

# Bridge Functions Consortium

Link Layer Discovery Protocol  
Interoperability Test Suite  
*Version 0.65*



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## **MODIFICATION RECORD**

<b>Version</b>	<b>Date</b>	<b>Editor(s)</b>	<b>Comments</b>
0.1	2005-02-10	Curtis Simonson	Initial Draft
0.2	2005-03-01	Curtis Simonson	Major additions and updates
0.3	2005-03-07	Paul Congdon Curtis Simonson	Minor Test Suite revisions Added LLDP.io.1.6
0.4	2005-03-29	Curtis Simonson Eelco Chaudron	Minor Test Suite revisions
0.45		Curtis Simonson	Generalized test suite to include test scenarios for all LLDP capable devices
0.5	2005-05-18	Curtis Simonson	Minor revisions and fixes
0.65	2007-07-30	Andrew Corcoran	General revisions

## **ACKNOWLEDGEMENTS**

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## **INTRODUCTION**

The University of New Hampshire's 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 functionality of their Link Layer Discovery Protocol capable products.

IEEE Std 802.1AB™-2005 states:

*“The Link Layer Discovery Protocol (LLDP)...allows stations attached to a 802 LAN to advertise, to other stations attached to the same 802 LAN, the major capabilities provided by the system incorporating that station, the management address or addresses of the entity or entities that provide management of those capabilities, and the identification of the station's point of attachment to the 802 LAN required by those management entity or entities.”<sup>1</sup>*

This test suite has been designed based on the set of definitions, principles, requirements and terminology that pertain to IEEE Std 802.1AB™-2005. The test suite is designed to help determine whether or not the DUT will behave in accordance with the standard during normal operation.

These tests are not designed as performance tests. The relative performance of Link Layer Discovery Protocol capable devices (e.g. TLV propagation speed, TLVs supported, etc.) is beyond the scope of this document.

These tests do not determine whether the DUT conforms to IEEE Std 802.1AB™-2005, nor are they designed as conformance tests. Rather, they provide one method to isolate problems within a Link Layer Discovery Protocol capable device that will affect interoperability. Successful completion of all tests contained in this suite does not guarantee that the tested device will operate with other Link Layer Discovery Protocol capable devices. However, combined with satisfactory completion of operations testing, these tests provide a reasonable level of confidence that the DUT will function well in most Link Layer Discovery Protocol capable environments.

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<sup>1</sup> IEEE Std 802.1AB™-2005 clause 1 [Overview]

## **REFERENCES**

The following documents are referenced in this text:

- |                          |  |
|--------------------------|--|
| [IEEE Std 802.1AB™-2005] | IEEE Computer Society LAN/MAN Standards Committee,<br>“Station and Media Access Control Connectivity<br>Discovery”   |
| [IEEE Std 802.1D™-2004]  | IEEE Computer Society LAN/MAN Standards Committee,<br>“Media Access Control (MAC) Bridges”   |
| [IEEE Std 802.1Q™-2003]  | IEEE Computer Society LAN/MAN Standards Committee,<br>“Virtual Bridged Local Area Networks”  |
| [IEEE Std 802.3™-2002]   | IEEE Computer Society LAN/MAN Standards Committee,<br>“Carrier sense multiple access with collision detection<br>(CSMA/CD) access method and physical layer<br>specifications” |

## DEFINITION OF TERMS

### Abbreviations and Acronyms:

BPDU	Bridge PDU
DHCP	Dynamic Host Configuration Protocol
DUT	Device Under Test
LAN	Local Area Network
LLDP	Link Layer Discovery Protocol (also know as Station and Media Access Control Connectivity Discovery, and defined in IEEE Std 802.1AB™-2005)
LT	Line Tap (A device used to capture and view packets on a Ethernet link.)
LP	Link Partner (An LLDP capable System connected to DUT.)
MAC	Media Access Control
MST BPDU	Multiple Spanning Tree BPDU (IEEE 802.1Q-2003 or 802.1Q-2005)
PDU	Protocol Data Unit
PHY	Physical Layer
PVID	Port VLAN ID
RST BPDU	Rapid Spanning Tree BPDU (IEEE 802.1w-2001 or 802.1D-2004)
ST BPDU	Spanning Tree BPDU (IEEE 802.1D-1998 or 802.1w/802.1D-2004 running in compatibility mode)
TLV	Type Length Value
TS	Test Station
VLAN	Virtual LAN

### Definitions:

DUT	An LLDP capable MAC Bridge assuming the role of Authenticator.
Local System	The LLDP capable system of concern.
<i>msgTxHold</i>	A multiplier used on the <i>msgTxInterval</i> to determine the TTL value transmitted in LLDPDUs.
<i>msgTxInterval</i>	Parameter used to determine the interval at which the LLDP agent transmits LLDPDUs.
Network Initialization	Reboot of all systems in network; power down → power up.
Remote System	An LLDP capable system attached to the Local System of concern.
<i>reinitDelay</i>	Parameter used to determine the delay from when the LLDP agent's <i>adminStatus</i> becomes “disabled” to when re-initialization will be attempted.
Service	A resource offered by a System (i.e. DHCP, FTP, HTTPS, etc.)
System	A device that is attached to a LAN by one or more ports. Examples of systems include end stations, IP phones, MAC Bridges, routers and servers.
Test Network	Network configured for use during testing; consists of TSs, DUT and LP(s).
<i>TxDelay</i>	Parameter used to determine the interval of transmission of LLDPDUs resulting from a change in value or status of the LLDP local system MIB.

## **TEST ORGANIZATION**

This document organizes tests by group based on related test methodology or goals. Each group begins with a brief set of comments pertaining to all tests within that group. This is followed by a series of description blocks; each block describes a single test. The format of the description block is as follows:

- Test Label:** The test label and title comprise the first line of the test block. The test label is the concatenation of the short test suite name, group number, and the test number within the group, separated by periods. The test number is the group number and the test number, also separated by a period. So, test label LLDP-MED.io.1.2 refers to the second test of the first test group in the LLDP-MED Interoperability suite. The test number is 1.2.
- Purpose:** The Purpose is a short statement describing what the test attempts to achieve. It is usually phrased as a simple assertion of the feature or capability to be tested.
- References:** The References section lists cross-references to the specifications and documentation that might be helpful in understanding and evaluating the test and results.
- Resource Requirements:** The Resource Requirements section specifies the software, hardware, and test equipment that will be needed to perform the test. The Discussion is a general discussion of the test and relevant section of the specification, including any assumptions made in the design or implementation of the test as well as known limitations.
- Discussion:** The Discussion is a general discussion of the test and relevant section of the specification, including any assumptions made in the design or implementation of the test as well as known limitations.
- Test Network:** This diagram shows how the Test Systems, DUT, and any other Devices used should be connected for each part of the Test, unless otherwise noted. Elements of the Procedure may change the Layout.
- Procedure:** This section of the test description contains the step-by-step instructions for carrying out the test. These steps include such things as enabling interfaces, disconnecting links between devices, and sending MAC frames from a Test Station. The test procedure also cues the tester to make observations, which are interpreted in accordance with the observable results given for that test part.
- Observable Results:** This section lists observable results that can be examined by the tester to verify that the DUT is operating properly. When multiple observable results are possible, this section provides a short discussion on how to interpret them. The determination of a PASS or FAIL for each test is usually based on how the behavior of the DUT compares to the results described in this section.
- Possible Problems:** This section contains a description of known issues with the test procedure, which may affect test results in certain situations.



## TEST SETUP

### Default Settings: DUT & LP(s)

#### Bridge Settings:

802.1X operating state	Disabled
LLDP Bridge entity state	Enabled
Spanning Tree Protocol operating state	Disabled
<i>txTTL</i>	120 seconds (4 * 30 = 120)
<i>msgTxHold</i>	4
<i>msgTxInterval</i>	30 seconds
<i>reinitDelay</i>	2 seconds
<i>txDelay</i>	2 seconds

#### Port Settings:

LLDP Port entity <i>adminStatus</i> parameter	<i>enabledTxRx</i>
Port VLAN ID	1
Name associated with VLAN 1	Default

*Note – Port settings apply to all Ports on the DUT and LP(s).*

## **GROUP 1: Basic LLDP.io**

### **Scope**

To verify the behavior of the LLDP capable DUT when placed in a Test Network with an LLDP capable Link Partner.

### **Overview**

These tests help determine whether the DUT can properly exchange LLDP TLVs, via LLDPDUs, when connected in Test Networks with LLDP capable Link Partners.

LLDP capable Systems transmit Local System information in LLDPDUs and store Remote System information received in LLDPDUs from directly connected Link Partners. Local System information and Remote System information exchanged via LLDPDUs must be stored in a format that can be retrieved by the network administrator.

IEEE Std. 802.1AB-2005 Clause 12 specifies a method for storing LLDP obtained information in SNMP MIBs and a method for retrieving LLDP obtained information using SNMP. If the LLDP capable System does not support SNMP, the System shall provide storage and retrieval capability equivalent to the functionality specified in IEEE Std. 802.1AB-2005 Clause 11.

## LLDP.io.1.1: Mandatory LLDP TLVs

**Purpose:** To verify that the DUT can properly exchange the mandatory TLVs with its Link Partner, an LLDP capable System.

### References:

- IEEE Std. 802.1AB-2005: Table 9-1
- IEEE Std. 802.1AB-2005: 10.1 Protocol initialization
- IEEE Std. 802.1AB-2005: 10.2 Frame transmission
- IEEE Std. 802.1AB-2005: 10.3 Frame reception
- IEEE Std. 802.1AB-2005: 10.5.1 Global variables

### Resource Requirements:

- 2 Test Stations
- DUT
- LLDP capable LPs
- SNMP software management tool

### Discussion:

This Test verifies that the DUT can properly exchange information with an LLDP capable Link Partner; specifically the mandatory TLVs defined in IEEE Std. 802.1AB-2005 Table 9-1. The three defined mandatory TLVs that generate objects to be stored and retrieved are: Chassis ID TLV, Port ID TLV and Time To Live TLV; the mandatory TLVs must be included in all LLDPDUs in the order listed above. All LLDPDUs must be terminated with the End Of LLDPDU TLV. In this Test the DUT and LLDP capable Link Partner must exchange the information contained in the mandatory TLVs. Information exchanged in the TLVs must be stored in an accessible format, such as SNMP.

This Test also verifies the proper operation of the *adminStatus* parameter, which controls the operating mode of the System's LLDP agent. The *adminStatus* parameter can be configured to one of the following values: *enabledTxRx*, *enabledTxOnly*, *enabledRxOnly*, *disabled*.

