



CHAPTER 19

Configuring Layer 3 Interfaces

This chapter contains information about how to configure Layer 3 interfaces on the Catalyst 6500 series switches.



Note

For complete syntax and usage information for the commands used in this chapter, refer to these publications:

- The *Catalyst Supervisor Engine 32 PISA Cisco IOS Command Reference*, Release 12.2ZY, at this URL:
<http://www.cisco.com/en/US/docs/switches/lan/catalyst6500/ios/12.2ZY/command/reference/cmdref.html>
- The Release 12.2 publications at this URL:
http://www.cisco.com/en/US/products/sw/iosswrel/ps1835/products_installation_and_configuration_guides_list.html

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Layer 3 Interface Configuration Guidelines and Restrictions

When configuring Layer 3 interfaces, follow these guidelines and restrictions:

- We recommend that you configure no more than 2,000 Layer 3 VLAN interfaces.
- The **ip unnumbered** command is supported on Layer 3 VLAN interfaces.
- To support VLAN interfaces, create and configure VLANs and assign VLAN membership to Layer 2 LAN ports. For more information, see [Chapter 12, “Configuring VLANs”](#) and [Chapter 11, “Configuring VTP.”](#)

- Catalyst 6500 series switches do not support:
 - Integrated routing and bridging (IRB)
 - Concurrent routing and bridging (CRB)
 - Remote source-route bridging (RSRB)
- Use bridge groups on VLAN interfaces, sometimes called fall-back bridging, to bridge nonrouted protocols. Bridge groups on VLAN interfaces are supported in software on the PISA.
- Catalyst 6500 series switches do not support the IEEE bridging protocol for bridge groups. Configure bridge groups to use the VLAN-bridge or the DEC spanning-tree protocol.

Configuring Subinterfaces on Layer 3 Interfaces

When configuring Layer 3 subinterfaces, follow these guidelines and restrictions:

- These features are supported on LAN port subinterfaces:
 - IPv4 unicast forwarding, including MPLS VPN
 - IPv4 multicast forwarding, including MPLS VPN
 - 6PE
 - EoMPLS
 - IPv4 unnumbered
 - Counters for subinterfaces in MIBS and with the **show vlans** command
 - iBGP and eBGP
 - OSPF
 - EIGRP
 - RIPv1/v2
 - RIPv2
 - ISIS
 - Static routing
 - Unidirectional link routing (UDLR)
 - IGMPv1, IGMPv2, IGMPv3
 - PIMv1, PIMv2
 - SSM IGMPv3lite and URD
 - Stub IP multicast routing
 - IGMP join
 - IGMP static group
 - Multicast routing monitor (MRM)
 - Multicast source discovery protocol (MSDP)
 - SSM
 - IPv4 Ping
 - IPv6 Ping

- Always use the **native** keyword when the VLAN ID is the ID of the IEEE 802.1Q native VLAN. Do not configure encapsulation on the native VLAN of an IEEE 802.1Q trunk without the **native** keyword.
- Because VLAN IDs are global to the switch, you can use a VLAN internally, on a subinterface, or with a Layer 3 VLAN interface.
 - You cannot configure an internal VLAN on a subinterface or a Layer 3 VLAN interface.
 - You cannot configure a subinterface VLAN on a Layer 3 VLAN interface.
 - You cannot configure a VLAN used with a Layer 3 VLAN interface on a subinterface.



Note You cannot configure a VLAN used on one interface or subinterface on another interface or subinterface.

- You can configure subinterfaces with any normal range or extended range VLAN ID in VTP transparent mode. Because VLAN IDs 1 to 1005 are global in the VTP domain and can be defined on other network devices in the VTP domain, you can use only extended range VLANs with subinterfaces in VTP client or server mode. In VTP client or server mode, normal range VLANs are excluded from subinterfaces.



Note If you configure normal range VLANs on subinterfaces, you cannot change the VTP mode from transparent.

To configure a subinterface, perform this task:

	Command	Purpose
Step 1	Router> enable	Enters privileged EXEC mode.
Step 2	Router# configure terminal	Enters global configuration mode.
Step 3	Router(config)# interface { <i>{type¹ slot/port.subinterface</i> } { port-channel <i>port_channel_number.subinterface</i> }}	Selects an interface and enters subinterface configuration mode.
Step 4	Router(config-subif)# encapsulation dot1q <i>vlan_ID</i> [native]	Configures 802.1Q encapsulation for the subinterface.
Step 5	Router(config-if)# exit	Returns to global configuration mode.

