



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.

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Restrictions for Configuring Layer 3 Subinterfaces

- Subinterfaces are not supported on StackWise Virtual Link.
- Subinterfaces with Software-Defined Access (SD-Access) is not supported.
- Subinterfaces, physical routed interfaces, and VLAN interfaces share the same hardware resources. The combination of all three interfaces cannot exceed the platform limits.
- For a given physical interface, only one subinterface can have the encapsulation as native.
- For a given physical interface, each subinterface should have a unique encapsulation ID.
- A physical interface cannot be used for Layer 3 services (no IP address configurations are supported on the physical interface) if one of the subinterface is configured as native.
- 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.

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, GigabitEthernet 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 GigabitEthernet interface 1/0/33 named GigabitEthernet 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.

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:

- IPv4 addressing and routing.
- Unicast routing: Open Shortest Path First (OSPF), 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).
- Unicast Reverse Path Forwarding (uRPF), and Equal-Cost Multipath (ECMP).
- Virtual routing and forwarding (VRF) lite.
- Router access control list and policy-based routing (PBR).
- Quality of Service (QoS): Marking and policing.
- Services: DHCP Server/Relay 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 { <i>type switch / slot / port.subinterface</i> } Example: Device(config)# interface GigabitEthernet1/0/33.201 Or Device(config)# interface range GigabitEthernet1/0/33.201-GigabitEthernet1/0/33.204	Selects an interface or interface range and enters subinterface configuration mode. (To remove an interface, use the no form of this command.) <ul style="list-style-type: none"> 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.) <ul style="list-style-type: none"> 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 GigabitEthernet 1/0/33
Device(config-if)# no switchport
Device(config-if)# no ip address
Device(config-if)# exit
Device(config)# interface GigabitEthernet 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
Device(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 16.10.1	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 supervisor modules C9400X-SUP-2 and C9400X-SUP-2XL, which were introduced in this release.

