Chapter 5

Configuring VLAN and S-VLAN Subinterfaces

This chapter describes how to configure VLAN and S-VLAN subinterfaces on E-series routers.

This chapter contains the following sections:

VLAN Overview

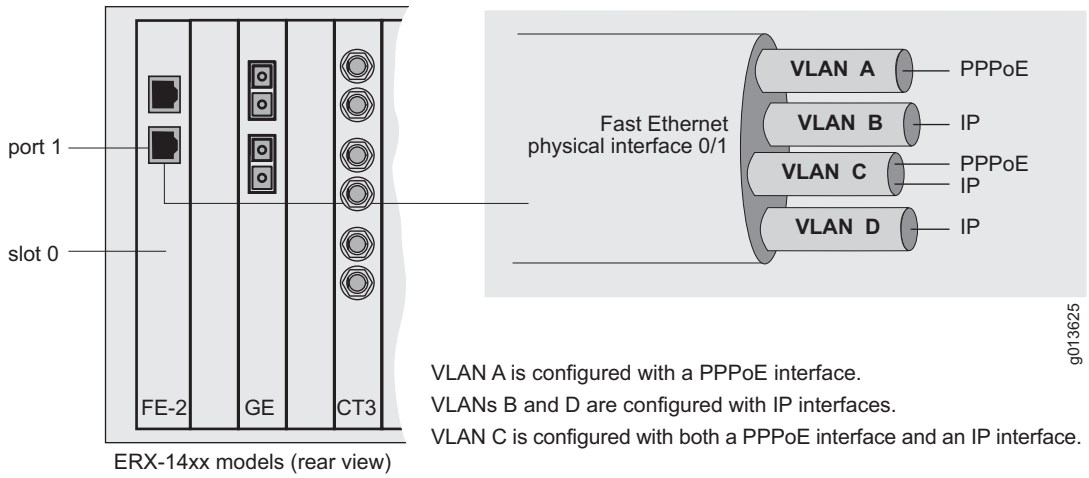
A virtual LAN (VLAN) enables multiplexing multiple IP and PPPoE interfaces and MPLS interfaces over a single physical Ethernet port. This multiplexing is accomplished through VLAN subinterfaces. Ethernet interfaces support the 802.1q-1998 IEEE Standards for Local and Metropolitan Area Networks: Virtual Bridged Local Area Networks, which the router uses as its standardized format for frame tagging.

The Ethernet V2 frame format enables multiplexing of different protocols over a single physical link. IEEE 802.1q compatibility extends the frame format by adding a tag that contains a VLAN ID. This feature enables multiplexing of different channels (VLANs) over the physical link; each channel is able to multiplex different protocols.

This capability works very much like ATM encapsulation as described in RFC 2684—Multiprotocol Encapsulation over ATM Adaptation Layer 5 (September 1999). This encapsulation type enables multiplexing of multiple protocols over a single ATM virtual circuit (VC).

As shown in Figure 13, VLANs are similar to ATM VCs, with the VLAN ID serving the same function as the virtual path identifier (VPI) and virtual channel identifier (VCI) to multiplex the different channels over the physical link. The Ethernet protocol type serves the same function within a VLAN as the logical link control (LLC) subnetwork attachment point (SNAP) within a VC, to multiplex the different protocols over the channel.

Figure 13: Use of VLANs to Multiplex Different Protocols over a Single Physical Link



In a VLAN configuration, the router can send VLAN 0 *tagged* or *untagged frames*.

All VLAN subinterfaces use the MAC address of the Ethernet interface over which they are configured. However, some configurations, such as multiple IP over VLAN subinterfaces, require that you connect many VLAN subinterfaces to a single device. In these cases, the device uses the MAC address to identify and select the correct VLAN to use. When the MAC address is the same for all VLANs, uneven load balancing of traffic occurs. To ensure proper load balancing, you must assign unique MAC addresses to the individual VLAN subinterfaces that are connected to the device. Any ARP requests and responses generated for the IP address assigned to a VLAN subinterface use this MAC address.

You must assign the MAC address when you configure the VLAN ID. If you change the MAC address of the VLAN subinterface after you configure it, system errors can occur. To change the MAC address, you must first remove the VLAN subinterface and then reconfigure it.

For more information, see:

- *JUNOSe IP, IPv6, and IGP Configuration Guide, Chapter 1, Configuring IP*
- *JUNOSe Link Layer Configuration Guide, Chapter 10, Configuring Point-to-Point Protocol over Ethernet*

S-VLAN Overview

As described in *VLAN Overview* on page 163, VLANs permit multiplexing multiple IP interfaces and PPPoE interfaces over a single physical Ethernet port by creating VLAN subinterfaces. As specified in IEEE Standard 802.1q, the 12-bit VLAN identifier's tagged frames enables the construction of a maximum of 4096 distinct VLANs. In an Ethernet B-RAS application environment, however, this VLAN limit is inadequate. A stacked VLAN (S-VLAN) provides a two-level VLAN tag structure, which extends the VLAN ID space to more than 16 million VLANs.

Creating an S-VLAN requires the use of a second encapsulation tag. The router performs decapsulation twice, once to get the S-VLAN tag and once to get the VLAN tag. This *double tagging* approach enables more than 16 million address possibilities, which more than satisfies the scaling requirement for Ethernet B-RAS applications.

VLAN and S-VLAN subinterfaces can coexist over the same VLAN major interface. You configure S-VLANs in the same way that you configure VLANs, with the addition of certain commands.

NOTE: See *JUNOSe Release Notes*, *Appendix A*, *System Maximums* for S-VLAN limitations.

Like VLANs, all S-VLAN subinterfaces use the MAC address of the Ethernet interface over which they are configured. For more information about assigning unique MAC address to the S-VLAN subinterface when assigning VLAN or S-VLAN IDs, see *VLAN Overview* on page 163.

VLAN and S-VLAN Platform Considerations

You can configure VLAN and S-VLAN subinterfaces on the following E-series routers:

- E120 router
- E320 router
- ERX-1440 router
- ERX-1410 router
- ERX-710 router
- ERX-705 router
- ERX-310 router

Module Requirements

For information about the modules supported on E-series routers:

- See the *ERX Module Guide* for modules supported on ERX-7xx models, ERX-14xx models, and the ERX-310 router.
- See the *E120 and E320 Module Guide* for modules supported on the E120 router and the E320 router.

Interface Specifiers

The configuration task examples in this chapter use the format for ERX-7xx models, ERX-14xx models, and the ERX-310 router to specify a VLAN or S-VLAN subinterface.

For ERX-7xx models, ERX-14xx models, and ERX-310 routers, use the *slot*/*port*[.*subinterface*] format. For example, the following command specifies a VLAN subinterface configured on port 0 of an I/O module in slot 4.

```
host1(config)#interface fastEthernet 4/0.1
```

For E120 and E320 routers, use the *slot*/*adapter*/*port*[.*subinterface*] format, which includes an identifier for the bay in which the I/O adapter (IOA) resides. For example, the following command specifies a VLAN subinterface configured on port 0 of the IOA installed in the upper adapter bay of slot 3.

```
host1(config)#interface gigabitEthernet 3/0/0.1
```

For more information about interface types and specifiers on E-series models, see *Interface Types and Specifiers* in *JUNOSe Command Reference Guide, About This Guide*.

VLAN and S-VLAN References

For more information about VLAN and S-VLAN implementations, consult the following resources:

- IEEE 802.1q (Virtual LANs)

Creating a VLAN Subinterface

Ethernet interfaces support IP, PPPoE, MPLS, or both IP and PPPoE on each VLAN. In addition to a VLAN major interface level, a VLAN subinterface level distinguishes the VLAN.

NOTE: You cannot configure VLANs on the Fast Ethernet port of the SRP module.

