Sun Ethernet Fabric Operating System

VLAN Administration Guide

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Using This Documentation

Oracle's 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. An example grouping is 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.

Product Notes

For late-breaking information and known issues about the following products, refer to the product notes at:

Sun Blade 6000 Ethernet Switched NEM 24p 10GbE:

http://www.oracle.com/pls/topic/lookup?ctx=SB6K-24p-10GbE

Sun Network 10GbE Switch 72p:

http://www.oracle.com/pls/topic/lookup?ctx=SN-10GbE-72p

Related Documentation

Documentation	Links
All Oracle products	http://oracle.com/documentation
Sun Blade 6000 Ethernet Switched NEM 24p 10GbE	http://www.oracle.com/pls/topic/lookup?ctx=SB6K-24p-10GbE
Sun Network 10GbE Switch 72p	http://www.oracle.com/pls/topic/lookup?ctx=SN-10GbE-72p
Sun Blade 6000 modular system	http://www.oracle.com/pls/topic/lookup?ctx=sb6000
Oracle Integrated Lights Out Manager (Oracle ILOM) 3.0	http://www.oracle.com/pls/topic/lookup?ctx=ilom30

For detailed information about the commands and options described in this document, refer to the *Sun Ethernet Fabric Operating System CLI Base Reference Manual*.

Acronyms and Abbreviations

Acronym or Abbreviation	Explanation
BPDU	Bridge protcol data unit
CLI	Command-line interface
FID	Forwarding identifier
GARP	Generic Attribute Registration Protocol
GMRP	GARP Multicast Registration Protocol
GVRP	GARP VLAN Registration Protocol
IP	Internet Protocol
IVL	Independent VLAN learning
LAN	Local area network

Acronym or Abbreviation	Explanation
MAC	Media access control
PNAC	Port-Based Network Authentication Protocol
PVID	Port VLAN ID
QinQ	VLAN stacking
RSTP	Rapid Spanning Tree Protocol
STP	Spanning Tree Protocol
VID	VLAN identifier
VLAN	Virtual LAN
WAN	Wide area network

CLI Command Modes

The following table lists the configuration modes used in this document with their access and exit methods.

Command Mode	Access Method	Prompt	Exit Method
User EXEC	Access SEFOS from Oracle ILOM with read-only rights (privilege level 1).	`SEFOS>`	Use logout or exit to return to the Oracle ILOM prompt.
Privileged EXEC	Access SEFOS from Oracle ILOM with full administrative rights (privilege level 15).	`SEFOS#`	Use the `logout` or `exit` command to return to the Oracle ILOM prompt.
Global Configuration	From User EXEC mode, use the `enable` command.	`SEFOS(config)#`	Use the `end` command to return to Privileged EXEC mode.
Interface Configuration	From Global Configuration mode, use the `interface interface-type interface-id` command.	`SEFOS(config-if)#`	Use the `exit` command to return to Global Configuration mode, or use the `end` command to return to Privileged EXEC mode.

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Learn about Oracle's commitment to accessibility	http://www.oracle.com/us/corporate/accessibility/index.html

Protocol Description

The following topic provides an introduction to VLAN technology:

Introduction

VLAN technology, defined under the IEEE 802.1q specifications, enables enterprises to extend the reach of their corporate networks across a WAN. VLANs enable partitioning of a LAN, based on functional requirements, while maintaining connectivity across all of the devices in the network. VLAN groups network devices and enables 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.

VLANs offer the following advantages over traditional LANs:

- **Performance**

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

- **Formation of virtual workgroups**

  VLANs help in forming virtual workgroups. When communication between the members of the workgroup is high, broadcasts and multicasts can be restricted within the workgroup.

- **Simplified administration**

  Most administration costs result from additions of users, movements in their physical locations, or changes to their configurations in the network. Every time a user is moved in a LAN, you must recable the workstation, add a new station address, and reconfigure hubs and routers. 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 can be broadcasted on a network. Placing only those users who are allowed access to such sensitive data on a VLAN can reduce the chances of an outsider gaining access to the data. VLANs can also be used to control broadcast domains, set up firewalls, restrict access, and inform the network manager of an intrusion.

A SEFOS VLAN logically segments the shared media LAN, forming virtual workgroups. This type of VLAN redefines and optimizes the basic transparent-bridging functions, such as learning, forwarding, filtering, and flooding.

VLAN Configuration

The following sections describe the configuration of VLAN module, running as a part of SEFOS.

Configuration Guidelines

The following guidelines apply to working with VLANs as part of SEFOS:

- VLAN is enabled in the switch by default, and it cannot be disabled.
- VLAN 1 is the default VLAN.
- The default L3 interface is VLAN 1.
- Until you configure the ports, all of the ports in the switch are members of the default VLAN.
- If you disable the GVRP state on a port with the global GVRP status enabled, then GVRP is disabled on the current port. GVRP packets received on that port are discarded, and GVRP registrations from other ports are not propagated on the port.
- Mapping of FIDs to VLANs is successful only when the VLAN learning mode is `hybrid`.
- You must configure a VLAN and add member ports before you can configure a static unicast or multicast MAC address in the forwarding database.
- If a port is an untagged member of a VLAN, you cannot configure that port as `trunk`.

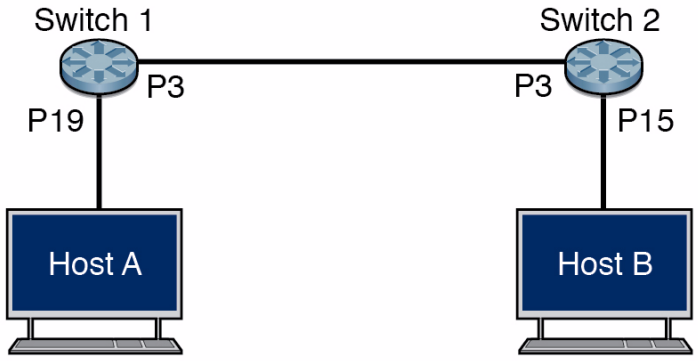
- To enable dot1q-tunneling status, the bridge mode must be set to `provider`.
- If the port mode is not set to `access`, you cannot set the dot1q-tunnel status on the port.
- To enable dot1q-tunneling on a port (802.1X, PNAC), port control must be set to `force-authorized`.
- If dot1q-tunneling status is disabled, you cannot set BPDU tunneling on the port.
- The leave timer must be two times greater than the join timer. The leave-all timer must be greater than the leave timer.
- You must ensure that the values for the acceptable frame type and ingress filtering on the port are suitable.

Default Settings

The following table lists the default settings for the switch.

Feature	Default Setting
VLAN module status	Enable
Default VLAN ID (configured in the switch)	1
System and port level GVRP and GMRP module status	Enabled
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

The following illustration shows a typical topology for a VLAN configuration in which two switches are connected to each other. Host A represents the terminal access to the VLAN.



Configuring Static VLAN Entries

You can configure static VLAN entries with the required number of member ports, untagged ports, and forbidden ports.

▼ Create Member Ports

This example shows ports 0/2-5 being added to VLAN 2.

1. Enter the VLAN configuration mode for VLAN 2.

```
SEFOS# configure terminal
SEFOS(config)# vlan 2
```

2. Add member ports to the VLAN.

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

Note – You can use `ex` as a replacement for `extreme-ethernet`, as in the preceding syntax.

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 one of the port types is not explicitly specified as `untagged`, then all of the ports are configured as `tagged` port types, allowing the 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 cannot support VLAN.

In the preceding example, the egress packets for the `extreme-ethernet 0/3` interface are transmitted without the tag, but on all of the other ports, the packets are transmitted with the tag.

▼ Create Forbidden Ports

The `forbidden` setting prevents the port from participating in the specified VLAN activity. This setting also ensures that any dynamic requests for the port to join the VLAN are ignored. In the following example, ports 0/2-5 are added to VLAN 2, and port 0/1 is assigned the `forbidden` tag.

1. Enter the configuration mode for the VLAN.

```
SEFOS# configure terminal
SEFOS(config)# vlan 2
```

2. Create a forbidden port.

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

Viewing VLAN Information

You can retrieve three types of information about VLANs. You can retrieve a summary of the VLANs on the switch, configuration details on all of the VLANs on the switch, or configuration details on a specific VLAN.

▼ Retrieve the VLAN Summary

- **Type.**

```
SEFOS# show vlan summary
Number of vlans: 2
```

▼ Retrieve the Configuration Details for all of the VLANs on a Switch

- **Type.**

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

▼ Retrieve the Configuration Details of a particular VLAN on the Switch

- **Type.**

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

▼ Delete a VLAN

In the following example, VLAN 4 is deleted from the VLAN list.

