BACnet® TESTING LABORATORIES
ADDENDA

Addendum fix2 to
BTL Test Package 23.3

Revision v1
Revised 3/11/2024

Approved by the BTL Working Group on March 7, 2024;
Approved by the BTL Working Group Voting Members on March 27, 2024;;
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[This foreword and the "Overview" on the following pages are not part of this Test Package. They are merely informative and do not contain requirements necessary for conformance to the Test Package.]

FOREWORD

The purpose of this addendum is to present current changes being made to the BTL Test Package. These modifications are the result of change proposals made pursuant to the continuous maintenance procedures and of deliberations within the BTL-WG Committee. The changes are summarized below.

In the following document, language to be added to existing clauses within the BTL Test Package 23.3 is indicated through the use of *italics*, while deletions are indicated by ~~strikethrough~~. Where entirely new subclauses are proposed to be added, plain type is used throughout.

In contrast, changes to BTL Specified Tests also contain a <mark>yellow</mark> highlight to indicate the changes made by this addendum. When this addendum is applied, all highlighting will be removed. Change markings on tests will remain to indicate the difference between the new test and an existing 135.1 test. If a test being modified has never existed in 135.1, the applied result should not contain any change markings. When this is the case, square brackets will be used to describe the changes required for this test.

Each addendum can stand independently unless specifically noted via dependency within the addendum. If multiple addenda change the same test or section, each future released addendum that changes the same test or section will note in square brackets whether or not those changes are reflected.

BTL-23.3 fix2-1: Fix SC Malformed BVLC Tests [BTLWG-1409, CR-0548, CR-0556]

Overview:

BTL-CR-0548 pointed out some inaccuracies with the current version test 14.YY.1.2.2 when the test is executed for the various operating modes of the IUT (Hub, Node, or Direct Connection). Another issue arises from the fact that this test is defined in the Basic Nodes portion of BTL Specified Tests and this section has a defined architecture that only applies to Basic Nodes tests.

Changes:

Checklist Changes

None

Test Plan Changes

[In BTL Test Plan, modify the entry in Section 9.9.2]

9.9.2 Is Able to Operate as a Node Without a Local Hub Function

The IUT supports operating as a node without a local hub function enabled.

...		
~~135.1-2023~~BTL - 12.5.1.2.2 - Malformed BVLC Test for Nodes without Hub Function		
	Test Conditionality	Must be executed.
	Test Directives	~~Apply the test with the IUT configured as a basic node connected to the TD as the primary hub~~.
	Testing Hints	
~~135.1-2023 - 12.5.1.2.3 - Discard BVLC with Wrong Address Test~~		
	~~Test Conditionality~~	~~Must be executed.~~
	~~Test Directives~~	
	~~Testing Hints~~	
...		

[In BTL Test Plan, modify the entry in Section 9.9.3]

9.9.3 Is Able to Operate as a Hub

The IUT is able to operate as a hub (contains a hub function).

...		
~~135.1-2023 - 12.5.1.2.2 - Malformed BVLC Test~~ BTL - 12.5.2.2.X - Malformed BVLC Test for Nodes operating as a Hub		
	Test Conditionality	Must be executed.
	Test Directives	~~Apply the test with the IUT configured as a basic node connected to the TD as the primary hub~~.
	Testing Hints	
...		

[In BTL Test Plan, modify the entry in Section 9.9.4 (…Operate as a Node without Hub Function…]

9.9.4 Is Supports Direct Connections

The IUT supports direct connections.

...	
~~135.1-2023 - 12.5.1.2.2 - Malformed BVLC Test~~ BTL - 12.5.3.1.2.X - Malformed BVLC Test for Nodes with a Direct Connection	

~~Test Conditionality~~	~~Must be executed.~~	
~~Test Directives~~	~~Apply the test with the IUT configured as a basic node connected to the TD as the primary hub.~~	
~~Testing Hints~~		
~~135.1-2023 - 12.5.1.2.3 - Discard BVLC with Wrong Address Test~~		
~~Test Conditionality~~	~~Must be executed.~~	
~~Test Directives~~	~~Apply the test with the IUT connected to the TD via a direct connection.~~	
~~Testing Hints~~		
...		

Specified Test Changes

[Move 12.5.1.2.2 from 135.1-2023 to BTL Specified Tests and modify as noted.]

