VLAN Administration Guide

For the Sun™ Ethernet Fabric Operating System

Part No. 821-0664-10

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Contents

Figures

Tables

Chapter 1

Introduction

Purpose and Scope

The SEFOS VLAN product facilitates grouping of devices on different physical LAN segments, which can communicate with each other as if they are all on the same physical LAN segment, for example, a network of computers that behave as if they are connected to the same wire even though they might be physically located on different segments of a LAN. VLANs are configured through software rather than hardware, making them extremely flexible. This document describes the configuration of VLAN on a switch running SEFOS.

Related Documentation

The documents listed as online are available at:

(http://docs.sun.com)

Access the Sun Blade 6000 Ethernet Switched NEM 24p 10GE documents and related documentation at:

(http://docs.sun.com/app/docs/prod/blade6k.nem24p#hic)

The following documents are for the Sun Blade 6000 Ethernet Switched NEM 24p 10GE:

Document	Part Number	Available
Where to Find Sun Blade 6000 Ethernet Switched NEM 24p 10GE Documentation	821-0407	Printed and online
Sun Blade 6000 Ethernet Switched NEM 24p 10GE User's Guide	821-0330	Online
Sun Blade 6000 Ethernet Switched NEM 24p 10GE Product Notes	821-0331	Online
Software Configuration Guide For the Sun Ethernet Fabric Operating System	821-0412	Online
Sun Ethernet Fabric Operating System CLI Base Reference Manual	821-0410	Online

Document	Part Number	Available
Sun Ethernet Fabric Operating System CLI Enterprise Reference Manual	821-0411	Online
RIP Administration Guide For the Sun Ethernet Fabric Operating System	821-0658	Online
STP Administration Guide For the Sun Ethernet Fabric Operating System	821-0660	Online
OSPF Administration Guide For the Sun Ethernet Fabric Operating System	821-0662	Online
IGS Administration Guide For the Sun Ethernet Fabric Operating System	821-0663	Online
VLAN Administration Guide For the Sun Ethernet Fabric Operating System	821-0664	Online
Link Aggregation Administration Guide For the Sun Ethernet Fabric Operating System	821-0665	Online
LLDP Administration Guide For the Sun Ethernet Fabric Operating System	821-0752	Online
PNAC Administration Guide For the Sun Ethernet Fabric Operating System	821-0754	Online
RADIUS Administration Guide For the Sun Ethernet Fabric Operating System	821-0756	Online

Access the Sun Blade 6000 Modular System documents and related documentation at:

(http://docs.sun.com/app/docs/prod/blade.6000mod)

The following documents are for the Sun Blade 6000 Modular System:

Document	Part Number	Available
Sun Blade 6000 Modular System Installation Guide	820-0050	Printed and online
Sun Blade 6000 Modular System Service Manual	820-0051	Online
Sun Blade 6000 Modular System Safety and Compliance Guide	820-0053	Online
Sun Blade 6000 Modular System Product Notes	820-0055	Online
Sun Blade 6000 Disk Module Administrator's Guide	820-1702	Online
Sun Blade 6000 Disk Module Configuration Guide	820-6547	Online
Integrated Lights Out Manager (ILOM) 2.0 User Guide	820-1188	Online

Access the ILOM 3.0 documents and related documentation at:

(http://docs.sun.com/app/docs/prod/blade6k.nem24p#hic)

For more information about how to work with ILOM features that are common to all platforms managed by ILOM 3.0, refer to the following documentation:

Title	Description	Part Number	Location
Sun Integrated Lights Out Manager (ILOM) 3.0 Concepts Guide	Conceptual information	820-6410	Online
Sun Integrated Lights Out Manager (ILOM) 3.0 Web Interface Procedures Guide	Browser interface information	820-6411	Online
Sun Integrated Lights Out Manager (ILOM) 3.0 CLI Procedures Guide	CLI procedural information	820-6412	Online
Sun Integrated Lights Out Manager (ILOM) 3.0 Management Protocols Reference Guide	SNMP and IPMI information	820-6413	Online
Sun Integrated Lights Out Manager (ILOM) 3.0 Getting Started Guide	Installation and configuration information	820-5523	Online
Sun Integrated Lights Out Manager (ILOM) Feature Updates and Release Notes	Issues and updated feature information	820-7329	Online

Documentation, Support, and Training

Sun Function	URL
Documentation	(http://docs.sun.com/)
Support	(http://www.sun.com/support/)
Training	(http://www.sun.com/training/)

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VLAN Administration Guide For the Sun Ethernet Fabric Operating System, Sun part number: 821-0664-10.

Acronyms

Acronym	Explanation
BPDU	Bridge Protocol Data Unit
CEP	Customer Edge Port
CNP	Customer Network Port
CVID	Customer VLAN Id
C-VLAN	Customer VLAN
DEI	Drop Eligible Indicator
E-LAN	Multipoint to Multipoint connectivity
E-LINE	Point to Point connectivity
FID	Filtering Identifier
GARP	Generic Attribute Registration Protocol
GMRP	GARP Multicast Registration Protocol
GVRP	GARP VLAN Registration Protocol
ID	Identifier
SEFOS	Sun Ethernet Fabric Operating System
IVL	Independent VLAN Learning
LAN	Local Area Network
MI	Multiple Instance
PCB	Provider Core Bridge
PCEP	Proprietary Customer Edge Port
PCNP	Proprietary Customer Network Port
PCP	Priority Code Point
PEB	Provider Edge Bridge
PEP	Provider Edge Port
PNAC	Port Based Network Authentication Protocol
PNP	Provider Network Port
PPNP	Proprietary Provider Network Port
PVID	Port VLAN ID
RSTP	Rapid Spanning Tree Protocol
STP	Spanning Tree Protocol
SVL	Shared VLAN Learning
S-VLAN	Service VLAN
VID	VLAN Identifier
VLAN	Virtual Local Area Network

Document Conventions

Convention	Usage
Bold	CLI commands Note: Lowercase characters are preferred; typing commands using uppercase characters might not be accepted.
Italics	Variables - user inputs for CLI commands
`Regular`	CLI command outputs
	Notes / Guidelines / Prerequisites
Bold italics	Output areas specific to the configuration

General Configurations

The following table provides the access and exit methods to various general configuration modes.

Command Mode	Access Method	Prompt	Exit method
User EXEC	This is the initial mode to start a session.	SEFOS>	The logout method is used.
Privileged EXEC	The User EXEC mode command enable, is used to enter the Privileged EXEC mode.	SEFOS#	To return from the Privileged EXEC mode to User EXEC mode, the **disable** command is used.
Global Configuration	The Privileged EXEC mode command configure terminal, is used to enter the Global Configuration Mode.	SEFOS(config)#	To exit to the Global Configuration Mode, the exit command is used and to exit to the Privileged EXEC mode, the **end** command is used.
Interface Configuration	The Global Configuration Mode command interface <interface-type><interface-id>, is used to enter the Interface Configuration Mode.	SEFOS(config-if)#	To exit to the Global Configuration Mode, the **exit** command is used and to exit to the Privileged EXEC mode, the **end** command is used.
VLAN Configuration	The Global Configuration Mode command VLAN <VLANid>, is used to enter the VLAN configuration mode	SEFOS(config-vlan)#	To exit to the Global Configuration Mode, the **exit** command is used and to exit to the Privileged EXEC mode, the **end** command is used

Chapter 2

Protocol Description

Virtual LAN (VLAN) technology, defined under the IEEE 802.1q specifications, allows enterprises to extend the reach of their corporate networks across WAN. VLANs enable partitioning of a LAN based on functional requirements, while maintaining connectivity across all devices on the network. VLAN groups network devices and enable them to behave as if, they are in one single network. Data security is ensured by keeping the data exchanged between the devices of a particular VLAN within the same network.

VLAN offers the following advantages over traditional LAN:

- **Performance**

  In networks with traffic consisting of a high percentage of broadcasts and multicasts, VLAN minimizes the possibility of sending the broadcast and multicast traffic to unnecessary destinations.

- **Formation of Virtual Workgroups**

  VLAN helps in forming virtual workgroups. During this period, communication between the members of the workgroup will be high. Broadcasts and multicasts can be restricted within the workgroup.

- **Simplified Administration**

  Most of the network costs are a result of adds, moves, and changes of users in the network. Every time a user is moved in a LAN, recabling, new station addressing, and reconfiguration of hubs and routers becomes necessary. Some of these tasks can be simplified with the use of VLANs.

- **Reduced Cost**

  VLANs can be used to create broadcast domains, which eliminate the need for expensive routers.

- **Security**

  Sensitive data may be periodically broadcast on a network. Placing only those users, who are allowed to access to such sensitive data on a VLAN can reduce the chances of an outsider gaining access to the data. VLAN can also be used to control broadcast domains, set up firewalls, restrict access, and inform the network manager of an intrusion.

SEFOS VLAN logically segments the shared media LAN, forming virtual workgroups. It redefines and optimizes the basic Transparent Bridging functionalities such as learning, forwarding, filtering and flooding.

Chapter 3

VLAN Configuration

The following sections describe the configuration of VLAN running as a part of the Sun Ethernet Fabric Operating System (SEFOS).

Configuring Guidelines

- VLAN is enabled in the switch by default.
- The default interface - VLAN 1- cannot be deleted in the switch.
- If port GVRP state is disabled, but global GVRP status is enabled, then GVRP is disabled on current port. GVRP packets received on that port will be discarded and GVRP registrations from other ports will not be propagated on this port.
- GARP cannot be started, if VLAN is shutdown, and GARP cannot be shutdown, if GVRP and/or GMRP are enabled.
- It is not possible to configure a port as trunk, if the port is an untagged member of a VLAN.
- Leave Timer must be two times greater than Join Timer, and Leaveall Timer must be greater than Leave Timer.
- Ensure that the values for Port Acceptable Frame Type and Port Ingress Filtering are suitable.

