Multilink Frame Relay over L2TPv3 AToM

Last Updated: November 22, 2011

This feature enables Multilink Frame Relay switching over Layer 2 Tunnel Protocol Version 3 (L2TPv3) and Any Transport over MPLS (AToM). The feature works with like-to-like interfaces and disparate interfaces (L2VPN interworking).

Multilink Frame Relay is the logical grouping of one or more physical interfaces between two devices of the User-to-Network Interface/Network-to-Network Interface (UNI/NNI) as one single Frame Relay data link.

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Finding Feature Information

Your software release may not support all the features documented in this module. For the latest feature information and caveats, see the release notes for your platform and software release. To find information about the features documented in this module, and to see a list of the releases in which each feature is supported, see the Feature Information Table at the end of this document.

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.
Prerequisites for Configuring Multilink Frame Relay over L2TPv3 AToM

Before configuring Multilink Frame Relay over L2TPv3/AToM, you should understand how to configure Layer 2 virtual private networks (VPNs) and Multilink Frame Relay. See the Additional References, page 16 for pointers to the feature modules that explain how to configure and use those features.

Restrictions for Configuring Multilink Frame Relay over L2TPv3 AToM

- Only data-link connection identifier (DLCI)-to-DLCI switching, where each DLCI maps to its own pseudowire, is supported. Port-port mode (also known as HDLC mode), where the entire content of the port, including the Local Management Interface (LMI), is carried across a single pseudowire, is not supported.
- The following functionality is not supported:
  - UNI/NNI or end-to-end fragmentation
  - Nonstop forwarding/stateful switchover
  - Four-byte DLCIs
- On the Cisco 7500 series routers, all bundle links must reside on the same port adapter (PA) of the Versatile Interface Processor (VIP). Links spreading across PAs are not supported.
- Cisco 7500 series routers support the VIP6-80, VIP4-80, VIP4-50, VIP2-50, CH-STM1, CT3/CE3, CT1/CE1, PA-4T+, and PA-8T port adapters.
- On the Cisco 12000 series routers, Multilink Frame Relay is supported only on the following pluggable modules: Cisco 4-port channelized T3 (DSO) shared port adapter, Cisco 8-port channelized T1/E1 shared port adapter, and the Cisco 1-port channelize OC-3/STM-1 shared port adapter.

Information About Configuring Multilink Frame Relay over L2TPv3 AToM

- Multilink Frame Relay over L2TPv3 AToM, page 2
- Internetworking Support for Multilink Frame Relay, page 3
- Quality of Service Support for Multilink Frame Relay over L2TPv3 AToM, page 3

Multilink Frame Relay over L2TPv3 AToM

Multilink Frame Relay over L2TPv3/AToM supports the following functionality:

- Permanent virtual circuit (PVC) status signaling
- LMI types cisco, q933a, and ANSI
- Sequencing
- Frame Relay policing (nondistributed)
- Type of service (ToS) marking for L2TPv3
Internetworking Support for Multilink Frame Relay

Interworking support for Multilink Frame Relay interfaces supports the following functionality:

- Frame Relay to Ethernet/VLAN (Ethernet and IP interworking)
- Frame Relay to PPP and ATM (IP interworking)
- Cisco and Internet Engineering Task Force (IETF) encapsulation on the customer-edge (CE) router
- Sequencing
- LMI interworking to notify CE routers of PVC status changes

Quality of Service Support for Multilink Frame Relay over L2TPv3 AToM

Note
Quality of Service features are not supported in Cisco IOS Release 12.4(11)T.

L2VPN quality of service (QoS) features supported for Frame Relay are also supported with the Multilink Frame Relay over L2TPv3/AToM feature. You can attach an input service policy to the Multilink Frame Relay interface or individual DLCIs on the interface using the map-class mechanism to police or mark the traffic. You can attach an output policy to the Multilink Frame Relay (MFR) interface to perform class-based queuing, including per-DLCI queuing using the `match fr-dlci` command.