*Note: During this Test, the LP's adminStatus parameter is initially set to enabledTxRx, the recommended default value as defined by IEEE Std. 802.1AB-2005.*

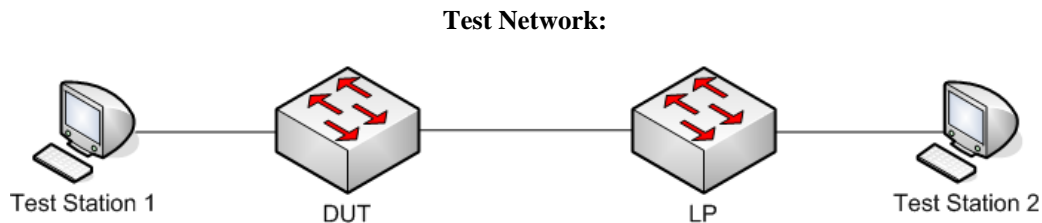


Figure 1: Mandatory LLDP TLVs

**Note – This is a basic test that must be passed before performing further LLDP.io testing.**

**Procedure:**

*Part A: Mandatory LLDP TLVs – DUT adminStatus = enabledTxRx*

1. Ensure that the [default](#) values are configured on the DUT and LP.
2. Start capture on Test Stations 1 and 2.
3. Wait 31 seconds.
4. Attempt to extract LLDP Local System mandatory TLV information from DUT and LP.
5. Attempt to extract LLDP Remote System mandatory TLV information from DUT and LP.
6. Stop capture on Test Stations 1 and 2, and observe the captured frames (if any).

*Part B: Mandatory LLDP TLVs – DUT adminStatus = enabledTxOnly*

7. Ensure that the [default](#) values are configured on the DUT and LP.
8. Set the DUT's *adminStatus* parameter to *enabledTxOnly*.
9. Start capture on Test Stations 1 and 2.
10. Wait 31 seconds.
11. Attempt to extract LLDP Local System mandatory TLV information from DUT and LP.
12. Attempt to extract LLDP Remote System mandatory TLV information from DUT and LP.
13. Stop capture on Test Stations 1 and 2, and observe the captured frames (if any).

*Part C: Mandatory LLDP TLVs – DUT adminStatus = enabledRxOnly*

14. Ensure that the [default](#) values are configured on the DUT and LP.
15. Set the DUT's *adminStatus* parameter to *enabledRxOnly*.
16. Start capture on Test Stations 1 and 2.
17. Wait 31 seconds.
18. Attempt to extract LLDP Local System mandatory TLV information from DUT and LP.
19. Attempt to extract LLDP Remote System mandatory TLV information from DUT and LP.
20. Stop capture on Test Stations 1 and 2, and observe the captured frames (if any).

*Note – “Wait 31 seconds” is used to ensure the propagation of information to the Remote Systems.*

**Observable Results:**

- In Part A, Test Stations 1 and 2 must capture properly formatted LLDPDUs containing the three mandatory TLVs and the End Of LLDPDU TLV. The LLDP Local System mandatory TLV information on the DUT and LP must correlate to the characteristics of the DUT and LP, respectively. The LLDP Remote System mandatory TLV information on the DUT and LP must contain the characteristics of the LP and DUT, respectively.
- In Part B, Test Stations 1 and 2 must capture properly formatted LLDPDUs containing the three mandatory TLVs and the End Of LLDPDU TLV. The LLDP Local System mandatory TLV information on the DUT and LP must correlate to the characteristics of the DUT and LP, respectively. The LLDP Remote System mandatory TLV information on the DUT must not contain the characteristics of the LP. The LLDP Remote System mandatory TLV information on the LP must contain the characteristics of the DUT.
- In Part C, Test Stations 1 and 2 must capture properly formatted LLDPDUs containing the three mandatory TLVs and the End Of LLDPDU TLV. The LLDP Local System mandatory TLV information on the DUT and LP must correlate to the characteristics of the DUT and LP, respectively. The LLDP Remote System mandatory TLV information on the DUT must contain the characteristics of the LP. The LLDP Remote System mandatory TLV information on the LP must not contain the characteristics of the DUT.

**Possible Problems:**

- None.

## LLDP.io.1.2: Optional LLDP TLVs

**Purpose:** To verify that the DUT can properly exchange the optional TLVs with its Link Partner, an LLDP capable System.

### References:

- IEEE Std. 802.1AB-2005: Table 9-1
- IEEE Std. 802.1AB-2005: 10.1 Protocol initialization
- IEEE Std. 802.1AB-2005: 10.2 Frame transmission
- IEEE Std. 802.1AB-2005: 10.3 Frame reception
- IEEE Std. 802.1AB-2005: 10.5.1 Global variables

### Resource Requirements:

- 2 Test Stations
- DUT
- LLDP capable LPs supporting optional TLVs
- SNMP software management tool

### Discussion:

This Test verifies that the DUT can properly exchange information with an LLDP capable Link Partner, specifically the optional TLVs defined in IEEE Std. 802.1AB-2005 Table 9-1. The five defined optional TLVs are: Port Description TLV, System TLV, System Description TLV, System Capabilities TLV and Management Address TLV; the optional TLVs may be included in the LLDPDU as determined by the implementer and/or device configuration. All LLDPDUs are terminated with the End Of LLDPDU TLV. In this Test the DUT and LLDP capable Link Partner must exchange the information contained in the optional TLVs supported by the DUT and LP. Information exchanged in the TLVs must be stored in an accessible format, such as SNMP.

This Test also verifies the proper operation of the *adminStatus* parameter, which controls the operating mode of the System's LLDP agent. The *adminStatus* parameter can be configured to one of the following values: *enabledTxRx*, *enabledTxOnly*, *enabledRxOnly*, *disabled*.

*Note: The LP's adminStatus parameter is set to enabledTxRx, during the entire Test.*

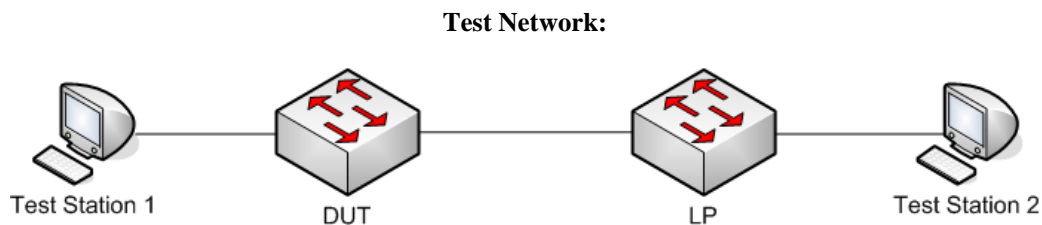


Figure 2: Optional LLDP TLVs

**Procedure:**

*Part A: Optional LLDP TLVs – DUT adminStatus = enabledTxRx*

1. Ensure that the [default](#) values are configured on the DUT and LP.
2. Set all the DUT's optional TLVs to enabled for transmission.
3. Start capture on Test Stations 1 and 2.
4. Wait 31 seconds.
5. Attempt to extract LLDP Local System optional TLV information from DUT and LP.
6. Attempt to extract LLDP Remote System optional TLV information from DUT and LP.
7. Stop capture on Test Stations 1 and 2, and observe the captured frames (if any).

*Part B: Optional LLDP TLVs – DUT adminStatus = enabledTxOnly*

8. Ensure that the [default](#) values are configured on the DUT and LP.
9. Set all the DUT's optional TLVs to enabled for transmission.
10. Set the DUT's *adminStatus* parameter to *enabledTxOnly*.
11. Start capture on Test Stations 1 and 2.
12. Wait 31 seconds.
13. Attempt to extract LLDP Local System optional TLV information from DUT and LP.
14. Attempt to extract LLDP Remote System optional TLV information from DUT and LP.
15. Stop capture on Test Stations 1 and 2, and observe the captured frames (if any).

*Part C: Optional LLDP TLVs – DUT adminStatus = enabledRxOnly*

16. Ensure that the [default](#) values are configured on the DUT and LP.
17. Set all the DUT's optional TLVs to enabled for transmission.
18. Set the DUT's *adminStatus* parameter to *enabledRxOnly*.
19. Start capture on Test Stations 1 and 2.
20. Wait 31 seconds.
21. Attempt to extract LLDP Local System optional TLV information from DUT and LP.
22. Attempt to extract LLDP Remote System optional TLV information from DUT and LP.
23. Stop capture on Test Stations 1 and 2, and observe the captured frames (if any).

**Observable Results:**

- In Part A, Test Stations 1 and 2 must capture properly formatted LLDPDUs containing the optional TLVs and the End Of LLDPDU TLV. The LLDP Local System optional TLV information on the DUT and LP must correlate to the characteristics of the DUT and LP, respectively. The LLDP Remote System optional TLV information on the DUT and LP must contain the characteristics of the LP and DUT, respectively.
- In Part B, Test Stations 1 and 2 must capture properly formatted LLDPDUs containing the optional TLVs and the End Of LLDPDU TLV. The LLDP Local System optional TLV information on the DUT and LP must correlate to the characteristics of the DUT and LP, respectively. The LLDP Remote System optional TLV information on the DUT must not contain the characteristics of the LP. The LLDP Remote System optional TLV information on the LP must contain the characteristics of the DUT.
- In Part C, Test Station 1 must not capture LLDPDUs. Test Station 2 must capture properly formatted LLDPDUs containing the optional TLVs and the End Of LLDPDU TLV. The LLDP Local System optional TLV information on the DUT and LP must contain the characteristics of the DUT and LP, respectively. The LLDP Remote System optional TLV information on the DUT must correlate to the characteristics of the LP. The LLDP Remote System optional TLV information on the LP must not contain the characteristics of the DUT.

**Possible Problems:**

- The LLDPDUs captured by Test Stations 1 and 2 will only contain the optional TLVs supported by the DUT and LP, respectively.
- The Remote System information on the DUT and LP will only reflect the optional TLVs supported by the LP and DUT, respectively.
- The Local System information on the DUT and LP will only reflect the optional TLVs supported by the DUT and LP, respectively.

### LLDP.io.1.3: Network (re)Initialization – Mandatory LLDP TLVs

**Purpose:** To verify that, during network (re)initialization, the DUT can properly exchange the mandatory TLVs with its Link Partner, an LLDP capable System.

**References:**

- IEEE Std. 802.1AB-2005: Table 9-1
- IEEE Std. 802.1AB-2005: 10.1 Protocol initialization
- IEEE Std. 802.1AB-2005: 10.2 Frame transmission
- IEEE Std. 802.1AB-2005: 10.3 Frame reception
- IEEE Std. 802.1AB-2005: 10.5.1 Global variables

**Resource Requirements:**

- 2 Test Stations
- DUT
- LLDP capable LPs
- SNMP software management tool

**Discussion:**

This Test verifies that, during network (re)initialization, the DUT can properly exchange information with an LLDP capable Link Partner, specifically the mandatory TLVs defined in IEEE Std. 802.1AB-2005 Table 9-1. The three defined mandatory TLVs that generate objects to be stored and retrieved are: Chassis ID TLV, Port ID TLV and Time To Live TLV; the mandatory TLVs must be included in all LLDPDUs in the order listed above. All LLDPDUs must be terminated with the End Of LLDPDU TLV. In this Test the DUT and LLDP capable Link Partner must exchange the information contained in the mandatory TLVs. Information exchanged in the TLVs must be stored in an accessible format, such as SNMP.