Default Configurations

Feature	Default Setting
VLAN Module status	Enable
Default VLAN Id configured in the switch	1
Mac based VLAN Classification	Disabled
Protocol-VLAN based classification	Enabled
System and port level GVRP and GMRP Module status	Enabled

Feature	Default Setting
Mac address table aging time	300 seconds
Acceptable frame types	All (Accepts untagged frames or priority-tagged frames or tagged frames received on the port)
Ingress filtering	Disabled
Switch port priority	0
Switch port mode	Hybrid
GARP Timers	Join: 20 seconds Leave: 60 seconds Leave all: 1000 seconds
Max traffic classes	Maximum number of traffic classes supported on a port is 8
Tunneling	Disabled

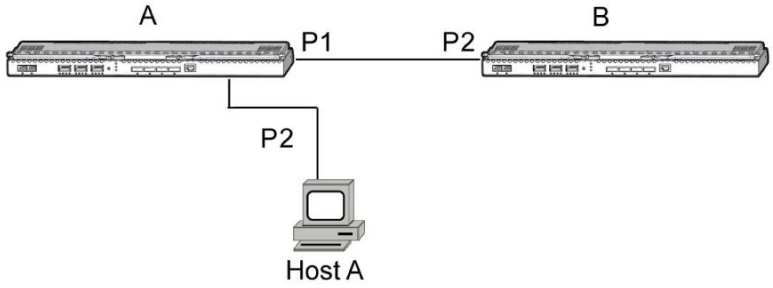

Figure 3-1: Topology for VLAN Configuration

Configuring Static VLAN

Static VLAN entries can be configured with the required number of member ports, untagged ports and forbidden ports. The following configuration deals with the creation of member ports:

- **Run the following commands to configure Static VLAN entry in the switch:**
  - Enter the Global configuration mode.

    SEFOS# **configure terminal**
  - Enter the VLAN configuration mode (for VLAN 2).

    SEFOS(config)# **vlan** *2*
  - Add member ports for VLAN.

    SEFOS(config-vlan)# **ports extreme-ethernet** *0/2-5* **untagged extreme-ethernet** *0/3*

    Member ports represent the set of ports permanently assigned to the VLAN egress list. Frames belonging to the specified VLAN are forwarded to the ports in the egress list.

    If the port type is not explicitly specified as **untagged**, then all the ports are configured to be of tagged port type allowing transmission of frames with the specified VLAN tag. The **untagged** setting allows the port to transmit the frames without a **vlan** tag. This setting is used for devices that can't support VLAN.

In the above example, the egress packets for the interface **extreme-ethernet** 0/3 are transmitted without the tag. On all the other ports, the packets are transmitted with the tag.

- Configure port 1 as forbidden port.

  SEFOS(config-vlan)# **ports extreme-ethernet** *0/2-5* **forbidden extreme-ethernet** *0/1*

Alternatively, the **forbidden** setting prevents the port from participating in the specified VLAN activity and ensures that, any dynamic requests for the port to join the VLAN will be ignored.

- Exit configuration mode.

  SEFOS(config)# **end**

- **View the VLAN information by running the following command:**

  SEFOS# **show vlan summary**

```
Number of vlans: 2
```

The output displays the number of VLANs in a switch.

- **View the configuration details of all the VLANs by running the following show command:**

  SEFOS# **show vlan**

```
VLAN database
-------------
VLAN ID             : 1
Member Ports        : Ex0/1, Ex0/2, Ex0/3, Ex0/4, Ex0/5, Ex0/6
                      Ex0/7, Ex0/8, Ex0/9, Ex0/10, Ex0/11, Ex0/12
                      Ex0/13, Ex0/14, Ex0/15, Ex0/16, Ex0/17, Ex0/18
                      Ex0/19, Ex0/20, Ex0/21, Ex0/22, Ex0/23, Ex0/24
Untagged Ports      : Ex0/1, Ex0/2, Ex0/3, Ex0/4, Ex0/5, Ex0/6
                      Ex0/7, Ex0/8, Ex0/9, Ex0/10, Ex0/11, Ex0/12
                      Ex0/13, Ex0/14, Ex0/15, Ex0/16, Ex0/17, Ex0/18
                      Ex0/19, Ex0/20, Ex0/21, Ex0/22, Ex0/23, Ex0/24
Forbidden Ports     : None
Name                :
Status              : Permanent
--------------------------------------------------
VLAN ID             : 2
Member Ports        : Ex0/2, Ex0/3, Ex0/4, Ex0/5
Untagged Ports      : None
Forbidden Ports     : Ex0/1
Name                :
Status              : Permanent
--------------------------------------------------
```

- **View the configuration details of a particular VLAN by running the following command:**

  SEFOS# **show vlan id** *2*

```
VLAN database
-------------
VLAN ID             : 2
Member Ports        : Ex0/2, Ex0/3, Ex0/4, Ex0/5
Untagged Ports      : None
Forbidden Ports     : Ex0/1
Name                :
Status              : Permanent
-----------------------------------------------
```

Deleting a VLAN

- **It is possible to delete a VLAN from the VLAN list using the no vlan <vlan-id(1-4094)> Global configuration mode command.**

  SEFOS(config)# **no vlan** *4*

The default VLAN - **vlan** 1 - cannot be deleted.

Enabling VLANs

A VLAN can be made active in two ways:

- By adding a member port to a VLAN (See section Configuring Static).
- By using the **vlan active** command.

Using the VLAN active Command

- **Use the vlan active command is to make a VLAN active in the switch.**
  - Enter Global configuration mode.

    SEFOS#**configure terminal**
  - Configure VLAN 2 in the switch.

    SEFOS(config)# **vlan** *2*
  - Run the following command to enable VLAN:

    SEFOS(config-vlan)# **vlan active**

If the **vlan active** command is used without configuring the member ports, then VLAN will have zero member ports. Resouces are allocated for active VLAN.

Configuring Static Unicast Entry

Configuring a Static Unicast Entry requires the VLAN to be configured and the member ports for that specified VLAN must also be configured.

- **Run the following commands to configure a Static Unicast Entry in the VLAN table:**
  - Enter Global configuration mode.

    SEFOS#**configure terminal**
  - Configure VLAN 2 in the switch.

    SEFOS(config)# **vlan** *2*
  - Configure a static VLAN entry with the required type of ports.

    SEFOS(config-vlan)# **ports extreme-ethernet** *0/2* **untagged extreme-ethernet** *0/2*
  - Exit Config-VLAN mode.

    SEFOS(config-vlan)# **exit**
  - Configure a static unicast MAC address in the forwarding database.

    SEFOS(config)# **mac-address-table static unicast** *22:22:22:22:22:22* **vlan** *2*

    interface extreme-ethernet *0/2*
  - Exit configuration mode.

    SEFOS(config)# **end**

- **View the configuration details by running the following command:**

  SEFOS# **show mac-address table static unicast**

```
Vlan  Mac Address        RecvPort Status   ConnectionId      Ports
----  -----------        -------- ------   ------------      -----
2     22:22:22:22:22:22           Permanent                  Ex0/2

Total Mac Addresses displayed: 1
```

Configuring Static Multicast Entry

To configure a Static Multicast Entry for a specified VLAN, the VLAN must have been configured prior and the member ports for that VLAN must also be configured.

1. **Run the following commands to configure Static Multicast Entry in the VLAN table:**
   - Enter Global configuration mode.

     SEFOS# **configure terminal**
   - Configure **vlan** 2 in the switch.

     SEFOS(config)# **vlan** *2*

- Configure a static VLAN entry with the required type of ports.

  SEFOS(config-vlan)# **ports extreme-ethernet** *0/2* **untagged extreme-ethernet** *0/2*

- Exit Config-VLAN mode.

  SEFOS(config-vlan)# **exit**

- Configure static Multicast MAC address in the forwarding database.

  SEFOS(config)# **mac-address-table static multicast** *01:02:03:04:05:06* **vlan** *2*

  interface extreme-ethernet *0/2*

  SEFOS(config)# **exit**

2. View the configuration details by running the following show command:

SEFOS# **show mac-address table static multicast**

```
Static Multicast Table
----------------------
VLAN            : 2
Mac Address     : 01:02:03:04:05:06
Receive Port    :
Member Ports    : Ex0/2
Forbidden Ports :
Status          : Permanent
-----------------------------------------------
Total Mac Addresses displayed: 1
```

Configuring Dynamic VLAN Learning

By default, GVRP is enabled globally, and can be enabled/disabled on a per-port basis. If GVRP is disabled globally in the switch, then use the CLI command "**set gvrp enable"** in the Global Configuration Mode to enable GVRP globally or use the "**set port gvrp** *interface id* **enable"** to enable GVRP on an interface in the Global Configuration Mode. If GVRP is disabled globally or on a particular port, then dynamic learning of VLAN will not take place globally or on that specified port accordingly. By default, all ports in a switch are created (but only port 1 is up) and added as member ports of default VLAN 1. See Figure 3-1 for setup. In switch A P1 is configured to be a member port of VLAN 2.

1. Run the following commands to retrieve the current gvrp values:

- Retrieve the current global gvrp status.

