



Amazon Sidewalk Test Specification

Protocol Stack 1.0, Document Revision A.1

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Chapter 1

Introduction

1.1 Scope

This document provides the Amazon Sidewalk reference test cases for certification of compliance with the Amazon Sidewalk specification.

1.1.1 Application

The specification includes test cases for Endpoint products, referred to as the Device Under Test (DUT). At this time there is no requirement for gateway certification, as all gateways on the Amazon Sidewalk network are Amazon devices, such as Echo and Ring products.

1.1.2 Naming Convention

Each test case has a short, unique identifier, and a title. The general format of a test case identifier is:

<AREA>/<ROLE>/<FEATURE>/<FUNCTION>/<CLASS>-<ID>

- <AREA> can be: CMN (Common), BLE, FSK, LORA, or MULTI (multi-radio)
- <ROLE> can be: EP (Endpoint), or GW (Gateway, reserved for future use)
- <FEATURE> can be: BCN, CONN, DATA, API
- <FUNCTION> is <FEATURE> dependent
- <CLASS> can be: BV (Behaviour Valid), or BI (Behaviour Invalid)
- <ID> is a unique integer to differentiate multiple test cases under the preceding fields

For example FSK/EP/BCN/JOIN/BV-01 - an FSK Endpoint test case for discovering a beacon, with valid behavior.

1.1.2.1 Behaviour Valid (BV) Tests

These tests verify that the DUT reacts in conformity with the specification when receiving valid message sequences.

1.1.2.2 Behaviour Invalid (BI) Tests

These tests verify that the DUT reacts in conformity with the specification when receiving sequences containing invalid messages, missing messages, messages of incorrect type or content, and is expected to recover and resume the protocol function.

1.2 General Test Requirements

Each test case has an **Expected Results** section. In all cases this will describe the criteria for a Pass Verdict. In some cases it may also describe criteria that could lead to an Inconclusive Verdict - this refers to a result that is not recorded as a fail but may indicate an undetected or undesirable condition and should be reviewed.

If a DUT cannot achieve a Pass Verdict or Inconclusive Verdict then it is automatically classified as a test failure, however in some cases additional specific details may be provided under Fail Verdict indicating why a test could fail. For example a test that attempts to send 10 data packets may explicitly state that a Fail Verdict is recorded if the Tester receives 9 or fewer packets.

1.3 Test Environment

The test specification requires one or two tester "roles" - the Upper Tester and the Lower Tester. These refer to the roles undertaken by the test equipment to drive the upper (top of stack) and lower (bottom of stack) interfaces to the Device Under Test. The roles do not mandate a particular physical implementation of the test equipment. Typically a single piece of test equipment would implement both roles, however for some test cases it may be possible to separate the roles across two independent entities.

The DUT lower interface is the radio, therefore the Lower Tester will reproduce the functionality and required behavior of a standard Amazon Sidewalk Gateway.

The DUT upper interface is the on-chip Amazon Sidewalk application API (e.g. the `sid_init`, `sid_start` etc. API calls). It is the responsibility of the test equipment provider to specify how the Upper Tester role within the test equipment will communicate with the on-chip API (e.g. via command-line interface, binary transport, or some other mechanism).

Chapter 2

Common Test Cases

2.1 CMN/EP/API/INF/BV/01: Endpoint has correct MCU version after launching Sidewalk application.

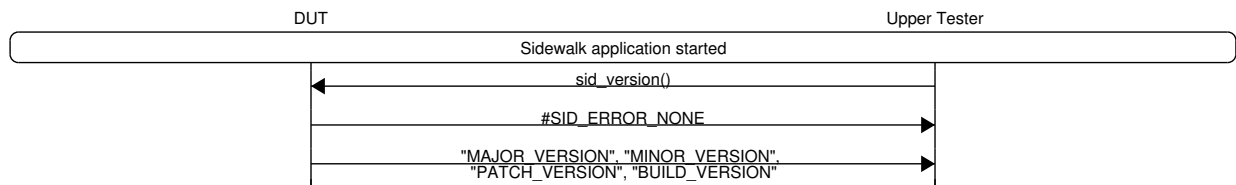
2.1.1 Test Purpose

DUT is able to start Sidewalk application and capture all values related to the MCU version. Captured values are consistent with the MCU build used by the DUT.

2.1.2 Initial Conditions

- DUT is flashed with a valid MCU build.

2.1.3 Test Procedure



2.1.4 Expected Results

2.1.4.1 Pass Verdict

DUT can successfully start the Sidewalk application.

DUT is able to utilize "sid_version" API call and capture the following values related to the MCU version: "MAJOR_VERSION", "MINOR_VERSION", "PATCH_VERSION", "BUILD_VERSION".

All obtained values are in line with the MCU build that is flashed on the DUT.

Chapter 3

BLE Test Cases

3.1 BLE/EP/CONN/REG/BV/01: An unregistered Endpoint successfully completes Sidewalk device registration over BLE.

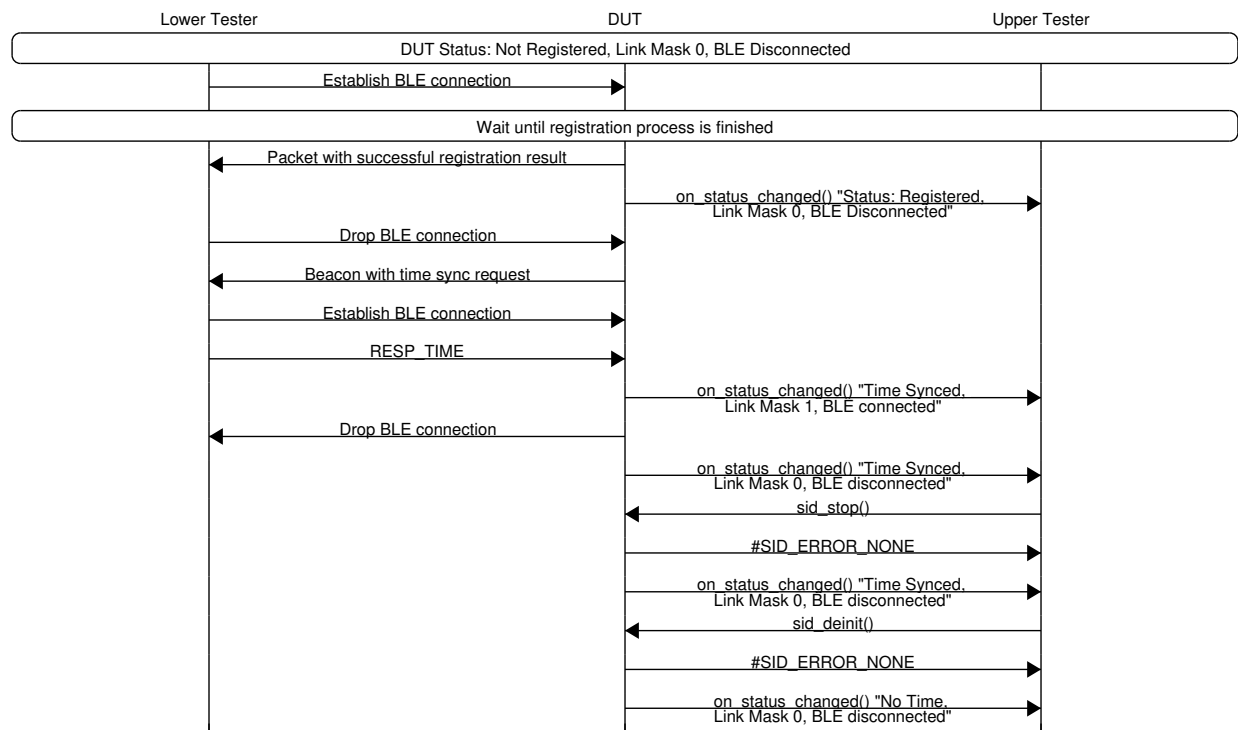
3.1.1 Test Purpose

An unregistered DUT configures the Sidewalk stack in BLE mode. It accepts a BLE connection from the Lower Tester and completes registration. After it has registered it uses BLE radio for Amazon Sidewalk network activities.

3.1.2 Initial Conditions

- DUT is not registered with Amazon Sidewalk network.
- The Sidewalk stack (BLE) is initialized and started on the DUT.
- Lower Tester operates in BLE mode.

3.1.3 Test Procedure



3.1.4 Expected Results

3.1.4.1 Pass Verdict

DUT with Sidewalk stack (BLE) initialized is successfully registered with Amazon Sidewalk network. Afterwards, DUT completes time synchronization over BLE.

3.2 BLE/EP/CONN/REG/BV/02: An unregistered Endpoint successfully completes Sidewalk device registration with use of FFN.

3.2.1 Test Purpose

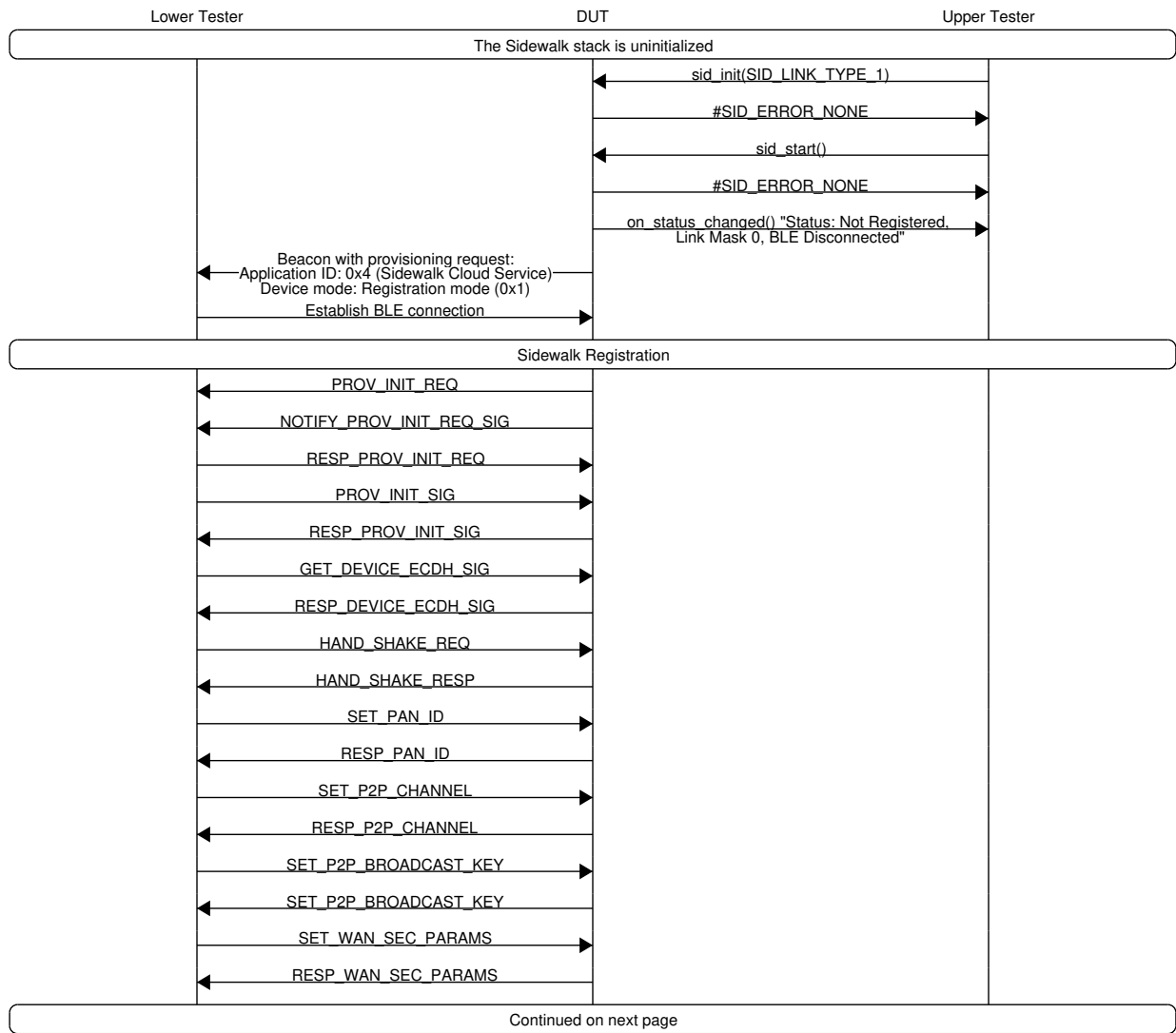
An unregistered DUT configures the Sidewalk stack in BLE mode. Lower tester establishes BLE connection after detecting beacon with provisioning request. DUT starts registration flow by sending "PROV_INIT_REQ" packet to Lower Tester. At the end of the registration flow, DUT receives SET_CONFIGURATION_COMPLETE packet from Lower Tester and responds with RESP_CONFIGURATION_COMPLETE packet, which is a sign of successful device registration. After that BLE connection is dropped and DUT continues to work using BLE radio for Amazon Sidewalk network activities.

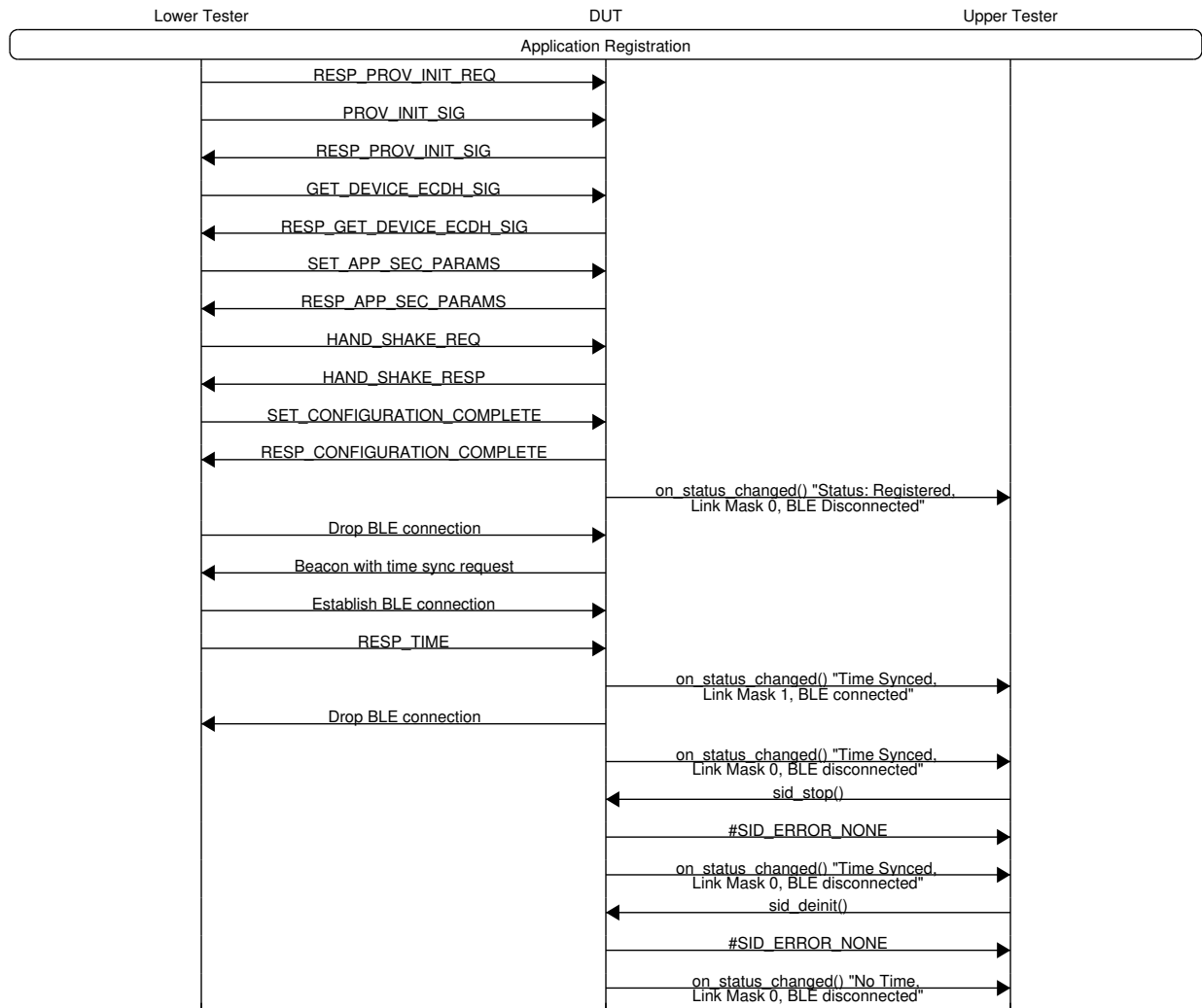
3.2.2 Initial Conditions

- DUT is fully unregistered from Amazon Sidewalk network (both Cloud and DUT side)

- Lower Tester operates in BLE mode.

3.2.3 Test Procedure





3.2.4 Expected Results

3.2.4.1 Pass Verdict

Before registration, DUT is transmitting beacons with provisioning request. This information is located in: "Application ID" - 5th octet of Manufacturing Data - 0x4 (Sidewalk Cloud Service) "Device State" - second and third bit in 6th octet of Manufacturing Data - Registration mode (0x1).

There may be more than one beacon transmitted by DUT before the BLE connection with Lower Tester is established, however this should not negatively affect the registration process.

Lower Tester establishes BLE connection with DUT, after detecting a beacon with provisioning request.

DUT sends "PROV_INIT_REQ" packet to initiate the registration flow.

Every registration related packet is successfully exchanged between Lower Tester and DUT.

DUT receives "SET_CONFIGURATION_COMPLETE" packet from Lower Tester and responds with "RESP_CONFIGURATION_COMPLETE". Those two packets signify that DUT is successfully registered with Amazon Sidewalk network with use of FFN.

Registration status on DUT changes to: "Registered".

Afterwards, DUT completes time synchronization over BLE.

3.3 BLE/EP/CONN/REG/BV/03: Endpoint can be deregistered from Sidewalk network.

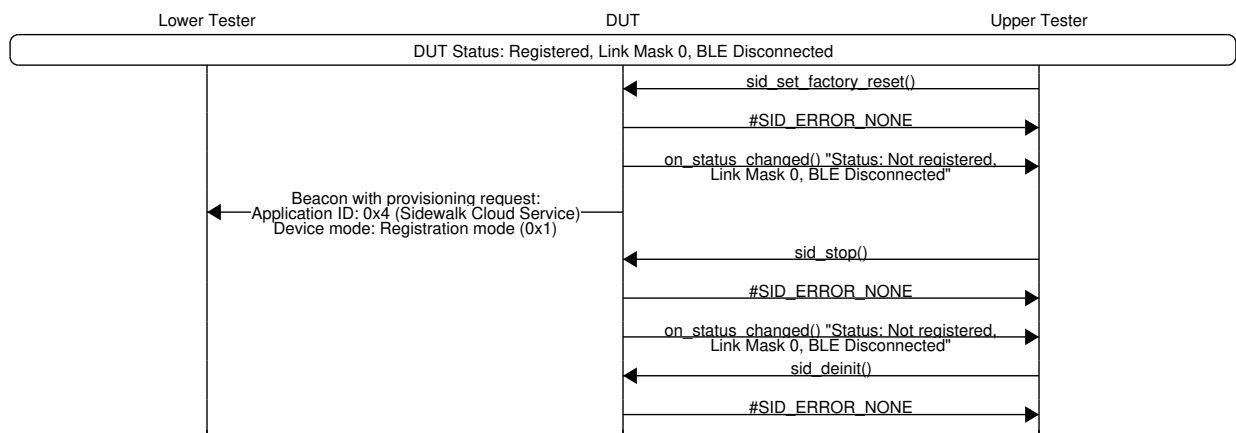
3.3.1 Test Purpose

To verify that the DUT is able to be deregistered from the Amazon Sidewalk network. After deregistration DUT starts transmitting beacons with provisioning request.

3.3.2 Initial Conditions

- DUT is registered with Amazon Sidewalk network.
- The Sidewalk stack (BLE) is initialized and started on the DUT.

3.3.3 Test Procedure



3.3.4 Expected Results

3.3.4.1 Pass Verdict

Calling the `sid_set_factory_reset` method should force the change in registration status of DUT to "not registered".

After deregistration, DUT starts transmitting beacons with provisioning request. This information is located in:

"Application ID" - 5th octet of Manufacturing Data - 0x4 (Sidewalk Cloud Service)

"Device State" - second and third bit in 6th octet of Manufacturing Data - Registration mode (0x1).

3.4 BLE/EP/DATA/DL/BV/01: Endpoint receives downlink packets with various sizes of Command data.

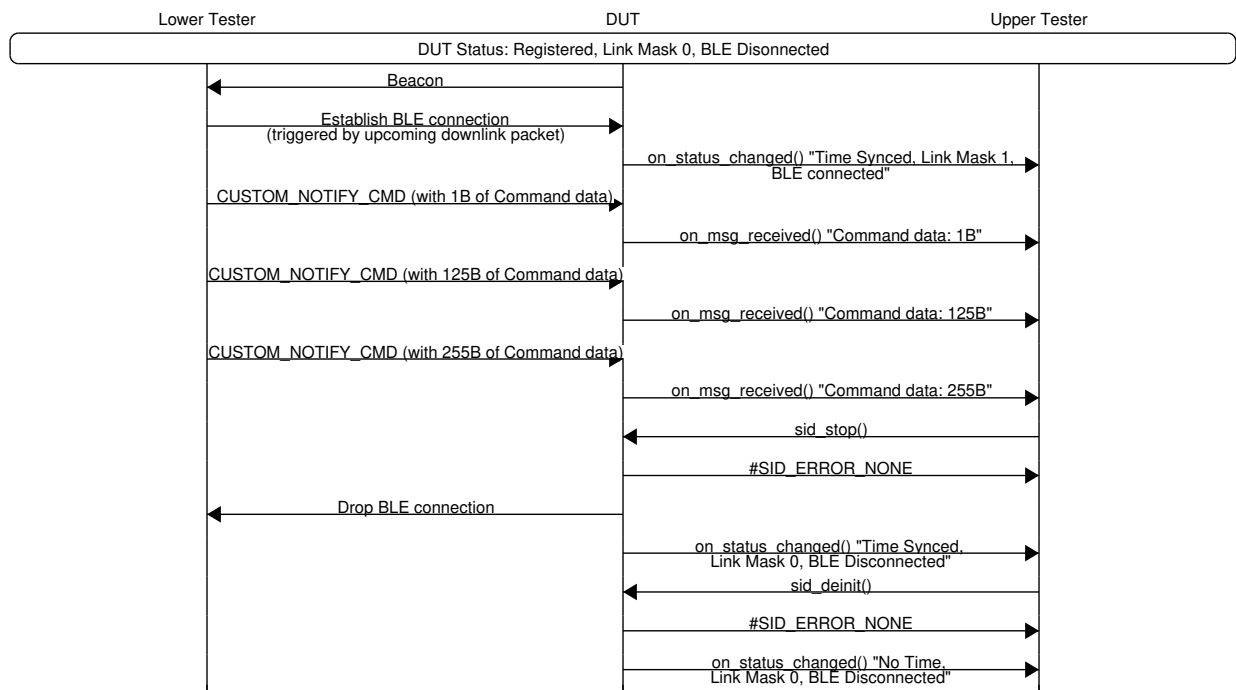
3.4.1 Test Purpose

DUT is able to receive downlink packets with various sizes of Command data (1B, 125B, 255B) sent from the Lower Tester.

3.4.2 Initial Conditions

- DUT is registered with Amazon Sidewalk network.
- Lower Tester operates in BLE mode.
- SidewalkNetworkFlag is enabled on the Lower Tester.
- The Sidewalk stack (BLE) is initialized and started on the DUT.
- DUT has completed the time synchronization.

3.4.3 Test Procedure



3.4.4 Expected Results

3.4.4.1 Pass Verdict

Packets with various sizes of Command data sent by Lower Tester are able to reach the DUT. The Command data content shall be verified for correctness on the Upper Tester side.

3.5 BLE/EP/DATA/UL/BV/01: Gateway receives uplink packets with various sizes of Command data from Endpoint.

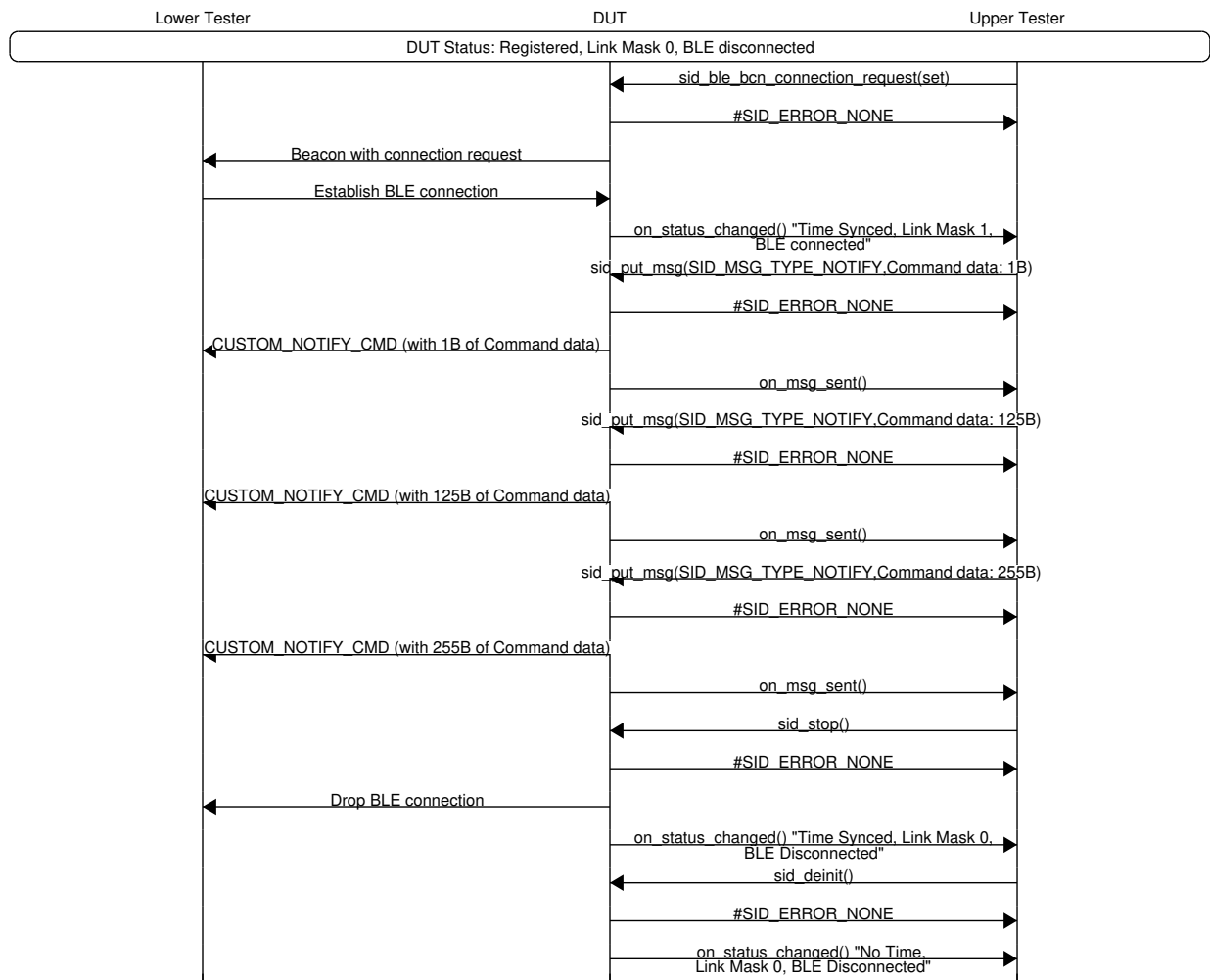
3.5.1 Test Purpose

Lower Tester is able to receive uplink packets with various sizes of Command data(1B, 125B, 255B) sent from the DUT.

3.5.2 Initial Conditions

- DUT is registered with Amazon Sidewalk network.
- Lower Tester operates in BLE mode.
- SidewalkNetworkFlag is enabled on the Lower Tester.
- The Sidewalk stack (BLE) is initialized and started on the DUT.
- DUT has completed the time synchronization.

3.5.3 Test Procedure



3.5.4 Expected Results

3.5.4.1 Pass Verdict

Packets with various sizes of Command data sent by DUT are able to reach the Lower Tester. The Command data content of each packet shall be verified for correctness on the Lower Tester side.

3.6 BLE/EP/CONN/EST/BV/01: Gateway establishes BLE connection on Endpoint’s request.

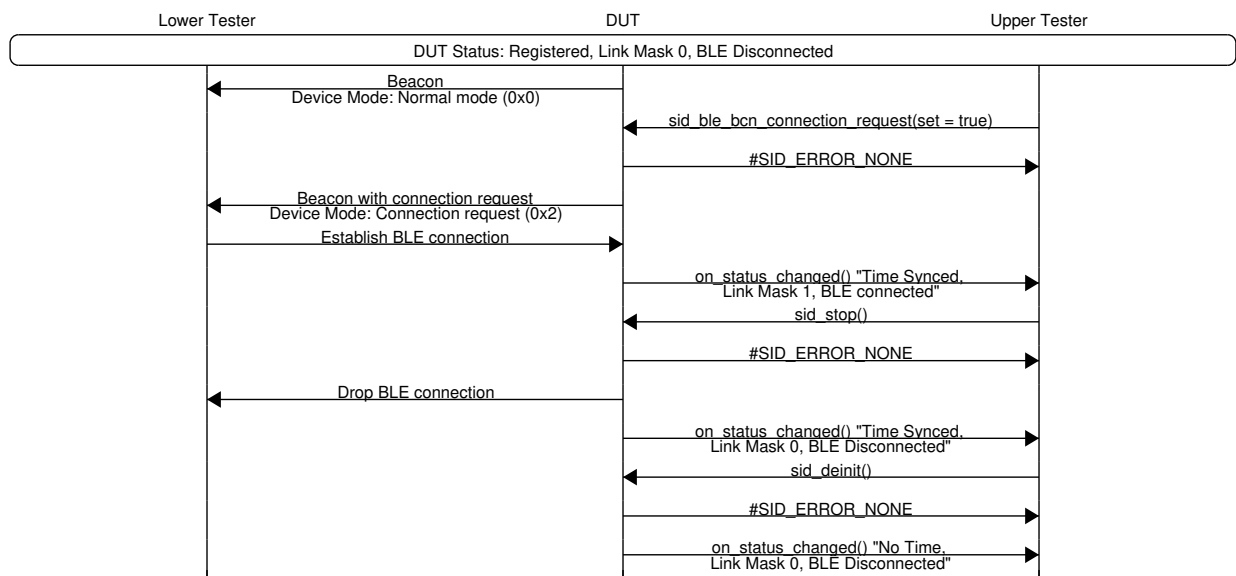
3.6.1 Test Purpose

To verify that Lower Tester successfully establishes BLE connection with DUT, after detecting connection request in the payload of the DUT’s advertising beacon.

3.6.2 Initial Conditions

- DUT is registered with Amazon Sidewalk network.
- Lower Tester operates in BLE mode.
- SidewalkNetworkFlag is enabled on the Lower Tester.
- The Sidewalk stack (BLE) is initialized and started on the DUT.
- DUT has completed the time synchronization.

3.6.3 Test Procedure



3.6.4 Expected Results

3.6.4.1 Pass Verdict

When BLE connection is requested, DUT should change beacon payload to include connection request. Change occurs in Device State - 6th octet of Manufacturing Data in the beacon. Within the Device State, second and third bits signify Device Mode, where: 0x0 - Normal mode, 0x2 - Connection request. Payload of the beacons to be checked with BLE sniffer on Lower Tester side.

Device Mode before setting the connection request: Normal mode (0x0).

Device Mode after setting the connection request: Connection request (0x2).

Lower Tester establishes BLE connection with DUT, after receiving beacon with connection request.

After BLE connection is established, DUT triggers "on_status_changed()" with "Link Mask" value of 1, which indicates that the BLE connection was established.

3.7 BLE/EP/CONN/EST/BV/02: Endpoint can connect with Gateway via BLE, after reinitializing Sidewalk library.

3.7.1 Test Purpose

To verify that DUT and Lower Tester can establish a BLE connection, after Sidewalk library is reinitialized.

3.7.2 Initial Conditions

- DUT is registered with Amazon Sidewalk network.

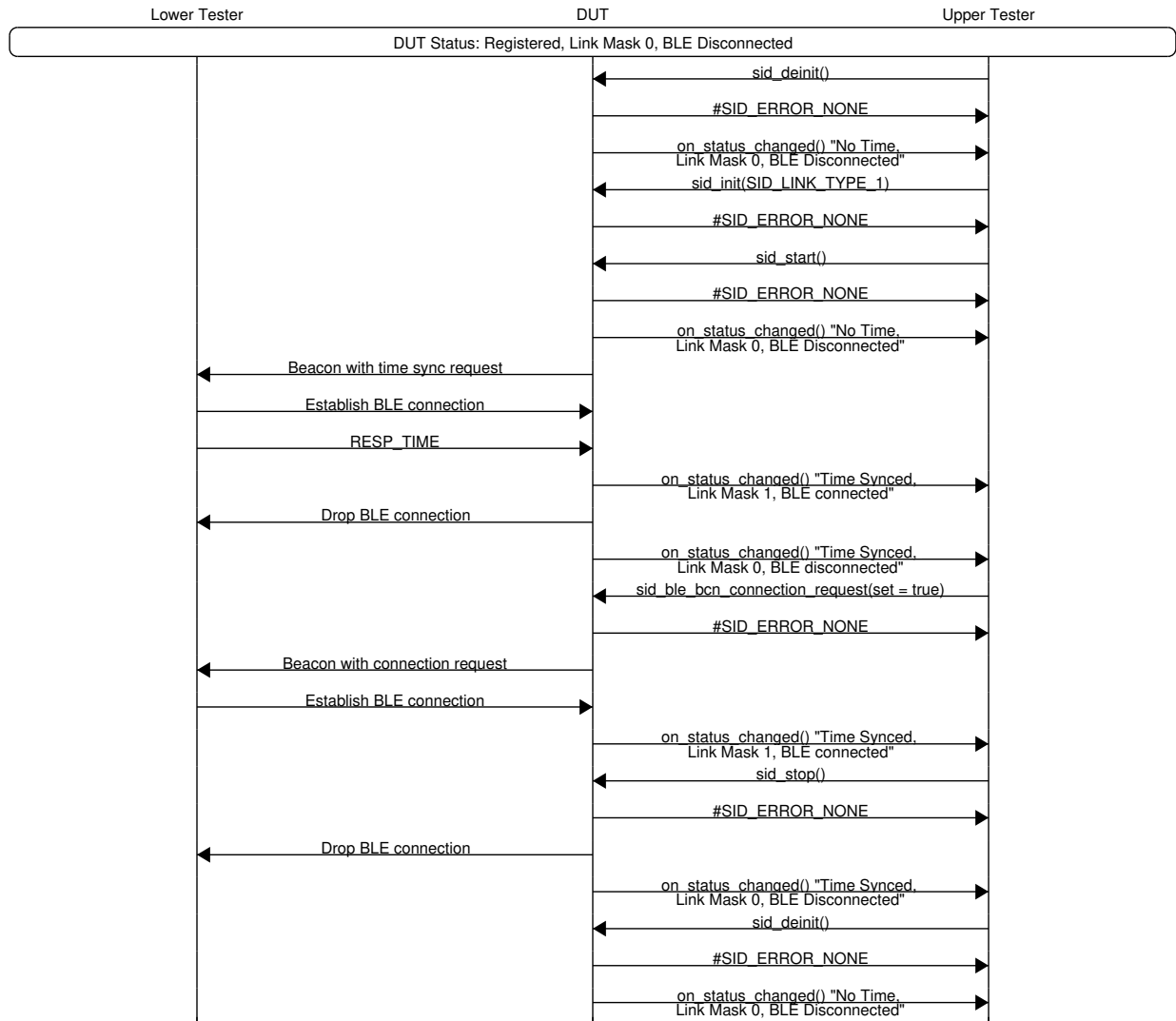
- Lower Tester operates in BLE mode.

- SidewalkNetworkFlag is enabled on the Lower Tester.

- The Sidewalk stack (BLE) is initialized and started on the DUT.

- DUT has completed the time synchronization.

3.7.3 Test Procedure



3.7.4 Expected Results

3.7.4.1 Pass Verdict

After reinitializing Sidewalk library DUT and Lower Tester establish BLE connection to complete time synchronization.

DUT is able to request and establish BLE connection with Lower Tester, when the time synchronization is completed.

During time synchronization and after requesting BLE connection, DUT triggers "on_status.changed()" with "Link Mask" value of 1, which indicates that the BLE connection was established.

3.8 BLE/EP/CONN/EST/BV/03: Endpoint can connect with Gateway via BLE, after restarting Sidewalk library.

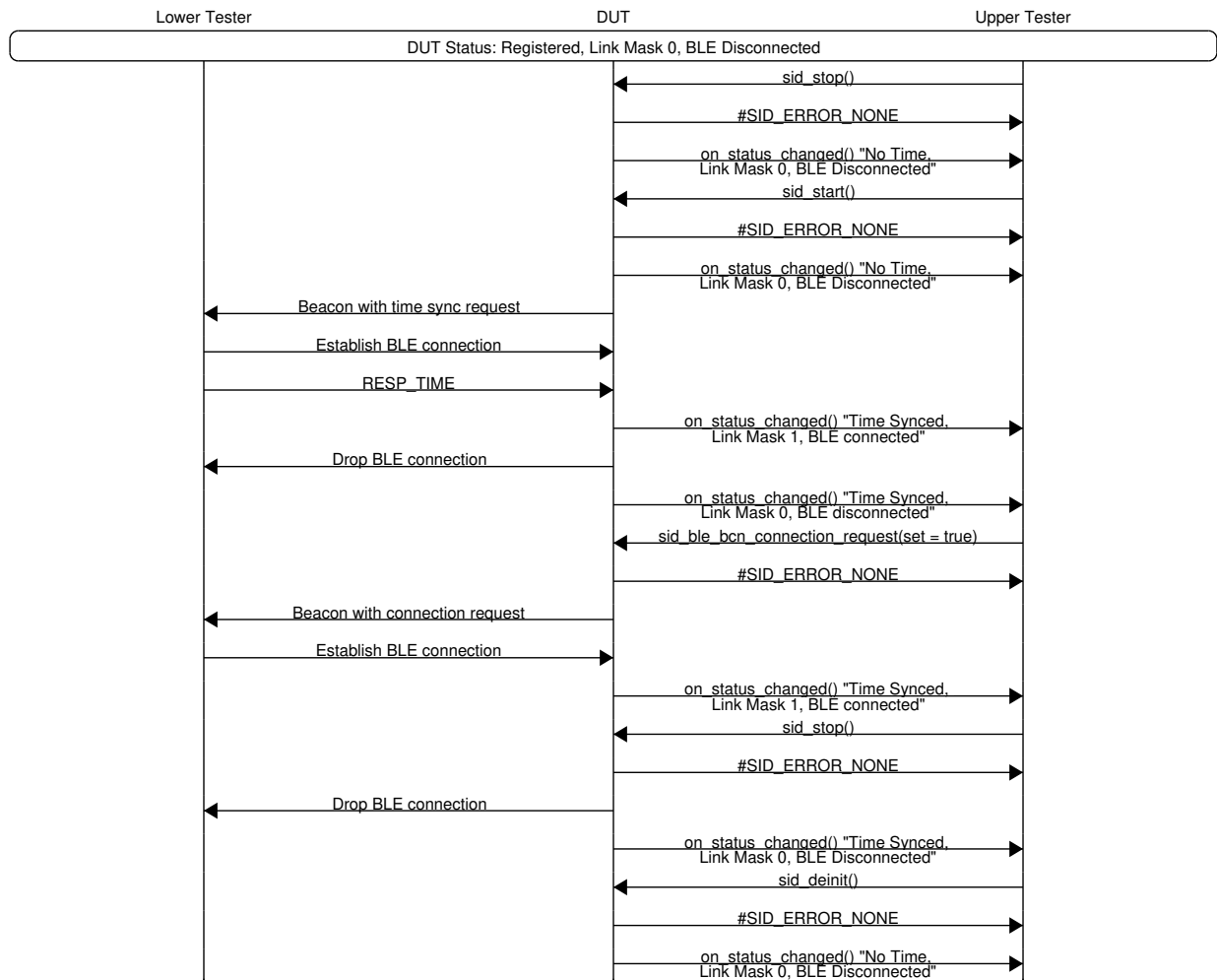
3.8.1 Test Purpose

To verify that DUT and Lower Tester can establish a BLE connection, after Sidewalk library is restarted.

3.8.2 Initial Conditions

- DUT is registered with Amazon Sidewalk network.
- Lower Tester operates in BLE mode.
- SidewalkNetworkFlag is enabled on the Lower Tester.
- The Sidewalk stack (BLE) is initialized and started on the DUT.
- DUT has completed the time synchronization.

3.8.3 Test Procedure



3.8.4 Expected Results

3.8.4.1 Pass Verdict

After restarting Sidewalk library DUT and Lower Tester establish BLE connection to complete time synchronization.

DUT is able to request and establish BLE connection with Lower Tester, when the time synchronization is completed.

During time synchronization and after requesting BLE connection, DUT triggers "on_status_changed()" with "Link Mask" value of 1, which indicates that the BLE connection was established.

