

L2VPN Local Switching—Frame Relay-Ethernet/VLAN

L2VPN Local Switching—Frame Relay-Ethernet/VLAN feature allows you to switch Frame Relay and Ethernet frames between two interfaces on the same device.

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Restrictions for L2VPN Local Switching—Frame Relay-Ethernet/VLAN

The following functions are not supported:

- Frame Relay-to-Ethernet IP-Mode local switching
- Frame Relay-to-Ethernet VLAN-Mode local switching
- Frame Relay Multilink Frame Relay (MFR)

Information About L2VPN Local Switching—Frame Relay-Ethernet/VLAN

L2VPN Local Switching—Frame Relay-Ethernet/VLAN Overview

The L2VPN Local Switching—Frame Relay-Ethernet/VLAN feature switches a Frame Relay frame to an Ethernet VLAN/QinQ frame over the same provider edge (PE) device. Only Ethernet (bridged) interworking mode is supported to switch packets between Frame Relay link and Ethernet VLAN/QinQ. In a bridged interworking mode, the MAC header is considered as the payload of Frame Relay frames.

The L2VPN Local Switching—Frame Relay-Ethernet/VLAN supports the following functions:

- The Frame Relay-Ethernet bridge mode local switching in data-link connection identifier (DLCI) mode.
- Port interface and subinterface Ethernet attachment circuit (AC) type with single tag or double tags (Q-in-Q).
- Cisco and IETF Frame Relay encapsulation.

The Frame Relay-Ethernet local switching topology is illustrated in the figure below.

Figure 1: Frame Relay-Ethernet Local Switching Topology

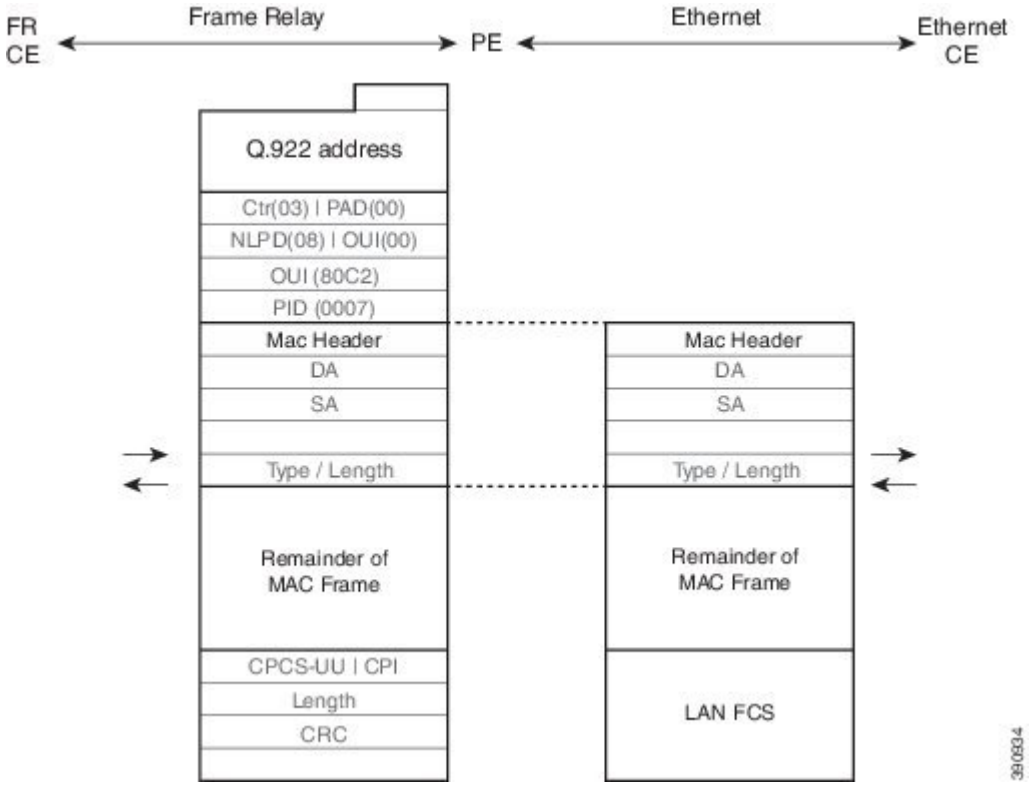


Frame Relay to Ethernet Port-Bridged Interworking

Frame Relay-Ethernet port-bridged interworking provides interoperability between a Frame Relay attachment virtual circuit (VC) and an Ethernet attachment VC connected to the same provider edge (PE) device. The bridged encapsulation is used that corresponds to the bridged (Ethernet) interworking mechanism.

Based on RFC 2427, *Multiprotocol Interconnect over Frame Relay*, the interworking is done at the PE connected to the Frame Relay attachment VC as shown in the figure below.