*Note: The DUT's and LP's adminStatus parameters are set to enabledTxRx, during the entire Test.*

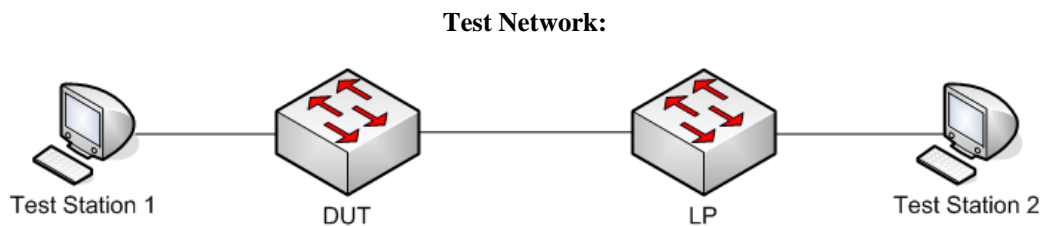


Figure 3: Network (re)Initialization – Mandatory LLDP TLVs

**Procedure:**

*Part A: Network initialization – Mandatory LLDP TLVs*

1. Ensure that the [default](#) values are configured on the DUT and LP.
2. Wait 31 seconds.
3. Attempt to extract LLDP Local System mandatory TLV information from DUT and LP.
4. Attempt to extract LLDP Remote System mandatory TLV information from DUT and LP.
5. Reboot the DUT and LP.
6. Start capture on Test Stations 1 and 2.
7. Wait 31 seconds.
8. Attempt to extract LLDP Local System mandatory TLV information from DUT and LP.
9. Attempt to extract LLDP Remote System mandatory TLV information from DUT and LP.
10. Stop capture on Test Stations 1 and 2, and observe the captured frames (if any).

*Part B: DUT initialization – Mandatory LLDP TLVs*

11. Ensure that the [default](#) values are configured on the DUT and LP.
12. Wait 31 seconds.
13. Disconnect power from the DUT.
14. Attempt to extract LLDP Local System mandatory TLV information from DUT and LP.
15. Attempt to extract LLDP Remote System mandatory TLV information from DUT and LP.
16. Connect power to the DUT.
17. Start capture on Test Stations 1 and 2.
18. Wait 31 seconds.
19. Attempt to extract LLDP Local System mandatory TLV information from DUT and LP.
20. Attempt to extract LLDP Remote System mandatory TLV information from DUT and LP.
21. Stop capture on Test Stations 1 and 2, and observe the captured frames (if any).

*Part C: LP initialization – Mandatory LLDP TLVs*

22. Ensure that the [default](#) values are configured on the DUT and LP.
23. Wait 31 seconds.
24. Disconnect power from the LP.
25. Attempt to extract LLDP Local System mandatory TLV information from DUT and LP.
26. Attempt to extract LLDP Remote System mandatory TLV information from DUT and LP.
27. Connect power to the LP.
28. Start capture on Test Stations 1 and 2.
29. Wait 31 seconds.
30. Attempt to extract LLDP Local System mandatory TLV information from DUT and LP.
31. Attempt to extract LLDP Remote System mandatory TLV information from DUT and LP.
32. Stop capture on Test Stations 1 and 2, and observe the captured frames (if any).

*Part D: Ageing of Information – Mandatory LLDP TLVs*

33. Ensure that the [default](#) values are configured on the DUT and LP.
34. Wait 31 seconds.
35. Attempt to extract LLDP Local System mandatory TLV information from DUT and LP.
36. Attempt to extract LLDP Remote System mandatory TLV information from DUT and LP.
37. Disconnect power to the LP.
38. Wait for 121 seconds.
39. Start capture on Test Stations 1 and 2.
40. Wait 31 seconds.
41. Attempt to extract LLDP Local System mandatory TLV information from DUT and LP.
42. Attempt to extract LLDP Remote System mandatory TLV information from DUT and LP.
43. Stop capture on Test Stations 1 and 2, and observe the captured frames (if any).



**Observable Results:**

- In Part A, during Steps 3 and 8, the LLDP Local System mandatory TLV information on the DUT and LP must correlate to the characteristics of the DUT and LP, respectively. During Steps 4 and 9, the LLDP Remote System mandatory TLV information on the DUT and LP must contain the characteristics of the LP and DUT, respectively. During Step 10, Test Stations 1 and 2 must capture properly formatted LLDPDUs containing the three mandatory TLVs and the End Of LLDPDU TLV.
- In Part B, during Step 14, the LLDP Local System information on the DUT must not be accessible. During Step 14, the LLDP Local System mandatory TLV information on the LP must correlate to the characteristics of the LP. During Step 15, the LLDP Remote System mandatory TLV information on the DUT must not be accessible. During Step 15, the LLDP Remote System mandatory TLV information on the LP must contain the characteristics of the DUT. During Step 19, the LLDP Local System mandatory TLV information on the DUT and LP must correlate to the characteristics of the DUT and LP, respectively. During Step 20, the LLDP Remote System mandatory TLV information on the DUT and LP must contain the characteristics of the LP and DUT, respectively. During Step 21, Test Stations 1 and 2 must capture properly formatted LLDPDUs containing the three mandatory TLVs and the End Of LLDPDU TLV.
- In Part C, during Step 25, the LLDP Local System information on the LP must not be accessible. During Step 25, the LLDP Local System mandatory TLV information on the DUT must correlate to the characteristics of the DUT. During Step 26, the LLDP Remote System mandatory TLV information on the LP must not be accessible. During Step 26, the LLDP Remote System mandatory TLV information on the DUT must contain the characteristics of the LP. During Step 30, the LLDP Local System mandatory TLV information on the DUT and LP must correlate to the characteristics of the DUT and LP, respectively. During Step 31, the LLDP Remote System mandatory TLV information on the DUT and LP must contain the characteristics of the LP and DUT, respectively. During Step 32, Test Stations 1 and 2 must capture properly formatted LLDPDUs containing the three mandatory TLVs and the End Of LLDPDU TLV.
- In Part D, during Step 35, the LLDP Local System mandatory TLV information on the DUT and LP must correlate to the characteristics of the DUT and LP, respectively. During Step 36, the LLDP Remote System mandatory TLV information on the DUT and LP must contain the characteristics of the LP and DUT, respectively. During Step 41, the LLDP Local System mandatory TLV information on the DUT must correlate to the characteristics of the DUT. During Step 41, the LLDP Local System information on the LP must not be accessible. During Step 42, the LLDP Remote System mandatory TLV information on the DUT must not contain the characteristics of the LP. During Step 42, the LLDP Remote System mandatory TLV information on the LP must not be accessible. During Step 43, Test Station 1 must capture properly formatted LLDPDUs containing the three mandatory TLVs and the End Of LLDPDU TLV. During Step 43, Test Station 2 must not capture LLDPDUs.

**Possible Problems:**

- None.

## LLDP.io.1.4: Network Shutdown – Mandatory LLDP TLVs

**Purpose:** To verify that, during network shutdown, the DUT can properly exchange the optional TLVs with its Link Partner, an LLDP capable System.

### References:

- IEEE Std. 802.1AB-2005: Table 9-1
- IEEE Std. 802.1AB-2005: 10.1 Protocol initialization
- IEEE Std. 802.1AB-2005: 10.2 Frame transmission
- IEEE Std. 802.1AB-2005: 10.2.1.2 Shutdown LLDPDU construction
- IEEE Std. 802.1AB-2005: 10.3 Frame reception
- IEEE Std. 802.1AB-2005: 10.3.2 LLDPDU validation
- IEEE Std. 802.1AB-2005: 10.5.1 Global variables

### Resource Requirements:

- 2 Test Stations
- DUT
- LLDP capable LPs
- SNMP software management tool

### Discussion:

This Test verifies that, during network shutdown, the DUT can properly exchange information with an LLDP capable Link Partner, specifically the mandatory TLVs defined in IEEE Std. 802.1AB-2005 Table 9-1. The three defined mandatory TLVs that generate objects to be stored and retrieved are: Chassis ID TLV, Port ID TLV and Time To Live TLV; the mandatory TLVs must be included in all LLDPDUs in the order listed above. All LLDPDUs must be terminated with the End Of LLDPDU TLV. In this Test the DUT and LLDP capable Link Partner must exchange the information contained in the mandatory TLVs. Information exchanged in the TLVs must be stored in an accessible format, such as SNMP.

This Test also verifies the proper operations of the DUT's LLDP Shutdown Procedure and the *adminStatus* parameter, which controls the operating mode of the DUT's LLDP Agent. The LLDP Shutdown Procedure is invoked when the LLDP Agent determines that a Port is about to become non-operational. The LLDP Shutdown Procedure causes an LLDPDU to be transmitted with a TTL value of zero, indicating that the LP should clear the Remote System information associated with the non-operational Port. The *adminStatus* parameter can be configured to one of the following values: *enabledTxRx*, *enabledTxOnly*, *enabledRxOnly*, *disabled*. During this Test, an *adminStatus* parameter value of *disabled* is used to simulate network shutdown.

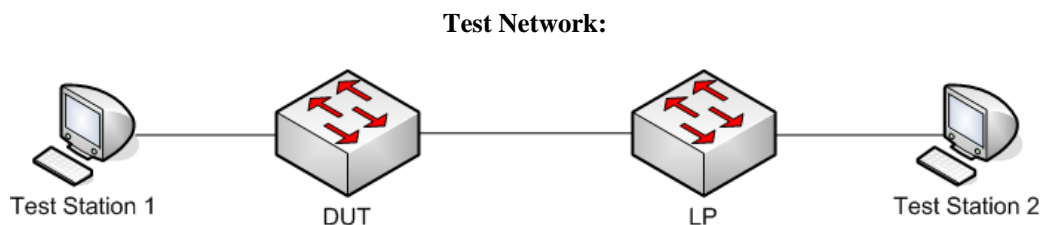


Figure 4: Network Shutdown – Mandatory LLDP TLVs

**Procedure:**

*Part A: Mandatory LLDP TLVs – DUT adminStatus = disabled*

1. Ensure that the [default](#) values are configured on the DUT and LP.
2. Wait 31 seconds.
3. Attempt to extract LLDP Local System mandatory TLV information from DUT and LP.
4. Attempt to extract LLDP Remote System mandatory TLV information from DUT and LP.
5. Set the DUT's *adminStatus* parameter to *disabled*.
6. Start capture on Test Stations 1 and 2.
7. Wait 31 seconds.
8. Attempt to extract LLDP Local System mandatory TLV information from DUT and LP.
9. Attempt to extract LLDP Remote System mandatory TLV information from DUT and LP.
10. Stop capture on Test Stations 1 and 2, and observe the captured frames (if any).