3.9 BLE/EP/CONN/DSC/BV/01: BLE connection between Gateway and Endpoint is dropped after 30 seconds of being idle.

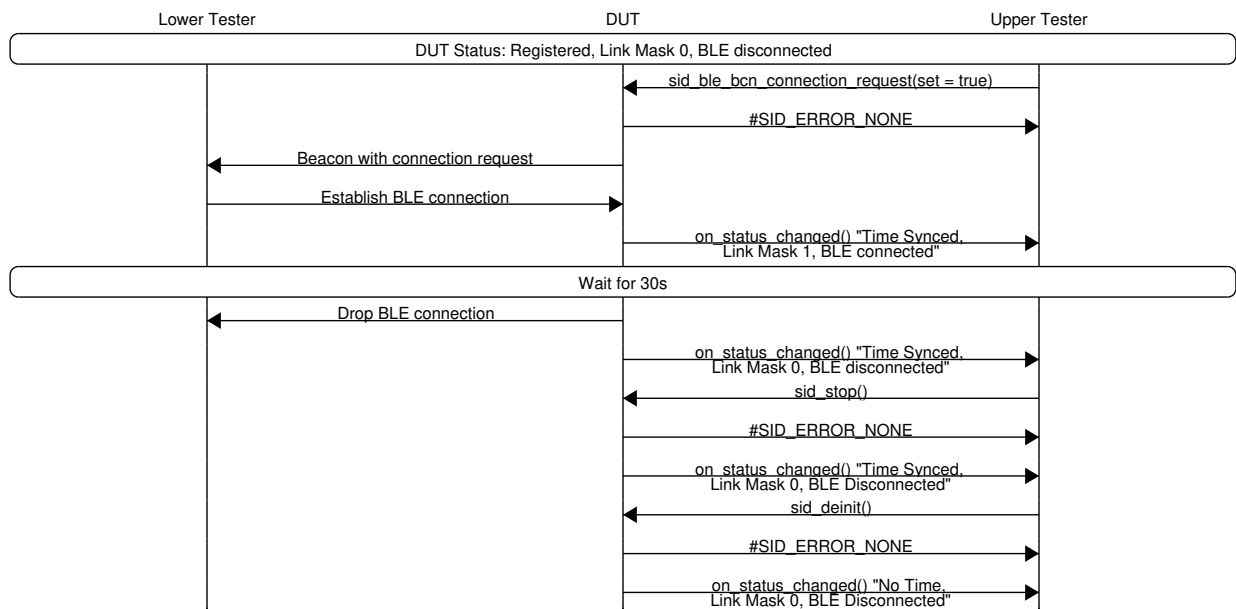
3.9.1 Test Purpose

To verify that BLE connection is dropped after 30 seconds, if there is no uplink/downlink traffic generated.

3.9.2 Initial Conditions

- DUT is registered with Amazon Sidewalk network.
- Lower Tester operates in BLE mode.
- SidewalkNetworkFlag is enabled on the Lower Tester.
- The Sidewalk stack (BLE) is initialized and started on the DUT.
- DUT has completed the time synchronization.

3.9.3 Test Procedure



3.9.4 Expected Results

3.9.4.1 Pass Verdict

BLE connection is dropped after 30 seconds, from the time it was established.

There should be no connection drops and reconnects before the 30 seconds timeout is reached.

After the timeout, DUT triggers "on_status_changed()" with "Link Mask" value of 0, which indicates that the BLE connection was dropped.

3.10 BLE/EP/CONN/DSC/BV/02: BLE connection between Gateway and Endpoint is extended by uplink packet and dropped after additional 30 seconds.

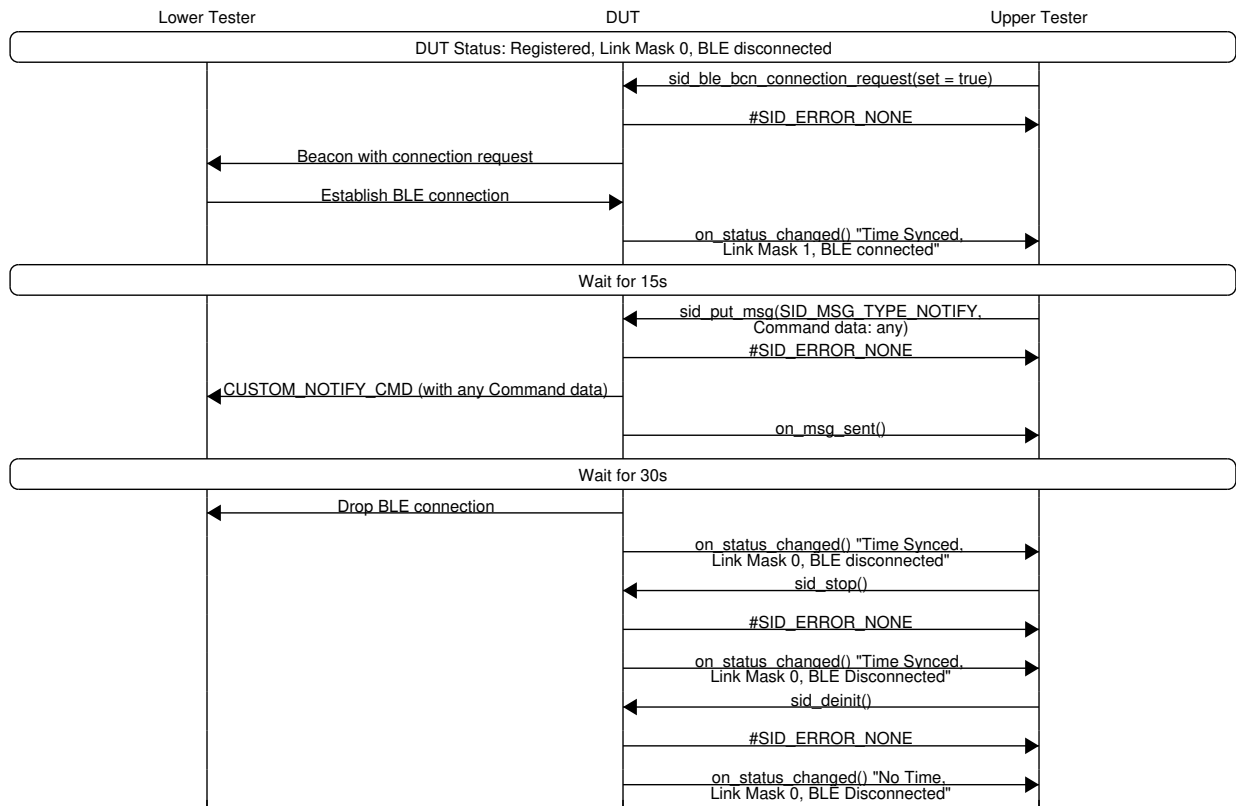
3.10.1 Test Purpose

To verify that BLE connection is dropped 30 seconds after uplink packet transmission was finished, which results in extending total time the devices are connected.

3.10.2 Initial Conditions

- DUT is registered with Amazon Sidewalk network.
- Lower Tester operates in BLE mode.
- SidewalkNetworkFlag is enabled on the Lower Tester.
- The Sidewalk stack (BLE) is initialized and started on the DUT.
- DUT has completed the time synchronization.

3.10.3 Test Procedure



3.10.4 Expected Results

3.10.4.1 Pass Verdict

BLE connection is dropped after 30 seconds, from the time the uplink packet transmission was finished.

There should be no connection drops and reconnects before the 30 seconds timeout is reached.

After the timeout, DUT triggers "on_status_changed()" with "Link Mask" value of 0, which indicates that the BLE connection was dropped.

3.11 BLE/EP/CONN/DSC/BV/03: BLE connection between Gateway and Endpoint is extended by downlink packet and dropped after additional 30 seconds.

3.11.1 Test Purpose

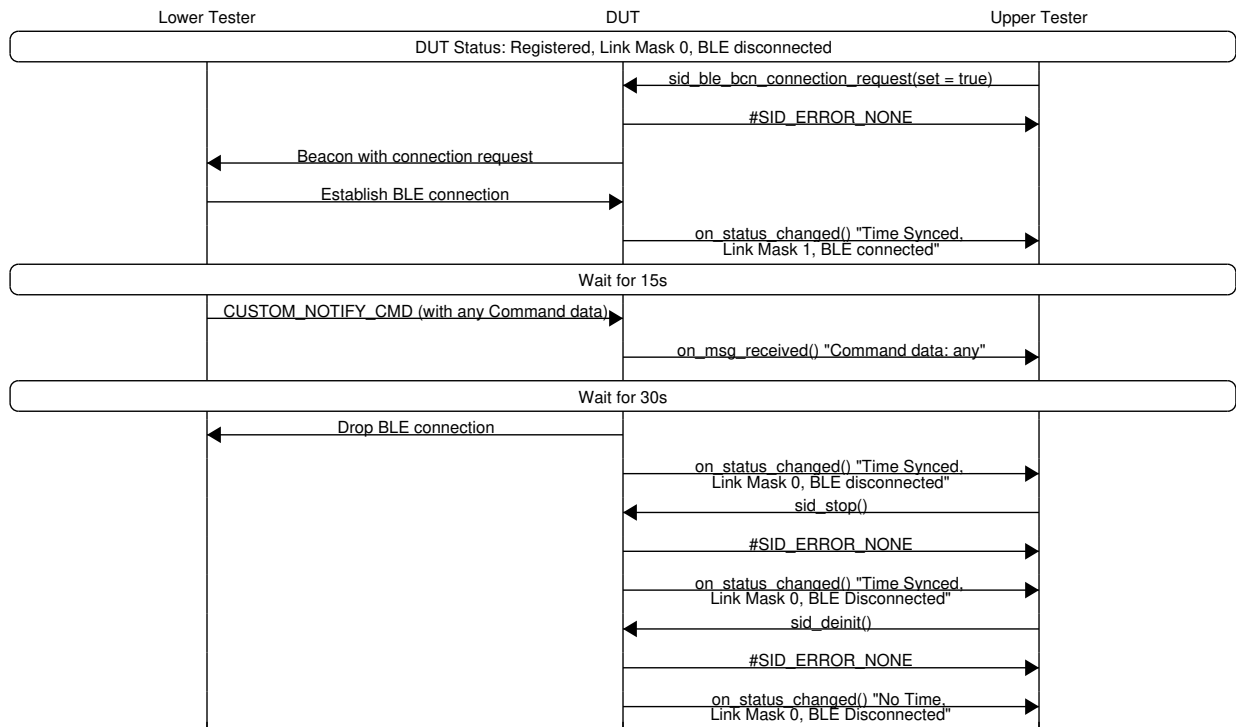
To verify that BLE connection is dropped 30 seconds after downlink packet transmission was finished, which results in extending total time the devices are connected.

3.11.2 Initial Conditions

- DUT is registered with Amazon Sidewalk network.

- Lower Tester operates in BLE mode.
- SidewalkNetworkFlag is enabled on the Lower Tester.
- The Sidewalk stack (BLE) is initialized and started on the DUT.
- DUT has completed the time synchronization.

3.11.3 Test Procedure



3.11.4 Expected Results

3.11.4.1 Pass Verdict

BLE connection is dropped after 30 seconds, from the time the downlink packet transmission was finished. There should be no connection drops and reconnects before the 30 seconds timeout is reached. After the timeout, DUT triggers "on_status.changed()" with "Link Mask" value of 0, which indicates that the BLE connection was dropped.

3.12 BLE/EP/CONN/DSC/BV/04: Endpoint drops BLE connection in case of received downlink packet with duplicated SEQ.

3.12.1 Applicability

This test case applies to devices compliant with the Amazon SidewalkSpecification v1.12 – v1.13.

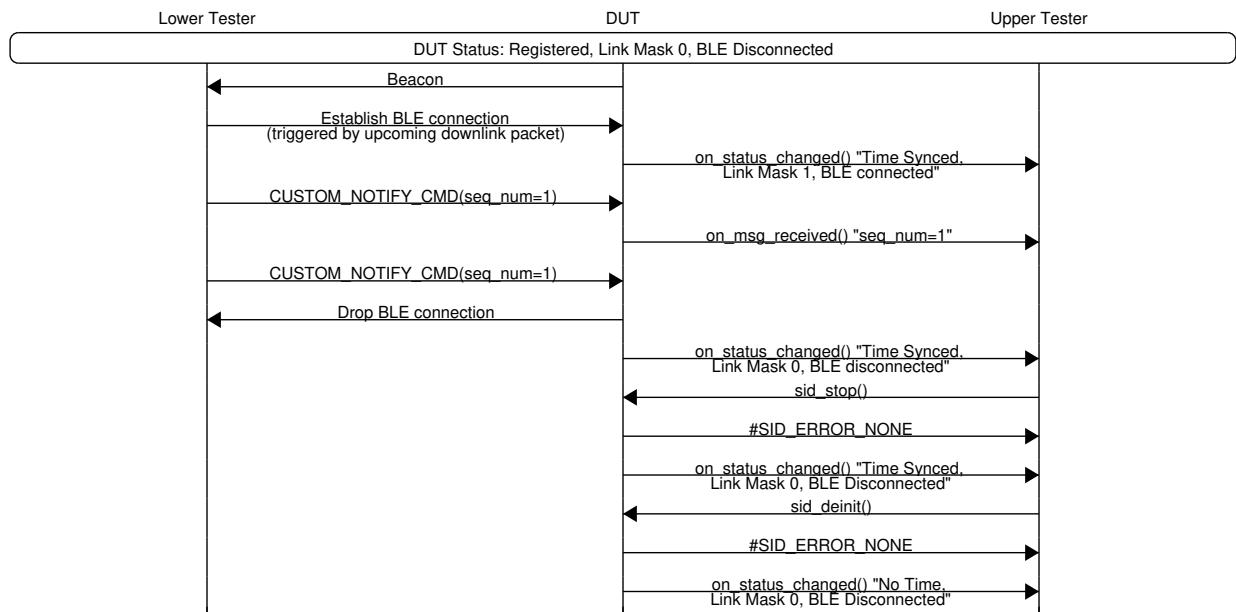
3.12.2 Test Purpose

To verify that a downlink packet which contains a duplicated sequence number causes DUT to drop the BLE connection.

3.12.3 Initial Conditions

- DUT is registered with Amazon Sidewalk network.
- Lower Tester operates in BLE mode.
- SidewalkNetworkFlag is enabled on the Lower Tester.
- The Sidewalk stack (BLE) is initialized and started on the DUT.
- DUT has completed the time synchronization.

3.12.4 Test Procedure



3.12.5 Expected Results

3.12.5.1 Pass Verdict

The first CUSTOM_NOTIFY_CMD packet sent by the Lower Tester containing sequence number equal to 1 should be decoded correctly and verified against the seq_num on the DUT side. Information about this event should be visible on the Upper Tester side.

Second CUSTOM_NOTIFY_CMD packet sent within 5 seconds by the Lower Tester with the same sequence number as the first one should be rejected by the DUT, therefore this event should not be visible on the Upper Tester side.

After the second packet was rejected, DUT triggers "on_status_changed()" with "Link Mask" value of 0, which indicates that the BLE connection was dropped.

3.13 BLE/EP/CONN/DSC/BV/05: Endpoint drops BLE connection in case of received downlink packets with duplicated SEQ range.

3.13.1 Applicability

This test case applies to devices compliant with the Amazon SidewalkSpecification v1.12 – v1.13.

3.13.2 Test Purpose

To verify that a group of five downlink packets which contain a duplicate sequence number cause DUT to drop the BLE connection.

3.13.3 Initial Conditions

- DUT is registered with Amazon Sidewalk network.

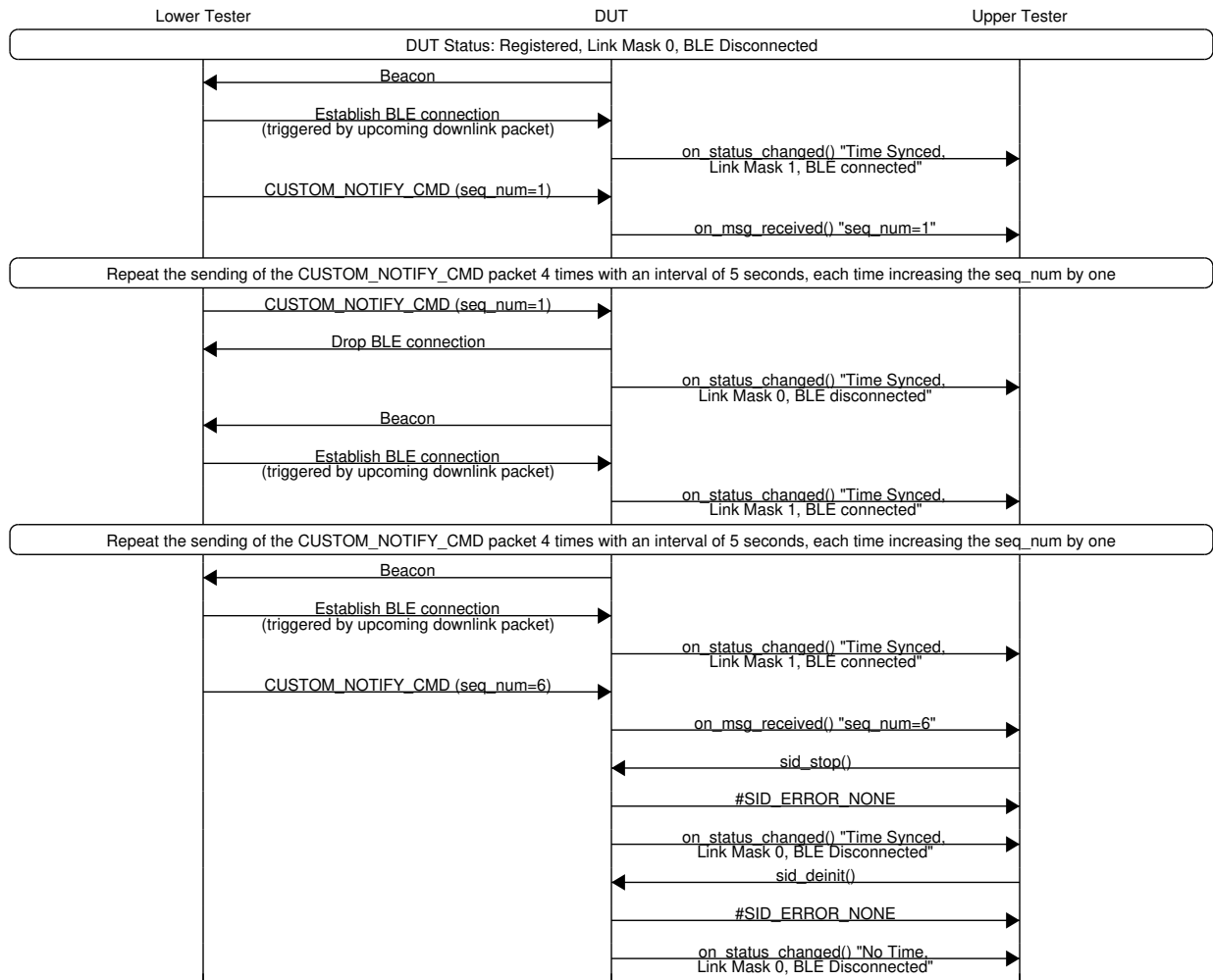
- Lower Tester operates in BLE mode.

- SidewalkNetworkFlag is enabled on the Lower Tester.

- The Sidewalk stack (BLE) is initialized and started on the DUT.

- DUT has completed the time synchronization.

3.13.4 Test Procedure



3.13.5 Expected Results

3.13.5.1 Pass Verdict

The first five CUSTOM_NOTIFY_CMD packets with sequence numbers increasing sequentially from 1 to 5 should be sent from the Lower Tester, correctly decoded and verified against the seq_num on the DUT side. Information about all five of these packets should be reported on the Upper Tester side.

Another five CUSTOM_NOTIFY_CMD packets containing sequence numbers from 1 to 5 sent from the Lower Tester, should be rejected by the DUT.

The last CUSTOM_NOTIFY_CMD packet with sequence number equal to 6 should be sent from the Lower Tester, correctly decoded and verified against the seq_num on the DUT side. Information about that packet should be reported on the Upper Tester side.

Each packet that was rejected, causes DUT to trigger "on_status_changed()" with "Link Mask" value of 0, which indicates that the BLE connection was dropped.

3.14 BLE/EP/CONN/DSC/BV/06: Endpoint drops BLE connection after stopping Sidewalk library.

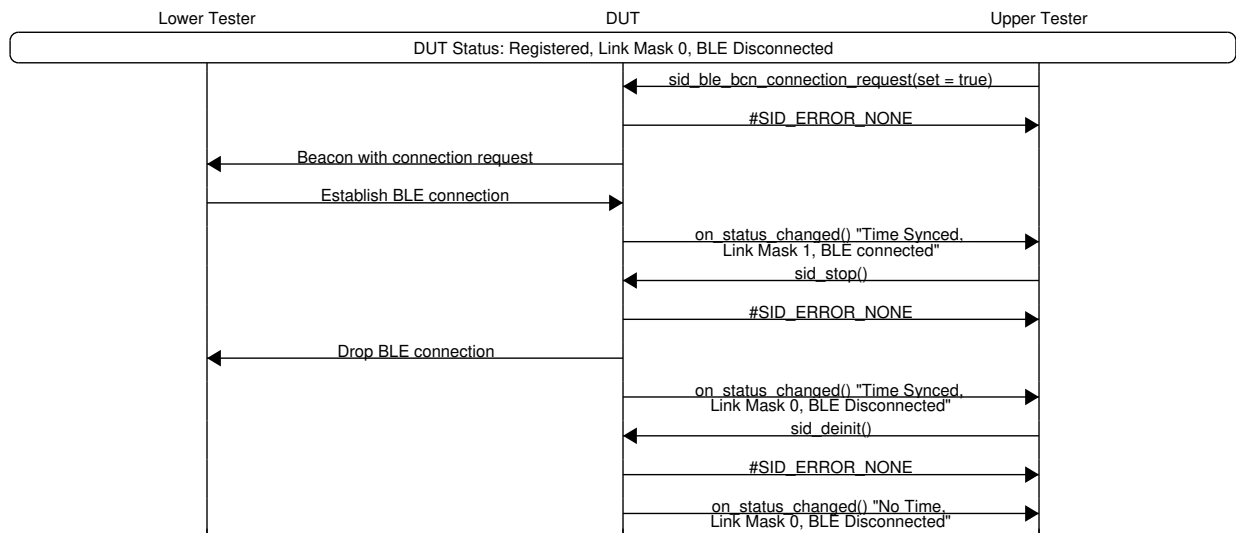
3.14.1 Test Purpose

To verify that DUT drops BLE connection if Sidewalk library is stopped.

3.14.2 Initial Conditions

- DUT is registered with Amazon Sidewalk network.
- Lower Tester operates in BLE mode.
- SidewalkNetworkFlag is enabled on the Lower Tester.
- The Sidewalk stack (BLE) is initialized and started on the DUT.
- DUT has completed the time synchronization.

3.14.3 Test Procedure



3.14.4 Expected Results

3.14.4.1 Pass Verdict

After sending the command to stop Sidewalk library, DUT triggers "on_status_changed()" with "Link Mask" value of 0, which indicates that the BLE connection was dropped.

3.15 BLE/EP/CONN/DSC/BV/07: Endpoint drops BLE connection after deinitializing Sidewalk library.

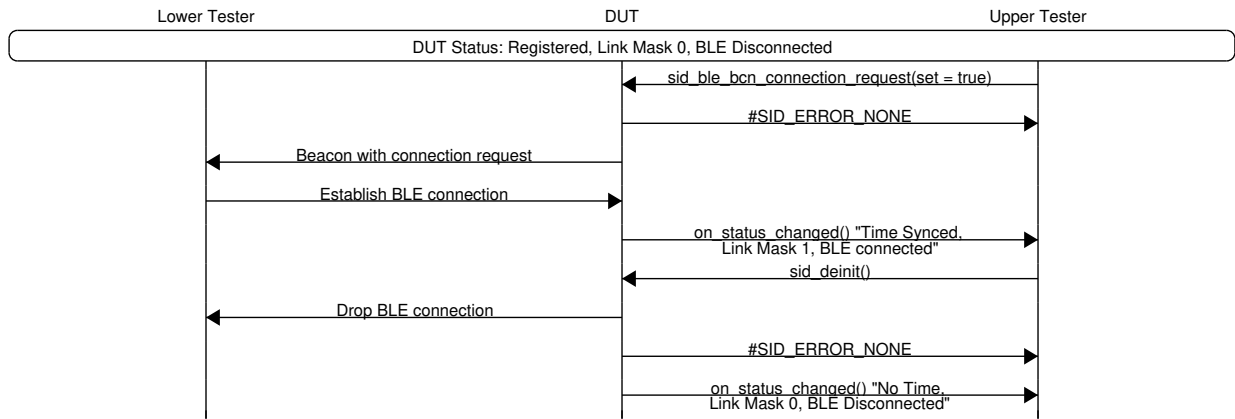
3.15.1 Test Purpose

To verify that DUT drops BLE connection if Sidewalk library is deinitialized.

3.15.2 Initial Conditions

- DUT is registered with Amazon Sidewalk network.
- Lower Tester operates in BLE mode.
- SidewalkNetworkFlag is enabled on the Lower Tester.
- The Sidewalk stack (BLE) is initialized and started on the DUT.
- DUT has completed the time synchronization.

3.15.3 Test Procedure



3.15.4 Expected Results

3.15.4.1 Pass Verdict

After sending the command to deinitialize Sidewalk library, DUT triggers "on_status_changed()" with "Link Mask" value of 0, which indicates that the BLE connection was dropped.

3.16 BLE/EP/CONN/BCN/BV/01: Endpoint transmits beacons only when BLE connection is not established.

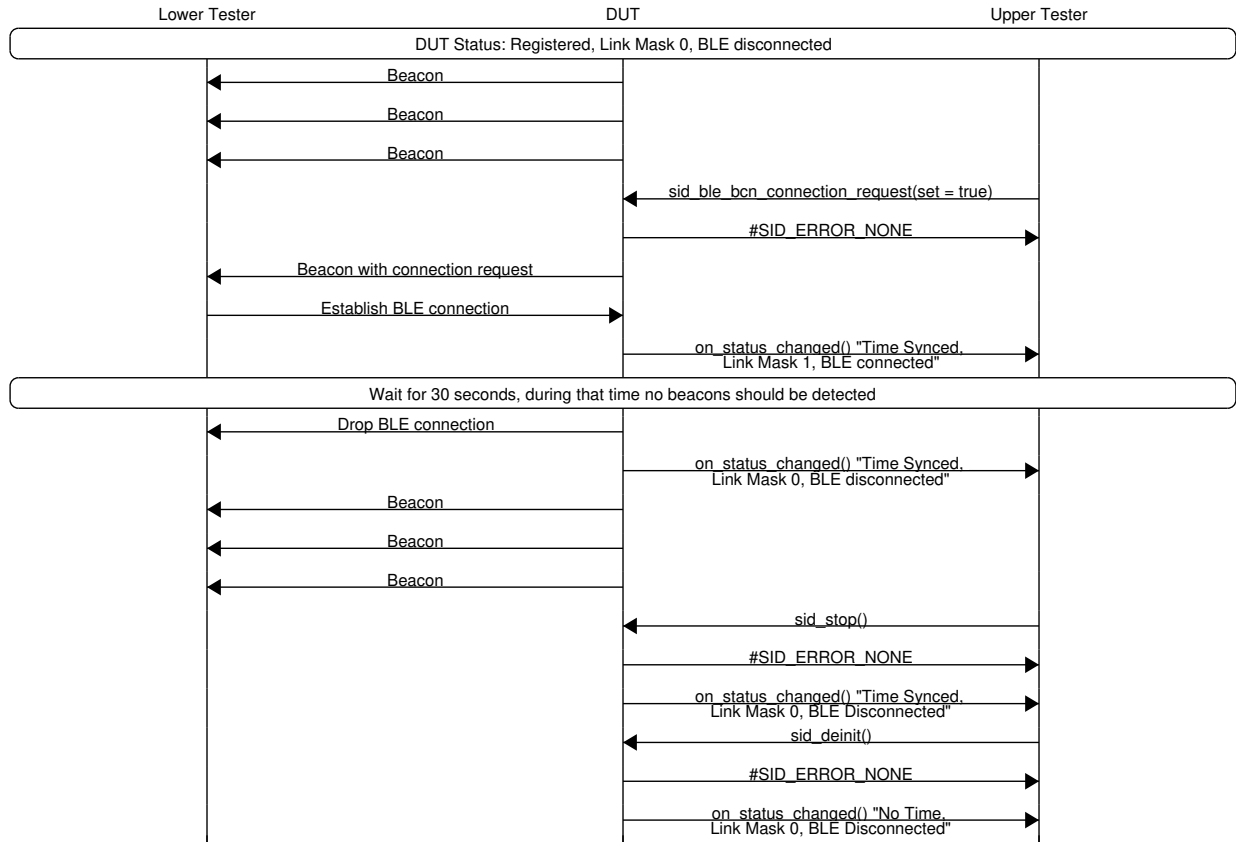
3.16.1 Test Purpose

To verify that DUT transmits beacons before establishing BLE connection and after disconnecting. During the active connection, no beacons should be transmitted.

3.16.2 Initial Conditions

- DUT is registered with Amazon Sidewalk network.
- Lower Tester operates in BLE mode.
- SidewalkNetworkFlag is enabled on the Lower Tester.
- The Sidewalk stack (BLE) is initialized and started on the DUT.
- DUT has completed the time synchronization.

3.16.3 Test Procedure



3.16.4 Expected Results

3.16.4.1 Pass Verdict

DUT transmits beacons before establishing BLE connection.

DUT stops transmitting beacons after establishing BLE connection.

DUT starts transmitting beacons again after disconnecting from the BLE connection.

All the beaconing activities to be checked with BLE sniffer on Lower Tester side.

3.17 BLE/EP/CONN/BCN/BV/02: Endpoint transmits beacons that contain Identifier (TX-ID), which changes every 15 minutes.

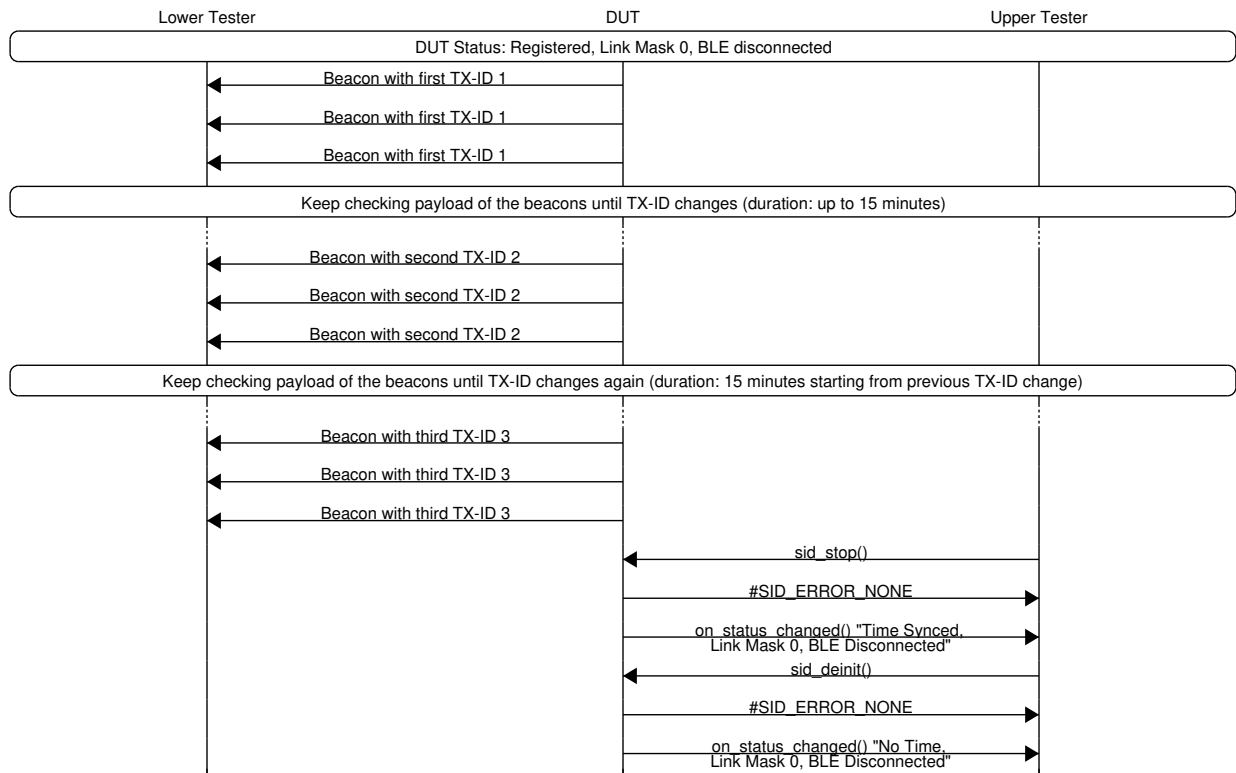
3.17.1 Test Purpose

To verify that DUT transmits beacons with Identifier (TX-ID). The Identifier is changed every 15 minutes, which can be verified in the application specific data of subsequent beacons.

3.17.2 Initial Conditions

- DUT is registered with Amazon Sidewalk network.
- Lower Tester operates in BLE mode.
- SidewalkNetworkFlag is enabled on the Lower Tester.
- The Sidewalk stack (BLE) is initialized and started on the DUT.
- DUT has completed the time synchronization.

3.17.3 Test Procedure



3.17.4 Expected Results

3.17.4.1 Pass Verdict

DUT transmits beacons with payload that contains TX-ID. TX-ID is 5 bytes long and is located in 2nd-6th octets of the "Application Specific Data", in "Manufacturing Data" section of the beacon.

First TX-ID change occurs within 15 minutes and is used as a starting point of second TX-ID change duration.

Second TX-ID change occurs 15 minutes after the first one.

There should be no additional changes in the data of TX-ID.

All the beaconing activities to be checked with BLE sniffer on Lower Tester side.

3.18 BLE/EP/CONN/BCN/BV/03: Endpoint transmits beacons with 160ms interval for the first 30 seconds after starting BLE protocol.

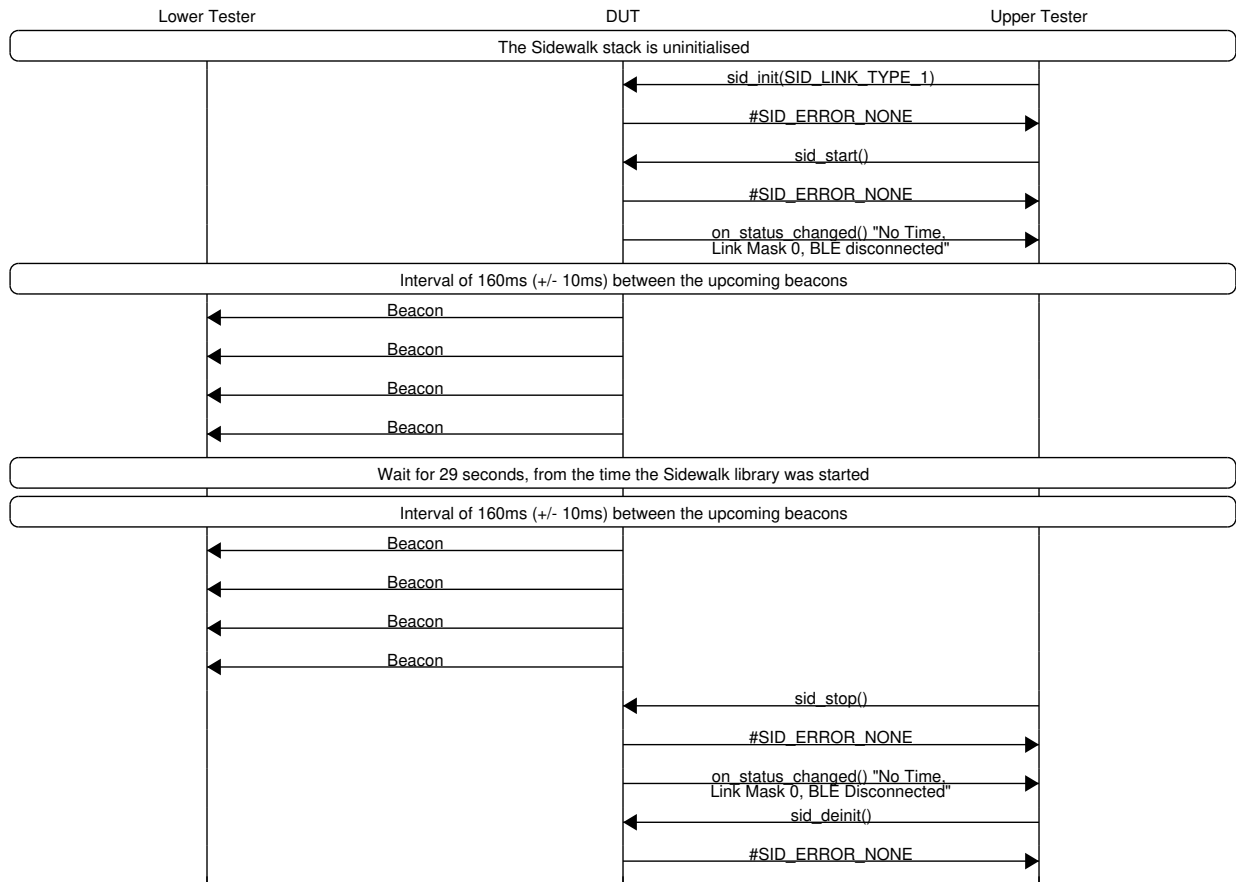
3.18.1 Test Purpose

To verify that DUT transmits a beacon every 160ms, with +/-10ms of acceptable range (150ms-170ms) for the first 30 seconds after starting BLE protocol. Lower Tester should not react to the beacons with BLE connection establishment, so that the beacon transmission interval stays uninterrupted.

3.18.2 Initial Conditions

- DUT is registered with Amazon Sidewalk network.

3.18.3 Test Procedure



3.18.4 Expected Results

3.18.4.1 Pass Verdict

The interval of 160ms (+/- 10ms) in beacon transmission is respected by DUT for the first 30 seconds after starting Sidewalk library.

At least 4 beacons to be verified in terms of the valid interval in both cases: immediately after starting Sidewalk library, and 29 seconds after starting Sidewalk library.

All the beaconing activities to be checked with BLE sniffer on Lower Tester side.

3.19 BLE/EP/CONN/BCN/BV/04: Endpoint transmits beacons with 1s interval, 30 seconds after starting BLE protocol.

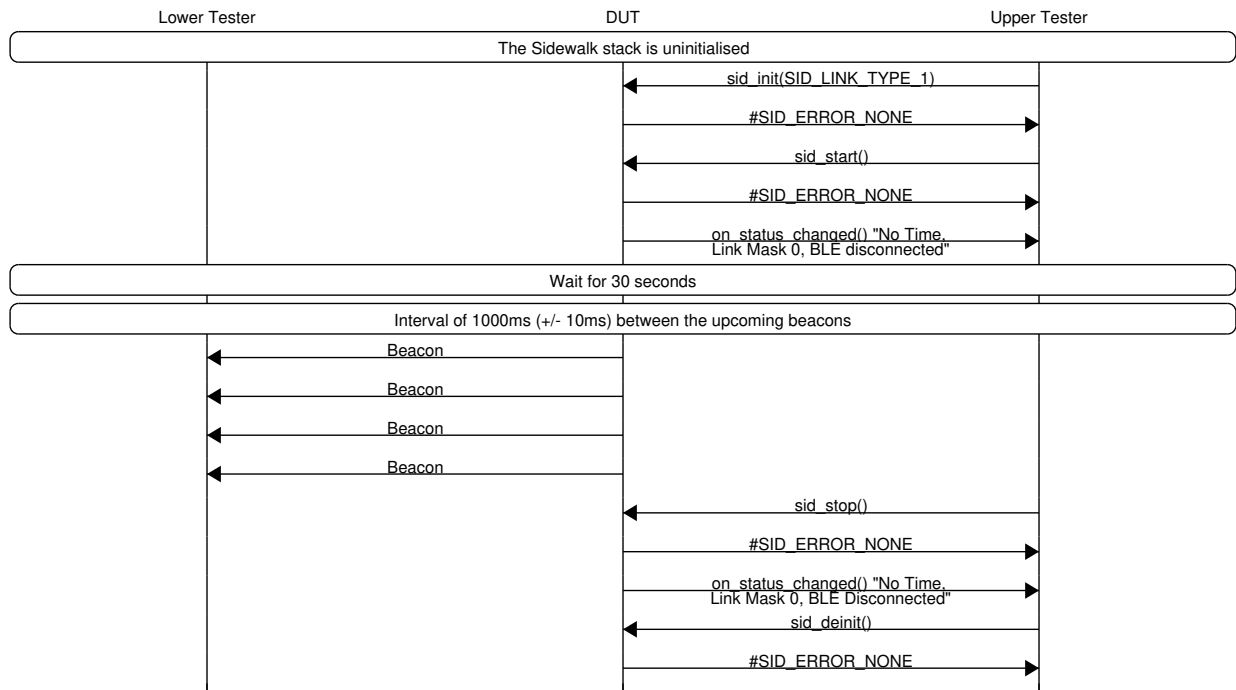
3.19.1 Test Purpose

To verify that DUT transmits a beacon every 1000ms, with +/-10ms of acceptable range (990ms-1010ms), 30 seconds after starting BLE protocol. Lower Tester should not react to the beacons with BLE connection establishment, so that the beacon transmission interval stays uninterrupted.

3.19.2 Initial Conditions

- DUT is registered with Amazon Sidewalk network.

3.19.3 Test Procedure



3.19.4 Expected Results

3.19.4.1 Pass Verdict

The interval of 1000ms (+/- 10ms) in beacon transmission is respected by DUT 30 seconds after starting Sidewalk library.

At least 4 beacons to be verified in terms of the valid interval.

All the beaconing activities to be checked with BLE sniffer on Lower Tester side.

