

Bridge Functions Consortium

GARP/GMRP Operation Test Suite Version 0.9

Technical Document



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MODIFICATION RECORD

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Initial Version

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The University of New Hampshire would like to acknowledge the efforts of the following individuals in the development of this test suite.

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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.

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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.

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 effect test results in certain situations.

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Group 1: Informative Preliminary Tests

Scope: The following tests are used for informative purposes only.

Overview: These tests are designed to provide information that will help facilitate the testing of the device under test (DUT). They cover some of the more basic concepts of GARP/GMRP and allow more accurate testing of the DUT.

Test 10.2.1.1 – 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: April 21, 2000

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.

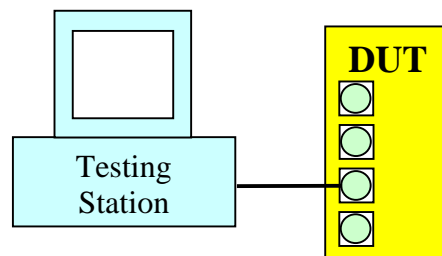


Figure 1

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.

Test 10.2.1.2 – Static Registration Maintained

Purpose: To verify that the device under test (DUT) doesn't register a group MAC address that is already statically configured.

References:

- IEEE 802.1D 1998: sub-clause 7.9.2

Resource Requirements:

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

Last Modification: April 21, 2000

Discussion: The Filtering Database provides the method of maintaining the registration entries made manually and dynamically. It consists of two types of entries: Static Filtering Entries and Dynamic Filtering Entries. Both entries consist of at least a MAC address and a Port Map. Static Filtering Entries may be modified by management, but Dynamic Filtering Entries may not. Dynamic Filtering Entries may be created or updated by the Learning Process, but Static Filtering Entries may not. Also, a Dynamic Filtering Entry shall not be created or updated if a Static Filtering Entry for that MAC address already exists.

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.

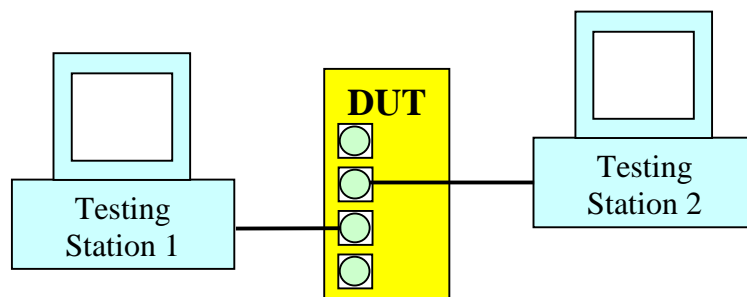


Figure 1

Procedure:

1. Configure the Port to which the Testing Station is connected to have a Static Filtering Entry for a specific group MAC address.
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 the group MAC address used in Step 1 from Testing Station 1.
4. Transmit a GMRP PDU containing an Empty event for the group MAC address used in Step 1 from Testing Station 2.
5. Record the captured frames on Testing Station 2.

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Observable Results:

- The DUT should not have transmitted any Join events for the group MAC address used in Step 1 to Testing Station 2.

Possible Problems:

- None.

Group 2: 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 if necessary as well as verifying that the granularity of 5 centiseconds or less is adhered to.

Test 10.2.2.1 – 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: April 21, 2000

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 $0 \leq T \leq \text{JoinTime}$. JoinTime is defined to be 20 centiseconds. All GARP timers shall be based on a timer resolution of 5 centiseconds or less.

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

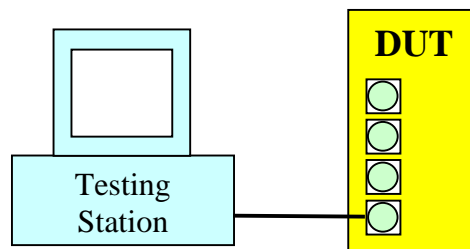


Figure 1

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 GMRP PDUs.
6. Repeat indefinitely.

Observable Results:

- In Part a, the Testing Station should have captured a GMRP PDU containing a JoinEmpty event for the group MAC address specified in Step 1 within 25 centiseconds. A second GMRP PDU should have been captured within 25 centiseconds after the first.

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- In Part b, the amount of time until the first GMRP PDU is captured should have an even distribution between 0 and 25 centiseconds. The amount of time between the first PDUs arrival and the second PDUs arrival should also have an even distribution between 0 and 25 centiseconds.

Possible Problems:

- None.

Test 10.2.2.2 – 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: April 21, 2000

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.

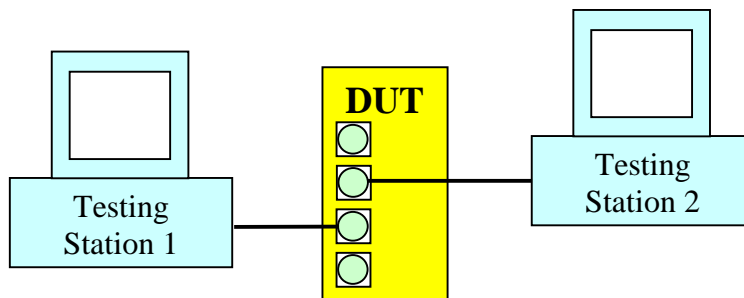


Figure 1

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 LeaveAll Message for the group MAC address user 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 10.2.2.3 – 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: April 21, 2000

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 $\text{LeaveAllTime} < T < 1.5 * \text{LeaveAllTime}$. 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.

