Bridge Functions Consortium

GARP/GMRP Operation Test Suite
Version 1.0

Technical Document

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MODIFICATION RECORD

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Calvin Bascom	University of New Hampshire
Les Bell	3Com Corporation
Ben Schultz	University of New Hampshire
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INTRODUCTION

Overview
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 GMRP capable products. GMRP is a GARP application and thus uses the generic GARP frame format for its PDUs. This frame format is defined in sub-clause 12.11 of the IEEE 802.1D 1998 standard. The Attribute types and values used in these GMRP PDUs are defined in sub-clause 10.3 of the IEEE 802.1D 1998 standard. This test suite has been designed based on the set of functions, state machines, and timers of the GARP standard defined in clause 12 of the IEEE 802.1D 1998 standard. This 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 802.1D 1998 standard and they are not designed as interoperability tests. Rather, they provide one method to isolate problems within the GMRP capable device that will affect the interoperability performance. Successful completion of all tests contained in this suite does not guarantee that the tested device will operate with other GMRP capable devices. However, combined with satisfactory operation in the IOL's interoperability test bed, these tests provide a reasonable level of confidence that the DUT will function well in most GMRP capable environments.

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

Test Number
The Test Number associated with each test follows a simple grouping structure. Listed first is a number signifying the clause of the 802.1D 1998 standard that the test suite is based on. Next comes a suite number signifying the number of this test suite relative to all other GMRP test suites. Next is a test group number to separate the tests into logical groups. Finally is the test's number within the group. This allows for the addition of future tests to the appropriate groups of the test suite without requiring the renumbering of the subsequent tests.

Purpose
This section gives a brief statement outlining what the test is attempting to achieve.

References
This section lists cross-references to the IEEE 802.1D 1998 standard and other documentation that might be helpful in understanding and evaluating the test and results.

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

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

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

Test Setup
This section describes the configuration of the test environment. Small changes in the configuration should be included in the test procedure. This test suite assumes that an Applicant and Registrar will initialize in the VO and MT states respectively. Unless otherwise specified, all Ports on the device under test (DUT) are configured to be untagged members of the Default VLAN.

Procedure
This section of the test description contains the step-by-step instructions for carrying out the test. It provides a cookbook approach to testing, and may be interspersed with observable results. Please note that in certain tests multiple Testing Stations register for the same Group MAC address at the same time. In this case, it is possible a race condition could occur between the reception of the Join event and the propagation of a GID_Join.request via GIP. This is permitted to occur when the order of registration has no effect on the outcome of the test. Also note that this test suite expects GMRP PDUs be sent not less than half JoinTime apart. The Groups which test the Applicant states assume no break between parts of each test.

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 a certain test is often based on the successful (or unsuccessful) detection of a certain observable result.

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

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Group 1: GARP Timers

Scope: The following tests cover the timers that are used by GARP.

Overview: These tests are designed to verify that the device under test (DUT) properly implements all GARP timers. This involves checking for randomness of timers and verifying that the granularity of 5 centiseconds or less is adhered to. In addition, these test also check that the appropriate actions are taken by the DUT upon expiry of a GARP timer.

Test 10.2.1.1 – jointimer Verification

Purpose: To verify that the device under test (DUT) properly uses the jointimer to give the DUT an opportunity to transmit a PDU if necessary. This test also verifies that the jointimer is started with a random value in the defined range.

References:

- IEEE 802.1D 1998: sub-clauses 12.10.2.1, 12.10.3.11, 12.12.2
- IEEE 802.1D 1998: Table 12-10

Resource Requirements:

- A Testing Station capable of transmitting and receiving arbitrary MAC frames.

Last Modification: June 28, 2001

Discussion: The jointimer is a timer used by GARP to control the frequency of opportunities for the DUT to transmit a PDU. The JoinTime is defined to be 20 centiseconds and the jointimer is started at a random value, T, in the range 0 <= T <= JoinTime. JoinTime is defined to be 20 centiseconds. All GARP timers shall be based on a timer resolution of 5 centiseconds or less.

Test Setup: Reset factory defaults on the DUT. Connect the Testing Station to the DUT as shown in Figure 1. Enable GMRP on the DUT and allow time for it to configure.

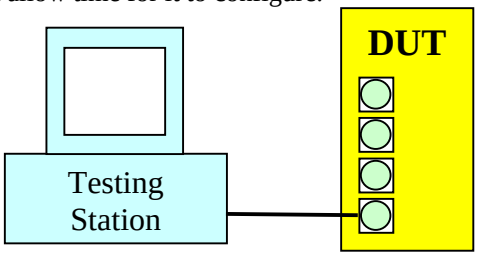

Figure 1

Procedure:

Part a: PDU Reception

1. Configure the Port to which the Testing Station is connected to have a Static Filtering Entry for a specific group MAC address.
2. Transmit GMRP PDUs containing a Message specifying the LeaveAll event from the Testing Station.
3. Set the Testing Station to capture GMRP PDUs.

Part b: jointimer Randomness Verification

4. Transmit GMRP PDUs containing a Message specifying the LeaveAll event from the Testing Station.
5. Set the Testing Station to capture n GMRP PDUs.

Observable Results:

- In Part a, the Testing Station should capture two GMRP PDUs containing a JoinIn event for the group MAC address specified in Step 1. The second GMRP PDU should have been captured within 25 centiseconds after the first.
- In Part b, the amount of time between the first PDUs arrival and the second PDUs arrival should have an even distribution between 0 and 25 centiseconds.

Possible Problems:

- None.

Test 10.2.1.2 – leavetimer Verification

Purpose: To verify that the device under test (DUT) properly uses the leavetimer when de-registering an Attribute.

References:

- IEEE 802.1D 1998: sub-clauses 12.10.2.2, 12.10.3.9, 12.12.2
- IEEE 802.1D 1998: Table 12-10

Resource Requirements:

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

Last Modification: June 28, 2001

Discussion: The leavetimer controls the amount of time that the Registrar will remain in the LV state before transitioning to the MT state. If the Registrar is still in the LV state when the leavetimer expires for a given Attribute on a given Port, the Registrar generates a GID_Leave.Indication and transitions to the MT state. GIP then propagates that GID_Leave.Indication to the instance(s) of GID associated with all other Ports that are in the Forwarding state. This causes those Ports Applicants for the Attribute to enter the LA state and transmit a LeaveEmpty message when the next transmitPDU! event occurs as long as no other Forwarding Port has a registration for that Attribute. LeaveTime is defined to be 60 centiseconds. All GARP timers shall be based on a timer resolution of 5 centiseconds or less.

Test Setup: Connect the Testing Stations to the DUT as shown in Figure 1. Enable GMRP on the DUT and allow time for it to configure.

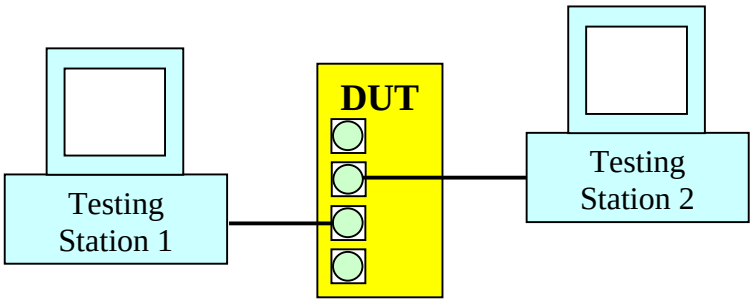

Figure 1

Procedure:

1. Set Testing Station 2 to capture GMRP PDUs.
2. Transmit a GMRP PDU containing a Message specifying the LeaveAll event from Testing Stations 1 and 2.
3. Transmit a GMRP PDU containing a Message specifying a JoinIn event for a specific group MAC address from Testing Station 1.
4. Transmit a GMRP PDU containing a Message specifying an Empty event for the group MAC address used in Step 3 from Testing Station 2.
5. Record the amount of time between the first LeaveAll generated by the DUT after Step 4 and the reception of the Leave Message for the group MAC address used in Steps 3 and 4.

Observable Results:

- The time recorded in Step 5 should be between 55 and 65 centiseconds.

Possible Problems:

- A timer variation of up to 25 centiseconds may occur due to the time waiting for the jointimer to expire.

Test 10.2.1.3 – leavetimer Stopped

Purpose: To verify that the device under test (DUT) stops the leavetimer when a JoinIn or JoinEmpty event is received while the Registrar is in the LV state.

References:

- IEEE 802.1D 1998: sub-clauses 12.8.1, 12.8.2
- IEEE 802.1D 1998: Tables 12-3, 12-4

Resource Requirements:

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

Last Modification: June 28, 2001

Discussion: When a Leave event is received on a Port, a Registrar which is in the IN state enters the LV state and the leavetimer is started. When the leavetimer expires, a GID_Leave.Indication is generated and passed to GIP on that Port. If a JoinIn or JoinEmpty event is received on that Port before the leavetimer expires, the Registrar should stop the leavetimer and go back to the IN state.

Test Setup: Connect the Testing Stations to the DUT as shown in Figure 1. Enable GMRP on the DUT and allow time for it to configure.

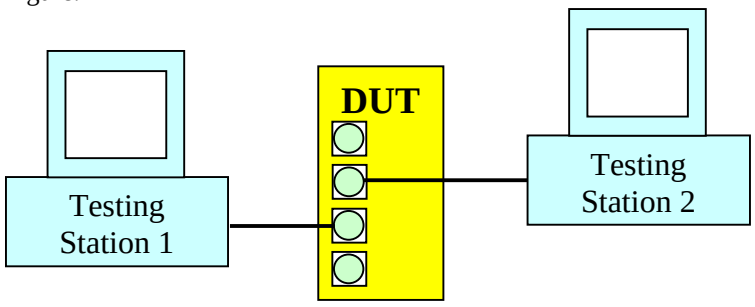

Figure 1

Procedure:

1. Set Testing Station 2 to capture GMRP PDUs.
2. Transmit a GMRP PDU containing a LeaveAll event from Testing Stations 1 and 2.
3. Transmit a GMRP PDU containing a JoinIn event for a specific group MAC address from Testing Station 1.
4. Transmit a GMRP PDU containing an Empty event for the group MAC address used in Step 3 from Testing Station 2.
5. Transmit a GMRP PDU containing a Leave event for the group MAC address used in Step 3 from Testing Station 1 immediately followed by a GMRP PDU containing a JoinIn event for the group MAC address used in Step 3 from Testing Station 1.

Observable Results:

- In Step 3, Testing Station 2 should capture two GMRP PDUs containing a JoinEmpty event for the group MAC address used in Step 3.
- In Step 4, Testing Station 2 should capture two GMRP PDUs containing a JoinEmpty event for the group MAC address used in Step 3.
- In Step 5, Testing Station 2 should not capture a GMRP PDU containing a LeaveEmpty event for the group MAC address used in Step 3 until after a LeaveAll event is generated by the DUT.

Possible Problems:

- None.

Test 10.2.1.4 – leavealltimer Verification

Purpose: To verify that the device under test (DUT) properly transmits a LeaveAll message upon expiry of the leavealltimer. This test also verifies that the leavealltimer is started with a random value in the defined range.

References:

- IEEE 802.1D 1998: sub-clauses 12.7.6, 12.8.3, 12.10.2.3, 12.12.2
- IEEE 802.1D 1998: Table 12-10

Resource Requirements:

- A Testing Station capable of transmitting and receiving arbitrary MAC frames.

Last Modification: June 28, 2001

Discussion: The leavealltimer is a timer used by GARP to control the frequency of generated LeaveAll messages. A GARP compliant device shall transmit a LeaveAll message upon the expiry of the leavealltimer. The leavealltimer is set to a random value, T, in the range LeaveAllTime < T < 1.5*LeaveAllTime. LeaveAllTime is defined to be 1000 centiseconds (10 seconds). The LeaveAll messages act as "garbage collection" messages that will eliminate any registrations of Attribute values that have expired. All GARP timers shall be implemented with a timer resolution of 5 centiseconds or less.

Test Setup: Connect the Testing Station to the DUT as shown in Figure 1. Enable GMRP on the DUT and allow time for it to configure.

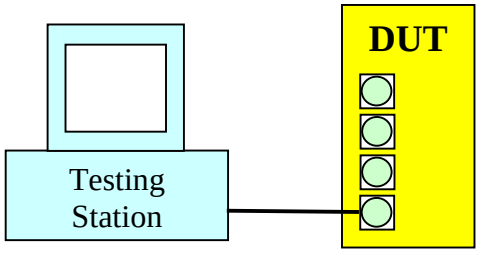

Figure 1

Procedure:

Part a: LeaveAll Reception

1. Set the Testing Station to capture GMRP PDUs.
2. Record the amount of time between the reception of each LeaveAll message.

Part b: LeaveAll Randomness Verification

3. Set the Testing Station to capture n GMRP PDUs containing a LeaveAll Message.

Observable Results:

- In Part a, the amount of time between captured GMRP PDUs containing messages specifying LeaveAll events should be between 995 and 1505 centiseconds.
- In Part b, the amount of time between captured GMRP PDUs containing messages specifying LeaveAll events should have a random distribution between 995 and 1505 centiseconds.

Possible Problems:

- Timer variations up to 25 centiseconds may occur due to the time necessary for the jointimer to expire.

Test 10.2.1.5 – leavealltimer Restarted

Purpose: To verify that the device under test (DUT) restarts the leavealltimer when a LeaveAll event is received in a GMRP PDU.

References:

- IEEE 802.1D 1998: sub-clauses 12.8.1, 12.8.2
- IEEE 802.1D 1998: Tables 12-3, 12-4

Resource Requirements:

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

Last Modification: June 28, 2001

Discussion: When a LeaveAll event is received on a Port a LeaveAll event is generated against the Applicant, Registrar, and LeaveAll State Machines. The effect of a LeaveAll event on the LeaveAll State Machine is that the LeaveAll Timer is started and the Passive state is entered to prevent the transmission of a LeaveAll Event for another 10 to 15 seconds.

Test Setup: Connect the Testing Stations to the DUT as shown in Figure 1. Enable GMRP on the DUT and allow time for it to configure.

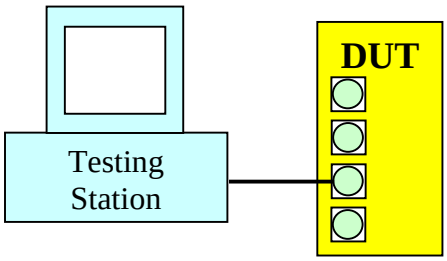

Figure 1

Procedure:

1. Set the Testing Station to capture arbitrary MAC frames.
2. Continuously transmit GMRP PDUs containing a LeaveAll event from the Testing Station.

Observable Results:

- No GMRP PDUs containing a LeaveAll event should be captured by the Testing Station.

Possible Problems:

- None.

Group 2: Message Propagation Verification

Scope: The following tests cover the propagation of GARP/GMRP messages.

Overview: These tests are designed to verify that Join, Leave, and Empty events are correctly propagated during the operation of the GMRP protocol. In addition, these tests verify events are correctly propagated with respect to the Common Spanning Tree Protocol, Static Filtering Entries, and the removal of Group Registration Entries.

Test 10.2.2.1 – Join Events

Purpose: To verify that the device under test (DUT) propagates Messages that indicate a Join event to all Ports associated with the GID that generated the indication.

References:

- IEEE 802.1D 1998: sub-clauses 12.2, 12.3.3
- IEEE 802.1D 1998: Figures 12-1,12-2, 12-3, 12-4

Resource Requirements:

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

Last Modification: June 28, 2001

Discussion: The operation of GARP is dependent on the propagation of messages that declare or de-register Attribute values. This propagation will reach every Bridge on the LAN in order to ensure that Bridges using the specific GARP application will be aware of the messages. The propagation of messages occurs when a GID_Join.indication is received by GIP from a Port. Such indications are created upon the reception of GARP PDUs that contain Join events on a Port for that GID.

The GID is the GARP Information Declaration for a GARP Application. It maintains the two state machines associated with GARP, the Registrar and Applicant.

Test Setup: Connect the Testing Stations to the DUT as shown in Figure 1. Enable GMRP on the DUT and allow time for it to configure.

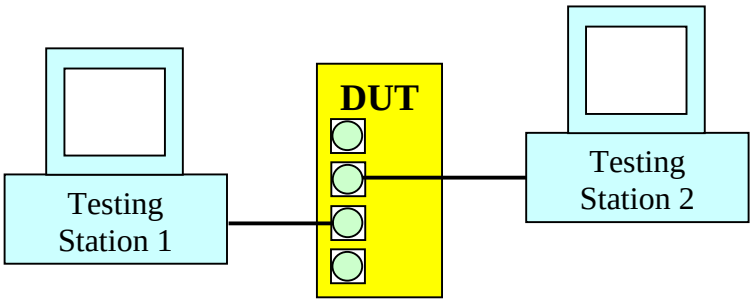

Figure 1

Procedure:

Part a: Registrar in MT State

1. Set Testing Station 2 to capture GMRP PDUs.
2. Transmit a GMRP PDU containing a LeaveAll event from Testing Stations 1 and 2.
3. Transmit a GMRP PDU containing a JoinIn event for a specific group MAC address from Testing Station 1.
4. Transmit a GMRP PDU containing an Empty event for the group MAC address used in Step 3 from Testing Station 2.
5. Record the captured frames on Testing Station 2.
6. Repeat Steps 1-5 using a JoinEmpty event during Step 3.

Part b: Registrar in IN state

7. Set Testing Station 2 to capture GMRP PDUs.
8. Transmit a GMRP PDU containing a LeaveAll event from Testing Stations 1 and 2.
9. Transmit a GMRP PDU containing a JoinIn event for a specific group MAC address from Testing Station 1.

10. Transmit a GMRP PDU containing a JoinEmpty event for the group MAC address used in Step 9 from Testing Station 2.
11. Record the captured frames on Testing Station 2.
12. Repeat Steps 7-11 using a JoinEmpty event for during Step 9.

Observable Results:

- In Part a, during Step 3, the DUT should have transmitted two GMRP PDUs containing a JoinEmpty event for the specified group MAC address to Testing Station 2. During Step 4, the DUT should have transmitted two GMRP PDUs containing a JoinEmpty event for the group MAC address used in Step 3 to Testing Station 2.
- In Part b, during Step 9, the DUT should have transmitted two GMRP PDUs containing a JoinEmpty event for the specified group MAC address to Testing Station 2. During Step 10, the DUT should have transmitted two GMRP PDUs containing a JoinIn event for the group MAC address used in Step 9 to Testing Station 2.

Possible Problems:

- None.

Test 10.2.2.2 – Leave Event with Multiple Registrations

Purpose: To verify that the device under test (DUT) correctly propagates Messages that indicate a Leave event to all appropriate Ports associated with the GID that generated the indication when multiple registrations exist.

References:

- IEEE 802.1D 1998: sub-clauses 12.2, 12.3.3
- IEEE 802.1D 1998: Figures 12-1,12-2, 12-3, 12-4
- IEEE 802.1D 1998: Tables 12-3, 12-4

Resource Requirements:

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

Last Modification: June 28, 2001

Discussion: The propagation of Leave messages occurs when a GID_Leave.indication is received by GIP from a Port. These indications occur when GARP PDUs that contain Leave events are received on a Port for that GID. Any GID_Leave.indication received by GIP is propagated as a GID_Leave.request to the instance(s) of GID associated with a given Port if all other Ports are now de-registered for that Attribute.

If there are multiple registrations for a given Attribute on a Bridge, and a Leave event is received by a registered Port, two situations are possible. If two Ports register membership and one receives a Leave event, the Registrar for that Port should enter the LV state and start the leavetimer. When the leavetimer expires, the Registrar should enter the MT state and a GID_Leave.request should be propagated via GIP to only the remaining registered Port. This GID_Leave.request should cause an Applicant in the VA, AA, or QA states to enter the LA state and transmit a LeaveEmpty message for that Attribute. If three or more Ports register membership and one receives a Leave event, a GID_Leave.request should not be propagated to any other Port, registered or otherwise.

Test Setup: Connect the Testing Stations to the DUT as shown in Figure 1. Enable GMRP on the DUT and allow time for it to configure.

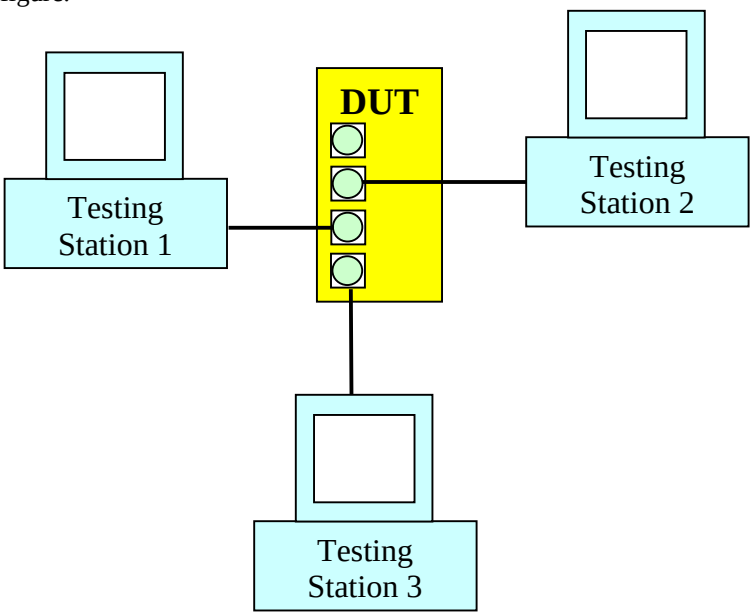

Figure 1

Procedure:

Part a: Two Ports Register Membership

1. Set Testing Stations 2 and 3 to capture GMRP PDUs.
2. Transmit a GMRP PDU containing a LeaveAll event from Testing Stations 1, 2, and 3.
3. Transmit a GMRP PDU containing a JoinIn event for a specific group MAC address from Testing Stations 1 and 2.
4. Transmit a GMRP PDU containing a LeaveIn event for the group MAC address used in Step 3 from Testing Station 1.
5. Record the captured frames on Testing Stations 2 and 3.
6. Repeat Steps 1-5 using a LeaveEmpty event during Step 4.

Part b: Three Ports Register Membership

7. Set Testing Stations 2 and 3 to capture GMRP PDUs.
8. Transmit a GMRP PDU containing a LeaveAll event from Testing Stations 1, 2, and 3.
9. Transmit a GMRP PDU containing a JoinIn event for a specific group MAC address from Testing Stations 1, 2, and 3.
10. Transmit a GMRP PDU containing a LeaveIn event for the group MAC address used in Step 9 from Testing Station 1.
11. Record the captured frames on Testing Stations 2 and 3.
12. Repeat Steps 7-11 using a LeaveEmpty event during Step 10.

Observable Results:

- In Part a, during Step 3, the DUT should have transmitted one or two GMRP PDUs containing a Join event for the specified group MAC address to Testing Station 2. The DUT also should have transmitted two GMRP PDUs containing a JoinEmpty event for the group MAC address used in Step 3 to Testing Station 3. During Step 4, the DUT should have transmitted a GMRP PDU containing a LeaveEmpty event for the group MAC address used in Step 3 to Testing Station 2. Testing Station 3 should not capture a GMRP PDU containing a LeaveEmpty event for the group MAC address used in Step 3.
- In Part b, during Step 9, the DUT should have transmitted one or two GMRP PDUs containing a Join event for the specified group MAC address to Testing Stations 2 and 3. During Step 10, the DUT should not have transmitted a GMRP PDU containing a LeaveEmpty event for the group MAC address used in Step 9 to Testing Stations 2 and 3.

Possible Problems:

- None.

Test 10.2.2.3 – Leave Event with Single Registration

Purpose: To verify that the device under test (DUT) correctly propagates Messages that indicate a Leave event to all appropriate Ports associated with the GID that generated the indication.

References:

- IEEE 802.1D 1998: sub-clauses 12.2, 12.3.3
- IEEE 802.1D 1998: Figures 12-1,12-2, 12-3, 12-4

Resource Requirements:

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

Last Modification: June 28, 2001

Discussion: The propagation of Leave messages occurs when a GID_Leave.indication is received by GIP from a Port. These indications occur when GARP PDUs that contain Leave events are received on a Port for that GID. Any GID_Leave.indication received by GIP is propagated as a GID_Leave.request to the instance(s) of GID associated with a given Port if all other Ports are now de-registered for that Attribute.

If there is a single registration for a given Attribute on a Bridge, and a Leave event is received by the registered Port, the Registrar for that Port should enter the LV state and start the leavetimer. When the leavetimer expires, the Registrar should enter the MT state and a GID_Leave.request should be propagated via GIP to all other Ports defined by the GIP Context. This GID_Leave.request should cause an Applicant in the VA, AA, or QA states to enter the LA state and transmit a LeaveEmpty message for that Attribute.

Test Setup: Connect the Testing Stations to the DUT as shown in Figure 1. Enable GMRP on the DUT and allow time for it to configure.

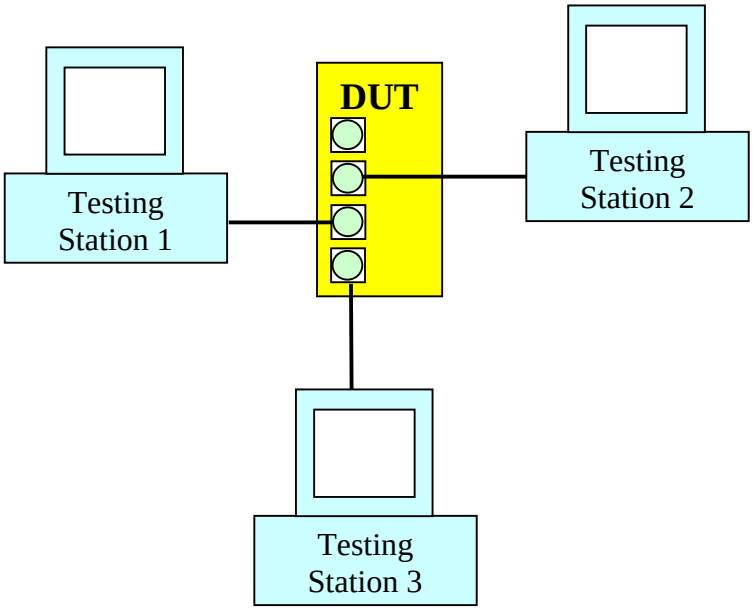

Figure 1

Procedure:

1. Set Testing Stations 2 and 3 to capture GMRP PDUs.
2. Transmit a GMRP PDU containing a LeaveAll event from Testing Stations 1, 2, and 3.

3. Transmit a GMRP PDU containing a JoinIn event for a specific group MAC address from Testing Station 1.
4. Transmit a GMRP PDU containing a LeaveIn event for the group MAC address used in Step 3 from Testing Station 1.
5. Record the captured frames on Testing Station 2 and 3.
6. Repeat Steps 1-5 using a LeaveEmpty event during Step 4.

