

14 Managing 802.1Q Groups

802.1Q is an IEEE standard for sending frames through the network tagged with VLAN identification. Alcatel has developed its own implementation of VLANs that closely follows the IEEE standard (and enhances it). However, Alcatel VLANs and 802.1Q VLANs cannot interoperate without special configuration.

If your network uses 802.1Q tagging, you will need to create 802.1Q groups and specify ports that will handle 802.1Q traffic. This can be done for both 10/100 and Gigabit Ethernet Mammoth modules.

Support for 802.1Q in the OmniSwitch allows you to set up port-based groups that interoperate with 802.1Q-compliant equipment from other networking vendors.

On Gigabit Ethernet modules only, a proprietary version of 802.1Q called X802.1Q is supported. See *X802.1Q vs. IEEE 802.1Q* on page 14-3 for more information on the differences between these versions.

Ports added to an 802.1Q group are done using Ethernet switch services. When using the service commands to add ports to an 802.1Q group, multiple spanning tree instances on a single port are supported. See *Single vs. Multiple Spanning Tree* on page 14-3 for more information on the differences between single and multiple spanning tree.

The 802.1Q specification defines *trunk* and *access* ports (and links). Trunk links are LAN segments used for multiplexing VLANs between VLAN bridges. All devices that are directly connected to a trunk link must be VLAN-aware. Access links are LAN segments used to multiplex one or more VLAN-unaware devices into a port of a VLAN bridge. (This also includes a hybrid with some tagged and some untagged Groups.)

◆ Note ◆

The use of the word *trunk* in this document should not be confused with the IEEE use of *trunking* with link aggregation (such as OmniChannel and IEEE 802.3ad). The general meaning of a trunk is an inter-switch link over which different types of traffic are multiplexed.

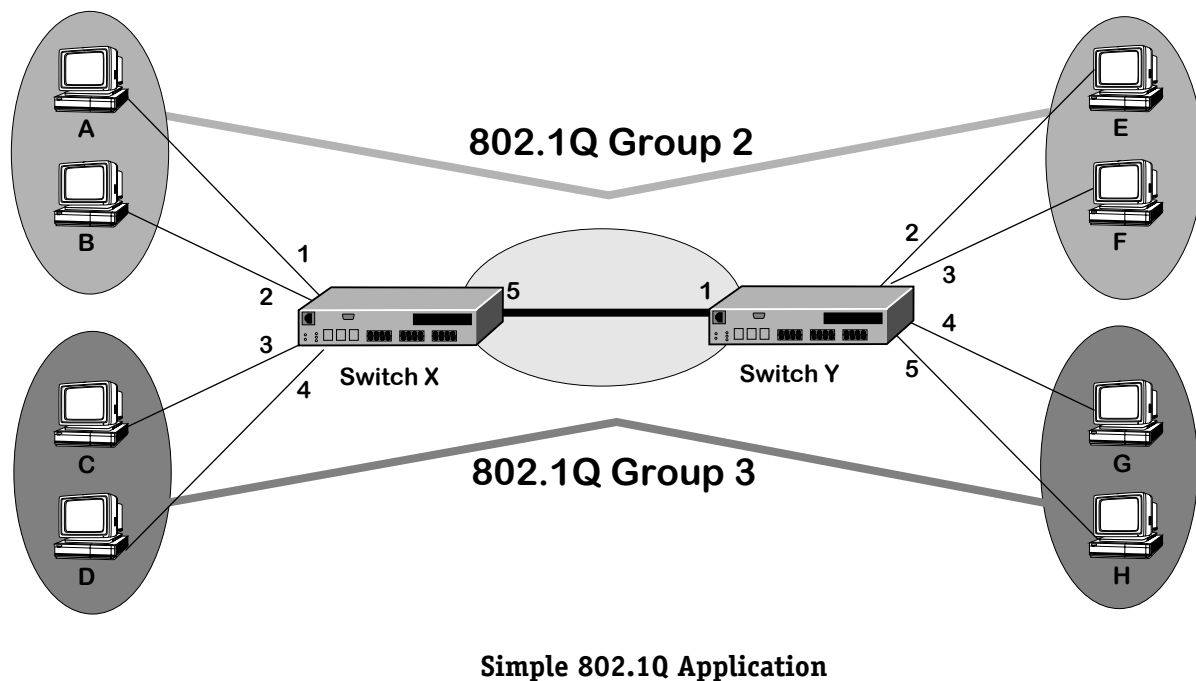
IEEE 802.1Q Sections Not Implemented

Some portions of the 802.1Q specification have not yet been implemented in the OmniStack. These include the following:

- The tunneling of non-canonical 802.5 frames is not supported, since the Alcatel OmniStack handles such traffic by frame translations. This tunneling mode of operation involves the Token Ring Encapsulation Flag in the 802.1Q header. It is not set or interpreted in the Alcatel OmniStack implementation.
- The Alcatel OmniStack implementation does not support the SNAP-encoded Tag Header (which is intended for Token Ring/FDDI LANs). Only the Ethernet-encoded 4-byte Tag Header is supported (and only Ethernet LANs are supported).
- Alcatel OmniStack does not support the Generic Attribute Registration Protocol (GARP) Multicast Registration Protocol (GMRP) and GARP VLAN Registration Protocol (GVRP) that are defined in 802.1Q.

Application Example

The following diagram illustrates a simple 802.1Q application:



In the above diagram, the PC devices need to be segmented into different 802.1Q VLANs. The switch port to which each device attaches is assigned to a mobile group, as illustrated above. End stations are assigned to 802.1Q groups based on the configuration of the port to which they are attached.

Devices A and B need to be in the same group as devices E and F. Similarly, devices C and D need to be in the same group as devices G and H. To implement this configuration, the switch ports to which these devices attach need to be assigned to the appropriate groups. This is done by creating trunking services that attach the port to an 802.1Q group.

Switch ports 1 and 2 on Switch X (attached to devices A and B) would be placed in the same 802.1Q group—Group 2, for example—as ports 2 and 3 on Switch Y (attached to devices E and F). Switch ports 3 and 4 on Switch X (attached to devices C and D) would be placed in the same group—Group 3—as ports 4 and 5 on Switch Y (attached to devices G and H). Switch port 5 on Switch X and port 1 on Switch Y, which form the Ethernet backbone between the two switches, would need to be included in 802.1Q Groups 2 and 3 in order to support the backbone traffic between all of these devices.

Only Mammoth ASIC-based Ethernet ports can be part of an 802.1Q group. Existing policies for a mobile group will not be affected by the group's support for 802.1Q.

By matching switch ports with 802.1Q groups, you are statically assigning the port to the group. Once assigned, an 802.1Q port cannot be dynamically assigned to another group. However, the same switch port can be statically assigned to more than one 802.1Q group.

X802.1Q vs. IEEE 802.1Q

Alcatel's original implementation of the 802.1Q specification (prior to its official approval) was a proprietary version called X802.1Q. This proprietary version is only available on Gigabit Ethernet modules.

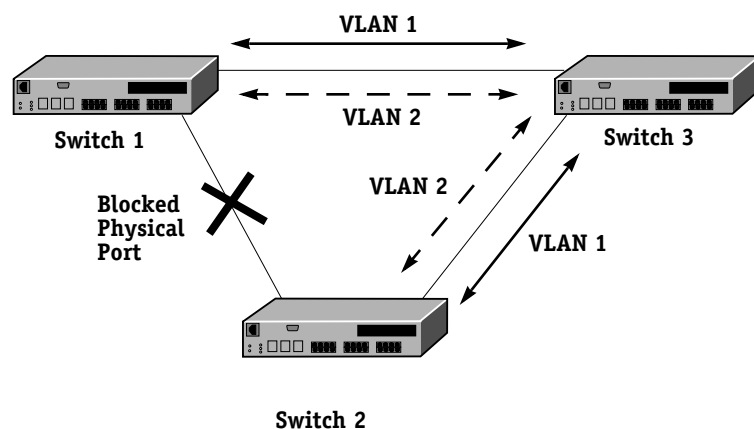
When adding an 802.1Q group to a Gigabit port a field in the display allows you to select either the proprietary 802.1Q (X802.1Q) or IEEE 802.1Q. For more information on adding an X802.1Q group to a port, see *Configuring 802.1Q on Gigabit Ethernet Ports* on page 14-8.