1. *type* = ethernet, fastethernet, gigabitethernet, tengigabitethernet, or ge-wan

Configuring IPv4 Routing and Addresses

For complete information and procedures, refer to these publications:

- *Cisco IOS IP and IP Routing Configuration Guide*, Release 12.2, at this URL:
http://www.cisco.com/en/US/docs/ios/12_2/ip/configuration/guide/fipr_c.html
- *Cisco IOS IP and IP Routing Command Reference*, Release 12.2, at these URLs:
http://www.cisco.com/en/US/docs/ios/12_2/ipaddr/command/reference/fipras_r.html
http://www.cisco.com/en/US/docs/ios/12_2/iproute/command/reference/fiprrp_r.html

When configuring IPv4 routing and addresses, follow these guidelines and restrictions:

- For information about the **maximum paths** command, refer to the *Catalyst Supervisor Engine 32 PISA Cisco IOS Command Reference*, Release 12.2ZY, publication.
- The Policy Feature Card 3B (PFC3B) provides hardware support for policy-based routing (PBR) for route-map sequences that use the **match ip address**, **set ip next-hop**, and **ip default next-hop** PBR keywords.

When configuring PBR, follow these guidelines and restrictions:

- The PFC3B provides hardware support for PBR configured on a tunnel interface.
- The PFC3B does not provide hardware support for PBR configured with the **set ip next-hop** keywords if the next hop is a tunnel interface.
- If the PISA address falls within the range of a PBR ACL, traffic addressed to the PISA is policy routed in hardware instead of being forwarded to the PISA. To prevent policy routing of traffic addressed to the PISA, configure PBR ACLs to deny traffic addressed to the PISA.
- Any options in Cisco IOS ACLs that provide filtering in a PBR route-map that would cause flows to be sent to the PISA to be switched in software are ignored. For example, logging is not supported in ACEs in Cisco IOS ACLs that provide filtering in PBR route-maps.
- PBR traffic through switching module ports where PBR is configured is routed in software if the switching module resets. (CSCee92191)

To configure PBR, refer to the *Cisco IOS Quality of Service Solutions Configuration Guide*, Release 12.2, “Classification,” “Configuring Policy-Based Routing,” at this URL:

http://www.cisco.com/en/US/docs/ios/12_2/qos/configuration/guide/qcftpbr_ps1835_TSD_Products_Configuration_Guide_Chapter.html

To configure IPv4 routing and an IPv4 address on a Layer 3 interface, perform this task:

	Command	Purpose
Step 1	Router(config)# ip routing	Enables IPv4 routing. (Required only if IPv4 routing is disabled.)
Step 2	Router(config)# router <i>ip_routing_protocol</i>	Specifies an IPv4 routing protocol.
Step 3	Router(config-router)# <i>ip_routing_protocol_commands</i>	Configures the IPv4 routing protocol.
Step 4	Router(config-router)# exit	Exits IPv4 routing protocol configuration mode.
Step 5	Router(config)# interface { <i>vlan vlan_ID</i> } { <i>type</i> ¹ <i>slot/port</i> } { port-channel <i>port_channel_number</i> }	Selects an interface to configure.
Step 6	Router(config-if)# ip address <i>ip_address</i> <i>subnet_mask</i>	Configures the IPv4 address and IPv4 subnet.
Step 7	Router(config-if)# no shutdown	Enables the interface.
Step 8	Router(config-if)# end	Exits configuration mode.
Step 9	Router# show interfaces [{ <i>vlan vlan_ID</i> } { <i>type</i> ¹ <i>slot/port</i> } { port-channel <i>port_channel_number</i> }] Router# show ip interfaces [{ <i>vlan vlan_ID</i> } { <i>type</i> ¹ <i>slot/port</i> } { port-channel <i>port_channel_number</i> }] Router# show running-config interfaces [{ <i>vlan vlan_ID</i> } { <i>type</i> ¹ <i>slot/port</i> } { port-channel <i>port_channel_number</i> }]	Verifies the configuration.

