgrade Time</i> fields both set to the current clock time (upgrade now).</p> <p>NOTE: This step is only required if the status code of the <i>Upgrade End Request</i> is SUCCESS.</p>	<p>If requested, DUT CLIENT unicasts a ZCL <i>default response</i> command frame to TH SERVER with the <i>status</i> field equal to 0x00 (SUCCESS).</p> <p>DUT CLIENT does nothing.</p> <p>NOTE: The client shall not process the NULL upgrade file.</p>

--- End of test case OTA-TC-17C ---

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4.4 Server test cases

4.4.1 OTA-TC-01S: Query upgrade server when no image is available

This tests that the OTA upgrade server (the DUT) handles a correctly formatted request from the OTA upgrade client (the TH).

4.4.1.1 Scope



OTA cluster (0x0019):

- *Query Next Image Request* command (0x01)
- *Query Next Image Response* command (0x02)

PICS:

- OTA.S
- OTA.S.C01.Rsp
- OTA.S.C02.Tx

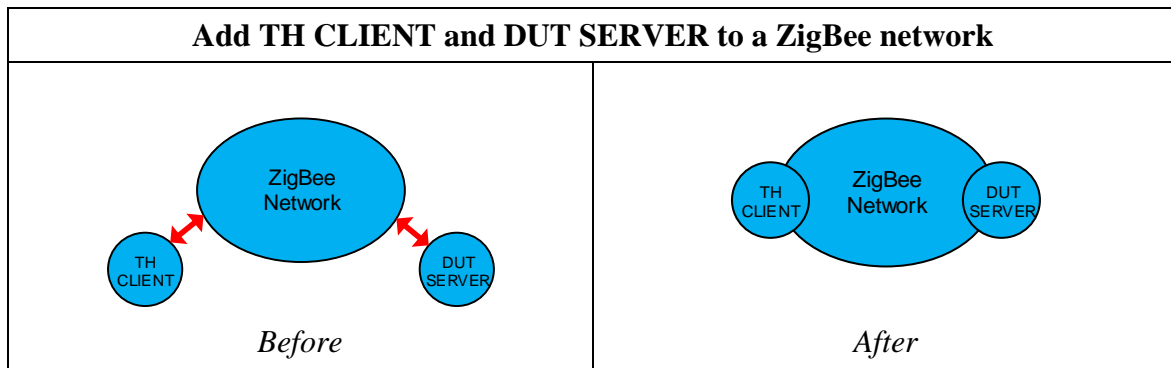
4.4.1.2 Required devices

Designation	Symbol	Description
TH CLIENT		Test harness client implementing: <ul style="list-style-type: none"> • The <i>OTA</i> cluster client.
DUT SERVER		Device under test server implementing: <ul style="list-style-type: none"> • The <i>OTA</i> cluster server.

4.4.1.3 Initial conditions

Item	Initial Conditions
1	A packet sniffer shall be observing the communication over the air interface.
2	All devices are factory new and powered off until used.
3	The test requires an OTA upgrade server setup as a ZR or ZC. The OTA upgrade client must be setup as the TH.
5	The OTA upgrade server shall be setup so that no new upgrade image is available for the client.
6	The OTA upgrade client shall discover the upgrade server's identity and be setup to periodically query the upgrade server

4.4.1.4 Test preparation



OTA-TC-01S: Query upgrade server when no image is available		
Item	Preparation Step	Observation
P1	Form a ZigBee network.	Observe appropriate command frame to form the network.
P2	Power on DUT SERVER and TH CLIENT.	DUT SERVER and TH CLIENT are powered on.
P3	Join DUT SERVER and TH CLIENT to a ZigBee network.	Observe appropriate communication between DUT SERVER, TH CLIENT and any other relevant node on the ZigBee network.

--- End of test case OTA-TC-01S preparation ---

783 **4.4.1.5 Test procedure**

OTA-TC-01S: Query upgrade server when no image is available			
Item	PICS	Test Harness Step	DUT pass Verification
1	OTA.S.C01.Rsp OTA.S.C02.Tx	TH CLIENT unicasts a ZCL <i>Query Next Image Request</i> command frame to DUT SERVER. The <i>Manufacturer Code</i> , <i>Image Type</i> and <i>Current File Version</i> fields depend on the configuration of the TH.	DUT SERVER unicasts a ZCL <i>Query Next Image Response</i> command frame to TH CLIENT with the <i>Status</i> field set to 0x98 (NO_IMAGE_AVAILABLE).
2	OTA.S.C01.Rsp OTA.S.C02.Tx	After 10s, TH CLIENT unicasts a ZCL <i>Query Next Image Request</i> command frame to DUT SERVER. The <i>Manufacturer Code</i> , <i>Image Type</i> and <i>Current File Version</i> fields depend on the configuration of the TH.	DUT SERVER unicasts a ZCL <i>Query Next Image Response</i> command frame to TH CLIENT with the <i>Status</i> field set to 0x98 (NO_IMAGE_AVAILABLE).

--- End of test case OTA-TC-01S ---

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4.4.2 OTA-TC-02S: Image notification with matching parameters

This tests the server's ability to send out image notifications (optional). Testing that the client responds to them is not required behavior, so we will not have test cases.

4.4.2.1 Scope

General:

- *Read attributes* command (0x00)
- *Read attributes response* command (0x01)



OTA cluster (0x0019):

- *Image Notify* command (0x00)
- *Query Next Image Request* command (0x01)
- *Query Next Image Response* command (0x02)

PICS:

- OTA.S
- OTA.S.C00.Tx, OTA.S.C02.Tx
- OTA.S.C01.Rsp
- INPT01, INPT02, INPT03
- OOMTS6

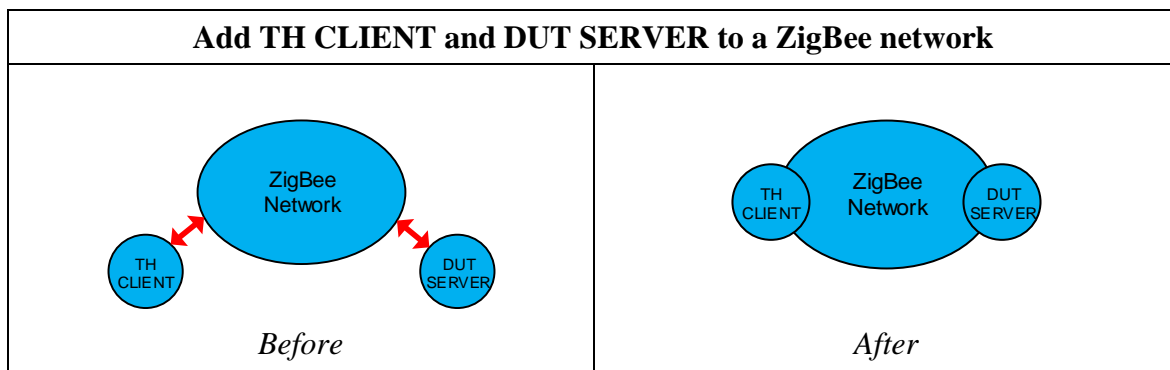
4.4.2.2 Required devices

Designation	Symbol	Description
TH CLIENT		Test harness client implementing: <ul style="list-style-type: none"> • The <i>OTA</i> cluster client.
DUT SERVER		Device under test server implementing: <ul style="list-style-type: none"> • The <i>OTA</i> cluster server.

4.4.2.3 Initial conditions

Item	Initial Conditions
1	A packet sniffer shall be observing the communication over the air interface.
2	All devices are factory new and powered off until used.
3	The test requires an OTA upgrade server setup as a ZR or ZC. The OTA upgrade client must be setup as the TH.
4	The OTA upgrade server shall have NO images available for the client to download.

4.4.2.4 Test preparation



OTA-TC-02S: Image notification with matching parameters		
Item	Preparation Step	Observation
P1	Form a ZigBee network.	Observe appropriate command frame to form the network.
P2	Power on DUT SERVER and TH CLIENT.	DUT SERVER and TH CLIENT are powered on.
P3	Join DUT SERVER and TH CLIENT to a ZigBee network.	Observe appropriate communication between DUT SERVER, TH CLIENT and any other relevant node on the ZigBee network.

--- End of test case OTA-TC-02S preparation ---

810 **4.4.2.5 Test procedure**

OTA-TC-02S: Image notification with matching parameters			
Item	PICS	Test Harness Step	DUT pass Verification
1	OTA.S.C00.Tx	-	DUT SERVER broadcasts a ZCL <i>Image Notify</i> command frame to all devices, indicating that an upgrade image is available, with the <i>Payload Type</i> field set to 0x00 (<i>Query jitter</i> only) and the <i>Query Jitter</i> field set to 0x00 (0%). The other fields in the <i>Image Notify</i> command frame shall be omitted.
2a	OTA.S.C00.Tx, INPT01	-	If INPT01 is supported, DUT SERVER broadcasts a ZCL <i>Image Notify</i> command frame to all devices, indicating that a new image is available, with the <i>Payload Type</i> field set to 0x01 (<i>Query jitter and manufacturer code</i>), the <i>Query Jitter</i> field set to 0x64 (100) and the <i>Manufacturer Code</i> field set according to the value that the OTA client device is using. NOTE: The manufacturer code will vary based on the OTA upgrade file that the server was informed about.
2b	OTA.S.C01.Rsp OTA.S.C02.Tx	TH CLIENT unicasts a ZCL <i>Query Next Image Request</i> command frame to DUT SERVER using its parameters for the <i>Manufacturer Code</i> , <i>Image Type</i> , and <i>Current File Version</i> fields.	DUT SERVER unicasts a ZCL <i>Query Next Image Response</i> command frame to TH CLIENT with the <i>Status</i> field set to 0x98 (NO_IMAGE_AVAILABLE).