Tasks to configure VLAN subinterface are:

- Creating a VLAN Major Interface on page 167
- Configuring IP over VLAN on page 167
- Configuring PPPoE over VLAN on page 169
- Configuring MPLS over VLAN on page 170
- Configuring IP over VLAN and PPPoE over VLAN on page 171

Creating a VLAN Major Interface

To use VLANs, you must first configure the Ethernet interface for VLAN encapsulation. This creates the VLAN major interface. For example:

1. Specify a Fast Ethernet, Gigabit Ethernet, or 10-Gigabit Ethernet port.

   host1(config)#**interface fastEthernet 4/0**

2. Specify VLAN as the encapsulation method.

   host1(config-if)#**encapsulation vlan**

   The router creates the VLAN major interface.

You can now create multiple VLAN subinterfaces to carry higher-level protocols. For examples, see *Creating a VLAN Subinterface*, next.

Configuring IP over VLAN

To configure IP over VLAN over an Ethernet interface:

1. Specify a Fast Ethernet, Gigabit Ethernet, or 10-Gigabit Ethernet port.

   host1(config)#**interface fastEthernet 4/0**

2. Specify VLAN as the encapsulation method.

   host1(config-if)#**encapsulation vlan**

   The VLAN major interface is added.

3. Create a VLAN subinterface by adding a subinterface number to the interface identification command.

   host1(config-if)#**interface fastEthernet 4/0.3**

4. Do one of the following:

   a. Assign a VLAN ID for the subinterface.

      host1(config-if)#**vlan id 201**

   b. Assign a VLAN ID and the optional unique MAC address for the subinterface.

      host1(config-if)#**vlan id 201 mac-address 0090.1a01.1234**

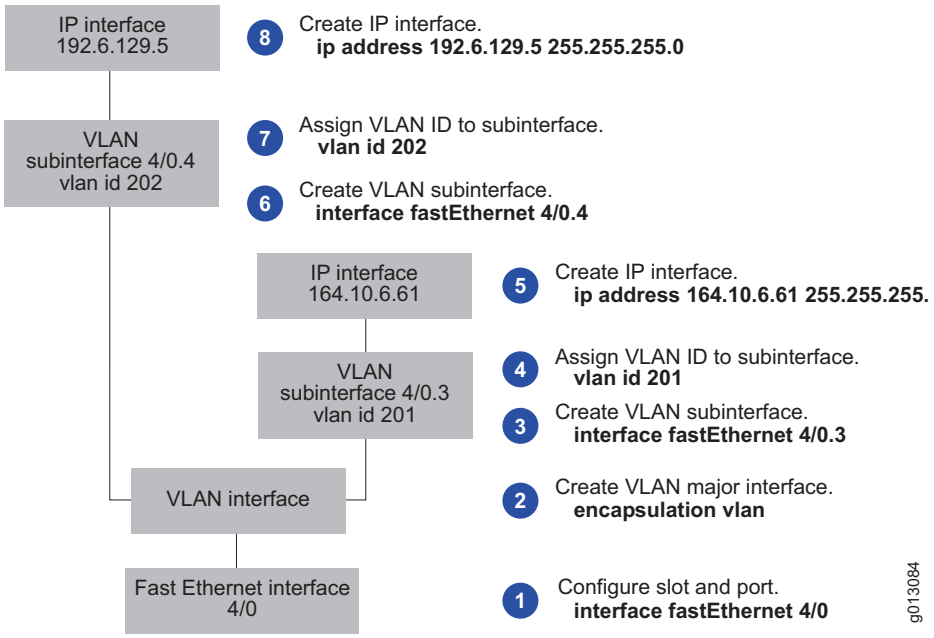
5. Assign an IP address and mask.

   host1(config-if)#**ip address 192.6.129.5 255.255.255.0**

6. (Optional) Configure additional VLAN subinterfaces by completing Steps 3 through 5.

Figure 14 illustrates the IP/VLAN/Fast Ethernet stacking, showing two separate VLAN subinterfaces. Configure one VLAN subinterface entirely; then configure the next VLAN subinterface.

Figure 14: Example of IP/VLAN/Fast Ethernet Stacking Configuration Steps



Configuring PPPoE over VLAN

To configure PPPoE over VLAN over an Ethernet interface:

1. Specify a Fast Ethernet, Gigabit Ethernet, or 10-Gigabit Ethernet port.

   host1(config)#**interface fastEthernet 4/1**

2. Specify VLAN as the encapsulation method.

   host1(config-if)#**encapsulation vlan**

   The VLAN major interface is added.

3. Create a VLAN subinterface by adding a subinterface number to the interface identification command.

   host1(config-if)#**interface fastEthernet 4/1.1**

4. Do one of the following:

   - Assign a VLAN ID for the subinterface.

     host1(config-if)#**vlan id 201**

   - Assign a VLAN ID and the optional unique MAC address for the subinterface.

     host1(config-if)#**vlan id 201 mac-address 0090.1a01.1234**

5. Specify PPPoE as the encapsulation method on the interface.

   host1(config-if)#**pppoe**

6. Create a PPPoE subinterface.

   host1(config-if)#**pppoe subinterface fastEthernet 4/1.1.1**

7. Specify PPP as the encapsulation method on the interface.

   host1(config-if)#**encapsulation ppp**

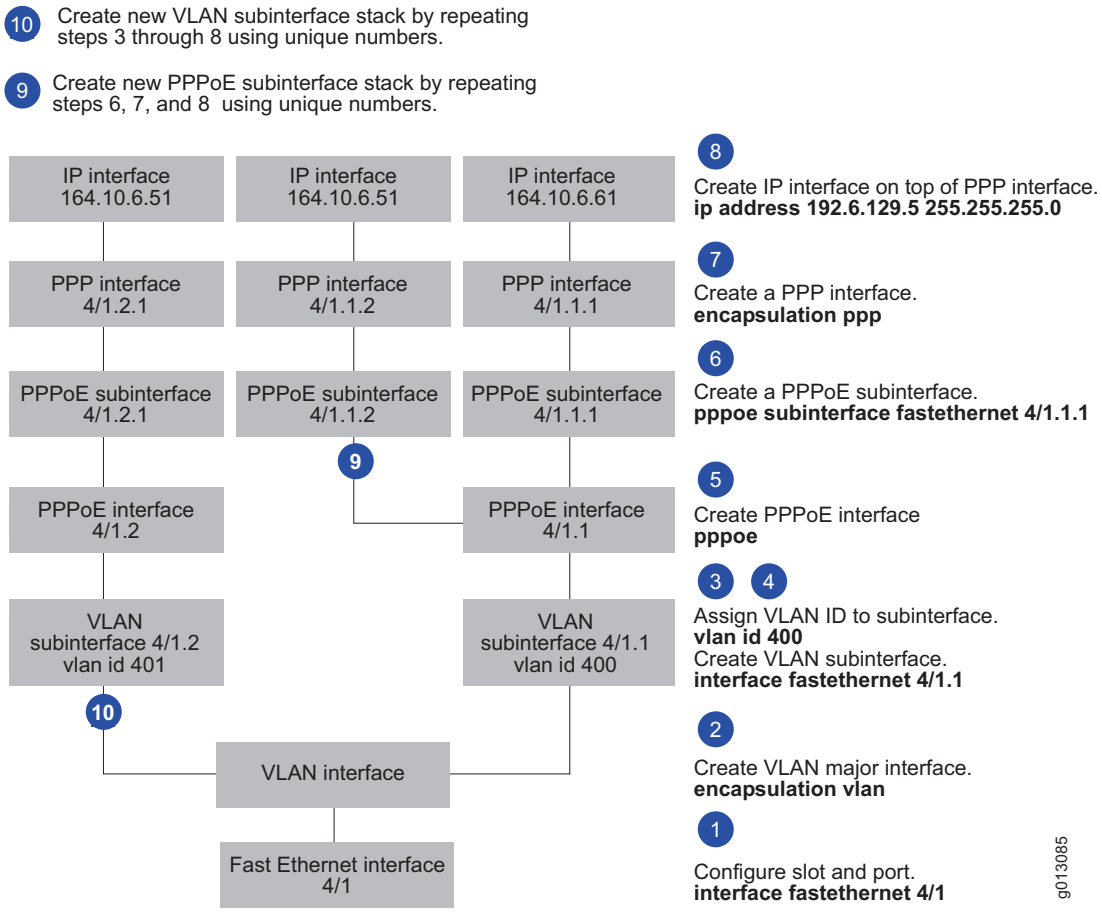
8. Assign an IP address and mask.

   host1(config-if)#**ip address 192.6.129.5 255.255.255.0**

9. (Optional) Configure additional VLAN subinterfaces by completing Steps 3 through 8.

