University of New Hampshire InterOperability Laboratory
Ethernet in the First Mile Consortium

Superseded

As of December 15, 2004 the Ethernet in the First Mile Clause 57 OAM Conformance Test Suite version 0.9 has been superseded by the release of the Clause 57 OAM Conformance Test Suite version 0.9.1. This document along with earlier versions, are available on the EFM Consortium test suite archive page.

Please refer to the following site for both current and superseded test suites:

http://www.iol.unh.edu/testsuites/efm/

EFM

THE ETHERNET IN THE FIRST MILE

Clause 57 OAM Conformance Test Suite v0.9

Technical Document

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March 01, 2004   Version 0.3 of OAM Test Suite Released
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Al Braga	University of New Hampshire InterOperability Laboratory
Eric Lynskey	University of New Hampshire InterOperability Laboratory
Ian Berry	University of New Hampshire InterOperability Laboratory

INTRODUCTION

Overview
The University of New Hampshire InterOperability Laboratory (UNH-IOL) is an institution designed to improve the interoperability of standards based products by providing an environment where a product can be tested against other implementations of a standard. This suite of tests has been developed to help implementers evaluate the functioning of their Clause 57 Operations, Administration, and Maintenance (OAM) based products. The tests do not determine if a product conforms to IEEE Std. 802.3ah-2004, nor are they purely interoperability tests. Rather, they provide one method to isolate problems within an OAM device. Successful completion of all tests contained in this suite does not guarantee that the tested device will operate with other devices. However, combined with satisfactory operation in the UNH-IOL interoperability test bed, these tests provide a reasonable level of confidence that the Device Under Test (DUT) will function well in most environments.

Organization of Tests
The tests contained in this document are organized to simplify the identification of information related to a test and to facilitate in the actual testing process. Each test contains an identification section that describes the test and provides cross-reference information. The discussion section covers background information and specifies why the test is to be performed. Tests are grouped by similar functions and further organized by technology. Each test contains the following information:

Test Number
The Test Number associated with each test follows a simple grouping structure. Listed first is the Test Group Number followed by the test's number within the group. This allows for the addition of future tests to the appropriate groups of the test suite without requiring the renumbering of the subsequent tests.

Purpose
The purpose is a brief statement outlining what the test attempts to achieve. The test is written at the functional level.

References
The references section lists cross-references to IEEE 802.3 standards and other documentation that might be helpful in understanding and evaluating the test and results.

Resource Requirements
The requirements section specifies the hardware, and test equipment that will be needed to perform the test. The items contained in this section are special test devices or other facilities, which may not be available on all devices.

Last Modification
This specifies the date of the last modification to this test.

Discussion
The discussion covers the assumptions made in the design or implementation of the test as well as known limitations. Other items specific to the test are covered here.

Test Setup
The setup section describes the configuration of the test environment. Small changes in the configuration should be included in the test procedure.

Procedure

The procedure section of the test description contains the step-by-step instructions for carrying out the test. It provides a cookbook approach to testing, and may be interspersed with observable results.

Observable Results

The observable results section lists specific items that can be examined by the tester to verify that the DUT is operating properly. When multiple values are possible for an observable result, this section provides a short discussion on how to interpret them. The determination of a pass or fail for a certain test is often based on the successful (or unsuccessful) detection of a certain observable result.

Possible Problems

This section contains a description of known issues with the test procedure, which may affect test results in certain situations.

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GROUP 1: OAMPDU Reception

Scope: The following tests cover OAM operations specific to the reception of OAMPDUs.

Overview: These tests are designed to verify that the device under test properly receives valid frames and discards frames with errors and reports these errors if possible. The OAM functions explored are defined in Clause 57 of IEEE Std. 802.3ah-2004.

Test 57.1.1 – OAMPDUs with FCS Errors

Purpose: To verify that the DUT detects frames with frame check sequence (FCS) errors.

References:
    [1]   IEEE Std. 802.3-2002 – subclauses 3.2.8, 4.2.3.1.2, 4.2.4.1.2

Resource Requirements:
- A testing station capable of both transmitting frames with arbitrary values in the FCS field and monitoring traffic from the DUT.

Last Modification: November 01, 2004

Discussion: Both transmit and receive algorithms of the MAC use a CRC to detect any errors generated during the transmission of the frame. The FCS field contains a 4-octet (32-bit) CRC value generated by the transmit algorithm. This value is computed as a function of the contents of the Destination Address, Source Address, Length/Type, Data and Pad (that is, all fields except the preamble, SFD, and FCS). The receiving MAC collects bits from the reconciliation layer or the PLS layer. One of the receiving MAC functions is to check for invalid MAC frames by checking the Frame Check Sequence (FCS) field. It does so by computing the 32-bit CRC of the received frame and comparing it to the received 32-bit CRC in the FCS field. In case of a mismatch, it should reject the frame.

Test Setup: Connect the DUT to the pattern generator and monitor ports of the testing station using the appropriate medium.

Procedure:
1. The testing station is instructed to transmit an OAMPDU with an incorrect 32-bit CRC value in the FCS field. This frame should be preceded and followed by a valid frame separated by at least minimum interFrameGap.

Observable Results:
    a.   The DUT should detect and discard the OAMPDU with an incorrect value in the FCS field, and, if clause 30 is implemented, log a FCS error.
    b.   The reception of OAMPDUs with FCS error should not affect the reception of valid frames.

Possible Problems: None.

Test 57.1.2 – Invalid OAMPDU Formats

Purpose: To verify that the DUT detects and discards invalid OAMPDUs.

References:
   [1]   IEEE Std. 802.3ah-2004 – subclauses 57.2.2, 57.4.2
   [2]   IEEE 802.3, 2002 Edition – subclauses 3.2.3, 3.2.6, 3.2.8 and 3.4

Resource Requirements:
   - A testing station capable of transmitting and monitoring traffic to and from the DUT.

Last Modification: November 01, 2004

Discussion: When a slow protocol frame indicating the OAM function, henceforth referred to as an OAMPDU, is received, the OAM sublayer checks the Destination Address field. If the address is the reserved multicast address for slow protocol transactions (01-80-C2-00-00-02), the OAMPDU is processed.

The OAM sublayer then parses the frame and determines if it is a slow protocol frame, that is, if the two-octet Length/Type field is 88-09. If the Length/Type field is not 0x8809, the OAM sublayer passes the frame up to the MAC client.

If a slow protocol frame is received, the OAM sublayer continues to parse the frame in order to determine the Subtype. The Subtype is a single octet field that indicates the slow protocol function; if it reads 0x03, then the function is OAM.

Furthermore OAMPDUs are basic frames and are not tagged. This includes but is not limited to QTag Prefix tagging.

Thus the OAM sublayer will only act on untagged OAMPDUs that have a Length/Type field equal to 0x8809, a Subtype of 0x03, and the reserved multicast address for slow protocol transactions.

Test Setup: Connect the DUT to the pattern generator and monitor ports of the testing station using the appropriate medium.

Procedure:

Test Frame	Description
1	Properly encapsulated OAMPDU with a Destination Address that is not the multicast address (01-80-C2-00-00-02).
2	Properly encapsulated OAMPDU with the unicast Destination Address of the DUT.
3	Properly encapsulated OAMPDU with the Length/Type field not set to 0x8809.
4	Properly encapsulated OAMPDU with the Subtype field not set to 0x03.
5	Properly encapsulated OAMPDU with a QTag Prefix.

   1.   The testing station is instructed to transmit Test Frame 1 from the table above. This test frame is preceded by and followed by a valid frame separated by at least minimum interFrameGap.
   2.   Step 1 is repeated for all test frames described in the table above.

Observable Results:
   a.   The DUT should detect and discard all Test Frames from the table above, and, if clause 30 is implemented, log any and all appropriate errors.
   b.   The reception of these test frames should not affect the reception of valid frames.

Possible Problems: None.

Test 57.1.3 – Fragments and Runts

Purpose: To verify that the DUT detects discards fragments and runt OAMPDUs.

References:
   [1]   IEEE Std. 802.3-2002 – subclauses 4.2.3.3 and 4.2.4.2.2, 4.2.9: process BitReceiver.

Resource Requirements:
   • A testing station capable of transmitting fragments and runts and also capable of monitoring traffic from the DUT.

Last Modification: November 01, 2004

Discussion: Although collisions do not exist in an EFM link, it is still possible that fragments may be received by the MAC should the remote transmitter be disabled, the fiber becomes disconnected, or the remote MAC have a problem such as an underrun condition. Such fragments must be dealt with accordingly and discarded by the receiving MAC.

A "runt" refers to a properly encapsulated frame that has a valid 32-bit CRC value but is less than minFrameSize (64 bytes). Despite containing a valid CRC the MAC should detect and discard these runts, as they are less than minFrameSize in length.

Test Setup: Connect the DUT to the pattern generator and monitor ports of the testing station using the appropriate medium.

Procedure:
Part A: Reception of Fragments
   1. The testing station is instructed to create a valid 64 byte Information OAMPDU test pattern, preceded by full preamble and SFD as shown below:

7	1	6	6	2	1	2	1	42	4
Preamble	SFD	DA	SA	L/T	Subtype	Flags	Code	Data/Pad	CRC

   2. The testing station is instructed to transmit the first byte of the test pattern preceded and followed by valid frames separated by at least minimum interFrameGap.
   3. Step 2 is repeated, increasing the number of transmitted bytes by one each time until the testing station has transmitted the entire test pattern.

Part B: Reception of Runts
   1. The testing station is instructed to transmit the test pattern described in Part A: step 1 with a single byte of data. This frame is preceded and followed by a valid frame separated by at least minimum interFrameGap.
   2. Repeat step 1, increasing the number of data bytes by one each time the testing station has transmitted the entire test pattern.

Observable Results:
   a. The DUT should detect and discard all received fragments, and indicate this in the statistics.
   b. The DUT should detect and discard all received runt OAMPDUs, and indicate this in the statistics.
   c. The reception of fragments and runt OAMPDUs should not affect the reception of valid frames.

Possible Problems: None

Test 57.1.4 – Minimum OAMPDU Size

Purpose: To verify that the DUT accepts OAMPDUs at least minFrameSize in length.

References:
    [1]   IEEE Std. 802.3ah-2004 – subclause 57.4.2
    [2]   IEEE Std. 802.3-2002 – subclauses 4.2.3.3 and 4.2.4.2.2, 4.2.9: process BitReceiver.

Resource Requirements:
- A testing station capable of transmitting and monitoring traffic to and from the DUT.

Last Modification: November 01, 2004

Discussion: The OAM sublayer must be capable of supporting frames of at least minFrameSize, which is currently defined as 64 bytes in length. Any OAMPDU not containing enough data to meet this requirement must then have pad added to the end of the Data/Pad field but prior to the FCS field as necessary to meet the minFrameSize requirement.

Test Setup: Connect the DUT to the pattern generator and monitor ports of the testing station using the appropriate medium.

Procedure:
1. The testing station is instructed to transmit an OAMPDU, minFrameSize in length preceded and followed by a valid frame separated by at least minimum interFrameGap.
2. Step 1 is repeated with all supported OAMPDU types.

Observable Results:
    a.   The DUT should accept OAMPDUs of minFrameSize in length.
    b.   The reception of minFrameSize OAMPDUs should not affect the reception of valid frames.

Possible Problems: None.

Test 57.1.5 – Maximum Advertised OAMPDU Size

Purpose: To verify that the DUT accepts OAMPDUs up to and including the advertised Maximum OAMPDU Size.

References:
   [1]   IEEE Std. 802.3ah-2004 – Table 57-9 – OAMPDU Configuration field

Resource Requirements:
   • A testing station capable of transmitting and monitoring traffic to and from the DUT.

Last Modification: November 01, 2004

Discussion: Each OAM client on a point-to-point link defines the Maximum OAMPDU Size, as the largest OAMPDU that OAM device is capable of receiving. When an OAM client receives the advertised Maximum OAMPDU Size from the remote OAM client, the values is compared to the local Maximum OAMPDU Size. The smaller value is then used as the maximum OAMPDU length allowed on the link.

Test Setup: Connect the DUT to the pattern generator and monitor ports of the testing station using the appropriate medium.

Procedure:
   1.   The testing station is instructed to perform the necessary steps to complete the OAM Discovery process.
   2.   The testing station is instructed to transmit an OAMPDU, minFrameSize in length, to the DUT. This frame should be preceded and followed by a valid frame separated by at least minimum interFrameGap.
   3.   Step 2 is repeated, incrementing the length of the OAMPDU by one octet, until Maximum OAMPDU Size for the link is reached.
   4.   Steps 1-3 are repeated with all supported OAMPDU types.

Observable Results:
   a.   The DUT should accept all received OAMPDUs up to and including the Maximum OAMPDU Size for the link.
   b.   The reception of OAMPDUs up to and including the Maximum OAMPDU Size for the link should not affect the reception of valid frames.

Possible Problems: None.

Test 57.1.6 – Reserved Flags with Values

Purpose: To verify that the DUT ignores values within the reserved portion of the Flags field.

References:
  [1]   IEEE Std. 802.3ah-2004 – subclauses 57.4.3, Table 57-3 – Flags field

Resource Requirements:
  • A testing station capable of transmitting and monitoring traffic to and from the DUT.

Last Modification: November 01, 2004

Discussion: When receiving a frame, the OAM sublayer of the receiving station interprets the value of the 2-octet long Flags field of all OAMPDUs. If a value other than zero is encountered in the *reserved* portion of the Flags field, the value within the reserved portion should be ignored and passed to the OAM client. This will ensure compatibility with future use of reserved bits and the OAM protocol.

Test Setup: Connect the DUT to the pattern generator and monitor ports of the testing station using the appropriate medium.

Procedure:
  1.   The testing station is instructed to transmit an OAMPDU with all reserved bits within the Flags field set high preceded and followed by a valid frame separated by at least minimum interFrameGap.
  2.   Step 1 is repeated with all supported OAMPDU types.

Observable Results:
  a.   The DUT should accept OAMPDUs with values in the reserved portion of the Flags field. The DUT should not respond differently to these OAMPDUs
  b.   The reception of OAMPDUs with values in the reserved portion of the Flags field should not affect the reception of valid frames.

Possible Problems: None.

Test 57.1.7 – Invalid Local Stable and Evaluating Flags

Purpose: To verify that the DUT properly handles the reception of invalid Local Stable and Evaluating flags.

References:
　[1]　IEEE Std. 802.3ah-2004 – subclauses 57.4.3, Table 57-3 – Flags field

Resource Requirements:
- A testing station capable of transmitting and monitoring traffic to and from the DUT.

Last Modification:　　　November 01, 2004

Discussion: All OAMPDUs contain a two-octet wide Flags field that contains among other things the current status of both the local and remote devices' OAM Discovery process. The status is transmitted in the Local Stable, Local Evaluating, Remote Stable, and Remote Evaluating flags. If the local OAM device receives an invalid Local Stable and Local Evaluating flag setting of 0x3 the value should be ignored and the device should continue operating using the last received valid flag values. The device however is still required to take these received flags and copy their values into the Remote Stable and Remote Evaluating flags.

Test Setup: Connect the DUT to the pattern generator and monitor ports of the testing station using the appropriate medium.

Test Procedure:
1. The testing station is instructed to perform the necessary steps to complete the OAM Discovery process.
2. The testing station is instructed to transmit an OAMPDU with both the Local Stable and Local Evaluating flags set high. This OAMPDU is preceded and followed by a valid frame separated by at least minimum interFrameGap.
3. Step 2 is repeated with all supported OAMPDU types.

Observable Results:
a. The DUT should accept all OAMPDUs with both the Local Stable and Evaluating flags set high. The reception of these OAMPDUs should not affect the current status of the OAM Discovery process.
b. The DUT should transmit all OAMPDUs with both the Remote Stable and Evaluating flags set high.
c. The reception of OAMPDUs with both the Local Stable and Evaluating flags set high should not affect the reception of valid frames.