  SEFOS# **show vlan device info**

```
Vlan device configurations
   -------------------------
   Vlan Status                    : Enabled
   Vlan Oper status               : Enabled
```

```
Gvrp status                          : Enabled
Gmrp status                          : Enabled
Gvrp Oper status                     : Enabled
Gmrp Oper status                     : Enabled
Mac-Vlan Status                      : Disabled
Subnet-Vlan Status                   : Disabled
Protocol-Vlan Status                 : Enabled
Bridge Mode                          : Customer Bridge
Base-Bridge Mode                     : Vlan Aware Bridge
Traffic Classes                      : Enabled
Vlan Operational Learning Mode       : IVL
Version number                       : 1
Max Vlan id                          : 4094
Max supported vlans                  : 4094
Unicast mac learning limit           : 16334
```

- Retrieve the current port gvrp value.

  SEFOS# **show vlan port config port ex** *0/1*

  Note that “ex” can be used the same as “extreme-ethernet”.

```
Vlan Port configuration table
   -------------------------
   Port Ex0/1
    Port Vlan ID                       : 1
    Port Acceptable Frame Type         : Admit All
    Port Ingress Filtering             : Disabled
    Port Mode                          : Hybrid
    Port Gvrp Status                   : Enabled
    Port Gmrp Status                   : Enabled
    Port Gvrp Failed Registrations     : 0
    Gvrp last pdu origin               : 00:00:00:00:00:00
    Port Restricted Vlan Registration  : Disabled
    Port Restricted Group Registration : Disabled
    Mac Based Support                  : Disabled
    Subnet Based Support               : Disabled
    Port-and-Protocol Based Support    : Enabled
    Default Priority                   : 0
    Filtering Utility Criteria         : Default
    Port Protected Status              : Disabled
    ----------------------------------------------------
```

If the switch has not been rebooted for this exercise, global and/or port gvrp status might be disabled. Run the following commands if you need to activate global and/or port gvrp status.

- To re-enable global gvrp:

  SEFOS# **config**

  SEFOS(config)# **set gvrp** *enable*

  SEFOS(config)# **exit**

  SEFOS#

- To enable Port gvrp:

  SEFOS# **config**

  SEFOS(config)# **set port gvrp extreme-ethernet** *0/1 enable*

  SEFOS(config)# **exit**

  SEFOS#

2. Run the following commands in switch A:

- Enter Global configuration mode.

  SEFOS# **configure terminal**

- Enter Interface configuration mode for interface 2 and make the interface up.

  SEFOS(config)# **interface extreme-ethernet** *0/2*

  SEFOS(config-if)# **no shutdown**

- Exit Interface configuration mode.

  SEFOS(config-if)# **exit**

- Configure VLAN 2 in the switch.

  SEFOS(config)# **vlan** *2*

- Configure VLAN 2 as static VLAN with the required type of ports.

  SEFOS(config-vlan)# **ports extreme-ethernet** *0/1* **untagged extreme-ethernet** *0/1*

- Exit Interface configuration mode.

  SEFOS(config-vlan)# **end**

3. View the VLAN information by running the following show command:

SEFOS# **show vlan**

The output in switch A is:

```
VLAN database
-------------
VLAN ID             : 1
Member Ports        : Ex0/1, Ex0/2, Ex0/3, Ex0/4, Ex0/5, Ex0/6
                      Ex0/7, Ex0/8, Ex0/9, Ex0/10, Ex0/11, Ex0/12
                      Ex0/13, Ex0/14, Ex0/15, Ex0/16, Ex0/17, Ex0/18
                      Ex0/19, Ex0/20, Ex0/21, Ex0/22, Ex0/23, Ex0/24
```

```
Untagged Ports      : Ex0/1, Ex0/2, Ex0/3, Ex0/4, Ex0/5, Ex0/6
                      Ex0/7, Ex0/8, Ex0/9, Ex0/10, Ex0/11, Ex0/12
                      Ex0/13, Ex0/14, Ex0/15, Ex0/16, Ex0/17, Ex0/18
                      Ex0/19, Ex0/20, Ex0/21, Ex0/22, Ex0/23, Ex0/24
Forbidden Ports     : None
Name                :
Status              : Permanent
-------------------------------------------------
VLAN ID             : 2
Member Ports        : Ex0/1
Untagged Ports      : Ex0/1
Forbidden Ports     : None
Name                :
Status              : Permanent
-------------------------------------------------
```

The output in switch B (assuming that you are already logged in to switch B) is:

SEFOS# **show vlan**

```
VLAN database
-------------
VLAN ID             : 1
Member Ports        : Ex0/1, Ex0/2, Ex0/3, Ex0/4, Ex0/5, Ex0/6
                      Ex0/7, Ex0/8, Ex0/9, Ex0/10, Ex0/11, Ex0/12
                      Ex0/13, Ex0/14, Ex0/15, Ex0/16, Ex0/17, Ex0/18
                      Ex0/19, Ex0/20, Ex0/21, Ex0/22, Ex0/23, Ex0/24
Untagged Ports      : Ex0/1, Ex0/2, Ex0/3, Ex0/4, Ex0/5, Ex0/6
                      Ex0/7, Ex0/8, Ex0/9, Ex0/10, Ex0/11, Ex0/12
                      Ex0/13, Ex0/14, Ex0/15, Ex0/16, Ex0/17, Ex0/18
                      Ex0/19, Ex0/20, Ex0/21, Ex0/22, Ex0/23, Ex0/24
Forbidden Ports     : None
Name                :
Status              : Permanent
-------------------------------------------------
VLAN ID             : 2
Member Ports        : Ex0/1
Untagged Ports      : None
Forbidden Ports     : None
Name                :
Status              : Dynamic Gvrp
```

Configuring Dynamic Multicast Learning

By default, GMRP is enabled globally and can be enabled/disabled on a per-port basis. If GMRP is disabled globally in the switch, use the CLI command "**set gmrp enable"** in the Global Configuration Mode to enable GMRP globally or use the "**set port gmrp** *id* **enable"** command in the Global Configuration Mode. If GMRP is disabled on a port or globally, then dynamic multicast learning will not take place globally or on that port. By default, all ports in a switch are created (but only port 1 is up) and added as member ports of default VLAN 1. See Figure 3-1 for setup.

1. Run the following commands to retrieve the current gmrp values:

- Retrieve the current global gmrp status.

SEFOS# **show vlan device info**

```
Vlan device configurations
  --------------------------
  Vlan Status                       : Enabled
  Vlan Oper status                  : Enabled
  Gvrp status                       : Enabled
  Gmrp status                       : Enabled
  Gvrp Oper status                  : Enabled
  Gmrp Oper status                  : Enabled
  Mac-Vlan Status                   : Disabled
  Subnet-Vlan Status                : Disabled
  Protocol-Vlan Status              : Enabled
  Bridge Mode                       : Customer Bridge
  Base-Bridge Mode                  : Vlan Aware Bridge
  Traffic Classes                   : Enabled
  Vlan Operational Learning Mode    : IVL
  Version number                    : 1
  Max Vlan id                       : 4094
  Max supported vlans               : 4094
  Unicast mac learning limit        : 16334
```

- Retrieve the current port gmrp value.

SEFOS# **show vlan port config port ex** *0/1*

```
Vlan Port configuration table
  --------------------------
  Port Ex0/1
   Port Vlan ID                      : 1
   Port Acceptable Frame Type        : Admit All
   Port Ingress Filtering            : Disabled
```

```
Port Mode                           : Hybrid
Port Gvrp Status                    : Enabled
Port Gmrp Status                    : Enabled
Port Gvrp Failed Registrations      : 0
Gvrp last pdu origin                : 00:00:00:00:00:00
Port Restricted Vlan Registration   : Disabled
Port Restricted Group Registration  : Disabled
Mac Based Support                   : Disabled
Subnet Based Support                : Disabled
Port-and-Protocol Based Support     : Enabled
Default Priority                    : 0
Filtering Utility Criteria          : Default
Port Protected Status               : Disabled
-----------------------------------------------------
```

If the switch has not been rebooted for this exercise, global and/or port gmrp status might be disabled. Run the following commands if you need to activate global and/or port gmrp status.

- To re-enable global gmrp:

  SEFOS# **config**

  SEFOS(config)# **set gmrp** *enable*

  SEFOS(config)# **exit**

  SEFOS#

- To enable Port gmrp:

  SEFOS# **config**

  SEFOS(config)# **set port gmrp extreme-ethernet** *0/1 enable*

  SEFOS(config)# **exit**

  SEFOS#

2. Run the following commands in switch B:

- Enter Global configuration mode.

  SEFOS# **configure terminal**

- Disable GMRP globally on the device.

  SEFOS(config)# **set gmrp** *disable*

- Return to Privileged EXEC Mode.

  SEFOS(config)# **end**

3. **Run the following commands in switch A to configure static Multicast MAC address:**

   - Enter Global configuration mode.

     SEFOS# **configure terminal**

   - Enter Interface configuration mode (for interface 2) and make the interface up.

     SEFOS(config)# **interface extreme-ethernet** *0/2*

     SEFOS(config-if)# **no shutdown**

   - Exit Interface configuration mode.

     SEFOS(config-if)# **exit**

   - Configure static Multicast MAC address.