1. *type* = ethernet, fastethernet, gigabitethernet, tengigabitethernet, or ge-wan

This example shows how to enable IPv4 Routing Information Protocol (RIP) routing:

```
Router# configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)# ip routing
Router(config)# router rip
Router(config-router)# network 10.0.0.0
Router(config-router)# end
Router#
```

This example shows how to configure an IPv4 address on Fast Ethernet port 5/4:

```
Router# configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)# interface fastethernet 5/4
Router(config-if)# ip address 172.20.52.106 255.255.255.248
Router(config-if)# no shutdown
Router(config-if)# end
Router#
```

This example uses the **show interfaces** command to display the interface IPv4 address configuration and status of Fast Ethernet port 5/4:

```
Router# show interfaces fastethernet 5/4
FastEthernet5/4 is up, line protocol is up
  Hardware is Cat6K 100Mb Ethernet, address is 0050.f0ac.3058 (bia 0050.f0ac.3058)
  Internet address is 172.20.52.106/29
  MTU 1500 bytes, BW 100000 Kbit, DLY 100 usec,
    reliability 255/255, txload 1/255, rxload 1/255
  Encapsulation ARPA, loopback not set
  Keepalive set (10 sec)
  Full-duplex, 100Mb/s
  ARP type: ARPA, ARP Timeout 04:00:00
  Last input 00:00:01, output never, output hang never
  Last clearing of "show interface" counters never
  Queueing strategy: fifo
  Output queue 0/40, 0 drops; input queue 0/75, 0 drops
  5 minute input rate 0 bits/sec, 0 packets/sec
  5 minute output rate 0 bits/sec, 0 packets/sec
    7 packets input, 871 bytes, 0 no buffer
    Received 0 broadcasts, 0 runts, 0 giants, 0 throttles
    0 input errors, 0 CRC, 0 frame, 0 overrun, 0 ignored
    0 input packets with dribble condition detected
    8 packets output, 1658 bytes, 0 underruns
    0 output errors, 0 collisions, 4 interface resets
    0 babbles, 0 late collision, 0 deferred
    0 lost carrier, 0 no carrier
    0 output buffer failures, 0 output buffers swapped out
Router#
```

This example uses the **show ip interface** command to display the detailed configuration and status of Fast Ethernet port 5/4:

```
Router# show ip interface fastethernet 5/4
FastEthernet5/4 is up, line protocol is up
  Internet address is 172.20.52.106/29
  Broadcast address is 255.255.255.255
  Address determined by setup command
  MTU is 1500 bytes
  Helper address is not set
  Directed broadcast forwarding is disabled
  Multicast reserved groups joined: 224.0.0.10
```

```

Outgoing access list is not set
Inbound access list is not set
Proxy ARP is enabled
Security level is default
Split horizon is enabled
ICMP redirects are always sent
ICMP unreachable are always sent
ICMP mask replies are never sent
IP fast switching is enabled
IP fast switching on the same interface is disabled
IP Flow switching is disabled
IP CEF switching is enabled
IP Fast switching turbo vector
IP Normal CEF switching turbo vector
IP multicast fast switching is enabled
IP multicast distributed fast switching is disabled
Router Discovery is disabled
IP output packet accounting is disabled
IP access violation accounting is disabled
TCP/IP header compression is disabled
RTP/IP header compression is disabled
Probe proxy name replies are disabled
Policy routing is disabled
Network address translation is disabled
WCCP Redirect outbound is disabled
WCCP Redirect exclude is disabled
BGP Policy Mapping is disabled
IP multicast multilayer switching is disabled
IP mls switching is enabled
Router#

```

This example uses the **show running-config** command to display the interface IPv4 address configuration of Fast Ethernet port 5/4:

```

Router# show running-config interfaces fastethernet 5/4
Building configuration...

Current configuration:
!
interface FastEthernet5/4
 description "Router port"
 ip address 172.20.52.106 255.255.255.248
 no ip directed-broadcast
!

```

Configuring IPX Routing and Network Numbers



Note

The PISA supports IPX with fast switching.