1. Enter the configuration mode.

```
SEFOS# configure terminal
```

2. Delete the VLAN (4 in this example).

```
SEFOS(config)# no vlan 4
SEFOS(config)# end
```

Note – The default VLAN (vlan 1) cannot be deleted.

▼ Enable VLANs

You can enable a VLAN by adding a member port or by using the `vlan active` command. The following example shows VLAN 2 being enabled.

1. **Configure VLAN 2 in the switch.**

```
SEFOS# configure terminal
SEFOS(config)# vlan 2
```

2. **Enable the VLAN.**

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

Note – If the `vlan active` command is used without configuring the member ports, the VLAN will have zero member ports. Resources are allocated for active VLANs.

▼ Configure a Static Unicast Entry

To configure a static unicast entry, you must first configure the VLAN and the member ports for the specified VLAN. The following example shows port 0/2 on VLAN 2 being configured with the MAC address `22:22:22:22:22:22`.

1. **Configure a static unicast entry in the VLAN table:.**

```
SEFOS# configure terminal
SEFOS(config)# vlan 2
```

2. **Configure a static VLAN entry with the required type of ports (0/2 in this example).**

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

3. **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
SEFOS(config)# end
```

4. Review the configuration details.

```
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
```

▼ Configure a Static Multicast Entry

To configure a static multicast entry for a specified VLAN, you must configure the VLAN prior to attempting to configure the static multicast entry. In addition, you must configure the member ports for that VLAN. In the following example, VLAN 2 is configured in the switch with member port 0/2 and a MAC address of 01:02:03:04:05:06.

1. Configure static multicast entry in the VLAN table.

```
SEFOS# configure terminal
SEFOS(config)# vlan 2
SEFOS(config-vlan)# ports extreme-ethernet 0/2 untagged
extreme-ethernet 0/2
SEFOS(config-vlan)# exit
```

2. Configure the 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
```

3. Review the configuration details.

```
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
```

▼ Configure Dynamic VLAN Learning

By default, GVRP is enabled globally and can be enabled or disabled on a per-port basis. If GVRP is disabled globally in the switch, use the `set gvrp enable` command to enable GVRP globally, or use the `set port gvrp interface_id enable` command to enable GVRP on an interface. If GVRP is disabled globally or on a particular port, then dynamic learning will not take place globally or on that specified port. By default, all of the ports in a switch are created (but only port 0/1 is up) and added as member ports of default VLAN, vlan 1. In switch A, P1 is configured to be a member port of VLAN 2. See "Default Settings" on page 8 for the example topology for this procedure.

1. Review 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
```

2. **Review the current port GVRP value.**

```
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 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
Dot1x Protocol Tunnel Status        : Peer
LACP Protocol Tunnel Status         : Peer
Spanning Tree Tunnel Status         : Peer
GVRP Protocol Tunnel Status         : Peer
GMRP Protocol Tunnel Status         : Peer
IGMP Protocol Tunnel Status         : Peer
Filtering Utility Criteria          : Default
Port Protected Status               : Disabled
```

If the switch has not been rebooted, the global or port GVRP status might be disabled.

3. **If you need to activate the global or port GVRP status, use the following commands.**

```
SEFOS# config
SEFOS(config)# set gvrp enable
SEFOS(config)# exit
```

4. **Enable port GVRP.**

```
SEFOS# config
SEFOS(config)# set port gvrp extreme-ethernet 0/3 enable
SEFOS(config)# exit
```

5. **Enable the interface (`0/3` in this example) in switch A.**

```
SEFOS# configure terminal
SEFOS(config)# interface extreme-ethernet 0/3
SEFOS(config-if)# no shutdown
SEFOS(config-if)# exit
```

6. **Configure VLAN 2 in switch A.**

```
SEFOS(config)# vlan 2
SEFOS(config-vlan)# ports extreme-ethernet 0/3 untagged
extreme-ethernet 0/3
SEFOS(config-vlan)# end
```

7. **Review the VLAN information in switch A (assuming that you are logged in to switch A).**

```
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        : Ex0/3
Untagged Ports      : Ex0/3
Forbidden Ports     : None
Name                :
Status              : Permanent
```

8. **Review the output in switch B (assuming that you are already logged in to switch B).**

```
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        : Ex0/3
Untagged Ports      : None
Forbidden Ports     : None
Name                :
Status              : Dynamic Gvrp
```

▼ Configure Dynamic Multicast Learning

By default, GMRP is enabled globally and can be enabled or disabled on a per-port basis. If GMRP is disabled globally in the switch, use the `set gmrp enable` command to enable GMRP globally, or use the `set port gmrp id enable` command. If GMRP is disabled globally or on a specific port, dynamic multicast learning will not take place globally or on that port. By default, all of the ports in a switch are created (but only port 0/1 is up) and added as member ports of the default VLAN, vlan 1. See "Default Settings" on page 8 for the example topology for this procedure.

1. Retrieve the current 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
```

2. Retrieve the GMRP value on the current port.

```
SEFOS# show vlan port config port ex 0/3
Vlan Port configuration table
 -------------------------
Port Ex0/3
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, global or port GRMP status might be disabled.

3. Disable GMRP in switch B.

```
SEFOS# configure terminal
SEFOS(config)# set gmrp disable
SEFOS(config)# end
```

4. In switch A, configure the static multicast MAC address.

```
SEFOS# configure terminal
SEFOS(config)# interface extreme-ethernet 0/3
```

```
SEFOS(config-if)# no shutdown
SEFOS(config-if)# exit
SEFOS(config)# mac-address-table static multicast
01:02:03:04:05:06 vlan 1 interface extreme-ethernet 0/3
```

5. Review the MAC address table details 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    : Ex0/3
Forbidden Ports :
Status          : Permanent
---------------------------------------
Total Mac Addresses displayed: 1
```

6. Review the MAC address table details by in switch B.

```
SEFOS# show mac-address-table
VLAN    Mac Address         Type     Ports
----    -----------         ----     -----
1       00:01:02:03:04:02   Learnt   Ex0/3 (Switch A, port Ex0/3
Mac addr)
Total Mac Addresses displayed: 1
```

7. Enable GMRP globally in switch B, and review the MAC address table details.

```
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   Ex0/3 (Switch A, port Ex0/3
Mac addr)
1       01:02:03:04:05:06   Learnt   Ex0/3
Total Mac Addresses displayed: 2
```

▼ Configure Restricted VLAN Registration

By default, restricted VLAN registration is disabled on a port. If restricted VLAN registration is enabled on a port, then the 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.

In the following procedure, P1 in switch A is configured as a member port of VLANs 2 and 3. See "Default Settings" on page 8 for the example topology for this procedure.

1. Create VLAN 2 and VLAN 3 in switch A.

```
SEFOS# config
Configuring from memory or network is not supported
SEFOS(config)# vlan 2
SEFOS(config-if)# port ex 0/3 untagged ex 0/3
SEFOS(config-if)# exit
SEFOS(config)# vlan 3
SEFOS(config-if)# port ex 0/3 untagged ex 0/3
SEFOS(config-if)# end
```

2. Review the VLAN output in switch A.

```
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        : Ex0/3
Untagged Ports      : Ex0/3
Forbidden Ports     : None
Name                :
```

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

3. Review the VLAN output in switch B.

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

See "Configure Dynamic VLAN Learning" on page 15 on how to enable GVRP. When GVRP is enabled, VLAN 2 and 3 are learned from switch A, as indicated by the dynamic GVRP attribute.

4. Enable restricted VLAN registration in switch B.

```
SEFOS# configure terminal
SEFOS(config)# interface extreme-ethernet 0/3
SEFOS(config-if)# vlan restricted enable
SEFOS(config-if)# end
```

5. Review 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
------------------------------------------------------
```

6. Create VLAN 2 in switch B, and review the VLAN details.

```
SEFOS# configure terminal
SEFOS(config)# vlan 2
SEFOS(config-vlan)# ports extreme-ethernet 0/3
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, Ex0/3
Untagged Ports      : None
Forbidden Ports     : None
Name                :
Status              : Permanent
```

The `ex 0/3` interface might take a few minutes to show up in VLAN 2.

Note – Because VLAN 2 is statically configured in switch B, VLAN 2 is learned dynamically on port 0/1 of switch B, even though restricted VLAN registration is enabled.

▼ Configure Restricted Group Registration

By default, port-level restricted group registration is disabled. If this feature is enabled, then the multicast group attribute or service requirement attribute is learned dynamically on a port, only if the specific multicast group attribute or 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 or service requirement attributes are learned dynamically, even if they are not statically configured in the switch. See "Default Settings" on page 8 for the example topology for this procedure.

1. In switch A, configure the static multicast MAC address.