     SEFOS(config)# **mac-address-table static multicast** *01:02:03:04:05:06* **vlan** *1*

     interface extreme-ethernet *0/1*

4. **View the MAC-address table details by running the following show command in switch A:**

   SEFOS# **show mac-address-table static multicast**

```
Static Multicast Table
----------------------
VLAN            : 1
Mac Address     : 01:02:03:04:05:06
Receive Port    :
Member Ports    : Ex0/1
Forbidden Ports :
Status          : Permanent
-----------------------------------------------
Total Mac Addresses displayed: 1
```

5. **View the MAC-Address-Table details by running the following show command in switch B:**

   SEFOS# **show mac-address-table**

```
VLAN    Mac Address         Type     Ports
----    -----------         ----     -----
1       00:01:02:03:04:02   Learnt   Ex0/1 (Switch A, port Ex0/1 Mac addr)
Total Mac Addresses displayed: 1
```

6. **Run the following commands to enable GMRP globally in switch B:**

   SEFOS# **configure terminal**

   SEFOS(config)# **set gmrp** *enable*

   SEFOS# **show mac-address-table**

```
VLAN    Mac Address          Type     Ports
----    -----------          ----     -----
1       00:01:02:03:04:02    Learnt   Ex0/1 (Switch A, port Ex0/1 Mac addr)
1       01:02:03:04:05:06    Learnt   Ex0/1
Total Mac Addresses displayed: 2
```

Configuring Restricted VLAN Registration

By default, restricted VLAN registration is disabled on a port. If restricted VLAN registration is enabled on a port, then VLAN is learned dynamically on that port, only if the specific VLAN is statically configured in the switch. If restricted VLAN registration rules are disabled, then GVRP packets are processed normally and VLANs are learned dynamically even if they are not statically configured in the switch.

See Figure 3-1 for setup. In Switch A, P1 is configured to be member port of VLANs 2 and 3.

1. **Create VLAN 2 and VLAN 3 in switch A using the following commands:**

   SEFOS# **config**

   Configuring from memory or network is not supported

   SEFOS(config)# **vlan** *2*

   SEFOS(config-if)# **port ex** *0/1* **untagged ex** *0/1*

   SEFOS(config-if)# **exit**

   SEFOS(config)# **vlan** *3*

   SEFOS(config-if)# **port ex** *0/1* **untagged ex** *0/1*

   SEFOS(config-if)# **end**

2. **View the VLAN information before configuring restricted VLAN registration.**

   The output in switch A is:

   SEFOS# **show vlan**

```
VLAN database
-------------
VLAN ID             : 1
Member Ports        : Ex0/1, Ex0/2, Ex0/3, Ex0/4, Ex0/5, Ex0/6
                      Ex0/7, Ex0/8, Ex0/9, Ex0/10, Ex0/11, Ex0/12
                      Ex0/13, Ex0/14, Ex0/15, Ex0/16, Ex0/17, Ex0/18
                      Ex0/19, Ex0/20, Ex0/21, Ex0/22, Ex0/23, Ex0/24
Untagged Ports      : Ex0/1, Ex0/2, Ex0/3, Ex0/4, Ex0/5, Ex0/6
                      Ex0/7, Ex0/8, Ex0/9, Ex0/10, Ex0/11, Ex0/12
                      Ex0/13, Ex0/14, Ex0/15, Ex0/16, Ex0/17, Ex0/18
                      Ex0/19, Ex0/20, Ex0/21, Ex0/22, Ex0/23, Ex0/24
```

```
Forbidden Ports     : None
Name                :
Status              : Permanent
-------------------------------------------------
VLAN ID             : 2
Member Ports        : Ex0/1
Untagged Ports      : Ex0/1
Forbidden Ports     : None
Name                :
Status              : Permanent
-------------------------------------------------
VLAN ID             : 3
Member Ports        : Ex0/1
Untagged Ports      : Ex0/1
Forbidden Ports     : None
Name                :
Status              : Permanent
-------------------------------------------------
```

The output in switch B is:

SEFOS# **show vlan**

```
VLAN database
-------------
VLAN ID             : 1
Member Ports        : Ex0/1, Ex0/2, Ex0/3, Ex0/4, Ex0/5, Ex0/6
                      Ex0/7, Ex0/8, Ex0/9, Ex0/10, Ex0/11, Ex0/12
                      Ex0/13, Ex0/14, Ex0/15, Ex0/16, Ex0/17, Ex0/18
                      Ex0/19, Ex0/20, Ex0/21, Ex0/22, Ex0/23, Ex0/24
Untagged Ports      : Ex0/1, Ex0/2, Ex0/3, Ex0/4, Ex0/5, Ex0/6
                      Ex0/7, Ex0/8, Ex0/9, Ex0/10, Ex0/11, Ex0/12
                      Ex0/13, Ex0/14, Ex0/15, Ex0/16, Ex0/17, Ex0/18
                      Ex0/19, Ex0/20, Ex0/21, Ex0/22, Ex0/23, Ex0/24
Forbidden Ports     : None
Name                :
Status              : Permanent
-------------------------------------------------
VLAN ID             : 2
Member Ports        : Ex0/1
Untagged Ports      : None
```

```
Forbidden Ports     : None
Name                :
Status              : Dynamic Gvrp
-------------------------------------------
VLAN ID             : 3
Member Ports        : Ex0/1
Untagged Ports      : None
Forbidden Ports     : None
Name                :
Status              : Dynamic Gvrp
-------------------------------------------
```

Note that the procedure documented in "Configuring Dynamic VLAN Learning" enables GVRP, therefore, VLAN 2 and 3 are learned from switch A as indicated by the Dynamic Gvrp attribute.

3. Run the following commands in switch B to enable restricted VLAN registration:

- Enter Global configuration mode.

  SEFOS# **configure terminal**

- Enable Restricted VLAN registration on a port.

  SEFOS(config)# **interface extreme-ethernet** *0/1*

  SEFOS(config-if)# **vlan restricted** *enable*

  SEFOS(config-if)# **end**

4. View the configuration details after enabling VLAN registration.

SEFOS# **show vlan**

```
VLAN database
-------------
VLAN ID             : 1
Member Ports        : Ex0/1, Ex0/2, Ex0/3, Ex0/4, Ex0/5, Ex0/6
                      Ex0/7, Ex0/8, Ex0/9, Ex0/10, Ex0/11, Ex0/12
                      Ex0/13, Ex0/14, Ex0/15, Ex0/16, Ex0/17, Ex0/18
                      Ex0/19, Ex0/20, Ex0/21, Ex0/22, Ex0/23, Ex0/24
Untagged Ports      : Ex0/1, Ex0/2, Ex0/3, Ex0/4, Ex0/5, Ex0/6
                      Ex0/7, Ex0/8, Ex0/9, Ex0/10, Ex0/11, Ex0/12
                      Ex0/13, Ex0/14, Ex0/15, Ex0/16, Ex0/17, Ex0/18
                      Ex0/19, Ex0/20, Ex0/21, Ex0/22, Ex0/23, Ex0/24
Forbidden Ports     : None
Name                :
Status              : Permanent
-------------------------------------------------
```

5. **Run the following commands to create VLAN 2 in switch B:**

   SEFOS# **configure terminal**

   SEFOS(config)# **vlan** *2*

   SEFOS(config-vlan)# **ports extreme-ethernet** *0/2*

   SEFOS(config-vlan)# **end**

   SEFOS# **show vlan**

```
VLAN database
-------------
VLAN ID             : 1
Member Ports        : Ex0/1, Ex0/2, Ex0/3, Ex0/4, Ex0/5, Ex0/6
                      Ex0/7, Ex0/8, Ex0/9, Ex0/10, Ex0/11, Ex0/12
                      Ex0/13, Ex0/14, Ex0/15, Ex0/16, Ex0/17, Ex0/18
                      Ex0/19, Ex0/20, Ex0/21, Ex0/22, Ex0/23, Ex0/24
Untagged Ports      : Ex0/1, Ex0/2, Ex0/3, Ex0/4, Ex0/5, Ex0/6
                      Ex0/7, Ex0/8, Ex0/9, Ex0/10, Ex0/11, Ex0/12
                      Ex0/13, Ex0/14, Ex0/15, Ex0/16, Ex0/17, Ex0/18
                      Ex0/19, Ex0/20, Ex0/21, Ex0/22, Ex0/23, Ex0/24
Forbidden Ports     : None
Name                :
Status              : Permanent
--------------------------------------------------
VLAN ID             : 2
Member Ports        : Ex0/1, Ex0/2
Untagged Ports      : None
Forbidden Ports     : None
Name                :
Status              : Permanent
```

Note that it might take a few seconds for Ex 0/1 to show up in VLAN 2.

> Since VLAN 2 is statically configured in switch B, VLAN 2 is learned dynamically on port 1 of switch B, even though restricted VLAN registration is enabled.

Configuring Restricted Group Registration

By default, port level restricted group registration is disabled. If this feature is enabled, then multicast group attribute/service requirement attribute is learned dynamically on a port, only if the specific multicast group attribute/ service requirement attribute is statically configured in the switch. If restricted group registration rules are disabled, then the GMRP packets are processed normally and the multicast group attribute/service requirement attributes are learned dynamically, even if they are not statically configured in the switch. See Figure 3-1 for setup.

1. **Run the following commands in switch A to configure static multicast MAC Address:**

   - Enter Global configuration mode.

     SEFOS#**configure terminal**

   - Configure static multicast entry with the required ports.