Figure 2: Protocol Stack for Frame Relay to Ethernet Port Bridged Interworking



The processing of Frame Relay-Ethernet port local switching is described as follows:

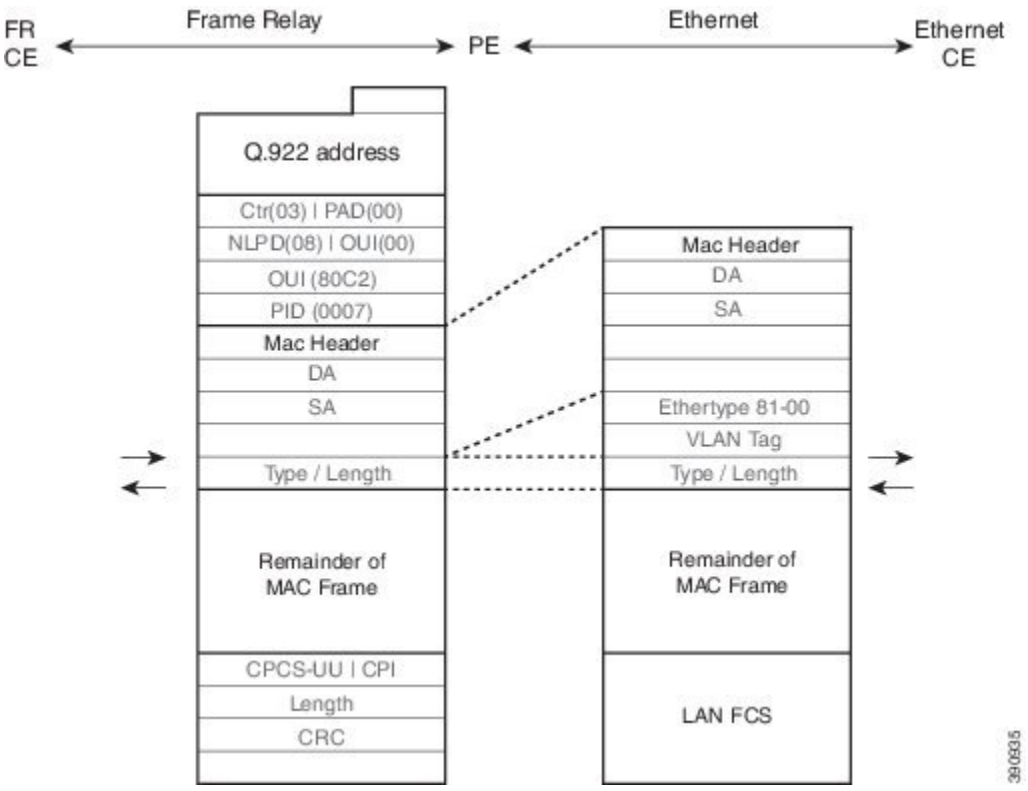
- In the direction from Frame Relay to Ethernet:
  - On the Frame Relay side, the Frame Relay header and trailer are removed. The packet is forwarded to Ethernet side.
  - On the Ethernet side, the MAC header is ignored.
- In the direction from Ethernet to Frame Relay:
  - On the Ethernet side, the MAC header is ignored.
  - On the Frame Relay side, the Frame Relay header is generated and added to the packet that is sent to the Frame Relay customer edge (CE) device.

Frame Relay to Ethernet VLAN/QinQ–Bridged Interworking

Frame Relay to Ethernet VLAN/QinQ bridged interworking provides interoperability between a Frame Relay attachment virtual circuit (VC) and an Ethernet VLAN attachment VC connected to the same provider edge (PE) device. The bridged encapsulation is used that corresponds to the bridged (Ethernet) interworking mechanism.

Based on RFC 2427, *Multiprotocol Interconnect over Frame Relay*, the interworking function is implemented on the PE connected to the Frame Relay attachment VC as shown in the figure below.

Figure 3: Protocol Stack for Frame Relay to Ethernet VLAN/QinQ Bridged Interworking



The process of Frame Relay to VLAN/QinQ bridged interworking is described as follows:

- In the direction from Frame Relay to Ethernet:
  - On the Frame Relay side, the Frame Relay header and trailer are removed. The packet is forwarded to Ethernet side.
  - On the Ethernet side, one or two VLAN tags are generated per the configuration and inserted into L2 header, which is referred as VLAN tag push.
- In the direction from Ethernet to Frame Relay:
  - On the Ethernet side, the one or two VLAN tags are removed. The packet is then forwarded to Frame Relay side.
  - On the Frame Relay side, the Frame Relay header is generated and added to the packet that is sent to the Frame Relay customer edge (CE) device.