Possible Problems:　　　None.

Test 57.1.8 – End of TLV and Variable Markers

Purpose: To verify that the DUT properly handles a number of different end of TLV and Variable markers.

References:
   [1]   IEEE Std. 802.3ah-2004 – subclause 57.5.1, 57.6.3

Resource Requirements:
   • A testing station capable of transmitting and monitoring traffic to and from the DUT.

Last Modification: November 01, 2004

Discussion: When receiving and processing OAMPDU Information TLVs, Link Event TLVs, Variable Descriptors, or Variable Containers, the detection of a TLV Type field or Variable Branch field value of 0x00 indicates that no more TLVs, or Variables follow. The reception of a Type or Branch field value of 0x00 indicates to the OAM device that all following fields can be ignored.

Test Setup: Connect the DUT to the pattern generator and monitor ports of the testing station using the appropriate medium.

Procedure:
Part A: End of TLV Markers

Test TLV	Type	Length	Value
1	-	-	-
2	0x00	-	-
3	0x00	Valid TLV	-
4	0x00	0x00	-
5	0x00	0x00	0x00…
6	0x00	0x00	Random Value
7	0x00	0x00	Valid TLV
8	0x00	0x01	-
9	0x00	0x01	0x00…
10	0x00	0x01	Random Value
11	0x00	0x01	Valid TLV
12	0x00	0x02	-
13	0x00	0x02	0x00…
14	0x00	0x02	Random Value
15	0x00	0x02	Valid TLV
16	0x00	0x03	-
17	0x00	0x03	0x00
18	0x00	0x03	0x0000
19	0x00	0x03	0x000000
20	0x00	0x03	Random Value
21	0x00	0x03	Valid TLV
22	0x00	0x03	0x00 Followed by a Valid TLV

1. The testing station is instructed to transmit a valid Information OAMPDU ending with Test TLV 1. This test frame is preceded by and followed by a valid frame separated by at least minimum interFrameGap.
2. Step 1 is repeated for each Test TLV described in the table above.
3. Steps 1 – 2 are repeated with Event Notification OAMPDUs.

Part B: End of Variable Markers

Variable	Branch	Leaf	Width	Value
1	-	-	-	-
2	0x00	-	-	-
3	0x00	Random Value	-	-
4	0x00	Valid TLV	-	-
5	0x00	0x0000	0x00	-
6	0x00	0x0000	0x00	0x00…
7	0x00	0x0000	0x00	Random Value
8	0x00	Random Value	0x01	-
9	0x00	Random Value	0x01	0x00
10	0x00	Random Value	0x01	0x00…
11	0x00	Random Value	0x01	Valid TLV
12	0x00	Random Value	0x01	Random Value
13	0x00	Random Value	Valid TLV	-
14	0x00	Random Value	Valid TLV	0x00
15	0x00	Random Value	Valid TLV	0x00…

1. The testing station is instructed to transmit a valid Variable Request OAMPDU ending with Variable 1. This test frame is preceded by and followed by a valid frame separated by at least minimum interFrameGap.
2. Step 1 is repeated for each Variable described in the table above.
3. Steps 1 – 2 are repeated with Variable Response OAMPDUs.

Observable Results:
   a. The DUT should accept each test frame and ignore any content after the end of TLV marker.
   b. The DUT should accept each test frame and ignore any content after the end of Variable marker.
   c. The reception of test frames should not affect the reception of valid request frames.

Possible Problems:
The tables in *Parts A and B* are not considered an exhaustive test of the end of TLV and Variable Markers, but rather a sample of interesting conditions.

Unless access to the OAM client is granted via the User Interface it may not be possible to verify the reception of any particular TLV.

Test 57.1.9 – TLVs with Incorrect Lengths

Purpose: To verify that the DUT discards OAMPDUs containing TLVs with incorrect Length fields.

References:
   [1]   IEEE Std. 802.3ah-2004 – subclauses 57.5.1

Resource Requirements:
   • A testing station capable of transmitting and monitoring traffic to and from the DUT.

Last Modification: November 01, 2004

Discussion: Information and Event Notification OAMPDUs can be made up of multiple TLVs. It is the responsibility of the OAM client to be aware of these different TLVs in order to process them correctly. If the OAM client receives a TLV in which the value of the Length field does not match the known or expected value for the particular value in the Type field, the TLV should be ignored. It is then up to the discretion of the OAM client to process or ignore the remainder of the TLVs in the OAMPDU.

Test Setup: Connect the DUT to the pattern generator and monitor ports of the testing station using the appropriate medium.

Procedure:
   1. The testing station is instructed to transmit an Information OAMPDU containing two TLVs. The Length field of the first TLV is less than the well-known value for that type, but should not be 0x00 or 0x01. The following TLV is properly formatted and valid. This OAMPDU is preceded and followed by a valid frame separated by at least minimum interFrameGap.
   2. Step 1 is repeated with a value in the Length field of the first TLV that is greater than the well-known value for that type, but should not encroach on the following TLV.
   3. Step 1 is repeated with a value in the Length field of the first TLV that is greater than the remaining length of the OAMPDU.
   4. Steps 1 – 3 are repeated with Event Notification OAMPDUs.

Observable Results:
   a. The DUT should accept all OAMPDUs containing TLVs with incorrect Length fields, however the TLV with an incorrect length should be ignored. All following TLVs may be ignored or acted upon.
   b. The reception of OAMPDUs containing TLVs with incorrect Length fields should not affect the reception of valid frames.

Possible Problems:
Unless access to the OAM client is granted via the User Interface it may not be possible to verify the reception of any particular TLV.

Test 57.1.10 – Truncated TLVs and Variable Containers

Purpose: To verify that the DUT discards truncated TLVs and Variable Containers.

References:
  [1]   IEEE Std. 802.3ah-2004 – subclauses 57.5.1, 57.6.3

Resource Requirements:
  • A testing station capable of transmitting and monitoring traffic to and from the DUT.

Last Modification: November 01, 2004

Discussion: It is the responsibility of the OAM client to be aware of the different TLVs and Variables that can be received in order to process them correctly. If the OAM client receives a TLV or Variable Container in which the value of the Length or Variable Width field indicates that the TLV or Variable Container will exceeds the remaining length of the OAMPDU, the TLV or Variable Container should be ignored.

Test Setup: Connect the DUT to the pattern generator and monitor ports of the testing station using the appropriate medium.

Procedure:
Part A: TLV Type OAMPDUs
  1.   The testing station is instructed to transmit an Information OAMPDU, minFrameSize in length. The last TLV is to be truncated such that the both the Type and Length fields of the TLV are contained within the OAMPDU. The Length value matches the expected value for the type of TLV being used. This OAMPDU is preceded and followed by a valid frame separated by at least minimum interFrameGap.
  2.   Step 1 is repeated with an Event Notification OAMPDU.

Part B: Variable Container Type OAMPDU
  1.   The testing station is instructed to transmit a Variable Response OAMPDU, minFrameSize in length. The last Variable Container is to be truncated such that the both the Branch, Leaf, and Width fields of the Variable Container are contained within the OAMPDU. The Width value does not have the 7th bit set high such to specify a Variable Indicator. This OAMPDU is preceded and followed by a valid frame separated by at least minimum interFrameGap.

Observable Results:
  a.   The DUT should accept all but the last TLV from OAMPDUs with truncated TLVs.
  b.   The DUT should accept all but the last Variable Container from Variable Response OAMPDUs with truncated Variable Containers.
  c.   The reception of OAMPDUs with truncated TLVs or Variable Containers should not affect the reception of valid frames.

Possible Problems:
Unless access to the OAM client is granted via the User Interface it may not be possible to verify the reception of any particular TLV.

Test 57.1.11 – Values in Reserved Bits of Information OAMPDU

Purpose: To verify that the DUT properly accepts Information OAMPDUs with Local Information TLVs with values in the reserved portions of the State, OAM Configuration, and OAMPDU Configuration fields.

References:
[1] IEEE Std. 802.3ah-2004 – Table 57-7, Table 57-8, Table 57-9

Resource Requirements:
- A testing station capable of transmitting and monitoring traffic to and from the DUT.

Last Modification: November 01, 2004

Discussion: When receiving an Information OAMPDU, the OAM sublayer of the receiving station interprets the value of the one-octet State, the one-octet OAM Configuration, and two-octet OAMPDU Configuration fields in both the Local Information TLV. If a value other than zero is encountered in the *reserved* portion of these fields, the value within the reserved portion should be ignored and passed to the OAM client. This will ensure compatibility with future use of reserved bits and the OAM protocol. The device however is still required to take these received reserved bits and copy their values into the Remote Information TLV.

Test Setup: Connect the DUT to the pattern generator and monitor ports of the testing station using the appropriate medium.

Procedure:
1. The testing station is instructed to transmit a valid Information OAMPDU with a Local Information TLV in which all reserved bits in the State field are set high. This OAMPDU is preceded and followed by a valid frame separated by at least minimum interFrameGap.
2. Step 1 is repeated with all reserved bits in the OAM Configuration field set high.
3. Step 1 is repeated with all reserved bits in the OAMPDU Configuration field set high.

Observable Results:
a. The DUT should ignore values in the reserved portion of the State field and process these Local Information TLVs like any other valid Information TLV. The DUT should be observed to respond with an Information OAMPDU with a Remote Information TLV containing the same reserved bit value set.
b. The DUT should ignore values in the reserved portion of the OAM Configuration field and process these Local Information TLVs like any other valid Information TLV. The DUT should be observed to respond with an Information OAMPDU with a Remote Information TLV containing the same reserved bit value set.
c. The DUT should ignore values in the reserved portion of the OAMPDU Configuration field and process these Local Information TLVs like any other valid Information TLV. The DUT should be observed to respond with an Information OAMPDU with a Remote Information TLV containing the same reserved bit value set.
d. The reception of Information OAMPDUs with values in the reserved portion of the State, OAM Configuration, and OAMPDU Configuration fields should not affect the reception of valid frames.

Possible Problems: None.

GROUP 2: OAMPDU Transmission

Scope: The following tests cover OAM operations specific to the transmission of OAMPDU.

Overview: These tests are designed to verify that the device under test transmits properly formed Local and Remote Information TLVs along with the Information OAMPDUs that contain these TLVs. The OAM functions explored are defined in Clause 57 of IEEE Std. 802.3a-2004.

Test 57.2.1 – Properly Encapsulated Information OAMPDUs

Purpose: To verify that the DUT properly encapsulates Information OAMPDUs.

References:
  [1]   IEEE Std. 802.3ah-2004 – subclauses 57.4.2, 57.4.2.1, 57.4.2.2, 57.4.2.3, 57.4.3.1, 57.5.2, 57.5.2.1, 57.5.2.2, Table 57-3, Table 57-6, Table 57-7, Table 57-8, Table 57-9

Resource Requirements:
  • A testing station capable of transmitting and monitoring traffic to and from the DUT.

Last Modification: November 01, 2004

Discussion: IEEE Std. 802.3ah-2004 defines the frame format for all Operations Administration, and Maintenance Protocol Data Units (OAMPDUs) and the TLVs used by the OAMPDUs, for proper operation of the OAM protocol. It is advised that organizations not deviate from the rules that govern proper OAMPDU construction.

The OAM sublayer resides under any bridging entity and as a result can only traverse a single link. Therefore all OAMPDUs are basic frames and are not tagged. This includes but is not limited to QTag Prefix tagging.

To ensure compatibility with future use of *reserved* bits and code types, all OAMPDUs should contain reserved bit spaces set low and not transmit any reserved code types. This includes all reserved portions of Information OAMPDUs:
  • Reserved flags
  • Reserved value for Local Stable and Local Evaluating flags
  • Reserved Code value
  • Reserved Information Type value
  • Reserved bit space within the State field of a Local Information TLV
  • Reserved bit space within the OAM Configuration field of a Local Information TLV
  • Reserved bit space within the OAMPDU Configuration field of a Local Information TLV

Test Setup: Connect the DUT to the pattern generator and monitor ports of the testing station using the appropriate medium.

Procedure:
  1. The DUT is instructed to reset the OAM Discovery process.
  2. The testing station in instructed to transmit an Information OAMPUD to the DUT.
  3. Wait one second.

Observable Results:
  a. The DUT should not transmit Information OAMPDUs with:
      • Tags including but not limited to the QTag Prefix
      • A value in the Reserved portion of the Flags field
      • The value of 0x3 in the Local Stable and Local Evaluating flags portion of the Flags field
      • Code values within the range of 0x05-FD inclusive or 0xFF
      • Information TLV type values within the range of 0x03 - 0xFD inclusive or 0xFF
      • A value in the Reserved portion of the Local Information TLV State field
      • A value in the Reserved portion of the Local Information TLV OAM Configuration field
      • A value in the Reserved portion of the Local Information TLV OAMPDU Configuration field

Possible Problems: None.

Test 57.2.2 – Information TLVs with Proper Revision Value

Purpose: To verify that the DUT properly starts and increments the Local Information TLV Revision field value and copies the remote Revision field value into Remote Information TLVs in all Information OAMPDUs.

References:
   [1]   IEEE Std. 802.3ah-2004 – subclauses 57.5.2.1, 57.5.2.2

Resource Requirements:
   - A testing station capable of transmitting and monitoring traffic to and from the DUT.

Last Modification: November 01, 2004

Discussion: The Local Information TLV contains a Revision field used to help the remote OAM device determine whether or not the TLV contains any new information that needs to be parsed. Each time the configuration of the local OAM changes an Information OAMPDU is sent with a Local Information TLV indicating these changes and an incremented Revision field. A received Information TLV with a previously seen value in the Revision field can be ignored. The OAM Discovery process shall start with an Information OAMPDU containing a Local Information TLV with the Revision field set to zero.

Test Setup: Connect the DUT to the pattern generator and monitor ports of the testing station using the appropriate medium.

Procedure:
Part A: DUT Sets Remote Revision to Zero
   1. The DUT is instructed to reset the OAM Discovery process.
   2. The testing station is instructed to transmit an Information OAMPDU with a Local Information TLV containing a Revision field set to 0x0000.

Part B: DUT Sets Remote Revision to Non-Zero
   1. The DUT is instructed to reset the OAM Discovery process.
   2. The testing station is instructed to transmit an Information OAMPDU with a Local Information TLV containing a Revision field set to a random non-zero value.

Part C: DUT Increments Remote Revision with Configuration Change
   1. The DUT is instructed to reset the OAM Discovery process.
   2. The testing station is instructed to transmit an Information OAMPDU with a Local Information TLV containing a Revision field set to 0x0000.
   3. Wait 1 second for the DUT to transmit an Information OAMPDU.
   4. The testing station is instructed to transmit an Information OAMPDU with a Local Information TLV indicating new configuration information and an incremented Revision field value, and a Remote Information TLV that is a copy of the last received Local Information TLV.

Part D: DUT sets Remote Revision to Non-Zero with Configuration Change
   1. The DUT is instructed to reset the OAM Discovery process.
   2. The testing station is instructed to transmit an Information OAMPDU with a Local Information TLV containing a Revision field set to 0x0000.
   3. Wait 1 second for the DUT to transmit an Information OAMPDU.
   4. The testing station is instructed to transmit an Information OAMPDU with a Local Information TLV indicating new configuration information and a random Revision field value, and a Remote Information TLV that is a copy of the last received Local Information TLV.

Part E: DUT Increments Local Revision with Configuration Change
1. The DUT is instructed to reset the OAM Discovery process.
2. The testing station is instructed to transmit an Information OAMPDU with a Local Information TLV containing a Revision field set to 0x0000.
3. If supported the DUT is instructed to change its configuration and transmit an Information OAMPDU with Local and Remote Information TLVs.

Observable Results:
a. The DUT should transmit the first Information OAMPDU with a Local Information TLV Revision field value of zero.
b. The DUT should increment the Local Information TLV Revision field after all local configuration changes.
c. The DUT should transmit Information OAMPDUs with the Remote Information TLV Revision field set to the last received Local Information TLV Revision field value.