     SEFOS(config)# **mac-address-table static multicast** *01:02:03:04:05:06* **vlan** *1*

     interface extreme-ethernet *0/1*

     SEFOS(config)# **end**

   - View the Static Multicast Table by running the following show command:

     SEFOS# **show mac-address-table static multicast**

```
Static Multicast Table
----------------------
VLAN            : 1
Mac Address     : 01:02:03:04:05:06
Receive Port    :
Member Ports    : Ex0/1
Forbidden Ports :
Status          : Permanent
-----------------------------------------------
```

2. **View the statically configured multicast entry by running the following show command:**

   SEFOS# **show mac-address-table**

The output in switch A is:

```
VLAN    Mac Address         Type     Ports
----    -----------         ----     -----
1       00:02:02:03:04:01   Learnt   Ex0/2 (Switch B port Ex2 mac address)
1       01:02:03:04:05:06   Static   Ex0/1
Total Mac Addresses displayed: 2
```

The output in switch B is:

SEFOS# **show mac-address-table**

```
VLAN  Mac Address         Type     Ports
----  -----------         ----     -----
1     00:01:02:03:04:02   Learnt   Ex0/1 (In Switch A, port Ex 0/1 Mac addr)
1     01:02:03:04:05:06   Learnt   Ex0/1 (Switch A group mac addr)

Total Mac Addresses displayed: 2
```

3. **Run the following commands to enable restricted group registration in switch B:**

- Enter Global configuration mode.

  SEFOS# **configure terminal**

- Enable restricted group registration on a port.

  SEFOS(config)# **interface extreme-ethernet** *0/1*

  SEFOS(config-if)# **group restricted** *enable*

  SEFOS(config-if)# **end**

- View the configuration details after enabling restricted group registration.

  SEFOS# **show mac-address-table**

```
VLAN    Mac Address         Type     Ports
----    -----------         ----     -----
1       00:01:02:03:04:02   Learnt   Ex0/1

Total Mac Addresses displayed: 1
```

- Create static multicast MAC address by running the following commands:
- Enter Global configuration mode.

  SEFOS# **configure terminal**

- Configure static multicast entry with the required ports.

  SEFOS(config)# **mac-address-table static multicast** *01:02:03:04:05:06* **vlan** *1*

  interface extreme-ethernet *0/2*

- Exit Global configuration mode.

  SEFOS(config)# **end**

- View the MAC Address Table details by running the following show command:

  SEFOS# **show mac-address-table**

```
VLAN    Mac Address         Type     Ports
----    -----------         ----     -----
1       00:01:02:03:04:02   Learnt   Ex0/1
1       01:02:03:04:05:06   Static   Ex0/1,Ex0/2
Total Mac Addresses displayed: 2
```

Classifying Frames to a VLAN

As per the IEEE standards, rules are defined for classifying the frames in a VLAN. VLAN classification is accomplished by associating a VLAN ID with each port on the switch. Optionally, frames can be classified according to the protocol identifier contained within the frame. Frame classification priority begins with VLAN Tag; followed by MAC based, protocol match, and finally the PVID.

Port-Based Classification

In port-based classification, the VLAN ID associated with an untagged or priority-tagged frame is determined, based on the port on which the frame arrives. Port-based classification requires the association of a specific VLAN ID, the port VLAN identifier (PVID) with each port.

- A port can be a member of only one port-based VLAN.
- If PVID value has not been explicitly configured for a port, then PVID assumes a default value of 1.

1. Run the following commands to configure the PVID that is assigned to untagged/priority-tagged frames:

- Enter Global configuration mode.

  SEFOS# **configure terminal**

  Configuring from memory or network is not supported

  SEFOS(config)# **vlan** *4*

  SEFOS(config-vlan)# **vlan active**

  SEFOS(config-vlan)# **exit**

- Enter Interface configuration mode for port extreme-ethernet 0/5.

  SEFOS(config)# **interface extreme-ethernet** *0/5*

- Configure the PVID that is to be assigned to untagged/priority-tagged frames.

  SEFOS(config-if)# **switchport pvid** *4*

  SEFOS(config-if)# **end**

2. View the configuration details by running the following show command:

SEFOS# **show vlan port config port extreme-ethernet** *0/5*

```
VLAN Port configuration table
-------------------------------
Port Ex0/5
 Port VLAN ID                      : 4
 Port Acceptable Frame Type        : Admit All
 Port Ingress Filtering            : Disabled
 Port Mode                         : Hybrid
 Port Gvrp Status                  : Enabled
 Port Gmrp Status                  : Enabled
 Port Gvrp Failed Registrations    : 0
 Gvrp last pdu origin              : 00:00:00:00:00:00
 Port Restricted VLAN Registration : Disabled
 Port Restricted Group Registration: Disabled
 Mac Based Support                 : Disabled
 Subnet Based Support              : Disabled
```

```
Port-and-Protocol Based Support     : Enabled
Default Priority                    : 0
Filtering Utility Criteria          : Default
Port Protected Status               : Disabled
-----------------------------------------------------
```

Service Classes and Expedited Traffic Handling

SEFOS VLAN supports multiple traffic classes to handle expedited traffic. Each traffic class is assigned a traffic type based on the time sensitiveness of the traffic. The aim is to meet the latency and throughput requirement of time-critical traffic in a LAN environment, where both time-critical and non-time-critical traffic compete for the network bandwidth.

Each priority tagged data frame received carries priority information. This information is used to map the traffic to one of the supported Traffic classes for a given outbound port. Based on the selected Traffic class, the frame is scheduled for outbound transmission.

Configuring VLAN Max Traffic Class

It is possible to configure the maximum number of traffic classes supported on a port.

1. **Run the following commands to configure the maximum number of traffic classes supported on a port:**
   - Enter Global configuration mode.

     SEFOS# **configure terminal**
   - Enter Interface configuration mode.

     SEFOS(config)# **interface extreme-ethernet** *0/2*
   - Configure the maximum number of traffic classes that can be supported on a port.

     SEFOS(config-if)# **vlan max-traffic-class** ***4***

     SEFOS(config-if)# **end**

2. **View the configuration information by running the following show command:**

   SEFOS# **show vlan traffic-classes port ex** *0/2*

```
Traffic Class table
---------------------
Port      Priority    Traffic Class
-----     ---------   -------------
Ex0/2     0           1
Ex0/2     1           0
Ex0/2     2           0
Ex0/2     3           1
```

```
Ex0/2     4            2
Ex0/2     5            2
Ex0/2     6            3
Ex0/2     7            3
```

Mapping Priority to Traffic Class

It is possible to map a priority to a traffic class on the specified port. The frame received on the interface with the configured priority is processed in the configured traffic class.

1. View the configuration information by running the following show command:

SEFOS# **show vlan traffic-classes port extreme-ethernet** *0/2*

```
Traffic Class table
---------------------
Port      Priority    Traffic Class
-----     ---------   -------------
Ex0/2     1           0
Ex0/2     2           1
Ex0/2     3           3
Ex0/2     4           4
Ex0/2     5           5
Ex0/2     6           6
Ex0/2     7           7
```

2. **Run the following commands to map a priority to a traffic class:**

- Enter Global configuration mode.

  SEFOS# **configure terminal**

- Enter Interface configuration mode.

  SEFOS(config)# **interface extreme-ethernet** *0/2*

- Map the priority to traffic class.

  SEFOS(config-if)# **vlan map-priority** *7* **traffic-class** *1*

  SEFOS(config-if)# **end**

3. View the configuration information by running the following show command:

SEFOS# **show vlan traffic-classes port extreme-ethernet** *0/2*

```
Traffic Class table
---------------------
Port     Priority    Traffic Class
-----    ---------   -------------
Ex0/2    1           0
Ex0/2    2           1
Ex0/2    3           3
Ex0/2    4           4
Ex0/2    5           5
Ex0/2    6           6
Ex0/2    7           1
```

Configuring Port Filtering

Configuring Acceptable Frametype

It is possible to configure the acceptable frame type for the port as one of the following:

- All frames
- Tagged frames
- Untagged and priority tagged frames.

1. Run the following commands to configure the acceptable frame type for the port:

- Enter Global configuration mode.

  SEFOS# **configure terminal**

- Enter Interface configuration mode and configure the frame type of the port as "tagged" for that interface.

  SEFOS(config)# **interface extreme-ethernet** *0/2*

  SEFOS(config-if)# **switchport acceptable-frame-type** *tagged*

  SEFOS(config-if)# **end**

2. View the configuration information by running the following show command:

SEFOS# **show vlan port config port ex** *0/2*

```
Vlan Port configuration table
------------------------------
 Port Ex0/2
 Port Vlan ID                      : 1
 Port Acceptable Frame Type        : Admit Only Vlan Tagged
 Port Ingress Filtering            : Disabled
 Port Mode                         : Hybrid
```

```
 Port Gvrp Status                    : Disabled
 Port Gmrp Status                    : Disabled
 Port Gvrp Failed Registrations      : 0
 Gvrp last pdu origin                : 00:00:00:00:00:00
 Port Restricted VLAN Registration   : Disabled
 Port Restricted Group Registration  : Disabled
 Mac Based Support                   : Disabled
 Subnet Based Support                : Disabled
 Port-and-Protocol Based Support     : Enabled
 Default Priority                    : 0
 Filtering Utility Criteria          : Default
 Port Protected Status               : Disabled
-------------------------------------------------------
```

When set to "tagged", the device will discard untagged and priority tagged frames received on the port and will process only the VLAN tagged frames.

Configuring Ingress Filtering

Enabling Ingress Filtering on a port does not allow frames for a VLAN from a port that is not the member port of that particular VLAN. Default is disabled.

1. **Run the following commands to enable ingress filtering on a port:**
   - Enter Global configuration mode.

     SEFOS# **configure terminal**
   - Enter Interface configuration mode and enable ingress filtering for that interface.