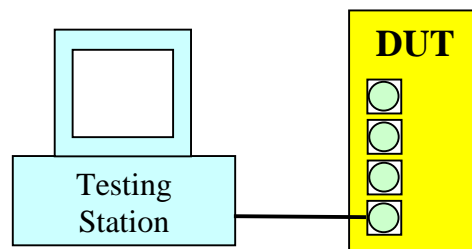


Figure 1

Procedure:

Part a: LeaveAll Reception

1. Set the Testing Station to capture 2 GMRP PDUs containing a LeaveAll Message.
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 received GMRP PDUs containing messages specifying LeaveAll events should be between 995 and 1505 centiseconds.
- In Part b, the amount of time between received 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.

Group 3: 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.

Test 10.2.3.1 – 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: April 21, 2000

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.

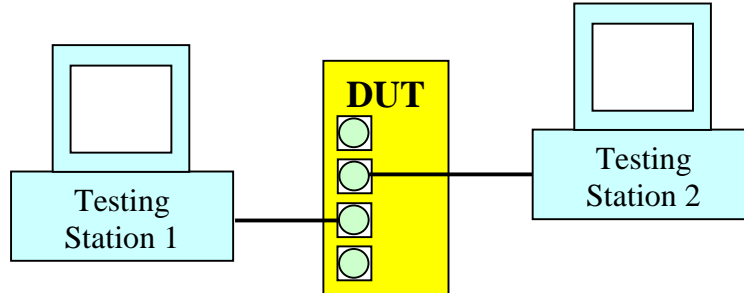


Figure 1

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 for group MAC address used 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.

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

Observable Results:

- In Part a, the DUT should have transmitted at least 2 GMRP PDUs containing a JoinEmpty event for group MAC address used in Step 3 to Testing Station 2.
- In Part b, the DUT should have transmitted at least 2 GMRP PDUs containing a JoinIn event for group MAC address used in Step 9 to Testing Station 2.

Possible Problems:

- None.

Test 10.2.3.2 – Leave Events

Purpose: To verify that the device under test (DUT) propagates Messages that indicate a Leave 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: April 21, 2000

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 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. A Leave event is not propagated if a registration exists for the Attribute Value on any other Port in the Forwarding set.

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.

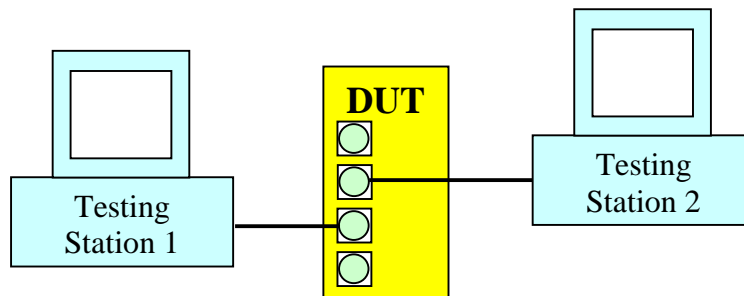


Figure 1

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

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Part b: Registrar in IN state

8. Set Testing Station 2 to capture GMRP PDUs.
9. Transmit a GMRP PDU 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 a JoinEmpty event for the group MAC address used in Step 10 from Testing Station 2.
12. Transmit a GMRP PDU containing a LeaveIn event for the group MAC address used in Step 10 from Testing Station 1.
13. Record the captured frames on Testing Station 2.
14. Repeat Steps 8-13 using a LeaveEmpty event for the group MAC address used in Step 10.

Observable Results:

- In Part a, the DUT should have transmitted at least 2 GMRP PDUs containing JoinEmpty events for the group MAC address used in Step 3 to Testing Station 2. During Step 5, 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.
- In Part b, the DUT should have transmitted at least 2 GMRP PDUs containing JoinIn events for the group MAC address used in Step 10 to Testing Station 2. During Step 12, the DUT should not have transmitted a GMRP PDU containing a LeaveEmpty event for the group MAC address used in Step 10 to Testing Station 2.

Possible Problems:

- None.

Test 10.2.3.3 – Registrations Propagated in Forwarding State

Purpose: To verify that the device under test (DUT) does propagate 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: April 21, 2000

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 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.

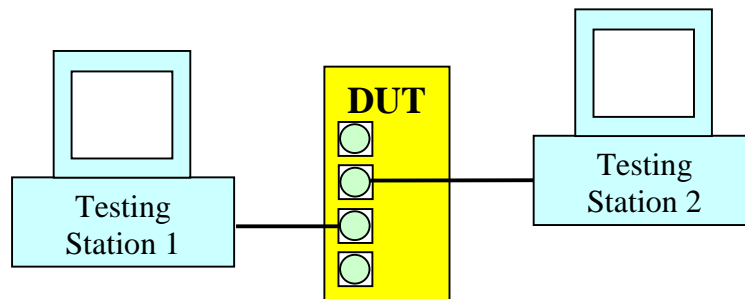


Figure 1

Procedure:

Part a: Static Configurations Propagated

1. Configure the Port to which Testing Station 1 is connected to have a Static Filtering Entry 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.

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7. Transmit a GMRP PDU containing an Empty event for the group MAC address used in Step 6 from Testing Station 2.
8. Record all frames received by Testing Station 2.
9. Repeat Steps 4-8 using a JoinEmpty event for the group MAC address used 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 received by Testing Station 2.
15. Repeat Steps 10-14 using a JoinEmpty event for the group MAC address used in Step 12.

