

Bridge Functions Consortium

Filtering Database
Operations Test Suite
Version 1.4



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MODIFICATION RECORD

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INTRODUCTION

The University of New Hampshire's InterOperability Laboratory (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 Filtering Database capable products.

The operation of Filtering Database provides Forwarding Process of frames with given values of destination MAC address parameter and VID which are to be forwarded through a given potential transmission Port. Filtering Database allows administrative control of Forwarding of frames with particular destination addresses and the inclusion in the Filtering Database of dynamic filtering information associated with Extended Filtering Services. This test suite has been designed based on Learning Process and Filtering Services described in IEEE 802.1Q 1998 and 802.1D 1998. The test suite focuses on testing whether or not the Device Under Test (DUT) will behave in accordance with the standard during normal operation.

The tests do not determine if a product conforms to the IEEE 802.1Q 1998 and 802.1D 1998 standards or the Amendments IEEE 802.1t-2001, IEEE 802.1u 2001, IEEE 802.1v 2001, IEEE 802.1w 2001 and they are not designed as interoperability tests. Rather, they provide one method to isolate problems within a Filtering Database capable device that will affect interoperability performance. Successful completion of all tests contained in this suite does not guarantee that the tested device will operate with other capable devices. However, combined with satisfactory completion of interoperability testing, these tests provide a reasonable level of confidence that the DUT will function well in most Filtering Database capable environments.

REFERENCES

The following documents are referenced in this text:

- IEEE 802.1D-1998
- IEEE 802.1Q-1998
- IEEE 802.1t-2001
- IEEE 802.1u-2001
- IEEE 802.1v-2001
- IEEE 802.1w- 2001
- IEEE 803 1998: Annex 31B

DEFINITION OF TERMS

Abbreviations and Acronyms:

| | |
|------|---------------------------|
| BPDU | Bridge Protocol Data Unit |
| DUT | Device Under Test |
| MAC | Media Access Control |

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 and test number, also separated by a period. So, test label FD.1.1.2 refers to the second test of the first group in the Filtering Database Test Suite.
- 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.
- 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 Setup:** The Test Setup section describes the configuration of all devices prior to the start of the test. Different parts of the procedure may involve configuration steps that deviate from what is given in the test setup. If a value is not provided for a protocol parameter, then the protocol's default is used for that parameter.
- 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 Testing 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

Each test in this suite uses the following setup for both the DUT and BP's unless otherwise stated.

- Reset the device to factory defaults.
- If GMRP is supported, enable it.
- If GVRP is supported, enable it.
- Enable the most recent version of the Spanning Tree Protocol supported by the Bridge.
- Enable VLAN if necessary.

- For each Port used during test:
 - Set the Acceptable Frame Types Parameter to Admit-all-Frames
 - Set the Enable Ingress Filtering Parameter to Reset (i.e. Disable Ingress Filtering)

Group 1: Permanent Database

Scope: These tests cover the various aspects of the Permanent Database.

Overview: These tests are designed to verify that the device under test (DUT) properly initializes the Filtering Database from the Permanent Database. These tests confirm that the required VLAN Registration Entries and Filtering Entries are in the Permanent Database. Finally, these test verify that the Filtering Entries for the reserved multicast addresses and the GARP application addresses cannot be removed from the Permanent Database.

Test FD.1.1.1 – Entry for Default PVID

Purpose: To verify that the device under test (DUT) has a Static VLAN Registration Entry for the VLAN corresponding to the Default PVID in the Permanent Database.

References:

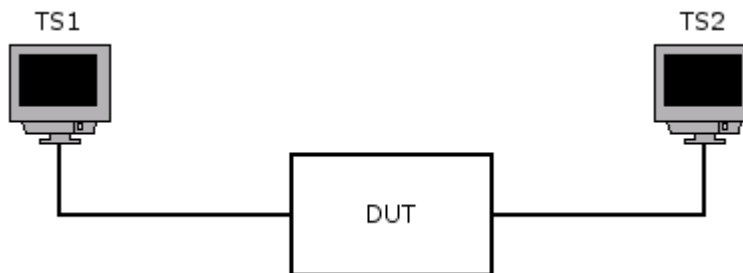
- IEEE 802.1Q 1998: sub-clauses 8.11.9, 8.11.10, 11.2.1.3
- IEEE 802.1Q 1998: Table 9-2
- IEEE 802.1v 2001: sub-clause 11.2.1.3

Resource Requirements:

- Testing Stations capable of transmitting and receiving arbitrary MAC frames.

Discussion: The initial state of the Permanent Database contains a Static VLAN Registration Entry for the VLAN corresponding to the Default PVID. The Port Map in this entry specifies Registration Fixed and forwarding untagged for all Ports of the Bridge. This entry may be modified or deleted through management. The Filtering Database must be initialized from the entries contained in the Permanent Database whenever initialization or re-initialization of the Filtering Database occurs.

Test Setup: Reset factory defaults on the DUT. Connect Testing Stations to the DUT as shown below. Enable Spanning Tree and GVRP on the DUT and allow time for configuration.



Procedure:

Part a: Static VLAN Registration Entry Exists

1. Set Testing Station 2 to capture arbitrary MAC frames.
2. Transmit Untagged Frames from Testing Station 1.

Part b: Static VLAN Registration Entry Specifies Forwarding Untagged

3. Set Testing Station 2 to capture arbitrary MAC frames.
4. Transmit Untagged Frames from Testing Station 1.
5. Transmit Priority-Tagged Frames from Testing Station 1.
6. Transmit Default VLAN-Tagged Frames from Testing Station 1.

Part c: Static VLAN Registration Entry Specifies Registration Fixed

7. Set Testing Stations 1 and 2 to capture GVRP PDUs.
8. Transmit a properly formatted GVRP PDU containing a LeaveAll Event from Testing Station 1.

Observable Results:

- In Part a, Testing Station 2 should receive all of the frames transmitted by Testing Station 1.
- In Part b, Testing Station 2 should receive all of the frames transmitted by Testing Station 1. All of the captured frames should be Untagged.
- In Part c, if the DUT supports basic filtering services, Testing Station 2 should capture the GVRP PDU transmitted by Testing Station 1. If the DUT supports extended filtering services, Testing Station 1 should capture 2 GVRP PDUs containing JoinIn events for the Default VLAN.

Possible Problems:

- If the DUT does not support VLAN, this test cannot be completed.
- If the DUT does not support GVRP, this test cannot be completed.

Test FD.1.1.2 – Entries for Reserved Multicast Addresses

Purpose: To verify that the device under test (DUT) has a Static Filtering Entry in the Permanent Database for each of the reserved multicast addresses that cannot be forwarded.

References:

- IEEE 802.1D 1998: sub-clauses 6.6.7.1, 7.12.3, 7.12.6
- IEEE 802.1Q 1998: sub-clauses 8.14.3, 8.14.6
- IEEE 802.1D 1998: Table 7-9
- IEEE 802.1Q 1998: Table 8-10
- IEEE 802.1t 2001: sub-clause 7.9

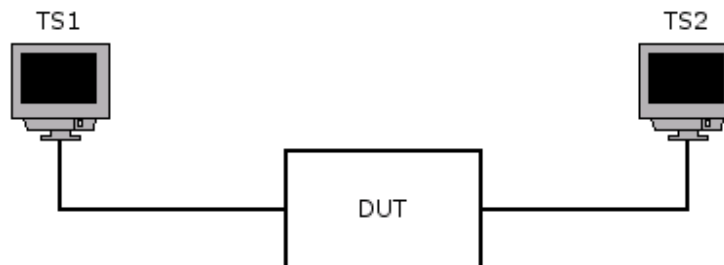
Resource Requirements:

- Testing Stations capable of transmitting and receiving arbitrary MAC frames.

Discussion: The initial state of the Permanent Database must contain a Static Filtering Entry for each of the reserved addresses defined in Table 7-9 and Table 8-10. Management on the DUT shall not provide the capability to modify or remove these Static Filtering Entries from the Filtering or Permanent Databases. The Filtering Database must be initialized from the entries contained in the Permanent Database whenever initialization or re-initialization of the Filtering Database occurs. The list of reserved addresses is as follows:

| Assignment | Value |
|---|-------------------|
| Bridge Group Address | 01-80-C2-00-00-00 |
| IEEE Std 802.3, 1998 edition, Full Duplex PAUSE operation | 01-80-C2-00-00-01 |
| Reserved for future standardization | 01-80-C2-00-00-02 |
| Reserved for future standardization | 01-80-C2-00-00-03 |
| Reserved for future standardization | 01-80-C2-00-00-04 |
| Reserved for future standardization | 01-80-C2-00-00-05 |
| Reserved for future standardization | 01-80-C2-00-00-06 |
| Reserved for future standardization | 01-80-C2-00-00-07 |
| Reserved for future standardization | 01-80-C2-00-00-08 |
| Reserved for future standardization | 01-80-C2-00-00-09 |
| Reserved for future standardization | 01-80-C2-00-00-0A |
| Reserved for future standardization | 01-80-C2-00-00-0B |
| Reserved for future standardization | 01-80-C2-00-00-0C |
| Reserved for future standardization | 01-80-C2-00-00-0D |
| Reserved for future standardization | 01-80-C2-00-00-0E |
| Reserved for future standardization | 01-80-C2-00-00-0F |

Test Setup: Connect Testing Stations to the DUT as shown below.



Procedure:

Part a: Removing the Static Filtering Entries

1. Attempt to remove the Static Filtering Entries in management.

Part b: Verifying the Static Filtering Entries Exist

2. Set Testing Station 2 to capture arbitrary MAC frames.
3. Transmit arbitrary MAC frames containing a destination address of 0x0180C2000000 from Testing Station 1.
4. Repeat steps 2 and 3 for every multicast address in Table 7-9 or Table 8-10.

Observable Results:

- In Part a, removal of the Static Filtering Entries should not be allowed.
- In Part b, Testing Station 2 should not receive any of the frames transmitted by Testing Station 1.

Possible Problems:

- If management is not supported, Part a can not be completed.

Test FD.1.1.3 – Entries for Unsupported GARP Application Addresses

Purpose: To verify that the device under test (DUT) has a Static Filtering Entry in the Permanent Database for each of the GARP Application Addresses assigned to a GARP Application that it supports. This test also verifies that there are no Static Filtering Entries defined for GARP Applications that are not supported.

