Chapter 25

Configuring Subscriber Interfaces

This chapter describes how to configure static and dynamic subscriber interfaces for remote access to the E-series router. This chapter contains the following sections:

Overview

You can configure E-series routers to create subscriber interfaces statically or dynamically.

The following list shows the underlying (layer 2) interfaces on which you can currently configure each type of subscriber interface.

- Static subscriber interfaces
  - Bridged Ethernet over ATM (with and without VLANs)
  - Fast Ethernet (with and without VLANs)
  - Gigabit Ethernet (with and without VLANs)
  - 10-Gigabit Ethernet (with and without VLANs)
  - IP over ATM
  - POS
  - Generic Routing Encapsulation (GRE) tunnels

- Dynamic subscriber interfaces
  - Bridged Ethernet over ATM (with and without VLANs)
  - Fast Ethernet (with and without VLANs)
  - Gigabit Ethernet (with and without VLANs)
  - 10-Gigabit Ethernet (with and without VLANs)
  - GRE tunnels

For information about platform support for subscriber interfaces, see *Platform Considerations* on page 514.

Relationship to Shared IP Interfaces

A subscriber interface is an extension of a *shared IP interface*. A shared IP interface is one of a group of IP interfaces that use the same layer 2 interface.

Shared IP interfaces are unidirectional—they can transmit but not receive traffic. In contrast, subscriber interfaces are bidirectional—they can both receive and transmit traffic.

For details about shared IP interfaces, see *Shared IP Interfaces* in *JUNOSe IP, IPv6, and IGP Configuration Guide, Chapter 1, Configuring IP*.

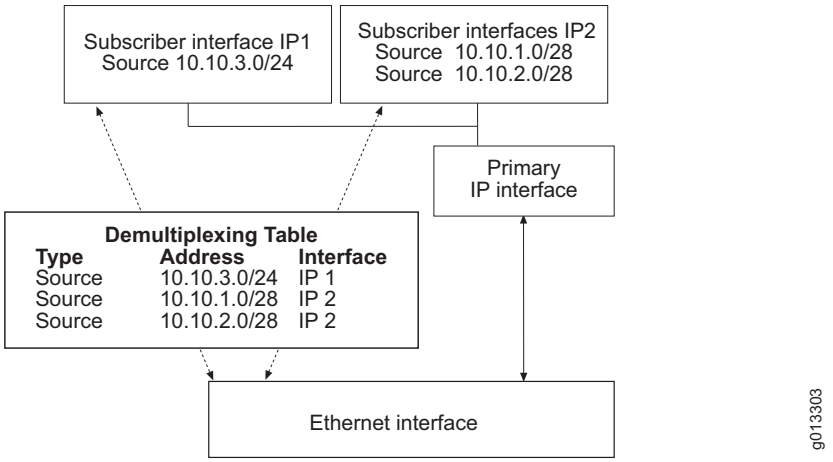
Relationship to Primary IP Interfaces

A subscriber interface operates only with a *primary IP interface*—a normal IP interface on a supported layer 2 interface, such as Ethernet. You create a primary interface by assigning an IP address to the Ethernet interface. Although you can configure a subscriber interface directly on an Ethernet interface, the subscriber interface does not operate until you assign an IP address to the Ethernet interface.

To configure a subscriber interface you must associate either a source address or a destination address with the interface. The router receives packets on a subscriber interface after demultiplexing the packet according to the specified source address or destination address. You can associate multiple source addresses or multiple destination addresses with a subscriber interface. However, a single primary interface and its associated subscriber interfaces can only demultiplex source addresses or destination addresses at any given time.

For example, Figure 16 illustrates the relationship between subscriber interfaces, an associated primary IP interface, and an associated Ethernet interface.

Figure 16: Subscriber Interfaces over Ethernet



When the router receives traffic on a primary interface, the primary interface performs a lookup in its demultiplexing table. If the result of the lookup is a subscriber interface, the traffic is received on the associated subscriber interface.

NOTE: You can use the **set dhcp relay giaddr-selects-interface** command to specify that the primary interface is identified by information in the giaddr field of DHCP ACK messages. By default, the router identifies the primary interface based on the interface used by the DHCP-destined packets. See *Using the Giaddr to Identify the Primary Interface for Dynamic Subscriber Interfaces* in *Chapter 20, Configuring DHCP Relay*.

Ethernet Interfaces and VLANs

In the absence of VLANs, Ethernet does not have a demultiplexing layer. A subscriber interface adds a demultiplexing layer for an Ethernet interface that is configured without VLANs. Using subscriber interfaces, the router can demultiplex or separate the traffic associated with different subscribers.

You can configure subscriber interfaces with VLANs. If you do so, the E-series router demultiplexes packets by using first the VLAN and then the subscriber interface.

Moving Interfaces

A shared IP interface that has associated subscriber demultiplexing attributes retains these attributes when it moves.

For details about moving shared IP interfaces, see *Moving IP Interfaces* in *JUNOSe IP, IPv6, and IGP Configuration Guide, Chapter 1, Configuring IP*.

Preventing IP Spoofing

You can prevent IP spoofing on subscriber interfaces by using media access control (MAC) address validation.

For information about configuring MAC address validation, see *MAC Address Validation* in *JUNOSe IP, IPv6, and IGP Configuration Guide, Chapter 1, Configuring IP*.

For information about the relationship between the MAC address validation state and dynamically created subscriber interfaces, see *Inheritance of MAC Address Validation State for Dynamic Subscriber Interfaces* on page 519.

Routing Protocols

You configure unicast routing protocols on subscriber interfaces in the same way that you configure routing protocols on primary IP interfaces, provided that you configure them to use unicast addressing when communicating with a peer. You can also enable multicast routing protocols such as IGMP on subscriber interfaces; however, we do not recommend this type of configuration.

Policies and QoS

You can configure policies, such as rate limiting and filtering, and quality of service (QoS) for subscriber interfaces in the same way that you do for primary IP interfaces. For more information, see the *JUNOSe Policy Management Configuration Guide* and the *JUNOSe Quality of Service Configuration Guide*.

Applications

In a cable modem network, service providers can use subscriber interfaces to:

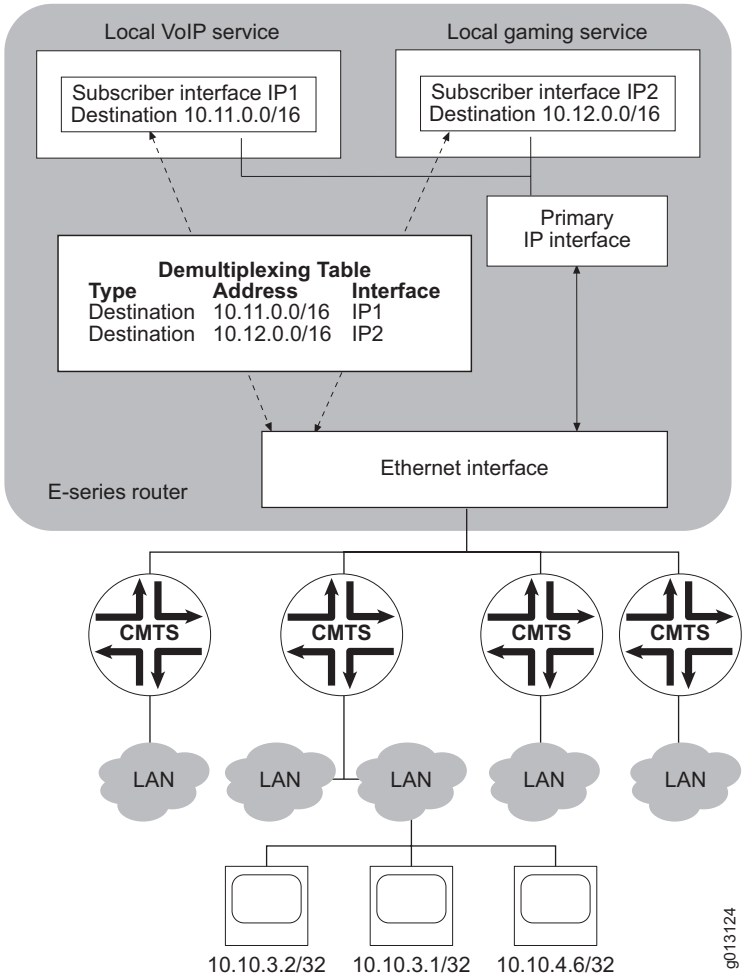
- Direct traffic toward special local content in the network
- Differentiate traffic for virtual private networks (VPNs)

Directing Traffic Toward Special Local Content

Figure 17 shows an example of a cable modem network. Multiple cable modem termination systems (CMTSs) connect to multiple shared media access LANs. Many subscribers connect to each LAN.