How To Configure L2VPN Local Switching—Frame Relay-Ethernet/VLAN

Configuring Frame Relay-Ethernet Port-Bridged Interworking

SUMMARY STEPS

1. **enable**
2. **configure terminal**
3. **interface** *type number*
4. **no ip address**
5. **exit**
6. **interface** *type number*
7. **encapsulation frame-relay**
8. **frame-relay interface-dlci** *dlci* **switched**
9. **exit**
10. **connect** *connection-name type number dlci* **interworking ethernet**
11. **end**

DETAILED STEPS

Procedure

	Command or Action	Purpose
Step 1	**enable** **Example:** `Device> enable`	Enables privileged EXEC mode. • Enter your password if prompted.

	Command or Action	Purpose
Step 2	**configure terminal** **Example:** `Device# configure terminal`	Enters global configuration mode.
Step 3	**interface** *type number* **Example:** `Device(config)# interface GigabitEthernet 0/0/0`	Specifies the interface type and number and enters interface configuration mode.
Step 4	**no ip address** **Example:** `Device(config-if)# no ip address`	Disables IP processing.
Step 5	**exit** **Example:** `Device(config-if)# exit`	Exits interface configuration mode and returns to global configuration mode.
Step 6	**interface** *type number* **Example:** `Device(config)# interface Serial 0/0/0:0`	Specifies the subinterface type and number and enters subinterface configuration mode.
Step 7	**encapsulation frame-relay** **Example:** `Device(config-subif)# encapsulation frame-relay`	Enables Frame Relay encapsulation.
Step 8	**frame-relay interface-dlci** *dlci* **switched** **Example:** `Device(config-subif)# frame-relay interface-dlci 57 switched`	Indicates that a Frame Relay data-link connection identifier (DLCI) is switched. The range is from 16 to 1007.
Step 9	**exit** **Example:** `Device(config-subif)# exit`	Exits subinterface configuration mode and returns to global configuration mode.
Step 10	**connect** *connection-name type number dlci* **interworking ethernet** **Example:** `Device(config)# connect Eth-Ser GigabitEthernet0/0/0 Serial0/0/0:0 57 interworking ethernet`	Creates Layer 2 data connections between two ports on the same device.
Step 11	**end** **Example:** `Device# end`	Exits global configuration mode and returns to privileged EXEC mode.

Configuring Frame Relay-Ethernet VLAN/QinQ Interworking

SUMMARY STEPS

1. **enable**
2. **configure terminal**
3. **interface** *type number*
4. **encapsulation dot1q** *vlan-id* **second-dot1q** *second vlan-id*
5. **exit**
6. **interface** *type number*
7. **encapsulation frame-relay**
8. **frame-relay interface-dlci** *dlci* **switched**
9. **exit**
10. **connect** *connection-name type number dlci* **interworking ethernet**
11. **end**

DETAILED STEPS

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 number* **Example:** `Device(config)# interface GigabitEthernet 0/0/0.1`	Specifies a subinterface type and number and enters subinterface configuration mode.
Step 4	**encapsulation dot1q** *vlan-id* **second-dot1q** *second vlan-id* **Example:** `Device(config-subif)# encapsulation dot1q 3 second-dot1q 4`	Specifies QinQ as the encapsulation method.
Step 5	**exit** **Example:** `Device(config-if)# exit`	Exits subinterface configuration mode and returns to global configuration mode.

	Command or Action	Purpose
Step 6	**interface** *type number* **Example:** `Device(config)# interface Serial 0/0/0:0`	Specifies a subinterface type and number and enters subinterface configuration mode.
Step 7	**encapsulation frame-relay** **Example:** `Device(config-subif)# encapsulation frame-relay`	Enables Frame Relay encapsulation.
Step 8	**frame-relay interface-dlci** *dlci* **switched** **Example:** `Device(config-subif)# frame-relay interface-dlci 58 switched`	Indicates that a Frame Relay data-link connection identifier (DLCI) is switched.
Step 9	**exit** **Example:** `Device(config-subif)# exit`	Exits subinterface configuration mode and returns to global configuration mode.
Step 10	**connect** *connection-name type number dlci* **interworking ethernet** **Example:** `Device(config)# connect Eth-FR GigabitEthernet0/0/0.1 Serial0/0/0:0 58 interworking ethernet`	Creates Layer 2 data connections between two ports on the same device.
Step 11	**end** **Example:** `Device# end`	Exits global configuration mode and returns to privileged EXEC mode.

