# Bridge Functions Consortium

## GARP/GMRP Frame Format Test Suite
**Version 1.0**

*Technical Document*


*Last Updated: June 28, 2001 2:09 PM*

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# MODIFICATION RECORD

| | |
|---|---|
| April 3, 2000 | Initial Version |
| April 14, 2000 | Version 0.95 Completed |
| November 8, 2000 | Version 0.99 Completed |
| June 21, 2001 | Version 1.0 Completed |

# ACKNOWLEDGEMENTS

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

| | |
|---|---|
| Micah Abbott | University of New Hampshire |
| Calvin Bascom | University of New Hampshire |
| Ben Schultz | University of New Hampshire |
| Rob Wolff | University of New Hampshire |

# 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 focuses on testing whether or not the device under test (DUT) will behave properly despite the fact that illegal values may be received in the fields of the GMRP PDUs.

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 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 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.

**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 affect test results in certain situations.

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## Test 10.3.1.1 – Attribute Type Verification

**Purpose:** To verify that the device under test (DUT) does not accept GMRP PDUs with an Attribute Type other than 0x01 or 0x02.

**References:**

- IEEE 802.1D 1998: sub-clauses 10.3.1.3, 12.10.1, 12.11.1.2, 12.11.2.2, 12.11.3.3
- IEEE 802.1D 1998: Figure 12-6
- 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 Attribute Type is encoded as a single octet, representing an unsigned binary number. The Attribute Type identifies the type of Attribute to which the Message applies. The range of values for a given Attribute Type, and the meanings of those values are defined by the specific GARP Application. The valid range of Attribute Type values is 1 to 255. The value of zero is reserved and may not be used by any GARP Application.

GMRP uses two Attribute Types. Attribute Type 0x01 signifies the Group Attribute Type. Attribute Type 0x02 signifies the Service Requirement Attribute Type.

**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.

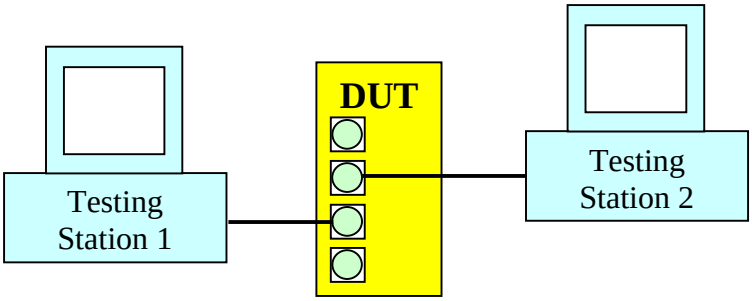


**Figure 1**

**Procedure:**

*Part a: Valid Attribute Type – Group Attribute Type*

1. Set Testing Station 2 to capture arbitrary MAC frames.
2. Transmit a properly formatted GMRP PDU containing a LeaveAll event from Testing Stations 1 and 2.
3. Transmit a properly formatted GMRP PDU containing an Attribute Type of 0x01 from Testing Station 1. The transmitted PDUs should contain a JoinIn event for a group MAC address.
4. Transmit a properly formatted GMRP PDU containing an Empty event for the same group MAC address used in Step 3 from Testing Station 2.

*Part b: Valid Attribute Type – Service Requirement Attribute Type*

5. Set Testing Station 2 to capture arbitrary MAC frames.
6. Transmit a properly formatted GMRP PDU containing a LeaveAll event from Testing Stations 1 and 2.
7. Transmit a properly formatted GMRP PDU containing an Attribute Type of 0x02 from Testing Station 1. The transmitted PDUs should contain a JoinIn event for a Service Requirement.

8. Transmit a properly formatted GMRP PDU containing an Empty event for the same Service Requirement used in Step 7 from Testing Station 2.

*Part c: Invalid Attribute Types*

9. Set Testing Station 2 to capture arbitrary MAC frames.
10. Transmit a properly formatted GMRP PDU containing a LeaveAll event from Testing Stations 1 and 2.
11. Transmit a properly formatted GMRP PDU containing an Attribute Type of 0x00 from Testing Station 1. The transmitted PDUs should contain a JoinIn event for a group MAC address.
12. Transmit a properly formatted GMRP PDU containing an Empty event for the same group MAC address used in Step 11 from Testing Station 2.
13. Repeat Steps 9-12 using Attribute Types of 0x03, 0x04, and 0xFF.
14. Repeat Steps 9-13 using a Service Requirement in Steps 11 and 12.