In this example, the service provider uses subscriber interfaces to direct traffic toward special local content on the network: a voice over Internet Protocol (VoIP) service on network 10.11.0.0/16, or a local gaming service on network 10.12.0.0/16. Rate limits and policies on the subscriber interface customize the service level for the associated service. In this application, the E-series router is the first-hop router for the subscribers, and the subscriber interfaces demultiplex traffic based on the destination address.

Figure 17: Subscriber Interfaces in a Cable Modem Network



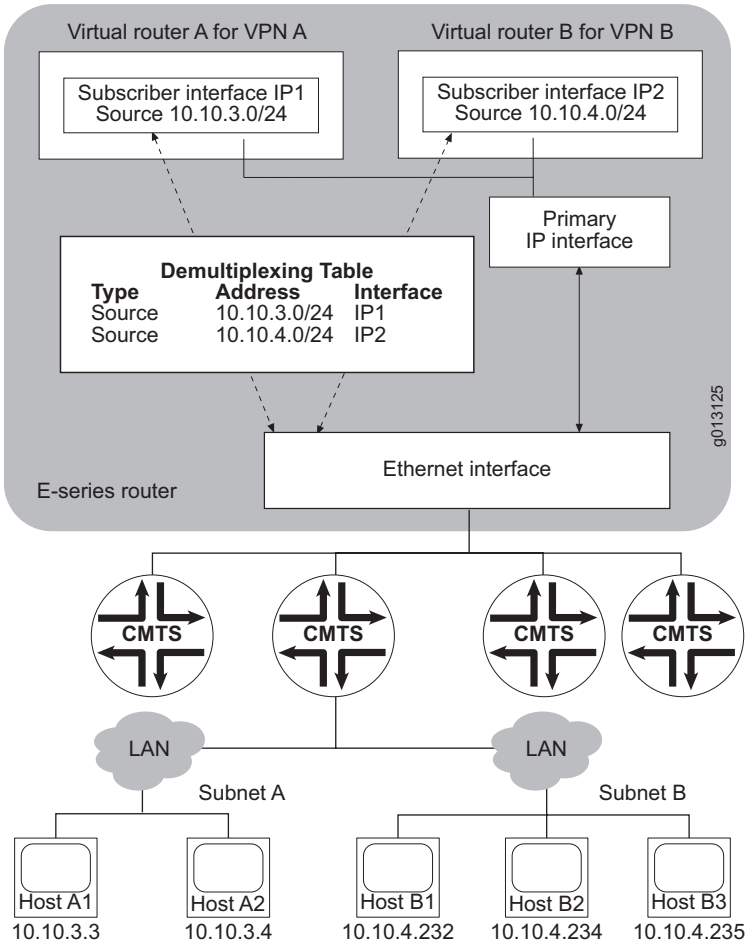
For instructions on configuring the application shown in Figure 17, see *Using a Destination Address to Demultiplex Traffic* on page 521.

Differentiating Traffic for VPNs

Similarly, service providers can use subscriber interfaces to differentiate traffic for VPNs. Figure 18 on page 514 shows an example of this application.

Customers on subnet A need to connect to VPN A, and customers on subnet B need to connect to VPN B. The E-series router connects to VPN A through virtual router A and to VPN B though virtual router B. Using two subscriber interfaces on the same primary interface (one on virtual router B and one on virtual router A), the E-series router can separate the traffic from subnets A and B. Because the E-series router is forwarding traffic in this application, the shared IP interface should demultiplex the traffic by using a source address.

Figure 18: Associating Subnets with a VPN Using Subscriber Interfaces



For instructions on configuring the application shown in Figure 18, see *Using a Source Address to Demultiplex Traffic* on page 524.

Platform Considerations

For information about modules that support subscriber interfaces on the ERX-7xx models, ERX-14xx models, and the ERX-310 router:

- See *ERX Module Guide, Table 1, ERX Module Combinations* for detailed module specifications.
- See *ERX Module Guide, Appendix A, Module Protocol Support* for information about the modules that support subscriber interfaces.

For information about modules that support subscriber interfaces on the E120 router and the E320 router:

- See *E120 and E320 Module Guide, Table 1, Modules and IOAs* for detailed module specifications.
- See *E120 and E320 Module Guide, Appendix A, IOA Protocol Support* for information about the modules that support subscriber interfaces.

Interface Specifiers

The configuration task examples in this chapter use the *slot*/*port* format to specify an interface. However, the interface specifier format that you use depends on the router that you are using.

For ERX-7xx models, ERX-14xx models, and ERX-310 routers, use the *slot*/*port* format. For example, the following command specifies a Gigabit Ethernet interface on slot 0, port 1 of an ERX-7xx model, ERX-14xx model, or ERX-310 router.

```
host1(config)#interface gigabitEthernet 0/1
```

For E120 and E320 routers, use the *slot*/*adapter*/*port* format, which includes an identifier for the bay in which the I/O adapter (IOA) resides. In the software, adapter 0 identifies the right IOA bay (E120 router) and the upper IOA bay (E320 router); adapter 1 identifies the left IOA bay (E120 router) and the lower IOA bay (E320 router). For example, the following command specifies a Gigabit Ethernet interface on slot 5, adapter 0, port 0 of an E320 router.

```
host1(config)#interface gigabitEthernet 5/0/0
```

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

References

For more information about the DHCP local server and DHCP external server, which are used in dynamic creation of subscriber interfaces, consult the following resources:

- *Chapter 17, DHCP Overview*
- RFC 2131—Dynamic Host Configuration Protocol (March 1997)

Dynamic Creation of Subscriber Interfaces

As an alternative to creating static subscriber interfaces, you can configure E-series routers to create subscriber interfaces dynamically.

When you create a static subscriber interface, as described in *Configuring Static Subscriber Interfaces* on page 521, each layer in the interface stack is created through an existing configuration mechanism such as command-line interface (CLI) or Simple Network Management Protocol (SNMP).

By contrast, the router creates dynamic subscriber interfaces on demand, in response to an external event. Two types of external events can cause dynamic creation of subscriber interfaces: when an Dynamic Host Configuration Protocol (DHCP) event occurs or when the router detects a packet.

DHCP Servers

The DHCP event that triggers dynamic creation of subscriber interfaces occurs when either a local DHCP server or external DHCP server assigns an IP address to a subscriber that has issued a DHCP request. After the DHCP server assigns the IP address and the router creates the associated dynamic subscriber interface, the subscriber can access required network services.

DHCP Local Server and Address Allocation

You can configure the DHCP local server to operate in either equal-access mode or standalone mode.

In standalone mode, the DHCP local server provides a basic DHCP service. The server receives a client request for an IP address and immediately allocates the subscriber an IP address from one of the local address pools.