Figure 15 illustrates the PPPoE/VLAN/Fast Ethernet stacking, showing two separate VLAN subinterfaces. One VLAN subinterface has two PPPoE subinterfaces, and one VLAN subinterface has one PPPoE subinterface.

Figure 15: Example of PPPoE/VLAN/Fast Ethernet Stacking Configuration Steps



Configuring MPLS over VLAN

To configure MPLS over VLAN over an Ethernet interface:

1. Specify a Fast Ethernet, Gigabit Ethernet, or 10-Gigabit Ethernet port.

   host1(config)#**interface fastEthernet 4/0**

2. Specify VLAN as the encapsulation method.

   host1(config-if)#**encapsulation vlan**

   The VLAN major interface is added.

3. Create a VLAN subinterface by adding a subinterface number to the interface identification command.

   host1(config-if)#**interface fastEthernet 4/1.1**

4. Do one of the following:

   - Assign a VLAN ID for the subinterface.

     host1(config-if)#**vlan id 400**

   - Assign a VLAN ID and the optional unique MAC address for the subinterface.

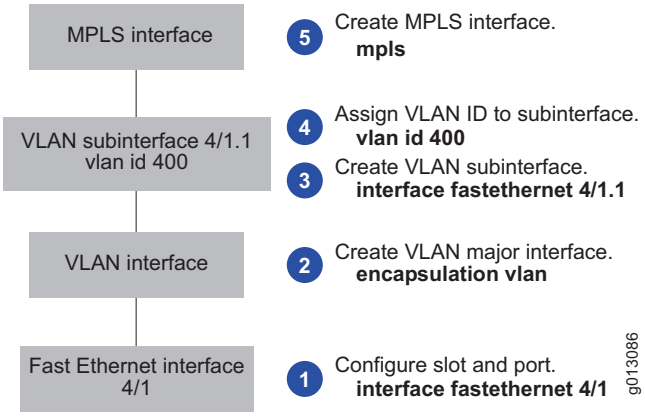
     host1(config-if)#**vlan id 400 mac-address 0090.1a01.1234**

5. Enable MPLS on the interface.

   host1(config-if)#**mpls**

Figure 16 illustrates the MPLS/VLAN/Fast Ethernet stacking, showing one VLAN subinterface.

Figure 16: Example of MPLS/VLAN/Fast Ethernet Stacking Configuration Steps



Configuring IP over VLAN and PPPoE over VLAN

To configure IP over VLAN with PPPoE over the same VLAN over an Ethernet interface:

1. Specify a Fast Ethernet, Gigabit Ethernet, or 10-Gigabit Ethernet port.

   host1(config)#**interface fastEthernet 4/1**

2. Specify VLAN as the encapsulation method.

   host1(config-if)#**encapsulation vlan**

   The VLAN major interface is added.

3. Create a VLAN subinterface by adding a subinterface number to the interface identification command.

   host1(config-if)#**interface fastEthernet 4/1.1**

4. Do one of the following:

   - Assign a VLAN ID for the subinterface.

     host1(config-if)#**vlan id 400**

   - Assign a VLAN ID and the optional unique MAC address for the subinterface.

     host1(config-if)#**vlan id 400 mac-address 0090.1a01.1234**

5. Create an IP interface on the same VLAN as the PPPoE interface.

   host1(config-if)#**ip address 164.10.6.71 255.255.255.0**

6. Specify PPPoE as the encapsulation method on the interface.

   host1(config-if)#**pppoe**

7. Create a PPPoE subinterface.

   host1(config-if)#**pppoe subinterface fastEthernet 4/1.1.1**

8. Specify PPP as the encapsulation method on the interface.

   host1(config-if)#**encapsulation ppp**

9. Assign an IP address and mask.

   host1(config-if)#**ip address 192.6.129.5 255.255.255.0**

10. (Optional) Configure additional PPPoE subinterfaces by completing Steps 7 through 9 using unique numbering.

To configure additional IP interfaces over the VLAN major interface:

1. Create a new VLAN subinterface by adding a unique subinterface number to the interface identification command.

   host1(config-if)#**interface fastEthernet 4/1.2**

2. Assign a VLAN ID for the subinterface.

   host1(config-if)#**vlan id 401**

3. Assign an IP address and mask.

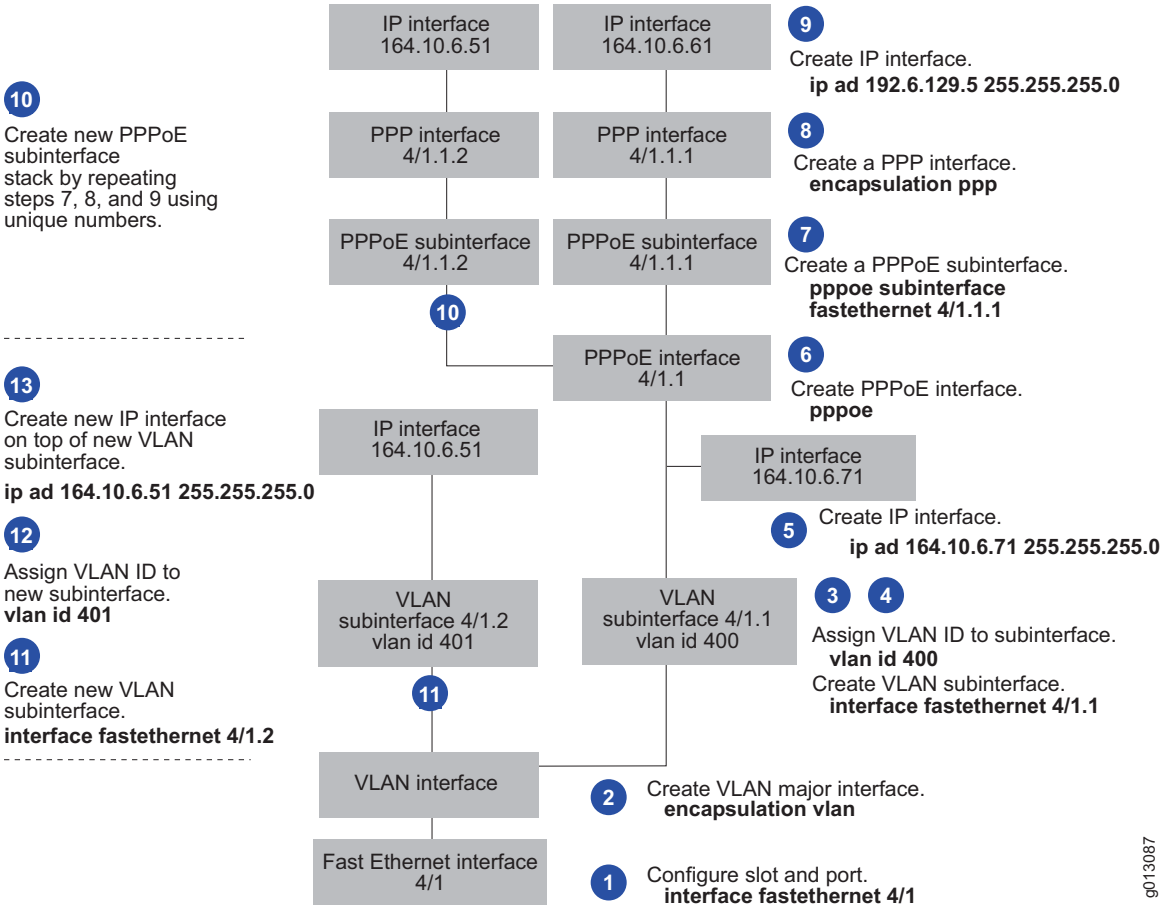
   host1(config-if)#**ip address 164.10.6.51 255.255.255.0**

Figure 17 illustrates the configuration steps for two VLAN subinterfaces. In this example:

- VLAN subinterface 4/1.1 has an IP interface, a PPPoE interface, and multiple PPPoE subinterface stacks.
- VLAN subinterface 4/1.2 has only an IP interface.