3.20 BLE/EP/CONN/BCN/BV/05: Endpoint transmits beacons with valid header.

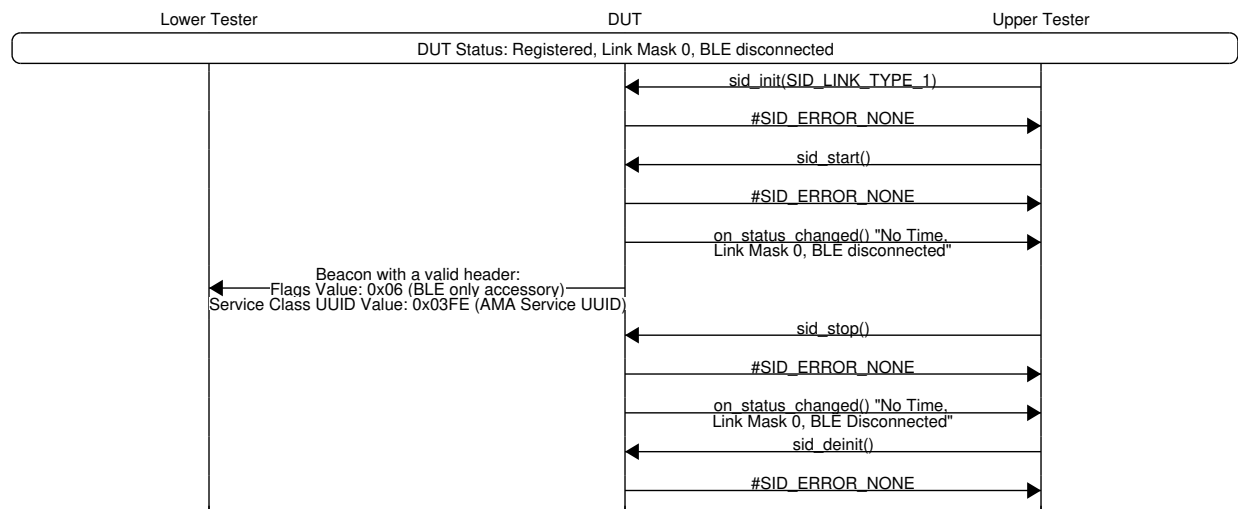
3.20.1 Test Purpose

To verify that DUT transmits beacons with specific values contained in the header field.

3.20.2 Initial Conditions

- DUT is registered with Amazon Sidewalk network.

3.20.3 Test Procedure



3.20.4 Expected Results

3.20.4.1 Pass Verdict

Header field is constant and not configurable, which means that it must always contain the following values:
3rd octet of the header: "Flags" Value - 0x06 (BLE only accessory)
6th-7th octets of the header: "Service Class UUID" Value - 0x03FE (AMA Service UUID)

Beacon header to be checked with BLE sniffer on Lower Tester side.

3.21 BLE/EP/CONN/DUP/BV/01: BLE connection is closed after Endpoint receives 10 packets with duplicate SEQ number within one minute (filter duplicates enabled).

3.21.1 Applicability

This test case applies to devices compliant with the Amazon SidewalkSpecification v1.14 and later.

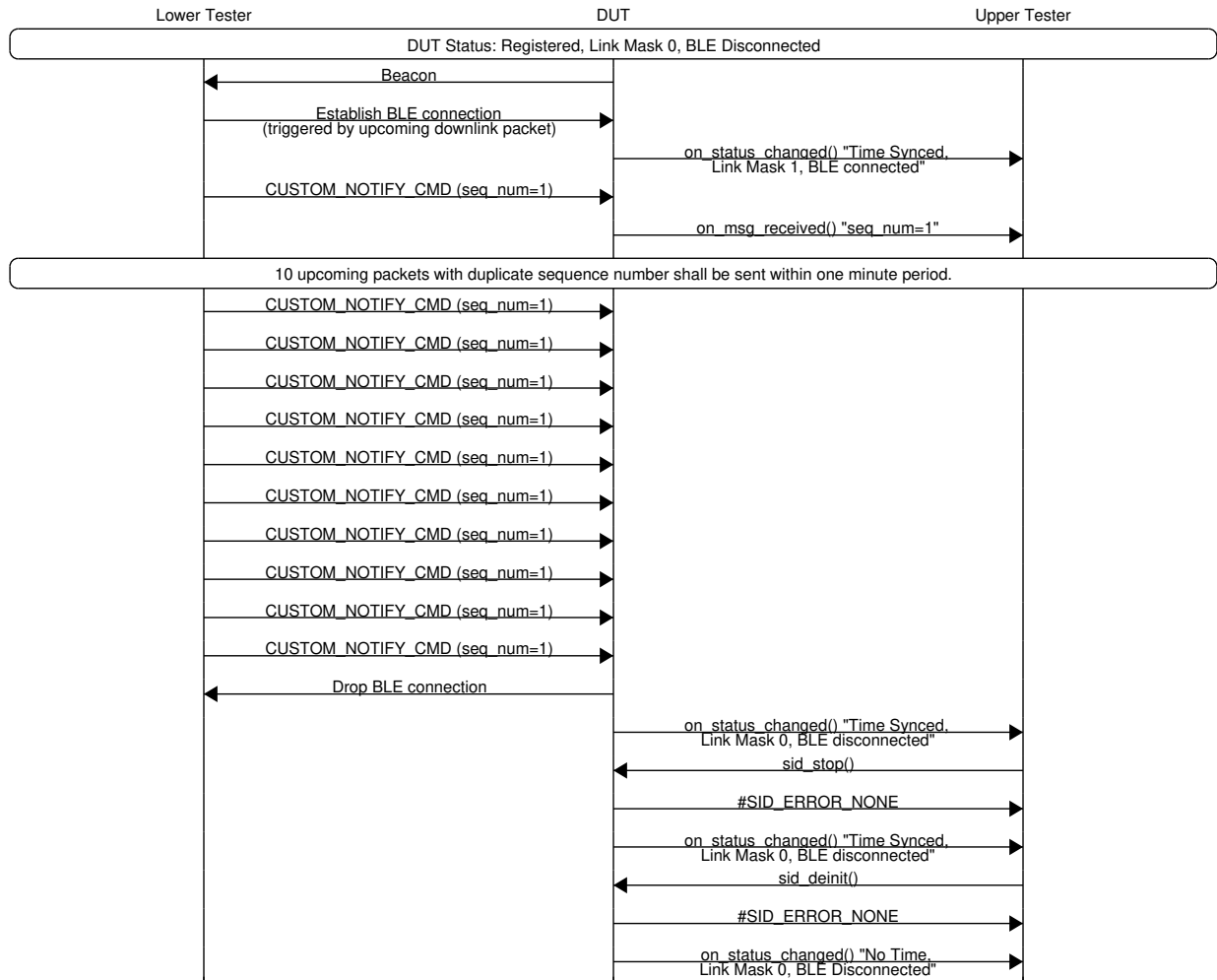
3.21.2 Test Purpose

To verify that DUT closes BLE connection after total of 10 packets with duplicate sequence number reach it within one minute. To confirm this behavior "filter duplicates" option has to be enabled on DUT.

3.21.3 Initial Conditions

- DUT is registered with Amazon Sidewalk network.
- Lower Tester operates in BLE mode.
- SidewalkNetworkFlag is enabled on the Lower Tester.
- The Sidewalk stack (BLE) is initialized and started on the DUT.
- DUT has completed the time synchronization.
- "Filter duplicates" option enabled on the DUT.

3.21.4 Test Procedure



3.21.5 Expected Results

3.21.5.1 Pass Verdict

The first CUSTOM_NOTIFY_CMD packet with sequence number equal to 1 should be sent from the Lower Tester, correctly decoded and verified against the seq_num on the DUT side. Information about this packet should be reported on the Upper Tester side.

Ten CUSTOM_NOTIFY_CMD packets with duplicate sequence number equal to 1 shall be sent from Lower within the one minute period.

One minute period starts after Lower Tester finishes transmission of the first downlink packet with duplicate sequence number.

All packets with duplicate sequence number are rejected by DUT. Information about them will not be reported on the Upper Tester side.

Upon arrival of the last CUSTOM_NOTIFY_CMD packet, DUT triggers "on_status_changed()" with "Link Mask" value of 0, which indicates that the BLE connection was dropped.

3.22 BLE/EP/CONN/DUP/BV/02: BLE connection is closed after Endpoint receives 10 packets with various duplicate SEQ numbers within one minute (filter duplicates enabled).

3.22.1 Applicability

This test case applies to devices compliant with the Amazon SidewalkSpecification v1.14 and later.

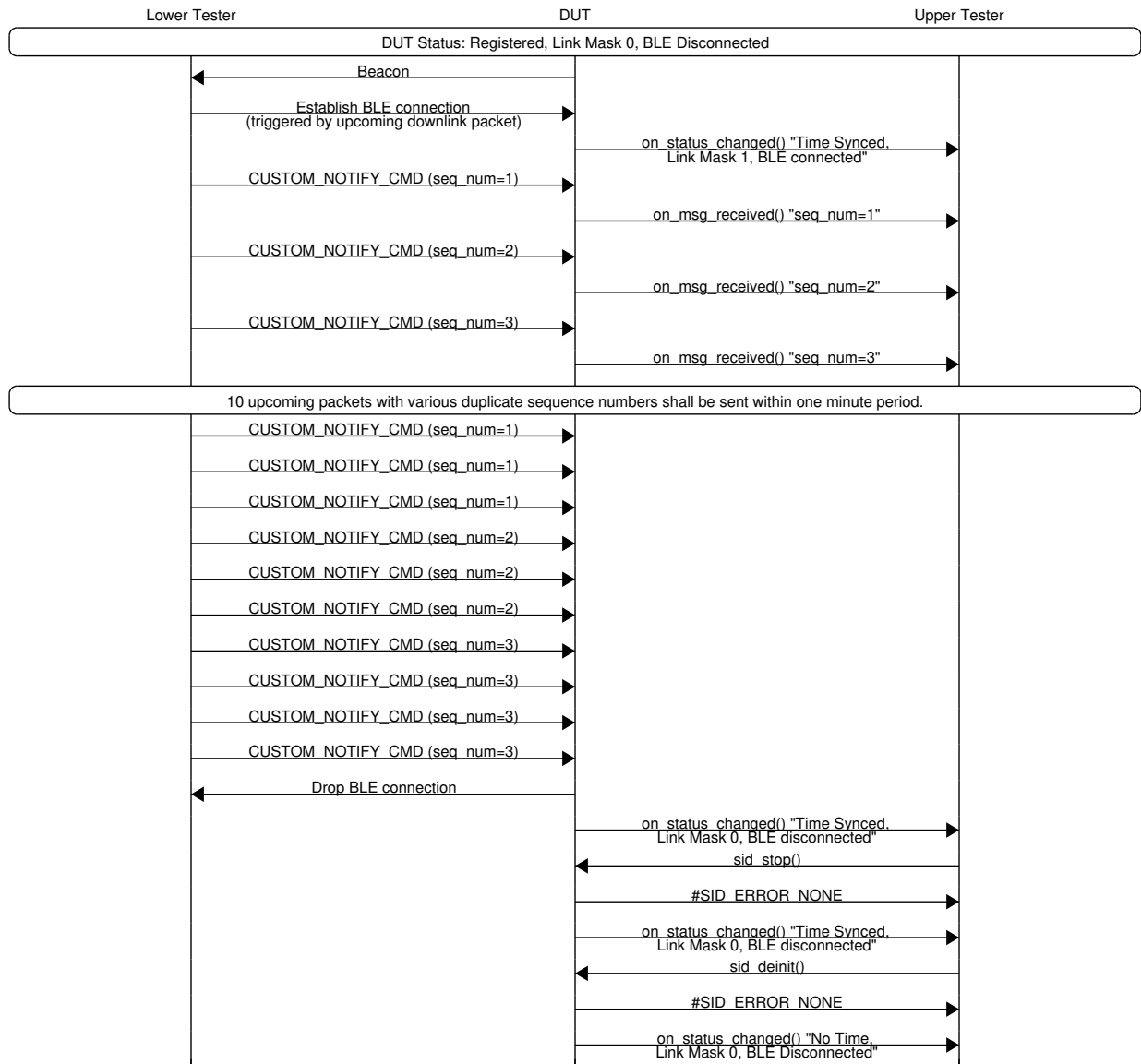
3.22.2 Test Purpose

To verify that DUT closes BLE connection after total of 10 packets with various duplicate sequence numbers reach it within one minute. To confirm this behavior "filter duplicates" option has to be enabled on DUT.

3.22.3 Initial Conditions

- DUT is registered with Amazon Sidewalk network.
- Lower Tester operates in BLE mode.
- SidewalkNetworkFlag is enabled on the Lower Tester.
- The Sidewalk stack (BLE) is initialized and started on the DUT.
- DUT has completed the time synchronization.
- "Filter duplicates" option enabled on the DUT.

3.22.4 Test Procedure



3.22.5 Expected Results

3.22.5.1 Pass Verdict

The first three CUSTOM_NOTIFY_CMD packets with sequence numbers increasing sequentially from 1 to 3 should be sent from the Lower Tester, correctly decoded and verified against the seq_num on the DUT side. Information about all three of these packets should be reported on the Upper Tester side.

Ten CUSTOM_NOTIFY_CMD packets with various duplicate sequence numbers ranging from 1 to 3, sent from the Lower Tester within the one minute period.

One minute period starts after Lower Tester finishes transmission of the first downlink packet with duplicate sequence number.

All packets with duplicate sequence number are rejected by DUT. Information about them will not be reported on the Upper Tester side.

Upon arrival of the last CUSTOM_NOTIFY_CMD packet, DUT triggers "on_status_changed()" with "Link Mask" value of 0, which indicates that the BLE connection was dropped.

3.23 BLE/EP/CONN/DUP/BV/03: BLE connection is not closed after Endpoint receives 10 packets with duplicate SEQ number within one minute (filter duplicates disabled).

3.23.1 Applicability

This test case applies to devices compliant with the Amazon SidewalkSpecification v1.14 and later.

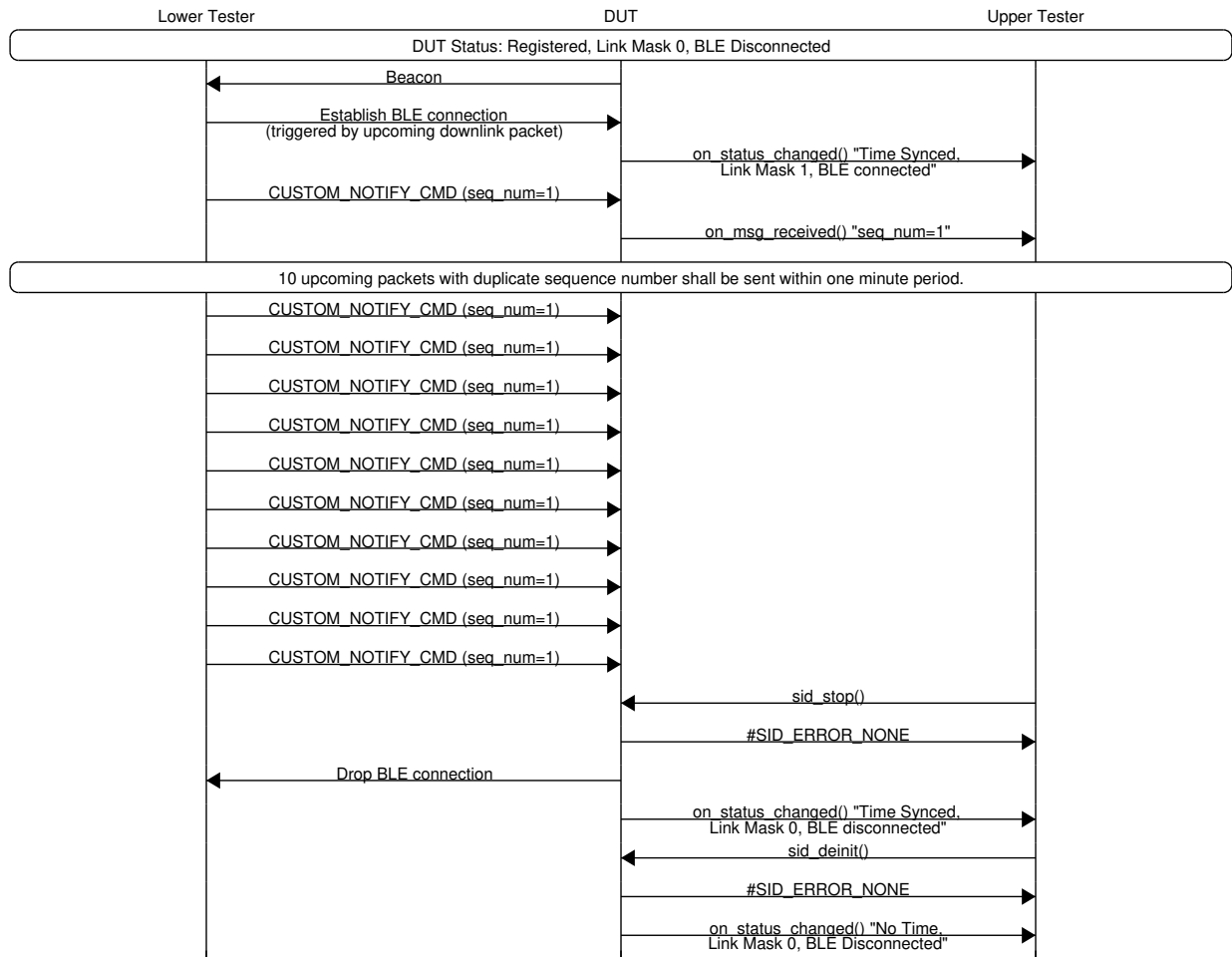
3.23.2 Test Purpose

To verify that DUT does not close BLE connection after total of 10 packets with duplicate sequence number reach it within one minute. To confirm this behavior "filter duplicates" option has to be disabled on DUT.

3.23.3 Initial Conditions

- DUT is registered with Amazon Sidewalk network.
- Lower Tester operates in BLE mode.
- SidewalkNetworkFlag is enabled on the Lower Tester.
- The Sidewalk stack (BLE) is initialized and started on the DUT.
- DUT has completed the time synchronization.
- "Filter duplicates" option disabled on the DUT.

3.23.4 Test Procedure



3.23.5 Expected Results

3.23.5.1 Pass Verdict

The first CUSTOM_NOTIFY_CMD packet with sequence number equal to 1 should be sent from the Lower Tester, correctly decoded and verified against the seq_num on the DUT side. Information about this packet should be reported on the Upper Tester side.

Ten CUSTOM_NOTIFY_CMD packets with duplicate sequence number equal to 1 shall be sent from Lower within the one minute period.

One minute period starts after Lower Tester finishes transmission of the first downlink packet with duplicate sequence number.

All packets with duplicate sequence number are rejected by DUT. Information about them will not be reported on the Upper Tester side.

Upon arrival of the last CUSTOM_NOTIFY_CMD packet, DUT does not trigger "on_status_changed()", which means that "Link Mask" value remains unchanged and the BLE connection was not dropped.

3.24 BLE/EP/CONN/DUP/BV/04: BLE connection is not closed after Endpoint receives 10 packets with various duplicate SEQ numbers within one minute (filter duplicates disabled).

3.24.1 Applicability

This test case applies to devices compliant with the Amazon SidewalkSpecification v1.14 and later.

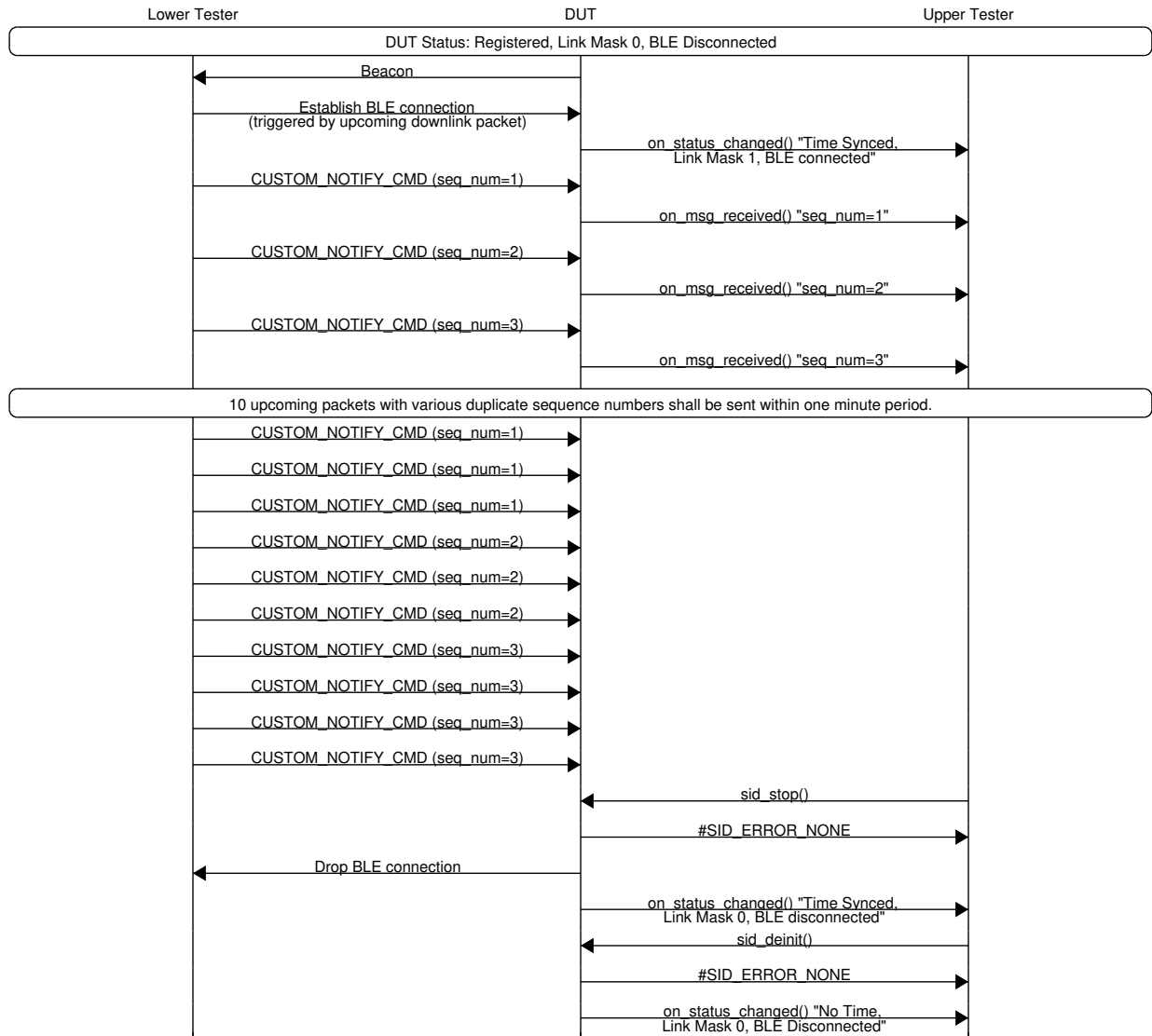
3.24.2 Test Purpose

To verify that DUT does not close BLE connection after total of 10 packets with various duplicate sequence numbers reach it within one minute. To confirm this behavior "filter duplicates" option has to be disabled on DUT.

3.24.3 Initial Conditions

- DUT is registered with Amazon Sidewalk network.
- Lower Tester operates in BLE mode.
- SidewalkNetworkFlag is enabled on the Lower Tester.
- The Sidewalk stack (BLE) is initialized and started on the DUT.
- DUT has completed the time synchronization.
- "Filter duplicates" option disabled on the DUT.

3.24.4 Test Procedure



3.24.5 Expected Results

3.24.5.1 Pass Verdict

The first three CUSTOM_NOTIFY_CMD packets with sequence numbers increasing sequentially from 1 to 3 should be sent from the Lower Tester, correctly decoded and verified against the seq_num on the DUT side. Information about all three of these packets should be reported on the Upper Tester side.

Ten CUSTOM_NOTIFY_CMD packets with various duplicate sequence numbers ranging from 1 to 3, sent from the Lower Tester within the one minute period.

One minute period starts after Lower Tester finishes transmission of the first downlink packet with duplicate sequence number.

All packets with duplicate sequence number are rejected by DUT. Information about them will not be reported on the Upper Tester side.

Upon arrival of the last CUSTOM_NOTIFY_CMD packet, DUT does not trigger "on_status_changed()", which means that "Link Mask" value remains unchanged and the BLE connection was not dropped.

3.25 BLE/EP/CONN/DUP/BV/05: BLE connection is not closed after 10 packets with duplicate SEQ number reach Endpoint, if not all of those packets are sent within one minute.

3.25.1 Applicability

This test case applies to devices compliant with the Amazon SidewalkSpecification v1.14 and later.

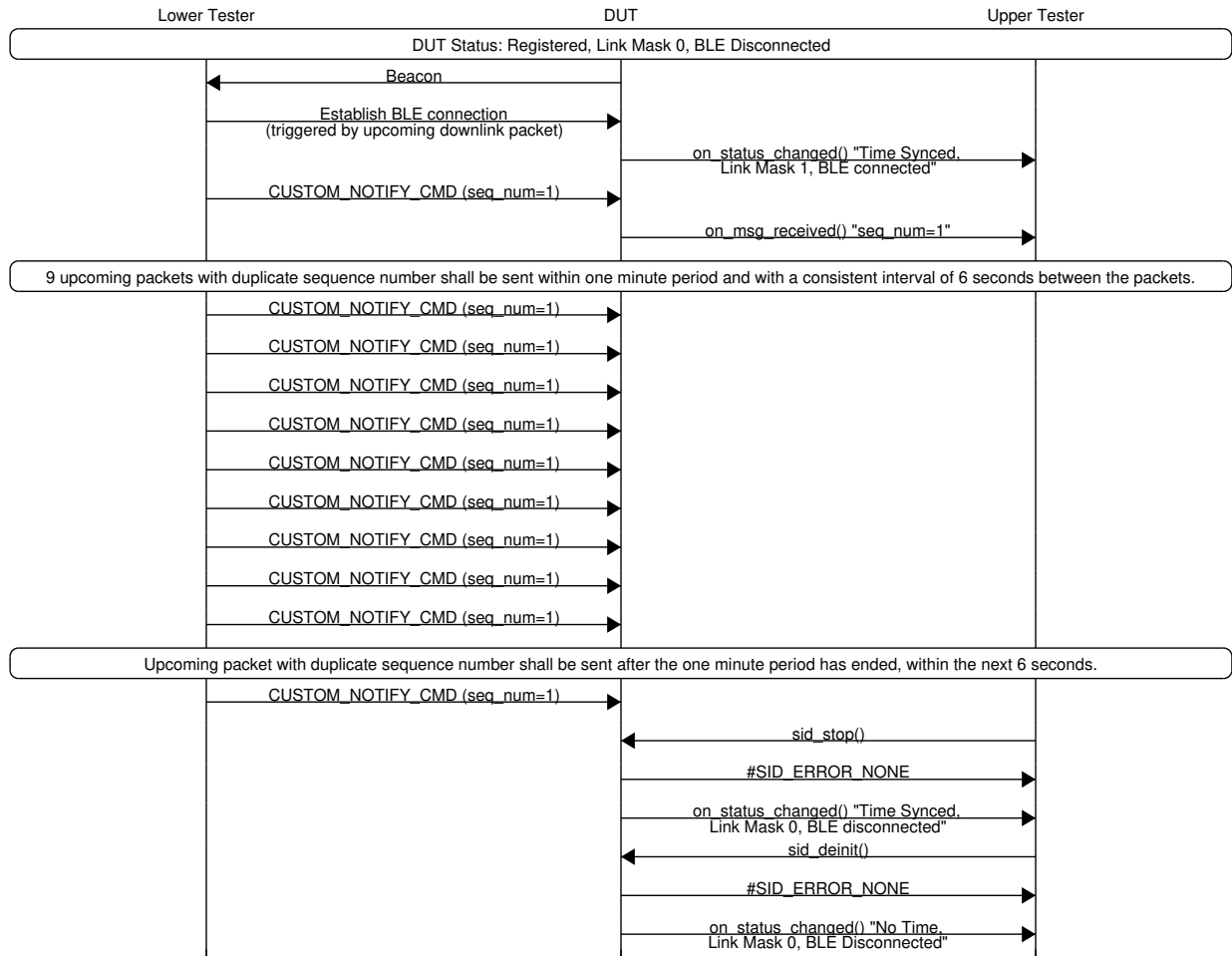
3.25.2 Test Purpose

To verify that DUT does not close BLE connection, when 10th packet with duplicate SEQ number is received by Endpoint more than one minute after the first one. DUT will reset the counter of duplicates after a minute passes, starting from the first packet with duplicate sequence number reaching DUT. To confirm this behavior "filter duplicates" option has to be enabled on DUT.

3.25.3 Initial Conditions

- DUT is registered with Amazon Sidewalk network.
- Lower Tester operates in BLE mode.
- SidewalkNetworkFlag is enabled on the Lower Tester.
- The Sidewalk stack (BLE) is initialized and started on the DUT.
- DUT has completed the time synchronization.
- "Filter duplicates" option enabled on the DUT.

3.25.4 Test Procedure



3.25.5 Expected Results

3.25.5.1 Pass Verdict

The first CUSTOM_NOTIFY_CMD packet with sequence number equal to 1 should be sent from the Lower Tester, correctly decoded and verified against the seq_num on the DUT side. Information about this packet should be reported on the Upper Tester side.

Ten CUSTOM_NOTIFY_CMD packets with duplicate sequence number equal to 1 shall be sent from Lower Tester, where:

Nine CUSTOM_NOTIFY_CMD packets are sent within the one minute period and with a consistent interval of 6 seconds between the packets. One CUSTOM_NOTIFY_CMD packet is sent after the one minute period has ended, within the next 6 seconds.

One minute period starts after Lower Tester finishes transmission of the first downlink packet with duplicate sequence number.

All packets with duplicate sequence number are rejected by DUT. Information about them will not be reported on the Upper Tester side.

Upon arrival of the last CUSTOM_NOTIFY_CMD packet, DUT does not trigger "on_status_changed()", which means that "Link Mask" value remains unchanged and the BLE connection was not dropped.

3.26 BLE/EP/NW/SYNC/TIME/BV/01: Endpoint completes the initial time sync procedure.

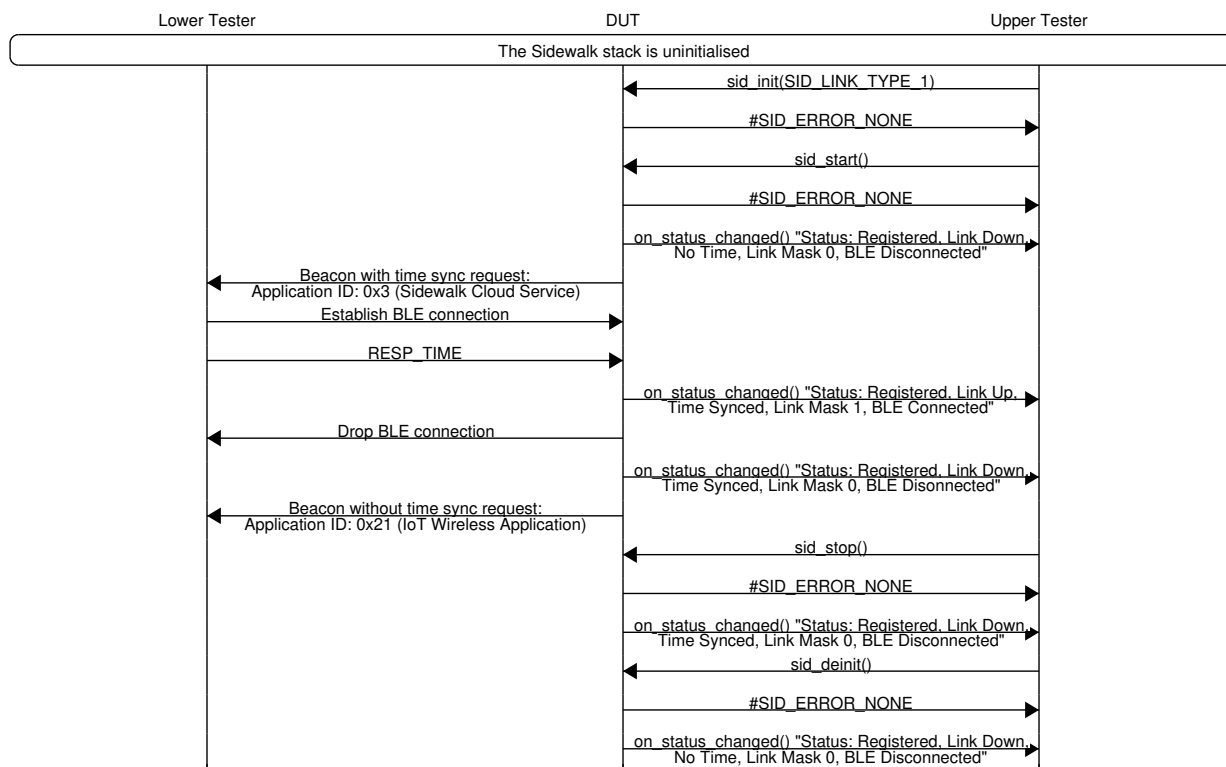
3.26.1 Test Purpose

DUT is able to pass the initial time synchronization procedure. Payload of the beacons transmitted by DUT is appropriate to the time sync state.

3.26.2 Initial Conditions

- DUT is registered with Amazon Sidewalk network.
- Lower Tester operates in BLE mode.
- SidewalkNetworkFlag is enabled on the Lower Tester.

3.26.3 Test Procedure



3.26.4 Expected Results

3.26.4.1 Pass Verdict

Depending on the time sync state of DUT, advertising beacon may contain the time sync request. This information is located in "Application ID" - 5th octet of Manufacturing Data in the beacon. Value of the Application ID signifies whether DUT is requesting time sync (0x3 - Sidewalk Cloud Service) or if it was already completed (0x21 - IoT Wireless Application). Payload of the beacons to be checked with BLE sniffer on Lower Tester side.

Before starting time sync procedure, DUT transmits beacons with time sync request - Application ID: 0x3 (Sidewalk Cloud Service).

There may be more than one beacon transmitted by DUT before the BLE connection with Lower Tester is established, however this should not negatively affect the time synchronization procedure.

Lower Tester establishes BLE connection with DUT after receiving beacon with time sync request.

The RESP_TIME packet will be sent to DUT right after establishing the BLE connection.

DUT is able to acquire time from the network.

No other UL transmission should take place until the DUT receives a correct RESP_TIME packet which will be reported via Time Status: synced.

After completing time synchronization procedure, DUT triggers "on_status_changed()" twice:

With "Link Mask" value of 1, Link status Up and Time synced, which indicate that the BLE connection was established and time synchronization was completed.

With "Link Mask" value of 0 and Link status Down, which indicate that the BLE connection was dropped right after.

Completion of the time synchronization procedure should also result in DUT transmitting beacons to the app server (without time sync request) - Application ID: 0x21 (IoT Wireless Application).

Chapter 4

FSK (900MHz) Test Cases

4.1 FSK/EP/BCN/DISCO/BV/01: FSK-WAN Endpoint discovers neighbor Gateway and synchronizes with it if roaming is allowed.

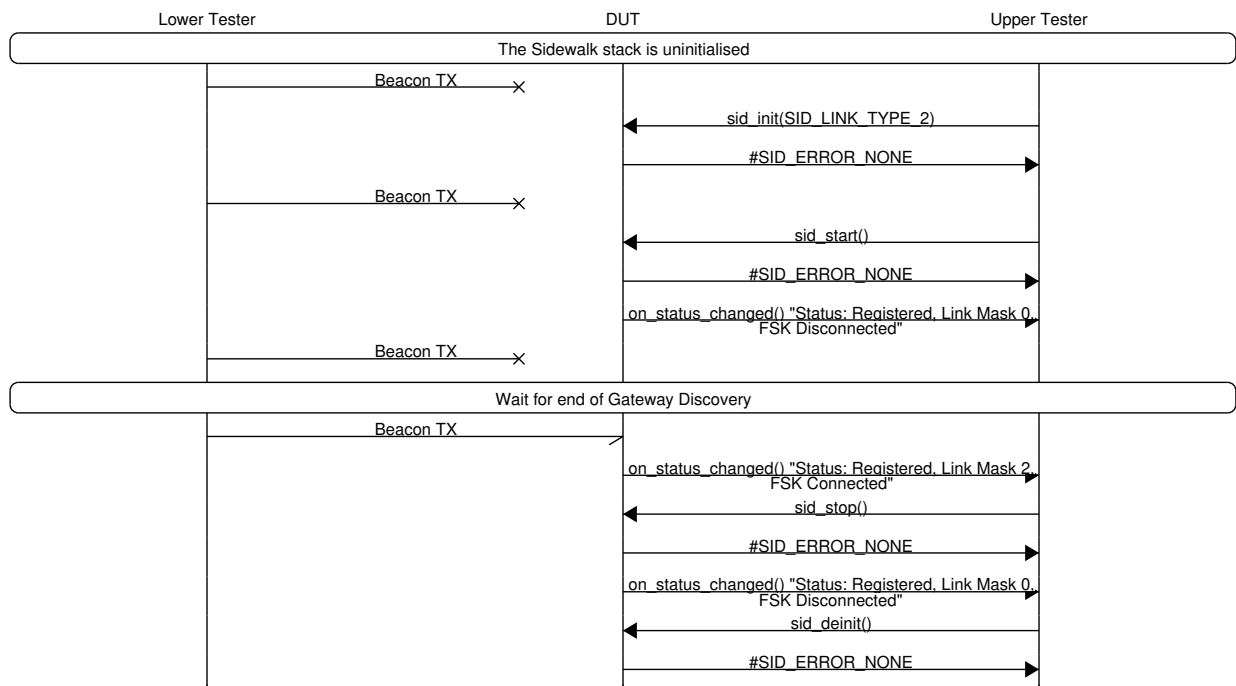
4.1.1 Test Purpose

DUT is able to discover and synchronize with neighbor Gateway if roam_opt flag is set to 1 in Beacon.

4.1.2 Initial Conditions

- DUT is registered with Amazon Sidewalk network.
- Lower Tester operates in the default mixed (MULTLRATE) mode.
- The protocol is enabled on the Lower Tester.
- SidewalkNetworkFlag is enabled on Lower Tester.

4.1.3 Test Procedure



4.1.4 Expected Results

4.1.4.1 Pass Verdict

DUT is able to detect Beacon and synchronize with the neighbor Gateway that allows roaming. Detection of Beacon and synchronization with GW should take place within 40 seconds of starting the Sidewalk stack.

In result the FSK stack goes connected state which means that synchronization on PHY layer has been achieved.

4.2 FSK/EP/BCN/DISCO/BV/02: FSK-WAN Endpoint discovers home Gateway and synchronizes with it even if roaming is forbidden.

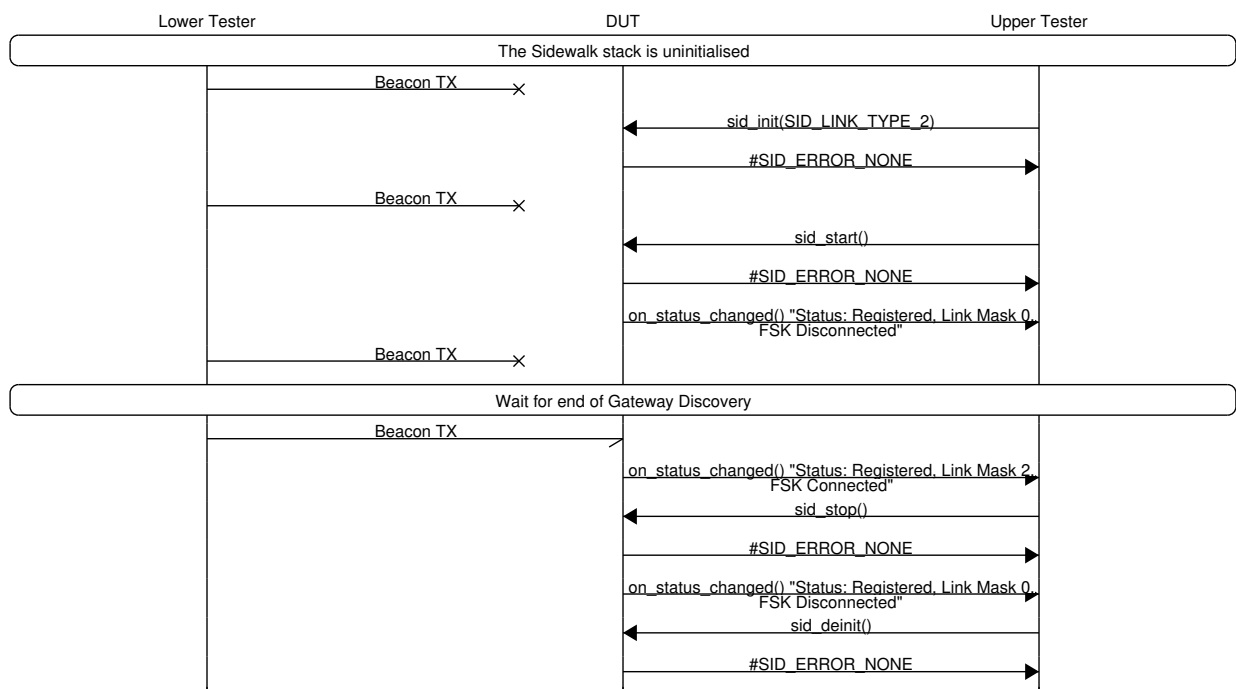
4.2.1 Test Purpose

DUT is able to discover and synchronize with home Gateway even if roam_opt flag is set to 0 in Beacon.

4.2.2 Initial Conditions

- DUT is registered with Amazon Sidewalk network.
- Lower Tester operates in the default mixed (MULTIRATE) mode.
- The protocol is enabled on the Lower Tester.
- SidewalkNetworkFlag is disabled on Lower Tester.

4.2.3 Test Procedure



4.2.4 Expected Results

4.2.4.1 Pass Verdict

DUT is able to detect Beacon and synchronize with the home Gateway that does not allow roaming. Detection of Beacon and synchronization with Lower Tester should take place within 40 seconds of starting the Sidewalk stack.