Observable Results:

- In Part a, the DUT should have transmitted exactly 2 GMRP PDUs containing a Join event for the group MAC address used in Step 1 to Testing Station 1.
- In Part b, the DUT should have transmitted at least 2 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 at least 2 GMRP PDUs containing a JoinIn event for group MAC address used in Step 12 to Testing Station 2.

Possible Problems:

- None.

Test 10.2.3.4 – 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: April 21, 2000

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 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.

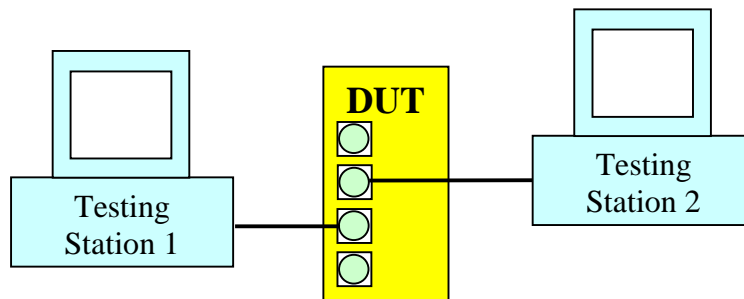


Figure 1

Procedure:

Part a: Static Configurations not Propagated

1. Configure the Port to which Testing Station 1 is connected to have a Static Filtering Entry for a specific group MAC address.
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. While continuing to transmit Configuration BPDUs, set Testing Station 2 to capture GMRP PDUs.
5. While continuing to transmit Configuration BPDUs, transmit GMRP PDUs containing a LeaveAll event from Testing Stations 1 and 2.

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

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 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 received by Testing Station 2.
13. Repeat Steps 6-12 using a JoinEmpty event for the group MAC address used 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 received by Testing Station 2.
21. Repeat Steps 14-20 using a JoinEmpty event for the group MAC address used in Step 18.

Observable Results:

- In Part a, no GMRP PDUs containing Join events for the group MAC address used in Step 1 should be received by Testing Station 2.
- In Parts b and c, no GMRP PDUs containing Join events for the specified group MAC addresses should be received by Testing Station 2.

Possible Problems:

- If Multiple Spanning Trees are supported, this test can not be completed.

Test 10.2.3.5 – 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: April 21, 2000

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.

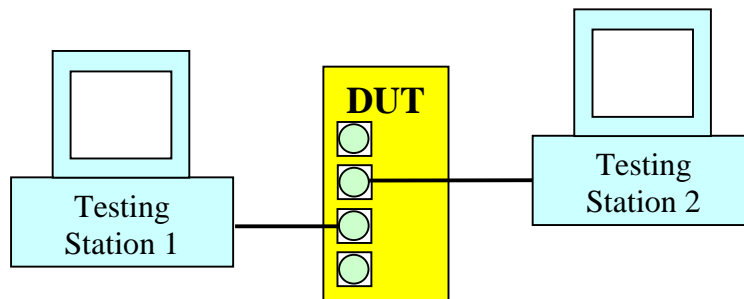


Figure 1

Procedure:

Part a: Static Configurations

1. Set the Max Age on the DUT to 20 seconds and the Forward Delay to 15 seconds.
2. 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.
5. While continuing to transmit Configuration BPDUs, configure the Port on the DUT that is connected to Testing Station 1 to have Static Filtering Entry for a specific group MAC address.

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6. 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. Set Testing Station 2 to capture GMRP PDUs.
8. 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.
9. 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.
10. After approximately 45 seconds transmit a GMRP PDU containing a LeaveAll event from Testing Stations 1 and 2.
11. Transmit a GMRP PDU containing a JoinIn event for a specific group MAC address from Testing Station 1.
12. Transmit a GMRP PDU containing an Empty event for the group MAC address used in Step 11 from Testing Station 2.
13. Record all frames received by Testing Station 2.
14. Repeat Steps 7-13 with a JoinEmpty event for the group MAC address used in Step 11.

Part c: Dynamic Configurations with Registrar in IN State

15. Set Testing Station 2 to capture GMRP PDUs.
16. 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.
17. 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.
18. After approximately 45 seconds transmit a GMRP PDU containing a LeaveAll event from Testing Stations 1 and 2.
19. Transmit a GMRP PDU containing a JoinIn event for a specific group MAC address from Testing Station 1.
20. Transmit a GMRP PDU containing an JoinEmpty event for the group MAC address used in Step 19 from Testing Station 2.
21. Record all frames received by Testing Station 2.
22. Repeat Steps 15-21 with a JoinEmpty event for the group MAC address used in Step 19.

Observable Results:

- In Part a, Testing Station 2 should capture exactly 2 GMRP PDUs containing a Join event for the new group MAC address before any LeaveAll Messages are received from the DUT.
- In Part b, Testing Station 2 should capture at least 2 GMRP PDUs containing a JoinEmpty event for the group MAC address used in Step 11 before any LeaveAll Messages are received from the DUT.
- In Part c, Testing Station 2 should capture at least 2 GMRP PDUs containing a JoinIn event for the group MAC address used in Step 19 before any LeaveAll Messages are received from the DUT.

Possible Problems:

- If the DUT does not support management, this test can not be completed.
- If Multiple Spanning Trees are supported, this test can not be completed.

Test 10.2.3.6 – 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: April 21, 2000

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.