In equal-access mode, the DHCP local server works with Juniper Networks Session and Resource Control (SRC) software and the authorization, accounting, and address assignment utility to provide an advanced subscriber configuration and management service. After the subscriber is authenticated through RADIUS, the DHCP server assigns the subscriber an IP address with a long lease time. This assignment of an IP address triggers the creation of dynamic subscriber interfaces.

For more information about the DHCP servers and the SRC software, see the following chapters:

- *Chapter 17, DHCP Overview*
- *SRC-PE Getting Started Guide*, *Chapter 1*, *SRC Product Overview*

DHCP External Server and Address Allocation

With DHCP external server, all communication between the subscriber and the DHCP server is monitored by the E-series router. The subscriber requests an address from the DHCP server through the E-series router. After the subscriber receives an IP address, the subscriber can access the Internet and use the value-added services provided by the E-series router and by the SRC software. The edge network must be using a DHCP relay function.

The services provided by integrating the E-series router's DHCP external server application with SRC software are similar to those provided when the DHCP local server is integrated with SRC software. For more information, see *SRC-PE Getting Started Guide*, *Chapter 1*, *SRC Product Overview*.

DHCP Relay Configuration

When you are configuring dynamic subscriber interface support, and you configure DHCP relay in the same virtual router as the dynamic subscriber interfaces, you must use the **set dhcp relay inhibit-access-route-creation** command to ensure that DHCP replay does not install access internal routes. Otherwise, DHCP relay will overwrite the access internal routes that are originally created for the subscriber interface.

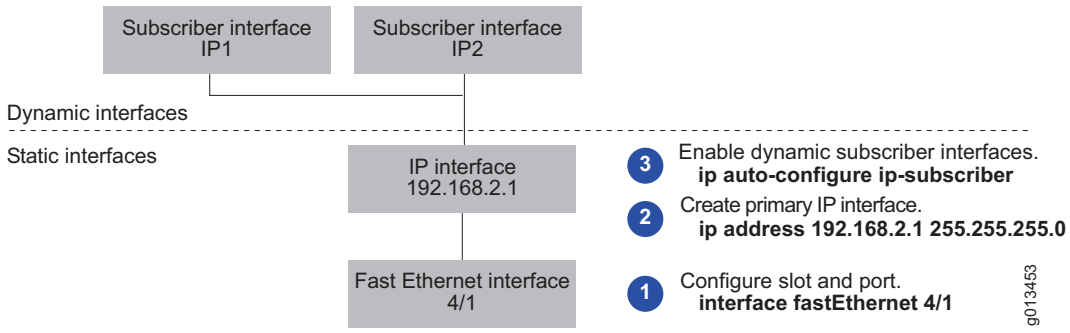
Supported Configurations

E-series routers currently support dynamic creation of subscriber interfaces with DHCP servers in the following configurations:

- IP over Ethernet
- IP over VLAN over Ethernet
- IP over bridged Ethernet over ATM

For example, Figure 19 shows the interface stacking in an IP over Ethernet dynamic subscriber interface configuration. The illustration indicates which layers in the stack are static and dynamic, and identifies the CLI commands typically used to create the configuration.

Figure 19: IP over Ethernet Dynamic Subscriber Interface Configuration



As shown in Figure 19, issuing the **ip auto-configure ip-subscriber** command configures the primary IP interface to enable dynamic creation of subscriber interfaces. However, the router does not actually create the dynamic subscriber interface until the DHCP server assigns an IP address to the associated subscriber.

To configure each supported configuration, see *Configuring Dynamic Subscriber Interfaces* on page 528.

Packet Detection

For GRE tunnel interfaces, the event that triggers dynamic creation of subscriber interfaces occurs when the router receives a packet with a source IP address that is not in the demultiplexer table. In this case, the primary IP interface must be in autoconfiguration mode.

Packet detection is the only method of dynamically creating subscriber interfaces on GRE tunnel interfaces; you cannot use DHCP local server or DHCP external server.

Issuing the **ip auto-configure ip-subscriber** command configures the primary IP address to enable dynamic configuration of subscriber interfaces. Unlike DHCP configurations, the router creates the dynamic subscriber interface when it receives the first packet that contains the subscriber's IP address as the source address.

In addition, a dynamic subscriber interface becomes inactive after a period of time in which the router receives no packets that contain the subscriber's IP address as the source address. You can configure the period of time by issuing the **ip inactivity-timer** command.

To configure dynamic creation of subscriber interfaces on GRE tunnel interfaces, see *Configuring Dynamic Subscriber Interfaces* on page 528.

Designating Traffic for the Primary IP Interface

When dynamic creation of subscriber interfaces is enabled on the primary IP interface (by means of the **ip auto-configure ip-subscriber** command), you can use the **ip source-prefix** command to specify the source address of traffic that is destined for the primary IP interface instead of the subscriber interface. If the DHCP server (for DHCP server configurations) or the router (for packet detection configurations) then assigns a subscriber an IP address matching this source prefix, the router does not create a dynamic subscriber interface for that address.

Using Framed Routes

You can use the **ip use-framed-routes ip-subscriber** command to enable a primary IP interface to use framed routes as source IP addresses when creating dynamic subscriber interfaces. The framed routes are applied to the dynamic subscriber interface during configuration so traffic from the subsets can traverse the interface. By applying framed routes in this fashion, you can extend the per-subscriber interface management to any subnetworks behind the dynamic subscriber interface. RADIUS includes the Framed-Route attribute [22] in Access-Accept messages to specify the route in the following format:

Framed-Route = *ipAddress/mask nextHop*

Inheritance of MAC Address Validation State for Dynamic Subscriber Interfaces

A dynamic IP subscriber interface inherits the MAC address validation state (enabled or disabled) configured for its parent static primary IP interface.

MAC address validation binds a MAC source address for an interface to a given IP source address. When the IP-MAC binding is established, the router forwards ingress packets on the interface when the packet's MAC source address and IP source address match, and drops ingress packets when the packet's MAC source address and IP source address do not match. MAC address validation thereby prevents spoofing on IP-based Ethernet interfaces, and is very useful in subscriber management applications.

When MAC address validation is enabled on an interface, the router checks the entry in the MAC validation table that corresponds to the IP source address of an incoming packet. The MAC source address of the packet must match the MAC source address of the table entry for the router to forward the packet.

How MAC Address Validation State Inheritance Works

To enable MAC address validation for the static primary IP interface, you must use the existing **ip mac-validate** command with either the **strict** keyword or the **loose** keyword. The **strict** keyword prevents transmission of IP packets that do not reside in the MAC validation table. The **loose** keyword, which is the default setting, enables IP packets to pass through even when the packets do not have entries in the MAC validation table; only packets that have matching IP-MAC pair entries in the table are validated.

When a dynamic IP subscriber interface is created with the MAC address validation state inherited from the static primary IP interface, an entry for the MAC source address is installed in the MAC validation table when MAC address validation is enabled (either loose or strict) on the static primary IP interface. For each packet received on this interface, the router compares the packet's MAC source address to the value in the MAC validation table. If these values match, the router forwards the packet; otherwise, the packet is discarded.

In addition, creation of the dynamic IP subscriber interface adds a static MAC address validation entry in the router's Address Resolution Protocol (ARP) table. This occurs regardless of whether you configure MAC address validation on the static primary IP interface with the **ip mac-validate strict** command or the **ip mac-validate loose** command.

Configuration of MAC Address Validation State Inheritance

No special configuration is required to enable inheritance of the MAC address validation state on dynamic IP subscriber interfaces; this occurs automatically provided that MAC address validation is properly enabled on the parent static primary IP interface with the **ip mac-validate** command. If MAC address validation is disabled on the static primary IP interface, the dynamic subscriber interface inherits the disabled state for MAC address validation.