The following ingress QoS features are supported with the Multilink Frame Relay over L2TPv3/AToM feature:

- Interface input policy matching on the discard eligibility (DE) bit to set Multiprotocol Label Switching (MPLS) EXP or tunnel differentiated services code point (DSCP).
- Virtual circuit (VC) input policy configured with a color-aware, two-rate, three-color policer using the DE bit as input color and setting the MPLS EXP bit or tunnel DSCP bit based on color.

Note
You cannot use the VC-level and interface-level input policies at the same time on the same interface.

The following egress QoS features are supported with the Multilink Frame Relay over L2TPv3/AToM feature:

- Egress queueing using tail drop or discard class-based weighted random early detection (WRED). You can use the latter with a core interface input policy to set the discard class based on the MPLS EXP or tunnel DSCP.
- Interface output policy matching on QoS group (selected by MPLS EXP or tunnel DSCP).
- Interface aggregate shaping policy with queuing policy.
- VC output shaping policy with tail drop or discard class-based WRED.
- Forward explicit congestion notification (FECN)/backward explicit congestion notification (BECN) marking.

Note
You cannot use VC-level and interface-level output policies at the same time on the same interface.
How to Configure Multilink Frame Relay over L2TPv3 AToM

- Configuring a Multilink Frame Relay Bundle Interface, page 4
- Configuring a Multilink Frame Relay Bundle Link Interface, page 5
- Connecting Frame Relay PVCs Between Routers, page 7
- Verifying Multilink Frame Relay over L2TPv3 AToM, page 8

Configuring a Multilink Frame Relay Bundle Interface

Configure a bundle interface to aggregate bandwidth of multiple member links under a single interface to one virtual pipe. To configure a bundle interface for Multilink Frame Relay, perform the following steps.

**SUMMARY STEPS**

1. enable  
2. configure terminal  
3. interface mfr number  
4. frame-relay multilink bid name

**DETAILED STEPS**

<table>
<thead>
<tr>
<th>Command or Action</th>
<th>Purpose</th>
</tr>
</thead>
<tbody>
<tr>
<td>Step 1 enable</td>
<td>Enables privileged EXEC mode.</td>
</tr>
<tr>
<td></td>
<td>• Enter your password if prompted.</td>
</tr>
<tr>
<td>Example:</td>
<td>Router&gt; enable</td>
</tr>
<tr>
<td>Step 2 configure terminal</td>
<td>Enters global configuration mode.</td>
</tr>
<tr>
<td>Example:</td>
<td>Router# configure terminal</td>
</tr>
</tbody>
</table>
Configuring a Multilink Frame Relay Bundle Link Interface

Configuring a Multilink Frame Relay bundle link interface allows you to combine bandwidth of multiple lower-speed serial links into a single large pipe and avoid the need of upgrading or purchasing new hardware. To configure a bundle link interface for Multilink Frame Relay, perform the following steps.

**SUMMARY STEPS**

1. enable
2. configure terminal
3. interface serial number
4. encapsulation frame-relay mfr number [name]
5. frame-relay multilink lid name
6. frame-relay multilink hello seconds
7. frame-relay multilink ack seconds
8. frame-relay multilink retry number
## DETAILED STEPS