In result the FSK stack goes connected state which means that synchronization on PHY layer has been achieved.

4.3 FSK/EP/BCN/DISCO/BV/03: FSK-WAN Endpoint detects a neighbor Gateway Beacon but continues with the Gateway discovery process if roaming is forbidden.

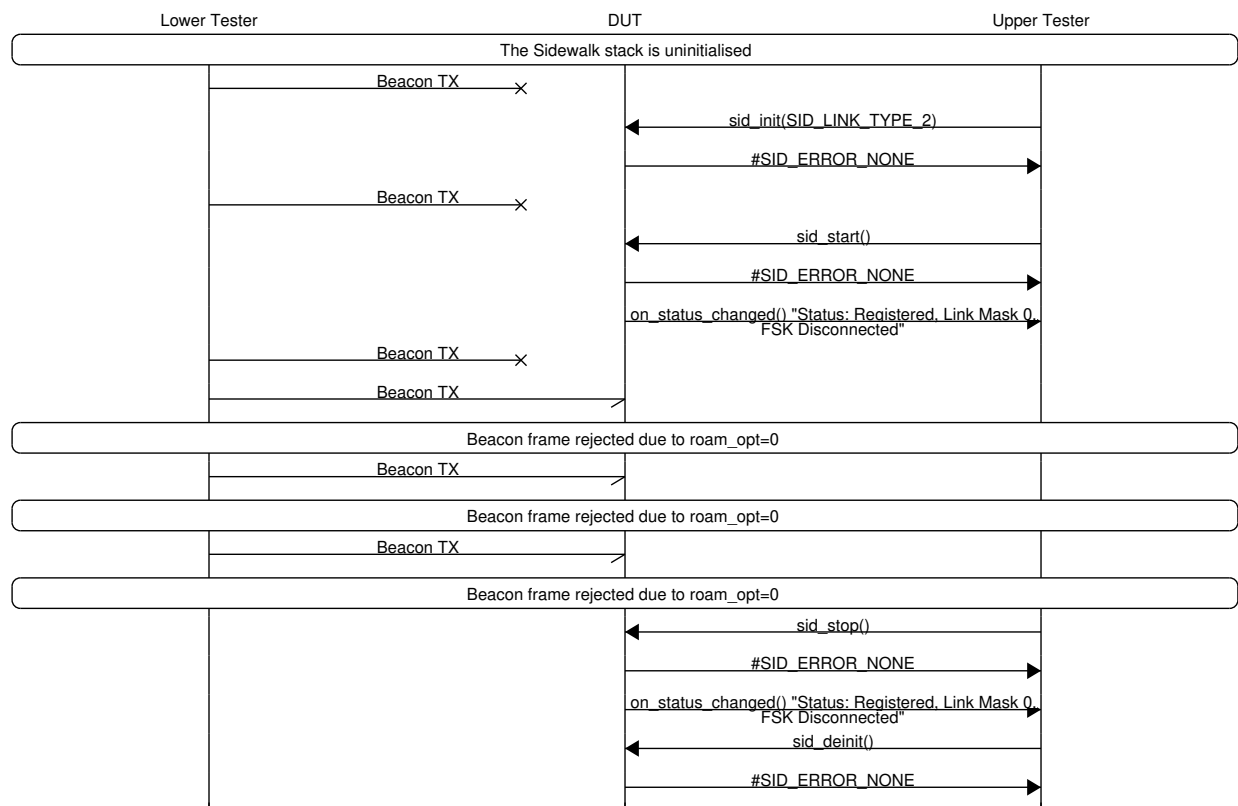
4.3.1 Test Purpose

DUT is able to detect Beacon frame but continues with the Gateway discovery process if roam_opt flag is set to 0 in Beacon.

4.3.2 Initial Conditions

- DUT is registered with Amazon Sidewalk network using different user accounts.
- Lower Tester operates in the default mixed (MULTI_RATE) mode.
- The protocol is enabled on the Lower Tester.
- SidewalkNetworkFlag is disabled on the Lower Tester.

4.3.3 Test Procedure



4.3.4 Expected Results

4.3.4.1 Pass Verdict

DUT is able to detect a Beacon, but the Gateway discovery procedure is continued and should not be successful due to disabled SidewalkNetworkFlag.

DUT should reject three consecutive Beacon frames which were received after stack is started. In result change of SID application status should not be observed and FSK stack should remain in disconnected state all the time.

No transmission of a UL packet should occur during the entire test as DUT is involved in a passive way in Beacon detection for most of time.

4.4 FSK/EP/CONN/REG/BV/01: An unregistered Endpoint successfully completes Sidewalk device registration over BLE.

4.4.1 Applicability

This test case applies to devices compliant with the Amazon SidewalkSpecification v1.12 – v1.13.

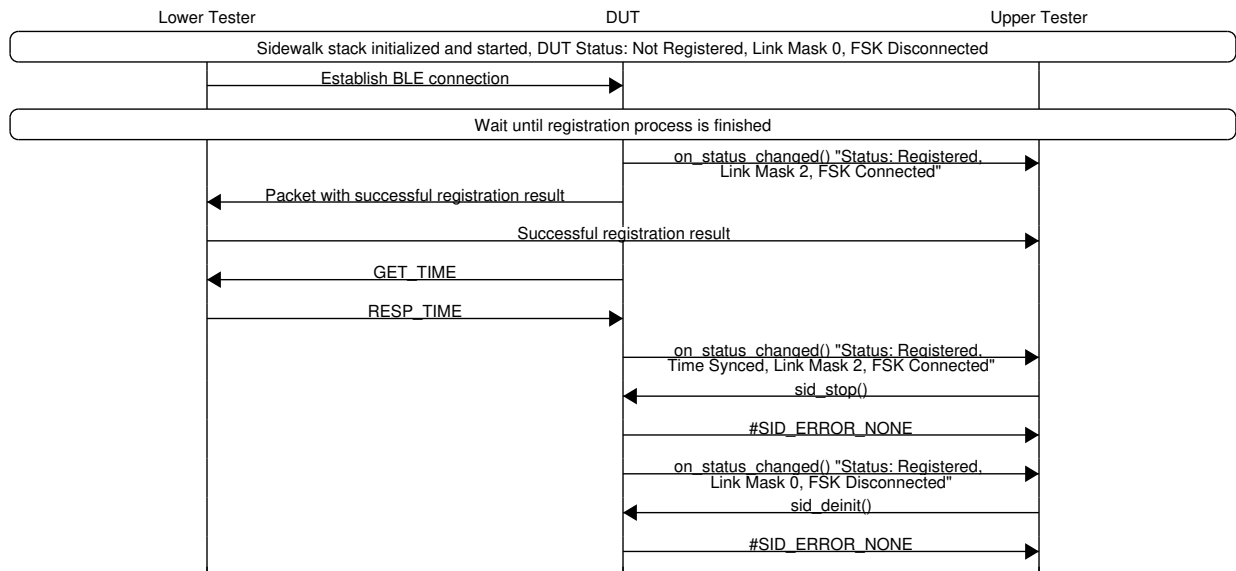
4.4.2 Test Purpose

An unregistered DUT configures the Sidewalk stack in FSK mode. It accepts a BLE connection from the Lower Tester and completes registration. After it has registered it uses FSK radio for Amazon Sidewalk network activities.

4.4.3 Initial Conditions

- DUT is not registered with Amazon Sidewalk network.
- The Sidewalk stack (FSK) is initialized and started on the DUT.

4.4.4 Test Procedure



4.4.5 Expected Results

4.4.5.1 Pass Verdict

DUT with Sidewalk stack (FSK) initialized is successfully registered with Amazon Sidewalk network.

Afterwards, DUT completes time synchronization over FSK.

4.5 FSK/EP/CONN/REG/BV/02: Endpoint can be deregistered from Sidewalk network.

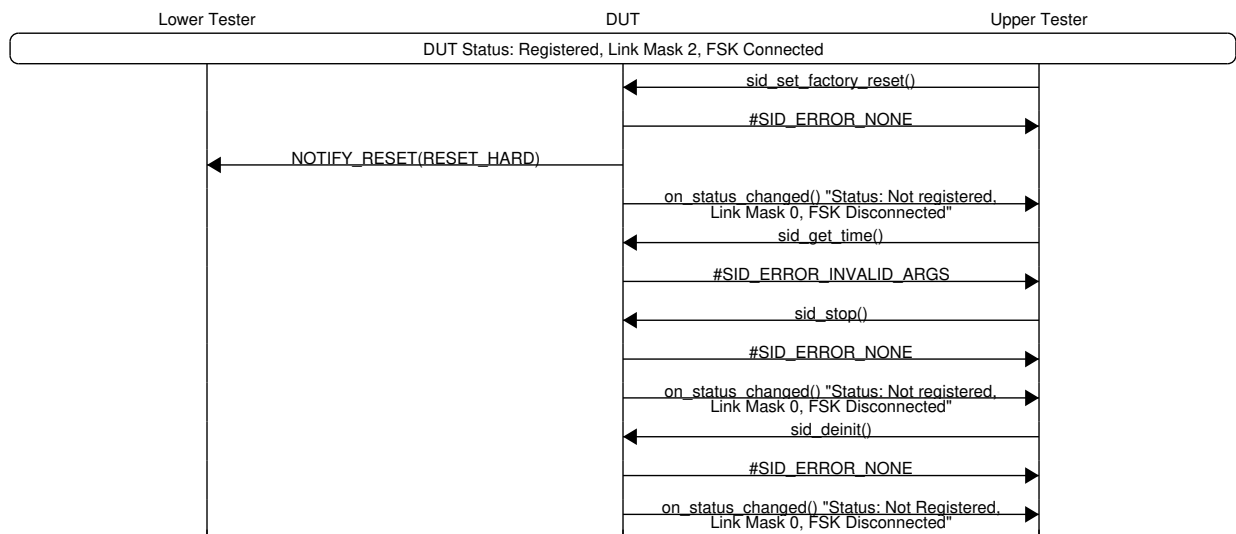
4.5.1 Test Purpose

To verify that the DUT is able to be deregistered from the Amazon Sidewalk network.

4.5.2 Initial Conditions

- DUT is registered with Amazon Sidewalk network.
- The Sidewalk stack (FSK) is initialized and started on the DUT.

4.5.3 Test Procedure



4.5.4 Expected Results

4.5.4.1 Pass Verdict

Calling the `sid_set_factory_reset` method should force the DUT to send the packet `NOTIFY_RESET` (with `RESET_HARD` parameter) to the Lower Tester. Then the DUT should report to the Upper Tester the change in registration status to "Not registered".

After successful deregistration, the attempt to send the `GET_TIME` packet should fail with the `SID_ERROR_INVALID_ARGS` returned to the Upper Tester.

4.6 FSK/EP/CONN/REG/BV/03: An unregistered Endpoint successfully completes Sidewalk device registration with use of FFN.

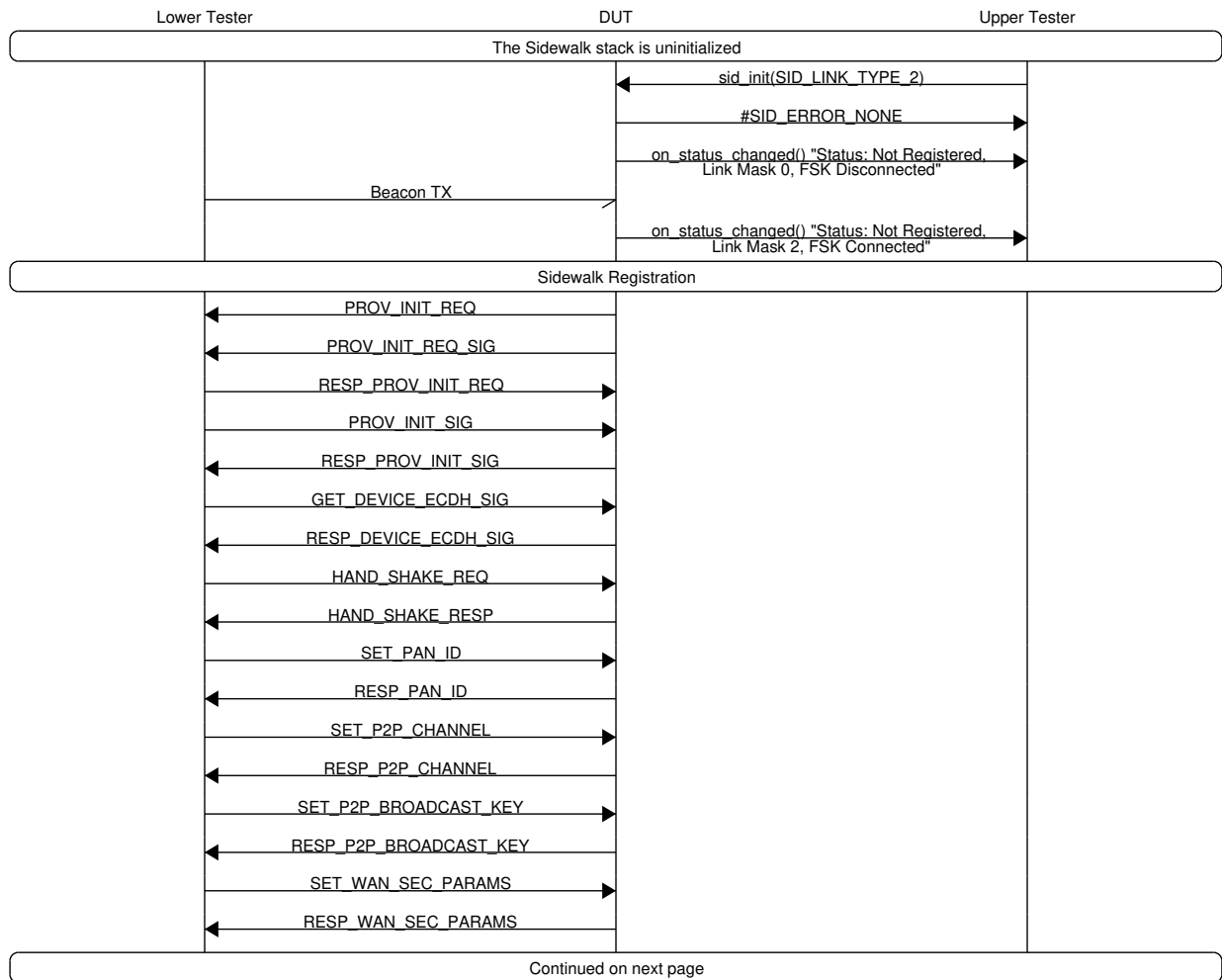
4.6.1 Test Purpose

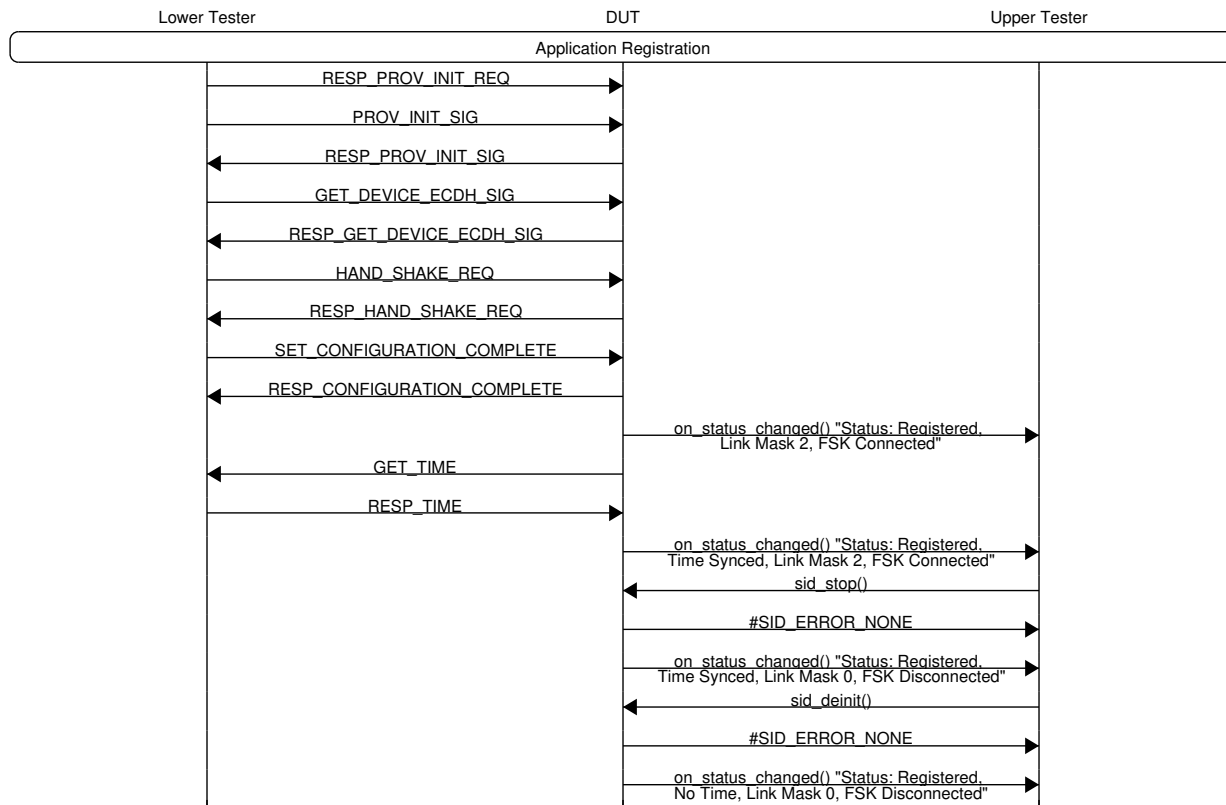
An unregistered DUT configures the Sidewalk stack in FSK mode. DUT synchronizes with Lower Tester (by detecting a Beacon) and starts registration flow by sending "PROV_INIT_REQ" packet to Lower Tester. At the end of the registration flow, DUT receives SET_CONFIGURATION_COMPLETE packet from Lower Tester and responds with RESP_CONFIGURATION_COMPLETE packet, which is a sign of successful device registration. After that DUT continues to work using FSK radio for Amazon Sidewalk network activities.

4.6.2 Initial Conditions

- DUT is fully unregistered from Amazon Sidewalk network (both Cloud and DUT side)

4.6.3 Test Procedure





4.6.4 Expected Results

4.6.4.1 Pass Verdict

Registration process is triggered by DUT, after detecting a Beacon and synchronizing with Lower Tester.

DUT sends "PROV_INIT_REQ" packet to initiate the registration flow.

Every registration related packet is successfully exchanged between Lower Tester and DUT.

During the process of registration, DUT does not change Sidewalk stack.

DUT receives "SET_CONFIGURATION_COMPLETE" packet from Lower Tester and responds with "RESP_CONFIGURATION_COMPLETE". Those two packets signify that DUT is successfully registered with Amazon Sidewalk network with use of FFN.

Afterwards, DUT completes time synchronization over FSK.

4.7 FSK/EP/CONN/SEQ/BV/01: Uplink packets contain SEQ number.

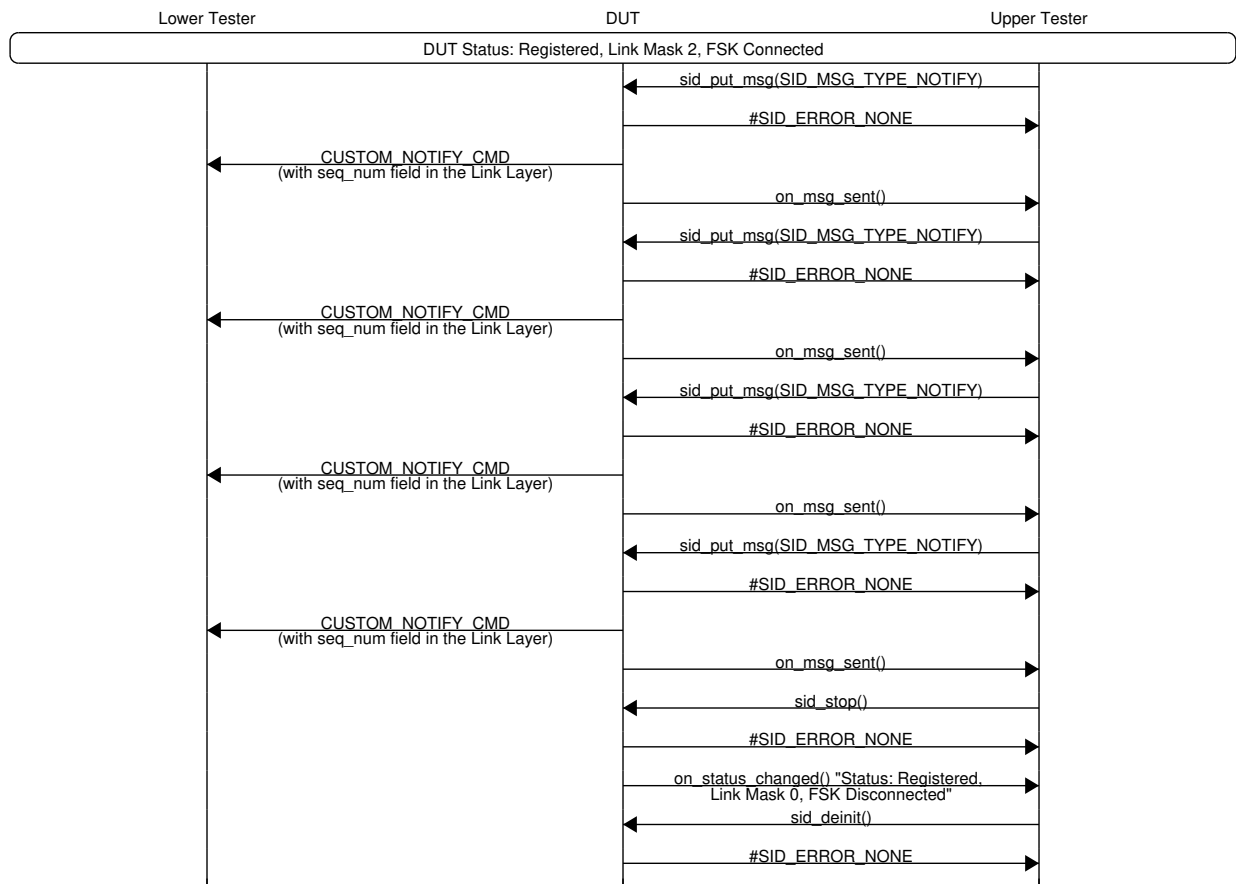
4.7.1 Test Purpose

To verify that the uplink packets sent by the DUT contain the sequence number written in the seq_num field in the Link Layer. With each subsequent sent packet, the value of seq_num should be incremented by one.

4.7.2 Initial Conditions

- DUT is registered with Amazon Sidewalk network.
- Lower Tester operates in the default mixed (MULTI_RATE) mode.
- The protocol is enabled on the Lower Tester.
- SidewalkNetworkFlag is enabled on the Lower Tester.
- The Sidewalk stack (FSK) is initialized and started on the DUT.
- DUT has completed the time synchronization and the Join procedure.

4.7.3 Test Procedure



4.7.4 Expected Results

4.7.4.1 Pass Verdict

The seq_num field is properly filled in the Link Layer of each CUSTOM_NOTIFY_CMD packet sent by DUT. Moreover, seq_num of each CUSTOM_NOTIFY_CMD packet should be incremented by one relative to the seq_num of the previous transmitted packet.

As the packet sequence number is sent as plain text in the Link Layer, the above condition can be validated on the Lower Tester side.

4.8 FSK/EP/CONN/SEQ/BV/02: Endpoint increments uplink SEQ number until UUID changes.

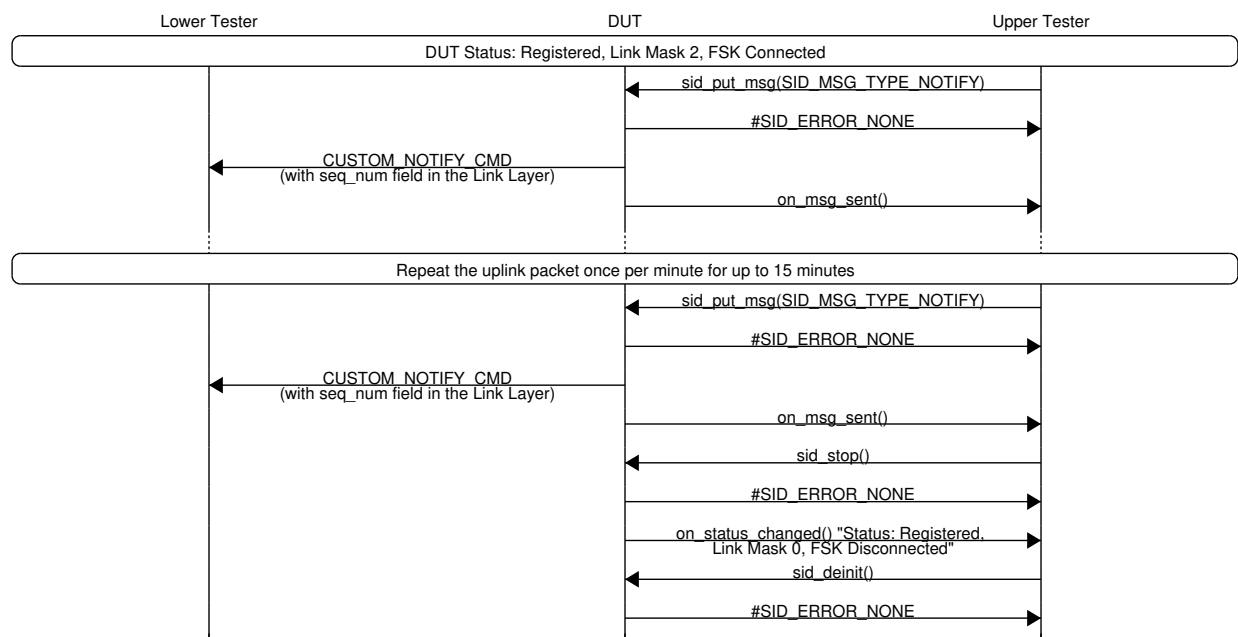
4.8.1 Test Purpose

To verify that the DUT increments the uplink packet sequence number until the UUID is changed. After the UUID is changed, the DUT should generate a new sequence number in the range between 0 and 16383.

4.8.2 Initial Conditions

- DUT is registered with Amazon Sidewalk network.
- Lower Tester operates in the default mixed (MULTI_RATE) mode.
- The protocol is enabled on the Lower Tester.
- SidewalkNetworkFlag is enabled on the Lower Tester.
- The Sidewalk stack (FSK) is initialized and started on the DUT.
- DUT has completed the time synchronization and the Join procedure.

4.8.3 Test Procedure



4.8.4 Expected Results

4.8.4.1 Pass Verdict

The seq_num field should be properly incremented by one for each subsequent packet sent by DUT within a maximum of 15 minutes from the previous UUID change, then a new sequence number should be generated in the range between 0 and 16383.

As the packet sequence number is sent as plain text in the Link Layer, all CUSTOM_NOTIFY_CMD packets can be verified for seq_num field content on the Lower Tester side.

4.9 FSK/EP/CONN/SEQ/BV/03: Endpoint accepts and decodes downlink packets with increased and decreased SEQ.

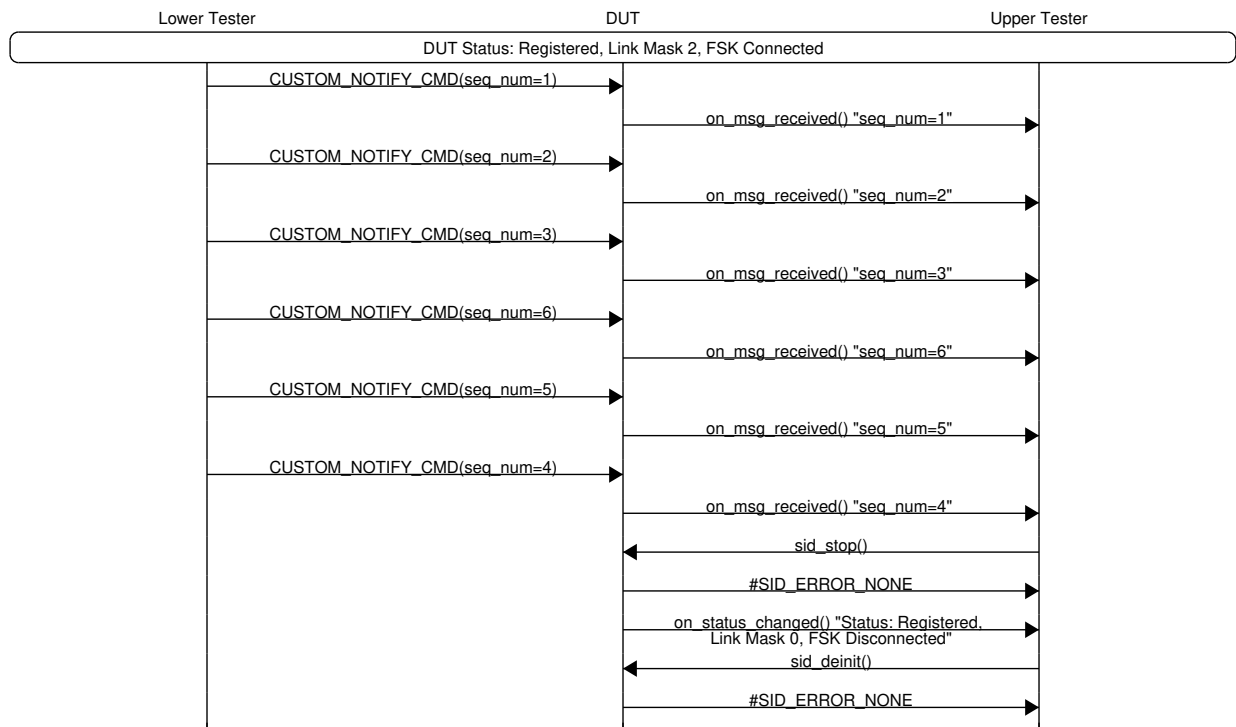
4.9.1 Test Purpose

To verify that the downlink packets with both increasing and decreasing sequence number can be decoded by the DUT.

4.9.2 Initial Conditions

- DUT is registered with Amazon Sidewalk network.
- Lower Tester operates in the default mixed (MULTI.RATE) mode.
- The protocol is enabled on the Lower Tester.
- SidewalkNetworkFlag is enabled on the Lower Tester.
- The Sidewalk stack (FSK) is initialized and started on the DUT.
- DUT has completed the time synchronization and the Join procedure.

4.9.3 Test Procedure



4.9.4 Expected Results

4.9.4.1 Pass Verdict

The first three CUSTOM_NOTIFY_CMD packets sent by Lower Tester to the DUT contain an increasing sequence number ranging from 1 to 3. The next three CUSTOM_NOTIFY_CMD packets contain a decreasing sequence number ranging from 6 to 4. All sent packets should be accepted and properly decoded by the DUT which should be manifested by reporting all six events to the Upper Tester.

4.10 FSK/EP/CONN/SEQ/BV/05: Endpoint rejects downlink packet with duplicated SEQ.

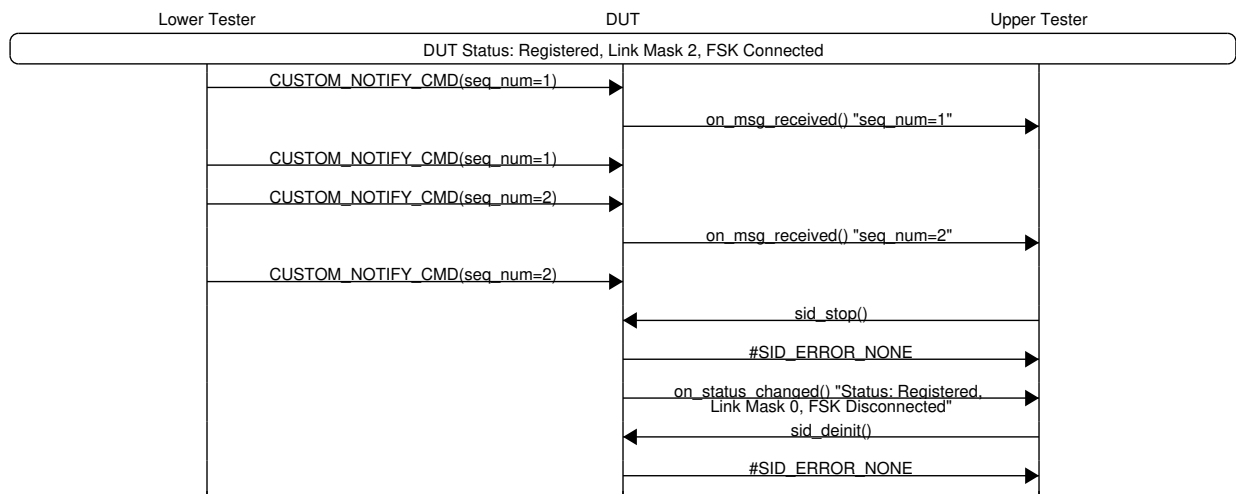
4.10.1 Test Purpose

To verify that a downlink packet which contains a duplicated sequence number is rejected by the DUT.

4.10.2 Initial Conditions

- DUT is registered with Amazon Sidewalk network.
- Lower Tester operates in the default mixed (MULTI_RATE) mode.
- The protocol is enabled on the Lower Tester.
- SidewalkNetworkFlag is enabled on the Lower Tester.
- The Sidewalk stack (FSK) is initialized and started on the DUT.
- DUT has completed the time synchronization and the Join procedure.

4.10.3 Test Procedure



4.10.4 Expected Results

4.10.4.1 Pass Verdict

The first CUSTOM_NOTIFY_CMD packet sent by the Lower Tester containing sequence number equal to 1 should be decoded correctly and information about this event should be visible on the Upper Tester side. However, another CUSTOM_NOTIFY_CMD packet sent by the Lower Tester also containing the same sequence number should be rejected by the DUT.

The third CUSTOM_NOTIFY_CMD packet containing parameter seq_num increased by one should be decoded correctly and information about this event should again be visible on the Upper Tester side. The fourth CUSTOM_NOTIFY_CMD packet with a duplicated seq_num equal to 2 should be rejected by the DUT.

In the case of duplicate packets, information about this event should not be visible on the Upper Tester side.

4.11 FSK/EP/CONN/SEQ/BV/06: Endpoint rejects downlink packet with duplicated SEQ range.

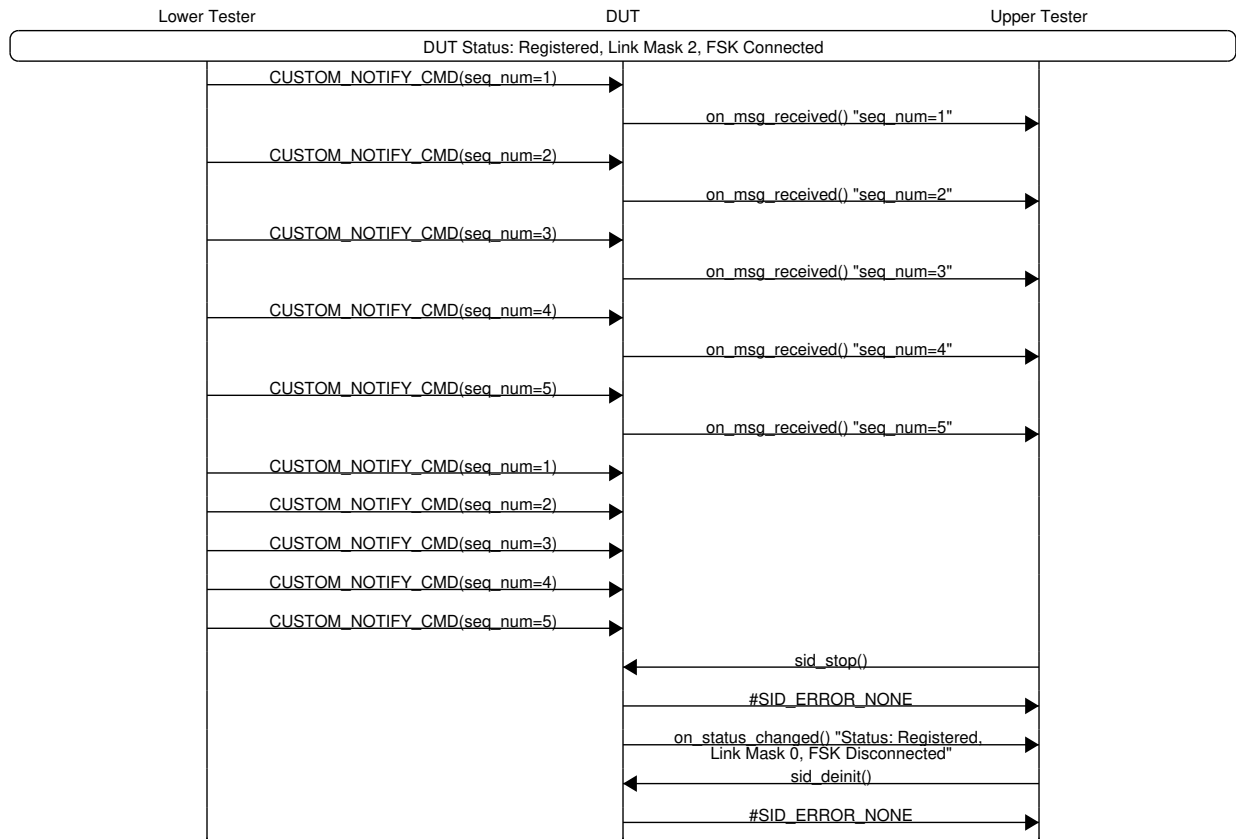
4.11.1 Test Purpose

To verify that a group of five downlink packets which contain a duplicate sequence number are rejected by the DUT.

4.11.2 Initial Conditions

- DUT is registered with Amazon Sidewalk network.
- Lower Tester operates in the default mixed (MULTI RATE) mode.
- The protocol is enabled on the Lower Tester.
- SidewalkNetworkFlag is enabled on the Lower Tester.
- The Sidewalk stack (FSK) is initialized and started on the DUT.
- DUT has completed the time synchronization and the Join procedure.

4.11.3 Test Procedure



4.11.4 Expected Results

4.11.4.1 Pass Verdict

The first five CUSTOM_NOTIFY_CMD packets with sequence numbers increasing sequentially from 1 to 5 should be sent from the Lower Tester and correctly decoded on the DUT side. Receipt of all five of these packets should be reported on the Upper Tester side.

After re-sending from the Lower Tester the same packets containing sequence numbers from 1 to 5, all of them should be rejected by the DUT. Information on these five events should not be visible on the Upper Tester side.

4.12 FSK/EP/CONN/SEQ/BV/07: SEQ number can be accepted again after getting 10 other messages.

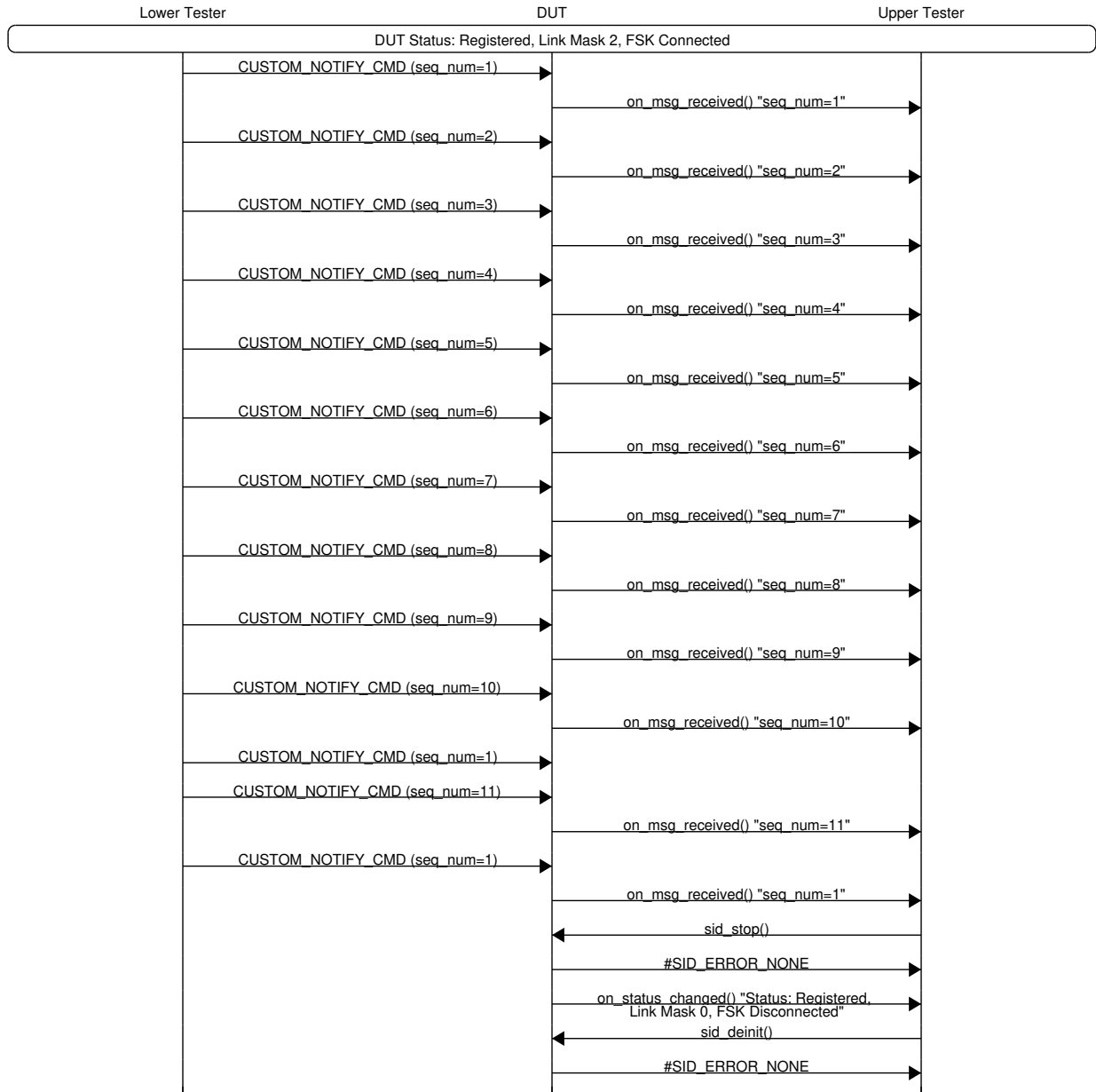
4.12.1 Test Purpose

DUT is able to receive downlink packet with already used SEQ number, after receiving at least 10 additional packets with different, unique SEQ number.