**Observable results:**

- In Part a, the DUT should register the group MAC address specified in Step 3 on the Port to which Testing Station 1 is connected. Testing Station 2 should capture four GMRP PDUs containing a JoinEmpty event for the specified group MAC address.
- In Part b, the DUT should register the Service Requirement specified in Step 7 on the Port to which Testing Station 1 is connected. Testing Station 2 should capture four GMRP PDUs containing a JoinEmpty event for the specified Service Requirement.
- In Part c, the DUT should discard the GMRP PDUs being transmitted by Testing Station 1. Testing Station 2 should not receive any GMRP PDUs containing events for the Attribute Value used in Step 11.

**Possible Problems:**

- None.

## Test 10.3.1.2 – Attribute Length Verification

**Purpose:** To verify that the device under test (DUT) discards all GMRP PDUs containing an invalid Attribute Length.

**References:**

- IEEE 802.1D 1998: sub-clauses 12.10.1, 12.11.2.3
- IEEE 802.1D 1998: Figure 12-6
- 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 Attribute Length value is encoded as a single octet, representing an unsigned binary number. The Attribute Length identifies the number of octets that comprise the Attribute, including the Attribute Length field. The range of allowable values used by the Attribute Length is 0x02 to 0xFF.

**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.

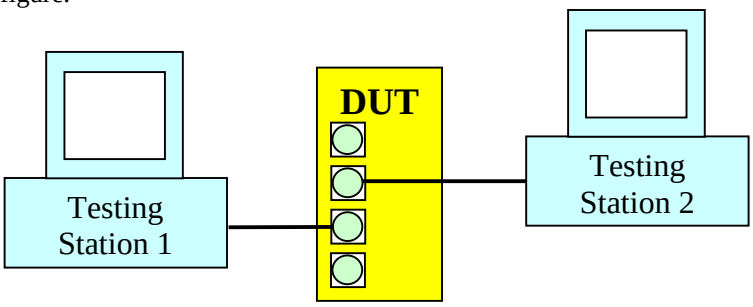


**Figure 1**

**Procedure:**

*Part a: Valid Attribute Length – Group Attribute Type*

1. Set Testing Station 2 to capture arbitrary MAC frames.
2. Transmit a properly formatted GMRP PDU containing a LeaveAll event from Testing Stations 1 and 2.
3. Transmit a properly formatted GMRP PDU containing an Attribute Length of 0x08 from Testing Station 1. The transmitted PDUs should contain a JoinIn event for a group MAC address.
4. Transmit a properly formatted GMRP PDU containing an Empty event for the same group MAC address used in Step 3 from Testing Station 2.

*Part b: Valid Attribute Length – Service Requirement Attribute Type*

5. Set Testing Station 2 to capture arbitrary MAC frames.
6. Transmit a properly formatted GMRP PDU containing a LeaveAll event from Testing Stations 1 and 2.
7. Transmit a properly formatted GMRP PDU containing an Attribute Length of 0x03 from Testing Station 1. The transmitted PDUs should contain a JoinIn event for a Service Requirement.
8. Transmit a properly formatted GMRP PDU containing an Empty event for the same Service Requirement used in Step 7 from Testing Station 2.

*Part c: Valid Attribute Length – LeaveAll Event*

9. Set Testing Station 2 to capture arbitrary MAC frames.
10. Transmit a properly formatted GMRP PDU containing a JoinIn event for a group MAC address from Testing Station 1.

11. Transmit a properly formatted GMRP PDU containing an Attribute Length of 0x02 from Testing Station 2. The transmitted PDU should contain a LeaveAll event.

*Part d: Invalid Attribute Length*

12. Set Testing Station 2 to capture arbitrary MAC frames.
13. Transmit a properly formatted GMRP PDU containing a LeaveAll event from Testing Stations 1 and 2.
14. Transmit a properly formatted GMRP PDU with an Attribute Length of 0x00 containing a JoinIn event for a group MAC address from Testing Station 1.
15. Transmit a properly formatted GMRP PDU containing an Empty event for the same group MAC address used in Step 14 from Testing Station 2.
16. Repeat Steps 12-15 using Attribute Lengths of 0x01, 0x07, and 0xFF in Step 14.
17. Repeat Steps 12-16 using a Service Requirement in Steps 14 and 15.

