
OAM and SAA Commands

Generic Commands

shutdown

Syntax [no] shutdown

Context config>saa>test

Description In order to modify an existing test it must first be shut down. When a test is created it will be in shutdown mode until a **no shutdown** command is executed.

A **shutdown** can only be performed if a test is not executing at the time the command is entered.

Use the **no** form of the command to set the state of the test to operational.

shutdown

Syntax [no] shutdown

Context config>test-oam>ldp-treetrace
config>test-oam>twamp>server
config>test-oam>twamp>server>prefix

Description This command suspends the background process running the LDP ECMP OAM tree discovery and path probing features. The configuration is not deleted.

Use the **no** form of the command to enable the background process.

OAM Commands

dns

Syntax `dns target-addr dns-name name-server ip-address [source ip-address] [send-count send-count] [timeout timeout] [interval interval] [record-type {ipv4-a-record | ipv6-aaa-record}]`

Context oam

Description This command performs DNS name resolution. If `ipv4-a-record` is specified, dns-names are queried for A-records only. If `ipv6-aaa-record` is specified, AAAA-records are queried first, and if a successful reply is not received, the dns-server is queried for A-records.

Parameters `send-count send-count` — The number of messages to send, expressed as a decimal integer. The **send-count** parameter is used to override the default number of message requests sent. Each message request must either timeout or receive a reply before the next message request is sent. The message **interval** value must be expired before the next message request is sent.

Default 1

Values 1 — 100

ip-address — The IP or IPv6 address of the primary DNS server.

ipv4-address - a.b.c.d

ipv6-address - x:x:x:x:x:x:x (eight 16-bit pieces)

x:x:x:x:x:d.d.d.d

x - [0..FFFF]H

d - [0..255]D

timeout timeout — The **timeout** parameter in seconds, expressed as a decimal integer. This value is used to override the default **timeout** value and is the amount of time that the router will wait for a message reply after sending the message request. Upon the expiration of message timeout, the requesting router assumes that the message response will not be received. Any response received after the request times out will be silently discarded.

Default 5

Values 1 — 120

interval interval — The **interval** parameter in seconds, expressed as a decimal integer. This parameter is used to override the default request message send interval and defines the minimum amount of time that must expire before the next message request is sent.

If the **interval** is set to 1 second, and the **timeout** value is set to 10 seconds, then the maximum time between message requests is 10 seconds and the minimum is 1 second. This depends upon the receipt of a message reply corresponding to the outstanding message request.

Default 1

Values 1 — 10

record-type — Specifies a record type.

Values **ipv4-a-record** — A record specific mapping a host name to an IPv4 address.
ipv6-aaaa-record — A record specific to the Internet class that stores a single IPv6 address.

ping

Syntax **ping** [*ip-address* | *dns-name*] [**rapid** | **detail**] [**ttl** *time-to-live*] [**tos** *type-of-service*] [**size** *bytes*] [**pattern** *pattern*] [**source** *ip-address* | *dns-name*] [**interval** *seconds*] [{**next-hop** *ip-address*} | {**interface** *interface-name*} | **bypass-routing**] [**count** *requests*] [**do-not-fragment**] [**router** *router-instance*] [**timeout** *timeout*]

Context <GLOBAL>

Description This command verifies the reachability of a remote host.

Parameters *ip-address* — The far-end IP address to which to send the **svc-ping** request message in dotted decimal notation.

Values ipv4-address: a.b.c.d
 ipv6-address: x:x:x:x:x:x:x[-interface]
 x:x:x:x:x:x.d.d.d.d[-interface]
 x: [0 — FFFF]H
 d: [0 — 255]D
 interface:32 characters maximum, mandatory for link local addresses

dns-name — The DNS name of the far-end device to which to send the **svc-ping** request message, expressed as a character string.

rapid — Packets will be generated as fast as possible instead of the default 1 per second.

detail — Displays detailed information.

ttl *time-to-live* — The TTL value for the MPLS label, expressed as a decimal integer.

Values 1 — 128

tos *type-of-service* — Specifies the service type.

Values 0 — 255

size *bytes* — The request packet size in bytes, expressed as a decimal integer.

Values 0 — 16384

pattern *pattern* — The data portion in a ping packet will be filled with the pattern value specified. If not specified, position info will be filled instead.

Values 0 — 65535

source *ip-address* — Specifies the IP address to be used.

Values

ipv4-address:	a.b.c.d
ipv6-address:	x:x:x:x:x:x:x
	x:x:x:x:x:d.d.d.d
x:	[0 — FFFF]H
d:	[0 — 255]D

router *router-instance* — Specifies the router name or service ID.

Values

<i>router-name:</i>	Base , management
<i>service-id:</i>	1 — 2147483647

Default Base

bypass-routing — Specifies whether to send the ping request to a host on a directly attached network bypassing the routing table.

interface *interface-name* — Specifies the name of an IP interface. The name must already exist in the **conf-fig>router>interface** context.

next-hop *ip-address* — Only displays static routes with the specified next hop IP address.

Values

ipv4-address:	a.b.c.d (host bits must be 0)
ipv6-address:	x:x:x:x:x:x:x (eight 16-bit pieces)
	x:x:x:x:x:d.d.d.d
x:	[0 — FFFF]H
d:	[0 — 255]

count *requests* — Specifies the number of times to perform an OAM ping probe operation. Each OAM echo message request must either timeout or receive a reply before the next message request is sent.

Values 1 — 100000

Default 5

do-not-fragment — Sets the DF (Do Not Fragment) bit in the ICMP ping packet.

timeout *seconds* — Overrides the default **timeout** value and is the amount of time that the router will wait for a message reply after sending the message request. Upon the expiration of message timeout, the requesting router assumes that the message response will not be received. A ‘request timeout’ message is displayed by the CLI for each message request sent that expires. Any response received after the request times out will be silently discarded.

Default 5

Values 1 — 10

tracert

Syntax `tracert [ip-address [dns-name] [ttl ttl] [wait milli-seconds] [no-dns] [source ip-address] [tos type-of-service] [router router-instance]`

Context oam

Description The TCP/IP tracert utility determines the route to a destination address. DNS lookups of the responding hosts is enabled by default.

```
*A:ALA-1# tracert 192.168.xx.xx4
tracert to 192.168.xx.xx4, 30 hops max, 40 byte packets
 1 192.168.xx.xx4 0.000 ms 0.000 ms 0.000 ms
*A:ALA-1#
```

Parameters *ip-address* — The far-end IP address to which to send the tracert request message in dotted decimal notation.

Values

ipv4-address :	a.b.c.d
ipv6-address:	x:x:x:x:x:x:x
	x:x:x:x:x:d.d.d.d
x:	[0 — FFFF]H
d:	[0 — 255]D

dns-name — The DNS name of the far-end device to which to send the tracert request message, expressed as a character string.

ttl *ttl* — The maximum Time-To-Live (TTL) value to include in the tracert request, expressed as a decimal integer.

Values 1 — 255

wait *milliseconds* — The time in milliseconds to wait for a response to a probe, expressed as a decimal integer.

Default 5000

Values 1 — 60000

no-dns — When the **no-dns** keyword is specified, DNS lookups of the responding hosts will not be performed, only the IP addresses will be printed.

Default DNS lookups are performed

source *ip-address* — The source IP address to use as the source of the probe packets in dotted decimal notation. If the IP address is not one of the device's interfaces, an error is returned.

tos *type-of-service* — The type-of-service (TOS) bits in the IP header of the probe packets, expressed as a decimal integer.

Values 0 — 255

router *router-name* — Specify the alphanumeric character string up to 32 characters.

Default Base

router *service-id* — The unique service identification number identifying the service in the service domain. This ID must be unique to this service and may not be used for any other service of any type. The *ser-*

vice-id must be the same number used for every 7750 SR on which this service is defined.

Values 1 — 2147483647

p2mp-lsp-ping

Syntax **p2mp-lsp-ping** [*lsp-name* [**p2mp-instance** *instance-name* [**s2l-dest-address** *ip-address* [...(upto 5 max)]]] [**ttl** *label-ttl*] [**fc** *fc-name* [**profile** {in|out}]] [**size** *octets*] [**timeout** *timeout*] [**detail**]
p2mp-lsp-ping [**ldp** *p2mp-identifier* [**sender-addr** *ip-address*] [**leaf-addr** *ip-address* [...up-to-5 max]]] [**fc** *fc-name* [**profile** {in|out}]] [**size** *octets*] [**timeout** *timeout*] [**detail**]
p2mp-lsp-ping [**ldp-ssm** **source** *ip-address* **group** *mcast-address* [**sender-addr** *ip-address*] [**leaf-addr** *ip-address* [...up-to-5 max]]] [**fc** *fc-name* [**profile** {in|out}]] [**size** *octets*] [**timeout** *timeout*] [**detail**]

Context oam

Description This command performs in-band connectivity test for an RSVP P2MP LSP. The echo request message is sent on the active P2MP instance and is replicated in the data path over all branches of the P2MP LSP instance. By default, all egress LER nodes which are leaves of the P2MP LSP instance will reply to the echo request message.

LDP P2MP generic-identifier along with source IP address of the head-end node can be used to uniquely identify LDP P2MP LSP in a network. LDP **p2mp-identifier** is a mandatory parameter to test LSP ping. LDP P2MP identifier specified to configure a tunnel-interface on head-end node must be used as **p2mp-identifier** to test a particular LSP.

The user can reduce the scope of the echo reply messages by explicitly entering a list of addresses for the egress LER nodes that are required to reply. A maximum of 5 addresses can be specified in a single run of the **p2mp-lsp-ping** command. A LER node is able to parse the list of egress LER addresses and if its address is included, it will reply with an echo reply message.

The output of the command without the detail option provides a high-level summary of error codes and/or success codes received. The output of the command with the detail option shows a line for each replying node as in the output of the LSP ping for a P2P LSP.

The display will be delayed until all responses are received or the timer configured in the timeout parameter expired. No other CLI commands can be entered while waiting for the display. A ^C will abort the ping operation. Note that p2mp-lsp-ping is not supported in a VPLS/B-VPLS PMSI context.

The timestamp format to be sent, and to be expected when received in a PDU, is as configured by the **config>test-oam>mpls-time-stamp-format** command. If RFC 4379 is selected, then the timestamp is in seconds and microseconds since 1900, otherwise it is in seconds and microseconds since 1970.

Parameters **fc** *fc-name* — The fc and profile parameters are used to indicate the forwarding class and profile of the MPLS echo request packet.

When an MPLS echo request packet is generated in CPM and is forwarded to the outgoing interface, the packet is queued in the egress network queue corresponding to the specified fc and profile parameter values. The marking of the packet's EXP is dictated by the LSP-EXP mappings on the outgoing interface.

When the MPLS echo request packet is received on the responding node, The fc and profile parameter values are dictated by the LSP-EXP mappings of the incoming interface.

When an MPLS echo reply packet is generated in CPM and is forwarded to the outgoing interface, the

packet is queued in the egress network queue corresponding to the fc and profile parameter values determined by the classification of the echo request packet, which is being replied to, at the incoming interface. The marking of the packet's EXP is dictated by the LSP-EXP mappings on the outgoing interface. The TOS byte is not modified. The following table summarizes this behavior:

Table 6: Request Packet and Behavior

cpm (sender node)	<p>echo request packet:</p> <ul style="list-style-type: none"> • packet{tos=1, fc1, profile1} • fc1 and profile1 are as entered by user in OAM command or default values • tos1 as per mapping of {fc1, profile1} to IP precedence in network egress QoS policy of outgoing interface
outgoing interface (sender node)	<p>echo request packet:</p> <ul style="list-style-type: none"> • pkt queued as {fc1, profile1} • ToS field=tos1 not remarked • EXP=exp1, as per mapping of {fc1, profile1} to EXP in network egress QoS policy of outgoing interface
Incoming interface (responder node)	<p>echo request packet:</p> <ul style="list-style-type: none"> • packet{tos1, exp1} • exp1 mapped to {fc2, profile2} as per classification in network QoS policy of incoming interface
cpm (responder node)	<p>echo reply packet:</p> <ul style="list-style-type: none"> • packet{tos=1, fc2, profile2}
outgoing interface (responder node)	<p>echo reply packet:</p> <ul style="list-style-type: none"> • pkt queued as {fc2, profile2} • ToS field= tos1 not remarked (reply inband or out-of-band) • EXP=exp2, if reply is inband, remarked as per mapping of {fc2, profile2} to EXP in network egress QoS policy of outgoing interface
Incoming interface (sender node)	<p>echo reply packet:</p> <ul style="list-style-type: none"> • packet{tos1, exp2} • exp2 mapped to {fc1, profile1} as per classification in network QoS policy of incoming interface

Default be
Values be, l2, af, l1, h2, ef, h1, nc

ldp p2mp-identifier — Identifier to specify a LDP P2MP LSP to ping.

Values The p2mp-identifier must be a 32 bit integer.

leaf-addr ip-address [*ip-address up to 5 max*] — Specifies the list of egress LER system addresses which are required to reply to LSP ping echo request message.

Values ipv4-address: a.b.c.d

lsp-name — Name that identifies an P2MP LSP to ping. The LSP name can be up to 32 characters long.

p2mp-instance instance-name — Configures the name, up to 32 characters long, of the specific instance of the P2MP LSP to send the echo request.

profile {in | out} — The profile of the LSP ping echo request message.

s2l-dest-addr ip-address [*ip-address...up to 5*] — Specifies the list of egress LER system addresses which are required to reply to the LSP ping echo request message.

Default out

sender-addr ip-address — specifies any local IP sender-addr for mLDP.

size octets — The size in octets, expressed as a decimal integer, of the MPLS echo request packet, including the IP header but not the label stack. The request payload is padded with zeroes to the specified size. Note that an OAM command is not failed if the user entered a size lower than the minimum required to build the packet for the echo request message. The payload is automatically padded to meet the minimum size.

Default 1 octet.

Values 1 — 9198

timeout timeout — The timeout parameter in seconds, expressed as a decimal integer. This value is used to override the default timeout value and is the amount of time that the router will wait for an echo reply message from all leaves of the P2MP LSP after sending the message request message. Upon the expiration of message timeout, the requesting router assumes that the missing replies will not be received. Any echo reply message received after the request times out will be silently discarded.

Default 10 seconds

Values 1 — 120

ttl label-ttl — The TTL value for the MPLS label, expressed as a decimal integer.

Default 255

Values 1 — 255

ldp-ssm — Configures a specific multicast stream to be tested when using dynamic multicast in mLDP. The source and group addresses correspond to the <S,G> being advertised by this mLDP FEC.

Values **source** *ip-address*
group *ip-address*

p2mp-lsp-trace

Syntax `p2mp-lsp-trace lsp-name p2mp-instance instance-name s2l-dest-address ip-address... [fc fc-name [profile {in | out}]] [size octets] [max-fail no-response-count] [probe-count probes-per-hop] [min-ttl min-label-ttl] [max-ttl max-label-ttl] [timeout timeout] [interval interval] [detail]`

Context oam

Description This command discovers and displays the hop-by-hop path for a source-to-leaf (S2L) sub-LSP of an RSVP P2MP LSP.

The LSP trace capability allows the user to trace the path of a single S2L path of a P2MP LSP. Its operation is similar to that of the p2mp-lsp-ping, but the sender of the echo reply request message includes the downstream mapping TLV to request the downstream branch information from a branch LSR or bud LSR. The branch LSR or bud LSR will then also include the downstream mapping TLV to report the information about the downstream branches of the P2MP LSP. An egress LER must not include this TLV in the echo response message.

The parameter probe-count operates in the same way as in LSP Trace on a P2P LSP. It represents the maximum number of probes sent per TTL value before giving up on receiving the echo reply message. If a response is received from the traced node before reaching maximum number of probes, then no more probes are sent for the same TTL. The sender of the echo request then increments the TTL and uses the information it received in the downstream mapping TLV to start sending probes to the node downstream of the last node which replied. This continues until the egress LER for the traced S2L path replied.

Similar to p2mp-lsp-ping, an LSP trace probe results on all egress LER nodes eventually receiving the echo request message but only the traced egress LER node will reply to the last probe.

Also any branch LSR node or bud LSR node in the P2MP LSP tree may receive a copy of the echo request message with the TTL in the outer label expiring at this node. However, only a branch LSR or bud LSR which has a downstream branch over which the traced egress LER is reachable will respond.

When a branch LSR or bud LSR responds, it sets the global return code in the echo response message to RC=14 - "See DDMAP TLV for Return Code and Return Sub-Code" and the return code in the DDMAP TLV corresponding to the outgoing interface of the branch used by the traced S2L path to RC=8 - "Label switched at stack-depth <RSC>". Note that p2mp-lsp-trace is not supported in a VPLS/B-VPLS PMSI context.

The timestamp format to be sent, and to be expected when received in a PDU, is as configured by the **conf>test-oam>mpls-time-stamp-format** command. If RFC 4379 is selected, then the timestamp is in seconds and microseconds since 1900, otherwise it is in seconds and microseconds since 1970.

Parameters **fc fc-name** — The fc and profile parameters are used to indicate the forwarding class and profile of the MPLS echo request packet.

When an MPLS echo request packet is generated in CPM and is forwarded to the outgoing interface, the packet is queued in the egress network queue corresponding to the specified fc and profile parameter values. The marking of the packet's EXP is dictated by the LSP-EXP mappings on the outgoing interface.

When the MPLS echo request packet is received on the responding node, The fc and profile parameter values are dictated by the LSP-EXP mappings of the incoming interface.

When an MPLS echo reply packet is generated in CPM and is forwarded to the outgoing interface, the packet is queued in the egress network queue corresponding to the fc and profile parameter values determined by the classification of the echo request packet, which is being replied to, at the incoming interface. The marking of the packet's EXP is dictated by the LSP-EXP mappings on the outgoing interface.

The TOS byte is not modified. The following table summarizes this behavior:

Table 7: Request Packet and Behavior

cpm (sender node)	echo request packet: <ul style="list-style-type: none"> packet{tos=1, fc1, profile1} fc1 and profile1 are as entered by user in OAM command or default values tos1 as per mapping of {fc1, profile1} to IP precedence in network egress QoS policy of outgoing interface
outgoing interface (sender node)	echo request packet: <ul style="list-style-type: none"> pkt queued as {fc1, profile1} ToS field=tos1 not remarked EXP=exp1, as per mapping of {fc1, profile1} to EXP in network egress QoS policy of outgoing interface
Incoming interface (responder node)	echo request packet: <ul style="list-style-type: none"> packet{tos1, exp1} exp1 mapped to {fc2, profile2} as per classification in network QoS policy of incoming interface
cpm (responder node)	echo reply packet: <ul style="list-style-type: none"> packet{tos=1, fc2, profile2}
outgoing interface (responder node)	echo reply packet: <ul style="list-style-type: none"> pkt queued as {fc2, profile2} ToS field= tos1 not remarked (reply inband or out-of-band) EXP=exp2, if reply is inband, remarked as per mapping of {fc2, profile2} to EXP in network egress QoS policy of outgoing interface
Incoming interface (sender node)	echo reply packet: <ul style="list-style-type: none"> packet{tos1, exp2} exp2 mapped to {fc1, profile1} as per classification in network QoS policy of incoming interface

Default be

Values be, l2, af, l1, h2, ef, h1, nc

interval *interval* — The interval parameter in seconds, expressed as a decimal integer. This parameter is used to override the default echo request message send interval and defines the minimum amount of time that must expire before the next echo request message is sent.

If the interval is set to 1 second, and the timeout value is set to 10 seconds, then the maximum time between message requests is 10 seconds and the minimum is 1 second. This depends upon the receipt of an echo reply message corresponding to the outstanding message request.

Default 1

Values 1 — 10

lsp-name — Name that identifies an P2MP LSP, to 32 characters long, to ping.

max-fail *no-response-count* — The maximum number of consecutive MPLS echo requests, expressed as a decimal integer that do not receive a reply before the trace operation fails for a given TTL.

Default 5

Values 1 — 255

max-ttl *max-label-ttl* — the maximum TTL value in the MPLS label for the LSP trace test, expressed as a decimal integer.

Default 30

Values 1-255

min-ttl *min-label-ttl* — The minimum TTL value in the MPLS label for the LSP trace test, expressed as a decimal integer.

Default 1

Values 1 — 255

p2mp-instance *instance-name* — configures the name, up to 32 characters long, of the specific instance of the P2MP LSP to send the echo request.

probe-count *probes-per-hop* — The number of LSP trace echo request messages to send per TTL value.