Keep the following guidelines in mind for using dynamic IP subscriber interfaces that inherit the MAC address validation state from their parent static primary IP interface:

- A dynamic subscriber interface inherits the MAC address validation state of its static primary IP interface only when the dynamic subscriber interface is created.
- You cannot change the MAC address validation state inherited by a dynamic subscriber interface from its static primary IP interface.
- Changing the MAC address validation state of a static primary IP interface does not affect the MAC address validation state of dynamic subscriber interfaces already created from this primary IP interface. Any dynamic subscriber interfaces created from this primary IP interface after you change the MAC address validation state inherit the new MAC validation state.
- When you configure a dynamic subscriber interface with one or more framed routes (subnets), we recommend that you use the **ip mac-validate loose** command to configure MAC address validation for the static primary IP interface. Using the **loose** keyword, which is the default, prevents the router from discarding packets with an IP source address from a subnet.
- Because enabling MAC address validation on an IP interface creates a static MAC address validation entry in the router's ARP table, be sure to observe the system limit for the maximum number of dynamic ARP table entries supported per line module. See the Link Layer Maximums tables in *Appendix A*, *System Maximums*, of the *Release Notes* corresponding to your software release for information about the maximum number of dynamic ARP entries that the router supports. Currently, this limit is set to 32,768 dynamic ARP entries for all E-series modules that support Ethernet interfaces.

Verification of MAC Address Validation State Inheritance

To verify inheritance of the MAC address validation state on a dynamic subscriber interface, you can use the **show ip mac-validate interface** command and the **show arp** command.

The following sample output from the **show ip mac-validate interface** command displays the MAC address validation state (strict) inherited by the dynamic subscriber interface ip74.39.64.3 from its parent static primary IP interface.

```
host1#show ip mac-validate interface ip74.39.64.3
ip74.39.64.3:  Strict

        Address       Hardware Addr
        74.39.64.3    0090.1a40.f4f6
```

Building on this example, the following sample output from the **show arp** command displays a static MAC address validation entry (74.39.64.3) in the ARP table for the dynamic subscriber interface when it is created with the MAC address validation state inherited from its parent static primary IP interface. The asterisk (*) indicates that the ARP entry was added as the result of issuing an **arp validate** command rather than an **arp** command.

```
host1#show arp
        Address          Age         Hardware Addr    Interface
     10.13.10.1        21600        0090.6939.751b    FastEthernet6/0
     74.39.64.3            -        0090.1a40.f4f6    ip74.39.64.3 *
    192.168.1.2        20700        0090.1a40.280d    FastEthernet8/2
```

Configuring Static Subscriber Interfaces

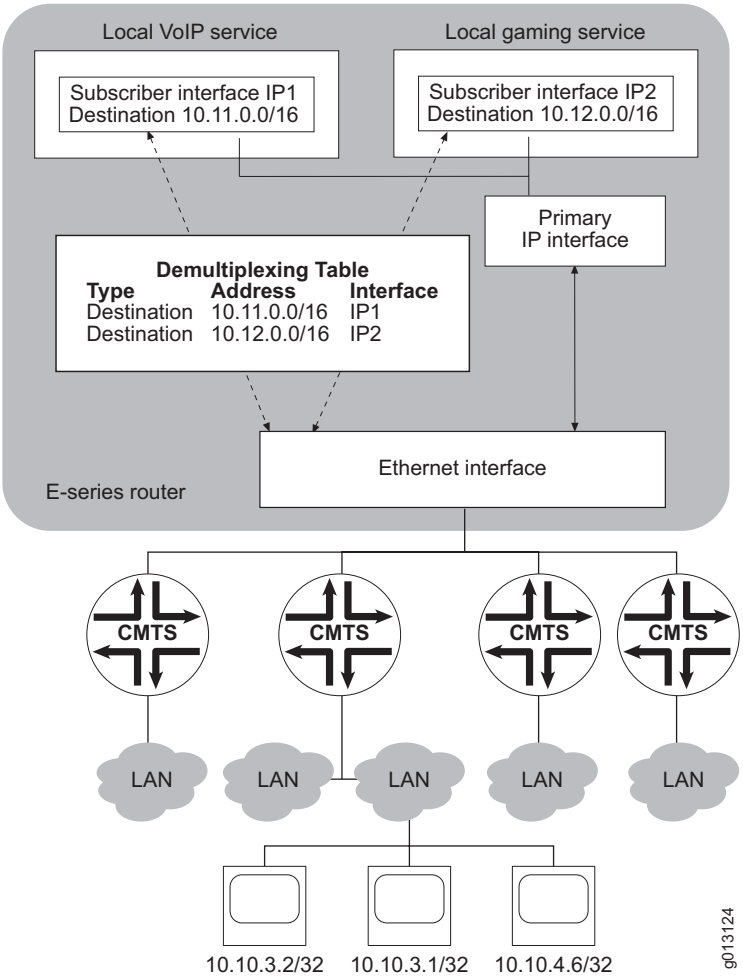
You can configure static subscriber interfaces on ATM, Fast Ethernet, Gigabit Ethernet, 10-Gigabit Ethernet, or POS layer 2 interfaces.

The examples in this section show how to configure static subscriber interfaces on a Fast Ethernet interface, but the steps for configuring static subscriber interfaces over other supported layer 2 interface types are similar.

Using a Destination Address to Demultiplex Traffic

The example in Figure 20 shows how you can use static subscriber interfaces to direct traffic toward special local content on the network, based on the traffic's destination address. In this application, a local VoIP service is on network 10.11.0.0./16, and a local gaming service is on network 10.12.0.0/16.

Figure 20: Subscriber Interfaces Using a Destination Address to Demultiplex Traffic



To configure the static subscriber interfaces shown in Figure 20, perform the following steps:

1. Configure a primary IP interface on a supported layer 2 interface.

   a. Create a layer 2 interface.

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

   b. Create a primary IP interface.

      host1(config-if)#**ip address 10.1.1.1 255.0.0.0**

   c. Configure the primary interface to use a destination address to demultiplex traffic. (By default, a source address is used to demultiplex traffic.)

      host1(config-if)#**ip demux-type da-prefix**

d. Exit Interface Configuration mode.

```
host1(config-if)#exit
```

2. Configure subscriber interface IP1.

a. Create the shared IP interface.

```
host1(config)#interface ip ip1
```

b. Associate the shared IP interface with the layer 2 interface by using one of the following methods:

- Static

```
host1(config-if)#ip share-interface fastEthernet 3/1
```

- Dynamic

```
host1:vr-a:vrf-1(config-if)#ip share-nexthop 10.1.1.2
```

c. To fully configure the shared interface, assign an address or make it unnumbered.

```
host1(config-if)#ip unnumbered loopback 0
```

d. Specify the destination addresses for the subscriber interface to use to demultiplex traffic.

```
host1(config-if)#ip destination-prefix 10.11.0.0 255.255.0.0
```