```
SEFOS# configure terminal
SEFOS(config)# mac-address-table static multicast
01:02:03:04:05:06 vlan 1 interface extreme-ethernet 0/3
SEFOS(config)# end
```

2. Review the output of the static multicast table.

```
SEFOS# show mac-address-table static multicast
Static Multicast Table
----------------------
VLAN            : 1
Mac Address     : 01:02:03:04:05:06
Receive Port    :
Member Ports    : Ex0/3
Forbidden Ports :
Status          : Permanent
-----------------------------------------------
```

3. Review the statically configured multicast entry in switch A.

```
SEFOS# show mac-address-table
VLAN    Mac Address          Type      Ports
----    -----------          ----      -----
1       00:02:02:03:04:01    Learnt    Ex0/3 (Switch B port Ex2 mac
address)
1        01:02:03:04:05:06    Static    Ex0/1
Total Mac Addresses displayed: 2
```

4. Review the output in switch B.

```
SEFOS# show mac-address-table
VLAN  Mac Address          Type      Ports
----  -----------          ----      -----
1     00:01:02:03:04:02    Learnt    Ex0/3 (In Switch A, port Ex 0/3
Mac addr)
1     01:02:03:04:05:06    Learnt    Ex0/3 (Switch A group mac addr)

Total Mac Addresses displayed: 2
```

5. Enable restricted group registration in switch B.

```
SEFOS# configure terminal
SEFOS(config)# interface extreme-ethernet 0/3
SEFOS(config-if)# group restricted enable
SEFOS(config-if)# end
```

6. Review 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   Ex0/3

Total Mac Addresses displayed: 1
```

7. Create the static multicast MAC address.

```
SEFOS# configure terminal
SEFOS(config)# mac-address-table static multicast
01:02:03:04:05:06 vlan 1 interface extreme-ethernet 0/3
SEFOS(config)# end
```

8. Review the MAC address table details.

```
SEFOS# show mac-address-table
VLAN    Mac Address         Type     Ports
----    -----------         ----     -----
1       00:01:02:03:04:02   Learnt   Ex0/3
1       01:02:03:04:05:06   Static   Ex0/1,Ex0/2
Total Mac Addresses displayed: 2
```

Configuring QinQ

VLAN stacking, also known as the 802.1ad standard, extends the original VLAN tagging technology by allowing VLAN packets to be tunneled in another VLAN tag. This extension is known as QinQ, VLAN stacking, or double tagging. QinQ resolves the scaling limitations of VLAN tagging by increasing the number of VLAN packets that can be transmitted with the limited number of VLAN tags allowed by the standard.

▼ Enable Tunneling on a Port

When enabling tunneling on a port, you must ensure that the following prerequisites are met:

- Bridge mode must be set to `provider` for dot1q-tunneling status to be enabled on an interface.
- Before configuring the bridge mode, spanning tree and GARP must be shut down.

1. Disable GVRP and GMRP, and shut down GARP spanning tree.

```
SEFOS(config)# set gvrp disable
SEFOS(config)# set gmrp disable
SEFOS(config)# shutdown garp
SEFOS(config)# no spanning-tree
SEFOS(config)# shutdown spanning-tree
SEFOS(config)# shutdown dot1x
SEFOS(config)# shutdown port-channel
SEFOS(config)# shutdown lldp
SEFOS(config)# no interface vlan 1
```

2. Configure the bridge mode of the switch.

```
SEFOS(config)# bridge-mode provider
```

3. **Enable GARP and spanning tree, and review the VLAN device details.**

```
SEFOS(config)# set no shutdown garp
SEFOS(config)# set gvrp enable
SEFOS(config)# set gmrp enable
SEFOS(config)# spanning-tree mode mst
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
Protocol-VLAN Status              : Enabled
Bridge Mode                       : Provider Bridge
Traffic Classes                   : Enabled
VLAN Operational Learning Mode    : IVL
Version number                    : 1
Max VLAN id                       : 4094
Max supported VLANs               : 1024
```

To enable dot1q-tunneling on a specified port, the `acceptable-frame-type` must be set to `untaggedAndPrioritytagged`. The port must be configured in access mode, and GVRP, GMRP, and STP must be disabled on that port.

4. **Disable GVRP on a port.**

```
SEFOS(config)# set port gvrp extreme-ethernet 0/3 disable
```

5. **Disable GMRP on a port.**

```
SEFOS(config)# set port gmrp extreme-ethernet 0/3 disable
SEFOS(config)# interface extreme-ethernet 0/3
```

6. **Configure the switch port acceptable-frame-type as untaggedAndPrioritytagged.**

```
SEFOS(config)# switchport acceptable-frame-type
untaggedAndPrioritytagged
```

7. **Configure the switch port mode to access.**

```
SEFOS(config)# switchport mode access
```

8. **Disable STP on a port.**

```
SEFOS(config)# spanning-tree disable
```

9. **Enable dot1q-tunneling on a specified interface.**

```
SEFOS(config)# switchport mode dot1q-tunnel
```

10. **Review the configuration details.**

```
SEFOS# show vlan port config port extreme-ethernet 0/3
VLAN Port configuration table
-------------------------------
Port Gi0/1
Port VLAN ID                          : 1
Port Acceptable Frame Type            : Admit Only Untagged and
Priority tagged
Port Ingress Filtering                : Disabled
Port Mode                             : Access
Port Gvrp Status                      : Disabled
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
Port-and-Protocol Based Support       : Enabled
Default Priority                      : 0
Tunnel Status                         : Enabled
Dot1x Protocol Tunnel Status          : Peer
LACP Protocol Tunnel Status           : Peer
Spanning Tree Tunnel Status           : Peer
GVRP Protocol Tunnel Status           : Peer
GMRP Protocol Tunnel Status           : Peer
IGMP Protocol Tunnel Status           : Peer
Filtering Utility Criteria            : Default
Port Protected Status                 : Disabled
-----------------------------------------------------
```

11. **Review the dot1q-tunnel interface output.**

```
SEFOS# show dot1q-tunnel interface extreme-ethernet 0/3
Interface
-------------
Ex0/3
```

▼ Enable STP Packet Tunneling

If dot1q-tunneling is enabled on a port, you can enable BPDU tunneling on that port.

1. Enable tunneling of STP BPDUs.

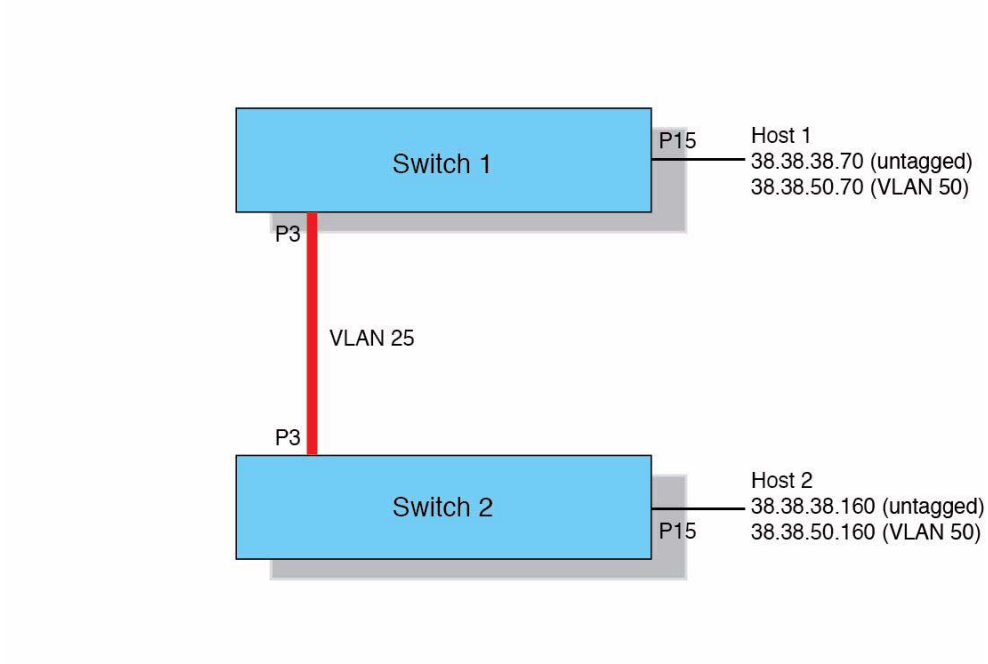
```
SEFOS# configure terminal
SEFOS(config)# interface extreme-ethernet 0/15
SEFOS(config-if)# switchport mode access
SEFOS(config-if)# switchport mode dot1q-tunnel
SEFOS(config-if)# spanning-tree disable
SEFOS(config-if)# l2protocol-tunnel stp
```

2. Review the configuration details.

```
SEFOS# show l2protocol-tunnel
 COS for Encapsulated STP Packet : 7
 Port  Protocol  Encapsulation Counter  Decapsulation Counter
----  --------  ---------------------  ---------------------
Ex0/15     stp          0                      0
Ex0/15     gvrp         0                      0
```

▼ Configure QinQ

This section contains an example of how to configure QinQ in SEFOS. In this example, two end devices are connected to two QinQ-enabled SEFOS switches, as shown in the following illustration. The end nodes communicate using untagged frames, as well as frames tagged with `VID=50`. The SEFOS switches are interconnected with `VID=25`.