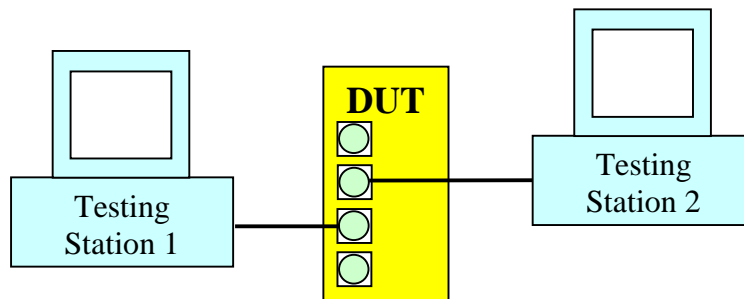


Figure 1

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 for a specific group MAC address.
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. This should result in the Port to which Testing Station 1 is connected entering the Blocking State.
4. Record all frames received by Testing Station 2.

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Part b: Dynamic Configurations with Registrar in MT State

5. Remove the static configuration created in Part a.
6. Set Testing Station 2 to capture GMRP PDUs.
7. Transmit a GMRP PDU containing a LeaveAll event from Testing Stations 1 and 2.
8. Transmit a GMRP PDU containing a JoinIn event for a specific group MAC address from Testing Station 1.
9. Transmit a GMRP PDU containing an Empty event for the group MAC address used in Step 8 from Testing Station 2.
10. 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.
11. 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.
12. Record all frames received by Testing Station 2.
13. Repeat Steps 6-12 with a JoinEmpty event for the group MAC address used in Step 8.

Part c: Dynamic Configurations with Registrar in IN State

14. Set Testing Station 2 to capture GMRP PDUs.
15. Transmit a GMRP PDU containing a LeaveAll event from Testing Stations 1 and 2.
16. Transmit a GMRP PDU containing a JoinIn event for a specific group MAC address from Testing Station 1.
17. Transmit a GMRP PDU containing a JoinEmpty event for the group MAC address used in Step 16 from Testing Station 2.
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. This should result in the Port to which Testing Station 1 is connected entering the Blocking State.
20. Record all frames received by Testing Station 2.
21. Repeat Steps 14-20 with a JoinEmpty event for the group MAC address used in Step 16.

Observable Results:

- In Part a, Testing Station 2 should not capture any GMRP PDUs containing a LeaveEmpty event for the group MAC address used in Step 1.
- In Parts b and c, Testing Station 2 should capture a GMRP PDU containing a LeaveEmpty event for the specific group MAC addresses when the Port on the DUT that is connected to Testing Station 1 enters the Blocking State.

Possible Problems:

- If Multiple Spanning Trees are supported, this test can not be completed.

Group 4: 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 state of the registrar will change continuously and the results of these tests will depend on its state as well.

Test 10.2.4.1 – JoinEmpty Event Received

Purpose: To verify that the device under test (DUT) transmits messages containing JoinEmpty events for all group MAC addresses that it wishes to maintain registrations for when a GMRP PDU containing a JoinEmpty event is received.

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: April 21, 2000

Discussion: When a JoinEmpty event for a registered attribute is received on a Port, the applicant for that attribute enters the VA state. If the receiving device wishes to maintain the registration for the attribute concerned than a JoinEmpty event must be transmitted out the receiving Port.

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.

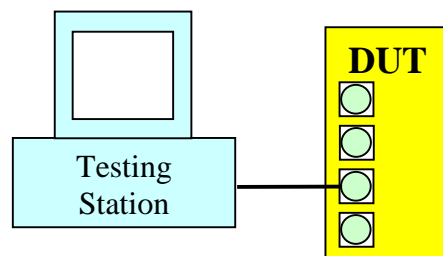


Figure 1

Procedure:

1. Configure the Port on the DUT that is connected to the Testing Station to have a Static Filtering Entry for a specific group MAC address.
2. Transmit GMRP PDUs containing a JoinEmpty event for the group MAC address used in Step 1 from the Testing Station.
3. While continuing to transmit PDUs, set the Testing Station to capture GMRP PDUs.

Observable Results:

- For each JoinEmpty event transmitted by the Testing Station, 2 GMRP PDUs containing JoinIn events for the group MAC address used in Step 1 should be captured.

Possible Problems:

- None.

Test 10.2.4.2 – Empty Event Received

Purpose: To verify that the device under test (DUT) transmits messages containing JoinEmpty events for all group MAC addresses that it wishes to maintain registrations for when a GMRP PDU containing an Empty event is received.

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: April 21, 2000

Discussion: When an Empty event for a registered attribute is received on a Port, the applicant for that attribute enters the VA state. If the receiving device wishes to maintain the registration for the attribute concerned than a JoinEmpty event must be transmitted out the receiving Port.

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.

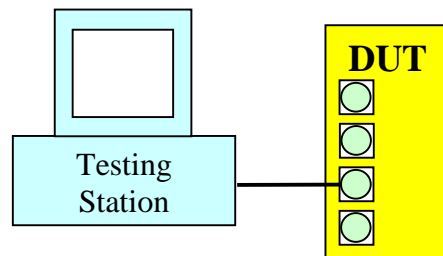


Figure 1

Procedure:

1. Configure the Port on the DUT that is connected to the Testing Station to have a Static Filtering Entry for a specific group MAC address.
2. Transmit GMRP PDUs containing an Empty event for the group MAC address used in Step 1 from the Testing Station.
3. While continuing to transmit PDUs, set the Testing Station to capture GMRP PDUs.

Observable Results:

- For each Empty event transmitted by the Testing Station, 2 GMRP PDUs containing Join events for the group MAC address used in Step 1 should be captured.

