

# **Bridge Functions Consortium**

## **GMRP Multi-System Interoperability Test Suite Version 0.95**

*Technical Document*



*Last Updated: April 21, 2000 11:28 AM*

---

***Bridge Functions Consortium  
InterOperability Laboratory  
Research Computing Center  
University of New Hampshire***

***Morse Hall, Room 332  
Durham, NH 03824  
Phone: (603) 862-0201  
Fax: (603) 862-1915***

***<http://www.iol.unh.edu/consortiums/bfc>***

## **MODIFICATION RECORD**

April 10, 2000  
April 14, 2000

Initial Version  
Version 0.95

## **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  
Calvin Bascom  
Ben Schultz

University of New Hampshire  
University of New Hampshire  
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 products that support GMRP. GMRP is a GARP application and thus operates according to the behavior defined by the GARP standard. This test suite focuses on testing the Interoperability of the DUT with other GMRP-capable devices.

The tests do not determine if a product conforms to the IEEE 802.1D standard, but they are designed as interoperability tests. Successful completion of all tests contained in this suite does not guarantee that the tested device will operate with other multicast-aware devices. However, these tests provide a reasonable level of confidence that the DUT will function well in most multicast-aware 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. Finally comes the test number itself. 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.

*The University of New Hampshire*  
*InterOperability Laboratory*

**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.

## **TABLE OF CONTENTS**

<b>MODIFICATION RECORD</b>	<b>i</b>
<b>ACKNOWLEDGEMENTS</b>	<b>ii</b>
<b>INTRODUCTION</b>	<b>iii</b>
Test 10.1.1.1 – Basic Interoperability	1
Test 12.1.1.2 – Advanced Interoperability	3
Test 12.1.1.3 – Basic Hybrid Interoperability	5
Test 12.1.1.4 – Advanced Hybrid Interoperability	7

### **Test 10.1.1.1 – Basic Interoperability**

**Purpose:** To verify that the device under test (DUT) can properly exchange multicast traffic after negotiating with another GMRP aware device.

**References:**

- IEEE 802.1D 1998: sub-clause 10.2

**Resource Requirements:**

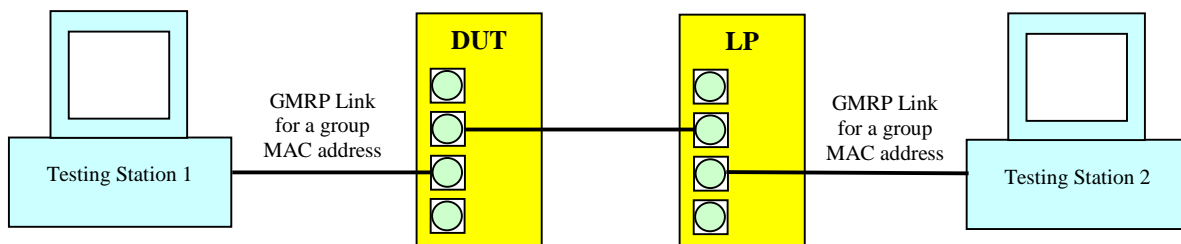
- Testing Stations capable of transmitting and receiving arbitrary MAC frames.

**Last Modification:** April 21, 2000

**Discussion:** When two devices connected together make a declaration for a specific group MAC address, they will forward all traffic destined for that group MAC address according to the behavior defined in the Filtering Database. GMRP creates Group Registration Entries in the Filtering Database for group MAC addresses. These Group Registration Entries also contain a Port Map for each outbound Port that specifies the filtering or forwarding behavior for that group MAC address. Thus, when an end station connected to a GMRP aware device transmits frames destined for a group MAC address found in the Filtering Database, the device will forward or filter the frames based on the Port Map for that group MAC address.

If an End Station wanted to receive or transmit traffic to or from a specific group MAC address, it would have to make a registration via GMRP. This test verifies that when two end stations register for the same group MAC address, they can successfully pass multicast traffic between each other.