NOTE: Before you can remove a VLAN subinterface, you must remove the upper-layer interface stack.

Figure 17: Example of PPPoE over VLAN with IP over VLAN Stacking Configuration Steps



encapsulation ppp

- Use to configure PPP as the encapsulation method for the interface.
- Example

  host1(config-if)#**encapsulation ppp**

- Use the **no** version to disable PPP on the interface.

encapsulation vlan

- Use to configure VLAN as the encapsulation method for the interface.
- Example

  host1(config-if)#**encapsulation vlan**

- Use the **no** version to disable VLAN on an interface.

ip address

- Use to set a primary or secondary IP address for an interface or subinterface.
- Specify the layer 2 encapsulation before you set the IP address.
- Example

  host1(config-if)#**ip address 192.6.129.5 255.255.255.0**

- Use the **no** version to remove an IP address or disable IP processing.

pppoe

- Use to configure PPPoE as the encapsulation method on the interface.
- Example

  host1(config-if)#**pppoe**

- Use the **no** version to disable PPPoE on the interface.

pppoe subinterface fastEthernet

- Use to create a PPPoE subinterface on a Fast Ethernet interface.
- Example

  host1(config-if)#**pppoe subinterface fastEthernet 4/1.1.1**

- Use the **no** version to remove a PPPoE subinterface on a Fast Ethernet interface.

pppoe subinterface gigabitEthernet
pppoe subinterface tenGigabitEthernet

- Use to create a PPPoE subinterface on a Gigabit Ethernet interface or on a 10-Gigabit Ethernet interface.
- Example 1—Creates a PPPoE subinterface on an ERX-7xx model, ERX-14xx model, or the ERX-310 router

  host1(config-if)#**pppoe subinterface gigabitEthernet 4/2.1.1**

- Example 2—Creates a PPPoE subinterface on the E320 router

  host1(config-if)#**pppoe subinterface tenGigabitEthernet 4/0/2.1.1**

- Use the **no** version to remove a PPPoE subinterface on a Gigabit Ethernet interface or on a 10-Gigabit Ethernet interface.

vlan description

- Use to assign an alias or description to a VLAN subinterface.
- You can use a maximum of 64 characters for the description or to name the alias.
- Example

  host1(config-if)#**vlan description randolph56a**

- Use the **no** version to remove the VLAN description.

vlan id

- Use to specify the VLAN ID.
- Use a VLAN ID that is in the range 0–4095 and is unique within the Ethernet interface.
- Issue the **vlan id** command before any upper bindings are made, such as IP or PPPoE.
- Use the **mac-address** keyword to specify a unique MAC address for the VLAN subinterface. When you do not specify a unique MAC address, the VLAN uses the MAC address of the Ethernet interface.
- Use the optional keyword **untagged** to specify that frames be sent untagged. The keyword is valid only for VLAN ID 0. Tagged frames can be received, but untagged frames are sent.
- Examples

  host1(config-if)#**vlan id 400**
  host1(config-if)#**vlan id 4 255 mac-address 0090.1a01.1234**

- There is no **no** version.

Configuring a S-VLAN Subinterface

Tasks to configure a S-VLAN subinterface include:

- Configuring an S-VLAN Subinterface on page 175
- Configuring PPPoE over an S-VLAN on page 176

Configuring an S-VLAN Subinterface

To configure an S-VLAN subinterface:

1. Specify a Fast Ethernet, Gigabit Ethernet, or 10-Gigabit Ethernet port.

   host1(config)#**interface fastEthernet 4/0**

2. Specify VLAN as the encapsulation method.

   host1(config-if)#**encapsulation vlan**

   The VLAN major interface is added.

3. Create a VLAN subinterface by adding a subinterface number to the interface identification command.

   host1(config-if)#**interface fastEthernet 4/1.1**

4. Assign an S-VLAN ID and a VLAN ID for the subinterface.

   host1(config-if)#**svlan id 4 255**

5. Assign an S-VLAN Ethertype.

   host1(config-if)#**svlan ethertype 88a8**

Configuring PPPoE over an S-VLAN

To configure PPPoE over an S-VLAN over an Ethernet interface:

1. Specify a Fast Ethernet, Gigabit Ethernet, or 10-Gigabit Ethernet port.

   host1(config)#**interface fastEthernet 4/0**

2. Specify VLAN as the encapsulation method.

   host1(config-if)#**encapsulation vlan**

   The VLAN major interface is added.

3. Create a VLAN subinterface by adding a subinterface number to the interface identification command.

   host1(config-if)#**interface fastEthernet 4/1.1**

4. Assign an S-VLAN ID and a VLAN ID for the subinterface.

   host1(config-if)#**svlan id 4 255**

5. Assign an S-VLAN Ethertype.

   host1(config-if)#**svlan ethertype 88a8**

6. Specify PPPoE as the encapsulation method on the interface.

   host1(config-if)#**pppoe**

7. Create a PPPoE subinterface.

   host1(config-if)#**pppoe subinterface fastEthernet 4/1.1.1**

8. Specify PPP as the encapsulation method on the interface.

   host1(config-if)#**encapsulation ppp**

9. Assign an IP address and mask.

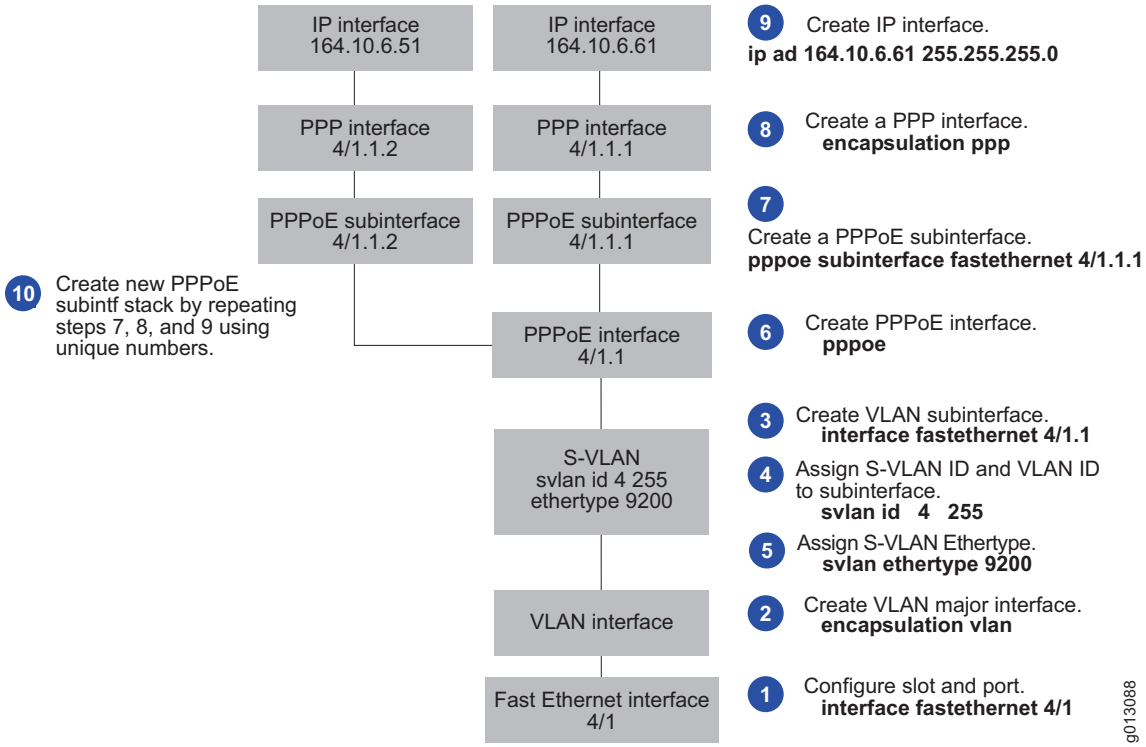
   host1(config-if)#**ip address 164.10.6.61 255.255.255.0**

10. (Optional) Configure additional PPPoE subinterfaces by completing Steps 7 through 9 using unique numbering.