e. Exit Interface Configuration mode.

```
host1(config-if)#exit
```

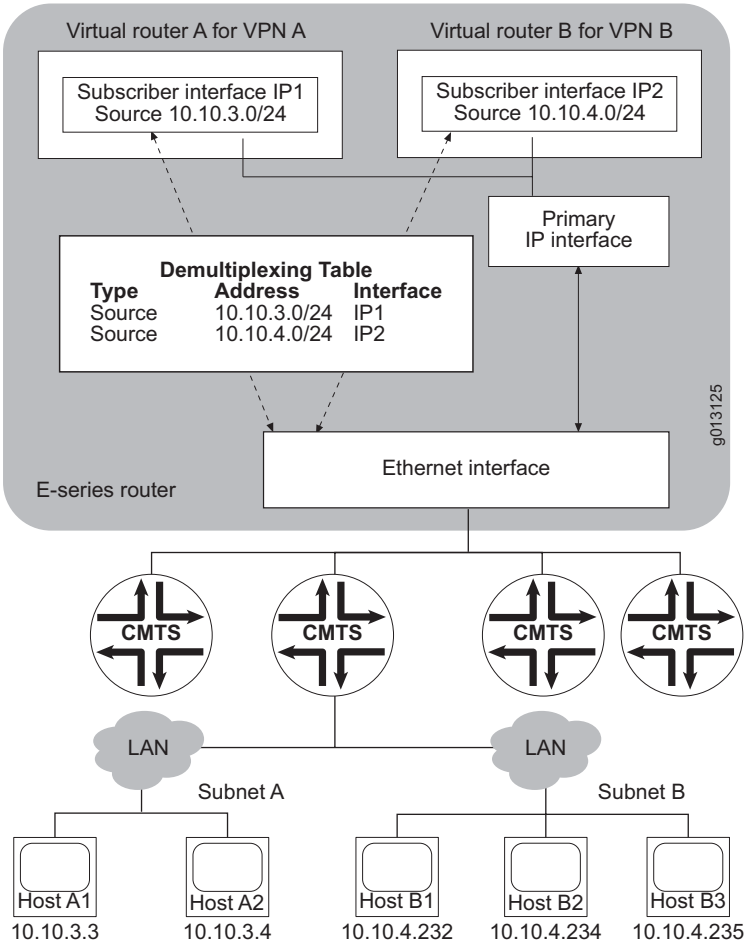
3. Repeat Step 2 to configure subscriber interface IP2.

```
host1(config)#interface ip ip2
host1(config-if)#ip share-interface fastEthernet 3/1
host1(config-if)#ip unnumbered loopback 0
host1(config-if)#ip destination-prefix 10.12.0.0 255.255.0.0
```

Using a Source Address to Demultiplex Traffic

Figure 21 shows how you can use static subscriber interfaces to differentiate traffic for VPN access, based on the traffic's source address.

Figure 21: Subscriber Interfaces Using a Source Address to Demultiplex Traffic



To configure the static subscriber interfaces shown in Figure 21, perform the following steps:

1. Configure a primary IP interface on a supported layer 2 interface.

   a. Create a layer 2 interface.

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

   b. Create a primary IP interface.

      host1(config-if)#**ip address 10.1.1.1 255.255.255.0**

   c. Exit Interface Configuration mode.

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

2. Configure subscriber interface IP1.

   a. Create the shared IP interface.

      host1(config)#**virtual-router vra**
      Proceed with new virtual-router creation? [confirm] **yes**
      host1:vra(config)#**interface ip ip1**

   b. Associate the shared IP interface with the layer 2 interface by using one of the following methods:

      - Static

      host1:vra(config-if)#**ip share-interface fastEthernet 4/1**

      - Dynamic

      host1:vra(config-if)#**ip share-nexthop 10.1.1.2**

   c. To fully configure the shared interface, assign an address or make it unnumbered.

      host1:vra(config-if)#**ip unnumbered loopback 0**

   d. Specify the source addresses for the subscriber interface to use to demultiplex traffic, then exit Interface Configuration mode.

      host1:vra(config-if)#**ip source-prefix 10.10.3.0 255.255.255.0**
      host1:vra(config-if)#**exit**

3. Create a static route that sends traffic for destination address 10.10.3.0 to subscriber interface IP1.

   host1:vra(config)#**ip route 10.10.3.0 255.255.255.0 ip ip1**

4. Repeat Step 2 to configure subscriber interface IP2.

   host1(config)#**virtual-router vrb**
   Proceed with new virtual-router creation? [confirm] **yes**
   host1:vrb(config)#**interface ip ip2**
   host1:vrb(config-if)#**ip share-interface fastEthernet 4/1**
   host1:vrb(config-if)#**ip unnumbered loopback 0**
   host1:vrb(config-if)#**ip source-prefix 10.10.4.0 255.255.255.0**
   host1:vrb(config-if)#**exit**

5. Create a static route that sends traffic for destination address 10.10.4.0 to subscriber interface IP2.

   host1:vrb(config)#**ip route 10.10.4.0 255.255.255.0 ip ip2**

6. Specify that DHCP relay does not install host routes—this avoids a conflict that can causes undesirable ARP behavior.

   host1(config)#**set dhcp relay inhibit-access-route-creation**

For details about the cause of this conflict and the use of the **set dhcp relay inhibit-access-route-creation** command to avoid the conflict, see *Preventing DHCP Relay from Installing Host Routes by Default* in *Chapter 20, Configuring DHCP Relay*.

interface ip

- Use to create an IP interface to share a layer 2 interface.
- Use the specified name to refer to the shared IP interface; you cannot use the layer 2 interface to refer to the shared IP interface, because the shared interface can be moved.
- Example

  host1(config)#**interface ip si0**

- Use the **no** version to delete the IP interface.

ip demux-type da-prefix

- Use to specify that the router use a destination address to demultiplex traffic for the subscriber interface.
- Example

  host1(config-if)#**ip demux-type da-prefix**

- Use the **no** version to restore the default situation in which the router uses a source address to demultiplex traffic.

ip destination-prefix

- Use to specify a destination address for a subscriber interface or for a primary IP interface.
- On the ERX-1440 router or the E320 router, you can configure up to 1024 subnets for static subscriber interfaces per primary IP interface when each subnet has a variable network mask that is less than /32. The number of subnets identifying a single route (/32) is still limited by the global maximum of 16,000 hosts per line module.
- Example

  host1(config-if)#**ip destination-prefix 196.168.2.2 255.0.0.0**

- Use the **no** version to remove the association between the interface and the specified IP destination address and mask.

ip share-interface

- Use to specify the layer 2 interface for this IP interface to share. The command fails if the layer 2 interface does not yet exist.
- If you issue this command on a shared IP interface, you cannot issue the **ip share-nexthop** command for the interface.
- After creating the shared IP interface, you can configure it as you do any other IP interface.

- The shared interface is operationally up when the layer 2 interface is operationally up and IP is properly configured.
- You can create operational shared IP interfaces in the absence of a primary IP interface.
- Example

  host1(config-if)#**ip share-interface atm 5/3.101**

- Use the **no** version to remove the association between the layer 2 interface and the shared IP interface. You can delete shared and primary IP interfaces independently.

ip share-nexthop

- Use to specify that the shared IP interface dynamically tracks a next hop. If the next hop changes, the shared IP interface moves to the new layer 2 interface associated with the IP interface toward the new next hop.
- If you issue this command on a shared IP interface, you cannot issue the **ip share-interface** command for the interface.
- If you issue this command on a shared IP interface, the shared interface cannot dynamically track the next hop for the specified destination if the next-hop IP address is resolvable over MPLS.
- If you specify a virtual router, the command fails if the VR does not already exist. If you do not specify a VR, the current VR is assumed.
- After creating the shared IP interface, you can configure it as you do any other IP interface.
- The shared interface is operationally up when the layer 2 interface associated with the specified next hop is operationally up and IP is properly configured.
- Example

  host1(config-if)#**ip share-nexthop 192.168.10.16**

- Use the **no** version to halt tracking of the next hop.

ip source-prefix

- Use to specify a source address for a subscriber interface.
- On the ERX-1440 router or the E320 router, you can configure up to 1024 subnets for static subscriber interfaces per primary IP interface when each subnet has a variable network mask that is less than /32. The number of subnets identifying a single route (/32) is still limited by the global maximum of 16,000 hosts per line module.
- Example

  host1(config-if)#**ip source-prefix 192.168.0.0 255.0.0.0**

- Use the **no** version to remove the association between the interface and the specified IP source address and mask.