Configuration Examples for L2VPN Local Switching—Frame Relay-Ethernet/VLAN

Example: Configuring Frame Relay-Ethernet Port Mode Bridged Interworking

The following example shows how to configure the Frame Relay-Ethernet port mode bridged interworking:

PE configuration:

```
interface GigabitEthernet0/0/1
   no ip address
   end
interface Serial0/1/2:0
   no ip address
   encapsulation frame-relay
   no keepalive
   frame-relay interface-dlci 60 switched
```

```
   end
connect FR-ETHQinQ Serial0/1/2:0 60 GigabitEthernet0/0/1 interworking ethernet
```

CE configuration: Frame-Relay-CE

```
 bridge irb
 bridge 16 protocol ieee
 bridge 16 route ip
 interface Serial2/0:0
   no ip address
   encapsulation frame-relay IETF
   no keepalive
  interface Serial2/0:0.1 point-to-point
   frame-relay interface-dlci 60
   bridge-group 60
  interface BVI16
   ip address 172.16.1.0 255.255.0.0
```

Ethernet-CE

```
interface GigabitEthernet0/0/1
 ip address 172.16.2.1 255.255.0.0
```

Example: Configuring Frame Relay-Ethernet VLAN 802.1Q Bridged Interworking

The following example shows how to configure Frame Relay-Ethernet VLAN 802.1Q bridged interworking:

PE configuration:

```
interface GigabitEthernet0/0/1.10
  encapsulation dot1Q 10
  end
interface Serial0/1/2:0
   no ip address
   encapsulation frame-relay
   no keepalive
   frame-relay interface-dlci 58 switched
   end
 connect FR-ETH1Q Serial0/1/2:0 58 GigabitEthernet0/0/1.10 interworking Ethernet
```

CE configuration: Frame Relay-CE

```
bridge irb
bridge 16 protocol ieee
bridge 16 route ip
interface Serial2/0:0
  no ip address
  encapsulation frame-relay IETF
  no keepalive
interface Serial2/0:0.1 point-to-point
  frame-relay interface-dlci 58
  bridge-group 16
interface BVI16
  ip address 172.18.1.2 255.255.0.0
```

Ethernet-CE

```
interface GigabitEthernet0/0/1.10
  encapsulation dot1Q 10
```

```
  ip address 172.17.2.1 255.255.0.0
```

Example: Configuring Frame Relay-VLAN QinQ Bridged Interworking

The following example shows how to configure Frame Relay-VLAN QinQ bridged interworking:

PE configuration:

```
interface GigabitEthernet0/0/1.11
  encapsulation dot1Q 11 second-dot1q 100
  end
interface Serial0/1/2:0
  no ip address
  encapsulation frame-relay
  no keepalive
  frame-relay interface-dlci 100 switched
  end
connect FR-ETHQinQ Serial0/1/2:0 100 GigabitEthernet0/0/1.11 interworking ethernet
```

CE configuration: Frame-Relay-CE

```
 bridge irb
 bridge 16 protocol ieee
 bridge 16 route ip
 interface Serial2/0:0
   no ip address
   encapsulation frame-relay IETF
   no keepalive
 interface Serial2/0:0.1 point-to-point
   frame-relay interface-dlci 100
   bridge-group 16
 interface BVI16
   ip address 172.18.1.3 255.255.0.0
```

Ethernet-CE

```
interface GigabitEthernet0/0/1.10
  encapsulation dot1Q 10 sec 10
  ip address 172.19.1.1 255.255.0.0
```

Additional References for L2VPN Local Switching—Frame Relay-Ethernet/VLAN

Related Documents

Related Topic	Document Title
Cisco IOS commands	Cisco IOS Master Commands List, All Releases
WAN commands	Cisco IOS Wide Area Network Command Reference

RFCs

RFC	Title
RFC 2427	Multiprotocol Interconnect over Frame Relay

Technical Assistance

Description	Link
The Cisco Support website provides extensive online resources, including documentation and tools for troubleshooting and resolving technical issues with Cisco products and technologies. To receive security and technical information about your products, you can subscribe to various services, such as the Product Alert Tool (accessed from Field Notices), the Cisco Technical Services Newsletter, and Really Simple Syndication (RSS) Feeds. Access to most tools on the Cisco Support website requires a Cisco.com user ID and password.	http://www.cisco.com/cisco/web/support/index.html

Feature Information for L2VPN Local Switching—Frame Relay-Ethernet/VLAN

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.

Use Cisco Feature Navigator to find information about platform support and Cisco software image support. To access Cisco Feature Navigator, go to www.cisco.com/go/cfn. An account on Cisco.com is not required.

Table 1: Feature Information for L2VPN Local Switching—Frame Relay-Ethernet/VLAN

Feature Name	Releases	Feature Information
L2VPN Local Switching—Frame Relay-Ethernet/VLAN		The L2VPN Local Switching—Frame Relay-Ethernet/VLAN feature allows you to switch Frame Relay and Ethernet frames between two interfaces on the same device.