4.12.2 Initial Conditions

- DUT is registered with Amazon Sidewalk network.
- Lower Tester operates in the default mixed (MULTI-RATE) mode.
- The protocol is enabled on the Lower Tester.
- SidewalkNetworkFlag is enabled on the Lower Tester.
- The Sidewalk stack (FSK) is initialized and started on the DUT.
- DUT has completed the time synchronization and the Join procedure.

4.12.3 Test Procedure



4.12.4 Expected Results

4.12.4.1 Pass Verdict

First, eleventh and thirteenth CUSTOM_NOTIFY_CMD packet contain the same SEQ number.

All the other CUSTOM_NOTIFY_CMD packets contain different, unique SEQ number.

Due to the fact that 10 additional packets have to be received by DUT before SEQ number can be reused: Eleventh CUSTOM_NOTIFY_CMD packet should be rejected by DUT (after 9 additional packets received). Thirteenth CUSTOM_NOTIFY_CMD packet should be received and decoded properly by DUT (after 10 additional packets received).

4.13 FSK/EP/CONN/SEQ/BV/08: SEQ number can be accepted again after Sidewalk stack reinitialization.

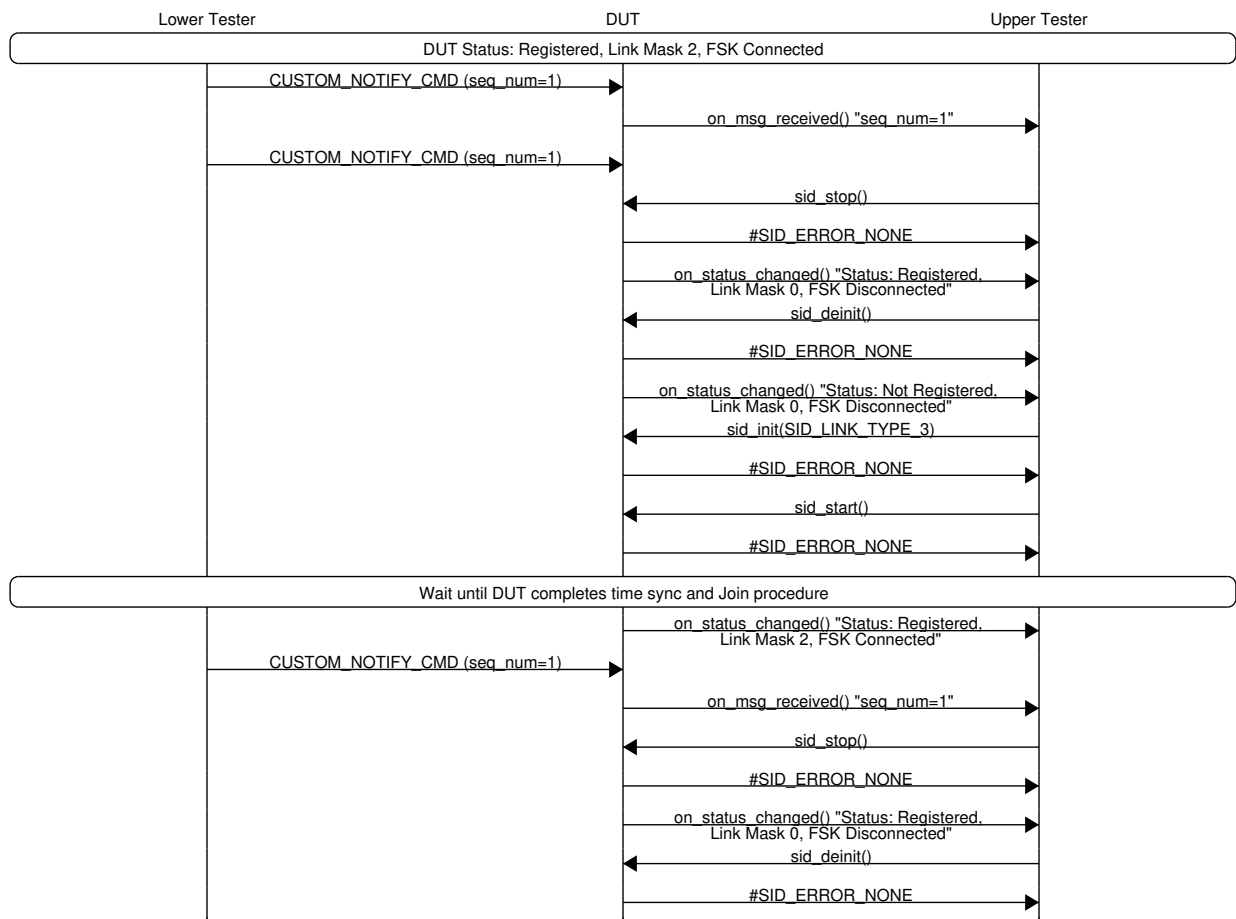
4.13.1 Test Purpose

DUT is able to receive downlink packet with already used SEQ number, after reinitialization of Sidewalk stack.

4.13.2 Initial Conditions

- DUT is registered with Amazon Sidewalk network.
- Lower Tester operates in the default mixed (MULTI_RATE) mode.
- The protocol is enabled on the Lower Tester.
- SidewalkNetworkFlag is enabled on the Lower Tester.
- The Sidewalk stack (FSK) is initialized and started on the DUT.
- DUT has completed the time synchronization and the Join procedure.

4.13.3 Test Procedure



4.13.4 Expected Results

4.13.4.1 Pass Verdict

First and third CUSTOM_NOTIFY_CMD packets should be received and decoded properly by DUT, despite having the same SEQ number.

Since there was no stack reinitialization before second CUSTOM_NOTIFY_CMD packet, it should be rejected by DUT because of repeating SEQ number.

4.14 FSK/EP/CONN/SEQ/BV/09: Endpoint drops the packet with SEQ which is out of range.

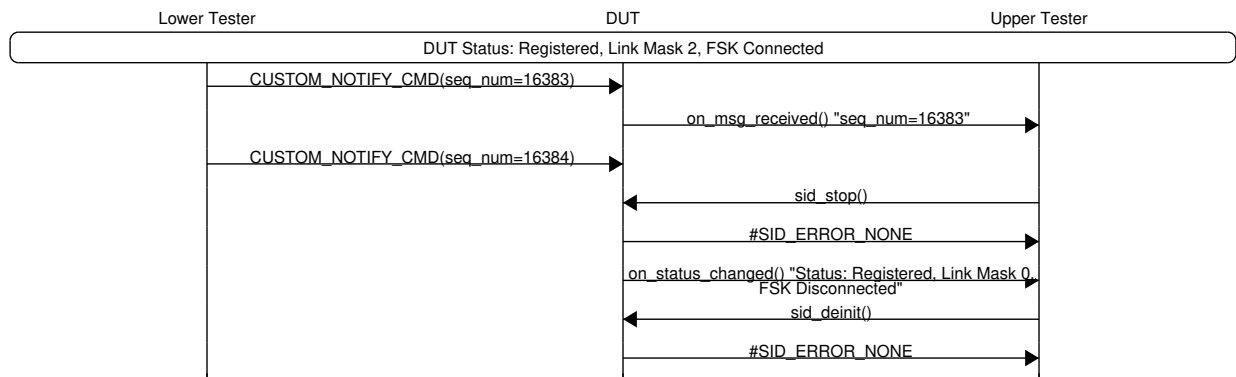
4.14.1 Test Purpose

To verify that a downlink packet which contains an out of range sequence number is dropped by the DUT.

4.14.2 Initial Conditions

- DUT is registered with Amazon Sidewalk network.
- Lower Tester operates in the default mixed (MULTLRATE) mode.
- The protocol is enabled on the Lower Tester.
- SidewalkNetworkFlag is enabled on Lower Tester.
- The Sidewalk stack (FSK) is initialized and started on the DUT.
- DUT has completed the time synchronization and the Join procedure.

4.14.3 Test Procedure



4.14.4 Expected Results

4.14.4.1 Pass Verdict

The first CUSTOM_NOTIFY_CMD packet sent by the Lower Tester containing the maximum allowed sequence number (16383) should be decoded correctly and information about this event should be visible on the Upper Tester side.

The second CUSTOM_NOTIFY_CMD packet sent by the Lower Tester should be dropped by the DUT due to the seq_num parameter being exceeded and therefore this event should not be reported to the Upper Tester.

4.15 FSK/EP/DATA/DL/BV/01: Endpoint receives downlink packets with various sizes of Command data.

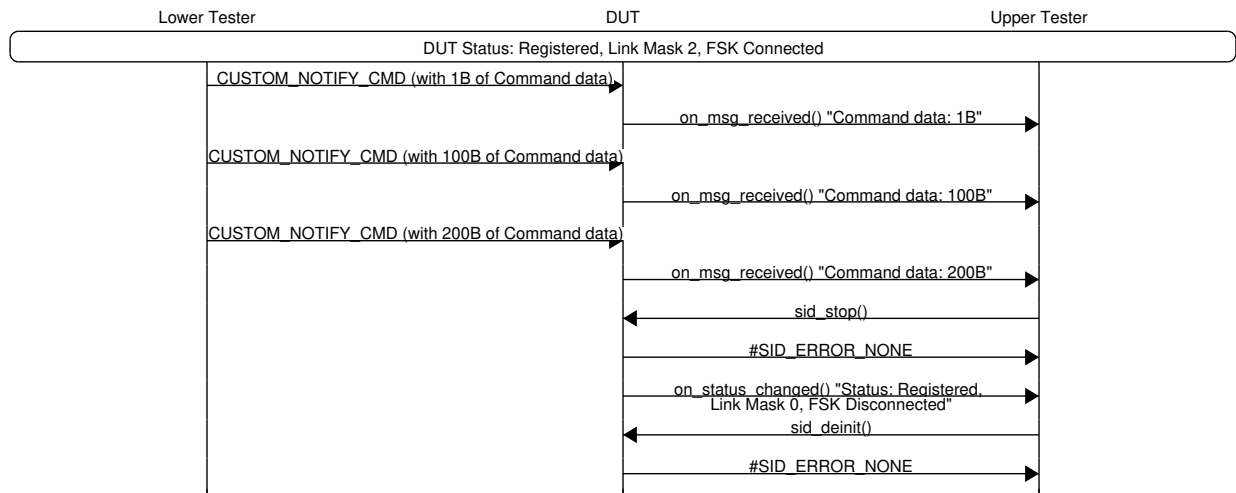
4.15.1 Test Purpose

DUT is able to receive downlink packets with various sizes of Command data (1B, 100B, 200B) sent from the Lower Tester.

4.15.2 Initial Conditions

- DUT is registered with Amazon Sidewalk network.
- Lower Tester operates in the default mixed (MULTI_RATE) mode.
- The protocol is enabled on the Lower Tester.
- SidewalkNetworkFlag is enabled on the Lower Tester.
- The Sidewalk stack (FSK) is initialized and started on the DUT.
- DUT has completed the time synchronization and the Join procedure.

4.15.3 Test Procedure



4.15.4 Expected Results

4.15.4.1 Pass Verdict

Packets with various sizes of Command data sent by Lower Tester are able to reach the DUT.

The Command data content must be verified for correctness on the Upper Tester side.

4.16 FSK/EP/DATA/UL/BV/01: Gateway receives uplink packets with various sizes of Command data from Endpoint.

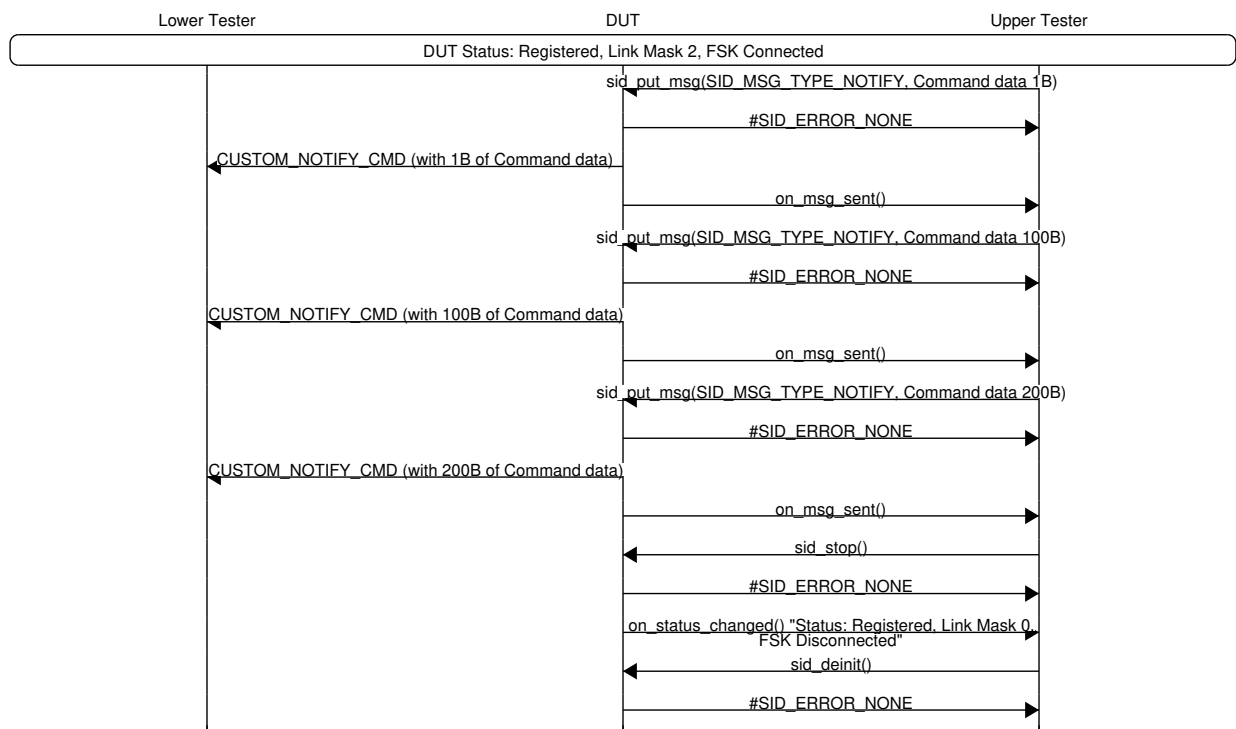
4.16.1 Test Purpose

Lower Tester is able to receive uplink packets with various sizes of Command data (1B, 100B, 200B) sent from the DUT.

4.16.2 Initial Conditions

- DUT is registered with Amazon Sidewalk network.
- Lower Tester operates in the default mixed (MULTI_RATE) mode.
- The protocol is enabled on the Lower Tester.
- SidewalkNetworkFlag is enabled on the Lower Tester.
- The Sidewalk stack (FSK) is initialized and started on the DUT.
- DUT has completed the time synchronization and the Join procedure.

4.16.3 Test Procedure



4.16.4 Expected Results

4.16.4.1 Pass Verdict

Packets with various sizes of Command data sent by DUT are able to reach the Lower Tester. The Command data content of each packet must be verified for correctness on the Lower Tester side.

4.17 FSK/EP/NW/SYNC/TIME/BV/01: Endpoint completes the initial time sync procedure.

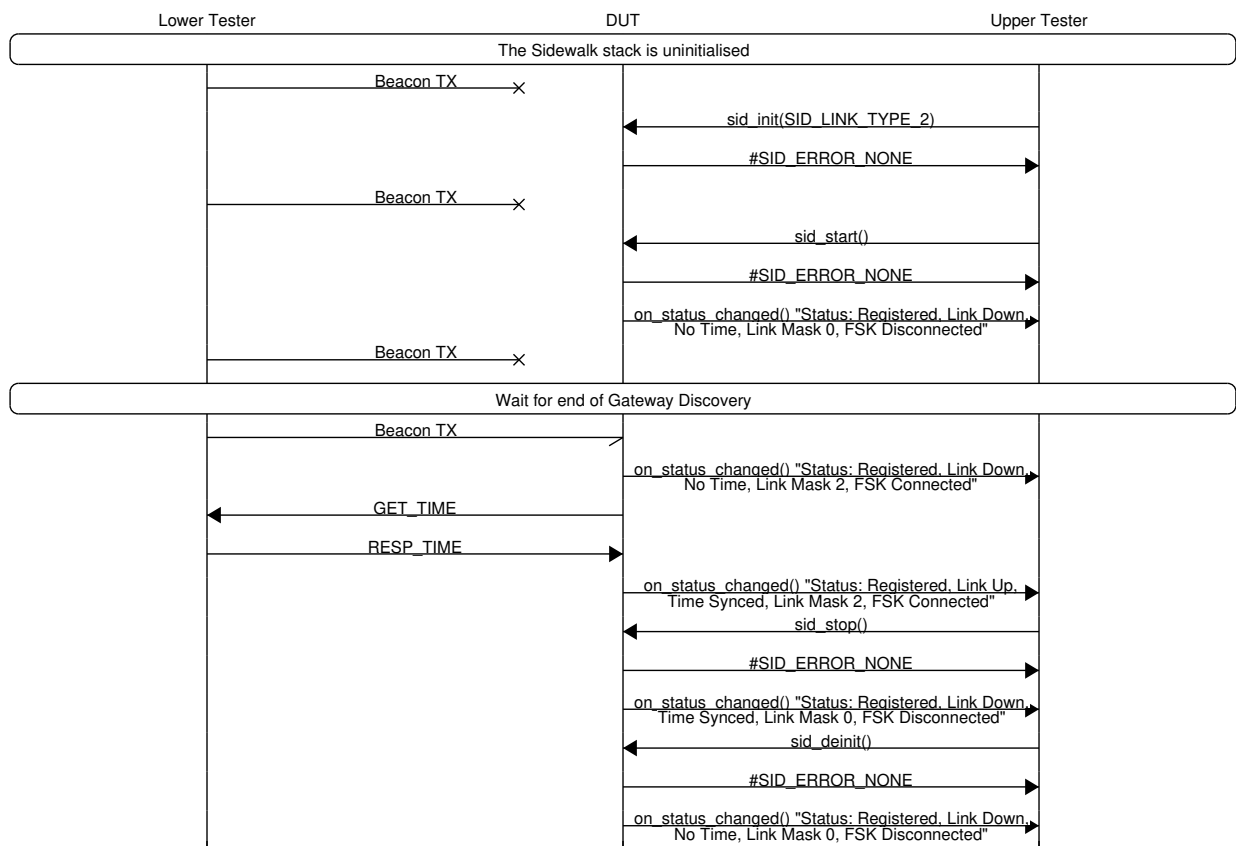
4.17.1 Test Purpose

DUT is able to pass the initial time synchronization procedure.

4.17.2 Initial Conditions

- DUT is registered with Amazon Sidewalk network.
- Lower Tester operates in the default mixed (MULTI_RATE) mode.
- The protocol is enabled on the Lower Tester.
- SidewalkNetworkFlag is enabled on Lower Tester.

4.17.3 Test Procedure



4.17.4 Expected Results

4.17.4.1 Pass Verdict

DUT is able to acquire time from the network.

Moreover, the GET_TIME packet must be the first UL transmission right after detecting the Beacon and synchronizing with the Lower Tester. The RESP_TIME packet will be sent to DUT within 30 seconds and no re-transmission of the GET_TIME packet should occur during this time.

No other UL transmission should take place until the DUT receives a correct RESP_TIME packet which will be reported via Time Status: Synced. Completion of the time synchronization procedure should also change the Link Status to Up.

4.18 FSK/EP/NW/SYNC/JOIN/BV/01: Endpoint completes the initial Join procedure.

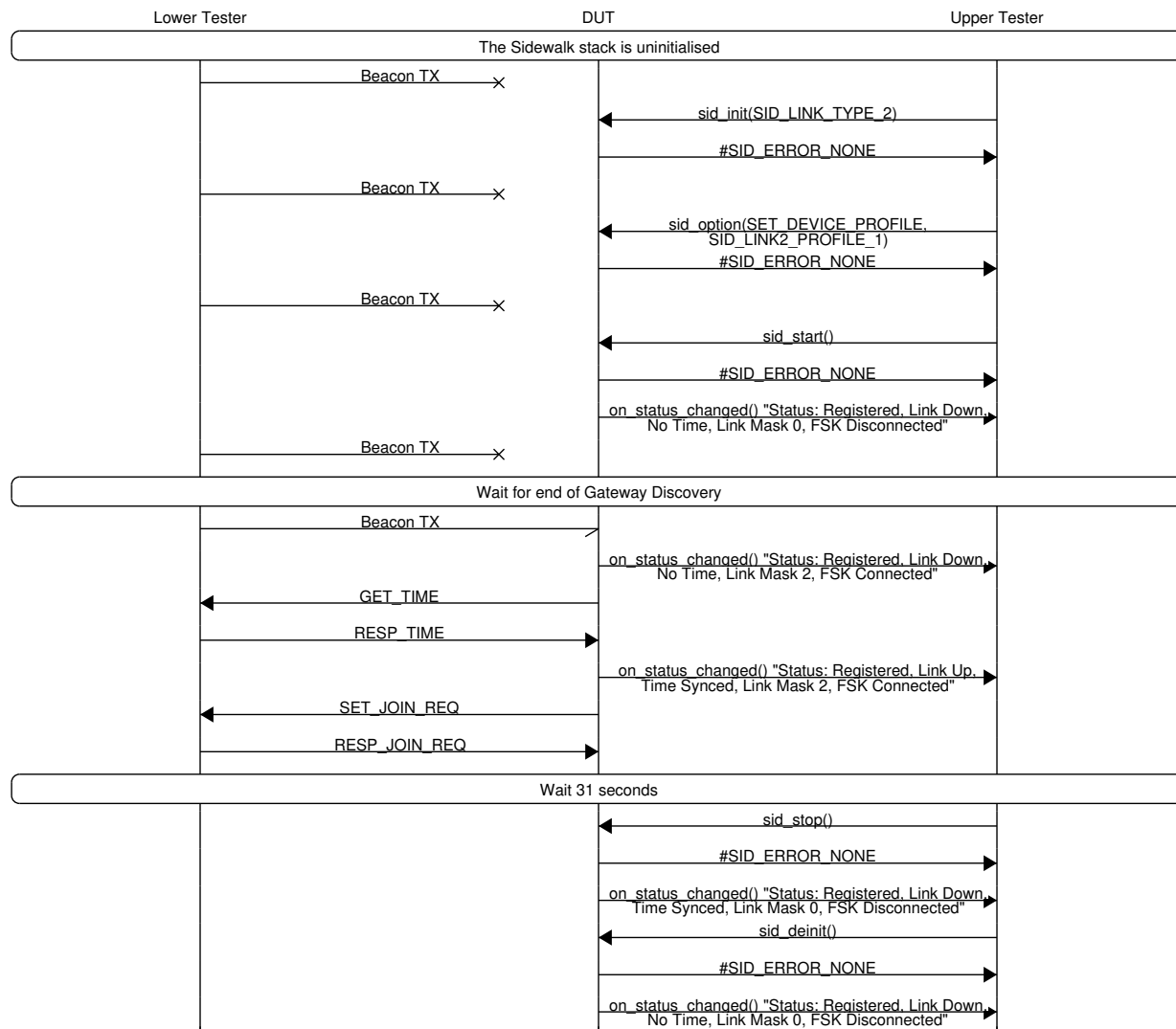
4.18.1 Test Purpose

DUT is able to pass the initial Join procedure.

4.18.2 Initial Conditions

- DUT is registered with Amazon Sidewalk network.
- DUT is configured as Profile 1 (FSK-WAN ADHOC).
- Lower Tester operates in the default mixed (MULTI_RATE) mode.
- The protocol is enabled on the Lower Tester.
- SidewalkNetworkFlag is enabled on Lower Tester.

4.18.3 Test Procedure



4.18.4 Expected Results

4.18.4.1 Pass Verdict

DUT is able to acquire positive Join response from the network.

Moreover, the GET_TIME packet must be the first UL transmission right after detecting the Beacon and synchronizing with the Lower Tester. The RESP_TIME packet will be sent to DUT within 30 seconds and no re-transmission of the GET_TIME packet should occur during this time.

Also no other UL transmission is allowed before the DUT receives the RESP_TIME packet which will be reported via Time Status: Synced. Completion of the time synchronization procedure should also change the Link Status to Up.

DUT should send the SET_JOIN_REQ packet right after the time synchronization procedure is complete. The RESP_JOIN_REQ packet will be sent back to DUT within 31 seconds and until then DUT should not repeat the transmission of the next SET_JOIN_REQ commands. This means the Join procedure completes as expected.

As the SET_JOIN_REQ carries requested link characteristics for both UL and the DL messaging expected on the end device, its content must be verified against the declared capabilities of the DUT.

4.19 FSK/EP/NW/SYNC/JOIN/BV/02: Endpoint keeps synchronization with the network by periodic transmission of Join request.

4.19.1 Test Purpose

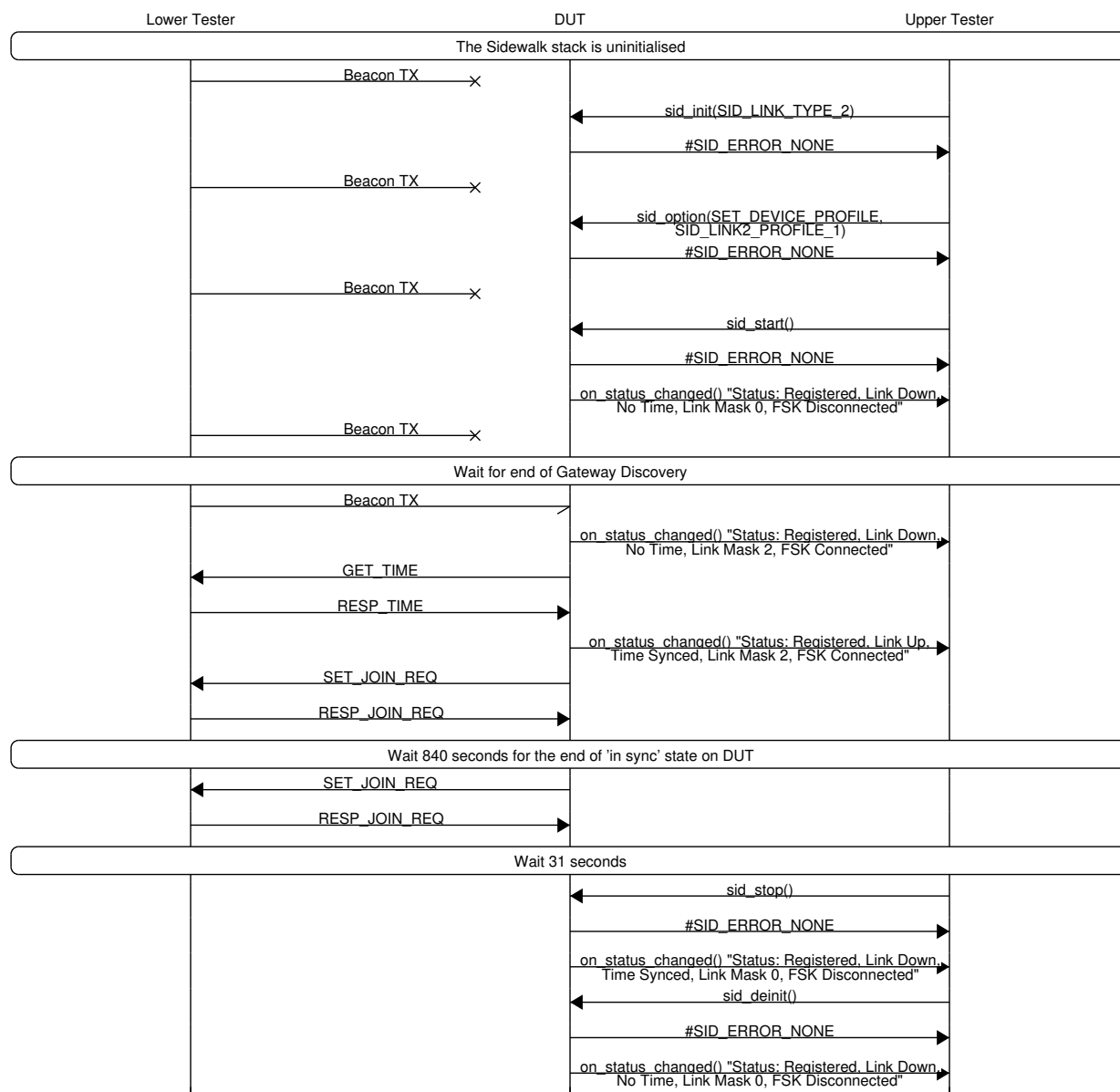
DUT is able to keep synchronization with the network by periodic transmission of Join request.

When the time sync and Join procedure is completed device is automatically synchronized with the network. Then after a period of 840 seconds of uplink inactivity (no data is transmitted), the DUT should send another Join request command to keep link with the network active/alive.

4.19.2 Initial Conditions

- DUT is registered with Amazon Sidewalk network.
- DUT is configured as Profile 1 (FSK-WAN ADHOC).
- Lower Tester operates in the default mixed (MULTI_RATE) mode.
- The protocol is enabled on the Lower Tester.
- SidewalkNetworkFlag is enabled on Lower Tester.

4.19.3 Test Procedure



4.19.4 Expected Results

4.19.4.1 Pass Verdict

DUT is able to acquire positive response from the network when Join request is sent during the active synchronization process.

The GET_TIME packet must be the first uplink transmission right after detecting the Beacon and synchronizing with the Lower Tester. The RESP_TIME packet will be sent to DUT within 30 seconds and no re-transmission of the GET_TIME packet should occur during this time.

Also no other uplink transmission is allowed before the DUT receives the RESP_TIME packet which will be reported via Time Status: Synced. Completion of the time synchronization procedure should also change the Link Status to Up.

DUT should send the SET_JOIN_REQ packet right after the time synchronization procedure is complete. The RESP_JOIN_REQ packet should be sent back to DUT within 31 seconds and until then DUT should not repeat the transmission of the next SET_JOIN_REQ commands.

After sending the first RESP_JOIN_REQ, wait 840 seconds after which DUT should send the second SET_JOIN_REQ packet to keep synchronization with the network. No uplink transmission should occur during this period.

After sending the second RESP_JOIN_REQ, wait 31 seconds and verify that DUT has not resent SET_JOIN_REQ. This means that the DUT is able to maintain synchronization with the network by periodic transmission of Join request.

As the initial SET_JOIN_REQ carries requested link characteristics for both uplink and the downlink messaging expected on the end device, its content must be verified against the declared capabilities of the DUT. In the case of the second SET_JOIN_REQ (Join request related to Network Synchronization), the only content that must be verified is the GWID field.

4.20 FSK/EP/NW/SYNC/JOIN/BV/03: Endpoint keeps synchronization with the network by embedded sync request.

4.20.1 Test Purpose

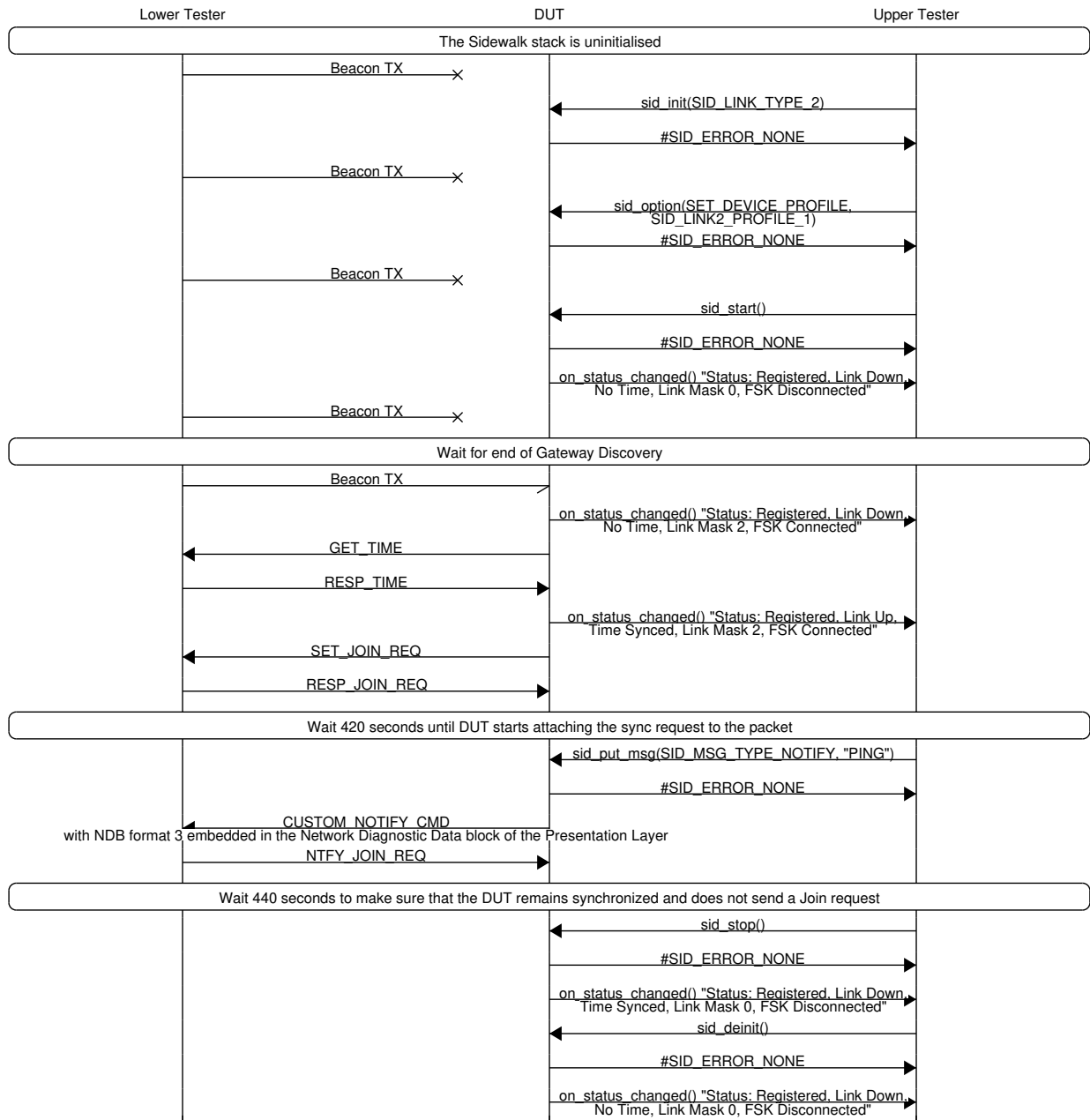
DUT is able to keep synchronization with the network with the use of embedded sync request.

When the time sync and Join procedure is completed device is automatically synchronized with the network. However, 420 seconds after a successful synchronization, the DUT should start attaching a sync request to each uplink packet in order to maintain the synchronization without the need to send a separate Join request, which reduces signalling.

4.20.2 Initial Conditions

- DUT is registered with Amazon Sidewalk network.
- DUT is configured as Profile 1 (FSK-WAN ADHOC).
- Lower Tester operates in the default mixed (MULTI_RATE) mode.
- The protocol is enabled on the Lower Tester.
- SidewalkNetworkFlag is enabled on Lower Tester.

4.20.3 Test Procedure



4.20.4 Expected Results

4.20.4.1 Pass Verdict

DUT is able to acquire Join notify from the network when synchronization request is embedded in uplink data.

The GET_TIME packet must be the first uplink transmission right after detecting the Beacon and synchronizing with the Lower Tester. The RESP_TIME packet will be sent to DUT within 30 seconds and no re-transmission of the GET_TIME packet should occur during this time.

Also no other uplink transmission is allowed before the DUT receives the RESP_TIME packet which will be reported via Time Status: Synced. Completion of the time synchronization procedure should also change the Link Status to Up.

DUT should send the SET_JOIN_REQ packet right after the time synchronization procedure is complete. The RESP_JOIN_REQ packet should be sent back to DUT within 31 seconds and until then DUT should not repeat the transmission of the next SET_JOIN_REQ commands.

After sending the RESP_JOIN_REQ, wait 420 seconds, then the Upper Tester must trigger sending uplink data on the DUT (CUSTOM_NOTIFY_CMD with "PING" as the Command data). As a result, the mentioned packet will be sent to the network. The uplink data must include TLV key 0x01 synchronization request in Network Data Blob format 3 and it must be verified on the Lower Tester side. The NTFY_JOIN_REQ packet should be sent back to DUT within 25 seconds.

After sending the NTFY_JOIN_REQ, wait another 440 seconds and verify that DUT does not send SET_JOIN_REQ during this period. This means that the DUT is able to maintain synchronization with the network by embedded sync request during transmission of regular data.

As the initial SET_JOIN_REQ carries requested link characteristics for both uplink and the downlink messaging expected on the end device, its content must be verified against the declared capabilities of the DUT.

4.21 FSK/EP/SEC/UUID/BV/01: Endpoint rotates UUID immediately after time sync.

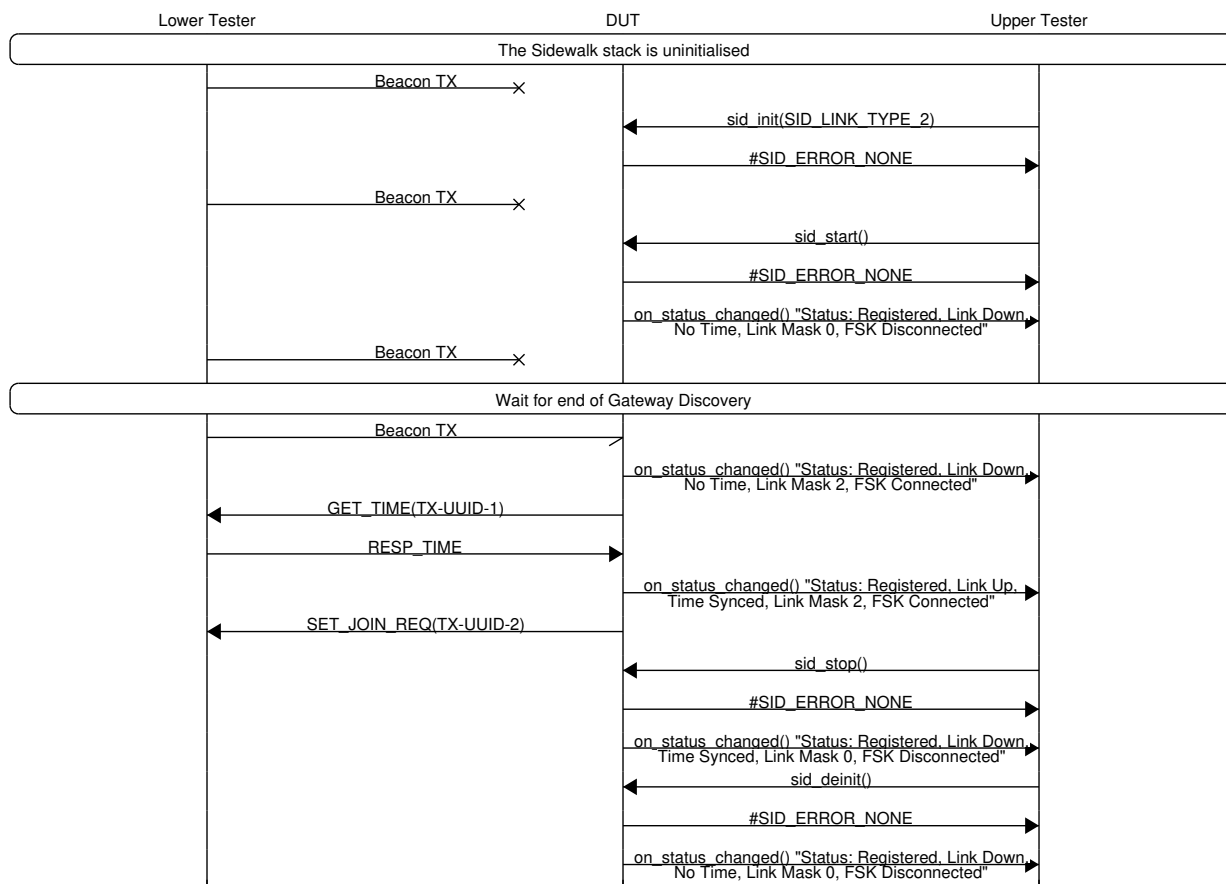
4.21.1 Test Purpose

DUT is able to change the current UUID and use it right after the time synchronization procedure is completed.

4.21.2 Initial Conditions

- DUT is registered with Amazon Sidewalk network.
- Lower Tester operates in the default mixed (MULTI_RATE) mode.
- The protocol is enabled on the Lower Tester.
- SidewalkNetworkFlag is enabled on the Lower Tester.

4.21.3 Test Procedure



4.21.4 Expected Results

4.21.4.1 Pass Verdict

UUID of the Endpoint should change right after successful time synchronization procedure, therefore the value of TX-UUID sent as part of the GET_TIME packet should be different from the TX-UUID sent in the SET_JOIN.REQ packet.

As the source device ID information is sent as plain text in the link layer, the above condition can be validated on the Lower Tester side.

