Layer 2 Protocol and 802.1Q Tunneling Guide

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CHAPTER 1

Configuring IEEE 802.1Q Tunneling

The IEEE 802.1Q Tunneling feature is designed for service providers who carry traffic of multiple customers across their networks and are required to maintain the VLAN and Layer 2 protocol configurations of each customer without impacting the traffic of other customers.

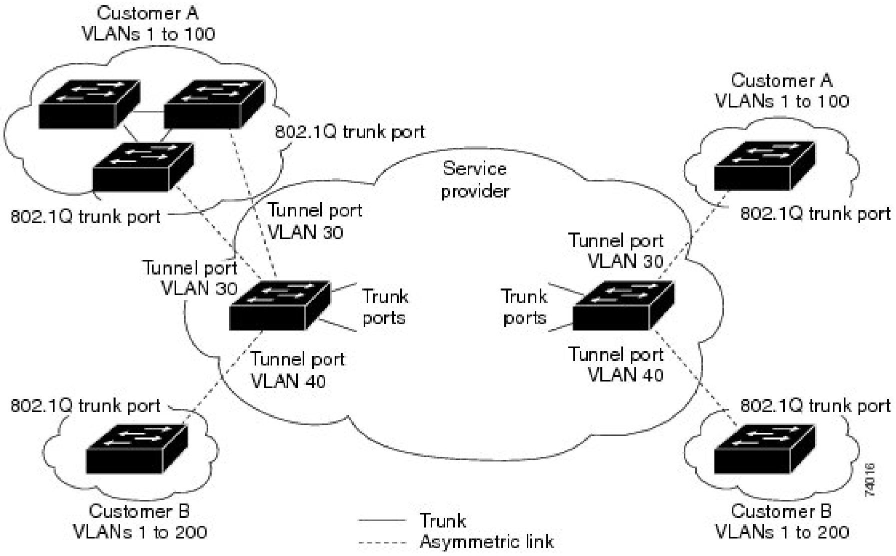
IEEE 802.1Q Tunnel Ports in a Service Provider Network

Business customers of service providers often have specific requirements for VLAN IDs and the number of VLANs to be supported. The VLAN ranges required by different customers in the same service-provider network might overlap, and traffic of customers through the infrastructure might be mixed. Assigning a unique range of VLAN IDs to each customer would restrict customer configurations and could easily exceed the VLAN limit (4096) of the IEEE 802.1Q specification.

Using the IEEE 802.1Q tunneling feature, service providers can use a single VLAN to support customers who have multiple VLANs. Customer VLAN IDs are preserved, and traffic from different customers is segregated within the service-provider network, even when they appear to be in the same VLAN. Using IEEE 802.1Q tunneling expands VLAN space by using a VLAN-in-VLAN hierarchy and retagging the tagged packets. A port configured to support IEEE 802.1Q tunneling is called a tunnel port. When you configure tunneling, you assign a tunnel port to a VLAN ID that is dedicated to tunneling. Each customer requires a separate service-provider VLAN ID, but that VLAN ID supports all of the customer’s VLANs.

Customer traffic tagged in the normal way with appropriate VLAN IDs comes from an IEEE 802.1Q trunk port on the customer device and into a tunnel port on the service-provider edge device. The link between the customer device and the edge device is asymmetric because one end is configured as an IEEE 802.1Q trunk port, and the other end is configured as a tunnel port. You assign the tunnel port interface to an access VLAN ID that is unique to each customer.