*Part B: Mandatory LLDP TLVs – LP adminStatus = disabled*

11. Ensure that the [default](#) values are configured on the DUT and LP.
12. Wait 31 seconds.
13. Attempt to extract LLDP Local System mandatory TLV information from DUT and LP.
14. Attempt to extract LLDP Remote System mandatory TLV information from DUT and LP.
15. Set the LP's *adminStatus* parameter to *disabled*.
16. Start capture on Test Stations 1 and 2.
17. Wait 31 seconds.
18. Attempt to extract LLDP Local System mandatory TLV information from DUT and LP.
19. Attempt to extract LLDP Remote System mandatory TLV information from DUT and LP.
20. Stop capture on Test Stations 1 and 2, and observe the captured frames (if any).

*Part C: Mandatory LLDP TLVs – Proper Shutdown Procedure*

21. Ensure that the [default](#) values are configured on the DUT and LP.
22. Wait 31 seconds.
23. Attempt to extract LLDP Local System mandatory TLV information from DUT and LP.
24. Attempt to extract LLDP Remote System mandatory TLV information from DUT and LP.
25. Invoke the DUT's LLDP Shutdown Procedure.  
*Note – The DUT shall remain operational, only the LLDP Agent should be shutdown.*
26. Start capture on Test Stations 1 and 2.
27. Wait 31 seconds.
28. Attempt to extract LLDP Local System mandatory TLV information from DUT and LP.
29. Attempt to extract LLDP Remote System mandatory TLV information from DUT and LP.
30. Stop capture on Test Stations 1 and 2, and observe the captured frames (if any).

*Note – Steps 25 through 30 must be completed before the TTL timer expires for the LPs Remote System information on the DUT.*

**Observable Results:**

- In Part A, during Step 3, the LLDP Local System mandatory TLV information on the DUT and LP must correlate to the characteristics of the DUT and LP, respectively. During Step 4, the LLDP Remote System mandatory TLV information on the DUT and LP must contain the characteristics of the LP and DUT, respectively. During Step 8, the LLDP Local System information on the DUT must correlate to the characteristics of the DUT. During Step 8, the LLDP Local System mandatory TLV information on the LP must correlate to the characteristics of the LP. During Step 9, the LLDP Remote System mandatory TLV information on the DUT must not be accessible. During Step 9, the LLDP Remote System mandatory TLV information on the LP must not contain the characteristics of the DUT. During Step 10, Test Station 1 must not capture LLDPDUs. During Step 10, Test Station 2 must capture properly formatted LLDPDUs containing the three mandatory TLVs and the End Of LLDPDU TLV.
- In Part B, during Step 13, the LLDP Local System mandatory TLV information on the DUT and LP must correlate to the characteristics of the DUT and LP, respectively. During Step 14, the LLDP Remote System mandatory TLV information on the DUT and LP must contain the characteristics of the LP and DUT, respectively. During Step 18, the LLDP Local System mandatory TLV information on the DUT must correlate to the characteristics of the DUT. During Step 18, the LLDP Local System information on the LP must correlate to the characteristics of the LP. During Step 19, the LLDP Remote System mandatory TLV information on the DUT must not contain the characteristics of the LP. During Step 19, the LLDP Remote System mandatory TLV information on the LP must not be accessible. During Step 20, Test Station 1 must capture properly formatted LLDPDUs containing the three mandatory TLVs and the End Of LLDPDU TLV. During Step 20, Test Station 2 must not capture LLDPDUs.
- In Part C, during Step 23, the LLDP Local System mandatory TLV information on the DUT and LP must correlate to the characteristics of the DUT and LP, respectively. During Step 24, the LLDP Remote System mandatory TLV information on the DUT and LP must contain the characteristics of the LP and DUT, respectively. During Step 28, the LLDP Local System mandatory TLV information on the DUT must correlate to the characteristics of the DUT. During Step 28, the LLDP Local System information on the LP must correlate to the characteristics of the LP. During Step 29, the LLDP Remote System mandatory TLV information on the DUT must not be accessible. During Step 29, the LLDP Remote System mandatory TLV information on the LP must contain the characteristics of the DUT. During Step 30, Test Station 1 must not capture LLDPDUs. During Step 30, Test Station 2 must capture properly formatted LLDPDUs containing the three mandatory TLVs and the End Of LLDPDU TLV.

**Possible Problems:**

- None.

## LLDP.io.1.5: Port Failure – Mandatory LLDP TLVs

**Purpose:** To verify the behavior of the DUT when a failure occurs on the link to its Link Partner, an LLDP capable System.

### References:

- IEEE Std. 802.1AB-2005: Table 9-1
- IEEE Std. 802.1AB-2005: 10.1 Protocol initialization
- IEEE Std. 802.1AB-2005: 10.2 Frame transmission
- IEEE Std. 802.1AB-2005: 10.2.1.2 Shutdown LLDPDU construction
- IEEE Std. 802.1AB-2005: 10.3 Frame reception
- IEEE Std. 802.1AB-2005: 10.3.2 LLDPDU validation
- IEEE Std. 802.1AB-2005: 10.3.7 LLDP local port/connection failure

### Resource Requirements:

- 2 Test Stations
- DUT
- LLDP capable LPs
- SNMP software management tool

### Discussion:

This Test verifies that the DUT exhibits the proper behavior when a failure occurs on the link to its LLDP capable Link Partner. IEEE Std. 802.1AB-2005 subclause 10.3.7 states that if a failure occurs on the link to the Remote System, before a shutdown LLDPDU is received, the LLDP agent shall not delete the Remote System information until the Port is re-initialized or the associated TTL timer expires. In this Test the DUT and LLDP capable Link Partner must exchange the information contained in the mandatory TLVs, prior to link failure. Information exchanged in the TLVs must be stored in an accessible format, such as SNMP, and appropriately maintained during link failure.

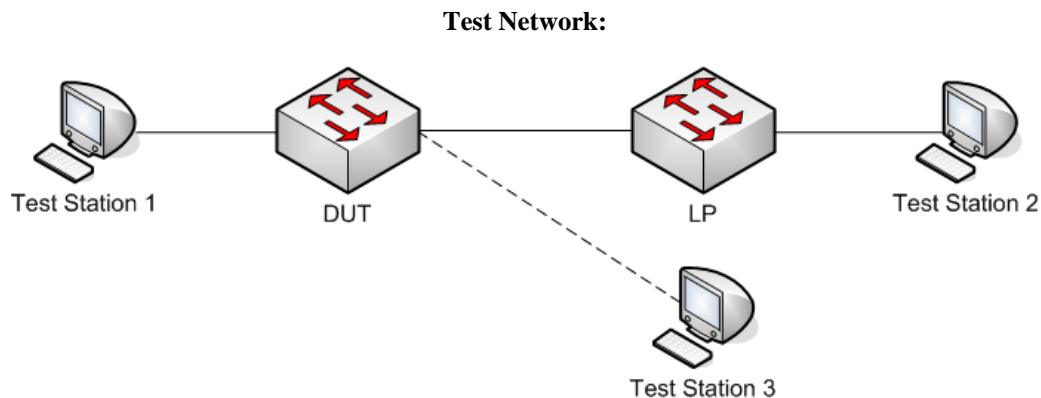


Figure 4: Network Shutdown – Mandatory LLDP TLVs

**Procedure:**

*Part A: Link Failure*

1. Ensure that the [default](#) values are configured on the DUT and LP.
2. Wait 31 seconds.
3. Attempt to extract LLDP Local System mandatory TLV information from DUT and LP.
4. Attempt to extract LLDP Remote System mandatory TLV information from DUT and LP.
5. Disconnect the link between the DUT and LP.
6. Start capture on Test Stations 1 and 2.
7. Wait 31 seconds.
8. Attempt to extract LLDP Local System mandatory TLV information from DUT and LP.
9. Attempt to extract LLDP Remote System mandatory TLV information from DUT and LP.
10. Stop capture on Test Stations 1 and 2, and observe the captured frames (if any).

*Part B: Link Re-initialization*

11. Ensure that the [default](#) values are configured on the DUT and LP.
12. Wait 31 seconds.
13. Disconnect the link between the DUT and LP.
14. Attempt to extract LLDP Local System mandatory TLV information from DUT and LP.
15. Attempt to extract LLDP Remote System mandatory TLV information from DUT and LP.
16. Start capture on Test Stations 1, 2 and 3.
17. Connect Test Station 3 to the Port on the DUT previously included in the link connected to the LP.
18. Wait 31 seconds.
19. Attempt to extract LLDP Local System mandatory TLV information from DUT and LP.
20. Attempt to extract LLDP Remote System mandatory TLV information from DUT and LP.
21. Stop capture on Test Stations 1, 2 and 3, and observe the captured frames (if any).

*Note – Steps 13 through 21 must be completed before the TTL timer expires for the LPs Remote System information on the DUT.*

**Observable Results:**

- In Part A, during Step 3, the LLDP Local System mandatory TLV information on the DUT and LP must correlate to the characteristics of the DUT and LP, respectively. During Step 4, the LLDP Remote System mandatory TLV information on the DUT and LP must contain the characteristics of the LP and DUT, respectively. During Step 8, the LLDP Local System mandatory TLV information on the DUT and LP must correlate to the characteristics of the DUT and LP, respectively. During Step 9, the LLDP Remote System mandatory TLV information on the DUT and LP must contain the characteristics of the LP and DUT, respectively. During Step 10, Test Stations 1 and 2 must capture properly formatted LLDPDUs containing the three mandatory TLVs and the End Of LLDPDU TLV.
- In Part B, during Step 14, the LLDP Local System mandatory TLV information on the DUT and LP must correlate to the characteristics of the DUT and LP, respectively. During Step 15, the LLDP Remote System mandatory TLV information on the DUT and LP must contain the characteristics of the LP and DUT, respectively. During Step 19, the LLDP Local System mandatory TLV information on the DUT and LP must correlate to the characteristics of the DUT and LP, respectively. During Step 20, the LLDP Remote System mandatory TLV information on the DUT must not contain the characteristics of the LP. During Step 20, the LLDP Remote System mandatory TLV information on the LP must contain the characteristics of the DUT. During Step 21, Test Stations 1 and 2 must capture properly formatted LLDPDUs containing the three mandatory TLVs and the End Of LLDPDU TLV.

**Possible Problems:**

- None.

## LLDP.io.1.6: LLDP.io in a Spanning Tree environment – Mandatory LLDP TLVs

**Purpose:** To verify that the DUT can properly exchange the mandatory TLVs with its Link Partner, an LLDP capable System, in a Spanning Tree enabled network, with links in the Blocking State.