Possible Problems: None.

Test 57.2.3 – Maximum Advertised OAMPDU Size

Purpose: To verify that the DUT does not transmit OAMPDUs greater than Maximum OAMPDU Size.

References:
    [1]   IEEE Std. 802.3ah-2004 – Table 57-9 – OAMPDU Configuration field

Resource Requirements:
- A testing station capable of transmitting and monitoring traffic to and from the DUT.

Last Modification: November 01, 2004

Discussion: Each OAM client on a point-to-point link defines the Maximum OAMPDU Size, as the largest OAMPDU that OAM device is capable of receiving. When an OAM client receives the advertised Maximum OAMPDU Size from the remote OAM client, the values is compared to the local Maximum OAMPDU Size. The smaller value is then used as the maximum OAMPDU length allowed on the link.

Test Setup: Connect the DUT to the pattern generator and monitor ports of the testing station using the appropriate medium.

Procedure:
Part A: DUT Sets Maximum OAMPDU Size
1. The DUT is instructed to reset the OAM Discovery process.
2. The testing station is instructed to perform the necessary steps required to complete the OAM Discovery process while transmitting Information OAMPDUs with Local Information TLVs containing a Maximum OAMPDU Size of maxUntaggedFrameSize within the OAMPDU Configuration field.
3. If supported, DUT is either implicitly or explicitly instructed to transmit large OAMPDUs, otherwise observe the link for three minutes.

Part B: Testing Station Sets Maximum OAMPDU Size
1. The DUT is instructed to reset the OAM Discovery process.
2. The testing station is instructed to perform the necessary steps required to complete the OAM Discovery process while transmitting Information OAMPDUs with Local Information TLVs containing a Maximum OAMPDU Size of minFrameSize within the OAMPDU Configuration field.
3. If supported, DUT is either implicitly or explicitly instructed to transmit large OAMPDUs, otherwise observe the link for three minutes.

Observable Results:
    a.   The DUT should not transmit OAMPDUs greater than the negotiated Maximum OAMPDU Size for the link.

Possible Problems:
It may not be possible for the testing station to cause the DUT to enter a state in which it would want to transmit OAMPDUs larger than Minimum OAMPDU Size. The testing station can try the following procedures:
- If supported, request enough variables to cause the DUT to transmit a Variable Response OAMPDU larger than Minimum OAMPDU Size.
- If supported, cause enough link events to cause the DUT to transmit an Event Notification OAMPDU larger than Minimum OAMPDU Size.

GROUP 3: OAM Discovery Process

Scope: The following tests cover OAM operations specific to the OAM Discovery process.

Overview: OAM provides a link partner discovery process, which is used to convey state and configuration information (such as current local multiplexer operation and Maximum OAMPDU Size) as well as OAM capabilities (such as OAM Loopback capable). The OAM Discovery process also ensures that two Passive mode OAM devices cannot establish an OAM link. These tests are designed to verify that the device under test functions properly and adheres to the rules governing the discovery of a remote OAM entity on the link as defined by the text and the functional state machines outlined in Clause 57 of IEEE Std. 802.3ah-2004.

Test 57.3.1 – Active Mode Selection

Purpose: To verify that the DUT follows the defined transmit and receive rules when operating in Active mode.

References:
   [1]   IEEE Std. 802.3ah-2004 – subclause 57.3.2.1, 57.3.2.1.2, 57.3.2.1.3, 57.3.2.2.6, Figure 57-5, Figure 57-6, 57.3.2.2.3, 57.3.2.2.4

Resource Requirements:
   • A testing station capable of transmitting and monitoring traffic to and from the DUT.

Last Modification: November 01, 2004

Discussion: When the OAM Discovery process is reset the DUT must select either an Active or Passive mode of operation. Active devices enter the ACTIVE_SEND_LOCAL state and initiate the OAM Discovery process by transmitting Information OAMPDUs with the following characteristics:
   • Local Stable flag set low and Local Evaluating flag set high
   • Remote Stable and Remote Evaluating flags set low
   • The first and only Information TLV must be a Local Information TLV
   • The entire frame must be minFrameSize in length

Regardless of the mode of operation, at this early stage of the OAM Discovery process, devices can only accept Information OAMPDU from the remote OAM device.

Test Setup: Connect the DUT to the pattern generator and monitor ports of the testing station using the appropriate medium.

Procedure:
   1.   The DUT is configured for Active mode operation and instructed to reset the OAM Discovery process.
   2.   The testing station is instructed to transmit non-Information OAMPDUs.
   3.   If supported, the DUT is instructed to transmit non-Information OAMPDUs, otherwise observe the link for three minutes.

Observable Results:
   a.   The DUT should transmit all Information OAMPDUs with:
         • A rate of no fewer than once a second, but no more then ten a second
         • Local Stable flag set low and Local Evaluating flag set high
         • Remote Stable and Remote Evaluation flags set low
         • A Local Information TLV as the first and only Information TLV
         • A length of minFrameSize
   b.   The DUT should not respond to non-Information OAMPDUs.
   c.   The DUT should not transmit requested non-Information OAMPDUs.

Possible Problems: None.

Test 57.3.2 – Passive Mode Selection

Purpose: To verify that the DUT follows the defined transmit and receive rules when operating in Passive mode.

References:
   [1]   IEEE Std. 802.3ah-2004 – subclause 57.3.2.1, 57.3.2.1.2, 57.3.2.1.3, 57.3.2.2.6, Figure 57-5, 57.3.2.3

Resource Requirements:
   - A testing station capable of transmitting and monitoring traffic to and from the DUT.

Last Modification: November 01, 2004

Discussion: When the OAM Discovery process is reset the DUT must select either an Active or Passive mode of operation. Passive devices enter the PASSIVE_WAIT state and wait for an Active device to initiate the OAM Discovery process.

Regardless of the mode of operation at this early stage of the OAM Discovery process, devices can only accept Information OAMPDU from the remote OAM device.

Test Setup: Connect the DUT to the pattern generator and monitor ports of the testing station using the appropriate medium.

Procedure:
   1.   The DUT is configured for Passive mode operation and instructed to reset the OAM Discovery process.
   2.   The testing station is instructed to transmit non-Information OAMPDUs.
   3.   If supported, the DUT is instructed to transmit non-Information OAMPDUs, otherwise observe the link for three minutes.

Observable Results:
   a.   The DUT should not transmit any Information OAMPDUs.
   b.   The DUT should not respond to non-Information OAMPDUs.
   c.   The DUT should not transmit requested non-Information OAMPDUs.

Possible Problems: None.

Test 57.3.3 – Remote State Valid

Purpose: To verify that the DUT properly interprets state information from the remote OAM device.

References:
- [1] IEEE Std. 802.3ah-2004 – subclause 57.3.2.1, 57.3.2.1.2, 57.3.2.1.3, 57.3.2.1.3, Figure 57-5, Figure 57-6, 57.3.2.2.6

Resource Requirements:
- A testing station capable of transmitting and monitoring traffic to and from the DUT.

Last Modification: November 01, 2004

Discussion: When OAM is enabled the device is configured for either Active or Passive mode operation. Active devices enter the ACTIVE_SEND_LOCAL state and initiate the OAM Discovery process by transmitting Information OAMPDUs with Local Information TLVs. Passive devices however enter the PASSIVE_WAIT state and wait for the initiation from an Active device. Regardless of the mode of operation at this early stage of the OAM Discovery process, devices can only accept Information OAMPDU from the remote OAM device.

Once an Information OAMPDU from the remote OAM device is received the device enters the SEND_LOCAL_REMOTE state. In this state the local OAM device still sets the Local Stable flag low and Local Evaluating flag high, however the Remote Stable and Remote Evaluating flags will be copies of the last received Local Stable and Local Evaluating flags from the remote OAM device. Furthermore, when the local OAM device enters the SEND_LOCAL_REMOTE state all subsequent Information OAMPDUs transmitted by the device will have a Remote Information TLV following the local Information TLV. This Remote Information with the exception of the Information Type field is an exact copy of the last received Local Information TLV from the remote OAM device.

Test Setup: Connect the DUT to the pattern generator and monitor ports of the testing station using the appropriate medium.

Procedure:
1. If supported, the DUT is configured for Active mode operation and instructed to reset the OAM Discovery process.
2. The testing station is instructed to transmit an Information OAMPDU with both the Local Stable and the Local Evaluating flags set low. The Information OAMPDU will contain a Local Information TLV with a configuration the DUT will consider unacceptable.
3. Wait one second.
4. The testing station is instructed to transmit non-Information OAMPDUs.
5. If supported, the DUT is instructed to transmit non-Information OAMPDUs.

Observable Results:
- a. After receiving information from the remote OAM device, the DUT should transmit all Information OAMPDUs with:
  - A rate of no fewer than once a second, but no more then ten a second
  - The Local Stable flag set low and the Local Evaluating flag set high
  - Exact copies of last received Local Stable and Local Evaluating flags in the Remote Stable and Remote Evaluating flags
  - A Local Information TLV followed by a Remote Information TLV that is an exact copy of last received Local Information TLV (with the exception of Information Type field)
  - A length of minFrameSize
- b. The DUT should not respond to non-Information OAMPDUs.
- c. The DUT should not transmit non-Information OAMPDUs.

Possible Problems:
IEEE 802.3ah-2004 does not specify what configurations will be deemed acceptable to an OAM device. The above procedure is intentionally vague. The vendor should be contacted to obtain the proper configuration requirements.

If the DUT can evaluate both the local and remote configurations quickly (under a second), the DUT may not be observed to maintain the Local Stable flag set low and the Local Evaluating flag set high. The DUT will deem the configuration unacceptable and set the Local Stable and Local Evaluating flags set low.

If an unacceptable configuration cannot be found and the DUT can evaluate both the local and remote configuration quickly (under a second), the DUT may not be observed to enter the SEND_LOCAL_REMOTE state and proceed directly to the SEND_LOCAL_REMOTE_OK state.

Test 57.3.4 – Local Satisfied

Purpose: To verify that the DUT properly indicates satisfaction with the remote OAM device configuration.

References:
[1] IEEE Std. 802.3ah-2004 – subclause 57.3.2.1, 57.3.2.1.4, 57.3.2.1.5, Figure 57-5, 57.3.2.1.7

Resource Requirements:
- A testing station capable of transmitting and monitoring traffic to and from the DUT.

Last Modification: November 01, 2004

Discussion: Once the local OAM device is in the SEND_LOCAL_REMOTE state and aware that the remote OAM device is operational, the configuration of the local OAM device is compared to the configuration of the remote OAM device. If the remote configuration is acceptable, the DUT will proceed to the SEND_LOCAL_REMOTE_OK state, where all subsequent Information OAMPDUs transmitted shall contain the Local Stable flag set high and the Local Evaluating flag set low. The Remote Stable and Remote Evaluating flags will still be copies of the last received Local Stable and Local Evaluating flags. Also the Remote Information TLV will be a copy of the last received Local Information TLV with the exception of the Information Type field.

However if the configuration of the remote device is not acceptable, the DUT will stay in the SEND_LOCAL_REMOTE state.

Test Setup: Connect the DUT to the pattern generator and monitor ports of the testing station using the appropriate medium.

Procedure:
1. The DUT is instructed to reset the OAM Discovery process.
2. The testing station is instructed to transmit an Information OAMPDU with the Local Stable flag set low and the Local Evaluating flag set high. The Information OAMPDU will contain a Local Information TLV with a configuration the DUT will consider acceptable.
3. Wait one second.
4. The testing station is instructed to transmit non-Information OAMPDUs.
5. If supported, the DUT is instructed to transmit non-Information OAMPDUs.

Observable Results:
a. After the reception of an Information OAMPDU with a Local Information TLV containing a configuration that DUT considers acceptable, the DUT should transmit all Information OAMPDUs with:
   - A rate of no fewer than once a second, but no more then ten a second
   - The Local Stable flag set high and the Local Evaluating flag set low
   - Exact copies of last received Local Stable and Local Evaluating flags in the Remote Stable and Remote Evaluation flags
   - A Local Information TLV followed by a Remote Information TLV that is an exact copy of last received Local Information TLV (with the exception of Information Type field)
b. The DUT should not respond to non-Information OAMPDUs.
c. The DUT should not transmit non-Information OAMPDUs.

Possible Problems:
IEEE 802.3ah-2004 does not specify what configurations will be deemed acceptable to an OAM device. The above procedure is intentionally vague. The vendor should be contacted to obtain the proper configuration requirements.

Test 57.3.5 – Remote Stable

Purpose: To verify that the DUT properly interprets remote OAM satisfaction with the local OAM configuration.

References:
[1]   IEEE Std. 802.3ah-2004 – subclause 57.3.2.1, 57.3.2.1.5, 57.3.2.1.6, 57.3.2.1.7, Figure 57-5, 57.3.2.2.6

Resource Requirements:
- A testing station capable of transmitting and monitoring traffic to and from the DUT.

Last Modification: November 01, 2004

Discussion: While in the SEND_LOCAL_REMOTE_OK state, the local OAM device waits for the remote OAM device to send information indicating that it is either satisfied or unsatisfied with the OAM link. In this state the local OAM device sends Information OAMPDUs with the Local Stable flag set high and the Local Evaluating flag set low.

If the remote OAM device is satisfied with the configuration it will send Information OAMPDUs with the Local Stable flag set high and the Local Evaluating flag set low. This will place the DUT in the SEND_ANY state where the local OAM device can send non-Information OAMPDUs. While in the SEND_ANY state all Information OAMPDUs will contain both Local and Remote Stable flags set high and both Local and Remote Evaluating flags set low.

Test Setup: Connect the DUT to the pattern generator and monitor ports of the testing station using the appropriate medium.

Procedure:
1. The DUT is instructed to reset the OAM Discovery process.
2. The testing station is instructed to transmit an Information OAMPDU with the Local Stable flag set low and the Local Evaluating flag set high. The Information OAMPDU will contain a Local Information TLV with a configuration the DUT will consider acceptable.
3. Wait one second.
4. The testing station is instructed to transmit an Information OAMPDU with the Local Stable flag set high and the Local Evaluating flag set low. The Information OAMPDU will contain a Local Information TLV with a configuration the DUT will consider acceptable. The Remote Stable flag, the Remote Evaluating flag, and the Remote Information TLV are set with values copied from the last received Information OAMPDU.
5. Wait one second.
6. The testing station is instructed to transmit non-Information OAMPDUs.
7. If supported, the DUT is instructed to transmit non-Information OAMPDUs.

Observable Results:
a. After the remote OAM device is satisfied, the DUT should transmit all Information OAMPDUs with:
    - A rate of no fewer than once a second, but no more then ten a second
    - The Local Stable flag set high and the Local Evaluating flag set low
    - Exact copies of last received Local Stable and Local Evaluating flags in the Remote Stable and Remote Evaluation flags
    - A Local Information TLV followed by a Remote Information TLV that is an exact copy of last received Local Information TLV (with the exception of Information Type field)
b. The DUT should respond to non-Information OAMPDUs.
c. The DUT should transmit non-Information OAMPDUs.

Possible Problems:
IEEE 802.3ah-2004 does not specify what configurations will be deemed acceptable to an OAM device. The above procedure is intentionally vague. The vendor should be contacted to obtain the proper configuration requirements.

Test 57.3.6 – Remote Unstable

Purpose: To verify that the DUT properly interprets the remote OAM device's dissatisfaction with the local OAM device configuration.

References:
   [1]   IEEE Std. 802.3ah-2004 – subclause 57.3.2.1, 57.3.2.1.6, 57.3.2.1.7, Figure 57-5, 57.3.2.2.6

Resource Requirements:
   • A testing station capable of transmitting and monitoring traffic to and from the DUT.