Default 1

Values 1 — 10

profile {*in* | *out*} — The profile of the LSP trace echo request message.

Default out

s2l-dest-addr *ip-address* — Specifies the egress LER system address of the S2L sub-LSP path which is being traced.

size *octets* — The size in octets, expressed as a decimal integer, of the MPLS echo request packet, including the IP header but not the label stack. The request pay-load is padded with zeroes to the specified size. Note that an OAM command is not failed if the user entered a size lower than the minimum required to build the packet for the echo request message. The payload is automatically padded to meet the minimum size.

Default 1 octets.

Values 1 — 9198

timeout *timeout* — The timeout parameter in seconds, expressed as a decimal integer. This value is used to override the default timeout value and is the amount of time that the router will wait for an echo reply message from all leaves of the P2MP LSP after sending the message request message. Upon the

expiration of message timeout, the requesting router assumes that the missing replies will not be received. Any echo reply message received after the request times out will be silently discarded.

Default 3 seconds

Values 1 — 60

Sample Output

```
*A:Dut-C# oam p2mp-lsp-trace "p2mp_1" p2mp-instance "1" s2l-dest-address 10.20.1.
10.20.1.4 10.20.1.5 10.20.1.6
*A:Dut-C# oam p2mp-lsp-trace "p2mp_1" p2mp-instance "1" s2l-dest-address 10.20.1.5 detail
P2MP LSP p2mp_1: 132 bytes MPLS payload
P2MP Instance 1, S2L Egress 10.20.1.5

  1 10.20.1.1 rtt=3.78 ms rc=8(DSRtrMatchLabel)
    DS 1: ipaddr 10.20.1.2 iftype 'ipv4Unnumbered' ifaddr 2 MRU=1500 label=131060
proto=4(RSVP-TE) B/E flags:0/0
  2 10.20.1.2 rtt=3.54 ms rc=8(DSRtrMatchLabel)
    DS 1: ipaddr 10.20.1.4 iftype 'ipv4Unnumbered' ifaddr 3 MRU=1500 label=131061
proto=4(RSVP-TE) B/E flags:0/0
  3 10.20.1.5 rtt=5.30 ms rc=5(DSMappingMismatched)

Probe returned multiple responses. Result may be inconsistent.

*A:Dut-C#
```

ATM Diagnostics

atm-ping

Syntax `atm-ping port-id: vpi/vci [end-to-end | segment] [dest destination-id] [send-count send-count] [timeout timeout] [interval seconds]`

Context <GLOBAL>

Description This command tests ATM path connectivity and round trip time on an ATM VCC.

Parameters *port-id:vpi/vci* — Specifies the ID of the access port of the target VC. This parameter is required.

Values	port-id	<i>slot/mda/port</i>
	aps-id	<i>aps-group-id</i>
		aps keyword
		group-id 1 — 64
	vpi	0 — 4095 (NNI)
		0 — 255 (UNI)
	vci	1, 2, 5 — 65535

end-to-end | segment — Specifies whether the ATM OAM loopback cell is destined to the first segment point in the line direction or the PVCC's connection endpoint.

Default end-to-end

dest destination-id — Defines the LLID field in an OAM loopback cell. If set to all 1s, only the connection end (end-to-end ping) or segment end (segment ping) will respond to the ping. If the 'segment' parameter is specified and 'dest' is set to a specific destination, only the destination will respond to the ping.

Values A 16 byte octet string, with each octet separated by a colon, if not specified the value of all 0x11 will be used.

send-count send-count — The number of messages to send, expressed as a decimal integer. The **send-count** parameter is used to override the default number of message requests sent. Each message request must either timeout or receive a reply before the next message request is sent. The message **interval** value must be expired before the next message request is sent.

Default 1

Values 1 — 100

timeout timeout — The **timeout** parameter in seconds, expressed as a decimal integer. This value is used to override the default timeout value and is the amount of time that the router will wait for a message reply after sending the message request. Upon the expiration of message timeout, the requesting router assumes that the message response will not be received. Any response received after the request times out will be silently discarded.

Default 5

Values 1 — 10

interval interval — The **interval** parameter in seconds, expressed as a decimal integer. This parameter is

used to override the default request message send interval and defines the minimum amount of time that must expire before the next message request is sent.

If the **interval** is set to 1 second, and the **timeout** value is set to 10 seconds, then the maximum time between message requests is 10 seconds and the minimum is 1 second. This depends upon the receipt of a message reply corresponding to the outstanding message request.

Default 1

Values 1 — 10

Service Diagnostics

ancp

Syntax **ancp** {**subscriber** *sub-ident-string* | **ancp-string** *ancp-string*} **loopback** [**count** *count*] [**timeout** *seconds*] [**alarm**]
ancp **subscriber** *sub-ident-string* **loopback** [**send-count** *send-count*] [**timeout** *seconds*] [**alarm**]

Context <GLOBAL>

Description This command sends an OAM request to the access node. ANCP can be used to send OAM messages to the access node. The access node must be able to accept these messages and will signal such support by the capability negotiations. If the operator attempts to send an OAM command to an access node that does not support such command the operation results in an error.

Parameters **subscriber** *sub-ident-string* — Specifies an existing subscriber-id. The node will use the ancp-string associated with the provided subscriber-id to identify the circuit.

ancp-string *ancp-string* — Specifies an existing ANCP string.

send-count *send-count* — Specifies the number of messages the access node will use to test the circuit. If omitted, the number will be determined by the access node via local policy.
 1 — 32

timeout *seconds* — Specifies how long the controlling node will wait for a result.
 0 — 300

alarm — Specifies that the CLI the result will be returned to the CLI and a trap will be issued to indicate the test finished. If the flag is used through SNMP the results will be available in the results MIB and after the node sent the trap to indicate the results are ready.

loopback — Sends an OAM loopback test request to the access node

sdp-mtu

Syntax **sdp-mtu** *orig-sdp-id* **size-inc** *start-octets* *end-octets* [**step** *step-size*] [**timeout** *seconds*] [**interval** *seconds*]

Context oam

Description Performs MTU Path tests on an SDP to determine the largest path-mtu supported on an SDP. The **size-inc** parameter can be used to easily determine the **path-mtu** of a given SDP-ID. The forwarding class is assumed to be Best-Effort Out-of-Profile. The message reply is returned with IP/GRE encapsulation from the far-end router. OAM request messages sent within an IP/GRE SDP must have the 'DF' IP header bit set to 1 to prevent message fragmentation.
 To terminate an **sdp-mtu** in progress, use the CLI break sequence <Ctrl-C>.

Special Cases

SDP Path MTU Tests — SDP Path MTU tests can be performed using the **sdp-mtu size-inc** keyword to easily determine the **path-mtu** of a given SDP-ID. The forwarding class is assumed to be Best-Effort Out-of-Profile. The message reply is returned with IP/GRE encapsulation from the far-end router.

With each OAM Echo Request sent using the **size-inc** parameter, a response line is displayed as message output. The path MTU test displays incrementing packet sizes, the number sent at each size until a reply is received and the response message.

As the request message is sent, its size value is displayed followed by a period for each request sent of that size. Up to three requests will be sent unless a valid response is received for one of the requests at that size. Once a response is received, the next size message is sent.

The response message indicates the result of the message request.

After the last reply has been received or response timeout, the maximum size message replied to indicates the largest size OAM Request message that received a valid reply.

Parameters

orig-sdp-id — The *sdp-id* to be used by **sdp-ping**, expressed as a decimal integer. The far-end address of the specified *sdp-id* is the expected *responder-id* within each reply received. The specified *sdp-id* defines the encapsulation of the SDP tunnel encapsulation used to reach the far end. This can be IP/GRE or MPLS. If *orig-sdp-id* is invalid or administratively down or unavailable for some reason, the SDP echo request message is not sent and an appropriate error message is displayed (once the **interval** timer expires, **sdp-ping** will attempt to send the next request if required).

Values 1 — 17407

size-inc *start-octets end-octets* — Indicates an incremental path MTU test will be performed with by sending a series of message requests with increasing MTU sizes. The *start-octets* and *end-octets* parameters are described below.

start-octets — The beginning size in octets of the first message sent for an incremental MTU test, expressed as a decimal integer.

Values 40 — 9198

end-octets — The ending size in octets of the last message sent for an incremental MTU test, expressed as a decimal integer. The specified value must be greater than *start-octets*.

Values 40 — 9198

step *step-size* — The number of octets to increment the message size request for each message sent for an incremental MTU test, expressed as a decimal integer. The next size message will not be sent until a reply is received or three messages have timed out at the current size.

If the incremented size exceeds the *end-octets* value, no more messages will be sent.

Default 32

Values 1 — 512

timeout *seconds* — The **timeout** parameter in seconds, expressed as a decimal integer. This value is used to override the default **timeout** value and is the amount of time that the router will wait for a message reply after sending the message request. Upon the expiration of message timeout, the requesting router assumes that the message response will not be received. A ‘request timeout’ message is displayed by the CLI for each message request sent that expires. Any response received after the request times out will be silently discarded.

Default 5

Values 1 — 10

interval seconds — The **interval** parameter in seconds, expressed as a decimal integer. This parameter is used to override the default request message send interval and defines the minimum amount of time that must expire before the next message request is sent.

If the **interval** is set to 1 second, and the **timeout** value is set to 10 seconds, then the maximum time between message requests is 10 seconds and the minimum is 1 second. This depends upon the receipt of a message reply corresponding to the outstanding message request.

Default 1

Values 1 — 10

Output Sample SDP MTU Path Test Sample Output

```
*A:Dut-A# oam sdp-mtu 1201 size-inc 512 3072 step 256
Size      Sent      Response
-----
512       .         Success
768       .         Success
1024      .         Success
1280      .         Success
1536      .         Success
1792      .         Success
2048      .         Success
2304      .         Success
2560      .         Success
2816      .         Success
3072      .         Success

Maximum Response Size: 3072
*A:Dut-A#
```

svc-ping

Syntax **svc-ping** *ip-address* [**service** *service-id*] [**local-sdp**] [**remote-sdp**]

Context <GLOBAL>

Description Tests a service ID for correct and consistent provisioning between two service end points.

The **svc-ping** command accepts a far-end IP address and a *service-id* for local and remote service testing. The following information can be determined from **svc-ping**:

1. Local and remote service existence
2. Local and remote service state
3. Local and remote service type correlation
4. Local and remote customer association
5. Local and remote service-to-SDP bindings and state
6. Local and remote ingress and egress service label association

Unlike **sdp-ping**, only a single message will be sent per command; no count nor interval parameter is supported and round trip time is not calculated. A timeout value of 10 seconds is used before failing the request. The forwarding class is assumed to be Best-Effort Out-of-Profile

If no request is sent or a reply is not received, all remote information will be shown as N/A.

To terminate a **svc-ping** in progress, use the CLI break sequence <Ctrl-C>.

Upon request timeout, message response, request termination, or request error the following local and remote information will be displayed. Local and remote information will be dependent upon service existence and reception of reply.

Field	Description	Values
Request Result	The result of the svc-ping request message.	Sent - Request Timeout Sent - Request Terminated Sent - Reply Received Not Sent - Non-Existent Service-ID Not Sent - Non-Existent SDP for Service Not Sent - SDP For Service Down Not Sent - Non-existent Service Egress Label
Service-ID	The ID of the service being tested.	<i>service-id</i>
Local Service Type	The type of service being tested. If <i>service-id</i> does not exist locally, N/A is displayed.	Epipes, Ipipes, Fpipes, Apipes TLS IES Mirror-Dest N/A
Local Service Admin State	The local administrative state of <i>service-id</i> . If the service does not exist locally, the administrative state will be Non-Existent.	Admin-Up Admin-Down Non-Existent
Local Service Oper State	The local operational state of <i>service-id</i> . If the service does not exist locally, the state will be N/A.	Oper-Up Oper-Down N/A

Field	Description	Values (Continued)
Remote Service Type	The remote type of service being tested. If <i>service-id</i> does not exist remotely, N/A is displayed.	Epipes, Ipipes, Fpipes, Apipes TLS IES Mirror-Dest N/A
Remote Service Admin State	The remote administrative state of <i>service-id</i> . If the service does not exist remotely, the administrative state is Non-Existent.	Up Down Non-Existent
Local Service MTU	The local service-mtu for <i>service-id</i> . If the service does not exist, N/A is displayed.	<i>service-mtu</i> N/A
Remote Service MTU	The remote service-mtu for <i>service-id</i> . If the service does not exist remotely, N/A is displayed.	<i>remote-service-mtu</i> N/A
Local Customer ID	The local <i>customer-id</i> associated with <i>service-id</i> . If the service does not exist locally, N/A is displayed.	<i>customer-id</i> N/A
Remote Customer ID	The remote <i>customer-id</i> associated with <i>service-id</i> . If the service does not exist remotely, N/A is displayed.	<i>customer-id</i> N/A
Local Service IP Address	The local system IP address used to terminate remotely configured SDP-ID (as the far-end address). If an IP interface has not been configured to be the system IP address, N/A is displayed.	<i>system-ip-address</i> N/A
Local Service IP Interface Name	The name of the local system IP interface. If the local system IP interface has not been created, N/A is displayed.	<i>system-interface-name</i> N/A
Local Service IP Interface State	The state of the local system IP interface. If the local system IP interface has not been created, Non-Existent is displayed.	Up Down Non-Existent
Expected Far-end Address	The expected IP address for the remote system IP interface. This must be the far-end address entered for the svc-ping command.	<i>orig-sdp-far-end-addr</i> <i>dest-ip-addr</i> N/A
Actual Far-end Address	The returned remote IP address. If a response is not received, the displayed value is N/A. If the far-end service IP interface is down or non-existent, a message reply is not expected. sd-ping should also fail.	<i>resp-ip-addr</i> N/A

Field	Description	Values (Continued)
Responders Expected Far-end Address	The expected source of the originator's <i>sdp-id</i> from the perspective of the remote router terminating the <i>sdp-id</i> . If the far-end cannot detect the expected source of the ingress <i>sdp-id</i> or the request is transmitted outside the <i>sdp-id</i> , N/A is displayed.	<i>resp-rec-tunnel-far-end-address</i> N/A
Originating SDP-ID	The <i>sdp-id</i> used to reach the far-end IP address if sdp-path is defined. The originating <i>sdp-id</i> must be bound to the <i>service-id</i> and terminate on the far-end IP address. If an appropriate originating <i>sdp-id</i> is not found, Non-Existent is displayed.	orig-sdp-id Non-Existent
Originating SDP-ID Path Used	Whether the Originating router used the originating <i>sdp-id</i> to send the svc-ping request. If a valid originating <i>sdp-id</i> is found, operational and has a valid egress service label, the originating router should use the <i>sdp-id</i> as the requesting path if sdp-path has been defined. If the originating router uses the originating <i>sdp-id</i> as the request path, Yes is displayed. If the originating router does not use the originating <i>sdp-id</i> as the request path, No is displayed. If the originating <i>sdp-id</i> is non-existent, N/A is displayed.	Yes No N/A
Originating SDP-ID Administrative State	The local administrative state of the originating <i>sdp-id</i> . If the <i>sdp-id</i> has been shutdown, Admin-Down is displayed. If the originating <i>sdp-id</i> is in the no shutdown state, Admin-Up is displayed. If an originating <i>sdp-id</i> is not found, N/A is displayed.	Admin-Up Admin-Up N/A
Originating SDP-ID Operating State	The local operational state of the originating <i>sdp-id</i> . If an originating <i>sdp-id</i> is not found, N/A is displayed.	Oper-Up Oper-Down N/A
Originating SDP-ID Binding Admin State	The local administrative state of the originating <i>sdp-ids</i> binding to <i>service-id</i> . If an <i>sdp-id</i> is not bound to the service, N/A is displayed.	Admin-Up Admin-Up N/A
Originating SDP-ID Binding Oper State	The local operational state of the originating <i>sdp-ids</i> binding to <i>service-id</i> . If an <i>sdp-id</i> is not bound to the service, N/A is displayed.	Oper-Up Oper-Down N/A
Responding SDP-ID	The <i>sdp-id</i> used by the far end to respond to the svc-ping request. If the request was received without the sdp-path parameter, the responding router will not use an <i>sdp-id</i> as the return path, but the appropriate responding <i>sdp-id</i> will be displayed. If a valid <i>sdp-id</i> return path is not found to the originating router that is bound to the <i>service-id</i> , Non-Existent is displayed.	<i>resp-sdp-id</i> Non-Existent

Field	Description	Values (Continued)
Responding SDP-ID Path Used	Whether the responding router used the responding <i>sdp-id</i> to respond to the svc-ping request. If the request was received via the originating <i>sdp-id</i> and a valid return <i>sdp-id</i> is found, operational and has a valid egress service label, the far-end router should use the <i>sdp-id</i> as the return <i>sdp-id</i> . If the far end uses the responding <i>sdp-id</i> as the return path, Yes is displayed. If the far end does not use the responding <i>sdp-id</i> as the return path, No is displayed. If the responding <i>sdp-id</i> is non-existent, N/A is displayed.	Yes No N/A
Responding SDP-ID Administrative State	The administrative state of the far-end <i>sdp-id</i> associated with the return path for <i>service-id</i> . When a return path is administratively down, Admin-Down is displayed. If the return <i>sdp-id</i> is administratively up, Admin-Up is displayed. If the responding <i>sdp-id</i> is non-existent, N/A is displayed.	Admin-Up Admin-Up N/A
Responding SDP-ID Operational State	The operational state of the far-end <i>sdp-id</i> associated with the return path for <i>service-id</i> . When a return path is operationally down, Oper-Down is displayed. If the return <i>sdp-id</i> is operationally up, Oper-Up is displayed. If the responding <i>sdp-id</i> is non-existent, N/A is displayed.	Oper-Up Oper-Down N/A
Responding SDP-ID Binding Admin State	The local administrative state of the responder's <i>sdp-id</i> binding to <i>service-id</i> . If an <i>sdp-id</i> is not bound to the service, N/A is displayed.	Admin-Up Admin-Down N/A
Responding SDP-ID Binding Oper State	The local operational state of the responder's <i>sdp-id</i> binding to <i>service-id</i> . If an <i>sdp-id</i> is not bound to the service, N/A is displayed.	Oper-Up Oper-Down N/A
Originating VC-ID	The originator's VC-ID associated with the <i>sdp-id</i> to the far-end address that is bound to <i>service-id</i> . If the <i>sdp-id</i> signaling is off, <i>originator-vc-id</i> is 0. If the <i>originator-vc-id</i> does not exist, N/A is displayed.	<i>originator-vc-id</i> N/A
Responding VC-ID	The responder's VC-ID associated with the <i>sdp-id</i> to <i>originator-id</i> that is bound to <i>service-id</i> . If the <i>sdp-id</i> signaling is off or the service binding to <i>sdp-id</i> does not exist, <i>responder-vc-id</i> is 0. If a response is not received, N/A is displayed.	<i>responder-vc-id</i> N/A
Originating Egress Service Label	The originating service label (VC-Label) associated with the <i>service-id</i> for the originating <i>sdp-id</i> . If <i>service-id</i> does not exist locally, N/A is displayed. If <i>service-id</i> exists, but the egress service label has not been assigned, Non-Existent is displayed.	<i>egress-vc-label</i> N/A Non-Existent

Field	Description	Values (Continued)
Originating Egress Service Label Source	The originating egress service label source. If the displayed egress service label is manually defined, Manual is displayed. If the egress service label is dynamically signaled, Signaled is displayed. If the <i>service-id</i> does not exist or the egress service label is non-existent, N/A is displayed.	Manual Signaled N/A
Originating Egress Service Label State	The originating egress service label state. If the originating router considers the displayed egress service label operational, Up is displayed. If the originating router considers the egress service label inoperative, Down is displayed. If the <i>service-id</i> does not exist or the egress service label is non-existent, N/A is displayed.	Up Down N/A
Responding Service Label	The actual responding service label in use by the far-end router for this <i>service-id</i> to the originating router. If <i>service-id</i> does not exist in the remote router, N/A is displayed. If <i>service-id</i> does exist remotely but the remote egress service label has not been assigned, Non-Existent is displayed.	<i>rec-vc-label</i> N/A Non-Existent
Responding Egress Service Label Source	The responder's egress service label source. If the responder's egress service label is manually defined, Manual is displayed. If the responder's egress service label is dynamically signaled, Signaled is displayed. If the <i>service-id</i> does not exist on the responder or the responder's egress service label is non-existent, N/A is displayed.	Manual Signaled N/A
Responding Service Label State	The responding egress service label state. If the responding router considers its egress service label operational, Up is displayed. If the responding router considers its egress service label inoperative, Down is displayed. If the <i>service-id</i> does not exist or the responder's egress service label is non-existent, N/A is displayed.	Up Down N/A
Expected Ingress Service Label	The locally assigned ingress service label. This is the service label that the far-end is expected to use for <i>service-id</i> when sending to the originating router. If <i>service-id</i> does not exist locally, N/A is displayed. If <i>service-id</i> exists but an ingress service label has not been assigned, Non-Existent is displayed.	<i>ingress-vc-label</i> N/A Non-Existent
Expected Ingress Label Source	The originator's ingress service label source. If the originator's ingress service label is manually defined, Manual is displayed. If the originator's ingress service label is dynamically signaled, Signaled is displayed. If the <i>service-id</i> does not exist on the originator or the originators ingress service label has not been assigned, N/A is displayed.	Manual Signaled N/A

Field	Description	Values (Continued)
Expected Ingress Service Label State	The originator's ingress service label state. If the originating router considers its ingress service label operational, Up is displayed. If the originating router considers its ingress service label inoperative, Down is displayed. If the <i>service-id</i> does not exist locally, N/A is displayed.	Up Down N/A
Responders Ingress Service Label	The assigned ingress service label on the remote router. This is the service label that the far end is expecting to receive for <i>service-id</i> when sending to the originating router. If <i>service-id</i> does not exist in the remote router, N/A is displayed. If <i>service-id</i> exists, but an ingress service label has not been assigned in the remote router, Non-Existent is displayed.	<i>resp-ingress-vc-label</i> N/A Non-Existent
Responders Ingress Label Source	The assigned ingress service label source on the remote router. If the ingress service label is manually defined on the remote router, Manual is displayed. If the ingress service label is dynamically signaled on the remote router, Signaled is displayed. If the <i>service-id</i> does not exist on the remote router, N/A is displayed.	Manual Signaled N/A
Responders Ingress Service Label State	The assigned ingress service label state on the remote router. If the remote router considers its ingress service label operational, Up is displayed. If the remote router considers its ingress service label inoperative, Down is displayed. If the <i>service-id</i> does not exist on the remote router or the ingress service label has not been assigned on the remote router, N/A is displayed.	Up Down N/A

Parameters *ip-address* — The far-end IP address to which to send the **svc-ping** request message in dotted decimal notation.

service *service-id* — The service ID of the service being tested must be indicated with this parameter. The service ID need not exist on the local 7750 SR-Series to receive a reply message.

