# VLAN Configuration Guide

RAPTOR™

Intelligent Cyber Secure Platform

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iS5 COMMUNICATIONS
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# Contents

# INTRODUCTION

# 1. Introduction

A virtual *LAN* (*VLAN*) is any broadcast domain that is partitioned and isolated in a computer network at the data link layer (Layer 2). *LAN* is the abbreviation for local area network and in this context virtual refers to a physical object recreated and altered by additional logic. *VLAN*s work by applying tags to network frames and handling these tags in networking systems – creating the appearance and functionality of network traffic that is physically on a single network but acts as if it is split between separate networks. In this way, *VLAN*s can keep network applications separate despite being connected to the same physical network, and without requiring multiple sets of cabling and networking devices to be deployed.

*VLAN*s allow network administrators to group hosts together even if the hosts are not directly connected to the same network switch. Because *VLAN* membership can be configured through software, this can greatly simplify network design and deployment. Without *VLAN*s, grouping hosts according to their resource needs the labor of relocating nodes or rewiring data links. *VLAN*s allow devices that must be kept separate to share the cabling of a physical network and yet be prevented from directly interacting with one another. This managed sharing yields gains in simplicity, security, traffic management, and economy.

This chapter describes the purpose and scope of this document, lists the conventions used in this document, and outlines the *CLI* Command Modes.

## 1.1. Purpose and Scope

The iSCom‘s *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, i.e. a network of computers that behave as if they are connected to the same wire even though they may actually be physically located on different segments of a *LAN*. *VLAN*s are configured through software rather than hardware, making them extremely flexible.

The reader is expected to have a basic knowledge of *VLAN* as a prerequisite.

## 1.2. CLI Document Convention

To provide a consistent user experience, this *CLI* document convention adheres to the Industry Standard *CLI* syntax.

In addition, the font and format are updated to show *DITA* / Structured Framemaker 2019 layout.

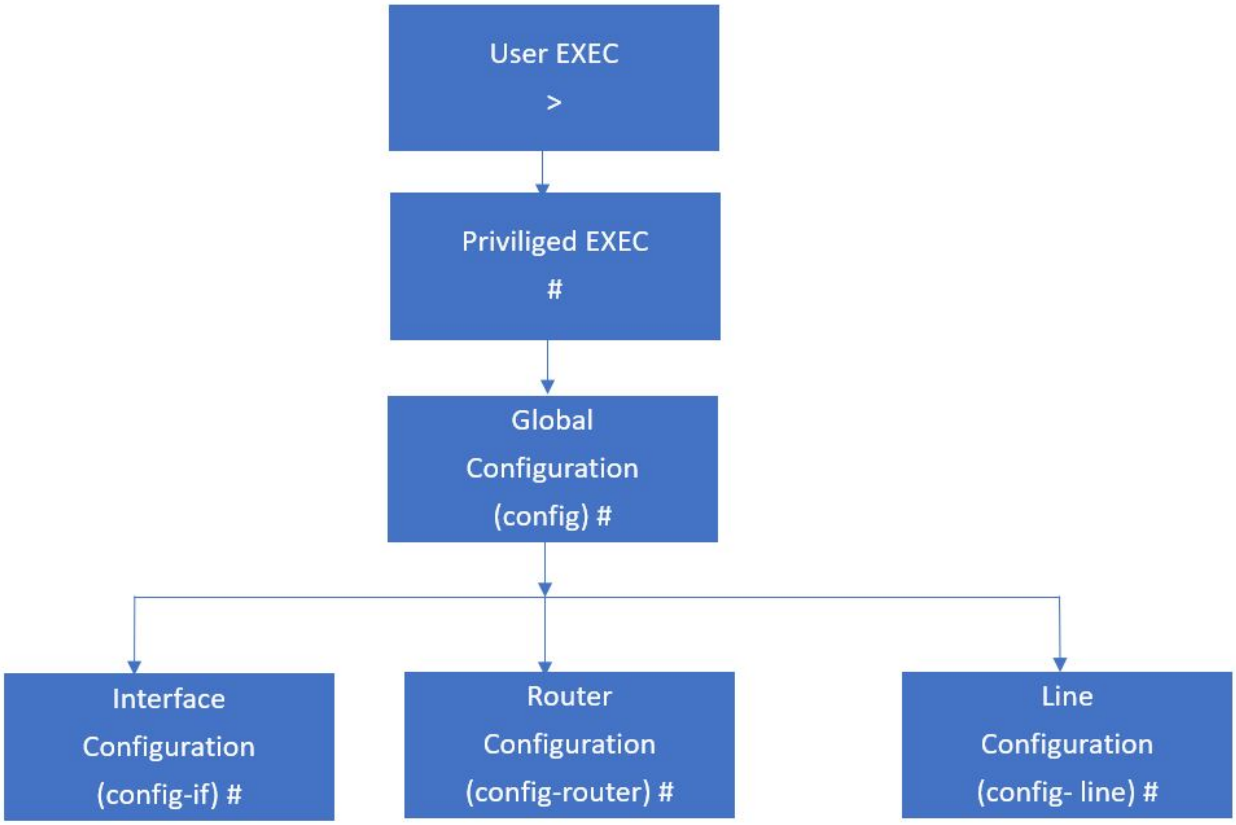
| Convention | Usage | DESCRIPTION |
|---|---|---|
| *Italics* | User inputs for *CLI* command | `configure terminal` |
| Font as shown | Syntax of the *CLI* command | `configure terminal` |
| < > | Parameter inside the brackets < > indicate the Input fields of syntax | `<integer (100-1000)>` |
| [ ] | Parameter inside [ ] indicate optional fields of syntax | `show split-horizon [all]` |
| { } | Grouping parameters in the syntax | `ip address <ip-address> [secondary {node0 \| node1}]` |
| \| | Separating grouped parameters in the syntax | `set http authentication-scheme {default\| basic\| digest}` |
| Font & format as shown | Example & CLI command outputs | iSCom# show split-horizon interface 1<br>`Ingress Port VlanId StorageType Egress List`<br>`========== ====== ========== ==========`<br>`Gi0/1 - Volatile Gi0/2,Gi0/3,Gi0/6` |
| Note | Notes | **NOTE:** All commands are case-sensitive |

# 1.3. CLI Command Modes

The *CLI* Modes are as follows.

The hierarchical structure of the command modes is as shown on the figure below.

**Figure 1:** CLI Command Modes



## User Exec Mode

| Prompt | Access method | Exit Method |
|---|---|---|
| iSCom> | This is the initial mode to start a session. | logout |

## Privileged Exec Mode

| Prompt | Access method | Exit Method |
|---|---|---|
| iSCom# | The User EXEC mode command `enable` is used to enter the Privileged EXEC Mode | To return from the Privileged EXEC mode to User EXEC mode, the command `disable` is used. |

## Global Configuration Mode

| Prompt | Access method | Exit Method |
|---|---|---|
| iSCom(config)# | The Privileged EXEC mode command `configure terminal` is used to enter the Global Configuration Mode. | To return from the Global Configuration Mode to Privileged Mode, the command `exit` is used. |

## Interface Configuration Mode

| Prompt | Access method | Exit Method |
|---|---|---|
| iSCom(config-if)# | The Global Configuration mode command `interface <interface-type><interface-id>` is used to enter the Interface Configuration Mode. | To return from the Interface Configuration mode to Global Configuration Mode, the command `exit` is used. To exit from the Interface Configuration mode to Privileged EXEC Mode, the command `end` is used. |

## Port Channel Interface Configuration

| Prompt | Access method | Exit Method |
|---|---|---|
| iSCom(config-if)# | The Global Configuration mode command `interface port <port channel-id>` is used to enter the Port Channel Interface Configuration Mode. | To return from the Port Channel Interface Configuration mode to Global Configuration Mode, the command `exit` is used. To exit from the Port Channel Interface Configuration mode to Privileged EXEC Mode, the command `end` is used. |

## VLAN Interface Configuration Mode

| Prompt | Access method | Exit Method |
|---|---|---|
| iSCom(config-if)# | The Global Configuration mode command `interface vlan <vlan id>` is used to enter the VLAN Interface Configuration Mode. | To return from the VLAN Interface Configuration mode to Global Configuration Mode, the command `exit` is used. To exit from the VLAN Interface Configuration mode to Privileged EXEC Mode, the command `end` is used. |

## MRP Interface Configuration Mode

| Prompt | Access method | Exit Method |
|---|---|---|
| iSCom(config-mrp)# | The Global Configuration mode command `mrp ringid 1`s used to enter the MRP Interface Configuration Mode. | To return from the MRP Interface Configuration mode to Global Configuration Mode, the command `exit` is used. To exit from the MRP Interface Configuration mode to Privileged EXEC Mode, the command `end` is used. |

## UFD Configuration Mode

| Prompt | Access method | Exit Method |
|---|---|---|
| iSCom(config-if)# | The Global Configuration mode command `ufd group <group-id (1-65535)>` is used to enter the UFD Interface Configuration Mode. | To return from the UFD Configuration mode to Global Configuration Mode, the command `exit` is used. To exit from the UFD Configuration mode to Privileged EXEC Mode, the command `end` is used. |

## DHCP Pool Configuration Mode

| Prompt | Access method | Exit Method |
|---|---|---|
| iSCom(dhcp-config)# | The Global Configuration mode command **`iSCom(config)# ip dhcp pool`***`<pool number (1-2147483647)>`* is used to enter the UFD Interface Configuration Mode. | To return from the DHCP Pool Configuration Mode to Global Configuration Mode, the command `exit` is used. To exit from the DHCP Pool Configuration Mode to Privileged EXEC Mode, the command `end` is used. |

## Privilege Levels and Command Access

The following table will list out the commands available for the different user levels in Privileged and User Exec levels.