Continued...

OTA-TC-02S: Image notification with matching parameters			
Item	PICS	Test Harness Step	DUT pass Verification
3a	OTA.S.C00.Tx, INPT02	-	<p>If INPT02 is supported, DUT SERVER broadcasts a ZCL <i>Image Notify</i> command frame to all devices, indicating that a new image is available, with the Payload Type field set to 0x02 (<i>Query jitter, manufacture code and image type</i>), the <i>Query Jitter</i> field set to 0x64 (100) and the <i>Manufacturer Code</i> and <i>Image Type</i> fields set according to the values of the OTA client.</p> <p>NOTE: <i>The manufacturer code and image type will vary based on the OTA upgrade file that the server was informed about.</i></p>
3b	OTA.S.C01.Rsp OTA.S.C02.Tx	TH CLIENT unicasts a ZCL <i>Query Next Image Request</i> command frame to DUT CLIENT using its parameters for the <i>Manufacturer Code</i> , <i>Image Type</i> and <i>Current File Version</i> fields.	DUT SERVER unicasts a ZCL <i>Query Next Image Response</i> command frame to TH CLIENT with the <i>Status</i> field set to 0x98 (NO_IMAGE_AVAILABLE).
4a	OTA.S.C00.Tx, INPT03	-	<p>If INPT03 is supported, DUT SERVER broadcasts a ZCL <i>Image Notify</i> command frame to all devices, indicating that the new image is available, with the <i>Payload Type</i> field set to 0x03 (<i>Query jitter, manufacture code, image type and new file version</i>), the <i>Query Jitter</i> field set to 0x64 (100) and the <i>Manufacturer Code</i>, <i>Image Type</i> and <i>New File Version</i> fields set according to the values of the OTA client.</p> <p>NOTE: <i>The manufacturer code and image type will vary based on the OTA upgrade file that the server was informed about.</i></p>

Continued...

OTA-TC-02S: Image notification with matching parameters			
Item	PICS	Test Harness Step	DUT pass Verification
4b	OTA.S.C01.Rsp OTA.S.C02.Tx	TH CLIENT unicasts a ZCL <i>Query Next Image Request</i> command frame using its parameters for the <i>Manufacturer Code</i> , <i>Image Type</i> and <i>Current File Version</i> fields.	DUT SERVER unicasts a ZCL <i>Query Next Image Response</i> command frame to TH CLIENT with the <i>Status</i> field set to 0x98 (NO_IMAGE_AVAILABLE).
5a	OTA.S.C00.Tx, INPT03, OOMTS6	-	If INPT03 AND OOMTS6 are both supported, DUT SERVER unicasts a ZCL <i>Image Notify</i> command frame to TH CLIENT, indicating that a new image is available, with the <i>Payload Type</i> field set to 0x03 (<i>Query jitter</i> , <i>manufacture code</i> , <i>image type</i> and <i>new file version</i>), the <i>Query Jitter</i> field set to 0x00 (0) and the <i>Manufacturer Code</i> and <i>Image Type</i> fields set to values that DIFFER from the OTA client device. This message shall be APS encrypted.
5b	OTA.S.C01.Rsp OTA.S.C02.Tx	TH CLIENT unicasts a ZCL <i>Query Next Image Request</i> command frame to DUT SERVER using its parameters for the <i>Manufacturer Code</i> , <i>Image Type</i> and <i>Current File Version</i> fields. NOTE: Clients are required to respond to unicast notifications, regardless of whether the parameters match or if the sent jitter is less than the chosen jitter.	DUT SERVER unicasts a ZCL <i>Query Next Image Response</i> command frame to TH CLIENT with the <i>Status</i> field set to 0x98 (NO_IMAGE_AVAILABLE).

Continued...

OTA-TC-02S: Image notification with matching parameters			
Item	PICS	Test Harness Step	DUT pass Verification
6	OTA.S.C00.Tx, INPT01	-	If INPT01 is supported, DUT SERVER broadcasts a ZCL <i>Image Notify</i> command frame to all devices, indicating that a new image is available, with the <i>Payload Type</i> field set to 0x01 (<i>Query jitter and manufacturer code</i>), the <i>Query Jitter</i> field set to 0x64 (100) and the <i>Manufacturer Code</i> set to a value that is DIFFERENT from the OTA client device's value.

--- End of test case OTA-TC-02S ---

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4.4.3 OTA-TC-03S: Simple download (upgrade)

This will test the server's ability to transfer a simple OTA upgrade file.

4.4.3.1 Scope

General:

- *Read attributes* command (0x00)
- *Read attributes response* command (0x01)



OTA cluster (0x0019):

- *Query Next Image Request* command (0x01)
- *Query Next Image Response* command (0x02)
- *Image Block Request* command (0x03)
- *Image Block Response* command (0x05)
- *Upgrade End Request* command (0x06)
- *Upgrade End Response* command (0x07)

PICS:

- OTA.S
- OTA.S.C02.Tx, OTA.S.C05.Tx, OTA.S.C07.Tx
- OTA.S.C01.Rsp, OTA.S.C03.Rsp, OTA.S.C06.Rsp

4.4.3.2 Required devices

Designation	Symbol	Description
TH CLIENT		Test harness client implementing: <ul style="list-style-type: none"> • The <i>OTA</i> cluster client.
DUT SERVER		Device under test server implementing: <ul style="list-style-type: none"> • The <i>OTA</i> cluster server.

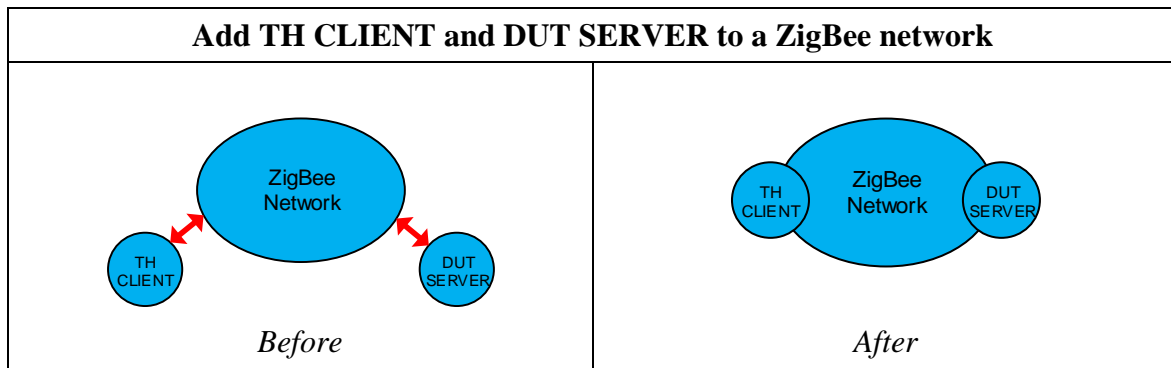
832 **4.4.3.3 Initial conditions**

Item	Initial Conditions
1	A packet sniffer shall be observing the communication over the air interface.
2	All devices are factory new and powered off until used.
3	The test requires an OTA upgrade server setup as a ZR or ZC. The OTA upgrade client must be setup as the TH.
4	The manufacturer must prepare a NULL upgrade file for the TH that has no vendor firmware, just an OTA header. There should be no optional fields. The version in the file shall be greater than the version currently installed on the OTA client (i.e. an upgrade).
5	The OTA upgrade server shall be setup so that no new upgrade image is available for the client.
6	The OTA upgrade client shall discover the upgrade server's identity and be setup to periodically query the upgrade server
7	The OTA upgrade client (TH) shall be setup so that both the <i>UpgradeActivation-Policy</i> attribute and the <i>UpgradeTimeoutPolicy</i> attribute are both set to 0x00.

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4.4.3.4 Test preparation



OTA-TC-03S: Simple download (upgrade)		
Item	Preparation Step	Observation
P1	Form a ZigBee network.	Observe appropriate command frame to form the network.
P2	Power on DUT SERVER and TH CLIENT.	DUT SERVER and TH CLIENT are powered on.
P3	Join DUT SERVER and TH CLIENT to a ZigBee network.	Observe appropriate communication between DUT SERVER, TH CLIENT and any other relevant node on the ZigBee network.