Configuring Dynamic Subscriber Interfaces

You can configure dynamic subscriber interfaces in the following configurations:

- IP over Ethernet
- IP over VLAN over Ethernet
- IP over bridged Ethernet over ATM
- GRE tunnels

The following sections describe how to create each of these basic configurations. In addition, *Dynamic Subscriber Interface Configuration Example* on page 532, provides a detailed sample configuration.

Configuring Dynamic Subscriber Interfaces over Ethernet

To configure a dynamic subscriber interface in an IP over Ethernet configuration by using DHCP events, perform the following steps:

1. Configure the DHCP server.

   For instructions, see *Configuring the DHCP Local Server* in *Chapter 19, Configuring DHCP Local Server*.

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

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

3. Create the primary IP interface by assigning an IP address and mask to the Ethernet interface (or make it unnumbered).

   host1(config-if)#**ip address 192.168.2.1 255.255.255.0**

4. Configure the primary IP interface to enable dynamic creation of subscriber interfaces.

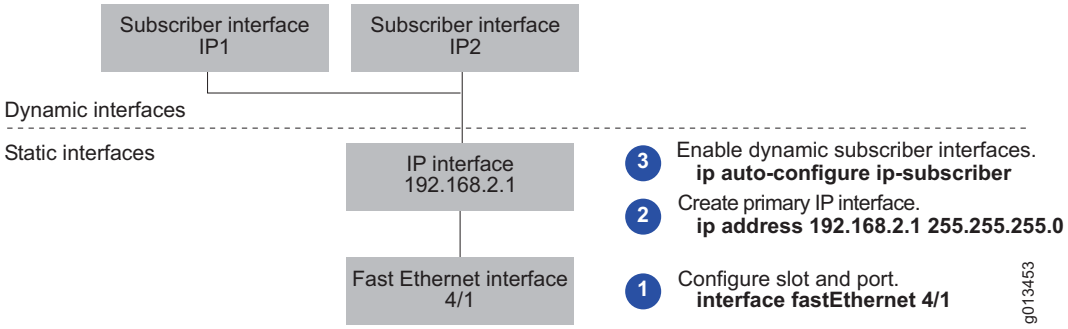
   host1(config-if)#**ip auto-configure ip-subscriber**

5. (Optional) Specify the source address of traffic that is destined for the primary IP interface.

   host1(config-if)#**ip source-prefix 192.168.2.1 255.255.255.0**

Figure 22 shows the interface stack built for this configuration.

Figure 22: IP over Ethernet Dynamic Subscriber Interface Configuration



Configuring Dynamic Subscriber Interfaces over VLANs

To configure a dynamic subscriber interface in an IP over VLAN over Ethernet configuration by using DHCP events, perform the following steps:

1. Configure the DHCP server.

   For instructions, see *Configuring the DHCP Local Server* in *Chapter 19, Configuring DHCP Local Server*.

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

   host1(config)#**interface gigabitEthernet 1/0**

3. Specify VLAN as the encapsulation method on the interface. This command creates the VLAN major interface.

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

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

   host1(config-if)#**interface gigabitEthernet 1/0.1**

5. Assign a unique VLAN ID to the VLAN subinterface.

   host1(config-if)#**vlan id 101**

6. Create the primary IP interface by assigning an IP address and mask to the VLAN subinterface (or make it unnumbered).

   host1(config-if)#**ip address 192.168.2.10 255.255.255.0**

7. Configure the primary IP interface to enable dynamic creation of subscriber interfaces.

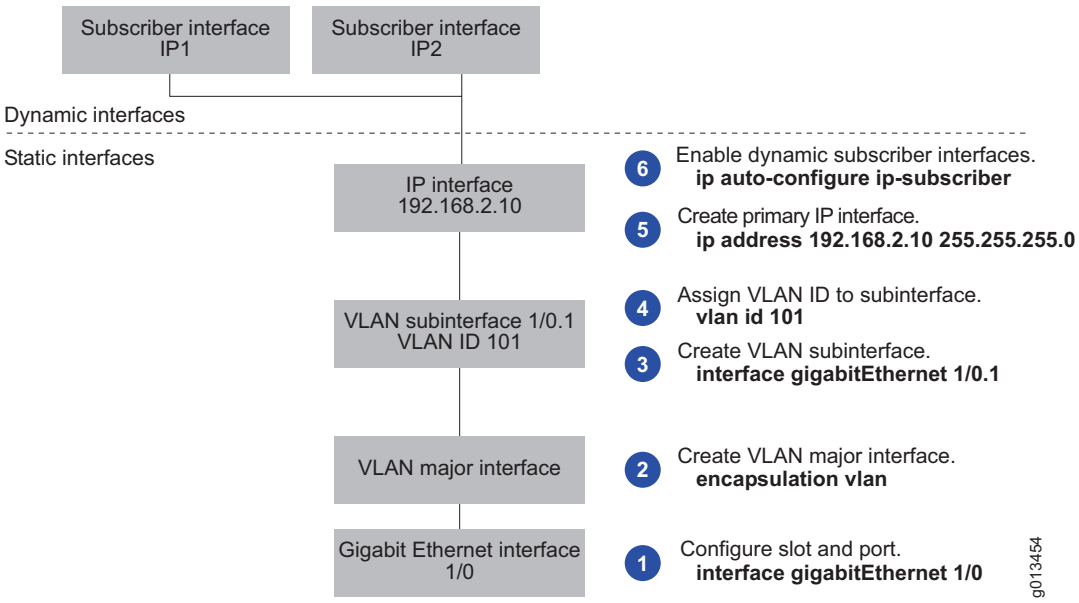
   host1(config-if)#**ip auto-configure ip-subscriber**

8. (Optional) Specify the source address of traffic that is destined for the primary IP interface.

   host1(config-if)#**ip source-prefix 192.168.2.10 255.255.255.0**

Figure 23 on page 530 shows the interface stack built for this configuration.

Figure 23: IP over VLAN over Ethernet Dynamic Subscriber Interface Configuration



Configuring Dynamic Subscriber Interfaces over Bridged Ethernet

To configure a dynamic subscriber interface in an IP over bridged Ethernet over ATM configuration by using DHCP events, perform the following steps:

1. Configure DHCP server.

   For instructions, see *Configuring the DHCP Local Server* in *Chapter 19, Configuring DHCP Local Server*.

2. Create an ATM major interface.

   host1(config)#**interface atm 3/3**

3. Create an ATM 1483 subinterface.

   host1(config-if)#**interface atm 3/3.1**

4. Configure an associated PVC for the ATM 1483 subinterface by specifying the VCD, the VPI, the VCI, and the encapsulation type.

   host1(config-subif)#**atm pvc 10 100 22 aal5snap**

5. Specify bridged Ethernet as the encapsulation method on the ATM 1483 subinterface.

   host1(config-subif)#**encapsulation bridge1483**

6. Create the primary IP interface by assigning an IP address and mask to the bridged Ethernet interface (or make it unnumbered).