| Command | First Param | Guest | Tech | Admin | Description |
|---|---|---|---|---|---|
| archive | download-sw | | x | x | Downloads software image |
| clear | | | | | Clears the specified parameters |
| | alarm | x | x | x | Alarm related information |
| | au-message | x | x | x | Address update messages related information |
| | cfa | x | x | x | CFA module related information |
| | interfaces | x | x | x | Protocol specific configuration of the interface |
| | meter-stats | x | x | x | Specific configuration for meter |
| | poe | x | x | x | PoE related configuration |

| Command | First Param | Guest | Tech | Admin | Description |
|---|---|---|---|---|---|
| | screen | x | x | x | Screen information |
| | ip | | x | x | IP related configuration |
| | line | | x | x | Configures line information |
| | logs | | x | x | Log information |
| | protocol | | x | x | Clears the specified protocol counters |
| | spanning-tree | | x | x | Spanning tree related configuration |
| | tcp | | x | x | TCP related configuration |
| clock | set | | x | x | Sets the system clock value |
| config-restore | | | | | Configures the restore option |
| | flash | | x | x | File in flash to be used for restoration |
| | norestore | | x | x | No configuration restore |
| | remote | | x | x | Remote location configuration |
| configure | terminal | | x | x | Configures the terminal |
| copy | | | x | x | Various copy options |
| debug | | | | | Configures trace for the protocol |
| | ip | x | x | x | IP related configuration |
| | show | x | x | x | Show mempool status |
| | sntp | x | x | x | SNTP related configuration |
| | crypto | | x | x | Crypto related information |
| | cybsec | | x | x | Cybsec related information |
| | dot1x | | x | x | PNAC related configuration |
| | etherchannel | | x | x | Etherchannel related information |
| | firewall | | x | x | Firewall related configuration |
| | garp | | x | x | GARP related configuration |
| | interface | | x | x | Configures trace for the interface management |
| | lacp | | x | x | LACP related configuration |
| | lldp | | x | x | LLDP related configuration |

| Command | First Param | Guest | Tech | Admin | Description |
|---|---|---|---|---|---|
| | lns | | x | x | LCD notification server |
| | nat | | x | x | Network Address Translation related configuration |
| | np | | x | x | NPAPI configuration |
| | ptp | | x | x | Precision time protocol related configuration |
| | qos | | x | x | QOS related configuration |
| | security | | x | x | Security related configuration |
| | spanning-tree | | x | x | Spanning tree related protocol configuration |
| | ssh | | x | x | SSH related configuration |
| | tacm | | x | x | Transmission and admission control related configuration |
| | vlan | | x | x | VLAN related configuration |
| display firewall rules | | | | x | Display firewall rules |
| dot1x | clear | x | x | x | Clear dot1x configuration |
| | initialize | | x | x | State machine and fresh authentication configuration |
| | re-authenticate | | x | x | Re-authentication |
| dump | | | | | Display memory content from the given memory location |
| | mem | | x | x | Dump memory |
| | que | | x | x | Show the queue related information |
| | sem | | x | x | Show the semaphore related information |
| | task | | x | x | Show the task related information |
| egress bridge | | | x | x | |
| end | | | x | x | Exit to the privileged Exec (#) mode |

| Command | First Param | Guest | Tech | Admin | Description |
|---|---|---|---|---|---|
| erase | | | x | x | Clears the contents of the startup configuration |
| exit | | x | x | x | Logout |
| factory reset | | | | x | Reset to factory default configuration |
| factory reset | users | | | x | Reset all users on switch |
| firmware | | | x | x | Upgrades firmware |
| generate | tech | | x | x | Generate the tech report of various system resources and protocol states for debugging |
| help | | x | x | x | Displays help for commands |
| ip | igmp snooping clear counters | x | x | x | Clears the IGMP snooping statistics |
| | clear counters | | x | x | Clear operation |
| | dhcp | | x | x | DHCP related configuration |
| | pim | | x | x | PIM related configuration |
| | ssh | | x | x | SSH related information |
| listuser | | | x | x | List the user, mode and groups |
| lock | | | x | x | Lock the console |
| logout | | x | x | x | Logout |
| memtrace | | | x | x | Configures memtrace |
| no ip | | | | | IP related information |
| | dhcp | | x | x | DHCP related configuration |
| | ssh | | x | x | SSH related information |
| no debug | | | | | Configures trace for the module |
| | ip | x | x | x | Stops debugging on IGMP or PIM |
| | sntp | x | x | x | Stops debugging on SNTP related configurations |
| | additional options... | | x | x | Stops debugging for other options |
| ping | | | | | |

| Command | First Param | Guest | Tech | Admin | Description |
|---|---|---|---|---|---|
| | A.B.C.D | x | x | x | Ping host |
| | ip dns host name | x | x | x | Ping host |
| | ip A.B.C.D | x | x | x | Ping host |
| | vrf | x | x | x | Ping vrf instance |
| readarpfromHardware ip | A.B.C.D | | x | x | Reads the arp for the given IP |
| readregister | | | x | x | Reads the value of the register from the hardware |
| release dhcp | | | x | x | Performs release operation |
| reload | | | x | x | Restarts the switch |
| renew dhcp | | | x | x | Performs renew operation |
| run script | | | x | x | Runs CLI commands |
| shell | | | | x | Shell to Linux prompt |
| show | | x | x | x | Shows configuration or information |
| sleep | | x | x | x | Puts the command prompt to sleep |
| ssl | | | | x | Configures secure sockets layer related parameters |
| snmpwalk mib | | | | | Allows the user to view Management Information Base related configuration. |
| | name | x | x | x | |
| | oid | x | x | x | |
| traceroute | | | | | Traces route to the destination IP |
| | A.B.C.D | | x | x | |
| write | | | x | x | Writes the running-config to a flash file |
| writeregister | | | x | x | writes in the specified register |

## Configuration Terminal Access

The Guest user level does not have access to the configuration terminal.

The Administration level has access to all commands in the configuration terminal.

The Technical level has access to all commands in the configuration terminal with the following exceptions listed below.

- enableuser
- mst
- password
- traffic

# 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 wide area network (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 a number of advantages over traditional LAN. They are:

1) **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.*

2) **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.*

3) **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, new station addressing, and reconfiguration of hubs and routers becomes necessary. Some of these tasks can be simplified with the use of VLANs.*

4) **Reduced Cost**

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

5) **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.*

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.

# VLAN Configuration

# 3. VLAN Configuration

The following sections describe the configuration of *VLAN* running as a part of *ISS*.

## 3.1. Configuration Guidelines

*VLAN* is enabled in the switch by default. The default interface— *VLAN* 1—cannot be deleted in the switch.

- *GVRP* (*GARP VLAN* Registration Protocol) and *GMRP* (*GARP* Multicast Registration Protocol) must be disabled prior to disabling *VLAN*.
- 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* (Generic Attribute Registration Protocol) cannot be started if *VLAN* is shutdown, and GARP cannot be shut down if *GVRP* and/or *GMRP* are enabled.
- To configure a static unicast/multicast *MAC* address in the forwarding database, *VLAN* must have been configured and member ports must have been configured for the specified *VLAN*.
- 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.

## 3.2. Default Configurations

The table shows the default *VLAN* configuration.

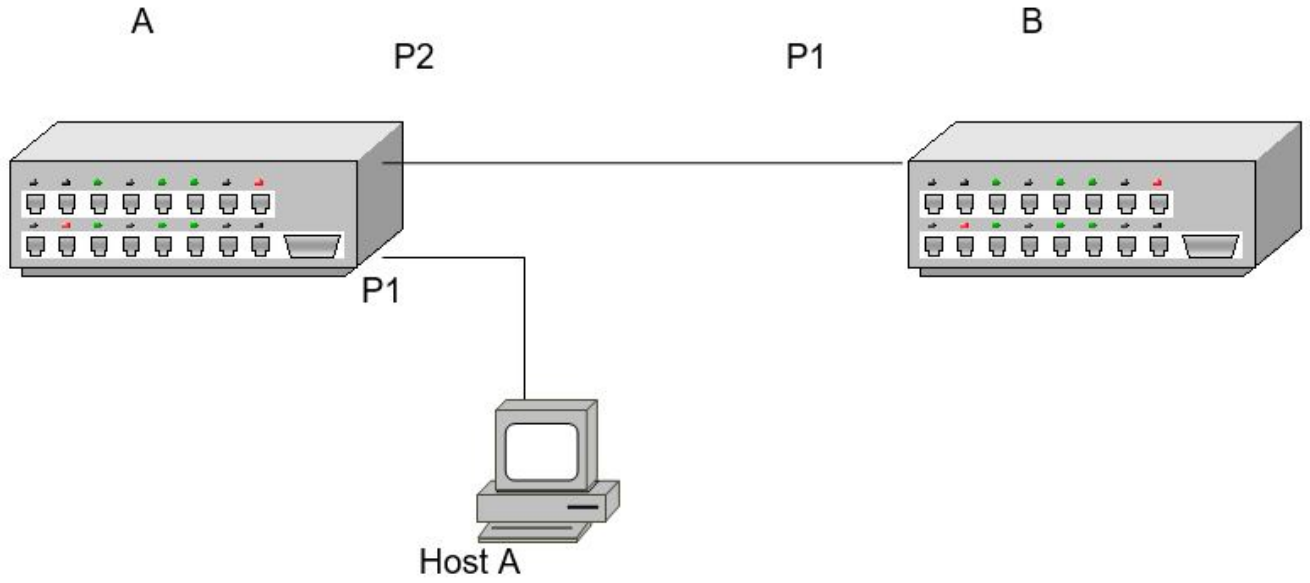
| Feature | Default Setting | Note |
|---|---|---|
| *VLAN* Module status | Enable | |
| Default *VLAN* ID configured in the switch | 1 | |
| *MAC*-based *VLAN* Classification | Disabled | |
| Protocol-*VLAN* based classification | Enabled | |

| Feature | Default Setting | Note |
|---|---|---|
| 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 | |

# 3.3. Configuration Topology

The figure below depicts the *VLAN* topology.