Figure 1: IEEE 802.1Q Tunnel Ports in a Service-Provider Network

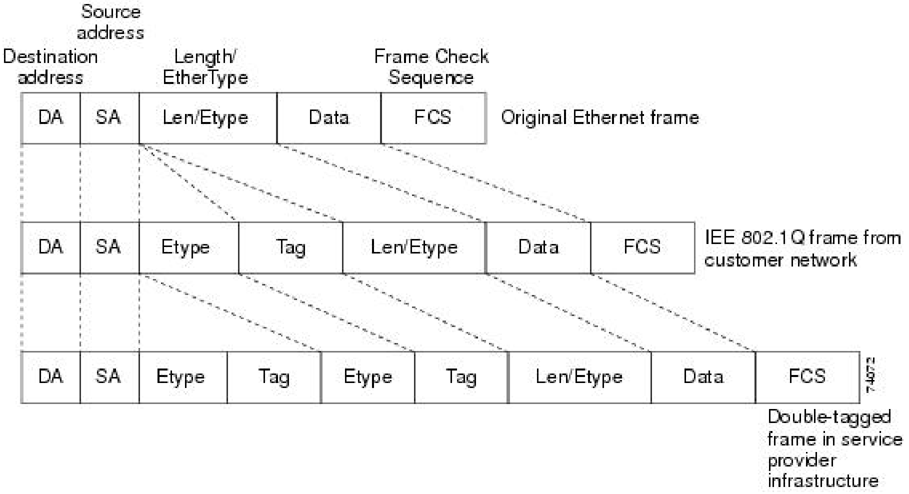


Packets coming from the customer trunk port into the tunnel port on the service-provider edge device are normally IEEE 802.1Q-tagged with the appropriate VLAN ID. The tagged packets remain intact inside the device and when they exit the trunk port into the service-provider network, they are encapsulated with another layer of an IEEE 802.1Q tag (called the metro tag) that contains the VLAN ID that is unique to the customer. The original customer IEEE 802.1Q tag is preserved in the encapsulated packet. Therefore, packets entering the service-provider network are double-tagged, with the outer (metro) tag containing the customer's access VLAN ID, and the inner VLAN ID being that of the incoming traffic.

When the double-tagged packet enters another trunk port in a service-provider core device, the outer tag is stripped as the device processes the packet. When the packet exits another trunk port on the same core device, the same metro tag is again added to the packet.

Figure 2: Original (Normal), IEEE 802.1Q, and Double-Tagged Ethernet Packet Formats

This figure shows the tag structures of the double-tagged packets.



When the packet enters the trunk port of the service-provider egress device, the outer tag is again stripped as the device internally processes the packet. However, the metro tag is not added when the packet is sent out the tunnel port on the edge device into the customer network. The packet is sent as a normal IEEE 802.1Q-tagged frame to preserve the original VLAN numbers in the customer network.

In the above network figure, Customer A was assigned VLAN 30, and Customer B was assigned VLAN 40. Packets entering the edge device tunnel ports with IEEE 802.1Q tags are double-tagged when they enter the service-provider network, with the outer tag containing VLAN ID 30 or 40, appropriately, and the inner tag containing the original VLAN number, for example, VLAN 100. Even if both Customers A and B have VLAN 100 in their networks, the traffic remains segregated within the service-provider network because the outer tag is different. Each customer controls its own VLAN numbering space, which is independent of the VLAN numbering space used by other customers and the VLAN numbering space used by the service-provider network.

At the outbound tunnel port, the original VLAN numbers on the customer's network are recovered. It is possible to have multiple levels of tunneling and tagging, but the device supports only one level in this release.

If traffic coming from a customer network is not tagged (native VLAN frames), these packets are bridged or routed as normal packets. All packets entering the service-provider network through a tunnel port on an edge device are treated as untagged packets, whether they are untagged or already tagged with IEEE 802.1Q headers. The packets are encapsulated with the metro tag VLAN ID (set to the access VLAN of the tunnel port) when they are sent through the service-provider network on an IEEE 802.1Q trunk port. The priority field on the metro tag is set to the interface class of service (CoS) priority configured on the tunnel port. (The default is zero if none is configured.)

Restrictions for Tunneling

- IEEE 802.1Q tunneling and Layer 2 protocol tunneling are supported on the following platforms:
    - Cisco 1000 Series Integrated Services Routers
    - Cisco 4000 Series Integrated Services Routers with the NIM-ES module
- The `vlan dot1q tag native` command is not supported.
- Since the Ethernet virtual connection (EVC) of the WAN port is used as the 802.1Q-in-802.1Q (QinQ) port, the encapsulation of the Ethernet flow point (EFP) of the Switch Virtual Interface (SVI) and WAN port only supports default EFP and 802.1Q EFP. The 802.1AD TPID (0x88a8) is not supported. You cannot use the switchport as the QinQ port towards the service provider.
- An SVI or Bridge Domain Interface (BDI) cannot route IEEE 802.1Q tunneling traffic.
- EtherChannels are not supported.
- The default DMAC of layer protocol tunneling is 01-00-0c-cd-cd-d0 and cannot be customized.