References:

- IEEE 802.1D 1998: sub-clauses 7.12.3
- IEEE 802.1Q 1998: sub-clauses 8.14.3
- IEEE 802.1Q 1998: Table 12-1
- IEEE 802.1u 2001: sub-clause 11.2.3.2.2

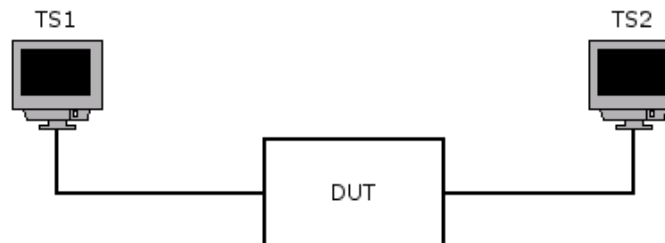
Resource Requirements:

- Testing Stations capable of transmitting and receiving arbitrary MAC frames.

Discussion: If the DUT supports Basic Filtering Services, the initial state of the Permanent Database must not contain a Static Filtering Entry for any of the GARP Application Addresses. If the DUT supports Extended Filtering Services, the initial state of the Permanent Database must contain a Static Filtering Entry for each supported GARP Application. The initial state of the Permanent Database must not contain a Static Filtering Entry for any unsupported GARP Application. Management shall not provide the capability to create, delete, or modify entries in the Permanent or Filtering Databases for any GARP application address. The Filtering Database must be initialized from the entries contained in the Permanent Database whenever initialization or re-initialization of the Filtering Database occurs. The list of GARP Application addresses is as follows:

| Assignment | Value |
|------------------------------|-------------------|
| GMRP address (See Clause 10) | 01-80-C2-00-00-20 |
| GVRP address | 01-80-C2-00-00-21 |
| Reserved | 01-80-C2-00-00-22 |
| Reserved | 01-80-C2-00-00-23 |
| Reserved | 01-80-C2-00-00-24 |
| Reserved | 01-80-C2-00-00-25 |
| Reserved | 01-80-C2-00-00-26 |
| Reserved | 01-80-C2-00-00-27 |
| Reserved | 01-80-C2-00-00-28 |
| Reserved | 01-80-C2-00-00-29 |
| Reserved | 01-80-C2-00-00-2A |
| Reserved | 01-80-C2-00-00-2B |
| Reserved | 01-80-C2-00-00-2C |
| Reserved | 01-80-C2-00-00-2D |
| Reserved | 01-80-C2-00-00-2E |
| Reserved | 01-80-C2-00-00-2F |

Test Setup: Connect Testing Stations to the DUT as shown below.



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Procedure:

Part a: Configuring Entries for GARP Application Addresses in Management

1. Attempt to create a Static Filtering Entry for the GARP application address 0x0180C2000020.
2. Repeat Step 1 using all GARP application addresses from Table 12-1.
3. If the DUT has a Static Filtering Entry for one of the GARP application addresses, attempt to remove that Static Filtering Entry.
4. Repeat Step 3 attempting to modify the Static Filtering Entry instead of attempting to remove it.

Part b: Basic Filtering Services

5. Set Testing Station 2 to capture arbitrary MAC frames.
6. Transmit arbitrary MAC frames containing a destination address of 0x0180C2000020 from Testing Station 1.
7. Repeat steps 5 and 6 using each GARP application address contained in Table 12-1.
8. Repeat step 5 and 6 using a properly formatted GVRP PDU containing a JoinIn Event for VLAN 64.
9. Repeat steps 5 and 6 using a properly formatted GMRP PDU containing a JoinIn Event for the 0x012222222222.

Part c: Extended Filtering Services

10. Set Testing Station 2 to capture arbitrary MAC frames.
11. Transmit arbitrary MAC frames containing a destination address of 0x0180C2000020 from Testing Station 1.
12. Repeat steps 8 and 9 using each GARP application address contained in Table 12-1.
13. Repeat Steps 10 and 11 using properly formatted GVRP PDU containing a JoinIn Event for VLAN 64.
14. Repeat steps 10 and 11 using properly formatted GMRP PDU containing a JoinIn Event for the 0x012222222222.

Observable Results:

- In Part a, none of the attempted creations of, deletions of, or modifications to the Static Filtering Entries should be permitted.
- In Part b, steps 6 and 7, Testing Station 2 should have received all of the frames transmitted by Testing Station 1 with source address equal to that of Testing Station 1. In part b step 8, if GVRP is not supported, or only Basic Filtering Services are supported, Testing Station 2 should capture all of the properly formatted GVRP PDUs transmitted by Testing Station 1 with the source address equal to that of the Testing Station 1. Otherwise, if GMRP is not supported, or only Basic Filtering Services are supported, Testing Station 2 should capture all of the properly formatted GMRP PDUs containing a JoinEmpty event for the specified multicast address.
- In Part c, Testing Station 2 should not have received the frames transmitted from Testing Station 1 containing a destination address of a GARP application supported by the DUT. Testing Station 2 should have received all of the frames containing the other destination addresses in Table 12-1.
- If the DUT passed Part b, it supports Basic Filtering Services.
- If the DUT passed Part c, it supports Extended Filtering Services.

Parameter:

According to the observable results above, the DUT supports:

_____ *Basic Filtering Services*

_____ *Extended Filtering Services*

Possible Problems:

- If management is not supported, Part a can not be completed.

Test FD.1.1.4 – Entry Indicating Forward All Groups

Purpose: To verify that the device under test (DUT) has a Static Filtering Entry in the Permanent Database with a MAC address specification of All Groups, in which the Port Map indicates Registration Fixed if the DUT supports Extended Filtering Services.

References:

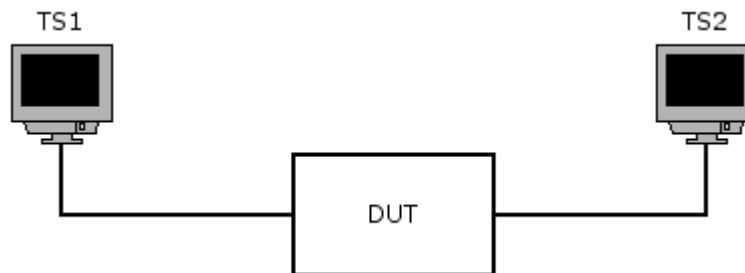
- IEEE 802.1D 1998: sub-clauses 10.3.2.3
- IEEE 802.1D 1998: Table 7-9
- IEEE 802.1Q 1998: Table 8-10
- IEEE 802.1Q 1998: Table 12-1

Resource Requirements:

- Testing Stations capable of transmitting and receiving arbitrary MAC frames.

Discussion: The initial state of the Permanent Database shall contain a Static Filtering Entry with a MAC address specification of All Groups, in which the Port Map indicates Registration Fixed. This entry will have the effect of determining the default Group filtering behavior of all Ports of the Bridge to be Forward All Groups. This entry may be modified or deleted through management action.

Test Setup: Reset factory defaults on the DUT. Connect Testing Stations to the DUT as shown below.



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Procedure:

1. Set Testing Station 2 to capture arbitrary MAC frames.
2. Transmit multicast frames from Testing Station 1 using several random multicast addresses other than those in Table 7-9 and Table 12-1.

Observable Results:

- Testing Station 2 should receive all frames transmitted by Testing Station 1.

Possible Problems:

- None.

Group 2: Learning Process

Scope: These tests cover the various aspects of the Learning Process.

Overview: These tests are designed to verify that the DUT correctly learns source MAC addresses. These tests check that addresses are learned conditionally on the state of the Port, the type of MAC address, and on the member set of the frame's VLAN classifications. These tests also check to see whether the DUT replaces old entries with new ones when the Filtering Database becomes full.

Test FD.1.2.1 – Learning Based on Port State

Purpose: To verify that the device under test (DUT) properly learns source MAC addresses on a Port that is in the Learning or Forwarding states but does not learn source MAC addresses on Ports in the Blocking or Listening states.

References:

- IEEE 802.1Q 1998: sub-clause 8.10
- IEEE 802.1D 1998: sub-clause 8.4
- IEEE 802.1w: sub-clause 17.9

Resource Requirements:

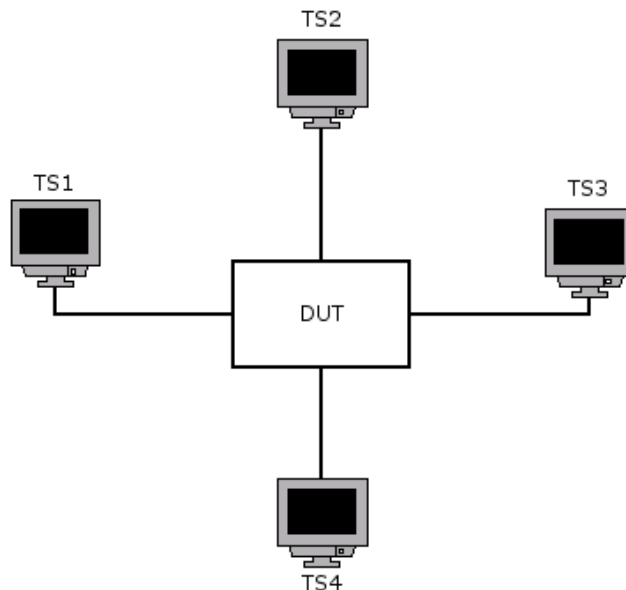
- Testing Stations capable of transmitting and receiving arbitrary MAC frames.

Discussion: When a frame is received on a Port and is not discarded by the ingress rules, that frame is passed to the Learning Process and the Forwarding Process. The Learning Process creates a Dynamic Filtering Entry associated with the frame's VID in the Filtering Database if all of the following are true:

1. The Port on which the frame was received is in a state that allows learning.
2. The source MAC address in the frame denotes a specific end station.
3. The resulting number of entries would not exceed the capacity of the Filtering Database.
4. The Member set for the frame's VID includes at least one Port.

This Dynamic Filtering Entry associates the reception Port with the source MAC address for use in future forwarding/filtering decisions.

Test Setup: Connect the Testing Stations to the DUT as shown below. Enable Spanning Tree on the DUT and allow time for it to configure.