**Figure 1:** VLAN Topology



# 3.4. Configuring Static VLAN

Static *VLAN*s which are also known as port-based *VLAN*s are created by manually assigning ports to a *VLAN*. When a device is connected to a port it automatically assumes the *VLAN* that the port is assigned to. The following configuration section elaborates on the creation of member ports: untagged ports and forbidden ports.

1. Login into the device using either *SSH* or the console port. For instructions on this, refer to the Quick Start Guide.

   STEP RESULT: You should see a command prompt similar to the following.

   ```
   iSCom#
   ```

2. Execute the following commands to assign member ports to *VLAN* 2.

   FOR EXAMPLE: Type the following:

   ```
   iSCom# configure terminal
   iSCom(config)# vlan 2
   iSCom(config-vlan)# ports gigabitethernet 0/2-5 untagged gigabitethernet
   0/3
   iSCom(config-vlan)# exit
   iSCom(config)# exit
   iSCom#
   ```

   TUTORIAL INFORMATION: 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 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 to configure a port connected to an end user device.

   In the above example, the packets for the interface gigabitethernet 0/3 are transmitted without the tag. On all other ports, the packets are transmitted with the tag.

   STEP RESULT: Type the following:

   **show vlan id 2**

   The following text should be displayed.

   ```
   Vlan database
   -------------
   Vlan ID             : 2
   Member Ports        : Gi0/2, Gi0/3, Gi0/4, Gi0/5
   Untagged Ports      : Gi0/3
   Forbidden Ports     : None
   Name                :
   Status              : Permanent
   Egress Ethertype    : 0x8100
   Service Loopback Status   : Disabled
   ```

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

iSCom#
```

3. Configure port 1 as forbidden port.

   FOR EXAMPLE: Type the following:

```
iSCom# configure terminal
iSCom(config)# vlan 2
iSCom(config-if)# ports gigabitethernet 0/2-5 forbidden gigabitethernet
0/1
iSCom(config)# end
iSCom#
```

   TUTORIAL INFORMATION: 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.

4. View the *VLAN* information by executing the following commands.

   FOR EXAMPLE: Type the following.

**iSCom# show vlan summary**

```
Number of vlans : 2
```

**iSCom# show vlan**

```
Vlan database
-------------
Vlan ID             : 1
Member Ports        : Gi0/1
Untagged Ports      : Gi0/1
Forbidden Ports     : None
Name                :
Status              : Permanent
Egress Ethertype    : 0x8100
Service Loopback Status   : Disabled
--------------------------------------------------
Vlan ID             : 2
Member Ports        : Gi0/2, Gi0/3, Gi0/4, Gi0/5
Untagged Ports      : None
Forbidden Ports     : Gi0/1
Name                :
Status              : Permanent
Egress Ethertype    : 0x8100
Service Loopback Status   : Disabled
--------------------------------------------------
```

**iSCom# show vlan id 2**

```
Vlan database
-------------
Vlan ID             : 2
Member Ports        : Gi0/2, Gi0/3, Gi0/4, Gi0/5
Untagged Ports      : None
Forbidden Ports     : Gi0/1
Name                :
Status              : Permanent
Egress Ethertype    : 0x8100
Service Loopback Status   : Disabled
-------------------------------------------------
```

# 3.5. Deleting Static VLAN

1. To delete a *VLAN* from the *VLAN* list, use the command**no vlan <vlan-id(1-4094)>** in Global Configuration Mode.

   FOR EXAMPLE: Enter the following:

   ```
   iSCom(config)# no vlan 4
   ```

   TUTORIAL INFORMATION: The default *VLAN*, which is *VLAN* 1, cannot be deleted.

# 3.6. Enabling VLAN

CONTEXT:

A *VLAN* can be made active in two ways by:

- Adding a member port to a *VLAN* (refer to the section "Configuring Static VLAN") or
- Using the **vlan active** command—see below for details.

## Using the vlan active Command

CONTEXT:

The vlan active command is used to make a *VLAN* active in the switch.

1. Enter Global Configuration Mode.

   FOR EXAMPLE:

   ```
   iSCom# configure terminal
   ```

2. Configure *VLAN* 2 in the switch.

   FOR EXAMPLE:

   ```
   iSCom (config)# vlan 2
   ```

3. Execute the following command to enable *VLAN*.

   FOR EXAMPLE:

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

RESULT:

**NOTE:** If the *VLAN* active command is used without configuring the member ports, then *VLAN* will have zero member ports.

# 3.7. Enabling Service Loopback of VLAN

A loopback interface is a virtual interface that is always up and reachable as long as at least one of the *IP* interfaces on the switch is operational. As a result, a loopback interface is useful for debugging tasks since its *IP* address can always be pinged if any other switch interface is up.

1. To configure a *VLAN* in loopback mode, use the **vlan loopback enable** command in *VLAN* Configuration Mode.

   FOR EXAMPLE: perform the following:

   ```
   iSCom# configure terminal
   iSCom(config)# vlan 2
   iSCom (config-vlan)# vlan active
   iSCom(config-vlan)# end
   ```

2. View the service loopback status of a *VLAN* by executing the following command.

   FOR EXAMPLE: perform the following:

   ```
   iSCom# show vlan id 2
   VLAN database
   -------------
   VLAN ID             : 2
   Member Ports        : Gi0/2, Gi0/3, Gi0/4, Gi0/5
   Untagged Ports      : None
   Forbidden Ports     : Gi0/1
   Name                :
   Status              : Permanent
   Egress Ethertype    : 0x8100
   Service Loopback Status   : Enabled
   ```

# 3.8. Disabling Service Loopback of VLAN

1. To disable *VLAN* loopback, use the **vlan loopback disable** command in *VLAN* Configuration Mode.

   FOR EXAMPLE: perform the following:

   ```
   iSCom# configure terminal
   ```

```
iSCom(config)# vlan 2
iSCom (config-vlan)# vlan loopback disable
iSCom(config-vlan)# end
```

2. View the service loopback status of a *VLAN* by executing the following command.

   FOR EXAMPLE: perform the following:

```
iSCom# show vlan id 2
VLAN database
-------------
VLAN ID              : 2
Member Ports         : Gi0/2, Gi0/3, Gi0/4, Gi0/5
Untagged Ports       : None
Forbidden Ports      : Gi0/1
Name                 :
Status               : Permanent
Egress Ethertype     : 0x8100
Service Loopback Status   : Disabled
```

# 3.9. Configuring Static Unicast Entry

Configuring a static unicast entry requires the *VLAN* to be configured. The member ports for that specified *VLAN* must also be configured.

1. Execute the following commands to configure a Static Unicast Entry in the *VLAN* table.

   FOR EXAMPLE: perform the following:

```
iSCom# configure terminal
```

   – Configure *VLAN* 2 in the switch.

```
iSCom(config)# vlan 2
```

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

```
iSCom(config-vlan)# ports gigabitethernet 0/2 untagged gigabitethernet
0/2
```

   – Exit from the *VLAN* Configuration Mode.

```
iSCom(config-vlan)# exit
```

   – Configure a static unicast *MAC* address in the forwarding database.

```
iSCom (config-vlan)# mac-address-table static unicast 22:22:22:22:22:22
vlan 2 interface gigabitethernet 0/2
iSCom(config-vlan)# end
```

2. Review the configuration.

   FOR EXAMPLE: perform the following:

```
iSCom# show mac-address-table static unicast
Vlan  Mac Address RecvPort Status        ConnectionId         Ports
```

```
----  ----------- -------- ------        ------------         -----
2     22:22:22:22:22:22           Permanent Gi0/2
Total Mac Addresses displayed: 1
```

# 3.10. Configuring Static Multicast Entry

Configuring a static multicast entry requires the *VLAN* to be configured. The member ports for that specified *VLAN* must also be configured.

1. Execute the following commands to configure a Static Multicast Entry in the *VLAN* table.

   FOR EXAMPLE: perform the following:

   ```
   iSCom# configure terminal
   ```

   – Configure *VLAN* 2 in the switch.

   ```
   iSCom(config)# vlan 2
   ```

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

   ```
   iSCom(config-vlan)# ports gigabitethernet 0/2 untagged gigabitethernet
   0/2
   ```

   – Exit from the *VLAN* Configuration Mode.

   ```
   iSCom(config-vlan)# exit
   ```

   – Configure a static Multicast *MAC* address in the forwarding database.

   ```
   iSCom (config-vlan)# mac-address-table static multicast 01:02:03:04:05:06
   vlan 2 interface gigabitethernet 0/2
   iSCom(config-vlan)# end
   ```

   STEP RESULT: *VLAN* 2 is configured in the switch with a member port 0/2 and a *MAC* address of 01:02:03:04:05:06

2. Review the configuration.

   FOR EXAMPLE: perform the following:

   ```
   iSCom# show mac-address-table static multicast
   Static Multicast Table
   ----------------------
   Vlan            : 2
   Mac Address     : 01:02:03:04:05:06
   Receive Port    :
   Member Ports    : Gi0/2
   Forbidden Ports :
   Status          : Permanent
   ------------------------------------------------