When implementing X802.1Q on Gigabit Ethernet modules, use the following guidelines:

- The number of groups must be equal on both sides of the link.
- The group IDs must be the same on both sides of the link.
- You must add groups in the same order on both ends of the link. For example, if you add groups 1, 2, 3, 4, and 5 on the local switch, you must add the same five groups in the same order on the remote switch. If groups are not added in this manner, 802.1Q packets will not be routed correctly.
- You must delete groups in the same order on both ends of the link. For example, if you delete groups 1, 2, 3, 4, and 5 on the local switch, you must delete the same five groups in the same order on the remote switch. If groups are not deleted in this manner, 802.1Q packets will not be routed correctly.
- You must use Alcatel equipment on both sides of the link.

Single vs. Multiple Spanning Tree

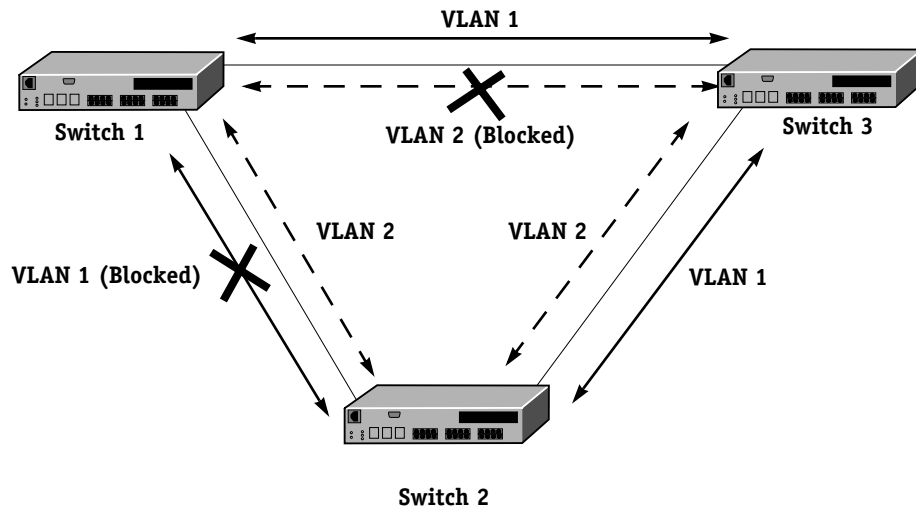
In previous releases of the OmniStack software (4.0 and earlier), spanning tree support was done on a per port basis. In other words, a physical port could only participate in one instance of a spanning tree on the network. If a network is passing both untagged and IEEE tagged frames, single spanning tree support could lead to packets being lost. Lost packets could occur if a port specifically assigned to handle one type of traffic (e.g. IEEE 802.1Q) is blocked by spanning tree, forcing traffic for that port to move to a port not assigned to handle IEEE 802.1Q traffic.



Port Based Spanning Tree

In the above diagram, the physical connection between Switch 1 and Switch 2 is blocked by spanning tree. No traffic can pass over the connected ports.

Release 4.1 (and later) of the OmniStack allows for multiple spanning tree instances on a single port. Put another way, a port can be part of separate spanning trees, with no impact on packet delivery. This is done by basing spanning tree configuration on groups rather than physical ports.