IEEE 802.1Q Tunneling and Other Features

Although IEEE 802.1Q tunneling works well for Layer 2 packet switching, there are incompatibilities between some Layer 2 features and Layer 3 switching.

- A tunnel port cannot be a routed port.
- IP routing is not supported on a VLAN that includes IEEE 802.1Q tunnel ports. Packets received from a tunnel port are forwarded based only on Layer 2 information. If routing is enabled on a switch virtual

interface (SVI) that includes tunnel ports, untagged IP packets received from the tunnel port are recognized and routed by the switch. Customers can access the Internet through its native VLAN. If this access is not needed, you should not configure SVIs on VLANs that include tunnel ports.

- Fallback bridging is not supported on tunnel ports. Because all IEEE 802.1Q-tagged packets received from a tunnel port are treated as non-IP packets, if fallback bridging is enabled on VLANs that have tunnel ports configured, IP packets would be improperly bridged across VLANs. Therefore, you must not enable fallback bridging on VLANs with tunnel ports.
- Tunnel ports do not support IP access control lists (ACLs).
- Layer 3 quality of service (QoS) ACLs and other QoS features related to Layer 3 information are not supported on tunnel ports. MAC-based QoS is supported on tunnel ports.
- EtherChannel port groups are compatible with tunnel ports as long as the IEEE 802.1Q configuration is consistent within an EtherChannel port group.
- Port Aggregation Protocol (PAgP), Link Aggregation Control Protocol (LACP), and UniDirectional Link Detection (UDLD) are supported on IEEE 802.1Q tunnel ports.
- Dynamic Trunking Protocol (DTP) is not compatible with IEEE 802.1Q tunneling because you must manually configure asymmetric links with tunnel ports and trunk ports.
- VLAN Trunking Protocol (VTP) does not work between devices that are connected by an asymmetrical link or devices that communicate through a tunnel.
- Loopback detection is supported on IEEE 802.1Q tunnel ports.
- When a port is configured as an IEEE 802.1Q tunnel port, spanning-tree bridge protocol data unit (BPDU) filtering is automatically enabled on the interface. Cisco Discovery Protocol (CDP) and the Layer Link Discovery Protocol (LLDP) are automatically disabled on the interface.
- When an IEEE 802.1Q tunnel port is configured as SPAN source, span filter must be applied for SVLAN to avoid packet loss.
- IGMP/MLD packet forwarding can be enabled on IEEE 802.1Q tunnels. This can be done by disabling IGMP/MLD snooping on the service provider network.

Default IEEE 802.1Q Tunneling Configuration

By default, IEEE 802.1Q tunneling is disabled because the default switchport mode is dynamic auto. Tagging of IEEE 802.1Q native VLAN packets on all IEEE 802.1Q trunk ports is also disabled.

How to Configure IEEE 802.1Q Tunneling

Follow these steps to configure a port as an IEEE 802.1Q tunnel port:

Before you begin

- Always use an asymmetrical link between the customer device and the edge device, with the customer device port configured as an IEEE 802.1Q trunk port and the edge device port configured as a tunnel port.

- Assign tunnel ports only to VLANs that are used for tunneling.
- Observe configuration requirements for native VLANs and for and maximum transmission units (MTUs).