   Total Mac Addresses displayed: 1
   ```

# 3.11. Configuring VLAN Learning Mode

By default, the *VLAN* learning mode is *IVL* (Independent *VLAN* Learning).

1. Execute the following commands to change the default learning mode to hybrid.

   FOR EXAMPLE: perform the following:

   ```
   iSCom# configure terminal
   ```

   – Configure the *VLAN* Learning Mode as Hybrid.

   ```
   iSCom(config)# vlan learning mode hybrid
   ```

   – Exit from the Configuration Mode.

   ```
   iSCom(config)# end
   ```

2. Review the configuration.

   FOR EXAMPLE: perform the following:

   ```
   iSCom# show vlan device info
   Vlan device configurations
   --------------------------
   Vlan Status                        : Enabled
   Vlan Oper status                   : Enabled
   Gvrp status                        : Disabled
   Gmrp status                        : Disabled
   Gvrp Oper status                   : Disabled
   Gmrp Oper status                   : Disabled
   Mac-Vlan Status                    : Disabled
   Subnet-Vlan Status                 : Disabled
   Protocol-Vlan Status               : Enabled
   Base-Bridge Mode                   : Vlan Aware Bridge
   Traffic Classes                    : Enabled
   Vlan Operational Learning Mode     : Hybrid
   Hybrid Default Learning Mode       : IVL
   Version number                     : 1
   Max Vlan id                        : 4094
   Max supported vlans                : 4094
   Global mac learning status         : Enabled
   Filtering Utility Criteria         : Enabled
   ```

# 3.12. Enabling GVRP

The Generic Attribute Registration Protocol (*GARP*) *VLAN* Registration Protocol (*GVRP*) is an IEEE 802.1Q-compliant method for facilitating automatic (dynamic) *VLAN* membership configuration.

*GVRP*-enabled switches can exchange *VLAN* configuration information with other *GVRP*-enabled switches.

CONTEXT:

*GVRP* reduces the chance of errors in *VLAN* configuration by automatically providing *VLAN* ID (VID) consistency across the network. In addition, you can use *GVRP* to dynamically enable port membership in static *VLAN*s configured on a switch. Once *GVRP* creates a dynamic *VLAN*, you can use the CLI to convert it to a static *VLAN*. *GVRP* can also reduce unnecessary broadcast traffic and unicast traffic.

Keep the following considerations in mind when configuring *GVRP*:

- A dynamic *VLAN* must be converted to a static *VLAN* before it can have an IP address.
- The total number of *VLAN*s on the switch (static and dynamic combined) cannot exceed the current Maximum *VLAN*s setting. For example, in the factory default state, the switch supports eight *VLAN*s. Thus, when four static *VLAN*s are configured on the switch, the switch can accept up to four additional *VLAN*s in any combination of static and dynamic. Any additional *VLAN*s advertised to the switch will not be added unless you first increase the maximum *VLAN*s setting.
- Converting a dynamic *VLAN* to a static *VLAN* and then executing the write memory command saves the *VLAN* in the startup configuration file and makes it a permanent part of the switch's *VLAN* configuration.
- Within the same broadcast domain, a dynamic *VLAN* can pass through a device that is not *GVRP*-aware. This is because a hub or a switch that is not *GVRP*-aware will flood the *GVRP* (multi-cast) advertisement packets out all ports.
- *GVRP* assigns dynamic *VLAN*s as Tagged *VLAN*s. To configure the *VLAN* as Untagged, you must first convert it to a static *VLAN*.
- Rebooting a switch on which a dynamic *VLAN* exists deletes that *VLAN*. However, the dynamic *VLAN* reappears after the reboot if *GVRP* is enabled and the switch again receives advertisements for that *VLAN* through a port configured to add dynamic *VLAN*s.
- By receiving advertisements from other devices running *GVRP*, the switch learns of static *VLAN*s on those other devices and automatically creates tagged *VLAN*s on the links to the advertising devices. Similarly, the switch advertises its static *VLAN*s to other *GVRP*-aware devices, as well as the dynamic VLANs the switch has learned.
- A *GVRP*-enabled switch does not advertise any *GVRP*-learned *VLAN*s out of the port(s) on which it originally learned of those *VLAN*s.
- While *GVRP* is enabled on the switch, you cannot apply any access control lists ( *ACL*)s to *VLAN*s configured on the same switch.

By default, *GVRP* is enabled globally and can be enabled/disabled on a per-port basis.

1. If *GVRP* is disabled globally in the switch, use the CLI command **set gvrp enable** in the Global Configuration Mode to enable *GVRP* globally.

   FOR EXAMPLE: `iSCom#` configure terminal

   – Enable *GVRP* globally.

   ```
   iSCom(config)# set gvrp enable
   ```

   – Exit from the Configuration Mode.

```
iSCom(config)# exit
```

TUTORIAL INFORMATION: When *GVRP* is disabled globally or on a particular port, dynamic learning of *VLAN* will not take place globally or on that specified 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.

2. To enable *GVRP* on a port, use the following command in the Global Configuration Mode.

   FOR EXAMPLE: `iSCom`# configure terminal

   – Enable *GVRP* on port 0/2.

```
iSCom(config)# set port gvrp gigabitethernet 0/2 enable
```

   – Exit from the Configuration Mode.

```
iSCom(config)# exit
```

3. Review the configuration.

   FOR EXAMPLE: perform the following:

```
iSCom# show vlan device info
Vlan device configurations
--------------------------
Vlan Status                         : Enabled
Vlan Oper status                    : Enabled
Gvrp status                         : Enabled
Gmrp status                         : Disabled
Gvrp Oper status                    : Enabled
Gmrp Oper status                    : Disabled
Mac-Vlan Status                     : Disabled
Subnet-Vlan Status                  : Disabled
Protocol-Vlan Status                : Enabled
Base-Bridge Mode                    : Vlan Aware Bridge
Traffic Classes                     : Enabled
Vlan Operational Learning Mode      : Hybrid
Hybrid Default Learning Mode        : IVL
Version number                      : 1
Max Vlan id                         : 4094
Max supported vlans                 : 4094
Global mac learning status          : Enabled
Filtering Utility Criteria          : Enabled
```

# 3.13. Enabling GVRP and Static VLAN

For Setup, refer to section Configuration Topology. In Switch A, P1 is configured to be a member port of *VLAN* 2.

1. Execute the following commands in Switch A.

   FOR EXAMPLE: perform the following:

   ```
   iSCom# configure terminal
   ```

   – Enable *GVRP* globally.

   ```
   iSCom(config)# set gvrp enable
   ```

   – Enter the Interface Configuration Mode for interface 2 and make the interface up.

   ```
   iSCom(config)# interface gigabitethernet 0/2
   iSCom(config-if)# no shutdown
   ```

   – Exit from Interface Configuration Mode.

   ```
   iSCom(config-if)# exit
   ```

   – Configure *VLAN* 2 in the switch

   ```
   iSCom(config)# vlan 2
   ```

   – Configure *VLAN* 2 as static *VLAN* with the required type of ports

   ```
   iSCom(config-vlan)# ports gigabitethernet 0/1 untagged gigabitethernet
   0/1
   ```

   – Exit from the Interface Configuration Mode

   ```
   iSCom(config-vlan)# end
   ```

2. Review the configuration.

   FOR EXAMPLE: perform the following:

   ```
   iSCom# show vlan device info
   Vlan device configurations
   --------------------------
   Vlan Status                       : Enabled
   Vlan Oper status                  : Enabled
   Gvrp status                       : Disabled
   Gmrp status                       : Disabled
   Gvrp Oper status                  : Disabled
   Gmrp Oper status                  : Disabled
   Mac-Vlan Status                   : Disabled
   Subnet-Vlan Status                : Disabled
   Protocol-Vlan Status              : Enabled
   Base-Bridge Mode                  : Vlan Aware Bridge
   Traffic Classes                   : Enabled
   Vlan Operational Learning Mode    : Hybrid
   Hybrid Default Learning Mode      : IVL
   ```

```
Version number                    : 1
Max Vlan id                       : 4094
Max supported vlans               : 4094
Global mac learning status        : Enabled
Filtering Utility Criteria        : Enabled