Figure 18 shows one S-VLAN subinterface with multiple PPPoE subinterface stacks.

NOTE: Before you can remove an S-VLAN/VLAN subinterface, you must remove the upper-layer interface stack.

Figure 18: Example of PPPoE over S-VLAN Stacking Configuration Steps



encapsulation ppp

- Use to configure PPP as the encapsulation method for the interface.
- Use the **no** version to remove PPP as the encapsulation method on the interface.

encapsulation vlan

- Use to configure VLAN as the encapsulation method for the interface.
- Use the **no** version to remove VLAN as the encapsulation method on the interface.

ip address

- Use to set a primary or secondary IP address for an interface or subinterface.
- Specify the layer 2 encapsulation before you set the IP address.
- Use the **no** version to remove an IP address or disable IP processing.

pppoe

- Use to configure PPPoE as the encapsulation method on the interface.
- Use the **no** version to disable PPPoE on the interface.

pppoe subinterface fastEthernet

- Use to create a PPPoE subinterface on a Fast Ethernet interface.
- Use the **no** version to remove a PPPoE subinterface on a Fast Ethernet interface.

pppoe subinterface gigabitEthernet
pppoe subinterface tenGigabitEthernet

- Use to create a PPPoE subinterface on a Gigabit Ethernet interface or on a 10-Gigabit Ethernet interface.
- Use the **no** version to remove a PPPoE subinterface on a Gigabit Ethernet interface or on a 10-Gigabit Ethernet interface.

svlan ethertype

- Use to assign an Ethertype value for the S-VLAN subinterface.
- Choose one of the following Ethertype values:
  - 8100—Specifies Ethertype value 0x8100, as defined in IEEE Standard 802.1q
  - 88a8—Specifies Ethertype value 0x88a8, as defined in draft IEEE Standard 802.1ad
  - 9100—Specifies Ethertype value 0x9100, which is the default
- Use an Ethertype value that matches the Ethertype value set on the customer premises equipment (CPE) to which your router connects.
- Example

  host1(config-if)#**svlan ethertype 8100**

- Use the **no** version to restore the default value, 9100.

svlan id

- Use to assign S-VLAN IDs and VLAN IDs to VLAN subinterfaces.
- Use S-VLAN ID and VLAN ID numbers that are in the range 0–4095 and that are unique within the Ethernet interface.
- Use the **mac-address** keyword to specify a unique MAC address for the VLAN subinterface. When you do not specify a unique MAC address, the VLAN uses the MAC address of the Ethernet interface.

- Examples

  host1(config-if)#**svlan id 4 255**
  host1(config-if)#**svlan id 4 255 mac-address 0090.1a01.1234**

- Issue the **svlan id** command before any upper bindings are made, such as IP or PPPoE.
- There is no **no** version.

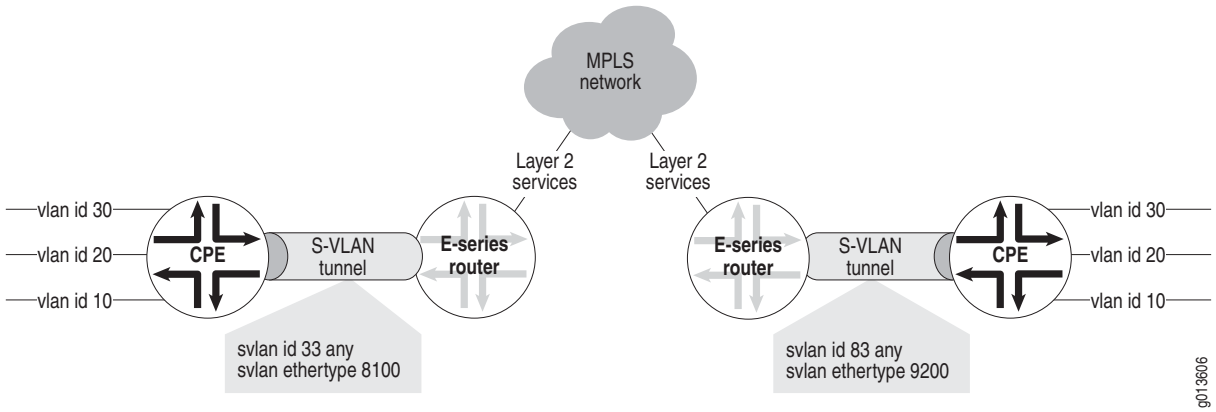
Configuring S-VLAN Tunnels for Layer 2 Services over MPLS

When you configure Ethernet layer 2 services over MPLS, you can create a special type of S-VLAN called an S-VLAN tunnel that uses a single interface to tunnel traffic from multiple VLANs across an MPLS network. The S-VLAN tunnel enables multiple VLANs, each configured with a unique VLAN ID tag, to share a common S-VLAN ID tag when they traverse an MPLS network.

Advantages

Using S-VLAN tunnels provides an easier and faster way to configure Ethernet layer 2 services over MPLS than using standard S-VLANs. For example, consider the network configuration shown in Figure 19.

Figure 19: S-VLAN Tunnels for Ethernet Layer 2 Services over MPLS



In this example, traffic from three VLAN subinterfaces must traverse the MPLS network. To accomplish this using standard S-VLANs, you issue the following commands to configure three separate S-VLANs with the same S-VLAN ID value and different VLAN IDs, as follows:

host1(config-if)#**svlan id 33 10**
host1(config-if)#**svlan id 33 20**
host1(config-if)#**svlan id 33 30**

By contrast, using an S-VLAN tunnel achieves the same result, but requires you to issue only a single **svlan id** command with the keyword **any** in place of the VLAN ID value. For example, the following command creates a single interface that tunnels traffic from VLANs configured with an S-VLAN ID of 33 and *any* VLAN ID to the same destination across the MPLS network. In effect, this command tunnels traffic from all three VLANs shown in Figure 19 on page 179.

```
host1(config-if)#svlan id 33 any
```

Interface Stacking

When you configure Ethernet layer 2 services over MPLS using S-VLAN tunnels, the only interface that you can stack over an S-VLAN tunnel is an MPLS tunnel, which you configure using the MPLS tunneling command (**mpls-relay** or **route interface**) that is appropriate for your configuration. Attempting to configure any other interface type—such as IP, MPLS (nontunnel), or PPPoE—over the S-VLAN tunnel causes the router to generate an error and reject the configuration as invalid.

For details about configuring MPLS and layer 2 services over MPLS, see:

- *JUNOSe BGP and MPLS Configuration Guide, Chapter 2, Configuring MPLS*
- *JUNOSe BGP and MPLS Configuration Guide, Chapter 5, Configuring Layer 2 Services over MPLS*

Configuration Example

This section uses the sample network topology shown in Figure 19 on page 179 to illustrate the steps for configuring S-VLAN tunnels for Ethernet layer 2 services over MPLS.

To configure S-VLAN tunnels for Ethernet layer 2 services over MPLS:

1. Specify a Fast Ethernet, Gigabit Ethernet, or 10-Gigabit Ethernet port.

   ```
   host1(config)#interface fastEthernet 4/0
   ```

2. Specify VLAN as the encapsulation method to create the VLAN major interface.

   ```
   host1(config-if)#encapsulation vlan
   ```

3. Create a VLAN subinterface.

   ```
   host1(config-if)#interface fastEthernet 8/1.1
   ```

4. Create the S-VLAN tunnel. This interface tunnels traffic from VLANs configured with an S-VLAN ID of 33 and any VLAN ID to the same destination across the MPLS network.