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** *interface-id* **Example:** `Device(config)# interface gigabitethernet2/0/1`	Enters interface configuration mode for the interface to be configured as a tunnel port. This should be the edge port in the service-provider network that connects to the customer device. Valid interfaces include physical interfaces and port-channel logical interfaces (port channels 1 to 48).
Step 4	**switchport access vlan** *vlan-id* **Example:** `Device(config-if)# switchport access vlan 2`	Specifies the default VLAN, which is used if the interface stops trunking. This VLAN ID is specific to the particular customer.
Step 5	**switchport mode dot1q-tunnel** **Example:** `Device(config-if)# switchport mode dot1q-tunnel`	Sets the interface as an IEEE 802.1Q tunnel port. **Note** Use the **no switchport mode dot1q-tunnel** interface configuration command to return the port to the default state of dynamic desirable.
Step 6	**exit** **Example:** `Device(config-if)# exit`	Returns to global configuration mode.

Step 7	**end**
	Example:
	`Device(config)# end`
		Returns to privileged EXEC mode.

Step 8	Use one of the following:
	• **show dot1q-tunnel**
	• **show running-config interface**
	Example:
	`Device# show dot1q-tunnel`
	or
	`Device# show running-config interface`
		Displays the ports configured for IEEE 802.1Q tunneling.
		Displays the ports that are in tunnel mode.

	Command or Action	Purpose
Step 9	**copy running-config startup-config** **Example:** `Device# copy running-config startup-config`	(Optional) Saves your entries in the configuration file.

Example: Configuring an IEEE 802.1Q Tunneling Port

The following example shows how to configure a switch port as a tunnel port and verify the configuration. In this example, traffic received from the LAN switch port Gigabit Ethernet interface 0/1/3 is tagged with tunnel VLAN 2000 and service VLAN 3000 and then transmitted to WAN port Gigabit Ethernet interface 0/0/1.

```
Device(config)# interface GigabitEthernet0/1/3
Device(config-if)# switchport access vlan 2000
% Access VLAN does not exist. Creating vlan 2000
Device(config-if)# switchport mode dot1q-tunnel
Device(config-if)# exit
Device(config)# interface Vlan2000
Device(config-if)# service instance 10 ethernet evc1
Device(config-if)# encapsulation dot1q 2000
Device(config-if)# rewrite ingress tag pop 1 symmetric
Device(config-if)# exit
Device(config)# interface GigabitEthernet0/0/1
Device(config-if)# service instance 10 ethernet
Device(config-if)# encapsulation dot1q 3000
Device(config-if)# rewrite ingress tag pop 1 symmetric
Device(config-if)# exit
Device(config)# bridge-domain 10
Device(config-if)# member GigabitEthernet0/0/1 service-instance 10
Device(config-if)# member Vlan2000 service-instance 10
Device(config-if)# exit
Device(config)# end
```

Monitoring Tunneling Status

The following table describes the commands used to monitor tunneling status.

Table 1: Commands for Monitoring Tunneling

Command	Purpose
show dot1q-tunnel	Displays IEEE 802.1Q tunnel ports on the device.
show dot1q-tunnel interface *interface-id*	Verifies if a specific interface is a tunnel port.

Feature History and Information for IEEE 802.1Q Tunneling

The following table provides release information about the feature or features described in this module. This table lists only the software release that introduced support for a given feature in a given software release train. Unless noted otherwise, subsequent releases of that software release train also support that feature.

Release	Modification
Cisco IOS XE Gibraltar 16.12.1	This feature was introduced

CHAPTER 2

Configuring Layer 2 Protocol Tunneling

Customers at different sites connected across a service-provider network need to use various Layer 2 protocols to scale their topologies to include all remote sites, as well as the local sites. STP must run properly, and every VLAN should build a proper spanning tree that includes the local site and all remote sites across the service-provider network. Cisco Discovery Protocol (CDP) must discover neighboring Cisco devices from local and remote sites. VLAN Trunking Protocol (VTP) must provide consistent VLAN configuration throughout all sites in the customer network.

When protocol tunneling is enabled, edge device on the inbound side of the service-provider network encapsulate Layer 2 protocol packets with a special MAC address and send them across the service-provider network. Core devices in the network do not process these packets but forward them as normal packets. Layer 2 protocol data units (PDUs) for CDP, STP, or VTP cross the service-provider network and are delivered to customer devices on the outbound side of the service-provider network. Identical packets are received by all customer ports on the same VLANs with these results:

- Users on each of a customer's sites can properly run STP, and every VLAN can build a correct spanning tree based on parameters from all sites and not just from the local site.
- CDP discovers and shows information about the other Cisco devices connected through the service-provider network.
- VTP provides consistent VLAN configuration throughout the customer network, propagating to all devices through the service provider.