12.5.1.2.2 Malformed BVLC Test ==*for Nodes without Hub Function*==

==Reason for Change: Changed test to be exclusively for devices without an active Hub Function. Also corrected/removed some of the negative tests.==

Purpose: Verify the device NAKs malformed / unknown unicast BVLC and ignores malformed / unknown broadcast BVLC ==*when operating as a Node without an active hub function*==.

Test Concept: With the IUT connected to the BACnet/SC network, send a sequence of malformed unicast and broadcast BVLCs to the IUT. Verify that the IUT responds ==*as required*== ~~with an appropriate NAK~~ to each ==*message*== ~~unicast one~~ and does not process nor route the messages.

Configuration Requirements: The IUT is connected to the BACnet/SC network as a node ~~or hub~~. ==*The TD is the active hub for the BACnet/SC network.*==

Test Steps:

-- ~~Invalid~~==*Unknown*== BVLC function
1. TRANSMIT
    'BVLC Function' =   (IV: an ~~invalid~~==*unknown*== 1-octet value),
    'Message ID' =   (M1: any valid value),
    ==*'Originating Virtual Address' =   D3,*==
    ==~~'Originating Virtual Address' absent~~==
    -- 'Destination Virtual Address' absent
    -- 'Destination Options' absent
    -- 'Data Options' absent
2. RECEIVE BVLC-Result,
    'Message ID' =   M1,
    -- 'Originating Virtual Address' absent
    ==*'Destination Virtual Address' =   D3*==
    ==~~'Destination Virtual Address' absent~~==
    'Destination Options' =   (absent or a valid list of options),
    -- 'Data Options' absent
    'Result for BVLC Function' =   IV,-- the supplied ~~invalid~~==*unknown*== BVLC function from the request
    'Result Code' =   X'01',   -- NAK
    'Error Header Marker' =   X'00',   -- not a header option problem
    'Error Class' =   COMMUNICATION,
    'Error Code' =   BVLC_FUNCTION_UNKNOWN
3. CHECK(that the IUT did not process nor forward the request)

-- Inclusion of an Originating Virtual Address when it is required to be absent
4. TRANSMIT Disconnect-Request,

      'Message ID' =   (M2: any valid value),
      'Originating Virtual Address' =   D3, *-- error condition, required to be absent*
      -- 'Destination Virtual Address' absent
      'Destination Options' =   (absent or a valid list of options),
      -- 'Data Options' absent

5.   IF (receive a message) THEN
      RECEIVE BVLC-Result,
         'Message ID' =   M2,
         -- 'Originating Virtual Address' absent
         -- If this message is interpreted as an invalid Disconnect-Request from D3, the DVA = D3.
         -- If this message is interpreted as an invalid OVA, the DVA is be absent.
         'Destination Virtual Address' = ~~D3~~*(D3 or absent)*
         'Destination Options' =   (absent or a valid list of options),
         -- 'Data Options' absent
         'Result for BVLC Function' = X'08',   -- Disconnect-Request
         'Result Code' =   X'01',   -- NAK
         'Error Header Marker' =   X'00',   -- not a header option problem
         'Error Class' =   (COMMUNICATION ~~or SERVICES~~),
         'Error Code' =   (HEADER_ENCODING_ERROR,
                     ~~INCONSISTENT_PARAMETER,~~
                     INCONSISTENT_PARAMETERS,
                     PARAMETER_OUT_OF_RANGE or OTHER)

6.   CHECK(that the IUT did not process the request)

-- Inclusion of a 'Destination Virtual Address when it is required to be absent
7.   TRANSMIT Disconnect-Request,
         'Message ID' =   (M3: any valid value),
         -- 'Originating Virtual Address' absent,
         'Destination Virtual Address' =   *(any non-broadcast VMAC), -- error condition, required to be absent* ~~(IUT's VMAC),~~
         'Destination Options' =   (absent or a valid list of options),
         -- 'Data Options' absent
8.   IF (receive a message) THEN
      RECEIVE BVLC-Result,
         'Message ID' =   M3,
         -- 'Originating Virtual Address' absent
         -- 'Destination Virtual Address' absent
         'Destination Options' =   (absent or a valid list of options),
         -- 'Data Options' absent
         'Result for BVLC Function' = X'08',   -- Disconnect-Request
         'Result Code' =   X'01',   -- NAK
         'Error Header Marker' =   X'00',   -- not a header option problem
         'Error Class' =   (COMMUNICATION ~~or SERVICES~~),
         'Error Code' =   (HEADER_ENCODING_ERROR,
                     ~~INCONSISTENT_PARAMETER~~
                     INCONSISTENT_PARAMETERS,
                     PARAMETER_OUT_OF_RANGE or OTHER)
9.   CHECK(that the IUT did not process the request)