Procedure:

Part a: Receiving Port in Blocking State

1. Transmit Configuration BPDUs containing a Root Identifier of higher priority than that of the DUT and a Root Path Cost of 0x0000000A from Testing Station 1.
2. Transmit Configuration BPDUs containing the same Root Identifier used in Step 1 and a Root Path Cost of 0x00000005 from Testing Station 2.
3. Set Testing Stations 1, 2, and 4 to capture arbitrary MAC frames.
4. While the Port on the DUT that is connected to Testing Station 1 is in the Blocking State, transmit unicast frames containing a source address of 0x222222222222 from Testing Station 1.
5. Transmit unicast frames containing a destination address of 0x222222222222 from Testing Station 3.

Part b: Receiving Port in Listening State

6. Transmit Configuration BPDUs containing a Root Identifier of higher priority than that of the DUT and a Root Path Cost of 0x0000000A from Testing Station 1.
7. Transmit Configuration BPDUs containing the same Root Identifier used in Step 1 and a Root Path Cost of 0x00000005 from Testing Station 2.
8. Stop transmitting from Testing Station 1 and 2. Wait for the forward Delay Timer to expire and Port transition to the Listening stage.
9. Set Testing Stations 1, 2, and 4 to capture arbitrary MAC frames.
10. While the Port on the DUT that is connected to Testing Station 1 is in the Listening State, transmit unicast frames containing a source address of 0x444444444444 from Testing Station 1.
11. Transmit unicast frames containing a destination address of 0x444444444444 from Testing Station 3.

Part c: Receiving Port in Learning State

12. Transmit Configuration BPDUs containing a Root Identifier of higher priority than that of the DUT and a Root Path Cost of 0x0000000A from Testing Station 1.
13. Transmit Configuration BPDUs containing the same Root Identifier used in Step 1 and a Root Path Cost of 0x00000005 from Testing Station 2.
14. Stop transmitting from Testing Station 1 and 2. Wait for the forward Delay Timer to expire and Port transition from Listening stage to Learning State (Two Forward Delay times).
15. Set Testing Stations 1 and 2 to capture arbitrary MAC frames.
16. While the Port on the DUT that is connected to Testing Station 1 is in the Learning State, transmit unicast frames containing a source address of 0x666666666666 from Testing Station 1.
17. Transmit unicast frames containing a destination address of 0x666666666666 from Testing Station 3.

Part d: Receiving Port in Forwarding State

18. Set Testing Stations 1 and 2 to capture arbitrary MAC frames.
19. While the Port on the DUT that is connected to Testing Station 1 is in the Forwarding State, transmit unicast frames containing a source address of 0x888888888888.
20. Transmit unicast frames containing a destination address of 0x888888888888 from Testing Station 3.

Observable Results:

- In Parts a and b, Testing Stations 2 and 4 should receive all frames transmitted by Testing Station 3.
- In Parts c and d, Testing Station 1 should receive all frames transmitted by Testing Station 3. Testing Station 2 should not receive any traffic.

Possible Problems:

- If the DUT does not support Spanning Tree (IEEE Std 802.1D-1998), this test cannot be completed.

Test FD.1.2.2 – Learning Based on Source MAC Address

Purpose: To verify that the device under test (DUT) properly learns source MAC addresses when they denote a specific end station and does not learn them when they denote a group MAC address.

References:

- IEEE 802.1Q 1998: sub-clause 8.10
- IEEE 802.1D 1998: sub-clause 7.8

Resource Requirements:

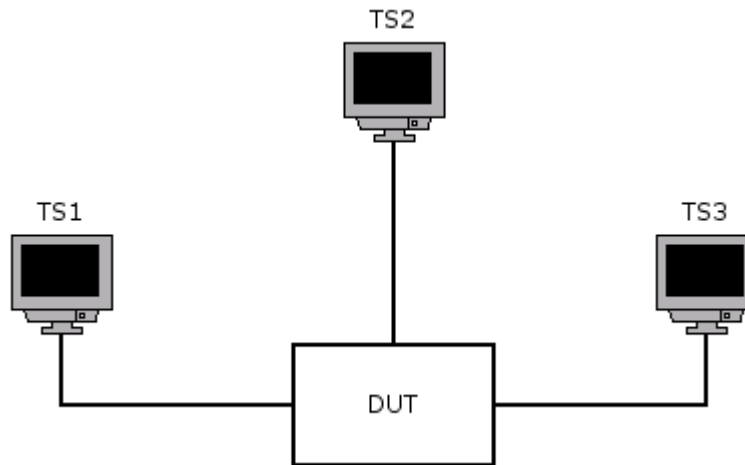
- Testing Stations capable of transmitting and receiving arbitrary MAC frames.

Discussion: When a frame is received on a Port and is not discarded by the ingress rules, that frame is passed to the Learning Process and the Forwarding Process. The Learning Process creates a Dynamic Filtering Entry associated with the frame's VID in the Filtering Database if all of the following are true:

1. The Port on which the frame was received is in a state that allows learning.
2. The source MAC address in the frame denotes a specific end station.
3. The resulting number of entries would not exceed the capacity of the Filtering Database.
4. The Member set for the frame's VID includes at least one Port.

This Dynamic Filtering Entry associates the reception Port with the source MAC address for use in future forwarding/filtering decisions.

Test Setup: Connect the Testing Stations to the DUT as shown below.



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Procedure:

Part a: Source MAC Address Denotes an End Station

1. Transmit unicast frames containing a source address of 0x222222222222 from Testing Station .
2. Before ageing time expires, set Testing Stations 1 and 2 to capture arbitrary MAC frames.
3. Transmit unicast frames containing a destination address of 0x222222222222 from Testing Station 3.

Part b: Source MAC Address Denotes a Group Address

4. Set Testing Stations 1 and 2 to capture arbitrary MAC frames.
5. Transmit unicast frames containing a source address of 0xFFFFFFFFFFFF from Testing Station 1.
6. Transmit unicast frames containing a destination address of 0xFFFFFFFFFFFF from Testing Station 3.
7. Repeat steps 4-6 using a source and destination address of 0x012222222222.

Observable Results:

- In Part a, Testing Station 1 should receive all frames transmitted by Testing Station 3. Testing Station 2 should not receive any traffic.
- In Part b, Testing Stations 1 and 2 should receive all frames transmitted by Testing Station 3.

Possible Problems:

- None.

Test FD.1.2.3 – Filtering Database Capacity Exceeded

Purpose: To determine if the device under test (DUT) overwrites the oldest entry in the Filtering Database or does not learn the new address when the capacity of the Filtering Database is exceeded.

References:

- IEEE 802.1Q 1998: sub-clause 8.10

Resource Requirements:

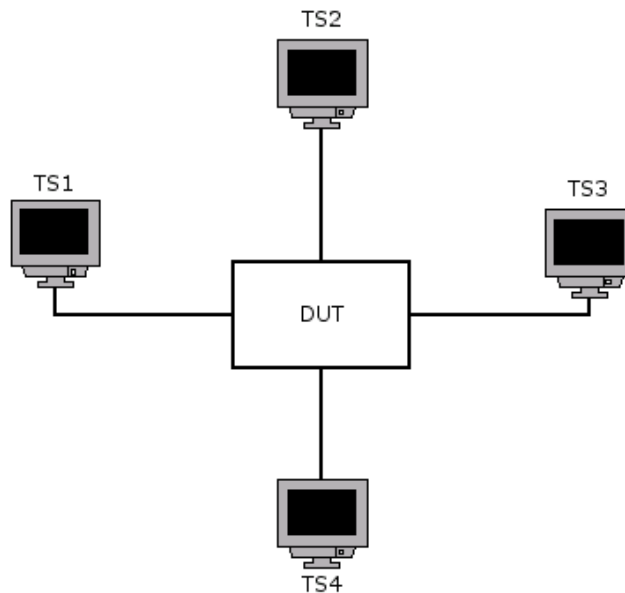
- Testing Stations capable of transmitting and receiving arbitrary MAC frames.

Discussion: When a frame is received on a Port and is not discarded by the ingress rules, that frame is passed to the Learning Process and the Forwarding Process. The Learning Process creates a Dynamic Filtering Entry associated with the frame's VID in the Filtering Database if all of the following are true:

1. The Port on which the frame was received is in a state that allows learning.
2. The source MAC address in the frame denotes a specific end station.
3. The resulting number of entries would not exceed the capacity of the Filtering Database.
4. The Member set for the frame's VID includes at least one Port.

This Dynamic Filtering Entry associates the reception Port with the source MAC address for use in future forwarding/filtering decisions.

Test Setup: Connect the Testing Stations to the DUT as shown below.



Procedure:

1. Set Testing Stations 4 to capture arbitrary MAC frames.
2. Transmit unicast frames containing a source address of 0x000000000001 from Testing Station 2. These frames should be set to Continuous Increment
3. Transmit unicast frames containing a destination address of 0x000000000001 from Testing Station 1. These frames should be set to Fixed.
4. Transmit unicast frames containing a destination address of 0x000000000001 from Testing Station 3. These frames should be set to Continuous Increment.

Observable Results:

- If the test completes due to Testing Station 4 receiving frames containing a destination address of 0x000000000001 transmitted by Testing Station 1 then the DUT overwrites the oldest entry when the capacity of the Filtering Database is exceeded.
- If the test completes due to Testing Stations 4 receiving frames containing a destination address equal to the source address transmitted by Testing Station 2, then the DUT stops learning addresses when the capacity of the Filtering Database is exceeded.

Possible Problems:

- None.

Test FD.1.2.4 – Learning Based on VID

Purpose: To verify that the device under test (DUT) properly learns source MAC addresses only when the Member set of the VID associated with the received frame contains at least one Port.

References:

- IEEE 802.1Q 1998: sub-clause 8.10, 8.11.9

Resource Requirements:

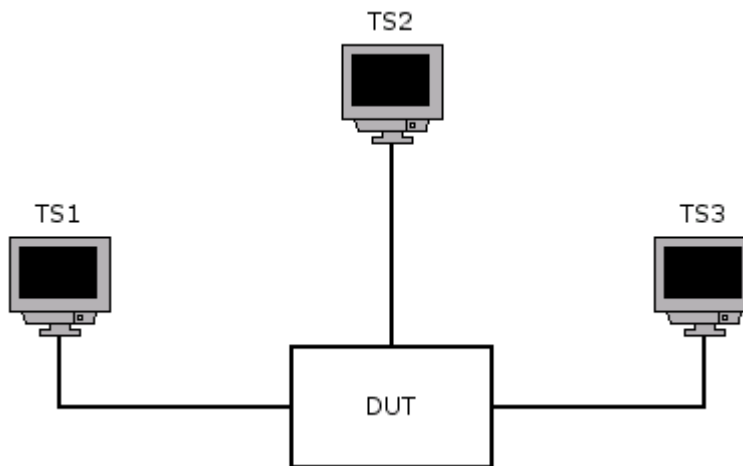
- Testing Stations capable of transmitting and receiving arbitrary MAC frames.