Observable Results:

- During Step 3, the DUT should have transmitted two GMRP PDUs containing a JoinEmpty event for the specified group MAC address to Testing Stations 2 and 3. During Step 4, the DUT should have transmitted a GMRP PDU containing a LeaveEmpty event for the group MAC address used in Step 3 to Testing Stations 2 and 3.

Possible Problems:

- None.

Test 10.2.2.4 – Leave Event Received on Unregistered Port

Purpose: To verify that the device under test (DUT) does not generate a GID_Leave.indication upon reception of a Leave event for an Attribute which is not registered on that Port.

References:

- IEEE 802.1D 1998: sub-clauses 12.2, 12.3.3
- IEEE 802.1D 1998: Figures 12-1,12-2, 12-3, 12-4
- IEEE 802.1D 1998: Tables 12-3, 12-4

Resource Requirements:

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

Last Modification: June 28, 2001

Discussion: The operation of GARP is dependent on the propagation of messages that declare or de-register Attribute values. This propagation will reach every Bridge on the LAN in order to ensure that Bridges using the specific GARP application will be aware of the messages. The propagation of Leave messages occurs when a GID_Leave.indication is received by GIP from a Port. Such indications are created upon the reception of GARP PDUs that contain Leave events on a Port for that GID. If the Registrar on a given Port is currently in the MT state, and receives a Leave event in a GARP PDU, no GID_Leave.indication should be generated.

The GID is the GARP Information Declaration for a GARP Application. It maintains the two state machines associated with GARP, the Registrar and Applicant.

Test Setup: Connect the Testing Stations to the DUT as shown in Figure 1. Enable GMRP on the DUT and allow time for it to configure.

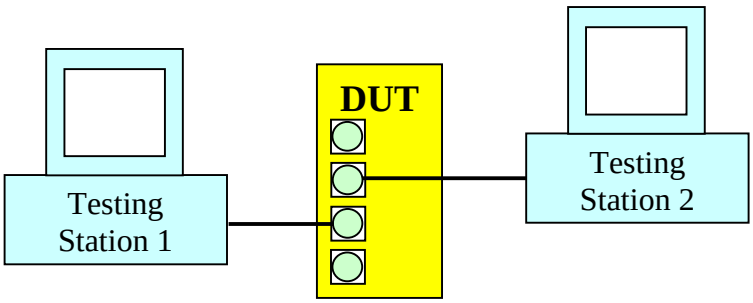

Figure 1

Procedure:

1. Set Testing Station 2 to capture GMRP PDUs.
2. Transmit a GMRP PDU containing a LeaveAll event from Testing Stations 1 and 2.
3. Transmit a GMRP PDU containing an Empty event for a specific group MAC address from Testing Station 2.
4. Transmit a GMRP PDU containing a LeaveIn event for the group MAC address used in Step 3 from Testing Station 1.
5. Record the captured frames on Testing Station 2.
6. Repeat Steps 1-5 using a LeaveEmpty event during Step 4.

Observable Results:

- Testing Station 2 should not capture a GMRP PDU containing a Leave event for the group MAC address used in Step 3.

Possible Problems:

- None.

Test 10.2.2.5 – LeaveAll Event De-registers Attributes

Purpose: To verify that the device under test (DUT) de-registers all dynamic registrations when a LeaveAll event occurs.

References:

- IEEE 802.1D 1998: sub-clauses 12.7.6, 12.10.3.8
- IEEE 802.1D 1998: Tables 12-3, 12-4, 12-5

Resource Requirements:

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

Last Modification: June 28, 2001

Discussion: The GID is the GARP Information Declaration for a GARP Application. It maintains the two state machines associated with GARP, the Registrar and Applicant. When a LeaveAll event occurs, either by reception of a GARP PDU containing a LeaveAll event or the expiry of the leavealltimer, the Registrar associated with each registered Attribute should start the leavetimer and enter the LV state. Upon expiry of the leavetimer, each Registrar should enter the MT state.

Test Setup: Connect the Testing Stations to the DUT as shown in Figure 1. Enable GMRP on the DUT and allow time for it to configure.

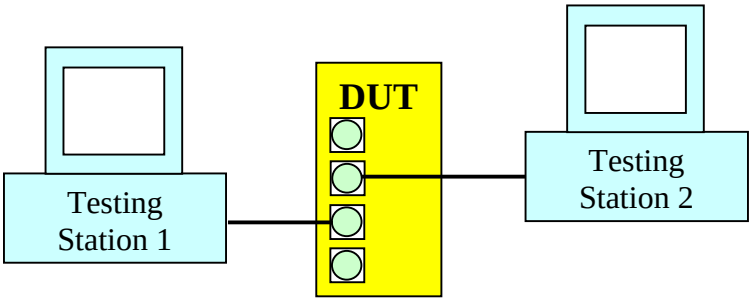

Figure 1

Procedure:

1. Set Testing Station 2 to capture arbitrary MAC frames.
2. Send a GMRP PDU containing a LeaveAll event from Testing Stations 1 and 2.
3. Send a GMRP PDU containing a JoinIn event for a specific group MAC address from Testing Stations 1 and 2.
4. Send a GMRP PDU containing a LeaveAll event from Testing Stations 1 and 2.
5. After the leavetimer has expired, send arbitrary MAC frames with a destination address of the multicast address specified in Step 3 from Testing Station 1.
6. Repeat Steps 1-5 allowing the leavealltimer to expire instead of transmitting GMRP PDUs in Step 4.

Observable Results:

- In Step 3, Testing Station 2 should capture one or two GMRP PDUs containing Join events for the specified group MAC address. In Step 4, Testing Station 2 should capture two GMRP PDUs containing a JoinEmpty event for the group MAC address used in Step 3. Testing Station 2 should also capture a GMRP PDU containing a LeaveEmpty event for the group MAC address used in Step 3 following the expiry of the leavetimer. In Step 5, Testing Station 2 should not capture any of the arbitrary MAC frames sent by Testing

Station 1. In Step 6, when repeating Step 4, Testing Station 2 should capture a GMRP PDU containing a LeaveAll event before the additional results above.

Possible Problems:

- None.

Test 10.2.2.6 – Registrations Propagated in Forwarding State

Purpose: To verify that the device under test (DUT) propagates the registrations of any Attribute Values on a Port that is in the Forwarding State.

References:

- IEEE 802.1D 1998: sub-clauses 12.2, 12.3.3
- IEEE 802.1D 1998: Figures 12-1, 12-2, 12-3, 12-4

Resource Requirements:

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

Last Modification: June 28, 2001

Discussion: The operation of GARP is dependent on the propagation of messages that declare or de-register Attribute values. This propagation will reach every Bridge on the LAN in order to ensure that Bridges using the specific GARP application will be aware of the messages. The propagation of messages occurs when a GID_Join.indication or a GID_Leave.indication is received by GIP from a Port. Such indications are created upon the reception of GARP PDUs that contain Join or Leave events on a Port for that GID.

When a Port is in the Forwarding State as defined by Spanning Tree, any registrations received on that Port should be propagated on the other Ports within the GIP Context.

The GID is the GARP Information Declaration for a GARP Application. It maintains the two state machines associated with GARP, the Registrar and Applicant.

Test Setup: Connect the Testing Stations to the DUT as shown in Figure 1. Enable GMRP on the DUT and allow time for it to configure.

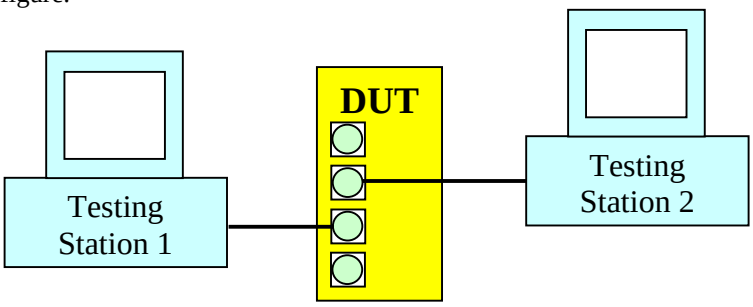

Figure 1

Procedure:

Part a: Static Configurations Propagated

1. Configure the Port to which Testing Station 2 is connected to have a Static Filtering Entry specifying forwarding for a specific group MAC address.
2. Set Testing Station 1 to capture GMRP PDUs.
3. Transmit a GMRP PDU containing a LeaveAll event from Testing Station 1.

Part b: Dynamic Configurations Propagated with Registrar in MT State

4. Set Testing Station 2 to capture GMRP PDUs.
5. Transmit a GMRP PDU containing a LeaveAll event from Testing Stations 1 and 2.
6. Transmit a GMRP PDU containing a JoinIn event for a specific group MAC address from Testing Station 1.
7. Transmit a GMRP PDU containing an Empty event for the group MAC address used in Step 5 from Testing Station 2.

8. Record all frames captured by Testing Station 2.
9. Repeat Steps 4-8 using a JoinEmpty event in Step 6.

Part c: Dynamic Configurations Propagated with Registrar in IN State

10. Set Testing Station 2 to capture GMRP PDUs.
11. Transmit a GMRP PDU containing a LeaveAll event from Testing Stations 1 and 2.
12. Transmit a GMRP PDU containing a JoinIn event for a specific group MAC address from Testing Station 1.
13. Transmit a GMRP PDU containing a JoinEmpty event for the group MAC address used in Step 12 from Testing Station 2.
14. Record all frames captured by Testing Station 2.
15. Repeat Steps 10-14 using a JoinEmpty event in Step 12.

Observable Results:

- In Part a, the DUT should have transmitted two GMRP PDUs containing a JoinEmpty event for the group MAC address used in Step 1 to Testing Station 1.
- In Part b, the DUT should have transmitted four GMRP PDUs containing a JoinEmpty event for the group MAC address used in Step 6 to Testing Station 2.
- In Part c, the DUT should have transmitted two GMRP PDUs containing a JoinEmpty event for the group MAC address used in Step 12 and two GMRP PDUs containing a JoinIn event for the group MAC address used in Step 12 to Testing Station 2.

Possible Problems:

- None.

Test 10.2.2.7 – Registrations Not Propagated in Blocking State

Purpose: To verify that the device under test (DUT) does not propagate the registrations of any Attribute Values on a Port that is in the Blocking State.

References:

- IEEE 802.1D 1998: sub-clauses 12.2, 12.3.3
- IEEE 802.1D 1998: Figures 12-1,12-2, 12-3, 12-4

Resource Requirements:

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

Last Modification: June 28, 2001

Discussion: The operation of GARP is dependent on the propagation of messages that declare or de-register Attribute values. This propagation will reach every Bridge on the LAN in order to ensure that Bridges using the specific GARP application will be aware of the messages. The propagation of messages occurs when a GID_Join.indication or a GID_Leave.indication is received by GIP from a Port. Such indications are created upon the reception of GARP PDUs that contain Join or Leave events on a Port for that GID.

When a Port is in the Blocking State as defined by Spanning Tree, any registrations received on that Port should not be propagated on the other Ports within the GIP Context.

The GID is the GARP Information Declaration for a GARP Application. It maintains the two state machines associated with GARP, the Registrar and Applicant.

Test Setup: Connect the Testing Stations to the DUT as shown in Figure 1. Enable GMRP on the DUT and allow time for it to configure.

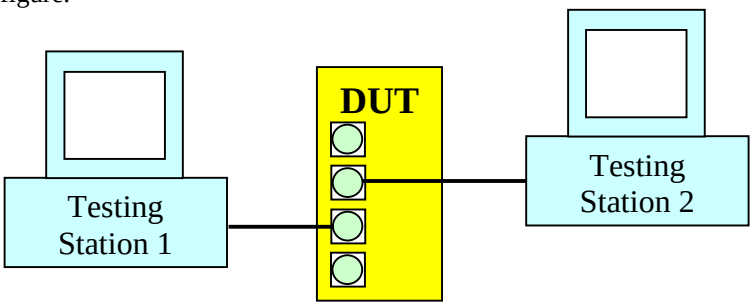

Figure 1

Procedure:

Part a: Static Configurations not Propagated

1. Transmit Configuration BPDUs with a Root ID of higher priority than the DUT and a Root Path Cost equal to 0x00000005 from Testing Station 2.
2. Transmit Configuration BPDUs with a Root ID equal to that transmitted by Testing Station 2 and a Root Path Cost equal to 0x0000000A from Testing Station 1.
3. While continuing to transmit Configuration BPDUs, set Testing Station 2 to capture GMRP PDUs.
4. While continuing to transmit Configuration BPDUs, configure the Port on the DUT connected to Testing Station 1 to have a Static Filtering Entry specifying forwarding for a specific group MAC address.

Part b: Dynamic Configurations not Propagated with Registrar in MT State

5. Remove the static configuration made in Part a.
6. Set Testing Station 2 to capture GMRP PDUs.

7. Transmit Configuration BPDUs with a Root ID of higher priority than the DUT and a Root Path Cost equal to 0x00000005 from Testing Station 2.
8. Transmit Configuration BPDUs with a Root ID equal to that transmitted by Testing Station 2 and a Root Path Cost equal to 0x0000000A from Testing Station 1.
9. Transmit GMRP PDUs containing a LeaveAll event from Testing Stations 1 and 2.
10. Transmit a GMRP PDU containing a JoinIn event for a specific group MAC address from Testing Station 1.
11. Transmit a GMRP PDU containing an Empty event for the group MAC address used in Step 10 from Testing Station 2.
12. Record all frames captured by Testing Station 2.
13. Repeat Steps 6-12 using a JoinEmpty event in Step 10.

Part c: Dynamic Configurations not Propagated with Registrar in IN State

14. Set Testing Station 2 to capture GMRP PDUs.
15. Transmit Configuration BPDUs with a Root ID of higher priority than the DUT and a Root Path Cost equal to 0x00000005 from Testing Station 2.
16. Transmit Configuration BPDUs with a Root ID equal to that transmitted by Testing Station 2 and a Root Path Cost equal to 0x0000000A from Testing Station 1.
17. Transmit GMRP PDUs containing a LeaveAll event from Testing Stations 1 and 2.
18. Transmit a GMRP PDU containing a JoinIn event for a specific group MAC address from Testing Station 1.
19. Transmit a GMRP PDU containing a JoinEmpty event for the group MAC address used in Step 18 from Testing Station 2.
20. Record all frames captured by Testing Station 2.
21. Repeat Steps 14-20 using a JoinEmpty event in Step 18.

Observable Results:

- In Part a, no GMRP PDUs containing Join events for the group MAC address configured in Step 4 should be captured by Testing Station 2.
- In Parts b and c, no GMRP PDUs containing Join events for the specified group MAC address should be captured by Testing Station 2.

Possible Problems:

- None.

Test 10.2.2.8 – Transition to Forwarding State

Purpose: To verify that the device under test (DUT) propagates Messages that indicate a Join event to all Ports associated with the GID when a Port enters the Forwarding state.

References:

- IEEE 802.1D 1998: sub-clauses 12.2, 12.3.3
- IEEE 802.1D 1998: Figures 12-1,12-2, 12-3, 12-4

Resource Requirements:

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

Last Modification: June 28, 2001

Discussion: The operation of GARP is dependent on the propagation of messages that declare or de-register Attribute values. This propagation will reach every Bridge on the LAN in order to ensure that Bridges using the specific GARP application will be aware of the messages. The propagation of messages occurs when a GID_Join.indication or a GID_Leave.indication is received by GIP from a Port. Such indications are created upon the reception of GARP PDUs that contain Join or Leave events on a Port for that GID.

When a Port enters the Forwarding state from the Blocking state, and a GID_Join.indication has been received more recently than a GID_Leave.indication, Join events are propagated.

The GID is the GARP Information Declaration for a GARP Application. It maintains the two state machines associated with GARP, the Registrar and Applicant.

Test Setup: Connect the Testing Stations to the DUT as shown in Figure 1. Enable GMRP on the DUT and allow time for it to configure.

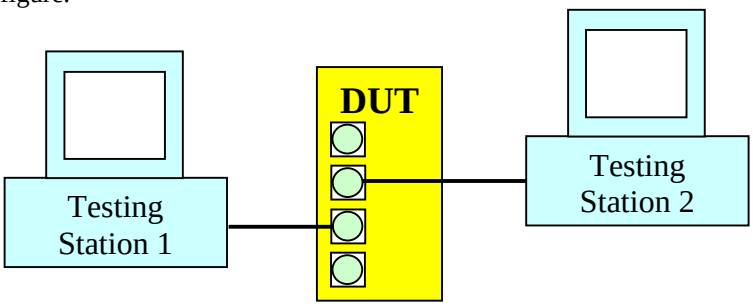

Figure 1

Procedure:

Part a: Static Configurations

1. Set the Max Age on the DUT to 20 seconds and the Forward Delay to 15 seconds.
2. Transmit Configuration BPDUs with a Root ID of higher priority than the DUT and a Root Path Cost equal to 0x00000005 from Testing Station 2.
3. Transmit Configuration BPDUs with a Root ID equal to that transmitted by Testing Station 2 and a Root Path Cost equal to 0x0000000A from Testing Station 1.
4. Set Testing Station 2 to capture GMRP PDUs.
5. While continuing to transmit Configuration BPDUs, configure the Port on the DUT that is connected to Testing Station 1 to have a Static Filtering Entry specifying forwarding for a specific group MAC address.
6. Stop transmitting Configuration BPDUs. After approximately 45 seconds, transmit a GMRP PDU containing a LeaveAll event from Testing Stations 1 and 2.

Part b: Dynamic Configurations with Registrar in MT State

7. Remove the static configurations made in Part a.
8. Set Testing Station 2 to capture arbitrary MAC frames.
9. Transmit Configuration BPDUs with a Root ID of higher priority than the DUT and a Root Path Cost equal to 0x00000005 from Testing Station 2.
10. Transmit Configuration BPDUs with a Root ID equal to that transmitted by Testing Station 2 and a Root Path Cost equal to 0x0000000A from Testing Station 1.
11. Stop transmitting Configuration BPDUs. After approximately 45 seconds, transmit a GMRP PDU containing a LeaveAll event from Testing Stations 1 and 2.
12. Transmit a GMRP PDU containing a JoinIn event for a specific group MAC address from Testing Station 1.
13. Transmit a GMRP PDU containing an Empty event for the group MAC address used in Step 12 from Testing Station 2.
14. Once the Port on the DUT connected to Testing Station 1 enters the Forwarding state, transmit arbitrary MAC frames with a destination address of the multicast address used in Step 12 from Testing Station 1.
15. Record all frames captured by Testing Station 2.
16. Repeat Steps 8-15 using a JoinEmpty event in Step 12.

Part c: Dynamic Configurations with Registrar in IN State

17. Set Testing Station 2 to capture GMRP PDUs.
18. Transmit Configuration BPDUs with a Root ID of higher priority than the DUT and a Root Path Cost equal to 0x00000005 from Testing Station 2.
19. Transmit Configuration BPDUs with a Root ID equal to that transmitted by Testing Station 2 and a Root Path Cost equal to 0x0000000A from Testing Station 1.
20. Stop transmitting Configuration BPDUs. After approximately 45 seconds transmit a GMRP PDU containing a LeaveAll event from Testing Stations 1 and 2.
21. Transmit a GMRP PDU containing a JoinIn event for a specific group MAC address from Testing Station 1.
22. Transmit a GMRP PDU containing an JoinEmpty event for the group MAC address used in Step 21 from Testing Station 2.
23. Once the Port on the DUT connected to Testing Station 1 enters the Forwarding state, transmit arbitrary MAC frames with a destination address of the multicast address used in Step 21 from Testing Station 1.
24. Record all frames captured by Testing Station 2.
25. Repeat Steps 17-24 using a JoinEmpty event in Step 21.

Observable Results:

- In Part a, Testing Station 2 should capture two GMRP PDUs containing a JoinEmpty event for the specified group MAC address before any LeaveAll Messages are captured from the DUT.
- In Part b, Testing Station 2 should capture two GMRP PDUs containing a JoinEmpty event for the group MAC address used in Step 12 before any LeaveAll Messages are captured from the DUT. Testing Station 2 should not capture the traffic transmitted by Testing Station 1.
- In Part c, Testing Station 2 should capture two GMRP PDUs containing a JoinIn event for the group MAC address used in Step 21 before any LeaveAll Messages are captured from the DUT. Testing Station 2 should capture the arbitrary MAC frames transmitted by Testing Station 1.

Possible Problems:

- None.

Test 10.2.2.9 – Transition to Blocking State

Purpose: To verify that the device under test (DUT) propagates Messages that indicate a Leave event to all Ports associated with the GID when a Port enters the Blocking state.

References:

- IEEE 802.1D 1998: sub-clauses 12.2, 12.3.3
- IEEE 802.1D 1998: Figures 12-1,12-2, 12-3, 12-4

Resource Requirements:

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

Last Modification: June 28, 2001

Discussion: The operation of GARP is dependent on the propagation of messages that declare or de-register Attribute values. This propagation will reach every Bridge on the LAN in order to ensure that Bridges using the specific GARP application will be aware of the messages. The propagation of messages occurs when a GID_Leave.indication or a GID_Join.indication is received by GIP from a Port. Such indications are created upon the reception of GARP PDUs that contain Leave or Join events on a Port for that GID.

When a Port enters the Blocking state from the Forwarding state, and a GID_Join.indication has been received more recently than a GID_Leave.indication, Leave events are propagated.

The GID is the GARP Information Declaration for a GARP Application. It maintains the two state machines associated with GARP, the Registrar and Applicant.

Test Setup: Connect the Testing Stations to the DUT as shown in Figure 1. Enable GMRP on the DUT and allow time for it to configure.

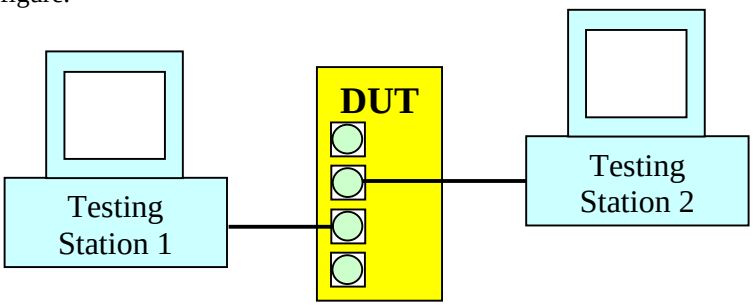

Figure 1

Procedure:

Part a: Static Configurations

1. Configure the Port on the DUT that is connected to Testing Station 1 to have a Static Filtering Entry specifying forwarding for a specific group MAC address.
2. Set Testing Station 2 to capture GMRP PDUs.
3. Transmit Configuration BPDUs with a Root ID of higher priority than the DUT and a Root Path Cost equal to 0x00000005 from Testing Station 2.
4. Transmit Configuration BPDUs with a Root ID equal to that transmitted by Testing Station 2 and a Root Path Cost equal to 0x0000000A from Testing Station 1. This should result in the Port to which Testing Station 1 is connected entering the Blocking State.
5. Record all frames captured by Testing Station 2.

Part b: Dynamic Configurations with Registrar in MT State

6. Remove the static configuration created in Part a.

7. Set Testing Station 2 to capture GMRP PDUs.
8. Transmit a GMRP PDU containing a LeaveAll event from Testing Stations 1 and 2.
9. Transmit a GMRP PDU containing a JoinIn event for a specific group MAC address from Testing Station 1.
10. Transmit a GMRP PDU containing an Empty event for the group MAC address used in Step 9 from Testing Station 2.
11. Transmit Configuration BPDUs with a Root ID of higher priority than the DUT and a Root Path Cost equal to 0x00000005 from Testing Station 2.
12. Transmit Configuration BPDUs with a Root ID equal to that transmitted by Testing Station 2 and a Root Path Cost equal to 0x0000000A from Testing Station 1. This should result in the Port to which Testing Station 1 is connected entering the Blocking State.
13. Transmit arbitrary MAC frames with a destination address of the multicast address used in Step 9 from Testing Station 1.
14. Record all frames captured by Testing Station 2.
15. Repeat Steps 7-14 using a JoinEmpty event in Step 9.

Part c: Dynamic Configurations with Registrar in IN State

16. Set Testing Station 2 to capture GMRP PDUs.
17. Transmit a GMRP PDU containing a LeaveAll event from Testing Stations 1 and 2.
18. Transmit a GMRP PDU containing a JoinIn event for a specific group MAC address from Testing Station 1.
19. Transmit a GMRP PDU containing a JoinEmpty event for the group MAC address used in Step 18 from Testing Station 2.
20. Transmit Configuration BPDUs with a Root ID of higher priority than the DUT and a Root Path Cost equal to 0x00000005 from Testing Station 2.
21. Transmit Configuration BPDUs with a Root ID equal to that transmitted by Testing Station 2 and a Root Path Cost equal to 0x0000000A from Testing Station 1. This should result in the Port to which Testing Station 1 is connected entering the Blocking State.
22. Transmit arbitrary MAC frames with a destination address of the multicast address used in Step 18 from Testing Station 1.
23. Record all frames captured by Testing Station 2.
24. Repeat Steps 16-23 using a JoinEmpty event in Step 18.

Observable Results:

- In Part a, Testing Station 2 should capture a GMRP PDU containing a LeaveEmpty event for the specified group MAC address when the Port on the DUT that is connected to Testing Station 1 enters the Blocking state.
- In Parts b and c, Testing Station 2 should capture a GMRP PDU containing a LeaveEmpty event for the specified group MAC address when the Port on the DUT that is connected to Testing Station 1 enters the Blocking state. Testing Station 2 should not capture the arbitrary MAC frames transmitted by Testing Station 1.

Possible Problems:

- None.

Test 10.2.2.10 – Propagation of Static Filtering Entries

Purpose: To verify that the device under test (DUT) propagates membership of Static Filtering Entries for group MAC addresses.

References:

- IEEE 802.1D 1998: sub-clauses 7.9.1, 12.9.1
- IEEE 802.1D 1998: Figures 12-1,12-2, 12-3, 12-4
- IEEE 802.1D 1998: Table 12-3, 12-4

Resource Requirements:

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

Last Modification: June 28, 2001

Discussion: Static Filtering Entries for group MAC addresses provide the Registrar Administrative Control values for the GMRP protocol. Static configuration of forwarding of specific group addressed frames to an outbound port indicates Registration Fixed on that port: a desire to receive frames addressed to that Group even in the absence of dynamic information. Static configuration of filtering of frames which might otherwise be sent to an outbound port indicates Registration Forbidden. The absence of a Static Filtering Entry for the group address, or the configuration of forwarding or filtering on the basis of dynamic filtering information, indicates Normal Registration

A Registrar Administrative Control value of Registration Fixed means the Registrar for that Attribute ignores all GARP messages, and remains in the IN state.

Because the IEEE standard is not explicit regarding propagation of Static Filtering Entries for group MAC addresses via GMRP, this test is informational only.

Test Setup: Connect the Testing Stations to the DUT as shown in Figure 1. Enable GMRP on the DUT and allow time for it to configure.