-- A truncated message
10. TRANSMIT Encapsulated-NPDU,
         'Message ID' =   (M4: any valid value),
         'Originating Virtual Address' =   ~~(OVA: absent, or D3 if IUT is configured as a hub),~~
         ~~'Destination Virtual Address' =   (IUT's VMAC),~~
         -- *'Destination Virtual Address' absent*
         -- 'Destination Options' absent
         -- 'Data Options' absent
         -- no NPDU included in the message
11. RECEIVE BVLC-Result,
         'Message ID' =   M4,

```
                -- 'Originating Virtual Address' absent
                'Destination Virtual Address' =      ~~OVA~~: D3,
                'Destination Options' =              (absent or a valid list of options),
                -- 'Data Options' absent
                'Result for BVLC Function' =         X'01',    -- Encapsulated-NPDU
                'Result Code' =                      X'01',    -- NAK
                'Error Header Marker' =              X'00',    -- not a header option problem
                'Error Class' =                      COMMUNICATION,
                'Error Code' =                       MESSAGE_INCOMPLETE | PAYLOAD_EXPECTED
```
12. CHECK(that the IUT did not process the request)

-- A message with extra octets added on
13. TRANSMIT Disconnect-Request,
```
                'Message ID' =                       (M5: any valid value),
                -- 'Originating Virtual Address' absent
                -- 'Destination Virtual Address' absent
                -- 'Destination Options' absent
                -- 'Data Options' absent
                (extra octets) =                     ({ X'C1',     --a bunch of octets that look like valid data options.
                                                     X'BF0003000012',
                                                     X'3F0003000034'})
```
14. RECEIVE BVLC-Result,
```
                'Message ID' =                       M5,
                -- 'Originating Virtual Address' absent
                -- 'Destination Virtual Address' absent
                'Destination Options' =              (absent or a valid list of options),
                -- 'Data Options' absent
                'Result for BVLC Function' =         X'08',    -- Disconnect-Request
                'Result Code' =                      X'01',    -- NAK
                'Error Header Marker' =              X'00',    -- not a header option problem
                'Error Class' =                      COMMUNICATION,
                'Error Code' =                       UNEXPECTED_DATA
```
15. CHECK(that the IUT did not process the request)

~~-- A truncated broadcast message~~
~~16. TRANSMIT Encapsulated-NPDU,~~
~~   DESTINATION =   GLOBAL_BROADCAST,~~
~~   'Message ID' =   (M6: any valid value),~~
~~   'Originating Virtual Address' absent,~~
~~   'Originating Virtual Address' = (D3)~~
~~   'Destination Virtual Address' = (local broadcast VMAC),~~
~~   'Destination Options' absent~~
~~   'Data Options' =   ({ X'E1'   Secure Path,~~
~~   more follows (but none are present)~~
~~   })~~
~~17. CHECK(that the IUT does not send a BVLC-Result, did not process the message, nor route the message)~~

[Remove 12.5.1.2.3]

12.5.1.2.3 Discard BVLC with Wrong Address Test

Purpose: To verify that BVLCs with an incorrect VMAC are dropped.

Test Concept: With the IUT connected to the BACnet/SC network, send a ReadProperty to the IUT in an invalid BVLC message with a BVLC Destination Address that does not match the IUT. Verify that the IUT does not respond with a BVLC NAK nor with a ReadProperty-ACK.