   ```
   host1(config-if)#svlan id 33 any
   ```

5. Assign an S-VLAN Ethertype.

   ```
   host1(config-if)#svlan ethertype 8100
   ```

6. Create the MPLS tunnel interface using the appropriate MPLS tunneling command for your configuration. For example:

   host1(config-if)#**route interface tunnel mpls:tunnel3 45**

   For complete instructions on configuring the MPLS tunnel, see *JUNOSe BGP and MPLS Configuration Guide, Chapter 5, Configuring Layer 2 Services over MPLS*.

7. Repeat Steps 1 through 6 using unique values to configure the S-VLAN tunnel and MPLS tunnel interfaces on the remote E-series router. For example:

   host2(config)#**interface fastEthernet 3/1**
   host2(config-if)#**encapsulation vlan**
   host2(config-if)#**interface fastEthernet 3/1.1**
   host2(config-if)#**svlan id 83 any**
   host2(config-if)#**svlan ethertype 88a8**
   host2(config-if)#**route interface tunnel mpls:tunnel2 45**

encapsulation vlan

- Use to configure VLAN as the encapsulation method for the interface.
- Use the **no** version to disable VLAN on an interface.

interface fastEthernet

- Use to select a Fast Ethernet interface on a line module.
- Example

  host1(config)#**interface fastEthernet 3/1**

- Use the **no** version to remove the interface or subinterface. You must issue the **no** version from the highest level down; you cannot remove an interface or subinterface if the one above it still exists.

route interface

- Use to route layer 2 traffic on a specific tunnel interface.
- Use the **no** version to negate this command.

NOTE: For details on the use of this command, see *JUNOSe BGP and MPLS Configuration Guide, Chapter 5, Configuring Layer 2 Services over MPLS*.

svlan ethertype

- Use to assign an Ethertype value for the S-VLAN tunnel interface.
- Choose one of the following Ethertype values:
  - 8100—Specifies Ethertype value 0x8100, as defined in IEEE Standard 802.1q
  - 88a8—Specifies Ethertype value 0x88a8, as defined in draft IEEE Standard 802.1ad
  - 9100—Specifies Ethertype value 0x9100, which is the default

- Use an Ethertype value that matches the Ethertype value set on the customer premises equipment (CPE) to which your router connects.
- Example

  host1(config-if)#**svlan ethertype 8100**

- Use the **no** version to restore the default value, 9100.

svlan id

- Use to create an S-VLAN tunnel interface for configuring Ethernet layer 2 services over MPLS.
- Assign an S-VLAN ID value in the range 0–4095 that is unique within the Ethernet interface.
- Use the **any** keyword to tunnel traffic from VLANs configured with the specified S-VLAN ID and any VLAN ID to the same destination across an MPLS network.
- Issue the **svlan id** command with the **any** keyword before you configure the upper binding, which must be an MPLS tunnel interface. Attempting to configure any other interface type over the S-VLAN tunnel causes an error.
- Example

  host1(config-if)#**svlan id 1000 any**

- There is no **no** version.

S-VLAN Oversubscription

When you configure S-VLAN subinterfaces over Ethernet interfaces to support dynamic PPPoE subinterfaces, you can take advantage of S-VLAN oversubscription.

The following module combinations support S-VLAN oversubscription:

- GE/FE line module and all of its associated I/O modules
- GE-2 line module and the GE-2 SFP I/O module
- GE-HDE line module and its associated I/O modules
- OC3/STM1 GE/FE line module and the OC3-2 GE APS I/O module
- ES2 4G LM and its associated Gigabit Ethernet and 10-Gigabit Ethernet IOAs
- ES2 10G LM and its associated Gigabit Ethernet and 10-Gigabit Ethernet IOAs

The maximum number of S-VLANs that you can create per I/O module with PPPoE major interfaces stacked over them is greater than the maximum number of dynamic PPPoE subinterfaces. The maximum number of PPP interfaces supported per line module is directly proportional to the maximum number of PPPoE subinterfaces.

As a result, you can oversubscribe S-VLANs by configuring up to the maximum number of S-VLANs supported on these I/O modules, knowing that no more than the maximum number of supported PPP sessions can be connected to the router at any one time.

For configuration instructions, see *Configuring Dynamic PPPoE over Static PPPoE with Ethernet and S-VLAN Interface Columns* in *JUNOSe Link Layer Configuration Guide, Chapter 15, Configuring Dynamic Interfaces*.

For specific information about the maximum number of S-VLANs supported per I/O module and the maximum number of PPP interfaces and PPPoE subinterfaces supported per line module, see *JUNOSe Release Notes*, *Appendix A*, *System Maximums*.

NOTE: The E120 and E320 routers can support up to two IOAs per line module. This maximum number of S-VLANs per line module does not change if one or two IOAs are installed.

Monitoring VLAN and S-VLAN Subinterfaces

This section explains how to display bit rate and packet rate statistics for VLAN subinterfaces and use the **show** commands to display the physical characteristics and the configured settings for VLAN and S-VLAN subinterfaces.

NOTE: The E120 router and E320 router output for **monitor** and **show** commands is identical to output from other E-series routers, except that the E120 and E320 router output also includes information about the adapter identifier in the interface specifier (*slot/adapter/port*).

Displaying Interface Rate Statistics for VLAN Subinterfaces

You can use the **monitor vlan interface** command to display bit rate and packet rate statistics over a specified time interval for one or more VLAN subinterfaces configured on the router.

To display interface rate statistics for VLAN subinterfaces:

1. Log in to the router by using a local console session or a virtual terminal (vty) session (such as a Telnet session).

   While you are using the **monitor vlan interface** command, you must keep the console or terminal session open and you cannot issue any other commands at the session during this time.

   For information about logging in to the router, see *Accessing the CLI* in *JUNOSe System Basics Configuration Guide, Chapter 2, Command-Line Interface*.

2. Access User Exec mode or Privileged Exec mode.

   For information, see *Accessing Command Modes* in *JUNOSe System Basics Configuration Guide, Chapter 2, Command-Line Interface*.

3. Specify the interface identifier for each VLAN subinterface that you want to monitor.

   host1#**monitor vlan interface fastEthernet 0/0.1 fastEthernet 4/0.1 display-time-of-day**

   For information about specifying interface identifiers for VLAN subinterfaces configured over Ethernet interfaces, see *VLAN Overview* on page 163. For information about specifying interface identifiers for VLAN subinterfaces configured over LAG bundles, see *Configuring a VLAN Subinterface for a LAG Bundle* on page 198.

   By default, the router uses a 5-second time interval between polls to calculate bit rates and packet rates for each specified VLAN subinterface. Optionally, you can use the **load-interval** keyword to specify a nondefault time interval in the range 5–30 seconds.

   You can also include the optional **display-time-of-day** keyword to show the time of day at which the router gathers statistics for each interval. Displaying the time of day enables you to monitor when a particular VLAN subinterface is underutilized or overutilized.

4. Review the command output.

```
host1#monitor vlan interface fastEthernet 0/0.1 fastEthernet 4/0.1
display-time-of-day
                        Seconds
                        between                                    Time
       Interface         polls    Input bps/pps   Output bps/pps   (UTC)
----------------------- -------- --------------- --------------- --------
FastEthernet 0/0.1             0           --/--           --/-- 10:50:07
FastEthernet 4/0.1             0           --/--           --/-- 10:50:07
FastEthernet 0/0.1             5      120240/100      120240/100 10:50:12
FastEthernet 4/0.1             5      120000/100      120000/100 10:50:12
FastEthernet 0/0.1             5      120240/100      120240/100 10:50:17
FastEthernet 4/0.1             5      120000/100      120000/100 10:50:17
```

   The router polls each VLAN subinterface at the specified load interval (the default 5-second interval in this example) to calculate and display bit rate and packet rate statistics. The first line of output for each interface always displays 0 (zero) for the number of seconds between polls, and dashes (*--/--*) in the Input bps/pps and Output bps/pps columns. These values indicate that the router initially takes a baseline for each interface against which to measure subsequent statistics. The router continues to display subsequent lines of output for each interface at the specified load interval until you press Ctrl + c to stop the command.