### References:

- IEEE Std. 802.1AB-2005: Table 9-1
- IEEE Std. 802.1AB-2005: 6 Architectural overview
- IEEE Std. 802.1AB-2005: 10.1 Protocol initialization
- IEEE Std. 802.1AB-2005: 10.2 Frame transmission
- IEEE Std. 802.1AB-2005: 10.3 Frame reception
- IEEE Std. 802.1AB-2005: 10.3.2 LLDPDU validation

### Resource Requirements:

- 2 Test Stations
- DUT
- STP/LLDP capable LPs
- SNMP software management tool

### Discussion:

This Test verifies that the DUT can properly exchange the mandatory TLVs with an LLDP capable Link Partner, when configured in a Spanning Tree network with links in the Blocking State. The DUT is placed in a network with three redundant links between the DUT and its LP. Due to the operation of Spanning Tree, two of the links are placed in the Blocking State. IEEE Std. 802.1AB-2005 Clause 6 stipulates that, since LLDP operates as an LLC procedure, it is not affected by the Spanning Tree state of the Bridge Port.

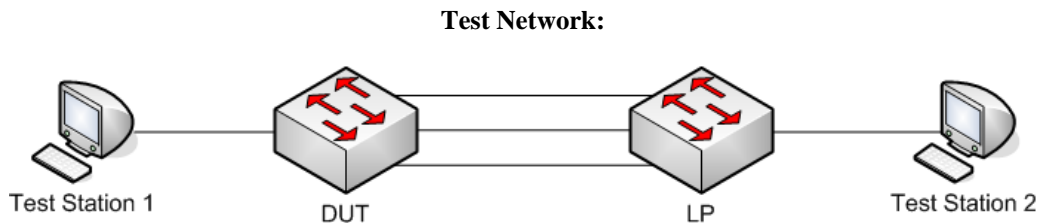


Figure 5: LLDP.io in a Spanning Tree environment – Mandatory LLDP TLVs

**Procedure:**

*Part A: LLDP in a Spanning Tree environment – Mandatory LLDP TLVs when the DUT is Root*

1. Ensure that the [default](#) values are configured on the DUT and LP.
2. Configure the DUT and Link Partner such that the DUT is the Root Bridge.
3. Start capture on Test Stations 1 and 2.
4. Wait 31 seconds.
5. Attempt to extract LLDP Local System mandatory TLV information from DUT and LP.
6. Attempt to extract LLDP Remote System mandatory TLV information from DUT and LP.
7. Stop capture on Test Stations 1 and 2, and observe the captured frames (if any).

*Part B: LLDP in a Spanning Tree environment – Mandatory LLDP TLVs when the DUT is not Root*

8. Ensure that the [default](#) values are configured on the DUT and LP.
9. Configure the DUT and Link Partner such that the LP is the Root Bridge
10. Start capture on Test Stations 1 and 2.
11. Wait 31 seconds.
12. Attempt to extract LLDP Local System mandatory TLV information from DUT and LP.
13. Attempt to extract LLDP Remote System mandatory TLV information from DUT and LP.
14. Stop capture on Test Stations 1 and 2, and observe the captured frames (if any).

**Observable Results:**

- In Part A and B, the LLDP Local System mandatory TLV information on the DUT and LP must correlate to the characteristics of the DUT and LP, respectively. The LLDP Remote System mandatory TLV information on the DUT and LP must contain the characteristics of the LP and DUT, respectively. The Remote System information on the DUT and LP must contain information indicating the three links between the two Systems. Test Stations 1 and 2 must capture properly formatted LLDPDUs containing the three mandatory TLVs and the End Of LLDPDU TLV.

**Possible Problems:**

- If the DUT does not support Spanning Tree, this Test cannot be completed.



## **GROUP 2: LLDP.io – IEEE 802.1 Organizationally Specific LLDP TLVs**

### **Scope**

To verify the behavior of the LLDP capable DUT in an LLDP enabled network running IEEE 802.1 Protocols.

### **Overview**

These tests help determine whether the DUT can properly exchange LLDP IEEE 802.1 Organizationally Specific LLDP TLVs, via LLDPDUs, when connected in Test Networks with other LLDP capable Link Partners capable of supporting IEEE 802.1 Protocols.

LLDP capable Systems transmit Local System information in LLDPDUs and store Remote System information received in LLDPDUs from directly connected Link Partners. Local System information and Remote System information exchanged via LLDPDUs must be stored in a format that can be retrieved by the network administrator.

IEEE Std. 802.1AB-2005 Clause 12 specifies a method for storing LLDP obtained information in SNMP MIBs and a method for retrieving LLDP obtained information using SNMP. If the LLDP capable System does not support SNMP, the System shall provide storage and retrieval capability equivalent to the functionality specified in IEEE Std. 802.1AB-2005 Clause 11.

## LLDP.io.2.1: IEEE 802.1 Organizationally Specific TLVs – VLANs

**Purpose:** To verify that the DUT can properly exchange the IEEE 802.1 Organizationally Specific VLAN TLVs with its Link Partner, an LLDP capable System.

### References:

- IEEE Std. 802.1AB-2005: Table 9-1
- IEEE Std. 802.1AB-2005: 10.1 Protocol initialization
- IEEE Std. 802.1AB-2005: 10.2 Frame transmission
- IEEE Std. 802.1AB-2005: 10.3 Frame reception
- IEEE Std. 802.1AB-2005: Annex F

### Resource Requirements:

- 2 Test Stations
- DUT
- LLDP capable LPs supporting IEEE 802.1 Organizationally Specific TLVs
- SNMP software management tool

### Discussion:

This Test verifies that the DUT can properly exchange information with an LLDP capable Link Partner, specifically the IEEE 802.1 Organizationally Specific VLAN TLVs defined in IEEE Std. 802.1AB-2005 Table F-1. The four defined IEEE 802.1 TLVs are: Port VLAN ID TLV, Port and Protocol VLAN ID TLV, VLAN Name TLV and Protocol Identity TLV; the IEEE 802.1 TLVs may be included in the LLDPDU as determined by the implementer. All LLDPDUs are terminated with the End Of LLDPDU TLV. In this Test the DUT and LLDP capable Link Partner must exchange the information contained in the IEEE 802.1 TLVs supported by the DUT and LP. Information exchanged in the TLVs must be stored in an accessible format such as SNMP.

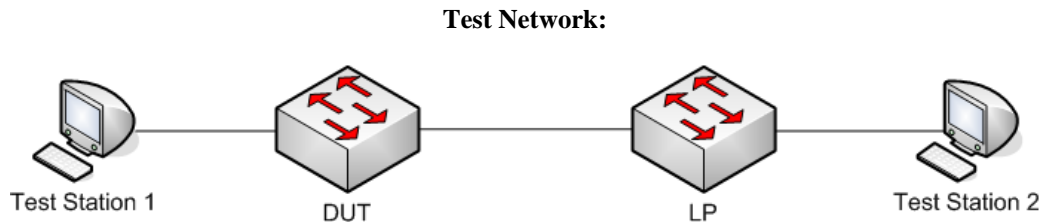


Figure 6: IEEE 802.1 Organizationally Specific TLVs – VLAN

**Procedure:**

*Part A: Port VLAN ID TLV*

1. Ensure that the [default](#) values are configured on the DUT and LP.
2. Enable transmission of the Port VLAN ID TLV.
3. Start capture on Test Stations 1 and 2.
4. Wait 31 seconds.
5. Attempt to extract LLDP Local System information from DUT and LP.
6. Attempt to extract LLDP Remote System information from DUT and LP.
7. Stop capture on Test Stations 1 and 2, and observe the captured frames (if any).

*Part B: Port and Protocol VLAN ID TLV*

8. Ensure that the [default](#) values are configured on the DUT and LP.
9. Enable transmission of the Port VLAN ID TLV.
10. Start capture on Test Stations 1 and 2.
11. Wait 31 seconds.
12. Attempt to extract LLDP Local System information from DUT and LP.
13. Attempt to extract LLDP Remote System information from DUT and LP.
14. Stop capture on Test Stations 1 and 2, and observe the captured frames (if any).

*Part C: VLAN Name TLV*

15. Ensure that the [default](#) values are configured on the DUT and LP.
16. Enable transmission of the Port VLAN ID TLV.
17. Start capture on Test Stations 1 and 2.
18. Wait 31 seconds.
19. Attempt to extract LLDP Local System information from DUT and LP.
20. Attempt to extract LLDP Remote System information from DUT and LP.
21. Stop capture on Test Stations 1 and 2, and observe the captured frames (if any).

**Observable Results:**

- In Part A, Test Stations 1 and 2 must capture properly formatted LLDPDUs containing the Port VLAN ID TLV and the End Of LLDPDU TLV. The LLDP Local System information on the DUT and LP must correlate to the characteristics of the DUT and LP, respectively. The LLDP Remote System information on the DUT and LP must contain the characteristics of the LP and DUT, respectively.
- In Part B, Test Stations 1 and 2 must capture properly formatted LLDPDUs containing the Port and Protocol VLAN ID TLV(s) and the End Of LLDPDU TLV. The LLDP Local System information on the DUT and LP must correlate to the characteristics of the DUT and LP, respectively. The LLDP Remote System information on the DUT and LP must contain the characteristics of the LP and DUT, respectively.
- In Part C, Test Stations 1 and 2 must capture properly formatted LLDPDUs containing the VLAN Name TLV(s) and the End Of LLDPDU TLV. The LLDP Local System information on the DUT and LP must correlate to the characteristics of the DUT and LP, respectively. The LLDP Remote System information on the DUT and LP must contain the characteristics of the LP and DUT, respectively.

**Possible Problems:**

- If the DUT does not support the IEEE 802.1 Organizationally Specific TLVs, this Test cannot be completed.

## LLDP.io.2.2: IEEE 802.1 Organizationally Specific TLVs – Spanning Tree

**Purpose:** To verify that the DUT can properly exchange the IEEE 802.1 Organizationally Specific Protocol Identity TLVs, containing Spanning Tree information, with its Link Partner, an LLDP capable System.

### References:

- IEEE Std. 802.1AB-2005: Table 9-1
- IEEE Std. 802.1AB-2005: 10.1 Protocol initialization
- IEEE Std. 802.1AB-2005: 10.2 Frame transmission
- IEEE Std. 802.1AB-2005: 10.3 Frame reception
- IEEE Std. 802.1AB-2005: Annex F

### Resource Requirements:

- 2 Test Stations
- DUT
- LLDP capable LPs supporting IEEE 802.1 Organizationally Specific Protocol Identity Spanning Tree TLV
- SNMP software management tool

### Discussion:

This Test verifies that the DUT can properly exchange information with an LLDP capable Link Partner, specifically the IEEE 802.1 Organizationally Specific Protocol Identity TLVs defined in IEEE Std. 802.1AB-2005 Table F-1. The IEEE 802.1 Protocol Identity TLV allows the implementer to advertise protocols supported by the Link, such as Spanning Tree versions; the IEEE 802.1 Protocol Identity TLV may be included in the LLDPDU as determined by the implementer. All LLDPDUs are terminated with the End Of LLDPDU TLV. In this Test the DUT and LLDP capable Link Partner must exchange the information contained in the IEEE 802.1 TLVs supported by the DUT and LP. Information exchanged in the TLVs must be stored in an accessible format such as SNMP.