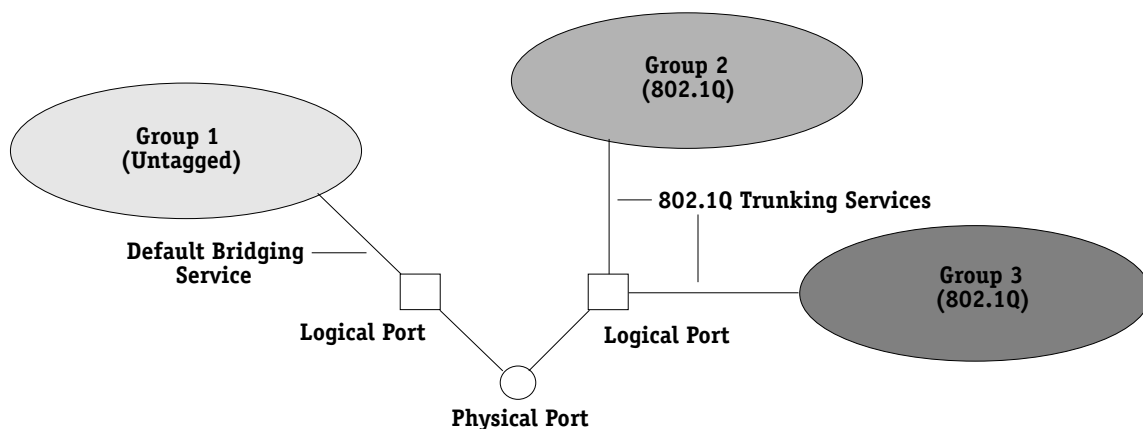


Group Based Spanning Tree

The above diagram shows how traffic on VLAN 1 is blocked between Switch 1 and Switch 2, while VLAN 2 traffic is allowed to pass. The reverse is true for Switch 1 and Switch 3 (i.e., VLAN 2 traffic is blocked, while VLAN 1 traffic is allowed to pass).

Service commands are used in Ethernet modules to assign groups to 10/100 and Gigabit ports. The commands **cas**, **das**, **mas**, and **vas** create, delete, modify, and view trunk services created to handle 802.1Q traffic over an Ethernet backbone. This trunk service, coupled with the default bridging service, allows you to pass both tagged and untagged frames over the same port.

The following diagram shows the logical structure of the trunked 802.1Q groups:



Logical Configuration of Multiple Groups on a Single Port

In the above diagram, Groups 2 and 3 have been trunked to the physical port with an 802.1Q trunking service.

Since spanning tree is group based, the physical port in the above diagram participates in two spanning tree instances: one for untagged traffic and one for 802.1Q tagged traffic. Both types of frames can now pass through the same port.

◆ **Important Note** ◆

Since a trunk is a service, and Alcatel switches have a 16 (10/100) or 15 (Gigabit) services per port limit, only 15 or 14 802.1Q groups can be added to the same port. In both cases, a default bridge service occupies one of the service slots.

Giga I and II ASIC Modules

Some early versions of the Gigabit Ethernet modules for the Omni Switch/Router use the Giga I or II ASIC. These modules do *not* support standard IEEE 802.1Q tagging.

You can use the **slot** command to determine if your Gigabit Ethernet module uses the Giga 1 or II ASIC. Use the number shown in the **Part-Number** field displayed by the **slot** command and compare it to the number in the **Part Number** columns in the table below. For example, if you have a GSX-FM-2 and the number in the **Part-Number** field shown by the **slot** command is **05023726**, then your module has a Giga 1 ASIC.

◆ **Note** ◆

See Chapter 7, “Switch-Wide Parameters,” for more information on the **slot** command

Gigabit Ethernet Modules with the Giga I or II ASIC

| Module | Part Number for Giga I (Shown in Slot Command) | Part Number for Giga II (Shown in Slot Command) |
|----------|---|--|
| GSM-FM-2 | N/A | 05026129 |
| GSM-FS-2 | N/A | 05026130 |
| GSX-FM-2 | 05023726 | 05023731 |
| GSX-FM-4 | 05021526 | 05021529 |
| GSX-FS-2 | 05023728 | 05023730 |
| GSX-FS-4 | 05021528 | 05021530 |

For information on configuring 802.1Q groups for use over Gigabit ports, see *Configuring 802.1Q on Gigabit Ethernet Ports* on page 14-8.

Assigning an 802.1Q Group to a Port

Previous versions of the OmniStack (version 4.0 and earlier) only allowed for single spanning tree configured 802.1Q groups using the menu commands **addqgp**, **viqgp**, and **delqgp**. These commands have been invalidated in the 4.1 release and replaced by the service commands **cas**, **mas**, **vas**, and **das**.

The procedure for assigning an 802.1Q group to a port is slightly different, depending on whether the port is a 10/100 or Gigabit Ethernet port.

For information on assigning an 802.1Q group to a 10/100 port, see *Configuring 802.1Q on 10/100 Ethernet Ports* on page 14-6. For information on assigning an 802.1Q group to a Gigabit port, see *Configuring 802.1Q on Gigabit Ethernet Ports* on page 14-8.

Configuring 802.1Q on 10/100 Ethernet Ports

Use the **cas** command to assign 802.1Q groups to 10/100 ports. To use this command, follow the steps below.

