



Configuring MPLS OAM

This chapter describes how to configure multiprotocol label switching (MPLS) operations, administration and maintenance (OAM) in the Cisco ASR 901 router.

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Understanding MPLS OAM

MPLS OAM helps service providers monitor label-switched paths (LSPs) and quickly isolate MPLS forwarding problems to assist with fault detection and troubleshooting in an MPLS network. The Cisco ASR 901 router supports the following MPLS OAM features:

LSP Ping

MPLS LSP ping uses MPLS echo request and reply packets, similar to Internet Control Message Protocol (ICMP) echo request and reply messages, to validate an LSP. ICMP echo request and reply messages validate IP networks; MPLS OAM echo and reply messages validate MPLS LDP networks. The LSP ping and trace functions use IPv4 UDP packets with UDP port number 3503. You can use MPLS LSP ping to validate IPv4 LDP or Forwarding Equivalence Classes (FECs) by using the **ping mpls** privileged EXEC command. The MPLS echo request packet is sent to a target router by using the label stack associated with the FEC to be validated.

The source address of the LSP echo request is the IP address of the LDP router generating the LSP request. The destination IP address is a 127.x.y.z/8 address, which prevents the IP packet from being switched to its destination if the LSP is broken. The 127.0.0.x destination address range prevents the OAM packets from exiting the egress provider-edge router, which keeps them from leaking from the service-provider network to the customer network.

In response to an MPLS echo request, an MPLS echo reply is forwarded as an IP packet by using IP, MPLS, or a combination of both. The source address of the MPLS echo-reply packet is an address obtained from the router generating the echo reply. The destination address is the source address of the router that originated the MPLS echo-request packet. The MPLS echo-reply destination port is the echo-request source port.

LSP Traceroute

MPLS LSP traceroute also uses MPLS echo request and reply packets to validate an LSP. You can use MPLS LSP traceroute to validate LDP IPv4 by using the **trace mpls** privileged EXEC command. The traceroute time-to-live (TTL) settings force expiration of the TTL along an LSP. MPLS LSP traceroute incrementally increases the TTL value in its MPLS echo requests (TTL = 1, 2, 3, 4) to discover the downstream mapping of each successive hop. The transit router processing the MPLS echo request returns an MPLS echo reply containing information about the transit hop in response to the TTL-expired MPLS packet. The MPLS echo reply destination port is sent to the echo request source port.

LSP Ping over Pseudowire

The LSP Ping over Pseudowire is used for detecting faults in the data plane or forwarding path for pseudowire services. The connectivity verification model for pseudowires consists of:

- Advertising the VCCV capability
- Verifying the data plane connectivity

Advertising the VCCV capability is done as part of MPLS Label Mapping message. This consists of Control Channel (CC) type which is a bitmask that indicates the type of control channel that can be used to verify connectivity. The Cisco ASR 901 router supports the following CC type:

- MPLS Router Alert Label (Type 2) : The control channel is created out of band and uses the router alert label (RA).



Note The Cisco ASR 901 router does not support Control Channel Type 1 and 3.

Connectivity verification type defines a bitmask that indicates the types of CV packets and protocols that can be sent on the specified control channel.

The LSP ping over pseudowire uses the same label stack as used by the pseudowire data path. Basically it contains the virtual circuit (VC) label and tunnel labels.

How to Configure MPLS OAM

This section contains the following topics:



Note On Cisco ASR 901, for a default MTU of 1500 bytes, IOS supports MPLS ping up to 1486 bytes. For MPLS ping with size more than 1486 bytes to work in Cisco ASR 901, the MTU setting on the SVI has to be adjusted to be more than 1500 bytes.

Using LSP Ping for LDP IPv4 FEC

When you enter the **ping mpls** privileged EXEC command to begin an LSP ping operation, the keyword that follows specifies the Forwarding Equivalence Class (FEC) that is the target of the LSP ping to which you want to verify connectivity.

Command	Purpose
ping mpls ipv4 <i>destination-address destination-mask</i>	To verify LSP path from Cisco ASR 901 to remote peer. The keywords have these meanings: <ul style="list-style-type: none"> • <i>destination-address destination-mask</i> —Specify the address and network mask of the target FEC.

Using LSP Traceroute for LDP IPv4 FEC

The LSP traceroute originator sends incremental MPLS echo requests to discover the downstream mapping of each successive hop. When the originating provider edge router receives the reply from the intermediate router, it forms another MPLS echo request with the same target FEC and the time-to-live is incremented by one.

Command	Purpose
traceroute mpls ipv4 <i>destination-address destination-mask</i>	To configure LSP IPv4 traceroute. <ul style="list-style-type: none"> • <i>destination-address destination-mask</i> is the address and network mask of the target FEC.

Using LSP Ping for Pseudowire

Use the **ping mpls pseudowire** command to verify the AToM pseudowire path.

Command	Purpose
ping mpls pseudowire <i>ipv4-address vc_id vc-id-value</i>	To verify AToM pseudowire path from the Cisco ASR 901 router to remote peer. <ul style="list-style-type: none"> • <i>ipv4-address</i> is the ip address of the remote peer. • vc_id is the virtual circuit id.

Using LSP Traceroute over Pseudowire

Use the **traceroute mpls pseudowire** command to verify the pseudowire path and the next hop details at the remote peer.

Command	Purpose
traceroute mpls pseudowire <i>ipv4-address vc_id vc-id-value segment</i>	To verify AToM pseudowire path from the Cisco ASR 901 router to remote peer and next hop details at remote peer. <ul style="list-style-type: none"> • <i>ipv4-address</i> is the ip address of the remote peer. • vc_id is the virtual circuit id.

Displaying AToM VCCV capabilities

Use the **show mpls l2transport** command to display the AToM VCCV capabilities.

Command	Purpose
show mpls l2transport binding vc_id <i>vc-id-value</i>	To display AToM VCCV capabilities negotiated between the peers. <ul style="list-style-type: none">• vc_id is the virtual circuit id.