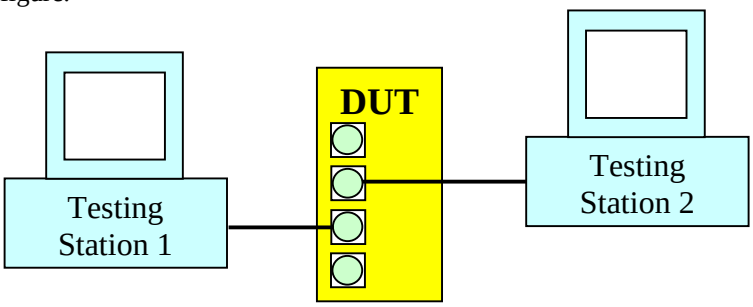

Figure 1

Procedure:

1. Set Testing Station 2 to capture GMRP PDUs.
2. Transmit a GMRP PDU containing a LeaveAll event from Testing Stations 1 and 2.
3. Configure the Port on the DUT that is connected to Testing Station 1 to have a Static Filtering Entry which specifies forwarding for a specific group MAC address.
4. Transmit a GMRP PDU containing a LeaveAll event from Testing Station 2.
5. Repeat Steps 1-4 allowing the leavealltimer to expire instead of transmitting a GMRP PDU in Step 4.

Observable Results:

- Testing Station 2 should capture four JoinEmpty events for the group MAC address used in Step 3.

Possible Problems:

- None.

Test 10.2.2.11 – Static Filtering Entry specifies Registration Fixed

Purpose: To verify that the device under test (DUT) correctly participates in the GMRP Protocol when Static Filtering Entries specifying forwarding are configured.

References:

- IEEE 802.1D 1998: sub-clause 7.9.1, 12.9.1
- IEEE 802.1D 1998: Table 12-3, Table 12-4

Resource Requirements:

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

Last Modification: June 28, 2001

Discussion: Static Filtering Entries for group MAC addresses provide the Registrar Administrative Control values for the GMRP protocol. Static configuration of forwarding of specific group addressed frames to an outbound port indicates Registration Fixed on that port: a desire to receive frames addressed to that Group even in the absence of dynamic information. Static configuration of filtering of frames which might otherwise be sent to an outbound port indicates Registration Forbidden. The absence of a Static Filtering Entry for the group address, or the configuration of forwarding or filtering on the basis of dynamic filtering information, indicates Normal Registration

The three possible Registrar Administrative Control values are Normal Registration, in which the Registrar responds normally to incoming GARP messages, Registration Fixed, in which the Registrar ignores all GARP messages and remains in the IN state, and Registration Forbidden, in which the Registrar ignores all GARP messages and remains in the MT state.

Test Setup: Connect the Testing Stations to the DUT as shown in Figure 1. Enable GMRP on the DUT and allow time for it to configure.

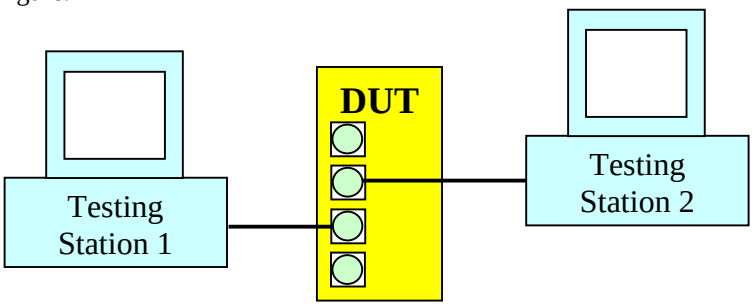

Figure 1

Procedure:

Part a: Receiving Join event

1. Configure a Static Filtering Entry which specifies forwarding for a specific group MAC address on the Port connected to Testing Station 1.
2. Transmit a GMRP PDU containing a LeaveAll event from Testing Stations 1 and 2.
3. Set Testing Station 2 to capture GMRP PDUs.
4. Transmit a GMRP PDU containing a JoinIn event for the group MAC address used in Step 1 from Testing Station 1.
5. Record the captured frames on Testing Station 2.
6. Repeat Steps 2-5 using a JoinEmpty event in Step 4.

Part b: Receiving Leave event

7. Transmit a GMRP PDU containing a LeaveAll event from Testing Stations 1 and 2.
8. Set Testing Station 2 to capture GMRP PDUs.

9. Transmit a GMRP PDU containing a LeaveEmpty event for the group MAC address used in Step 1 from Testing Station 1.
10. Record the captured frames on Testing Station 2.
11. Repeat Steps 7-10 using a LeaveIn event in Step 9.

Observable Results:

- In part a, the DUT should not have transmitted any Join events for the group MAC address specified in Step 1 to Testing Station 2 until a LeaveAll event was generated by the DUT.
- In part b, Testing Station 2 should not capture a GMRP PDU containing a LeaveEmpty event for the group MAC address specified in Step 1. The Static Filtering Entry for the group MAC address specified in Step 1 should not have been removed.

Possible Problems:

- None.

Test 10.2.2.12 – Static Filtering Entry specifies Registration Forbidden

Purpose: To verify that the device under test (DUT) correctly participates in the GMRP Protocol when Static Filtering Entries specifying filtering are configured.

References:

- IEEE 802.1D 1998: sub-clause 7.9.1, 12.9.1
- IEEE 802.1D 1998: Table 12-3, Table 12-4

Resource Requirements:

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

Last Modification: June 28, 2001

Discussion: Static Filtering Entries for group MAC addresses provide the Registrar Administrative Control values for the GMRP protocol. Static configuration of forwarding of specific group addressed frames to an outbound port indicates Registration Fixed on that port: a desire to receive frames addressed to that Group even in the absence of dynamic information. Static configuration of filtering of frames which might otherwise be sent to an outbound port indicates Registration Forbidden. The absence of a Static Filtering Entry for the group address, or the configuration of forwarding or filtering on the basis of dynamic filtering information, indicates Normal Registration

The three possible Registrar Administrative Control values are Normal Registration, in which the Registrar responds normally to incoming GARP messages, Registration Fixed, in which the Registrar ignores all GARP messages and remains in the IN state, and Registration Forbidden, in which the Registrar ignores all GARP messages and remains in the MT state.

Test Setup: Connect the Testing Stations to the DUT as shown in Figure 1. Enable GMRP on the DUT and allow time for it to configure.

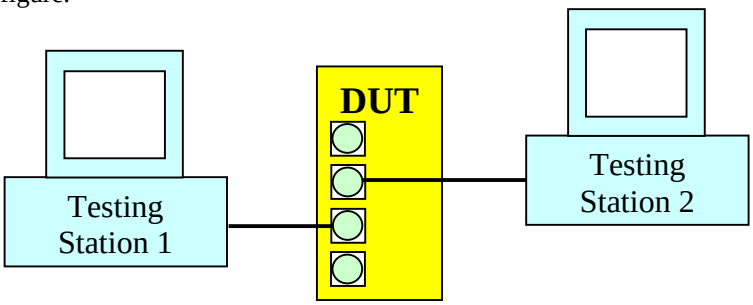

Figure 1

Procedure:

Part a: Receiving Join event

1. Configure a Static Filtering Entry which specifies filtering for a specific group MAC address on the Port connected to Testing Station 1.
2. Transmit a GMRP PDU containing a LeaveAll event from Testing Stations 1 and 2.
3. Set Testing Station 2 to capture GMRP PDUs.
4. Transmit a GMRP PDU containing a JoinIn event for the group MAC address used in Step 1 from Testing Station 1.
5. Record the captured frames on Testing Station 2.
6. Repeat Steps 2-5 using a JoinEmpty event in Step 4.

Part b: Receiving Leave event

7. Transmit a GMRP PDU containing a LeaveAll event from Testing Stations 1 and 2.
8. Set Testing Station 2 to capture GMRP PDUs.

9. Transmit a GMRP PDU containing a LeaveEmpty event for the group MAC address used in Step 1 from Testing Station 1.
10. Record the captured frames on Testing Station 2.
11. Repeat Steps 7-10 using a LeaveIn event in Step 9.

Observable Results:

- In part a, the DUT should not have transmitted any Join events for the group MAC address specified in Step 1 to Testing Station 2.
- In part b, Testing Station 2 should not capture a GMRP PDU containing a LeaveEmpty event for the group MAC address specified in Step 1. The Static Filtering Entry for the group MAC address specified in Step 1 should not have been removed.

Possible Problems:

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

Test 10.2.2.13 – Dynamic Registration Removed Via Management

Purpose: To verify that the device under test (DUT) propagates a GID_Leave.request to all appropriate Ports when the membership of an Attribute is removed via management.

References:

- IEEE 802.1D 1998: sub-clauses 12.3.3
- IEEE 802.1D 1998: Tables 12-3, 12-4

Resource Requirements:

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

Last Modification: June 28, 2001

Discussion: The GID is the GARP Information Declaration for a GARP Application. It maintains the two state machines associated with GARP, the Registrar and Applicant. The GIP is the GARP Information Propagation function and propagates Attribute registrations information to other instances of GID. When the last registration for an Attribute is de-registered, a GID_Leave.request should be propagated via GIP to all appropriate Ports. This GID_Leave.request should prompt the transmission of a LeaveEmpty event for the Attribute.

Test Setup: Connect the Testing Stations to the DUT as shown in Figure 1. Enable GMRP on the DUT and allow time for it to configure.

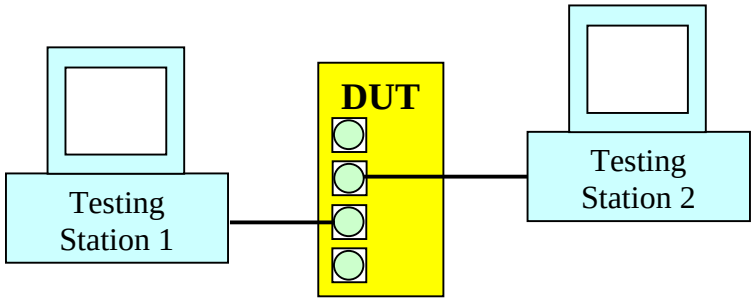

Figure 1

Procedure:

1. Set Testing Station 2 to capture arbitrary MAC frames.
2. Transmit a GMRP PDU containing a LeaveAll event from Testing Stations 1 and 2.
3. Transmit a GMRP PDU containing a JoinIn event for a specific group MAC address from Testing Station 1.
4. Transmit a GMRP PDU containing an Empty event for the group MAC address used in Step 3 from Testing Station 2.
5. If possible, remove through management the dynamic registration for the group MAC address used in Step 3 on the Port connected to Testing Station 1.
6. Record the captured frames on Testing Station 2.

Observable Results:

- In Step 3, Testing Station 2 should capture two GMRP PDUs containing JoinEmpty events for the specified group MAC address. In Step 4, Testing Station 2 should capture two GMRP PDUs containing JoinEmpty events for the group MAC address used in Step 3. In Step 5, Testing Station 2 should capture a LeaveEmpty event for the group MAC address used in Step 3.

Possible Problems:

- If the DUT does not support removing Dynamic Group Registration Entries via management, this test cannot be completed.

Group 3: Applicant Behavior in VO State

Scope: The following tests cover the operation of the GMRP Applicant when it is in the VO state.

Overview: These tests are designed to verify that the DUT takes the appropriate actions when messages are received by an Applicant in the VO state. The results of these tests will depend on the state of the Registrar as well. For each test, if no direct observable result from a state transition can be obtained, additional events are sent to obtain a result.

Test 10.2.3.1 – JoinIn Event Received

Purpose: To verify that the device under test (DUT) exhibits proper behavior when the Applicant for a given Attribute is in the VO state.

References:

- IEEE 802.1D 1998: sub-clauses 12.8.1, 12.8.2
- IEEE 802.1D 1998: Tables 12-3, 12-4

Resource Requirements:

- A Testing Station capable of transmitting and receiving arbitrary MAC frames.

Last Modification: June 28, 2001

Discussion: When a JoinIn event for a given Attribute is received on a Port, an Applicant in the VO state enters the AO state and takes no other action. If an Applicant in the AO state receives a GID_Join.request from GIP, it should enter the AP state. Upon expiry of the jointimer, the transmitPDU! event occurs. The Applicant should then transmit one GMRP PDU containing a Join event and transition to the QA state.

Test Setup: Connect the Testing Station to the DUT as shown in Figure 1. Enable GMRP on the DUT and allow time for it to configure.

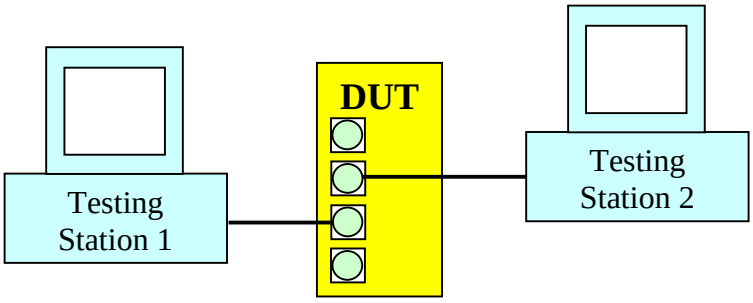

Figure 1

Procedure:

Part a: Receiving JoinIn event

1. Transmit a GMRP PDU containing a LeaveAll event from Testing Stations 1 and 2.
2. Set Testing Station 1 to capture GMRP PDUs.
3. Transmit a GMRP PDU containing a JoinIn event for a specific group MAC address from Testing Station 1.

Part b: Verifying Applicant in AO State

4. Transmit a GMRP PDU containing a JoinIn event for the group MAC address used in Step 3 from Testing Station 2.
5. Record the captured frames on Testing Station 1.

Observable Results:

- In Part a, during Step 3, Testing Station 1 should not capture any GMRP PDUs containing events for the specified group MAC address. The Applicant for the specified group MAC address on the Port connected to Testing Station 1 should transition to the AO state.
- In Part b, during Step 4, Testing Station 1 should capture one GMRP PDU containing a JoinIn event for the group MAC address used in Step 3. This confirms that the Applicant for the group MAC address used in Step 3 on the Port connected to Testing Station 1 transitioned to the AO state in Part a.

Possible Problems:

- None.

Test 10.2.3.2 – JoinEmpty Event Received

Purpose: To verify that the device under test (DUT) exhibits proper behavior when the Applicant for a given Attribute is in the VO state.

References:

- IEEE 802.1D 1998: sub-clauses 12.8.1, 12.8.2
- IEEE 802.1D 1998: Tables 12-3, 12-4

Resource Requirements:

- A Testing Station capable of transmitting and receiving arbitrary MAC frames.

Last Modification: June 28, 2001

Discussion: When a JoinEmpty event for a given Attribute is received on a Port, an Applicant in the VO state should remain in the VO state and take no other action. If an Applicant in the VO state receives a GID_Join.request from GIP, it should enter the VP state. Upon expiry of the jointimer, the transmitPDU! event occurs. The Applicant should then transmit two GMRP PDUs containing a Join event and eventually transition to the QA state.

Test Setup: Connect the Testing Station to the DUT as shown in Figure 1. Enable GMRP on the DUT and allow time for it to configure.

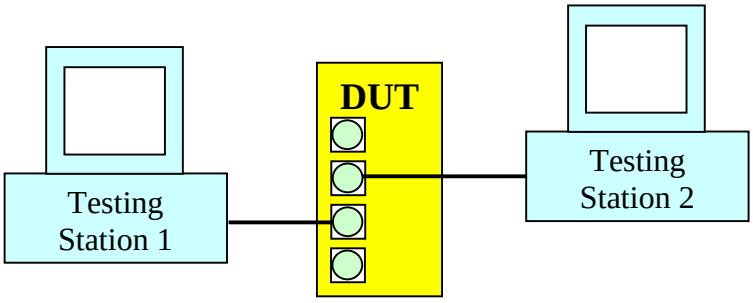

Figure 1

Procedure:

Part a: Receiving JoinEmpty event

1. Transmit a GMRP PDU containing a LeaveAll event from Testing Stations 1 and 2.
2. Set Testing Station 1 to capture GMRP PDUs.
3. Transmit a GMRP PDU containing a JoinEmpty event for a specific group MAC address from Testing Station 1.

Part b: Verifying Applicant in VO State

4. Transmit a GMRP PDU containing a JoinIn event for the group MAC address used in Step 3 from Testing Station 2.
5. Record the captured frames on Testing Station 1.

Observable Results:

- In Part a, during Step 3, Testing Station 1 should not capture any GMRP PDUs containing events for the specified group MAC address. The Applicant for the group MAC address used in Step 3 on the Port connected to Testing Station 1 should remain in VO state.
- In Part b, during Step 4, Testing Station 1 should capture two GMRP PDUs containing a JoinIn event for the group MAC address used in Step 3. The Applicant for the group MAC address used in Step 3 on the Port connected to Testing Station 1 should have transitioned to the QA state. This confirms that the Applicant for

the group MAC address used in Step 3 on the Port connected to Testing Station 1 remained in the VO state in Part a.

Possible Problems:

- None.

Test 10.2.3.3 – Empty Event Received

Purpose: To verify that the device under test (DUT) exhibits proper behavior when the Applicant for a given Attribute is in the VO state.

References:

- IEEE 802.1D 1998: sub-clauses 12.8.1, 12.8.2
- IEEE 802.1D 1998: Tables 12-3, 12-4

Resource Requirements:

- A Testing Station capable of transmitting and receiving arbitrary MAC frames.

Last Modification: June 28, 2001

Discussion: When an Empty event for a given Attribute is received on a Port, an Applicant in the VO state should remain in the VO state and take no other action. When an Applicant in the VO state receives a GID_Join.request from GIP, it transitions to the VP state. When the jointimer expires, the transmitPDU! event occurs. After transmitting a Join event, the Applicant transitions to the AA state. When the jointimer expires a second time, the Applicant transmits another Join event and transitions to the QA state.

Test Setup: Connect the Testing Station to the DUT as shown in Figure 1. Enable GMRP on the DUT and allow time for it to configure.

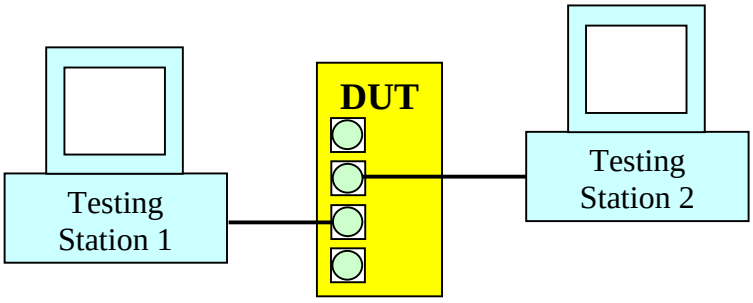

Figure 1

Procedure:

Part a: Receiving Empty event

1. Transmit a GMRP PDU containing a LeaveAll event from Testing Stations 1 and 2.
2. Set Testing Station 1 to capture GMRP PDUs.
3. Transmit a GMRP PDU containing an Empty event for a specific group MAC address from Testing Station 1.

Part b: Verifying Applicant in VO State

4. Transmit a GMRP PDU containing a JoinIn event for the group MAC address used in Step 3 from Testing Station 2.
5. Record the captured frames on Testing Station 1.

Observable Results:

- In Part a, during Step 3, Testing Station 1 should not capture any GMRP PDUs containing events for the specified group MAC address. The Applicant for the group MAC address used in Step 3 on the Port connected to Testing Station 1 should remain in VO state.
- In Part b, during Step 4, Testing Station 1 should capture two GMRP PDUs containing a JoinEmpty event for the group MAC address used in Step 3. The Applicant for the group MAC address used in Step 3 on the Port

connected to Testing Station 1 should have transitioned to the QA state. This confirms that the Applicant for the group MAC address used in Step 3 on the Port connected to Testing Station 1 remained in the VO state in Part a.

Possible Problems:

- None.

Test 10.2.3.4 – LeaveIn Event Received

Purpose: To verify that the device under test (DUT) exhibits proper behavior when the Applicant for a given Attribute is in the VO state.

References:

- IEEE 802.1D 1998: sub-clauses 12.8.1, 12.8.2
- IEEE 802.1D 1998: Tables 12-3, 12-4

Resource Requirements:

- A Testing Station capable of transmitting and receiving arbitrary MAC frames.

Last Modification: June 28, 2001

Discussion: When a LeaveIn event for a given Attribute is received on a Port, an Applicant in the VO state enters the LO state. After the jointimer expires, the transmitPDU! event occurs. The Applicant in the LO state then transmits an Empty message for that Attribute and transitions back to the VO state again. It is possible, however, that an implementation will limit state information to those Attribute values in which the Participant has an immediate interest. Thus a LeaveIn event would not necessarily prompt the transmission of an Empty event.

Test Setup: Connect the Testing Station to the DUT as shown in Figure 1. Enable GMRP on the DUT and allow time for it to configure.

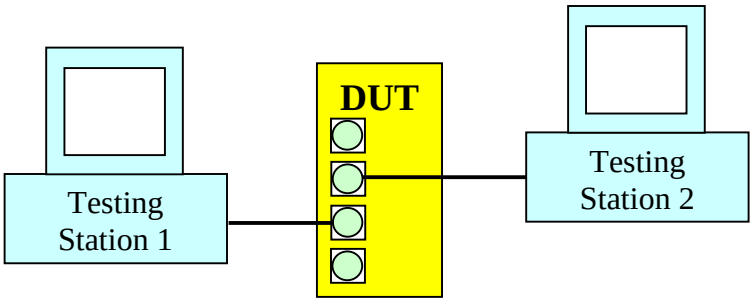

Figure 1

Procedure:

Part a: Receiving LeaveIn event

1. Transmit a GMRP PDU containing a LeaveAll event from Testing Stations 1 and 2.
2. Set Testing Station 1 to capture GMRP PDUs.
3. Transmit a GMRP PDU containing a LeaveIn event for a specific group MAC address from Testing Station 1.

Part b: Verifying Applicant in VO State

4. Transmit a GMRP PDU containing a JoinIn event for the group MAC address used in Step 3 from Testing Station 2.
5. Record the captured frames on Testing Station 1.

Observable Results:

- In Part a, during Step 3, Testing Station 1 should capture a GMRP PDU containing an Empty event for the specified group MAC address. The Applicant for the group MAC address used in Step 3 on the Port connected to Testing Station 1 should have transitioned to the LO state and back to the VO state.
- In Part b, during Step 4, Testing Station 1 should capture two GMRP PDUs containing a JoinEmpty event for the group MAC address used in Step 3. This confirms that the Applicant for the group MAC address used in Step 3 on the Port connected to Testing Station 1 was in the VO state at the end of Part a.

Possible Problems:

- Because the DUT may limit state information to those Attribute values in which the Participant has an immediate interest, an Empty event for the group MAC address used in Step 3 may not be received in Part a.
- Part b does not necessarily verify that the Applicant transitioned to the LO state and back to the VO state.

Test 10.2.3.5 – LeaveEmpty Event Received

Purpose: To verify that the device under test (DUT) exhibits proper behavior when the Applicant for a given Attribute is in the VO state.

References:

- IEEE 802.1D 1998: sub-clauses 12.8.1, 12.8.2
- IEEE 802.1D 1998: Tables 12-3, 12-4

Resource Requirements:

- A Testing Station capable of transmitting and receiving arbitrary MAC frames.

Last Modification: June 28, 2001

Discussion: When a LeaveEmpty event for a given Attribute is received on a Port, an Applicant in the VO state enters the LO state. After the jointimer expires, the transmitPDU! event occurs. The Applicant in the LO state then transmits an Empty message for that Attribute and transitions back to the VO state again. It is possible, however, that an implementation will limit state information to those Attribute values in which the Participant has an immediate interest. Thus a LeaveEmpty event would not necessarily prompt the transmission of an Empty event.

Test Setup: Connect the Testing Station to the DUT as shown in Figure 1. Enable GMRP on the DUT and allow time for it to configure.

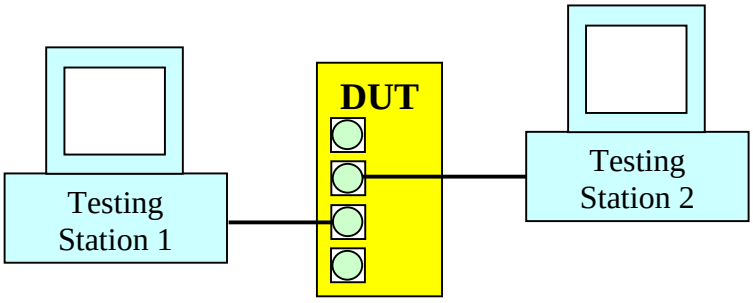

Figure 1

Procedure:

Part a: Receiving LeaveEmpty event

1. Transmit a GMRP PDU containing a LeaveAll event from Testing Stations 1 and 2.
2. Set Testing Station 1 to capture GMRP PDUs.
3. Transmit a GMRP PDU containing a LeaveEmpty event for a specific group MAC address from Testing Station 1.

Part b: Verifying Applicant in VO State

4. Transmit a GMRP PDU containing a JoinIn event for the group MAC address used in Step 3 from Testing Station 2.
5. Record the captured frames on Testing Station 1.

Observable Results:

- In Part a, during Step 3, Testing Station 1 should capture a GMRP PDU containing an Empty event for the specified group MAC address. The Applicant for the group MAC address used in Step 3 on the Port connected to Testing Station 1 should have transitioned to the LO state and back to the VO state.
- In Part b, during Step 4, Testing Station 1 should capture two GMRP PDUs containing a JoinEmpty event for the group MAC address used in Step 3. This confirms that the Applicant for the group MAC address used in Step 3 on the Port connected to Testing Station 1 was in the VO state at the end of Part a.

Possible Problems:

- Because the DUT may limit state information to those Attribute values in which the Participant has an immediate interest, an Empty event for the group MAC address used in Step 3 may not be received in Part a.
- Part b does not necessarily verify that the Applicant transitioned to the LO state and back to the VO state.

Test 10.2.3.6 – LeaveAll Event Received

Purpose: To verify that the device under test (DUT) exhibits proper behavior when the Applicant for a given Attribute is in the VO state.

References:

- IEEE 802.1D 1998: sub-clauses 12.8.1, 12.8.2
- IEEE 802.1D 1998: Tables 12-3, 12-4

Resource Requirements:

- A Testing Station capable of transmitting and receiving arbitrary MAC frames.

Last Modification: June 28, 2001

Discussion: When a LeaveAll event for a given Attribute is received on a Port, an Applicant in the VO state enters the LO state. After the jointimer expires, the transmitPDU! event occurs. The Applicant in the LO state then transmits an Empty message for that Attribute and transitions back to the VO state again. It is possible, however, that an implementation will limit state information to those Attribute values in which the Participant has an immediate interest. Thus a LeaveAll event would not necessarily prompt an Empty event being transmitted for an Attribute the DUT has not yet encountered.

Test Setup: Connect the Testing Station to the DUT as shown in Figure 1. Enable GMRP on the DUT and allow time for it to configure.