     SEFOS(config)# **interface extreme-ethernet** *0/1*

     SEFOS(config-if)# **switchport ingress-filter**

     SEFOS(config-if)# **end**

2. **View the configuration details by running the following show command:**

   SEFOS# **show vlan port config port extreme-ethernet** *0/2*

```
VLAN Port configuration table
------------------------------
Port Ex0/2
Port VLAN ID                        : 1
Port Acceptable Frame Type          : Admit All
Port Ingress Filtering              : Enabled
Port Mode                           : Hybrid
```

```
Port Gvrp Status                    : Enabled
Port Gmrp Status                    : Enabled
Port Gvrp Failed Registrations      : 0
Gvrp last pdu origin                : 00:00:00:00:00:00
Port Restricted VLAN Registration   : Disabled
Port Restricted Group Registration  : Disabled
Mac Based Support                   : Disabled
Subnet Based Support:               : Disabled
Port-and-Protocol Based Support     : Enabled
Default Priority                    : 0
Filtering Utility Criteria          : Default
Port Protected Status               : Disabled
---------------------------------------------------
```

Chapter 5

Flow-Based Configuration

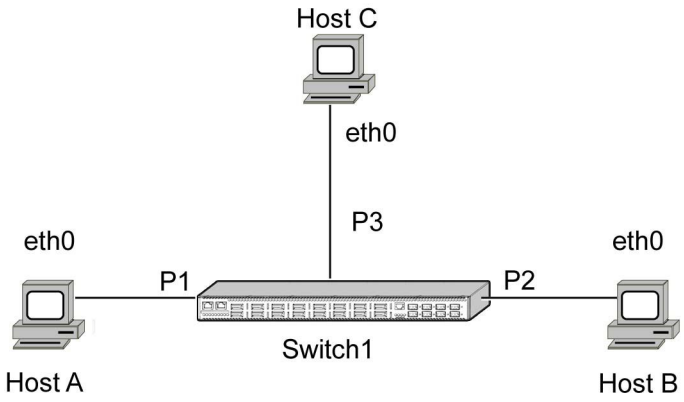

Table 5-1: Configuration for Topology 1

Node	Port	MAC Address	IP Address
Host A	eth0	00:11:22:33:44:0a	12.0.0.10
Host B	eth0	00:11:22:33:44:0b	12.0.0.20
Host C	eth0	00:11:22:33:44:0c	12.0.0.30
Switch1	P1	00:01:02:03:04:01	12.0.0.1
	P2	00:01:02:03:04:02	
	P3	00:01:02:03:04:03	

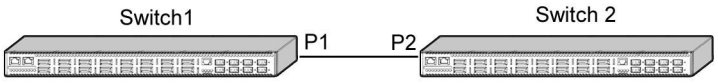

Figure 5-5: Topology 2

Table 5-2: Configuration for Topology 2

Node	Port	MAC Address	IP Address
Switch1	eth0	00:01:02:03:04:01	12.0.0.1
	eth1	00:01:02:03:04:02	
Switch2	eth0	00:02:02:03:04:01	12.0.0.2
	eth1	00:02:02:03:04:02	

Configuring Static Unicast Entry

To work with Static Unicast Entry, the following are to be carried out.

Configuration Guidelines

1. **Configuration of static unicast entry.**
2. **Configuration of VLAN.**

Configurations

1. **See Figure 5-4 and Table 5-1 for the topology for this procedure.**
2. **Run the following commands in switch1:**
   - Enter Global configuration mode.

     SEFOS# **configure terminal**
   - Configure VLAN 2 in the switch.

     SEFOS(config)# **vlan** *2*
   - Configure the static VLAN entry with the required ports.

     SEFOS(config-vlan)# **ports** *extreme-ethernet 0/1-3*
   - Exit VLAN configuration mode.

     SEFOS(config-vlan)# **exit**
   - Enter Interface configuration mode.

     SEFOS(config)# **interface range** *extreme-ethernet 0/1-3*

- Make the interfaces 1-3 up.

  SEFOS(config-if)# **no shutdown**

- Exit Interface configuration mode.

  SEFOS(config-if)# **exit**

- Configure the static unicast entry.

  SEFOS(config)# **mac-address-table static unicast** *00:11:22:33:44:0b* **vlan** *2*

  interface *extreme-ethernet 0/2*

- Exit Global configuration mode.

  SEFOS(config)# **exit**

3. View the VLAN-related configurations by running the following commands:

SEFOS# **show vlan id** *2*

```
Vlan database
-------------------
Vlan ID                   : 2
Member Ports              : Ex0/1, Ex0/2, Ex0/3
Untagged Ports            : None
Forbidden Ports           : None
Name                      :
Status                    : Permanent
-----------------------------------------------------
```

SEFOS# **show mac-address-table static unicast**

```
Vlan     Mac Address         RecvPort    Status   ConnectionId    Ports
------  ------------------  ----------  -------  ------------    ------
2        00:11:22:33:44:0b               Permanent                Ex0/2

Total Mac Addresses displayed: 1
```

After spanning topology settlement, send the tagged (VLAN 2) unicast data packet to Host B from Host A.

Configuring Static Multicast Entry

To work with Static Multicast Entry, the following are to be carried out.

Configuration Guidelines

1. **Configuration of static multicast entry.**
2. **Configuration of VLAN.**

Configuration Steps

1. **See Figure 5-4 and Table 5-1 for the topology for this procedure.**
2. **Run the following commands in switch1:**

   At switch1:

   - Enter Global configuration mode.

     SEFOS# **configure terminal**

   - Configure VLAN 2 in the switch.

     SEFOS(config)# **vlan** *2*

   - Configure the static VLAN entry with the required ports.

     SEFOS(config-vlan)# **ports** *extreme-ethernet 0/1-3*

   - Exit VLAN configuration mode.

     SEFOS(config-vlan)# **exit**

   - Enter Interface configuration mode.

     SEFOS(config)# **interface range** *extreme-ethernet 0/1-3*

   - Make the interfaces 1-3 up.

     SEFOS(config-if)# **no shutdown**

   - Exit Interface configuration mode.

     SEFOS(config-if)# **exit**

   - Configure the static multicast entry

     SEFOS(config)# **mac-address-table static multicast** *01:02:02:02:02:02* **vlan** *2* **interface** *extreme-ethernet 0/3*

   - Exit Global configuration mode.

     SEFOS(config)# **exit**

4. **View the static multicast information by running the following command:**

   SEFOS# **show mac-address-table static multicast**

```
Static Multicast Table
----------------------
Vlan            : 2
Mac Address     : 01:02:02:02:02:02
Receive Port    :
Member Ports    : Ex0/3
Status          : Permanent
-----------------------------------------------


Total Mac Addresses displayed: 1
```

5. **View the created VLAN.**

SEFOS# **show vlan id** *2*

```
Vlan database
-------------------
Vlan ID             : 2
Member Ports         : Ex0/1, Ex0/2, Ex0/3
Untagged Ports      : None
Forbidden Ports     : None
Name                :
Status              : Permanent
-------------------------------------------------
```

After spanning topology settlement, send the tagged (VLAN 2) multicast data packet to host C from host A.

Configuring GVRP

To work with GVRP, the following are to be carried out.

Dynamic VLAN Learning

For Dynamic VLAN Learning, the following are to be carried out.

Configuration Guidelines

1. **Enable the interface P2 in Switch1 and Switch2.**
2. **Configure VLAN.**

Configuration Steps

1. **See Figure 5-5 and Table 5-2 for the topology for this procedure.**
2. **Run the following commands in the switches:**

At switch1:

- Enter Global configuration mode.

  SEFOS# **configure terminal**

- Enter Interface configuration mode.

  SEFOS(config)# **interface** *extreme-ethernet 0/2*

- Make the interface up.

  SEFOS(config-if)# **no shutdown**

- Return to Global configuration mode.

  SEFOS(config-if)# **exit**

- Configure VLAN 2 in the switch.

  SEFOS(config)# **vlan** *2*

- Configure the static VLAN entry with the required ports.

  SEFOS(config-VLAN)# **ports** *extreme-ethernet 0/1-2*

- Return to Privileged EXEC mode.

  SEFOS(config-VLAN)# **end**

At switch2:

- Enter Global configuration mode.

  SEFOS# **configure terminal**

- Enter Interface configuration mode.

  SEFOS(config)# **interface** *extreme-ethernet 0/2*

- Make the interface up.

  SEFOS(config-if)# **no shutdown**

- Return to Global configuration mode.

  SEFOS(config-if)# **exit**

3. View the VLANs in the switches.

At switch1:

SEFOS# **show vlan id** *2*

```
Vlan database
-------------------
Vlan ID                    : 2
Member Ports               : Ex0/1, Ex0/2
Untagged Ports             : None
Forbidden Ports            : None
Name                       :
Status                     : Permanent
```

At switch2:

SEFOS# **show vlan id** *2*

```
Vlan database
-------------------
Vlan ID                    : 2
Member Ports               : Ex0/2
```

```
Untagged Ports             : None
Forbidden Ports            : None
Name                       :
Status                     : Dynamic Gvrp
-------------------------------------------------
```

Configuring Restricted VLAN Registration

To work with Restricted Registration, the following are to be carried out.

Configuration Guidelines

1. **Enable the interface P2 in Switch1 and Switch2.**
2. **Configure VLAN.**
3. **Configure Restricted VLAN Registration.**

Configuration Steps

1. **See Figure 5-5 and Table 5-2 for the topology for this procedure.**
2. **Run the following commands in the switches:**

At switch1:

- Enter Global configuration mode.

  SEFOS# **configure terminal**

- Enter Interface configuration mode.

  SEFOS(config)# **interface** *extreme-ethernet 0/2*

- Make the interface up.

  SEFOS(config-if)# **no shutdown**

- Return to Global configuration mode.