Discussion: When a frame is received on a Port and is not discarded by the ingress rules, that frame is passed to the Learning Process and the Forwarding Process. The Learning Process creates a Dynamic Filtering Entry associated with the frame's VID in the Filtering Database if all of the following are true:

1. The Port on which the frame was received is in a state that allows learning.
2. The source MAC address in the frame denotes a specific end station.
3. The resulting number of entries would not exceed the capacity of the Filtering Database.
4. The Member set for the frame's VID includes at least one Port.

This Dynamic Filtering Entry associates the reception Port with the source MAC address for use in future forwarding/filtering decisions.

Test Setup: Connect the Testing Stations to the DUT as shown below.



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Procedure:

Part a: Member Set Includes at least one Port

1. Set Testing Stations 1 and 2 to capture arbitrary MAC frames.
2. Transmit unicast frames containing a source address of 0x222222222222 from Testing Station 1.
3. Transmit unicast frames containing a destination address of 0x222222222222 from Testing Station 3.

Part b: Member Set Includes no Ports

4. Set Testing Stations 1 and 2 to capture arbitrary MAC frames.
5. Transmit unicast, VLAN-Tagged Frames containing a source address of 0x222222222222 with VID 64 from Testing Station 1.
6. Transmit unicast frames containing a destination address of 0x222222222222 from Testing Station 3.

Observable Results:

- In Part a, Testing Station 1 should receive all frames transmitted by Testing Station 3. Testing Station 2 should not receive any traffic from Testing Station 3.
- In Part b, Testing Stations 1 and 2 should receive all frames transmitted by Testing Station 3.

Possible Problems:

- None.

Test FD.1.2.5 – Learning from Frames with Errors

Purpose: To verify that the device under test (DUT) learns source MAC addresses received only in error-free frames.

References:

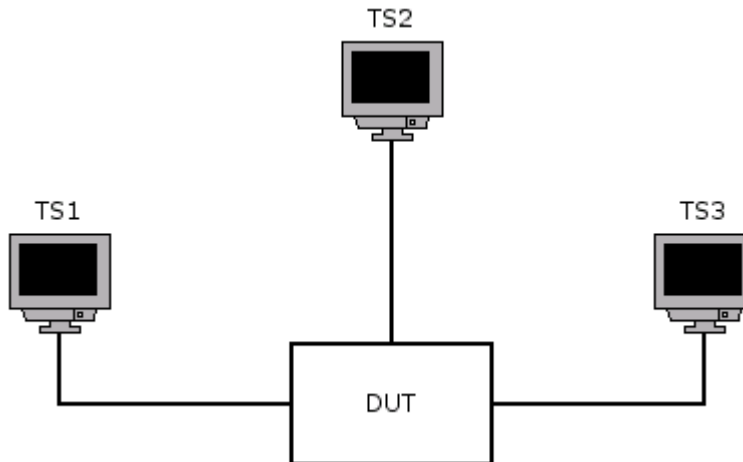
- IEEE 802.1D 1998: sub-clause 7.5, 7.8
- IEEE 802.1Q 1998: sub-clause 8.5, 8.6, 8.10

Resource Requirements:

- Testing Stations capable of transmitting and receiving arbitrary MAC frames.

Discussion: All error-free received frames give rise to EM_UNITDATA indication primitives which are handled by the individual MAC entity associated with the receiving Port. All other frames are discarded by the MAC entity without giving rise to any EM_UNITDATA indication and thus are not passed to the Learning Process.

Test Setup: Connect the Testing Stations to the DUT as shown below.



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Procedure:

1. Transmit unicast frames containing a source address of 0x222222222222 from Testing Station 2. These frames should contain an invalid FCS.
2. Set Testing Stations 2 and 3 to capture arbitrary MAC frames.
3. Transmit unicast frames containing a destination address of 0x222222222222 from Testing Station 1.
4. Repeat Steps 1-3 using frames that exceed the maximum and minimum transmission sizes.

Observable Results:

- Testing Stations 2 and 3 should receive all frames transmitted by Testing Station 1.

Possible Problems:

- None.

Test FD.1.2.6 – Learning from Frames Discarded on Ingress

Purpose: To verify that the device under test (DUT) learns source MAC addresses received only from frames that are not discarded by the Ingress Rules.

References:

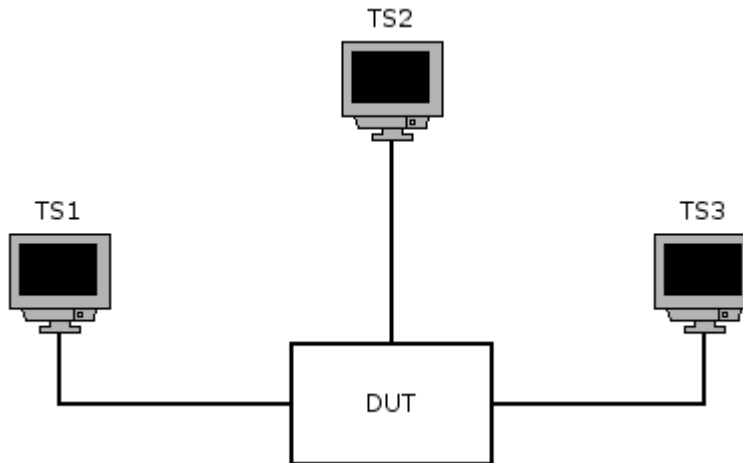
- IEEE 802.1Q 1998: sub-clause 8.4.3, 8.6, 8.10, 8.11.9
- IEEE 802.1Q 1998: Table 9-2

Resource Requirements:

- Testing Stations capable of transmitting and receiving arbitrary MAC frames.

Discussion: If the `vlan_identifier` parameter carried in a received indication is equal to the null VLAN ID and the `Acceptable Frame Types` parameter for the Port through which the frame was received is set to the value *Admit Only VLAN-tagged frames*, then the frame shall be discarded. If the `Enable Ingress Filtering` parameter for the Port through which the frame was received is *Set*, and if the Port is not in the Member Set for the frame’s VLAN classification, then the frame is discarded. All frames that are not discarded as a result of the application of the ingress rules are submitted to the Forwarding Process and the Learning Process.

Test Setup: Connect the Testing Stations to the DUT as shown below.



Procedure:

Part a: Acceptable Frame Types Parameter

1. If possible, set the Acceptable Frame Types parameter for the Port on the DUT that is connected to Testing Station 2 to *Admit Only VLAN-tagged frames*.
2. Transmit Untagged frames containing a source address of 0x222222222222 from Testing Station 2.
3. Set Testing Stations 2 and 3 to capture arbitrary MAC frames.
4. Transmit arbitrary MAC frames containing a destination address of 0x222222222222 from Testing Station 1.

Part b: Enable Ingress Filtering Parameter

5. If possible, set the Enable Ingress Filtering parameter for the Port on the DUT that is connected to Testing Station 2 to *Set*. Configure the Ports connected to Testing Station 1 and 3 to be tagged members of the member set for VID 64.
6. Transmit VLAN-tagged frames with a VID of 64 containing a source address of 0x222222222222 from Testing Station 2.
7. Set Testing Stations 2 and 3 to capture arbitrary MAC frames.
8. Transmit arbitrary MAC frames containing a destination address of 0x222222222222 from Testing Station 1.

Observable Results:

- In Parts a and b, Testing Stations 2 and 3 should receive all traffic transmitted by Testing Station 1.

Possible Problems:

- If the Acceptable Frame Types parameter cannot be set, this test cannot be completed.
- If the Enable Ingress Filtering parameter cannot be set, this test cannot be completed.

Test FD.1.2.7 – Duplicate Entries not Allowed

Purpose: To verify that the device under test (DUT) does not create more than one Dynamic Filtering Entry in the Filtering Database for a given combination of MAC address and FID.

References:

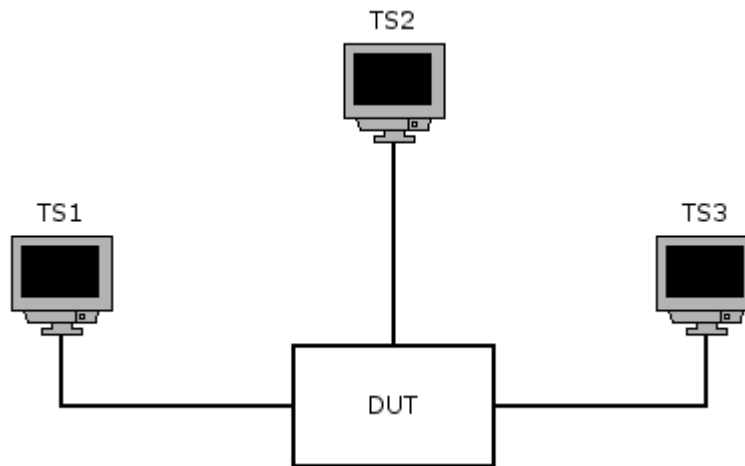
- IEEE 802.1D 1998: sub-clause 7.9.2
- IEEE 802.1Q 1998: sub-clause 8.11.3

Resource Requirements:

- Testing Stations capable of transmitting and receiving arbitrary MAC frames.

Discussion: Dynamic Filtering Entries are created and updated by the Learning Process. They shall be automatically removed after a specified time, the Ageing Time, has elapsed since the entry was created or last updated. No more than one Dynamic Filtering Entry shall be created in the Filtering Database for a given combination of MAC address and FID.

Test Setup: Connect the Testing Stations to the DUT as shown below.



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Procedure:

1. Transmit arbitrary MAC frames containing a source address of 0x222222222222 from Testing Station 1.
2. Transmit arbitrary MAC frames containing a source address of 0x222222222222 from Testing Station 2.
3. Set Testing Stations 1 and 2 to capture arbitrary MAC frames.
4. Transmit arbitrary MAC frames containing a destination address of 0x222222222222 from Testing Station 3.

Observable Results:

- Testing Station 2 should receive all of the traffic transmitted by Testing Station 3. Testing Station 1 should not receive any of the traffic transmitted by Testing Station 3.