Possible Problems:

- None.

Test 10.2.4.3 – LeaveIn Event Received

Purpose: To verify that the device under test (DUT) transmits messages containing JoinEmpty events for all group MAC addresses that it wishes to maintain registrations for when a GMRP PDU containing a LeaveIn event is received.

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: April 21, 2000

Discussion: When a LeaveIn event for a registered attribute is received on a Port, the applicant for that attribute enters the VA state. If the receiving device wishes to maintain the registration for the attribute concerned than a JoinEmpty event must be transmitted out the receiving Port.

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.

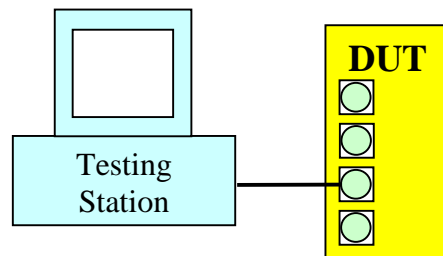


Figure 1

Procedure:

1. Configure the Port on the DUT that is connected to the Testing Station to have a Static Filtering Entry for a specific group MAC address.
2. Transmit GMRP PDUs containing a LeaveIn event for the group MAC address used in Step 1 from the Testing Station.
3. While continuing to transmit PDUs, set the Testing Station to capture GMRP PDUs.

Observable Results:

- For each LeaveIn event transmitted by the Testing Station, 2 GMRP PDUs containing Join events for the group MAC address used in Step 1 should be captured.

Possible Problems:

- None.

Test 10.2.4.4 – LeaveEmpty Event Received

Purpose: To verify that the device under test (DUT) transmits messages containing JoinEmpty events for all group MAC addresses that it wishes to maintain registrations for when a GMRP PDU containing a LeaveEmpty event is received.

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: April 21, 2000

Discussion: When a LeaveEmpty event for a registered attribute is received on a Port, the applicant for that attribute enters the VP state. If the receiving device wishes to maintain the registration for the attribute concerned than a JoinEmpty event must be transmitted out the receiving Port.

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.

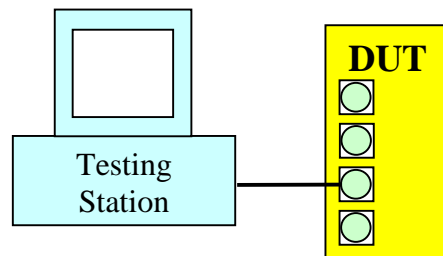


Figure 1

Procedure:

1. Configure the Port on the DUT that is connected to the Testing Station to have a Static Filtering Entry for a specific group MAC address.
2. Transmit GMRP PDUs containing a LeaveEmpty event for the group MAC address used in Step 1 from the Testing Station.
3. While continuing to transmit PDUs, set the Testing Station to capture GMRP PDUs.

Observable Results:

- For each LeaveEmpty event transmitted by the Testing Station, 2 GMRP PDUs containing Join events for the group MAC address used in Step 1 should be captured.

Possible Problems:

- None.

Test 10.2.4.5 – LeaveAll Event Received

Purpose: To verify that the device under test (DUT) transmits messages containing JoinEmpty events for all group MAC addresses that it wishes to maintain registrations for when a GMRP PDU containing a LeaveAll event is received.

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: April 21, 2000

Discussion: When a LeaveAll event is received on a Port, the applicants for every attribute enter the VP state. For all attributes that the receiving device wishes to maintain, a JoinEmpty event must be transmitted out the receiving Port.

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.

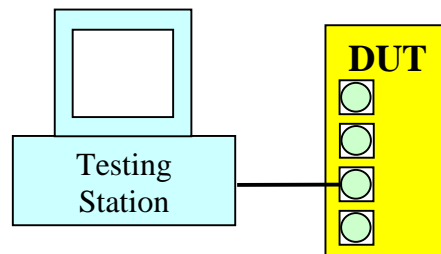


Figure 1

Procedure:

1. Configure the Port on the DUT that is connected to the Testing Station to have a Static Filtering Entry for a specific group MAC address.
2. Transmit GMRP PDUs containing a LeaveAll event for the group MAC address used in Step 1 from the Testing Station.
3. While continuing to transmit PDUs, set the Testing Station to capture GMRP PDUs.

Observable Results:

- For each LeaveAll event transmitted by the Testing Station, 2 GMRP PDUs containing Join events for the group MAC address used in Step 1 should be captured.

Possible Problems:

- None.

Test 10.2.4.6 – ReqLeave Event Received

Purpose: To verify that the device under test (DUT) transmits a message containing LeaveEmpty event for the group MAC address associated with this applicant.

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: April 21, 2000

Discussion: When a ReqLeave event occurs on an applicant associated with a currently registered attribute, a LeaveEmpty message should be transmitted out the Port associated with that applicant and the VO state should be entered. If another Leave event is received on that Port an Empty message should be transmitted out that Port.

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.

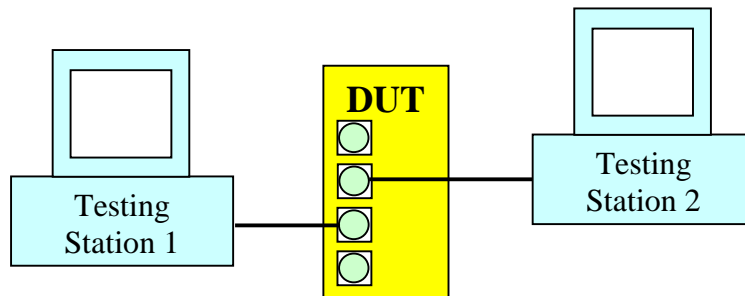


Figure 1

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.
6. Transmit a GMRP PDU containing a LeaveAll event from Testing Station 2.