1. Configure switch 1.

```
SEFOS# configure terminal
SEFOS(config)# shutdown spanning-tree
SEFOS(config)# set gvrp disable
SEFOS(config)# set gmrp disable
SEFOS(config)# shutdown garp
SEFOS(config)# bridge-mode provider
SEFOS(config)# vlan 25
SEFOS(config-vlan)# port extreme-ethernet 0/3
SEFOS(config-vlan)# exit
SEFOS(config)# interface extreme-ethernet 0/3
SEFOS(config-if)# switchport pvid 25
SEFOS(config-if)# no shutdown
SEFOS(config-if)# exit
SEFOS(config)# interface extreme-ethernet 0/15
SEFOS(config-if)# switchport access vlan 25
SEFOS(config-if)# switchport acceptable-frame-type
untaggedAndPrioritytagged
SEFOS(config-if)# switchport mode access
SEFOS(config-if)# switchport mode dot1q-tunnel
SEFOS(config-if)# no shutdown
SEFOS(config-if)# exit
```

```
SEFOS(config)# spanning-tree mode mst
SEFOS(config)# spanning-tree compatibility mst
SEFOS(config)# exit
```

2. Review the VLAN output.

```
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, Ex0/16, 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, Ex0/16, Ex0/17, Ex0/18, Ex0/19
Ex0/20, Ex0/21, Ex0/22, Ex0/23, Ex0/24
Forbidden Ports     : None
Name                :
Status              : Permanent
---------------------------------------------------
Vlan ID             : 25
Member Ports        : Ex0/3, Ex0/15
Untagged Ports      : Ex0/15
Forbidden Ports     : None
Name                :
Status              : Permanent
---------------------------------------------------
```

3. Configure switch 2.

```
SEFOS# configure terminal
SEFOS(config)# shut spanning-tree
SEFOS(config)# set gvrp disable
SEFOS(config)# set gmrp disable
SEFOS(config)# shutdown garp
SEFOS(config)# bridge-mode provider
SEFOS(config)# vlan 25
SEFOS(config-vlan)# port extreme-ethernet 0/3
SEFOS(config-vlan)# exit
SEFOS(config)# interface extreme-ethernet 0/3
SEFOS(config-if)# switchport pvid 25
SEFOS(config-if)# no shutdown
SEFOS(config-if)# exit
SEFOS(config)# interface extreme-ethernet 0/15
SEFOS(config-if)# switchport access vlan 25
```

```
SEFOS(config-if)# switchport acceptable-frame-type
untaggedAndPrioritytagged
SEFOS(config-if)# switchport mode access
SEFOS(config-if)# switchport mode dot1q-tunnel
SEFOS(config-if)# no shutdown
SEFOS(config-if)# exit
SEFOS(config)# spanning-tree mode mst
SEFOS(config)# spanning-tree compatibility mst
SEFOS(config)# exit
```

4. Review the VLAN output.

```
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, Ex0/16, 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, Ex0/16, Ex0/17, Ex0/18, Ex0/19
Ex0/20, Ex0/21, Ex0/22, Ex0/23, Ex0/24
Forbidden Ports     : None
Name                :
Status              : Permanent
---------------------------------------------------
Vlan ID             : 25
Member Ports        : Ex0/3, Ex0/15
Untagged Ports      : Ex0/15
Forbidden Ports     : None
Name                :
Status              : Permanent
---------------------------------------------------
```

5. Connect host 1 to P15 on switch 1.

```
# vconfig add eth1 50
Added VLAN with VID == 50 to IF -:eth1:-
# ifconfig eth1.50 38.38.50.70/24 up
# ifconfig eth1
eth1      Link encap:Ethernet  HWaddr 00:1B:21:53:6E:55
 inet addr:38.38.38.70  Bcast:38.38.38.255  Mask:255.255.255.0
# ifconfig eth1.50inet6 addr: fe80::21b:21ff:fe53:6e55/64
Scope:Link
eth1.50   Link encap:Ethernet  HWaddr 00:1B:21:53:6E:55
```

```
UP BROADCAST RUNNING MULTICAST  MTU:1500  Metric:1
inet addr:38.38.50.70  Bcast:38.38.50.255  Mask:255.255.255.0
RX packets:5827022 errors:0 dropped:0 overruns:0 frame:0
inet6 addr: fe80::21b:21ff:fe53:6e55/64 Scope:Link
TX packets:757389 errors:0 dropped:0 overruns:0 carrier:0
UP BROADCAST RUNNING MULTICAST  MTU:1500  Metric:1
collisions:0 txqueuelen:1000
RX packets:23 errors:0 dropped:0 overruns:0 frame:0
RX bytes:1059492521 (1010.4 MiB)  TX bytes:40934494 (39.0 MiB)
TX packets:76 errors:0 dropped:0 overruns:0 carrier:0
collisions:0 txqueuelen:0
RX bytes:1428 (1.3 KiB)  TX bytes:15873 (15.5 KiB)
```

6. Configure host 2, connected to P15, on switch 2.

```
# ifconfig eth5 38.38.38.160/24 up
# ifconfig eth5
eth5      Link encap:Ethernet  HWaddr 00:1B:21:53:6D:A1
 inet addr:38.38.38.160  Bcast:38.38.38.255  Mask:255.255.255.0
# vconfig add eth5 50inet6 addr: fe80::21b:21ff:fe53:6da1/64
Scope:Link
Added VLAN with VID == 50 to IF -:eth5:-
UP BROADCAST RUNNING MULTICAST  MTU:1500  Metric:1
# ifconfig eth5.50 38.38.50.160/24 upRX packets:219 errors:0
dropped:0 overruns:0 frame:0
# ifconfig eth5.50TX packets:227 errors:0 dropped:0 overruns:0
carrier:0
eth5.50   Link encap:Ethernet  HWaddr 00:1B:21:53:6D:A1
collisions:0 txqueuelen:1000
inet addr:38.38.50.160  Bcast:38.38.50.255  Mask:255.255.255.0
inet6 addr: fe80::21b:21ff:fe53:6da1/64 Scope:Link
RX bytes:34743 (33.9 KiB)  TX bytes:35379 (34.5 KiB)
UP BROADCAST RUNNING MULTICAST  MTU:1500  Metric:1
RX packets:68 errors:0 dropped:0 overruns:0 frame:0
TX packets:50 errors:0 dropped:0 overruns:0 carrier:0
collisions:0 txqueuelen:0
RX bytes:15013 (14.6 KiB)  TX bytes:9312 (9.0 KiB)
```

7. **Ping host 2 from host 1 on the untagged VLAN interface.**

```
# ping 38.38.50.160
PING 38.38.50.160 (38.38.50.160) 56(84) bytes of data.
64 bytes from 38.38.50.160: icmp_seq=1 ttl=64 time=1.46 ms
```

8. **Ping host 2 from host 1 on the tagged VLAN interface.**

```
# ping 38.38.38.160
PING 38.38.38.160 (38.38.38.160) 56(84) bytes of data.
64 bytes from 38.38.38.160: icmp_seq=1 ttl=64 time=1.02 ms
64 bytes from 38.38.38.160: icmp_seq=2 ttl=64 time=0.036 ms
64 bytes from 38.38.38.160: icmp_seq=3 ttl=64 time=0.042 ms
```

9. **Ping host 1 from host 2 on the untagged VLAN interface.**

```
# ping 38.38.38.70
PING 38.38.38.70 (38.38.38.70) 56(84) bytes of data.
64 bytes from 38.38.38.70: icmp_seq=1 ttl=64 time=0.080 ms
64 bytes from 38.38.38.70: icmp_seq=2 ttl=64 time=0.041 ms
64 bytes from 38.38.38.70: icmp_seq=3 ttl=64 time=0.033 ms
```

10. **Ping host 1 from host 2 on the tagged VLAN interface.**

```
# ping 38.38.50.70
PING 38.38.50.70 (38.38.50.70) 56(84) bytes of data.
64 bytes from 38.38.50.70: icmp_seq=1 ttl=64 time=0.937 ms
64 bytes from 38.38.50.70: icmp_seq=2 ttl=64 time=0.039 ms
64 bytes from 38.38.50.70: icmp_seq=3 ttl=64 time=0.036 ms
```