Last Modification: November 01, 2004

Discussion:
If local OAM device is in the SEND_LOCAL_REMOTE_OK state and the remote OAM device becomes unsatisfied with the configuration, the remote OAM device will send Information OAMPDUs with the Local Stable and Local Evaluating flags set low. The DUT has should wait in the SEND_LOCAL_REMOTE_OK state in hopes that the remote OAM device will change its configuration to something that is acceptable to both the local and remote OAM device.

However, if the local OAM device is in the SEND_ANY state and transmitting OAMPDUs indicating that local and remote OAM Discovery is complete, and the remote OAM device becomes unsatisfied with the link, the local OAM device returns to the SEND_LOCAL_REMOTE_OK state.

When the local OAM device is in the SEND_LOCAL_REMOTE_OK state, it will transmit Information OAMPDUs with Local and Remote Information TLVs and with the Local Stable flag set high and the Local Evaluating flag set low.

Test Setup: Connect the DUT to the pattern generator and monitor ports of the testing station using the appropriate medium.

Procedure:
Part A: While in SEND_LOCAL_REMOTE_OK
   1. The DUT is instructed to reset the OAM Discovery process.
   2. The testing station is instructed to transmit an Information OAMPDU with the Local Stable flag set low and the Local Evaluating flag set high. The Information OAMPDU will contain a Local Information TLV with a configuration the DUT will consider acceptable.
   3. Wait one second.
   4. The testing station is instructed to transmit an Information OAMPDU with the Local Stable flag set low and the Local Evaluating flag set low. The Information OAMPDU will contain a Local Information TLV with a configuration the DUT will consider acceptable. The Remote Stable flag, the Remote Evaluating flag, and the Remote Information TLV are set with values copied from the last received Information OAMPDU.
   5. Wait one second.
   6. The testing station is instructed to transmit non-Information OAMPDUs.
   7. If supported, the DUT is instructed to transmit non-Information OAMPDUs.

Part B: From SEND_ANY
1. The DUT is instructed to reset the OAM Discovery process.
2. The testing station is instructed to perform the necessary steps to complete the OAM Discovery process.
3. Wait one second.
4. The testing station is instructed to transmit an Information OAMPDU with both the Local Stable and Local Evaluating flags set low. The Information OAMPDU will contain a Local Information TLV with a configuration the DUT will consider acceptable. The Remote Stable flag, the Remote Evaluating flag, and the Remote Information TLV are set with values copied from the last received Information OAMPDU.
5. The testing station is instructed to transmit non-Information OAMPDUs.
6. If supported, the DUT is instructed to transmit non-Information OAMPDUs.

Observable Results:
a. After the reception of the remote OAM device's dissatisfaction, the DUT should transmit all Information OAMPDUs with:
   - A rate of no fewer than once a second, but no more then ten a second
   - The Local Stable flag set high and the Local Evaluating flag set low
   - Exact copies of last received Local Stable and Local Evaluating flags in the Remote Stable and Remote Evaluation flags
   - A Local Information TLV followed by a Remote Information TLV that is an exact copy of last received Local Information TLV (with the exception of Information Type field)
b. The DUT should not respond to non-Information OAMPDUs.
c. The DUT should not transmit non-Information OAMPDUs.

Possible Problems:
IEEE 802.3ah-2004 does not specify what configurations will be deemed acceptable to an OAM device. The above procedure is intentionally vague. The vendor should be contacted to obtain the proper configuration requirements.

Test 57.3.7 – Local Unsatisfied

Purpose: To verify that the DUT properly indicates dissatisfaction with the link to the remote OAM device.

References:
  [1] IEEE Std. 802.3ah-2004 – subclause 57.3.2.1, 57.3.2.1.4, 57.3.2.1.5, 57.3.2.1.6, 57.3.2.1.7, Figure 57-5, 57.3.2.2.6

Resource Requirements:
  • A testing station capable of transmitting and monitoring traffic to and from the DUT.

Last Modification: November 01, 2004

Discussion: If the local OAM device is in the SEND_LOCAL_REMOTE_OK state and waiting for the remote OAM device to indicate that it is satisfied, and the local OAM device becomes dissatisfied with the link, it will return to the SEND_LOCAL_REMOTE state.

If the local OAM device is in the SEND_ANY state and transmitting OAMPDUs indicating that local and remote OAM Discovery is complete, and the local OAM device becomes unsatisfied with the link, it also returns to the SEND_LOCAL_REMOTE state.

In the SEND_LOCAL_REMOTE state, the local OAM device will transmit Information OAMPDUs with both Local and Remote Information TLVs and both Local Stable and Local Evaluating flags set low.

Test Setup: Connect the DUT to the pattern generator and monitor ports of the testing station using the appropriate medium.

Procedure:
Part A: From SEND_LOCAL_REMOTE_OK
  1. The DUT is instructed to reset the OAM Discovery process.
  2. The testing station is instructed to transmit an Information OAMPDU with the Local Stable flag set low and the Local Evaluating flag set high. The Information OAMPDU will contain a Local Information TLV with a configuration the DUT will consider acceptable.
  3. Wait one second.
  4. The testing station is instructed to transmit an Information OAMPDU with the Local Stable flag set low and the Local Evaluating flag set high. The Information OAMPDU will contain a Local Information TLV with a configuration the DUT will consider unacceptable. The Remote Stable flag, the Remote Evaluating flag, and the Remote Information TLV are set with values copied from the last received Information OAMPDU.
  5. Wait one second.
  6. The testing station is instructed to transmit non-Information OAMPDUs.
  7. If, supported, the DUT is instructed to transmit non-Information OAMPDUs.

Part B: From SEND_ANY
  1. The DUT is instructed to reset the OAM Discovery process.
  2. The testing station is instructed to perform the necessary steps to complete the OAM Discovery process.
  3. Wait one second.
  4. The testing station is instructed to transmit an Information OAMPDU with the Local Stable flag set low and the Local Evaluating flag set high. The Information OAMPDU will contain a Local Information TLV with a configuration the DUT will consider unacceptable. The Remote Stable flag, the Remote Evaluating flag, and the Remote Information TLV are set with values copied from the last received Information OAMPDU.
  5. The testing station is instructed to transmit non-Information OAMPDUs.
  6. If supported, the DUT is instructed to transmit non-Information OAMPDUs.

Observable Results:

    a.   After becoming dissatisfied with the link, the DUT should transmit all Information OAMPDUs with:

- A rate of no fewer than once a second, but no more then ten a second
- Both the Local Stable and Local Evaluating flags set low
- Exact copies of last received Local Stable and Local Evaluating flags in the Remote Stable and Remote Evaluation flags
- A Local Information TLV followed by a Remote Information TLV that is an exact copy of last received Local Information TLV (with the exception of Information Type field)
- A length of minFrameSize

    b.   The DUT should not respond to non-Information OAMPDUs.

    c.   The DUT should not transmit non-Information OAMPDUs.

Possible Problems:

IEEE 802.3ah-2004 does not specify what configurations will be deemed acceptable to an OAM device. The above procedure is intentionally vague. The vendor should be contacted to obtain the proper configuration requirements.

Test 57.3.8 – Link Faults

Purpose: To verify that the DUT proceeds to the LINK_FAULT state when a link fault condition exists.

References:
   [1]   IEEE Std. 802.3ah-2004 – subclause 57.3.2.1, 57.3.2.1.1, 57.3.2.1.2, 57.3.2.1.3, Figure 57-5, 57.3.2.2.6

Resource Requirements:
   - A testing station capable of transmitting and monitoring traffic to and from the DUT.
   - A testing station capable of disabling its transmitter.

Last Modification: November 01, 2004

Discussion: The OAM Discovery process also ensures that when a device loses either the OAM or physical link, it recognizes the fault condition and proceeds to the LINK_FAULT state.   While in the LINK_FAULT state the local OAM device will do the following:
   - If the physical link is down, indicated by local_link_status set to FAIL, the DUT will transmit Information OAMPDUs with the Link Fault Critical link event flag set and contain no Information TLVs.
   - If the OAM link is down, indicated by local_lost_link_timer_done set to TRUE, the DUT will fall out of the LINK_FAULT state and go to either the ACTIVE_SEND_LOCAL or PASSIVE_WAIT states.

All Information OAMPDUs transmitted by the local OAM device will contain the Local Stable flag set low and the Local Evaluating flag set high to indicate the OAM Discovery process has not completed.

Test Setup: Connect the DUT to the pattern generator and monitor ports of the testing station using the appropriate medium.

Procedure:
Part A: Local_link_status=FAIL
   1.   The DUT is instructed to reset the OAM Discovery process.
   2.   The testing station is instructed to perform the necessary steps to complete the OAM Discovery process.
   3.   Wait one second.
   4.   The testing station is instructed to disable its transmitter.
   5.   The testing station is instructed to transmit non-Information OAMPDUs.
   6.   If supported, the DUT is instructed to transmit non-Information OAMPDUs.

Part B: Local_lost_link_timer_done while Active
   1.   The DUT is configured for Active mode operation instructed to reset the OAM Discovery process.
   2.   The testing station is instructed to perform the necessary steps to complete the OAM Discovery process.
   3.   Wait one second.
   4.   The testing station is instructed to stop the transmission of all OAMPDUs.
   5.   Wait five seconds.
   6.   The testing station is instructed to transmit non-Information OAMPDUs.
   7.   If supported, the DUT is instructed to transmit non-Information OAMPDUs.

Part C: Local_lost_link_timer_done while Passive
   1.   The DUT is configured for Passive mode operation and instructed to reset the OAM Discovery process.
   2.   The testing station is instructed to perform the necessary steps to complete the OAM Discovery process.
   3.   Wait one second.
   4.   The testing station is instructed to stop the transmission of all OAMPDUs.
   5.   Wait five seconds.
   6.   The testing station is instructed to transmit non-Information OAMPDUs.
   7.   If supported, the DUT is instructed to transmit non-Information OAMPDUs.

Observable Results:

Part A: Local_link_status=FAIL
   a. After the remote transmitter is disabled, the DUT should transmit all Information OAMPDUs with:
   - A rate of no fewer than once a second, but no more then ten a second
   - The Local Stable flag set low and the Local Evaluating flag set high
   - Exact copies of last received Local Stable and Local Evaluating flags in the Remote Stable and Remote Evaluation flags
   - Link Fault Critical link event flag set high
   - No Information TLVs
   - A length of minFrameSize
   b. The DUT should not respond to non-Information OAMPDUs.
   c. The DUT should not transmit non-Information OAMPDUs.

Part B: Local_lost_link_timer_done while Active
   d. After the remote device is silent for five seconds, the DUT should transmit all Information OAMPDUs with:
   - A rate of no fewer than once a second, but no more then ten a second
   - The Local Stable flag set low and the Local Evaluating flag set low
   - Both the Remote Stable and Remote Evaluating flags set low
   - A Local Information TLV
   - A length of minFrameSize
   e. The DUT should not respond to non-Information OAMPDUs.
   f. The DUT should not transmit non-Information OAMPDUs.

Part C: Local_lost_link_timer_done while Passive
   g. The DUT should not transmit any Information OAMPDUs.
   h. The DUT should not respond to non-Information OAMPDUs.
   i. The DUT should not transmit non-Information OAMPDUs.

Possible Problems:
If the DUT does not support unidirectional operation Part A cannot be performed.

Test 57.3.9 – Non-Information OAMPDU Keep Alive

Purpose: To verify that the DUT can keep the OAM Discovery process alive without receiving Information OAMPDUs.

References:
> [1] IEEE Std. 802.3ah-2004 – subclause 57.3.2.1, 57.3.2.1.5, 57.3.2.1.6, 57.3.2.1.7, Figure 57-5, 57.3.2.2.6, Figure 57-8

Resource Requirements:
- A testing station capable of transmitting and monitoring traffic to and from the DUT.

Last Modification: November 01, 2004

Discussion: If the remote OAM device is satisfied with the configuration it will send Information OAMPDUs with the Local Stable flag set high and the Local Evaluating flag set low. This will place the DUT in the SEND_ANY state where the local OAM device can send non-Information OAMPDUs. While in the SEND_ANY state all Information OAMPDUs will contain both Local and Remote Stable flags set high and both Local and Remote Evaluating flags set low.

When in the SEND_ANY state, any OAMPDU can be used to keep the link alive regardless of whether the local OAM client can interpret it or not.

Test Setup: Connect the DUT to the pattern generator and monitor ports of the testing station using the appropriate medium.

Procedure:
Part A: Supported Non-Information OAMPDUs
1. The DUT is instructed to reset the OAM Discovery process.
2. The testing station is instructed to perform the necessary steps to complete the OAM Discovery process.
3. Wait one second.
4. The testing station is instructed to stop the transmission of Information OAMPDUs and transmit supported non-Information OAMPDUs with the Local Stable flag set high and the Local Evaluating flag set low.

Part B: Unsupported Non-Information OAMPDUs
1. The DUT is instructed to reset the OAM Discovery process.
2. The testing station is instructed to perform the necessary steps to complete the OAM Discovery process.
3. Wait one second.
4. The testing station is instructed to stop the transmission of Information OAMPDUs and transmit unsupported non-Information OAMPDUs with the Local Stable flag set high and the Local Evaluating flag set low.

Observable Results:
Part A: Supported Non-Information OAMPDUs
a. The DUT should keep the OAM Discovery process alive with the reception of supported non-Information OAMPDUs.

Part B: Unsupported Non-Information OAMPDUs
b. The DUT should keep the OAM Discovery process alive with the reception of unsupported non-Information OAMPDUs.

Possible Problems: None.

Test 57.3.10 – Unstable Non-Information OAMPDU Reception

Purpose: To verify that the DUT properly reacts to non-Information OAMPDUs from an unstable remote OAM device.

References:
   [1]   IEEE Std. 802.3ah-2004 – subclause 57.3.2.1, 57.3.2.1.5, 57.3.2.1.6, 57.3.2.1.7, Figure 57-5, 57.3.2.2.6, Figure 57-8

Resource Requirements:
   • A testing station capable of transmitting and monitoring traffic to and from the DUT.

Last Modification: November 01, 2004

Discussion: If the local OAM device is in the SEND_ANY state and transmitting OAMPDUs indicating that local and remote OAM Discovery is complete, and the remote OAM device becomes unsatisfied with the link, the local OAM device returns to the SEND_LOCAL_REMOTE_OK state. When the local OAM device is in the SEND_LOCAL_REMOTE_OK state, it will transmit Information OAMPDUs with Local and Remote Information TLVs and with the Local Stable flag set high and the Local Evaluating flag set low.

Test Setup: Connect the DUT to the pattern generator and monitor ports of the testing station using the appropriate medium.

Procedure:
Part A: Supported Non-Information OAMPDUs
   1. The DUT is instructed to reset the OAM Discovery process.
   2. The testing station is instructed to perform the necessary steps to complete the OAM Discovery process.
   3. Wait one second.
   4. The testing station is instructed to stop the transmission of Information OAMPDUs and transmit supported non-Information OAMPDUs with the Local Stable flag set low and the Local Evaluating flag set high.
   5. If supported, the DUT is instructed to transmit non-Information OAMPDUs.

Part B: Unsupported Non-Information OAMPDUs
   1. The DUT is instructed to reset the OAM Discovery process.
   2. The testing station is instructed to perform the necessary steps to complete the OAM Discovery process.
   3. Wait one second.
   4. The testing station is instructed to stop the transmission of Information OAMPDUs and transmit unsupported non-Information OAMPDUs with the Local Stable flag set low and the Local Evaluating flag set high.
   5. If supported, the DUT is instructed to transmit non-Information OAMPDUs

Observable Results:
   a. After the reception of the remote OAM device's dissatisfaction, the DUT should transmit all Information OAMPDUs with:
      • A rate of no fewer than once a second, but no more then ten a second
      • The Local Stable flag set high and the Local Evaluating flag set low
      • Exact copies of last received Local Stable and Local Evaluating flags in the Remote Stable and Remote Evaluation flags
      • A Local Information TLV followed by a Remote Information TLV that is an exact copy of last received Local Information TLV (with the exception of Information Type field)
   b. The DUT should not respond to non-Information OAMPDUs.
   c. The DUT should not transmit non-Information OAMPDUs.