<table>
<thead>
<tr>
<th>Command or Action</th>
<th>Purpose</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Step 1 enable</strong></td>
<td>Enables privileged EXEC mode.</td>
</tr>
<tr>
<td></td>
<td>• Enter your password if prompted.</td>
</tr>
<tr>
<td><strong>Example:</strong></td>
<td></td>
</tr>
<tr>
<td>Router&gt; enable</td>
<td></td>
</tr>
<tr>
<td><strong>Step 2 configure terminal</strong></td>
<td>Enters global configuration mode.</td>
</tr>
<tr>
<td><strong>Example:</strong></td>
<td></td>
</tr>
<tr>
<td>Router# configure terminal</td>
<td></td>
</tr>
<tr>
<td><strong>Step 3 interface serial number</strong></td>
<td>Configures an interface and enters interface configuration mode.</td>
</tr>
<tr>
<td><strong>Example:</strong></td>
<td></td>
</tr>
<tr>
<td>Router(config)# interface serial 1/1</td>
<td></td>
</tr>
<tr>
<td><strong>Step 4 encapsulation frame-relay mfr number [name]</strong></td>
<td>Creates a multilink Frame Relay bundle link and associates the link with a bundle.</td>
</tr>
<tr>
<td><strong>Example:</strong></td>
<td></td>
</tr>
<tr>
<td>Router(config-if)# encapsulation frame-relay mfr 1</td>
<td>(Optional) Assigns a bundle link identification name with a multilink Frame Relay bundle link.</td>
</tr>
<tr>
<td><strong>Step 5 frame-relay multilink lid name</strong></td>
<td>(Optional) Assigns a bundle link identification name with a multilink Frame Relay bundle link.</td>
</tr>
<tr>
<td><strong>Example:</strong></td>
<td></td>
</tr>
<tr>
<td>Router(config-if)# frame-relay multilink lid four</td>
<td>The bundle link identification (LID) will not go into effect until the interface has gone from the down state to the up state. One way to bring the interface down and back up again is by using the shutdown and no shutdown commands in interface configuration mode.</td>
</tr>
<tr>
<td><strong>Step 6 frame-relay multilink hello seconds</strong></td>
<td>(Optional) Configures the interval at which a bundle link will send out hello messages. The default value is 10 seconds.</td>
</tr>
<tr>
<td><strong>Example:</strong></td>
<td></td>
</tr>
<tr>
<td>Router(config-if)# frame-relay multilink hello 20</td>
<td></td>
</tr>
</tbody>
</table>
Connecting Frame Relay PVCs Between Routers

By connecting Frame Relay PVCs between routers, you can integrate Frame Relay over a Level 2 VPN backbone, which allows you to use your existing Frame Relay network without upgrading. To connect Frame Relay PVCs between routers, perform the following steps.

**SUMMARY STEPS**

1. enable
2. configure terminal
3. connect connection-name mfr number dlci l2transport
4. xconnect peer-router-id vcid encapsulation mpls

**DETAILED STEPS**

<table>
<thead>
<tr>
<th>Command or Action</th>
<th>Purpose</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Step 1</strong> enable</td>
<td>Enables privileged EXEC mode.</td>
</tr>
<tr>
<td></td>
<td>• Enter your password if prompted.</td>
</tr>
<tr>
<td><strong>Example:</strong></td>
<td></td>
</tr>
<tr>
<td>Router&gt; enable</td>
<td></td>
</tr>
<tr>
<td><strong>Step 2</strong> configure terminal</td>
<td>Enters global configuration mode.</td>
</tr>
<tr>
<td><strong>Example:</strong></td>
<td></td>
</tr>
<tr>
<td>Router# configure terminal</td>
<td></td>
</tr>
</tbody>
</table>
Command or Action | Purpose
--- | ---
**Step 3** connect connection-name mfr number dlci l2transport | Defines connections between Frame Relay PVCs.  
  - Using the l2transport keyword specifies that the PVC will not be a locally switched PVC, but will be tunneled over the backbone network.  
  - The connection-name argument is a text string that you provide.  
  - The dlci argument is the DLCI number of the PVC that will be connected.

Example:  
Router(config)# connect fr1 mfr 1 100 l2transport

**Step 4** xconnect peer-router-id vcid encapsulation mpls | Creates the VC to transport the Layer 2 packets. In a DLCI-to-DLCI connection type, Frame Relay over MPLS uses the xconnect command in connect configuration submode.

Example:  
Router(config-fr-pw-switching)# xconnect 10.0.0.1 123 encapsulation mpls

### Verifying Multilink Frame Relay over L2TPv3 AToM

To verify the configuration of Multilink Frame Relay, perform the following steps. The tunnel and session should be in the established (est) state.