--- End of test case OTA-TC-03S preparation ---

838 **4.4.3.5 Test procedure**

OTA-TC-03S: Simple download (upgrade)			
Item	PICS	Test Harness Step	DUT pass Verification
1	-	-	DUT SERVER shall be informed of the NULL upgrade file for the OTA client indicating that it is the <i>next</i> upgrade file for the corresponding manufacturer ID and Image Type ID. This shall be done via a manufacturer specific process.
2	OTA.S.C01.Rsp OTA.S.C02.Tx OUPS1	TH CLIENT unicasts a ZCL <i>Query Next Image request</i> command frame to DUT SERVER with the <i>Manufacturer Code</i> , <i>Image Type</i> , and <i>Current File Version</i> fields equal to appropriate values for the TH.	DUT SERVER unicasts a ZCL <i>Query Next Image response</i> command frame to TH CLIENT with the <i>Status</i> field set to 0x00 (SUCCESS) and the <i>Manufacturer Code</i> , <i>Image Type</i> , <i>File Version</i> , and <i>Image Size</i> fields set according to the OTA upgrade file prepared as part of the initial conditions.
3	OTA.S.C03.Rsp OTA.S.C05.Tx	TH CLIENT unicasts a ZCL <i>Image Block Request</i> command frame to DUT SERVER with the <i>Manufacturer Code</i> , <i>Image Type</i> and <i>File Version</i> fields equal to the values of the previous request, the <i>File Offset</i> field equal to zero and the <i>Maximum Data Size</i> field equal to a suitable value for the TH.	DUT SERVER unicasts a ZCL <i>Image Block Response</i> command frame to TH CLIENT with the <i>Manufacturer Code</i> , <i>Image Type</i> and <i>File Version</i> fields set according to the values of the OTA upgrade file, the <i>File Offset</i> field set to the value in the previous request and the <i>Data Size</i> field set to a value suitable for the DUT.
4	OTA.S.C06.Rsp OTA.S.C07.Tx	TH CLIENT unicasts a ZCL <i>Upgrade End Request</i> command frame to DUT SERVER with the <i>Status</i> field equal to 0x00 (SUCCESS) and the <i>Manufacturer Code</i> , <i>Image Type</i> and <i>File Version</i> fields equal to values according to the file that was downloaded.	DUT SERVER unicasts a ZCL <i>Upgrade End Response</i> command frame to TH CLIENT with the <i>Manufacturer Code</i> , <i>Image Type</i> and <i>File Version</i> matching the values in the <i>Upgrade End Request</i> command frame from TH CLIENT, the <i>Current Time</i> field is set either to the current clock time (upgrade now) or to any value and the <i>Upgrade Time</i> field is set either to the current clock time (upgrade now) or to 0xffffffff.

--- End of test case OTA-TC-03S ---

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4.4.4 OTA-TC-04S: File download with immediate upgrade

This will test the server's ability to transfer a FULL, valid OTA upgrade file, and request the OTA client immediately upgrade once the download is complete.

4.4.4.1 Scope

General:

- *Read attributes* command (0x00)
- *Read attributes response* command (0x01)



OTA cluster (0x0019):

- *Query Next Image Request* command (0x01)
- *Query Next Image Response* command (0x02)
- *Image Block Request* command (0x03)
- *Image Block Response* command (0x05)
- *Upgrade End Request* command (0x06)
- *Upgrade End Response* command (0x07)

PICS:

- OTA.S
- OTA.S.C02.Tx, OTA.S.C05.Tx, OTA.S.C07.Tx
- OTA.S.C01.Rsp, OTA.S.C03.Rsp, OTA.S.C06.Rsp

4.4.4.2 Required devices

Designation	Symbol	Description
TH CLIENT		Test harness client implementing: <ul style="list-style-type: none"> • The <i>OTA</i> cluster client.
DUT SERVER		Device under test server implementing: <ul style="list-style-type: none"> • The <i>OTA</i> cluster server.

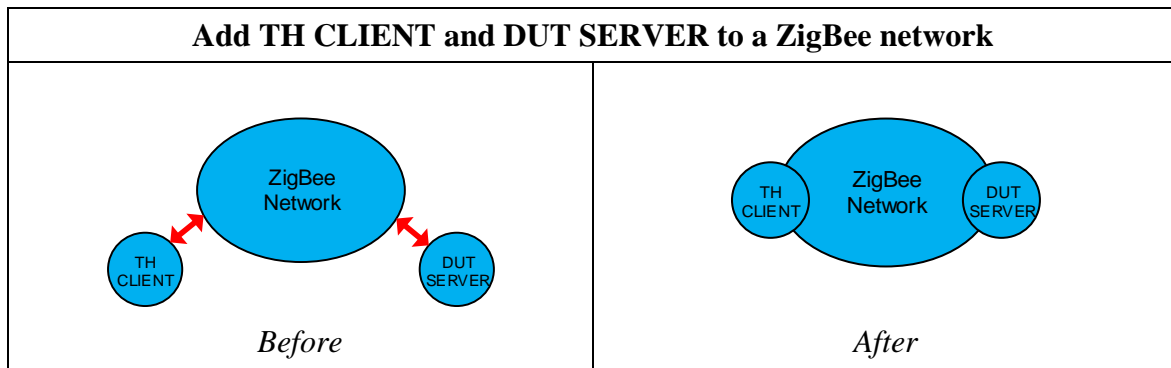
860 **4.4.4.3 Initial conditions**

Item	Initial Conditions
1	A packet sniffer shall be observing the communication over the air interface.
2	All devices are factory new and powered off until used.
3	The test requires an OTA upgrade server setup as a ZR or ZC. The OTA upgrade client must be setup as the TH.
4	The manufacturer must prepare a FULL upgrade file for the TH that contains their vendor firmware.
5	The OTA upgrade server shall be setup so that no new upgrade image is available for the client.
6	The OTA upgrade client shall discover the upgrade server's identity and be setup to periodically query the upgrade server
7	Using platform specific means, verify the current running version of software the client is using.
8	The OTA upgrade client (TH) shall be setup so that both the <i>UpgradeActivation-Policy</i> attribute and the <i>UpgradeTimeoutPolicy</i> attribute are both set to 0x00.

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4.4.4.4 Test preparation



OTA-TC-04S: File download with immediate upgrade		
Item	Preparation Step	Observation
P1	Form a ZigBee network.	Observe appropriate command frame to form the network.
P2	Power on DUT SERVER and TH CLIENT.	DUT SERVER and TH CLIENT are powered on.
P3	Join DUT SERVER and TH CLIENT to a ZigBee network.	Observe appropriate communication between DUT SERVER, TH CLIENT and any other relevant node on the ZigBee network.

--- End of test case OTA-TC-04S preparation ---

866 **4.4.4.5 Test procedure**

OTA-TC-04S: File download with immediate upgrade			
Item	PICS	Test Harness Step	DUT pass Verification
1	-	-	DUT SERVER shall be informed of the upgrade file for the OTA client indicating that it is the <i>next</i> upgrade file for the corresponding manufacturer ID and Image Type ID. This shall be done via a manufacturer specific process.
2	OTA.S.C01.Rsp OTA.S.C02.Tx	TH CLIENT unicasts a ZCL <i>Query Next Image Request</i> command frame to DUT SERVER with the <i>Manufacturer Code</i> , <i>Image Type</i> and <i>Current File Version</i> fields equal to appropriate values for the TH.	DUT SERVER unicasts a ZCL <i>Query Next Image Response</i> command frame to TH CLIENT with the <i>Status</i> field set to 0x00 (SUCCESS) and the <i>Manufacturer Code</i> , <i>Image Type</i> , <i>File Version</i> and <i>Image Size</i> fields set according to the OTA upgrade file prepared as part of the initial conditions.
3	OTA.S.C03.Rsp OTA.S.C05.Tx	TH CLIENT unicasts a ZCL <i>Image Block Request</i> command frame to DUT SERVER with the <i>Manufacturer Code</i> , <i>Image Type</i> and <i>File Version</i> fields equal to the values of the previous request, the <i>File Offset</i> field equal to zero and the <i>Maximum Data Size</i> field equal to a suitable value for the TH.	DUT SERVER unicasts a ZCL <i>Image Block Response</i> command frame to TH CLIENT with the <i>Manufacturer Code</i> , <i>Image Type</i> and <i>File Version</i> fields set according to the values of the OTA upgrade file, the <i>File Offset</i> field set to the value in the previous request and the <i>Data Size</i> field set to a value suitable for the DUT.
4a	OTA.S.C03.Rsp OTA.S.C06.Tx	TH CLIENT unicasts a ZCL <i>Image Block Request</i> command frame to DUT SERVER with the <i>Manufacturer Code</i> , <i>Image Type</i> and <i>File Version</i> fields equal to the values of the previous request, the <i>File Offset</i> field commensurate with the next block and the <i>Maximum Data Size</i> field equal to a suitable value for the TH.	DUT SERVER unicasts a ZCL <i>Image Block Response</i> command frame to TH CLIENT with the <i>Manufacturer Code</i> , <i>Image Type</i> and <i>File Version</i> fields set according to the values of the OTA upgrade file, the <i>File Offset</i> field set to the value in the previous request and the <i>Data Size</i> field set to a value suitable for the DUT.
4b	-	The test shall repeat from step 4a, until the complete file has been downloaded.	-

Continued...

OTA-TC-04S: File download with immediate upgrade			
Item	PICS	Test Harness Step	DUT pass Verification
5	OTA.S.C06.Rsp OTA.S.C07.Tx	TH CLIENT unicasts a ZCL <i>Upgrade End Request</i> command frame to DUT SERVER with the <i>Status</i> field equal to 0x00 (SUCCESS) and the <i>Manufacturer Code</i> , <i>Image Type</i> and <i>File Version</i> fields equal to values according to the file that was downloaded.	DUT SERVER unicasts a ZCL <i>Upgrade End Response</i> command frame to TH CLIENT with the <i>Manufacturer Code</i> , <i>Image Type</i> and <i>File Version</i> matching the values in the <i>Upgrade End Request</i> command frame from TH CLIENT and the <i>Current Time</i> and <i>Upgrade Time</i> fields are both set to the current clock time (upgrade now).