Possible Problems:

- None.

Test FD.1.2.8 – New Entry Prevented due to Static Filtering Entry

Purpose: To verify that the device under test (DUT) does not create a Dynamic Filtering Entry in the Filtering Database when a Static Filtering Entry already exists.

References:

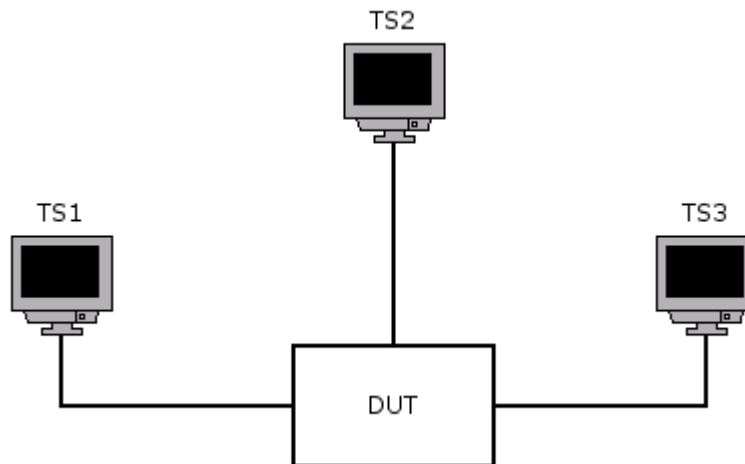
- IEEE 802.1D 1998: sub-clause 7.9.2

Resource Requirements:

- Testing Stations capable of transmitting and receiving arbitrary MAC frames.

Discussion: A Dynamic Filtering Entry shall not be created or updated by the Learning Process if any Static Filtering Entry already exists for this MAC address with a control element specification, for the outbound Port specified by the Learning Process, that specifies forwarding or filtering irrespective of dynamic filtering information.

Test Setup: Connect the Testing Stations to the DUT as shown below.



Procedure:

1. Create a Static Filtering Entry that has a control element specification specifying forwarding of some unicast MAC address for the Port on the DUT that is connected to Testing Station 2.
2. Transmit arbitrary MAC frames containing a source address equal to the MAC address used in Step 1 from Testing Station 3.
3. Set Testing Stations 2 and 3 to capture arbitrary MAC frames.
4. Transmit arbitrary MAC frames containing a destination address equal to the MAC address used in Step 1 from Testing Station 1.

Observable Results:

- Testing Station 3 should not receive any of the traffic transmitted by Testing Station 1. Testing Station 2 should receive all of the traffic transmitted by Testing Station 1.

Possible Problems:

- If the DUT does not support management, this test cannot be completed.

Group 3: Miscellaneous

Scope: These tests cover miscellaneous functions of the Filtering Database.

Overview: These tests are designed to verify that the device under test (DUT) properly discards frames with an invalid Protocol Identifier. These tests verify that Dynamic Filtering Entries cannot be created or updated through management. These tests verify that explicit Static Filtering Entries override general ones. These tests also verify that the source address of all PDUs is the transmitting Port's MAC address and that these PDUs all have the correct LLC source and destination addresses. Finally, these tests verify that Basic Filtering Services are properly implemented.

Test FD.1.3.1 – Protocol Identifier Verification

Purpose: To verify that the device under test (DUT) discards frames with an invalid Protocol Identifier and passes all other frames to the appropriate Protocol Entity.

References:

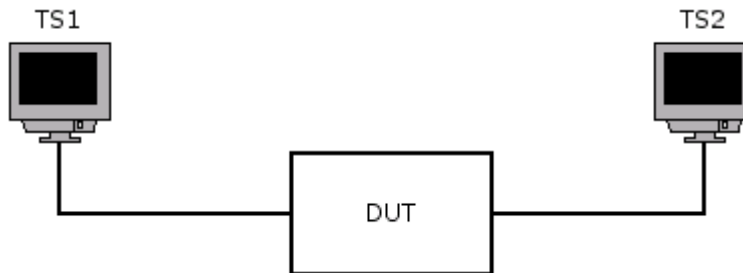
- IEEE 802.1D 1998: sub-clause 7.12.3, 10.3.1.2
- IEEE 802.1D 1998: Table 7-9, Table 12-1
- IEEE 802.1Q 1998: sub-clause 8.14.3
- IEEE 802.1Q 1998: Table 8-10, Table 11-1

Resource Requirements:

- Testing Stations capable of transmitting and receiving arbitrary MAC frames.

Discussion: When a frame destined for a reserved address or a GARP application address is received on a Bridge, the Bridge must pass the frame to either the Bridge Protocol Entity or the GARP Protocol Entity. These Protocol Entities must then pass the frame to the appropriate protocol based on the Protocol Identifier in the frame. If the frame contains an invalid Protocol Identifier then it shall be discarded.

Test Setup: Connect the Testing Stations to the DUT as shown below.



Procedure:

Part a: Bridge Protocol Entity Protocol Identifier

1. Set Testing Station 2 to capture Configuration BPDUs.
2. Transmit properly formatted Configuration BPDUs containing a Root Identifier of higher priority than that of the DUT and a destination address equal to the Bridge Group Address from Testing Station 1.

Part b: GARP Protocol Entity Protocol Identifier

3. Set Testing Station 2 to capture GARP PDUs.
4. Transmit a properly formatted GVRP PDU containing a JoinIn event for a VID greater than 1 and a destination address equal to the GVRP multicast address from Testing Station 1.
5. Transmit a properly formatted GVRP PDU containing an Empty event for the VID used in step 3 and a destination address equal to the GVRP multicast address from Testing Station 2.
6. Repeat steps 3-5 using GMRP PDUs and the GMRP multicast address.

Part c: Invalid Protocol Identifiers

7. Set Testing Station 2 to capture arbitrary MAC frames.
8. Transmit Configuration BPDUs containing a Protocol Identifier of 0x0001, a Root Identifier of higher priority than that of the DUT, and a destination address equal to the Bridge Group Address from Testing Station 1.
9. Set Testing Station 2 to capture arbitrary MAC frames.
10. Transmit GVRP PDUs containing a Protocol Identifier of 0x0000, a JoinIn event for a VID greater than 1, and a destination address equal to the GVRP multicast address from Testing Station 1.
11. Transmit GVRP PDUs containing a Protocol Identifier of 0x0000, an Empty event for the VID used in step 10, and a destination address equal to the GVRP multicast address from Testing Station 1.
12. Repeat steps 9-11 using GMRP PDUs and the GMRP multicast address.

Observable Results:

- In Part a, Testing Station 2 should capture Configuration BPDUs with a Root Identifier equal to that used by Testing Station 1.
- In Part b step 4, if GVRP is not supported or only Basic Filtering Services are supported, Testing Station 2 should capture all of the PDUs transmitted by Testing Station 1. Otherwise, Testing Station 2 should capture at least 2 GVRP PDUs containing a JoinEmpty event for the specified VID. In step 6, if GMRP is not supported or only Basic Filtering Services are supported, Testing Station 2 should capture all of the PDUs transmitted by Testing Station 1. Otherwise, Testing Station 2 should capture at least 2 GMRP PDUs containing a JoinEmpty event for the specified multicast address.
- In Part c step 8, Testing Station 2 should capture Configuration BPDUs containing a Root Identifier equal to the Bridge Identifier of the DUT. In steps 11 and 12, if the GARP Application is not supported or only Basic Filtering Services are supported, Testing Station 2 should capture all PDUs transmitted by Testing Station 1. Otherwise, Testing Station 2 should not capture any GARP PDUs.

Possible Problems:

- None.

Test FD.1.3.2 – Dynamic Entries not Changed in Management

Purpose: To verify that the device under test (DUT) does not allow Dynamic Filtering Entries to be created or updated through management.

References:

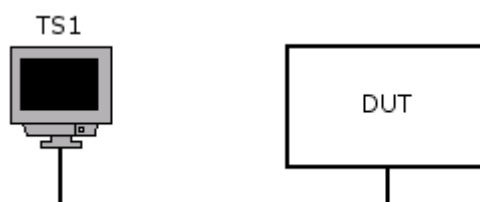
- IEEE 802.1D 1998: sub-clause 7.9.2
- IEEE 802.1Q 1998: sub-clause 8.11.3

Resource Requirements:

- Testing Stations capable of transmitting and receiving arbitrary MAC frames.

Discussion: Dynamic Filtering Entries cannot be created or updated through management.

Test Setup: Connect the Testing Stations to the DUT as shown below.



Procedure:

1. Transmit arbitrary MAC frames containing a source address of 0x222222222222 from Testing Station 1.
2. Attempt to update the Dynamic Filtering Entry in the Filtering Database that results from the previous transmission to indicate that Testing Station 1 is reachable through a different Port.
3. Attempt to create a Dynamic Filtering Entry for an arbitrary unicast MAC address.

Observable Results:

- The update and creation of the Dynamic Filtering Entries should not be permitted.

Possible Problems:

- If management is not supported, this test can not be completed.

Test FD.1.3.3 – Conflicting Static Filtering Entries

Purpose: To verify that the device under test (DUT) properly allows a Static Filtering Entry for a specific group MAC address and Port to override another Static Filtering Entry specifying Forward All Groups for all Ports.

References:

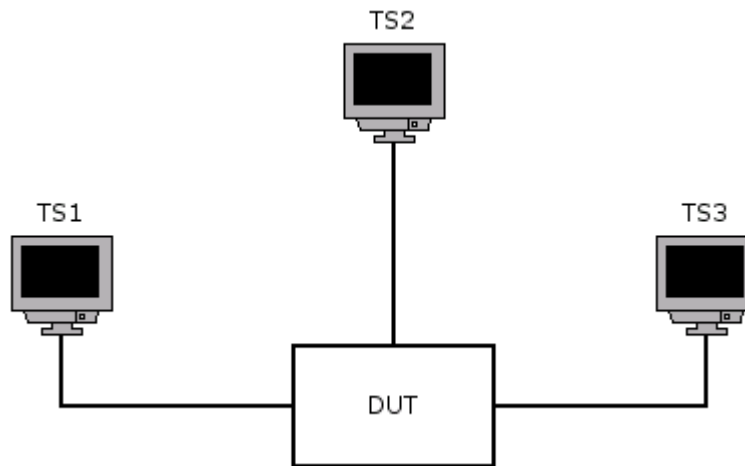
- IEEE 802.1D 1998: sub-clause 7.9.4
- IEEE 802.1Q 1998: sub-clause 8.11.6

Resource Requirements:

- Testing Stations capable of transmitting and receiving arbitrary MAC frames.

