Configuring Layer 3 Subinterfaces

This module describes how to configure the dot1q VLAN subinterfaces on a Layer 3 interface, which forwards IPv4 and IPv6 packets to another device using static or dynamic routing protocols. You can use Layer 3 interfaces for IP routing and inter-VLAN routing of Layer 2 traffic.

- Restrictions for Configuring Layer 3 Subinterfaces, on page 1
- Information About Layer 3 Subinterfaces, on page 2
- How to Configure Layer 3 Subinterfaces, on page 3
- Example: Configuring Layer 3 Subinterfaces, on page 4
- Feature History for Layer 3 Subinterfaces, on page 4

Restrictions for Configuring Layer 3 Subinterfaces

- Subinterfaces are not supported on StackWise Virtual Link.
- Subinterfaces with Software-Defined Access (SD-Access) is not supported.
- Do not configure more than 4,000 Layer 3 interfaces, that includes routed physical interfaces, SVI interfaces and subinterfaces.
- A maximum of 1000 SVI interfaces is supported.
- Do not configure encapsulation on the native VLAN of an IEEE 802.1Q trunk without the **native** keyword. Always use the **native** keyword of the **dot1q vlan** command when the VLAN ID is the ID of the IEEE 802.1Q native VLAN.
- If you configure normal-range VLANs on subinterfaces, you cannot change the VLAN Trunking Protocol (VTP) mode from Transparent.
- If a Layer 3 port has a subinterface configured with dot1q as the native VLAN, Cisco recommends not to configure routing related configuration on the Layer 3 port as it will hinder the functionality of the native VLAN subinterface.
- The **encapsulation dot1q native** command is not supported for subinterfaces on the Cisco Catalyst 9600X Series Switches.

Information About Layer 3 Subinterfaces

A dot1q VLAN subinterface is a virtual Cisco IOS interface that is associated with a VLAN ID on a routed physical interface. A parent interface is a physical port. Subinterfaces can be created on Layer 3 physical interfaces and Layer 3 port channels. A subinterface can be associated with different functionalities such as IP addressing, forwarding policies, Quality of Service (QoS) policies, and security policies.

Subinterfaces divide the parent interface into two or more virtual interfaces on which you can assign unique Layer 3 parameters such as IP addresses and dynamic routing protocols. The IP address for each subinterface should be in a different subnet from any other subinterface on the parent interface.

You can create a subinterface with a name that consists of the parent interface name (for example, HundredGigabitEthernet 1/0/33) followed by a period and then by a number that is unique for that subinterface. For example, you can create a subinterface for HundredGigabitEthernet interface 1/0/33 named HundredGigabitEthernet 1/0/33.1, where .1 indicates the subinterface.

One of the uses of subinterfaces is to provide unique Layer 3 interfaces to each VLAN that is supported by the parent interface. In this scenario, the parent interface connects to a Layer 2 trunking port on another device. You can configure a subinterface and associate the subinterface to a VLAN ID using 802.1Q trunking.

You can configure subinterfaces with any normal range or extended range VLAN ID in VLAN Trunking Protocol (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.

Use bridge groups on VLAN interfaces (also called fall-back bridging) to bridge nonrouted protocols. Bridge groups on VLAN interfaces are supported on the route processor (RP) software.

You can configure the same VLAN ID on a Layer 2 VLAN or Layer 3 VLAN interface and on a Layer 3 subinterface.

The following features and protocols are supported on Layer 3 subinterfaces:

- Addressing and routing: IPv4 and IPv6.
- Unicast routing: Open Shortest Path First (OSPF), Enhanced Interior Gateway Routing Protocol (EIGRP), Routing Information Protocol (RIP), Border Gateway Protocol (BGP), and static routing.
- Multicast routing: Internet Group Management Protocol (IGMP), Protocol-Independent Multicast Sparse Mode (PIM-SM), Source Specific Multicast (SSM), and Multiprotocol Label Switching (MPLS).
- First-Hop Redundancy Protocol (FHRP) protocols: Hot Standby Router Protocol (HSRP), Virtual Router Redundancy Protocol (VRRP), and Gateway Load Balancing Protocol (GLBP).
- Bidirectional Forwarding Detection (BFD), Unicast Reverse Path Forwarding (uRPF), and Equal-Cost Multipath (ECMP).
- Maximum transmission unit (MTU) and IPv4 fragmentation.
- Virtual routing and forwarding (VRF) lite.
- Router access control list and policy-based routing (PBR).
- Quality of Service (QoS): Marking and policing.