--- End of test case OTA-TC-04S ---

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869 4.4.5 OTA-TC-05S: Simple download with wait for run upgrade command

870 This will test the server's ability to transfer a valid OTA upgrade file, and then send the run
871 upgrade command.

872 4.4.5.1 Scope

873 General:

- 874 • *Read attributes* command (0x00)
- 875 • *Read attributes response* command (0x01)



876 OTA cluster (0x0019):

- 877 • *Query Next Image Request* command (0x01)
- 878 • *Query Next Image Response* command (0x02)
- 879 • *Image Block Request* command (0x03)
- 880 • *Image Block Response* command (0x05)
- 881 • *Upgrade End Request* command (0x06)
- 882 • *Upgrade End Response* command (0x07)

883 PICS:

- 884 • OTA.S
- 885 • OTA.S.C02.Tx, OTA.S.C05.Tx, OTA.S.C07.Tx
- 886 • OTA.S.C01.Rsp, OTA.S.C03.Rsp, OTA.S.C06.Rsp

887 4.4.5.2 Required devices

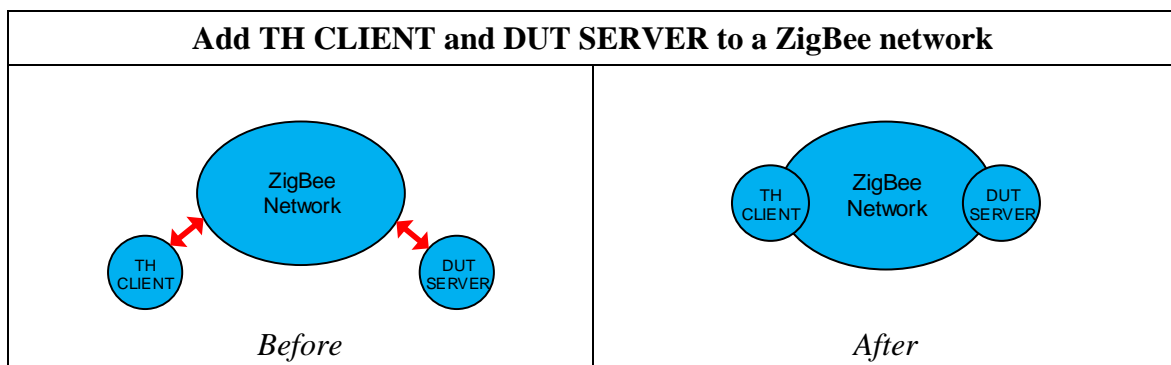
Designation	Symbol	Description
TH CLIENT		Test harness client implementing: <ul style="list-style-type: none"> • The <i>OTA</i> cluster client.
DUT SERVER		Device under test server implementing: <ul style="list-style-type: none"> • The <i>OTA</i> cluster server.

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4.4.5.3 Initial conditions

Item	Initial Conditions
1	A packet sniffer shall be observing the communication over the air interface.
2	All devices are factory new and powered off until used.
3	The test requires an OTA upgrade server setup as a ZR or ZC. The OTA upgrade client must be setup as the TH.
4	The manufacturer must prepare a FULL upgrade file for the TH that contains their vendor firmware.
5	The OTA upgrade server shall be setup so that no new upgrade image is available for the client.
6	The OTA upgrade client shall discover the upgrade server's identity and be setup to periodically query the upgrade server.
7	The OTA upgrade client (TH) shall be setup so that both the <i>UpgradeActivation-Policy</i> attribute and the <i>UpgradeTimeoutPolicy</i> attribute are both set to 0x00.

4.4.5.4 Test preparation



OTA-TC-05S: Simple download with wait for run upgrade command		
Item	Preparation Step	Observation
P1	Form a ZigBee network.	Observe appropriate command frame to form the network.
P2	Power on DUT SERVER and TH CLIENT.	DUT SERVER and TH CLIENT are powered on.
P3	Join DUT SERVER and TH CLIENT to a ZigBee network.	Observe appropriate communication between DUT SERVER, TH CLIENT and any other relevant node on the ZigBee network.

--- End of test case OTA-TC-05S preparation ---

894 **4.4.5.5 Test procedure**

OTA-TC-05S: Simple download with wait for run upgrade command			
Item	PICS	Test Harness Step	DUT pass Verification
1	-	-	DUT SERVER shall be informed of the upgrade file for the OTA client indicating that it is the <i>next</i> upgrade file for the corresponding manufacturer ID and Image Type ID. This shall be done via a manufacturer specific process.
2	OTA.S.C01.Rsp OTA.S.C02.Tx	TH CLIENT unicasts a ZCL <i>Query Next Image Request</i> command frame to DUT SERVER with the <i>Manufacturer Code</i> , <i>Image Type</i> and <i>Current File Version</i> fields equal to appropriate values for the TH.	DUT SERVER unicasts a ZCL <i>Query Next Image Response</i> command frame to TH CLIENT with the <i>Status</i> field set to 0x00 (SUCCESS) and the <i>Manufacturer Code</i> , <i>Image Type</i> , <i>File Version</i> and <i>Image Size</i> fields set according to the OTA upgrade file prepared as part of the initial conditions.
3	OTA.S.C03.Rsp OTA.S.C05.Tx	TH CLIENT unicasts a ZCL <i>Image Block Request</i> command frame to DUT SERVER with the <i>Manufacturer Code</i> , <i>Image Type</i> and <i>File Version</i> fields equal to the values of the previous request, the <i>File Offset</i> field equal to zero and the <i>Maximum Data Size</i> field equal to a suitable value for the TH.	DUT SERVER unicasts a ZCL <i>Image Block Response</i> command frame to TH CLIENT with the <i>Manufacturer Code</i> , <i>Image Type</i> and <i>File Version</i> fields set according to the values of the OTA upgrade file, the <i>File Offset</i> field set to the value in the previous request and the <i>Data Size</i> field set to a value suitable for the DUT.
4a	OTA.S.C03.Rsp OTA.S.C05.Tx	TH CLIENT unicasts a ZCL <i>Image Block Request</i> command frame to DUT SERVER with the <i>Manufacturer Code</i> , <i>Image Type</i> and <i>File Version</i> fields equal to the values of the previous request, the <i>File Offset</i> field commensurate with the next block and the <i>Maximum Data Size</i> field equal to a suitable value for the TH.	DUT SERVER unicasts a ZCL <i>Image Block Response</i> command frame to TH CLIENT with the <i>Manufacturer Code</i> , <i>Image Type</i> and <i>File Version</i> fields set according to the values of the OTA upgrade file, the <i>File Offset</i> field set to the value in the previous request and the <i>Data Size</i> field set to a value suitable for the DUT.
4b	-	The test shall repeat from step 4a, until the complete file has been downloaded.	-

Continued...

OTA-TC-05S: Simple download with wait for run upgrade command			
Item	PICS	Test Harness Step	DUT pass Verification
5	OTA.S.C06.Rsp OTA.S.C07.Tx	TH CLIENT unicasts a ZCL <i>Upgrade End Request</i> command frame to DUT SERVER with the <i>Status</i> field equal to 0x00 (SUCCESS) and the <i>Manufacturer Code</i> , <i>Image Type</i> and <i>File Version</i> fields equal to values according to the file that was downloaded.	DUT SERVER unicasts a ZCL <i>Upgrade End Response</i> command frame to TH CLIENT with the <i>Manufacturer Code</i> , <i>Image Type</i> and <i>File Version</i> matching the values in the <i>Upgrade End Request</i> command frame from TH CLIENT, the <i>Current Time</i> field set to any value and the <i>Upgrade Time</i> field set to 0xffffffff (wait for upgrade).
6a	-	-	Optional: DUT SERVER unicasts a ZCL <i>read attributes</i> command frame to TH CLIENT to read the <i>ImageUpgradeStatus</i> attribute. NOTE: This step may be completed at a random interval before the 5 minute countdown.
6b	-	Conditional on step 6a being executed: TH CLIENT unicasts a ZCL <i>read attributes response</i> command frame to DUT SERVER with a status of SUCCESS and a value equal to 0x03 (<i>Waiting to Upgrade</i>).	-
7	OTA.S.C07.Tx	-	DUT SERVER unicasts a ZCL <i>Upgrade End Response</i> command frame to TH CLIENT with the <i>Manufacturer Code</i> , <i>Image Type</i> and <i>File Version</i> fields matching the values in the <i>Upgrade End Request</i> command frame from TH CLIENT and the <i>Current Time</i> and <i>Upgrade Time</i> fields both set to the current clock time (upgrade now).

--- End of test case OTA-TC-05S ---

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4.4.6 OTA-TC-06S: Simple download with server supporting out-of-scope activation mechanism

This will test the server's ability to download a valid OTA upgrade file, but will not then direct an OTA client to activate the downloaded file utilizing normal ZigBee mechanisms.

4.4.6.1 Scope

General:

- *Read attributes* command (0x00)
- *Read attributes response* command (0x01)



OTA cluster (0x0019):

- *Query Next Image Request* command (0x01)
- *Query Next Image Response* command (0x02)
- *Image Block Request* command (0x03)
- *Image Block Response* command (0x05)
- *Upgrade End Request* command (0x06)
- *Upgrade End Response* command (0x07)

PICS:

- OTA.S
- OTA.S.C02.Tx, OTA.S.C05.Tx, OTA.S.C07.Tx
- OTA.S.C01.Rsp, OTA.S.C03.Rsp, OTA.S.C06.Rsp

4.4.6.2 Required devices

Designation	Symbol	Description
TH CLIENT		Test harness client implementing: <ul style="list-style-type: none"> • The <i>OTA</i> cluster client.
DUT SERVER		Device under test server implementing: <ul style="list-style-type: none"> • The <i>OTA</i> cluster server.