11. **Review the learned MAC addresses on switch 1.**

```
SEFOS# show mac-address-table
Vlan    Mac Address          Type     Ports
----    -----------          ----     -----
25      00:1b:21:53:6d:a1    Learnt   Ex0/3
25      00:1b:21:53:6e:55    Learnt   Ex0/15

Total Mac Addresses displayed: 2
```

12. Review the configuration information on switch 1.

```
SEFOS# show vlan port config port extreme-ethernet 0/15
Vlan Port configuration table
------------------------------
Port Ex0/15
Port Vlan ID                        : 25
Port Acceptable Frame Type          : Admit Only Untagged and
Priority Tagged
Port Ingress Filtering              : Disabled
Port Mode                           : Access
Port Gvrp Status                    : Disabled
Port Gmrp Status                    : Disabled
Port Gvrp Failed Registrations      : 2
Gvrp last pdu origin                : 00:00:00:00:00:00
Port Restricted Vlan Registration   : Disabled
Port Restricted Group Registration  : Unknown
Mac Based Support                   : Disabled
Subnet Based Support                : Disabled
Port-and-Protocol Based Support     : Enabled
Default Priority                    : 0
Tunnel Status                       : Enabled
Dot1x Protocol Tunnel Status        : Peer
LACP Protocol Tunnel Status         : Peer
Spanning Tree Tunnel Status         : Peer
GVRP Protocol Tunnel Status         : Peer
GMRP Protocol Tunnel Status         : Peer
IGMP Protocol Tunnel Status         : Peer
Filtering Utility Criteria          : Default
Port Protected Status               : Disabled
-------------------------------------------------------
```

13. Review the VLAN port configuration table.

```
SEFOS# show vlan port config port extreme-ethernet 0/3
Vlan Port configuration table
------------------------------
Port Ex0/3
Port Vlan ID                        : 25
Port Acceptable Frame Type          : Admit All
Port Ingress Filtering              : Disabled
Port Mode                           : Hybrid
Port Gvrp Status                    : Disabled
Port Gmrp Status                    : Disabled
Port Gvrp Failed Registrations      : 2
Gvrp last pdu origin                : 00:00:00:00:00:00
Port Restricted Vlan Registration   : Disabled
Port Restricted Group Registration  : Unknown
```

```
Mac Based Support                    : Disabled
Subnet Based Support                 : Disabled
Port-and-Protocol Based Support      : Enabled
Default Priority                     : 0
Tunnel Status                        : Disabled
Dot1x Protocol Tunnel Status         : Peer
LACP Protocol Tunnel Status          : Peer
Spanning Tree Tunnel Status          : Peer
GVRP Protocol Tunnel Status          : Peer
GMRP Protocol Tunnel Status          : Peer
IGMP Protocol Tunnel Status          : Peer
Filtering Utility Criteria           : Default
Port Protected Status                : Disabled
-------------------------------------------------------
```

14. Review the learned MAC addresses on switch 2.

```
SEFOS# show mac-address-table
Vlan    Mac Address          Type     Ports
----    -----------          ----     -----
25      00:1b:21:53:6d:a1    Learnt   Ex0/15
25      00:1b:21:53:6e:55    Learnt   Ex0/3

Total Mac Addresses displayed: 2
```

15. Review the configuration information on switch 1.

```
SEFOS# show vlan port config port extreme-ethernet 0/15
Vlan Port configuration table
------------------------------
Port Ex0/15
Port Vlan ID                         : 25
Port Acceptable Frame Type           : Admit Only Untagged and
Priority Tagged
Port Ingress Filtering               : Disabled
Port Mode                            : Access
Port Gvrp Status                     : Disabled
Port Gmrp Status                     : Disabled
Port Gvrp Failed Registrations       : 2
Gvrp last pdu origin                 : 00:00:00:00:00:00
Port Restricted Vlan Registration    : Disabled
Port Restricted Group Registration   : Unknown
Mac Based Support                    : Disabled
Subnet Based Support                 : Disabled
Port-and-Protocol Based Support      : Enabled
Default Priority                     : 0
Tunnel Status                        : Enabled
```

```
Dot1x Protocol Tunnel Status        : Peer
LACP Protocol Tunnel Status         : Peer
Spanning Tree Tunnel Status         : Peer
GVRP Protocol Tunnel Status         : Peer
GMRP Protocol Tunnel Status         : Peer
IGMP Protocol Tunnel Status         : Peer
Filtering Utility Criteria          : Default
Port Protected Status               : Disabled
-------------------------------------------------------
```

16. Review the VLAN port configuration table.

```
SEFOS# show vlan port config port extreme-ethernet 0/3
Vlan Port configuration table
-------------------------------
Port Ex0/3
Port Vlan ID                        : 25
Port Acceptable Frame Type          : Admit All
Port Ingress Filtering              : Disabled
Port Mode                           : Hybrid
Port Gvrp Status                    : Disabled
Port Gmrp Status                    : Disabled
Port Gvrp Failed Registrations      : 2
Gvrp last pdu origin                : 00:00:00:00:00:00
Port Restricted Vlan Registration   : Disabled
Port Restricted Group Registration  : Unknown
Mac Based Support                   : Disabled
Subnet Based Support                : Disabled
Port-and-Protocol Based Support     : Enabled
Default Priority                    : 0
Tunnel Status                       : Disabled
Dot1x Protocol Tunnel Status        : Peer
LACP Protocol Tunnel Status         : Peer
Spanning Tree Tunnel Status         : Peer
GVRP Protocol Tunnel Status         : Peer
GMRP Protocol Tunnel Status         : Peer
IGMP Protocol Tunnel Status         : Peer
Filtering Utility Criteria          : Default
Port Protected Status               : Disabled
-------------------------------------------------------
```

Configuring Service Classes and Expedited Traffic

SEFOS VLAN supports multiple traffic classes to handle expedited traffic. Each traffic class is assigned a traffic type based on the time sensitivity of the traffic. The aim is to meet the latency and throughput requirements 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 that is 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.

▼ Map a Priority to Traffic Class

You can map a priority to a traffic class on the specified port (0/2 in this example). The frame received on the interface with the configured priority is processed in the configured traffic class.

1. View the configuration information.

```
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. Map a priority to a traffic class.

```
SEFOS# configure terminal
SEFOS(config)# interface extreme-ethernet 0/2
```

```
SEFOS(config-if)# vlan map-priority 7 traffic-class 1
SEFOS(config-if)# end
SEFOS(config)# exit
```

3. Review the configuration information.

```
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

Port filtering process involves configuring the acceptable frame time and configuring the ingress filter. The following procedure includes port 0/2 as the example port.

▼ Configure the Acceptable Frame Type

You can configure the acceptable frame type for the port as one of the following:

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

In the following example, the frame type is set to `tagged`.

1. Configure the acceptable frame type for the port.

```
SEFOS# configure terminal
SEFOS(config)# interface extreme-ethernet 0/2
SEFOS(config-if)# switchport acceptable-frame-type tagged
SEFOS(config-if)# end
SEFOS(config)# exit
```

2. Review the configuration information.

```
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 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
Tunnel Status                         : Disabled
Dot1x Protocol Tunnel Status          : Peer
LACP Protocol Tunnel Status           : Peer
Spanning Tree Tunnel Status           : Peer
GVRP Protocol Tunnel Status           : Peer
GMRP Protocol Tunnel Status           : Peer
IGMP Protocol Tunnel Status           : Peer
Filtering Utility Criteria            : Default
Port Protected Status                 : Disabled
------------------------------------------------------
```

Note – When set to `tagged`, the device discards untagged and priority tagged frames received on the port. The device will process only the VLAN tagged frames.

▼ Configure 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. The default is disabled. The following procedure includes port 0/2 as the example port.

1. Enable ingress filtering on the port.

```
SEFOS# configure terminal
SEFOS(config)# interface extreme-ethernet 0/2
SEFOS(config-if)# switchport ingress filter
SEFOS(config-if)# end
```

2. Review the configuration details.

```
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
Tunnel Status                       : Disabled
Dot1x Protocol Tunnel Status        : Peer
LACP Protocol Tunnel Status         : Peer
Spanning Tree Tunnel Status         : Peer
GVRP Protocol Tunnel Status         : Peer
GMRP Protocol Tunnel Status         : Peer
IGMP Protocol Tunnel Status         : Peer
Filtering Utility Criteria          : Default
Port Protected Status               : Disabled
-----------------------------------------------------
```

Flow-Based Configuration

The procedures in this chapter are based on three example topologies of flow-based configurations. Each example includes information about the topology of the configuration. The procedures include general instructions for setting up the configurations.