**Observable results:**

- In Part a, the DUT should register the group MAC address specified in Step 3 on the Port to which Testing Station 1 is connected. Testing Station 2 should capture four GMRP PDUs containing a JoinEmpty event for the specified group MAC address.
- In Part b, the DUT should register the Service Requirement specified in Step 7 on the Port to which Testing Station 1 is connected. Testing Station 2 should capture four GMRP PDUs containing a JoinEmpty event for Service Requirement used in Step 7.
- In Part c, the DUT should register the group MAC address specified in Step 10 on the Port to which Testing Station 1 is connected. Testing Station 2 should capture four GMRP PDUs containing a JoinEmpty event for the specified group MAC address.
- In Part d, **t**he DUT should discard the GMRP PDU transmitted by Testing Station 1 in Step 14. Testing Station 2 should not receive any GMRP PDUs containing events for the Attribute Value used in Steps 14 and 15.

**Possible Problems:**

- None.

## Test 10.3.1.3 – Attribute Event Verification

**Purpose:** To verify that the device under test (DUT) discards all GMRP PDUs containing an invalid Attribute Event.

**References:**

- IEEE 802.1D 1998: sub-clauses 12.10.1, 12.11.2.5, 12.11.3.3
- IEEE 802.1D 1998: Figure 12-6
- 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 Attribute Event value is encoded as a single octet, representing an unsigned binary number. There is a set of operators defined in the standard that are encoded in the Attribute Event field of a PDU. The range of allowable values used by the Attribute Event is 0x00 to 0x05. The meanings for each of these values are as follows:

0x00: LeaveAll operator
0x01: JoinEmpty operator
0x02: JoinIn operator
0x03: LeaveEmpty operator
0x04: LeaveIn operator
0x05: Empty operator

Any other value for the Attribute Event field is reserved.

**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.

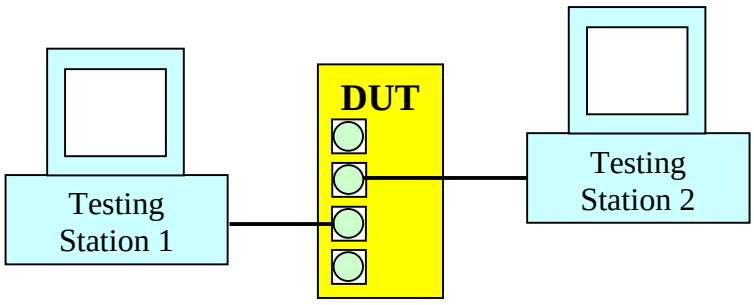


**Figure 1**

**Procedure:**

*Part a: Valid Attribute Event: LeaveAll*

1. Set Testing Station 2 to capture arbitrary MAC frames.
2. Transmit properly formatted GMRP PDUs with an Attribute Event value of 0x00 from Testing Station 2.

*Part b: Valid Attribute Event: JoinEmpty*

3. Set Testing Station 2 to capture arbitrary MAC frames.
4. Transmit a properly formatted GMRP PDU containing a LeaveAll event from Testing Stations 1 and 2.

5. Transmit a properly formatted GMRP PDU with an Attribute Event value of 0x01 for a group MAC address from Testing Station 1.
6. Transmit a properly formatted GMRP PDU containing an Empty event for the same group MAC address used in Step 5 from Testing Station 2.

*Part c: Valid Attribute Event: JoinIn*

7. Set Testing Station 2 to capture arbitrary MAC frames.
8. Transmit a properly formatted GMRP PDU containing a LeaveAll event from Testing Stations 1 and 2.
9. Transmit a properly formatted GMRP PDU with an Attribute Event value of 0x02 for a group MAC address from Testing Station 1.
10. Transmit a properly formatted GMRP PDU containing an Empty event for the same group MAC address used in Step 9 from Testing Station 2.

*Part d: Valid Attribute Event: LeaveEmpty*

11. Set Testing Station 2 to capture arbitrary MAC frames.
12. Transmit a properly formatted GMRP PDU containing a LeaveAll event from Testing Stations 1 and 2.
13. Transmit a properly formatted GMRP PDU containing a JoinIn event for a group MAC address from Testing Station 1.
14. Transmit a properly formatted GMRP PDU containing an Empty event for the same group MAC address used in Step 13 from Testing Station 2.
15. Transmit a properly formatted GMRP PDU with an Attribute Event value of 0x03 for the group MAC address specified in Step 13 from Testing Station 1.