Discussion: Forwarding and filtering of group-addressed frames may be managed by specifying defaults for each VLAN and outbound Port. A Static Filtering Entry specifying Forward All Groups causes all group-address frames to be forwarded unless an explicit Static Filtering Entry specifies filtering independent of any dynamic filtering information.

Test Setup: Connect the Testing Stations to the DUT as shown below.



Procedure:

1. Create a Static Filtering Entry specifying Forward All Groups on all Ports.
2. Create a Static Filtering Entry specifying filtering of a specific group MAC address for the Port on the DUT that is connected to Testing Station 1.
3. Set Testing Stations 1 and 3 to capture arbitrary MAC frames.
4. Transmit arbitrary MAC frames containing a destination address equal to the group MAC address used in Step 2 from Testing Station 2.

Observable Results:

- Testing Station 1 should not receive any of the traffic being transmitted by Testing Station 2. Testing Station 3 should receive all of the traffic being transmitted by Testing Station 2.

Possible Problems:

- If the DUT does not support management, this test cannot be completed.

Test FD.1.3.4 – Basic Filtering Services Default Behavior

Purpose: To verify that the device under test (DUT) defaults to Forward All Groups for all Ports and all VLANs when only Basic Filtering Services are implemented.

References:

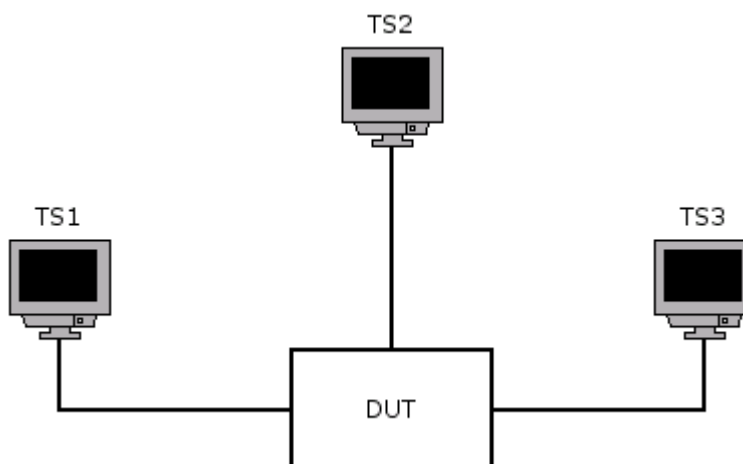
- IEEE 802.1D 1998: sub-clause 7.9.4
- IEEE 802.1Q 1998: sub-clause 8.11.6

Resource Requirements:

- Testing Stations capable of transmitting and receiving arbitrary MAC frames.

Discussion: In Bridges that support only Basic Filtering Services, the default Group filtering behavior is Forward All Groups for all Ports of the Bridge, for all VLANs.

Test Setup: Reset Factory Defaults on the DUT. Connect the Testing Stations to the DUT as shown in Figure 1.



Procedure:

1. Set Testing Stations 2 and 3 to capture arbitrary MAC frames.
2. Transmit arbitrary MAC frames containing a destination address equal to some group MAC address from Testing Station 1.
3. Repeat Steps 1-2 using other group MAC addresses.
4. Configure the Ports on the DUT that are connected to the Testing Stations as untagged members of a VLAN other than the Default VLAN.
5. Repeat Steps 1-3.

Observable Results:

- Testing Stations 2 and 3 should receive all traffic that is being transmitted by Testing Station 1.

Possible Problems:

- If the DUT does not support management, this test can not be completed.

Test FD.1.3.5 – Source Address of PDUs

Purpose: To verify that the device under test (DUT) uses the transmitting Port's MAC address as the source address in all BPDUs and GARP PDUs that are transmitted.

References:

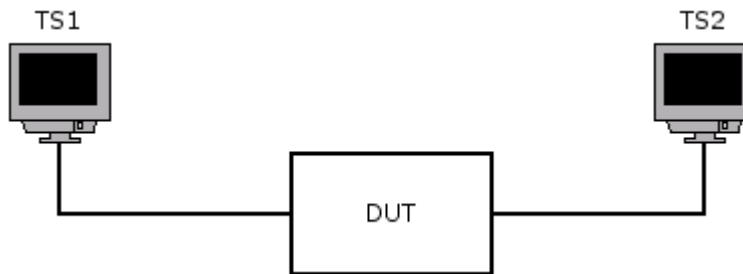
- IEEE 802.1D 1998: sub-clause 7.12.2, 7.12.3

Resource Requirements:

- Testing Stations capable of transmitting and receiving arbitrary MAC frames.

Discussion: The individual MAC Entity associated with each Bridge Port shall have a separate individual MAC address. The source address field of MAC frames conveying BPDUs or GARP PDUs contains the individual MAC Address of the Bridge Port through which the PDU is transmitted.

Test Setup: Connect the Testing Stations to the DUT as shown below. Enable Spanning Tree and all supported GARP Applications and allow time for configuration.



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Procedure:

Part a: Source Address of GARP PDUs

1. Set Testing Stations 1 and 2 to capture arbitrary MAC frames.
2. Transmit a GARP PDU specifying a LeaveAll Event for each supported GARP Application from Testing Stations 1 and 2.

Part b: Source Address of Spanning Tree BPDUs

3. Set Testing Stations 1 and 2 to capture arbitrary MAC frames
4. Transmit a Configuration BPDU containing a Root Identifier of lower priority than that of the DUT from Testing Stations 1 and 2.

Observable Results:

- In parts a and b, all of the GARP PDUs and BPDUs captured by Testing Stations 1 and 2 should have the MAC address of the transmitting Port on the DUT as the source address.

Possible Problems:

- None.

Test FD.1.3.6 – LLC Addresses

Purpose: To verify that the device under test (DUT) uses the proper LLC addresses in all BPDUs and GARP PDUs.

References:

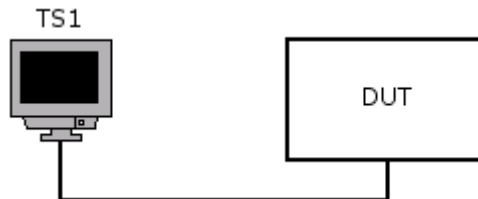
- IEEE 802.1D 1998: sub-clause 7.12.3
- IEEE 802.1D 1998: Table 7-8

Resource Requirements:

- Testing Stations capable of transmitting and receiving arbitrary MAC frames.

Discussion: A Bridge Protocol Entity or a GARP Protocol Entity uses the DL_UNITDATA.request primitive provided by the individual LLC Entities associated with each active Bridge Port to transmit BPDUs or GARP PDUs. Each PDU is transmitted on one selected Bridge Port. PDUs are received through corresponding DL_UNITDATA.indication primitives. The source_address and destination_address parameters of the DL_UNITDATA.request primitive shall both denote the standard LLC address assigned to the Bridge Spanning Tree Protocol. This identifies the Bridge Protocol Entity and the GARP Protocol Entity among other users of LLC. The value assigned to the Bridge Spanning Tree Protocol LLC address is given in Table 7-8.

Test Setup: Connect the Testing Stations to the DUT as shown below. Enable Spanning Tree and all supported GARP Applications and allow time for configuration.



Procedure:

1. Set Testing Station 1 to capture arbitrary MAC frames.
2. Transmit a GARP PDU specifying a LeaveAll Event for each supported GARP Application from Testing Station 1.
3. Transmit a Configuration BPDU containing a Root Identifier of lower priority than that of the DUT from Testing Station 1.

Observable Results:

- All of the BPDUs and GARP PDUs captured by Testing Station 1 should have the standard LLC address in both the source service access point (SSAP) and destination service access point fields (DSAP).

Possible Problems:

- None.

Test FD.1.3.7 – Basic Filtering Services

Purpose: To verify that the device under test (DUT) supports the appropriate MAC address specifications and control element values in its Static Filtering Entries.

References:

- IEEE 802.1D 1998: sub-clause 7.9.1

Resource Requirements:

- Testing Stations capable of transmitting and receiving arbitrary MAC frames.

Last Modification: June 6, 2007

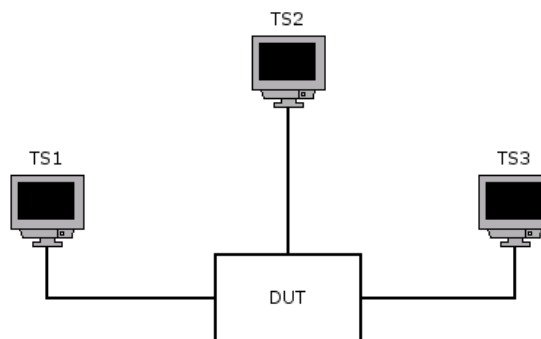
Discussion: A Static Filtering Entry specifies:

- a. A MAC Address specification, comprising
 1. An Individual MAC Address; or
 2. A Group MAC Address; or
 3. All Group Addresses, for which no more specific Static Filtering Entry exists; or
 4. All Unregistered Group Addresses, for which no more specific Static Filtering Entry exists.
- b. A Port Map, containing a control element for each outbound Port, specifying that a frame with a destination MAC Address that meets this specification is to be
 1. Forwarded, independently of any dynamic filtering information held by the Filtering Database; or
 2. Filtered, independently of any dynamic filtering information; or
 3. Forwarded or filtered on the basis of dynamic filtering information, or on the basis of the default Group filtering behavior for the outbound Port (7.9.4) if no dynamic filtering information is present specifically for the MAC Address.

All Bridges shall have the capability to support the first two values for the MAC Address specification, and the first two values for each control element for all Static Filtering Entries (i.e., shall have the capability to support a1, a2, b1, and b2 above).

A Bridge that supports Extended Filtering Services shall have the capability to support all four values for the MAC Address specification and all three control element values for Static Filtering Entries that specify group MAC Addresses, and may have the capability to support all three control element values for Static Filtering Entries that specify individual MAC Addresses (i.e., shall have the capability to support a1 through a4, and may have the capability to support b3, in addition to support of b1 and b2).

Test Setup: Connect the Testing Stations to the DUT as shown below.