4.22 FSK/EP/SEC/UUID/BV/02: UUID rotates every 15 minutes after time sync.

4.22.1 Test Purpose

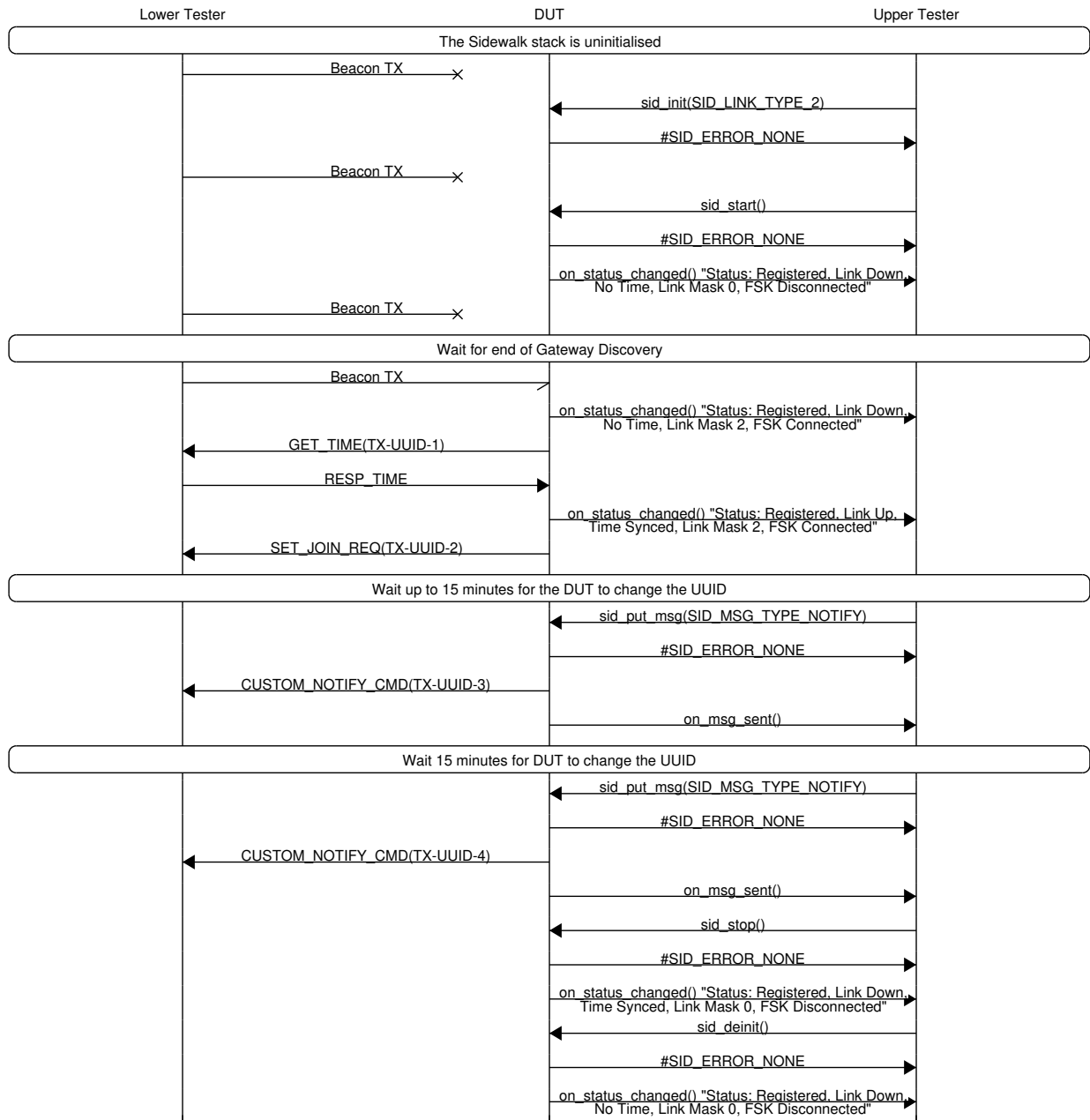
DUT is able to change the UUID every 15 minutes after the time synchronization procedure is completed.

4.22.2 Initial Conditions

- DUT is registered with Amazon Sidewalk network.

- Lower Tester operates in the default mixed (MULTI_RATE) mode.
- The protocol is enabled on the Lower Tester.
- SidewalkNetworkFlag is enabled on the Lower Tester.

4.22.3 Test Procedure



4.22.4 Expected Results

4.22.4.1 Pass Verdict

After successful time synchronization procedure, the UUID of the DUT should change every 15 minutes (the first change may occur earlier). Therefore, the TX-UUID value sent as part of the SET_JOIN_REQ packet

should be different from the TX-UUID sent up to 15 minutes later in the CUSTOM_NOTIFY_CMD packet. The next CUSTOM_NOTIFY_CMD packet sent exactly 15 minutes after the previous UUID change should contain the new UUID.

As the source device ID information is sent as plain text in the link layer, the above condition can be validated on the Lower Tester side.

4.22.4.2 Fail Verdict

A test failure will occur if the DUT re-uses an older TX-UUID at any point during the test.

4.23 FSK/EP/SEC/UUID/BV/03: Endpoint can exchange UL/DL during UUID rotation.

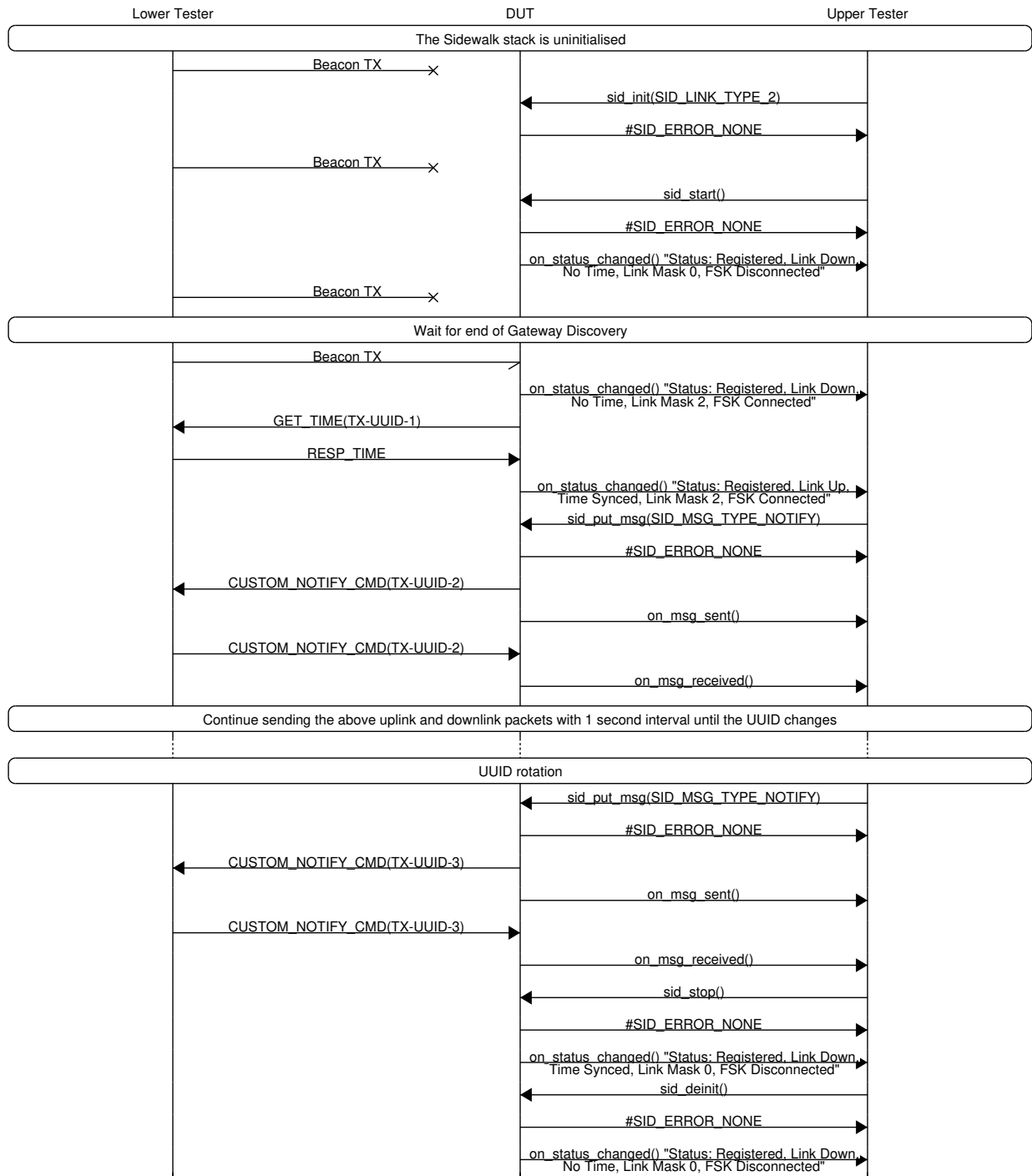
4.23.1 Test Purpose

DUT is able to exchange the uplink and downlink packets during UUID rotation.

4.23.2 Initial Conditions

- DUT is registered with Amazon Sidewalk network.
- Lower Tester operates in the default mixed (MULTLRATE) mode.
- The protocol is enabled on the Lower Tester.
- SidewalkNetworkFlag is enabled on the Lower Tester.

4.23.3 Test Procedure



4.23.4 Expected Results

4.23.4.1 Pass Verdict

After successful time synchronization procedure, the UUID of the DUT should change every 15 minutes. All packets, both uplink and downlink, transmitted around the moment of UUID rotation should be handled

correctly and reach the destination.

Chapter 5

LoRa (900MHz) Test Cases

5.1 LORA/EP/DATA/DL/BV/01: Endpoint receives downlink packets with various sizes of Command data.

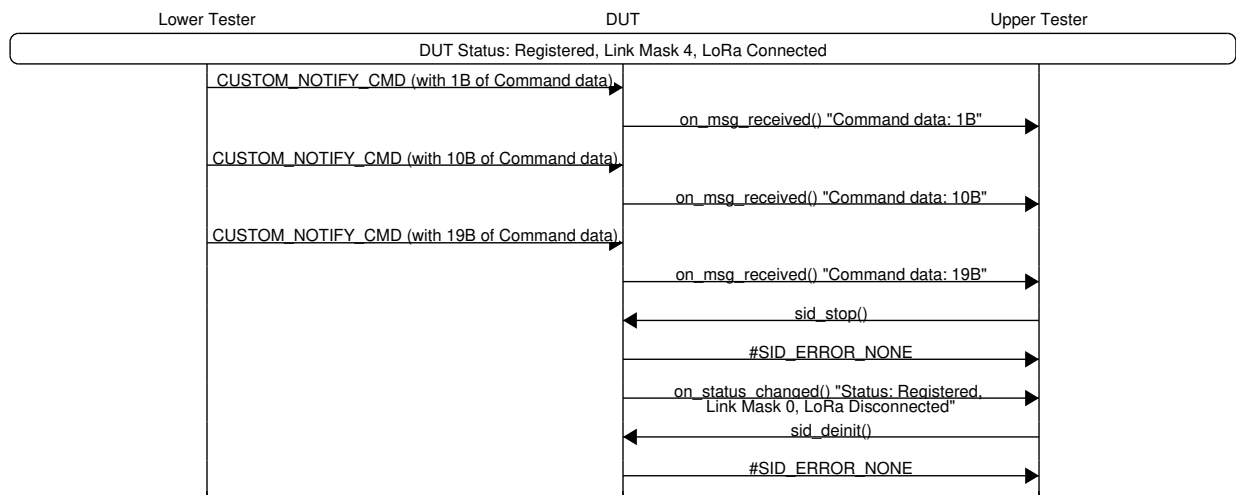
5.1.1 Test Purpose

DUT is able to receive downlink packets with various sizes of Command data (1B, 10B, 19B) sent from the Lower Tester.

5.1.2 Initial Conditions

- DUT is configured as profile B.
- DUT is registered with Amazon Sidewalk network.
- Lower Tester operates in the default mixed (MULTI_RATE) mode.
- Both DUT and Lower Tester operate on the same LDR channel.
- The protocol is enabled on the Lower Tester.
- SidewalkNetworkFlag is enabled on the Lower Tester.
- The Sidewalk stack (LoRa) is initialized and started on the DUT.
- DUT has completed the time synchronization and the Join procedure.

5.1.3 Test Procedure



5.1.4 Expected Results

5.1.4.1 Pass Verdict

Packets with various sizes of Command data sent by Lower Tester are able to reach the DUT.

The Command data content must be verified for correctness on the Upper Tester side.

5.2 LORA/EP/DATA/UL/BV/01: Gateway receives uplink packets with various Command data sizes from Endpoint.

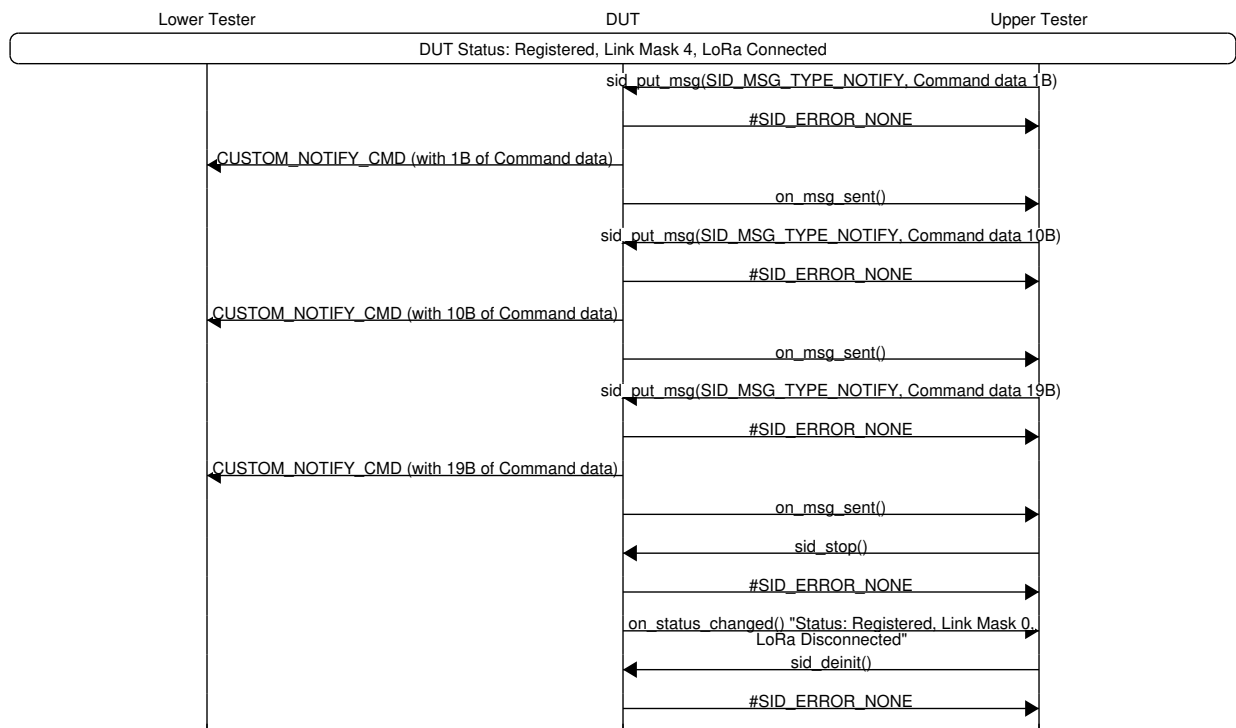
5.2.1 Test Purpose

Lower Tester is able to receive uplink packets with various Command data sizes (1B, 10B, 19B) sent from the DUT.

5.2.2 Initial Conditions

- DUT is registered with Amazon Sidewalk network.
- DUT is configured as Profile B.
- Lower Tester operates in the default mixed (MULTI_RATE) mode.
- Both DUT and Lower Tester operates on the same LDR channel.
- The protocol is enabled on the Lower Tester.
- SidewalkNetworkFlag is enabled on Lower Tester.
- The Sidewalk stack (LoRa) is initialized and started on the DUT.
- DUT has completed the time synchronization and the Join procedure.

5.2.3 Test Procedure



5.2.4 Expected Results

5.2.4.1 Pass Verdict

Packets with various sizes of Command data sent by DUT are able to reach the Lower Tester.

The Command data content of each packet must be verified for correctness on the Lower Tester side.

5.3 LORA/EP/SEC/UUID/BV/01: Endpoint rotates UUID immediately after time sync.

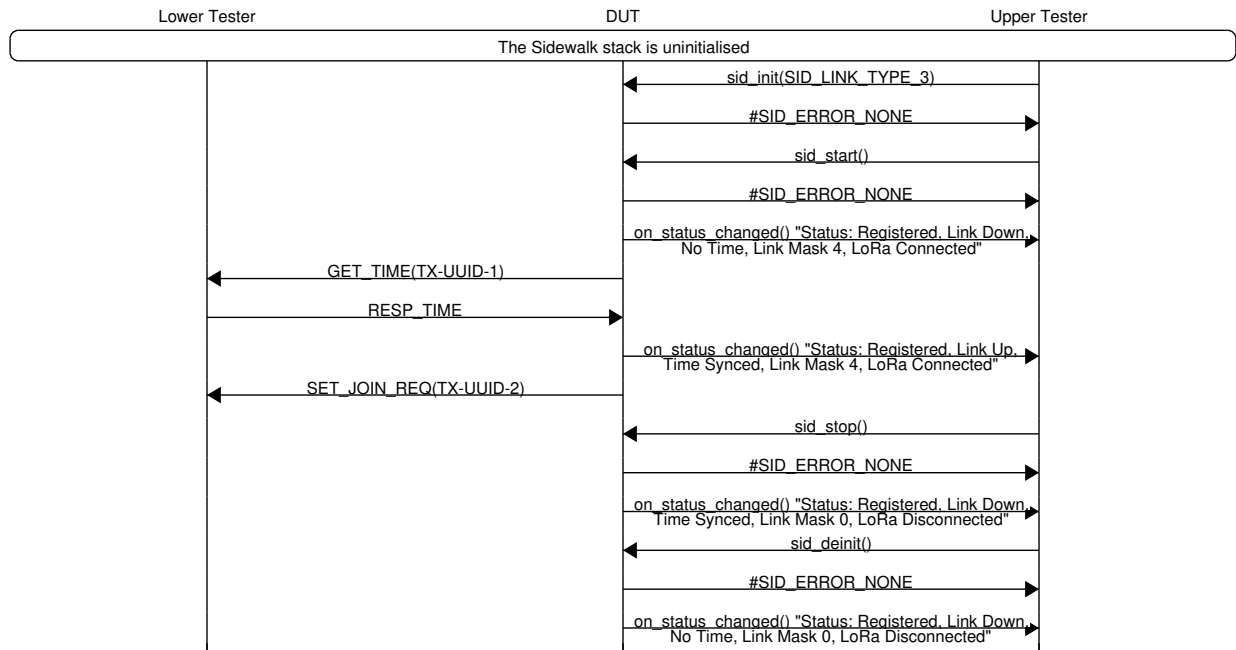
5.3.1 Test Purpose

DUT is able to change the current UUID and use it right after the time synchronization procedure is completed.

5.3.2 Initial Conditions

- DUT is registered with Amazon Sidewalk network.
- DUT is configured as Profile B.
- Lower Tester operates in the default mixed (MULTI_RATE) mode.
- Both DUT and Lower Tester operates on the same LDR channel.
- The protocol is enabled on the Lower Tester.
- SidewalkNetworkFlag is enabled on Lower Tester.

5.3.3 Test Procedure



5.3.4 Expected Results

5.3.4.1 Pass Verdict

UUID of the Endpoint should change right after successful time synchronization procedure, therefore the value of TX-UUID sent as part of the GET_TIME packet should be different from the TX-UUID sent in the SET_JOIN_REQ packet.

As the source device ID information is sent as plain text in the link layer, the above condition can be validated on the Lower Tester side.

5.4 LORA/EP/SEC/UUID/BV/02: UUID rotates every 15 minutes after time sync.

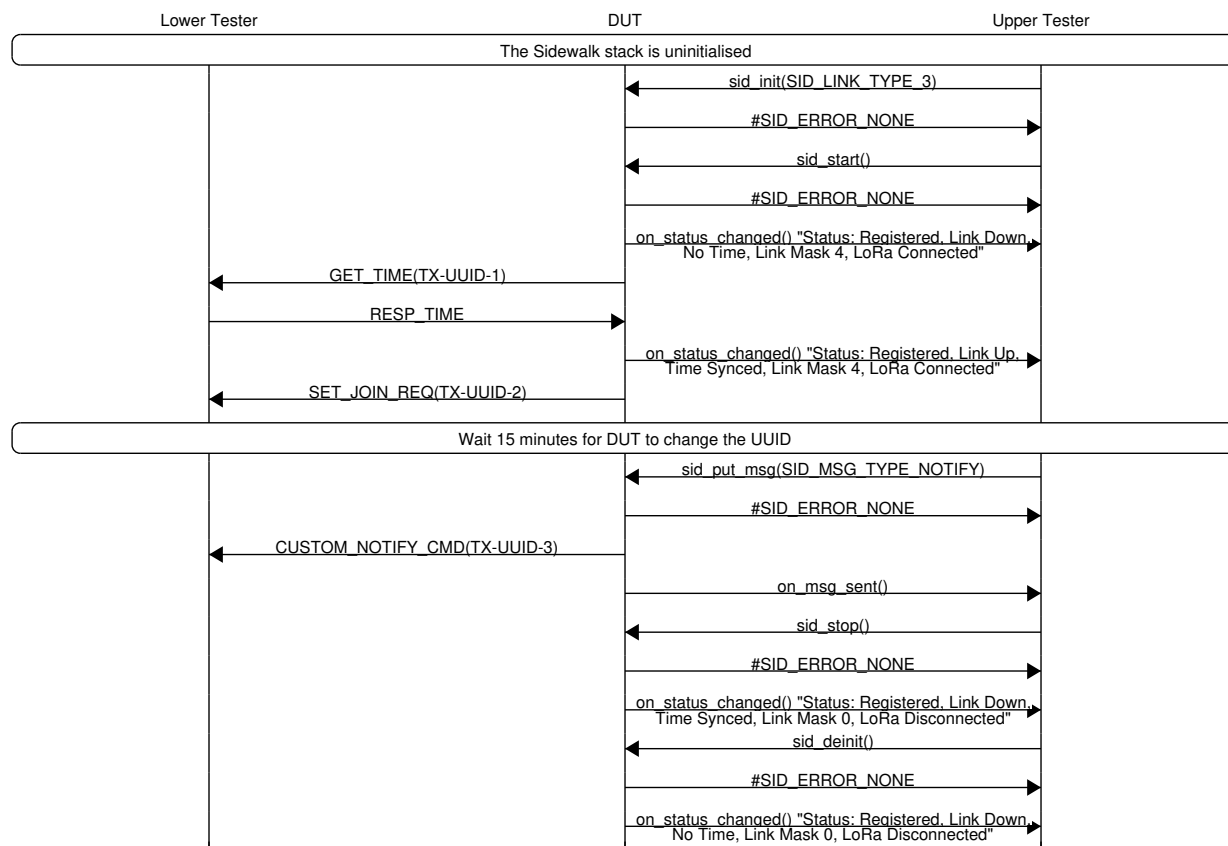
5.4.1 Test Purpose

DUT is able to change the UUID every 15 minutes after the time synchronization procedure is completed.

5.4.2 Initial Conditions

- DUT is registered with Amazon Sidewalk network.
- DUT is configured as Profile B.
- Lower Tester operates in the default mixed (MULTI.RATE) mode.
- Both DUT and Lower Tester operates on the same LDR channel.
- The protocol is enabled on the Lower Tester.
- SidewalkNetworkFlag is enabled on Lower Tester.

5.4.3 Test Procedure



5.4.4 Expected Results

5.4.4.1 Pass Verdict

After successful time synchronization procedure, the UUID of the DUT should change every 15 minutes. Therefore, the TX-UUID value sent as part of the SET_JOIN_REQ packet should be different from the TX-UUID sent 15 minutes later in the CUSTOM_NOTIFY_CMD packet.

As the source device ID information is sent as plain text in the link layer, the above condition can be validated on the Lower Tester side.

5.4.4.2 Fail Verdict

A test failure will occur if the DUT re-uses an older TX-UUID at any point during the test.

5.5 LORA/EP/SEC/UUID/BV/03: Endpoint can exchange UL/DL during UUID rotation.

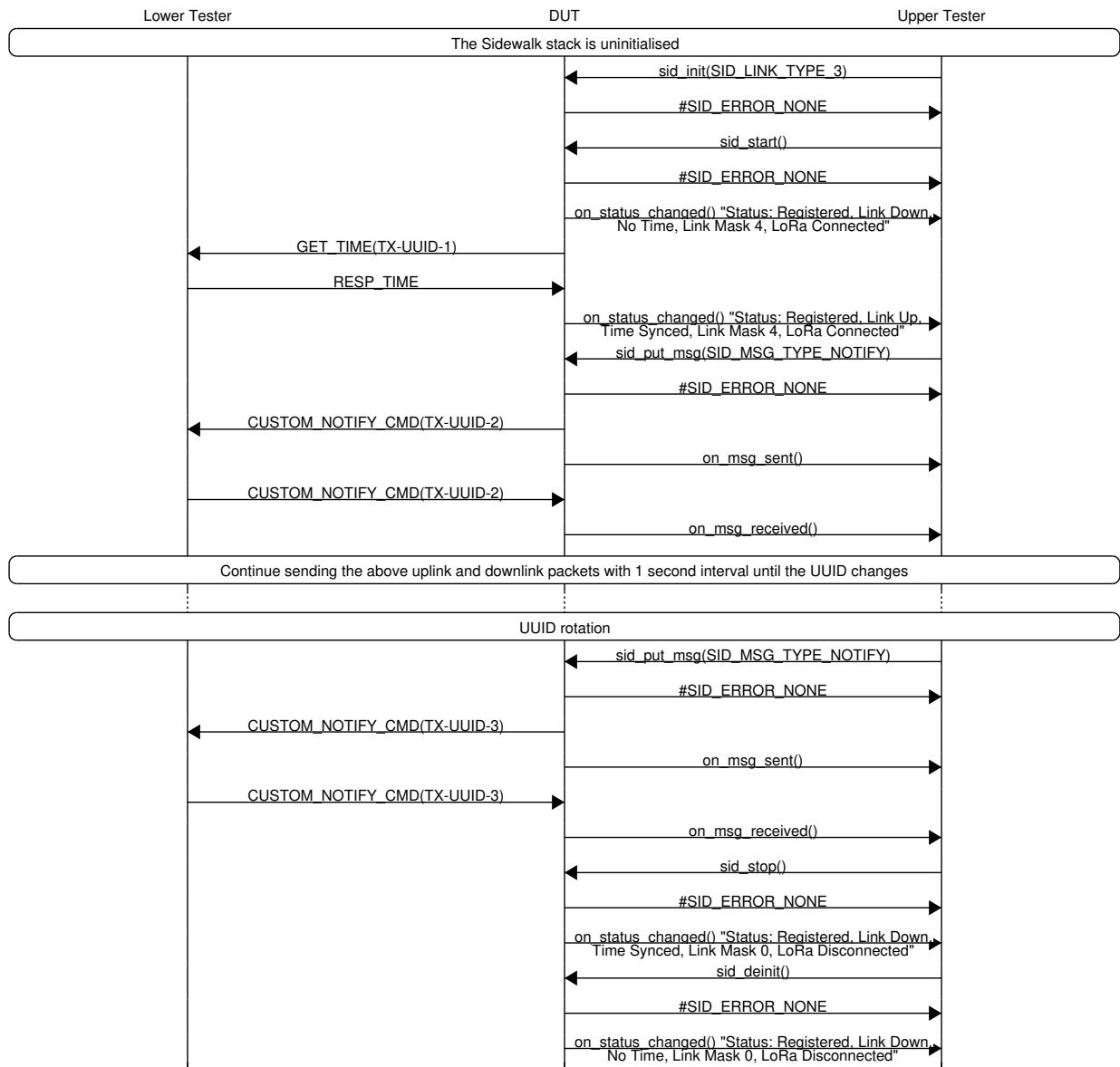
5.5.1 Test Purpose

DUT is able to exchange the uplink and downlink packets during UUID rotation.

5.5.2 Initial Conditions

- DUT is registered with Amazon Sidewalk network.
- DUT is configured as Profile B.
- Lower Tester operates in the default mixed (MULTI_RATE) mode.
- Both DUT and Lower Tester operates on the same LDR channel.
- The protocol is enabled on the Lower Tester.
- SidewalkNetworkFlag is enabled on Lower Tester.

5.5.3 Test Procedure



5.5.4 Expected Results

5.5.4.1 Pass Verdict

After successful time synchronization procedure, the UUID of the DUT should change every 15 minutes. All packets, both uplink and downlink, transmitted around the moment of UUID rotation should be handled correctly and reach the destination.

5.6 LORA/EP/CONN/REG/BV/01: An unregistered Endpoint successfully completes Sidewalk device registration over BLE.

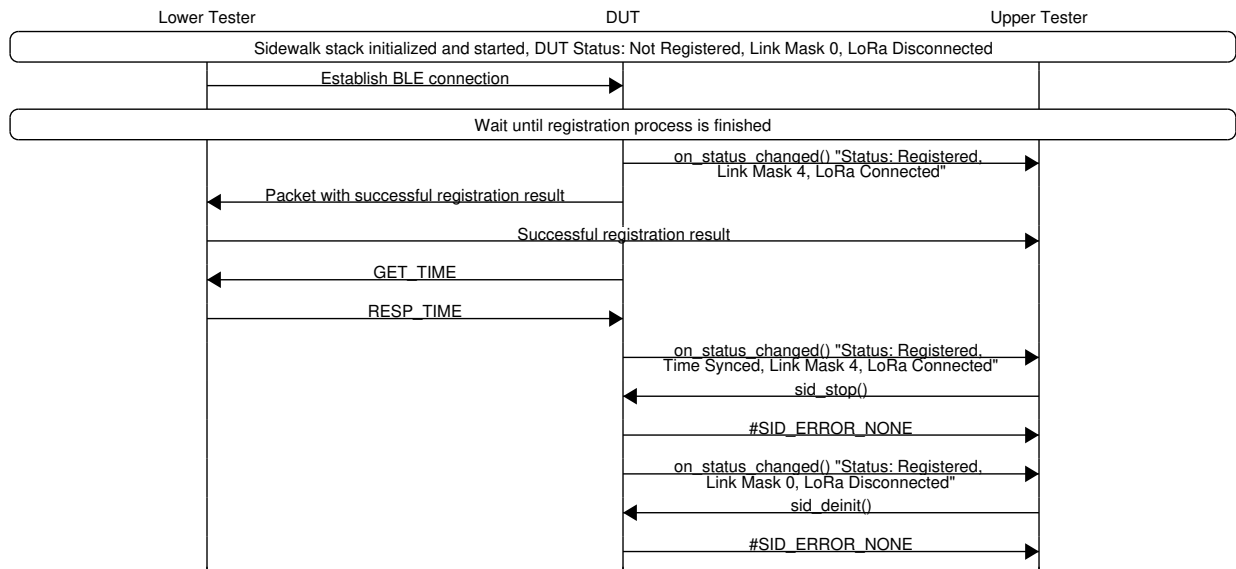
5.6.1 Test Purpose

An unregistered DUT configures the Sidewalk stack in LoRa mode. It accepts a BLE connection from the Lower Tester and completes registration. After it has registered it uses LoRa radio for Amazon Sidewalk network activities.

5.6.2 Initial Conditions

- DUT is not registered with Amazon Sidewalk network.
- The Sidewalk stack (LoRa) is initialized and started on the DUT.

5.6.3 Test Procedure



5.6.4 Expected Results

5.6.4.1 Pass Verdict

DUT with Sidewalk stack (LoRa) initialized is successfully registered with Amazon Sidewalk network. Afterwards, DUT completes time synchronization over LoRa.

5.7 LORA/EP/CONN/REG/BV/02: Endpoint can be deregistered from Sidewalk network.

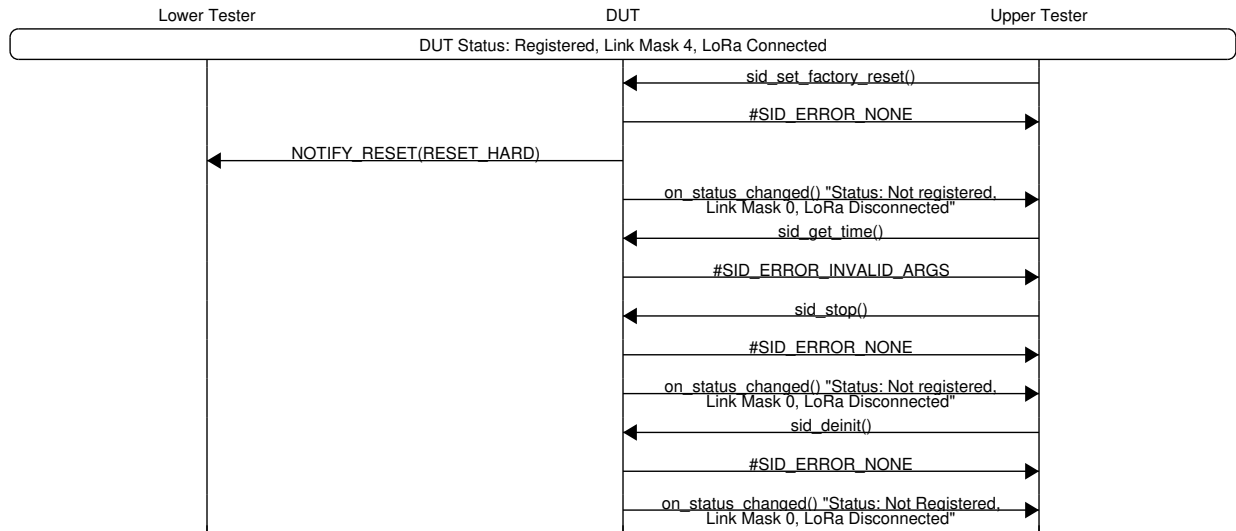
5.7.1 Test Purpose

To verify that the DUT is able to be deregistered from the Amazon Sidewalk network.

5.7.2 Initial Conditions

- DUT is registered with Amazon Sidewalk network.
- The Sidewalk stack (LoRa) is initialized and started on the DUT.

5.7.3 Test Procedure



5.7.4 Expected Results

5.7.4.1 Pass Verdict

Calling the `sid_set_factory_reset` method should force the DUT to send the packet `NOTIFY_RESET` (with `RESET_HARD` parameter) to the Lower Tester. Then the DUT should report to the Upper Tester the change in registration status to "Not registered".

After successful deregistration, the attempt to send the `GET_TIME` packet should fail with the `SID_ERROR_INVALID_ARGS` returned to the Upper Tester.

5.8 LORA/EP/CONN/LP/BV/01: Endpoint can select Profile A and complete Join procedure.

5.8.1 Test Purpose

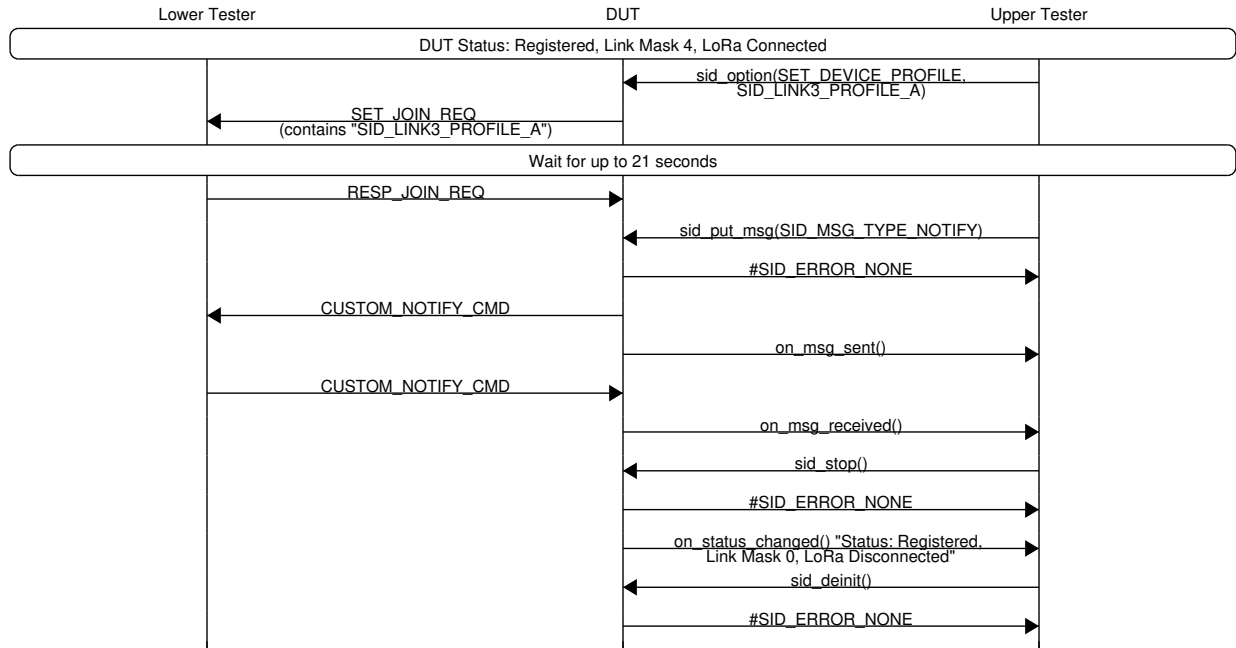
DUT is able to set Profile A and complete Join procedure triggered after profile selection. DUT and Lower Tester can exchange data after successful Join procedure.

5.8.2 Initial Conditions

- DUT is registered with Amazon Sidewalk network.
- Lower Tester operates in the default mixed (`MULTI_RATE`) mode.
- The protocol is enabled on the Lower Tester.
- `SidewalkNetworkFlag` is enabled on Lower Tester.

- The Sidewalk stack (LoRa) is initialized and started on the DUT.
- Both DUT and Lower Tester operate on the same LDR channel.
- DUT has completed the time synchronization.

5.8.3 Test Procedure



5.8.4 Expected Results

5.8.4.1 Pass Verdict

Transmission of "SET_JOIN_REQ" is triggered after setting the Profile A.

Content of the "SET_JOIN_REQ" packet must be verified in terms of whether it contains Profile A data.

"RESP_JOIN_REQ" packet must be sent back to DUT (within 21 seconds), confirming that Join procedure finished successfully.

After completing Join procedure DUT and Lower Tester can exchange data (UL and DL packet).

5.9 LORA/EP/CONN/LP/BV/02: Endpoint can select Profile B and complete Join procedure.

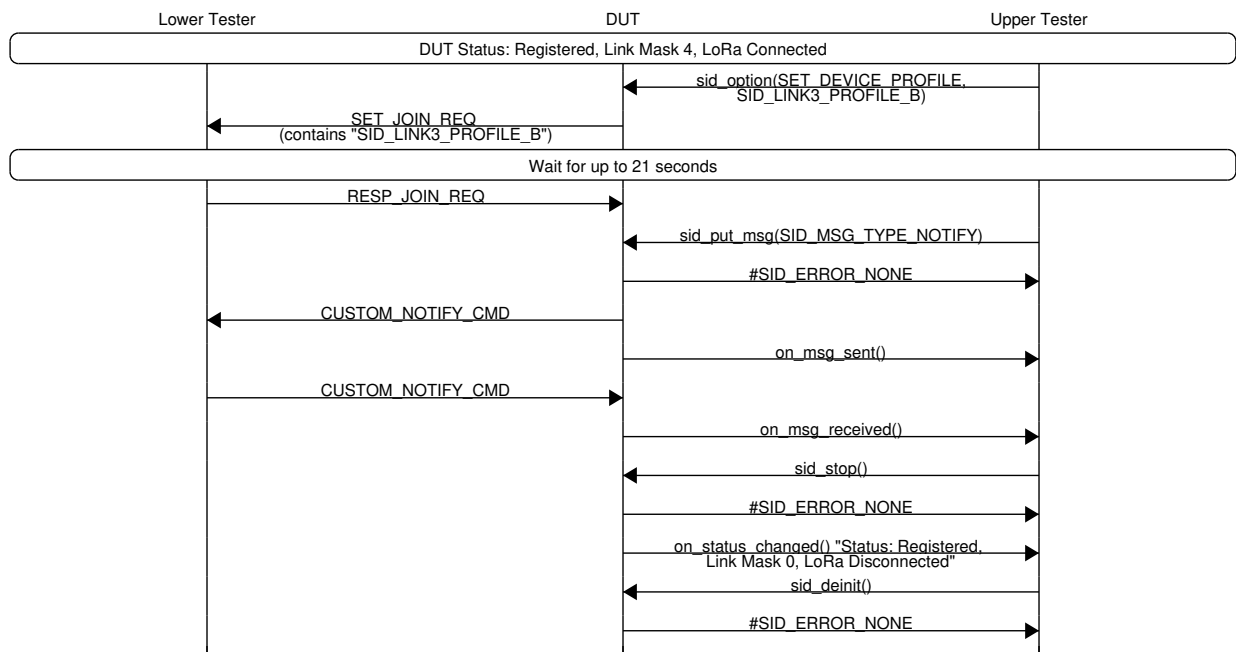
5.9.1 Test Purpose

DUT is able to set Profile B and complete Join procedure triggered after profile selection. DUT and Lower Tester can exchange data after successful Join procedure.

5.9.2 Initial Conditions

- DUT is registered with Amazon Sidewalk network.
- Lower Tester operates in the default mixed (MULTI_RATE) mode.
- The protocol is enabled on the Lower Tester.
- SidewalkNetworkFlag is enabled on Lower Tester.
- The Sidewalk stack (LoRa) is initialized and started on the DUT.
- Both DUT and Lower Tester operate on the same LDR channel.
- DUT has completed the time synchronization.

5.9.3 Test Procedure



5.9.4 Expected Results

5.9.4.1 Pass Verdict

Transmission of "SET_JOIN_REQ" is triggered after setting the Profile B.