*Part e: Valid Attribute Event: LeaveIn*

16. Set Testing Station 2 to capture arbitrary MAC frames.
17. Transmit a properly formatted GMRP PDU containing a LeaveAll event from Testing Stations 1 and 2.
18. Transmit a properly formatted GMRP PDU containing a JoinIn event for a group MAC address from Testing Station 1.
19. Transmit a properly formatted GMRP PDU containing an Empty event for the same group MAC address used in Step 18 from Testing Station 2.
20. Transmit a properly formatted GMRP PDU with an Attribute Event value of 0x04 for the group MAC address specified in Step 18 from Testing Station 1.

*Part f: Valid Attribute Event: Empty*

21. Set Testing Station 2 to capture arbitrary MAC frames.
22. Transmit a properly formatted GMRP PDU containing an Empty event for a group MAC address from Testing Station 1.

*Part g: Invalid Attribute Event*

23. Set Testing Station 2 to capture arbitrary MAC frames.
24. Transmit GMRP PDUs with an Attribute Event value of 0x06 for a group MAC address from Testing Station 1.
25. Transmit a properly formatted GMRP PDU containing an Empty event for the same group MAC address used in Step 24 from Testing Station 2.
26. Repeat Steps 23-25 using an Attribute Event of 0xFF in Step 24.
27. Repeat Steps 23-26 using a Service Requirement in Steps 24 and 25.

**Observable results:**

- In Part a, Testing Station 2 should not capture any GMRP PDUs.
- In Part b, the DUT should register the group MAC address specified in Step 5 on the Port to which Testing Station 1 is connected. Testing Station 2 should receive four GMRP PDUs containing a JoinEmpty event for the group MAC address specified in Step 5.
- In Part c, the DUT should register the group MAC address specified in Step 9 on the Port to which Testing Station 1 is connected. Testing Station 2 should receive four GMRP PDUs containing a JoinEmpty event for the group MAC address specified in Step 9.
- In Part d, during Step 13, the DUT should register the group MAC address specified on the Port to which Testing Station 1 is connected. Testing Station 2 should capture four GMRP PDUs containing a JoinEmpty event for the group MAC address specified in Step 13. During Step 15, the DUT should de-register the group MAC address specified in Step 13 on the Port to which Testing Station 1 is connected. Testing Station 2 should receive a GMRP PDU containing a LeaveEmpty event for the group MAC address specified in Step 13.
- In Part e, during Step 18, the DUT should register the group MAC address specified on the Port to which the Testing Station 1 is connected. Testing Station 2 should capture four GMRP PDUs containing a JoinEmpty event for the group MAC address specified in Step 18. During Step 20, the DUT should de-register the group MAC address specified in Step 18 on the Port to which Testing Station 1 is connected. Testing Station 2 should receive a GMRP PDU containing a LeaveEmpty event for the group MAC address specified in Step 18.
- In Part f, Testing Station 2 should not capture any GMRP PDUs.
- In Part g, the DUT should discard the GMRP PDUs transmitted by Testing Station 1. Testing Station 2 should not receive any GMRP PDUs containing events for the Attribute Value used in Steps 24 and 25.

**Possible Problems:**

- None.

## Test 10.3.1.4 – Attribute Value Verification

**Purpose:** To verify that the device under test (DUT) discards all GMRP PDUs containing an invalid Attribute Value.

**References:**

- IEEE 802.1D 1998: sub-clauses 10.3.1.4, 12.10.1, 12.11.2.6
- IEEE 802.1D 1998: Figure 12-6
- IEEE 802.1D 1998: Tables 12-1, 12-3, 12-4

**Resource Requirements:**

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

**Last Modification:** June 28, 2001

**Discussion:** GMRP defines two Attribute Types to be used during its operation. The first Attribute Type defined is the Group Attribute Type. Its Attribute Values are encoded in six octets that represent a Group MAC address. The valid Attribute Values for the Group Attribute Type is any Group MAC address. Any individual MAC addresses shall not be used for this Attribute Type.

The second Attribute Type defined is the Service Requirement Attribute Type. Its Attribute Values are encoded as a single octet that represents the Default Filtering Behavior to be used for the Port on which the GMRP message is received. There are two defined values of this Type are defined. The All Groups Attribute Value is encoded as 0x00. The All Unregistered Groups Attribute Value is encoded as 0x01.