Values 1 — 2147483647

local-sdp — Specifies the **svc-ping** request message should be sent using the same service tunnel encapsulation labeling as service traffic. If **local-sdp** is specified, the command attempts to use an egress *sdp-id* bound to the service with the specified **far-end** IP address with the VC-Label for the service. The far-end address of the specified *sdp-id* is the expected *responder-id* within the reply received. The *sdp-id* defines the encapsulation of the SDP tunnel encapsulation used to reach the far end; this can be IP/GRE or MPLS. On originator egress, the service-ID must have an associated VC-Label to reach the far-end address of the *sdp-id* and the *sdp-id* must be operational for the message to be sent.

If **local-sdp** is not specified, the **svc-ping** request message is sent with GRE encapsulation with the OAM label.

The following table indicates whether a message is sent and how the message is encapsulated based on

the state of the service ID.

Local Service State	local-sdp Not Specified		local-sdp Specified	
	Message Sent	Message Encapsulation	Message Sent	Message Encapsulation
Invalid Local Service	Yes	Generic IP/GRE OAM (PLP)	No	None
No Valid SDP-ID Bound	Yes	Generic IP/GRE OAM (PLP)	No	None
SDP-ID Valid But Down	Yes	Generic IP/GRE OAM (PLP)	No	None
SDP-ID Valid and Up, But No Service Label	Yes	Generic IP/GRE OAM (PLP)	No	None
SDP-ID Valid, Up and Egress Service Label	Yes	Generic IP/GRE OAM (PLP)	Yes	SDP Encapsulation with Egress Service Label (SLP)

remote-sdp — Specifies **svc-ping** reply message from the **far-end** should be sent using the same service tunnel encapsulation labeling as service traffic.

If **remote-sdp** is specified, the **far-end** responder attempts to use an egress *sdp-id* bound to the service with the message originator as the destination IP address with the VC-Label for the service. The *sdp-id* defines the encapsulation of the SDP tunnel encapsulation used to reply to the originator; this can be IP/GRE or MPLS. On responder egress, the service-ID must have an associated VC-Label to reach the originator address of the *sdp-id* and the *sdp-id* must be operational for the message to be sent.

If **remote-sdp** is not specified, the **svc-ping** request message is sent with GRE encapsulation with the OAM label.

The following table indicates how the message response is encapsulated based on the state of the remote service ID.

Remote Service State	Message Encapsulation	
	remote-sdp Not Specified	remote-sdp Specified
Invalid Ingress Service Label	Generic IP/GRE OAM (PLP)	Generic IP/GRE OAM (PLP)
Invalid Service-ID	Generic IP/GRE OAM (PLP)	Generic IP/GRE OAM (PLP)
No Valid SDP-ID Bound on Service-ID	Generic IP/GRE OAM (PLP)	Generic IP/GRE OAM (PLP)
SDP-ID Valid But Down	Generic IP/GRE OAM (PLP)	Generic IP/GRE OAM (PLP)
SDP-ID Valid and Up, but No Service Label	Generic IP/GRE OAM (PLP)	Generic IP/GRE OAM (PLP)
SDP-ID Valid and Up, Egress Service Label, but VC-ID Mismatch	Generic IP/GRE OAM (PLP)	Generic IP/GRE OAM (PLP)
SDP-ID Valid and Up, Egress Service Label, but VC-ID Match	Generic IP/GRE OAM (PLP)	SDP Encapsulation with Egress Service Label (SLP)

Sample Output

```
*A:router1> svc-ping far-end 10.10.10.10 service 101 local-sdp remote-sdp
Request Result: Sent - Reply Received
```

```
Service-ID: 101
```

```
Err      Basic Info                Local      Remote
---      -
---      Type:                          TLS        TLS
---      Admin State:                   Up         Up
---      Oper State:                    Up         Up
---      Service-MTU:                  1514      1514
---      Customer ID:                  1001      1001

Err      System IP Interface Info
---      -
Local Interface Name: "7750 SR-System-IP-Interface (Up to 32 chars)..."
---      Local IP Interface State:      Up
---      Local IP Address:              10.10.10.11
---      IP Address Expected By Remote: 10.10.10.11
---      Expected Remote IP Address:   10.10.10.10
---      Actual Remote IP Address:     10.10.10.10

Err      SDP-ID Info                    Local      Remote
---      -
---      Path Used:                    Yes        Yes
---      SDP-ID:                      123       325
---      Administrative State:        Up         Up
---      Operative State:             Up         Up
---      Binding Admin State:         Up         Up
---      Binding Oper State:          Up         Up
---      Binding VC-ID:              101       101

Err      Service Label Information      Label     Source     State
---      -
```

—	Local Egress Label:	45	Signaled	Up
—	Remote Expected Ingress:	45	Signaled	Up
—	Remote Egress:	34	Signaled	Up
—	Local Expected Ingress:	34	Signaled	Up

host-connectivity-verify

Syntax **host-connectivity-verify service** *service-id* [**sap** *sap-id*]
host-connectivity-verify subscriber *sub-ident-string* [**sla-profile** *sla-profile-name*]

Context oam

Description This command triggers the host connectivity verification checks.

Parameters **service** *service-id* — Specifies the service ID to diagnose or manage.

Values 1 — 2147483647

sap *sap-id* — Specifies the physical port identifier portion of the SAP definition. See [Common CLI Command Descriptions on page 439](#) for command syntax.

sub-profile *sub-profile-name* — Specifies an existing subscriber profile name. The subscriber profile is configured in the **config>subscr-mgmt>sub-profile** context.

sla-profile *sla-profile-name* — Specifies an existing SLA profile name. The SLA profile is configured in the **config>subscr-mgmt>sla-profile** context.

vprn-ping

Syntax **vprn-ping service-id source** *ip-address destination ip-address* [**fc** *fc-name* [**profile** [**in** | **out**]]][**size** *size*] [**ttl** *vc-label-ttl*] [**return-control**] [**interval** *interval*] [**send-count** *send-count*] [**timeout** *timeout*]

Context <GLOBAL>
config>saa>test>type

Description This command performs a VPRN ping.

Parameters **service** *service-id* — The VPRN service ID to diagnose or manage.

Values *service-id*: 1 — 2147483647
svc-name: 64 characters maximum

source *ip-address* — The IP prefix for the source IP address in dotted decimal notation.

Values *ipv4-address*: 0.0.0.0 — 255.255.255.255
ipv6-address: x:x:x:x:x:x:x
x:x:x:x:x:d.d.d.d
x: [0..FFFF]H
d: [0..255]D

destination *ip-address* — The IP prefix for the destination IP address in dotted decimal notation.

Values 0.0.0.0 — 255.255.255.255

size *octets* — The OAM request packet size in octets, expressed as a decimal integer.

Values 1 — 9198

ttl *vc-label-ttl* — The TTL value in the VC label for the OAM request, expressed as a decimal integer.

Default 255

Values 1 — 255

return-control — Specifies the response to come on the control plane.

interval *interval* — The **interval** parameter in seconds, expressed as a decimal integer. This parameter is used to override the default request message send interval and defines the minimum amount of time that must expire before the next message request is sent.

If the **interval** is set to 1 second where the **timeout** value is set to 10 seconds, then the maximum time between message requests is 10 seconds and the minimum is 1 second. This depends upon the receipt of a message reply corresponding to the outstanding message request.

Default 1

Values 1 — 10

send-count *send-count* — The number of messages to send, expressed as a decimal integer. The **count** parameter is used to override the default number of message requests sent. Each message request must either timeout or receive a reply before the next message request is sent. The message **interval** value must be expired before the next message request is sent.

Default 1

Values 1 — 100

timeout *timeout* — The **timeout** parameter in seconds, expressed as a decimal integer. This value is used to override the default **timeout** value and is the amount of time that the router will wait for a message reply after sending the message request. Upon the expiration of message timeout, the requesting router assumes that the message response will not be received. Any response received after the request times out will be silently discarded.

Default 5

Values 1 — 100

fc-name — The forwarding class of the MPLS echo request encapsulation.

Default be

Values be, l2, af, l1, h2, ef, h1, nc

profile {in | out} — The profile state of the MPLS echo request encapsulation.

Default out

Sample Output

```
A:PE_1# oam vprn-ping 25 source 10.4.128.1 destination 10.16.128.0
```

Sequence	Node-id	Reply-Path	Size	RTT

[Send request Seq. 1.]				
1	10.128.0.3:cpm	In-Band	100	0ms

...				
A:PE_1#				

A:PE_1#				

vprn-trace

Syntax `vprn-trace service-id source src-ip destination ip-address [fc fc-name [profile [in | out]] [size size] [min-ttl vc-label-ttl] [max-ttl vc-label-ttl] [return-control] [probe-count probes-per-hop] [interval seconds] [timeout timeout]`

Context <GLOBAL>
config>saa>test>type

Description Performs VPRN trace.

Parameters `service service-id` — The VPRN service ID to diagnose or manage.

Values

<code>service-id:</code>	1 — 2147483647
<code>svc-name:</code>	64 characters maximum

`source src-ip` — The IP prefix for the source IP address in dotted decimal notation.

Values

<code>ipv4-address:</code>	0.0.0.0 — 255.255.255.255
<code>ipv6-address:</code>	x:x:x:x:x:x:x
	x:x:x:x:x:d.d.d.d
	x: [0..FFFF]H
	d: [0..255]D

`destination dst-ip` — The IP prefix for the destination IP address in dotted decimal notation.

Values 0.0.0.0 — 255.255.255.255

`size octets` — The OAM request packet size in octets, expressed as a decimal integer.

`min-ttl vc-label-ttl` — The minimum TTL value in the VC label for the trace test, expressed as a decimal integer.

Default 1

Values 1 — 255

`max-ttl vc-label-ttl` — The maximum TTL value in the VC label for the trace test, expressed as a decimal integer.

Default 4

Values 1 — 255

`return-control` — Specifies the OAM reply to a data plane OAM request be sent using the control plane instead of the data plane.

Default OAM reply sent using the data plane.

probe-count *send-count* — The number of OAM requests sent for a particular TTL value, expressed as a decimal integer.

Default 1

Values 1 — 10

interval *seconds* — The **interval** parameter in seconds, expressed as a decimal integer. This parameter is used to override the default request message send interval and defines the minimum amount of time that must expire before the next message request is sent.

If the **interval** is set to 1 second where the **timeout** value is set to 10 seconds, then the maximum time between message requests is 10 seconds and the minimum is 1 second. This depends upon the receipt of a message reply corresponding to the outstanding message request.

Default 1

Values 1 — 10

timeout *timeout* — The **timeout** parameter in seconds, expressed as a decimal integer. This value is used to override the default **timeout** value and is the amount of time that the router will wait for a message reply after sending the message request. Upon the expiration of message timeout, the requesting router assumes that the message response will not be received. Any response received after the request times out will be silently discarded.

Default 3

Values 1 — 10

fc-name — The forwarding class of the MPLS echo request encapsulation.

Default be

Values be, l2, af, l1, h2, ef, h1, nc

profile {in | out} — The profile state of the MPLS echo request encapsulation.

Default out

Sample Output

```
A:PE_1# oam vprn-trace 25 source 10.4.128.1 destination 10.16.128.0
TTL Seq Reply Node-id          Rcvd-on          Reply-Path RTT
-----
[Send request TTL: 1, Seq. 1.]
1  1  1  10.128.0.4          cpm              In-Band         0ms
  Requestor 10.128.0.1 Route: 0.0.0.0/0
    Vpn Label: 131071 Metrics 0 Pref 170 Owner bgpVpn
    Next Hops: [1] ldp tunnel
    Route Targets: [1]: target:65100:1
  Responder 10.128.0.4 Route: 10.16.128.0/24
    Vpn Label: 131071 Metrics 0 Pref 170 Owner bgpVpn
    Next Hops: [1] ldp tunnel
    Route Targets: [1]: target:65001:100

[Send request TTL: 2, Seq. 1.]
2  1  1  10.128.0.3          cpm              In-Band         0ms
```

```
Requestor 10.128.0.1 Route: 0.0.0.0/0
  Vpn Label: 131071 Metrics 0 Pref 170 Owner bgpVpn
  Next Hops: [1] ldp tunnel
  Route Targets: [1]: target:65100:1
Responder 10.128.0.3 Route: 10.16.128.0/24
  Vpn Label: 0 Metrics 0 Pref 0 Owner local
  Next Hops: [1] ifIdx 2 nextHopIp 10.16.128.0
```

```
[Send request TTL: 3, Seq. 1.]
```

```
[Send request TTL: 4, Seq. 1.]
```

```
...
```

```
-----  
A:PE_1#
```

VPLS MAC Diagnostics

cpe-ping

Syntax `cpe-ping service service-id destination ip-address source ip-address [ttl vc-label-ttl] [return-control] [source-mac ieee-address] [fc fc-name [profile {in | out}]] [interval interval] [send-count send-count] [send-control]`

Context
oam
config>saa>test>type

Description This ping utility determines the IP connectivity to a CPE within a specified VPLS service.

Parameters `service service-id` — The service ID of the service to diagnose or manage.

Values

<i>service-id:</i>	1 — 2147483647
<i>svc-name:</i>	64 characters maximum

destination ip-address — Specifies the IP address to be used as the destination for performing an OAM ping operations.

source ip-address — Specify an unused IP address in the same network that is associated with the VPLS or PBB Epipe.

ttl vc-label-ttl — The TTL value in the VC label for the OAM MAC request, expressed as a decimal integer.

Values 1 — 255

Default 255

return-control — Specifies the MAC OAM reply to a data plane MAC OAM request be sent using the control plane instead of the data plane. This parameter is only valid for VPLS services.

Default MAC OAM reply sent using the data plane.

source-mac ieee-address — Specify the source MAC address that will be sent to the CPE. If not specified or set to 0, the MAC address configured for the CPM is used. This parameter is not applicable to CPE ping on Epipes.

fc-name — The forwarding class of the MPLS echo request encapsulation.

Values be, l2, af, l1, h2, ef, h1, nc

Default be

profile {in | out} — The profile state of the MPLS echo request encapsulation for VPLS and the ARP packet for PBB Epipe and Epipe VLLs.

Default out

interval interval — The **interval** parameter in seconds, expressed as a decimal integer. This parameter is used to override the default request message send interval and defines the minimum amount of time that must expire before the next message request is sent.

If the **interval** is set to 1 second where the **timeout** value is set to 10 seconds, then the maximum time

between message requests is 10 seconds and the minimum is 1 second. This depends upon the receipt of a message reply corresponding to the outstanding message request.

Values 1 — 10

Default 1

send-count *send-count* — The number of messages to send, expressed as a decimal integer. The **count** parameter is used to override the default number of message requests sent. Each message request must either timeout or receive a reply before the next message request is sent. The message **interval** value must be expired before the next message request is sent.

Values 1 — 100

Default 1

send-control — Specifies the MAC OAM request be sent using the control plane instead of the data plane. This parameter is only valid for VPLS services.

Default MAC OAM request sent using the data plane.

mac-populate

Syntax **mac-populate** *service-id* **mac** *ieee-address* [**flood**] [**age** *seconds*] [**force**]

Context oam

Description This command populates the FIB with an OAM-type MAC entry indicating the node is the egress node for the MAC address and optionally floods the OAM MAC association throughout the service. The **mac-populate** command installs an OAM MAC into the service FIB indicating the device is the egress node for a particular MAC address. The MAC address can be bound to a particular SAP (the **target-sap**) or can be associated with the control plane in that any data destined to the MAC address is forwarded to the control plane (CPM). As a result, if the service on the node has neither a FIB nor an egress SAP, then it is not allowed to initiate a **mac-populate**.

The MAC address that is populated in the FIBs in the provider network is given a type OAM, so that it can be treated distinctly from regular dynamically learned or statically configured MACs. Note that OAM MAC addresses are operational MAC addresses and are not saved in the device configuration. An exec file can be used to define OAM MACs after system initialization.

The **force** option in **mac-populate** forces the MAC in the table to be type OAM in the case it already exists as a dynamic, static or an OAM induced learned MAC with some other type binding.

An OAM-type MAC cannot be overwritten by dynamic learning and allows customer packets with the MAC to either ingress or egress the network while still using the OAM MAC entry.

The **flood** option causes each upstream node to learn the MAC (that is, populate the local FIB with an OAM MAC entry) and to flood the request along the data plane using the flooding domain. The flooded **mac-populate** request can be sent via the data plane or the control plane. The **send-control** option specifies the request be sent using the control plane. If **send-control** is not specified, the request is sent using the data plane.

An **age** can be provided to age a particular OAM MAC using a specific interval. By default, OAM MAC addresses are not aged and can be removed with a **mac-purge** or with an FDB clear operation.

When split horizon group (SHG) is configured, the flooding domain depends on which SHG the packet originates from. The **target-sap** *sap-id* value dictates the originating SHG information.

Parameters

service *service-id* — The Service ID of the service to diagnose or manage.

Values 1 — 2147483647

destination *ieee-address* — The MAC address to be populated.

flood — Sends the OAM MAC populate to all upstream nodes.

Default MAC populate only the local FIB.

age *seconds* — The age for the OAM MAC, expressed as a decimal integer.

Default The OAM MAC does not age.

Values 1 — 65535

force — Converts the MAC to an OAM MAC even if it currently another type of MAC.

Default Do not overwrite type.

target-sap *sap-id* — The local target SAP bound to a service on which to associate the OAM MAC. By default, the OAM MAC is associated with the control plane, that is, it is associated with the CPU on the router.

When the **target-sap** *sap-id* value is not specified the MAC is bound to the CPM. The originating SHG is 0 (zero). When the **target-sap** *sap-id* value is specified, the originating SHG is the SHG of the target-sap.

Default Associate OAM MAC with the control plane (CPU).

mac-purge

Syntax **mac-purge** *service-id* **target** *ieee-address* [**flood**] [**send-control**] [**register**]

Context oam

Description

This command removes an OAM-type MAC entry from the FIB and optionally floods the OAM MAC removal throughout the service. A **mac-purge** can be sent via the forwarding path or via the control plane. When sending the MAC purge using the data plane, the TTL in the VC label is set to 1. When sending the MAC purge using the control plane, the packet is sent directly to the system IP address of the next hop.