Content of the "SET_JOIN_REQ" packet must be verified in terms of whether it contains Profile B data.

"RESP_JOIN_REQ" packet must be sent back to DUT (within 21 seconds), confirming that Join procedure finished successfully.

After completing Join procedure DUT and Lower Tester can exchange data (UL and DL packet).

5.10 LORA/EP/CONN/SEQ/BV/01: Uplink packets contain SEQ number.

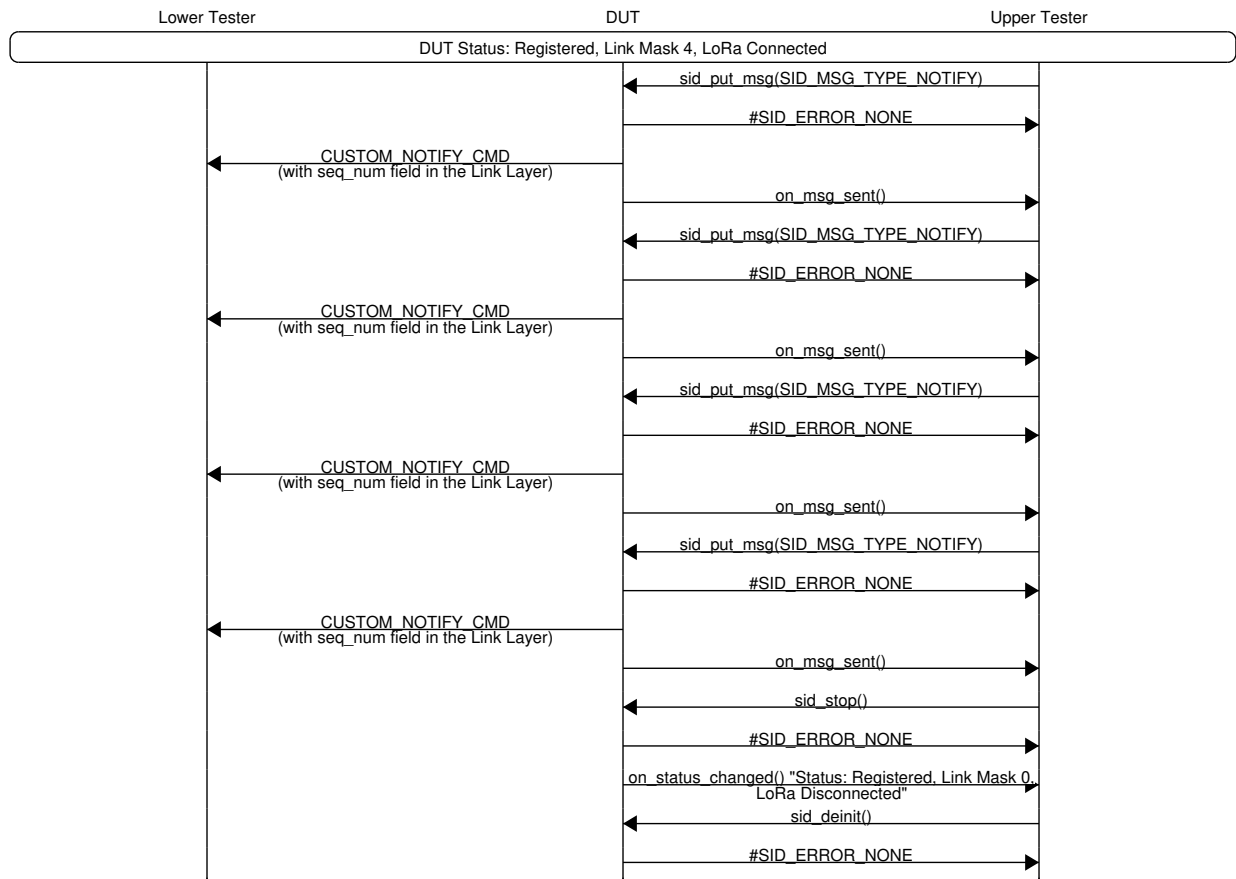
5.10.1 Test Purpose

To verify that the uplink packets sent by the DUT contain the sequence number written in the seq_num field in the Link Layer. With each subsequent sent packet, the value of seq_num should be incremented by one.

5.10.2 Initial Conditions

- DUT is registered with Amazon Sidewalk network.
- DUT is configured as Profile B.
- Lower Tester operates in the default mixed (MULTIRATE) mode.
- Both DUT and Lower Tester operates on the same LDR channel.
- The protocol is enabled on the Lower Tester.
- SidewalkNetworkFlag is enabled on Lower Tester.
- The Sidewalk stack (LoRa) is initialized and started on the DUT.
- DUT has completed the time synchronization and the Join procedure.

5.10.3 Test Procedure



5.10.4 Expected Results

5.10.4.1 Pass Verdict

The seq_num field is properly filled in the Link Layer of each CUSTOM_NOTIFY_CMD packet sent by DUT. Moreover, seq_num of each CUSTOM_NOTIFY_CMD packet should be incremented by one relative to the seq_num of the previous transmitted packet.

As the packet sequence number is sent as plain text in the Link Layer, the above condition can be validated on the Lower Tester side.

5.11 LORA/EP/CONN/SEQ/BV/02: Endpoint increments uplink SEQ number until UUID changes.

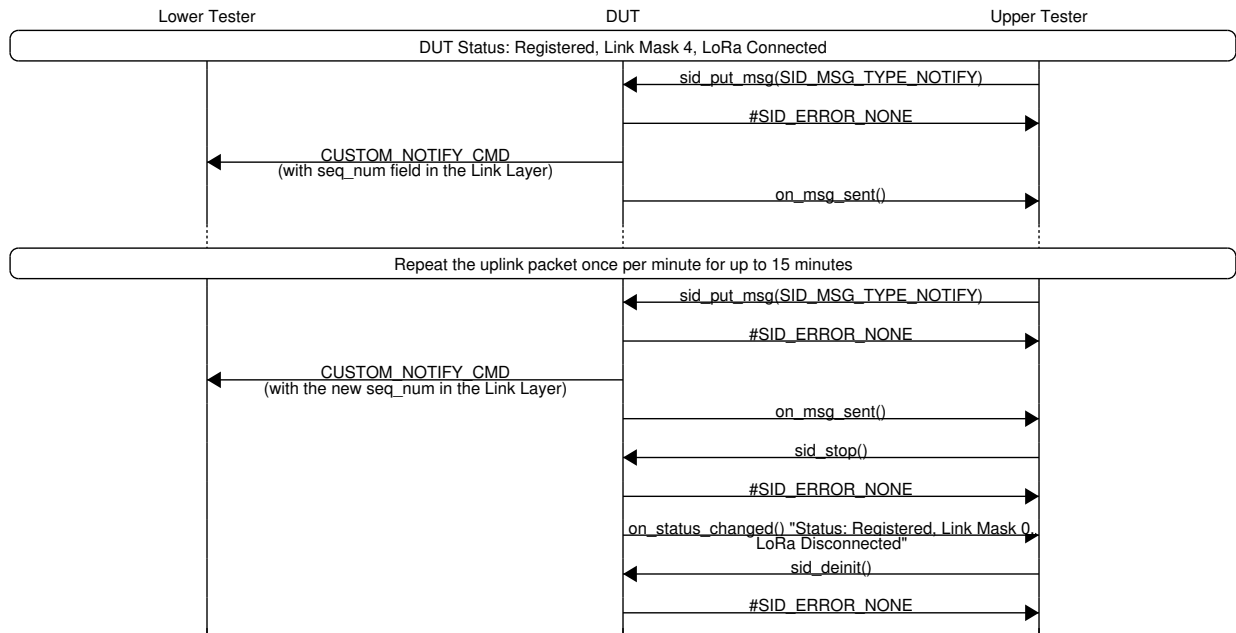
5.11.1 Test Purpose

To verify that the DUT increments the uplink packet sequence number until the UUID is changed. After the UUID is changed, the DUT should generate a new sequence number in the range between 0 and 16383.

5.11.2 Initial Conditions

- DUT is registered with Amazon Sidewalk network.
- DUT is configured as Profile B.
- Lower Tester operates in the default mixed (MULTI_RATE) mode.
- Both DUT and Lower Tester operates on the same LDR channel.
- The protocol is enabled on the Lower Tester.
- SidewalkNetworkFlag is enabled on Lower Tester.
- The Sidewalk stack (LoRa) is initialized and started on the DUT.
- DUT has completed the time synchronization and the Join procedure.

5.11.3 Test Procedure



5.11.4 Expected Results

5.11.4.1 Pass Verdict

The seq_num field should be properly incremented by one for each subsequent packet sent by DUT within a maximum of 15 minutes from the previous UUID change, then a new sequence number should be generated in the range between 0 and 16383.

As the packet sequence number is sent as plain text in the Link Layer, all CUSTOM_NOTIFY_CMD packets can be verified for seq_num field content on the Lower Tester side.

5.12 LORA/EP/CONN/SEQ/BV/03: Endpoint accepts and decodes downlink packets with increased and decreased SEQ.

5.12.1 Test Purpose

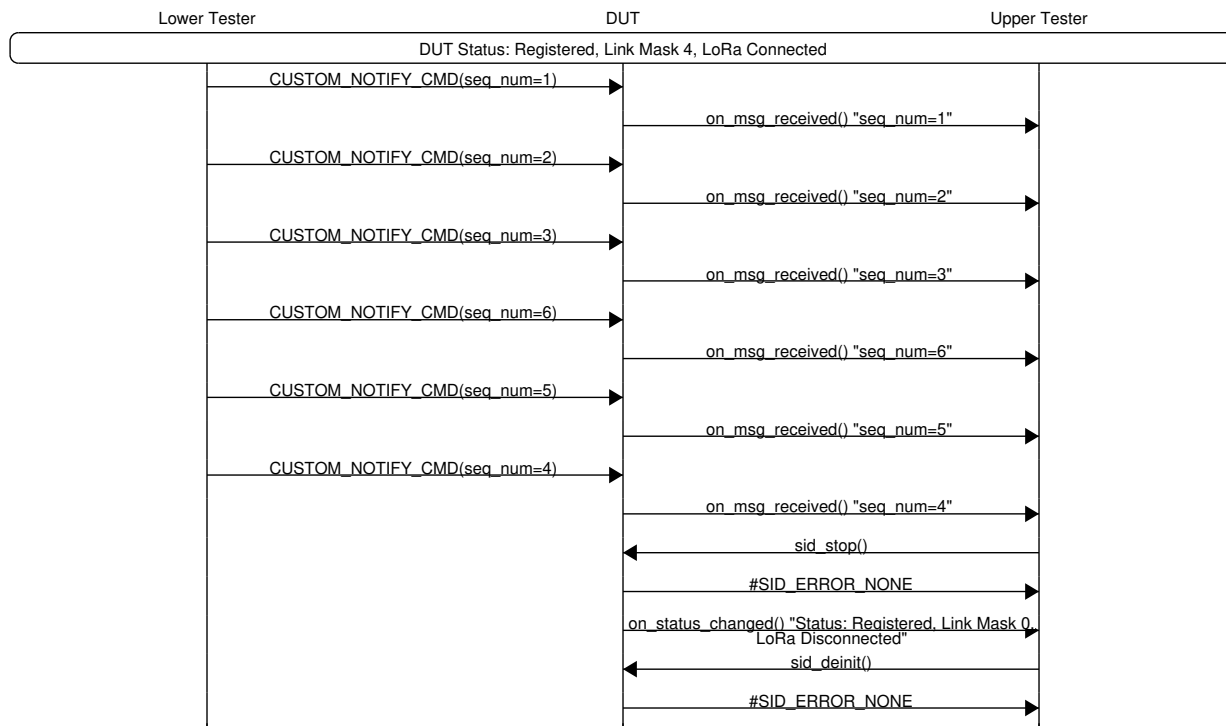
To verify that the downlink packets with both increasing and decreasing sequence number can be decoded by the DUT.

5.12.2 Initial Conditions

- DUT is registered with Amazon Sidewalk network.
- DUT is configured as Profile B.
- Lower Tester operates in the default mixed (MULTIRATE) mode.
- Both DUT and Lower Tester operates on the same LDR channel.
- The protocol is enabled on the Lower Tester.
- SidewalkNetworkFlag is enabled on Lower Tester.

- The Sidewalk stack (LoRa) is initialized and started on the DUT.
- DUT has completed the time synchronization and the Join procedure.

5.12.3 Test Procedure



5.12.4 Expected Results

5.12.4.1 Pass Verdict

The first three CUSTOM_NOTIFY_CMD packets sent by Lower Tester to the DUT contain an increasing sequence number ranging from 1 to 3. The next three CUSTOM_NOTIFY_CMD packets contain a decreasing sequence number ranging from 6 to 4. All sent packets should be accepted and properly decoded by the DUT which should be manifested by reporting all six events to the Upper Tester.

5.13 LORA/EP/CONN/SEQ/BV/05: Endpoint rejects downlink packet with duplicated SEQ.

5.13.1 Test Purpose

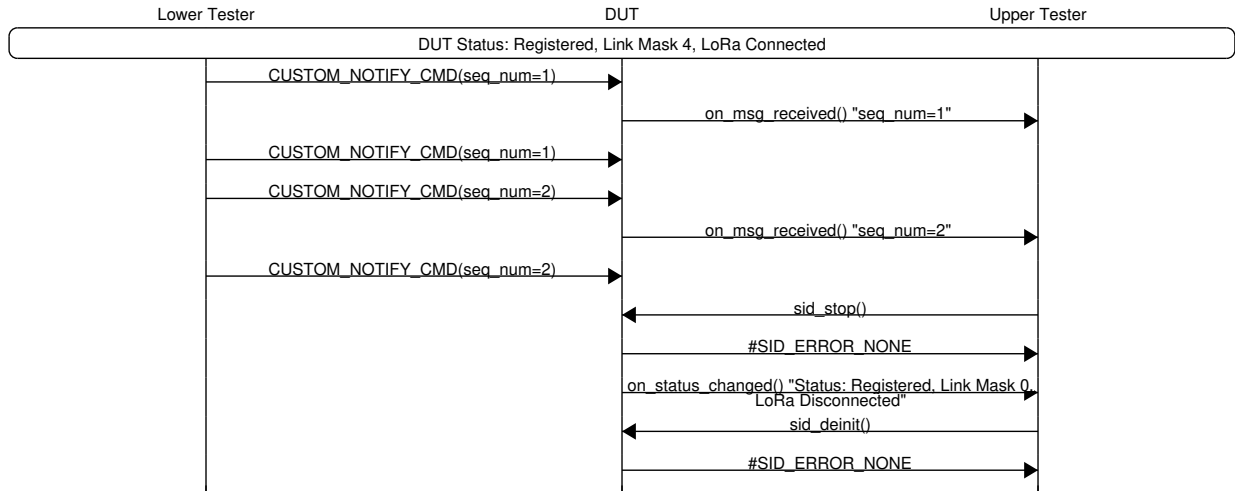
To verify that a downlink packet which contains a duplicated sequence number is rejected by the DUT.

5.13.2 Initial Conditions

- DUT is registered with Amazon Sidewalk network.
- DUT is configured as Profile B.
- Lower Tester operates in the default mixed (MULTLRATE) mode.

- Both DUT and Lower Tester operates on the same LDR channel.
- The protocol is enabled on the Lower Tester.
- SidewalkNetworkFlag is enabled on Lower Tester.
- The Sidewalk stack (LoRa) is initialized and started on the DUT.
- DUT has completed the time synchronization and the Join procedure.

5.13.3 Test Procedure



5.13.4 Expected Results

5.13.4.1 Pass Verdict

The first CUSTOM_NOTIFY_CMD packet sent by the Lower Tester containing sequence number equal to 1 should be decoded correctly and information about this event should be visible on the Upper Tester side. However, another CUSTOM_NOTIFY_CMD packet sent by the Lower Tester also containing the same sequence number should be rejected by the DUT.

The third CUSTOM_NOTIFY_CMD packet containing parameter seq_num increased by one should be decoded correctly and information about this event should again be visible on the Upper Tester side. The fourth CUSTOM_NOTIFY_CMD packet with a duplicated seq_num equal to 2 should be rejected by the DUT.

In the case of duplicate packets, information about this event should not be visible on the Upper Tester side.

5.14 LORA/EP/CONN/SEQ/BV/06: Endpoint rejects downlink packet with duplicated SEQ range.

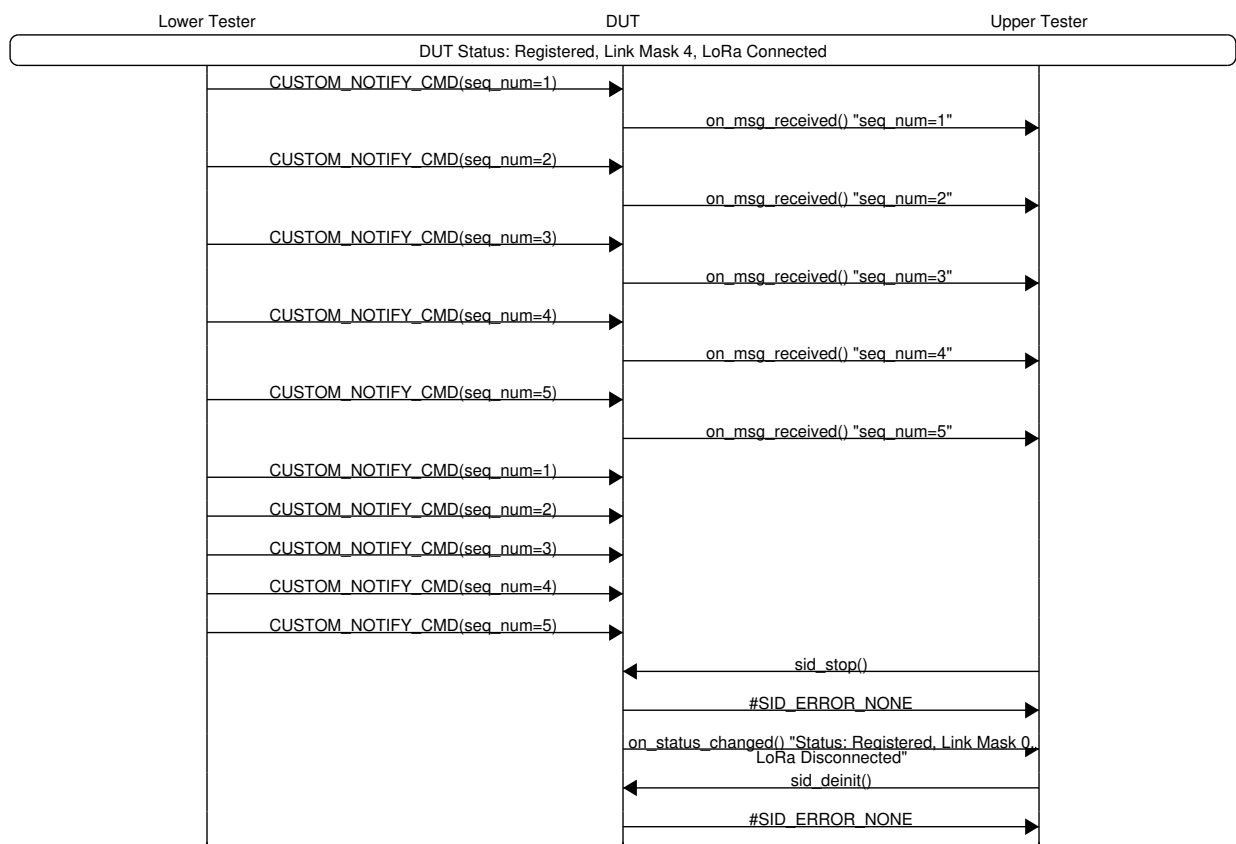
5.14.1 Test Purpose

To verify that a group of five downlink packets which contain a duplicate sequence number are rejected by the DUT.

5.14.2 Initial Conditions

- DUT is registered with Amazon Sidewalk network.
- DUT is configured as Profile B.
- Lower Tester operates in the default mixed (MULTI_RATE) mode.
- Both DUT and Lower Tester operates on the same LDR channel.
- The protocol is enabled on the Lower Tester.
- SidewalkNetworkFlag is enabled on Lower Tester.
- The Sidewalk stack (LoRa) is initialized and started on the DUT.
- DUT has completed the time synchronization and the Join procedure.

5.14.3 Test Procedure



5.14.4 Expected Results

5.14.4.1 Pass Verdict

The first five CUSTOM_NOTIFY_CMD packets with sequence numbers increasing sequentially from 1 to 5 should be sent from the Lower Tester and correctly decoded on the DUT side. Receipt of all five of these packets should be reported on the Upper Tester side.

After re-sending from the Lower Tester the same packets containing sequence numbers from 1 to 5, all of them should be rejected by the DUT. Information on these five events should not be visible on the Upper Tester side.

5.15 LORA/EP/CONN/SEQ/BV/07: SEQ number can be accepted again after getting 10 other messages.

5.15.1 Test Purpose

DUT is able to receive downlink packet with already used SEQ number, after receiving at least 10 additional packets with different, unique SEQ number.

5.15.2 Initial Conditions

- DUT is registered with Amazon Sidewalk network.

- DUT is configured as Profile B.

- Lower Tester operates in the default mixed (MULTI_RATE) mode.

- Both DUT and Lower Tester operate on the same LDR channel.

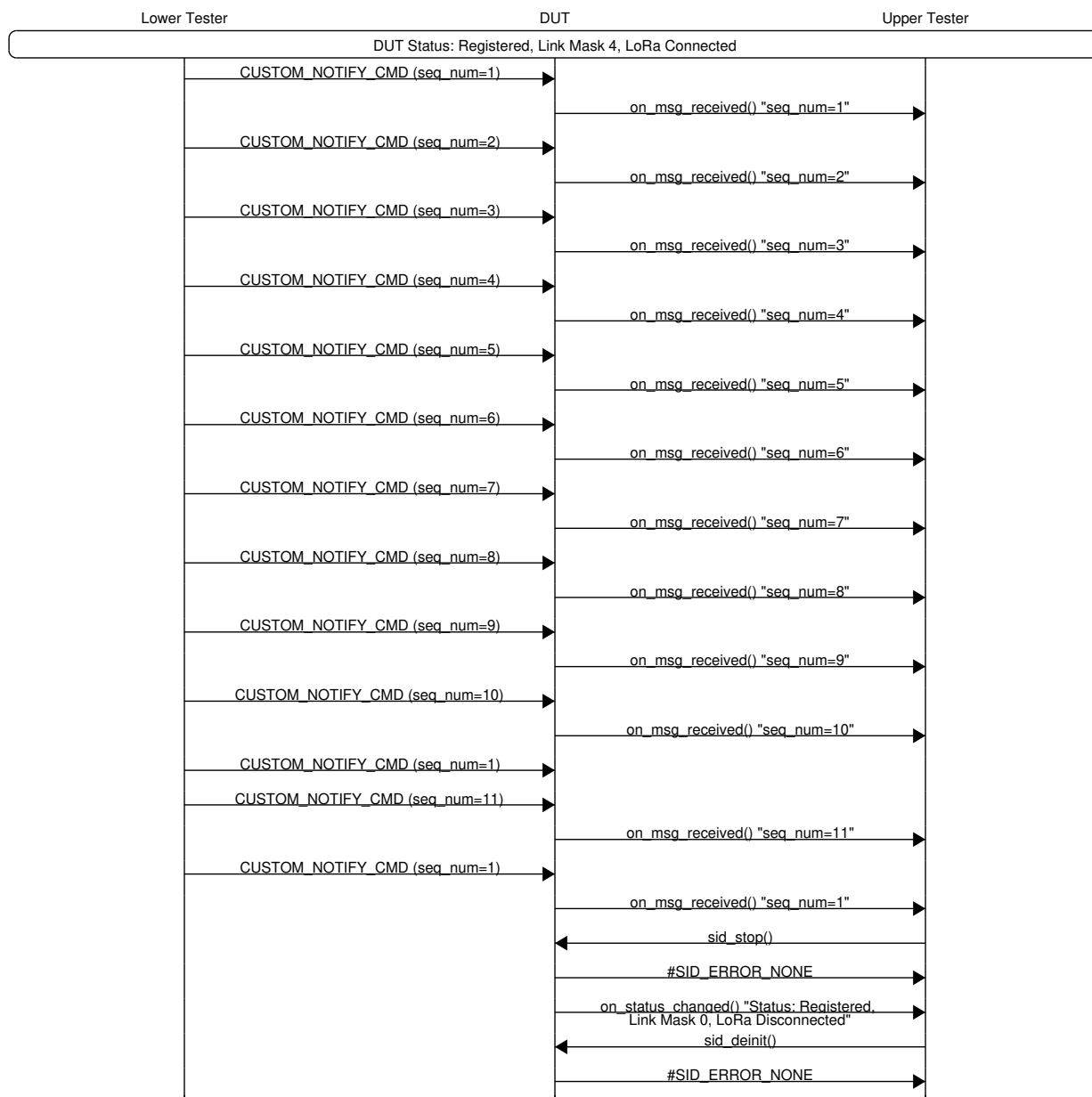
- The protocol is enabled on the Lower Tester.

- SidewalkNetworkFlag is enabled on the Lower Tester.

- The Sidewalk stack (LoRa) is initialized and started on the DUT.

- DUT has completed the time synchronization and the Join procedure.

5.15.3 Test Procedure



5.15.4 Expected Results

5.15.4.1 Pass Verdict

First, eleventh and thirteenth CUSTOM_NOTIFY_CMD packet contain the same SEQ number.

All the other CUSTOM_NOTIFY_CMD packets contain different, unique SEQ number.

Due to the fact that 10 additional packets have to be received by DUT before SEQ number can be reused: Eleventh CUSTOM_NOTIFY_CMD packet should be rejected by DUT (after 9 additional packets received). Thirteenth CUSTOM_NOTIFY_CMD packet should be received and decoded properly by DUT (after 10 additional packets received).

5.16 LORA/EP/CONN/SEQ/BV/08: SEQ number can be accepted again after Sidewalk stack reinitialization.

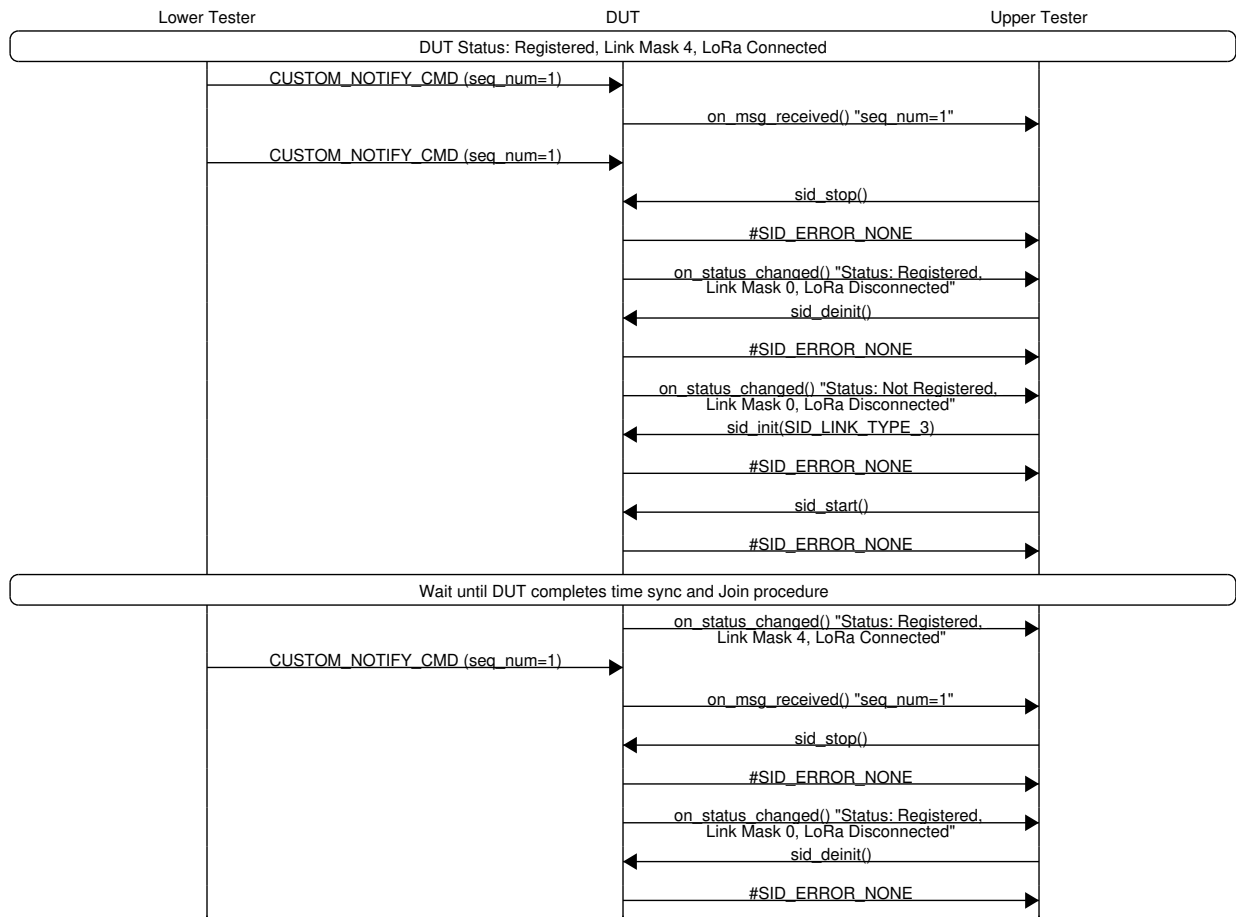
5.16.1 Test Purpose

DUT is able to receive downlink packet with already used SEQ number, after reinitialization of Sidewalk stack.

5.16.2 Initial Conditions

- DUT is registered with Amazon Sidewalk network.
- DUT is configured as Profile B.
- Lower Tester operates in the default mixed (MULTI_RATE) mode.
- Both DUT and Lower Tester operate on the same LDR channel.
- The protocol is enabled on the Lower Tester.
- SidewalkNetworkFlag is enabled on the Lower Tester.
- The Sidewalk stack (LoRa) is initialized and started on the DUT.
- DUT has completed the time synchronization and the Join procedure.

5.16.3 Test Procedure



5.16.4 Expected Results

5.16.4.1 Pass Verdict

First and third CUSTOM_NOTIFY_CMD packets should be received and decoded properly by DUT, despite having the same SEQ number.

Since there was no stack reinitialization before second CUSTOM_NOTIFY_CMD packet, it should be rejected by DUT because of repeating SEQ number.

5.17 LORA/EP/CONN/SEQ/BV/09: Endpoint drops the packet with SEQ which is out of range.

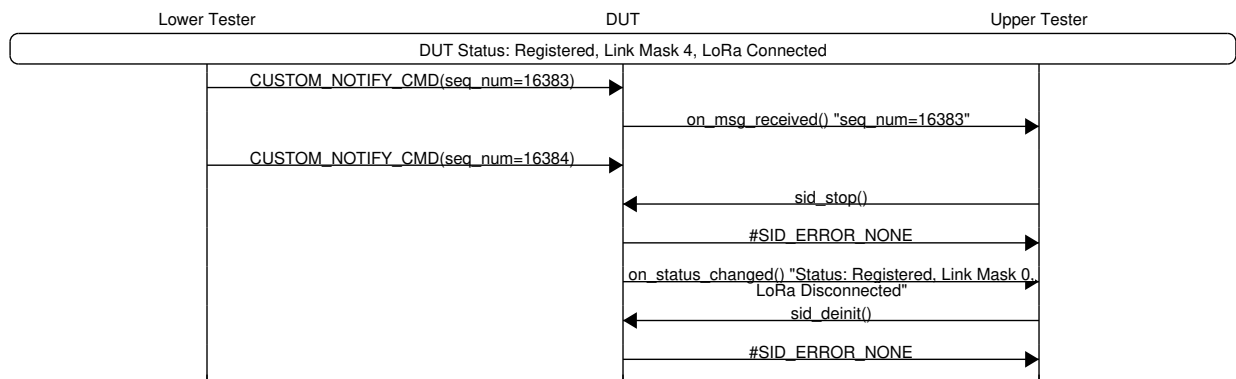
5.17.1 Test Purpose

To verify that a downlink packet which contains an out of range sequence number is dropped by the DUT.

5.17.2 Initial Conditions

- DUT is registered with Amazon Sidewalk network.
- DUT is configured as Profile B.
- Lower Tester operates in the default mixed (MULTI_RATE) mode.
- Both DUT and Lower Tester operates on the same LDR channel.
- The protocol is enabled on the Lower Tester.
- SidewalkNetworkFlag is enabled on Lower Tester.
- The Sidewalk stack (LoRa) is initialized and started on the DUT.
- DUT has completed the time synchronization and the Join procedure.

5.17.3 Test Procedure



5.17.4 Expected Results

5.17.4.1 Pass Verdict

The first CUSTOM_NOTIFY_CMD packet sent by the Lower Tester containing the maximum allowed sequence number (16383) should be decoded correctly and information about this event should be visible on the Upper Tester side.

The second CUSTOM_NOTIFY_CMD packet sent by the Lower Tester should be dropped by the DUT due to the seq_num parameter being exceeded and therefore this event should not be reported to the Upper Tester.

5.18 LORA/EP/NW/SYNC/JOIN/BV/02: Endpoint keeps synchronization with the network by periodic transmission of Join request.

5.18.1 Test Purpose

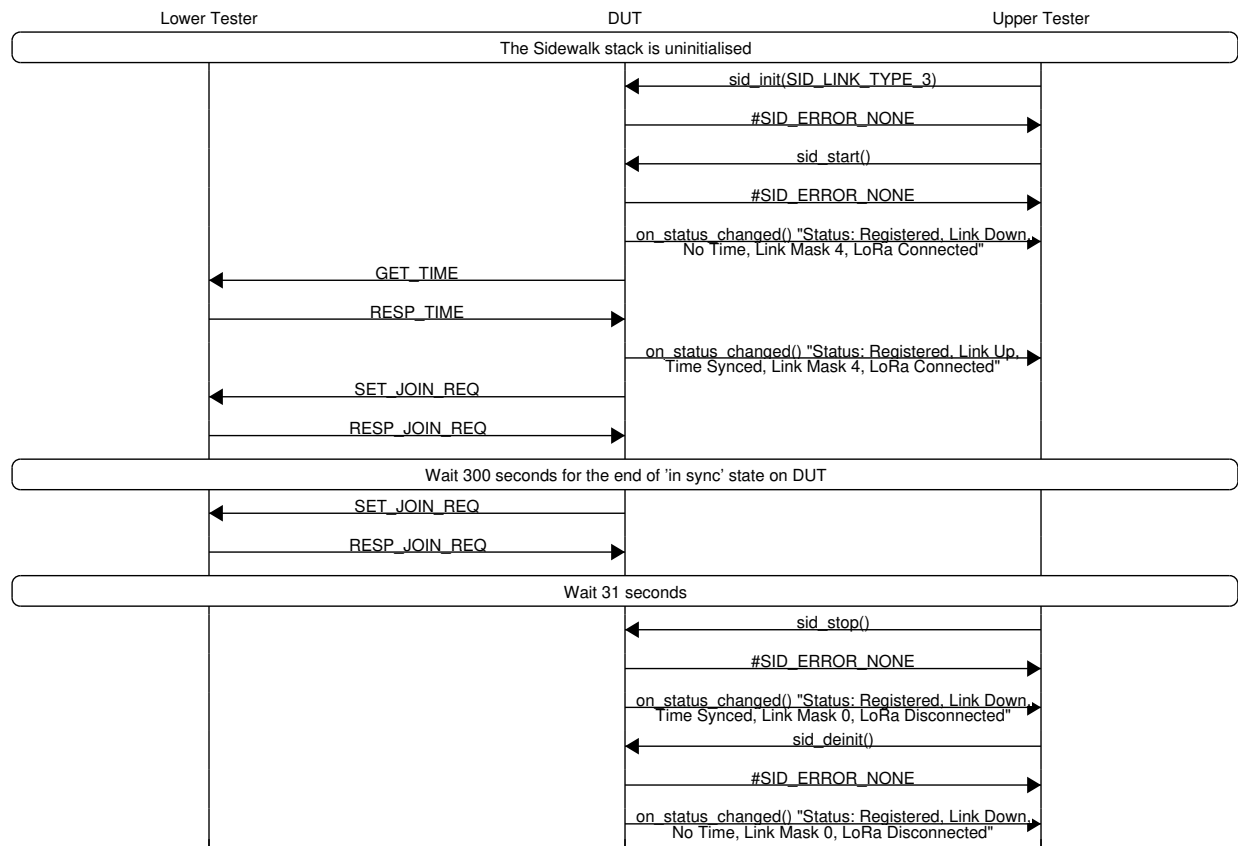
DUT is able to keep synchronization with the network by periodic transmission of Join request.

When the time sync and Join procedure is completed device is automatically synchronized with the network. Then after a period of 300 seconds of uplink inactivity (no data is transmitted), the DUT should send another Join request command to keep link with the network active/alive.

5.18.2 Initial Conditions

- DUT is registered with Amazon Sidewalk network.
- DUT is configured as Profile B.
- Lower Tester operates in the default mixed (MULTI_RATE) mode.
- Both DUT and Lower Tester operates on the same LDR channel.
- The protocol is enabled on the Lower Tester.
- SidewalkNetworkFlag is enabled on Lower Tester.

5.18.3 Test Procedure



5.18.4 Expected Results

5.18.4.1 Pass Verdict

DUT is able to acquire positive response from the network when Join request is sent during the active synchronization process.

The GET_TIME packet must be the first uplink transmission right after initializing the Sidewalk stack with LoRa modulation. The RESP_TIME packet will be sent to DUT within 30 seconds and no re-transmission of the GET_TIME packet should occur during this time.

Also no other uplink transmission is allowed before the DUT receives the RESP_TIME packet which will be reported via Time Status: Synced. Completion of the time synchronization procedure should also change the Link Status to Up.

DUT should send the SET_JOIN_REQ packet right after the time synchronization procedure is complete. The RESP_JOIN_REQ packet should be sent back to DUT within 31 seconds and until then DUT should not repeat the transmission of the next SET_JOIN_REQ commands.

After sending the first RESP_JOIN_REQ, wait 300 seconds after which DUT should send the second SET_JOIN_REQ packet to keep synchronization with the network. No uplink transmission should occur during this period.

After sending the second RESP_JOIN_REQ, wait 31 seconds and verify that DUT has not resent SET_JOIN_REQ. This means that the DUT is able to maintain synchronization with the network by periodic transmission of Join request.

As the SET_JOIN_REQ carries requested async profile attributes, its content must be verified against the declared capabilities of the DUT.

5.19 LORA/EP/NW/SYNC/JOIN/BV/03: Endpoint keeps synchronization with the network by embedded sync request.

5.19.1 Test Purpose

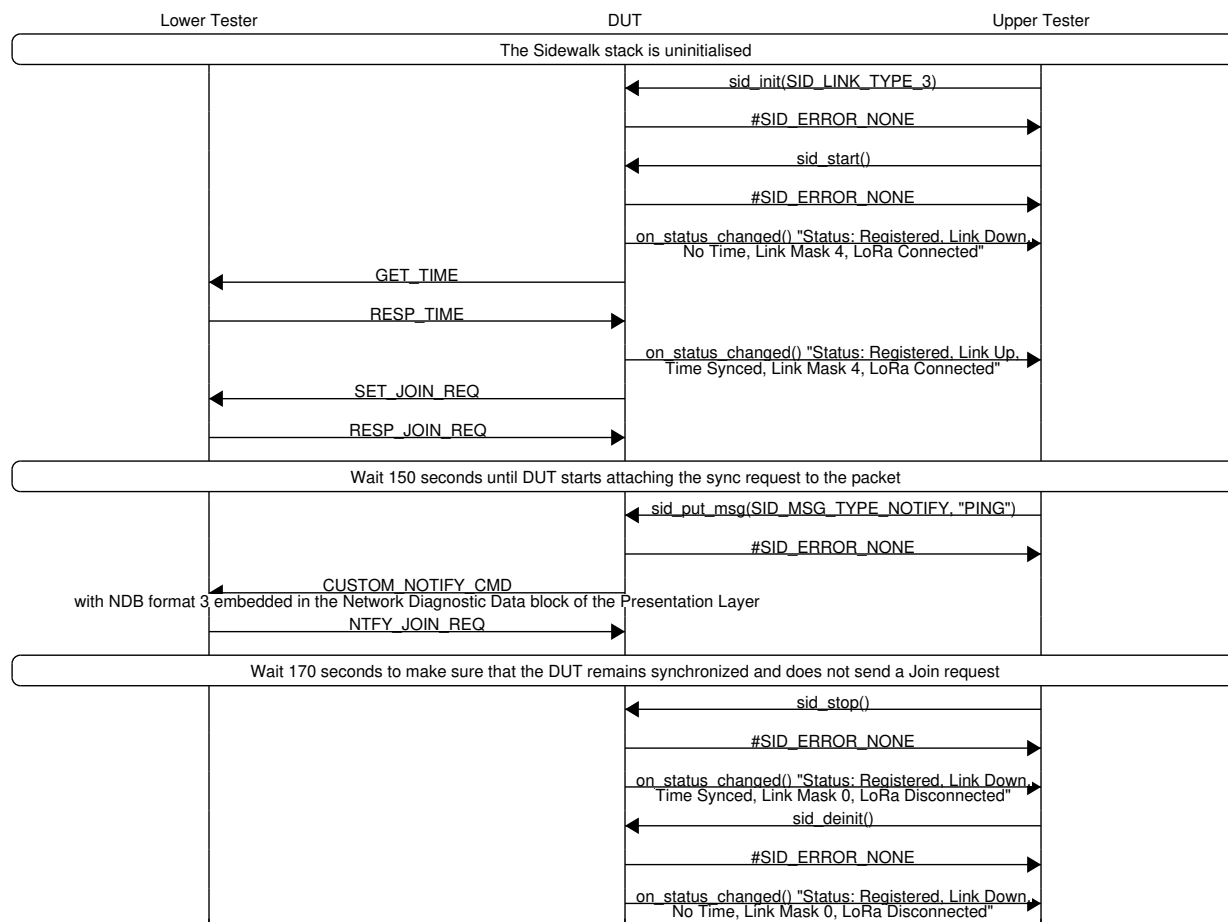
DUT is able to keep synchronization with the network with the use of embedded sync request.