   For a description of each field in the **monitor vlan interface** command output, see **monitor vlan interface** on page 185.

5. When you are finished, press Ctrl + c to stop the **monitor vlan interface** command.

   host1#**^C**

monitor vlan interface

- Use to display bit rate and packet rate statistics over a specified time interval for one or more VLAN subinterfaces.
- You must use the **monitor vlan interface** command in a dedicated console or terminal session for the duration of the monitoring session.
- Specify the interface identifier for each VLAN subinterface that you want to monitor.
- To specify a nondefault time interval in the range 5–30 seconds at which the router calculates bit rate and packet rate statistics, use the optional **load-interval** keyword. The default time interval is 5 seconds.
- To display the time at which the router calculates bit rate and packet rate statistics for the current interval, use the optional **display-time-of-day** keyword.
- To stop the **monitor vlan interface** command, press Ctrl + c.
- Field descriptions
  - Interface—Interface identifier for the Ethernet or LAG interface on which the VLAN subinterface resides
  - Seconds between polls—Number of seconds at which the router calculates bit rate and packet rate statistics
  - Input bps/pps—Number of bits per second (bps) and packets per second (pps) received on this interface during the specified load interval
  - Output bps/pps—Number of bits per second (bps) and packets per second (pps) transmitted on this interface during the specified load interval
  - Time—Time of day, in hh:mm:ss format, at which the router calculates the bit rate and packet rate statistics for the current interval
- Example 1—Displays bit rate and packet rate statistics over the default (5-second) load interval for a single VLAN subinterface

```
host1#monitor vlan interface fastEthernet 0/0.1
                        Seconds
                        between
       Interface         polls    Input bps/pps   Output bps/pps
----------------------- -------- --------------- ---------------
FastEthernet 0/0.1              0           --/--           --/--
FastEthernet 0/0.1              5      120240/100      120240/100
FastEthernet 0/0.1              5      120000/100      120000/100
FastEthernet 0/0.1              5        92400/77        92400/77
FastEthernet 0/0.1              5        88800/74        88800/74
FastEthernet 0/0.1              5      120000/100      120000/100
host1#^C
```

- Example 2—Displays bit rate and packet rate statistics over a 10-second load interval for two VLAN subinterfaces, with the time of day that the statistics were calculated

```
host1#monitor vlan interface fastEthernet 0/0.1 fastEthernet 4/0.1
load-interval 10 display-time-of-day
                       Seconds
                       between                                      Time
       Interface        polls    Input bps/pps   Output bps/pps   (UTC)
----------------------- -------- --------------- --------------- --------
FastEthernet 0/0.1             0           --/--           --/-- 10:50:33
FastEthernet 4/0.1             0           --/--           --/-- 10:50:33
FastEthernet 0/0.1            10      120120/100      120120/100 10:50:43
FastEthernet 4/0.1            10      120000/100      120000/100 10:50:43
FastEthernet 0/0.1            10      120000/100      120000/100 10:50:53
FastEthernet 4/0.1            10      120000/100      120000/100 10:50:53
host1#^C
```

- There is no **no** version.

Using Ethernet show Commands

Use the **show** commands described in this section to display information about your Ethernet configuration and to monitor Ethernet interfaces.

show interfaces fastEthernet

- Use to display the status of Fast Ethernet interfaces, VLAN subinterfaces, or S-VLAN subinterfaces.
- You can specify the following keywords:
  - **delta**—Specifies that baselined statistics are to be shown
  - **brief**—Displays the operational status of all configured interfaces
- Field descriptions when you display the status of a Fast Ethernet VLAN or S-VLAN subinterface
  - *Subinterface number*—Location of the subinterface that carries the VLAN or S-VLAN traffic
  - Administrative status—Operational state that you configured for this interface; up or down
  - VLAN ID—Domain number of the VLAN
  - SVLAN ID—Domain number of the stacked VLAN
  - Ethertype—Ethertype assignment for the S-VLAN subinterface, 0x8100, 0x88a8, or 0x9100; 0x9100 is the default
  - In—Analysis of inbound traffic on this interface
    - Bytes—Number of bytes received on the VLAN or S-VLAN subinterface
    - Packets—Sum of all unicast, broadcast, and multicast packets received on the VLAN or S-VLAN subinterface
    - Multicast—Number of multicast packets received on the VLAN or S-VLAN subinterface
    - Broadcast—Number of broadcast packets received on the VLAN or S-VLAN subinterface

- Errors—Total number of errors in all received packets; some packets might contain more than one error
- Discards—Total number of discarded incoming packets

- Out—Analysis of outbound traffic on this interface
  - Bytes—Number of bytes sent on the VLAN or S-VLAN subinterface
  - Packets—Number of packets sent on the VLAN or S-VLAN subinterface
  - Multicast—Number of multicast packets sent on the VLAN or S-VLAN subinterface
  - Broadcast—Number of broadcast packets sent on the VLAN or S-VLAN subinterface
  - Errors—Total number of errors in all transmitted packets; note that some packets might contain more than one error
  - Discards—Total number of discarded outgoing packets

- Example 1—Displays the status of a Fast Ethernet VLAN subinterface

```
host1:vr2#show interfaces fastEthernet 8/3.1
FastEthernet8/3.1 is Up, Administrative status is Up
  VLAN ID: 10, address 0090.5e00.0001

In: Bytes 39256, Packets 612
   Multicast 0, Broadcast 0
   Errors 0, Discards 0
Out: Bytes 453622O, Packets 70873
   Multicast 0, Broadcast 70258
   Errors 0, Discards 0
ARP Statistics:
  In: ARP requests 1, ARP responses 0
   Errors 0, Discards 0
  Out: ARP requests 1, ARP responses 0
   Errors 0, Discards 0
```

- Example 2—Displays the status of a Fast Ethernet S-VLAN subinterface

```
host1:vr2#show interfaces fastEthernet 0/0.1
FastEthernet0/0.1 is Up, Administrative status is Up
  SVLAN ID: 1, VLAN ID: 0, Ethertype 0x9100

  In: Bytes 39256, Packets 612
   Multicast 0, Broadcast 0
   Errors 0, Discards 0
  Out: Bytes 453622O, Packets 70873
   Multicast 0, Broadcast 70258
   Errors 0, Discards 0
ARP Statistics:
  In: ARP requests 0, ARP responses 0
   Errors 0, Discards 0
  Out: ARP requests 0, ARP responses 0
   Errors 0, Discards 0
```

show interfaces gigabitEthernet
show interfaces tenGigabitEthernet

- Use to display the status of Gigabit Ethernet interfaces, 10-Gigabit Ethernet interfaces, VLAN subinterfaces, or S-VLAN subinterfaces.
- You can specify the following keywords:
  - **delta**—Specifies that baselined statistics are to be shown
  - **brief**—Displays the operational status of all configured interfaces
- Field descriptions when you display the status of a Gigabit Ethernet or 10-Gigabit Ethernet VLAN or S-VLAN subinterface
  - *Subinterface number*—Location of the subinterface that carries the VLAN or S-VLAN traffic
  - Administrative status—Operational state that you configured for this interface; up or down
  - VLAN ID—Domain number of the VLAN
  - SVLAN ID—Domain number of the stacked VLAN
  - Ethertype—Ethertype assignment for the S-VLAN subinterface, 0x8100, 0x88a8, or 0x9100; 0x9100 is the default
  - In—Analysis of inbound traffic on this interface
    - Bytes—Number of bytes received on the VLAN or S-VLAN subinterface
    - Packets—Sum of all unicast, broadcast, and multicast packets received on the VLAN or S-VLAN subinterface
    - Multicast—Number of multicast packets received on the VLAN or S-VLAN subinterface
    - Broadcast—Number of broadcast packets received on the VLAN or S-VLAN subinterface
    - Errors—Total number of errors in all received packets; some packets might contain more than one error
    - Discards—Total number of discarded incoming packets
  - Out—Analysis of outbound traffic on this interface
    - Bytes—Number of bytes sent on the VLAN or S-VLAN subinterface
    - Packets—Number of packets sent on the VLAN or S-VLAN subinterface
    - Multicast—Number of multicast packets sent on the VLAN or S-VLAN subinterface
    - Broadcast—Number of broadcast packets sent on the VLAN or S-VLAN subinterface
    - Errors—Total number of errors in all transmitted packets; some packets might contain more than one error
    - Discards—Total number of discarded outgoing packets