**Test Setup:** Connect the Testing Stations to the DUT and the Link Partner (LP) as shown in Figure 1. Enable GMRP on the DUT and LP, allowing time for configuration.



**Figure 1**

**Procedure:**

1. Transmit GMRP PDUs containing a JoinIn message for a specific group MAC address from Testing Station 1.
2. Transmit GMRP PDUs containing a JoinIn message for the group MAC address used in Step 1 from Testing Station 2.
3. Set Testing Station 2 to capture arbitrary MAC frames.
4. Transmit multicast traffic destined for the group MAC address used in Step 1 from Testing Station 1.
5. Repeat steps 1-4, reversing the roles of the Testing Stations.

*The University of New Hampshire*  
*InterOperability Laboratory*

**Observable Results:**

- In step 4, Testing Station 2 should receive all multicast frames transmitted by Testing Station 1. No duplicate frames should be received and no frames should be lost.
- In step 5, Testing Station 1 should receive all multicast frames transmitted by Testing Station 2. No duplicate frames should be received and no frames should be lost.

**Possible Problems:**

- None.



### Test 12.1.1.2 – Advanced Interoperability

**Purpose:** To verify that the device under test (DUT) can properly exchange multicast traffic after negotiating with another GMRP aware device.

**References:**

- IEEE 802.1D 1998: sub-clause 10.2

**Resource Requirements:**

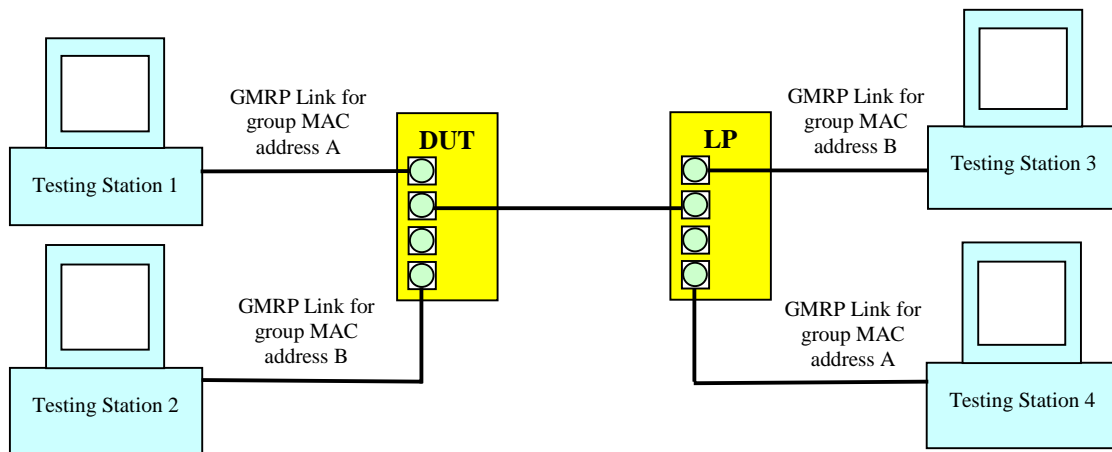
- Testing Stations capable of transmitting and receiving arbitrary MAC frames.

**Last Modification:** April 21, 2000

**Discussion:** When two devices connected together make a declaration for a specific group MAC address, they will forward all traffic destined for that group MAC address according to the behavior defined in the Filtering Database. GMRP creates Group Registration Entries in the Filtering Database for group MAC addresses. These Group Registration Entries also contain a Port Map for each outbound Port that specifies the filtering or forwarding behavior for that group MAC address. Thus, when an end station connected to a GMRP aware device transmits frames destined for a group MAC address found in the Filtering Database, the device will forward or filter the frames based on the Port Map for that group MAC address.

If an End Station wanted to receive or transmit traffic to or from a specific group MAC address, it would have to make a registration via GMRP. This test verifies that when two end stations register for the same group MAC address, they can successfully pass multicast traffic between each other.