Possible Problems: None.

GROUP 4: Transmitter Operation

Scope: The following tests cover OAM operations specific to the transmission of OAM client frames provided within OAM.

Overview: These tests are designed to verify that the device under test functions properly and adheres to the transmission of OAM client frame rules as defined by the text and the functional state machines outlined in Clause 57 of IEEE Std. 802.3ah-2004.

Test 57.4.1 – Expiration of pdu_timer

Purpose: To verify that the DUT follows the proper procedures after a second without a request to transmit an OAMPDU.

References:
   [1]   IEEE Std. 802.3ah-2004 – subclauses 57.3.2.2, 57.3.2.2.1, 57.3.2.2.2, 57.2.2.3, Figure 57-6, Figure 57-5, 57.3.2.1.3

Resource Requirements:
   - A testing station capable of transmitting and monitoring traffic to and from the DUT.
   - A testing station capable of disabling its transmitter.

Last Modification: November 01, 2004

Discussion: OAM is a connection-oriented protocol capable of timing out if the connection becomes stagnant. In order to keep the OAM Discovery process from restarting, every OAM device must transmit an OAMPDU at least once a second. When the OAM client does not wish to transmit any OAMPDUs the OAM sublayer relies on the expiration of the one-second pdu_timer as the mechanism to properly time the injection of an Information OAMPDU into the stream of transmitted frames.

The OAM sublayer however does the above with two restrictions:
   - If the local OAM device is operating in Passive mode and has yet to receive an Information OAMPDU from the remote Active mode OAM device the local OAM sublayer will not transmit any OAMPDUs.
   - The local OAM sublayer will not transmit any Information OAMPDUs if the OAM client has already transmitted a frame within the last second.

Test Setup: Connect the DUT to the pattern generator and monitor ports of the testing station using the appropriate medium.

Procedure:
Part A: Pdu_timer Resets Normally
   1.   The DUT is instructed to reset the OAM Discovery process.
   2.   The testing station is instructed to transmit an Information OAMPDU to the DUT.
   3.   Wait one second.

Part B: Pdu_timer Reset After Transmission
   1.   The DUT is instructed to reset the OAM Discovery process.
   2.   The testing station is instructed to go through the necessary steps to complete the OAM Discovery process.
   3.   The link is observed for three seconds.
   4.   If supported, the DUT is explicitly or implicitly instructed to transmit an OAMPDU as close to the expiration of pdu_timer as possible, otherwise observe the link for three minutes.

Part C: Passive Mode Request
   1.   If supported the DUT is configured for Passive mode operation and is instructed to reset the OAM Discovery process.
   2.   If supported, the DUT is instructed to transmit an OAMPDU, otherwise observe the link for three minutes.

Observable Results:
Part A: Pdu_timer Resets Normally
   a.   The DUT should transmit Information OAMPDUs at a rate of no fewer than once a second in the absence of any other OAMPDU requests.

Part B: Pdu_timer Reset After Transmission

b. The DUT should wait between one and two seconds before transmitting the first Information OAMPDU immediately following the transmission of a requested OAMPDU. The DUT should be observed to transmit all subsequent Information OAMPDUs at a rate of no fewer than once a second.

Part C: Passive Mode Request

c. The DUT should not transmit any OAMPDUs while in Passive mode.

Possible Problems:

Although pdu_timer expires once a second it does not guarantee that an OAMPDU is transmitted every second.

Following the transmission of a non-Information OAMPDU, the pdu_timer expires normally. Since an OAMPDU was transmitted within the last second the OAM sublayer will not transmit an Information OAMPDU. Pdu_timer will reset and then must expire once again before an Information OAMPDU will be automatically transmitted. This will create a period between the transmission of the non-Information OAMPDU and the Information OAMPDU greater than one but less than two seconds.

Test 57.4.2 – Valid OAMPDU Requests

Purpose: To verify that the DUT transmits OAMPDUs as a result of valid requests.

References:
  [1] IEEE Std. 802.3ah-2004 – subclauses 57.3.2.2.3, 57.3.2.2.6, Figure 57-6, Figure 57-5

Resource Requirements:
- A testing station capable of transmitting and monitoring traffic to and from the DUT.
- A testing station capable of disabling its transmitter.

Last Modification: November 01, 2004

Discussion: The OAM sublayer is bound by rules governing the transmission of slow protocol frames. As a result the OAM sublayer must not allow the OAM client to transmit more than 10 OAMPDUs per second. It is up to the OAM sublayer to determine whether the OAM client's request to transmit an OAMPDU is valid. A request is deemed valid if the OAM sublayer:
- Is not passively waiting in the OAM Discovery process
- Has not already transmitted ten OAMPDUs
- Is not transmitting OAMPDUs with a critical link event flag set

However, if the OAM sublayer has completed the OAM Discovery process and has a critical link event, the link is considered less than optimal and the DUT is permitted to transmit any desired number of OAMPDUs at any desired rate. Additionally a link fault, indicated by the Link Fault critical link event flag set, is considered an OAM Discovery fault condition and is limited by the once a second rate.

Test Setup: Connect the DUT to the pattern generator and monitor ports of the testing station using the appropriate medium.

Procedure:
Part A: Valid OAMPDU Request
  1. The DUT is instructed to reset the OAM Discovery process.
  2. The testing station is instructed to perform the necessary steps to complete the OAM Discovery process.
  3. If supported, the DUT is instructed to transmit twenty OAMPDUs as quickly as possible, otherwise observe the link for three minutes.

Part B: Valid Critical Link Event Request
  1. The DUT is instructed to reset the OAM Discovery process.
  2. The testing station is instructed to perform the necessary steps to complete the OAM Discovery process.
  3. If supported, the DUT is instructed to transmit twenty OAMPDUs with the Critical Event critical link event flag set high as quickly as possible, otherwise observe the link for three minutes.
  4. Step 3 is repeated with the Dying Gasp critical link event flag set high.

Part C: Valid Link Fault Requests
  1. The DUT is instructed to reset the OAM Discovery process.
  2. The testing station is instructed to perform the necessary steps to complete the OAM Discovery process.
  3. Wait one second.
  4. The testing station is instructed to disable its transmitter.
  5. If supported, the DUT is instructed to transmit twenty Information OAMPDUs with the Link Fault critical link event flag set high as quickly as possible, otherwise observe the link for three minutes.

Observable Results:

Part A: Valid OAMPDU Request
    a.   The DUT should transmit all OAMPDUs at a rate of no more than ten frames a second.

Part B: Valid Critical Link Event Request
    b.   The DUT should transmit OAMPDUs at any desired rate.

Part C: Valid Link Fault Requests
    c.   The DUT should transmit Information OAMPDUs only and at a rate of no fewer than once a second.

Possible Problems:
Although the DUT should not be observed to transmit more than ten OAMPDUs a second, the second is relative to the expiration of pdu_timer and not to any test system or network clock. As a result, a test system that uses the system clock may observe the DUT transmitting more than ten OAMPDUs a second. Assuming that the pdu_timer expired exactly half way through the second, the first half could contain ten OAMPDUs from the last second of transmission and the second half could contain the current transmission of ten OAMPDUs. In this case the DUT should not be observed to transmit more than twenty OAMPDUs within a second.

Test 57.4.3 – Invalid OAMPDU Requests Ignored

Purpose: To verify that the DUT does not transmit OAMPDUs as a result of invalid requests.

References:
    [1]   IEEE Std. 802.3-2004 – subclauses 57.3.2.2.3, 57.3.2.2.6, Figure 57-6, Figure 57-5

Resource Requirements:
- A testing station capable of transmitting and monitoring traffic to and from the DUT.
- A testing station capable of disabling its transmitter.

Last Modification: November 01, 2004

Discussion: The OAM sublayer is bound by rules governing the transmission of slow protocol frames. As a result the OAM sublayer must not allow the OAM client to transmit more than 10 OAMPDUs per second. It is up to the OAM sublayer to determine whether the OAM client's request to transmit an OAMPDU is valid. A request is deemed valid if the OAM sublayer:
- Is not passively waiting in the OAM Discovery process
- Has not already transmitted ten OAMPDUs
- Is not transmitting OAMPDUs with a critical link event flag set

However, if the OAM sublayer has completed the OAM Discovery process and has a critical link event, the link is considered less than optimal and the DUT is permitted to transmit any desired number of OAMPDUs at any desired rate. Additionally a link fault, indicated by the Link Fault critical link event flag set, is considered an OAM Discovery fault condition and is limited by the once a second rate.

All invalid requests to transmit an OAMPDU should be discarded by the OAM sublayer. The OAM sublayer should continue to operate normally in its current OAM Discovery state.

Test Setup: Connect the DUT to the pattern generator and monitor ports of the testing station using the appropriate medium.

Procedure:
Part A: Invalid Local_lost_link_timer Request
1. The DUT is instructed to reset the OAM Discovery process.
2. The testing station is instructed to perform the necessary steps to complete the OAM Discovery process.
3. Wait five seconds.
4. If supported, the DUT is explicitly or implicitly instructed to transmit twenty non-Information OAMPDUs, otherwise observe the link for three minutes.

Part B: Invalid Critical Link Event Request
1. The DUT is instructed to reset the OAM Discovery process.
2. The testing station is instructed to transmit an Information OAMPDU to the DUT.
3. If supported, the DUT is explicitly instructed to transmit twenty OAMPDUs with the Critical Event critical link event flag set high as quickly as possible, otherwise observe the link for three minutes.
4. Step 3 is repeated with the Dying Gasp critical link event flag set high.

Part C: Invalid Link Fault Request
1. The DUT is instructed to reset the OAM Discovery process.
2. The testing station is instructed to perform the necessary steps to complete the OAM Discovery process.
3. The testing station is instructed to disable its transmitter.
4. If supported, the DUT is explicitly instructed to transmit, as quickly as possible, twenty non-Information OAMPDUs with the Link Fault critical link event flag set high, otherwise observe the link for three minutes.

Part D: Invalid Passive Mode Request
1. If supported the DUT is configured for Passive mode operation and is instructed to reset the OAM Discovery process.
2. If supported, the DUT is instructed to transmit twenty OAMPDUs as quickly as possible, otherwise observe the link for three minutes.
3. If supported, the DUT is instructed to transmit twenty OAMPDUs as quickly as possible, otherwise observe the link for three minutes.

Observable Results:
Part A: Invalid Local_lost_link_timer Request
    a. The DUT should transmit only Information OAMPDUs after local_lost_link_timer expires.

Part B: Invalid Critical Link Event Request
    b. The DUT should not transmit OAMPDUs with critical link event flags set when the OAM Discovery process has not completed.

Part C: Invalid Link Fault Request
    c. The DUT should not transmit any non-Information OAMPDUs when a link fault condition exists.

Part D: Invalid Passive Mode Request
    d. The DUT should not transmit any OAMPDUs while in the PASSIVE_WAIT state.

Possible Problems: None.

GROUP 5: Multiplexer Operation

Scope: The following tests cover OAM operations specific to the multiplexer functionality provided within OAM.

Overview: These tests are designed to verify that the device under test properly injects OAMPDUs into the MAC client stream of data and adheres to the rules defined by the text and the functional state machines outlined in Clause 57 of IEEE Std. 802.3ah-2004.

Test 57.5.1 – Traffic Priority

Purpose: To verify that the DUT places priority on the transmission of OAMPDUs above MAC client traffic.

References:
    [1]   IEEE Std. 802.3ah-2004 – subclause 57.3.3.1.1, Figure 57-7

Resource Requirements:
- A testing station capable of transmitting and monitoring traffic to and from the DUT.

Last Modification: November 01, 2004

Discussion: An OAM device must transmit at least one OAMPDU every second in order to keep the OAM Discovery process alive. To keep the OAMPDU from being delayed by a large queue of MAC client data, the OAM sublayer ensures that all OAMPDUs have priority over higher layer traffic.

Test Setup: Connect the DUT to the pattern generator and monitor ports of the testing station using the appropriate medium.

Procedure:
1. If supported, while OAM is enabled, the DUT is instructed to enable the reception of MAC Control PAUSE Flow Control frames.
2. The DUT is instructed to transmit a continuous stream of line rate MAC client frames. If possible, multiple ingress ports should converge out the OAM capable egress port.
3. The testing station is instructed to transmit enough PAUSE frames to inhibit transmission from the DUT for one second.

Observable Results:
    a.   The DUT should transmit OAMPDUs at a rate of no less than once a second, despite a flood of MAC client traffic.

Possible Problems: None.

Test 57.5.2 – Unidirectional Traffic

Purpose: To verify that the DUT does not transmit MAC client data while in unidirectional mode.

References:
  [1]   IEEE Std. 802.3ah-2004 – subclause 57.3.3.1.2, Figure 57-7

Resource Requirements:
  • A testing station capable of transmitting and monitoring traffic to and from the DUT.
  • A testing station capable of disabling its transmitter.

Last Modification: November 01, 2004

Discussion: The OAM sublayer ensures that OAMPDUs have priority over higher layer traffic. Should the physical link become unstable and a device is unable to receive frames from its peer, the OAM sublayer will halt the transmission of all higher layer traffic and allow only the transmission of Information OAMPDUs with the Link Fault critical link event flag set and without Information TLVs.

Test Setup: Connect the DUT to the pattern generator and monitor ports of the testing station using the appropriate medium.

Procedure:
  1. The DUT is instructed to reset the OAM Discovery process.
  2. The testing station is instructed to perform the necessary steps to complete the OAM Discovery process.
  3. The testing station is instructed to disable its transmitter.
  4. The DUT in instructed to transmit MAC client data.

Observable Results:
  a. The DUT should not transmit MAC client data while operating in a unidirectional mode.
  b. The DUT should transmit only Information OAMPDUs with the Link Fault critical link event flag set high and containing no Information TLVs.

Possible Problems: None.

GROUP 6: Event Notification Operation

Scope: The following tests cover OAM operations specific to the optional link event notification functionality provided within OAM.

Overview: These tests are designed to verify that the device under test functions properly and adheres to the rules defined in Clause 57 of IEEE Std. 802.3ah-2004.

Note: Link event notification operation is an optional function of the Clause 57 OAM. Devices that do no support event notification should ignore the tests found in Group 6.

Test 57.6.1 – Properly Encapsulated Event Notification OAMPDUs

Purpose: To verify that the DUT properly encapsulates Event Notification OAMPDUs.

References:
   [1]   IEEE Std. 802.3ah-2004 – subclauses 57.4.3.2, 57.5.3, Table 57-12

Resource Requirements:
   - A testing station capable of transmitting and monitoring traffic to and from the DUT.
   - A testing station capable of transmitting Layer 1 or 2 errored frames.

Last Modification: November 01, 2004

Discussion: IEEE Std. 802.3ah-2004 defines the frame format for all Operations Administration, and Maintenance Protocol Data Units (OAMPDUs) and the TLVs used by the OAMPDUs, for proper operation of the OAM protocol. It is advised that organizations not deviate from the rules that govern proper OAMPDU construction.

The OAM sublayer resides under any bridging entity and as a result can only traverse a single link. Therefore all OAMPDUs are basic frames and are not tagged. This includes but is not limited to QTag Prefix tagging.

The Event Notification OAMPDU has a number of different Link Event TLVs defined. The OAM sublayer shall not transmit an Event Notification OAMPDU without at least one Link Event TLV.

To ensure compatibility with future use of *reserved* bits and code types, all OAMPDUs should contain reserved bit spaces set low and not transmit any reserved code types. This includes all reserved portions of Event Notification OAMPDUs:
   - Reserved flags
   - Reserved value for Local Stable and Local Evaluating flags
   - Reserved Link Event Type value

Test Setup: Connect the DUT to the pattern generator and monitor ports of the testing station using the appropriate medium.