   host1(config-subif)#**ip address 192.168.2.20 255.255.255.0**

7. Configure the primary IP interface to enable dynamic creation of subscriber interfaces.

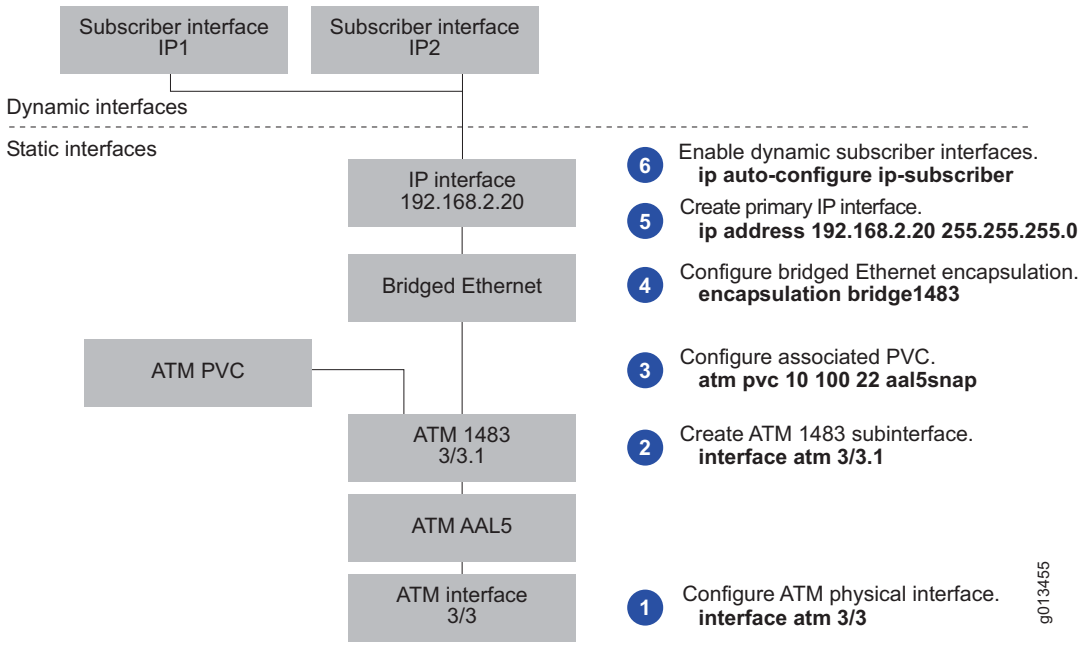
   host1(config-subif)#**ip auto-configure ip-subscriber**

8. (Optional) Specify the source address of traffic that is destined for the primary IP interface.

   host1(config-subif)#**ip source-prefix 192.168.2.20 255.255.255.0**

Figure 24 shows the interface stack built for this configuration.

Figure 24: IP over Bridged Ethernet over ATM Dynamic Subscriber Interface Configuration



Configuring Dynamic Subscriber Interfaces over GRE Tunnels

To configure a dynamic subscriber interface in an GRE tunnel configuration by using packet detection, perform the following steps:

1. Create a GRE tunnel interface.

   For instructions, see *Configuration Tasks* in *JUNOSe IP Services Configuration Guide, Chapter 10, Configuring IP Tunnels*.

2. Create the primary IP interface by assigning an IP address and mask to the bridged Ethernet interface (or make it unnumbered).

   host1(config-subif)#**ip address 192.168.2.20 255.255.255.0**

3. Configure the packet detect feature and specify that IP automatically detect packets that do not match any entries in the demultiplexer table.

   host1(config-if)#**ip auto-detect ip-subscriber**

4. Configure the primary IP interface to enable dynamic creation of subscriber interfaces.

   host1(config-subif)#**ip auto-configure ip-subscriber**

5. (Optional) Specify the IP inactivity timer.

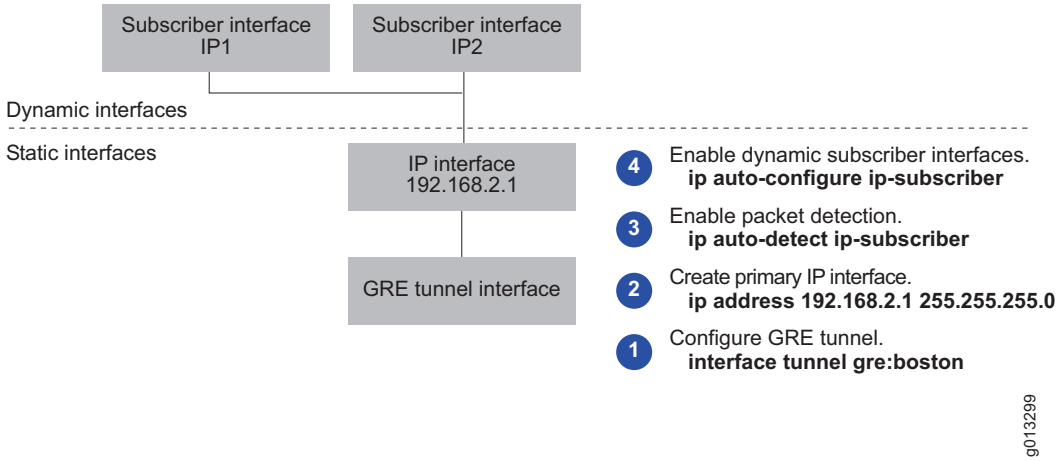
   host1(config-subif)#**ip inactivity-timer 100**

6. (Optional) Specify the source address of traffic that is destined for the primary IP interface.

   host1(config-subif)#**ip source-prefix 192.168.2.1 255.255.255.0**

Figure 25 shows the interface stack built for this configuration.

Figure 25: GRE Tunnel Dynamic Subscriber Interface Configuration



Dynamic Subscriber Interface Configuration Example

The procedure in this section shows how to configure dynamic subscriber interfaces by using the same loopback interface referenced by multiple unnumbered IP interfaces. Instead of assigning a different IP address to each physical interface, this example assigns an IP address to a loopback interface (loopback 0). Each physical interface is then configured as an unnumbered IP interface, referencing the same loopback interface. This example uses a DHCP local server.

This approach has the following benefits:

- A loopback interface provides a stable IP address that can minimize the impact if a physical interface in the network goes down.
- Unnumbered IP interfaces preserve valuable IP address space.

To configure dynamic subscriber interfaces, perform the following steps:

1. Enable the DHCP local server for standalone mode.

   host1(config)#**service dhcp-local standalone**

2. Access DHCP Local Pool Configuration mode for the local address pool.

   host1(config)#**ip dhcp-local pool ispWestford**

3. Specify the enduring IP addresses that the DHCP local server can assign from the local address pool.

   host1(config-dhcp-local)#**network 10.20.0.0 255.255.192.0**

4. Specify the router to forward traffic from the IP addresses to destinations on other subnets.

   host1(config-dhcp-local)#**default-router 10.20.32.1**

5. Exit DHCP Local Pool Configuration mode.

   host1(config-dhcp-local)#**exit**

6. Configure a loopback interface.

   host1(config)#**interface loopback 0**

7. Assign an IP address and mask to the loopback interface.

   host1(config-if)#**ip address 10.20.32.1 255.255.255.0**

8. Exit Interface Configuration mode.

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

9. Specify a Fast Ethernet port.

   host1(config)#**interface fastEthernet 3/0**

10. Create an unnumbered primary IP interface associated with the loopback interface configured in Steps 6 and 7.

    host1(config-if)#**ip unnumbered loopback 0**

11. Configure the primary IP interface to enable dynamic creation of subscriber interfaces.

    host1(config-if)#**ip auto-configure ip-subscriber**

12. Exit Interface Configuration mode.

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

13. Repeat Steps 9 through 12 for each Fast Ethernet interface on which you want to configure dynamic subscriber interfaces. For example:

    host1(config)#**interface fastEthernet 3/1**
    host1(config-if)#**ip unnumbered loopback 0**
    host1(config-if)#**ip auto-configure ip-subscriber**
    host1(config-if)#**exit**
    host1(config)#**interface fastEthernet 3/2**
    host1(config-if)#**ip unnumbered loopback 0**
    host1(config-if)#**ip auto-configure ip-subscriber**
    host1(config-if)#**exit**

atm pvc

- Use to configure a PVC on an ATM interface.
- Specify the VCD, the VPI, the VCI, and the encapsulation type. (For more information about these parameters, see *Creating a Basic Configuration* in *JUNOSe Link Layer Configuration Guide, Chapter 1, Configuring ATM*.)
- Example

  host1(config-subif)#**atm pvc 10 100 22 aal5snap**

- Use the **no** version to remove the specified PVC.