A MAC address is purged only if it is marked as OAM. A mac-purge request is an HVPLS OAM packet, with the following fields. The Reply Flags is set to 0 (since no reply is expected), the Reply Mode and Reserved fields are set to 0. The Ethernet header has source set to the (system) MAC address, the destination set to the broadcast MAC address. There is a VPN TLV in the FEC Stack TLV to identify the service domain.

If the register option is provided, the R bit in the Address Delete flags is turned on.

The **flood** option causes each upstream node to be sent the OAM MAC delete request and to flood the request along the data plane using the flooding domain. The flooded **mac-purge** request can be sent via the data plane or the control plane. The **send-control** option specifies the request be sent using the control plane. If **send-control** is not specified, the request is sent using the data plane.

The **register** option reserves the MAC for OAM testing where it is no longer an active MAC in the FIB for forwarding, but it is retained in the FIB as a registered OAM MAC. Registering an OAM MAC prevents relearns for the MAC based on customer packets. Relearning a registered MAC can only be done through a **mac-populate** request. The originating SHG is always 0 (zero).

Parameters **service** *service-id* — The service ID of the service to diagnose or manage.

Values 1 — 2147483647

target *ieee-address* — The MAC address to be purged.

flood — Sends the OAM MAC purge to all upstream nodes.

Default MAC purge only the local FIB.

send-control — Send the mac-purge request using the control plane.

Default Request is sent using the data plane.

register — Reserve the MAC for OAM testing.

Default Do not register OAM MAC.

mac-ping

Syntax **mac-ping service** *service-id* **destination** *dst-ieee-address* [**source** *src-ieee-address*] [**fc** *fc-name*] [**profile** *in | out*] [**size** *octets*] [**tll** *vc-label-ttl*] [**send-count** *send-count*] [**send-control**] [**return-control**] [**interval** *interval*] [**timeout** *timeout*]

Context oam
config>saa>test>type

Description The **mac-ping** utility is used to determine the existence of an egress SAP binding of a given MAC within a VPLS service.

A **mac-ping** packet can be sent via the control plane or the data plane. The **send-control** option specifies the request be sent using the control plane. If **send-control** is not specified, the request is sent using the data plane.

A **mac-ping** is forwarded along the flooding domain if no MAC address bindings exist. If MAC address bindings exist, then the packet is forwarded along those paths, provided they are active. A response is generated only when there is an egress SAP binding for that MAC address or if the MAC address is a “local” OAM MAC address associated with the device’s control plan.

A **mac-ping** reply can be sent using the data plane or the control plane. The **return-control** option specifies the reply be sent using the control plane. If **return-control** is not specified, the request is sent using the data plane.

A **mac-ping** with data plane reply can only be initiated on nodes that can have an egress MAC address binding. A node without a FIB and without any SAPs cannot have an egress MAC address binding, so it is not a node where replies in the data plane will be trapped and sent up to the control plane.

A control plane request is responded to via a control plane reply only.

By default, MAC OAM requests are sent with the system or chassis MAC address as the source MAC. The **source** option allows overriding of the default source MAC for the request with a specific MAC address.

When a **source** *ieee-address* value is specified and the source MAC address is locally registered within a split horizon group (SHG), then this SHG membership will be used as if the packet originated from this SHG. In all other cases, SHG 0 (zero) will be used. Note that if the **mac-trace** is originated from a non-zero SHG, such packets will not go out to the same SHG.

If EMG is enabled, mac-ping will return only the first SAP in each chain.

Parameters

service *service-id* — The service ID of the service to diagnose or manage.

Values 1 — 2147483647

destination *ieee-address* — The destination MAC address for the OAM MAC request.

size *octets* — The MAC OAM request packet size in octets, expressed as a decimal integer. The request payload is padded to the specified size with a 6 byte PAD header and a byte payload of 0xAA as necessary. If the octet size specified is less than the minimum packet, the minimum sized packet necessary to send the request is used.

Default No OAM packet padding.

Values 1 — 65535

ttl *vc-label-ttl* — The TTL value in the VC label for the OAM MAC request, expressed as a decimal integer.

Default 255

Values 1 — 255

send-control — Specifies the MAC OAM request be sent using the control plane instead of the data plane.

Default MAC OAM request sent using the data plane.

return-control — Specifies the MAC OAM reply to a data plane MAC OAM request be sent using the control plane instead of the data plane.

Default MAC OAM reply sent using the data plane.

source *src-ieee-address* — The source MAC address from which the OAM MAC request originates. By default, the system MAC address for the chassis is used.

Default The system MAC address.

Values Any unicast MAC value.

fc *fc-name* — The **fc** parameter is used to test the forwarding class of the MPLS echo request packets. The actual forwarding class encoding is controlled by the network egress LSP-EXP mappings.

Values be, l2, af, l1, h2, ef, h1, nc

profile {**in** | **out**} — The profile state of the MPLS echo request encapsulation.

Default out

interval *interval* — The **interval** parameter in seconds, expressed as a decimal integer. This parameter is used to override the default request message send interval and defines the minimum amount of time that must expire before the next message request is sent.

If the **interval** is set to 1 second where the **timeout** value is set to 10 seconds, then the maximum time between message requests is 10 seconds and the minimum is 1 second. This depends upon the receipt of a message reply corresponding to the outstanding message request.

Default 1

Values 1 — 10

send-count *send-count* — The number of messages to send, expressed as a decimal integer. The **count** parameter is used to override the default number of message requests sent. Each message request must either timeout or receive a reply before the next message request is sent. The message **interval** value must be expired before the next message request is sent.

Default 1

Values 1 — 100

timeout *timeout* — The **timeout** parameter in seconds, expressed as a decimal integer. This value is used to override the default **timeout** value and is the amount of time that the router will wait for a message reply after sending the message request. Upon the expiration of message timeout, the requesting router assumes that the message response will not be received. Any response received after the request times out will be silently discarded.

Default 5

Values 1 — 10

mac-trace

Syntax **mac-trace service** *service-id* **destination** *ieee-address* [**size** *octets*] [**min-ttl** *vc-label-ttl*] [**max-ttl** *vc-label-ttl*] [**send-control**] [**return-control**] [**source** *ieee-address*] [**z-count** *probes-per-hop*] [**interval** *interval*] [**timeout** *timeout*]

Context oam
config>saa>test>type

Description This command displays the hop-by-hop path for a destination MAC address within a VPLS. The MAC traceroute operation is modeled after the IP traceroute utility which uses ICMP echo request and reply packets with increasing TTL values to determine the hop-by-hop route to a destination IP. The MAC traceroute command uses Alcatel-Lucent OAM packets with increasing TTL values to determine the hop-by-hop route to a destination MAC.

In a MAC traceroute, the originating device creates a MAC ping echo request packet for the MAC to be tested with increasing values of the TTL. The echo request packet is sent through the control plane or data plane and awaits a TTL exceeded response or the echo reply packet from the device with the destination MAC. The devices that reply to the echo request packets with the TTL exceeded and the echo reply are displayed.

When a **source** *ieee-address* value is specified and the source MAC address is locally registered within a split horizon group (SHG), then this SHG membership will be used as if the packet originated from this SHG. In all other cases, SHG 0 (zero) will be used. Note that if the **mac-ping** is originated from a non-zero SHG, such packets will not go out to the same SHG.

If EMG is enabled, mac-trace will return only the first SAP in each chain.

Parameters **service** *service-id* — The Service ID of the service to diagnose or manage.

Values 1 — 2147483647

destination *ieee-address* — The destination MAC address to be traced.

size *octets* — The MAC OAM request packet size in octets, expressed as a decimal integer. The request payload is padded to the specified size with a 6 byte PAD header and a byte payload of 0xAA as necessary. If the octet size specified is less than the minimum packet, the minimum sized packet necessary to send the request is used.

Default No OAM packet padding.

Values 1 — 65535

min-ttl *vc-label-ttl* — The minimum TTL value in the VC label for the MAC trace test, expressed as a decimal integer.

Default 1

Values 1 — 255

max-ttl *vc-label-ttl* — The maximum TTL value in the VC label for the MAC trace test, expressed as a decimal integer.

Default 4

Values 1 — 255

send-control — Specifies the MAC OAM request be sent using the control plane instead of the data plane.

Default MAC OAM request sent using the data plane.

return-control — Specifies the MAC OAM reply to a data plane MAC OAM request be sent using the control plane instead of the data plane.

Default MAC OAM reply sent using the data plane.

source *ieee-address* — The source MAC address from which the OAM MAC request originates. By default, the system MAC address for the chassis is used.

Default The system MAC address.

Values Any unicast MAC value.

send-count *send-count* — The number of MAC OAM requests sent for a particular TTL value, expressed as a decimal integer.

Default 1

Values 1 — 100

interval *interval* — The **interval** parameter in seconds, expressed as a decimal integer. This parameter is used to override the default request message send interval and defines the minimum amount of time that must expire before the next message request is sent.

If the **interval** is set to 1 second, and the **timeout** value is set to 10 seconds, then the maximum time between message requests is 10 seconds and the minimum is 1 second. This depends upon the receipt of a message reply corresponding to the outstanding message request.

Default 1

Values 1 — 10

timeout *timeout* — The **timeout** parameter in seconds, expressed as a decimal integer. This value is used to

override the default **timeout** value and is the amount of time that the router will wait for a message reply after sending the message request. Upon the expiration of message timeout, the requesting router assumes that the message response will not be received. Any response received after the request times out will be silently discarded.

Default 5

Values 1 — 10

IGMP Snooping Diagnostics

mfib-ping

Syntax **mfib-ping service** *service-id* **source** *src-ip* **destination** *mcast-address* [**size** *size*] [**ttl** *vc-label-ttl*] [**return-control**] [**interval** *interval*] [**send-count** *send-count*] [**timeout** *timeout*]

Context oam

Description The mfib-ping utility determines the list of SAPs which egress a certain IP multicast stream (identified by source unicast and destination multicast IP addresses) within a VPLS service. An mfib-ping packet is always sent via the data plane.

An mfib-ping is forwarded across the VPLS following the MFIB. If an entry for the specified source unicast and destination multicast IP addresses exist in the MFIB for that VPLS, then the packet is forwarded along those paths, provided they are active. A response is generated only when there is an egress SAP binding for the specified IP multicast stream.

An mfib-ping reply can be sent using the data plane or the control plane. The return-control option specifies the reply be sent using the control plane. If return-control is not specified, the reply is sent using the data plane.

Parameters **service** *service-id* — The service ID of the VPLS to diagnose or manage.

Values 1 — 2147483647

source *src-ip* — The source IP address for the OAM request.

destination *mcast-address* — The destination multicast address for the OAM request.

size *size* — The multicast OAM request packet size in octets, expressed as a decimal integer. The request payload is padded to the specified size with a 6 byte PAD header and a byte payload of 0xAA as necessary.

If the octet size specified is less than the minimum packet, the minimum sized packet necessary to send the request is used.

Default No OAM packet padding.

Values 1 — 65535

ttl *vc-label-ttl* — The TTL value in the VC label for the OAM request, expressed as a decimal integer.

Default 255

Values 1 — 255

return-control — Specifies the OAM reply has to be sent using the control plane instead of the data plane.

Default OAM reply is sent using the data plane.

interval *interval* — The interval parameter in seconds, expressed as a decimal integer. This parameter is used to override the default request message send interval and defines the minimum amount of time that must expire before the next message request is sent.

If the interval is set to 1 second where the timeout value is set to 10 seconds, then the maximum time between message requests is 10 seconds and the minimum is 1 second. This depends upon the receipt of a message reply corresponding to the outstanding message request.

Default 1

Values 1 — 10

send-count *send-count* — The number of messages to send, expressed as a decimal integer. The count parameter is used to override the default number of message requests sent. Each message request must either timeout or receive a reply before the next message request is sent.

The message interval value must be expired before the next message request is sent.

Default 1

Values 1 — 100

timeout *seconds* — The timeout parameter in seconds, expressed as a decimal integer. This value is used to override the default timeout value and is the amount of time that the 7750 SR will wait for a message reply after sending the next message request.

Upon the expiration of message timeout, the requesting 7750 SR assumes that the message response will not be received. A 'request timeout' message is displayed by the CLI for each message request sent that expires. Any response received after the request times out will be silently discarded.

Default 5

Values 1 — 100

Specifications

MFIB 224.0.0.X pings — Mfib-ping requests directed to a destination address in the special 224.0.0.X range are flooded throughout the service flooding domain and will receive a response from all operational SAPs. Note that SAPs that are operationally down do not reply. If EMG is enabled, mfib-ping will return only the first SAP in each chain.

Multicast FIB Connectivity Test Sample Output

```
A:ALA-A# oam mfib-ping service 10 source 10.10.10.1 destination 225.0.0.1 count 2
Seq Node-id                               Path      Size  RTT
-----
[Send request Seq. 1.]
1  51.51.51.51:sap1/1/1                    Self      100   0ms
1  54.54.54.54:sap1/1/2                    In-Band   100   20ms
1  54.54.54.54:sap1/1/3                    In-Band   100   10ms
1  52.52.52.52:sap1/1/3                    In-Band   100   20ms
[Send request Seq. 2.]
2  51.51.51.51:sap1/1/1                    Self      100   0ms
2  52.52.52.52:sap1/1/2                    In-Band   100   10ms
2  54.54.54.54:sap1/1/2                    In-Band   100   10ms
2  52.52.52.52:sap1/1/3                    In-Band   100   20ms
2  54.54.54.54:sap1/1/3                    In-Band   100   30ms
-----
A:ALA-AIM# oam mfib-ping service 1 source 11.11.0.0 destination 224.0.0.1
Seq Node-id                               Path      Size  RTT
-----
[Send request Seq. 1.]
```


OAM and SAA Command Reference

```
1 10.20.1.3:sap1/1/5:1          Not in MFIB Self    40    0ms
1 10.20.1.3:sap1/1/2:1          Self              40    10ms
[Echo replies received: 2]
```

A:ALA-AIM#

EFM Commands

efm

Syntax *port-id*

Context oam>efm

Description This command enables Ethernet in the First Mile (EFM) OAM tests loopback tests on the specified port. The EFM OAM remote loopback OAMPDU will be sent to the peering device to trigger remote loopback.
When EFM OAM is disabled or shutdown on a port, the dying gasp flag for the OAMPDU is set for the OAMPDUs sent to the peer. This speeds up the peer loss detection time.

Parameters *port-id* — Specify the port ID in the slot/mda/port format. **Note:** On the 7950, The XMA ID takes the place of the MDA.

local-loopback

Syntax **local-loopback {start | stop}**

Context oam>efm

Description This command enables local loopback tests on the specified port.

remote-loopback

Syntax **remote-loopback {start | stop}**

Context oam>efm

Description This command enables remote Ethernet in the First Mile (EFM) OAM loopback tests on the specified port. The EFM OAM remote loopback OAMPDU will be sent to the peering device to trigger remote loopback.
In order for EFM OAM tunneling to function properly, EFM OAM tunneling should be configured for VLL services or a VPLS service with two SAPs only.

ETH-CFM OAM Commands

linktrace

Syntax `linktrace mac-address mep mep-id domain md-index association ma-index [ttl ttl-value]`

Context `oam>eth-cfm`

Default The command specifies to initiate a linktrace test.

Parameters *mac-address* — Specifies a unicast destination MAC address.

mep *mep-id* — Specifies the local mep-id.

Values 1 — 8191

domain *md-index* — Specifies the MD index.

Values 1 — 4294967295

association *ma-index* — Specifies the MA index.

Values 1 — 4294967295

ttl *ttl-value* — Specifies the TTL for a returned linktrace.

Values 0 — 255

loopback

Syntax `loopback {mac-address|multicast} mep mep-id domain md-index association ma-index [send-count send-count] [size data-size] [priority priority]`

Context `oam>eth-cfm`

Default The command specifies to initiate a loopback test.

Parameters *mac-address* — Specifies a unicast MAC address or multicast MAC address. The last nibble of the mcast address must match the level of the local MEP or the command will error and the test will not be instantiated.

multicast — Builds the class one destination multicast address based on the level of the local MEP. The last nibble of the multicast address must match the level of the local MEP or the command will error and the test will not be instantiated.

mep *mep-id* — Specifies the local mep-id.

Values 1 — 8191

domain *md-index* — Specifies the MD index.

Values 1 — 4294967295

association *ma-index* — Specifies the MA index.

Values 1 — 4294967295

send-count *send-count* — Specifies the number of messages to send, expressed as a decimal integer. Loop-back messages are sent back to back, with no delay between the transmissions.

Default 1

Values 1 — 5

size *data-size* — This is the size of the data portion of the data TLV. If 0 is specified no data TLV is added to the packet.

Values 0 — 1500

priority *priority* — Specifies a 3-bit value to be used in the VLAN tag, if present, in the transmitted frame.

Values 0 — 7

eth-test

Syntax *mac-address mep mep-id domain md-index association ma-index [priority priority] [data-length data-length]*

Context oam>eth-cfm

Description This command issues an ETH-CFM test.

Parameters *mac-address* — Specifies a unicast MAC address.

mep *mep-id* — Specifies the local mep-id.

Values 1 — 8191

domain *md-index* — Specifies the MD index.

Values 1 — 4294967295

association *ma-index* — Specifies the MA index.

Values 1 — 4294967295

data-length *data-length* — Indicates the UDP data length of the echo reply, the length starting after the IP header of the echo reply.

Values 64 — 1500

Default 64

one-way-delay-test

Syntax	one-way-delay-test <i>mac-address</i> mep <i>mep-id</i> domain <i>md-index</i> association <i>ma-index</i> [priority <i>priority</i>]
Context	oam>eth-cfm
Description	This command issues an ETH-CFM one-way delay test.
Parameters	<p><i>mac-address</i> — Specifies a unicast MAC address.</p> <p>mep <i>mep-id</i> — Specifies the local mep-id.</p> <p>Values 1 — 8191</p> <p>domain <i>md-index</i> — Specifies the MD index.</p> <p>Values 1 — 4294967295</p> <p>association <i>ma-index</i> — Specifies the MA index.</p> <p>Values 1 — 4294967295</p> <p>priority <i>priority</i> — Specifies the priority.</p> <p>Values 0 — 7</p> <p>Default The CCM and LTM priority of the MEP.</p>

two-way-delay-test

Syntax	two-way-delay-test <i>mac-address</i> mep <i>mep-id</i> domain <i>md-index</i> association <i>ma-index</i> [priority <i>priority</i>]
Context	oam>eth-cfm
Description	This command issues an ETH-CFM two-way delay test.
Parameters	<p><i>mac-address</i> — Specifies a unicast MAC address.</p> <p>mep <i>mep-id</i> — Specifies the local mep-id.</p> <p>Values 1 — 8191</p> <p>domain <i>md-index</i> — Specifies the MD index.</p> <p>Values 1 — 4294967295</p> <p>association <i>ma-index</i> — Specifies the MA index.</p> <p>Values 1 — 4294967295</p> <p>priority <i>priority</i> — Specifies the priority.</p> <p>Values 0 — 7</p> <p>Default The CCM and LTM priority of the MEP.</p>

two-way-slm-test

Syntax **two-way-slm-test** *mac-address* **mep** *mep-id* **domain** *md-index* **association** *ma-index* [**priority** *priority*] [**send-count** *send-count*] [**size** *data-size*] [**timeout** *timeout*] [**interval** *interval*]

Context oam>eth-cfm

Description This command configures an Ethernet CFM two-way SLM test in SAA.

mac-address — Specifies a unicast destination MAC address.

mep *mep-id* — Specifies the local mep-id.

Values 1 — 8191

domain *md-index* — Specifies the MD index.

Values 1 — 4294967295

association *ma-index* — Specifies the MA index.

Values 1 — 4294967295

priority *priority* — Specifies the priority.

Values 0—7

send-count *send-count* — The number of messages to send, expressed as a decimal integer. The count parameter is used to override the default number of message requests sent. The message interval value must be expired before the next message request is sent.

Values 1 — 1000

Default 1

size *data-size* — This is the size of the data portion of the data TLV. If 0 is specified no data TLV is added to the packet.