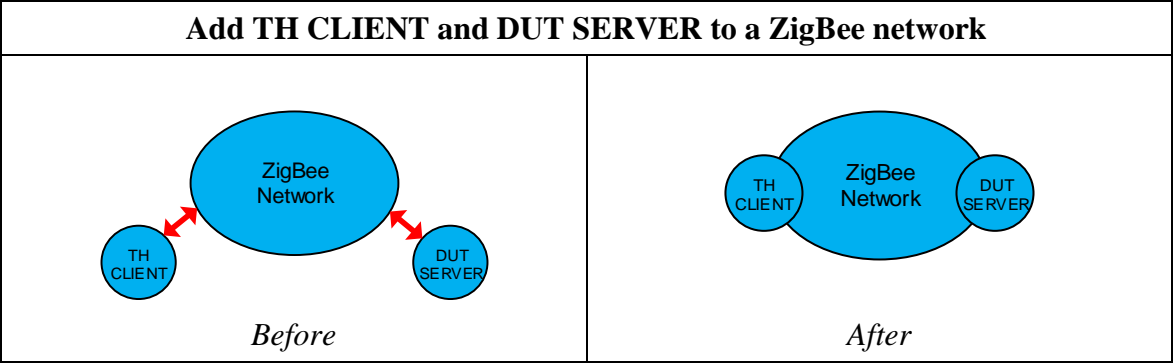
918 **4.4.6.3 Initial conditions**

Item	Initial Conditions
1	A packet sniffer shall be observing the communication over the air interface.
2	All devices are factory new and powered off until used.
3	The test requires an OTA upgrade server setup as a ZR or ZC. The OTA upgrade client must be setup as the TH.
4	The manufacturer must prepare a FULL upgrade file for the TH that contains their vendor firmware.
5	The OTA upgrade server shall be setup so that no new upgrade image is available for the client.
6	The OTA upgrade client shall discover the upgrade server's identity and be setup to periodically query the upgrade server.
7	The OTA upgrade client (TH) shall be setup so that both the <i>UpgradeActivationPolicy</i> attribute and the <i>UpgradeTimeoutPolicy</i> attribute are both set to 0x00.

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921 **4.4.6.4 Test preparation**



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OTA-TC-06S: Simple download with server supporting out-of-scope activation mechanism		
Item	Preparation Step	Observation
P1	Form a ZigBee network.	Observe appropriate command frame to form the network.
P2	Power on DUT SERVER and TH CLIENT.	DUT SERVER and TH CLIENT are powered on.
P3	Join DUT SERVER and TH CLIENT to a ZigBee network.	Observe appropriate communication between DUT SERVER, TH CLIENT and any other relevant node on the ZigBee network.

--- End of test case OTA-TC-06S preparation ---

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4.4.6.5 Test procedure

OTA-TC-06S: Simple download with server supporting out-of-scope activation mechanism			
Item	PICS	Test Harness Step	DUT pass Verification
1	-	-	DUT SERVER shall be informed of the upgrade file for the OTA client indicating that it is the <i>next</i> upgrade file for the corresponding manufacturer ID and Image Type ID. This shall be done via a manufacturer specific process.
2	OTA.S.C01.Rsp OTA.S.C02.Tx	TH CLIENT unicasts a ZCL <i>Query Next Image Request</i> command frame to DUT SERVER with the <i>Manufacturer Code</i> , <i>Image Type</i> and <i>Current File Version</i> fields equal to appropriate values for the TH.	DUT SERVER unicasts a ZCL <i>Query Next Image Response</i> command frame to TH CLIENT with the <i>Status</i> field set to 0x00 (SUCCESS) and the <i>Manufacturer Code</i> , <i>Image Type</i> , <i>File Version</i> and <i>Image Size</i> fields set according to the OTA upgrade file prepared as part of the initial conditions.
3	OTA.S.C03.Rsp OTA.S.C05.Tx	TH CLIENT unicasts a ZCL <i>Image Block Request</i> command frame to DUT SERVER with the <i>Manufacturer Code</i> , <i>Image Type</i> and <i>File Version</i> fields equal to the values of the previous request, the <i>File Offset</i> field equal to zero and the <i>Maximum Data Size</i> field equal to a suitable value for the TH.	DUT SERVER unicasts a ZCL <i>Image Block Response</i> command frame to TH CLIENT with the <i>Manufacturer Code</i> , <i>Image Type</i> and <i>File Version</i> fields set according to the values of the OTA upgrade file, the <i>File Offset</i> field set to the value in the previous request and the <i>Data Size</i> field set to a value suitable for the DUT.
4a	OTA.S.C03.Rsp OTA.S.C05.Tx	TH CLIENT unicasts a ZCL <i>Image Block Request</i> command frame to DUT SERVER with the <i>Manufacturer Code</i> , <i>Image Type</i> and <i>File Version</i> fields equal to the values of the previous request, the <i>File Offset</i> field commensurate with the next block and the <i>Maximum Data Size</i> field equal to a suitable value for the TH.	DUT SERVER unicasts a ZCL <i>Image Block Response</i> command frame to TH CLIENT with the <i>Manufacturer Code</i> , <i>Image Type</i> and <i>File Version</i> fields set according to the values of the OTA upgrade file, the <i>File Offset</i> field set to the value in the previous request and the <i>Data Size</i> field set to a value suitable for the DUT.

Continued...

OTA-TC-06S: Simple download with server supporting out-of-scope activation mechanism			
Item	PICS	Test Harness Step	DUT pass Verification
4b	-	The test shall repeat from step 4a, until the complete file has been downloaded.	-
5	OTA.S.C06.Rsp OTA.S.C07.Tx	TH CLIENT unicasts a ZCL <i>Upgrade End Request</i> command frame to DUT SERVER with the <i>Status</i> field equal to 0x00 (SUCCESS) and the <i>Manufacturer Code</i> , <i>Image Type</i> and <i>File Version</i> fields equal to values according to the file that was downloaded.	DUT SERVER unicasts a ZCL <i>Upgrade End Response</i> command frame to TH CLIENT with the <i>Manufacturer Code</i> , <i>Image Type</i> and <i>File Version</i> matching the values in the <i>Upgrade End Request</i> command frame from TH CLIENT, the <i>Current Time</i> field set to any value and the <i>Upgrade Time</i> field set to 0xffffffff (wait for upgrade).
6a	-	-	Optional: DUT SERVER unicasts a ZCL <i>read attributes</i> command frame to TH CLIENT to read the <i>ImageUpgradeStatus</i> attribute. NOTE: This step may be completed at a random interval before the 5 minute countdown.
6b	-	Conditional on step 6a being executed: TH CLIENT unicasts a ZCL <i>read attributes response</i> command frame to DUT SERVER with a status of SUCCESS and a value equal to 0x06 (<i>Waiting to Upgrade via External Event</i>).	-
7	OTA.S.C06.Rsp OTA.S.C07.Tx	TH CLIENT unicasts a ZCL <i>Upgrade End Request</i> command frame to DUT SERVER with the <i>Status</i> field equal to 0x00 (SUCCESS) and the <i>Manufacturer Code</i> , <i>Image Type</i> and <i>File Version</i> fields equal to values according to the file that was downloaded.	DUT SERVER unicasts a ZCL <i>Upgrade End Response</i> command frame to TH CLIENT with the <i>Manufacturer Code</i> , <i>Image Type</i> and <i>File Version</i> matching the values in the <i>Upgrade End Request</i> command frame from TH CLIENT, the <i>Current Time</i> field set to any value and the <i>Upgrade Time</i> field set to 0xffffffff (wait for upgrade).

--- End of test case OTA-TC-06S ---

4.4.7 OTA-TC-07S: Missing file

This will test the server to see if it correctly responds to a request for a non-existent file.

4.4.7.1 Scope

General:

- *Default response* command (0x0b)



OTA cluster (0x0019):

- *Image Block Request* command (0x03)

PICS:

- OTA.S
- OTA.S.C03.Rsp

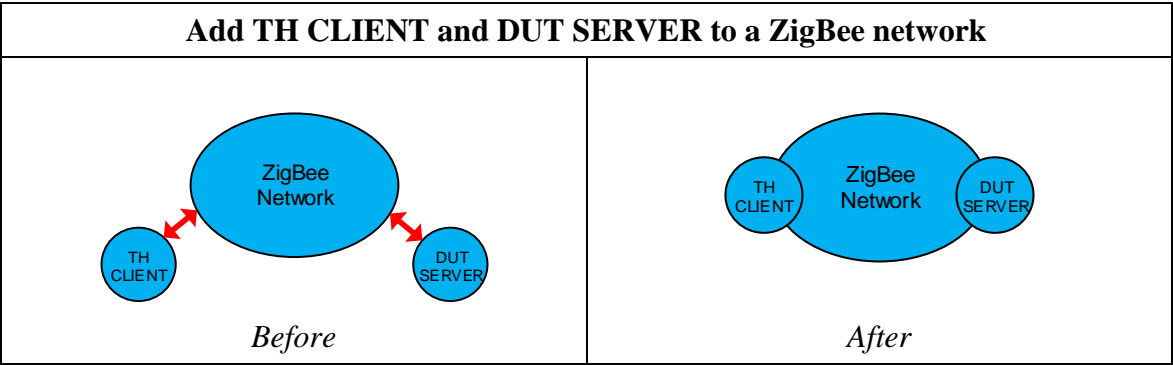
4.4.7.2 Required devices

Designation	Symbol	Description
TH CLIENT		Test harness client implementing: <ul style="list-style-type: none"> • The <i>OTA</i> cluster client.
DUT SERVER		Device under test server implementing: <ul style="list-style-type: none"> • The <i>OTA</i> cluster server.