Procedure:
   1. The DUT is instructed to reset the OAM Discovery process.
   2. The testing station is instructed to perform the necessary steps to complete the OAM Discovery process.
   3. Wait one second.
   4. If supported, the DUT is explicitly or implicitly instructed to transmit an Event Notification OAMPDU.

Observable Results:
   a. The DUT should not transmit Information OAMPDUs with:
      - Tags including but not limited to the QTag Prefix
      - A value in the Reserved portion of the Flags field
      - The value of 0x3 in the Local Stable and Local Evaluating flags portion of the Flags field
      - No Link Event TLVs present
      - Link Event TLV type values within the range of 0x03 - 0xFD inclusive or 0xFF

Possible Problems: None.

Test 57.6.2 – Sequence Number Increments Correctly

Purpose: To verify that the DUT increments the sequence number on all unique Event Notification OAMPDUs transmitted.

References:
   [1]   IEEE Std. 802.3ah-2004 – subclause 57.4.3.2

Resource Requirements:
   - A testing station capable of transmitting and monitoring traffic to and from the DUT.
   - A testing station capable of transmitting Layer 1 or 2 errored frames.

Last Modification: November 01, 2004

Discussion: Since an Ethernet link is a best effort transport; any packet sent along the segment may become corrupt and discarded. In order to help ensure a particular Event Notification OAMPDU is received at the remote OAM sublayer, duplicate Event Notification OAMPDUs may be transmitted across the link. To keep a receiving OAM device from parsing and interpreting repeated Event Notification OAMPDU a sequence number proceeds the first Event TLV. This sequence number should be incremented only on the transmission of unique Event Notification OAMPDUs.

Test Setup: Connect the DUT to the pattern generator and monitor ports of the testing station using the appropriate medium.

Procedure:
   1. The DUT is instructed to reset the OAM Discovery process.
   2. The testing station is instructed to perform the necessary steps to complete the OAM Discovery process.
   3. The testing station is instructed to send a continuous stream of errored packets in a manner to cause the DUT to transmit an Event Notification OAMPDU.
   4. The testing station is then instructed to stop sending errored packet.
   5. The testing station is again instructed to send a continuous stream of errored packets in a manner to cause the DUT to transmit an Event Notification OAMPDU.

Observable Results:
   a. The DUT should increment the sequence number in all unique Event Notification OAMPDUs regardless of the initial value.

Possible Problems: None.

Test 57.6.3 – Duplicate Event Notification OAMPDUs

Purpose: To verify that the DUT transmits all duplicate Event Notification OAMPDUs in succession.

References:
> [1]   IEEE Std. 802.3ah-2004 – subclause 57.4.3.2

Resource Requirements:
- A testing station capable of transmitting and monitoring traffic to and from the DUT.
- A testing station capable of transmitting Layer 1 or 2 errored frames.

Last Modification: November 01, 2004

Discussion: Since an Ethernet link is a best effort transport; any packet sent along the segment may be become corrupt and discarded. In order to help ensure a particular Event Notification OAMPDU is received at the remote OAM sublayer, duplicate Event Notification OAMPDUs may be transmitted across the link. It is recommended that duplicate Event Notification OAMPDUs be sent without any intervening Event Notification OAMPDU.

Test Setup: Connect the DUT to the pattern generator and monitor ports of the testing station using the appropriate medium.

Procedure:
1. The DUT is instructed to reset the OAM Discovery process.
2. The testing station is instructed to perform the necessary steps to complete the OAM Discovery process.
3. The testing station is instructed to send a continuous stream of errored packets in a manner to cause the DUT to transmit an Event Notification OAMPDU.

Observable Results:
a. The DUT should transmit duplicate Event Notification OAMPDUs with the same sequence number and without any different intervening Event Notification OAMPDUs between them.

Possible Problems:
The DUT may not support duplicate Event Notification OAMPDUs.

Test 57.6.4 – Identical Event TLVs

Purpose: To verify that the DUT does not transmit the same Event TLV within different Event Notification OAMPDUs.

References:
 [1] IEEE Std. 802.3ah-2004 – subclause 57.4.3.2

Resource Requirements:
 • A testing station capable of transmitting frames and monitoring traffic to and from the DUT.
 • A testing station capable of transmitting Layer 1 or 2 errored frames.

Last Modification: November 01, 2004

Discussion: Event Notification OAMPDUs use Event TLVs to report link events to a remote OAM device. To keep a receiving OAM device from parsing and interpreting repeated Event Notification OAMPDU a sequence number proceeds the first Event TLV. It is recommended that the same Event TLV (reporting the same event condition) not be used in multiple Event Notification OAMPDUs.

Test Setup: Connect the DUT to the pattern generator and monitor ports of the testing station using the appropriate medium.

Procedure:
 1. The DUT is instructed to reset the OAM Discovery process.
 2. The testing station is instructed to perform the necessary steps to complete the OAM Discovery process.
 3. The testing station is instructed to continuously send errored packets to the DUT in a manner to cause the DUT to transmit an Event Notification OAMPDU.
 4. The testing station is instructed to continuously send errored packets to the DUT in a manner as to case the DUT to transmit a different Event Notification OAMPDU.

Observable Results:
 a. The DUT should transmit all Event Notification OAMPDUs with different sequence numbers and none should contain the same Link Event TLV.

Possible Problems: None.

GROUP 7: Variable Request Operation

Scope:.The following tests cover OAM operations specific to the variable request functionality provided within OAM.

Overview: Variable requests provide a mechanism to poll the remote OAM device of its MIB attributes, packages, and objects using CMIP encodings. These tests are designed to verify that the device under test properly requests MIB variables while adhering to the rules defined in Clause 57 of IEEE Std. 802.3ah-2004.

Note: Variable query operation is an optional function of the Clause 57 OAM. Devices that do no support variable requests should ignore the tests found in Group 7.

Test 57.2.1 – Properly Encapsulated Variable Request OAMPDUs

Purpose: To verify that the DUT properly encapsulates Variable Request OAMPDUs.

References:
  [1] IEEE Std. 802.3ah-2004 – subclauses 57.4.3.3

Resource Requirements:
  • A testing station capable of transmitting and monitoring traffic to and from the DUT.

Last Modification: November 01, 2004

Discussion: IEEE Std. 802.3ah-2004 defines the frame format for all Operations Administration, and Maintenance Protocol Data Units (OAMPDUs) and the TLVs used by the OAMPDUs, for proper operation of the OAM protocol. It is advised that organizations not deviate from the rules that govern proper OAMPDU construction.

The OAM sublayer resides under any bridging entity and as a result can only traverse a single link. Therefore all OAMPDUs are basic frames and are not tagged. This includes but is not limited to QTag Prefix tagging.

The Variable Request OAMPDU can contain a number of different Variable Descriptors, however the OAM sublayer will not transmit a Variable Request OAMPDU without at least one Variable Descriptor.

To ensure compatibility with future use of *reserved* bits and code types, all OAMPDUs should contain reserved bit spaces set low and not transmit any reserved code types. This includes all reserved portions of Variable Request OAMPDUs:
  • Reserved flags
  • Reserved value for Local Stable and Local Evaluating flags

Test Setup: Connect the DUT to the pattern generator and monitor ports of the testing station using the appropriate medium.

Procedure:
  1. The DUT is instructed to reset the OAM Discovery process.
  2. The testing station is instructed to perform the necessary steps to complete the OAM Discovery process.
  3. Wait one second.
  4. If supported, the DUT is explicitly or implicitly instructed to transmit a Variable Request OAMPDU.

Observable Results:
  a. The DUT should not transmit Information OAMPDUs with:
      • Tags including but not limited to the QTag Prefix
      • A value in the Reserved portion of the Flags field
      • The value of 0x3 in the Local Stable and Local Evaluating flags portion of the Flags field
      • No Variable Descriptors present
      • No Variable Descriptors requesting actions.

Possible Problems: None.

Test 57.7.2 – Variable Request from Passive Device

Purpose: To verify that the DUT does not transmit Variable Request OAMPDUs while in Passive mode.

References:
    [1]   IEEE Std. 802.3ah-2004 – subclause 57.2.4, Table 57-1

Resource Requirements:
- A testing station capable of transmitting and monitoring traffic from itself and the DUT.

Last Modification: November 01, 2004

Discussion: OAM devices operating in Passive mode are restricted from initiating operations in which the local device would be taking an active role. As a result devices operating in Passive mode cannot initiate variable requests.

Test Setup: Connect the DUT to the pattern generator and monitor ports of the testing station using the appropriate medium.

Procedure:
1. If supported, the DUT is configured for Passive mode operation and instructed to reset the OAM Discovery process.
2. The testing station is instructed to perform the necessary steps to complete the OAM Discovery process.
3. Wait one second.
4. If supported, the DUT is explicitly instructed to transmit a Variable Request OAMPDU.

Observable Results:
    a.   The DUT should not transmit Variable Request OAMPDUs while operating in Passive mode.

Possible Problems: None.

GROUP 8: Variable Response Operation

Scope: The following tests cover OAM operations specific to the optional remote loopback functionality provided within OAM.

Overview: Variable responses provide a mechanism to return CMIP encoded attributes, packages, and objects polled by the remote OAM device. These tests are designed to verify that the device under test properly responds to MIB variables requests while adhering to the rules defined in Clause 57 of IEEE Std. 802.3ah-2004.

Note: Variable query operation is an optional function of the Clause 57 OAM. Devices that do no support variable responses should ignore the tests found in Group 8.

Test 57.8.1 – Properly Encapsulated Variable Response OAMPDUs

Purpose: To verify that the DUT properly encapsulates Variable Response OAMPDUs.

References:
[1]   IEEE Std. 802.3ah-2004 – subclauses 57.4.3.4

Resource Requirements:
- A testing station capable of transmitting and monitoring traffic to and from the DUT.

Last Modification: November 01, 2004

Discussion: IEEE Std. 802.3ah-2004 defines the frame format for all Operations Administration, and Maintenance Protocol Data Units (OAMPDUs) and the TLVs used by the OAMPDUs, for proper operation of the OAM protocol. It is advised that organizations not deviate from the rules that govern proper OAMPDU construction.

The OAM sublayer resides under any bridging entity and as a result can only traverse a single link. Therefore all OAMPDUs are basic frames and are not tagged. This includes but is not limited to QTag Prefix tagging.

The Variable Response OAMPDU can contain a number of different Variable Containers, however the OAM sublayer will not transmit a Variable Response OAMPDU without at least one Variable Container.

To ensure compatibility with future use of *reserved* bits and code types, all OAMPDUs should contain reserved bit spaces set low and not transmit any reserved code types. This includes all reserved portions of Variable Response OAMPDUs:
- Reserved flags
- Reserved value for Local Stable and Local Evaluating flags

Test Setup: Connect the DUT to the pattern generator and monitor ports of the testing station using the appropriate medium.

Procedure:
1. The DUT is instructed to reset the OAM Discovery process.
2. The testing station is instructed to perform the necessary steps to complete the OAM Discovery process.
3. Wait one second.
4. The testing station is instructed to transmit a Variable Request OAMPDU.
5. Wait one second.

Observable Results:
a. The DUT should not transmit Information OAMPDUs with:
   - Tags including but not limited to the QTag Prefix
   - A value in the Reserved portion of the Flags field
   - The value of 0x3 in the Local Stable and Local Evaluating flags portion of the Flags field
   - No Variable Containers present

Possible Problems: None.

Test 57.8.2 – Timely Response

Purpose: To verify that the DUT transmits Variable Response OAMPDUs within one second of reception of the Variable Request.

References:
   [1]   IEEE Std. 802.3ah-2004 – subclause 57.4.3.4, Table 57-14, Annex 30A

Resource Requirements:
   - A testing station capable of transmitting and monitoring traffic to and from the DUT.
   - A testing station capable of decoding Variable Containers.

Last Modification: November 01, 2004

Discussion: OAM provides a mechanism to poll or query a capable remote OAM device of its MIB variables with the use of Variable Request and Variable Response OAMPDUs. This is beneficial in gathering statistical information from a peer OAM device. Each Variable Response OAMPDU contains one or more Variable Containers, which contain MIB attributes, objects, and/or packages. Regardless of content, a Variable Response OAMPDU should take no longer than one second to be generated as a result of a Variable Request OAMPDU.

Test Setup: Connect the DUT to the pattern generator and monitor ports of the testing station using the appropriate medium.

Procedure:
Part A: Known Variables
   1. The DUT is instructed to reset the OAM Discovery process.
   2. The testing station is instructed to perform the necessary steps to complete the OAM Discovery process.
   3. The testing station is instructed to send a Variable Request OAMPDU with a Variable Descriptor containing a request for a MIB attribute the DUT can return.
   4. Wait one second.
   5. Step 3 is repeated with a request for the largest package the DUT can return.
   6. Step 3 is repeated with a request for the larges object the DUT can return.

Part B: Unknown Variables
   1. The DUT is instructed to reset the OAM Discovery process.
   2. The testing station is instructed to perform the necessary steps to complete the OAM Discovery process.
   3. The testing station is instructed to send a Variable Request OAMPDU with a Variable Descriptor containing a request for a MIB attribute the DUT cannot return.
   4. Wait one second.
   5. Step 3 is repeated with a request for the largest package the DUT cannot return.
   6. Step 3 is repeated with a request for the larges object the DUT cannot return.

Observable Results:
Part A: Known Variables
   a. The DUT should transmit a Variable Response OAMPDU with a Variable Container within one second of the reception of the Variable Request OAMPDU querying known variables.

Part B: Unknown Variables
   b. The DUT should transmit a Variable Response OAMPDU with a Variable Container indicating an error within one second of the reception of the Variable Request OAMPDU querying unknown variables.

Possible Problems: None.

Test 57.8.3 – Error Indication

Purpose: To verify that the DUT transmits Variable Response OAMPDUs with proper error indication.

References:
   [1]   IEEE Std. 802.3ah-2004 – subclause 57.4.3.4, Table 57-14, Annex 30A

Resource Requirements:
   - A testing station capable of transmitting and monitoring traffic to and from the DUT.
   - A testing station capable of decoding Variable Containers.

Last Modification: November 01, 2004

Discussion: OAM provides a mechanism to poll or query a capable remote OAM device of its MIB variables with the use of Variable Request and Variable Response OAMPDUs. This is beneficial in gathering statistical information from a peer OAM device. Each Variable Response OAMPDU contains one or more Variable Containers, which contain MIB attributes, objects, and/or packages.

If an OAM device capable of responding to variable requests cannot return one or more attributes for an object or package the local OAM device can do one of two things:
   - Return a Variable Indicator Error for all attributes that cannot be returned and return those attributes that can.
   - Return a Variable Indicator Error for the entire object or package

Test Setup: Connect the DUT to the pattern generator and monitor ports of the testing station using the appropriate medium.

Procedure:
   1. The DUT is instructed to reset the OAM Discovery process.
   2. The testing station is instructed to perform the necessary steps to complete the OAM Discovery process.
   3. The testing station is instructed to send a Variable Request OAMPDU with a Variable Descriptor containing a request for a MIB package in which the DUT cannot return all contained attributes.
   4. Wait one second.
   5. Step 3 is repeated with a request for a MIB object in which the DUT cannot return all contained attributes.

Observable Results:
   a. The DUT should either return a Variable Error for all attributes it could not return or return a Variable Error for the entire package or object.

Possible Problems: None.

Test 57.8.4 – Variable Container Larger than Rest of Frame

Purpose: To verify that the DUT handles requested variables which are larger than the maximum allowed OAMPDU.

References:
   [1]   IEEE Std. 802.3ah-2004 – subclause 57.6, 574.3.4, Table 57-14, Annex 30A

Resource Requirements:
   - A testing station capable of transmitting and monitoring traffic to and from the DUT.
   - A testing station capable of decoding Variable Containers.