Layer 2 protocol tunneling can be used independently or can enhance IEEE 802.1Q tunneling. If protocol tunneling is not enabled on IEEE 802.1Q tunneling ports, remote devices at the receiving end of the service-provider network do not receive the PDUs and cannot properly run STP, CDP, and VTP. When protocol tunneling is enabled, Layer 2 protocols within each customer's network are totally separate from those running within the service-provider network. Customer devices on different sites that send traffic through the service-provider network with IEEE 802.1Q tunneling achieve complete knowledge of the customer's VLAN. If IEEE 802.1Q tunneling is not used, you can still enable Layer 2 protocol tunneling by connecting to the customer device through access ports and by enabling tunneling on the service-provider access port.

For example, in the following figure (Layer 2 Protocol Tunneling), Customer X has four devices in the same VLAN, that are connected through the service-provider network. If the network does not tunnel PDUs, devices on the far ends of the network cannot properly run STP, CDP, and VTP. For example, STP for a VLAN on a device in Customer X, Site 1, will build a spanning tree on the devices at that site without considering convergence parameters based on Customer X's devices in Site 2. This could result in the topology shown in the Layer 2 Network Topology without Proper Convergence figure.

Figure 3: Layer 2 Protocol Tunneling

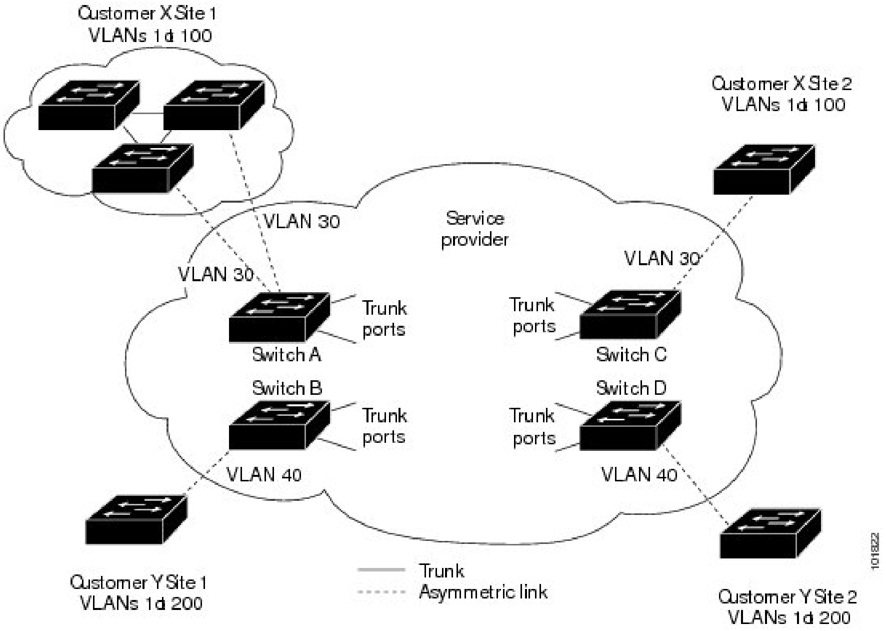
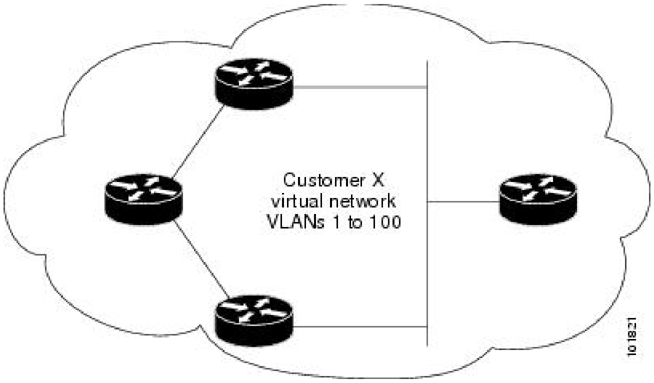


Figure 4: Layer 2 Network Topology Without Proper Convergence



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Feature History and Information for Layer 2 Protocol Tunneling

The following table provides release information about the feature or features described in this module. This table lists only the software release that introduced support for a given feature in a given software release train. Unless noted otherwise, subsequent releases of that software release train also support that feature.