Procedure:

1. Create a Static Filtering Entry for the Port on the DUT that is connected to Testing Station 2 that specifies forwarding for some individual MAC address.
2. Set Testing Station 2 and 3 to capture arbitrary MAC frames.
3. Transmit arbitrary MAC frames containing a destination address equal to that used in Step 1 from Testing Station 1.
4. Modify the entry created in Step 1 to indicate filtering (i.e. Blocking) for that MAC address and Port.
5. Repeat Steps 2-4.
6. Create a Static Filtering Entry for the Port on the DUT that is connected to Testing Station 2 that specifies forwarding for some group MAC address.
7. Repeat Steps 2-4 using the address from Step 6.
8. Modify the Static Filtering Entry created in Step 6 to indicate filtering for that MAC address and Port.
9. Repeat Steps 2-4 using the address from Step 6.
10. Repeat Steps 2-4 using the address from Step 6.

Observable Results:

- In Steps 3 and 8, Testing Station 2 should have received all traffic transmitted by Testing Station 1. Test Station 3 should not receive traffic from Test Station 1.
- In Steps 6 and 10, Testing Station 2 should not have received any of the traffic transmitted by Testing Station 1.

Possible Problems:

- If the DUT does not support management, this test cannot be completed.

Group 4: Ageing Time

Scope: These tests cover the various aspects of ageing out dynamic entries in the filtering database.

Overview: These tests are designed to verify that the device under test (DUT) properly ages out dynamic filtering entries that are not of the Group Registration Entry type. These tests also verify that Dynamic Group Registration and VLAN Registration Entries are not aged out. Finally these tests verify that static entries of any type are not aged out.

Test FD.1.4.1 – Ageing Time Verification

Purpose: To verify that the device under test (DUT) properly ages out dynamic entries in the Filtering Database when the Ageing Timer expires.

References:

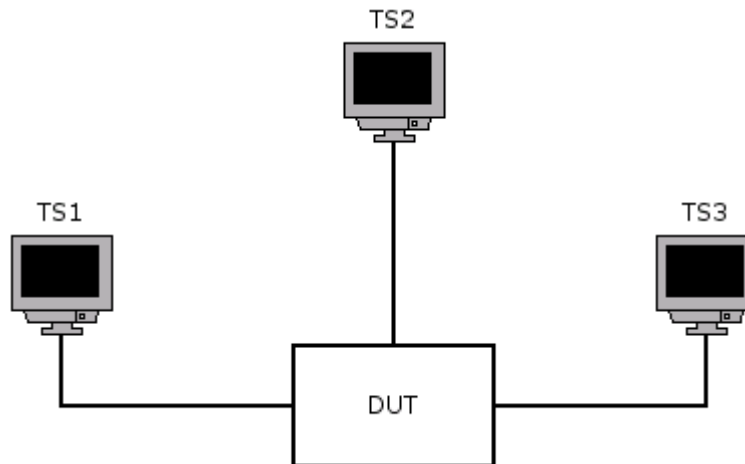
- IEEE 802.1D 1998: sub-clause 7.9.2, 8.5.1.8
- IEEE 802.1Q 1998: sub-clause 8.11.3
- IEEE 802.1D 1998: Table 7-4
- IEEE 802.1Q 1998: Table 8-4

Resource Requirements:

- Testing Stations capable of transmitting and receiving arbitrary MAC frames.

Discussion: The ageing out of Dynamic Filtering Entries ensures that end stations that have been moved to a different part of the Bridged LAN will not be permanently prevented from receiving frames. It also handles the changes in the Spanning Tree Active Topology that may cause end stations to appear to move from the point of view of the Bridge. During such a Topology Change Period, the Bridge's Forward Delay time is used as the ageing time. The range of Forward Delay is 4.0 – 30.0 seconds. The ageing time may be set in management. It has a range of 10.0 – 1000000.0 seconds. If the ageing time can be set in management, the Bridge shall have the capability to use values in the range specified, with a granularity of 1 second.

Test Setup: Connect the Testing Stations to the DUT as shown below.



Procedure:

Part a: Setting the Ageing Time in Management

1. Attempt to set the ageing time to 0 seconds.
2. Attempt to set the ageing time to 9 seconds.
3. Attempt to set the ageing time to 1000001 seconds.
4. Attempt to set the ageing time to 10 seconds.
5. Repeat step 3 with ageing times of 300, 50000, and 1000000 seconds.

Part b: Normal Ageing Time

6. If possible, set the ageing time on the DUT to 10 seconds.
7. Set Testing Station 3 to capture arbitrary MAC frames.
8. Transmit an arbitrary MAC frame containing source address of 0x222222222222 from Testing Station 1.
9. Immediately following Step 8, transmit arbitrary MAC frames containing a destination address of 0x222222222222 from Testing Station 2.
10. Observe the frames captured by Testing Station 3.
11. Repeat steps 5-8 using ageing times of 300 and 1000 seconds.

Part c: Ageing Time During a Spanning Tree Topology Change Period

12. If possible, set the ageing time on the DUT to the recommended default value of 300 seconds.
13. Transmit a Configuration BPDU containing a Root Identifier of higher priority than that of the DUT from Testing Station 1.
14. Set Testing Station 3 to capture arbitrary MAC frames.
15. Wait for Message Age timer to expire.
16. Immediately following Step 15, transmit an arbitrary MAC frame containing a source address of 0x222222222222 from Testing Station 2.
17. Immediately following Step 16, transmit arbitrary MAC frames containing a destination address of 0x222222222222 from Testing Station 1.
18. Observe the frames captured by Testing Station 3.

Observable Results:

- In Part a, all but the first three settings should have been permitted.
- In Part b, the time from when the packet with source address of 0x222222222222 transmitted by Testing Station 1 is received by Testing Station 3, to when Testing Station 3 receives a packet with destination address of 0x222222222222 should be equal to the ageing time.
- In Part c, the time from when the packet with source address of 0x222222222222 transmitted by Testing Station 1 is received by Testing Station 3, to when Testing Station 3 receives a packet with destination address of 0x222222222222 again should be equal to the Forward Delay time.

Possible Problems:

- Part c cannot be complete if the Bridge does not support regular Spanning Tree (IEEE Std 802.1D-1998).

Test FD.1.4.2 – Static Filtering Entries not Aged Out

Purpose: To verify that the device under test (DUT) does not age out static entries in the Filtering Database when the Ageing Timer expires.

References:

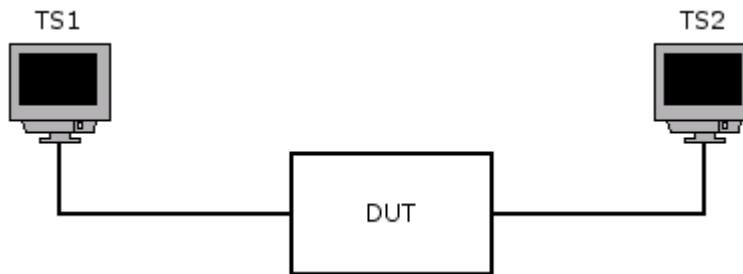
- IEEE 802.1D 1998: sub-clause 7.9
- IEEE 802.1Q 1998: sub-clause 8.11
- IEEE 802.1D 1998: Table 7-4

Resource Requirements:

- Testing Stations capable of transmitting and receiving arbitrary MAC frames.

Discussion: Static filtering information is added to, modified, and removed from the Filtering Database only under explicit management control. It shall not be automatically removed by any ageing mechanism.

Test Setup: Reset factory defaults on the DUT. Connect the Testing Stations to the DUT as shown in Figure 1.



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Procedure:

1. Set Testing Station 2 to capture arbitrary MAC frames.
2. Transmit arbitrary MAC frames containing a destination address of 0x0180C2000002 from Testing Station 1.
3. Repeat steps 1 and 2 after the ageing time expires.

Observable Results:

- Testing Station 2 should not receive any of the traffic being transmitted by Testing Station 1.

Possible Problems:

- None.

Test FD.1.4.3 – Static VLAN Registration Entries not Aged Out

Purpose: To verify that the device under test (DUT) does not age out static VLAN registration entries in the Filtering Database when the Ageing Timer expires.

References:

- IEEE 802.1D 1998: sub-clause 7.9
- IEEE 802.1Q 1998: sub-clause 8.11
- IEEE 802.1D 1998: Table 7-4

Resource Requirements:

- Testing Stations capable of transmitting and receiving arbitrary MAC frames.

Discussion: Static VLAN Registration Entries are added to, modified, and removed from the Filtering Database only under explicit management control. It shall not be automatically removed by any ageing mechanism.

Test Setup: Reset factory defaults on the DUT. Connect the Testing Stations to the DUT as shown in Figure 1.

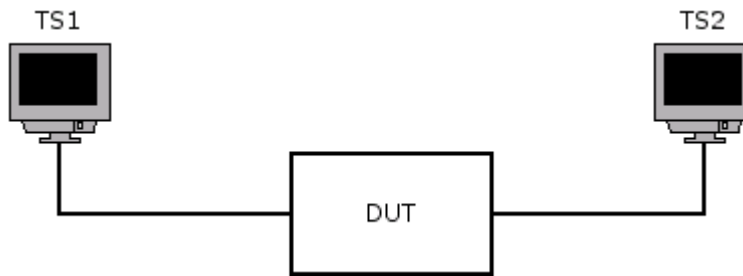


Figure 1

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InterOperability Laboratory*

Procedure:

1. Set Testing Station 2 to capture arbitrary MAC frames.
2. Transmit Default VLAN Tagged frames from Testing Station 1.
3. Repeat steps 1 and 2 after the ageing time expires.

Observable Results:

- Testing Station 2 should receive all of the traffic being transmitted by Testing Station 1.

Possible Problems:

- None.

Group 5: Frame Reception

Scope: These tests cover the various aspects associated with frame reception.

Overview: These tests are designed to verify that the device under test (DUT) properly discards frames that are not in the range of sizes allowed. These tests also verify that frames with a bad FCS are discarded.

Test FD.1.5.1 – Minimum Untagged Size

Purpose: To verify that the device under test (DUT) forwards Untagged Frames of minimum size and discards those with a size less than this minimum.