  SEFOS(config-if)# **exit**

- Configure VLAN 2 in the switch.

  SEFOS(config)# **vlan** *2*

- Configure the static VLAN entry with the required ports.

  SEFOS(config-vlan)# **ports** *extreme-ethernet 0/1-2*

- Return to Privileged EXEC mode.

  SEFOS(config-vlan)# **end**

At switch2:

- Enter Global configuration mode.

  SEFOS# **configure terminal**

- Enter Interface configuration mode.

  SEFOS(config)# **interface** *extreme-ethernet 0/2*

- Make the interface up.

  SEFOS(config-if)# **no shutdown**

- Return to Privileged EXEC mode.

  SEFOS(config-if)# **end**

3. Enable Restricted VLAN registration in switch 2.

- Enter Global configuration mode.

  SEFOS# **configure terminal**

- Enter Interface configuration mode.

  SEFOS(config)# **interface** *extreme-ethernet 0/2*

- Enable Restricted VLAN registration on a port.

  SEFOS(config-if)# **vlan restricted enable**

- Return to Privileged EXEC mode.

  SEFOS(config-if)# **end**

4. View the status by running the following command:

SEFOS# **show vlan port config port** *extreme-ethernet 0/2*

```
Vlan Port configuration table
-------------------------------------
 Port Ex0/2
 Port Vlan ID                          : 1
 Port Acceptable Frame Type            : Admit All
 Port Ingress Filtering                : Disabled
 Port Mode                             : Hybrid
 Port Gvrp Status                      : Enabled
 Port Gmrp Status                      : Enabled
 Port Gvrp Failed Registrations        : 0
 Gvrp last pdu origin                  : 00:01:02:03:04:02
 Port Restricted Vlan Registration     : Enabled
 Port Restricted Group Registration    : Disabled
 Mac Based Support                     : Disabled
 Port-and-Protocol Based Support       : Enabled
 Default Priority                      : 0
 Filtering Utility Criteria            : Default
 Port Protected Status                 : Disabled
 ---------------------------------------------------------------------------
```

5. **View the VLAN by using the command in the switches:**

   At switch1:

   SEFOS# **show vlan id** *2*

```
Vlan database
-------------------
Vlan ID                    : 2
Member Ports               : Ex0/1, Ex0/2
Untagged Ports             : None
Forbidden Ports            : None
Name                       :
Status                     : Permanent
--------------------------------------------------
```

   At switch2:

   SEFOS# **show vlan id** *2*

```
Vlan database
--------------
```

Note that VLAN 2 is not learned in switch2.

Configuring GMRP

To work with GMRP, the following are to be carried out.

Configuration Guidelines

1. **Enable the interface P2 in switch1 and switch2.**
2. **Configure static multicast entry.**

Configuration Steps

1. **See Figure 5-5 and Table 5-2 for the topology for this procedure.**
2. **Run the following commands in the switches:**

   At switch1:

   - Enter Global configuration mode.

     SEFOS# **configure terminal**

- Enter Interface configuration mode.

  SEFOS(config)# **interface** *extreme-ethernet 0/1*

- Make the interface up.

  SEFOS(config-if)# **no shutdown**

- Return to Global configuration mode.

  SEFOS(config-if)# **exit**

- Enter Interface configuration mode.

  SEFOS(config)# **interface** *extreme-ethernet 0/2*

- Make the interface up.

  SEFOS(config-if)# **no shutdown**

- Return to Global configuration mode.

  SEFOS(config-if)# **exit**

- Configure VLAN 2 in the switch.

  SEFOS(config)# **vlan** *2*

- Configure the static VLAN entry with the required ports.

  SEFOS(config-vlan)# **ports** *extreme-ethernet 0/1-2*

- Return to Global configuration mode.

  SEFOS(config-vlan)# **exit**

- Create the static multicast entry.

  SEFOS(config)# **mac-address-table static multicast** *01:02:02:02:02:02* **vlan** *2* **interface** *extreme-ethernet 0/2*

- Return to Privileged EXEC mode.

  SEFOS(config)# **end**

At switch 2:

- Enter Global configuration mode.

  SEFOS# **configure terminal**

- Enter Interface configuration mode.

  SEFOS(config)# **interface** *extreme-ethernet 0/2*

- Make the interface up.

  SEFOS(config-if)# **no shutdown**

- Return to Global configuration mode.

  SEFOS(config-if)# **exit**

3. **View the multicast group entries in the switches.**

At switch1:

SEFOS# **show mac-address-table static multicast**

```
Static Multicast Table
------------------------------
Vlan           : 2
Mac Address    : 01:02:02:02:02:02
Receive Port   :
Member Ports   : Ex0/1
Status         : Permanent
-----------------------------------------------

Total Mac Addresses displayed: 1
```

At switch2:

SEFOS# **show mac-address table**

```
Vlan    Mac Address              Type     Ports
-------   -------------------    -------  --------
1       00:01:02:03:04:02        Learnt   Ex0/2
2       00:01:02:03:04:02        Learnt   Ex0/2
2       01:02:02:02:02:02        Learnt   Ex0/2

Total Mac Addresses displayed: 3
```

Configuring Restricted Group Registration

For configuring Restricted Group Registration, the following are to be carried.

Configuration Guidelines

1. **Enable the interface P2 in switch1 and switch2.**
2. **Configure static multicast entry.**
3. **Configure Restricted Group Registration.**

Configuration Steps

1. **See Figure 5-5 and Table 5-2 for the topology for this procedure.**
2. **Run the following commands in the switches:**

At switch1:

- Enter Global configuration mode.

  SEFOS# **configure terminal**

- Enter Interface configuration mode.

  SEFOS(config)# **interface** *extreme-ethernet 0/1*

- Make the interface up.

  SEFOS(config-if)# **no shutdown**

- Return to Global configuration mode.

  SEFOS(config-if)# **exit**

- Enter Interface configuration mode.

  SEFOS(config)# **interface** *extreme-ethernet 0/2*

- Make the interface up.

  SEFOS(config-if)# **no shutdown**

- Return to Global configuration mode.

  SEFOS(config-if)# **exit**

- Configure VLAN 2 in the switch.

  SEFOS(config)# **vlan** *2*

- Configure the static VLAN entry with the required ports.

  SEFOS(config-vlan)# **ports** *extreme-ethernet 0/1-2*

- Return to Global configuration mode.

  SEFOS(config-vlan)# **exit**

- Create the static multicast entry.

  SEFOS(config)# **mac-address-table static multicast** *01:02:02:02:02:02* **VLAN** *2* **interface** *extreme-ethernet 0/2*

- Return to Privileged EXEC mode.

  SEFOS(config)# **end**

At switch 2:

- Enter Global configuration mode.

  SEFOS# **configure terminal**

- Enter Interface configuration mode.

  SEFOS(config)# **interface** *extreme-ethernet 0/2*

- Make the interface up.

  SEFOS(config-if)# **no shutdown**

- Return to Global configuration mode.

  SEFOS(config-if)# **exit**

3. **Enable Restricted Group registration in switch 2.**

- Enter Global configuration mode.

  SEFOS# **configure terminal**

- Enter Interface configuration mode.

  SEFOS(config)# **interface** *extreme-ethernet 0/2*

- Enable Restricted Group registration on a port.

  SEFOS(config-if)# **group restricted enable**

- Return to Privileged EXEC mode.

  SEFOS(config-if)# **end**

4. **View the status by running the following command:**

   SEFOS# **show vlan port config port** *extreme-ethernet 0/2*

```
Vlan Port configuration table
-------------------------------------
 Port Ex0/2
 Port Vlan ID                          : 1
 Port Acceptable Frame Type            : Admit All
 Port Ingress Filtering                : Disabled
 Port Mode                             : Hybrid
 Port Gvrp Status                      : Enabled
 Port Gmrp Status                      : Enabled
 Port Gvrp Failed Registrations        : 0
 Gvrp last pdu origin                  : 00:01:02:03:04:02
 Port Restricted Vlan Registration     : Disabled
 Port Restricted Group Registration    : Enabled
 Mac Based Support                     : Disabled
 Subnet Based Support                  : Disabled
 Port-and-Protocol Based Support       : Enabled
 Default Priority                      : 0
 Filtering Utility Criteria            : Default
 Port Protected Status                 : Disabled
 ---------------------------------------------------------------------------
```

5. **View the group entries by using the command:**

   SEFOS# **show mac-address-table**

```
Vlan    Mac Address         Type     Ports
-------   ---------------   -------  -------
1       00:01:02:03:04:02   Learnt   Ex0/2
2       00:01:02:03:04:02   Learnt   Ex0/2
Total Mac Addresses displayed: 2
```

Group entry (01:02:02:02:02:02) is not present in Switch2.

Classifying VLAN

VLAN is classified as follows:

- PVID-based classification

PVID-Based Classification

For configuring PVID-based classification, the following are to be carried out.

Configuration Guidelines

1. **Configure VLAN.**
2. **Configure PVID for ports.**

Configuration Steps

1. **See Figure 5-4 and Table 5-1 for the topology for this procedure.**
2. **Run the following commands at switch 1:**
   - Enter Global configuration mode.

     SEFOS# **configure terminal**
   - Configure VLAN 1 in the switch.

     SEFOS(config)# **vlan** *1*
   - Configure the static VLAN entry with the required ports.

     SEFOS(config-vlan)# **ports** *extreme-ethernet* **0/1-3 untagged** *extreme-ethernet 0/1-3*
   - Exit VLAN configuration mode.