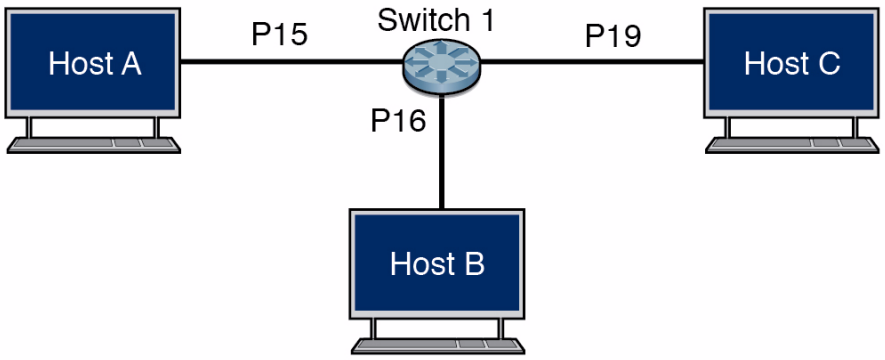
The following sections explain the topologies and the procedures:

Flow-Based Example Topologies

This section show example topologies of flow-based configurations. These topologies are referenced in the procedures in this chapter.

Example Topolgy 1

In the first example configuration, three hosts are attached to a single switch. Each device has a node name, an associated port, a MAC address, and an IP address.



The following table contains the details of the topology.

Node	Port	IP Address
Host A	N/A	12.0.0.10
Host B	N/A	12.0.0.20
Host C	N/A	12.0.0.30
Switch 1	P15	12.0.0.1
	P16	
	P3	

Example Topolgy 2

In this configuration, two switches are connected to each other. Both switches have node names, assigned port numbers, MAC addresses, and IP addresses.

The following table contains the details of the topology.

Node	Port	IP Address
Switch 1	P3	12.0.0.1
	eth1	

Node	Port	IP Address
Switch 2	P3	12.0.0.2
	eth1	

Example Topolgy 3

The following illustration shows the third example topology of the flow-based configurations referenced in this guide.

Configuring Static Unicast and Multicast Entries

This section contains prerequisites and instructions on how to work with static unicast and multicast entry.

▼ Configure Static Unicast Entry in Topology 1

For this procedure, you must first configure the VLAN. See "Example Topolgy 1" on page 43 for the topology for this procedure.

1. Configure the VLAN in switch 1.

```
SEFOS# configure terminal
SEFOS(config)# vlan 2
SEFOS(config-vlan)# ports extreme-ethernet 0/3,0/15,0/19
SEFOS(config-vlan)# exit
SEFOS(config)# interface extreme-ethernet 0/3
SEFOS(config-if)# no shutdown
SEFOS(config-if)# exit
SEFOS(config)# interface extreme-ethernet 0/15
SEFOS(config-if)# no shutdown
SEFOS(config-if)# exit
```

```
SEFOS(config)# interface extreme-ethernet 0/19
SEFOS(config-if)# no shutdown
SEFOS(config-if)# exit
SEFOS(config)# mac-address-table static unicast 00:1b:21:53:6e:55
vlan 2 interface ext 0/15
SEFOS(config)# exit
```

2. **Review the VLAN-related configurations.**

```
SEFOS# show vlan id 2
Vlan database
-------------------
Vlan ID             : 2
Member Ports        : Ex0/15, Ex0/19
Untagged Ports      : None
Forbidden Ports     : None
Name                :
Status              : Permanent
-------------------------------------------------------------------
```

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

4. **Check the learned MAC addresses.**

```
SEFOS# show mac-address-table
Vlan     Mac Address          Type       Ports
-----------------------------------------------
2        00:1b:21:53:6d:b9    Learnt     Ex0/19
2        00:1b:21:53:6e:55    Static     Ex0/15

Total Mac Addresses Displayed: 2
```

▼ Configure Static Unicast Entry in Topology 2

For this procedure, you must first configure the VLAN. See "Example Topolgy 2" on page 44 for the topology for this procedure.

1. **Configure the VLAN in switch 1.**

```
SEFOS# configure terminal
SEFOS(config)# vlan 2
SEFOS(config-vlan)# ports extreme-ethernet 0/3,0/15,0/19
SEFOS(config-vlan)# exit
SEFOS(config)# interface extreme-ethernet 0/15
```

```
SEFOS(config-if)# no shutdown
SEFOS(config-if)# exit
SEFOS(config)# interface extreme-ethernet 0/19
SEFOS(config-if)# no shutdown
SEFOS(config-if)# exit
SEFOS(config)# interface extreme-ethernet 0/3
SEFOS(config-if)# no shutdown
SEFOS(config-if)# exit
SEFOS(config)# exit
```

2. Review the MAC address table.

```
SEFOS# show mac-address-table
Vlan      Mac Address           Type         Ports
-----------------------------------------------------
2         00:1b:21:53:6d:b9     Learnt       Ex0/19
2         00:1b:21:53:6e:55     Static       Ex0/15
2         01:02:03:04:05:06     Static       Ex0/3

Total Mac Addresses Displayed: 3
-----------------------------------------------
```

3. Review the created VLAN.

```
SEFOS# show vlan id 2
Vlan database
-------------------
Vlan ID             : 2
Member Ports        : Ex0/3, Ex0/15, Ex0/19
Untagged Ports      : None
Forbidden Ports     : None
Name                :
Status              : Permanent
-----------------------------------------------------
```

Configuring GVRP

GVRP is an application defined in the IEEE 802.1Q standard that is used to control VLANs. With GVRP, a single switch is manually configured with all the desired VLANs for the network, and all other switches on the network learn those VLANs dynamically. GVRP is enabled by default in Oracle's SEFOS.

This section contains two examples of how to configure GVRP. In both examples, two switches are connected back-to-back using one port on each switch.

▼ Configure VGRP for Topology 1

For this configuration, you must ensure that the following prerequisites are met:

- Interface P2 in switch 1 and switch 2 must be enabled.
- VLAN must be configured.

See "Example Topolgy 1" on page 43 for the topology referenced this procedure.

1. Configure the VLAN in switch 1.

```
SEFOS# configure terminal
SEFOS(config)# interface extreme-ethernet 0/15
SEFOS(config-if)# no shutdown
SEFOS(config-if)# exit
SEFOS(config)# vlan 2
SEFOS(config-VLAN)# ports extreme-ethernet 0/15,0/3
SEFOS(config-VLAN)# exit
SEFOS(config)# interface extreme-ethernet 0/3
SEFOS(config-if)# no shutdown
SEFOS(config-VLAN)# exit
```

2. Configure the VLAN in switch 2.

```
SEFOS# configure terminal
SEFOS(config)# interface extreme-ethernet 0/3
SEFOS(config-if)# no shutdown
SEFOS(config-if)# exit
```

3. Review the VLAN output in switch 1.

```
SEFOS# show vlan id 2
Vlan database
-------------------
Vlan ID             : 2
Member Ports        : Ex0/3, Ex0/15
Untagged Ports      : None
Forbidden Ports     : None
Name                :
Status              : Permanent
--------------------------------------
```

4. Review the VLAN output in switch 2.

```
SEFOS# show vlan id 2
Vlan database
-------------------
Vlan ID              : 2
Member Ports         : Ex0/3
Untagged Ports       : None
Forbidden Ports      : None

Name                 :
Status               : Dynamic Gvrp
--------------------------------------
```

▼ Configure VGRP for Topology 2

In this topology, two switches are connected back-to-back using two ports on each switch. The spanning tree that is running in the switches is RSTP. Switch 2 is the root bridge in STP.

- Interface P1 and P2 in switch 1 and switch 2 must be enabled.
- VLAN must be configured.

See "Example Topolgy 2" on page 44 for the topology referenced in this procedure.