iSCom# show vlan
Vlan database
-------------
Vlan ID             : 1
Member Ports        : Gi0/1, Gi0/2, Gi0/3, Gi0/4, Gi0/5, Gi0/6
Gi0/7, Gi0/8, Gi0/9, Gi0/10, Gi0/11, Gi0/12
Gi0/13, Gi0/14, Gi0/15, Gi0/16, Gi0/17, Gi0/18
Gi0/19, Gi0/20, Gi0/21, Gi0/22, Gi0/23, Gi0/24
Ex0/1, Ex0/2, Ex0/3, Ex0/4
Untagged Ports      : Gi0/1, Gi0/2, Gi0/3, Gi0/4, Gi0/5, Gi0/6
Gi0/7, Gi0/8, Gi0/9, Gi0/10, Gi0/11, Gi0/12
Gi0/13, Gi0/14, Gi0/15, Gi0/16, Gi0/17, Gi0/18
Gi0/19, Gi0/20, Gi0/21, Gi0/22, Gi0/23, Gi0/24
Ex0/1, Ex0/2, Ex0/3, Ex0/4
Forbidden Ports     : None
Name                :
Status              : Permanent
Egress Ethertype    : 0x8100
Service Loopback Status   : Disabled
-----------------------------------------------------
Vlan ID             : 2
Member Ports        : Gi0/1
Untagged Ports      : Gi0/1
Forbidden Ports     : None
Name                :
Status              : Permanent
Egress Ethertype    : 0x8100
Service Loopback Status   : Disabled
-----------------------------------------------------
```

# 3.14. Enabling GMRP

GARP Multicast Registration Protocol (*GMRP*) is a Generic Attribute Registration Protocol (GARP) application that provides a constrained multicast flooding facility similar to IGMP snooping. *GMRP* and GARP are industry-standard protocols defined by the IEEE 802.1P.

CONTEXT:

*GMRP* provides a mechanism that allows bridges and end stations to dynamically register group membership information with the MAC bridges attached to the same LAN segment and for that information to be disseminated across all bridges in the Bridged LAN that supports extended filtering services. The operation of *GMRP* relies upon the services provided by the GARP.

When a host wants to join an IP multicast group, it sends an IGMP join message, which spawns a *GMRP* join message. Upon receipt of the *GMRP* join message, the switch adds the port through which the join message was received to the appropriate Multicast group. The switch propagates the *GMRP* join message to all other hosts in the VLAN, one of which is typically the Multicast source. When the source is multicasting to the group, the switch forwards the multicast only to the ports from which it received join messages for the group. The switch sends periodic *GMRP* queries. If a host wants to remain in a multicast group, it responds to the query. In this case, the switch does nothing. If a host does not want to remain in the Multicast group, it can either send a leave message or not respond to the periodic queries from the switch. If the switch receives a leave message or receives no response from the host for the duration of the leave all timer, the switch removes the host from the multicast group.

By default, *GMRP* is enabled globally and can be enabled/disabled on a per-port basis.

1. If *GMRP* is disabled globally in the switch, use the CLI command **set gmrp enable** in the Global Configuration Mode to enable GMRP globally.

   FOR EXAMPLE: `iSCom#` configure terminal

   – Enable GVRP globally.

   ```
   iSCom(config)# set gmrp enable
   ```

   – Exit from the Configuration Mode.

   ```
   iSCom(config)# exit
   ```

   TUTORIAL INFORMATION: When GVRP is disabled globally or on a particular port, dynamic learning of VLAN will not take place globally or on that specified 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.

2. To enable *GMRP* on a port, use the following command in the Global Configuration Mode.

   FOR EXAMPLE: `iSCom#` configure terminal

   – Enable GVRP on port 0/2.

   ```
   iSCom(config)# set port gmrp gigabitethernet 0/2 enable
   ```

   – Exit from the Configuration Mode.

   ```
   iSCom(config)# exit
   ```

3. Review the configuration.

   FOR EXAMPLE: perform the following:

   ```
   iSCom# 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
Base-Bridge Mode                    : Vlan Aware Bridge
Traffic Classes                     : Enabled
Vlan Operational Learning Mode      : Hybrid
Hybrid Default Learning Mode        : IVL
Version number                      : 1
Max Vlan id                         : 4094
Max supported vlans                 : 4094
Global mac learning status          : Enabled
Filtering Utility Criteria          : Enabled
```

4. To disable *GMRP* on a port, use the following command in the Global Configuration Mode.

   FOR EXAMPLE: `iSCom`# configure terminal

   – Enable GVRP globally.

   ```
   iSCom(config)# set port gmrp gigabitethernet 0/2 disable
   ```

   – Exit from the Configuration Mode.

   ```
   iSCom(config)# exit
   ```

5. Review the configuration.

   FOR EXAMPLE: perform the following:

   ```
   iSCom# show vlan port config port gigabitethernet 0/2
   Vlan Port configuration table
   -----------------------------
   Port Gi0/2 Bridge Port Type                    :
   Customer Bridge Port Port Vlan ID                          : 1
   Port Acceptable Frame Type          : Admit All
   Port Mac Learning Status            : Enabled
   Port Ingress Filtering              : Enabled
   Port Mode                           : Hybrid
   Port Gvrp Status                    : Enabled
   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
Ingress EtherType                   : 0x8100
Egress EtherType                    : 0x8100
Egress TPID Type                    : Portbased
Allowable TPID 1                    : 0x0
Allowable TPID 2                    : 0x0
Allowable TPID 3                    : 0x0
Reflection Status                   : Disabled
```

# 3.15. Configuring VLAN Dynamic Multicast Learning

For Setup, refer to section Configuration Topology.

1. Execute the following commands in Switch A.

   FOR EXAMPLE: perform the following:

   ```
   iSCom# configure terminal
   ```

   – Enable *GVRP* globally.

   ```
   iSCom(config)# set gmrp enable
   ```

   – Enter the Interface Configuration Mode for interface 2 and make the interface up.

   ```
   iSCom(config)# interface gigabitethernet 0/2
   iSCom(config-if)# no shutdown
   ```

   – Exit from Interface Configuration Mode.

   ```
   iSCom(config-if)# exit
   ```

   – Configure static Multicast *MAC* address

   ```
   iSCom(config)# mac-address-table static multicast 01:02:03:04:05:06 vlan
   1 interface gigabitethernet 0/2
   ```

   – Exit from the Interface Configuration Mode

   ```
   iSCom(config)# exit
   ```

2. Review the configuration.

   FOR EXAMPLE: perform the following:

   ```
   iSCom# show mac-address-table static multicast
   ```

```
Static Multicast Table
----------------------
Vlan            : 1
Mac Address     : 01:02:03:04:05:06
Receive Port    :
Member Ports    : Gi0/2
Forbidden Ports :
Status          : Permanent
-----------------------------------------------

Total Mac Addresses displayed: 1
```

3. Execute the following commands in Switch B.

   FOR EXAMPLE: perform the following:

   ```
   iSCom# configure terminal
   ```

   – Enable *GVRP* globally.

   ```
   iSCom(config)# set gmrp disable
   ```

   – Exit from the Interface Configuration Mode

   ```
   iSCom(config-vlan)# end
   ```

4. View the *MAC* Address table details by executing the following show command.

   FOR EXAMPLE: perform the following:

   ```
   iSCom# show mac-address-table
   VLAN    Mac Address         Type     Ports
   ----    -----------         ----     -----
   1       00:01:02:03:04:02   Learnt   Gi0/1
   Total Mac Addresses displayed: 1
   ```

5. Execute the following commands to enable *GMRP* globally in Switch B.

   FOR EXAMPLE: perform the following:

   ```
   iSCom# configure terminal
   ```

   – Enable GVRP globally.

   ```
   iSCom(config)# set gmrp enable
   ```

   – Exit from the Interface Configuration Mode

   ```
   iSCom(config-vlan)# end
   ```

6. View the *MAC* Address table details by executing the following show command.

   FOR EXAMPLE: perform the following:

   ```
   iSCom# show mac-address-table
   VLAN    Mac Address         Type     Ports
   ----    -----------         ----     -----
   1       00:01:02:03:04:02   Learnt   Gi0
   ```

```
1       01:02:03:04:05:06   Learnt   Gi0/1
Total Mac Addresses displayed: 1
```

# 3.16. Configuring Restricted VLAN Registration

By default, restricted *VLAN* registration is disabled on a port. If restricted *VLAN* registration is enabled on a port, *VLAN* is learnt dynamically on that port, only if the specific *VLAN* is statically configured in the switch. When restricted *VLAN* registration rules are disabled, *GVRP* packets are processed normally and *VLAN*s are learnt dynamically even if they are not statically configured in the switch. For Setup, refer to section Configuration Topology. In Switch A, P1 is configured to be member port of *VLAN*s 2 and 3.

1. Execute the following commands in Switch A.

   FOR EXAMPLE: perform the following:

   ```
   iSCom# configure terminal
   ```

   – Enable *VLAN* 2.

   ```
   iSCom(config)# vlan 2
   iSCom(config-vlan)# port gigabitethernet 0/1 untagged gigabitethernet 0/1
   iSCom(config-vlan)# exit
   iSCom(config)# vlan 3
   iSCom(config-vlan)# port gigabitethernet 0/1 untagged gigabitethernet 0/1
   ```

   – Exit from the Interface Configuration Mode

   ```
   iSCom(config-vlan)# end
   ```

2. Review the configuration in Switch A.

   FOR EXAMPLE: perform the following:

   ```
   iSCom# show vlan
   Vlan database
   -------------
   Vlan ID             : 1
   Member Ports        : Gi0/1, Gi0/2, Gi0/3, Gi0/4, Gi0/5, Gi0/6
   Gi0/7, Gi0/8, Gi0/9, Gi0/10, Gi0/11, Gi0/12
   Gi0/13, Gi0/14, Gi0/15, Gi0/16, Gi0/17, Gi0/18
   Gi0/19, Gi0/20, Gi0/21, Gi0/22, Gi0/23, Gi0/24
   Ex0/1, Ex0/2, Ex0/3, Ex0/4

   Untagged Ports      : Gi0/1, Gi0/2, Gi0/3, Gi0/4, Gi0/5, Gi0/6
   Gi0/7, Gi0/8, Gi0/9, Gi0/10, Gi0/11, Gi0/12
   Gi0/13, Gi0/14, Gi0/15, Gi0/16, Gi0/17, Gi0/18
   Gi0/19, Gi0/20, Gi0/21, Gi0/22, Gi0/23, Gi0/24
   Ex0/1, Ex0/2, Ex0/3, Ex0/4
   Forbidden Ports     : None
   ```

```
Name                :
Status              : Permanent
Egress Ethertype    : 0x8100
Service Loopback Status   : Disabled
-------------------------------------------------
Vlan ID             : 2
Member Ports        : Gi0/1
Untagged Ports      : Gi0/1
Forbidden Ports     : None
Name                :
Status              : Permanent
Egress Ethertype    : 0x8100
Service Loopback Status   : Disabled
-------------------------------------------------
Vlan ID             : 3
Member Ports        : Gi0/1
Untagged Ports      : Gi0/1
Forbidden Ports     : None
Name                :
Status              : Permanent
Egress Ethertype    : 0x8100
Service Loopback Status   :
Disabled-------------------------------------------------
```

FOR EXAMPLE: check the output in Switch B:

```
iSCom# show vlan
Vlan database
-------------
Vlan ID             : 1
Member Ports        : Gi0/1, Gi0/2, Gi0/3, Gi0/4, Gi0/5, Gi0/6
Gi0/7, Gi0/8, Gi0/9, Gi0/10, Gi0/11, Gi0/12
Gi0/13, Gi0/14, Gi0/15, Gi0/16, Gi0/17, Gi0/18
Gi0/19, Gi0/20, Gi0/21, Gi0/22, Gi0/23, Gi0/24
Ex0/1, Ex0/2, Ex0/3, Ex0/4

Untagged Ports      : Gi0/1, Gi0/2, Gi0/3, Gi0/4, Gi0/5, Gi0/6
Gi0/7, Gi0/8, Gi0/9, Gi0/10, Gi0/11, Gi0/12
Gi0/13, Gi0/14, Gi0/15, Gi0/16, Gi0/17, Gi0/18
Gi0/19, Gi0/20, Gi0/21, Gi0/22, Gi0/23, Gi0/24
Ex0/1, Ex0/2, Ex0/3, Ex0/4
```

```
Forbidden Ports     : None
Name                :
Status              : Dynamic Gvrp
Egress Ethertype    : 0x8100
Service Loopback Status   : Disabled
--------------------------------------------------
Vlan ID             : 2
Member Ports        : Gi0/1
Untagged Ports      : Gi0/1
Forbidden Ports     : None
Name                :
Status              : Dynamic Gvrp
Egress Ethertype    : 0x8100
Service Loopback Status   : Disabled
--------------------------------------------------
Vlan ID             : 3
Member Ports        : Gi0/3
Untagged Ports      : Gi0/3
Forbidden Ports     : None
Name                :
Status              : Dynamic Gvrp
Egress Ethertype    : 0x8100
Service Loopback Status   :
Disabled--------------------------------------------------
```

3. Execute the following commands in Switch B to enable restricted *VLAN* registration.

   FOR EXAMPLE: perform the following:

```
iSCom# configure terminal
```

   – Enable Restricted VLAN registration on a port.

```
iSCom(config)# interface gigabitethernet 0/1
iSCom(config-if)# vlan restricted enable
iSCom(config-vlan)# end
```

4. View the configuration details after enabling the *VLAN* registration

   FOR EXAMPLE: iSCom# show vlan

```
Vlan database
-------------
Vlan ID             : 1
Member Ports        : Gi0/1, Gi0/2, Gi0/3, Gi0/4, Gi0/5, Gi0/6
Gi0/7, Gi0/8, Gi0/9, Gi0/10, Gi0/11, Gi0/12
```

```
Gi0/13, Gi0/14, Gi0/15, Gi0/16, Gi0/17, Gi0/18
Gi0/19, Gi0/20, Gi0/21, Gi0/22, Gi0/23, Gi0/24
Ex0/1, Ex0/2, Ex0/3, Ex0/4
Untagged Ports    : Gi0/1, Gi0/2, Gi0/3, Gi0/4, Gi0/5, Gi0/6
Gi0/7, Gi0/8, Gi0/9, Gi0/10, Gi0/11, Gi0/12
Gi0/13, Gi0/14, Gi0/15, Gi0/16, Gi0/17, Gi0/18
Gi0/19, Gi0/20, Gi0/21, Gi0/22, Gi0/23, Gi0/24
Ex0/1, Ex0/2, Ex0/3, Ex0/4
Forbidden Ports     : None
Name                :
Status              : Permanent
Egress Ethertype    : 0x8100
Service Loopback Status   : Disabled
-------------------------------------------------
```

5. Create *VLAN* 2 in Switch B.

   FOR EXAMPLE: perform the following:

   ```
   iSCom# configure terminal
   ```

   – Create VLAN 2.

   ```
   iSCom(config)# vlan 2
   iSCom(config-vlan)# port gigabitethernet 0/2
   ```

   – Exit from the Interface Configuration Mode

   ```
   iSCom(config-vlan)# end
   ```

6. View the configuration details in Switch B.

   FOR EXAMPLE: iSCom# show vlan

   ```
   Vlan database
   -------------
   Vlan ID             : 1
   Member Ports        : Gi0/1, Gi0/2, Gi0/3, Gi0/4, Gi0/5, Gi0/6
   Gi0/7, Gi0/8, Gi0/9, Gi0/10, Gi0/11, Gi0/12
   Gi0/13, Gi0/14, Gi0/15, Gi0/16, Gi0/17, Gi0/18
   Gi0/19, Gi0/20, Gi0/21, Gi0/22, Gi0/23, Gi0/24
   Ex0/1, Ex0/2, Ex0/3, Ex0/4

   Untagged Ports      : Gi0/1, Gi0/2, Gi0/3, Gi0/4, Gi0/5, Gi0/6
   Gi0/7, Gi0/8, Gi0/9, Gi0/10, Gi0/11, Gi0/12
   Gi0/13, Gi0/14, Gi0/15, Gi0/16, Gi0/17, Gi0/18
   Gi0/19, Gi0/20, Gi0/21, Gi0/22, Gi0/23, Gi0/24
   Ex0/1, Ex0/2, Ex0/3, Ex0/4
   Forbidden Ports     : None
   Name                :
   ```

```
Status              : Permanent
Egress Ethertype    : 0x8100
Service Loopback Status   : Disabled
------------------------------------------------------
VLAN ID             : 2
Member Ports        : Gi0/1, Gi0/2
Untagged Ports      : None
Forbidden Ports     : None
Name                :
Status              : Permanent
```

**NOTE:** Since *VLAN* 2 is statically configured in Switch B, *VLAN* 2 is learnt dynamically on Port 1 of Switch B, even though restricted *VLAN* registration is enabled.

# 3.17. 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 learnt 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 learnt dynamically, even if they are not statically configured in the switch. For Setup, refer to section Configuration Topology.

1. Execute the following commands in switch A to configure static multicast MAC Address.

   FOR EXAMPLE: perform the following:

   ```
   iSCom# configure terminal
   ```

   – Configure static Multicast *MAC* address.

   ```
   iSCom(config)# mac-address-table static multicast 01:02:03:04:05:06 vlan
   1 interface gigabitethernet 0/2
   ```

   – Exit from the Interface Configuration Mode

   ```
   iSCom(config)# exit
   ```

2. Review the Static Multicast Table.

   FOR EXAMPLE: perform the following:

   ```
   iSCom# show mac-address-table static multicast
   Static Multicast Table
   ----------------------
   Vlan            : 1
   Mac Address     : 01:02:03:04:05:06
   Receive Port    :
   Member Ports    : Gi0/2
   Forbidden Ports :
   Status          : Permanent
   ```

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

Total Mac Addresses displayed: 1
```

3. View the statically configured multicast entry by executing the following show command:

   FOR EXAMPLE: perform the following:

   The output in Switch A is:

```
iSCom# show mac-address-table
Vlan    Mac Address         Type     ConnectionId       Ports
----    -----------         ----     ------------       -----
1       00:02:02:03:04:01   Learnt   Gi0/2 (Switch B port 1 mac address)
1       01:02:03:04:05:06   Static                       Gi0/2

Total Mac Addresses displayed: 2
```

   The output in Switch B is:

```
iSCom# show mac-address-table
Vlan    Mac Address         Type     ConnectionId       Ports
----    -----------         ----     ------------       -----
1       00:01:02:03:04:02 Learnt   Gi0/1 (in switch A port 2 mac
address)
1       01:02:03:04:05:06   Static Gi0/1 (group mac address configured
In switch A)

Total Mac Addresses displayed: 2
```

4. Execute the following commands in Switch B to enable restricted group registration.

   FOR EXAMPLE: perform the following:

```
iSCom# configure terminal
```

   – Enable restricted group registration on a port.

```
iSCom(config)# interface gigabitethernet 0/1
iSCom(config-if)# group restricted enable
iSCom(config-vlan)# end
```

5. View the statically configured multicast entry by executing the following show command:

   FOR EXAMPLE: perform the following:

   The output in Switch B is:

```
iSCom# show mac-address-table
Vlan    Mac Address         Type     ConnectionId       Ports
----    -----------         ----     ------------       -----
1       00:01:02:03:04:02 Learnt   Gi0/1
```

```
Total Mac Addresses displayed: 1
```

6. Create static multicast *MAC* address by executing the following commands.

   FOR EXAMPLE: perform the following:

   ```
   iSCom# configure terminal
   ```

   – Configure static multicast entry with the required ports.

   ```
   iSCom(config)# mac-address-table static multicast 01:02:03:04:05:06 vlan
   1 interface gigabitethernet 0/2
   ```

   – Exit from the Interface Configuration Mode.

   ```
   iSCom(config)# end
   ```

7. View the statically configured multicast entry by executing the following show command:

   FOR EXAMPLE: perform the following:

   The output in Switch B is:

   ```
   iSCom# show mac-address-table
   Vlan    Mac Address         Type     ConnectionId       Ports
   ----    -----------         ----     ------------       -----
   1       00:01:02:03:04:02 Learnt   Gi0/1
   1       01:02:03:04:05:06   Static   Gi0/1,Gi0/2

   Total Mac Addresses displayed: 2
   ```

   **NOTE:** As the Group-Mac Address 01:02:03:04:05:06 is statically configured in switch B, it is learnt dynamically on port 1 of switch B, even though restricted group registration is enabled.

# 3.18. Changing the Forwarding Mode

CONTEXT:

Raptor maintains forwarding tables that contain *MAC* addresses and associated interfaces for each Layer 2 *VLAN*. When a packet arrives with a new source *MAC* address in its frame header, Raptor adds the *MAC* address to its forwarding table and tracks the interface at which the packet arrived.

The following sections describe the configuration of the forwarding modes for a *VLAN*: forward-all and forward-unregistered.