     SEFOS(config-vlan)# **exit**
   - Enter the Interface configuration mode.

     SEFOS(config)# **interface range** *extreme-ethernet 0/1-3*

- Make interfaces 1-3 up.

  SEFOS(config-if)# **no shutdown**

  SEFOS(config-if)# **exit**

- Configure VLAN 2 in the switch.

  SEFOS(config)# **vlan** *2*

- Configure the static VLAN entry with the required ports.

  SEFOS(config-vlan)# **ports** *extreme-ethernet 0/1-2*

- Return to Privileged EXEC mode.

  SEFOS(config-vlan)# **end**

3. Configure the PVID for the Interface P1 as VLAN 2.

- Enter Global configuration mode.

  SEFOS# **configure terminal**

- Enter Interface configuration mode.

  SEFOS(config)# **interface** *extreme-ethernet 0/1*

- Set PVID as 2 for the interface.

  SEFOS(config-if)# **switchport pvid** *2*

- Return to Privileged EXEC mode.

  SEFOS(config-if)# **end**

4. View the VLAN-related configurations by running the following commands:

SEFOS# **show vlan**

```
Vlan database
-------------------
Vlan ID                          : 1
Member Ports                     : Ex0/1, Ex0/2, Ex0/3
Untagged Ports                   : Ex0/1, Ex0/2, Ex0/3
Forbidden Ports                  : None
Name                             :
Status                           : Permanent
--------------------------------------------------
Vlan ID                          : 2
Member Ports                     : Ex0/1, Ex0/2
Untagged Ports                   : None
Forbidden Ports                  : None
Name                             :
Status                           : Permanent
```

```
-------------------------------------------------
```

SEFOS# **show vlan port config port** *extreme-ethernet 0/1*

```
Vlan Port configuration table
-------------------------------------
 Port Ex0/1
 Port Vlan ID                                  : 2
 Port Acceptable Frame Type                    : Admit All
 Port Ingress Filtering                        : Disabled
 Port Mode                                     : Hybrid
 Port Gvrp Status                              : Enabled
 Port Gmrp Status                              : Enabled
 Port Gvrp Failed Registrations                : 0
 Gvrp last pdu origin                          : 00:00:00:00:00:00
 Port Restricted Vlan Registration             : Disabled
 Port Restricted Group Registration            : Disabled
 Mac Based Support                             : Disabled
 Subnet Based Support                          : Disabled
 Port-and-Protocol Based Support               : Enabled
 Default Priority                              : 0
 Filtering Utility Criteria                    : Default
 Port Protected Status                         : Disabled
 ---------------------------------------------------------------------------
```

Unicast packets are reached only to Host B as a tagged VLAN2 packet that is sent by Host A.

Configuring Acceptable Frame Types

To work with Acceptable Frame types, the following are to be carried out.

Configuration Guidelines

1. **Configuration of VLAN.**
2. **Configuration of PVID for the interfaces.**
3. **Configuration of Acceptable Frame Types.**

Configuration Steps

1. **See Figure 5-4 and Table 5-1 for the topology for this procedure.**
2. **Run the following commands in the switch 1:**
   - Enter Global configuration mode.

SEFOS# **configure terminal**

- Configure VLAN 1 in the switch.

  SEFOS(config)# **vlan** *1*

- Configure the static VLAN entry with the required ports.

  SEFOS(config-vlan)# **ports** *extreme-ethernet 0/1-2* **untagged** *extreme-ethernet 0/1-2*

- Return from VLAN Configuration mode.

  SEFOS(config-vlan)# **exit**

- Enter Interface configuration mode.

  SEFOS(config)# **interface** *extreme-ethernet 0/1*

- Make the interface up.

  SEFOS(config-if)# **no shutdown**

- Set PVID as VLAN 1

  SEFOS(config-if)# **switchport pvid** *1*

- Return from Interface configuration mode.

  SEFOS(config-if)# **exit**

- Enter Interface configuration mode.

  SEFOS(config)# **interface** *extreme-ethernet 0/2*

- Make the interface up.

  SEFOS(config-if)# **no shutdown**

- Set PVID as VLAN 2.

  SEFOS(config-if)# **switchport pvid** *1*

- Return to Privileged EXEC mode.

  SEFOS(config-if)# **end**

3. Wait for around 30 seconds (topology settlement), to initiate ping from host A to host B, which is successful.

4. Run the following commands to at switch 1 to configure the Acceptable Frame Type for port P1:

- Enter Global configuration mode.

  SEFOS# **configure terminal**

- Enter Interface configuration mode.

  SEFOS(config)# **interface** *extreme-ethernet 0/1*

- Configure the Acceptable Frame Type.

  SEFOS(config-if)# **switchport acceptable-frame-type tagged**

- Return to Privileged EXEC mode.

  SEFOS(config-vlan)# **end**

5. View the VLAN related configurations by running the following commands:

SEFOS# **show vlan**

```
Vlan database
-------------------
Vlan ID                          : 1
Member Ports                     : Ex0/1, Ex0/2
Untagged Ports                   : Ex0/1, Ex0/2
Forbidden Ports                  : None
Name                             :
Status                           : Permanent
--------------------------------------------------
```

SEFOS# **show vlan port config port** *extreme-ethernet 0/1*

```
Vlan Port configuration table
-------------------------------
 Port Ex0/1
 Port Vlan ID                          : 1
 Port Acceptable Frame Type            : Admit Only Vlan Tagged
 Port Ingress Filtering                : Disabled
 Port Mode                             : Hybrid
 Port Gvrp Status                      : Enabled
 Port Gmrp Status                      : Enabled
 Port Gvrp Failed Registrations        : 0
 Gvrp last pdu origin                  : 00:00:00:00:00:00
 Port Restricted Vlan Registration     : Disabled
 Port Restricted Group Registration    : Disabled
 Mac Based Support                     : Disabled
 Subnet Based Support                  : Disabled
 Port-and-Protocol Based Support       : Enabled
 Default Priority                      : 0
 Filtering Utility Criteria            : Default
 Port Protected Status                 : Disabled
 ------------------------------------------------------------------------
```

Once the Acceptable Frame Type is configured as Admit OnlyVLAN Tagged, the ping fails (as ping packets are untagged) from Host A to Host B.

Configuring Ingress Filtering

To work with Ingress Filtering, the following are to be carried out.

Configuration Guidelines

1. **Configuration of VLAN.**
2. **Configuration of PVID for the interfaces.**
3. **Configuration of Ingress filtering.**

Configuration Steps

1. **See Figure 5-4 and Table 5-1 for the topology for this procedure.**
2. **Run the following commands in switch1:**
   - Enter Global configuration mode.

     SEFOS# **configure terminal**
   - Configure VLAN 2 in the switch.

     SEFOS(config)# **vlan** *2*
   - Configure the static VLAN entry with the required ports.

     SEFOS(config-vlan)# **ports** *extreme-ethernet* **0/2 untagged** *extreme-ethernet 0/2*
   - Return from VLAN Configuration mode.

     SEFOS(config-vlan)# **exit**
   - Enter Interface configuration mode.

     SEFOS(config)# **interface** *extreme-ethernet 0/1*
   - Make the interface up.

     SEFOS(config-if)# **no shutdown**
   - Set PVID as VLAN 2.

     SEFOS(config-if)# **switchport pvid** *2*
   - Return from Interface configuration mode.

     SEFOS(config-if)# **exit**
   - Enter Interface configuration mode.

     SEFOS(config)# **interface** *extreme-ethernet 0/2*
   - Make the interface up.

     SEFOS(config-if)# **no shutdown**
   - Set PVID as VLAN 2.

     SEFOS(config-if)# **switchport pvid** *2*
   - Return to Privileged EXEC mode.

     SEFOS(config-if)# **end**

3. **Wait for approximately 30 seconds (topology settlement) to initiate ping from Host A to Host B, and the ARP packet reaches Host B.**

4. **Enable ingress filtering in port P1 at switch 1 as follows**

   - Enter Global configuration mode.

     SEFOS# **configure terminal**

   - Enter Interface configuration mode.

     SEFOS(config)# **interface** *extreme-ethernet 0/2*

   - Configure the ingress filter.

     SEFOS(config-if)# **switchport ingress-filter**

   - Return to Privileged EXEC mode.

     SEFOS(config-vlan)# **end**

5. **View the VLAN-related configurations by running the following commands:**

   SEFOS# **show vlan id 2**

```
Vlan database
-------------------
Vlan ID                          : 2
Member Ports                     : Ex0/2
Untagged Ports                   : Ex0/2
Forbidden Ports                  : None
Name                             :
Status                           : Permanent
-----------------------------------------------------
```

   SEFOS# **show vlan port config port extreme-ethernet** *0/2*

```
Vlan Port configuration table
------------------------------
 Port Ex0/2
 Port  Vlan ID                                  : 1
 Port Acceptable Frame Type                     : Admit All
 Port Ingress Filtering                         : Enabled
 Port Mode                                      : Hybrid
 Port Gvrp Status                               : Enabled
 Port Gmrp Status                               : Enabled
 Port Gvrp Failed Registrations                 : 0
 Gvrp last pdu origin                           : 00:00:00:00:00:00
```

```
Port Restricted Vlan Registration            : Disabled
Port Restricted Group Registration           : Disabled
Mac Based Support                            : Disabled
Subnet Based Support                         : Disabled
Port-and-Protocol Based Support              : Enabled
Default Priority                             : 0
Filtering Utility Criteria                   : Default
Port Protected Status                        : Disabled
-------------------------------------------------------------------
```

The APR packet reaches Host B, when the Ingress filtering is enabled.