4.4.7.3 Initial conditions

Item	Initial Conditions
1	A packet sniffer shall be observing the communication over the air interface.
2	All devices are factory new and powered off until used.
3	The test requires an OTA upgrade server setup as a ZR or ZC. The OTA upgrade client must be setup as the TH.

939 **4.4.7.4 Test preparation**



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OTA-TC-07S: Missing file		
Item	Preparation Step	Observation
P1	Form a ZigBee network.	Observe appropriate command frame to form the network.
P2	Power on DUT SERVER and TH CLIENT.	DUT SERVER and TH CLIENT are powered on.
P3	Join DUT SERVER and TH CLIENT to a ZigBee network.	Observe appropriate communication between DUT SERVER, TH CLIENT and any other relevant node on the ZigBee network.

--- End of test case OTA-TC-07S preparation ---

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942 **4.4.7.5 Test procedure**

OTA-TC-07S: Missing file			
Item	PICS	Test Harness Step	DUT pass Verification
1	OTA.S.C03.Rsp OUPS4	<p>TH CLIENT unicasts a ZCL <i>Image Block Request</i> command frame to DUT SERVER with the <i>Manufacturer Code</i> field equal to 0xffff0, the <i>Image Type</i> field equal to 0x0000 and <i>File Version</i> field equal to 0xffffffff0.</p> <p>NOTE: <i>The Manufacturer Code, Image Type and File Version fields may be varied to any values such that the DUT SEVRER has no knowledge of that upgrade file.</i></p>	<p>DUT SERVER unicasts a ZCL <i>Default Response</i> command frame to TH CLIENT with the <i>Status</i> field set to 0x98 (NO_IMAGE_AVAILABLE).</p>

--- End of test case OTA-TC-07S ---

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4.4.8 OTA-TC-08S: Image page request

This will test the server's ability to handle an image page request to receive multiple blocks sent without requesting each one.

NOTE: This test is required only if the device supports the optional feature image page request.

4.4.8.1 Scope

General:

- *Read attributes* command (0x00)
- *Read attributes response* command (0x01)



OTA cluster (0x0019):

- *Query Next Image Request* command (0x01)
- *Query Next Image Response* command (0x02)
- *Image Page Request* command (0x04)
- *Image Block Response* command (0x05)
- *Upgrade End Request* command (0x06)
- *Upgrade End Response* command (0x07)

PICS:

- OTA.S
- OTA.S.C02.Tx, OTA.S.C05.Tx, OTA.S.C07.Tx
- OTA.S.C01.Rsp, OTA.S.C02.Rsp, OTA.S.C06.Rsp

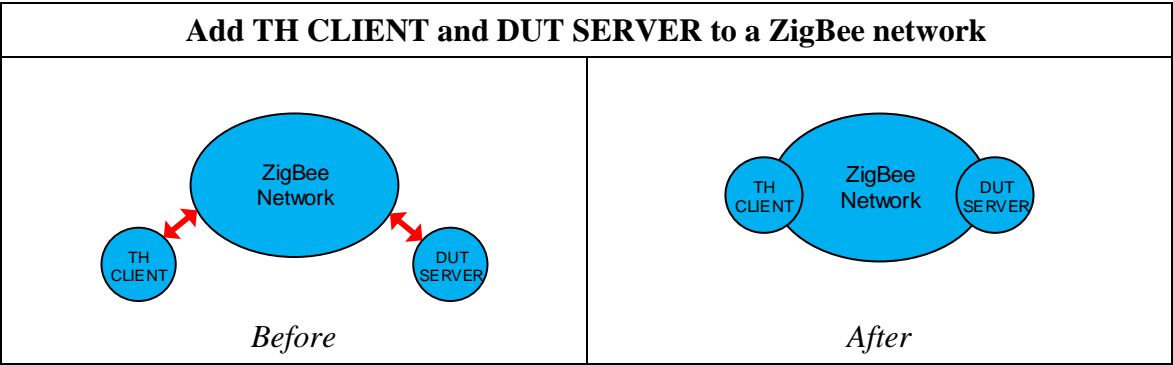
4.4.8.2 Required devices

Designation	Symbol	Description
TH CLIENT		Test harness client implementing: <ul style="list-style-type: none"> • The <i>OTA</i> cluster client.
DUT SERVER		Device under test server implementing: <ul style="list-style-type: none"> • The <i>OTA</i> cluster server.

4.4.8.3 Initial conditions

Item	Initial Conditions
1	A packet sniffer shall be observing the communication over the air interface.
2	All devices are factory new and powered off until used.
3	The test requires an OTA upgrade server setup as a ZR or ZC. The OTA upgrade client must be setup as the TH.
4	The manufacturer must prepare a FULL upgrade file for the TH that contains their vendor firmware.
5	The OTA upgrade server shall be setup so that no new upgrade image is available for the client.
6	The OTA upgrade client shall discover the upgrade server's identity and be setup to periodically query the upgrade server

970 **4.4.8.4 Test preparation**



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OTA-TC-08S: Image page request		
Item	Preparation Step	Observation
P1	Form a ZigBee network.	Observe appropriate command frame to form the network.
P2	Power on DUT SERVER and TH CLIENT.	DUT SERVER and TH CLIENT are powered on.
P3	Join DUT SERVER and TH CLIENT to a ZigBee network.	Observe appropriate communication between DUT SERVER, TH CLIENT and any other relevant node on the ZigBee network.

--- End of test case OTA-TC-08S preparation ---

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973 **4.4.8.5 Test procedure**

OTA-TC-08S: Image page request			
Item	PICS	Test Harness Step	DUT pass Verification
1	-	-	DUT SERVER shall be informed of the upgrade file for the OTA client indicating that it is the <i>next</i> upgrade file for the corresponding manufacturer ID and Image Type ID. This shall be done via a manufacturer specific process.
2	OTA.S.C01.Rsp OTA.S.C02.Tx	TH CLIENT unicasts a ZCL <i>Query Next Image Request</i> command frame to DUT SERVER with the <i>Manufacturer Code</i> , <i>Image Type</i> and <i>Current File Version</i> fields equal to appropriate values for the DUT.	DUT SERVER unicasts a ZCL <i>Query Next Image Response</i> command frame to TH CLIENT with the <i>Status</i> field set to 0x00 (SUCCESS), the <i>Manufacturer Code</i> , <i>Image Type</i> , <i>File Version</i> and <i>Image Size</i> fields set according to the OTA upgrade file prepared as part of the initial conditions.
3	OTA.S.C04.Rsp OTA.S.C05.Tx	TH CLIENT unicasts a ZCL <i>Image Page Request</i> command frame to DUT SERVER with the <i>Manufacturer Code</i> , <i>Image Type</i> and <i>File Version</i> fields equal to the values of the previous request, the <i>File Offset</i> field equal to zero and the <i>Maximum Data Size</i> , <i>Page Size</i> and <i>Response Spacing</i> fields equal to suitable values for the TH.	DUT SERVER unicasts multiple ZCL <i>Image Block Response</i> command frames to TH CLIENT with the <i>Manufacturer Code</i> , <i>Image Type</i> and <i>File Version</i> fields set according to the values of the OTA upgrade file, the <i>File Offset</i> field set to the value in the original query request, incremented by the server's maximum data size for each subsequent image block response, and the <i>Data Size</i> field set to a value suitable for the DUT. Each <i>Image Block Response</i> command frame corresponds to the maximum data size of the DUT and the page size value sent by TH CLIENT in the previous request.
4a	-	-	Optional: DUT SERVER unicasts a ZCL <i>read attributes</i> command frame to TH CLIENT to read the <i>ImageUpgradeStatus</i> attribute.

Continued...

OTA-TC-08S: Image page request			
Item	PICS	Test Harness Step	DUT pass Verification
4b	-	<p><i>Conditional on step 4a being executed:</i></p> <p>TH CLIENT unicasts a ZCL <i>read attributes response</i> command frame to DUT SERVER with a status of SUCCESS and a value equal to 0x01 (<i>Download in Progress</i>).</p>	-
5a	OTA.S.C04.Rsp OTA.S.C05.Tx	TH CLIENT unicasts a ZCL <i>Image Page Request</i> command frame to DUT SERVER with the <i>Manufacturer Code</i> , <i>Image Type</i> and <i>File Version</i> fields equal to the values of the previous request, the <i>File Offset</i> field commensurate with the next page and the <i>Maximum Data Size</i> , <i>Page Size</i> and <i>Response Spacing</i> fields equal to suitable values for the TH.	<p>DUT SERVER unicasts multiple ZCL <i>Image Block Response</i> command frames to TH CLIENT with the <i>Manufacturer Code</i>, <i>Image Type</i> and <i>File Version</i> fields set according to the values of the OTA upgrade file, the <i>File Offset</i> field set to the value in the original query request, incremented by the server's maximum data size for each subsequent image block response, and the <i>Data Size</i> field set to a value suitable for the DUT.</p> <p>Each <i>Image Block Response</i> command frame corresponds to the maximum data size of the DUT and the page size value sent by TH CLIENT in the previous request.</p>
5b	-	The test shall repeat from step 5a, until the complete file has been downloaded.	-

Continued...