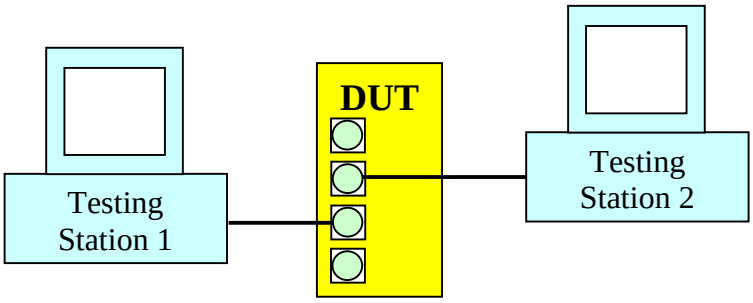

Figure 1

Procedure:

Part a: Receiving LeaveAll event

1. Set Testing Station 1 to capture GMRP PDUs.
2. Transmit a GMRP PDU containing a LeaveAll event from Testing Station 1.

Part b: Verifying Applicant in VO State

3. Transmit a GMRP PDU containing a JoinIn event for a specific group MAC address from Testing Station 2.
4. Record the captured frames on Testing Station 1.

Observable Results:

- In Part a, during Step 2, Testing Station 1 should capture a GMRP PDU containing an Empty event for the group MAC address to be used in Step 3. The Applicant for the group MAC address to be used in Step 3 on the Port connected to Testing Station 1 should have transitioned to the LO state and back to the VO state.
- In Part b, during Step 3, Testing Station 1 should capture two GMRP PDUs containing a JoinEmpty event for the specified group MAC address. This confirms that the Applicant for the group MAC address used in Step 3 on the Port connected to Testing Station 1 was in the VO state at the end of Part a.

Possible Problems:

- Because the DUT may limit state information to those Attribute values in which the Participant has an immediate interest, an Empty event for group MAC address may not be received in Part a.
- Part b does not necessarily verify that the Applicant transitioned to the LO state and back to the VO state.

Test 10.2.3.7 – ReqJoin Event Received

Purpose: To verify that the device under test (DUT) exhibits proper behavior when the Applicant for a given Attribute is in the VO state.

References:

- IEEE 802.1D 1998: sub-clauses 12.8.1, 12.8.2
- IEEE 802.1D 1998: Tables 12-3, 12-4

Resource Requirements:

- A Testing Station capable of transmitting and receiving arbitrary MAC frames.

Last Modification: June 28, 2001

Discussion: When an Applicant in the VO state receives a GID_Join.request from GIP, it transitions to the VP state. When the jointimer expires, the transmitPDU! event occurs. After transmitting a Join event, the Applicant transitions to the AA state. When the jointimer expires a second time, the Applicant transmits another Join event and transitions to the QA state.

Test Setup: Connect the Testing Station to the DUT as shown in Figure 1. Enable GMRP on the DUT and allow time for it to configure.

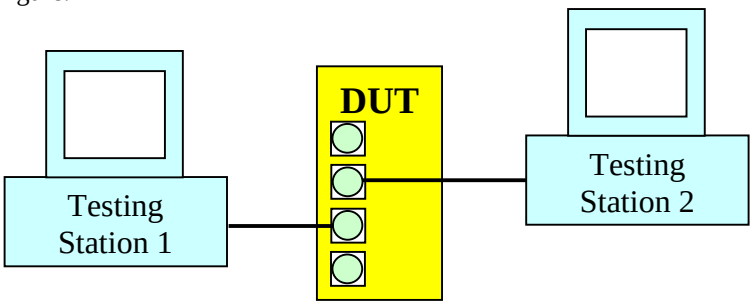

Figure 1

Procedure:

Part a: Receiving GID_Join.request event

1. Transmit a GMRP PDU containing a LeaveAll event from Testing Stations 1 and 2.
2. Set Testing Station 1 to capture GMRP PDUs.
3. Transmit a GMRP PDU containing a JoinIn event for a specific group MAC address from Testing Station 2.

Part b: Verifying Applicant in QA State

4. Transmit a GMRP PDU containing an Empty event for the group MAC address used in Step 3 from Testing Station 1.
5. Record the captured frames on Testing Station 1.

Observable Results:

- In Part a, during Step 3, Testing Station 1 should capture two GMRP PDUs containing a JoinEmpty event for the specified group MAC address. The Applicant for the group MAC address used in Step 3 on the Port connected to Testing Station 1 should have eventually transitioned to the QA state.
- In Part b, during Step 4, Testing Station 1 should capture two GMRP PDUs containing a JoinEmpty event for the group MAC address used in Step 3. This confirms the Applicant for the group MAC address used in Step 3 on the Port connected to Testing Station 1 was in the QA state at the end of Part a.

Possible Problems:

- None.

Group 4: Applicant Behavior in AO State

Scope: The following tests cover the operation of the GMRP Applicant when it is in the AO state.

Overview: These tests are designed to verify that the DUT takes the appropriate actions when messages are received by an Applicant in the AO state. The results of these tests will depend on the state of the Registrar as well. For each test, if no direct observable result from a state transition can be obtained, additional events are sent to obtain a result.

Test 10.2.4.1 – JoinIn Event Received

Purpose: To verify that the device under test (DUT) exhibits proper behavior when the Applicant for a given Attribute is in the AO state.

References:

- IEEE 802.1D 1998: sub-clauses 12.8.1, 12.8.2
- IEEE 802.1D 1998: Tables 12-3, 12-4

Resource Requirements:

- A Testing Station capable of transmitting and receiving arbitrary MAC frames.

Last Modification: June 28, 2001

Discussion: When a JoinIn event for a given Attribute is received by an Applicant in the VO state, it transitions to the AO state. Upon reception of another JoinIn event, an Applicant in the AO state enters the QO state. When an Applicant in the QO state receives a GID_Join.request from GIP, it transitions to the QP state and does not transmit any GMRP PDUs. If an Applicant in the QP state receives an Empty event, it eventually transitions to the QA state after transmitting two GMRP PDUs containing Join events.

Test Setup: Connect the Testing Station to the DUT as shown in Figure 1. Enable GMRP on the DUT and allow time for it to configure.

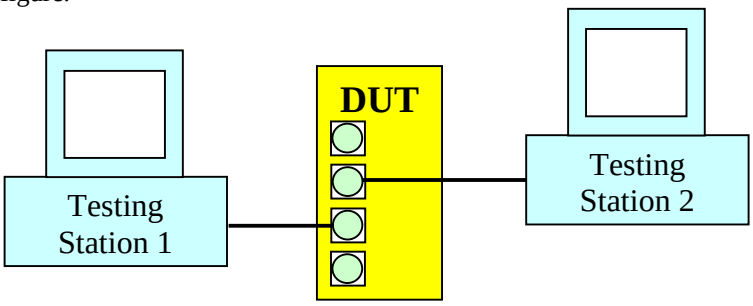

Figure 1

Procedure:

Part a: Receiving JoinIn event

1. Transmit a GMRP PDU containing a LeaveAll event from Testing Stations 1 and 2.
2. Set Testing Station 1 to capture GMRP PDUs.
3. Transmit two GMRP PDUs containing a JoinIn event for a specific group MAC address from Testing Station 1.

Part b: Verifying Applicant in QO State

4. Transmit a GMRP PDU containing a JoinIn event for the group MAC address used in Step 3 from Testing Station 2.
5. Transmit a GMRP PDU containing an Empty event for the group MAC address from Testing Station 1.
6. Record the captured frames on Testing Station 1.

Observable Results:

- In Part a, during Step 3, Testing Station 1 should not capture any GMRP PDUs containing events for the specified group MAC address. The Applicant for the group MAC address used in Step 3 on the Port connected to Testing Station 1 should have transitioned to the QO state.
- In Part b, during Step 4, Testing Station 1 should not capture any GMRP PDUs containing events for the group MAC address used in Step 3. During Step 5, Testing Station 1 should capture two GMRP PDUs containing a

JoinIn event for the group MAC address used in Step 3. This confirms that the Applicant for the group MAC address used in Step 3 on the Port connected to Testing Station 1 transitioned to the QO state in Part a.

Possible Problems:

- None.

Test 10.2.4.2 – JoinEmpty Event Received

Purpose: To verify that the device under test (DUT) exhibits proper behavior when the Applicant for a given Attribute is in the AO state.

References:

- IEEE 802.1D 1998: sub-clauses 12.8.1, 12.8.2
- IEEE 802.1D 1998: Tables 12-3, 12-4

Resource Requirements:

- A Testing Station capable of transmitting and receiving arbitrary MAC frames.

Last Modification: June 28, 2001

Discussion: When a JoinIn event for a given Attribute is received by an Applicant in the VO state, it transitions to the AO state. Upon reception of a JoinEmpty event, an Applicant in the AO state transitions back to the VO state. When an Applicant in the VO state receives a GID_Join.request from GIP, it transitions to the VP state. When the jointimer expires, the transmitPDU! event occurs. After transmitting a Join event, the Applicant transitions to the AA state. When the jointimer expires a second time, the Applicant transmits another Join event and transitions to the QA state.

Test Setup: Connect the Testing Station to the DUT as shown in Figure 1. Enable GMRP on the DUT and allow time for it to configure.

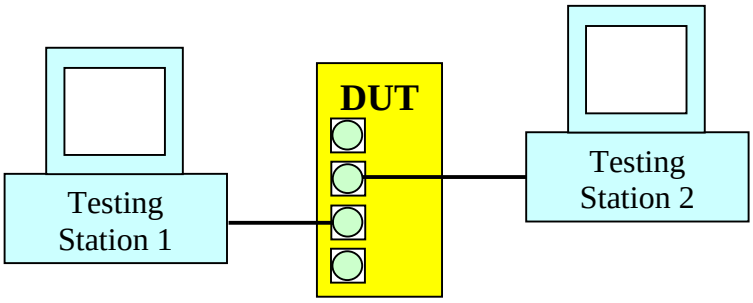

Figure 1

Procedure:

Part a: Receiving JoinIn event

1. Transmit a GMRP PDU containing a LeaveAll event from Testing Stations 1 and 2.
2. Set Testing Station 1 to capture GMRP PDUs.
3. Transmit a GMRP PDU containing a JoinIn event for a specific group MAC address from Testing Station 1.
4. Transmit a GMRP PDU containing a JoinEmpty event for the group MAC address used in Step 3 from Testing Station 1.

Part b: Verifying Applicant in VO State

5. Transmit a GMRP PDU containing a JoinIn event for the group MAC address used in Step 3 from Testing Station 2.
6. Record the captured frames on Testing Station 1.

Observable Results:

- In Part a, during Steps 3 and 4, Testing Station 1 should not capture any GMRP PDUs containing events for the specified group MAC address. The Applicant for the group MAC address used in Step 3 on the Port connected to Testing Station 1.should have transitioned to the VO state.
- In Part b, during Step 5, Testing Station 1 should capture two GMRP PDUs containing a JoinIn event for the group MAC address used in Step 3. This confirms that the Applicant for the group MAC address used in Step 3 on the Port connected to Testing Station 1 transitioned to the VO state in Part a.

Possible Problems:

- None.

Test 10.2.4.3 – Empty Event Received

Purpose: To verify that the device under test (DUT) exhibits proper behavior when the Applicant for a given Attribute is in the AO state.

References:

- IEEE 802.1D 1998: sub-clauses 12.8.1, 12.8.2
- IEEE 802.1D 1998: Tables 12-3, 12-4

Resource Requirements:

- A Testing Station capable of transmitting and receiving arbitrary MAC frames.

Last Modification: June 28, 2001

Discussion: When a JoinIn event for a given Attribute is received by an Applicant in the VO state, it transitions to the AO state. Upon reception of an Empty event, an Applicant in the AO state transitions back to the VO state. When an Applicant in the VO state receives a GID_Join.request from GIP, it transitions to the VP state. When the jointimer expires, the transmitPDU! event occurs. After transmitting a Join event, the Applicant transitions to the AA state. When the jointimer expires a second time, the Applicant transmits another Join event and transitions to the QA state.

Test Setup: Connect the Testing Station to the DUT as shown in Figure 1. Enable GMRP on the DUT and allow time for it to configure.

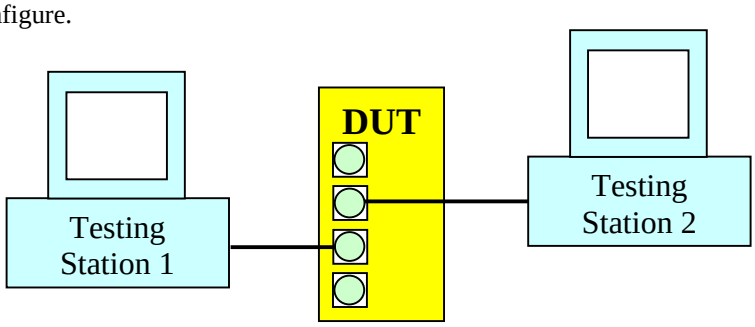

Figure 1

Procedure:

Part a: Receiving Empty event

1. Transmit a GMRP PDU containing a LeaveAll event from Testing Stations 1 and 2.
2. Set Testing Station 1 to capture GMRP PDUs.
3. Transmit a GMRP PDU containing a JoinIn event for a specific group MAC address from Testing Station 1.
4. Transmit a GMRP PDU containing an Empty event for the group MAC address used in Step 3 from Testing Station 1.

Part b: Verifying Applicant in VO State

5. Transmit a GMRP PDU containing a JoinIn event for the group MAC address used in Step 3 from Testing Station 2.
6. Record the captured frames on Testing Station 1.

Observable Results:

- In Part a, during Steps 3 and 4, Testing Station 1 should not capture any GMRP PDUs containing events for the specified group MAC address. The Applicant for the group MAC address used in Step 3 on the Port connected to Testing Station 1.should have transitioned to the VO state.
- In Part b, during Step 5, Testing Station 1 should capture two GMRP PDUs containing a JoinIn event for the group MAC address used in Step 3. This confirms that the Applicant for the group MAC address used in Step 3 on the Port connected to Testing Station 1 transitioned to the VO state in Part a.

Possible Problems:

- None.

Test 10.2.4.4 – LeaveIn Event Received

Purpose: To verify that the device under test (DUT) exhibits proper behavior when the Applicant for a given Attribute is in the AO state.

References:

- IEEE 802.1D 1998: sub-clauses 12.8.1, 12.8.2
- IEEE 802.1D 1998: Tables 12-3, 12-4

Resource Requirements:

- A Testing Station capable of transmitting and receiving arbitrary MAC frames.

Last Modification: June 28, 2001

Discussion: When a JoinIn event for a given Attribute is received by an Applicant in the VO state, it transitions to the AO state. Upon reception of a LeaveIn event, an Applicant in the AO state enters the LO state. After the jointimer expires, the transmitPDU! event occurs. The Applicant in the LO state then transmits an Empty message for that Attribute and transitions to the VO state.

Test Setup: Connect the Testing Station to the DUT as shown in Figure 1. Enable GMRP on the DUT and allow time for it to configure.

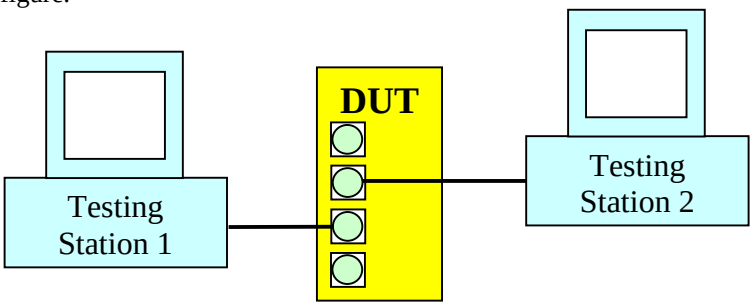

Figure 1

Procedure:

Part a: Receiving LeaveIn event

1. Transmit a GMRP PDU containing a LeaveAll event from Testing Stations 1 and 2.
2. Set Testing Station 1 to capture GMRP PDUs.
3. Transmit a GMRP PDU containing a JoinIn event for a specific group MAC address from Testing Station 1.
4. Transmit a GMRP PDU containing a LeaveIn event for the group MAC address used in Step 3 from Testing Station 1.

Part b: Verifying Applicant in VO State

5. After the leavetimer expires, transmit a GMRP PDU containing a JoinIn event for the group MAC address used in Step 3 from Testing Station 2.
6. Record the captured frames on Testing Station 1.

Observable Results:

- In Part a, during Step 4, Testing Station 1 should capture a GMRP PDU containing an Empty event for the group MAC address used in Step 3. The Applicant for the group MAC address used in Step 3 on the Port connected to Testing Station 1 should have transitioned to the LO state and back to the VO state.
- In Part b, during Step 5, Testing Station 1 should capture two GMRP PDUs containing a JoinEmpty event for the group MAC address used in Step 3. This confirms that the Applicant for the group MAC address used in Step 3 on the Port connected to Testing Station 1 was in the VO state at the end of Part a.

Possible Problems:

- Part b does not necessarily verify that the Applicant transitioned to the LO state and back to the VO state.

Test 10.2.4.5 – LeaveEmpty Event Received

Purpose: To verify that the device under test (DUT) exhibits proper behavior when the Applicant for a given Attribute is in the AO state.

References:

- IEEE 802.1D 1998: sub-clauses 12.8.1, 12.8.2
- IEEE 802.1D 1998: Tables 12-3, 12-4

Resource Requirements:

- A Testing Station capable of transmitting and receiving arbitrary MAC frames.

Last Modification: June 28, 2001

Discussion: When a JoinIn event for a given Attribute is received by an Applicant in the VO state, it transitions to the AO state. Upon reception of a LeaveEmpty event, an Applicant in the AO state enters the LO state. After the jointimer expires, the transmitPDU! event occurs. The Applicant in the LO state then transmits an Empty message for that Attribute and transitions to the VO state.

Test Setup: Connect the Testing Station to the DUT as shown in Figure 1. Enable GMRP on the DUT and allow time for it to configure.

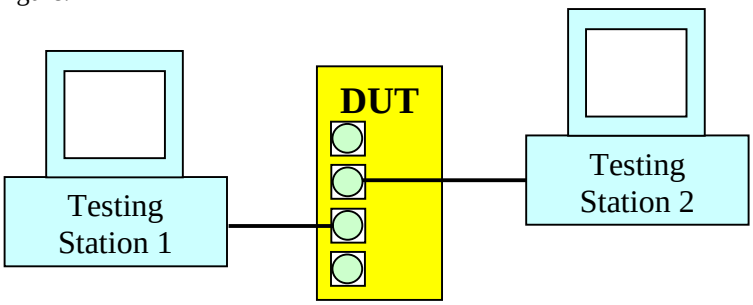

Figure 1

Procedure:

Part a: Receiving LeaveEmpty event

1. Transmit a GMRP PDU containing a LeaveAll event from Testing Stations 1 and 2.
2. Set Testing Station 1 to capture GMRP PDUs.
3. Transmit a GMRP PDU containing a JoinIn event for a specific group MAC address from Testing Station 1.
4. Transmit a GMRP PDU containing a LeaveEmpty event for the group MAC address used in Step 3 from Testing Station 1.

Part b: Verifying Applicant in VO State

5. After the leavetimer expires, transmit a GMRP PDU containing a JoinIn event for the group MAC address used in Step 3 from Testing Station 2.
6. Record the captured frames on Testing Station 1.

Observable Results:

- In Part a, during Step 4, Testing Station 1 should capture a GMRP PDU containing an Empty event for the group MAC address used in Step 3. The Applicant for the group MAC address used in Step 3 on the Port connected to Testing Station 1 should have transitioned to the LO state and back to the VO state.
- In Part b, during Step 5, Testing Station 1 should capture two GMRP PDUs containing a JoinEmpty event for the group MAC address used in Step 3. This confirms that the Applicant for the group MAC address used in Step 3 on the Port connected to Testing Station 1 was in the VO state at the end of Part a.

Possible Problems:

- Part b does not necessarily verify that the Applicant transitioned to the LO state and back to the VO state.

Test 10.2.4.6 – LeaveAll Event Received

Purpose: To verify that the device under test (DUT) exhibits proper behavior when the Applicant for a given Attribute is in the AO state.

References:

- IEEE 802.1D 1998: sub-clauses 12.8.1, 12.8.2
- IEEE 802.1D 1998: Tables 12-3, 12-4

Resource Requirements:

- A Testing Station capable of transmitting and receiving arbitrary MAC frames.

Last Modification: June 28, 2001

Discussion: When a JoinIn event for a given Attribute is received by an Applicant in the VO state, it transitions to the AO state. When a LeaveAll event for a given Attribute is received on a Port, an Applicant in the AO state enters the LO state. After the jointimer expires, the transmitPDU! event occurs. The Applicant in the LO state then transmits an Empty message for that Attribute and transitions back to the VO state again.

Test Setup: Connect the Testing Station to the DUT as shown in Figure 1. Enable GMRP on the DUT and allow time for it to configure.

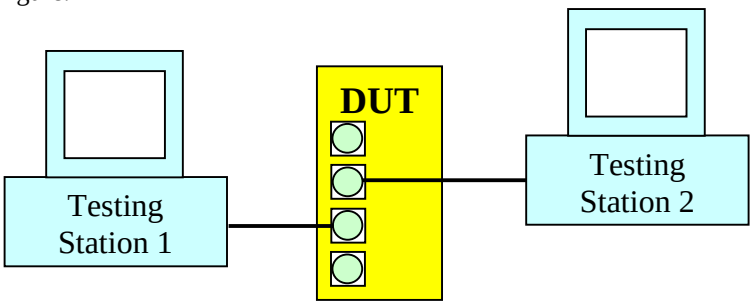

Figure 1

Procedure:

Part a: Receiving LeaveAll event

1. Set Testing Station 1 to capture GMRP PDUs.
2. Transmit a GMRP PDU containing a JoinIn event for a specific group MAC address Testing Station 1.
3. Transmit a GMRP PDU containing a LeaveAll event from Testing Station 1.

Part b: Verifying Applicant in VO State

4. After the leavetimer expires, transmit a GMRP PDU containing a JoinIn event for the group MAC address used in Step 2 from Testing Station 2.
5. Record the captured frames on Testing Station 1.

Observable Results:

- In Part a, during Step 3, Testing Station 1 should capture a GMRP PDU containing an Empty event for the group MAC address used in Step 2. The Applicant for the group MAC address used in Step 2 on the Port connected to Testing Station 1 should have transitioned to the LO state and back to the VO state.
- In Part b, during Step 4, Testing Station 1 should capture two GMRP PDUs containing a JoinEmpty event for the group MAC address used in Step 2. This confirms that the Applicant for the group MAC address used in Step 2 on the Port connected to Testing Station 1 was in the VO state at the end of Part a.

Possible Problems:

- Part b does not necessarily verify that the Applicant transitioned to the LO state and back to the VO state.

Test 10.2.4.7 – ReqJoin Event Received

Purpose: To verify that the device under test (DUT) exhibits proper behavior when the Applicant for a given Attribute is in the AO state.

References:

- IEEE 802.1D 1998: sub-clauses 12.8.1, 12.8.2
- IEEE 802.1D 1998: Tables 12-3, 12-4

Resource Requirements:

- A Testing Station capable of transmitting and receiving arbitrary MAC frames.

Last Modification: June 28, 2001

Discussion: When a JoinIn event for a given Attribute is received by an Applicant in the VO state, it transitions to the AO state. When an Applicant in the AO state receives a GID_Join.request from GIP, it transitions to the AP state. Following the expiry of the jointimer, the Applicant transmits one Join event and transitions to the QA state.

Test Setup: Connect the Testing Station to the DUT as shown in Figure 1. Enable GMRP on the DUT and allow time for it to configure.

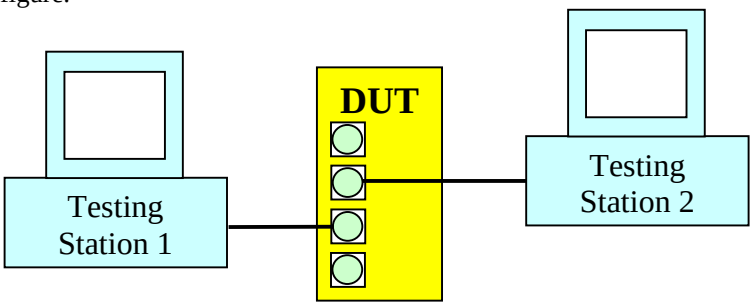

Figure 1

Procedure:

Part a: Receiving GID_Join.request event

1. Transmit a GMRP PDU containing a LeaveAll event from Testing Stations 1 and 2.
2. Set Testing Station 1 to capture GMRP PDUs.
3. Transmit a GMRP PDU containing a JoinIn event for a specific group MAC address from Testing Station 1.
4. Transmit a GMRP PDU containing a JoinIn event for the group MAC address used in Step 3 from Testing Station 2.

Part b: Verifying Applicant in QA State

5. Transmit a GMRP PDU containing an Empty event for the group MAC address used in Step 3 from Testing Station 1.
6. Record the captured frames on Testing Station 1.

Observable Results:

- In Part a, during Step 4, Testing Station 1 should capture one GMRP PDU containing a JoinIn event for the group MAC address used in Step 3. The Applicant for the group MAC address used in Step 3 on the Port connected to Testing Station 1 should have eventually transitioned to the QA state.
- In Part b, during Step 5, Testing Station 1 should capture two GMRP PDUs containing a JoinIn event for the group MAC address used in Step 3. This confirms that the Applicant for the group MAC address used in Step 3 on the Port connected to Testing Station 1 was in the QA state at the end of Part a.

Possible Problems:

- None.

Group 5: Applicant Behavior in QO State

Scope: The following tests cover the operation of the GMRP Applicant when it is in the QO state.

Overview: These tests are designed to verify that the DUT takes the appropriate actions when messages are received by an Applicant in the QO state. The results of these tests will depend on the state of the Registrar as well. For each test, if no direct observable result from a state transition can be obtained, additional events are sent to obtain a result.

Test 10.2.5.1 – JoinIn Event Received

Purpose: To verify that the device under test (DUT) exhibits proper behavior when the Applicant for a given Attribute is in the QO state.

References:

- IEEE 802.1D 1998: sub-clauses 12.8.1, 12.8.2
- IEEE 802.1D 1998: Tables 12-3, 12-4

Resource Requirements:

- A Testing Station capable of transmitting and receiving arbitrary MAC frames.

Last Modification: June 28, 2001

Discussion: When a JoinIn event for a given Attribute is received by an Applicant in the VO state, it transitions to the AO state. Another received JoinIn event causes an Applicant in the AO state to transition to the QO state. An additional JoinIn event causes the Applicant to remain in the QO state. When an Applicant in the QO state receives a GID_Join.request from GIP, it transitions to the QP state and does not transmit an event. If an Applicant in the QP state receives an Empty event it eventually transitions to the QA state after transmitting two GMRP PDUs containing Join events.