Test Steps:

1. TRANSMIT Encapsulated-NPDU,

'Message ID' =   (M1: any valid value),
-- 'Originating Virtual Address'   (absent or any valid VMAC)
'Destination Virtual Address' =   (any non-broadcast VMAC other than the IUT's),
-- 'Destination Options' absent
'Data Options' = ({X'41'}), -- Secure Path
'BACnet NPDU' =
 ReadProperty-Request,
 'Object Identifier' =   (O: any object in the IUT),
 'Property Identifier' = Object_Name
2. CHECK(that the IUT does not response with a BVLC-Result nor a ReadProperty-ACK)

[In BTL Specified Tests, add new test]

12.5.2.2.X - Malformed BVLC Test for Nodes operating as a Hub

Reason for Change: Test broken out from original test 12.5.1.2.2.

Purpose: Verify the device NAKs malformed / unknown unicast BVLCs and ignores malformed / unknown broadcast BVLCs when operating as a Node with an active hub function.

Test Concept: With the IUT connected to the BACnet/SC network and operating as the active hub, send a sequence of malformed unicast and broadcast BVLCs to the IUT. Verify that the IUT responds as required to each message and does not process nor route the messages.

Configuration Requirements: The IUT is connected to the BACnet/SC network and is operating as the active hub. The TD is connected to the BACnet/SC network as a node.

Test Steps:

-- Unknown BVLC function
1. TRANSMIT
 'BVLC Function' =   (IV: an unknown 1-octet value),
 'Message ID' =   (M1: any valid value),
 -- 'Originating Virtual Address' absent
 -- 'Destination Virtual Address' absent
 -- 'Destination Options' absent
 -- 'Data Options' absent
2. RECEIVE BVLC-Result,
 'Message ID' =   M1,
 -- 'Originating Virtual Address' absent
 -- 'Destination Virtual Address' absent
 'Destination Options' = (absent or a valid list of options),
 -- 'Data Options' absent
 'Result for BVLC Function' = IV,-- the supplied unknown BVLC function from the request
 'Result Code' = X'01', -- NAK
 'Error Header Marker' = X'00', -- not a header option problem
 'Error Class' =   COMMUNICATION,
 'Error Code' =   BVLC_FUNCTION_UNKNOWN
3. CHECK(that the IUT did not process nor forward the request)

-- Inclusion of an Originating Virtual Address when it is required to be absent
4. TRANSMIT Disconnect-Request,
 'Message ID' =   (M2: any valid value),
 'Originating Virtual Address' = D3, -- error condition, required to be absent
 -- 'Destination Virtual Address' absent
 'Destination Options' = (absent or a valid list of options),
 -- 'Data Options' absent
5. IF (receive a message) THEN
 RECEIVE BVLC-Result,
  'Message ID' = M2,

        -- 'Originating Virtual Address' absent
        -- A valid message from a hub requires DVA to be absent
        -- 'Destination Virtual Address' absent

'Destination Options' =	(absent or a valid list of options),
-- 'Data Options' absent	
'Result for BVLC Function' =	X'08', -- Disconnect-Request
'Result Code' =	X'01', -- NAK
'Error Header Marker' =	X'00', -- not a header option problem
'Error Class' =	(COMMUNICATION),
'Error Code' =	(HEADER_ENCODING_ERROR,
	INCONSISTENT_PARAMETERS,
	PARAMETER_OUT_OF_RANGE or OTHER)

6.   CHECK(that the IUT did not process the request)

-- Inclusion of a 'Destination Virtual Address when it is required to be absent
7.   TRANSMIT Disconnect-Request,

'Message ID' =	(M3: any valid value),
-- 'Originating Virtual Address' absent,	
'Destination Virtual Address' =	(IUT's VMAC), -- error condition, required to be absent
'Destination Options' =	(absent or a valid list of options),
-- 'Data Options' absent	

8.   IF (receive a message) THEN
        RECEIVE BVLC-Result,

'Message ID' =	M3,
-- 'Originating Virtual Address' absent	
-- 'Destination Virtual Address' absent	
'Destination Options' =	(absent or a valid list of options),
-- 'Data Options' absent	
'Result for BVLC Function' =	X'08', -- Disconnect-Request
'Result Code' =	X'01', -- NAK
'Error Header Marker' =	X'00', -- not a header option problem
'Error Class' =	(COMMUNICATION),
'Error Code' =	(HEADER_ENCODING_ERROR,
	INCONSISTENT_PARAMETERS,
	PARAMETER_OUT_OF_RANGE or OTHER)