When the time sync and Join procedure is completed device is automatically synchronized with the network. However, 150 seconds after a successful synchronization, the DUT should start attaching a sync request to each uplink packet in order to maintain the synchronization without the need to send a separate Join request, which reduces signalling.

5.19.2 Initial Conditions

- DUT is registered with Amazon Sidewalk network.
- DUT is configured as Profile B.
- Lower Tester operates in the default mixed (MULTI.RATE) mode.
- Both DUT and Lower Tester operates on the same LDR channel.
- The protocol is enabled on the Lower Tester.
- SidewalkNetworkFlag is enabled on Lower Tester.

5.19.3 Test Procedure



5.19.4 Expected Results

5.19.4.1 Pass Verdict

DUT is able to acquire Join notify from the network when synchronization request is embedded in uplink data.

The GET_TIME packet must be the first uplink transmission right after initializing the Sidewalk stack with LoRa modulation. The RESP_TIME packet will be sent to DUT within 30 seconds and no re-transmission of the GET_TIME packet should occur during this time.

Also no other uplink transmission is allowed before the DUT receives the RESP_TIME packet which will be reported via Time Status: Synced. Completion of the time synchronization procedure should also change the Link Status to Up.

DUT should send the SET_JOIN_REQ packet right after the time synchronization procedure is complete. The RESP_JOIN_REQ packet should be sent back to DUT within 31 seconds and until then DUT should not repeat the transmission of the next SET_JOIN_REQ commands.

After sending the RESP_JOIN_REQ, wait 150 seconds, then the Upper Tester must trigger sending uplink data on the DUT (CUSTOM_NOTIFY_CMD with "PING" as the Command data). As a result, the mentioned packet will be sent to the network. The uplink data must include TLV key 0x01 synchronization request in Network Data Blob format 3 and it must be verified on the Lower Tester side. The NTFY_JOIN_REQ packet should be sent back to DUT within 25 seconds.

After sending the NTFY_JOIN_REQ, wait another 170 seconds and verify that DUT does not send SET_JOIN_REQ during this period. This means that the DUT is able to maintain synchronization with the network by embedded sync request during transmission of regular data.

As the SET_JOIN_REQ carries requested async profile attributes, its content must be verified against the declared capabilities of the DUT.

5.20 LORA/EP/NW/SYNC/TIME/BV/01: Endpoint completes the initial time sync procedure.

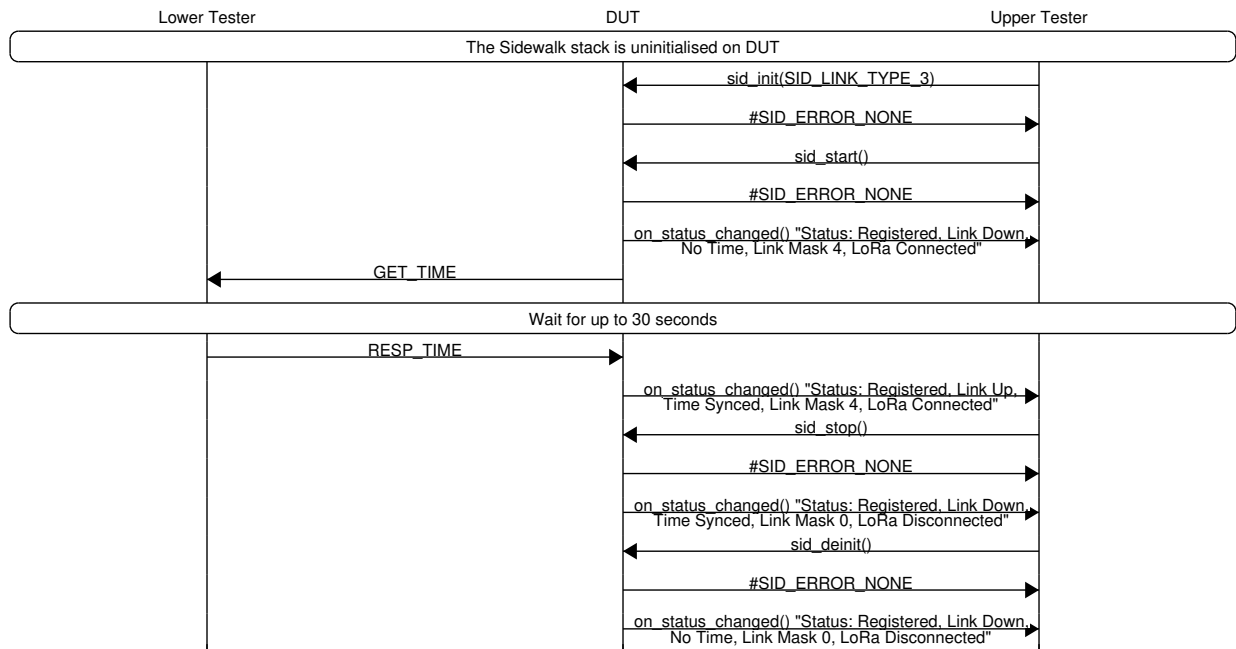
5.20.1 Test Purpose

DUT is able to pass the initial time synchronization procedure.

5.20.2 Initial Conditions

- DUT is registered with Amazon Sidewalk network.
- Lower Tester operates in the default mixed (MULTI_RATE) mode.
- The protocol is enabled on the Lower Tester.
- Both DUT and Lower Tester operate on the same LDR channel.
- SidewalkNetworkFlag is enabled on Lower Tester.

5.20.3 Test Procedure



5.20.4 Expected Results

5.20.4.1 Pass Verdict

DUT is able to acquire time from the network.

The RESP_TIME packet will be sent to DUT within 30 seconds and no re-transmission of the GET_TIME packet should occur during this time.

No other UL transmission should take place until the DUT receives a correct RESP_TIME packet which will be reported via Time Status: Synced.

Completion of the time synchronization procedure should also change the Link Status to Up.

Chapter 6

Multi-radio Test Cases

6.1 MULTI/EP/API/INIT/BV/01: Switch between 900MHz and BLE stack multiple times.

6.1.1 Test Purpose

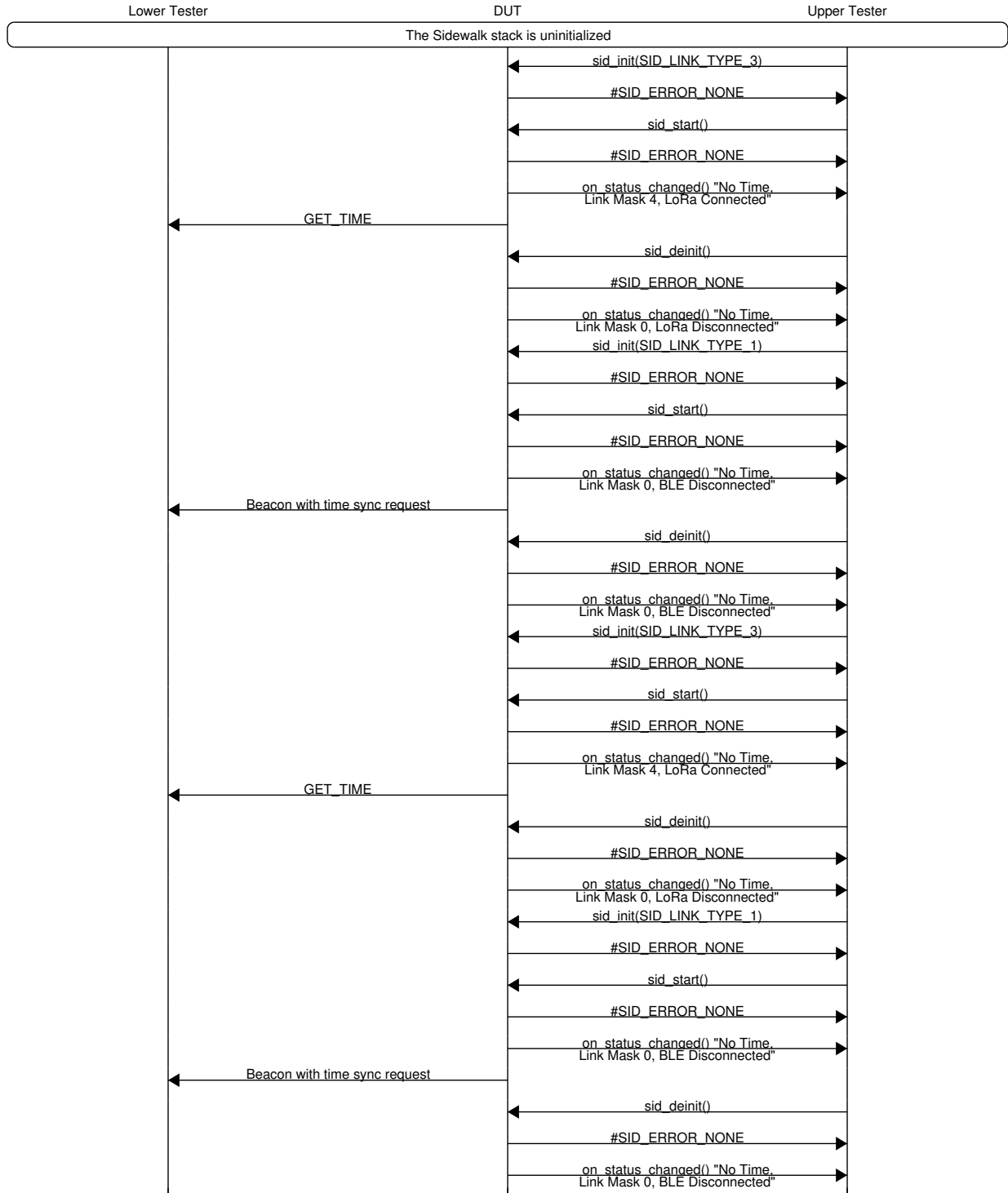
To verify that DUT is able to switch between 900MHz (LoRa) and BLE stack multiple times and the stack is initialized correctly each time.

6.1.2 Initial Conditions

- DUT is registered with Amazon Sidewalk network.

- The Sidewalk stack is not initialized on the DUT.

6.1.3 Test Procedure



6.1.4 Expected Results

6.1.4.1 Pass Verdict

The DUT should correctly switch between the 900MHz (LoRa) and BLE stacks.

Each time after initializing and starting the 900MHz (LoRa) stack, the DUT should send a GET_TIME packet via LoRa.

In turn, after each initialization and start of the BLE stack, the DUT should start broadcasting Beacons containing a request for time synchronization.

6.2 MULTI/EP/CONN/DL/BV/01: Endpoint is able to receive a downlink packet using BLE.

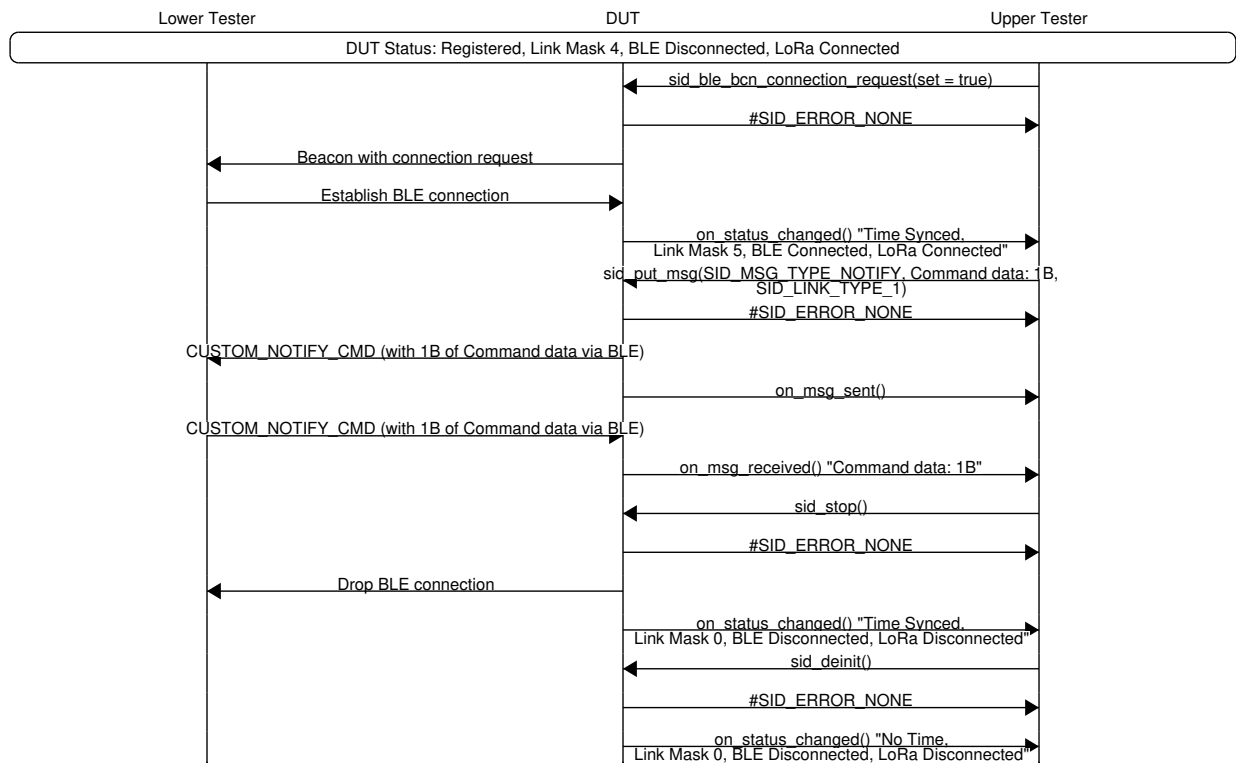
6.2.1 Test Purpose

To verify that the DUT is able to receive a downlink packet over BLE when the last uplink packet was sent also over BLE.

6.2.2 Initial Conditions

- DUT is registered with Amazon Sidewalk network.
- Lower Tester operates in BLE mode.
- SidewalkNetworkFlag is enabled on the Lower Tester.
- The Sidewalk stack (BLE + LoRa) is initialized and started on the DUT.
- DUT has completed the time synchronization.

6.2.3 Test Procedure



6.2.4 Expected Results

6.2.4.1 Pass Verdict

When the DUT sends an uplink packet over BLE, it should expect a response in downlink direction to arrive using the same technology and should be able to receive it.

6.3 MULTI/EP/CONN/DL/BV/02: Endpoint is able to receive a downlink packet using LoRa

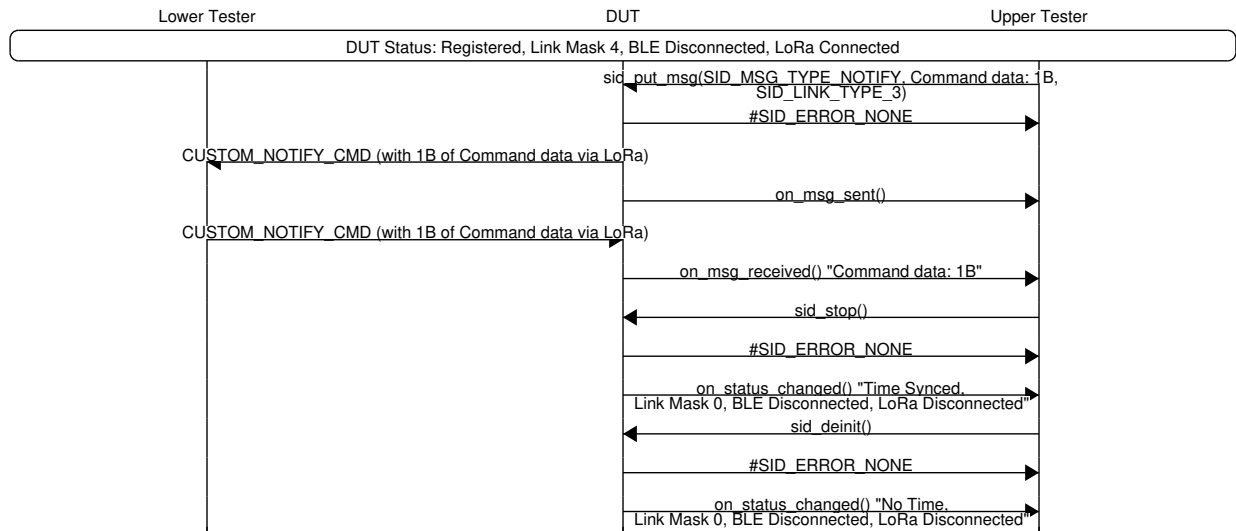
6.3.1 Test Purpose

To verify that DUT receives a downlink packet through LoRa, when multi-radio (BLE + LoRa) is initialized.

6.3.2 Initial Conditions

- DUT is registered with Amazon Sidewalk network.
- Lower Tester operates in BLE + LoRa mode.
- SidewalkNetworkFlag is enabled on the Lower Tester.
- The Sidewalk stack (BLE + LoRa) is initialized and started on the DUT.
- DUT has completed the time synchronization.
- DUT has completed join procedure for LoRa stack

6.3.3 Test Procedure



6.3.4 Expected Results

6.3.4.1 Pass Verdict

When the Sidewalk multi-radio stack (BLE + LoRa) initialized, DUT is able to receive a downlink packet using LoRa.

The CUSTOM_NOTIFY_CMD downlink packet should be verified on the DUT and Lower Tester side:
For Lower Tester: downlink packet was successfully transmitted using correct technology (LoRa)
For DUT: downlink packet was received.

To make sure that the downlink packet will be sent using correct technology, DUT has to send an additional uplink packet via LoRa first.

6.4 MULTI/EP/CONN/DL/BV/03: Endpoint is able to receive a downlink packet using LoRa, while BLE connection with Gateway is established.

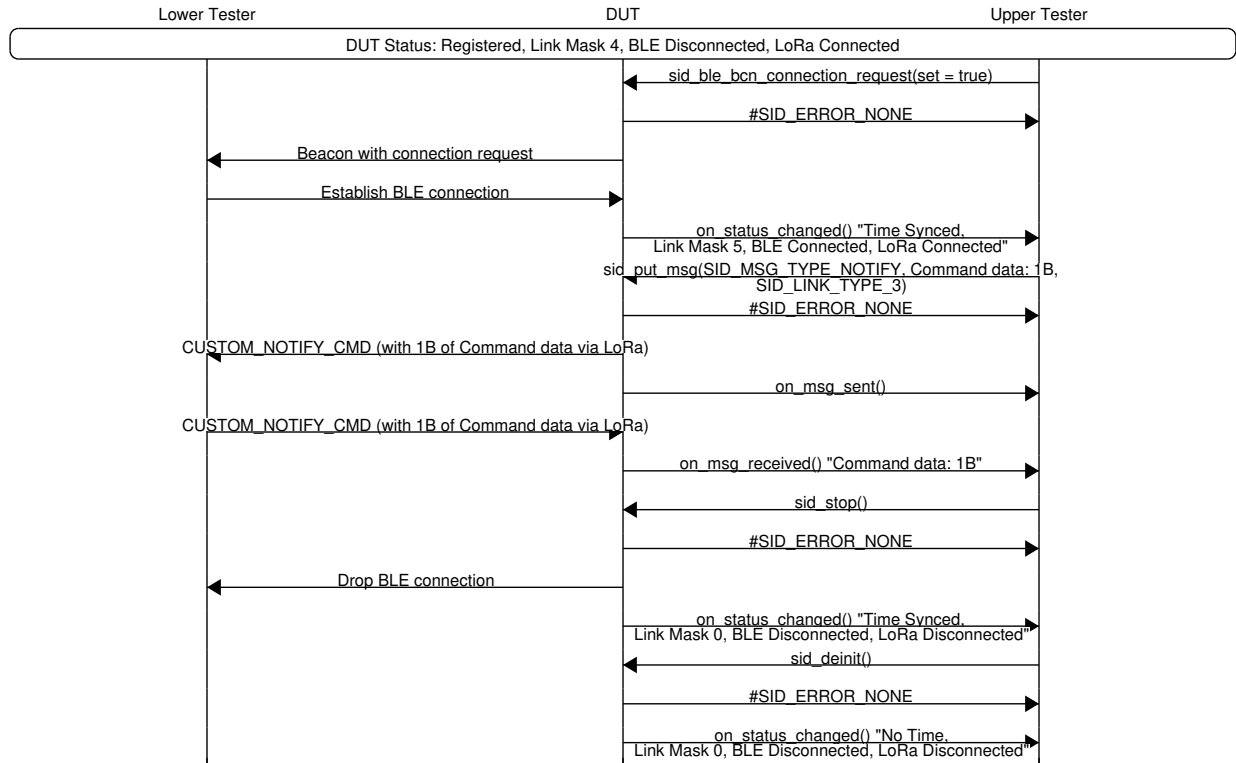
6.4.1 Test Purpose

To verify that DUT receives a downlink packet through LoRa, when multi-radio (BLE + LoRa) is initialized and BLE connection is established between DUT and Lower Tester.

6.4.2 Initial Conditions

- DUT is registered with Amazon Sidewalk network.
- Lower Tester operates in BLE + LoRa mode.
- SidewalkNetworkFlag is enabled on the Lower Tester.
- The Sidewalk stack (BLE + LoRa) is initialized and started on the DUT.
- DUT has completed the time synchronization.
- DUT has completed join procedure for LoRa stack

6.4.3 Test Procedure



6.4.4 Expected Results

6.4.4.1 Pass Verdict

When the Sidewalk multi-radio stack (BLE + LoRa) initialized and BLE connection established between DUT and Lower Tester, DUT is still able to receive a downlink packet using LoRa.

The CUSTOM_NOTIFY_CMD downlink packet should be verified on the DUT and Lower Tester side:

For Lower Tester: downlink packet was successfully transmitted using correct technology (LoRa)

For DUT: downlink packet was received.

To make sure that the downlink packet will be sent using correct technology, DUT has to send an additional uplink packet via LoRa after establishing BLE connection and before the downlink packet is scheduled.

6.5 MULTI/EP/CONN/SEND/LINK/BV/01: Uplink performed through BLE, when send link 0 and active BT connection.

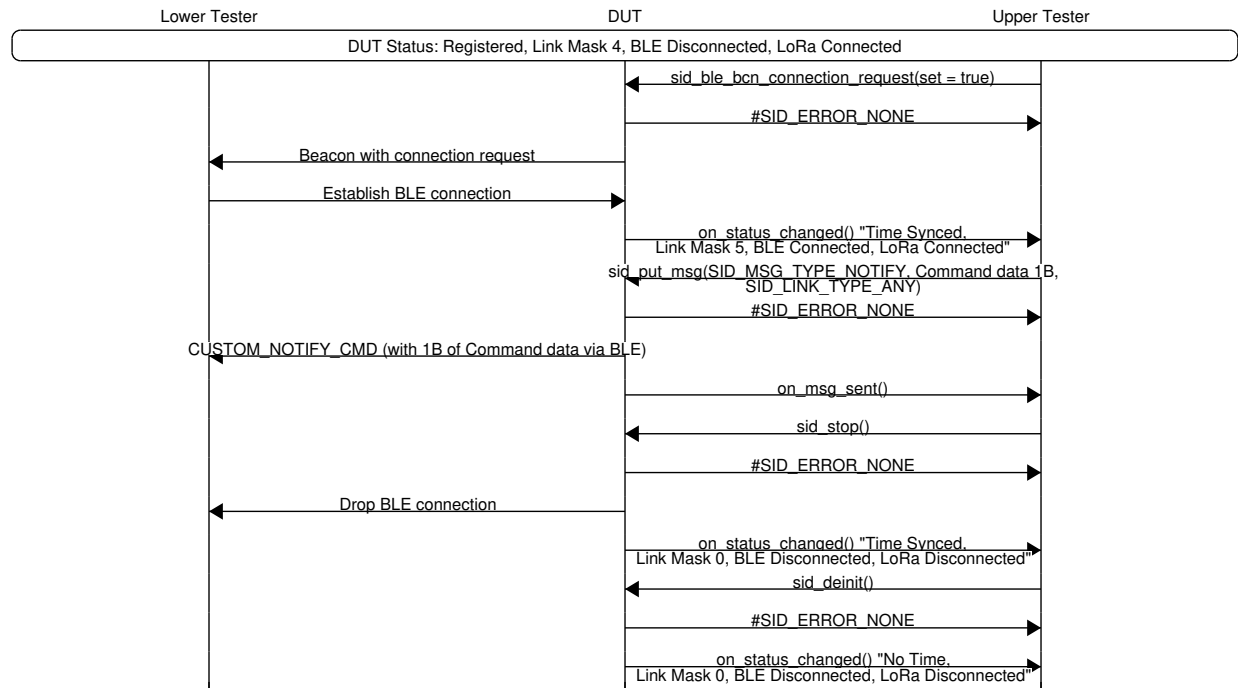
6.5.1 Test Purpose

To verify that DUT sends uplink packet through BLE when Multi-radio (BLE + LORA) is initialized, the send_link is set to SID_LINK_TYPE_ANY and there is an active BLE connection.

6.5.2 Initial Conditions

- DUT is registered with Amazon Sidewalk network.
- Lower Tester operates in BLE + LoRa mode.
- SidewalkNetworkFlag is enabled on the Lower Tester.
- The Sidewalk stack (BLE + LoRa) is initialized and started on the DUT.
- DUT has completed the time synchronization.

6.5.3 Test Procedure



6.5.4 Expected Results

6.5.4.1 Pass Verdict

When the Sidewalk multi-radio stack (BLE + LoRa) initialized, the link type is set to `SID_LINK_TYPE_ANY` and both BLE and LoRa are connected, the DUT should use BLE to send any uplink packet.

The `CUSTOM_NOTIFY_CMD` packet should be verified on the Lower Tester side against the technology in which it was received (BLE).

6.6 MULTI/EP/CONN/SEND/LINK/BV/02: Uplink performed through BLE, when send_link 1 and active BT connection.

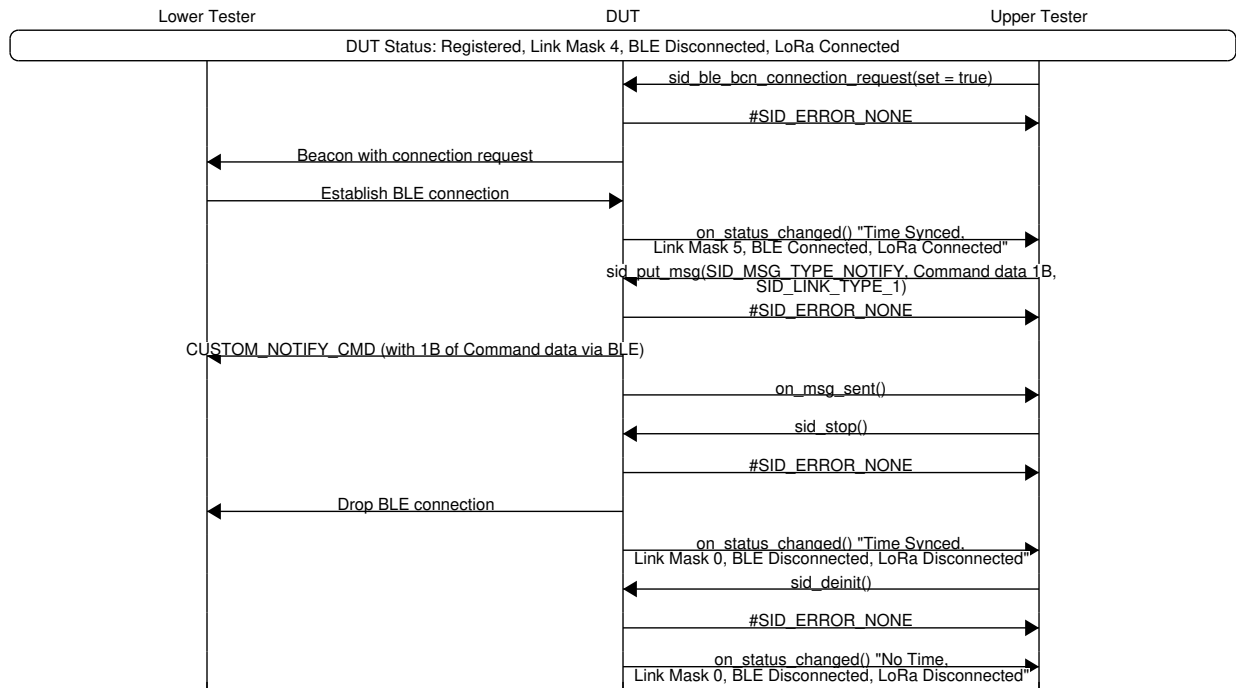
6.6.1 Test Purpose

To verify that DUT sends uplink packet through BLE when Multi-radio (BLE + LORA) is initialized, the `send_link` is set to `SID_LINK_TYPE_1` (BLE) and there is an active BLE connection.

6.6.2 Initial Conditions

- DUT is registered with Amazon Sidewalk network.
- Lower Tester operates in BLE + LoRa mode.
- SidewalkNetworkFlag is enabled on the Lower Tester.
- The Sidewalk stack (BLE + LoRa) is initialized and started on the DUT.
- DUT has completed the time synchronization.

6.6.3 Test Procedure



6.6.4 Expected Results

6.6.4.1 Pass Verdict

When the Sidewalk multi-radio stack (BLE + LoRa) initialized, the link type is set to SID_LINK_TYPE_1 (BLE) and both BLE and LoRa are connected, the DUT should use BLE to send any uplink packet.

The CUSTOM_NOTIFY_CMD packet should be verified on the Lower Tester side against the technology in which it was received (BLE).

6.7 MULTI/EP/CONN/SEND/LINK/BV/03: Uplink performed through LoRa, when send_link 3 and active BT connection.

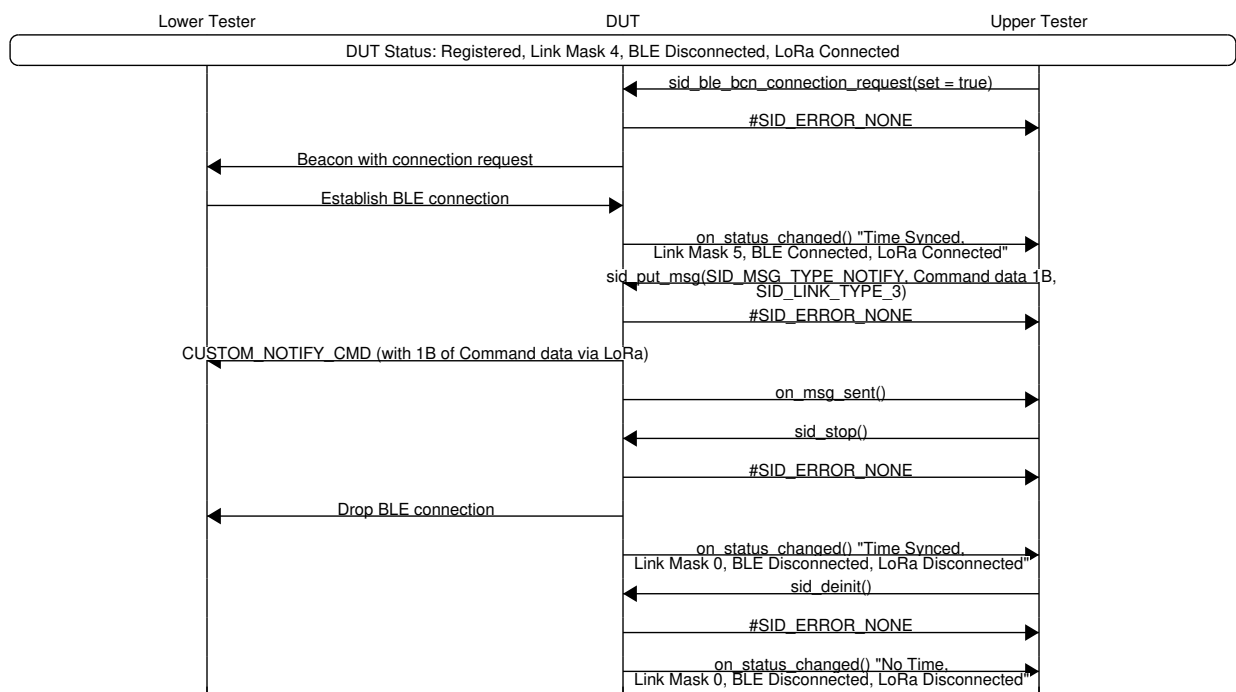
6.7.1 Test Purpose

To verify that DUT sends uplink packet through LoRa when Multi-radio (BLE + LORA) is initialized, the send_link is set to SID_LINK_TYPE_3 (LoRa) and there is an active BLE connection.

6.7.2 Initial Conditions

- DUT is registered with Amazon Sidewalk network.
- Lower Tester operates in BLE + LoRa mode.
- SidewalkNetworkFlag is enabled on the Lower Tester.
- The Sidewalk stack (BLE + LoRa) is initialized and started on the DUT.
- DUT has completed the time synchronization.

6.7.3 Test Procedure



6.7.4 Expected Results

6.7.4.1 Pass Verdict

When the Sidewalk multi-radio stack (BLE + LoRa) initialized, the link type is set to `SID_LINK_TYPE_3` (LoRa) and both BLE and LoRa are connected, the DUT should use LoRa to send any uplink packet.

The `CUSTOM_NOTIFY_CMD` packet should be verified on the Lower Tester side against the technology in which it was received (LoRa).

6.8 MULTI/EP/CONN/SEND/LINK/BV/04: Uplink performed through LoRa, when send_link 0 and terminated BT connection.

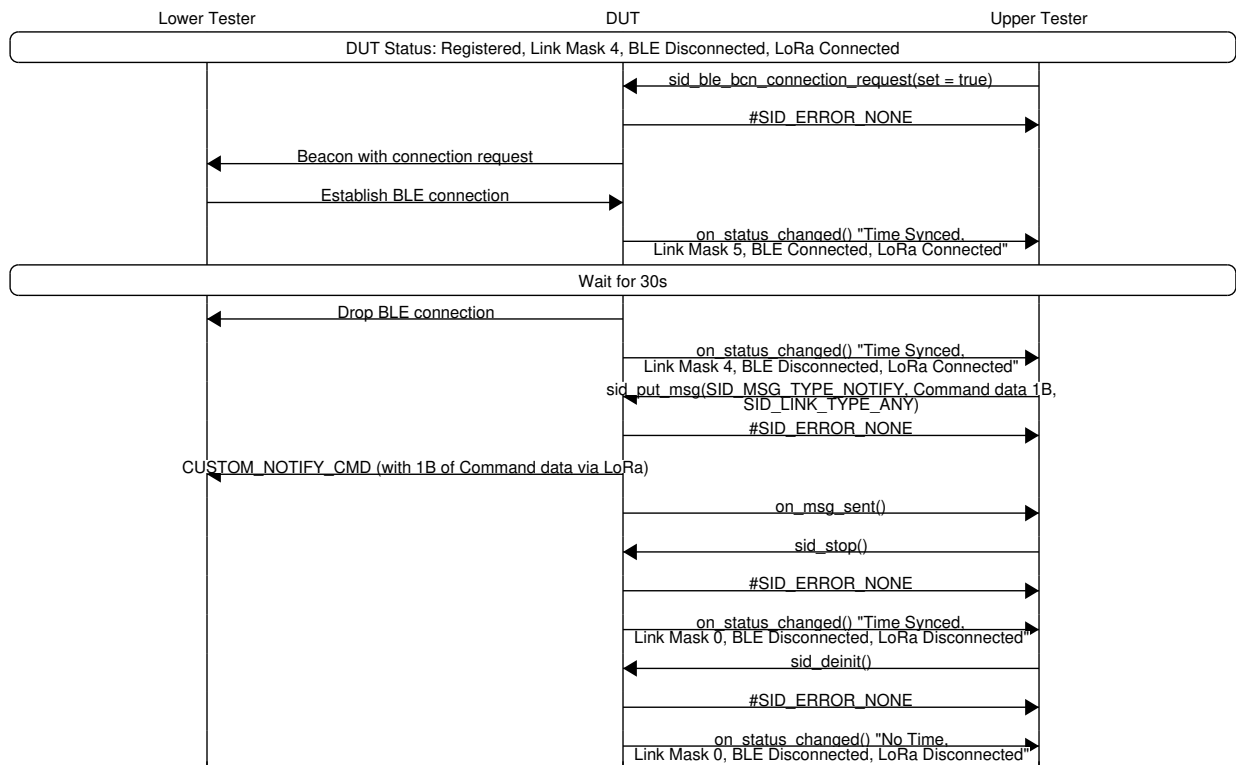
6.8.1 Test Purpose

To verify that DUT sends uplink packet through LoRa when Multi-radio (BLE + LORA) is initialized, the send_link is set to SID_LINK_TYPE_ANY and the BLE is disconnected.

6.8.2 Initial Conditions

- DUT is registered with Amazon Sidewalk network.
- Lower Tester operates in BLE + LoRa mode.
- SidewalkNetworkFlag is enabled on the Lower Tester.
- The Sidewalk stack (BLE + LoRa) is initialized and started on the DUT.
- DUT has completed the time synchronization.

6.8.3 Test Procedure



6.8.4 Expected Results

6.8.4.1 Pass Verdict

When the Sidewalk multi-radio stack (BLE + LoRa) initialized, the link type is set to `SID_LINK_TYPE_ANY`, BLE is terminated but LoRa is connected, the DUT should use LoRa to send any uplink packet.

The `CUSTOM_NOTIFY_CMD` packet should be verified on the Lower Tester side against the technology in which it was received (LoRa).

6.9 MULTI/EP/CONN/SEND/LINK/BV/05: Uplink not performed, when send_link 1 and terminated BT connection.

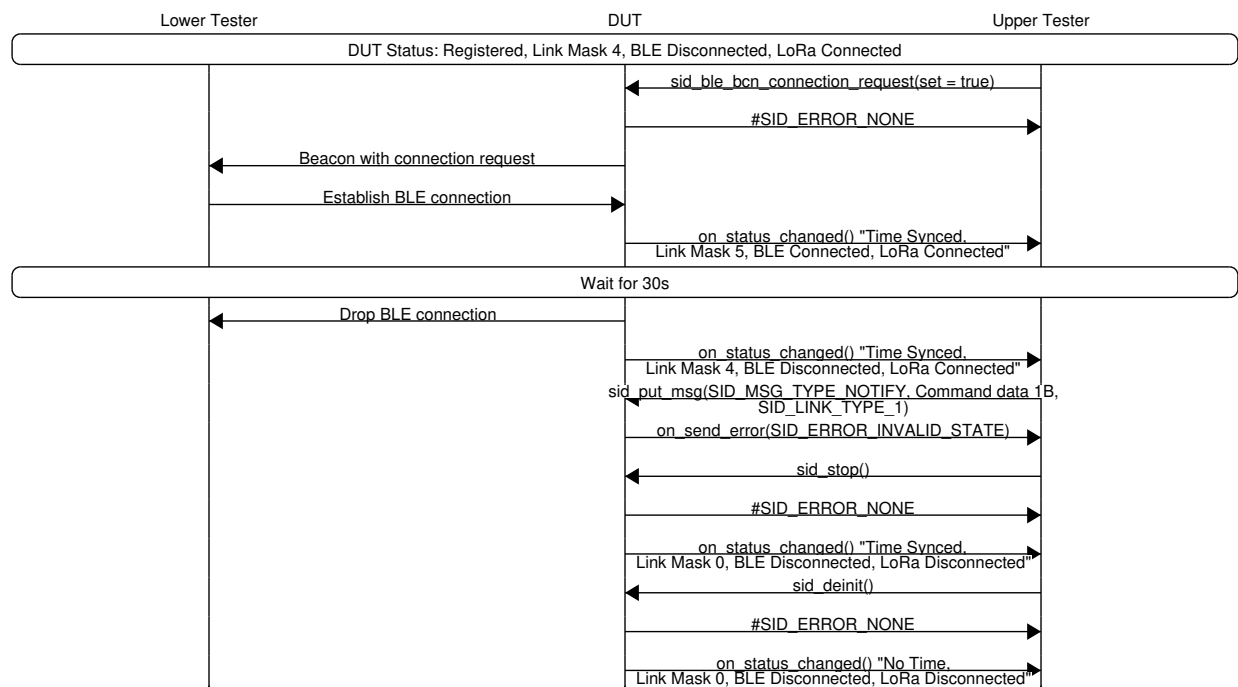
6.9.1 Test Purpose

To verify that DUT does not send uplink packet when Multi-radio (BLE + LORA) is initialized, the `send_link` is set to `SID_LINK_TYPE_1` (BLE) and the BLE is disconnected.

6.9.2 Initial Conditions

- DUT is registered with Amazon Sidewalk network.
- Lower Tester operates in BLE + LoRa mode.
- SidewalkNetworkFlag is enabled on the Lower Tester.
- The Sidewalk stack (BLE + LoRa) is initialized and started on the DUT.
- DUT has completed the time synchronization.

6.9.3 Test Procedure



6.9.4 Expected Results

6.9.4.1 Pass Verdict

When the Sidewalk multi-radio stack (BLE + LoRa) initialized, the link type is set to `SID_LINK_TYPE_1` (BLE) but BLE connection is terminated, then it should not be possible to send any uplink packet. The DUT should return an appropriate error indicating that the requested stack is in the invalid state.

Additional verification should be done on the Lower Tester side to make sure that no packet has been received.

Chapter 7

Change History

Version	Summary of Changes
Protocol Stack 1.0, Document Revision A	First release of specification.
Protocol Stack 1.0, Document Revision A.1	Expanded Introduction section to provide background on tester roles. Corrected test case IDs to use slash separators. Layout changes to message sequence charts.