Test Setup: Connect the Testing Station to the DUT as shown in Figure 1. Enable GMRP on the DUT and allow time for it to configure.

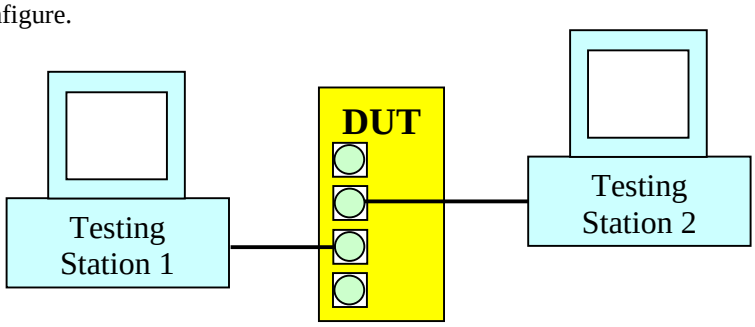

Figure 1

Procedure:

Part a: Receiving JoinIn event

1. Transmit a GMRP PDU containing a LeaveAll event from Testing Stations 1 and 2.
2. Set Testing Station 1 to capture GMRP PDUs.
3. Transmit three GMRP PDUs containing a JoinIn event for a specific group MAC address from Testing Station 1.

Part b: Verifying Applicant in QO State

4. Transmit a GMRP PDU containing a JoinIn event for the group MAC address used in Step 3 from Testing Station 2.
5. Transmit a GMRP PDU containing an Empty event for the group MAC address used in Step 3 from Testing Station 1.
6. Record the captured frames on Testing Station 1.

Observable Results:

- In Part a, during Step 3, Testing Station 1 should not capture any GMRP PDUs containing events for the specified group MAC address. The Applicant for the group MAC address used in Step 3 on the Port connected to Testing Station 1 should have remained in the QO state.
- In Part b, during Step 5, Testing Station 1 should capture two GMRP PDUs containing JoinIn events for the group MAC address used in Step 3. This confirms that the Applicant for the group MAC address used in Step 3 on the Port connected to Testing Station 1 remained in the QO state in Part a.

Possible Problems:

- None.

Test 10.2.5.2 – JoinEmpty Event Received

Purpose: To verify that the device under test (DUT) exhibits proper behavior when the Applicant for a given Attribute is in the QO state.

References:

- IEEE 802.1D 1998: sub-clauses 12.8.1, 12.8.2
- IEEE 802.1D 1998: Tables 12-3, 12-4

Resource Requirements:

- A Testing Station capable of transmitting and receiving arbitrary MAC frames.

Last Modification: June 28, 2001

Discussion: When a JoinIn event for a given Attribute is received by an Applicant in the VO state, it transitions to the AO state. Another received JoinIn event causes an Applicant in the AO state to transition to the QO state. Upon reception of a JoinEmpty event, an Applicant in the QO state enters the VO state. If an Applicant in the VO state receives a GID_Join.request from GIP, it transitions to the VP state. When the jointimer expires, the transmitPDU! event occurs. The Applicant in the VP state transmits a Join event and transitions to the AA state. When the jointimer expires again, the Applicant transmits another Join event and transitions to the QA state.

Test Setup: Connect the Testing Station to the DUT as shown in Figure 1. Enable GMRP on the DUT and allow time for it to configure.

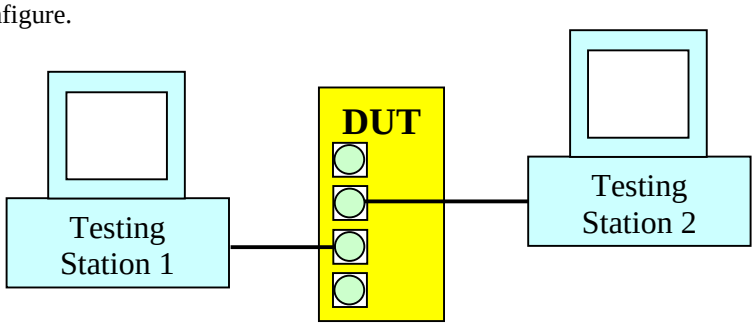

Figure 1

Procedure:

Part a: Receiving JoinEmpty event

1. Transmit a GMRP PDU containing a LeaveAll event from Testing Stations 1 and 2.
2. Set Testing Station 1 to capture GMRP PDUs.
3. Transmit two GMRP PDUs containing a JoinIn event for a specific group MAC address from Testing Station 1.
4. Transmit a GMRP PDU containing a JoinEmpty event for the group MAC address used in Step 3 from Testing Station 1.

Part b: Verifying Applicant in VO State

5. Transmit a GMRP PDU containing a JoinIn event for the group MAC address used in Step 3 from Testing Station 2.
6. Record the captured frames on Testing Station 1.

Observable Results:

- In Part a, during Steps 3 and 4, Testing Station 1 should not capture any GMRP PDUs containing events for the specified group MAC address. The Applicant for the group MAC address used in Step 3 on the Port connected to Testing Station 1 should have transitioned to the VO state.
- In Part b, during Step 5, Testing Station 1 should capture two GMRP PDUs containing JoinIn events for the group MAC address used in Step 3. This confirms that the Applicant for the group MAC address used in Step 3 on the Port connected to Testing Station 1 transitioned to the VO state in Part a.

Possible Problems:

- None.

Test 10.2.5.3 – Empty Event Received

Purpose: To verify that the device under test (DUT) exhibits proper behavior when the Applicant for a given Attribute is in the QO state.

References:

- IEEE 802.1D 1998: sub-clauses 12.8.1, 12.8.2
- IEEE 802.1D 1998: Tables 12-3, 12-4

Resource Requirements:

- A Testing Station capable of transmitting and receiving arbitrary MAC frames.

Last Modification: June 28, 2001

Discussion: When a JoinIn event for a given Attribute is received by an Applicant in the VO state, it transitions to the AO state. Another received JoinIn event causes an Applicant in the AO state to transition to the QO state. Upon reception of an Empty event, an Applicant in the QO state enters the VO state. If an Applicant in the VO state receives a GID_Join.request from GIP, it transitions to the VP state. When the jointimer expires, the transmitPDU! event occurs. The Applicant in the VP state transmits a Join event and transitions to the AA state. When the jointimer expires again, the Applicant transmits another Join event and transitions to the QA state.

Test Setup: Connect the Testing Station to the DUT as shown in Figure 1. Enable GMRP on the DUT and allow time for it to configure.

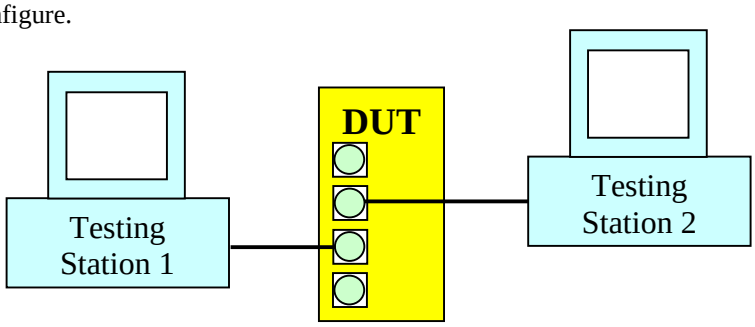

Figure 1

Procedure:

Part a: Receiving Empty event

1. Transmit a GMRP PDU containing a LeaveAll event from Testing Stations 1 and 2.
2. Set Testing Station 1 to capture GMRP PDUs.
3. Transmit two GMRP PDUs containing a JoinIn event for a specific group MAC address from Testing Station 1.
4. Transmit a GMRP PDU containing an Empty event for the group MAC address used in Step 3 from Testing Station 1.

Part b: Verifying Applicant in VO State

5. Transmit a GMRP PDU containing a JoinIn event for the group MAC address used in Step 3 from Testing Station 2.
6. Record the captured frames on Testing Station 1.

Observable Results:

- In Part a, during Steps 3 and 4, Testing Station 1 should not capture any GMRP PDUs containing events for the specified group MAC address. The Applicant for the group MAC address used in Step 3 on the Port connected to Testing Station 1 should have transitioned to the VO state.
- In Part b, during Step 5, Testing Station 1 should capture two GMRP PDUs containing a JoinIn event for the group MAC address used in Step 3. This confirms that the Applicant for the group MAC address used in Step 3 on the Port connected to Testing Station 1 transitioned to the VO state in Part a.

Possible Problems:

- None.

Test 10.2.5.4 – LeaveIn Event Received

Purpose: To verify that the device under test (DUT) exhibits proper behavior when the Applicant for a given Attribute is in the QO state.

References:

- IEEE 802.1D 1998: sub-clauses 12.8.1, 12.8.2
- IEEE 802.1D 1998: Tables 12-3, 12-4

Resource Requirements:

- A Testing Station capable of transmitting and receiving arbitrary MAC frames.

Last Modification: June 28, 2001

Discussion: When a JoinIn event for a given Attribute is received by an Applicant in the VO state, it transitions to the AO state. Another received JoinIn event causes an Applicant in the AO state to transition to the QO state. Upon reception of a LeaveIn event, an Applicant in the QO state enters the LO state. After the jointimer expires, the transmitPDU! event occurs. The Applicant in the LO state then transmits an Empty message for that Attribute and transitions to the VO state.

Test Setup: Connect the Testing Station to the DUT as shown in Figure 1. Enable GMRP on the DUT and allow time for it to configure.

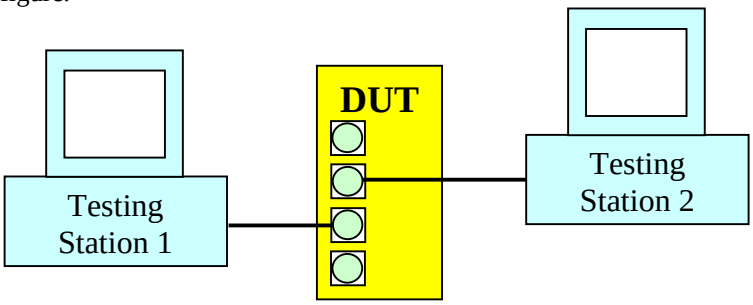

Figure 1

Procedure:

Part a: Receiving LeaveIn event

1. Transmit a GMRP PDU containing a LeaveAll event from Testing Stations 1 and 2.
2. Set Testing Station 1 to capture GMRP PDUs.
3. Transmit two GMRP PDUs containing a JoinIn event for a specific group MAC address from Testing Station 1.
4. Transmit a GMRP PDU containing a LeaveIn event for the group MAC address used in Step 3 from Testing Station 1.

Part b: Verifying Applicant in VO State

5. After the leavetimer expires, transmit a GMRP PDU containing a JoinIn event for the group MAC address used in Step 3 from Testing Station 2.
6. Record the captured frames on Testing Station 1.

Observable Results:

- In Part a, during Step 4, Testing Station 1 should capture a GMRP PDU containing an Empty event for the group MAC address used in Step 3. The Applicant for the group MAC address used in Step 3 on the Port connected to Testing Station 1 should have transitioned to the LO state and back to the VO state.
- In Part b, during Step 5, Testing Station 1 should capture two GMRP PDUs containing a JoinEmpty event for the group MAC address used in Step 3. This confirms that the Applicant for the group MAC address used in Step 3 on the Port connected to Testing Station 1 was in the VO state at the end of Part a.

Possible Problems:

- Part b does not necessarily verify that the Applicant transitioned to the LO state and back to the VO state.

Test 10.2.5.5 – LeaveEmpty Event Received

Purpose: To verify that the device under test (DUT) exhibits proper behavior when the Applicant for a given Attribute is in the QO state.

References:

- IEEE 802.1D 1998: sub-clauses 12.8.1, 12.8.2
- IEEE 802.1D 1998: Tables 12-3, 12-4

Resource Requirements:

- A Testing Station capable of transmitting and receiving arbitrary MAC frames.

Last Modification: June 28, 2001

Discussion: When a JoinIn event for a given Attribute is received by an Applicant in the VO state, it transitions to the AO state. Another received JoinIn event causes an Applicant in the AO state to transition to the QO state. Upon reception of a LeaveEmpty event, an Applicant in the QO state enters the LO state. After the jointimer expires, the transmitPDU! event occurs. The Applicant in the LO state then transmits an Empty message for that Attribute and transitions to the VO state.

Test Setup: Connect the Testing Station to the DUT as shown in Figure 1. Enable GMRP on the DUT and allow time for it to configure.

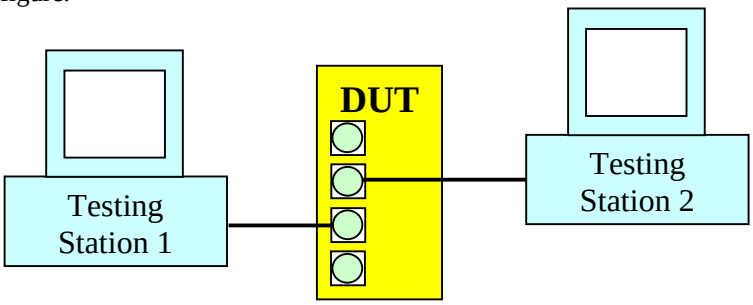

Figure 1

Procedure:

Part a: Receiving LeaveEmpty event

1. Transmit a GMRP PDU containing a LeaveAll event from Testing Stations 1 and 2.
2. Set Testing Station 1 to capture GMRP PDUs.
3. Transmit two GMRP PDUs containing a JoinIn event for a specific group MAC address from Testing Station 1.
4. Transmit a GMRP PDU containing a LeaveEmpty event for the group MAC address used in Step 3 from Testing Station 1.

Part b: Verifying Applicant in VO State

5. After the leavetimer expires, transmit a GMRP PDU containing a JoinIn event for the group MAC address used in Step 3 from Testing Station 2.
6. Record the captured frames on Testing Station 1.

Observable Results:

- In Part a, during Step 4, Testing Station 1 should capture a GMRP PDU containing an Empty event for the group MAC address used in Step 3. The Applicant for the group MAC address used in Step 3 on the Port connected to Testing Station 1 should have transitioned to the LO state and back to the VO state.
- In Part b, during Step 5, Testing Station 1 should capture two GMRP PDUs containing a JoinEmpty event for the group MAC address used in Step 3. This confirms that the Applicant for the group MAC address used in Step 3 on the Port connected to Testing Station 1 was in the VO state at the end of Part a.

Possible Problems:

- Part b does not necessarily verify that the Applicant transitioned to the LO state and back to the VO state.

Test 10.2.5.6 – LeaveAll Event Received

Purpose: To verify that the device under test (DUT) exhibits proper behavior when the Applicant for a given Attribute is in the QO state.

References:

- IEEE 802.1D 1998: sub-clauses 12.8.1, 12.8.2
- IEEE 802.1D 1998: Tables 12-3, 12-4

Resource Requirements:

- A Testing Station capable of transmitting and receiving arbitrary MAC frames.

Last Modification: June 28, 2001

Discussion: When a JoinIn event for a given Attribute is received by an Applicant in the VO state, it transitions to the AO state. Another received JoinIn event causes an Applicant in the AO state to transition to the QO state. Upon reception of a LeaveAll event, an Applicant in the QO state enters the LO state. After the jointimer expires, the transmitPDU! event occurs. The Applicant in the LO state then transmits an Empty message for that Attribute and transitions to the VO state.

Test Setup: Connect the Testing Station to the DUT as shown in Figure 1. Enable GMRP on the DUT and allow time for it to configure.

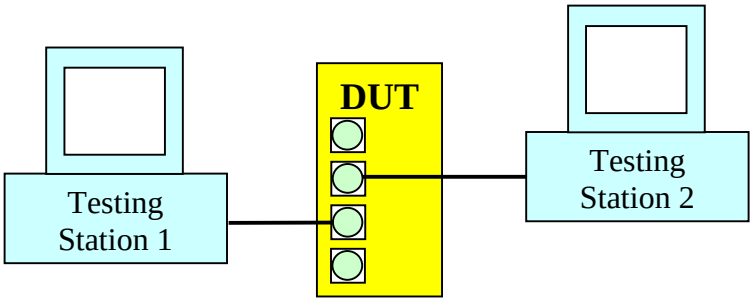

Figure 1

Procedure:

Part a: Receiving LeaveAll event

1. Set Testing Station 1 to capture GMRP PDUs.
2. Transmit two GMRP PDUs containing a JoinIn event for a specific group MAC address from Testing Station 1.
3. Transmit a GMRP PDU containing a LeaveAll event from Testing Station 1.

Part b: Verifying Applicant in VO State

4. After the leavetimer expires, transmit a GMRP PDU containing a JoinIn event for the group MAC address used in Step 2 from Testing Station 2.
5. Record the captured frames on Testing Station 1.

Observable Results:

- In Part a, during Step 3, Testing Station 1 should capture a GMRP PDU containing an Empty event for the group MAC address used in Step 2. The Applicant for the group MAC address used in Step 2 on the Port connected to Testing Station 1 should have transitioned to the LO state and back to the VO state.
- In Part b, during Step 4, Testing Station 1 should capture two GMRP PDUs containing a JoinEmpty event for the group MAC address used in Step 2. This confirms that the Applicant for the group MAC address used in Step 2 on the Port connected to Testing Station 1 was in the VO state at the end of Part a.

Possible Problems:

- Part b does not necessarily verify that the Applicant transitioned to the LO state and back to the VO state.

Test 10.2.5.7 – ReqJoin Event Received

Purpose: To verify that the device under test (DUT) exhibits proper behavior when the Applicant for a given Attribute is in the QO state.

References:

- IEEE 802.1D 1998: sub-clauses 12.8.1, 12.8.2
- IEEE 802.1D 1998: Tables 12-3, 12-4

Resource Requirements:

- A Testing Station capable of transmitting and receiving arbitrary MAC frames.

Last Modification: June 28, 2001

Discussion: When a JoinIn event for a given Attribute is received by an Applicant in the VO state, it transitions to the AO state. Another received JoinIn event causes an Applicant in the AO state to transition to the QO state. When an Applicant in the QO state receives a GID_Join.request from GIP, it transitions to the QP state and does not transmit any Join events.

Test Setup: Connect the Testing Station to the DUT as shown in Figure 1. Enable GMRP on the DUT and allow time for it to configure.

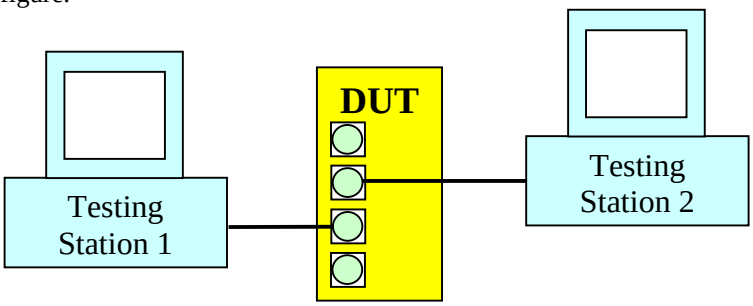

Figure 1

Procedure:

Part a: Receiving GID_Join.request event

1. Transmit a GMRP PDU containing a LeaveAll event from Testing Stations 1 and 2.
2. Set Testing Station 1 to capture GMRP PDUs.
3. Transmit two GMRP PDUs containing a JoinIn event for a specific group MAC address from Testing Station 1.
4. Transmit a GMRP PDU containing a JoinIn event for the group MAC address used in Step 3 from Testing Station 2.

Part b: Verifying Applicant in QP State

5. Transmit a GMRP PDU containing an Empty event for the group MAC address used in Step 3 from Testing Station 1.
6. Record the captured frames on Testing Station 1.

Observable Results:

- In Part a, during Step 4, Testing Station 1 should not capture any GMRP PDUs containing events for the group MAC address used in Step. The Applicant for the group MAC address used in Step 3 on the Port connected to Testing Station 1 should have transitioned to the QP state.
- In Part b, during Step 5, Testing Station 1 should capture two GMRP PDUs containing a JoinIn event for the group MAC address used in Step 3. This confirms that the Applicant for the group MAC address used in Step 3 on the Port connected to Testing Station 1 was in the QP state at the end of Part a.

Possible Problems:

- None.

Group 6: Applicant Behavior in QA State

Scope: The following tests cover the operation of the GMRP Applicant when it is in the QA state.

Overview: These tests are designed to verify that the DUT takes the appropriate actions when messages are received by an Applicant in the QA state. The results of these tests will depend on the state of the Registrar as well. For each test, if no direct observable result from a state transition can be obtained, additional events are sent to obtain a result.

Test 10.2.6.1 – JoinIn Event Received

Purpose: To verify that the device under test (DUT) exhibits proper behavior when the Applicant for a given Attribute is in the QA state.

References:

- IEEE 802.1D 1998: sub-clauses 12.8.1, 12.8.2
- IEEE 802.1D 1998: Tables 12-3, 12-4

Resource Requirements:

- A Testing Station capable of transmitting and receiving arbitrary MAC frames.

Last Modification: June 28, 2001

Discussion: When an Applicant in the VO state receives a GID_Join.request from GIP, it transitions to the QA after transmitting two GMRP PDUs containing Join events. When a JoinIn event is received by an Applicant in the QA state, that Applicant should remain in the QA state and not transmit any GARP PDUs.

Test Setup: Connect the Testing Station to the DUT as shown in Figure 1. Enable GMRP on the DUT and allow time for it to configure.

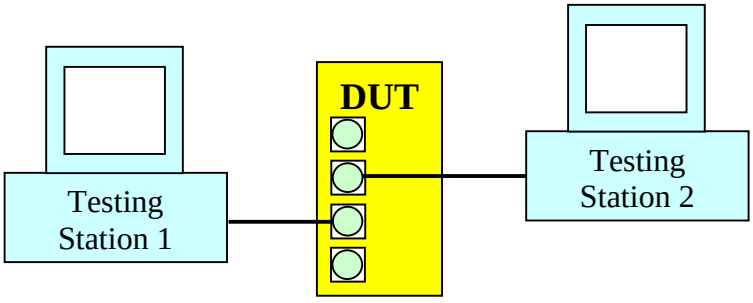

Figure 1

Procedure:

Part a: Receiving JoinIn event

1. Transmit a GMRP PDU containing a LeaveAll event from Testing Stations 1 and 2.
2. Set Testing Station 1 to capture GMRP PDUs.
3. Transmit a GMRP PDU containing a JoinIn event for a specific group MAC address from Testing Station 2.
4. Transmit a GMRP PDU containing a JoinIn event for the group MAC address used in Step 3 from Testing Station 1.

Part b: Verifying Applicant in QA State

5. Transmit a GMRP PDU containing an Empty event for the group MAC address used in Step 3 from Testing Station 1.
6. Record the captured frames on Testing Station 1.

Observable Results:

- In Part a, during Step 3, Testing Station 1 should capture two GMRP PDUs containing a JoinEmpty event for the specified group MAC address. During Step 4, Testing Station 1 should not capture any GMRP PDUs containing events for the group MAC address used in Step 3. The Applicant for the group MAC address used in Step 3 on the Port connected to the Testing Station 1 should have remained in the QA state.
- In Part b, during Step 5, Testing Station should capture two GMRP PDUs containing a JoinIn event for the group MAC address used in Step 3. This confirms that the Applicant for the group MAC address used in Step 3 on the Port connected to Testing Station 1 was in the QA state at the end of Part a.

Possible Problems:

- None.

Test 10.2.6.2 – JoinEmpty Event Received

Purpose: To verify that the device under test (DUT) exhibits proper behavior when the Applicant for a given Attribute is in the QA state.

References:

- IEEE 802.1D 1998: sub-clauses 12.8.1, 12.8.2
- IEEE 802.1D 1998: Tables 12-3, 12-4

Resource Requirements:

- A Testing Station capable of transmitting and receiving arbitrary MAC frames.

Last Modification: June 28, 2001

Discussion: When an Applicant in the VO state receives a GID_Join.request from GIP, it transitions to the QA after transmitting two GMRP PDUs containing Join events. When a JoinEmpty event is received by an Applicant in the QA state, that Applicant should enter the VA state. Upon expiry of the jointimer, the transmitPDU! event occurs. The Applicant should then transmit a Join event and transition to the AA state. After the jointimer expires again, the Applicant should transmit another Join event and transition back to the QA state.

Test Setup: Connect the Testing Station to the DUT as shown in Figure 1. Enable GMRP on the DUT and allow time for it to configure.

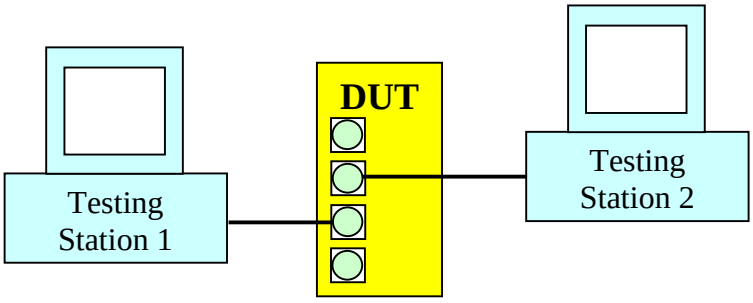

Figure 1

Procedure:

1. Transmit a GMRP PDU containing a LeaveAll event from Testing Stations 1 and 2.
2. Set Testing Station 1 to capture GMRP PDUs.
3. Transmit a GMRP PDU containing a JoinIn event for a specific group MAC address from Testing Station 2.
4. Transmit a GMRP PDU containing a JoinEmpty event for the group MAC address used in Step 3 from Testing Station 1.

Observable Results:

- During Step 3, Testing Station 1 should capture two GMRP PDUs containing a JoinEmpty event for the specified group MAC address. During Step 4, Testing Station 1 should capture two GMRP PDUs containing a JoinIn event for the group MAC address used in Step 3. The Applicant for the group MAC address used in Step 3 on the Port connected to Testing Station 1 should have eventually transitioned to the QA state.

Possible Problems:

- None.

Test 10.2.6.3 – Empty Event Received

Purpose: To verify that the device under test (DUT) exhibits proper behavior when the Applicant for a given Attribute is in the QA state.

References:

- IEEE 802.1D 1998: sub-clauses 12.8.1, 12.8.2
- IEEE 802.1D 1998: Tables 12-3, 12-4

Resource Requirements:

- A Testing Station capable of transmitting and receiving arbitrary MAC frames.

Last Modification: June 28, 2001

Discussion: When an Applicant in the VO state receives a GID_Join.request from GIP, it transitions to the QA after transmitting two GMRP PDUs containing Join events. When an Empty event is received by an Applicant in the QA state, that Applicant should enter the VA state. Upon expiry of the jointimer, the transmitPDU! event occurs. The Applicant should then transmit a Join event and transition to the AA state. After the jointimer expires again, the Applicant should transmit another Join event and transition back to the QA state.

Test Setup: Connect the Testing Station to the DUT as shown in Figure 1. Enable GMRP on the DUT and allow time for it to configure.