## Forward-all

The forward-all information for a *VLAN* specifies the set of ports (of a *VLAN*) to which all multicast packets must be forwarded.

1. Execute the following commands to configure a set of ports as forward-all.

   FOR EXAMPLE: perform the following:

   ```
   iSCom# configure terminal
   ```

   – Enter the *VLAN* Configuration Mode (for *VLAN* 2).

```
iSCom(config)# vlan 4
iSCom(config-vlan)# port gigabitethernet 0/2-4
iSCom(config-vlan)# forward-all static-ports gigabitethernet 0/2
forbidden-ports gigabitethernet 0/4
```

– Exit from the Interface Configuration Mode

```
iSCom(config-vlan)# end
```

2. View the configuration information by executing the following show command.

FOR EXAMPLE: perform the following:

```
iSCom# show forward-all
Vlan Forward All Table
-----------------------

Vlan ID : 1
ForwardAll Ports          : None
ForwardAll Static Ports   : None
ForwardAll ForbiddenPorts : None
------------------------------------------------------------
Vlan ID : 2
ForwardAll Ports          : None
ForwardAll Static Ports   : None
ForwardAll ForbiddenPorts : None
------------------------------------------------------------
Vlan ID : 3
ForwardAll Ports          : None
ForwardAll Static Ports   : None
ForwardAll ForbiddenPorts : None
------------------------------------------------------------
Vlan ID : 4
ForwardAll Ports          : Gi0/2
ForwardAll Static Ports   : Gi0/2
ForwardAll ForbiddenPorts : Gi0/4
------------------------------------------------------------
```

**NOTE:** Forbidden ports are the set of ports in a *VLAN*, configured by the user, over which the multi-cast group-addressed frames are not forwarded.

## Forward-Unregistered

Forwarding unregistered information for a *VLAN* specifies the set of ports for a *VLAN* that does not have specific forwarding information.

1. Execute the following commands in Switch A.

   FOR EXAMPLE: perform the following:

   ```
   iSCom# configure terminal
   ```

   – Enter the *VLAN* Configuration Mode (for *VLAN* 2).

   ```
   iSCom(config)# vlan 4
   iSCom(config-vlan)# port gigabitethernet 0/2-4
   iSCom(config-vlan)# forward-unregistered static-ports gigabitethernet 0/1
   forbidden-ports gigabitethernet 0/4
   ```

   – Exit from the Interface Configuration Mode

   ```
   iSCom(config-vlan)# end
   ```

2. View the configuration information by executing the following show command.

   FOR EXAMPLE: perform the following:

   ```
   iSCom# show forward-unregistered
   Vlan Forward Unregistered Table
   ---------------------------------

   Vlan ID : 1
   Unreg ports           : Gi0/1, Gi0/2, Gi0/3, Gi0/4, Gi0/5, Gi0/6
   Gi0/7, Gi0/8, Gi0/9, Gi0/10, Gi0/11, Gi0/12
   Gi0/13, Gi0/14, Gi0/15, Gi0/16, Gi0/17, Gi0/18
   Gi0/19, Gi0/20, Gi0/21, Gi0/22, Gi0/23, Gi0/24
   Ex0/1, Ex0/2, Ex0/3, Ex0/4

   Unreg Static Ports    : Gi0/1, Gi0/2, Gi0/3, Gi0/4, Gi0/5, Gi0/6
   Gi0/7, Gi0/8, Gi0/9, Gi0/10, Gi0/11, Gi0/12
   Gi0/13, Gi0/14, Gi0/15, Gi0/16, Gi0/17, Gi0/18
   Gi0/19, Gi0/20, Gi0/21, Gi0/22, Gi0/23, Gi0/24
   Ex0/1, Ex0/2, Ex0/3, Ex0/4

   Unreg Forbidden Ports : None
   -----------------------------------------------------
   Vlan ID : 2
   Unreg ports           : Gi0/2
   Unreg Static Ports    : Gi0/2
   Unreg Forbidden Ports : None
   -----------------------------------------------------
   ```

```
Vlan ID : 3
Unreg ports           : Gi0/3
Unreg Static Ports    : Gi0/3
Unreg Forbidden Ports : None
-----------------------------------------------------
Vlan ID : 4
Unreg ports           : Gi0/1
Unreg Static Ports    : Gi0/1
Unreg Forbidden Ports : Gi0/4
----------------------
```

# 3.19. 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 a *VLAN* Tag, followed by *MAC*-based, protocol-based, and finally port-based classification, where the *VLAN* is recognized by the port *VLAN* Identifier (*PVID*). The device supports port-based and protocol-based classification.

## Port-Based Classification

CONTEXT:

For port-based (or *PVID*-based) classification of frames, the following prerequisites must be met:

- *VLAN* must be configured (in the configuration below, this is *VLAN* 4)
- *PVID* for the interfaces must be configured
- Acceptable frame types must be configured.

Port-based classification requires the association of a specific *VLAN* ID—the port *VLAN* Identifier (*PVID*)—with each port. 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.

**NOTE:** A port can be a member of only one port-based *VLAN*.

**NOTE:** If *PVID* value has not been explicitly configured for a port, *PVID* assumes a default value of 1.

1. Execute the following commands to configure *PVID* for interface P5 as *VLAN* 4.

   FOR EXAMPLE: perform the following:

   – Enter the Global Configuration Mode.

   ```
   iSCom# configure terminal
   ```

   – Enter the Interface Configuration Mode for port gigabitethernet 0/5.

   ```
   iSCom(config)# interface gigabitethernet 0/5
   ```

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

```
iSCom(config-if)# switchport pvid 4
```

– Exit from the Interface Configuration Mode

```
iSCom(config-if)# end
```

2. Review the *VLAN*-related configuration.

FOR EXAMPLE: `iSCom`# show vlan id 4

```
Vlan database
-------------
Vlan ID             : 4
Member Ports        : Gi0/1, Gi0/2, Gi0/3, Gi0/4
Untagged Ports      : None
Forbidden Ports     : None
Name                :
Status              : Permanent
Egress Ethertype    : 0x8100
Service Loopback Status   :
Disabled----------------------------------------------------
```

3. View the *VLAN* port configuration table of Port Gi0/5 by executing the following show command.

FOR EXAMPLE: perform the following:

```
iSCom# show vlan port config port gigabitethernet 0/5
Vlan Port configuration table
------------------------------
Port Gi0/5
Bridge Port Type                    : Customer Bridge Port
Port Vlan ID                        : 4
Port Acceptable Frame Type          : Admit All
Port Mac Learning Status            : Enabled
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
```

```
Ingress EtherType                    : 0x8100
Egress EtherType                     : 0x8100
Egress TPID Type                     : Portbased
Allowable TPID 1                     : 0x0
Allowable TPID 2                     : 0x0
Allowable TPID 3                     : 0x0
Reflection Status                    : Disabled
-----------------------------------------------------
```

STEP RESULT: Unicast packets should only reach host B as a tagged *VLAN* 4 packet (see above the Port Vlan ID shown as 4)that is sent by host A.

## Port and Protocol-Based Classification

Groups of protocols can be defined and then bound to a port. After the protocol group is bound to a port, every packet originating from a protocol in the group is mapped to a *VLAN* that is configured in the protocol-based groups. Then, all tagged and untagged frames will be forwarded based on the protocol-to-*VLAN* mapping.

1. Execute the following commands to configure protocol-based *VLAN* classification.

   FOR EXAMPLE: perform the following:

   – Enter the Global Configuration Mode.

   ```
   iSCom# configure terminal
   ```

   – Define a group ID for a specific encapsulation and protocol value combination.

   ```
   iSCom(config)# map protocol ip enet-v2 protocols-group 10
   ```

   **NOTE:** ip stands for an Ethernet V2 frame that has an IPv4 packet. The protocol number is 0x0800.

   **NOTE:** enet-v2 stands for the standard IEEE 802.3 frame format.

   – Exit from the Interface Configuration Mode

   ```
   iSCom(config)# exit
   ```

2. View the configuration details by executing the following show command.

   FOR EXAMPLE: perform the following:

   ```
   iSCom show vlan protocols-group
   Protocol Group Table
   --------------------
   ------------------------------------------
   Frame Type      Protocol             Group
   ------------------------------------------
   Enet-v2         IP                  10
   ------------------------------------------
   ```

3. Map the protocol group 10 to the *VLAN* identifier 4 and to the specified interface Gi0/7.

   FOR EXAMPLE: perform the following:

– Enter the Global Configuration Mode.

```
iSCom# configure terminal
```

– Go to port interface gigabitethernet 0/7.

```
iSCom(config)# interface gigabitethernet 0/7
iSCom(config-if)# switchport map protocols-group 10 vlan 4
```

**NOTE:** In this example, the interface GI0/7 is assigned to protocol-based group 10 which is mapped to *VLAN* 4.

```
iSCom(config)# exit
iSCom# show protocol-vlan
Port Protocol Table
-------------------------------------
Port           Group          Vlan ID
-------------------------------------
Gi0/7          10             4
-------------------------------------
```

**NOTE:** From the above shown Port protocol table, we can see that the IP packets received on the interface GI0/ 7 have *VLAN* ID of 4.

# 3.20. Service Classes and Expedited Traffic Handling

CONTEXT:

iSCom's *VLAN* supports multiple traffic classes for handling 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 received priority tagged data frame 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 Maximum Number of Traffic Classes

CONTEXT:

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

1. Execute the following commands to configure the maximum number of traffic classes supported on a port.

   FOR EXAMPLE: perform the following:

   – Enter the Global Configuration Mode.

   ```
   iSCom# configure terminal
   ```

   – Enter the Interface Configuration Mode.