Observable Results:

- In step 3, Testing Station 2 should capture 2 GMRP PDUs containing a JoinEmpty event for the group MAC address used.
- In step 4, Testing Station 2 should capture a GMRP PDU containing a LeaveEmpty event for the group MAC address used in Step 3.
- In step 5, Testing Station 2 should capture a GMRP PDU containing an Empty event for the group MAC address used in Step 3.

Possible Problems:

- None.

Group 5: Miscellaneous

Scope: The following tests cover the operations of GARP/GMRP don't fit into the above categories.

Overview: These tests are designed to verify that the device under test (DUT) can properly pack multiple messages and attributes into a PDU and that it can parse such a PDU when it is received. These tests also verify that the leavetimer is properly stopped when a JoinIn or JoinEmpty event is received when the registrar is in the LV state before the leavetimer expires.

Test 10.2.5.1 – GMRP PDU Packing

Purpose: To verify that the device under test (DUT) will accept GMRP PDUs with multiple Messages encoded within a single PDU.

References:

- IEEE 802.1D 1998: sub-clause 12.11.3.1
- IEEE 802.1D 1998: Figure 12-6

Resource Requirements:

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

Last Modification: April 21, 2000

Discussion: The GARP standard allows for multiple messages of varying Attribute Types to be encoded within a single PDU. By doing so the total amount of traffic transmitted by the protocol is reduced. This is accomplished by defining the Attribute Type before the Attributes are encoded in the Messages. The only limit to the number of Messages that are transmitted in a single PDU is the physical frame size limit of your network topology.

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.

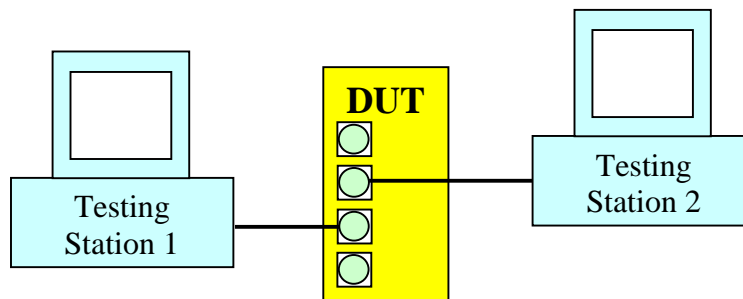


Figure 1

Procedure:

Part a: Minimum Messages in a PDU

1. Set Testing Station 2 to capture GMRP PDUs.
2. Transmit a GMRP PDU with one Message encoded in the PDU. The transmitted PDU should contain a JoinIn event for a specific group MAC address.
3. Transmit a GMRP PDU containing an Empty event for the group MAC address used in Step 2 from Testing Station 2.

Part b: N Messages in a PDU

4. Set Testing Station 2 to capture GMRP PDUs.
5. Transmit a GMRP PDU with N Messages encoded in the PDU, where N is greater than one. The transmitted PDU should contain JoinIn events for multiple, distinct group MAC addresses.
6. Transmit a GMRP PDU containing an Empty event for each of the group MAC addresses used in Step 5 from Testing Station 2.

Part c: Maximum Messages in a PDU

7. Set Testing Station 2 to capture GMRP PDUs.
8. Transmit a GMRP PDU with the maximum number of Messages encoded in the PDU. The transmitted PDU should contain JoinIn events for multiple, distinct group MAC addresses.

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9. Transmit a GMRP PDU containing an Empty event for each of the group MAC addresses used in Step 8 from Testing Station 2.

Observable results:

- In part a, the DUT should register the group MAC address specified in Step 1 on the Port to which Testing Station 1 is connected. Testing Station 2 should capture at least 2 GMRP PDUs containing a JoinEmpty event for the specified group MAC address.
- In part b, the DUT should register the group MAC addresses specified in Step 3 on the Port to which Testing Station 1 is connected. Testing Station 2 should capture at least 2 GMRP PDUs containing JoinEmpty events for all specified group MAC addresses.
- In part c, the DUT should register the group MAC addresses specified in Step 5 on the Port to which Testing Station 1 is connected. Testing Station 2 should capture at least 2 GMRP PDUs containing JoinEmpty events for all specified group MAC addresses.

Possible Problems:

- None.

Test 10.2.5.2 – GMRP PDU Parsing

Purpose: To verify that the device under test (DUT) properly parses GMRP PDUs in all possible scenarios that can occur.

References:

- IEEE 802.1D 1998: sub-clauses 10.3.1.3, 12.11.2.2, 12.11.2.4, 12.11.2.7, 12.11.3

Resource Requirements:

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

Last Modification: April 21, 2000

Discussion: GMRP PDUs contain a list of Messages followed by an End Mark. These Messages are made up of an Attribute Type followed by an Attribute List. This Attribute List is a list of Attributes followed by an End Mark. The physical end of the PDU is also interpreted as an End Mark. When a compliant device receives a GMRP PDU it must parse that PDU to obtain all of the Messages in it, as well as all of the Attributes within each Message. There are four events that can take place during this parsing of the PDUs:

1. The physical end of the PDU is encountered. If the last Attribute to be unpacked was complete, the Attribute is processed normally and processing of the PDU terminates. If the last Attribute to be unpacked was incomplete, the partial Attribute is discarded and the processing of the PDU terminates.
2. Two successive End Marks are encountered. This case signals the end of this PDU even though the physical end of the PDU has not yet been reached.
3. An unrecognized Attribute Type is encountered. The current message is discarded by discarding successive Attributes until either an End Mark or the physical end of the PDU is encountered. If the End Mark is encountered processing resumes with the next Message.
4. An unrecognized Attribute Event is encountered. The Attribute associated with the unrecognized Attribute Event is discarded and processing continues with the next Attribute or Message if the end of the PDU has not been reached.