The Protocol Identity TLV's protocol identity information string contains the first N octets of the Protocol Data Unit after the layer 2 addresses. The value of N is chosen such that the protocol identity information string contains enough octets for the receiver to properly identify the protocol and protocol version.

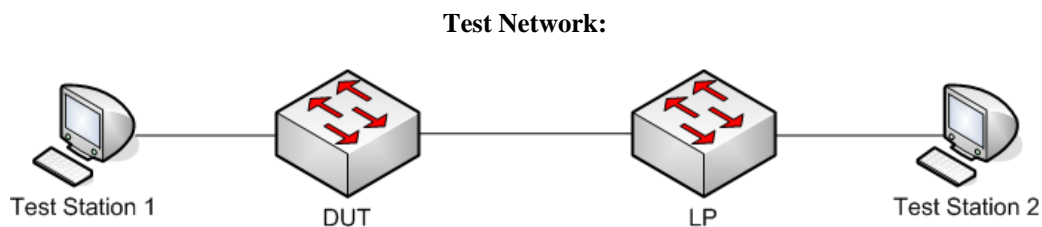


Figure 7: IEEE 802.1 Organizationally Specific TLVs – Spanning Tree

**Procedure:**

*Part A: Spanning Tree – Version 0*

1. Ensure that the [default](#) values are configured on the DUT and LP.
2. Enable Spanning Tree Protocol on the DUT and LP.
3. Enable Spanning Tree Protocol on all Ports on the DUT and LP.
4. Set the DUT's and LP's Force Protocol Version parameter to 0.
5. Enable transmission of the Spanning Tree Protocol Identity TLV.
6. Start capture on Test Stations 1 and 2.
7. Wait 31 seconds.
8. Attempt to extract LLDP Local System information from DUT and LP.
9. Attempt to extract LLDP Remote System information from DUT and LP.
10. Stop capture on Test Stations 1 and 2, and observe the captured frames (if any).

*Part B: Rapid Spanning Tree – Version 2*

11. Ensure that the [default](#) values are configured on the DUT and LP.
12. Enable Spanning Tree Protocol on the DUT and LP.
13. Enable Spanning Tree Protocol on all Ports on the DUT and LP.
14. Set the DUT's and LP's Force Protocol Version parameter to 2.
15. Enable transmission of the Spanning Tree Protocol Identity TLV.
16. Start capture on Test Stations 1 and 2.
17. Wait 31 seconds.
18. Attempt to extract LLDP Local System information from DUT and LP.
19. Attempt to extract LLDP Remote System information from DUT and LP.
20. Stop capture on Test Stations 1 and 2, and observe the captured frames (if any).

*Part C: Multiple Spanning Tree – Version 3*

21. Ensure that the [default](#) values are configured on the DUT and LP.
22. Enable Spanning Tree Protocol on the DUT and LP.
23. Enable Spanning Tree Protocol on all Ports on the DUT and LP.
24. Set the DUT's and LP's Force Protocol Version parameter to 3.
25. Enable transmission of the Spanning Tree Protocol Identity TLV.
26. Start capture on Test Stations 1 and 2.
27. Wait 31 seconds.
28. Attempt to extract LLDP Local System information from DUT and LP.
29. Attempt to extract LLDP Remote System information from DUT and LP.
30. Stop capture on Test Stations 1 and 2, and observe the captured frames (if any).

**Observable Results:**

- In Part A, Test Stations 1 and 2 must capture properly formatted LLDPDUs containing the Protocol Identity TLV, corresponding to Spanning Tree version 0, and the End Of LLDPDU TLV. Test Stations 1 and 2 must capture properly formatted ST BPDUs. The LLDP Local System information on the DUT and LP must correlate to the characteristics of the DUT and LP, respectively. The LLDP Remote System information on the DUT and LP must contain the characteristics of the LP and DUT, respectively.
- In Part B, Test Stations 1 and 2 must capture properly formatted LLDPDUs containing the Protocol Identity TLV, corresponding to Spanning Tree version 2, and the End Of LLDPDU TLV. Test Stations 1 and 2 must capture properly formatted RST BPDUs. The LLDP Local System information on the DUT and LP must correlate to the characteristics of the DUT and LP, respectively. The LLDP Remote System information on the DUT and LP must contain the characteristics of the LP and DUT, respectively.
- In Part C, Test Stations 1 and 2 must capture properly formatted LLDPDUs containing the Protocol Identity TLV, corresponding to Spanning Tree version 3, and the End Of LLDPDU TLV. Test Stations 1 and 2 must capture properly formatted MST BPDUs. The LLDP Local System information on the DUT and LP must correlate to the characteristics of the DUT and LP, respectively. The LLDP Remote System information on the DUT and LP must contain the characteristics of the LP and DUT, respectively.

**Possible Problems:**

- If the DUT does not support the IEEE 802.1 Organizationally Specific TLVs, this Test cannot be completed.
- If the DUT does not support the IEEE 802.1 Organizationally Specific Protocol Identity TLV for Spanning Tree, this Test cannot be completed.

## **GROUP 3: LLDP.io – IEEE 802.3 Organizationally Specific LLDP TLVs**

### **Scope**

To verify the behavior of the LLDP capable DUT in an LLDP enabled network running IEEE 802.3 Protocols.

### **Overview**

These tests help determine whether the DUT can properly exchange LLDP IEEE 802.3 Organizationally Specific LLDP TLVs, via LLDPDUs, when connected in Test Networks with other LLDP capable Link Partners supporting IEEE 802.3 Protocols.

LLDP capable Systems transmit Local System information in LLDPDUs and store Remote System information received in LLDPDUs from directly connected Link Partners. Local System information and Remote System information exchanged via LLDPDUs must be stored in a format that can be retrieved by the network administrator.

IEEE Std. 802.1AB-2005 Clause 12 specifies a method for storing LLDP obtained information in SNMP MIBs and a method for retrieving LLDP obtained information using SNMP. If the LLDP capable System does not support SNMP, the System shall provide storage and retrieval capability equivalent to the functionality specified in IEEE Std. 802.1AB-2005 Clause 11.

### LLDP.io.3.1: IEEE 802.3 Organizationally Specific TLVs – MAC/PHY

**Purpose:** To verify that the DUT can properly exchange the IEEE 802.3 Organizationally Specific MAC/PHY TLV with its Link Partner, an LLDP capable System.

**References:**

- IEEE Std. 802.1AB-2005: Table 9-1
- IEEE Std. 802.1AB-2005: 10.1 Protocol initialization
- IEEE Std. 802.1AB-2005: 10.2 Frame transmission
- IEEE Std. 802.1AB-2005: 10.3 Frame reception
- IEEE Std. 802.1AB-2005: Annex G

**Resource Requirements:**

- 2 Test Stations
- DUT
- LLDP capable LPs supporting IEEE 802.3 Organizationally Specific TLVs
- SNMP software management tool

**Discussion:**

This Test verifies that the DUT can properly exchange information with an LLDP capable Link Partner, specifically the IEEE 802.3 Organizationally Specific MAC/PHY TLV defined in IEEE Std. 802.1AB-2005 Table G-1. The four defined IEEE 802.3 TLVs are: MAC/PHY Configuration/Status TLV, Power Via MDI TLV, Link Aggregation TLV and Maximum Frame Size TLV; the IEEE 802.3 TLVs may be included in the LLDPDU as determined by the implementer. All LLDPDUs are terminated with the End Of LLDPDU TLV. In this Test the DUT and LLDP capable Link Partner must exchange the information contained in the IEEE 802.3 TLVs supported by the DUT and LP. Information exchanged in the TLVs must be stored in an accessible format such as SNMP.

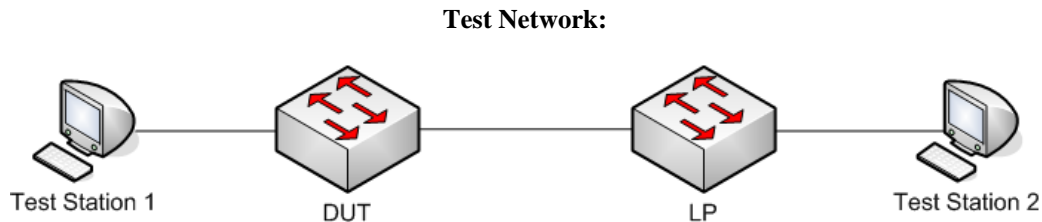


Figure 11: IEEE 802.3 Organizationally Specific TLVs – MAC/PHY



**Procedure:**

*Part A: MAC/PHY TLV – Default Configuration*

1. Ensure that the [default](#) values are configured on the DUT and LP.
2. Enable transmission of the MAC/PHY Configuration/Status TLV.
3. Start capture on Test Stations 1 and 2.
4. Wait 31 seconds.
5. Attempt to extract LLDP Local System information from DUT and LP.
6. Attempt to extract LLDP Remote System information from DUT and LP.
7. Stop capture on Test Stations 1 and 2, and observe the captured frames (if any).

*Part B: MAC/PHY TLV – Auto-negotiation supported/enabled*

8. Ensure that the [default](#) values are configured on the DUT and LP.
9. Enable Auto-negotiation on all Ports on the DUT and LP.
10. Enable transmission of the MAC/PHY Configuration/Status TLV.
11. Start capture on Test Stations 1 and 2.
12. Wait 31 seconds.
13. Attempt to extract LLDP Local System information from DUT and LP.
14. Attempt to extract LLDP Remote System information from DUT and LP.
15. Stop capture on Test Stations 1 and 2, and observe the captured frames (if any).

*Part C: MAC/PHY TLV – Auto-negotiation supported/disabled*

16. Ensure that the [default](#) values are configured on the DUT and LP.
17. Disable Auto-negotiation on all Ports on the DUT and LP.
18. Enable transmission of the MAC/PHY Configuration/Status TLV.
19. Start capture on Test Stations 1 and 2.
20. Wait 31 seconds.
21. Attempt to extract LLDP Local System information from DUT and LP.
22. Attempt to extract LLDP Remote System information from DUT and LP.
23. Stop capture on Test Stations 1 and 2, and observe the captured frames (if any).