   ```
   iSCom(config)# interface gigabitethernet 0/2
   ```

– Configure the maximum number of traffic classes that can be supported on a port.

```
iSCom(config-if)# vlan max-traffic-class 4
```

– Exit from the Interface Configuration Mode

```
iSCom(config-vlan)# end
```

2. View the configuration information by executing the following show command.

FOR EXAMPLE: `iSCom` show vlan traffic-classes port gigabitethernet 0/2

```
Max Vlan Traffic Class table
-------------------------
Port     Max Traffic Class
-----    -----------------
Gi0/2    4

Traffic Class table
---------------------
Port     Priority    Traffic Class
-----    ---------   -------------
Gi0/2    0           1
Gi0/2    1           0
Gi0/2    2           0
Gi0/2    3           1
Gi0/2    4           2
Gi0/2    5           2
Gi0/2    6           3
Gi0/2    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. As per 802.1p, traffic priority class values are from 0 (low) through 7 (high).

1. Execute the following commands to map a priority to a traffic class.

FOR EXAMPLE: perform the following:

– Enter the Global Configuration Mode.

```
iSCom# configure terminal
```

– Enter the Interface Configuration Mode.

```
iSCom(config)# interface gigabitethernet 0/2
```

– Map the priority to traffic class.

```
iSCom(config-if)# vlan map-priority 7 traffic-class 1
```

– Exit from the Interface Configuration Mode

```
iSCom(config-vlan)# end
```

2. View the configuration information by executing the following show command

   FOR EXAMPLE: `iSCom` show vlan traffic-classes port gigabitethernet 0/2

```
Max Vlan Traffic Class table
-------------------------
Port     Max Traffic Class
-----    -----------------
Gi0/2    4

Traffic Class table
---------------------
Port     Priority    Traffic Class
-----    ---------   -------------
Gi0/2    0           1
Gi0/2    1           0
Gi0/2    2           0
Gi0/2    3           1
Gi0/2    4           2
Gi0/2    5           2
Gi0/2    6           3
Gi0/2    7           1
```

# 3.21. Configuring Port Filtering

## Configuring Acceptable Frame Type

CONTEXT:

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

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

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

   FOR EXAMPLE: perform the following:

   – Enter the Global Configuration Mode.

```
iSCom# configure terminal
```

   – Enter the Interface Configuration Mode.

```
iSCom(config)# interface gigabitethernet 0/2
```

   – Configure the acceptable frame type for the port.

```
iSCom(config-if)# switchport acceptable-frame-type tagged
```

– Exit from the Interface Configuration Mode

```
iSCom(config-if)# end
```

2. View the configuration information by executing the following show command

FOR EXAMPLE: `iSCom` show vlan port config port gigabitethernet 0/2

```
vlan Port configuration table
------------------------------
Port Gi0/2
Bridge Port Type                    : Customer Bridge Port
Port Vlan ID                        : 10
Port Acceptable Frame Type          : Admit Only Vlan Tagged
Port Mac Learning Status            : Enabled
Port Ingress Filtering              : Enabled
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
Ingress EtherType                   : 0x8100
Egress EtherType                    : 0x8100
Egress TPID Type                    : Portbased
Allowable TPID 1                    : 0x0
Allowable TPID 2                    : 0x0
Allowable TPID 3                    : 0x0
Reflection Status                   : Disabled
-------------------------------------------------------
```

**NOTE:**

When set to “tagged”, the device will discard untagged and priority tagged frames received on the port and will “admit only VLAN tagged” frames.

## Mapping Priority to Traffic Class

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*.

1. Execute the following commands to enable ingress filtering on a port.

   FOR EXAMPLE: perform the following:

   – Enter the Global Configuration Mode.

   ```
   iSCom# configure terminal
   ```

   – Enter the Interface Configuration Mode.

   ```
   iSCom(config)# interface gigabitethernet 0/1
   ```

   – Enable ingress filtering for that interface.

   ```
   iSCom(config-if)# switchport ingress-filter
   ```

   – Exit from the Interface Configuration Mode

   ```
   iSCom(config-if)# end
   ```

2. View the configuration information by executing the following show command - Port Ingress Filtering is set to enabled.

   FOR EXAMPLE: `iSCom` show vlan config port gigabitethernet 0/1

   ```
   Vlan Port configuration table
   -----------------------------
   Port Gi0/1
   Bridge Port Type                    : Customer Bridge Port
   Port Vlan ID                        : 1
   Port Acceptable Frame Type          : Admit All
   Port Mac Learning Status            : Enabled
   Port Ingress Filtering              : Enabled
   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
   Ingress EtherType                   : 0x8100
   Egress EtherType                    : 0x8100
   ```

```
Egress TPID Type                    : Portbased
Allowable TPID 1                    : 0x0
Allowable TPID 2                    : 0x0
Allowable TPID 3                    : 0x0
Reflection Status                   : Disabled
-----------------------------------------------------
```

## Configuring Filtering Utility Criteria

CONTEXT: Filtering Utility Criteria can be configured as **Default** or **Enhanced**. By default, the Filtering Utility Criteria will be selected as **Default**.

1. Execute the following commands to change the Filtering Utility Criteria on a port.

   FOR EXAMPLE: perform the following:

   – Enter the Global Configuration Mode.

   ```
   iSCom# configure terminal
   ```

   – Enter the Interface Configuration Mode.

   ```
   iSCom(config)# interface gigabitethernet 0/1
   ```

   – Enable ingress filtering for that interface.

   ```
   iSCom(config-if)# switchport filtering-utility-criteria enhanced
   ```

   – Exit from the Interface Configuration Mode

   ```
   iSCom(config-if)# end
   ```

2. View the configuration information by executing the following show command - the Filtering Utility Criteria is set to enhanced.

   FOR EXAMPLE: `iSCom` show vlan config port gigabitethernet 0/1

   ```
   Vlan Port configuration table
   ------------------------------
   Port Gi0/1
   Bridge Port Type                    : Customer Bridge Port
   Port Vlan ID                        : 1
   Port Acceptable Frame Type          : Admit All
   Port Mac Learning Status            : Enabled
   Port Ingress Filtering              : Enabled
   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          : Enhanced
Port Protected Status               : Disabled
Ingress EtherType                   : 0x8100
Egress EtherType                    : 0x8100
Egress TPID Type                    : Portbased
Allowable TPID 1                    : 0x0
Allowable TPID 2                    : 0x0
Allowable TPID 3                    : 0x0
Reflection Status                   : Disabled
-----------------------------------------------------
```

# 4. Port Packet Reflection Feature

## 4.1. Configuration Guidelines

Reflection status will be configurable per port.

## 4.2. Default Configurations

Packet reflection status of a port is disabled by default

## 4.3. Configuration Steps

1. Execute the following commands to enable reflection status of a port.

   FOR EXAMPLE: perform the following:

   – Enter the Global Configuration Mode.

   ```
   iSCom# configure terminal
   ```

   – Enter the Interface Configuration Mode.

   ```
   iSCom(config)# interface gigabitethernet 0/1
   ```

   – Configure the packet reflection on port Gi 0/1

   ```
   iSCom(config-if)# set packet-reflection enable
   iSCom(config-if)# no shutdown
   ```

   – Exit from the Interface Configuration Mode

   ```
   iSCom(config-if)# end
   ```

2. View the configuration information by executing the following show command

   FOR EXAMPLE: `iSCom` show vlan port config port gi 0/1

   FOR EXAMPLE: Vlan Port configuration table

   ```
   ------------------------------
   Port Gi0/1
   Bridge Port Type                    : Customer Bridge Port
   Port Vlan ID                        : 1
   Port Acceptable Frame Type          : Admit All
   Port Mac Learning Status            : Enabled
   Port Ingress Filtering              : Enabled
   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
Ingress EtherType                   : 0x8100
Egress EtherType                    : 0x8100
Egress TPID Type                    : Portbased
Allowable TPID 1                    : 0x0
Allowable TPID 2                    : 0x0
Allowable TPID 3                    : 0x0
Reflection Status                   : Enabled
-----------------------------------------------------
```

3. Execute the following commands to disable reflection status of a port.

   FOR EXAMPLE: perform the following:

   – Enter the Global Configuration Mode.

   ```
   iSCom# configure terminal
   ```

   – Enter the Interface Configuration Mode.

   ```
   iSCom(config)# interface gigabitethernet 0/1
   ```

   – Configure the packet reflection on port Gi 0/1

   ```
   iSCom(config-if)# set packet-reflection disable
   iSCom(config-if)# no shutdown
   ```

   – Exit from the Interface Configuration Mode

   ```
   iSCom(config-if)# end
   ```

4. View the configuration information by executing the following show command

   FOR EXAMPLE: `iSCom` show vlan port config port gi 0/1

   FOR EXAMPLE: Vlan Port configuration table

```
------------------------------
Port Gi0/1
Bridge Port Type                : Customer Bridge Port
Port Vlan ID                    : 1
Port Acceptable Frame Type      : Admit All
Port Mac Learning Status        : Enabled
Port Ingress Filtering          : Enabled
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
Ingress EtherType                   : 0x8100
Egress EtherType                    : 0x8100
Egress TPID Type                    : Portbased
Allowable TPID 1                    : 0x0
Allowable TPID 2                    : 0x0
Allowable TPID 3                    : 0x0
Reflection Status                   : Disabled
-----------------------------------------------------
```

# 4.4. Show Running Config

1. View the non-default configuration for reflection status for the port GI0/1 with enabled packet reflection using below command.

   FOR EXAMPLE:

```
iSCom show running-config interface gigabitethernet 0/11
#Building configuration...
!
interface gigabitethernet 0/1
!
interface gigabitethernet 0/1
mac-addr e8:e8:75:90:5f:82
no shutdown
!
interface gigabitethernet 0/1
set packet-reflection enable
!
!
end
```