The only valid Attribute Types for GMRP are defined to be 0x01 and 0x02. Valid Attribute Events consist of 0x00-0x05. The End Mark is defined to be 0x00.

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.

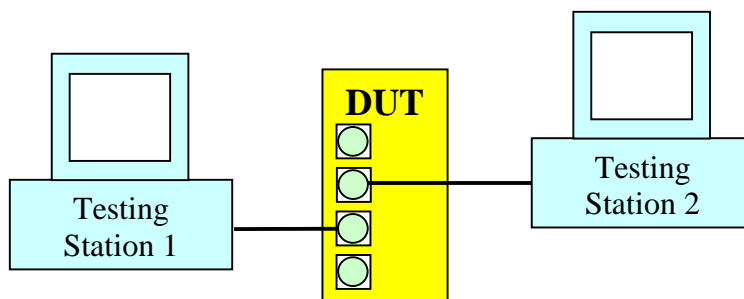


Figure 1

Procedure:

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Part a: Physical End of the PDU

1. Set Testing Station 2 to capture GMRP PDUs.
2. Transmit a GMRP PDU containing multiple Messages specifying JoinIn events for multiple, distinct group MAC addresses from Testing Station 1. An End Mark should terminate all Attribute Lists but should not terminate the Message list.
3. Transmit a GMRP PDU containing an Empty event for all group MAC addresses specified in Step 2 from Testing Station 2.

Part b: Two End Marks within PDU

4. Set Testing Station 2 to capture GMRP PDUs.
5. Transmit a GMRP PDU containing multiple Messages specifying JoinIn events for multiple, distinct group MAC addresses from Testing Station 1. An End Mark should terminate all Attribute Lists as well as the Message list. The PDUs should contain several Messages specifying JoinIn events for multiple, distinct group MAC addresses after the End Mark that terminates the Message list.
6. Transmit a GMRP PDU containing an Empty event for all group MAC addresses specified in Step 5 from Testing Station 2.

Part c: Unrecognized Attribute Type

7. Set Testing Station 2 to capture GMRP PDUs.
8. Transmit a GMRP PDU containing multiple Messages specifying JoinIn events for multiple, distinct group MAC addresses from Testing Station 1. An End Mark should terminate all Attribute Lists as well as the Message List. One of the Messages in the middle of the PDUs should contain an invalid Attribute Type.
9. Transmit a GMRP PDU containing an Empty event for all group MAC addresses specified in Step 8 from Testing Station 2.

Part d: Unrecognized Attribute Event

10. Set Testing Station 2 to capture GMRP PDUs.
11. Transmit a GMRP PDU containing multiple Messages specifying JoinIn events for multiple, distinct group MAC addresses from Testing Station 1. An End Mark should terminate all Attribute Lists as well as the Message list. One of the Attribute Lists in a Message somewhere in the middle of the PDUs should contain an invalid Attribute Event.
12. Transmit a GMRP PDU containing an Empty event for all group MAC addresses specified in Step 11 from Testing Station 2.

Observable Results:

- In Part a, the DUT should register all of the group MAC addresses specified. Testing Station 2 should capture at least 2 GMRP PDUs containing a JoinEmpty event for all specified group MAC addresses.
- In Part b, the DUT should register all of the group MAC addresses specified before the End Mark that terminates the Message List. Testing Station 2 should capture GMRP PDUs containing a JoinEmpty event for all group MAC addresses specified before then End Mark that terminates the Message List.
- In Part c, the DUT should register all of the group MAC addresses specified except those specified in the Message containing the invalid Attribute Type. Testing Station 2 should capture at least 2 GMRP PDUs containing a JoinEmpty event for all group MAC addresses specified except those specified in the Message containing the invalid Attribute Type.
- In Part d, the DUT should register all of the group MAC addresses specified except the one specified in the Attribute containing the invalid Attribute Event. Testing Station 2 should capture at least 2 GMRP PDUs containing a JoinEmpty event for all group MAC addresses specified except the one specified in the Attribute containing the invalid Attribute Event.

Possible Problems:

- None.

Test 10.2.5.3 – 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 before the leavetimer expires.

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: April 21, 2000

Discussion: When a Leave event is received on a Port the registrar 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.

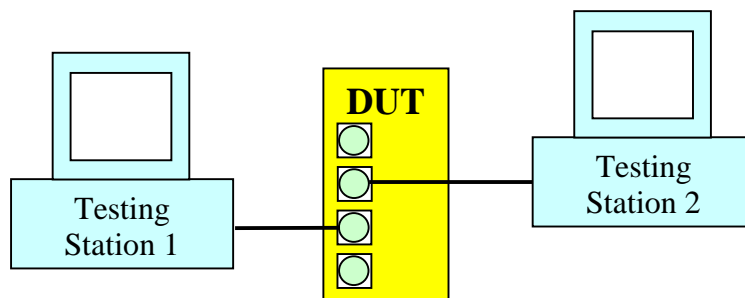


Figure 1

Procedure:

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

Observable Results:

- In step 3, Testing Station 2 should capture at least 2 GMRP PDUs containing a JoinEmpty event for the group MAC address used in Step 2.
- In step 4, Testing Station 2 should not capture any additional traffic until the first LeaveAll Message generated by the DUT.