Feature	Release	Description
L2 Protocol Tunnel CDP under LAN Switching Interface	Cisco IOS XE Bengaluru 17.4.1a	You can now configure L2CP X for tunneling so that it forwards all other l2cp with the DST MAC 01:00:0C:CD:CD:D0 except X with the DST MAC 01:00:0C:CD:CD:D0 on the following platforms: • Cisco 1000 Series Integrated Services Routers • Cisco 4000 Series Integrated Services Routers
Layer 2 Protocol Tunneling	Cisco IOS XE Gibraltar 16.12.1	This feature was introduced on the following platforms: • Cisco 1000 Series Integrated Services Routers • Cisco 4000 Series Integrated Services Routers

Restrictions for Tunneling

- IEEE 802.1Q tunneling and Layer 2 protocol tunneling are supported on the following platforms:
  - Cisco 1000 Series Integrated Services Routers
  - Cisco 4000 Series Integrated Services Routers with the NIM-ES module
- The `vlan dot1q tag native` command is not supported.
- Since the Ethernet virtual connection (EVC) of the WAN port is used as the 802.1Q-in-802.1Q (QinQ) port, the encapsulation of the Ethernet flow point (EFP) of the Switch Virtual Interface (SVI) and WAN port only supports default EFP and 802.1Q EFP. The 802.1AD TPID (0x88a8) is not supported. You cannot use the switchport as the QinQ port towards the service provider.
- An SVI or Bridge Domain Interface (BDI) cannot route IEEE 802.1Q tunneling traffic.
- EtherChannels are not supported.
- The default DMAC of layer protocol tunneling is 01-00-0c-cd-cd-d0 and cannot be customized.

Layer 2 Protocol Tunneling on Ports

You can enable Layer 2 protocol tunneling (by protocol) on the ports that are connected to the customer in the edge devices of the service-provider network. The service-provider edge devices connected to the customer device perform the tunneling process. Edge device tunnel ports are connected to customer IEEE 802.1Q trunk ports. Edge device access ports are connected to customer access ports. The edge devices connected to the customer device perform the tunneling process.

The device supports Layer 2 protocol tunneling for CDP, STP, and VTP. For emulated point-to-point network topologies, it also supports PAgP, LACP, LLDP, and UDLD protocols.

Note PAgP, LACP, and UDLD protocol tunneling is only intended to emulate a point-to-point topology. An erroneous configuration that sends tunneled packets to many ports could lead to a network failure.

When the Layer 2 PDUs that entered the service-provider inbound edge device through a Layer 2 protocol-enabled port exit through the trunk port into the service-provider network, the device overwrites the customer PDU-destination MAC address with a well-known Cisco proprietary multicast address (01-00-0c-cd-cd-d0). If IEEE 802.1Q tunneling is enabled, packets are also double-tagged; the outer tag is the customer metro tag, and the inner tag is the customer's VLAN tag. The core devices ignore the inner tags and forward the packet to all trunk ports in the same metro VLAN. The edge devices on the outbound side restore the proper Layer 2 protocol and MAC address information and forward the packets to all tunnel or access ports in the same metro VLAN. Therefore, the Layer 2 PDUs remain intact and are delivered across the service-provider infrastructure to the other side of the customer network.

