



## Q-n-Q Tunneling

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Service providers often have multiple customers with overlapping VLAN ranges. Q-in-Q tunneling or 802.1Q tunneling is the mechanism that allows service providers to preserve customer VLANS being transported through the service provider networks. Q-in-Q tunneling uses a two-level VLAN tag structure. Each customer is assigned a unique VLAN within the service providers network, this unique tag is added to all incoming frames from the customer network. The original frame from the customer remains untouched. The inner frame is often referred to as the customer VLAN tag because the customer originally assigns it.

Q-in-Q tunneling significantly reduces the number of VLAN required within a customer network as each customer is assigned a unique VLAN. To the customer the service provider network appears as a transparent bridge connecting their sites together.

When configuring Q-in-Q tunneling the ports connected directly to the customer switch are configured with the command "switchport trunk encapsulation dot1q". The customer ports are configured as per normal and require no extra configuration.

```
interface FastEthernet0/20
description customer
switchport trunk encapsulation dot1q
switchport mode trunk
switchport nonegotiate
end
```

```
Interface FastEthernet0/21
description service provider
switchport access vlan 21
switchport mode dot1q-tunnel
l2protocol-tunnel cdp
l2protocol-tunnel stp
l2protocol-tunnel vtp
no cdp enable
end
```

In the above example Fast 0/20 resides on the customer switch, while Fast 0/21 is on the service provider switch and configured as a tunnel port. VLAN 21 becomes the outer tag and is added to all frames from Fast 0/20 sent down to Fast 0/21. The service provider port is specifically configured also to carry CDP, STP and VTP frames. The configuration can be verified with the command "show l2protocol-tunnel interface fast 0/21"

If the customer is running a negotiated EtherChannel a slightly different configuration is required. On the customer side a normal EtherChannel is configured.

```
interface Fastethernet0/1
switchport trunk encapsulation dot1q
switchport mode trunk
channel-group 1 mode desirable
```

```
interface Fastethernet0/2
switchport trunk encapsulation dot1q
switchport mode trunk
channel-group 1 mode desirable
```

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The service provider configuration is slightly different from the previous example.

```
interface FastEthernet0/1
switchport access vlan 17
switchport mode dot1q-tunnel
l2protocol-tunnel point-to-point pagp
end
```

```
interface fastethernet0/2
switchport access vlan 18
switchport mode dot1q-tunnel
l2protocol-tunnel point-to-point pagp
end
```

In this case we use the “l2protocol-tunnel point-to-point pagp” command to carry the PagP frames across the service provider network. Also one customer VLAN is assigned per incoming port from the customer switch. For LACP the “l2protocol-tunnel point-to-point LACP” would be used.

Article Source: <http://www.ccbootcamp.com/support-resources/resources/articles-by-ccbootcamp.html>

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