1. Review the spanning tree output in switch 2 (the root bridge).

```
SEFOS# show spanning-tree
Root Id          Priority   32768
Address          00:14:4f:6c:61:cf
Cost             0
Port             0 [0]
This bridge is the root
Max Age 20 Sec, forward delay 15 Sec

MST00

Spanning tree Protocol has been enabled.

MST00 is executing the mstp compatible Multiple Spanning Tree
Protocol
Bridge Id        Priority  32768
Address  00:14:4f:6c:61:cf
Max age is 20 sec, forward delay is 15 sec
Dynamic Path Cost is Disabled
Name     Role         State        Cost     Prio    Type
```

```
----     ----          -----         ----     ----    ------
Ex0/3    Designated    Forwarding    2000     128     P2P
Ex0/15   Designated    Forwarding    2000     128     P2P
Ex0/16   Designated    Forwarding    2000     128     P2P
Ex0/19   Designated    Forwarding    2000     128     P2P
Ex0/22   Designated    Forwarding    2000     128     P2P
```

2. Review the spanning tree output in switch 1 (the nonroot bridge).

```
SEFOS# show spanning-tree
Root Id          Priority   32768
 Address    00:14:4f:6c:61:cf
Cost       2000
Port       3 [Ex0/3]
Max age 20 Sec, forward delay 15 Sec

MST00

Spanning tree Protocol has been enabled

MST00 is executing the mstp compatible Multiple Spanning Tree
Protocol
Bridge Id       Priority 32768
Address 00:21:28:56:d7:a9
Max age is 20 sec, forward delay is 15 sec
Dynamic Path Cost is Disabled
Name              Role         State        Cost     Prio    Type
----              ----         -----        ----     ----    ------
Ex0/3             Root         Forwarding   2000     128     P2P
Ex0/15            Designated   Forwarding   2000     128     P2P
Ex0/19            Designated   Forwarding   2000     128     P2P
Ex0/21            Designated   Forwarding   2000     128     P2P
```

3. Create VLAN 2 on switch 2 (the root bridge), and review the VLAN database details.

```
SEFOS# configure terminal
SEFOS(config)# vlan 2
SEFOS(config-vlan)# ports extreme-ethernet 0/3
SEFOS(config-vlan)# exit
SEFOS(config)# exit
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, ...
```

```
Untagged Ports      : Ex0/1, Ex0/2, Ex0/3, Ex0/4, Ex0/5, Ex0/6
Ex0/7, Ex0/8, ...
Forbidden Ports     : None
Name                :
Status              : Permanent
-------------------------------------------------
Vlan ID             : 2
Member Ports        : Ex0/3
Untagged Ports      : None
Forbidden Ports     : None
Name                :
Status              : Permanent
-----------------------------------------
```

4. Review the new VLAN output on switch 2 (the nonroot bridge).

```
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, ...
Untagged Ports      : Ex0/1, Ex0/2, Ex0/3, Ex0/4, Ex0/5, Ex0/6
Ex0/7, Ex0/8, ...
Forbidden Ports     : None
Name                :
Status              : Permanent
-------------------------------------------------
Vlan ID             : 2
Member Ports        : Ex0/3, Ex0/4
Untagged Ports      : None
Forbidden Ports     : None

Name                :
Status              : Dynamic Gvrp
-------------------------------------------------
```

The switch propagates the VLAN declaration or registration on all the forwarding ports in the switch. In the preceding example, when VLAN 2 was created on the root bridge (switch 2), the switch propagated this information on all of the forwarding ports (Ex0/3 and Ex0/4), thus allowing switch 1 to learn about VLAN 2 through two ports (Ex0/3 and Ex0/4) using GVRP.

▼ Configure VLANs on the Nonroot Bridge

The same configuration guidelines apply for VLANs on nonroot bridges (switch 1) as they do on the root bridge (switch 2).

1. Create a VLAN on switch 2.

```
SEFOS# configure terminal
SEFOS(config)# vlan 2
SEFOS(config-vlan)# ports extreme-ethernet 0/3
SEFOS(config-vlan)# exit
SEFOS(config)# exit
```

2. Review the VLAN configuration.

```
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, ...
Untagged Ports      : Ex0/1, Ex0/2, Ex0/3, Ex0/4, Ex0/5, Ex0/6
Ex0/7, Ex0/8, ...
Forbidden Ports     : None
Name                :
Status              : Permanent
------------------------------------------------------
Vlan ID             : 2
Member Ports        : Ex0/3, Ex0/4
Untagged Ports      : None
Forbidden Ports     : None
Name                :
Status              : Permanent
------------------------------------------------------
```

3. **On switch 1, verify that switch 1 learned about VLAN 2 using GVRP.**

```
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, ...
Untagged Ports      : Ex0/1, Ex0/2, Ex0/3, Ex0/4, Ex0/5, Ex0/6
Ex0/7, Ex0/8, ...
Forbidden Ports     : None
Name                :
Status              : Permanent
------------------------------------------------
Vlan ID             : 2
Member Ports        : Ex0/3
Untagged Ports      : None
Forbidden Ports     : None
Name                :
Status              : Dynamic Gvrp
----------------------------------------
```

The switch propagates the VLAN declaration or registration on all of the forwarding ports in the switch. In the proceding example, when VLAN 2 was created on the nonroot bridge (switch 1), the switch propagated this information only on port Ex0/3 because port Ex0/4 is in the discarding state. Switch 2 learned about VLAN 2 through a single port (Ex0/3) using GVRP. Port Ex0/3 was added automatically to vlan2 on switch 1 because switch 2 propagated VLAN registration through port Ex0/3.

▼ Configure Restricted VLAN Registration

To configure restricted registration, you must ensure that the following prerequisites are met:

- Interface P3 in switch 1 and switch 2 must be enabled.
- VLAN must be configured.
- Restricted VLAN registration must be configured.

See "Default Settings" on page 8 for the topology for this procedure.

1. Configure the VLAN in switch 1.

```
SEFOS# configure terminal
SEFOS(config)# interface extreme-ethernet 0/3
SEFOS(config-if)# no shutdown
SEFOS(config-if)# exit
SEFOS(config)# vlan 2
SEFOS(config-vlan)# ports extreme-ethernet 0/3-4
SEFOS(config-vlan)# end
```

2. Configure the VLAN in switch 2.

```
SEFOS# configure terminal
SEFOS(config)# interface extreme-ethernet 0/3
SEFOS(config-if)# no shutdown
SEFOS(config-if)# end
```

3. Enable restricted VLAN registration in switch 2.

```
SEFOS# configure terminal
SEFOS(config)# interface extreme-ethernet 0/3
SEFOS(config-if)# vlan restricted enable
SEFOS(config-if)# end
```

4. Review the VLAN status.

```
SEFOS# show vlan port config port extreme-ethernet 0/3
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
Dot1x Protocol Tunnel Status          : Peer
LACP Protocol Tunnel Status           : Peer
Spanning Tree Tunnel Status           : Peer
```

```
GVRP Protocol Tunnel Status             : Peer
GMRP Protocol Tunnel Status             : Peer
IGMP Protocol Tunnel Status             : Peer
Filtering Utility Criteria              : Default
Port Protected Status                   : Disabled
-------------------------------------------------------
```

5. Review the VLAN output in switch 1.

```
SEFOS# show vlan id 2
Vlan database
-------------------
Vlan ID              : 2
Member Ports         : Ex0/3, Ex0/4
Untagged Ports       : None
Forbidden Ports      : None
Name                 :
Status               : Permanent
---------------------------------------
```

6. Review the VLAN output in switch 2.

```
SEFOS# show vlan id 2
Vlan database
--------------
```

Note – VLAN 2 is not learned in switch 2.

▼ Configure GMRP

To configure GMRP, you must ensure that the following prerequisites are met:

- Interface P3 in switch 1 and switch 2 must be enabled.
- Static multicast entry must be configured.

See "Default Settings" on page 8 for the topology for this procedure.

1. Configure the VLAN in switch 1.

```
SEFOS# configure terminal
SEFOS(config)# interface range extreme-ethernet 0/3-4
SEFOS(config-if)# no shutdown
SEFOS(config-if)# exit
```

```
SEFOS(config)# vlan 2
SEFOS(config-vlan)# ports extreme-ethernet 0/3-4
SEFOS(config-vlan)# exit
SEFOS(config)# mac-address-table static multicast
01:02:03:04:05:06 vlan 2 interface extreme-ethernet 0/3
SEFOS(config)# end
```

2. Configure the VLAN in switch 2.

```
SEFOS# configure terminal
SEFOS(config)# interface extreme-ethernet 0/3
SEFOS(config-if)# no shutdown
SEFOS(config-if)# end
```

3. Review the multicast group entries in switch 1.

```
SEFOS# show mac-address-table static multicast
Static Multicast Table
------------------------------
Vlan           : 2
Mac Address    : 01:02:03:04:05:06
Receive Port   :
Member Ports   : Ex0/3
Status         : Permanent
-------------------------------------

Total Mac Addresses displayed: 1
```

4. Review the multicast group entries in switch 1.

```
SEFOS# show mac-address table
Vlan    Mac Address                Type     Ports
-------   -------------------    -------  --------
1       00:14:4f:6c:61:d1        Learnt   Ex0/3
1       00:1b:21:53:71:f9        Learnt   Ex0/3
2       00:14:4f:6c:61:d1        Learnt   Ex0/3
2       01:02:03:04:05:06        Static   Ex0/3

Total Mac Addresses displayed: 4
```

▼ Configure Restricted Group Registration

To configure restricted group registration, you must ensure that the following prerequisites are met:

- Interface P3 in switch 1 and switch 2 must be enabled.
- Static multicast entry must be configured.
- Restricted VLAN registration must be configured.