**Test Setup:** Connect the Testing Stations to the DUT and the Link Partner (LP) as shown in Figure 1. Enable GMRP on the DUT and LP, allowing time for configuration.



**Figure 1**

**Procedure:**

1. Transmit GMRP PDUs containing a JoinIn message for group MAC address A (can be any valid group MAC address) from Testing Station 1 and Testing Station 4.
2. Transmit GMRP PDUs containing a JoinIn message for group MAC address B (must be different from address used in Step 1) from Testing Station 2 and Testing Station 3.
3. While still transmitting GMRP PDUs, set Testing Station 2 and Testing Station 4 to capture arbitrary MAC frames.
4. While continuing to transmit GMRP PDUs, transmit multicast traffic destined for group MAC address A from Testing Station 1.
5. While continuing to transmit GMRP PDUs, transmit multicast traffic destined for group MAC address B from Testing Station 3.
6. Record all frames received on Testing Station 2 and Testing Station 4.
7. Repeat steps 1-6, reversing the roles of the Testing Stations.

**Observable Results:**

- In step 6, Testing Station 4 should receive all multicast frames transmitted by Testing Station 1 destined for group MAC address A. No duplicate frames should be received and no frames should be lost. Testing Station 2 should receive all multicast frames transmitted by Testing Station 3 destined for group MAC address B. No duplicate frames should be received and no frames should be lost.
- Testing Station 4 should not receive any traffic from Testing Station 3 and Testing Station 2 should not receive any traffic from Testing Station 1.
- In step 7, Testing Station 1 should receive all multicast frames transmitted by Testing Station 4 destined for group MAC address A. No duplicate frames should be received and no frames should be lost. Testing Station 3 should receive all multicast frames transmitted by Testing Station 2 destined for group MAC address B. No duplicate frames should be received and no frames should be lost.
- In step 7, Testing Station 1 should not receive any traffic from Testing Station 2 and Testing Station 3 should not receive any traffic from Testing Station 4.

**Possible Problems:**

- None.

### Test 12.1.1.3 – Basic Hybrid Interoperability

**Purpose:** To verify that the device under test (DUT) can properly exchange multicast traffic with another device configured with a Static Filtering Entry for a specific group MAC address.

**References:**

- IEEE 802.1D 1998: sub-clause 10.2

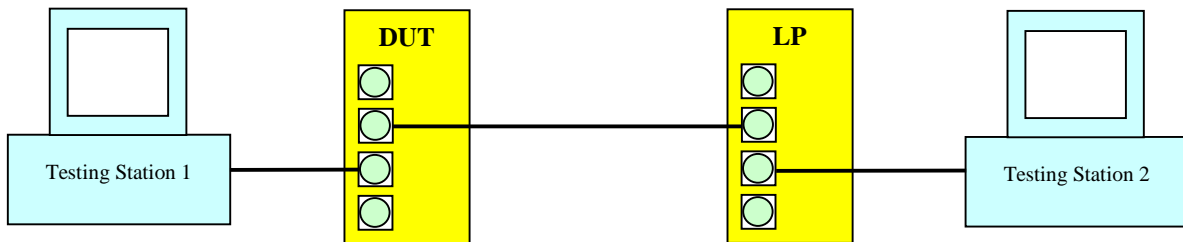
**Resource Requirements:**

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

**Last Modification:** April 21, 2000

**Discussion:** The 802.1D standard allows for two different configurations of group MAC addresses, dynamic and static. Dynamically configured group MAC addresses are known as Group Registration Entries and are defined by GMRP. Static group MAC addresses are known as Static Filtering Entries and are defined by the user accessing the switch's management functions. This still allows for data to be exchanged via the differently defined group MAC addresses.

**Test Setup:** Connect the Testing Stations to the DUT and the Link Partner (LP) as shown in Figure 1. Enable GMRP on the DUT, allowing time for configuration.