Last Modification: November 01, 2004

Discussion: OAM provides a mechanism to poll or query a capable remote OAM device of its MIB variables with the use of Variable Request and Variable Response OAMPDUs. This is beneficial in gathering statistical information from a peer OAM device. Each Variable Response OAMPDU contains one or more Variable Containers, which contain MIB attributes, objects, and/or packages. If a variable is requested such that the Variable Container will produce a Variable Request OAMPDU larger than the maximum OAMPDU size, the receiving device should send an error code.

Test Setup: Connect the DUT to the pattern generator and monitor ports of the testing station using the appropriate medium.

Procedure:
Part A: Large Package Request
   1. The DUT is instructed to reset the OAM Discovery process.
   2. The testing station is instructed to perform the necessary steps to complete the OAM Discovery process. The testing station should advertise a Maximum OAMPDU Size of minFrameSize.
   3. Wait one second.
   4. The testing station is instructed to send a Variable Request OAMPDU with a Variable Descriptor containing a request for a MIB package larger than the current maximum OAMPDU size.
   5. Wait one second.

Part B: Large Object Request
   1. The DUT is instructed to reset the OAM Discovery process.
   2. The testing station is instructed to perform the necessary steps to complete the OAM Discovery process. The testing station should advertise a Maximum OAMPDU Size of minFrameSize.
   3. Wait one second.
   4. The testing station is instructed to send a Variable Request OAMPDU with a Variable Descriptor containing a request for a MIB object larger than the current maximum OAMPDU size.
   5. Wait one second.

Observable Results:
   a. The DUT should not transmit a Variable Container, which contains requested MIB variables larger than the maximum allowed OAMPDU for the link. The DUT should transmit a Variable Container with the 0x01 error code.

Possible Problems: None.

Test 57.8.5 – Response to Action Request

Purpose: To verify that the DUT does not respond to requests for MIB actions.

References:
    [1]   IEEE Std. 802.3ah-2004 – Table 57-14, Annex 30A

Resource Requirements:
- A testing station capable of transmitting and monitoring traffic to and from the DUT.
- A testing station capable of decoding Variable Containers.

Last Modification: November 01, 2004

Discussion: OAM provides a mechanism to poll or query a capable remote OAM device of its MIB variables with the use of Variable Request and Variable Response OAMPDUs. This is beneficial in gathering statistical information from a peer OAM device. Each Variable Response OAMPDU contains one or more Variable Containers, which contain MIB attributes, objects, and/or packages. A Variable Container is not permitted to contain a MIB action.

Test Setup: Connect the DUT to the pattern generator and monitor ports of the testing station using the appropriate medium.

Procedure:
1. The DUT is instructed to reset the OAM Discovery process.
2. The testing station is instructed to perform the necessary steps to complete the OAM Discovery process.
3. Wait one second.
4. The testing station is instructed to send a Variable Request OAMPDU with a Variable Descriptor containing a request for a MIB action.
5. Wait one second.

Observable Results:
    a. The DUT should not be observed to transmit Variable Response OAMPDUs with Variable Containers, which contains a MIB action.

Possible Problems: None.

GROUP 9: Remote Loopback Operation

Scope: The following tests cover OAM operations specific to the optional remote loopback functionality provided within OAM.

Overview: OAM provides a data link layer frame-level loopback mechanism that can be remotely controlled by an OAM device. These tests are designed to verify that the device under test, whether the local OAM device initiating the loopback command or the remote OAM device adhering to the loopback command, functions properly and adheres to the rules defined in Clause 57 of IEEE Std. 802.3ah-2004.

Note: Loopback operation is an optional function of the Clause 57 OAM. Devices that do no support OAM remote loopback should ignore the tests found in Group 9.

Test 57.9.1 – Properly Encapsulated Loopback Control OAMPDUs

Purpose: To verify that the DUT properly encapsulates Loopback Control OAMPDUs.

References:
  [1] IEEE Std. 802.3ah-2004 – subclauses 57.4.3.5

Resource Requirements:
  • A testing station capable of transmitting and monitoring traffic to and from the DUT.

Last Modification: November 01, 2004

Discussion: IEEE Std. 802.3ah-2004 defines the frame format for all Operations Administration, and Maintenance Protocol Data Units (OAMPDUs) and the TLVs used by the OAMPDUs, for proper operation of the OAM protocol. It is advised that organizations not deviate from the rules that govern proper OAMPDU construction.

The OAM sublayer resides under any bridging entity and as a result can only traverse a single link. Therefore all OAMPDUs are basic frames and are not tagged. This includes but is not limited to QTag Prefix tagging.

To ensure compatibility with future use of *reserved* bits and code types, all OAMPDUs should contain reserved bit spaces set low and not transmit any reserved code types. This includes all reserved portions of Variable Response OAMPDUs:
  • Reserved flags
  • Reserved value for Local Stable and Local Evaluating flags
  • Reserved Loopback Command value

Test Setup: Connect the DUT to the pattern generator and monitor ports of the testing station using the appropriate medium.

Procedure:
  1. The DUT in instructed to reset the OAM Discovery process.
  2. The testing station in instructed to perform the necessary steps to complete the OAM Discovery process.
  3. Wait one second.
  4. If supported, the DUT is explicitly instructed to transmit a Loopback Control OAMPDU.

Observable Results:
  a. The DUT should not transmit Loopback Control OAMPDUs with:
     • Tags including but not limited to the QTag Prefix
     • A value in the Reserved portion of the Flags field
     • The value of 0x3 in the Local Stable and Local Evaluating flags portion of the Flags field
     • Loopback Command value of 0x00 or within the range of 0x03 - 0xFF inclusive

Possible Problems: None.

Test 57.9.2 – Loopback Control from Passive Device

Purpose: To verify that the DUT does not transmit Loopback Control OAMPDUs while in Passive mode.

References:
[1] IEEE Std. 802.3ah-2004 – subclause 57.2.4, Table 57-1

Resource Requirements:
- A testing station capable of transmitting and monitoring traffic to and from the DUT.

Last Modification: November 01, 2004

Discussion: OAM devices operating in Passive mode are restricted from initiating operations in which the local device would be taking an active role. As a result devices operating in Passive mode cannot initiate remote loopback operation.

Test Setup: Connect the DUT to the pattern generator and monitor ports of the testing station using the appropriate medium.

Procedure:
1. If supported, the DUT is configured for Passive mode operation and instructed to reset the OAM Discovery process.
2. The testing station is instructed to perform the necessary steps to complete the OAM Discovery process.
3. Wait one second.
4. If supported, the DUT is explicitly instructed to transmit a Loopback Control OAMPDU.

Observable Results:
a. The DUT should not transmit Loopback Control OAMPDUs while operating in Passive mode.

Possible Problems: None.

Test 57.9.3.1 – Initiation – Master Starts

Purpose: To verify that the DUT stops transmitting and responding to non-OAMPDUs when initiating the loopback operation.

References:
   [1]   IEEE Std. 802.3ah-2004 – subclauses 57.2.11.1, 57.3.1.2, Figure 57-7, Figure 57-8

Resource Requirements:
   • A testing station capable of transmitting and monitoring traffic to and from the DUT.

Last Modification: November 01, 2004

Discussion: When a local OAM device is initiating the loopback operation, it must first stop the transmission and reception of all non-OAMPDUs to and from the remote OAM device before transmitting a Loopback Control OAMPDU with the Enable OAM Remote Loopback command.

The OAM sublayer does this by setting local mux_action to DISCARD thus stopping the introduction of new traffic into the network. The OAM sublayer then sets local_par_action to DISCARD, sinking all received non-OAMPDUs but passing all OAMPDUs to the OAM client. This ensures that any looped back frame will not be received by the MAC client and reintroduced into the network, while allowing OAMPDUs to reach the OAM client and keep the OAM Discovery process from restarting. The OAM sublayer then transmits a Loopback Control OAMPDU with the Loopback Command field set to the Enable OAM Remote Loopback command.

It is understood that stopping the reception of MAC client frames as a result of the loopback operation may be a cause of frame loss at either OAM device.

Test Setup: Connect the DUT to the pattern generator and monitor ports of the testing station using the appropriate medium.

Procedure:
   1.   The DUT is instructed to reset the OAM Discovery process.
   2.   The testing station is instructed to perform the necessary steps to complete the OAM Discovery process.
   3.   Wait one second.
   4.   The DUT is instructed to transmit a continuous stream of valid MAC client frames to the testing station.
   5.   The testing station is instructed to transmit a continuous stream of valid MAC client frames to the DUT.
   6.   The DUT in instructed to transmit a Loopback Control OAMPDU with the Enable OAM Remote Loopback command.
   7.   Wait half of a second.
   8.   The testing station is instructed to transmit an Information OAMPDU with an incremented Revision field in the Local Information TLV.

Observable Results:
   a.   The DUT should stop the transmission and reception of MAC client frames before sending Loopback Control OAMPDUs.
   b.   The DUT should transmit a Loopback Control OAMPDU with the Enable OAM Remote Loopback command value (0x01).
   c.   The DUT should transmit and respond to OAMPDUs throughout the initiation of loopback operation.

Possible Problems: None.

Test 57.9.3.2 – Initiation – Slave Acknowledges

Purpose: To verify that the DUT stops responding to non-OAMPDUs when accepting the initiation of the loopback operation.

References:
   [1]   IEEE Std. 802.3ah-2004 – subclauses 57.2.11.1, 57.2.11.6, 57.3.1.2, Figure 57-6, Figure 57-7

Resource Requirements:
   • A testing station capable of transmitting and monitoring traffic to and from the DUT.

Last Modification: November 01, 2004

Discussion: When a local OAM device is responding to the initiation of the loopback operation, it has one second to stop the transmission of MAC client frames and loopback any received non-OAMPDU transmission from the remote OAM device. Once done, the local OAM device, still constrained by the one-second limit, must then send an Information OAMPDU indicating this new configuration to the remote OAM device.

Upon the reception of a Loopback Control OAMPDU with the Enable OAM Remote Loopback command, the local OAM sublayer sets local_mux_action to DISCARD, sinking or queuing all transmissions of non-OAMPDUs, and sets local_par_action to LB, looping back all received non-OAMPDUs while passing all OAMPDUs to the OAM client. This ensures that any non-OAMPDU will be looped back, while allowing OAMPDUs to reach the OAM client. The local OAM device then transmits an Information OAMPDU with these changes reflected in the State field of the Local Information TLV.

It is understood that stopping the transmission of MAC client frames as a result of the loopback operation may be a cause of frame loss at either OAM device.

Test Setup: Connect the DUT to the pattern generator and monitor ports of the testing station using the appropriate medium.

Procedure:
   1.   The DUT is instructed to reset the OAM Discovery process.
   2.   The testing station is instructed to perform the necessary steps to complete the OAM Discovery process.
   3.   Wait one second.
   4.   The DUT is instructed to transmit a continuous stream of valid MAC client frames to the testing station.
   5.   The testing station is instructed to transmit a continuous stream of valid MAC client frames to the DUT.
   6.   The testing station in instructed to transmit a Loopback Control OAMPDU with the Enable OAM Remote Loopback command.
   7.   The testing station is instructed to transmit an Information OAMPDU with an incremented Revision field in the Local Information TLV.

Observable Results:
   a.   The DUT should stop the transmission of MAC client frames and start looping back received MAC client frames before sending an Information OAMPDU.
   b.   The DUT should transmit an Information OAMPDU with an updated State field (0x05) within one second of the reception of a Loopback Control OAMPDU with the Enable OAM Remote Loopback command.
   c.   The DUT should transmit and respond to OAMPDUs throughout the initiation of loopback operation.

Possible Problems: None.

Test 57.9.3.3 – Initiation – Master Completes

Purpose: To verify that the DUT starts transmitting test frames after receiving an acknowledgement of loopback initiation.

References:
   [1]   IEEE Std. 802.3ah-2004 – subclauses 57.2.11.1, 57.2.11.6, 57.3.1.2, Figure 57-6, Figure 57-7

Resource Requirements:
   • A testing station capable of transmitting and monitoring traffic to and from the DUT.

Last Modification: November 01, 2004

Discussion: When a local OAM device is initiating the loopback operation, it must first stop the transmission and reception of non-OAMPDUs to and from the remote OAM device before transmitting a Loopback Control OAMPDU with the Enable OAM Remote Loopback command. The remote then changes states appropriately and sends an acknowledgement. After the local OAM device receives the acknowledgement, it enables the transmission of MAC client frames (the loopback test frames).

The OAM sublayer enables the transmission of MAC client frames by setting local_mux_action to FWD allowing the transmission of MAC client data. The OAM sublayer does this only after it receives an Information OAMPDU with state information indicating that the remote OAM device has set local_mux_action to DISCARD and local_par_action to LB.

It is understood that stopping the transmission of MAC client frames as a result of the loopback operation may be a cause of frame loss at either OAM device.

Test Setup: Connect the DUT to the pattern generator and monitor ports of the testing station using the appropriate medium.

Procedure:
   1. The DUT is instructed to reset the OAM Discovery process.
   2. The testing station is instructed to perform the necessary steps to complete the OAM Discovery process.
   3. Wait one second.
   4. The DUT is instructed to transmit a continuous stream of valid MAC client frames to the testing station.
   5. The testing station is instructed to transmit a continuous stream of valid MAC client frames to the DUT.
   6. The DUT in instructed to transmit a Loopback Control OAMPDU with the Enable OAM Remote Loopback command.
   7. The testing station is instructed to transmit an Information OAMPDU with a State field indicating local_mux_action set to DISCARD and local_par_action set to LB.
   8. Wait one second.

Observable Results:
   a. The DUT should transmit a Loopback Control OAMPDU with the Enable OAM Remote Loopback command value (0x01).
   b. The DUT should copy the remote device's updated State field value (0x05) into the Remote Information TLV State field of all following Information OAMPDUs.
   c. The DUT should start the transmission of MAC client loopback test frames to the testing station.
   d. The DUT should not respond or forward MAC client frames received from the testing station.
   e. The DUT should transmit Information OAMPDUs with an updated State field value (0x02) after the reception of an Information OAMPDU from the remote OAM device.

Possible Problems: None.

Test 57.9.3.4 – Initiation – Simultaneous Initiation

Purpose: To verify that the DUT follows the recommended procedures when simultaneously initiating the loopback operation with another OAM device.

References:
   [1]   IEEE Std. 802.3ah-2004 – subclause 57.2.11.1

Resource Requirements:
   • A testing station capable of transmitting and monitoring traffic to and from the DUT.

Last Modification: November 01, 2004

Discussion: If a local OAM device initiates loopback operation and while waiting for the confirmation Information OAMPDU from the remote OAM device receives a Loopback Control OAMPDU with the Enable OAM Remote Loopback command instead, the local OAM device is recommended to adhere to the following procedures:
   • If the local OAM device has a higher Source Address than the remote OAM device, it is to enter loopback operation, at the control of the remote OAM device.
   • If the local OAM device has a lower Source Address than that of the remote OAM device, it is to ignore the Loopback Control OAMPDU and continue waiting for the Information OAMDPU from the remote OAM device.

This ensures that both devices cannot simultaneously place the remote OAM device into loopback mode.

Test Setup: Connect the DUT to the pattern generator and monitor ports of the testing station using the appropriate medium.

Procedure:
Part A: DUT has smaller Address
   1. The DUT is instructed to reset the OAM Discovery process.
   2. The testing station is instructed to perform the necessary steps to complete the OAM Discovery process.
   3. Wait one second.
   4. The DUT is instructed to transmit a Loopback Control OAMPDU with the Enable OAM Remote Loopback command.
   5. The testing station is instructed to transmit a Loopback Control OAMPDU with the Enable OAM Remote Loopback command and a Source Address larger than that of the DUT.

Part B: DUT has Larger Address
   1. The DUT is instructed to reset the OAM Discovery process.
   2. The testing station is instructed to perform the necessary steps to complete the OAM Discovery process.
   3. Wait one second.
   4. The DUT is instructed to transmit a Loopback Control OAMPDU with the Enable OAM Remote Loopback command.
   5. The testing station is instructed to transmit a Loopback Control OAMPDU with the Enable OAM Remote Loopback command and a Source Address smaller than that of the DUT.