9.   CHECK(that the IUT did not process the request)

-- A truncated message
10. TRANSMIT Encapsulated-NPDU,

'Message ID' =	(M4: any valid value),
--'Originating Virtual Address' absent	
-- 'Destination Virtual Address' absent,	
-- 'Destination Options' absent	
-- 'Data Options' absent	
-- no NPDU included in the message	

11. RECEIVE BVLC-Result,

'Message ID' =	M4,
-- 'Originating Virtual Address' absent	
-- 'Destination Virtual Address' absent	
'Destination Options' =	(absent or a valid list of options),
-- 'Data Options' absent	
'Result for BVLC Function' =	X'01', -- Encapsulated-NPDU
'Result Code' =	X'01', -- NAK
'Error Header Marker' =	X'00', -- not a header option problem
'Error Class' =	COMMUNICATION,
'Error Code' =	MESSAGE_INCOMPLETE | PAYLOAD_EXPECTED

12. CHECK(that the IUT did not process the request)

-- A message with extra octets added on
13. TRANSMIT Disconnect-Request,

'Message ID' =   (M5: any valid value),
-- 'Originating Virtual Address' absent
-- 'Destination Virtual Address' absent
-- 'Destination Options' absent
-- 'Data Options' absent
(extra octets) =   ({ X'C1',   --a bunch of octets that look like valid data options.
                                                 X'BF0003000012',
                                                 X'3F0003000034'})

14. RECEIVE BVLC-Result,
      'Message ID' =   M5,
      -- 'Originating Virtual Address' absent
      -- 'Destination Virtual Address' absent
      'Destination Options' =   (absent or a valid list of options),
      -- 'Data Options' absent
      'Result for BVLC Function' =   X'08',   -- Disconnect-Request
      'Result Code' =   X'01',   -- NAK
      'Error Header Marker' =   X'00',   -- not a header option problem
      'Error Class' =   COMMUNICATION,
      'Error Code' =   UNEXPECTED_DATA

15. CHECK(that the IUT did not process the request)

-- A truncated broadcast message
16. TRANSMIT Encapsulated-NPDU,
      DESTINATION =   GLOBAL_BROADCAST,
      'Message ID' =   (M6: any valid value),
      -- 'Originating Virtual Address' absent,
      'Destination Virtual Address' =   (local broadcast VMAC),
      -- 'Destination Options' absent
      'Data Options' =   ({ X'E1' -- Secure Path,
                                                 more follows (but none are present)
                                                 })

17. CHECK(that the IUT does not send a BVLC-Result, did not process the message, nor route the message)

[In BTL Specified Tests, add new test]

12.5.3.1.2.X - Malformed BVLC Test for Nodes with a Direct Connection

Reason for Changes: Test broken out from original 12.5.1.2.2.

Purpose: Verify the device NAKs malformed / unknown unicast BVLC and ignores malformed / unknown broadcast BVLC when it has a direct connection with the TD.

Test Concept: With the IUT connected to the BACnet/SC network, the TD sends a sequence of malformed unicast and broadcast BVLCs to the IUT. Verify that the IUT responds as required to each message and does not process nor route the messages.

Configuration Requirements: The IUT has a direct connection established with the TD.

Test Steps:

-- Unknown BVLC function
1. TRANSMIT
      'BVLC Function' =   (IV: an unknown 1-octet value),
      'Message ID' =   (M1: any valid value),
      -- 'Originating Virtual Address' absent
      -- 'Destination Virtual Address' absent
      -- 'Destination Options' absent
      -- 'Data Options' absent
2. RECEIVE BVLC-Result,
      'Message ID' =   M1,
      -- 'Originating Virtual Address' absent
      -- 'Destination Virtual Address' absent

'Destination Options' =   (absent or a valid list of options),
-- 'Data Options' absent
'Result for BVLC Function' =   IV,-- the supplied unknown BVLC function from the request
'Result Code' =   X'01',   -- NAK
'Error Header Marker' =   X'00',   -- not a header option problem
'Error Class' =   COMMUNICATION,
'Error Code' =   BVLC_FUNCTION_UNKNOWN
3. CHECK(that the IUT did not process nor forward the request)