Default 0

Values 0 — 1500

timeout *timeout* — The **timeout** parameter in seconds, expressed as a decimal integer. This value is used to override the default **timeout** value and is the amount of time that the router will wait for a message reply after sending the message request. Upon the expiration of message timeout, the requesting router assumes that the message response will not be received. Any response received after the request times out will be silently discarded. The **timeout** value must be less than the **interval**.

Default 5

Values 1 — 10

interval *interval* — The interval parameter in seconds, expressed as a decimal integer. This parameter is used to configure the spacing between probes within a test run.

Default 5

Values [0.1 .. 0.9 | 1 .. 10]

Service Assurance Agent (SAA) Commands

saa

Syntax **saa**

Context config

Description This command creates the context to configure the Service Assurance Agent (SAA) tests.

test

Syntax **test name [owner test-owner]**
no test name

Context config>saa

Description This command identifies a test and create/modify the context to provide the test parameters for the named test. Subsequent to the creation of the test instance the test can be started in the OAM context.

A test can only be modified while it is shut down.

The **no** form of this command removes the test from the configuration. In order to remove a test it can not be active at the time.

Parameters *name* — Identify the saa test name to be created or edited.

owner test-owner — Specifies the owner of an SAA operation up to 32 characters in length.

Values If a *test-owner* value is not specified, tests created by the CLI have a default owner "TIMOS CLP".

accounting-policy

Syntax **accounting-policy acct-policy-id**
no accounting-policy

Context config>saa>test

Description This command associates an accounting policy to the SAA test. The accounting policy must already be defined before it can be associated else an error message is generated.

A notification (trap) when a test is completed is issued whenever a test terminates.

The **no** form of this command removes the accounting policy association.

Default none

Parameters *acct-policy-id* — Enter the accounting *policy-id* as configured in the **config>log>accounting-policy** context.

Values 1 — 99

description

Syntax **description** *description-string*
no description

Context config>saa>test

Description This command creates a text description stored in the configuration file for a configuration context. The **description** command associates a text string with a configuration context to help identify the content in the configuration file. The **no** form of this command removes the string from the configuration.

Default No description associated with the configuration context.

Parameters *string* — The description character string. Allowed values are any string up to 80 characters long composed of printable, 7-bit ASCII characters. If the string contains special characters (#, \$, spaces, etc.), the entire string must be enclosed within double quotes.

continuous

Syntax [**no**] **continuous**

Context config>saa>test

Description This command specifies whether the SAA test is continuous. Once you have configured a test as continuous, you cannot start or stop it by using the **saa** command. The **no** form of the command disables the continuous running of the test. Use the **shutdown** command to disable the test.

jitter-event

Syntax **jitter-event rising-threshold** *threshold* [**falling-threshold** *threshold*] [**direction**]
no jitter-event

Context config>saa>test

Description Specifies that at the termination of an SAA test probe, the calculated jitter value is evaluated against the configured rising and falling jitter thresholds. SAA threshold events are generated as required. Once the threshold (rising/falling) is crossed, it is disabled from generating additional events until the opposite threshold is crossed. If a falling-threshold is not supplied, the rising threshold will be re-enabled when it falls below the threshold after the initial crossing that generate the event.

The configuration of jitter event thresholds is optional.

Parameters	<p>rising-threshold <i>threshold</i> — Specifies a rising threshold jitter value. When the test run is completed, the calculated jitter value is compared to the configured jitter rising threshold. If the test run jitter value is greater than the configured rising threshold value then an SAA threshold event is generated. The SAA threshold event is <code>tmnxOamSaaThreshold</code>, logger application OAM, event #2101.</p> <p>Default 0</p> <p>Values 0 — 2147483 milliseconds</p> <p>falling-threshold <i>threshold</i> — Specifies a falling threshold jitter value. When the test run is completed, the calculated jitter value is compared to the configured jitter falling threshold. If the test run jitter value is greater than the configured falling threshold value then an SAA threshold event is generated. The SAA threshold event is <code>tmnxOamSaaThreshold</code>, logger application OAM, event #2101.</p> <p>Default 0</p> <p>Values 0 — 2147483 milliseconds</p> <p><i>direction</i> — Specifies the direction for OAM ping responses received for an OAM ping test run.</p> <p>Values inbound — Monitor the value of jitter calculated for the inbound, one-way, OAM ping responses received for an OAM ping test run. outbound — Monitor the value of jitter calculated for the outbound, one-way, OAM ping requests sent for an OAM ping test run. roundtrip — Monitor the value of jitter calculated for the round trip, two-way, OAM ping requests and replies for an OAM ping test run.</p> <p>Default roundtrip</p>
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latency-event

Syntax	latency-event rising-threshold <i>threshold</i> [falling-threshold <i>threshold</i>] [direction] no latency-event
Context	config>saa>test
Description	<p>Specifies that at the termination of an SAA test probe, the calculated latency event value is evaluated against the configured rising and falling latency event thresholds. SAA threshold events are generated as required.</p> <p>Once the threshold (rising/falling) is crossed, it is disabled from generating additional events until the opposite threshold is crossed. If a falling-threshold is not supplied, the rising threshold will be re-enabled when it falls below the threshold after the initial crossing that generate the event.</p> <p>The configuration of latency event thresholds is optional.</p>
Parameters	<p>rising-threshold <i>threshold</i> — Specifies a rising threshold latency value. When the test run is completed, the calculated latency value is compared to the configured latency rising threshold. If the test run latency value is greater than the configured rising threshold value then an SAA threshold event is generated. The SAA threshold event is <code>tmnxOamSaaThreshold</code>, logger application OAM, event #2101.</p> <p>Default 0</p> <p>Values 0 — 2147483 milliseconds</p>

falling-threshold *threshold* — Specifies a falling threshold latency value. When the test run is completed, the calculated latency value is compared to the configured latency falling threshold. If the test run latency value is greater than the configured falling threshold value then an SAA threshold event is generated. The SAA threshold event is `tmnxOamSaaThreshold`, logger application OAM, event #2101.

Default 0

Values 0 — 2147483 milliseconds

direction — Specifies the direction for OAM ping responses received for an OAM ping test run.

Values **inbound** — Monitor the value of jitter calculated for the inbound, one-way, OAM ping responses received for an OAM ping test run.

outbound — Monitor the value of jitter calculated for the outbound, one-way, OAM ping requests sent for an OAM ping test run.

roundtrip — Monitor the value of jitter calculated for the round trip, two-way, OAM ping requests and replies for an OAM ping test run.

Default roundtrip

loss-event

Syntax `loss-event rising-threshold threshold [falling-threshold threshold] [direction]`
`no loss-event`

Context `config>saa>test`

Description Specifies that at the termination of an SAA testrun, the calculated loss event value is evaluated against the configured rising and falling loss event thresholds. SAA threshold events are generated as required.

The configuration of loss event thresholds is optional.

Parameters **rising-threshold** *threshold* — Specifies a rising threshold loss event value. When the test run is completed, the calculated loss event value is compared to the configured loss event rising threshold. If the test run loss event value is greater than the configured rising threshold value then an SAA threshold event is generated. The SAA threshold event is `tmnxOamSaaThreshold`, logger application OAM, event #2101.

Default 0

Values 0 — 2147483647 packets

falling-threshold *threshold* — Specifies a falling threshold loss event value. When the test run is completed, the calculated loss event value is compared to the configured loss event falling threshold. If the test run loss event value is greater than the configured falling threshold value then an SAA threshold event is generated. The SAA threshold event is `tmnxOamSaaThreshold`, logger application OAM, event #2101.

Default 0

Values 0 — 2147483647 packets

direction — Specifies the direction for OAM ping responses received for an OAM ping test run.

Values **inbound** — Monitor the value of jitter calculated for the inbound, one-way, OAM ping responses received for an OAM ping test run.

outbound — Monitor the value of jitter calculated for the outbound, one-way, OAM ping requests sent for an OAM ping test run.

roundtrip — Monitor the value of jitter calculated for the round trip, two-way, OAM ping requests and replies for an OAM ping test run.

Default roundtrip

trap-gen

Syntax trap-gen

Context config>saa>test

Description This command enables the context to configure trap generation for the SAA test.

probe-fail-enable

Syntax [no] probe-fail-enable

Context config>saa>test>trap-gen

Description This command enables the generation of an SNMP trap when probe-fail-threshold consecutive probes fail during the execution of the SAA ping test. This command is not applicable to SAA trace route tests.

The **no** form of the command disables the generation of an SNMP trap.

probe-fail-threshold

Syntax [no] probe-fail-threshold 0..15

Context config>saa>test>trap-gen

Description This command has no effect when probe-fail-enable is disabled. This command is not applicable to SAA trace route tests.

The **probe-fail-enable** command enables the generation of an SNMP trap when the probe-fail-threshold consecutive probes fail during the execution of the SAA ping test. This command is not applicable to SAA trace route tests.

The **no** form of the command returns the threshold value to the default.

Default 1

probe-history

Syntax `probe-history [auto | drop | keep]`

Context `config>saa>test`

Description Defines history probe behavior. Defaults are associated with various configured parameters within the SAA test. Auto (keep) is used for test with probe counts of 100 or less, and intervals of 1 second and above. Auto (drop) will only maintain summary information for tests marked as continuous with file functions, probe counts in excess of 100 and intervals of less than 1 second. SAA tests that are not continuous with a write to file will default to Auto (keep). The operator is free to change the default behaviors for each type. Each test that maintains per probe history will consume more system memory. When per probe entries are required the probe history is available at the completion of the test.

Default auto

Parameters

- auto** — An auto selector that determines the storage of the history information.
- drop** — Store summarized min/max/ave data not per probe information for test runs. This may be configured for all tests in an effort to conserve memory.
- keep** — Store per probe information for tests. This consumes significantly more memory than summary information and should only be used if necessary.

test-completion-enable

Syntax `[no] test-completion-enable`

Context `config>saa>test>trap-gen`

Description This command enables the generation of a trap when an SAA test completes. The **no** form of the command disables the trap generation.

test-fail-enable

Syntax `[no] test-fail-enable`

Context `config>saa>test>trap-gen`

Description This command enables the generation of a trap when a test fails. In the case of a ping test, the test is considered failed (for the purpose of trap generation) if the number of failed probes is at least the value of the **test-fail-threshold** parameter.

The **no** form of the command disables the trap generation.

test-fail-threshold

Syntax	[no] test-fail-threshold <i>0..15</i>
Context	config>saa>test>trap-gen
Description	<p>This command configures the threshold for trap generation on test failure.</p> <p>This command has no effect when test-fail-enable is disabled. This command is not applicable to SAA trace route tests.</p> <p>The no form of the command returns the threshold value to the default.</p>
Default	1

type

Syntax	type no type
Context	config>saa>test
Description	<p>This command creates the context to provide the test type for the named test. Only a single test type can be configured.</p> <p>A test can only be modified while the test is in shut down mode.</p> <p>Once a test type has been configured the command can be modified by re-entering the command, the test type must be the same as the previously entered test type.</p> <p>To change the test type, the old command must be removed using the config>saa>test>no type command.</p>

cpe-ping

Syntax	cpe-ping service <i>service-id</i> destination <i>ip-address</i> source <i>ip-address</i> [ttl <i>vc-label-ttl</i>] [return-control] [source-mac <i>ieee-address</i>] [fc <i>fc-name</i>] [profile [in out]] [interval <i>interval</i>] [send-count <i>send-count</i>] [send-control]						
Context	oam config>saa>test>type						
Description	This ping utility determines the IP connectivity to a CPE within a specified VPLS service.						
Parameters	<p>service <i>service-id</i> — The service ID of the service to diagnose or manage.</p> <table> <tr> <td>Values</td> <td><i>service-id:</i></td> <td>1 — 2147483647</td> </tr> <tr> <td></td> <td><i>svc-name:</i></td> <td>64 characters maximum</td> </tr> </table> <p>destination <i>ip-address</i> — Specifies the IP address to be used as the destination for performing an OAM ping operations.</p> <p>source <i>ip-address</i> — Specify an unused IP address in the same network that is associated with the VPLS or PBB Epipe.</p>	Values	<i>service-id:</i>	1 — 2147483647		<i>svc-name:</i>	64 characters maximum
Values	<i>service-id:</i>	1 — 2147483647					
	<i>svc-name:</i>	64 characters maximum					

ttl *vc-label-ttl* — The TTL value in the VC label for the OAM MAC request, expressed as a decimal integer.

Values 1 — 255

Default 255

return-control — Specifies the MAC OAM reply to a data plane MAC OAM request be sent using the control plane instead of the data plane. This parameter is only valid for VPLS services.

Default MAC OAM reply sent using the data plane.

source-mac *ieee-address* — Specify the source MAC address that will be sent to the CPE. If not specified or set to 0, the MAC address configured for the CPM is used. This parameter is not applicable to CPE ping on Epipes.

fc-name — The forwarding class of the MPLS echo request encapsulation.

Values be, l2, af, l1, h2, ef, h1, nc

Default be

profile {**in** | **out**} — The profile state of the MPLS echo request encapsulation for VPLS and the ARP packet for PBB Epipe and Epipe VLLs.

Default out

interval *interval* — The **interval** parameter in seconds, expressed as a decimal integer. This parameter is used to override the default request message send interval and defines the minimum amount of time that must expire before the next message request is sent.

If the **interval** is set to 1 second where the **timeout** value is set to 10 seconds, then the maximum time between message requests is 10 seconds and the minimum is 1 second. This depends upon the receipt of a message reply corresponding to the outstanding message request.

Values 1 — 10

Default 1

send-count *send-count* — The number of messages to send, expressed as a decimal integer. The **count** parameter is used to override the default number of message requests sent. Each message request must either timeout or receive a reply before the next message request is sent. The message **interval** value must be expired before the next message request is sent.

Values 1 — 100

Default 1

send-control — Specifies the MAC OAM request be sent using the control plane instead of the data plane. This parameter is only valid for VPLS services.

Default MAC OAM request sent using the data plane.

dns

Syntax **dns target-addr** *dns-name* **name-server** *ip-address* [**source** *ip-address*] [**send-count** *send-count*] [**time-out** *timeout*] [**interval** *interval*]

Context <GLOBAL>
config>saa>test>type

Description This command configures a DNS name resolution test.

Parameters **target-addr** — The IP host address to be used as the destination for performing an OAM ping operation.
dns-name — The DNS name to be resolved to an IP address.
name-server *ip-address* — Specifies the server connected to a network that resolves network names into network addresses.
source *ip-address* — Specifies the IP address to be used as the source for performing an OAM ping operation.
send-count *send-count* — The number of messages to send, expressed as a decimal integer. The **send-count** parameter is used to override the default number of message requests sent. Each message request must either timeout or receive a reply before the next message request is sent. The message **interval** value must be expired before the next message request is sent.

Default 1

Values 1 — 100

time-out *timeout* — The **timeout** parameter in seconds, expressed as a decimal integer. This value is used to override the default **timeout** value and is the amount of time that the router will wait for a message reply after sending the message request. Upon the expiration of message timeout, the requesting router assumes that the message response will not be received. Any response received after the request times out will be silently discarded.

Default 5

Values 1 — 120

interval *interval* — The **interval** parameter in seconds, expressed as a decimal integer. This parameter is used to override the default request message send interval and defines the minimum amount of time that must expire before the next message request is sent.

If the **interval** is set to 1 second, and the **timeout** value is set to 10 seconds, then the maximum time between message requests is 10 seconds and the minimum is 1 second. This depends upon the receipt of a message reply corresponding to the outstanding message request.

Default 1

Values 1 — 10

eth-cfm-linktrace

Syntax `eth-cfm-linktrace mac-address mep mep-id domain md-index association ma-index [ttl ttl-value] [fc {fc-name}] [profile {in|out}] [send-count send-count] [timeout interval] [interval interval]`

Context `config>saa>test>type`

Description This command configures a CFM linktrace test in SAA.

Parameters *mac-address* — Specifies a unicast destination MAC address.

mep *mep-id* — Specifies the local mep-id.

Values 1 — 8191

domain *md-index* — Specifies the MD index.

Values 1 — 4294967295

association *ma-index* — Specifies the MA index.

Values 1 — 4294967295

ttl *ttl-value* — Specifies the maximum number of hops traversed in the linktrace.

Values 1— 255

Default 64

fc *fc-name* — The **fc** parameter is used to indicate the forwarding class of the MPLS echo request packets. The actual forwarding class encoding is controlled by the network egress LSP-EXP mappings.

Values be, l2, af, l1, h2, ef, h1, nc

Default nc

profile {**in** | **out**} — The profile state of the MPLS echo request encapsulation.

Default in

send-count *send-count* — The number of messages to send, expressed as a decimal integer. The **count** parameter is used to override the default number of message requests sent. Each message request must either timeout or receive a reply before the next message request is sent. The message **interval** value must be expired before the next message request is sent.

Values 1 — 10

Default 1

time-out *interval* — The time-out parameter in seconds, expressed as a decimal integer. This value is used to override the default timeout value and is the amount of time that the router will wait for a message reply after sending the last probe for a particular test. Upon the expiration of timeout the test will be marked complete and no more packets will be processed for any of those request probes.

Values 1 — 10

Default 5

interval *interval* — The interval parameter in seconds, expressed as a decimal integer. This parameter is

used to override the default request message send interval and defines the minimum amount of time that must expire before the next message request is sent.

Values 1 — 10

Default 5

eth-cfm-loopback

Syntax **eth-cfm-loopback** *mac-address* **mep** *mep-id* **domain** *md-index* **association** *ma-index* [**size** *data-size*] [**fc** {*fc-name*}] [**profile** {*in|out*}] [**send-count** *send-count*] [**time-out** *interval*] [**interval** *interval*]

Context config>saa>test>type

Description This command configures an Ethernet CFM loopback test in SAA.

mac-address — Specifies a unicast destination MAC address.

mep *mep-id* — Specifies the local mep-id.

Values 1 — 8191

domain *md-index* — Specifies the MD index.

Values 1 — 4294967295

association *ma-index* — Specifies the MA index.

Values 1 — 4294967295

size *data-size* — This is the size of the data portion of the data TLV. If 0 is specified no data TLV is added to the packet.

Values 0 — 1500

Default 0

fc *fc-name* — The **fc** parameter is used to indicate the forwarding class of the MPLS echo request packets. The actual forwarding class encoding is controlled by the network egress LSP-EXP mappings.

Values be, l2, af, l1, h2, ef, h1, nc

Default nc

profile {*in | out*} — The profile state of the MPLS echo request encapsulation.

Default in

send-count *send-count* — The number of messages to send, expressed as a decimal integer. The **count** parameter is used to override the default number of message requests sent. Each message request must either timeout or receive a reply before the next message request is sent. The message **interval** value must be expired before the next message request is sent.

Default 1

Values 1 — 100

time-out *interval* — The time-out parameter in seconds, expressed as a decimal integer. This value is used to override the default timeout value and is the amount of time that the router will wait for a message

reply after sending the last probe for a particular test. Upon the expiration of timeout the test will be marked complete and no more packets will be processed for any of those request probes.

Values 1 — 10

Default 5

interval *interval* — The interval parameter in seconds, expressed as a decimal integer. This parameter is used to override the default request message send interval and defines the minimum amount of time that must expire before the next message request is sent.

Values 1 — 10

Default 5

eth-cfm-two-way-delay

Syntax **eth-cfm-two-way-delay** *mac-address* **mep** *mep-id* **domain** *md-index* **association** *ma-index* [**fc** {*fc-name*}] [**profile** {*in|out*}] [**send-count** *send-count*] [**time-out** *interval*] [**interval** *interval*]

Context config>saa>test>type

Description This command configures an Ethernet CFM two-way delay test in SAA.

mac-address — Specifies a unicast destination MAC address.

mep *mep-id* — Specifies the local mep-id.

Values 1 — 8191

domain *md-index* — Specifies the MD index.

Values 1 — 4294967295

association *ma-index* — Specifies the MA index.

Values 1 — 4294967295

fc *fc-name* — The **fc** parameter is used to indicate the forwarding class of the MPLS echo request packets. The actual forwarding class encoding is controlled by the network egress LSP-EXP mappings.

Values be, l2, af, l1, h2, ef, h1, nc

Default nc

send-count *send-count* — The number of messages to send, expressed as a decimal integer. The count parameter is used to override the default number of message requests sent. The message interval value must be expired before the next message request is sent.

Values 1 — 100

Default 1

time-out *interval* — The time-out parameter in seconds, expressed as a decimal integer. This value is used to override the default timeout value and is the amount of time that the router will wait for a message reply after sending the last probe for a particular test. Upon the expiration of timeout the test will be

marked complete and no more packets will be processed for any of those request probes.