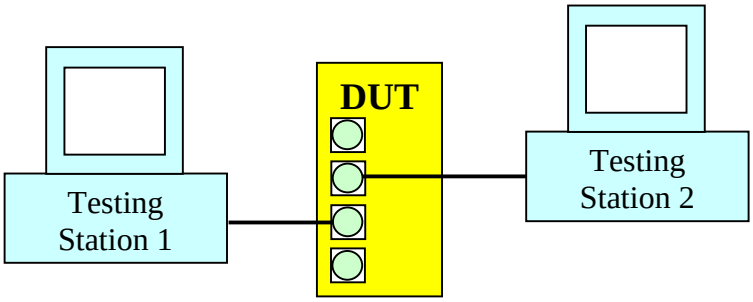

Figure 1

Procedure:

1. Transmit a GMRP PDU containing a LeaveAll event from Testing Stations 1 and 2.
2. Set Testing Station 1 to capture GMRP PDUs.
3. Transmit a GMRP PDU containing a JoinIn event for a specific group MAC address from Testing Station 2.
4. Transmit a GMRP PDU containing an Empty event for the group MAC address used in Step 3 from Testing Station 1.

Observable Results:

- In Part a, during Step 3, Testing Station 1 should capture two GMRP PDUs containing a JoinEmpty event for the specified group MAC address. During Step 4, Testing Station 1 should capture two GMRP PDUs containing a JoinEmpty event for the group MAC address used in Step 3. The Applicant for the group MAC address used in Step 3 on the Port connected to Testing Station 1 should have eventually transitioned to the QA state.

Possible Problems:

- None.

Test 10.2.6.4 – LeaveIn Event Received

Purpose: To verify that the device under test (DUT) exhibits proper behavior when the Applicant for a given Attribute is in the QA state.

References:

- IEEE 802.1D 1998: sub-clauses 12.8.1, 12.8.2
- IEEE 802.1D 1998: Tables 12-3, 12-4

Resource Requirements:

- A Testing Station capable of transmitting and receiving arbitrary MAC frames.

Last Modification: June 28, 2001

Discussion: When an Applicant in the VO state receives a GID_Join.request from GIP, it transitions to the QA after transmitting two GMRP PDUs containing Join events. When a LeaveIn event is received by an Applicant in the QA state, that Applicant should enter the VA state. Upon expiry of the jointimer, the transmitPDU! event occurs. The Applicant should then transmit a Join event and transition to the AA state. After the jointimer expires again, the Applicant should transmit another Join event and transition back to the QA state.

Test Setup: Connect the Testing Station to the DUT as shown in Figure 1. Enable GMRP on the DUT and allow time for it to configure.

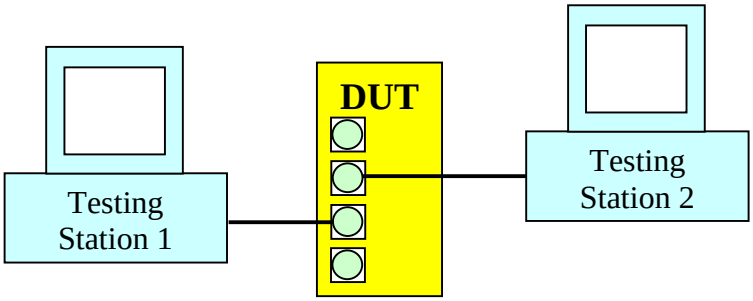

Figure 1

Procedure:

1. Transmit a GMRP PDU containing a LeaveAll event from Testing Stations 1 and 2.
2. Set Testing Station 1 to capture GMRP PDUs.
3. Transmit a GMRP PDU containing a JoinIn event for a specific group MAC address from Testing Station 2.
4. Transmit a GMRP PDU containing a LeaveIn event for the group MAC address used in Step 3 from Testing Station 1.

Observable Results:

- In Part a, during Step 3, Testing Station 1 should capture two GMRP PDUs containing a JoinEmpty event for the specified group MAC address. During Step 4, Testing Station 1 should capture two GMRP PDUs containing a JoinEmpty event for the group MAC address used in Step 3. The Applicant for the group MAC address used in Step 3 on the Port connected to Testing Station 1 should have eventually transitioned to the QA state.

Possible Problems:

- None.

Test 10.2.6.5 – LeaveEmpty Event Received

Purpose: To verify that the device under test (DUT) exhibits proper behavior when the Applicant for a given Attribute is in the QA state.

References:

- IEEE 802.1D 1998: sub-clauses 12.8.1, 12.8.2
- IEEE 802.1D 1998: Tables 12-3, 12-4

Resource Requirements:

- A Testing Station capable of transmitting and receiving arbitrary MAC frames.

Last Modification: June 28, 2001

Discussion: When an Applicant in the VO state receives a GID_Join.request from GIP, it transitions to the QA after transmitting two GMRP PDUs containing Join events. When a LeaveEmpty event is received by an Applicant in the QA state, that Applicant should enter the VP state. Upon expiry of the jointimer, the transmitPDU! event occurs. The Applicant should then transmit a Join event and transition to the AA state. After the jointimer expires again, the Applicant should transmit another Join event and transition back to the QA state.

Test Setup: Connect the Testing Station to the DUT as shown in Figure 1. Enable GMRP on the DUT and allow time for it to configure.

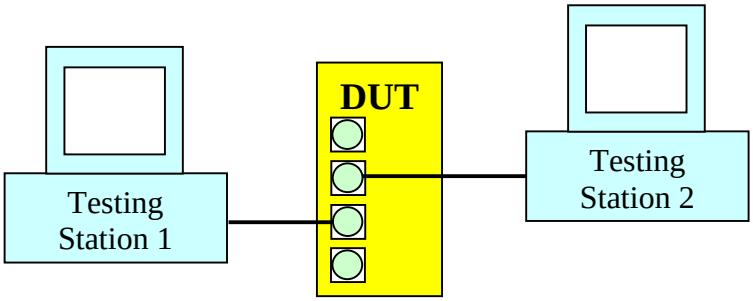

Figure 1

Procedure:

1. Transmit a GMRP PDU containing a LeaveAll event from Testing Stations 1 and 2.
2. Set Testing Station 1 to capture GMRP PDUs.
3. Transmit a GMRP PDU containing a JoinIn event for a specific group MAC address from Testing Station 2.
4. Transmit a GMRP PDU containing a LeaveEmpty event for the group MAC address used in Step 3 from Testing Station 1.

Observable Results:

- In Part a, during Step 3, Testing Station 1 should capture two GMRP PDUs containing a JoinEmpty event for the specified group MAC address. During Step 4, Testing Station 1 should capture two GMRP PDUs containing a JoinEmpty event for the group MAC address used in Step 3. The Applicant for the group MAC address used in Step 3 on the Port connected to Testing Station 1 should have eventually transitioned to the QA state.

Possible Problems:

- None.

Test 10.2.6.6 – LeaveAll Event Received

Purpose: To verify that the device under test (DUT) exhibits proper behavior when the Applicant for a given Attribute is in the QA state..

References:

- IEEE 802.1D 1998: sub-clauses 12.8.1, 12.8.2
- IEEE 802.1D 1998: Tables 12-3, 12-4

Resource Requirements:

- A Testing Station capable of transmitting and receiving arbitrary MAC frames.

Last Modification: June 28, 2001

Discussion: When an Applicant in the VO state receives a GID_Join.request from GIP, it transitions to the QA after transmitting two GMRP PDUs containing Join events. When a LeaveAll event is received by an Applicant in the QA state, that Applicant should enter the VP state. Upon expiry of the jointimer, the transmitPDU! event occurs. The Applicant should then transmit a Join event and transition to the AA state. After the jointimer expires again, the Applicant should transmit another Join event and transition back to the QA state.

Test Setup: Connect the Testing Station to the DUT as shown in Figure 1. Enable GMRP on the DUT and allow time for it to configure.

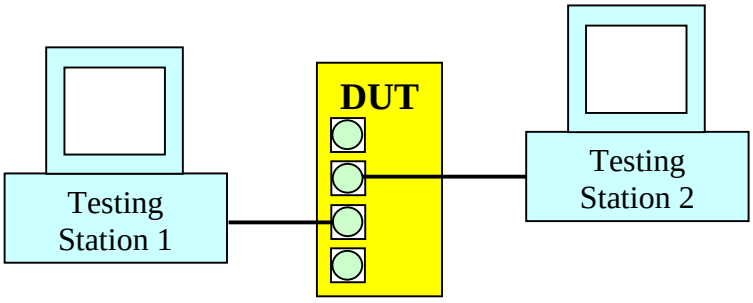

Figure 1

Procedure:

1. Transmit a GMRP PDU containing a LeaveAll event from Testing Stations 1 and 2.
2. Set Testing Station 1 to capture GMRP PDUs.
3. Transmit a GMRP PDU containing a JoinIn event for a specific group MAC address from Testing Station 2.
4. Transmit a GMRP PDU containing a LeaveAll event for the group MAC address used in Step 3 from Testing Station 1.

Observable Results:

- In Part a, during Step 3, Testing Station 1 should capture two GMRP PDUs containing a JoinEmpty event for the specified group MAC address. During Step 4, Testing Station 1 should capture two GMRP PDUs containing a JoinEmpty event for the group MAC address used in Step 3. The Applicant for the group MAC address used in Step 3 on the Port connected to Testing Station 1 should have eventually transitioned to the QA state.

Possible Problems:

- None.

Test 10.2.6.7 – ReqJoin Event Received

Purpose: To verify that the device under test (DUT) exhibits proper behavior when the Applicant for a given Attribute is in the QA state.

References:

- IEEE 802.1D 1998: sub-clauses 12.3.3, 12.8.1, 12.8.2
- IEEE 802.1D 1998: Tables 12-3, 12-4

Resource Requirements:

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

Last Modification: June 28, 2001

Discussion: When an Applicant in the VO state receives a GID_Join.request from GIP, it transitions to the QA after transmitting two GMRP PDUs containing Join events. If an Applicant in the QA state receives additional GID_Join.request events, it takes no further action. Although this is an inapplicable event/state combination, this test ensures that the Applicant does not transition out of the QA state or transmit any GMRP PDUs.

Test Setup: Connect the Testing Stations to the DUT as shown in Figure 1. Enable GMRP on the DUT and allow time for it to configure.

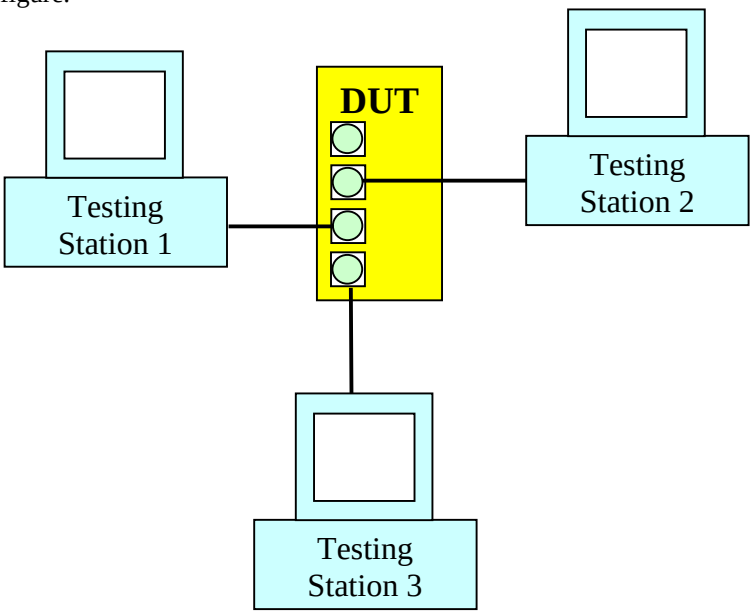

Figure 1

Procedure:

Part a: Receiving GID_Join.request event

1. Transmit a GMRP PDU containing a LeaveAll event from Testing Stations 1, 2, and 3.
2. Set Testing Station 1 to capture GMRP PDUs.
3. Transmit a GMRP PDU containing a JoinIn event for a specific group MAC address from Testing Station 2.
4. Transmit a GMRP PDU containing a JoinIn event for the group MAC address used in Step 3 from Testing Station 3.

Part b: Verifying Applicant in QA State

5. Transmit a GMRP PDU containing an Empty event for the group MAC address used in Step 3 from Testing Station 1.
6. Record the captured frames on Testing Station 1.

Observable Results:

- In Part a, during Step 3, Testing Station 1 should capture two GMRP PDUs containing a JoinEmpty event for the specified group MAC address. During Step 4, Testing Station 1 should not capture any GMRP PDUs containing events for the group MAC address used in Step 3. The Applicant for the group MAC address used in Step 3 on the Port connected to Testing Station 1 should remain in the QA state.
- In Part b, during Step 5, Testing Station 1 should capture two GMRP PDUs containing a JoinEmpty event for the group MAC address used in Step 3. This confirms the Applicant for the group MAC address used in Step 3 on the Port connected to Testing Station 1 was in the QA state at the end of Part a.

Possible Problems:

- None.

Test 10.2.6.8 – ReqLeave Event Received

Purpose: To verify that the device under test (DUT) exhibits proper behavior when the Applicant for a given Attribute is in the QA state.

References:

- IEEE 802.1D 1998: sub-clauses 12.8.1, 12.8.2
- IEEE 802.1D 1998: Tables 12-3, 12-4

Resource Requirements:

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

Last Modification: June 28, 2001

Discussion: When an Applicant in the VO state receives a GID_Join.request from GIP, it transitions to the QA after transmitting two GMRP PDUs containing Join events. A GID_Leave.request received by the Applicant causes it to transition to the LA state. When the jointimer expires, the transmitPDU! event occurs. The Applicant transmits a LeaveEmpty event and transitions to the VO state.

Test Setup: Connect the Testing Stations to the DUT as shown in Figure 1. Enable GMRP on the DUT and allow time for it to configure.

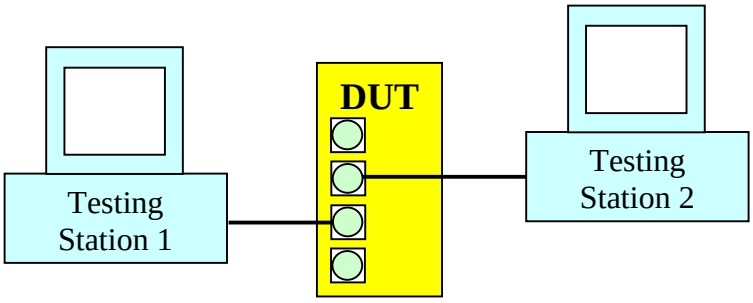

Figure 1

Procedure:

Part a: Receiving GID_Leave.request event

1. Transmit a GMRP PDU containing a LeaveAll event from Testing Stations 1 and 2.
2. Set Testing Station 1 to capture GMRP PDUs.
3. Transmit a GMRP PDU containing a JoinIn event for a specific group MAC address from Testing Station 2.
4. Transmit a GMRP PDU containing a LeaveEmpty event for the group MAC address used in Step 3 from Testing Station 2.

Part b: Verifying Applicant in VO State

5. After the leavetimer has expired, transmit a GMRP PDU containing a JoinIn event for the group MAC address used in Step 3 from Testing Station 2.
6. Record the captured frames on Testing Station 1.

Observable Results:

- In Part a, during Step 3, Testing Station 1 should capture two GMRP PDUs containing a JoinEmpty event for the specified group MAC address. During Step 4, Testing Station 1 should capture a GMRP PDU containing a LeaveEmpty event for the group MAC address used in Step 3. The Applicant for the group MAC address used in Step 3 on the Port connected to Testing Station 1 should eventually transition to the VO state.
- In Part b, during Step 5, Testing Station 1 should capture two GMRP PDUs containing a JoinEmpty event for the group MAC address used in Step 3. This confirms that the Applicant for the group MAC address used in Step 3 on the Port connected to Testing Station 1 was in the VO state at the end of Part a.

Possible Problems:

- None.

Group 7: Applicant Behavior in QP State

Scope: The following tests cover the operation of the GMRP Applicant when it is in the QP state.

Overview: These tests are designed to verify that the DUT takes the appropriate actions when messages are received by an Applicant in the QP state. The results of these tests will depend on the state of the Registrar as well. For each test, if no direct observable result from a state transition can be obtained, additional events are sent to obtain a result.

Test 10.2.7.1 – JoinIn Event Received

Purpose: To verify that the device under test (DUT) exhibits proper behavior when the Applicant for a given Attribute is in the QP state.

References:

- IEEE 802.1D 1998: sub-clauses 12.8.1, 12.8.2
- IEEE 802.1D 1998: Tables 12-3, 12-4

Resource Requirements:

- A Testing Station capable of transmitting and receiving arbitrary MAC frames.

Last Modification: June 28, 2001

Discussion: When a JoinIn event for a given Attribute is received by an Applicant in the VO state, it transitions to the AO state. Another received JoinIn event causes an Applicant in the AO state to transition to the QO state. When an Applicant in the QO state receives a GID_Join.request from GIP, it transitions to the QP state and does not transmit any Join events. When an Applicant in the QP state receives a JoinIn event, it should take no action. When an Applicant in the QP state receives an Empty event, it should send two Join events and eventually transition to the QA state.

Test Setup: Connect the Testing Station to the DUT as shown in Figure 1. Enable GMRP on the DUT and allow time for it to configure.

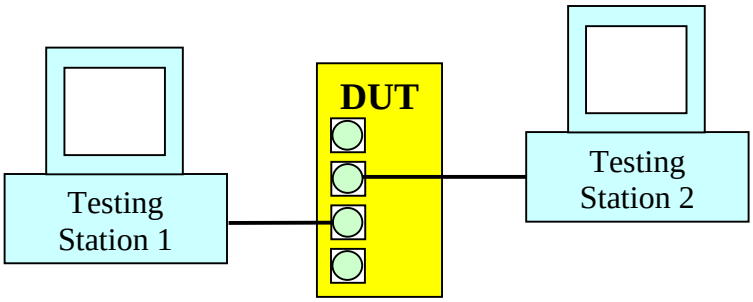

Figure 1

Procedure:

Part a: Receiving JoinIn event

1. Transmit a GMRP PDU containing a LeaveAll event from Testing Stations 1 and 2.
2. Set Testing Station 1 to capture GMRP PDUs.
3. Transmit two GMRP PDUs containing a JoinIn event for a specific group MAC address from Testing Station 1.
4. Transmit a GMRP PDU containing a JoinIn event for the group MAC address used in Step 3 from Testing Station 2.
5. Transmit a GMRP PDU containing a JoinIn event for the group MAC address used in Step 3 from Testing Station 1.

Part b: Verifying Applicant in QP State

6. Transmit a GMRP PDU containing an Empty event for the group MAC address used in Step 3 from Testing Station 1.
7. Record the captured frames on Testing Station 1.

Observable Results:

- In Part a, during Step 3, Testing Station 1 should not capture any GMRP PDUs containing events for the specified group MAC address. During Step 4, Testing Station 1 should not capture any PDUs containing events for the group MAC address used in Step 3. During Step 5, Testing Station 1 should not capture any GMRP PDUs containing events for the group MAC address used in Step 3. The Applicant for the group MAC address used in Step 3 on the Port connected to Testing Station 1 should have remained in the QP state.
- In Part b, during Step 6, Testing Station 1 should capture two GMRP PDUs containing a JoinIn event for the group MAC address used in Step 3. This confirms that the Applicant for the group MAC address used in Step 3 on the Port connected to Testing Station remained in the QP state.

Possible Problems:

- None.

Test 10.2.7.2 – JoinEmpty Event Received

Purpose: To verify that the device under test (DUT) exhibits proper behavior when the Applicant for a given Attribute is in the QP state.

References:

- IEEE 802.1D 1998: sub-clauses 12.8.1, 12.8.2
- IEEE 802.1D 1998: Tables 12-3, 12-4

Resource Requirements:

- A Testing Station capable of transmitting and receiving arbitrary MAC frames.

Last Modification: June 28, 2001

Discussion: When a JoinIn event for a given Attribute is received by an Applicant in the VO state, it transitions to the AO state. Another received JoinIn event causes an Applicant in the AO state to transition to the QO state. When an Applicant in the QO state receives a GID_Join.request from GIP, it transitions to the QP state and does not transmit any Join events. When an Applicant in the QP state receives a JoinEmpty event, it should transition to the VP state. After the jointimer expires, the transmitPDU! event occurs. The Applicant in the VP state should send a Join event and transition to the AA state. After the jointimer expires again, the Applicant should transmit another Join event and transition to the QA state.

Test Setup: Connect the Testing Station to the DUT as shown in Figure 1. Enable GMRP on the DUT and allow time for it to configure.

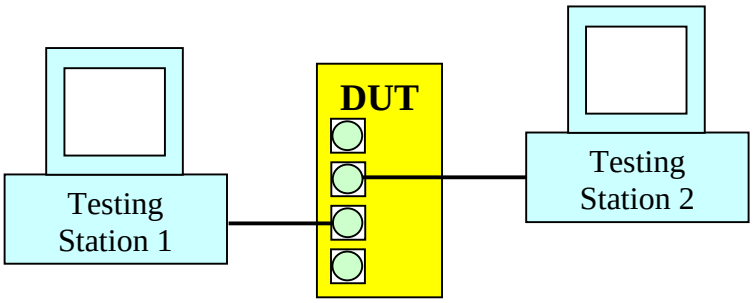

Figure 1

Procedure:

1. Transmit a GMRP PDU containing a LeaveAll event from Testing Stations 1 and 2.
2. Set Testing Station 1 to capture GMRP PDUs.
3. Transmit two GMRP PDUs containing a JoinIn event for a specific group MAC address from Testing Station 1.
4. Transmit a GMRP PDU containing a JoinIn event for the group MAC address used in Step 3 from Testing Station 2.
5. Transmit a GMRP PDU containing a JoinEmpty event for the group MAC address used in Step 3 from Testing Station 1.

Observable Results:

- During Step 3, Testing Station 1 should not capture any GMRP PDUs containing events for the specified group MAC address. During Step 4, Testing Station 1 should not capture any GMRP PDUs containing events for the group MAC address used in Step 3. During Step 5, Testing Station 1 should capture two GMRP PDUs

containing a JoinIn event for the group MAC address used in Step 3. The Applicant for the group MAC address used in Step 3 on the Port connected to Testing Station 1 should have eventually transitioned to the QA state.

Possible Problems:

- None.

Test 10.2.7.3 – Empty Event Received

Purpose: To verify that the device under test (DUT) exhibits proper behavior when the Applicant for a given Attribute is in the QP state.

References:

- IEEE 802.1D 1998: sub-clauses 12.8.1, 12.8.2
- IEEE 802.1D 1998: Tables 12-3, 12-4

Resource Requirements:

- A Testing Station capable of transmitting and receiving arbitrary MAC frames.

Last Modification: June 28, 2001

Discussion: When a JoinIn event for a given Attribute is received by an Applicant in the VO state, it transitions to the AO state. Another received JoinIn event causes an Applicant in the AO state to transition to the QO state. When an Applicant in the QO state receives a GID_Join.request from GIP, it transitions to the QP state and does not transmit any Join events. When an Applicant in the QP state receives an Empty event, it should transition to the VP state. After the jointimer expires, the transmitPDU! event occurs. The Applicant in the VP state should send a Join event and transition to the AA state. After the jointimer expires again, the Applicant should transmit another Join event and transition to the QA state.

Test Setup: Connect the Testing Station to the DUT as shown in Figure 1. Enable GMRP on the DUT and allow time for it to configure.

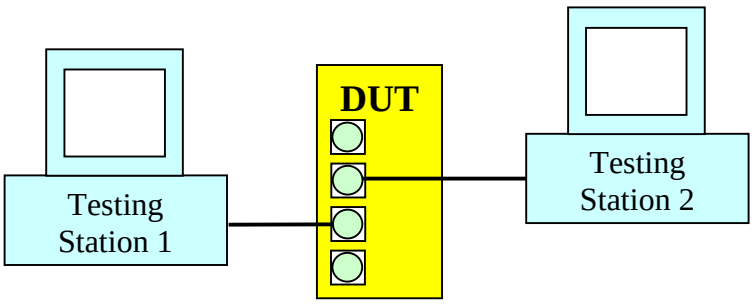

Figure 1

Procedure:

1. Transmit a GMRP PDU containing a LeaveAll event from Testing Stations 1 and 2.
2. Set Testing Station 1 to capture GMRP PDUs.
3. Transmit two GMRP PDUs containing a JoinIn event for a specific group MAC address from Testing Station 1.
4. Transmit a GMRP PDU containing a JoinIn event for the group MAC address used in Step 3 from Testing Station 2.
5. Transmit a GMRP PDU containing an Empty event for the group MAC address used in Step 3 from Testing Station 1.

Observable Results:

- During Step 3, Testing Station 1 should not capture any GMRP PDUs containing events for the specified group MAC address. During Step 4, Testing Station 1 should not capture any GMRP PDUs containing events for the group MAC address used in Step 3. During Step 5, Testing Station 1 should capture two GMRP PDUs

containing a JoinIn event for the group MAC address used in Step 3. The Applicant for the group MAC address used in Step 3 on the Port connected to Testing Station 1 should have eventually transitioned to the QA state.

Possible Problems:

- None.

Test 10.2.7.4 – LeaveIn Event Received

Purpose: To verify that the device under test (DUT) exhibits proper behavior when the Applicant for a given Attribute is in the QP state.

References:

- IEEE 802.1D 1998: sub-clauses 12.8.1, 12.8.2
- IEEE 802.1D 1998: Tables 12-3, 12-4

Resource Requirements:

- A Testing Station capable of transmitting and receiving arbitrary MAC frames.

Last Modification: June 28, 2001

Discussion: When a JoinIn event for a given Attribute is received by an Applicant in the VO state, it transitions to the AO state. Another received JoinIn event causes an Applicant in the AO state to transition to the QO state. When an Applicant in the QO state receives a GID_Join.request from GIP, it transitions to the QP state and does not transmit any Join events. When an Applicant in the QP state receives a LeaveIn event, it should transition to the VP state. After the jointimer expires, the transmitPDU! event occurs. The Applicant in the VP state should send a Join event and transition to the AA state. After the jointimer expires again, the Applicant should transmit another Join event and transition to the QA state.

Test Setup: Connect the Testing Station to the DUT as shown in Figure 1. Enable GMRP on the DUT and allow time for it to configure.

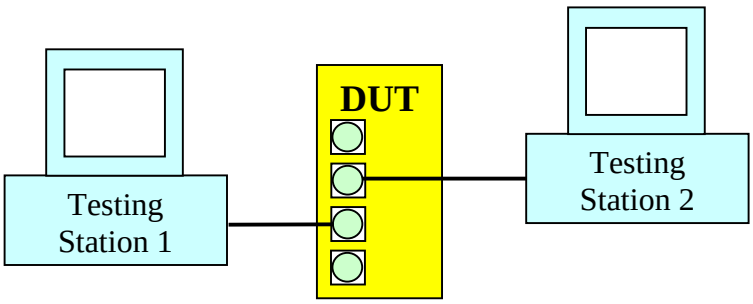

Figure 1

Procedure:

1. Transmit a GMRP PDU containing a LeaveAll event from Testing Stations 1 and 2.
2. Set Testing Station 1 to capture GMRP PDUs.
3. Transmit two GMRP PDUs containing a JoinIn event for a specific group MAC address from Testing Station 1.
4. Transmit a GMRP PDU containing a JoinIn event for the group MAC address used in Step 3 from Testing Station 2.
5. Transmit a GMRP PDU containing a LeaveIn event for the group MAC address used in Step 3 from Testing Station 1.