OTA-TC-08S: Image page request			
Item	PICS	Test Harness Step	DUT pass Verification
6	OTA.S.C06.Rsp OTA.S.C07.Tx	TH CLIENT unicasts a ZCL <i>Upgrade End Request</i> command frame to DUT SERVER with the <i>Status</i> field equal to 0x00 (SUCCESS) and the <i>Manufacturer Code</i> , <i>Image Type</i> and <i>File Version</i> fields equal to values according to the file that was downloaded.	DUT SERVER unicasts a ZCL <i>Upgrade End Response</i> command frame to TH CLIENT with the <i>Manufacturer Code</i> , <i>Image Type</i> and <i>File Version</i> fields matching the values in the <i>Upgrade End Request</i> command frame from TH CLIENT and the <i>Current Time</i> and <i>Upgrade Time</i> fields both set to the current clock time (upgrade now). <i>NOTE: If the time cluster is not supported by the OTA server then both the current time and the upgrade time shall be set to zero.</i>

--- End of test case OTA-TC-08S ---

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4.4.9 OTA-TC-09S: Device specific upgrade files

This will test the server's ability to transfer a simple OTA upgrade file that is intended for a specific device.

NOTE: This test is required only if the device supports the optional feature device specific file request.

4.4.9.1 Scope



OTA cluster (0x0019):

- Image Page Request command (0x04)
- Image Block Response command (0x05)
- Upgrade End Request command (0x06)
- Upgrade End Response command (0x07)
- Query Device Specific File Request command (0x08)
- Query Device Specific File Response command (0x09)

PICS:

- OTA.S
- OTA.S.C05.Tx, OTA.S.C07.Tx, OTA.S.C09.Tx
- OTA.S.C02.Rsp, OTA.S.C06.Rsp, OTA.S.C08.Rsp

4.4.9.2 Required devices

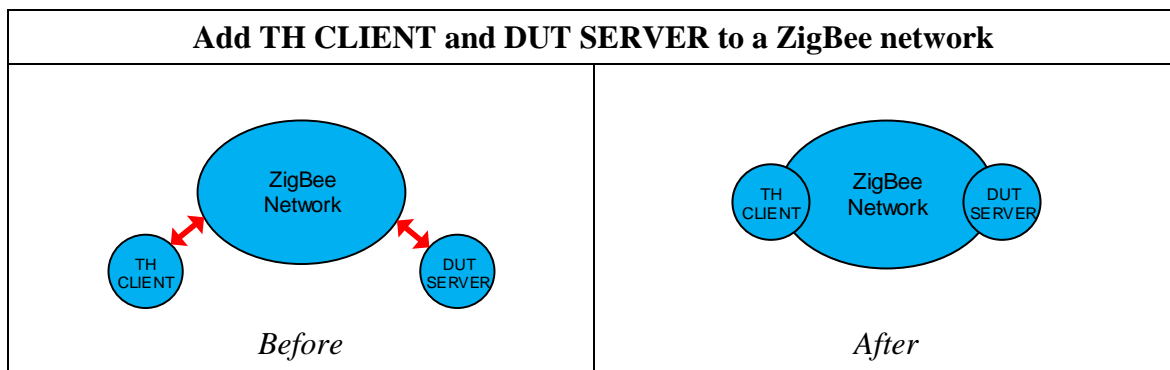
Designation	Symbol	Description
TH CLIENT		Test harness client implementing: <ul style="list-style-type: none"> • The OTA cluster client.
DUT SERVER		Device under test server implementing: <ul style="list-style-type: none"> • The OTA cluster server.

995 **4.4.9.3 Initial conditions**

Item	Initial Conditions
1	A packet sniffer shall be observing the communication over the air interface.
2	All devices are factory new and powered off until used.
3	The test requires an OTA upgrade server setup as a ZR or ZC. The OTA upgrade client must be setup as the TH.
4	The manufacturer must prepare <u>two</u> NULL upgrade files for the TH that has no vendor firmware, just an OTA header. These upgrade files should include the <i>Upgrade file destination</i> field. The upgrade file destination of one file shall be set to the IEEE address of the OTA client. The second file shall be set to the IEEE address of (>) 00000000001.
5	The OTA upgrade server shall be setup so that no new upgrade image is available for the client.
6	The OTA upgrade client shall discover the upgrade server's identity and be setup to periodically query the upgrade server

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998 **4.4.9.4 Test preparation**

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OTA-TC-09S: Device specific upgrade files		
Item	Preparation Step	Observation
P1	Form a ZigBee network.	Observe appropriate command frame to form the network.
P2	Power on DUT SERVER and TH CLIENT.	DUT SERVER and TH CLIENT are powered on.
P3	Join DUT SERVER and TH CLIENT to a ZigBee network.	Observe appropriate communication between DUT SERVER, TH CLIENT and any other relevant node on the ZigBee network.

--- End of test case OTA-TC-09S preparation ---

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1001 **4.4.9.5 Test procedure**

OTA-TC-09S: Device specific upgrade files			
Item	PICS	Test Harness Step	DUT pass Verification
1	-	-	DUT SERVER shall be informed of the two NULL upgrade file for the OTA client indicating that they are the <i>next</i> upgrade files for the corresponding manufacturer ID and Image Type ID. This shall be done via a manufacturer specific process.
2	OTA.S.C08.Rsp OTA.S.C09.Tx	TH CLIENT unicasts a ZCL <i>Query Device Specific File Request</i> command frame to DUT SERVER with the <i>Request Node Address</i> , <i>Manufacturer Code</i> , <i>Image Type</i> , <i>File Version</i> and <i>Current ZigBee Stack Version</i> fields equal to appropriate values for the TH.	DUT SERVER unicasts a ZCL <i>Query Device Specific File Response</i> command frame to TH CLIENT with the <i>Status</i> field set to 0x00 (SUCCESS) and the <i>Manufacturer Code</i> , <i>Image Type</i> , <i>File Version</i> and <i>Image Size</i> fields set according to the OTA upgrade file prepared as part of the initial conditions.
3	OTA.S.C03.Rsp OTA.S.C05.Tx	TH CLIENT unicasts a ZCL <i>Image Block Request</i> command frame to DUT SERVER with the <i>Manufacturer Code</i> , <i>Image Type</i> , <i>File Version</i> and <i>Request Node Address</i> fields equal to the values of the previous request, the <i>File Offset</i> field equal to zero and the <i>Maximum Data Size</i> field equal to a suitable value for the TH.	DUT SERVER unicasts a ZCL <i>Image Block Response</i> command frame to TH CLIENT with the <i>Manufacturer Code</i> , <i>Image Type</i> and <i>File Version</i> set according to the values of the OTA upgrade file, the <i>File Offset</i> field set to the value in the previous request and the <i>Data Size</i> field set to a value suitable for the DUT.

Continued...

OTA-TC-09S: Device specific upgrade files			
Item	PICS	Test Harness Step	DUT pass Verification
4	OTA.S.C06.Rsp OTA.S.C07.Tx	TH CLIENT unicasts a ZCL <i>Upgrade End Request</i> command frame to DUT SERVER with the <i>Status</i> field equal to 0x00 (SUCCESS) and the <i>Manufacturer Code</i> , <i>Image Type</i> and <i>File Version</i> fields equal to values according to the file that was downloaded.	DUT SERVER unicasts a ZCL <i>Upgrade End Response</i> command frame to TH CLIENT with the <i>Manufacturer Code</i> , <i>Image Type</i> and <i>File Version</i> fields matching the values in the <i>Upgrade End Request</i> command frame from TH CLIENT and the <i>Current Time</i> and <i>Upgrade Time</i> fields both set to the current clock time (upgrade now). NOTE: <i>If the time cluster is not supported by the OTA server then both the current time and the upgrade time shall be set to zero.</i>

--- End of test case OTA-TC-09S ---

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4.4.10 OTA-TC-10S: Rate limiting

This test verifies that the server can rate limit a client. This test is optional, depending on the PICS for the device (if it supports rate limiting).

4.4.10.1 Scope



OTA cluster (0x0019):

- *Query Next Image Request* command (0x01)
- *Query Next Image Response* command (0x02)
- *Image Block Request* command (0x03)
- *Image Block Response* command (0x05)
- *Upgrade End Request* command (0x06)
- *Upgrade End Response* command (0x07)

PICS:

- OTA.S
- OTA.S.C02.Tx, OTA.S.C05.Tx, OTA.S.C07.Tx
- OTA.S.C01.Rsp, OTA.S.C03.Rsp, OTA.S.C06.Rsp

4.4.10.2 Required devices

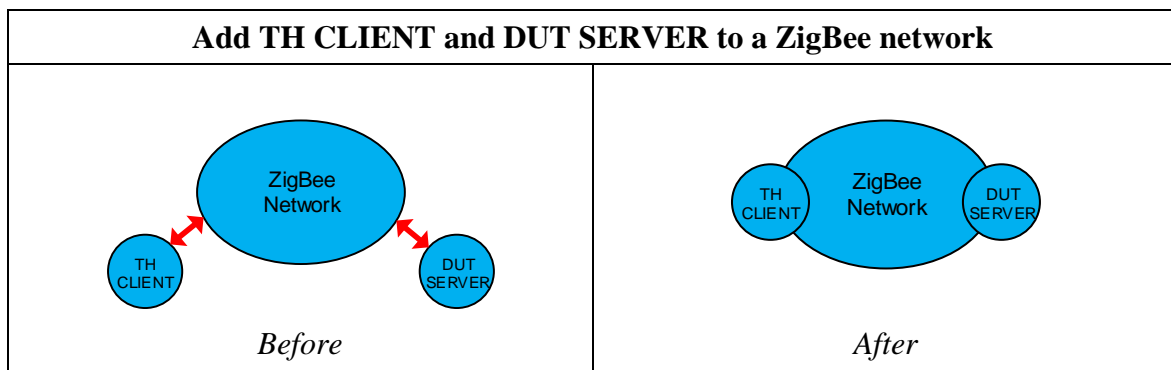
Designation	Symbol	Description
TH CLIENT		Test harness client implementing: <ul style="list-style-type: none"> • The <i>OTA</i> cluster client.
DUT SERVER		Device under test server implementing: <ul style="list-style-type: none"> • The <i>OTA</i> cluster server.