**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.

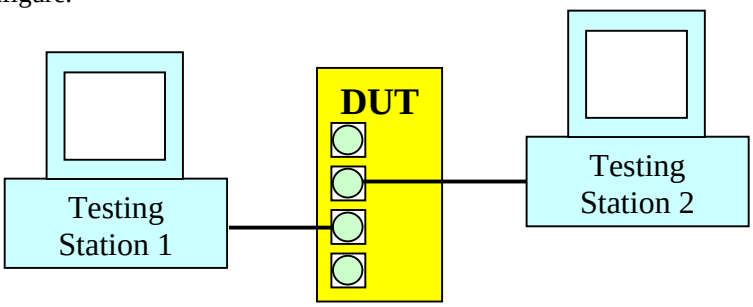


**Figure 1**

**Procedure:**

*Part a: Valid Attribute Values – Group Attribute Type*

1. Set Testing Station 2 to capture arbitrary MAC frames.
2. Transmit a properly formatted GMRP PDU containing a LeaveAll event from Testing Stations 1 and 2.
3. Transmit a properly formatted GMRP PDU containing a Group Attribute Type and an Attribute Value of 0x012222222222 from Testing Station 1. The transmitted PDUs should contain a JoinIn event.
4. Transmit a properly formatted GMRP PDU containing an Empty event for the same group MAC address used in Step 3 from Testing Station 2.
5. Repeat Steps 1-4 using Attribute Values of 0x032222222222 and 0x0F2222222222.

*Part b: Valid Attribute Values – Service Requirement Attribute Type*

6. Set Testing Station 2 to capture arbitrary MAC frames.
7. Transmit a properly formatted GMRP PDU containing a LeaveAll event from Testing Stations 1 and 2.

8. Transmit a properly formatted GMRP PDU containing a Service Requirement Attribute Type and an Attribute Value of 0x00 from Testing Station 1. The transmitted PDU should contain a JoinIn event.
9. Transmit a properly formatted GMRP PDU containing an Empty event for the same Attribute Value used in Step 8 from Testing Station 2.
10. Repeat Steps 6-9 using the Attribute Value of 0x01 in Steps 8 and 9.

*Part c: Invalid Attribute Values – Group Attribute Type*

11. Set Testing Station 2 to capture arbitrary MAC frames.
12. Transmit a properly formatted GMRP PDU containing a LeaveAll event from Testing Stations 1 and 2.
13. Transmit a properly formatted GMRP PDU containing a Group Attribute Type and an Attribute Value of 0x222222222222 from Testing Station 1. The transmitted PDU should contain a JoinIn event.
14. Transmit a properly formatted GMRP PDU containing an Empty event for the same MAC address used in Step 13 from Testing Station 2.
15. Repeat Steps 11-14 using Attribute Values of 0x444444444444, 0x888888888888, and all reserved group MAC addresses from Table 8-10 in IEEE 802.1Q 1998 and Table 12-1 in IEEE 802.1D 1998.

*Part d: Invalid Attribute Values – Service Requirement Attribute Type*

16. Set Testing Station 2 to capture arbitrary MAC frames.
17. Transmit a properly formatted GMRP PDU containing a LeaveAll event from Testing Stations 1 and 2.
18. Transmit a properly formatted GMRP PDU containing a Service Requirement Attribute Type and an Attribute Value of 0x03 from Testing Station 1. The transmitted PDU should contain a JoinIn event.
19. Transmit a properly formatted GMRP PDU containing an Empty event for the same Attribute Value used in Step 18 from Testing Station 2.
20. Repeat Steps 16-19 using an Attribute Value of 0xFF in Steps 18 and 19.

**Observable results:**

- In Part a, the DUT should register the group MAC address specified in Step 3 on the Port to which Testing Station 1 is connected. Testing Station 2 should capture four GMRP PDUs containing a JoinEmpty event for the specified group MAC address.
- In Part b, the DUT should register the Service Requirement specified in Step 8 on the Port to which Testing Station 1 is connected. Testing Station 2 should capture four GMRP PDUs containing a JoinEmpty event for the specified Service Requirement.
- In Part c, the DUT should discard the GMRP PDUs transmitted by Testing Station 1. Testing Station 2 should not receive any GMRP PDUs containing events for the group MAC address used in Steps 13 and 14.
- In Part d, the DUT should discard the GMRP PDUs transmitted by Testing Station 1. Testing Station 2 should not receive any GMRP PDUs containing events for the Attribute Value used in Steps 18 and 19.

**Possible Problems:**

- None.