Possible Problems:

- None.

Test 10.2.5.4 – Multicast Functionality

Purpose: To verify that the device under test (DUT) will properly transmit multicast traffic after group MAC addresses have been registered via GMRP.

References:

- IEEE 802.1D 1998: sub-clause 10.2

Resource Requirements:

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

Last Modification: April 21, 2000

Discussion: GMRP is a GARP application designed to allow the dynamic registration and de-registration of Group membership information. GMRP provides a method for registering group MAC addresses and modifying the filtering behavior of Bridges. Thus, when GMRP is fully configured and operational, multicast traffic can be transmitted to a Bridge and it will only reach those End Stations who have registered to receive that traffic.

This test verifies that when an End Station registers a group MAC address on a Bridge, the Bridge will properly transmit traffic destined for the group MAC address to that End Station.

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.

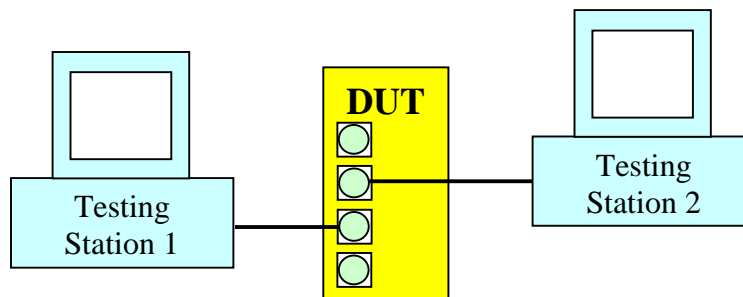


Figure 1

Procedure:

1. Set both Testing Stations to capture arbitrary MAC frames.
2. Transmit GMRP PDUs containing JoinIn events for a group MAC address from both Testing Stations.
3. Transmit multicast traffic destined for the group MAC address used in Step 2 from Testing Station 1.
4. Record frames captured on Testing Station 2.
5. Transmit multicast traffic destined for the group MAC address used in Step 2 from Testing Station 2.
6. Record frames captured on Testing Station 1.

Observable results:

- Testing Station 1 should receive all multicast traffic transmitted from Testing Station 2. Testing Station 2 should receive all multicast traffic from Testing Station 1. No frames should be lost or duplicated.

Possible Problems:

- None.

Test 10.2.5.5 – Filtering Behavior Functionality

Purpose: To verify that the device under test (DUT) will properly forward or filter frames after registering a Service Requirement Attribute Type.

References:

- IEEE 802.1D 1998: sub-clause 7.9.4, 10.2

Resource Requirements:

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

Last Modification: April 21, 2000

Discussion: GMRP is a GARP application designed to allow the dynamic registration and de-registration of Group membership information. GMRP provides a method for registering group MAC addresses and modifying the filtering behavior of Bridges. Thus, when GMRP is fully configured and operational, multicast traffic can be transmitted to a Bridge and it will only reach those End Stations who have registered to receive that traffic.

This test verifies that when an End Station registers a Service Requirement on a Port of a Bridge, the Bridge will properly forward or filter the multicast traffic transmitted to the Bridge.

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.

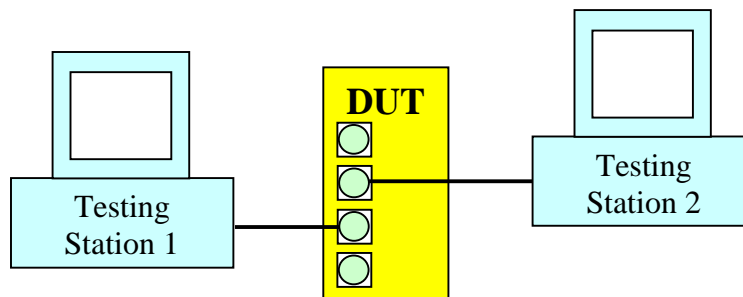


Figure 1

Procedure:

Part a: All Groups Service Attribute Type

1. Set Testing Station 2 to capture arbitrary MAC frames.
2. Transmit GMRP PDUs containing JoinIn events for the All Groups Service Attribute Type from Testing Station 2.
3. Transmit multicast traffic destined for various group MAC addresses from Testing Station 1.
4. Record frames captured on Testing Station 2.

Part b: All Unregistered Groups Service Attribute Type

5. Set Testing Station 2 to capture arbitrary MAC frames.
6. Configure the Port to which Testing Station 2 is connected to have Static Filtering Entries for various group MAC addresses. These Entries should specify that the addresses should be filtered, not forwarded.
7. Transmit GMRP PDUs containing JoinIn events for the All Unregistered Groups Service Attribute Type from Testing Station 2.
8. Transmit multicast traffic destined for the group MAC addresses used in Step 6, as well as group MAC addresses not specified in Step 6 from Testing Station 1.
9. Record frames captured on Testing Station 2.

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Observable results:

- In part a, Testing Station 2 should receive all multicast traffic transmitted from Testing Station 1.
- In part b, Testing Station 2 should receive all multicast traffic destined for group MAC addresses not used in Step 6 that were transmitted by Testing Station 1.

Possible Problems:

- None.