**SUMMARY STEPS**
1. show l2tunnel
2. show mpls forwarding

**DETAILED STEPS**

**Step 1** show l2tunnel  
On both PE routers, use the following command to verify the configuration of Multilink Frame Relay over L2TPv3:

Example:  
PE1# show l2tunnel  
Tunnel and Session Information  
Total tunnels 1 sessions 1  
LocID RemID Remote Name State Remote Address Port Sessions L2TPclass  
35788 41451 FRWI1 est 10.9.9.9 0 1 l2tp_default_cl  
LocID RemID TunID Username, Intf/ State
Verifying Multilink Frame Relay over L2TPv3 AToM

Configuration Examples for Multilink Frame Relay over L2TPv3 AToM

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- Frame Relay-to-Ethernet VLAN Interworking over L2TPv3 on Multilink Frame Relay Interfaces Example, page 11
- Frame Relay-to-Ethernet Interworking over MPLS on Multilink Frame Relay Interfaces Example, page 11
- MQC Color-Aware Policing Example, page 12
- DE Bit Matching Example, page 13
- DLCI-Based queuing Example, page 13
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- Aggregate Shaping Example, page 14
- VC Shaping Example, page 15
- FECN BECN Marking Example, page 15
Frame Relay-to-Frame Relay over L2TPv3 on Multilink Frame Relay Interfaces Example

The following example sets up Multilink Frame Relay interfaces to transport Frame Relay data between PE routers:

<table>
<thead>
<tr>
<th>PE1</th>
<th>PE2</th>
</tr>
</thead>
</table>
| configure terminal  
ip cef distributed  
frame-relay switching  
!  
interface loopback 0  
ip address 10.8.8.8 255.255.255.255  
no shutdown  
!  
pseudowire-class fr-xconnect  
encapsulation l2tp  
protocol l2tpv3  
ip local interface loopback0  
!  
controller T3 1/1/1  
t1 1 framing esf  
t1 1 clock source internal  
t1 1 channel-group 1 timeslots 1-24 speed 64  
!  
t1 2 framing esf  
t1 2 clock source inter  
t1 2 channel-group 1 timeslots 1-24 speed 64  
!  
interface mfr 1  
en encapsulation frame-relay  
logging event dlci-status-change  
frame-relay intf-type nni  
no shutdown  
!  
interface Serial1/1/1:1  
en encapsulation frame-relay mfr1  
interface Serial1/1/2:1  
en encapsulation frame-relay mfr1  
!  
interface POS4/1/0  
clock source internal  
ip address 10.13.0.0 255.255.255.0  
no shutdown  
no fair-queue  
!  
connect fr-fr mfr1 206 12  
xconnect 10.9.9.9 6 pw-class fr-xconnect  
!  
router ospf 10  
  network 10.13.0.0 0.0.0.0 area 0  
  network 10.8.8.8 0.0.0.0 area 0  
end | configure terminal  
ip routing  
ip cef  
frame-relay switching  
!  
interface loopback 0  
ip address 10.9.9.9 255.255.255.255  
no shutdown  
!  
interface p2/0  
clock source internal  
ip address 10.14.0.2 255.255.255.0  
no shutdown  
no fair-queue  
!  
controller T3 3/1  
t1 1 framing esf  
t1 1 clock source internal  
t1 1 channel-group 1 timeslots 1-24 speed 64  
!  
t1 2 framing esf  
t1 2 clock source internal  
t1 2 channel-group 1 timeslots 1-24 speed 64  
!  
interface mfr2  
en encapsulation frame-relay  
logging event dlci-status-change  
frame-relay intf-type dce  
no shutdown  
!  
interface serial3/1/1:1  
en encapsulation frame-relay mfr2  
!  
interface s3/1/2:1  
en encapsulation frame-relay mfr2  
!  
pseudowire-class fr-xconnect  
en encapsulation l2tpv3  
protocol l2tpv3  
ip local interface loopback0  
!  
connect fr-fr mfr2 306 12transport  
xconnect 10.8.8.8 6 pw-class fr-xconnect  
!  
router ospf 10  
  network 10.14.0.2 0.0.0.0 area 0  
  network 10.9.9.9 0.0.0.0 area 0  
end |
Frame Relay-to-Ethernet VLAN Interworking over L2TPv3 on Multilink Frame Relay Interfaces Example