Values 1 — 10

Default 5

interval *interval* — The interval parameter in seconds, expressed as a decimal integer. This parameter is used to configure the spacing between probes within a test run.

Values 1 .. 10]

eth-cfm-two-way-slm

Syntax **eth-cfm-two-way-delay** *mac-address* **mep** *mep-id* **domain** *md-index* **association** *ma-index* [**fc** *{fc-name}*] [**send-count** *send-count*] [**size** *data-size*] [**timeout** *timeout*] [**interval** *interval*]

Context config>saa>test>type

Description This command configures an Ethernet CFM two-way SLM test in SAA.

mac-address — Specifies a unicast destination MAC address.

mep *mep-id* — Specifies the local mep-id.

Values 1 — 8191

domain *md-index* — Specifies the MD index.

Values 1 — 4294967295

association *ma-index* — Specifies the MA index.

Values 1 — 4294967295

fc *fc-name* — The **fc** parameter is used to indicate the forwarding class of the MPLS echo request packets. The actual forwarding class encoding is controlled by the network egress LSP-EXP mappings.

Default nc

Values be, l2, af, l1, h2, ef, h1, nc

profile {**in** | **out**} — The profile state of the MPLS echo request encapsulation.

Default in

send-count *send-count* — The number of messages to send, expressed as a decimal integer. The count parameter is used to override the default number of message requests sent. The message interval value must be expired before the next message request is sent.

Default 1

Values 1 — 1000

size *data-size* — This is the size of the data portion of the data TLV. If 0 is specified no data TLV is added to the packet.

Default 0

Values 0 — 1500

timeout *timeout* — The time-out parameter in seconds, expressed as a decimal integer. This value is used to override the default timeout value and is the amount of time that the router will wait for a message reply after sending the last probe for a particular test. Upon the expiration of timeout the test will be marked complete and no more packets will be processed for any of those request probes.

Default 5

Values 1 — 10

interval *interval* — The interval parameter in seconds, expressed as a decimal integer. This parameter is used to configure the spacing between probes within a test run.

Values 1 .. 10

icmp-ping

Syntax **icmp-ping** [*ip-address* | *dns-name*] [**rapid** | **detail**] [**ttl** *time-to-live*] [**tos** *type-of-service*] [**size** *bytes*] [**pattern** *pattern*] [**source** *ip-address* | *dns-name*] [**interval** *seconds*] [{**next-hop** *ip-address*} | {**interface** *interface-name*}] [**bypass-routing**] [**count** *requests*] [**do-not-fragment**] [**router** *router-instance* | **service-name** *service-name*] [**time-out** *interval*]

Context config>saa>test>type

Description This command configures an ICMP traceroute test.

Parameters *ip-address* — The far-end IP address to which to send the **svc-ping** request message in dotted decimal notation.

Values

ipv4-address:	a.b.c.d
ipv6-address:	x:x:x:x:x:x:x:x x:x:x:x:x:x.d.d.d.d
x:	[0 — FFFF]H
d:	[0 — 255]D

dns-name — The DNS name of the far-end device to which to send the **svc-ping** request message, expressed as a character string up to 63 characters maximum.

Values

ipv6-address:	x:x:x:x:x:x:x[-interface] x:x:x:x:x:x.d.d.d.d[-interface]
x:	[0 — FFFF]H
d:	[0 — 255]D

interface (32 chars max, mandatory for link local addresses)

rapid — Packets will be generated as fast as possible instead of the default 1 per second.

detail — Displays detailed information.

ttl *time-to-live* — The TTL value for the MPLS label, expressed as a decimal integer.

Values 1 — 128

tos *type-of-service* — Specifies the service type.

Values 0 — 255

size bytes — The request packet size in bytes, expressed as a decimal integer.

Values 0 — 16384

pattern pattern — The data portion in a ping packet will be filled with the pattern value specified. If not specified, position info will be filled instead.

Values 0 — 65535

source ip-address|dns-name — Specifies the IP address to be used.

Values

ipv4-address:	a.b.c.d
ipv6-address:	x:x:x:x:x:x:x
	x:x:x:x:x:d.d.d.d
	x: [0 — FFFF]H
	d: [0 — 255]D
dns-name:	128 characters max

interval interval — The interval parameter in seconds, expressed as a decimal integer. This parameter is used to override the default request message send interval and defines the minimum amount of time that must expire before the next message request is sent.

Values 1 — 10

Default 1

next-hop ip-address — Only displays static routes with the specified next hop IP address.

Values

ipv4-address:	a.b.c.d (host bits must be 0)
ipv6-address:	x:x:x:x:x:x:x (eight 16-bit pieces)
	x:x:x:x:x:d.d.d.d
	x: [0 — FFFF]H
	d: [0 — 255]D

interface interface-name — The name used to refer to the interface. The name must already exist in the **config>router>interface** context.

bypass-routing — Specifies whether to send the ping request to a host on a directly attached network bypassing the routing table.

count requests — Specifies the number of times to perform an OAM ping probe operation. Each OAM echo message request must either timeout or receive a reply before the next message request is sent.

Values 1 — 100000

Default 5

do-not-fragment — Sets the DF (Do Not Fragment) bit in the ICMP ping packet.

router router-instance — Specifies the router name or service ID.

Values

router-name:	Base , management
service-id:	1 — 2147483647

Default Base

service-name service-name — Specifies the service name as an integer or string.

Values

service-id:	1 — 2147483647
svc-name:	64 characters maximum

timeout *timeout* — The time-out parameter in seconds, expressed as a decimal integer. This value is used to override the default timeout value and is the amount of time that the router will wait for a message reply after sending the last probe for a particular test. Upon the expiration of timeout the test will be marked complete and no more packets will be processed for any of those request probes.

Values 1 — 10

Default 5

icmp-trace

Syntax **icmp-trace** [*ip-address* | *dns-name*] [**ttl** *time-to-live*] [**wait** *milli-seconds*] [**tos** *type-of-service*] [**source** *ip-address*] [**tos** *type-of-service*] [**router** *router-instance* | **service-name** *service-name*]

Context config>saa>test>type

Description This command configures an ICMP traceroute test.

Parameters *ip-address* — The far-end IP address to which to send the **svc-ping** request message in dotted decimal notation.

Values

ipv4-address:	a.b.c.d
ipv6-address:	x:x:x:x:x:x:x x:x:x:x:x:d.d.d.d
x:	[0 — FFFF]H
d:	[0 — 255]D

dns-name — The DNS name of the far-end device to which to send the **svc-ping** request message, expressed as a character string to 63 characters maximum.

ttl *time-to-live* — The TTL value for the MPLS label, expressed as a decimal integer.

Values 1 — 255

wait *milliseconds* — The time in milliseconds to wait for a response to a probe, expressed as a decimal integer.

Values 1 — 60000

tos *type-of-service* — Specifies the service type.

Values 0 — 255

Default 5000

source *ip-address* — Specifies the IP address to be used.

Values

ipv4-address:	a.b.c.d
ipv6-address:	x:x:x:x:x:x:x x:x:x:x:x:d.d.d.d
x:	[0 — FFFF]H
d:	[0 — 255]D

router *router-instance* — Specifies the router name or service ID.

Values	<i>router-name:</i>	Base , management
	<i>service-id:</i>	1 — 2147483647
Default		Base

Isp-ping

Syntax **Isp-ping** *lsp-name* [**path** *path-name*]
Isp-ping static *lsp-name* [**dest-global-id** *global-id* **dest-node-id** *node-id*] [**control-channel** none | non-ip] [**path-type** active | working | protect] [**fc** *fc-name* [**profile** in | out] [**interval** *interval*] [**send-count** *send-count*] [**size** *octets*] [**src-ip-address** *ip-address*] [**timeout** *timeout*] [**ttl** *label-ttl*] [**detail**]

Isp-ping bgp-label-prefix *ip-prefix/mask* [**path-destination** *ip-address* [**interface** *if-name* | **next-hop** *ip-address*]]

Isp-ping prefix *ip-prefix/mask* [**path-destination** *ip-address* [**interface** *if-name* | **next-hop** *ip-address*]]

Isp-ping static *lsp-name* [**assoc-channel** none|non-ip] [**dest-global-id** *global-id* **dest-node-id** *node-id*] [**path-type** active | working | protect]

NOTE: Options common to all **Isp-ping** cases: [**fc** *fc-name* [**profile** in|out]] [**interval** *interval*] [**send-count** *send-count*] [**size** *octets*] [**src-ip-address** *ip-address*] [**timeout** *timeout*] [**ttl** *label-ttl*]

Context oam
 config>saa>test>type

Description This command, when used with the **static** option, performs in-band on-demand LSP connectivity verification tests for static MPLS-TP LSPs. For other LSP types, the **static** option should be excluded and these are described elsewhere in this user guide.

The **Isp-ping static** command performs an LSP ping using the protocol and data structures defined in the RFC 4379, Detecting Multi-Protocol Label Switched (MPLS) Data Plane Failures, as extended by RFC 6426, MPLS On-Demand Connectivity Verification and Route Tracing.

In an LSP ping, the originating device creates an MPLS echo request packet for the LSP and path to be tested, containing a static LSP target FEC stack TLV for the LSP. The MPLS echo request packet is sent through the data plane, encapsulated in either the LSP label or the MPLS-TP G-ACh channel, and awaits an MPLS echo reply packet from the device terminating the LSP. The status of the LSP is displayed when the MPLS echo reply packet is received.

In MPLS-TP, the echo request and echo reply messages are always sent in-band over the LSP, either in a G-ACh channel or encapsulated as an IP packet below the LSP label.

The timestamp format to be sent, and to be expected when received in a PDU, is as configured by the `config>test-oam>mpls-time-stamp-format` command. If RFC 4379 is selected, then the timestamp is in seconds and microseconds since 1900, otherwise it is in seconds and microseconds since 1970.

Parameters *lsp-name* — Name that identifies an LSP to ping. The LSP name can be up to 32 characters long.

dest-global-id *global-id* — The MPLS-TP global ID for the far end node of the LSP under test. If this is not entered, then the dest-global-id is taken from the LSP context.

dest-node-id *node-id* — The MPLS-TP global ID for the far end node of the LSP under test. If this is not entered, then the dest-global-id is taken from the LSP context.

control-channel {**none** | **non-ip**} — The encapsulation format to use for the LSP Ping echo request and echo reply packet.

Values none — IP encapsulation in an MPLS labeled packet

Values non-ip — MPLS-TP encapsulation without UDP/IP headers, in an MPLS-TP G-ACh on the LSP using channel type 0x025.

Default non-ip

force — Allows LSP Ping to test a path that is operationally down, including cases where MPLS-TP BFD CC/V is enabled and has taken a path down. This parameter is only allowed in the OAM context; it is not allowed for a test configured as a part of an SAA.

Default disabled

path-type {**active** | **working** | **protect**} — The LSP path to test.

Default active

Values active — The currently active path. If MPLS-TP linear protection is configured on the LSP, then this is the path that is selected by by MPLS-TP PSC protocol for sending user plane traffic. If MPLS-TP linear protection is not configured, then this will be the wokring path.

Values working — The working path of the MPLS-TP LSP.

Values protect — The protect path of the MPLS-TP LSP.

path *path-name* — The LSP path name along which to send the LSP ping request.

Values Any path name associated with the LSP.

Default The active LSP path.

bgp-label-prefix *ip-prefix/mask* — Specifies the address prefix and subnet mask of the target BGP IPv4 label route.

src-ip-address *ip-addr* — Specifies the source IP address. This option is used when an OAM packet must be generated from a different address than the node's system interface address. An example is when the OAM packet is sent over an LDP LSP and the LDP LSR-ID of the corresponding LDP session to the next-hop is set to an address other than the system interface address.

Values ipv4-address: a.b.c.d

fc *fc-name* — The fc and profile parameters are used to indicate the forwarding class and profile of the MPLS echo request packet.

When an MPLS echo request packet is generated in CPM and is forwarded to the outgoing interface, the packet is queued in the egress network queue corresponding to the specified fc and profile parameter values. The marking of the packet's EXP is dictated by the LSP-EXP mappings on the outgoing interface.

When the MPLS echo request packet is received on the responding node, The fc and profile parameter

values are dictated by the LSP-EXP mappings of the incoming interface.

When an MPLS echo reply packet is generated in CPM and is forwarded to the outgoing interface, the packet is queued in the egress network queue corresponding to the fc and profile parameter values determined by the classification of the echo request packet, which is being replied to, at the incoming interface. The marking of the packet's EXP is dictated by the LSP-EXP mappings on the outgoing interface. The TOS byte is not modified. The following table summarizes this behavior:

Table 8: Request Packet and Behavior

cpm (sender node)	<p>echo request packet:</p> <ul style="list-style-type: none"> • packet{tos=1, fc1, profile1} • fc1 and profile1 are as entered by user in OAM command or default values • tos1 as per mapping of {fc1, profile1} to IP precedence in network egress QoS policy of outgoing interface
outgoing interface (sender node)	<p>echo request packet:</p> <ul style="list-style-type: none"> • pkt queued as {fc1, profile1} • ToS field=tos1 not remarked • EXP=exp1, as per mapping of {fc1, profile1} to EXP in network egress QoS policy of outgoing interface
Incoming interface (responder node)	<p>echo request packet:</p> <ul style="list-style-type: none"> • packet{tos1, exp1} • exp1 mapped to {fc2, profile2} as per classification in network QoS policy of incoming interface
cpm (responder node)	<p>echo reply packet:</p> <ul style="list-style-type: none"> • packet{tos=1, fc2, profile2}
outgoing interface (responder node)	<p>echo reply packet:</p> <ul style="list-style-type: none"> • pkt queued as {fc2, profile2} • ToS field= tos1 not remarked (reply inband or out-of-band) • EXP=exp2, if reply is inband, remarked as per mapping of {fc2, profile2} to EXP in network egress QoS policy of outgoing interface
Incoming interface (sender node)	<p>echo reply packet:</p> <ul style="list-style-type: none"> • packet{tos1, exp2} • exp2 mapped to {fc1, profile1} as per classification in network QoS policy of incoming interface

The LSP-EXP mappings on the receive network interface controls the mapping of the message reply back at the originating router.

Default be

Values be, l2, af, l1, h2, ef, h1, nc

src-ip-address *ip-addr* — This parameter specifies the source IP address. This parameter is used when an OAM packet must be generated from a different address than the node's system interface address. For example, when the OAM packet is sent over an LDP LSP and the LDP LSR-ID of the corresponding LDP session to the next-hop is set to an address other than the system interface address.

Values ipv4-address: a.b.c.d

profile {*in* | *out*} — The profile state of the MPLS echo request packet.

Default out

size *octets* — The MPLS echo request packet size in octets, expressed as a decimal integer. The request payload is padded with zeroes to the specified size.

Values 1 — 9198

Default 1

ttl *label-ttl* — The TTL value for the MPLS label, expressed as a decimal integer.

Values 1 — 255

Default 255

send-count *send-count* — The number of messages to send, expressed as a decimal integer. The **send-count** parameter is used to override the default number of message requests sent. Each message request must either timeout or receive a reply before the next message request is sent. The message **interval** value must be expired before the next message request is sent.

Values 1 — 100

Default 1

time-out *interval* — The time-out parameter in seconds, expressed as a decimal integer. This value is used to override the default timeout value and is the amount of time that the router will wait for a message reply after sending the last probe for a particular test. Upon the expiration of timeout the test will be marked complete and no more packets will be processed for any of those request probes.

Values 1 — 10

Default 5

interval *interval* — The interval parameter in seconds, expressed as a decimal integer. This parameter is used to override the default request message send interval and defines the minimum amount of time that must expire before the next message request is sent.

path-destination *ip-address* — Specifies the IP address of the path destination from the range 127/8.

interface *interface-name* — Specifies the name of an IP interface. The name must already exist in the **config>router>interface** context.

next-hop *ip-address* — Only displays static routes with the specified next hop IP address.

Values ipv4-address: a.b.c.d (host bits must be 0)
ipv6-address: x:x:x:x:x:x:x (eight 16-bit pieces)
x:x:x:x:x:d.d.d.d

x: [0 — FFFF]H
d: [0 — 255]D

prefix *ip-prefix/mask* — Specifies the address prefix and subnet mask of the target BGP IPv4 label route.

static *lsp-name* — Specifies an LSP ping route using the RFC 6426, *MPLS On-Demand Connectivity Verification and Route Tracing*, Target FEC Stack code point Static LSP.

assoc-channel none|non-ip — Specifies the launched echo request's usage of the Associated Channel (ACH) mechanism, when testing an MPLS-TP LSP.

Values **none** — Use the Associated Channel mechanism described in RFC 6426, Section 3.3.
 non-ip — Do not use an Associated Channel, as described in RFC 6426, Section 3.1.

dest-global-id *global-id* — Indicates the source MPLS-TP global identifier of the replying node. The value is copied from the reply's RFC 6426 Source Identifier TLV.

Values 0 — 4294967295

Default 0

dest-node-id *node-id* — Specifies the target MPLS-TP Node Identifier.

Values a.b.c.d | 1 — 4294967295>

Default 0

path-type *active | working | protect* — Specifies the type of an MPLS TP path.

Values **active** - test the currently-active path of the MPLS-TP LSP
 working - test the primary path of the MPLS-TP LSP
 protect - test the secondary path of the MPLS-TP LSP

Sample Output

```
A:DUTA# oam lsp-ping prefix 4.4.4.4/32 detail
LSP-PING 4.4.4.4/32: 80 bytes MPLS payload
Seq=1, send from intf dut1_to_dut3, reply from 4.4.4.4
      udp-data-len=32 ttl=255 rtt=5.23ms rc=3 (EgressRtr)

---- LSP 4.4.4.4/32 PING Statistics ----
1 packets sent, 1 packets received, 0.00% packet loss
round-trip min = 5.23ms, avg = 5.23ms, max = 5.23ms, stddev = 0.000ms
```

```
=====
LDP LSR ID: 1.1.1.1
=====
```

```
Legend: U - Label In Use, N - Label Not In Use, W - Label Withdrawn
        WP - Label Withdraw Pending, BU - Alternate For Fast Re-Route
=====
```

```
LDP Prefix Bindings
=====
```

Prefix Peer	IngLbl	EgrLbl	EgrIntf/ LspId	EgrNextHop
4.4.4.4/32 3.3.3.3	131069N	131067	1/1/1	1.3.1.2
4.4.4.4/32 6.6.6.6	131069U	131064	--	--

```
-----  
No. of Prefix Bindings: 2  
-----  
A:DUTA#
```

lsp-trace

Syntax

lsp-trace *lsp-name* [**path** *path-name*]

lsp-trace static *lsp-name* [**control-channel** *non* | *non-ip*] [**force**] [**path-type** *active* | *working* | *protect*] [**detail**] [**fc** *fc-name* [**profile** *in*|*out*]] [**interval** *interval*] [**max-fail** *no-response-count*] [**max-ttl** *max-label-ttl*] [**min-ttl** *min-label-ttl*] [**probe-count** *probes-per-hop*] [**size** *octets*] [**src-ip-address** *ip-address*] [**timeout** *timeout*] [**downstream-map-tlv** *dsmap* | *ddmap*] [**detail**]

lsp-trace bgp-label-prefix *ip-prefix/mask* [**path-destination** *ip-address* [**interface** *if-name* | **next-hop** *ip-address*]]

lsp-trace prefix *ip-prefix/mask* [**path-destination** *ip-address* [**interface** *if-name* | **next-hop** *ip-address*]]

lsp-trace static *lsp-name* [**assoc-channel** *none*|*non-ip*] [**path-type** *active* | *working* | *protect*]

NOTE: Options common to all **lsp-trace** cases: [**detail**] [**downstream-map-tlv** *downstream-map-tlv*] [**fc** *fc-name* [**profile** *in*|*out*]] [**interval** *interval*] [**max-fail** *no-response-count*] [**max-ttl** *max-label-ttl*] [**min-ttl** *min-label-ttl*] [**probe-count** *probes-per-hop*] [**size** *octets*] [**src-ip-address** *ip-address*] [**timeout** *timeout*]

Context

oam
config>saa>test>type

Description

This command, when used with the **static** option, performs in-band on-demand LSP traceroute tests for static MPLS-TP LSPs. For other LSP types, the **static** option should be excluded and these are described elsewhere in this user guide.

The **lsp-trace static** command performs an LSP trace using the protocol and data structures defined in the RFC 4379, Detecting Multi-Protocol Label Switched (MPLS) Data Plane Failures, as extended by RFC 6426, MPLS On-Demand Connectivity Verification and Route Tracing.