Observable Results:

- During Step 3, Testing Station 1 should not capture any GMRP PDUs containing events for the specified group MAC address. During Step 4, Testing Station 1 should not capture any GMRP PDUs containing events for the group MAC address used in Step 3. During Step 5, Testing Station 1 should capture two GMRP PDUs containing a JoinEmpty event for the group MAC address used in Step 3. The Applicant for the group MAC

address used in Step 3 on the Port connected to Testing Station 1 should have eventually transitioned to the QA state.

Possible Problems:

- None.

Test 10.2.7.5 – LeaveEmpty Event Received

Purpose: To verify that the device under test (DUT) exhibits proper behavior when the Applicant for a given Attribute is in the QP state.

References:

- IEEE 802.1D 1998: sub-clauses 12.8.1, 12.8.2
- IEEE 802.1D 1998: Tables 12-3, 12-4

Resource Requirements:

- A Testing Station capable of transmitting and receiving arbitrary MAC frames.

Last Modification: June 28, 2001

Discussion: When a JoinIn event for a given Attribute is received by an Applicant in the VO state, it transitions to the AO state. Another received JoinIn event causes an Applicant in the AO state to transition to the QO state. When an Applicant in the QO state receives a GID_Join.request from GIP, it transitions to the QP state and does not transmit any Join events. When an Applicant in the QP state receives a LeaveEmpty event, it should transition to the VP state. After the jointimer expires, the transmitPDU! event occurs. The Applicant in the VP state should send a Join event and transition to the AA state. After the jointimer expires again, the Applicant should transmit another Join event and transition to the QA state.

Test Setup: Connect the Testing Station to the DUT as shown in Figure 1. Enable GMRP on the DUT and allow time for it to configure.

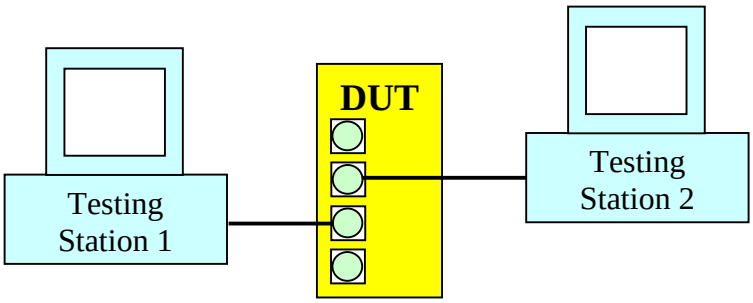

Figure 1

Procedure:

1. Transmit a GMRP PDU containing a LeaveAll event from Testing Stations 1 and 2.
2. Set Testing Station 1 to capture GMRP PDUs.
3. Transmit two GMRP PDUs containing a JoinIn event for a specific group MAC address from Testing Station 1.
4. Transmit a GMRP PDU containing a JoinIn event for the group MAC address used in Step 3 from Testing Station 2.
5. Transmit a GMRP PDU containing a LeaveEmpty event for the group MAC address used in Step 3 from Testing Station 1.

Observable Results:

- During Step 3, Testing Station 1 should not capture any GMRP PDUs containing events for the specified group MAC address. During Step 4, Testing Station 1 should not capture any GMRP PDUs containing events for the group MAC address used in Step 3. During Step 5, Testing Station 1 should capture two GMRP PDUs containing a JoinEmpty event for the group MAC address used in Step 3. The Applicant for the group MAC

address used in Step 3 on the Port connected to Testing Station 1 should have eventually transitioned to the QA state.

Possible Problems:

- None.

Test 10.2.7.6 – LeaveAll Event Received

Purpose: To verify that the device under test (DUT) exhibits proper behavior when the Applicant for a given Attribute is in the QP state.

References:

- IEEE 802.1D 1998: sub-clauses 12.8.1, 12.8.2
- IEEE 802.1D 1998: Tables 12-3, 12-4

Resource Requirements:

- A Testing Station capable of transmitting and receiving arbitrary MAC frames.

Last Modification: June 28, 2001

Discussion: When a JoinIn event for a given Attribute is received by an Applicant in the VO state, it transitions to the AO state. Another received JoinIn event causes an Applicant in the AO state to transition to the QO state. When an Applicant in the QO state receives a GID_Join.request from GIP, it transitions to the QP state and does not transmit any Join events. When an Applicant in the QP state receives a LeaveAll event, it should transition to the VP state. After the jointimer expires, the transmitPDU! event occurs. The Applicant in the VP state should send a Join event and transition to the AA state. After the jointimer expires again, the Applicant should transmit another Join event and transition to the QA state.

Test Setup: Connect the Testing Station to the DUT as shown in Figure 1. Enable GMRP on the DUT and allow time for it to configure.

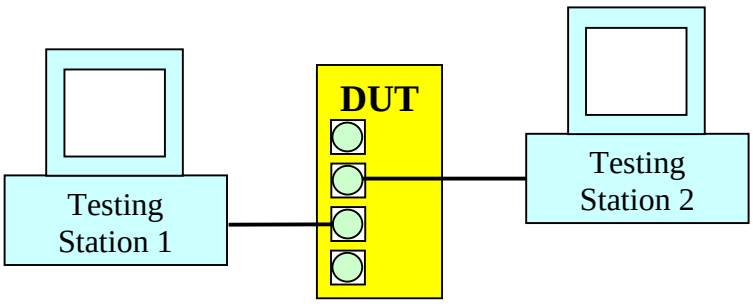

Figure 1

Procedure:

1. Transmit a GMRP PDU containing a LeaveAll event from Testing Stations 1 and 2.
2. Set Testing Station 1 to capture GMRP PDUs.
3. Transmit two GMRP PDUs containing a JoinIn event for a specific group MAC address from Testing Station 1.
4. Transmit a GMRP PDU containing a JoinIn event for the group MAC address used in Step 3 from Testing Station 2.
5. Transmit a GMRP PDU containing a LeaveAll event from Testing Station 1.

Observable Results:

- During Step 3, Testing Station 1 should not capture any GMRP PDUs containing events for the specified group MAC address. During Step 4, Testing Station 1 should not capture any GMRP PDUs containing events for the group MAC address used in Step 3. During Step 5, Testing Station 1 should capture two GMRP PDUs containing a JoinEmpty event for the group MAC address used in Step 3. The Applicant for the group MAC

address used in Step 3 on the Port connected to Testing Station 1 should have eventually transitioned to the QA state.

Possible Problems:

- None.

Test 10.2.7.7 – ReqJoin Event Received

Purpose: To verify that the device under test (DUT) exhibits proper behavior when the Applicant for a given Attribute is in the QP state.

References:

- IEEE 802.1D 1998: sub-clauses 12.8.1, 12.8.2
- IEEE 802.1D 1998: Tables 12-3, 12-4

Resource Requirements:

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

Last Modification: June 28, 2001

Discussion: When a JoinIn event for a given Attribute is received by an Applicant in the VO state, it transitions to the AO state. Another received JoinIn event causes an Applicant in the AO state to transition to the QO state. When an Applicant in the QO state receives a GID_Join.request from GIP, it transitions to the QP state and does not transmit any Join events. If an Applicant in the QP state receives another GID_Join.request it takes no action. Although this is an inapplicable event/state combination, this test ensures that the Applicant does not transition out of the QP state or transmit any GMRP PDUs.

Test Setup: Connect the Testing Stations to the DUT as shown in Figure 1. Enable GMRP on the DUT and allow time for it to configure.

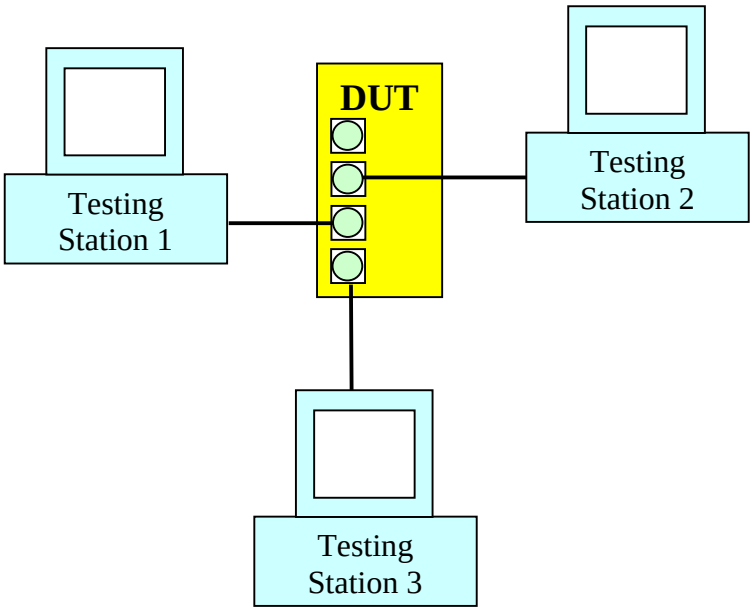

Figure 1

Procedure:

Part a: Receiving GID_Join.request event

1. Transmit a GMRP PDU containing a LeaveAll event from Testing Stations 1, 2, and 3.
2. Set Testing Station 1 to capture GMRP PDUs.
3. Transmit two GMRP PDUs containing a JoinIn event for a specific group MAC address from Testing Station 1.

4. Transmit a GMRP PDU containing a JoinIn event for the group MAC address used in Step 3 from Testing Station 2.
5. Transmit a GMRP PDU containing a JoinIn event for the group MAC address used in Step 3 from Testing Station 3.

Part b: Verifying Applicant in QP State

6. Transmit a GMRP PDU containing an Empty event for the group MAC address used in Step 3 from Testing Station 1.
7. Record the captured frames on Testing Station 1.

Observable Results:

- In Part a, during Step 3, Testing Station 1 should not capture any GMRP PDUs containing events for the specified group MAC address. During Step 4, Testing Station 1 should not capture any GMRP PDUs containing events for the group MAC address used in Step 3. During Step 5, Testing Station 1 should not capture any GMRP PDUs containing events for the group MAC address used in Step 3. The Applicant for the group MAC address used in Step 3 on the Port connected to Testing Station 1 should have remained in the QP state.
- In Part b, during Step 6, Testing Station 1 should capture two GMRP PDUs containing a JoinIn event for the group MAC address used in Step 3. This confirms that the Applicant for the group MAC address used in Step 3 on the Port connected to Testing Station 1 remained in the QP state in Part a.

Possible Problems:

- None.

Test 10.2.7.8 – ReqLeave Event Received

Purpose: To verify that the device under test (DUT) exhibits proper behavior when the Applicant for a given Attribute is in the QP state.

References:

- IEEE 802.1D 1998: sub-clauses 12.8.1, 12.8.2
- IEEE 802.1D 1998: Tables 12-3, 12-4

Resource Requirements:

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

Last Modification: June 28, 2001

Discussion: When a JoinIn event for a given Attribute is received by an Applicant in the VO state, it transitions to the AO state. Another received JoinIn event causes an Applicant in the AO state to transition to the QO state. When an Applicant in the QO state receives a GID_Join.request from GIP, it transitions to the QP state and does not transmit any Join events. When an Applicant in the QP state receives another GID_Leave.request it transitions back to the QO state.

Test Setup: Connect the Testing Stations to the DUT as shown in Figure 1. Enable GMRP on the DUT and allow time for it to configure.

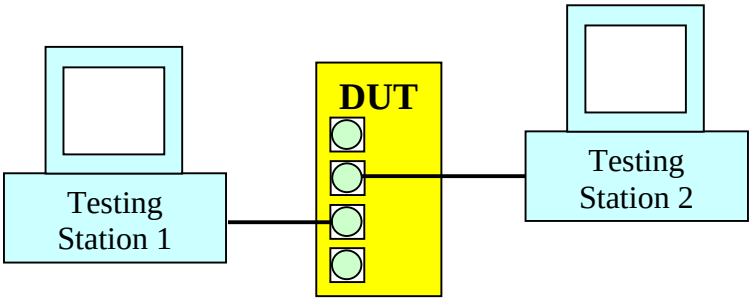

Figure 1

Procedure:

Part a: Receiving GID_Leave.request event

1. Transmit a GMRP PDU containing a LeaveAll event from Testing Stations 1 and 2.
2. Set Testing Station 1 to capture GMRP PDUs.
3. Transmit two GMRP PDUs containing a JoinIn event for a specific group MAC address from Testing Station 1.
4. Transmit a GMRP PDU containing a JoinIn event for the group MAC address used in Step 3 from Testing Station 2.
5. Transmit a GMRP PDU containing a LeaveEmpty event for the group MAC address used in Step 3 from Testing Station 2.

Part b: Verifying Applicant in QO State

6. After the leavetimer has expired, transmit a GMRP PDU containing a JoinIn event for the group MAC address used in Step 3 from Testing Station 2.
7. Transmit a GMRP PDU containing an Empty event for the group MAC address used in Step 3 from Testing Station 1.
8. Record the captured frames on Testing Station 1.

Observable Results:

- In Part a, during Step 3, Testing Station 1 should not capture any GMRP PDUs containing events for the specified group MAC address. During Step 4, Testing Station 1 should not capture any GMRP PDUs containing events for the group MAC address used in Step 3. During Step 5, Testing Station 1 should not capture any GMRP PDUs containing events for the group MAC address used in Step 3. The Applicant for the group MAC address used in Step 3 on the Port connected to Testing Station 1 should have transitioned to the QO state.
- In Part b, during Step 7, Testing Station 1 should capture two GMRP PDUs containing a JoinIn event for the group MAC address used in Step 3. This confirms that the Applicant for the group MAC address used in Step 3 on the Port connected to Testing Station 1 transitioned to the QO state.

Possible Problems:

- None.

Group 8: Forward or Filter

Scope: The following tests cover the use of the Filtering Database in conjunction with the operations of GARP/GMRP.

Overview: These tests are designed to verify that the device under test (DUT) can properly forward or filter multicast traffic based on the presence of Static Filtering Entries and Group Registration Entries.

Test 10.2.8.1 – Group MAC Registered, All Group Addresses Registered

Purpose: To verify that the device under test (DUT) will properly handle multicast traffic destined for a group MAC address for which the Group Registration Entry Control Element specifies Registered (Forward) and the All Groups Addresses control element specifies Registered.

References:

- IEEE 802.1D 1998: sub-clause 7.9
- IEEE 802.1D 1998: table 7-7

Resource Requirements:

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

Last Modification: June 28, 2001

Discussion: The Filtering Database is the underlying mechanism through which GMRP operates. GMRP creates Group Registration Entries within the Filtering Database when a Join message for a specific group MAC address is received. These Group Registration Entries are comprised of a MAC address specification and a Port Map that specifies forwarding or filtering of frames for that MAC address.

In this scenario, a Port will have an All Group Addresses control element which specifies Registered. This same Port will receive a GMRP message indicating a Join for a specific group MAC address, hence it will be Registered. The behavior that is a result of this combination should be Forward (Forward All Groups).

Test Setup: Connect the Testing Stations to the DUT as shown in Figure 1. Enable GMRP on the DUT and allow time for it to configure.

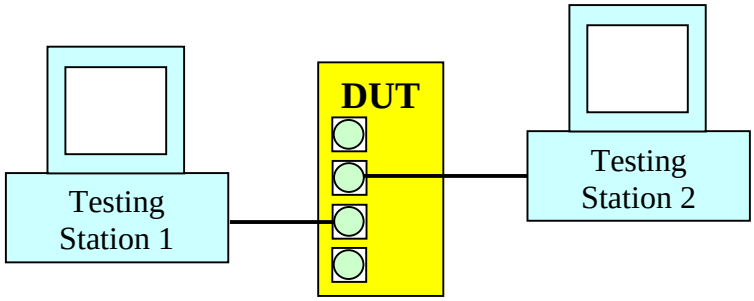

Figure 1

Procedure:

1. Transmit a GMRP PDU containing a LeaveAll event from Testing Stations 1 and 2.
2. Transmit a GMRP PDU containing a JoinIn event for a Service Requirement Attribute of All Groups from Testing Station 1.
3. Transmit a GMRP PDU containing a JoinIn event for a specific group MAC address from Testing Station 1.
4. Set Testing Station 1 to capture arbitrary MAC frames.
5. Transmit multicast traffic destined for the group MAC address used in Step 3 from Testing Station 2.
6. If possible, repeat Steps 1-5 configuring a Static Filtering Entry specifying Forward All Groups on the Port on the DUT connected to Testing Station 1 in Step 2.

Observable results:

- Testing Station 1 should receive all of the multicast traffic transmitted from Testing Station 2.

Possible Problems:

- None.

Test 10.2.8.2 – Group MAC Not Registered, All Group Addresses Registered

Purpose: To verify that the device under test (DUT) will properly handle multicast traffic destined for a group MAC address for which the Group Registration Entry Control Element specifies Not Registered (Filter) and the All Groups Addresses control element specifies Registered.

References:

- IEEE 802.1D 1998: sub-clause 7.9
- IEEE 802.1D 1998: table 7-7

Resource Requirements:

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

Last Modification: June 28, 2001

Discussion: The Filtering Database is the underlying mechanism through which GMRP operates. GMRP creates Group Registration Entries within the Filtering Database when a Join message for a specific group MAC address is received. These Group Registration Entries are comprised of a MAC address specification and a Port Map that specifies forwarding or filtering of frames for that MAC address.

In this scenario, Port A will have an All Group Addresses control element which specifies Registered. Port B will receive a GMRP message indicating a Join for a specific group MAC address. This will result in Port A having a Group Registration Entry Control Element specifying Not Registered (Filter). The behavior that is a result of this combination should be Forward (Forward All Groups).

Test Setup: Connect the Testing Stations to the DUT as shown in Figure 1. Enable GMRP on the DUT and allow time for it to configure.

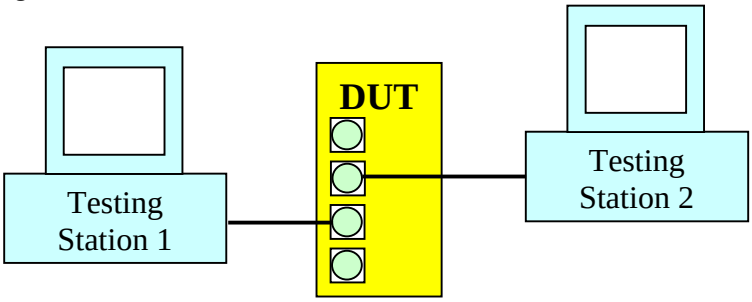

Figure 1

Procedure:

1. Transmit a GMRP PDU containing a LeaveAll event from Testing Stations 1 and 2.
2. Transmit a GMRP PDU containing a JoinIn event for a Service Requirement Attribute of All Groups from Testing Station 1.
3. Transmit a GMRP PDU containing a JoinIn event for a specific group MAC address from Testing Station 2.
4. Set Testing Station 1 to capture arbitrary MAC frames.
5. Transmit multicast traffic destined for the group MAC address used in Step 3 from Testing Station 2.
6. If possible, repeat Steps 1-5 configuring a Static Filtering Entry specifying Forward All Groups on the Port on the DUT connected to Testing Station 1 in Step 2.

Observable results:

- Testing Station 1 should receive all of the multicast traffic transmitted from Testing Station 2.

Possible Problems:

- None.

Test 10.2.8.3 – Group MAC Not Present, All Group Addresses Registered

Purpose: To verify that the device under test (DUT) will properly handle multicast traffic destined for a group MAC address for which the Group Registration Entry Control Element specifies No Group Registration Entry present and the All Groups Addresses control element specifies Registered.

References:

- IEEE 802.1D 1998: sub-clause 7.9
- IEEE 802.1D 1998: table 7-7

Resource Requirements:

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

Last Modification: June 28, 2001

Discussion: The Filtering Database is the underlying mechanism through which GMRP operates. GMRP creates Group Registration Entries within the Filtering Database when a Join message for a specific group MAC address is received. These Group Registration Entries are comprised of a MAC address specification and a Port Map that specifies forwarding or filtering of frames for that MAC address.

In this scenario, a Port will have an All Group Addresses control element which specifies Registered. No GMRP messages will be received for any group MAC addresses. This should result in having a Group Registration Entry Control Element of No Group Registration Entry present. The behavior that is a result of this combination should be Forward (Forward All Groups).

Test Setup: Connect the Testing Stations to the DUT as shown in Figure 1. Enable GMRP on the DUT and allow time for it to configure.

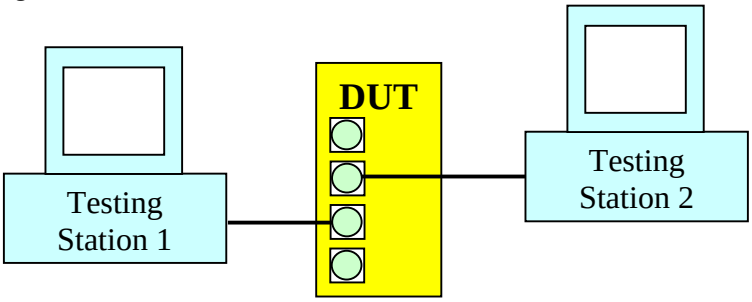

Figure 1

Procedure:

1. Transmit a GMRP PDU containing a LeaveAll event from Testing Stations 1 and 2.
2. Transmit a GMRP PDU containing a JoinIn event for a Service Requirement Attribute of All Groups from Testing Station 1.
3. Set Testing Station 1 to capture arbitrary MAC frames.
4. Transmit multicast traffic destined for a specific group MAC address from Testing Station 2.
5. If possible, repeat Steps 1-4 configuring a Static Filtering Entry specifying Forward All Groups on the Port on the DUT connected to Testing Station 1 in Step 2.

Observable results:

- Testing Station 1 should receive all of the multicast traffic transmitted from Testing Station 2.

Possible Problems:

- None.

Test 10.2.8.4 – Group MAC Registered, All Unregistered Group Addresses Registered

Purpose: To verify that the device under test (DUT) will properly handle multicast traffic destined for a group MAC address for which the Group Registration Entry Control Element specifies Registered and the All Unregistered Groups Addresses control element specifies Registered.

References:

- IEEE 802.1D 1998: sub-clause 7.9
- IEEE 802.1D 1998: table 7-7

Resource Requirements:

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

Last Modification: June 28, 2001

Discussion: The Filtering Database is the underlying mechanism through which GMRP operates. GMRP creates Group Registration Entries within the Filtering Database when a Join message for a specific group MAC address is received. These Group Registration Entries are comprised of a MAC address specification and a Port Map that specifies forwarding or filtering of frames for that MAC address.

In this scenario, a Port will have an All Unregistered Group Addresses control element which specifies Registered. This same Port will receive a GMRP message indicating a Join for a specific group MAC address. This should result in the Group Registration Entry Control Element specifying Registered (Forward). The behavior that is a result of this combination should be Forward.

Test Setup: Connect the Testing Stations to the DUT as shown in Figure 1. Enable GMRP on the DUT and allow time for it to configure.

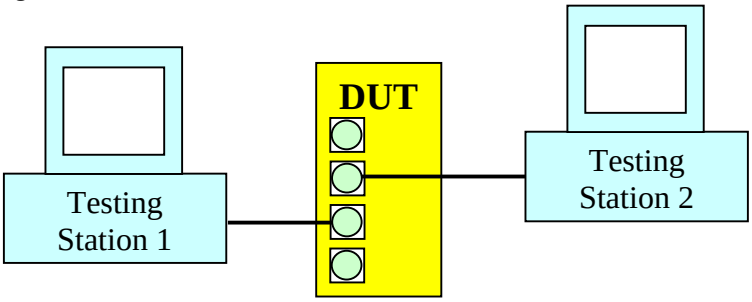

Figure 1

Procedure:

1. Transmit a GMRP PDU containing a LeaveAll event from Testing Stations 1 and 2.
2. Transmit a GMRP PDU containing a JoinIn event for a Service Requirement Attribute of All Unregistered Groups from Testing Station 1.
3. Transmit a GMRP PDU containing a JoinIn event for a specific group MAC address from Testing Station 1.
4. Set Testing Station 1 to capture arbitrary MAC frames.
5. Transmit multicast traffic destined for the group MAC address used in Step 3 from Testing Station 2.
6. If possible, repeat Steps 1-5 configuring a Static Filtering Entry specifying Forward Unregistered Groups on the Port on the DUT connected to Testing Station 1 in Step 2.

Observable results:

- Testing Station 1 should receive all of the multicast traffic transmitted from Testing Station 2.

Possible Problems:

- None.

Test 10.2.8.5 – Group MAC Not Registered, All Unregistered Group Addresses Registered

Purpose: To verify that the device under test (DUT) will properly handle multicast traffic destined for a group MAC address for which the Group Registration Entry Control Element specifies Not Registered (Filter) and the All Unregistered Groups Addresses control element specifies Registered.

References:

- IEEE 802.1D 1998: sub-clause 7.9
- IEEE 802.1D 1998: table 7-7

Resource Requirements:

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

Last Modification: June 28, 2001

Discussion: The Filtering Database is the underlying mechanism through which GMRP operates. GMRP creates Group Registration Entries within the Filtering Database when a Join message for a specific group MAC address is received. These Group Registration Entries are comprised of a MAC address specification and a Port Map that specifies forwarding or filtering of frames for that MAC address.

In this scenario, Port A will have an All Unregistered Group Addresses control element which specifies Registered. Port B will receive a GMRP message indicating a Join for a specific group MAC address. This should result in the Group Registration Control Element for Port A specifying Not Registered (Filter). The behavior that is a result of this combination should be Filter.

Test Setup: Connect the Testing Stations to the DUT as shown in Figure 1. Enable GMRP on the DUT and allow time for it to configure.

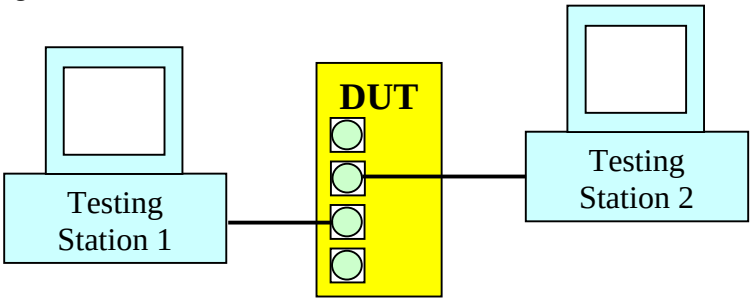

Figure 1

Procedure:

1. Transmit a GMRP PDU containing a LeaveAll event from Testing Stations 1 and 2.
2. Transmit a GMRP PDU containing a JoinIn event for a Service Requirement Attribute of All Unregistered Groups from Testing Station 1.
3. Transmit a GMRP PDU containing a JoinIn event for a specific group MAC address from Testing Station 2.
4. Set Testing Station 1 to capture arbitrary MAC frames.
5. Transmit multicast traffic destined for the group MAC address used in Step 3 from Testing Station 2.
6. If possible, repeat Steps 1-5 configuring a Static Filtering Entry specifying Forward Unregistered Groups on the Port on the DUT connected to Testing Station 1 in Step 2.