default-router

- Use to specify the IP address of the router for the subscriber's computer to use for traffic destined for locations beyond the local subnet.
- Specify the IP address of a primary server, and optionally, specify the IP address of a secondary server.
- Example

  host1(config-dhcp-local)#**default-router 10.10.1.1**

- Use the **no** version to remove the association between the address pool and the router.

encapsulation bridge1483

- Use to configure bridged Ethernet as the encapsulation method on an interface.
- Example

  host1(config-subif)#**encapsulation bridge1483**

- Use the **no** version to remove bridged Ethernet as the encapsulation method on the interface.

encapsulation vlan

- Use to configure VLAN as the encapsulation method on an interface.
- Issuing this command creates the VLAN major interface.
- Example

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

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

interface atm

- Use to configure an ATM interface or subinterface type in the *slot*/*port*.*subinterface* format:
  - *slot*—Specifies router chassis slot
  - *port*—Specifies I/O module port
  - *subinterface*—Specifies subinterface number
- Example

  host1(config-if)#**interface atm 9/1.1**

- Use the **no** version to remove the ATM interface or subinterface.

interface fastEthernet

- Use to select a Fast Ethernet (FE) interface on a line module or an SRP module.
- Example

  host1(config)#**interface fastEthernet 1/0**

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

interface gigabitEthernet

- Use to select a Gigabit Ethernet interface.

NOTE: You can configure only the primary port, 0, on the Gigabit Ethernet module. The router automatically uses the redundant port if the primary port fails.

- Example

  host1(config)#**interface gigabitEthernet 1/0**

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

interface tenGigabitEthernet

- Use to select a 10-Gigabit Ethernet interface on the E120 router or the E320 router.
- Use the *slot/adapter/port* format.
- Example

  host1(config)#**interface tenGigabitEthernet 4/0/1**

- Use the **no** version to remove IP from an interface. 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.

interface loopback

- Use to access and configure a loopback interface.
- You can use a loopback interface to provide a stable IP address that can minimize the impact if a physical interface goes down.
- Example

  host1(config)#**interface loopback 10**
  host1(config-if)#**ip address 10.20.32.1 255.255.255.0**

- Use the **no** version to delete the loopback interface.

ip address

- Use to set an IP address for an interface or a subinterface.
- Specify the layer 2 encapsulation before you set the IP address.
- Issuing this command creates the primary IP interface. You must create a primary IP interface on which to enable dynamic creation of subscriber interfaces.
- Example

  host1(config-subif)#**ip address 192.168.2.50 255.255.255.0**

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

ip auto-configure ip-subscriber

- Use to configure an IP interface to support creation of dynamic subscriber interfaces. The specified IP interface is considered the primary interface.
- The router creates the required dynamic subscriber interfaces when the IP address is assigned to the associated subscriber. The address might be assigned by an external DHCP server, the DHCP local server, or the packet detect feature.
- Use the **include-primary** keyword to specify that the primary interface can be assigned to a subscriber. Use the **exclude-primary** keyword to specify that the primary interface is not used for subscribers. The primary interface is not assigned to a subscriber by default.
- You can issue this command from Interface Configuration mode, Subinterface Configuration mode, or Profile Configuration mode.

- Example

  host1(config-if)#**ip auto-configure ip-subscriber include-primary**

- Use the **no** version to disable creation of dynamic subscriber interfaces associated with this primary IP interface. Use the **no** version with the **include-primary** keyword to specify that the primary interface is not assigned to a subscriber.

ip auto-detect ip-subscriber

- Use to set the router's packet detect feature and specify that IP automatically detect packets that do not match any entries in the demultiplexer table. When an unmatched packet is detected, an event is generated that determines whether to create a dynamic subscriber interface.
- Example

  host1(config-if)#**ip auto-detect ip-subscriber**

- Use the **no** version to restore the default, in which packet detection is disabled.

ip dhcp-local pool

- Use to access DHCP Local Pool Configuration mode.
- The DHCP local server uses pool names other than default to maintain configuration information for subscribers to a particular domain.
- Example

  host1(config)#**ip dhcp-local pool ispBoston**

- Use the **no** version to prevent the DHCP local server from supplying IP addresses from the specified pool.

ip inactivity-timer

- Use to configure the inactivity timer value. A dynamically created subscriber interface is deleted if it is inactive for a period longer than the inactivity timer value.
- The timer value can be in the range 1–65335 minutes.
- A timer value of 0 specifies that dynamically created subscriber interfaces are never deleted by the inactivity timer.
- Example

  host1(config-if)#**ip inactivity-timer 100**

- Use the **no** version to restore the default, in which inactivity timer feature is disabled.

ip source-prefix

- Use to configure a subscriber interface or a primary IP interface enabled for dynamic creation of subscriber interfaces to demultiplex traffic with the specified source address.
- You can issue this command from either Interface Configuration mode or Subinterface Configuration mode.
- Example

  host1(config-if)#**ip source-prefix 10.10.2.0 255.255.255.0**

- Use the **no** version to remove the association between the interface and the specified IP source address and mask.

ip unnumbered

- Use to configure an unnumbered IP interface.
- This command enables IP processing on an interface without assigning an explicit IP address to the interface.
- You must specify an interface location, which is the identifier of another interface on which the router has an assigned IP address. This interface cannot be another unnumbered interface.
- Examples

  host1(config-if)#**ip unnumbered fastEthernet 3/0**
  host1(config-if)#**ip unnumbered loopback 10**

- Use the **no** version to disable IP processing on the interface.

ip use-framed-routes ip-subscriber

- Use to configure a static primary IP interface to use framed routes as source IP addresses when creating dynamic subscriber interfaces. The router uses the Framed-Route RADIUS attribute [22] sent in Access-Accept messages to apply framed routes to subscriber interfaces associated with the primary interface.
- Example

  host1(config-if)#**ip use-framed-routes ip-subscriber**

- Use the **no** version to disable the use of framed routes when creating dynamic subscriber interfaces associated with this primary IP interface.

network

- Use to specify the IP addresses that the DHCP local server can provide from an address pool.
- Example

  host1(config-dhcp-local)#**network 10.10.1.0 255.255.255.0**

- Use the **no** version to remove the network address and mask.

service dhcp-local

- Use to enable the DHCP local server to operate in either equal-access mode or standalone mode.
- Example

  host1(config)#**service dhcp-local standalone**

- Use the **no** version to disable the DHCP local server.

set dhcp relay giaddr-selects-interface

- Use to configure DHCP relay to use information in the giaddr in DHCP server-destined packets to identify the primary interface on which dynamic subscriber interfaces are built. See *Using the Giaddr to Identify the Primary Interface for Dynamic Subscriber Interfaces* in *Chapter 20, Configuring DHCP Relay* for additional information about this feature.
- Example

  host1(config)#**set dhcp relay giaddr-selects-interface**

- Use the **no** version to restore the default in which DHCP relay builds dynamic subscriber interfaces on the IP interface that is used for DHCP server-destined messages.

vlan id

- Use to configure a VLAN ID for a VLAN subinterface.
- Specify a VLAN ID number that is in the range 0–4095 and is unique within the Ethernet interface.
- Issue the **vlan id** command before you configure any upper-layer interfaces, such as IP.
- Example

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

- There is no **no** version.