- Services: Network Address Translation (NAT) IPv4, Security Group Access Control List (SGACL) enforcement, DHCP Server/Relay, SGT Exchange Protocol (SXP), and NetFlow.
- Layer 3 EtherChannels.

How to Configure Layer 3 Subinterfaces

You can configure one or more subinterfaces on a routed interface. Configure the parent interface as a routed interface by using the **no switchport** command. The parent interface can have its own IP address, policies, and configurations attached to it. Untagged traffic and any tagged traffic or VLAN (not handled by the subinterface) that comes into the port are handled by the parent interface.

Procedure

	Command or Action	Purpose
Step 1	**enable** **Example:** `Device> enable`	Enables privileged EXEC mode. Enter your password, if prompted.
Step 2	**configure terminal** **Example:** `Device# configure terminal`	Enters global configuration mode.

Step 3	**interface** {*type switch* / *slot* / *port.subinterface*}
	Example:
	`Device(config)# interface HundredGigabitEthernet 1/0/33.201`
	Or
	`Device(config)# interface range HundredGigabitEthernet1/0/33.201-HundredGigabitEthernet1/0/33.204`
		Selects an interface or interface range and enters subinterface configuration mode. (To remove an interface, use the **no** form of this command.)
		• You can also specify a range of interfaces along with the associated dot1q VLAN IDs as shown in this example.

Step 4	**encapsulation dot1q** *vlan-id* [**native**] **Example:** `Device(config-subif)# encapsulation dot1q 201 native`	Configures 802.1Q encapsulation for the subinterface. The range is from 1 to 4000. (To remove 802.1Q encapsulation for the subinterface, use the **no** form of this command.) • **native**: To make a subinterface the default handler of untagged packets coming to the port, use this keyword. If you configure this keyword on the subinterface, and IP and other configurations are also configured on the parent interface, this keyword overwrites the configurations on the parent interface. Configure either this keyword on the subinterface or the configurations on the parent interface at a time.

	Command or Action	Purpose
		Note **shutdown** and **no shutdown** commands can be used to shutdown or reverse the shutdown on a specific subinterface without affecting the traffic passing through the parent interface or other subinterfaces.
Step 5	**end** **Example:** `Device(config-subif)# end`	Exits subinterface mode and returns to privileged EXEC mode.

Example: Configuring Layer 3 Subinterfaces

The following example shows how to configure subinterfaces on layer 3 interfaces:

```
Device> enable
Device# configure terminal
Device(config)# interface HundredGigabitEthernet 1/0/33
Device(config-if)# no switchport
Device(config-if)# no ip address
Device(config-if)# exit
Device(config)# interface HundredGigabitEthernet 1/0/33.201
Device(config-subif)# encapsulation dot1q 201 native
Device(config-subif)# end
```

The following example shows how to configure subinterfaces on layer 3 port channels:

```
Device> enable
Device# configure terminal
Device(config)# interface port-channel 2
Device(config-if)# no switchport
Device(config-if)# no ip address
Device(config-if)# exit
Device(config)# interface port-channel 2.10
Device(config-subif)# encapsulation dot1q 10
Decvice(config-subif)# ip address 10.10.10.11 255.255.255.0
Device(config-subif)# end
```

Feature History for Layer 3 Subinterfaces

This table provides release and related information for the features explained in this module.

These features are available in all the releases subsequent to the one they were introduced in, unless noted otherwise.

Table 1: Feature History for Layer 3 Subinterfaces

Release	Feature	Feature Information
Cisco IOS XE Gibraltar 16.11.1	Layer 3 Subinterfaces	Layer 3 interfaces forward IPv4 and IPv6 packets to another device using static or dynamic routing protocols. You can use Layer 3 interfaces for IP routing and inter-VLAN routing of Layer 2 traffic.
Cisco IOS XE Gibraltar 16.12.1	EtherChannel and Multiprotocol Label Switching	These features were introduced on Layer 3 subinterfaces.
Cisco IOS XE Cupertino 17.7.1	Layer 3 Subinterfaces	This feature was implemented on Cisco Catalyst 9600 Series Supervisor 2 Module (C9600X-SUP-2).

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