1. Enter **cas** at the system prompt, as shown:

```
cas <slot>/<port>
```

where **<slot>** is the slot of the module, and **<port>** is the port number that is to be added to the group. For example, to add port 3 on slot 5, you would enter:

```
cas 5/3
```

2. The following prompt displays:

```
Slot 3 Port 5 Ethernet 802.1Q Service
1) Description                :
2) Group ID                   :
3) Tag                        :
4) Priority                    :
5) Mode
    Multiple Spanning Tree (3)
    Single Spanning Tree   (4) :
```

You can modify the parameters by entering the line number, and equal sign, and then the value for the parameter. For example, to change the **Group ID** to **5**, you would enter **2** (the line number for **Group ID**), an equal sign (=), and a **5** (the group number), as shown:

```
2=5
```

3. Remember to save your changes by typing **save** at the system prompt when you have finished with the configuration.

The following sections describes the parameters displayed in the screen above.

Description

A textual description (up to thirty characters) for the service created when adding the port to a group.

Group ID

The number of the group to which the port is to be added.

Tag

A simple identifier that is added to 802.1Q packets for identification. This value can be any number between 1 and 4094.

Priority

The priority level of the tagged frames. Enter a number from 0 to 7, with 7 being the highest priority.

Mode

This field allows you to choose either multiple or single spanning tree. This option only appears if the module uses 10/100 Ethernet ports. Once you select a type of spanning tree for a port, the port automatically retains the spanning tree selection for any other group it is added to.

For example, suppose port 3/1 is assigned to be in Group 2, and to use single spanning tree. If the port were to be assigned to another group, it would automatically set itself to use single spanning tree for that group as well.

For more information on single vs. multiple spanning tree, see *Single vs. Multiple Spanning Tree* on page 14-3.

Configuring 802.1Q on Gigabit Ethernet Ports

Use the **cas** command to assign 802.1Q groups to Gigabit ports. To use this command, follow the steps below.

1. Enter **cas** at the system prompt, as shown:

```
cas <slot>/<port>
```

where **<slot>** is the slot of the module, and **<port>** is the port number that is to be added to the group. For example, to add port 3 on slot 5, you would enter:

```
cas 5/3
```

2. The following prompt displays:

```
Slot 3 Port 5 Ethernet 802.1Q Service
1) Description                      :
2) Group ID                        :
3) Tag                             :
4) Priority                        :
5) Mode
   Proprietary Tagging (1)
   IEEE Standard Tagging (2)      :
```

You can modify the parameters by entering the line number, and equal sign, and then the value for the parameter. For example, to change the **Group ID** to **5**, you would enter **2** (the line number for **Group ID**), an equal sign (=), and a **5** (the group number), as shown:

```
2=5
```

3. Remember to save your changes by typing **save** at the system prompt when you have finished with the configuration.

Description

A textual description (up to thirty characters) for the service created when adding the port to a group.

Group ID

The number of the group to which the port is to be added.

Tag

A simple identifier that is added to 802.1Q packets for identification. This value can be any number between 1 and 4094.

Priority

The priority level of the tagged frames. Enter a number from 0 to 7, with 7 being the highest priority.

Mode

This field allows you to choose either the proprietary 802.1Q (X802.1Q) or IEEE 802.1Q versions. Enter **1** for X802.1Q, or **2** for IEEE 802.1Q. This option only appears if the module uses Gigabit Ethernet ports. Once you select the 802.1Q type, the port automatically retains the selection for any other group it is added to.

For example, suppose port 3/1 is assigned to be in Group 2, and to use IEEE 802.1Q. If the port were to be assigned to another group, it would automatically set itself to use IEEE 802.1Q for that group as well.

For more information on proprietary vs. IEEE 802.1Q, see *X802.1Q vs. IEEE 802.1Q* on page 14-3.

Modifying 802.1Q Groups

802.1Q groups for both 10/100 and Gigabit Ethernet ports can be modified using the **mas** command. The procedure is slightly different in each case.