For complete information and procedures, refer to these publications:

- *Cisco IOS AppleTalk and Novell IPX Configuration Guide*, Release 12.2, at this URL:
http://www.cisco.com/en/US/docs/ios/12_2/atipx/configuration/guide/fatipx_c.html
- *Cisco IOS AppleTalk and Novell IPX Command Reference*, Release 12.2, at this URL:
http://www.cisco.com/en/US/docs/ios/12_2/atipx/command/reference/fatipx_r.html

To configure routing for Internetwork Packet Exchange (IPX) and configure IPX on a Layer 3 interface, perform this task:

	Command	Purpose
Step 1	Router(config)# ipx routing	Enables IPX routing.
Step 2	Router(config)# router ipx_routing_protocol	Specifies an IP routing protocol. This step might include other commands, such as specifying the networks to route with the network command.
Step 3	Router(config)# interface {vlan vlan_ID} {type¹ slot/port} {port-channel port_channel_number}	Selects an interface to configure.
Step 4	Router(config-if)# ipx network [network unnumbered] encapsulation encapsulation_type	Configures the IPX network number. This enables IPX routing on the interface. When you enable IPX routing on the interface, you can also specify an encapsulation type.
Step 5	Router(config-if)# no shutdown	Enables the interface.
Step 6	Router(config-if)# end	Exits configuration mode.
Step 7	Router# show interfaces [{vlan vlan_ID} {type ¹ slot/port} {port-channel port_channel_number}] Router# show ipx interfaces [{vlan vlan_ID} {type ¹ slot/port} {port-channel port_channel_number}] Router# show running-config interfaces [{vlan vlan_ID} {type ¹ slot/port} {port-channel port_channel_number}]	Verifies the configuration.

1. *type* = ethernet, fastethernet, gigabitethernet, or tengigabitethernet, or ge-wan

This example shows how to enable IPX routing and assign an IPX network address to interface VLAN 100:

```
Router# configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)# ipx routing
Router(config)# ipx router rip
Router(config-ipx-router)# network all
Router(config-ipx-router)# interface vlan 100
Router(config-if)# ipx network 100 encapsulation snap
Router(config-if)# no shutdown
Router(config-if)# end
Router# copy running-config startup-config
```

Configuring AppleTalk Routing, Cable Ranges, and Zones

For complete information and procedures, refer to these publications:

- *Cisco IOS AppleTalk and Novell IPX Configuration Guide*, Release 12.2, at this URL:
http://www.cisco.com/en/US/docs/ios/12_2/atipx/configuration/guide/fatipx_c.html
- *Cisco IOS AppleTalk and Novell IPX Command Reference*, Release 12.2, at this URL:
http://www.cisco.com/en/US/docs/ios/12_2/atipx/command/reference/fatipx_r.html

To configure routing for AppleTalk, perform this task beginning in global configuration mode:

	Command	Purpose
Step 1	Router(config)# appletalk routing	Enables AppleTalk routing.
Step 2	Router(config)# interface {vlan vlan_ID} {type ¹ slot/port} {port-channel port_channel_number}	Selects an interface to configure.
Step 3	Router(config-if)# appletalk cable-range cable_range	Assigns a cable range to the interface.
Step 4	Router(config-if)# appletalk zone zone_name	Assigns a zone name to the interface.
Step 5	Router(config-if)# no shutdown	Enables the interface.
Step 6	Router(config-if)# end	Exits configuration mode.
Step 7	Router# show interfaces [{vlan vlan_ID} {type ¹ slot/port} {port-channel port_channel_number}] Router# show appletalk interfaces [{vlan vlan_ID} {type ¹ slot/port} {port-channel port_channel_number}] Router# show running-config interfaces [{vlan vlan_ID} {type ¹ slot/port} {port-channel port_channel_number}]	Verifies the configuration.

1. *type* = ethernet, fastethernet, gigabitethernet, or tengigabitethernet, or ge-wan

This example shows how to enable AppleTalk routing and assign an AppleTalk cable-range and zone name to interface VLAN 100:

```
Router# configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)# appletalk routing
Router(config)# interface vlan 100
Router(config-if)# appletalk cable-range 100-100
Router(config-if)# appletalk zone Engineering
Router(config-if)# no shutdown
Router(config-if)# end
Router# copy running-config startup-config
```

Configuring Other Protocols on Layer 3 Interfaces

Refer to these publications for information about configuring other protocols on Layer 3 interfaces:

- *Cisco IOS Apollo Domain, VINES, DECnet, ISO CLNS, and XNS Configuration Guide*, Release 12.2, at this URL:
http://www.cisco.com/en/US/docs/ios/12_2/apollo/configuration/guide/fapolo_c.html
- *Cisco IOS Apollo Domain, VINES, DECnet, ISO CLNS, and XNS Command Reference*, Release 12.2, at this URL:
http://www.cisco.com/en/US/docs/ios/12_2/apollo/command/reference/fapolo_r.html