The LSP trace operation is modeled after the IP traceroute utility which uses ICMP echo request and reply packets with increasing TTL values to determine the hop-by-hop route to a destination IP.

In an LSP trace, the originating device creates an MPLS echo request packet for the LSP to be tested with increasing values of the TTL in the outermost label. The MPLS echo request packet is sent through the data plane and awaits a TTL exceeded response or the MPLS echo reply packet from the device terminating the LSP. The devices that reply to the MPLS echo request packets with the TTL exceeded and the MPLS echo reply are displayed.

In MPLS-TP, the echo request and echo reply messages are always sent in-band over the LSP, either in a G-ACh channel or encapsulated as an IP packet below the LSP label.

The timestamp format to be sent, and to be expected when received in a PDU, is as configured by the `config>test-oam>mpls-time-stamp-format` command. If RFC 4379 is selected, then the timestamp is in seconds and microseconds since 1900, otherwise it is in seconds and microseconds since 1970.

- Parameters** *lsp-name* — Name that identifies an LSP to ping. The LSP name can be up to 32 characters long.
- path** *path-name* — The LSP pathname along which to send the LSP trace request.
- Values** Any path name associated with the LSP.
- Default** The active LSP path.
- control-channel** {*none* | *non-ip*} — The encapsulation format to use for the MPLS echo request and echo reply packet.
- Values** *none* — IP encapsulation in an MPLS labeled packet
- Values** *non-ip* — MPLS-TP encapsulation without UDP/IP headers, in an MPLS-TP G-ACh on the LSP using channel type 0x025.
- Default** *non-ip*
- bgp-label-prefix** *ip-prefix/mask* — Specifies the address prefix and subnet mask of the target BGP IPv4 label route.
- size** *octets* — The size in octets, expressed as a decimal integer, of the MPLS echo request packet, including the IP header but not the label stack. The request pay-load is padded with zeroes to the specified size. Note that an OAM command is not failed if the user entered a size lower than the minimum required to build the packet for the echo request message. The payload is automatically padded to meet the minimum size.
- Values** 1 — 9198
- Default** 1
- src-ip-address** *ip-addr* — Specifies the source IP address. This option is used when an OAM packet must be generated from a different address than the node's system interface address. An example is when the OAM packet is sent over an LDP LSP and the LDP LSR-ID of the corresponding LDP session to the next-hop is set to an address other than the system interface address.
- Values** ipv4-address: a.b.c.d
- min-ttl** *min-label-ttl* — The minimum TTL value in the MPLS label for the LSP trace test, expressed as a decimal integer.
- Default** 1
- Values** 1 — 255
- max-ttl** *max-label-ttl* — The maximum TTL value in the MPLS label for the LDP tree-trace test, expressed as a decimal integer.
- Values** 1 — 255
- Default** 30
- max-fail** *no-response-count* — The maximum number of consecutive MPLS echo requests, expressed as a decimal integer that do not receive a reply before the trace operation fails for a given TTL.
- Values** 1 — 255
- Default** 5
- send-count** *send-count* — The number of messages to send, expressed as a decimal integer. The **send-count** parameter is used to override the default number of message requests sent. Each message request must

either timeout or receive a reply before the next message request is sent. The message **interval** value must be expired before the next message request is sent.

Values 1 — 100

Default 1

timeout *timeout* — The **timeout** parameter in seconds, expressed as a decimal integer. This value is used to override the default **timeout** value and is the amount of time that the router will wait for a message reply after sending the message request. Upon the expiration of message timeout, the requesting router assumes that the message response will not be received. A ‘request timeout’ message is displayed by the CLI for each message request sent that expires. Any response received after the request times out will be silently discarded.

Values 1 — 10

Default 3

interval *interval* — The **interval** parameter in seconds, expressed as a decimal integer. This parameter is used to override the default request message send interval and defines the minimum amount of time that must expire before the next message request is sent.

If the **interval** is set to 1 second, and the **timeout** value is set to 10 seconds, then the maximum time between message requests is 10 seconds and the minimum is 1 second. This depends upon the receipt of a message reply corresponding to the outstanding message request.

Values 1 — 10

Default 1

downstream-map-tlv {**ddmap** | **dsmap**} — LSP Trace commands with this option can only be executed if the control-channel is set to none. The DSMAP/DDMAP TLV is only included in the echo request message if the egress interface is either a numbered IP interface, or an unnumbered IP interface. The TLV will not be included if the egress interface is of type unnumbered-mpls-tp.

fc *fc-name* — The **fc** and profile parameters are used to indicate the forwarding class and profile of the MPLS echo request packet.

When an MPLS echo request packet is generated in CPM and is forwarded to the outgoing interface, the packet is queued in the egress network queue corresponding to the specified **fc** and profile parameter values. The marking of the packet's EXP is dictated by the LSP-EXP mappings on the outgoing interface.

When the MPLS echo request packet is received on the responding node, The **fc** and profile parameter values are dictated by the LSP-EXP mappings of the incoming interface.

When an MPLS echo reply packet is generated in CPM and is forwarded to the outgoing interface, the packet is queued in the egress network queue corresponding to the **fc** and profile parameter values determined by the classification of the echo request packet, which is being replied to, at the incoming interface. The marking of the packet's EXP is dictated by the LSP-EXP mappings on the outgoing interface. The TOS byte is not modified. The following table summarizes this behavior:

Table 9: Request Packet and Behavior

cpm (sender node)	echo request packet: <ul style="list-style-type: none"> packet{tos=1, fc1, profile1} fc1 and profile1 are as entered by user in OAM command or default values tos1 as per mapping of {fc1, profile1} to IP precedence in network egress QoS policy of outgoing interface
outgoing interface (sender node)	echo request packet: <ul style="list-style-type: none"> pkt queued as {fc1, profile1} ToS field=tos1 not remarked EXP=exp1, as per mapping of {fc1, profile1} to EXP in network egress QoS policy of outgoing interface
Incoming interface (responder node)	echo request packet: <ul style="list-style-type: none"> packet{tos1, exp1} exp1 mapped to {fc2, profile2} as per classification in network QoS policy of incoming interface
cpm (responder node)	echo reply packet: <ul style="list-style-type: none"> packet{tos=1, fc2, profile2}
outgoing interface (responder node)	echo reply packet: <ul style="list-style-type: none"> pkt queued as {fc2, profile2} ToS field= tos1 not remarked (reply inband or out-of-band) EXP=exp2, if reply is inband, remarked as per mapping of {fc2, profile2} to EXP in network egress QoS policy of outgoing interface
Incoming interface (sender node)	echo reply packet: <ul style="list-style-type: none"> packet{tos1, exp2} exp2 mapped to {fc1, profile1} as per classification in network QoS policy of incoming interface

Values be, l2, af, l1, h2, ef, h1, nc

Default be

profile {in | out} — The profile state of the MPLS echo request packet.

Default out

path-destination *ip-address* — Specifies the IP address of the path destination from the range 127/8.

interface *interface-name* — Specifies the name of an IP interface. The name must already exist in the con-fig>router>interface context.

downstream-map-tlv {**dsmap**|**ddmap**|**none**} — Specifies which format of the downstream mapping TLV to use in the LSP trace packet. The DSMAP TLV is the original format in RFC 4379. The DDMAP is the new enhanced format specified in RFC 6424. The user can also choose not to include the downstream mapping TLV by entering the value none.

Default Inherited from global configuration of downstream mapping TLV in option **mpls-echo-request-downstream-map** {**dsmap** | **ddmap** }.

Sample Output

```
*A:Dut-A# oam lsp-trace prefix 10.20.1.6/32 downstream-map-tlv ddmap path-destination
127.0.0.1 detail lsp-trace to 10.20.1.6/32: 0 hops min, 0 hops max, 152 byte packets
1 10.20.1.2 rtt=3.44ms rc=8(DSRtrMatchLabel) rsc=1
   DS 1: ipaddr=127.0.0.1 ifaddr=0 iftype=ipv4Unnumbered MRU=1500
       label[1]=131070 protocol=3(LDP)
2 10.20.1.4 rtt=4.65ms rc=8(DSRtrMatchLabel) rsc=1
   DS 1: ipaddr=127.0.0.1 ifaddr=0 iftype=ipv4Unnumbered MRU=1500
       label[1]=131071 protocol=3(LDP)
3 10.20.1.6 rtt=7.63ms rc=3(EgressRtr) rsc=1 *A:Dut-A#
```

```
*A:Dut-C# oam lsp-trace "p_1" detail
lsp-trace to p_1: 0 hops min, 0 hops max, 116 byte packets
1 10.20.1.2 rtt=3.46ms rc=8(DSRtrMatchLabel)
   DS 1: ipaddr 10.20.1.4 ifaddr 3 iftype 'ipv4Unnumbered' MRU=1500 label=131071
proto=4(RSVP-TE)
2 10.20.1.4 rtt=3.76ms rc=8(DSRtrMatchLabel)
   DS 1: ipaddr 10.20.1.6 ifaddr 3 iftype 'ipv4Unnumbered' MRU=1500 label=131071
proto=4(RSVP-TE)
3 10.20.1.6 rtt=5.68ms rc=3(EgressRtr)
*A:Dut-C#
```

lsp-trace over a numbered IP interface

```
A:DUTA#
A:DUTA# oam lsp-trace prefix 5.5.5.5/32 detail
lsp-trace to 5.5.5.5/32: 0 hops min, 0 hops max, 104 byte packets
1 6.6.6.6 rtt=2.45ms rc=8(DSRtrMatchLabel)
   DS 1: ipaddr=5.6.5.1 ifaddr=5.6.5.1 iftype=ipv4Numbered MRU=1564 label=131071
proto=3(LDP)
2 5.5.5.5 rtt=4.77ms rc=3(EgressRtr)
A:DUTA#
```

lsp-trace over an unnumbered IP interface

```
*A:Dut-A# oam lsp-trace prefix 10.20.1.6/32 downstream-map-tlv ddmap path-destination
127.0.0.1 detail lsp-trace to 10.20.1.6/32: 0 hops min, 0 hops max, 152 byte packets
1 10.20.1.2 rtt=3.44ms rc=8(DSRtrMatchLabel) rsc=1
   DS 1: ipaddr=127.0.0.1 ifaddr=0 iftype=ipv4Unnumbered MRU=1500
       label[1]=131070 protocol=3(LDP)
2 10.20.1.4 rtt=4.65ms rc=8(DSRtrMatchLabel) rsc=1
   DS 1: ipaddr=127.0.0.1 ifaddr=0 iftype=ipv4Unnumbered MRU=1500
       label[1]=131071 protocol=3(LDP)
3 10.20.1.6 rtt=7.63ms rc=3(EgressRtr) rsc=1 *A:Dut-A#
```



```
*A:Dut-A# oam ldp-treetrace prefix 10.20.1.6/32

ldp-treetrace for Prefix 10.20.1.6/32:

    127.0.0.1, ttl = 3 dst = 127.1.0.255 rc = EgressRtr status = Done
Hops: 127.0.0.1 127.0.0.1

    127.0.0.1, ttl = 3 dst = 127.2.0.255 rc = EgressRtr status = Done
Hops: 127.0.0.1 127.0.0.1

ldp-treetrace discovery state: Done
ldp-treetrace discovery status: ' OK '
Total number of discovered paths: 2
Total number of failed traces: 0
```

mac-ping

Syntax **mac-ping service service-id destination dst-ieee-address [source src-ieee-address] [fc fc-name [profile in | out]] [size octets] [ttl vc-label-ttl] [send-count send-count] [send-control] [return-control] [interval interval] [time-out interval]**

Context oam
config>saa>test>type

Description The mac-ping utility is used to determine the existence of an egress SAP binding of a given MAC within a VPLS service.

A **mac-ping** packet can be sent via the control plane or the data plane. The **send-control** option specifies the request be sent using the control plane. If **send-control** is not specified, the request is sent using the data plane.

A **mac-ping** is forwarded along the flooding domain if no MAC address bindings exist. If MAC address bindings exist, then the packet is forwarded along those paths, provided they are active. A response is generated only when there is an egress SAP binding for that MAC address or if the MAC address is a “local” OAM MAC address associated with the device’s control plan.

A **mac-ping** reply can be sent using the data plane or the control plane. The **return-control** option specifies the reply be sent using the control plane. If **return-control** is not specified, the request is sent using the data plane.

A **mac-ping** with data plane reply can only be initiated on nodes that can have an egress MAC address binding. A node without a FIB and without any SAPs cannot have an egress MAC address binding, so it is not a node where replies in the data plane will be trapped and sent up to the control plane.

A control plane request is responded to via a control plane reply only.

By default, MAC OAM requests are sent with the system or chassis MAC address as the source MAC. The **source** option allows overriding of the default source MAC for the request with a specific MAC address.

When a **source ieee-address** value is specified and the source MAC address is locally registered within a split horizon group (SHG), then this SHG membership will be used as if the packet originated from this SHG. In all other cases, SHG 0 (zero) will be used. Note that if the **mac-trace** is originated from a non-zero SHG, such packets will not go out to the same SHG.

If EMG is enabled, mac-ping will return only the first SAP in each chain.

Parameters

service *service-id* — The service ID of the service to diagnose or manage.

Values *service-id:* 1 — 2147483647
 svc-name: 64 characters maximum

destination *ieee-address* — The destination MAC address for the OAM MAC request.

size *octets* — The MAC OAM request packet size in octets, expressed as a decimal integer. The request payload is padded to the specified size with a 6 byte PAD header and a byte payload of 0xAA as necessary. If the octet size specified is less than the minimum packet, the minimum sized packet necessary to send the request is used.

Values 1 — 65535

Default No OAM packet padding.

ttl *vc-label-ttl* — The TTL value in the VC label for the OAM MAC request, expressed as a decimal integer.

Values 1 — 255

Default 255

send-control — Specifies the MAC OAM request be sent using the control plane instead of the data plane.

Default MAC OAM request sent using the data plane.

return-control — Specifies the MAC OAM reply to a data plane MAC OAM request be sent using the control plane instead of the data plane.

Default MAC OAM reply sent using the data plane.

source *src-ieee-address* — The source MAC address from which the OAM MAC request originates. By default, the system MAC address for the chassis is used.

Values Any unicast MAC value.

Default The system MAC address.=

fc *fc-name* — The **fc** parameter is used to test the forwarding class of the MPLS echo request packets. The actual forwarding class encoding is controlled by the network egress LSP-EXP mappings.

Values be, l2, af, l1, h2, ef, h1, nc

interval *interval* — The interval parameter in seconds, expressed as a decimal integer. This parameter is used to override the default request message send interval and defines the minimum amount of time that must expire before the next message request is sent.

send-count *send-count* — The number of messages to send, expressed as a decimal integer. The **count** parameter is used to override the default number of message requests sent. Each message request must either timeout or receive a reply before the next message request is sent. The message **interval** value must be expired before the next message request is sent.

Values 1 — 100

Default 1

timeout *interval* — The time-out parameter in seconds, expressed as a decimal integer. This value is used to override the default timeout value and is the amount of time that the router will wait for a message reply after sending the last probe for a particular test. Upon the expiration of timeout the test will be marked

complete and no more packets will be processed for any of those request probes.

Values 1 — 10

Default 5

sdp-ping

Syntax **sdp-ping** *orig-sdp-id* [**resp-sdp** *resp-sdp-id*] [**fc** *fc-name* [**profile** {*in* | *out*}]] [**time-out** *interval*] [**interval** *interval*] [**size** *octets*] [**send-count** *send-count*]

Context oam
config>saa>test>type

Description This command tests SDPs for uni-directional or round trip connectivity and performs SDP MTU Path tests. The **sdp-ping** command accepts an originating SDP-ID and an optional responding SDP-ID. The size, number of requests sent, message time-out and message send interval can be specified. All **sdp-ping** requests and replies are sent with PLP OAM-Label encapsulation, as a *service-id* is not specified. For round trip connectivity testing, the **resp-sdp** keyword must be specified. If **resp-sdp** is not specified, a uni-directional SDP test is performed. To terminate an **sdp-ping** in progress, use the CLI break sequence <Ctrl-C>. An **sdp-ping** response message indicates the result of the **sdp-ping** message request. When multiple response messages apply to a single SDP echo request/reply sequence, the response message with the highest precedence will be displayed. The following table displays the response messages sorted by precedence.

Result of Request	Displayed Response Message	Precedence
Request timeout without reply	Request Timeout	1
Request not sent due to non-existent <i>orig-sdp-id</i>	Orig-SDP Non-Existent	2
Request not sent due to administratively down <i>orig-sdp-id</i>	Orig-SDP Admin-Down	3
Request not sent due to operationally down <i>orig-sdp-id</i>	Orig-SDP Oper-Down	4
Request terminated by user before reply or timeout	Request Terminated	5
Reply received, invalid <i>origination-id</i>	Far End: Originator-ID Invalid	6
Reply received, invalid <i>responder-id</i>	Far End: Responder-ID Error	7
Reply received, non-existent <i>resp-sdp-id</i>	Far End: Resp-SDP Non-Existent	8
Reply received, invalid <i>resp-sdp-id</i>	Far End: Resp-SDP Invalid	9
Reply received, <i>resp-sdp-id</i> down (admin or oper)	Far-end: Resp-SDP Down	10
Reply received, No Error	Success	11

Parameters

orig-sdp-id — The SDP-ID to be used by **sdp-ping**, expressed as a decimal integer. The far-end address of the specified SDP-ID is the expected *responder-id* within each reply received. The specified SDP-ID defines the encapsulation of the SDP tunnel encapsulation used to reach the far end. This can be IP/GRE or MPLS. If *orig-sdp-id* is invalid or administratively down or unavailable for some reason, the SDP Echo Request message is not sent and an appropriate error message is displayed (once the **interval** timer expires, sdp-ping will attempt to send the next request if required).

Values 1 — 17407

resp-sdp *resp-sdp-id* — Optional parameter is used to specify the return SDP-ID to be used by the far-end router for the message reply for round trip SDP connectivity testing. If *resp-sdp-id* does not exist on the far-end router, terminates on another router different than the originating router, or another issue prevents the far-end router from using *resp-sdp-id*, the SDP echo reply will be sent using generic IP/GRE OAM encapsulation. The received forwarding class (as mapped on the ingress network interface for the far end) defines the forwarding class encapsulation for the reply message.

Values 1 — 17407

Default null. Use the non-SDP return path for message reply.

fc *fc-name* — The **fc** parameter is used to indicate the forwarding class of the SDP encapsulation. The actual forwarding class encoding is controlled by the network egress DSCP or LSP-EXP mappings.

The DSCP or LSP-EXP mappings on the receive network interface controls the mapping back to the internal forwarding class used by the far-end router that receives the message request. The egress mappings of the egress network interface on the far-end router controls the forwarding class markings on the return reply message.

The DSCP or LSP-EXP mappings on the receive network interface controls the mapping of the message reply back at the originating router. This is displayed in the response message output upon receipt of the message reply.

Values be, l2, af, l1, h2, ef, h1, nc

Default be

profile {**in** | **out**} — The profile state of the SDP encapsulation.

Default out

time-out *interval* — The time-out parameter in seconds, expressed as a decimal integer. This value is used to override the default timeout value and is the amount of time that the router will wait for a message reply after sending the last probe for a particular test. Upon the expiration of timeout the test will be marked complete and no more packets will be processed for any of those request probes.

Values 1 — 10

Default 5

interval *interval* — The interval parameter in seconds, expressed as a decimal integer. This parameter is used to override the default request message send interval and defines the minimum amount of time that must expire before the next message request is sent.

Values 1 — 10

Default 1

size *octets* — The **size** parameter in octets, expressed as a decimal integer. This parameter is used to over-

ride the default message size for the **sdp-ping** request. Changing the message size is a method of checking the ability of an SDP to support a **path-mtu**. The size of the message does not include the SDP encapsulation, VC-Label (if applied) or any DLC headers or trailers.

When the OAM message request is encapsulated in an IP/GRE SDP, the IP 'DF' (Do Not Fragment) bit is set. If any segment of the path between the sender and receiver cannot handle the message size, the message is discarded. MPLS LSPs are not expected to fragment the message either, as the message contained in the LSP is not an IP packet.

Values 40 — 9198

Default 40

send-count *send-count* — The number of messages to send, expressed as a decimal integer. The **count** parameter is used to override the default number of message requests sent. Each message request must either timeout or receive a reply before the next message request is sent. The message **interval** value must be expired before the next message request is sent.