To modify the configuration of an 802.1Q group for 10/100 ports, use the **mas** command as shown:

```
mas <slot>/<port> <instance> <groupid>
```

where **<slot>** is the slot number of the module on the switch, **<port>** is the port number where the service was created, **<instance>** is the identifier for the service on this port, and **<groupid>** is the number of the group that the port belongs to. For example, to modify 802.1Q service for group 2, instance 1, on port 5 of slot 2, enter:

```
mas 2/5 1 2
```

To modify the configuration of an 802.1Q group for Gigabit ports, use the **mas** command as shown:

```
mas <slot>/<port> <instance>
```

where **<slot>** is the slot number of the module on the switch, **<port>** is the port number where the service was created, and **<instance>** is the identifier for the service on this port. For example, to modify 802.1Q service instance 1 on port 5 of slot 2, enter:

```
mas 2/5 1
```

In either cases, a screen similar to the following is displayed:

```
Slot 2 Port 5 Ethernet 802.1Q Service
```

```
1) Tag           : 3  
2) Priority       : 0
```

To change a field setting, enter the line number, and equal sign, and the new value. For example, to change the **Priority** setting to **7**, you would enter a **2** (the line number for priority), an equal sign (=), and a **7**, as shown:

```
2=7
```

Remember to save the changes to the service by enter **save** at the system prompt when finished.

To find the instance and group assignment of a port, use the **vas** command. See *Viewing 802.1Q/X802.1Q Groups in a Port* on page 14-11 for more information.

Viewing 802.1Q/X802.1Q Groups in a Port

To view the ports assigned to an 802.1Q group, enter the **vas** command at the system prompt as shown:

```
vas <slot>/<port>
```

where **<slot>** is the slot number of the module on the switch and **<port>** is the port number where the service was created. For example, to view an 802.1Q service on port 5 of slot 2, enter:

```
vas 2/5
```

A screen similar to the following is displayed:

| Gigabit Ethernet Services | | | | | | | | |
|---------------------------|------|----------|-------|----------|-----|----------|------|-------------|
| Slot | Port | Instance | Vport | Group Id | Tag | Priority | Mode | Description |
| ==== | ==== | ===== | ===== | ===== | == | ===== | ==== | ===== |
| 2 | 5 | 1 | 27 | 3 | 3 | 0 | IEEE | 802.1Q |

As a variation of this command, it is possible to enter **vas** without a slot or port number. This will display all services configured for the switch.

◆ Note ◆

The above screen is for Gigabit ports. The display is slightly different for 10/100 ports.

The following section describes the fields displayed using the **vas** command.

Slot. The slot number of the switch on which the service is located.

Port. The port number of the slot on which the service is located.

Instance. The service identifier for the 802.1Q service.

Vport. The virtual port number that the service uses.

Group Id. The group identifier for the group attached to this service.

Tag. The tag information entered into tagged frames, as specified when creating the service.

Priority. The priority number assigned to packets from this service.

Mode. This field displays different information depending on whether the switch ports are 10/100 or Gigabit. If the ports are 10/100, this field shows either multiple or single spanning tree. If the ports are Gigabit, this field shows either proprietary 802.1Q (X802.1Q) or IEEE 802.1Q.

For more information on single vs. multiple spanning tree, see *Single vs. Multiple Spanning Tree* on page 14-3. For more information on proprietary vs. IEEE 802.1Q, see *X802.1Q vs. IEEE 802.1Q* on page 14-3.

Description. A textual description used to identify the service.

Deleting 802.1Q/X802.1Q Groups from a Port

802.1Q groups for both 10/100 and Gigabit Ethernet ports can be deleted using the **das** command. The procedure is slightly different in each case.

To delete an 802.1Q group from a 10/100 port, use the **das** command as shown:

```
das <slot>/<port> <instance> <groupid>
```

where **<slot>** is the slot number of the module on the switch, **<port>** is the port number where the service was created, **<instance>** is the identifier for the service on this port, and **<groupid>** is the number of the group that the port belongs to. For example, to delete an 802.1Q service for group 2, instance 1, on port 5 of slot 2, enter:

```
das 2/5 1 2
```

To delete 802.1Q groups from a Gigabit port, enter the **das** command as shown:

```
das <slot>/<port> <instance>
```

where **<slot>** is the slot number of the module on the switch, **<port>** is the port number where the service was created, and **<instance>** is the identifier for the service on this port. For example, to delete 802.1Q service instance 1 on port 5 of slot 2, enter:

```
das 2/5 1
```

In either case, a message will appear confirming the delete operation:

```
802.1Q service deleted for Group ID 3 on 3/9 (slot/Port)
```

◆ Note ◆

You must delete groups in the same order on both ends of the link. For example, if you delete groups 1, 2, 3, 4, and 5 on the local switch, you must delete the same five groups in the same order on the remote switch. If groups are not deleted in this manner, 802.1Q packets will not be routed correctly.