See "Default Settings" on page 8 for the topology for this procedure.

1. Configure the VLAN in switch 1.

```
SEFOS# configure terminal
SEFOS(config)# interface extreme-ethernet 0/3
SEFOS(config-if)# no shutdown
SEFOS(config-if)# exit
SEFOS(config)# interface extreme-ethernet 0/4
SEFOS(config-if)# no shutdown
SEFOS(config-if)# exit
SEFOS(config)# vlan 2
SEFOS(config-vlan)# ports extreme-ethernet 0/3-4
SEFOS(config-vlan)# exit
SEFOS(config)# mac-address-table static multicast
01:02:03:04:05:06 vlan 2 interface extreme-ethernet 0/3
SEFOS(config)# end
```

2. Configure the VLAN in switch 2.

```
SEFOS# configure terminal
SEFOS(config)# interface extreme-ethernet 0/3
SEFOS(config-if)# no shutdown
SEFOS(config-if)# exit
```

3. Enable restricted group registration in switch 2.

```
SEFOS# configure terminal
SEFOS(config)# interface extreme-ethernet 0/3
SEFOS(config-if)# group restricted enable
SEFOS(config-if)# end
```

4. Review the VLAN status.

```
SEFOS# show vlan port config port extreme-ethernet 0/3
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
Dot1x Protocol Tunnel Status              : Peer
LACP Protocol Tunnel Status               : Peer
Spanning Tree Tunnel Status               : Peer
GVRP Protocol Tunnel Status               : Peer
GMRP Protocol Tunnel Status               : Peer
IGMP Protocol Tunnel Status               : Peer
Filtering Utility Criteria                : Default
Port Protected Status                     : Disabled
------------------------------------------------------------
```

5. Review the VLAN group entries.

```
SEFOS# show mac-address-table
Vlan    Mac Address          Type      Ports
-------   ---------------    -------   -------
1       00:1b:21:53:71:f9    Learnt    Ex0/16
1       00:21:28:56:d7:ab    Learnt    Ex0/3
1       00:21:28:56:d7:ac    Learnt    Ex0/4

Total Mac Addresses displayed: 3
```

Note – The group entry (`01:02:03:04:05:06`) is not present in switch 2.

▼ Classify VLANs

VLANs have PVID-based classifications. To configure PVID-based classifications, you must ensure that the follow prerequisites are met:

- VLAN must be configured.
- PVID for ports must be configured.

See "Default Settings" on page 8 for the topology for this procedure.

1. Configure the VLAN in switch 1.

```
SEFOS# configure terminal
SEFOS(config)# vlan 2
SEFOS(config-vlan)# ports extreme-ethernet 0/15,0/19
SEFOS(config-vlan)# end
```

2. Configure the PVID for interface `P1` as VLAN 2.

```
SEFOS# configure terminal
SEFOS(config)# interface extreme-ethernet 0/1
SEFOS(config-if)# switchport pvid 2
SEFOS(config-if)# end
```

3. Review the VLAN-related configurations.

```
SEFOS# show vlan
Vlan database
-------------------
Vlan ID              : 2
Member Ports         : Ex0/15, Ex0/19
Untagged Ports       : None
Forbidden Ports      : None
Name                 :
Status               : Permanent
```

4. **Review the VLAN port configuration table.**

```
SEFOS# show vlan port config port extreme-ethernet 0/1
Vlan Port configuration table
-------------------------------------
Port Ex0/15
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
Dot1x Protocol Tunnel Status        : Peer
LACP Protocol Tunnel Status         : Peer
Spanning Tree Tunnel Status         : Peer
GVRP Protocol Tunnel Status         : Peer
GMRP Protocol Tunnel Status         : Peer
IGMP Protocol Tunnel Status         : Peer
Filtering Utility Criteria          : Default
Port Protected Status               : Disabled
```

Unicast packets should only reach host B as a tagged VLAN 2 packet that is sent by host A.

▼ Create Acceptable Frame Types

To work with acceptable frame types, you must ensure that the follow prerequisites are met:

- VLAN must be configured.
- PVID for the interfaces must be configured.
- Acceptable frame types must be configured.

See "Default Settings" on page 8 for the topology for this procedure.

1. **Configure the VLAN in switch 1.**

```
SEFOS# configure terminal
SEFOS(config)# vlan 15
SEFOS(config-vlan)# ports extreme-ethernet 0/15,0/19 untagged
extreme-ethernet 0/15,0/19
SEFOS(config-vlan)# exit
SEFOS(config)# interface extreme-ethernet 0/15
SEFOS(config-if)# no shutdown
SEFOS(config-if)# switchport pvid 5
SEFOS(config-if)# exit
SEFOS(config)# interface extreme-ethernet 0/19
SEFOS(config-if)# no shutdown
SEFOS(config-if)# switchport pvid 5
SEFOS(config-if)# end
```

2. **Wait for at least 30 seconds for the topology to settle, then ping host B from host A.**

   The ping must be successful.

3. **On switch 1, configure the acceptable frame type for port P15.**

```
SEFOS# configure terminal
SEFOS(config)# interface extreme-ethernet 0/15
SEFOS(config-if)# switchport acceptable-frame-type tagged
SEFOS(config-vlan)# end
```

4. **Review the VLAN-related configurations.**

```
SEFOS# show vlan id 5
Vlan database
-------------------
Vlan ID             : 5
Member Ports        : Ex0/15, Ex0/19
Untagged Ports      : Ex0/15, Ex0/19
Forbidden Ports     : None
Name                :
Status              : Permanent
-----------------------------------
```

5. **Review the VLAN port configuration table.**

```
SEFOS# show vlan port config port extreme-ethernet 0/15
Vlan Port configuration table
------------------------------
Port Ex0/15
Port Vlan ID                        : 5
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
Tunnel Status                       : Disabled
Dot1x Protocol Tunnel Status        : Peer
LACP Protocol Tunnel Status         : Peer
Spanning Tree Tunnel Status         : Peer
GVRP Protocol Tunnel Status         : Peer
GMRP Protocol Tunnel Status         : Peer
IGMP Protocol Tunnel Status         : Peer
Filtering Utility Criteria          : Default
Port Protected Status               : Disabled
-------------------------------------------------------------------
```

After you configure the acceptable frame type as `Admit OnlyVLAN Tagged`, the ping from host A to host B should fail because `ping`(1M) packets are untagged.

▼ Configure Ingress Filtering

To work with ingress traffic, you must ensure that the follow prerequisites are met:

- VLAN must be configured.
- PVID for the interfaces must be configured.
- Ingress filtering must be configured.

See "Default Settings" on page 8 for the topology for this procedure.

1. **Configure the VLAN in switch 1.**

```
SEFOS# configure terminal
SEFOS(config)# vlan 2
SEFOS(config-vlan)# ports extreme-ethernet 0/15 untagged
extreme-ethernet 0/15
SEFOS(config-vlan)# exit
SEFOS(config)# interface extreme-ethernet 0/19
SEFOS(config-if)# no shutdown
SEFOS(config-if)# switchport pvid 2
SEFOS(config-if)# exit
SEFOS(config)# interface extreme-ethernet 0/15
SEFOS(config-if)# no shutdown
SEFOS(config-if)# switchport pvid 2
SEFOS(config-if)# end
```

2. **Wait for at least 30 seconds for the topology to settle, then ping host B from host A to ensure that the APR packet reaches host B.**

3. **Enable ingress filtering in port P15 at switch 1.**

```
SEFOS# configure terminal
SEFOS(config)# interface extreme-ethernet 0/15
SEFOS(config-if)# switchport ingress filter
SEFOS(config-if)# end
```

4. **Review the VLAN-related configurations.**

```
SEFOS# show vlan id 2
Vlan database
-------------------
Vlan ID             : 2
Member Ports        : Ex0/15
Untagged Ports      : Ex0/15
Forbidden Ports     : None
Name                :
Status              : Permanent
---------------------------------
```

5. Review the VLAN port configuration table.

```
SEFOS# show vlan port config port extreme-ethernet 0/15
Vlan Port configuration table
------------------------------
Port Ex0/15
Port  Vlan ID                          : 2
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
Tunnel Status                          : Disabled
Dot1x Protocol Tunnel Status           : Peer
LACP Protocol Tunnel Status            : Peer
Spanning Tree Tunnel Status            : Peer
GVRP Protocol Tunnel Status            : Peer
GMRP Protocol Tunnel Status            : Peer
IGMP Protocol Tunnel Status            : Peer
Filtering Utility Criteria             : Default
Port Protected Status                  : Disabled
---------------------------------------------------
```

The APR packet should reach host B when ingress filtering is enabled.