Observable Results:
Part A: DUT has smaller Address
   a. The DUT should respond to the test station with an Information OAMPDU with an updated Local Information TLV State field value (0x05).

Part B: DUT has Larger Address

    b. The DUT should ignore the Loopback Control OAMPDU and continue to wait for an Information OAMPDU containing a Local Information TLV with an updated State field (0x05) from the remote OAM device.

Possible Problems: None.

Test 57.9.4.1 – During – Master Transmit and Receive OAMPDUs

Purpose: To verify that the DUT transmits and receives OAMPDUs at least once a second when controlling the loopback operation.

References:
   [1]   IEEE Std. 802.3ah-2004 – subclauses 57.2.11.2, 57.3.1.2, Figure 57-7, Figure 57-8

Resource Requirements:
   • A testing station capable of transmitting and monitoring traffic to and from the DUT.

Last Modification: November 01, 2004

Discussion: When an OAM device has the remote OAM device looping MAC client frames back, the local OAM device is still bound by the rules governing the restart of the OAM Discovery process. As a result the local OAM device must still be capable of receiving incoming OAMPDUs and transmitting one OAMPDU at a rate of at least once a second. The DUT however should discard any non-OAMPDU to keep the MAC client from re-introducing test frames into the network.

Test Setup: Connect the DUT to the pattern generator and monitor ports of the testing station using the appropriate medium.

Procedure:
   1. The DUT is instructed to reset the OAM Discovery process.
   2. The testing station is instructed to perform the necessary steps to complete the OAM Discovery process.
   3. Wait one second.
   4. The DUT is instructed to transmit a Loopback Control OAMPDU with the Enable Remote OAM Loopback command.
   5. The testing station is instructed to transmit an Information OAMPDU with a State field indicating local_mux_action set to DISCARD and local_par_action set to LB.
   6. Wait one second.

Observable Results:
   a. The DUT should transmit Information OAMPDUs with Local Information TLV State fields with an updated value (0x02) and Remote Information TLV State fields with an updated value (0x05). These Information OAMPDUs should be transmitted at a rate of at least once per second.
   b. The DUT should receive and respond to OAMPDUs from the remote OAM device.

Possible Problems: None.

Test 57.9.4.2 – During – Slave Transmit and Receive OAMPDUs

Purpose: To verify that the DUT transmits and receives OAMPDUs at least once a second when looping frames back to the remote OAM device.

References:
   [1]   IEEE Std. 802.3ah-2004– subclauses 57.2.11.2, 57.3.1.2, Figure 57-7, Figure 57-8

Resource Requirements:
- A testing station capable of transmitting and monitoring traffic to and from the DUT.

Last Modification: November 01, 2004

Discussion: When a local OAM device is looping MAC client frames back to the remote OAM device, the local OAM device is still bound by the rules governing the restart of the OAM Discovery process. As a result the local OAM device must still be capable of receiving incoming OAMPDUs and transmitting one at least once OAMPDU per second. The DUT however should loopback any non-OAMPDU to keep the MAC client from receiving test frames.

Test Setup: Connect the DUT to the pattern generator and monitor ports of the testing station using the appropriate medium.

Procedure:
1. The DUT is instructed to reset the OAM Discovery process.
2. The testing station is instructed to perform the necessary steps to complete the OAM Discovery process.
3. Wait one second.
4. The testing station is instructed to transmit a Loopback Control OAMPDU with the Enable OAM Remote Loopback command to the DUT.
5. Wait one second.

Observable Results:
a. The DUT should transmit Information OAMPDUs with Local Information TLV State fields with an updated value (0x05) and Remote Information TLV State fields with an updated value (0x02). These Information OAMPDUs should be transmitted at a rate of at least once per second.
b. The DUT should receive and respond to OAMPDUs from the remote OAM device.

Possible Problems: None.

Test 57.9.4.3 – During – Slave Loops Back Test Frames

Purpose: To verify that the DUT properly loops frames back to the remote OAM device.

References:
    [1]   IEEE Std. 802.3ah-2004 – subclauses 57.2.11.2, 57.3.1.2, Figure 57-7, Figure 57-8

Resource Requirements:
- A testing station capable of transmitting and monitoring traffic to and from the DUT.

Last Modification: November 01, 2004

Discussion: When a local OAM device is looping MAC client frames back to the remote OAM device, the local OAM device does so without altering any field of the loopback test frame.

Since the OAM sublayer resides above the MAC and MAC Control sublayers, frames destined for these layers will not be looped back. Also any errored frames (e.g. invalid CRC) should not be passed up by the MAC and therefore should not be looped back.

Test Setup: Connect the DUT to the pattern generator and monitor ports of the testing station using the appropriate medium.

Procedure:
Part A:
1. The DUT is instructed to reset the OAM Discovery process.
2. The testing station is instructed to perform the necessary steps to complete the OAM Discovery process.
3. Wait one second.
4. The testing station is instructed to transmit a Loopback Control OAMPDU with the Enable OAM Remote Loopback command to the DUT.
5. Wait one second.
6. The testing station is instructed to transmit 5 ICMP Echo Request frames to be looped back by the DUT.

Part B:
1. Part A step 6 is repeated with MAC Control PAUSE frames.

Part C:
1. Part A step 6 is repeated with loopback test frames containing an incorrect CRC in the FCS field.

Observable Results:
Part A: Valid Loopback Test Frames
    a.   The DUT should loopback ICMP Echo Request frames back to the testing station. These frames should be identical to the ICMP Echo Request frames transmitted by the testing station; this includes the same Destination and Source MAC addresses.

Part B: Valid MAC Control Frames
    b.   The DUT should not loopback MAC Control frames.

Part C: Invalid Loopback Test Frames
    c.   The DUT should not loopback frames with an incorrect CRC in the FCS field. If clause 30 is implemented, the DUT should log a FCS error.

Possible Problems:
If the DUT does not implement a MAC Control sublayer and a bridging entity the frames in Part B may be looped back.

Test 57.9.5.1 – Exiting – Master Starts

Purpose: To verify that the DUT stops transmitting and responding to non-OAMPDUs when exiting the loopback operation.

References:
   [1]   IEEE Std. 802.3ah-2004 – subclauses 57.2.11.2, 57.3.1.2, Figure 57-7, Figure 57-8

Resource Requirements:
   • A testing station capable of transmitting and monitoring traffic to and from the DUT.

Last Modification: November 01, 2004

Discussion: When a local OAM device wishes to exit loopback mode, the local OAM device should send a Loopback Control OAMPDU with the Loopback Command field set to Disable OAM Remote Loopback command. This will notify the remote OAM device that loopback operation is no longer required.

The OAM sublayer does this by setting local mux_action to DISCARD stopping the introduction of new traffic into the network. The OAM sublayer then sets local_par_action to DISCARD sinking all received non-OAMPDUs but passing all OAMPDUs to the OAM client. This ensures that any looped back frame will not be received by the MAC client and reintroduced into the network, while allowing OAMPDUs to reach the OAM client and keep the OAM Discovery process from restarting. The OAM sublayer then transmits a Loopback Control OAMPDU with the Loopback Command field set to the Disable OAM Remote Loopback command.

Test Setup: Connect the DUT to the pattern generator and monitor ports of the testing station using the appropriate medium.

Procedure:
   1. The DUT is instructed to reset the OAM Discovery process.
   2. The testing station is instructed to perform the necessary steps to complete the OAM Discovery process.
   3. Wait one second.
   4. The DUT is instructed to transmit a Loopback Control OAMPDU with the Enable OAM Remote Loopback command.
   5. The testing station is instructed to transmit an Information OAMPDU with a State field indicating local_mux_action set to DISCARD and local_par_action set to LB.
   6. The DUT is instructed to transmit a continuous stream of valid MAC client frames to be looped back by the testing station.
   7. The DUT is instructed to transmit a Loopback Control OAMPDU with the Disable OAM Remote Loopback command.
   8. Wait half of a second.
   9. The testing station is instructed to transmit an Information OAMPDU with an incremented Revision field in the Local Information TLV.

Observable Results:
   a. The DUT should stop the transmission and reception of MAC client frames before sending Loopback Control OAMPDUs.
   b. The DUT should transmit a Loopback Control OAMPDU with the Disable OAM Remote Loopback command value (0x02).
   c. The DUT should transmit and respond to OAMPDUs throughout the initiation of loopback operation.

Possible Problems: None.

Test 57.9.5.2 – Exiting – Slave Acknowledges

Purpose: To verify that the DUT start responding to non-OAMPDUs when accepting the discontinuation of the loopback operation.

References:
[1] IEEE Std. 802.3ah-2004 – subclauses 57.2.11.2, 57.2.11.6, 57.3.1.2, Figure 57-7, Figure 57-8

Resource Requirements:
- A testing station capable of transmitting and monitoring traffic to and from the DUT.

Last Modification: November 01, 2004

Discussion: When a local OAM device is responding to the exiting of loopback operation, it has one second to stop the looping back of MAC client frames and forward any received non-OAMPDU transmission from the remote OAM device to the MAC client. Once done, the local OAM device, still constrained by the one-second limit, must then send an Information OAMPDU indicating this new configuration to the remote OAM device.

Upon the reception of a Loopback Control OAMPDU with the Disable OAM Remote Loopback command, the local OAM sublayer sets local_mux_action to FWD, forwarding all transmissions of non-OAMPDUs down to the MAC, and sets local_par_action to FWD, passing all received non-OAMPDUs to the MAC client while passing all OAMPDUs to the OAM client. The local OAM device then transmits an Information OAMPDU with these changes reflected in the State field of the Local Information TLV.

Test Setup: Connect the DUT to the pattern generator and monitor ports of the testing station using the appropriate medium.

Procedure:
1. The DUT is instructed to reset the OAM Discovery process.
2. The testing station is instructed to perform the necessary steps to complete the OAM Discovery process.
3. Wait one second.
4. The DUT is instructed to transmit a continuous stream of valid MAC client frames to the testing station.
5. The testing station is instructed to transmit a continuous stream of valid MAC client frames to the DUT.
6. The testing station in instructed to transmit a Loopback Control OAMPDU with the Enable OAM Remote Loopback command.
7. The testing station is instructed to transmit a Loopback Control OAMPDU with the Disable OAM Remote Loopback command.
8. The testing station is instructed to transmit an Information OAMPDU with an incremented Revision field in the Local Information TLV.

Observable Results:
a. The DUT should stop the start transmitting and responding to or forwarding MAC client frames before sending an Information OAMPDU.
b. The DUT should transmit an Information OAMPDU with an updated State field (0x00) within one second of the reception of a Loopback Control OAMPDU with the Disable OAM Remote Loopback command.
c. The DUT should transmit and respond to OAMPDUs throughout the initiation of loopback operation.

Possible Problems: None.

Test 57.9.5.3 – Exiting – Master Completes

Purpose: To verify that the DUT receives non-OAMPDU after exiting loopback mode.

References:
[1]   IEEE Std. 802.3ah-2004 – subclauses 57.2.11.2, 57.3.1.2, Figure 57-7, Figure 57-8

Resource Requirements:
- A testing station capable of transmitting and monitoring traffic to and from the DUT.

Last Modification: November 01, 2004

Discussion: When a local OAM device is exiting the loopback operation, it must first stop the transmission and reception of non-OAMPDUs to and from the remote OAM device before transmitting a Loopback Control OAMPDU with the Disable OAM Remote Loopback command. The remote then changes states appropriately and sends an acknowledgement. After the local OAM device receives the acknowledgement, it enables the transmission and reception of MAC client frames (normal network traffic).

The OAM sublayer enables the transmission and reception of MAC client frames by setting local_mux_action and local_par_action to FWD. The OAM sublayer does this only after it receives an Information OAMPDU with state information indicating that the remote OAM device has set local_mux_action and local_par_action to FWD.

Test Setup: Connect the DUT to the pattern generator and monitor ports of the testing station using the appropriate medium.

Procedure:
1. The DUT is instructed to reset the OAM Discovery process.
2. The testing station is instructed to perform the necessary steps to complete the OAM Discovery process.
3. Wait one second.
4. The DUT is instructed to transmit a continuous stream of valid MAC client frames to the testing station.
5. The testing station is instructed to transmit a continuous stream of valid MAC client frames to the DUT.
6. The DUT in instructed to transmit a Loopback Control OAMPDU with the Enable OAM Remote Loopback command.
7. The testing station is instructed to transmit an Information OAMPDU with a State field indicating local_mux_action set to DISCARD and local_par_action set to LB.
8. The DUT in instructed to transmit a Loopback Control OAMPDU with the Disable OAM Remote Loopback command.
9. The testing station is instructed to transmit an Information OAMPDU with a State field indicating local_mux_action and local_par_action set to FWD.
10. Wait one second.

Observable Results:
a. The DUT should transmit a Loopback Control OAMPDU with the Disable OAM Remote Loopback command value (0x02).
b. The DUT should copy the remote device's updated State field value (0x00) into the Remote Information TLV State field of all following Information OAMPDUs.
c. The DUT should start the transmission of MAC client loopback test frames to the testing station.
d. The DUT should respond or forward MAC client frames received from the testing station.
e. The DUT should transmit Information OAMPDUs with an updated State field value (0x00) after the reception of an Information OAMPDU from the remote OAM device.

Possible Problems: None.

Test 57.9.5.4 – Exiting – Time Out

Purpose: To verify that the DUT exits loopback mode due to the expiration of local_lost_link_timer.

References:
  [1]   IEEE Std. 802.3ah-2004 – subclauses 57.2.11.2, 57.3.1.2, Figure 57-5, Figure 57-7, Figure 57-8

Resource Requirements:
  •   A testing station capable of transmitting and monitoring traffic to and from the DUT.

Last Modification: November 01, 2004

Discussion: If during the remote OAM loopback operation the local OAM device experiences a period of five seconds without the reception of an OAMPDU, local OAM device will reset. When the global transition local_lost_link_timer_done is TRUE, the DUT will fall out of the LINK_FAULT state and go to either the ACTIVE_SEND_LOCAL or PASSIVE_WAIT states. Here the local OAM device will transmit Information OAMPDUs with default configurations if active or stay silent if passive.

Test Setup: Connect the DUT to the pattern generator and monitor ports of the testing station using the appropriate medium.

Procedure:
Part A: DUT is Master
  1.   The DUT is instructed to reset the OAM Discovery process.
  2.   The testing station is instructed to perform the necessary steps to complete the OAM Discovery process.
  3.   Wait one second.
  4.   The DUT in instructed to transmit a Loopback Control OAMPDU with the Enable OAM Remote Loopback command.
  5.   The testing station is instructed to transmit an Information OAMPDU with a State field indicating local_mux_action set to DISCARD and local_par_action set to LB.
  6.   The testing station is instructed to stop all OAMPDU transmissions.
  7.   Wait five seconds.
  8.   The testing station is instructed to transmit an Information OAMPDU.

Part B: DUT is Slave
  1.   The DUT is instructed to reset the OAM Discovery process.
  2.   The testing station is instructed to perform the necessary steps to complete the OAM Discovery process.
  3.   Wait one second.
  4.   The testing station in instructed to transmit a Loopback Control OAMPDU with the Enable OAM Remote Loopback command.
  5.   Wait one second.
  6.   The testing station is instructed to stop all OAMPDU transmissions.
  7.   Wait five seconds.
  8.   The testing station is instructed to transmit an Information OAMPDU.

Observable Results:
Part A: DUT is Master
  a.   The DUT should reset the OAM Discovery process and transmit Information OAMPDUs containing Local Information TLVs containing State fields with default configurations.

Part B: DUT is Slave
  b.   The DUT should reset the OAM Discovery process and transmit Information OAMPDUs containing Local Information TLVs containing State fields with default configurations.

Possible Problems: None.