- Example 1—Displays the status of a Gigabit Ethernet VLAN subinterface

```
host1:vr2#show interfaces gigabitEthernet 2/0.1
GigabitEthernet2/0.1 is Up, Administrative status is Up
  VLAN ID: 10, address 0090.5e00.0001

  In: Bytes 2357, Packets 23
   Multicast 0, Broadcast 0
   Errors 0, Discards 0
  Out: Bytes 4872, Packets 57
   Multicast 0, Broadcast 0
   Errors 0, Discards 0
ARP Statistics:
  In: ARP requests 0, ARP responses 0
   Errors 0, Discards 0
  Out: ARP requests 0, ARP responses 0
   Errors 0, Discards 0
```

- Example 2—Displays the status of a Gigabit Ethernet S-VLAN subinterface

```
host1:vr2#show interfaces gigabitEthernet 2/0.2
GigabitEthernet2/0.2 is Up, Administrative status is Up
  SVLAN ID: 10, VLAN ID: 100, Ethertype 0x9100

  In: Bytes 2357, Packets 23
   Multicast 0, Broadcast 0
   Errors 0, Discards 0
  Out: Bytes 4872, Packets 57
   Multicast 0, Broadcast 57
ARP Statistics:
  In: ARP requests 0, ARP responses 0
   Errors 0, Discards 0
  Out: ARP requests 0, ARP responses 0
   Errors 0, Discards 0
```

show vlan subinterface

- Use to display configuration and status information for a specified VLAN subinterface or for all VLAN subinterfaces configured on the router.
- Use the **summary** keyword to display only the counts of all VLAN subinterfaces and VLAN major interfaces configured on the router.
- Use the **mac-address** keyword to display information about the VLAN subinterfaces that were configured with unique MAC addresses.
- Use the **vlan** or **svlan** keywords to display information about specific S-VLAN IDs or VLAN IDs.
- Field descriptions
  - Interface—Type and specifier of the VLAN subinterface
  - Status—Status of the VLAN subinterface: up, down, dormant, lowerLayerDown, absent
  - MTU—Maximum allowable size (in bytes) of the maximum transmission unit (MTU) for the VLAN subinterface
  - Svlan Id—S-VLAN ID value, if configured
  - Vlan Id—VLAN ID value for the VLAN subinterface
  - Ethertype—S-VLAN Ethertype value, if configured

- Type—Type of VLAN subinterface
  - Static—VLAN or S-VLAN subinterface was configured statically
  - Dynamic—VLAN or S-VLAN subinterface was configured dynamically
- In—Analysis of inbound traffic on this interface
  - Bytes—Number of bytes received on the VLAN or S-VLAN subinterface
  - Packets—Sum of all unicast, broadcast, and multicast packets received on the VLAN or S-VLAN subinterface
  - Multicast—Number of multicast packets received on the VLAN or S-VLAN subinterface
  - Broadcast—Number of broadcast packets received on the VLAN or S-VLAN subinterface
  - Errors—Total number of errors in all received packets; some packets might contain more than one error
  - Discards—Total number of discarded incoming packets
- Out—Analysis of outbound traffic on this interface
  - Bytes—Number of bytes sent on the VLAN or S-VLAN subinterface
  - Packets—Number of packets sent on the VLAN or S-VLAN subinterface
  - Multicast—Number of multicast packets received on the VLAN or S-VLAN subinterface
  - Broadcast—Number of broadcast packets received on the VLAN or S-VLAN subinterface
  - Errors—Total number of errors in all transmitted packets; some packets might contain more than one error
  - Discards—Total number of discarded outgoing packets
- ARP Statistics—Analysis of ARP traffic on this interface; In fields are for traffic received on the interface and Out fields are for traffic sent on the interface
  - ARP requests—Number of ARP requests
  - ARP responses—Number of ARP responses
  - Errors—Total number of errors in all ARP packets
  - Discards—Total number of discarded ARP packets
- Total VLAN interfaces—Total numbers of VLAN subinterfaces and VLAN major interfaces configured on the router; this is the only field that appears when you specify the **summary** keyword

- Example 1—Displays full status and configuration information for all VLAN subinterfaces configured on the router

```
host1#show vlan subinterface
        Interface           Status   MTU  Svlan Id Vlan Id  Ethertype  Type
------------------------ ---------- ---- -------- -------- --------- -------
ATM 3/0.1.2              Up         1522 ----     11       ----      Static
ATM 3/0.1.3              Up         1522 ----     12       ----      Static
ATM 3/1.1.1              Up         1522 ----     13       ----      Static
ATM 3/1.1.2              Up         1522 ----     14       ----      Static
ATM 3/2.1.1              Down       1526 4        255      0x9100    Static
FastEthernet 4/5.1       Up         1522 ----     1        ----      Dynamic
6 vlan subinterfaces found
```

- Example 2—Displays full status and configuration information for the specified VLAN subinterface

```
host1#show vlan subinterface fastEthernet 0/0.1
        Interface           Status   MTU  Svlan Id Vlan Id  Ethertype  Type
------------------------ ---------- ---- -------- -------- --------- -------
FastEthernet 0/0.1       Up         1526        1        0    0x9100 Static

In: Bytes 39256, Packets 612
   Multicast 0, Broadcast 0
   Errors 0, Discards 0
  Out: Bytes 4538652, Packets 70911
   Multicast 0, Broadcast 70296
   Errors 0, Discards 0
ARP Statistics:
  In: ARP requests 0, ARP responses 0
   Errors 0, Discards 0
  Out: ARP requests 0, ARP responses 0
   Errors 0, Discards 0
```

- Example 3—Displays only brief summary information for all VLAN subinterfaces configured on the router

```
host1#show vlan subinterface summary
Total VLAN interfaces: 6 subinterfaces, 3 major interfaces
```

- Example 4—Displays full status and configuration information for all VLAN subinterfaces configured with a unique MAC address

```
host1#show vlan subinterface mac-address
        Interface          Svlan Id  Vlan Id    MAC Address
------------------------  --------  --------  --------------
FastEthernet 4/0.25            ----        25  0090.dfad.2abd
FastEthernet 4/0.10050            1        50  0090.adad.0abd
2 vlan subinterfaces found
```

- Example 5—Displays full status and configuration information for a VLAN subinterface on a LAG bundle

```
host1#show vlan subinterface lag boston.1
        Interface           Status   MTU  Svlan Id Vlan Id  Ethertype  Type
------------------------ ---------- ---- -------- -------- --------- -------
lag boston.1             Up         1522 ----     1        ----      Static
```

- Example 6—Displays full status and configuration information for the specified S-VLAN ID

```
host1#show vlan subinterface svlan 100 53
        Interface           Status   MTU  Svlan Id Vlan Id  Ethertype  Type
------------------------ ---------- ---- -------- -------- --------- -------
FastEthernet 0/0.1        Up         1526 100      53       0x9100    Static
FastEthernet 4/6.1        Up         1526 100      53       0x9100    Dynamic
2 vlan subinterfaces found
```