References:

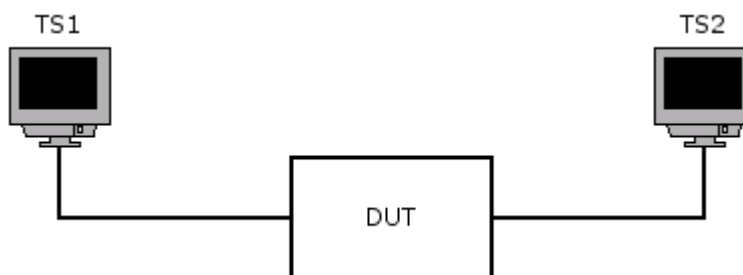
- IEEE 802.3 1998: sub-clause 4.4.2
- IEEE 802.1Q 1998: sub-clauses 7.2 and 8.5

Resource Requirements:

- Testing Stations capable of transmitting and receiving arbitrary MAC frames.

Discussion: The minimum size for an Untagged Frame is 64 bytes. Frames smaller than this minimum shall be discarded upon reception.

Test Setup: Connect the Testing Stations to the DUT as shown below.



Procedure:

Part a: Minimum Untagged Size

1. Set Testing Station 2 to capture arbitrary MAC frames.
2. Transmit 64 byte Untagged Frames from Testing Station 1.

Part b: Minimum Untagged Size Exceeded

3. Set Testing Station 2 to capture arbitrary MAC frames.
4. Transmit 63 byte Untagged Frames from Testing Station 1.

Observable Results:

- In Part a, Testing Station 2 should receive all frames transmitted from Testing Station 1.
- In Part b, Testing Station 2 should receive no traffic.

Possible Problems:

- None.

Test FD.1.5.2 – Maximum Untagged Size

Purpose: To verify that the device under test (DUT) forwards Untagged Frames of maximum size and discards those with a size greater than this maximum.

References:

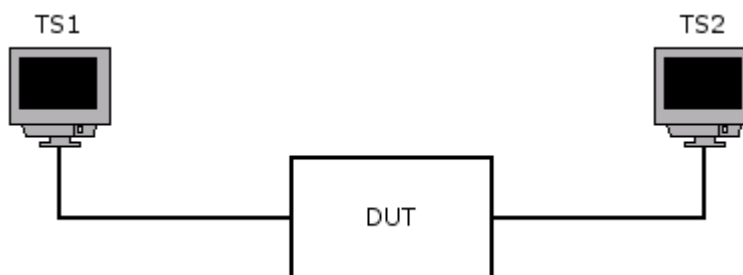
- IEEE 802.3 1998: sub-clause 4.4.2
- IEEE P802.1Q 1998: sub-clauses 7.2 and 8.5

Resource Requirements:

- Testing Stations capable of transmitting and receiving arbitrary MAC frames.

Discussion: The maximum size for an Untagged Frame is 1518 bytes. Frames larger than this maximum shall be discarded upon reception.

Test Setup: Connect the Testing Stations to the DUT as shown below.



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Procedure:

Part a: Maximum Untagged Size

1. Set Testing Station 2 to capture arbitrary MAC frames.
2. Transmit 1518 byte Untagged Frames from Testing Station 1.

Part b: Maximum Untagged Size Exceeded

3. Set Testing Station 2 to capture arbitrary MAC frames.
4. Transmit 1519 byte Untagged Frames from Testing Station 1.
5. Repeat steps 3 and 4 using 1522 byte Untagged Frames.

Observable Results:

- In Part a, Testing Station 2 should receive all frames transmitted from Testing Station 1.
- In Part b, Testing Station 2 should receive no traffic.

Possible Problems:

- None.

Test FD.1.5.3 – Bad FCS Received

Purpose: To verify that the device under test (DUT) correctly discards received frames that contain an invalid FCS.

References:

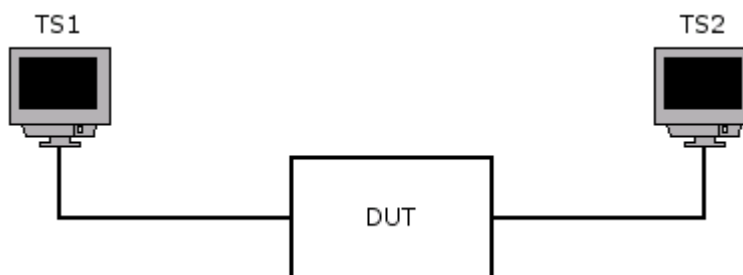
- IEEE 802.1Q 1998: sub-clause 8.5

Resource Requirements:

- Testing Stations capable of transmitting and receiving arbitrary MAC frames.

Discussion: A received frame that is in error shall be discarded upon reception.

Test Setup: Connect the Testing Stations to the DUT as shown below.



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Procedure:

1. Set Testing Station 2 to capture arbitrary MAC frames.
2. Transmit arbitrary MAC frames from Testing Station 1 containing an invalid FCS.

Observable Results:

- Testing Station 2 should not receive any of the traffic being transmitted by Testing Station 1.

Possible Problems:

- None.

Test FD.1.5.4 – Frame Ordering Maintained

Purpose: To verify that the device under test (DUT) does not deliver frames out of order.

References:

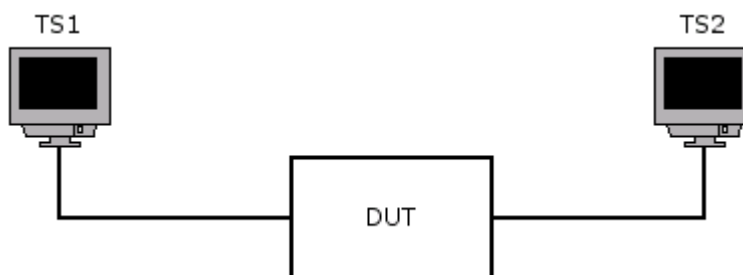
- IEEE 802.1D 1998: sub-clause 6.3.3

Resource Requirements:

- Testing Stations capable of transmitting and receiving arbitrary MAC frames.

Discussion: The MAC Service does not permit the reordering of frames with a given user priority for a given combination of destination address and source address.

Test Setup: Connect the Testing Stations to the DUT as shown below.



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InterOperability Laboratory*

Procedure:

1. Set Testing Station 2 to capture arbitrary MAC frames.
2. Transmit arbitrary MAC frames from Testing Station 1 at line rate. The data fields in each successive frame should be incremented.

Observable Results:

- Testing Station 2 should receive all of the traffic being transmitted by Testing Station 1. None of the received frames should arrive out of the order in which they are transmitted.

Possible Problems:

- None.

Test FD.1.5.5 – Frames Not Duplicated

Purpose: To verify that the device under test (DUT) does not duplicate any frames that it receives when forwarding them.

References:

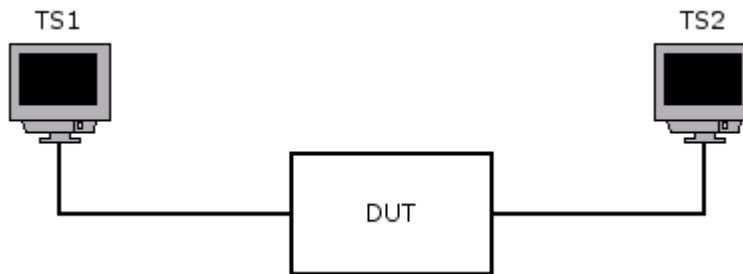
- IEEE 802.1D 1998: sub-clause 6.3.4

Resource Requirements:

- Testing Stations capable of transmitting and receiving arbitrary MAC frames.

Discussion: The MAC Service does not permit the duplication of frames. The potential for frame duplication in a Bridged LAN arises through the possibility of duplication of received frames on subsequent transmission within the Bridge, or through the possibility of multiple paths between source and destination end stations. Where Bridges in a Bridged LAN are capable of connecting the individual MACs in such a way that multiple paths between any source station-destination station pairs exist, the operation of a protocol is required to ensure that a single path is used.

Test Setup: Connect the Testing Stations to the DUT as shown below.



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Procedure:

1. Set Testing Station 2 to capture arbitrary MAC frames.
2. Transmit arbitrary MAC frames from Testing Station 1. The data fields in each successive frame should be incremented.

Observable Results:

- Testing Station 2 should receive all of the traffic being transmitted by Testing Station 1. No duplicate frames should be received.

Possible Problems:

- None.

Test FD.1.5.6 – Maximum Bridge Transit Delay

Purpose: To verify that the device under test (DUT) discards frames that remain within the bridge for longer than Maximum Bridge Transit Delay.

References:

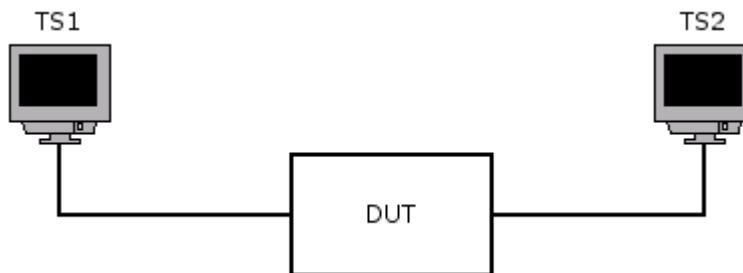
- IEEE 802.1D 1998: sub-clause 6.3.5, 6.3.6
- IEEE 802.1D 1998: Table 8-2
- IEEE 802.3 1998: Annex 31B

Resource Requirements:

- Testing Stations capable of transmitting and receiving arbitrary MAC frames.

Discussion: The MAC service introduces a frame transit delay that is dependent on the particular media and MAC method employed. Frame transit delay is the elapsed time between an MA_UNTIDATA.request primitive and the corresponding MA_UNITDATA.indication primitive. Elapsed time values are calculated only on Service Data Units that are successfully transferred. The value of the maximum bridge transit delay is based on both the maximum delays imposed by all the Bridges in the Bridged LAN and the desired maximum frame lifetime. A recommended value and an absolute maximum are specified in Table 8-2.

Test Setup: Connect the Testing Stations to the DUT as shown below.



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Procedure:

1. Transmit PAUSE frames continuously from Testing Station 2.
2. Set Testing Station 2 to capture arbitrary MAC frames.
3. Transmit an arbitrary MAC frame from Testing Station 1.
4. After 4 seconds have elapsed, stop transmitting PAUSE frames from Testing Station 2.

Observable Results:

- Testing Station 2 should never receive the arbitrary MAC frames that were transmitted by Testing Station 1.

Possible Problems:

- If the DUT does not support PAUSE operations, this test cannot be completed.