Observable results:

- Testing Station 1 should not receive any of the multicast traffic transmitted from Testing Station 2.

Possible Problems:

- None.

Test 10.2.8.6 – Group MAC Not Present, All Unregistered Group Addresses Registered

Purpose: To verify that the device under test (DUT) will properly handle multicast traffic destined for a group MAC address for which the Group Registration Entry Control Element specifies No Group Registration Entry present and the All Unregistered Groups Addresses control element specifies Registered.

References:

- IEEE 802.1D 1998: sub-clause 7.9
- IEEE 802.1D 1998: table 7-7

Resource Requirements:

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

Last Modification: June 28, 2001

Discussion: The Filtering Database is the underlying mechanism through which GMRP operates. GMRP creates Group Registration Entries within the Filtering Database when a Join message for a specific group MAC address is received. These Group Registration Entries are comprised of a MAC address specification and a Port Map that specifies forwarding or filtering of frames for that MAC address.

In this scenario, a Port will have an All Unregistered Group Addresses control element which specifies Registered. No GMRP messages will be received for any group MAC addresses. This should result in having a Group Registration Entry Control Element of No Group Registration Entry present. The behavior that is a result of this combination should be Forward (Forward Unregistered Groups).

Test Setup: Connect the Testing Stations to the DUT as shown in Figure 1. Enable GMRP on the DUT and allow time for it to configure.

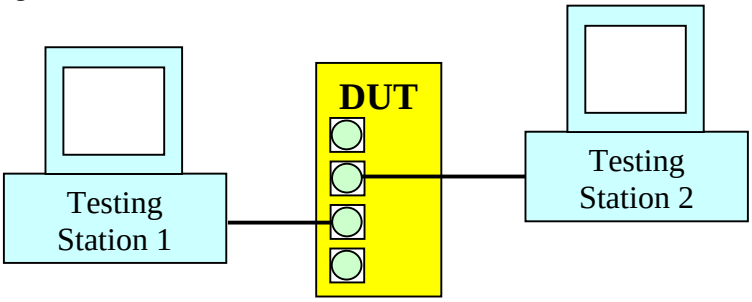

Figure 1

Procedure:

1. Transmit a GMRP PDU containing a LeaveAll event from Testing Stations 1 and 2.
2. Transmit a GMRP PDU containing a JoinIn event for a Service Requirement Attribute of All Unregistered Groups from Testing Station 1.
3. Set Testing Station 1 to capture arbitrary MAC frames.
4. Transmit multicast traffic destined for a specific group MAC address from Testing Station 2.
5. If possible, repeat Steps 1-4 configuring a Static Filtering Entry specifying Forward Unregistered Groups on the Port on the DUT connected to Testing Station 1 in Step 2.

Observable results:

- Testing Station 1 should receive all of the multicast traffic transmitted from Testing Station 2.

Possible Problems:

- None.

Test 10.2.8.7 – Group MAC Registered, Default Group Filtering Behavior

Purpose: To verify that the device under test (DUT) will properly handle multicast traffic destined for a group MAC address for which the Group Registration Entry Control Element specifies Registered and both the All Unregistered Groups Addresses and All Group Addresses control elements specify Not Registered.

References:

- IEEE 802.1D 1998: sub-clause 7.9
- IEEE 802.1D 1998: table 7-7

Resource Requirements:

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

Last Modification: June 28, 2001

Discussion: The Filtering Database is the underlying mechanism through which GMRP operates. GMRP creates Group Registration Entries within the Filtering Database when a Join message for a specific group MAC address is received. These Group Registration Entries are comprised of a MAC address specification and a Port Map that specifies forwarding or filtering of frames for that MAC address.

In this scenario, a Port will have an All Unregistered Group Addresses control element and an All Group Addresses control element which specify Not Registered. This same Port will receive a GMRP message indicating a Join for a specific group MAC address. This should result in the Group Registration Entry Control Element specifying Registered (Forward). The behavior that is a result of this combination should be Forward.

Test Setup: Connect the Testing Stations to the DUT as shown in Figure 1. Enable GMRP on the DUT and allow time for it to configure.

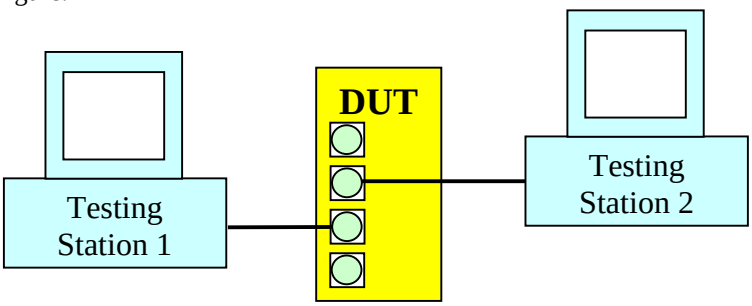

Figure 1

Procedure:

1. Transmit a GMRP PDU containing a LeaveAll event from Testing Stations 1 and 2.
2. Transmit a GMRP PDU containing a JoinIn event for a specific group MAC address from Testing Station 1.
3. Set Testing Station 1 to capture arbitrary MAC frames.
4. Transmit multicast traffic destined for the group MAC address used in Step 3 from Testing Station 2.
5. Repeat Steps 1-4 transmitting a GMRP PDU containing a JoinIn event for a Service Requirement Attribute of All Unregistered Groups from Testing Station 2 before Step 2.
6. Repeat Steps 1-4 transmitting a GMRP PDU containing a JoinIn event for a Service Requirement Attribute of All Groups from Testing Station 2 before Step 2.

Observable results:

- Testing Station 1 should receive all of the multicast traffic transmitted from Testing Station 2.

Possible Problems:

- None.

Test 10.2.8.8 – Group MAC Not Registered, Default Group Filtering Behavior

Purpose: To verify that the device under test (DUT) will properly handle multicast traffic destined for a group MAC address for which the Group Registration Entry Control Element specifies Not Registered (Filter) and the All Unregistered Groups Addresses and All Group Addresses control elements specify Not Registered.

References:

- IEEE 802.1D 1998: sub-clause 7.9
- IEEE 802.1D 1998: table 7-7

Resource Requirements:

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

Last Modification: June 28, 2001

Discussion: The Filtering Database is the underlying mechanism through which GMRP operates. GMRP creates Group Registration Entries within the Filtering Database when a Join message for a specific group MAC address is received. These Group Registration Entries are comprised of a MAC address specification and a Port Map that specifies forwarding or filtering of frames for that MAC address.

In this scenario, Port A will have the All Unregistered Group Addresses and All Group Addresses control elements specify Not Registered. Port B will receive a GMRP message indicating a Join for a specific group MAC address. This should result in the Group Registration Control Element for Port A to specify Not Registered (Filter). The behavior that is a result of this combination should be Filter.

Test Setup: Connect the Testing Stations to the DUT as shown in Figure 1. Enable GMRP on the DUT and allow time for it to configure.

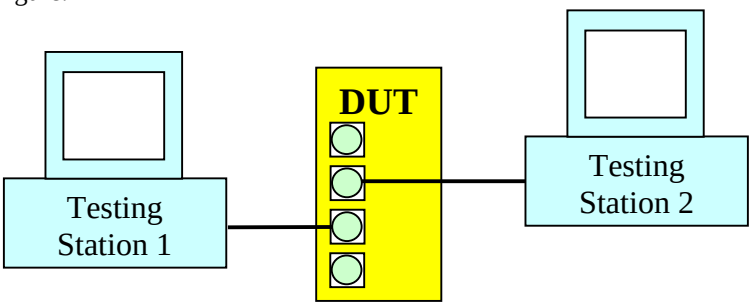

Figure 1

Procedure:

1. Transmit a GMRP PDU containing a LeaveAll event from Testing Stations 1 and 2.
2. Transmit a GMRP PDU containing a JoinIn event for a specific group MAC address from Testing Station 2.
3. Set Testing Station 1 to capture arbitrary MAC frames.
4. Transmit multicast traffic destined for the group MAC address used in Step 3 from Testing Station 2.
5. Repeat Steps 1-4 transmitting a GMRP PDU containing a JoinIn event for a Service Requirement Attribute of All Unregistered Groups from Testing Station 2 before Step 2.
6. Repeat Steps 1-4 transmitting a GMRP PDU containing a JoinIn event for a Service Requirement Attribute of All Groups from Testing Station 2 before Step 2.

Observable results:

- Testing Station 1 should not receive any of the multicast traffic transmitted from Testing Station 2.

Possible Problems:

- None.

Test 10.2.8.9 – Group MAC Not Present, Default Group Filtering Behavior

Purpose: To verify that the device under test (DUT) will properly handle multicast traffic destined for a group MAC address for which the Group Registration Entry Control Element specifies No Group Registration Entry present and the All Unregistered Groups Addresses and All Group Addresses control elements specify Not Registered.

References:

- IEEE 802.1D 1998: sub-clause 7.9
- IEEE 802.1D 1998: table 7-7

Resource Requirements:

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

Last Modification: June 28, 2001

Discussion: The Filtering Database is the underlying mechanism through which GMRP operates. GMRP creates Group Registration Entries within the Filtering Database when a Join message for a specific group MAC address is received. These Group Registration Entries are comprised of a MAC address specification and a Port Map that specifies forwarding or filtering of frames for that MAC address.

In this scenario, a Port will have the All Unregistered Group Addresses and All Group Addresses control elements specify Not Registered. No GMRP messages will be received for any group MAC addresses. This should result in having a Group Registration Entry Control Element of No Group Registration Entry present. The behavior that is a result of this combination should be Filter (Filter Unregistered Groups).

Test Setup: Connect the Testing Stations to the DUT as shown in Figure 1. Enable GMRP on the DUT and allow time for it to configure.

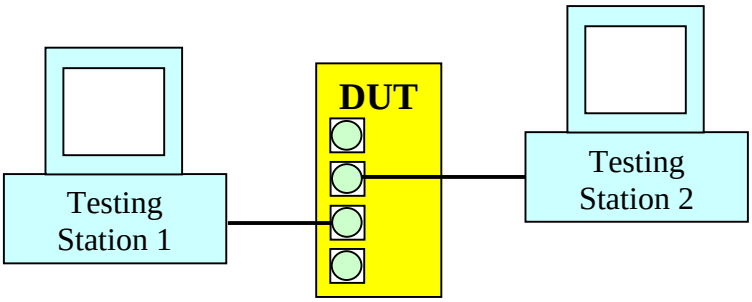

Figure 1

Procedure:

1. Set Testing Station 1 to capture arbitrary MAC frames.
2. Transmit multicast traffic destined for a specific group MAC address from Testing Station 2.
3. Repeat Steps 1-2 transmitting a GMRP PDU containing a LeaveAll event from Testing Stations 1 and 2, and then a JoinIn event for a Service Requirement Attribute of All Unregistered Groups Testing Station 2. This should occur before Step 1.
4. Repeat Steps 1-2 transmitting a GMRP PDU containing a LeaveAll event from Testing Stations 1 and 2, and then a JoinIn event for a Service Requirement Attribute of All Groups Testing Station 2. This should occur before Step 1.

Observable results:

- Testing Station 1 should not receive any of the multicast traffic transmitted from Testing Station 2.

Possible Problems:

- None

Group 9: GMRP and VLANs

Scope: The following tests cover how GMRP operates within a VLAN context.

Overview: These tests are designed to verify that the device under test (DUT) can properly participate in the GMRP protocol when VLANs are configured. These tests should only be performed if the DUT is VLAN-aware.

Test 10.2.9.1 – Egress Rules

Purpose: To verify that the DUT will follow the egress rules for VLANs when participating in the GMRP protocol.

References:

- IEEE 802.1Q-1998 clause 10

Resource Requirements:

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

Last Modification: June 28, 2001

Discussion: The use of GMRP in a VLAN context allows GMRP registrations to be made that are specific to that VLAN. That is, it allows the Group filtering behavior for one VLAN to be independent of the Group filtering behavior for other VLANs.

GMRP Participants in VLAN Bridges apply the same egress rules that are defined for the transmission Port. Thus, GMRP PDUs are transmitted through a given Port only if the value of the Member Set for the Port for the VLAN concerned indicates that the VLAN is registered on the Port. Also, GMRP PDUs are transmitted as VLAN-tagged or as untagged frames in accordance with the state of the Untagged Set for that Port for the VLAN concerned. Where VLAN-tagged frames are transmitted, the VID field of the tag header carries the VLAN-Context Identifier value.

Test Setup: Connect the Testing Stations to the DUT as shown in Figure 1. Enable GMRP on the DUT and allow time for it to configure. Ensure the Acceptable Frame Types parameter is set to Admit All Frames and the Enable Ingress Filtering parameter is set to Reset.

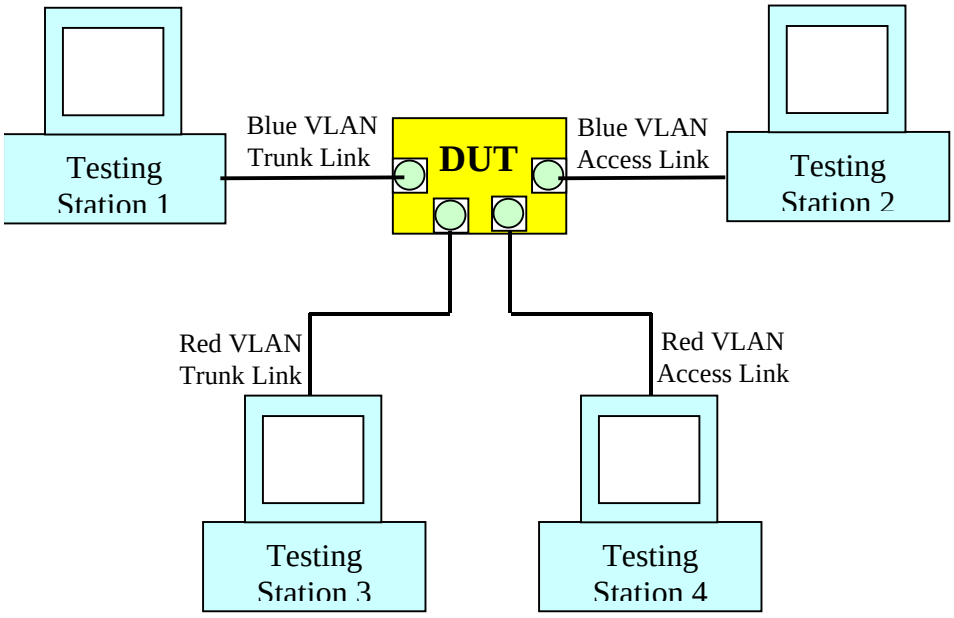

Figure 1

Procedure:

Part a: Untagged Set

1. Set the Testing Stations to capture GMRP PDUs.
2. Transmit a GMRP PDU containing a LeaveAll event, appropriately tagged, from Testing Stations 1 and 2.
3. Transmit a GMRP PDU tagged for the Blue VLAN containing a JoinIn event for a specific group MAC address from Testing Station 1.
4. Transmit an untagged GMRP PDU containing a Empty event for the group MAC address used in Step 3 from Testing Station 2.
5. Repeat Steps 1-4, using a Service Requirement Attribute instead of a group MAC address in Steps 3 and 4..

Part b: Tagged Set

6. Set the Testing Stations to capture GMRP PDUs.
7. Transmit a GMRP PDU containing a LeaveAll event, appropriately tagged, from Testing Stations 3 and 4.
8. Transmit an untagged GMRP PDU containing a JoinIn event for a specific group MAC address from Testing Station 4.
9. Transmit a GMRP PDU tagged for the Red VLAN containing a Empty event for the group MAC address used in Step 8 from Testing Station 3.
10. Repeat Steps 6-9, using a Service Requirement Attribute instead of a group MAC address in Steps 8 and 9..

Observable results:

- In Part a, in Step 3, Testing Station 2 should capture two untagged GMRP PDUs containing a JoinEmpty event for the appropriate Attribute Value. In Step 4, Testing Station 2 should capture two untagged GMRP PDUs containing a JoinEmpty event for the appropriate Attribute Value. Testing Stations 3 and 4 should not receive any events for the Attributes transmitted in Part a.
- In Part b, in Step 8, Testing Station 3 should capture two GMRP PDUs tagged for the Red VLAN containing a JoinEmpty event for the appropriate Attribute Value. In Step 9, Testing Station 3 should capture two GMRP PDUs tagged for the Red VLAN containing a JoinEmpty event for the appropriate Attribute Value. Testing Stations 1 and 2 should not receive any events for the Attributes transmitted in Part b.

Possible Problems:

- None.

Test 10.2.9.2 – Ingress Rules

Purpose: To verify that the DUT will follow the ingress rules for VLANs when participating in the GMRP protocol.

References:

- IEEE 802.1Q-1998 clause 10

Resource Requirements:

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

Last Modification: June 28, 2001

Discussion: The use of GMRP in a VLAN context allows GMRP registrations to be made that are specific to that VLAN. That is, it allows the Group filtering behavior for one VLAN to be independent of the Group filtering behavior for other VLANs.

Implementations of GMRP in VLAN Bridges apply the same ingress rules to received GMRP PDUs that are defined for the reception Port. Thus GMRP frames with no classification (untagged or priority-tagged GMRP frames) are discarded if the Acceptable Frame Types parameter for the Port is set to Admit Only VLAN-tagged frames. Otherwise, they are classified according to the PVID for the Port. VLAN-tagged GMRP frames are classified according to the VID carried in the tag header. If Ingress Filtering is enabled, and if the Port is not in the Member set for the GMRP frame's VLAN classification, then the frame is discarded.

Test Setup: Connect the Testing Stations to the DUT as shown in Figure 1. Enable GMRP on the DUT and allow time for it to configure.

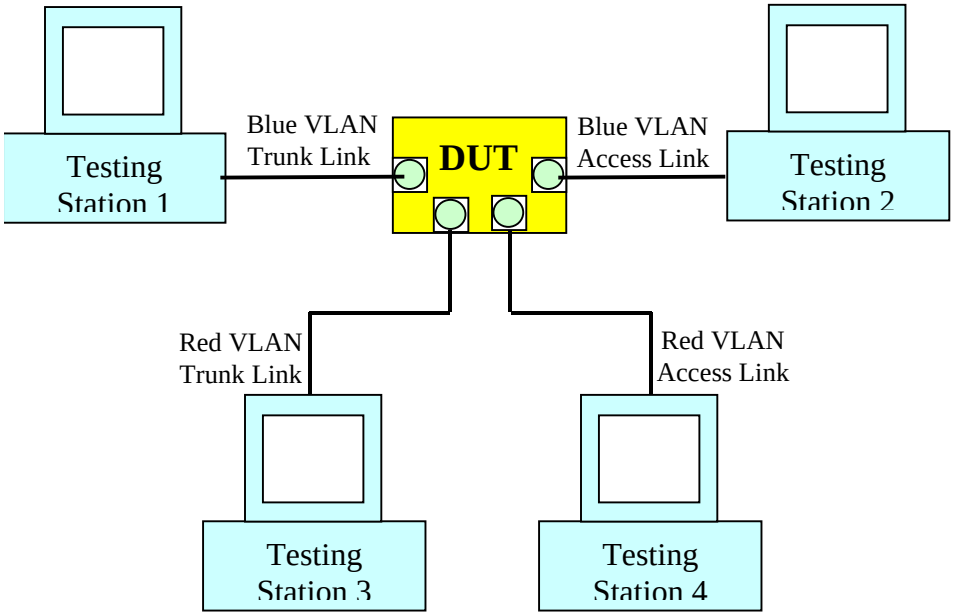

Figure 1

Procedure:

Part a: Acceptable Frame Types Parameter

1. If possible, set the Acceptable Frame Types parameter to Admit Only VLAN-tagged frames.

2. Set the Testing Stations to capture GMRP PDUs.
3. Transmit a GMRP PDU containing a LeaveAll event, appropriately tagged, from Testing Stations 1 and 2.
4. Transmit an untagged GMRP PDU containing a JoinIn event for a specific group MAC address from Testing Station 2.
5. Transmit a GMRP PDU tagged for the Blue VLAN containing a Empty event for the group MAC address used in Step 3 from Testing Station 1.
6. Repeat Steps 1-4, using a Service Requirement Attribute instead of a group MAC address in Steps 3 and 4..

Part b: Ingress Filtering

7. If possible, set the Enable Ingress Filtering parameter to Set.
8. Set the Testing Stations to capture GMRP PDUs.
9. Transmit a GMRP PDU containing a LeaveAll event, appropriately tagged, from Testing Stations 3 and 4.
10. Transmit a GMRP PDU tagged for the Blue VLAN containing a JoinIn event for a specific group MAC address from Testing Station 3.
11. Transmit a GMRP PDU tagged for the Blue VLAN containing a Empty event for the group MAC address used in Step 10 from Testing Station 3.
12. Repeat Steps 7-11, using a Service Requirement Attribute instead of a group MAC address in Steps 10 and 11..

Observable results:

- In Part a, none of the Testing Stations should receive events for the Attributes transmitted.
- In Part b, none of the Testing Stations should receive events for the Attributes transmitted.

Possible Problems:

- None.

Test 10.2.9.3 – Multiple Participants

Purpose: To verify that the DUT maintains a GMRP Participant for each VLAN Context.

References:

- IEEE 802.1Q-1998 clause 10

Resource Requirements:

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

Last Modification: June 28, 2001

Discussion: The use of GMRP in a VLAN context allows GMRP registrations to be made that are specific to that VLAN. That is, it allows the Group filtering behavior for one VLAN to be independent of the Group filtering behavior for other VLANs.

For each Port of the Bridge, a distinct instance of the GMRP Participant can exist for each VLAN Context supported by the Bridge. Each GMRP Participant maintains its own set of GARP Applicant and Registrar state machines, and its own Leave All state machine. There is no GMRP Participant associated with the Base Spanning Tree Context.

Test Setup: Connect the Testing Stations to the DUT as shown in Figure 1. Enable GMRP on the DUT and allow time for it to configure.

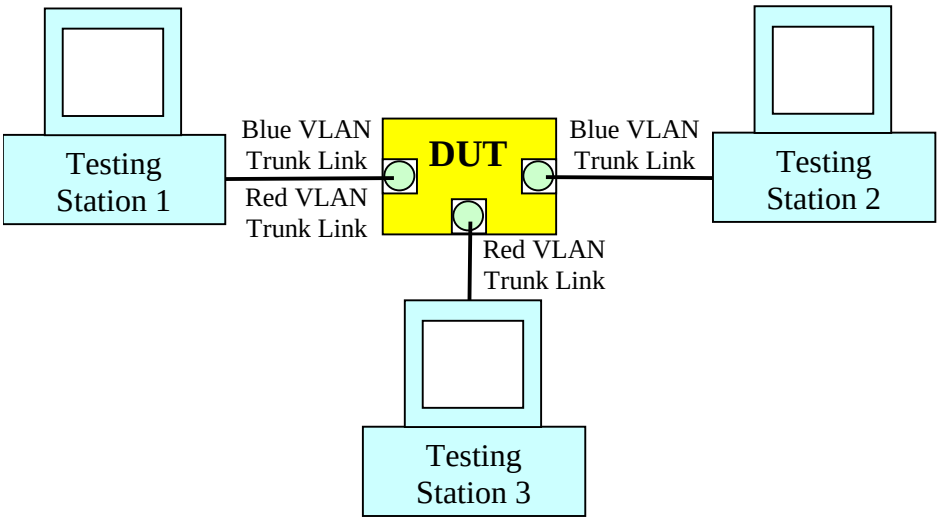

Figure 1

Procedure:

Part a: Applicant State Machine

1. Set the Testing Stations to capture GMRP PDUs.
2. Transmit a GMRP PDU containing a LeaveAll event, appropriately tagged, from Testing Stations 1, 2, and 3. Testing Station 1 should transmit a GMRP PDU for both the Red and Blue VLANs.
3. Transmit a GMRP PDU tagged for the Blue VLAN containing a JoinIn event for a specific group MAC address from Testing Station 2.
4. Transmit a GMRP PDU tagged for the Red VLAN containing a JoinIn event for the group MAC address used in Step 3 from Testing Station 3.
5. Repeat Steps 1-4, using a Service Requirement Attribute instead of a group MAC address in Steps 3 and 4.

Part b: Registrar State Machine

6. Set the Testing Stations to capture GMRP PDUs.
7. Transmit a GMRP PDU containing a LeaveAll event, appropriately tagged, from Testing Stations 1, 2, and 3. Testing Station 1 should transmit a GMRP PDU for both the Red and Blue VLANs.
8. Transmit a GMRP PDU tagged for the Blue VLAN containing a JoinIn event for a specific group MAC address from Testing Station 1.
9. Transmit a GMRP PDU tagged for the Red VLAN containing a JoinIn event for the group MAC address used in Step 8 from Testing Station 1.
10. Repeat Steps 6-10, using a Service Requirement Attribute instead of a group MAC address in Steps 8 and 9.

Part c: Leave All State Machine

11. Set Testing Station 1 to capture GMRP PDUs.
12. Wait for the DUT to send a LeaveAll for each VLAN to Testing Station 1.

Observable results:

- In Part a, Step 3, Testing Station 1 should capture two GMRP PDUs tagged for the Blue VLAN containing a JoinEmpty event for the Attribute Value used in Step 3. Testing Station 3 should not capture any events for the Attribute Value used in Step 3. In Step 4, Testing Station 1 should capture two GMRP PDUs tagged for the Red VLAN containing a JoinEmpty event for the Attribute Value used in Step 3. Testing Station 2 should not capture any events for the Attribute Value used in Step 3.
- In Part b, Step 8, Testing Station 2 should capture two GMRP PDUs tagged for the Blue VLAN containing a JoinEmpty event for the Attribute Value used in Step 8. Testing Station 3 should not capture any events for the Attribute Value used in Step 8. In Step 9, Testing Station 3 should capture two GMRP PDUs tagged for the Red VLAN containing a JoinEmpty event for the Attribute Value used in Step 8. Testing Station 2 should not capture any events for the Attribute Value used in Step 8.
- In Part c, Testing Station 1 should capture a GMRP PDU tagged for the Blue VLAN containing a LeaveAll event. Testing Station 1 should also capture a GMRP PDU tagged for the Red VLAN containing a LeaveAll event.

Possible Problems:

- None