The following example sets up Multilink Frame Relay interfaces to perform Frame Relay-to-Ethernet VLAN interworking between PE routers. The example uses IP interworking, also referred to as routed interworking.

```
PE1
configure terminal
ip cef distributed
frame-relay switching

interface loopback 0
  ip address 10.8.8.8 255.255.255.255
  no shutdown
pseudowire-class ip
  encapsulation l2tp
  interworking ip
  ip local interface loopback0

interface mfr 1
  encapsulation frame-relay
  logging event dlci-status-change
  no shutdown
  frame-relay intf-type nni

interface Serial1/1/1:1
  encapsulation frame-relay mfr1
interface Serial1/1/2:1
  encapsulation frame-relay mfr1

interface POS4/1/0
  clock source internal
  ip address 13.0.0.2 255.255.255.0
  no shutdown
  no fair-queue

connect fr-vlan mfr1 206 l2
xconnect 9.9.9.9 13.0.0.2 pw-class ip
router ospf 10
  network 10.13.0.2 0.0.0.0 area 0
  network 10.8.8.8 0.0.0.0 area 0
end

PE2
configure terminal
ip routing
ip cef
frame-relay switching

interface loopback 0
  ip address 10.9.9.9 255.255.255.255
  no shutdown
pseudowire-class ip
  encapsulation l2tp
  interworking ip
  ip local interface loopback0

interface p2/0
  clock source internal
  ip address 10.14.0.2 255.255.255.0
  no shutdown
  no fair-queue

interface FastEthernet0/1
  no shutdown
interface FastEthernet0/1.6
  encapsulation dot1Q 6
  xconnect 10.8.8.8 6 pw-class ip
  no shutdown
router ospf 10
  network 10.14.0.2 0.0.0.0 area 0
  network 10.9.9.9 0.0.0.0 area 0
end
```

Frame Relay-to-Ethernet Interworking over MPLS on Multilink Frame Relay Interfaces Example

The following example sets up Multilink Frame Relay interfaces to perform Frame Relay-to-Ethernet interworking between PE routers. The example uses IP interworking, also referred to as routed interworking.
**MQC Color-Aware Policing Example**

Quality of Service features are not supported in Cisco IOS Release 12.4(11)T.

The following example configures a VC input policy with a color-aware, two-rate, three-color policing method using a DE bit as input color and setting the tunnel Differentiated Services Code Point (DSCP) based on color. Packets in excess of peak rates are discarded.

```plaintext
class-map not-fr-de
match not fr-de
!
policy-map police
class class-default
police cir 64000 pir 256000
conform-color not-fr-de
conform-action set-dscp-tunnel-transmit af31
exceed-action set-dscp-tunnel-transmit af32
violator-action drop
!
```

---

Table 1: Configuration Examples for Multilink Frame Relay over L2TPv3 AToM

<table>
<thead>
<tr>
<th>PE1</th>
<th>PE2</th>
</tr>
</thead>
</table>
| configure terminal  
  ip cef distributed  
  frame-relay switching  ! | configure terminal  
  ip routing  
  ip cef  
  frame-relay switching  ! |
|   | interface loopback 0  
  ip address 10.8.8.8 255.255.255.255  
  no shutdown  ! | interface loopback 0  
  ip address 10.9.9.9 255.255.255.255  
  no shutdown  ! |
|   | interface mfr 1  
  encapsulation frame-relay  
  logging event dlni-status-change  
  no shutdown  
  frame-relay intf-type nni  ! | interface POS2/0  
  clock source internal  
  ip address 10.14.0.2 255.255.255.0  
  no shutdown  
  no fair-queue  
  mpls ip  ! |
|   |   | router ospf 10  
  network 10.14.0.2 0.0.0.0 area 0  
  network 10.9.9.9 0.0.0.0 area 0  ! |
|   |   | mpls label protocol ldp  
  mpls ldp router-id loopback0  
  mpls ip  ! | pseudowire-class atom  
  encapsulation mpls  
  interworking ip  ! |
|   |   | connect fr-eth mfr1 207 l2  
  xconnect 10.8.8.8 7 pw-class atom  
  end  ! | interface FastEthernet0/1  
  xconnect 10.8.8.8 7 pw-class atom  
  no shutdown  ! |
```
DE Bit Matching Example

Quality of Service features are not supported in Cisco IOS Release 12.4(11)T.

The following example shows the configuration of an interface input policy matching on the DE bit to set the tunnel DSCP:

```
class-map de
  match fr-de
! policy-map de
  class de
    set ip dscp tunnel af32
  class class-default
    set ip dscp tunnel af31
! interface MFR1
  service-policy input de
```

DLCI-Based queueing Example

Quality of Service features are not supported in Cisco IOS Release 12.4(11)T.

The following example shows the configuration of an interface output policy matching on a QoS group based on the DLCI:

```
class-map dlc100
  match fr-dlci 100
class-map dlc200
  match fr-dlci 200
! policy-map dlc
  class dlc100
    bandwidth percent 10
  class dlc200
    bandwidth percent 20
! interface MFR1
  service-policy output dlc
```

Discard Class-Based WRED Example

Quality of Service features are not supported in Cisco IOS Release 12.4(11)T.
The following example shows the configuration of an interface output policy matching on a QoS group based on the tunnel DSCP:

class-map conform
match ip dscp af31
match mpls experimental 4
class-map exceed
match ip dscp af32
match mpls experimental 3
class-map cos1
match qos-group 1
!
policy-map core
class conform
set qos-group 1
set discard-class 1
class exceed
set qos-group 1
set discard-class 2
!
policy-map wred
class cos1
bandwidth percent 40
random-detect discard-class-based
random-detect discard-class 1 20 30 10
random-detect discard-class 2 1 9 10
!
interface POS1/0
service-policy input core
!
interface MFR1
service-policy output wred

Aggregate Shaping Example

Note
Quality of Service features are not supported in Cisco IOS Release 12.4(11)T.

The following example shows the configuration of an interface aggregate shaping policy with a DLCI-based queueing policy:

class-map dlci205
match fr-dlci 205
class-map dlci206
match fr-dlci 206
!
policy-map dlci
class dlci205
bandwidth 128
class dlci206
bandwidth 256
!
policy-map shape
class class-default
shape average 512000 2048 2048
service-policy dlci
!
interface MFR1
service-policy output shape
VC Shaping Example

Quality of Service features are not supported in Cisco IOS Release 12.4(11)T.

The following example shows the configuration of a VC output shaping policy with discard class-based WRED:

```plaintext
class-map conform
match mpls experimental 4
class-map exceed
match mpls experimental 3
class-map cos1
match qos-group 1
!
policy-map core
class conform
set qos-group 1
set discard-class 1
class exceed
set qos-group 1
set discard-class 2
!
policy-map vc-wred
class class-default
bandwidth percent 40
random-detect discard-class-based
random-detect discard-class 1 20 30 10
random-detect discard-class 2 1 9 10
!
policy-map shape
class class-default
shape average 512000 2048 2048
service-policy vc-wred
!
interface POS4/1/0
service-policy input core
!
interface MFR1
frame-relay interface-dlci 206 switched
class shape
!
map-class frame-relay shape
service-policy output shape
```

FECN BECN Marking Example

Quality of Service features are not supported in Cisco IOS Release 12.4(11)T.

The following example shows the configuration of an output policy that configures BECN and FECN bits:

```plaintext
policy-map dlci
class dlci100
  bandwidth percent 10
class dlci200
  bandwidth percent 20
  set fr-fecn-becn 1
interface MFR1
  service-policy output dlci
  frame-relay congestion-management
  threshold ecn 20
```
# Additional References

The following sections provide references related to the Multilink Frame Relay over L2TPv3/AToM feature.

## Related Documents

<table>
<thead>
<tr>
<th>Related Topic</th>
<th>Document Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>Multilink Frame Relay</td>
<td>• For the Cisco 7500 series routers:</td>
</tr>
<tr>
<td></td>
<td>Distributed Multilink Frame Relay (FRF.16)</td>
</tr>
<tr>
<td></td>
<td>• For the Cisco 7200 series routers:</td>
</tr>
<tr>
<td></td>
<td>Multilink Frame Relay (FRF.16)</td>
</tr>
<tr>
<td>L2VPN interworking</td>
<td>L2VPN Interworking</td>
</tr>
<tr>
<td>Layer 2 Tunneling Protocol, Version 3</td>
<td>L2TPV3</td>
</tr>
<tr>
<td>Layer 2 local switching</td>
<td>Layer 2 Local Switching</td>
</tr>
</tbody>
</table>

## Standards

<table>
<thead>
<tr>
<th>Standard</th>
<th>Title</th>
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</thead>
<tbody>
<tr>
<td>draft-martini-l2circuit-trans-mpls-08.txt</td>
<td>Transport of Layer 2 Frames Over MPLS</td>
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<tr>
<td>draft-martini-l2circuit-encap-mpls-04.txt</td>
<td>Encapsulation Methods for Transport of Layer 2 Frames Over MPLS</td>
</tr>
<tr>
<td>draft-ietf-l2tpext-l2tp-base-03.txt</td>
<td>Layer Two Tunneling Protocol (Version 3)</td>
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</tbody>
</table>

## MIBs

<table>
<thead>
<tr>
<th>MIB</th>
<th>MIBs Link</th>
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<tbody>
<tr>
<td>• Cisco Frame Relay MIB (CISCO-FRAME-RELAY-MIB.my)</td>
<td>To locate and download MIBs for selected platforms, Cisco IOS releases, and feature sets, use Cisco MIB Locator found at the following URL: <a href="http://www.cisco.com/go/mibs">http://www.cisco.com/go/mibs</a></td>
</tr>
<tr>
<td>• Interfaces MIB (IF-MIB.my)</td>
<td></td>
</tr>
<tr>
<td>• MPLS LDP MIB (MPLS-LDP-MIB.my)</td>
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## RFCs

<table>
<thead>
<tr>
<th>RFC</th>
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<tr>
<td>RFC 2661</td>
<td>Layer Two Tunneling Protocol</td>
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Technical Assistance

<table>
<thead>
<tr>
<th>Description</th>
<th>Link</th>
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<tbody>
<tr>
<td>The Cisco Technical Support &amp; Documentation website contains thousands of pages of searchable technical content, including links to products, technologies, solutions, technical tips, and tools. Registered Cisco.com users can log in from this page to access even more content.</td>
<td><a href="http://www.cisco.com/techsupport">http://www.cisco.com/techsupport</a></td>
</tr>
</tbody>
</table>

Command Reference

The following commands are introduced or modified in the feature or features documented in this module. For information about these commands, see the Cisco IOS Multiprotocol Label Switching Command Reference at http://www.cisco.com/en/US/docs/ios/mpls/command/reference/mp_book.html. For information about all Cisco IOS commands, go to the Command Lookup Tool at http://tools.cisco.com/Support/CLILookup or to the Cisco IOS Master Commands List.

- xconnect

Feature Information for Multilink Frame Relay over L2TPv3 AToM

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>
<thead>
<tr>
<th>Feature Name</th>
<th>Releases</th>
<th>Feature Information</th>
</tr>
</thead>
<tbody>
<tr>
<td>Multilink Frame Relay over L2TPv3/AToM</td>
<td>12.0(28)S 12.2(25)S 12.0(32)S 12.4(11)T</td>
<td>This feature was introduced in Cisco IOS Release 12.0(28)S for the Cisco 7200 and 7500 series routers. This feature was integrated into Cisco IOS Release 12.2(25)S. In Cisco IOS Release 12.0(32)S, this feature added support for the following pluggable modules for the Cisco 12000 series router: Cisco 4-port channelized T3 (DSO) shared port adapter, Cisco 8-port channelized T1/E1 shared port adapter, and the Cisco 1-port channelized OC-3/STM-1 shared port adapter. This feature was integrated into Cisco IOS Release 12.4(11)T.</td>
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</table>