1022 **4.4.10.3 Initial conditions**

Item	Initial Conditions
1	A packet sniffer shall be observing the communication over the air interface.
2	All devices are factory new and powered off until used.
3	The test requires an OTA upgrade server setup as a ZR or ZC. The OTA upgrade client must be setup as the TH.
4	The manufacturer must prepare a NULL upgrade file for the TH that has no vendor firmware, just an OTA header. There should be no optional fields. The version in the file shall be greater than the version currently installed on the OTA client (i.e. an upgrade).
5	The OTA upgrade server shall be setup so that no new upgrade image is available for the client.
6	The OTA upgrade client shall discover the upgrade server's identity and be setup to periodically query the upgrade server
7	The client shall be configured with its production MinimumBlockPeriod value, which may be zero or another value.

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1025 **4.4.10.4 Test preparation**

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OTA-TC-10S: Rate limiting		
Item	Preparation Step	Observation
P1	Form a ZigBee network.	Observe appropriate command frame to form the network.
P2	Power on DUT SERVER and TH CLIENT.	DUT SERVER and TH CLIENT are powered on.
P3	Join DUT SERVER and TH CLIENT to a ZigBee network.	Observe appropriate communication between DUT SERVER, TH CLIENT and any other relevant node on the ZigBee network.

--- End of test case OTA-TC-10S preparation ---

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1028 **4.4.10.5 Test procedure**

OTA-TC-10S: Rate limiting			
Item	PICS	Test Harness Step	DUT pass Verification
1	-	-	DUT SERVER shall be informed of the NULL upgrade file for the OTA client indicating that it is the <i>next</i> upgrade file for the corresponding manufacturer ID and Image Type ID. This shall be done via a manufacturer specific process.
2	OTA.S.C01.Rsp OTA.S.C02.Tx	TH CLIENT unicasts a ZCL <i>Query Next Image Request</i> command frame to DUT SERVER with the <i>Manufacturer Code</i> , <i>Image Type</i> and <i>Current File Version</i> fields equal to appropriate values for the TH.	DUT SERVER unicasts a ZCL <i>Query Next Image Response</i> command frame to TH CLIENT with the <i>Status</i> field set to 0x00 (SUCCESS), the <i>Manufacturer Code</i> , <i>Image Type</i> , <i>File Version</i> and <i>Image Size</i> fields set according to the OTA upgrade file prepared as part of the initial conditions.
3	OTA.S.C03.Rsp OTA.S.C05.Tx	TH CLIENT unicasts a ZCL <i>Image Block Request</i> command frame to DUT SERVER with bit 1 of the <i>Field Control</i> field set to 1 (<i>MinimumBlockPeriod</i> present), the <i>Manufacturer Code</i> , <i>Image Type</i> and <i>File Version</i> fields equal to the values of the previous request, the <i>File Offset</i> field equal to zero, the <i>Maximum Data Size</i> field equal to a suitable value for the TH and the <i>MinimumBlockPeriod</i> field equal to the current value of TH CLIENT's <i>MinimumBlockPeriod</i> attribute.	DUT SERVER unicasts a ZCL <i>Image Block Response</i> command frame to TH CLIENT with the <i>Status</i> field set to 0x97 (WAIT_FOR_DATA), the <i>Current Time</i> and <i>Request Time</i> fields both set to 0 and the <i>MinimumBlockPeriod</i> field set to a value other than the client's current value.

Continued...

OTA-TC-10S: Rate limiting			
Item	PICS	Test Harness Step	DUT pass Verification
4a	OTA.S.C03.Rsp OTA.S.C05.Tx	After a delay of <i>MinimumBlockPeriod</i> milliseconds after step 3, TH CLIENT unicasts a ZCL <i>Image Block Request</i> command frame to DUT SERVER with bit 1 of the <i>Field Control</i> field set to 1 (<i>MinimumBlockPeriod</i> present), the <i>Manufacturer Code</i> , <i>Image Type</i> and <i>File Version</i> fields equal to the values of the previous request, the <i>File Offset</i> field equal to zero, the <i>Maximum Data Size</i> field equal to a suitable value for the TH and the <i>MinimumBlockPeriod</i> field equal to the value provided by DUT SERVER in the <i>Image Block Response</i> command frame.	DUT SERVER unicasts a ZCL <i>Image Block Response</i> command frame to TH CLIENT with the <i>Status</i> field set to SUCCESS, the <i>Manufacturer Code</i> , <i>Image Type</i> and <i>File Version</i> fields set according to the values of the OTA upgrade file, the <i>File Offset</i> field set to the value in the previous request and the <i>Data Size</i> field set to a value suitable for the DUT.
4b	-	The test shall repeat from step 4a, until TH CLIENT has fetched all of the parts of the file.	-
5	OTA.S.C06.Rsp OTA.S.C07.Tx	TH CLIENT unicasts a ZCL <i>Upgrade End Request</i> command frame to DUT SERVER with the <i>Status</i> field equal to 0x00 (SUCCESS) and the <i>Manufacturer Code</i> , <i>Image Type</i> and <i>File Version</i> fields equal to values according to the file that was downloaded.	DUT SERVER unicasts a ZCL <i>Upgrade End Response</i> command frame to TH CLIENT with the <i>Manufacturer Code</i> , <i>Image Type</i> and <i>File Version</i> fields matching the values in the <i>Upgrade End Request</i> command frame from TH CLIENT and the <i>Current Time</i> and <i>Upgrade Time</i> fields both set to the current clock time (upgrade now). NOTE: <i>If the time cluster is not supported by the OTA server then both the current time and the upgrade time shall be set to zero.</i>

--- End of test case OTA-TC-10S ---

1030 5 Annex A: PICS to test case cross reference

1031 5.1 Server

PICS	Test case OTA-TC-xxx										
	01G	01S	02S	03S	04S	05S	06S	07S	08S	09S	10S
ZDC1											
OUI1											
OUI2a											
OUI2b											
OTA.S	X	X	X	X	X	X	X	X	X	X	X
OTA.S.Afffd	X										
OTA.S.Afffe	X										
OTA.S.C01.Rsp		X	X	X	X	X	X		X		X
OTA.S.C03.Rsp				X	X	X	X	X		X	X
OTA.S.C04.Rsp									X		
OTA.S.C06.Rsp				X	X	X	X		X	X	X
OTA.S.C08.Rsp										X	
OTA.S.C00.Tx			X								
OTA.S.C02.Tx		X	X	X	X	X	X		X		X
OTA.S.C05.Tx				X	X	X	X		X	X	X
OTA.S.C07.Tx				X	X	X	X		X	X	X
OTA.S.C09.Tx										X	
OOMTS6			X								
OUPS1				X							

	Test case OTA-TC-xxx										
PICS	01G	01S	02S	03S	04S	05S	06S	07S	08S	09S	10S
OUPS2											
OUPS3											
OUPS4								X			
INPT01			X								
INPT02			X								
INPT03			X								

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	Test case: OTA-TC-xxx																	
PICS	01G	01C	02C	03C	04C	05C	06C	07C	08C	09C	10C	11C	12C	13C	14C	15C	16C	17C
ZDC1																		
OUI1																		
OUI2a																		
OUI2b																		
OTA.C	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
OTA.C.A0000		X																
OTA.C.A0001		X																
OTA.C.A0002		X						X							X			
OTA.C.A0003		X																
OTA.C.A0004		X																
OTA.C.A0005		X																
OTA.C.A0006		X						X	X	X			X	X	X	X		
OTA.C.A0007		X																
OTA.C.A0008		X																
OTA.C.A0009		X																
OTA.C.A000a		X																
OTA.C.A000b		X				X	X	X	X	X			X					
OTA.C.A000c		X																
OTA.C.Afffd	X																	
OTA.C.Afffe	X																	
OTA.C.C00.Rsp					X													
OTA.C.C02.Rsp				X	X	X	X	X	X	X	X	X	X	X	X	X		X
OTA.C.C05.Rsp						X	X	X	X	X	X	X	X	X	X	X	X	X
OTA.C.C07.Rsp						X	X	X	X	X			X			X	X	X

	Test case: OTA-TC-xxx																	
PICS	01G	01C	02C	03C	04C	05C	06C	07C	08C	09C	10C	11C	12C	13C	14C	15C	16C	17C
OTA.C.C09.Rsp																	X	
OTA.C.C01.Tx				X	X	X	X	X	X	X	X	X	X	X	X	X		X
OTA.C.C03.Tx						X	X	X	X	X	X	X	X	X	X		X	X
OTA.C.C04.Tx																X		
OTA.C.C06.Tx						X	X	X	X	X	X	X	X		X	X	X	X
OTA.C.C08.Tx																	X	
OOMTS6																		
OUPC0a																		
OUPC0b																		
OUPC1																		
OUPC2														X				
OUPC3															X			
OUPC4													X					X
OUPC5												X						
OUPC6									X									
OUPC7										X								
OUPC8																		
OUPC9																		
OUPC10																		
OUPC11																		
OUPC12							X											

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