**Figure 1**

**Procedure:**

*Part a: Outside of Network Statically Configured*

1. Configure the Ports on the DUT and LP that are connected to the Testing Stations as having a Static Filtering Entry for a specific group MAC address.
2. Transmit GMRP PDUs containing JoinIn events for the group MAC address used in Step 1 from Testing Station 1.
3. While continuing to transmit the PDUs, set Testing Station 1 to capture arbitrary MAC frames.
4. Transmit multicast traffic destined for the group MAC address used in Step 1 from Testing Station 2.
5. Record all received frames on Testing Station 1.
6. Repeat steps 1-5, reversing the roles of the Testing Stations.

*Part b: Core of Network Statically Configured*

7. Remove the static configurations created in Part a.
8. Configure the Ports connecting the DUT and LP as having Static Filtering Entries for a specific group MAC address.
9. Transmit GMRP PDUs containing JoinIn events for the group MAC address used in Step 8 from Testing Station 1.
10. While continuing to transmit the PDUs, set Testing Station 1 to capture arbitrary MAC frames.

*The University of New Hampshire*  
*InterOperability Laboratory*

11. Transmit multicast traffic destined for the group MAC address used in Step 8 from Testing Station 2.
12. Record all received frames on Testing Station 1.
13. Repeat steps 7-12, reversing the roles of the Testing Stations.

**Observable Results:**

- In Part a step 5, Testing Station 1 should receive all frames transmitted by Testing Station 2 destined for the group MAC address used in Step 1. No frames should be lost or duplicated.
- In Part a step 6, Testing Station 2 should receive all frames transmitted by Testing Station 1 destined for the group MAC address used in Step 1. No frames should be lost or duplicated.
- In Part b step 12, Testing Station 1 should receive all frames transmitted by Testing Station destined for the group MAC address used in Step 8. No frames should be lost or duplicated.
- In Part b step 13, Testing Station 2 should receive all frames transmitted by Testing Station destined for the group MAC address used in Step 8. No frames should be lost or duplicated.

**Possible Problems:**

- None.

#### Test 12.1.1.4 – Advanced Hybrid Interoperability

**Purpose:** To verify that the device under test (DUT) can properly exchange multicast traffic with another device configured with a Static Filtering Entry for a specific group MAC address.

**References:**

- IEEE 802.1D 1998: sub-clauses 11.2, 11.2.1.2

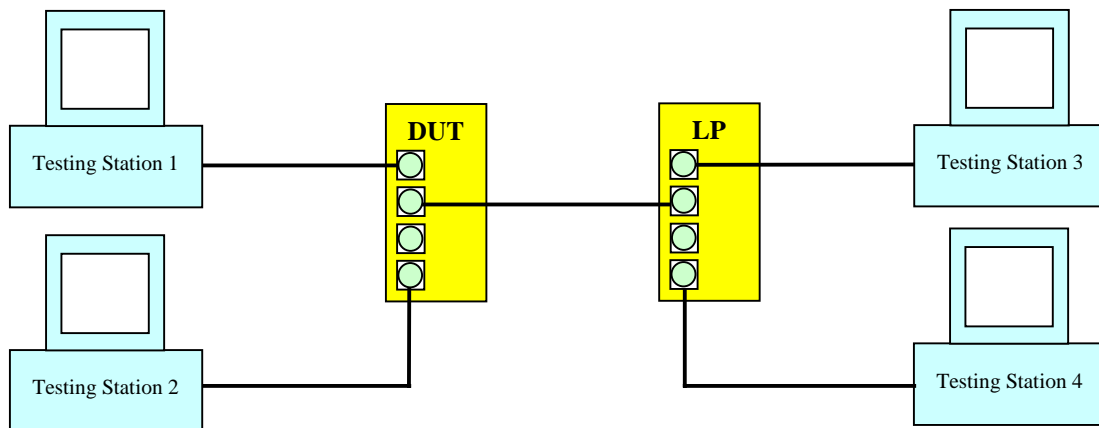
**Resource Requirements:**

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

**Last Modification:** April 21, 2000

**Discussion:** The 802.1D standard allows for two different configurations of group MAC addresses, dynamic and static. Dynamically configured group MAC addresses are known as Group Registration Entries and are defined by GMRP. Static group MAC addresses are known as Static Filtering Entries and are defined by the user accessing the switch's management functions. This still allows for data to be exchanged via the differently defined group MAC addresses.