-- Inclusion of an Originating Virtual Address when it is required to be absent
4. TRANSMIT Disconnect-Request,
            'Message ID' =   (M2: any valid value),
            'Originating Virtual Address' =   TD's VMAC, -- error condition, required to be absent
            -- 'Destination Virtual Address' absent
            'Destination Options' =   (absent or a valid list of options),
            -- 'Data Options' absent
5. IF (receive a message) THEN
            RECEIVE BVLC-Result,
                'Message ID' =   M2,
                -- 'Originating Virtual Address' absent
                -- A valid message with Direct Connect requires DVA to be absent
                -- 'Destination Virtual Address' absent
                'Destination Options' =   (absent or a valid list of options),
                -- 'Data Options' absent
                'Result for BVLC Function' =   X'08',   -- Disconnect-Request
                'Result Code' =   X'01',   -- NAK
                'Error Header Marker' =   X'00',   -- not a header option problem
                'Error Class' =   (COMMUNICATION),
                'Error Code' =   (HEADER_ENCODING_ERROR,
                                                INCONSISTENT_PARAMETERS,
                                                PARAMETER_OUT_OF_RANGE or OTHER)
6. CHECK(that the IUT did not process the request)

-- Inclusion of a 'Destination Virtual Address when it is required to be absent
7. TRANSMIT Disconnect-Request,
            'Message ID' =   (M3: any valid value),
            -- 'Originating Virtual Address' absent,
            'Destination Virtual Address' =   (IUT's VMAC), -- error condition, required to be absent
            'Destination Options' =   (absent or a valid list of options),
            -- 'Data Options' absent
8. IF (receive a message) THEN
            RECEIVE BVLC-Result,
                'Message ID' =   M3,
                -- 'Originating Virtual Address' absent
                -- 'Destination Virtual Address' absent
                'Destination Options' =   (absent or a valid list of options),
                -- 'Data Options' absent
                'Result for BVLC Function' =   X'08',   -- Disconnect-Request
                'Result Code' =   X'01',   -- NAK
                'Error Header Marker' =   X'00',   -- not a header option problem
                'Error Class' =   (COMMUNICATION),
                'Error Code' =   (HEADER_ENCODING_ERROR,
                                                INCONSISTENT_PARAMETERS,
                                                PARAMETER_OUT_OF_RANGE or OTHER)
9. CHECK(that the IUT did not process the request)

-- A truncated message
10. TRANSMIT Encapsulated-NPDU,
            'Message ID' =   (M4: any valid value),
            -- 'Originating Virtual Address' absent

```
          -- 'Destination Virtual Address' absent
          -- 'Destination Options' absent
          'Data Options' =                    ({X'41'}), -- Secure Path
          -- no NPDU included in the message
11.  RECEIVE BVLC-Result,
          'Message ID' =                      M4,
          -- 'Originating Virtual Address' absent
          -- 'Destination Virtual Address' absent
          -- 'Data Options' absent
          'Result for BVLC Function' =        X'01',    -- Encapsulated-NPDU
          'Result Code' =                     X'01',    -- NAK
          'Error Header Marker' =             X'00',    -- not a header option problem
          'Error Class' =                     COMMUNICATION,
          'Error Code' =                      MESSAGE_INCOMPLETE | PAYLOAD_EXPECTED
12.  CHECK(that the IUT did not process the request)


-- A message with extra octets added on
13.  TRANSMIT Disconnect-Request,
          'Message ID' =                      (M5: any valid value),
          -- 'Originating Virtual Address' absent
          -- 'Destination Virtual Address' absent
          -- 'Destination Options' absent
          -- 'Data Options' absent
          (extra octets) =                    ({ X'C1',     --a bunch of octets that look like valid data options.
                                              X'BF0003000012',
                                              X'3F0003000034'})
14.  RECEIVE BVLC-Result,
          'Message ID' =                      M5,
          -- 'Originating Virtual Address' absent
          -- 'Destination Virtual Address' absent
          'Destination Options' =             (absent or a valid list of options),
          -- 'Data Options' absent
          'Result for BVLC Function' =        X'08',    -- Disconnect-Request
          'Result Code' =                     X'01',    -- NAK
          'Error Header Marker' =             X'00',    -- not a header option problem
          'Error Class' =                     COMMUNICATION,
          'Error Code' =                      UNEXPECTED_DATA
15.  CHECK(that the IUT did not process the request)
```