Note Configure L2CP X for tunneling to forward all other l2CP with the DST MAC 01:00:0C:CD:CD:D0 except X with DST MAC 01:00:0C:CD:CD:D0

See the Layer 2 Protocol Tunneling Figure 1 with Customer X and Customer Y in access VLANs 30 and 40, respectively. Asymmetric links connect the customers in Site 1 to edge devices in the service-provider network. The Layer 2 PDUs (for example, BPDUs) coming into Switch B from Customer Y in Site 1 are forwarded to the infrastructure as double-tagged packets with the well-known MAC address as the destination MAC address. These double-tagged packets have the metro VLAN tag of 40, as well as an inner VLAN tag (for example, VLAN 100). When the double-tagged packets enter Switch D, the outer VLAN tag 40 is removed, the well-known MAC address is replaced with the respective Layer 2 protocol MAC address, and the packet is sent to Customer Y on Site 2 as a single-tagged frame in VLAN 100.

You can also enable Layer 2 protocol tunneling on access ports on the edge device connected to access or trunk ports on the customer switch. In this case, the encapsulation and decapsulation process is the same as described in the previous paragraph, except that the packets are not double-tagged in the service-provider network. The single tag is the customer-specific access VLAN tag.

In switch stacks, Layer 2 protocol tunneling configuration is distributed among all stack members. Each stack member that receives an ingress packet on a local port encapsulates or decapsulates the packet and forwards it to the appropriate destination port. On a single switch, ingress Layer 2 protocol-tunneled traffic is sent across all local ports in the same VLAN on which Layer 2 protocol tunneling is enabled. In a stack, packets received by a Layer 2 protocol-tunneled port are distributed to all ports in the stack that are configured for Layer 2 protocol tunneling and are in the same VLAN. All Layer 2 protocol tunneling configuration is handled by the stack master and distributed to all stack members.

Configuring Layer 2 Protocol Tunneling

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** *interface-id* **Example:** `Device(config)# interface gigabitethernet1/0/1`	Specifies the interface connected to the phone, and enters interface configuration mode.
Step 4	Use one of the following: • **switchport mode dot1q-tunnel** **Example:** `Device(config-if)# switchport mode dot1q-tunnel`	Configures the interface as an IEEE 802.1Q tunnel port or a trunk port.
Step 5	**l2protocol-tunnel** [**cdp** | **lldp** | **point-to-point** | **stp** | **vtp**] **Example:** `Device(config-if)# l2protocol-tunnel cdp`	Enables protocol tunneling for the desired protocol. If no keyword is entered, tunneling is enabled for all four Layer 2 protocols. **Note** Use the **no l2protocol-tunnel** [**cdp** | **lldp** | **point-to-point** | **stp** | **vtp**] interface configuration command to disable protocol tunneling for one of the Layer 2 protocols or for all three.
Step 6	**l2protocol-tunnel shutdown-threshold** [*packet_second_rate_value* | **cdp** | **lldp point-to-point** | **stp** | **vtp**] **Example:** `Device(config-if)# l2protocol-tunnel shutdown-threshold 100 cdp`	(Optional) Configures the threshold for packets-per-second accepted for encapsulation. The interface is disabled if the configured threshold is exceeded. If no protocol option is specified, the threshold applies to each of the tunneled Layer 2 protocol types. The range is 1 to 4096. The default is to have no threshold configured. **Note** If you also set a drop threshold on this interface, the **shutdown-threshold** value must be greater than or equal to the **drop-threshold** value.