## Test 10.3.1.5 – 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:** June 28, 2001

**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 the 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.

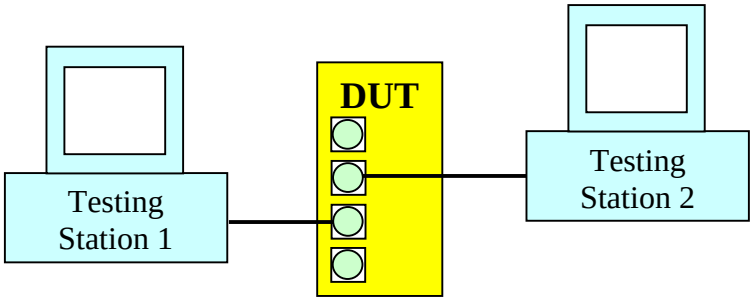


**Figure 1**

**Procedure:**

*Part a: Minimum Messages in a PDU*

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

*Part b: N Messages in a PDU*

5. Transmit a GMRP PDU containing a LeaveAll event from Testing Stations 1 and 2.
6. Set Testing Station 2 to capture GMRP PDUs.
7. 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 one Service Requirement and multiple, distinct group MAC addresses.
8. Transmit a GMRP PDU containing an Empty event for each of the Attribute Values used in Step 7 from Testing Station 2.

*Part c: Maximum Messages in a PDU*

9. Transmit a GMRP PDU containing a LeaveAll event from Testing Stations 1 and 2.

10. Set Testing Station 2 to capture GMRP PDUs.
11. Transmit a GMRP PDU with the maximum number of Messages encoded in the PDU. The transmitted PDU should contain JoinIn events for one Service Requirement and multiple, distinct group MAC addresses.
12. Transmit a GMRP PDU containing an Empty event for each of the Attribute Values used in Step 11 from Testing Station 2.

**Observable results:**

- In Part a, the DUT should register the group MAC address specified in Step 3 on the Port to which Testing Station 1 is connected. Testing Station 2 should capture four GMRP PDUs containing a JoinEmpty event for the specified group MAC address.
- In Part b, **t**he DUT should register the Attribute Values specified in Step 7 on the Port to which Testing Station 1 is connected. Testing Station 2 should capture four GMRP PDUs containing JoinEmpty events for all specified Attribute Values.
- In Part c, **t**he DUT should register the Attribute Values specified in Step 11 on the Port to which Testing Station 1 is connected. Testing Station 2 should capture four GMRP PDUs containing JoinEmpty events for all specified Attribute Values.

**Possible Problems:**

- None.

## Test 10.3.1.6 – 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:** June 28, 2001

**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.

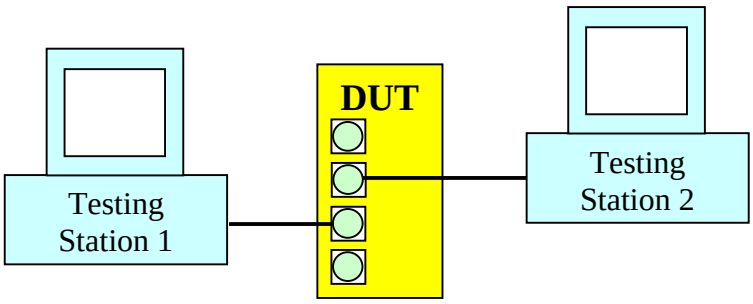


**Figure 1**

**Procedure:**

*Part a: Physical End of the PDU*

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

*Part b: Two End Marks within PDU*

5. Transmit a GMRP PDU containing a LeaveAll event from Testing Stations 1 and 2.
6. Set Testing Station 2 to capture GMRP PDUs.
7. Transmit a GMRP PDU containing multiple Messages specifying JoinIn events for one Service Requirement and 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.
8. Transmit a GMRP PDU containing an Empty event for all Attribute Values specified in Step 7 from Testing Station 2.

*Part c: Unrecognized Attribute Type*

9. Transmit a GMRP PDU containing a LeaveAll event from Testing Stations 1 and 2.
10. Set Testing Station 2 to capture GMRP PDUs.
11. Transmit a GMRP PDU containing multiple Messages specifying JoinIn events for one Service Requirement and 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 PDU should contain an invalid Attribute Type.
12. Transmit a GMRP PDU containing an Empty event for all Attribute Values specified in Step 11 from Testing Station 2.

*Part d: Unrecognized Attribute Event*

13. Transmit a GMRP PDU containing a LeaveAll event from Testing Stations 1 and 2.
14. Set Testing Station 2 to capture GMRP PDUs.
15. Transmit a GMRP PDU containing multiple Messages specifying JoinIn events for one Service Requirement and 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 in the middle of the PDU should contain an invalid Attribute Event.
16. Transmit a GMRP PDU containing an Empty event for all Attribute Values specified in Step 15 from Testing Station 2.

**Observable Results:**

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

**Possible Problems:**

- None.