**Test Setup:** Connect the Testing Stations to the DUT and the Link Partner (LP) as shown in Figure 1. Enable GMRP on the DUT and LP, allowing time for configuration.



**Figure 1**

**Procedure:**

*Part a: Outside of Network Statically Configured*

1. Configure the Ports on the DUT and LP that are connected to Testing Stations 1 and 3 as having Static Filtering Entries for group MAC address A (can be any valid group MAC address).
2. Configure the Ports on the DUT and LP that are connected to Testing Stations 2 and 4 as having Static Filtering Entries for group MAC address B (must be different from group MAC address used in Step 1).
3. Transmit GMRP PDUs containing JoinIn events for group MAC address A from Testing Station 2.
4. While continuing to transmit the PDUs, set Testing Station 2 to capture arbitrary MAC frames.
5. Transmit GMRP PDUs containing JoinIn events for group MAC address B from Testing Station 3.
6. While continuing to transmit the PDUs, set Testing Station 3 to capture arbitrary MAC frames.

*The University of New Hampshire*  
*InterOperability Laboratory*

7. Transmit multicast traffic destined for the proper group MAC address from Testing Station 1 and Testing Station 4.
8. Record all received frames on Testing Station 2 and Testing Station 3.
9. Repeat steps 1-8, reversing the roles of the Testing Stations.

*Part b: Core of Network Statically Configured*

10. Remove the static configurations created in Part a.
11. Configure the Ports connecting the DUT and LP as having Static Filtering Entries for group MAC address A and B.
12. Configure the Port connected to Testing Station 1 as having a Static Filtering Entry for group MAC address A.
13. Configure the Port connected to Testing Station 3 as having a Static Filtering Entry for group MAC address B.
14. Transmit GMRP PDUs containing JoinIn events for group MAC address A from Testing Station 4.
15. While continuing to transmit GMRP PDUs, set Testing Station 4 to capture arbitrary MAC frames.
16. Transmit GMRP PDUs containing JoinIn events for group MAC address B from Testing Station 2.
17. While continuing to transmit GMRP PDUs, set Testing Station 2 to capture arbitrary MAC frames.
18. Transmit multicast traffic destined for the proper group MAC addresses from Testing Station 1 and Testing Station 3.
19. Record all received frames on Testing Station 2 and Testing Station 4.
20. Repeat steps 11-19, reversing the roles of the Testing Stations.

**Observable Results:**

- In Part a step 8, Testing Station 2 should receive all frames transmitted by Testing Station 4. No frames should be lost or duplicated. No other frames should be received. Testing Station 3 should receive all frames transmitted by Testing Station 1. No frames should be lost or duplicated. No other frames should be received.
- In Part a step 9, Testing Station 4 should receive all frames transmitted by Testing Station 2 and Testing Station 1 should receive all frames transmitted by Testing Station 3. No frames should be lost or duplicated. No other frames should be received.
- In Part b step 18, Testing Station 2 should receive all frames transmitted by Testing Station 3 destined for group MAC address B. No frames should be lost or duplicated. No other frames should be received. Testing Station 4 should receive all frames transmitted by Testing Station 1 destined for group MAC address A. No frames should be lost or duplicated. No other frames should be received.
- In Part b step 20, Testing Station 3 should receive all frames transmitted by Testing Station 2 destined for group MAC address B and Testing Station 1 should receive all frames transmitted by Testing Station 4 destined for group MAC address A. No frames should be lost or duplicated. No other frames should be received.

**Possible Problems:**

- None.