	Command or Action	Purpose
		Note Use the **no l2protocol-tunnel shutdown-threshold** [*packet_second_rate_value* | **cdp** | **lldp**| **point-to-point** | **stp** | **vtp**] and the **no l2protocol-tunnel drop-threshold** [*packet_second_rate_value* | **cdp** | **lldp**| **point-to-point** |**stp** | **vtp**] commands to return the shutdown and drop thresholds to the default settings.
Step 7	**l2protocol-tunnel drop-threshold** [*packet_second_rate_value* | **cdp** | **lldp** | **point-to-point** | **stp** | **vtp**] **Example:** `Device(config-if)# ` **`l2protocol-tunnel drop-threshold 100 cdp`**	(Optional) Configures the threshold for packets-per-second accepted for encapsulation. The interface drops packets if the configured threshold is exceeded. If no protocol option is specified, the threshold applies to each of the tunneled Layer 2 protocol types. The range is 1 to 4096. The default is to have no threshold configured. **Note** If you also set a shutdown threshold on this interface, the **drop-threshold** value must be less than or equal to the **shutdown-threshold** value. **Note** Use the **no l2protocol-tunnel shutdown-threshold** [**cdp** | **lldp**| **point-to-point** | **stp** | **vtp**] and the **no l2protocol-tunnel drop-threshold** [**cdp** | **stp** | **vtp**] commands to return the shutdown and drop thresholds to the default settings.
Step 8	**exit** **Example:** `Device(config-if)# ` **`exit`**	Returns to global configuration mode.
Step 9	**errdisable recovery cause l2ptguard** **Example:** `Device(config)# ` **`errdisable recovery cause l2ptguard`**	(Optional) Configures the recovery mechanism from a Layer 2 maximum-rate error so that the interface is reenabled and can try again. Errdisable recovery is disabled by default; when enabled, the default time interval is 300 seconds.
Step 10	**l2protocol-tunnel cos** *value* **Example:** `Device(config)# ` **`l2protocol-tunnel cos value 7`**	(Optional) Configures the CoS value for all tunneled Layer 2 PDUs. The range is 0 to 7; the default is the default CoS value for the interface. If none is configured, the default is 5.
Step 11	**spanning-tree bpdufilter enable** **Example:** `Device(config)# ` **`spanning-tree bpdufilter enable`**	Inserts a BPDU filter for spanning tree. **Note** While configuring Layer 2 Protocol Tunneling on a trunk port, you must enable a BPDU filter for spanning tree.

	Command or Action	Purpose

Step 12	**end**
	Example:
	`Device(config)# end`
		Returns to privileged EXEC mode.

Step 13	**show l2protocol** **Example:** `Device# show l2protocol`	Displays the Layer 2 tunnel ports on the device, including the protocols configured, the thresholds, and the counters.
Step 14	**copy running-config startup-config** **Example:** `Device# copy running-config startup-config`	(Optional) Saves your entries in the configuration file.

Example: Configuring Layer 2 Protocol Tunneling

The following example shows how to configure Layer 2 protocol tunneling for CDP, STP, and VTP and to verify the configuration.

```
Device(config)# interface gigabitethernet1/0/11
Device(config-if)# l2protocol-tunnel cdp
Device(config-if)# l2protocol-tunnel stp
Device(config-if)# l2protocol-tunnel vtp
Device(config-if)# l2protocol-tunnel shutdown-threshold 1500
Device(config-if)# l2protocol-tunnel drop-threshold 1000
Device(config-if)# exit
Device(config)# l2protocol-tunnel cos 7
Device(config)# end
Device# show l2protocol

COS for Encapsulated Packets: 7
Port Protocol Shutdown Drop Encapsulation Decapsulation Drop
Threshold Threshold Counter Counter Counter
------- -------- --------- --------- ------------- ------------- -------------
Gi0/11 cdp 1500 1000 2288 2282 0
stp 1500 1000 116 13 0
vtp 1500 1000 3 67 0
pagp ---- ---- 0 0 0
lacp ---- ---- 0 0 0
udld ---- ---- 0 0 0
```

Monitoring Tunneling Status

The following table describes the commands used to monitor tunneling status.

Table 2: Commands for Monitoring Tunneling

Command	Purpose
clear l2protocol-tunnel counters	Clears the protocol counters on Layer 2 protocol tunneling ports.
show dot1q-tunnel	Displays IEEE 802.1Q tunnel ports on the device.
show dot1q-tunnel interface *interface-id*	Verifies if a specific interface is a tunnel port.
show l2protocol-tunnel	Displays information about Layer 2 protocol tunneling ports.
show errdisable recovery	Verifies if the recovery timer from a Layer 2 protocol-tunnel error disable state is enabled.
show l2protocol-tunnel interface *interface-id*	Displays information about a specific Layer 2 protocol tunneling port.
show l2protocol-tunnel summary	Displays only Layer 2 protocol summary information.

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