**Observable Results:**

- In Part A, Test Stations 1 and 2 must capture properly formatted LLDPDUs containing the MAC/PHY TLV, corresponding to default configuration of the DUT and LP, respectively, and the End Of LLDPDU TLV. The LLDP Local System information on the DUT and LP must correlate to the characteristics of the DUT and LP, respectively. The LLDP Remote System information on the DUT and LP must contain the characteristics of the LP and DUT, respectively.
- In Part B, Test Stations 1 and 2 must capture properly formatted LLDPDUs containing the MAC/PHY TLV, indicating that Auto-negotiation is supported and enabled on the DUT and LP, respectively, and the End Of LLDPDU TLV. The LLDP Local System information on the DUT and LP must correlate to the characteristics of the DUT and LP, respectively. The LLDP Remote System information on the DUT and LP must contain the characteristics of the LP and DUT, respectively.
- In Part C, Test Stations 1 and 2 must capture properly formatted LLDPDUs containing the MAC/PHY TLV, indicating that Auto-negotiation is supported but disabled on the DUT and LP, respectively, and the End Of LLDPDU TLV. The LLDP Local System information on the DUT and LP must correlate to the characteristics of the DUT and LP, respectively. The LLDP Remote System information on the DUT and LP must contain the characteristics of the LP and DUT, respectively.

**Possible Problems:**

- If the DUT does not support the IEEE 802.3 Organizationally Specific TLVs, this Test cannot be completed.
- If Auto-negotiation is not supported by the DUT, Parts B and C cannot be completed.

### LLDP.io.3.2: IEEE 802.3 Organizationally Specific TLVs – Power Via MDI

**Purpose:** To verify that the DUT can properly exchange the IEEE 802.3 Organizationally Specific Power Via MDI TLV with its Link Partner, an LLDP capable System.

**References:**

- IEEE Std. 802.1AB-2005: Table 9-1
- IEEE Std. 802.1AB-2005: 10.1 Protocol initialization
- IEEE Std. 802.1AB-2005: 10.2 Frame transmission
- IEEE Std. 802.1AB-2005: 10.3 Frame reception
- IEEE Std. 802.1AB-2005: Annex G

**Resource Requirements:**

- 2 Test Stations
- DUT
- LLDP capable LPs supporting IEEE 802.3 Organizationally Specific TLVs
- SNMP software management tool

**Discussion:**

This Test verifies that the DUT can properly exchange information with an LLDP capable Link Partner, specifically the IEEE 802.3 Organizationally Specific Power Via MDI TLV defined in IEEE Std. 802.1AB-2005 Table G-1. The four defined IEEE 802.3 TLVs are: MAC/PHY Configuration/Status TLV, Power Via MDI TLV, Link Aggregation TLV and Maximum Frame Size TLV; the IEEE 802.3 TLVs may be included in the LLDPDU as determined by the implementer. All LLDPDUs are terminated with the End Of LLDPDU TLV. In this Test the DUT and LLDP capable Link Partner must exchange the information contained in the IEEE 802.3 TLVs supported by the DUT and LP. Information exchanged in the TLVs must be stored in an accessible format such as SNMP.

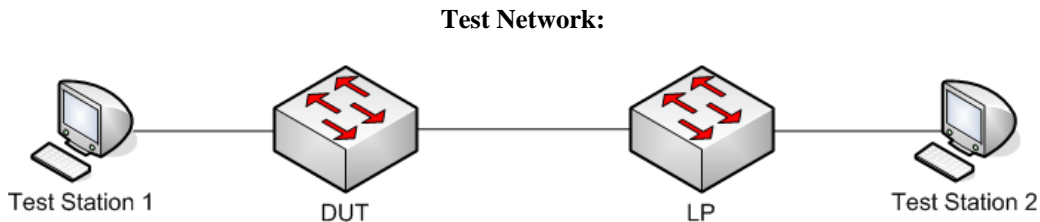


Figure 12: IEEE 802.3 Organizationally Specific TLVs – Power Via MDI

**Procedure:**

*Part A: Power Via MDI – Default Configuration*

1. Ensure that the [default](#) values are configured on the DUT and LP.
2. Enable transmission of the Power Via MDI TLV.
3. Start capture on Test Stations 1 and 2.
4. Wait 31 seconds.
5. Attempt to extract LLDP Local System information from DUT and LP.
6. Attempt to extract LLDP Remote System information from DUT and LP.
7. Stop capture on Test Stations 1 and 2, and observe the captured frames (if any).

*Part B: Power Via MDI – supported/enabled*

8. Ensure that the [default](#) values are configured on the DUT and LP.
9. Enable Power Via MDI on all Ports on the DUT and LP.
10. Enable transmission of the Power Via MDI TLV.
11. Start capture on Test Stations 1 and 2.
12. Wait 31 seconds.
13. Attempt to extract LLDP Local System information from DUT and LP.
14. Attempt to extract LLDP Remote System information from DUT and LP.
15. Stop capture on Test Stations 1 and 2, and observe the captured frames (if any).

*Part C: Power Via MDI – supported/disabled*

16. Ensure that the [default](#) values are configured on the DUT and LP.
17. Disable Power Via MDI on all Ports on the DUT and LP.
18. Enable transmission of the Power Via MDI TLV.
19. Start capture on Test Stations 1 and 2.
20. Wait 31 seconds.
21. Attempt to extract LLDP Local System information from DUT and LP.
22. Attempt to extract LLDP Remote System information from DUT and LP.
23. Stop capture on Test Stations 1 and 2, and observe the captured frames (if any).

**Observable Results:**

- In Part A, Test Stations 1 and 2 must capture properly formatted LLDPDUs containing the Power Via MDI TLV, corresponding to default capabilities of the DUT and LP, respectively, and the End Of LLDPDU TLV. The LLDP Local System information on the DUT and LP must correlate to the characteristics of the DUT and LP, respectively. The LLDP Remote System information on the DUT and LP must contain the characteristics of the LP and DUT, respectively.
- In Part B, Test Stations 1 and 2 must capture properly formatted LLDPDUs containing the Power Via MDI TLV, indicating that Power Via MDI is supported and enabled on the DUT and LP, respectively, and the End Of LLDPDU TLV. The LLDP Local System information on the DUT and LP must correlate to the characteristics of the DUT and LP, respectively. The LLDP Remote System information on the DUT and LP must contain the characteristics of the LP and DUT, respectively.
- In Part C, Test Stations 1 and 2 must capture properly formatted LLDPDUs containing the Power Via MDI TLV, indicating that Power Via MDI is supported but disabled on the DUT and LP, respectively, and the End Of LLDPDU TLV. The LLDP Local System information on the DUT and LP must correlate to the characteristics of the DUT and LP, respectively. The LLDP Remote System information on the DUT and LP must contain the characteristics of the LP and DUT, respectively.

**Possible Problems:**

- If the DUT does not support the IEEE 802.3 Organizationally Specific TLVs, this Test cannot be completed.
- If Power Via MDI is not supported by the DUT, Parts B and C cannot be completed.

### LLDP.io.3.3: IEEE 802.3 Organizationally Specific TLVs – Link Aggregation

**Purpose:** To verify that the DUT can properly exchange the IEEE 802.3 Organizationally Specific Link Aggregation TLV with its Link Partner, an LLDP capable System.

**References:**

- IEEE Std. 802.1AB-2005: Table 9-1
- IEEE Std. 802.1AB-2005: 10.1 Protocol initialization
- IEEE Std. 802.1AB-2005: 10.2 Frame transmission
- IEEE Std. 802.1AB-2005: 10.3 Frame reception
- IEEE Std. 802.1AB-2005: Annex G

**Resource Requirements:**

- 2 Test Stations
- DUT
- LLDP capable LPs supporting IEEE 802.3 Organizationally Specific TLVs
- SNMP software management tool

**Discussion:**

This Test verifies that the DUT can properly exchange information with an LLDP capable Link Partner, specifically the IEEE 802.3 Organizationally Specific Link Aggregation TLV defined in IEEE Std. 802.1AB-2005 Table G-1. The four defined IEEE 802.3 TLVs are: MAC/PHY Configuration/Status TLV, Power Via MDI TLV, Link Aggregation TLV and Maximum Frame Size TLV; the IEEE 802.3 TLVs may be included in the LLDPDU as determined by the implementer. All LLDPDUs are terminated with the End Of LLDPDU TLV. In this Test the DUT and LLDP capable Link Partner must exchange the information contained in the IEEE 802.3 TLVs supported by the DUT and LP. Information exchanged in the TLVs must be stored in an accessible format such as SNMP.

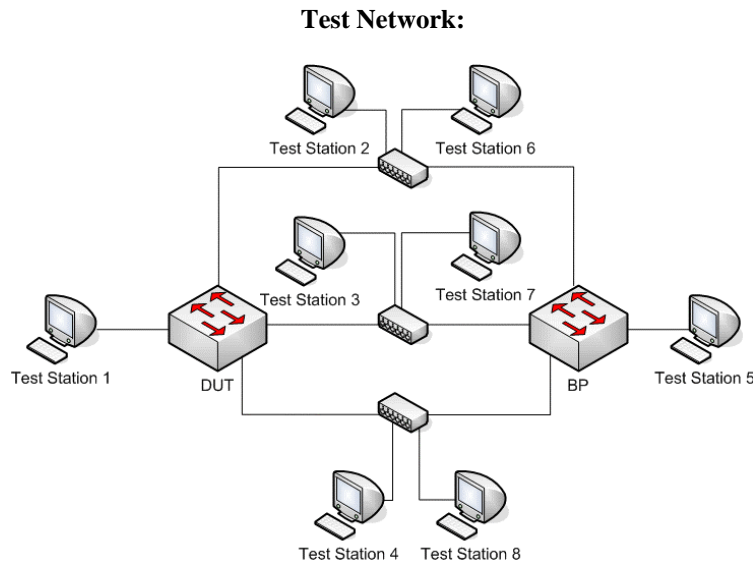


Figure 13: IEEE 802.3 Organizationally Specific TLVs – Link Aggregation

**Procedure:**

*Part A: Link Aggregation – Disabled/Inactive*

1. Ensure that the [default](#) values are configured on the DUT and LP.
2. Enable transmission of the Link Aggregation TLV.
3. Start capture on Test Stations 1 and 2.
4. Wait 31 seconds.
5. Attempt to extract LLDP Local System information from DUT and LP.
6. Attempt to extract LLDP Remote System information from DUT and LP.
7. Stop capture on Test Stations 1 and 2, and observe the captured frames (if any).

*Part B: Link Aggregation – Enabled/Inactive*

8. Ensure that the [default](#) values are configured on the DUT and LP.
9. Enable Link Aggregation on all Ports on the DUT.
10. Enable transmission of the Link Aggregation TLV.
11. Start capture on Test Stations 1 and 2.
12. Wait 31 seconds.
13. Attempt to extract LLDP Local System information from DUT and LP.
14. Attempt to extract LLDP Remote System information from DUT and LP.
15. Stop capture on Test Stations 1 and 2, and observe the captured frames (if any).
16. Disable Link Aggregation on all Ports on the DUT.
17. Enable Link Aggregation on all Ports on the LP.
18. Repeat Steps 11-15.

*Part C: Link Aggregation – Enabled/Active*

19. Ensure that the [default](#) values are configured on the DUT and LP.
20. Enable Link Aggregation on all Ports on the DUT and LP. Ensure a Link Aggregation comprised of the Ports connecting the DUT and LP is created and active.
21. Enable transmission of the Link Aggregation TLV.
22. Start capture on Test Stations 1 and 2.
23. Wait 31 seconds.
24. Attempt to extract LLDP Local System information from DUT and LP.
25. Attempt to extract LLDP Remote System information from DUT and LP.
26. Stop capture on Test Stations 1 and 2, and observe the captured frames (if any).

**Observable Results:**

- In Part A, during Step 7, Test Stations 1, 2, 3 and 4 must capture properly formatted LLDPDUs containing the Link Aggregation TLV, corresponding to the configured settings of the DUT, and the End Of LLDPDU TLV. During Step 7, Test Stations 5, 6, 7 and 8 must capture properly formatted LLDPDUs containing the Link Aggregation TLV, corresponding to the configured settings of the LP, and the End of LLDPDU TLV. The LLDP Local System information on the DUT and LP must correlate to the characteristics of the DUT and LP, respectively. The LLDP Remote System information on the DUT and LP must contain the characteristics of the LP and DUT, respectively.
- In Part B, during Steps 15 and 18, Test Stations 1, 2, 3 and 4 must capture properly formatted LLDPDUs containing the Link Aggregation TLV, corresponding to the configured settings of the DUT, and the End of LLDPDU TLV. During Step 15, Test Stations 5, 6, 7 and 8 must capture properly formatted LLDPDUs containing the Link Aggregation TLV, corresponding to the configured settings of the LP, and the End of LLDPDU TLV. The LLDP Local System information on the DUT and LP must correlate to the characteristics of the DUT and LP, respectively. The LLDP Remote System information on the DUT and LP must contain the characteristics of the LP and DUT, respectively.
- In Part C, during Step 26, Test Stations 1, 2, 3 and 4 must capture properly formatted LLDPDUs containing the Link Aggregation TLV, corresponding to the configured settings of the DUT, and the End Of LLDPDU TLV. During Step 26, Test Stations 5, 6, 7 and 8 must capture properly formatted LLDPDUs containing the Link Aggregation TLV, corresponding to the configured settings of the LP, and the End Of LLDPDU TLV. The LLDP Local System information on the DUT and LP must correlate to the characteristics of the DUT and LP, respectively. The LLDP Remote System information on the DUT must correlate to the characteristics of the LP and DUT, respectively.

**Possible Problems:**

- If the DUT does not support the IEEE 802.3 Organizationally Specific TLVs, this Test cannot be completed.
- If the DUT does not support Link Aggregation, Parts B and C cannot be completed.

### LLDP.io.3.4: IEEE 802.3 Organizationally Specific TLVs – Maximum Frame Size

**Purpose:** To verify that the DUT can properly exchange the IEEE 802.3 Organizationally Specific Maximum Frame Size TLV with its Link Partner, an LLDP capable System.

**References:**

- IEEE Std. 802.1AB-2005: Table 9-1
- IEEE Std. 802.1AB-2005: 10.1 Protocol initialization
- IEEE Std. 802.1AB-2005: 10.2 Frame transmission
- IEEE Std. 802.1AB-2005: 10.3 Frame reception
- IEEE Std. 802.1AB-2005: Annex G

**Resource Requirements:**

- 2 Test Stations
- DUT
- LLDP capable LPs supporting IEEE 802.3 Organizationally Specific TLVs
- SNMP software management tool

**Discussion:**

This Test verifies that the DUT can properly exchange information with an LLDP capable Link Partner, specifically the IEEE 802.3 Organizationally Specific Maximum Frame Size TLV defined in IEEE Std. 802.1AB-2005 Table G-1. The four defined IEEE 802.3 TLVs are: MAC/PHY Configuration/Status TLV, Power Via MDI TLV, Link Aggregation TLV and Maximum Frame Size TLV; the IEEE 802.3 TLVs may be included in the LLDPDU as determined by the implementer. All LLDPDUs are terminated with the End Of LLDPDU TLV. In this Test the DUT and LLDP capable Link Partner must exchange the information contained in the IEEE 802.3 TLVs supported by the DUT and LP. Information exchanged in the TLVs must be stored in an accessible format such as SNMP.

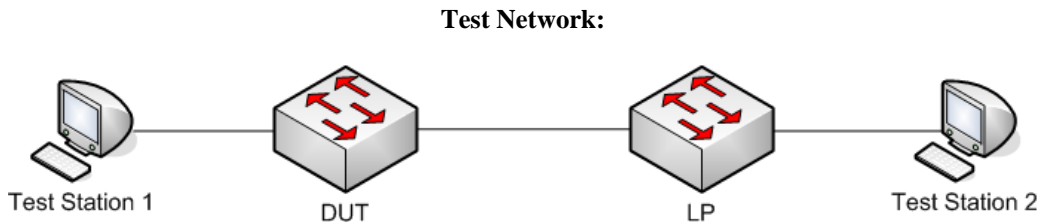


Figure 14: IEEE 802.3 Organizationally Specific TLVs – Maximum Frame Size

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*Part A: Maximum Frame Size – Default Configuration*

1. Ensure that the [default](#) values are configured on the DUT and LP.
2. Enable transmission of the Link Aggregation TLV.
3. Start capture on Test Stations 1 and 2.
4. Wait 31 seconds.
5. Attempt to extract LLDP Local System information from DUT and LP.
6. Attempt to extract LLDP Remote System information from DUT and LP.
7. Stop capture on Test Stations 1 and 2, and observe the captured frames (if any).

**Observable Results:**

- In Part A, Test Stations 1 and 2 must capture properly formatted LLDPDUs containing the Maximum Frame Size TLV, corresponding to default capabilities of the DUT and LP, respectively, and the End Of LLDPDU TLV. The LLDP Local System information on the DUT and LP must correlate to the characteristics of the DUT and LP, respectively. The LLDP Remote System information on the DUT and LP must contain the characteristics of the LP and DUT, respectively.

**Possible Problems:**

- If the DUT does not support the IEEE 802.3 Organizationally Specific TLVs, this Test cannot be completed.



## **GROUP 4: LLDP.io – Organizationally Specific LLDP TLVs**

### **Scope**

To verify the behavior of the LLDP capable DUT in an LLDP enabled network running Organizationally Specific Protocols.

### **Overview**

These tests help determine whether the DUT can properly exchange LLDP Organizationally Specific LLDP TLVs, via LLDPDUs, when connected in Test Networks with other LLDP capable Link Partners capable of supporting Organizationally Specific Protocols.

LLDP capable Systems transmit Local System information in LLDPDUs and store Remote System information received in LLDPDUs from directly connected Link Partners. Local System information and Remote System information exchanged via LLDPDUs must be stored in a format that can be retrieved by the network administrator.

IEEE Std. 802.1AB-2005 Clause 12 specifies a method for storing information obtained via LLDP in SNMP MIBs and a method for retrieving information obtained via LLDP using SNMP. If the LLDP capable System does not support SNMP, the System shall provide storage and retrieval capability equivalent to the functionality specified in IEEE Std. 802.1AB-2005 Clause 11.

## LLDP.io.4.1: Organizationally Specific TLVs

**Purpose:** To verify that the DUT can properly exchange the Organizationally Specific TLVs with its Link Partner, an LLDP capable System.

### References:

- IEEE Std. 802.1AB-2005: Table 9-1
- IEEE Std. 802.1AB-2005: 9.6 Organizationally Specific TLVs
- IEEE Std. 802.1AB-2005: 10.1 Protocol initialization
- IEEE Std. 802.1AB-2005: 10.2 Frame transmission
- IEEE Std. 802.1AB-2005: 10.3 Frame reception

### Resource Requirements:

- 2 Test Stations
- DUT
- LLDP capable LPs supporting Organizationally Specific TLVs
- SNMP software management tool

### Discussion:

This Test verifies that the DUT can properly exchange information with an LLDP capable Link Partner, specifically the Organizationally Specific TLVs whose format is defined in IEEE Std. 802.1AB-2005 subclause 9.6. The Organizationally Specific TLVs are designed to allow organizations and vendors to define TLVs that advertise information to directly connected LLDP entities; the Organizationally Specific TLVs have a specifically defined TLV format that must be adhered to and may be included in the LLDPDU as determined by the implementer. All LLDPDUs are terminated with the End Of LLDPDU TLV. In this Test the DUT and LLDP capable Link Partner must exchange the information contained in the IEEE 802.3 TLVs supported by the DUT and LP. Information exchanged in the TLVs must be stored in an accessible format such as SNMP.

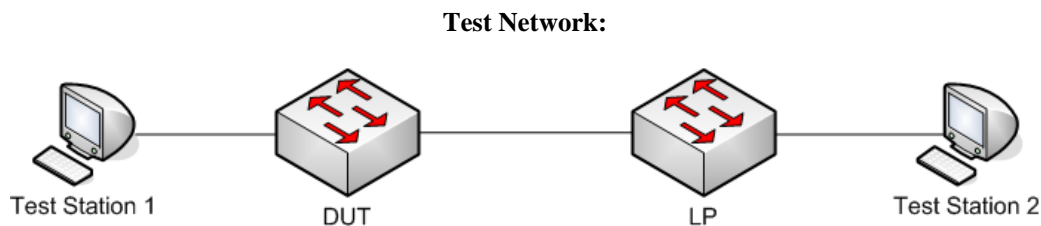


Figure 15: IEEE 802.1 Organizationally Specific TLVs

### Test Specific Setup:

- A Test Specific Setup must be determined prior to executing the Test. The Test Specific Setup must be documented in the Procedure section of the Test Report.

### Note:

- Variations of this Test may be run as often as necessary to test the LLDP implementation. In the Test Report, the results from each iteration of the Test will be recorded as individual Tests, with Test numbered separately starting at LLDP.io.4.1 (LLDP.io.4.2, LLDP.io.4.3, etc.).

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*Part A: Organizationally Specific TLVs – Test Specific Configuration*

1. Ensure that the [default](#) values are configured on the DUT and LP.
2. Enable transmission of the Organizationally Specific TLV.
3. Configure the predefined Test Specific Setup.
4. Start capture on Test Stations 1 and 2.
5. Wait 31 seconds.
6. Attempt to extract LLDP Local System information from DUT and LP.
7. Attempt to extract LLDP Remote System information from DUT and LP.
8. Stop capture on Test Stations 1 and 2, and observe the captured frames (if any).

**Observable Results:**

- In Part A, Test Stations 1 and 2 must capture properly formatted LLDPDUs containing the Organizationally Specific TLV(s), corresponding to configured capabilities of the DUT and LP, respectively, and the End Of LLDPDU TLV. The LLDP Local System information on the DUT and LP must correlate to the characteristics of the DUT and LP, respectively. The LLDP Remote System information on the DUT and LP must contain the characteristics of the LP and DUT, respectively.

**Possible Problems:**

- If the DUT does not support at least one Organizationally Specific TLV, this Test cannot be completed.