Values 1 — 100

Default 1

SpecialCases Single Response Connectivity Tests — A single response sdp-ping test provides detailed test results. Upon request timeout, message response, request termination, or request error the following local and remote information will be displayed. Local and remote information will be dependent upon SDP-ID existence and reception of reply.

Field	Description	Values
Request Result	The result of the sdp-ping request message.	Sent - Request Timeout Sent - Request Terminated Sent - Reply Received Not Sent - Non-Existent Local SDP-ID Not Sent - Local SDP-ID Down
Originating SDP-ID	The originating SDP-ID specified by orig-sdp .	<i>orig-sdp-id</i>
Originating SDP-ID Administrative State	The local administrative state of the originating SDP-ID. If the SDP-ID has been shutdown, Admin-Down is displayed. If the originating SDP-ID is in the no shutdown state, Admin-Up is displayed. If the <i>orig-sdp-id</i> does not exist, Non-Existent is displayed.	Admin-Up Admin-Down Non-Existent
Originating SDP-ID Operating State	The local operational state of the originating SDP-ID. If <i>orig-sdp-id</i> does not exist, N/A will be displayed.	Oper-Up Oper-Down N/A

Field	Description	Values
Originating SDP-ID Path MTU	The local path-mtu for <i>orig-sdp-id</i> . If <i>orig-sdp-id</i> does not exist locally, N/A is displayed.	<i>orig-path-mtu</i> N/A
Responding SDP-ID	The SDP-ID requested as the far-end path to respond to the sdp-ping request. If resp-sdp is not specified, the responding router will not use an SDP-ID as the return path and N/A will be displayed.	<i>resp-sdp-id</i> N/A
Responding SDP-ID Path Used	Displays whether the responding router used the responding <i>sdp-id</i> to respond to the sdp-ping request. If <i>resp-sdp-id</i> is a valid, operational SDP-ID, it must be used for the SDP echo reply message. If the far-end uses the responding <i>sdp-id</i> as the return path, Yes will be displayed. If the far-end does not use the responding <i>sdp-id</i> as the return path, No will be displayed. If resp-sdp is not specified, N/A will be displayed.	Yes No N/A
Responding SDP-ID Administrative State	The administrative state of the responding <i>sdp-id</i> . When <i>resp-sdp-id</i> is administratively down, Admin-Down will be displayed. When <i>resp-sdp-id</i> is administratively up, Admin-Up will be displayed. When <i>resp-sdp-id</i> exists on the far-end router but is not valid for the originating router, Invalid is displayed. When <i>resp-sdp-id</i> does not exist on the far-end router, Non-Existent is displayed. When resp-sdp is not specified, N/A is displayed.	Admin-Down Admin-Up Invalid Non-Existent N/A
Responding SDP-ID Operational State	The operational state of the far-end <i>sdp-id</i> associated with the return path for <i>service-id</i> . When a return path is operationally down, Oper-Down is displayed. If the return <i>sdp-id</i> is operationally up, Oper-Up is displayed. If the responding <i>sdp-id</i> is non-existent, N/A is displayed.	Oper-Up Oper-Down N/A
Responding SDP-ID Path MTU	The remote path-mtu for <i>resp-sdp-id</i> . If <i>resp-sdp-id</i> does not exist remotely, N/A is displayed	<i>resp-path-mtu</i> N/A
Local Service IP Address	The local system IP address used to terminate remotely configured <i>sdp-ids</i> (as the <i>sdp-id</i> far-end address). If an IP address has not been configured to be the system IP address, N/A is displayed.	<i>system-ip-addr</i> N/A
Local Service IP Interface Name	The name of the local system IP interface. If the local system IP interface has not been created, N/A is displayed.	<i>system-interface-name</i> N/A
Local Service IP Interface State	The state of the local system IP interface. If the local system IP interface has not been created, Non-Existent is displayed.	Up Down Non-Existent
Expected Far End Address	The expected IP address for the remote system IP interface. This must be the far-end address configured for the <i>orig-sdp-id</i> .	<i>orig-sdp-far-end-addr</i> <i>dest-ip-addr</i> N/A

Field	Description	Values
Actual Far End Address	The returned remote IP address. If a response is not received, the displayed value is N/A. If the far-end service IP interface is down or non-existent, a message reply is not expected.	<i>resp-ip-addr</i> N/A
Responders Expected Far End Address	The expected source of the originators <i>sdp-id</i> from the perspective of the remote 7750 SR-Series terminating the <i>sdp-id</i> . If the far-end cannot detect the expected source of the ingress <i>sdp-id</i> , N/A is displayed.	<i>resp-rec-tunnel-far-end-addr</i> N/A
Round Trip Time	The round trip time between SDP echo request and the SDP echo reply. If the request is not sent, times out or is terminated, N/A is displayed.	<i>delta-request-reply</i> N/A

Single Response Round Trip Connectivity Test Sample Output

```
A:router1> sdp-ping 10 resp-sdp 22 fc ef
Request Result: Sent - Reply Received
RTT: 30ms
```

```
Err SDP-ID Info      Local  Remote
___ SDP-ID:          10    22
___ Administrative State: Up    Up
___ Operative State:  Up    Up
___ Path MTU         4470  4470
___ Response SDP Used:      Yes
```

```
Err System IP Interface Info
Local Interface Name: "ESR-System-IP-Interface (Up to 32 chars)..."
___ Local IP Interface State:    Up
___ Local IP Address:           10.10.10.11
___ IP Address Expected By Remote: 10.10.10.11
___ Expected Remote IP Address:   10.10.10.10
___ Actual Remote IP Address:    10.10.10.10
```

```
Err FC Mapping Info  Local  Remote
___ Forwarding Class Assured Assured
___ Profile          In    In
```

Multiple Response Connectivity Tests — When the connectivity test count is greater than one (1), a single line is displayed per SDP echo request send attempt.

The request number is a sequential number starting with 1 and ending with the last request sent, incrementing by one (1) for each request. This should not be confused with the *message-id* contained in each request and reply message.

A response message indicates the result of the message request. Following the response message is the round trip time value. If any reply is received, the round trip time is displayed.

After the last reply has been received or response timed out, a total is displayed for all messages sent and all replies received. A maximum, minimum and average round trip time is also displayed. Error response and timed out requests do not apply towards the average round trip time.

Multiple Response Round Trip Connectivity Test Sample Output

```
A:router1> sdp-ping 6 resp-sdp 101size 1514 count 5
Request   Response   RTT
-----
1        Success    10ms
2        Success    15ms
3        Success    10ms
4        Success    20ms
5        Success    5ms
Sent: 5   Received: 5
Min: 5ms   Max: 20ms   Avg: 12ms
```

vccv-ping

Syntax

```
vccv-ping sdp-id:vc-id [src-ip-address ip-addr dst-ip-address ip-addr pw-id pw-id][reply-mode
{ip-routed|control-channel}] [fc fc-name [profile {in | out}]] [size octets] [send-count send-
count] [timeout timeout] [interval interval] [ttl vc-label-ttl]
vccv-ping static sdp-id:vc-id [dest-global-id global-id dest-node-id node-id] [control-channel
ipv4 | non-ip] [src-ip-address ip-addr] [count send-count] [fc fc-name [profile in|out]] [interval
interval] [size octets] [timeout timeout] [ttl vc-label-ttl] [detail]
vccv-ping spoke-sdp-fec spoke-sdp-fec-id [saii-type2 global-id:prefix:ac-id taii-type2 global-
id:prefix:ac-id] [src-ip-address ip-addr dst-ip-address ip-addr] [reply-mode {ip-routed | control-
channel}] [fc fc-name [profile {in | out}]] [size octets] [count send-count] [timeout timeout]
[interval interval] [ttl vc-label-ttl]
vccv-ping saii-type2 global-id:prefix:ac-id taii-type2 global-id:prefix:ac-id [src-ip-address ip-
addr dst-ip-address ip-addr] [reply-mode {ip-routed | control-channel}] [fc fc-name [profile {in
| out}]] [size octets] [count send-count] [timeout timeout] [interval interval] [ttl vc-label-ttl]
```

Context

```
oam
config>saa>test
```

Description

This command, when used with the **static** option, configures a Virtual Circuit Connectivity Verification (VCCV) ping test for static MPLS-TP pseudowires used in a VLL service. A vccv-ping test checks connectivity of a VLL inband. It checks to verify that the destination (target) PE is the egress for the Static PW FEC. It provides for a cross-check between the dataplane and the configuration. It is inband which means that the vccv-ping message is sent using the same encapsulation and along the same path as user packets in that VLL. The vccv-ping test is the equivalent of the lsp-ping test for a VLL service. The vccv-ping static command reuses an lsp-ping message format and can be used to test an MPLS-TP pseudowire VLL configured over an MPLS SDP. VCCV Ping for MPLS-TP pseudowires always uses the VCCV control word (associated channel header) with either an IPv4 channel type (0x0021) or on-demand CV message channel type (0x0025).

Note that **vccv-ping static** can only be initiated on a T-PE. Both the echo request and reply messages are sent using the same, in-band, encapsulation. The target FEC stack contains a static PW FEC TLV. The contents of this TLV are populated based on the source Node ID, source Global ID, and Destination Global ID and Destination Node ID in the **vccv-ping** command (or taken from the pseudowire context if omitted from the command).

The timestamp format to be sent, and to be expected when received in a PDU, is as configured by the `config>test-oam>mpls-time-stamp-format` command. If RFC 4379 is selected, then the timestamp is in seconds and microseconds since 1900, otherwise it is in seconds and microseconds since 1970.

Parameters

sdp-id:vc-id — The VC ID of the pseudowire being tested must be indicated with this parameter. The VC ID needs to exist on the local router and the far-end peer needs to indicate that it supports VCCV to allow the user to send vccv-ping message.

Values 1 — 17407:1 — 4294967295

spoke-sdp-fec *spoke-sdp-fec-id* — If a FEC 129 PW is being tested, then its *spoke-sdp-fec-id* must be indicated with this parameter. The *spoke-sdp-fec-id* must exist on the local router and the far-end peer needs to indicate that it supports VCCV to allow the user to send vccv-ping messages.

spoke-sdp-fec is mutually exclusive with the *sdp-id:vc-id* parameter.

Values 1 — 4294967295

count *send-count* — The number of messages to send, expressed as a decimal integer. The count parameter is used to override the default number of message requests sent. The message interval value must be expired before the next message request is sent.

Values 1 — 100

Default 1

control-channel {**ipv4** | **non-ip**} — Specifies the encapsulation format to use for the VCCV ping echo request and echo reply packet.

Values **ipv4** — IPv4 encapsulation in an IPv4 pseudowire associated channel (channel type 0x0021)

Values **non-ip** — MPLS-TP encapsulation without UDP/IP headers, in pseudowire associated channel using channel type 0x025.

Default non-ip

saii-type2 *global-id:prefix:ac-id* — If a FEC129 AII Type 2 pseudowire is being tested, then the source attachment individual identifier (SAII) must be indicated.

The **saii-type2** parameter is mutually exclusive with the *sdp-id:vc-id* parameter.

Syntax: *global-id* — The global ID of this 7x50 T-PE node.

Values: 1 — 4294967295

prefix — The prefix on this 7x50 T-PE node that the spoke-SDP is associated with.

ac-id — An unsigned integer representing a locally unique identifier for the spoke-SDP.

Values: 1 — 4294967295

taii-type2 *global-id:prefix:ac-id* — If a FEC129 AII Type 2 pseudowire is being tested, then the target attachment individual identifier (TAII) must be indicated. The **taii-type2** parameter is mutually exclusive with *sdp-id:vc-id*.

Syntax: *global-id* — The global ID of the far end T-PE node of the FEC129 pseudowire.
 Values: 1 — 4294967295
prefix — The prefix on far end. T-PE node that the pseudowire being tested is associated with.
 Values: ipv4-formatted address: a.b.c.d
ac-id — An unsigned integer representing a locally unique identifier for the pseudowire being tested at the far end T-PE.
 Values: 1 — 4294967295

src-ip-address *ip-addr* — Specifies the source IP address.

Values ipv4-address: a.b.c.d

dst-ip-address *ip-address* — Specifies the destination IP address.

Values ipv4-address: a.b.c.d

pw-id *pw-id* — Specifies the pseudowire ID to be used for performing a **vccv-ping** operation. The pseudowire ID is a non-zero 32-bit connection ID required by the FEC 128, as defined in RFC 4379, *Detecting Multi-Protocol Label Switched (MPLS) Data Plane Failures*.

reply-mode {**ip-routed** | **control-channel**} — The reply-mode parameter indicates to the far-end how to send the reply message. The option control-channel indicates a reply mode in-band using vccv control channel.

Default control-channel

fc *fc-name* — The fc and profile parameters are used to indicate the forwarding class and profile of the MPLS echo request packet.

When an MPLS echo request packet is generated in CPM and is forwarded to the outgoing interface, the packet is queued in the egress network queue corresponding to the specified fc and profile parameter values. The marking of the packet's EXP is dictated by the LSP-EXP mappings on the outgoing interface.

When the MPLS echo request packet is received on the responding node, The fc and profile parameter values are dictated by the LSP-EXP mappings of the incoming interface.

When an MPLS echo reply packet is generated in CPM and is forwarded to the outgoing interface, the packet is queued in the egress network queue corresponding to the fc and profile parameter values determined by the classification of the echo request packet, which is being replied to, at the incoming interface. The marking of the packet's EXP is dictated by the LSP-EXP mappings on the outgoing interface. The TOS byte is not modified. The following table summarizes this behavior:

Table 10: Request Packet and Behavior

cpm (sender node)	echo request packet: <ul style="list-style-type: none"> • packet{tos=1, fc1, profile1} • fc1 and profile1 are as entered by user in OAM command or default values • tos1 as per mapping of {fc1, profile1} to IP precedence in network egress QoS policy of outgoing interface
-------------------	---

Table 10: Request Packet and Behavior (Continued)

outgoing interface (sender node)	echo request packet: <ul style="list-style-type: none"> • pkt queued as {fc1, profile1} • ToS field=tos1 not remarked • EXP=exp1, as per mapping of {fc1, profile1} to EXP in network egress QoS policy of outgoing interface
Incoming interface (responder node)	echo request packet: <ul style="list-style-type: none"> • packet{tos1, exp1} • exp1 mapped to {fc2, profile2} as per classification in network QoS policy of incoming interface
cpm (responder node)	echo reply packet: <ul style="list-style-type: none"> • packet{tos=1, fc2, profile2}
outgoing interface (responder node)	echo reply packet: <ul style="list-style-type: none"> • pkt queued as {fc2, profile2} • ToS field= tos1 not remarked (reply inband or out-of-band) • EXP=exp2, if reply is inband, remarked as per mapping of {fc2, profile2} to EXP in network egress QoS policy of outgoing interface
Incoming interface (sender node)	echo reply packet: <ul style="list-style-type: none"> • packet{tos1, exp2} • exp2 mapped to {fc1, profile1} as per classification in network QoS policy of incoming interface

Values be, l2, af, l1, h2, ef, h1, nc

Default be

profile {in | out} — The profile state of the MPLS echo request packet.

Default out

timeout seconds — The time-out parameter in seconds, expressed as a decimal integer. This value is used to override the default timeout value and is the amount of time that the router will wait for a message reply after sending the last probe for a particular test. Upon the expiration of timeout the test will be marked complete and no more packets will be processed for any of those request probes.

Values 1 — 10

Default 5

interval interval — The interval parameter in seconds, expressed as a decimal integer. This parameter is

used to configure the spacing between probes within a test run.

Values 1 .. 10

Default 1

size *octets* — The size in octets, expressed as a decimal integer, of the MPLS echo request packet, including the IP header but not the label stack. The request pay-load is padded with zeroes to the specified size. Note that an OAM command is not failed if the user entered a size lower than the minimum required to build the packet for the echo request message. The payload is automatically padded to meet the minimum size.

Values 1 — 9198

Default 1

send-count *send-count* — The number of messages to send, expressed as a decimal integer. The count parameter is used to override the default number of message requests sent. The message interval value must be expired before the next message request is sent.

Values 1 — 1000

Default 1

ttl *vc-label-ttl* — Specifies the time-to-live value for the vc-label of the echo request message. The outer label TTL is still set to the default of 255 regardless of this value.

Sample Output

```
Ping TPE to SPE on a LDP/GRE tunnel
=====

*A:Dut-B# oam vccv-ping 3:1
VCCV-PING 3:1 88 bytes MPLS payload
Seq=1, send from intf toSPE1-D-8 to NH 12.1.8.2
      reply from 4.4.4.4 via Control Channel
      udp-data-len=56 rtt=0.689ms rc=8 (DSRtrMatchLabel)

---- VCCV PING 3:1 Statistics ----
1 packets sent, 1 packets received, 0.00% packet loss
round-trip min = 0.689ms, avg = 0.689ms, max = 0.689ms, stddev = 0.000ms

Ping TPE to SPE on a RSVP tunnel
=====

A:Dut-C# oam vccv-ping 5:1
VCCV-PING 5:1 88 bytes MPLS payload
Seq=1, send from intf toSPE2-E-5 to NH 12.3.5.1
      send from lsp toSPE2-E-5
      reply from 5.5.5.5 via Control Channel
      udp-data-len=56 rtt=1.50ms rc=8 (DSRtrMatchLabel)

---- VCCV PING 5:1 Statistics ----
1 packets sent, 1 packets received, 0.00% packet loss
round-trip min = 1.50ms, avg = 1.50ms, max = 1.50ms, stddev = 0.000ms
```

```

Ping TPE to TPE over multisegment pseudowire
=====
*A:Dut-C# oam vccv-ping 5:1 src-ip-address 4.4.4.4 dst-ip-address 2.2.2.2 pw-id 1 ttl 3
VCCV-PING 5:1 88 bytes MPLS payload
Seq=1, send from intf toSPE2-E-5 to NH 12.3.5.1
      send from lsp toSPE2-E-5
      reply from 2.2.2.2 via Control Channel
      udp-data-len=32 rtt=2.50ms rc=3 (EgressRtr)

---- VCCV PING 5:1 Statistics ----
1 packets sent, 1 packets received, 0.00% packet loss
round-trip min = 2.50ms, avg = 2.50ms, max = 2.50ms, stddev = 0.000ms

Ping SPE to TPE (over LDP tunnel)
=====

Single segment:
-----

*A:Dut-D# oam vccv-ping 3:1 reply-mode ip-routed
VCCV-PING 3:1 88 bytes MPLS payload
Seq=1, send from intf toTPE1-B-8 to NH 12.1.8.1
      reply from 2.2.2.2 via IP
      udp-data-len=32 rtt=1.66ms rc=3 (EgressRtr)

---- VCCV PING 3:1 Statistics ----
1 packets sent, 1 packets received, 0.00% packet loss
round-trip min = 1.66ms, avg = 1.66ms, max = 1.66ms, stddev = 0.000ms

Multisegment:
-----

*A:Dut-D>config>router# oam vccv-ping 4:200 src-ip-address 5.5.5.5 dst-ip-address 3.3.3.3
pw-id 1 ttl 2 reply-mode ip-routed
VCCV-PING 4:200 88 bytes MPLS payload
Seq=1, send from intf toSPE2-E-5 to NH 12.2.5.2
      reply from 3.3.3.3 via IP
      udp-data-len=32 rtt=3.76ms rc=3 (EgressRtr)

---- VCCV PING 4:200 Statistics ----
1 packets sent, 1 packets received, 0.00% packet loss
round-trip min = 3.76ms, avg = 3.76ms, max = 3.76ms, stddev = 0.000ms

Ping SPE to SPE
=====

*A:Dut-D# oam vccv-ping 4:200 reply-mode ip-routed
VCCV-PING 4:200 88 bytes MPLS payload
Seq=1, send from intf toSPE2-E-5 to NH 12.2.5.2
      reply from 5.5.5.5 via IP
      udp-data-len=56 rtt=1.77ms rc=8 (DSRtrMatchLabel)

---- VCCV PING 4:200 Statistics ----
1 packets sent, 1 packets received, 0.00% packet loss
round-trip min = 1.77ms, avg = 1.77ms, max = 1.77ms, stddev = 0.000ms

```

vccv-trace

Syntax `vccv-trace sdp-id:vc-id [fc fc-name [profile {in | out}]] [size octets] [reply-mode ip-routed|control-channel] [probe-count probes-per-hop] [timeout timeout] [interval interval] [min-ttl min-vc-label-ttl] [max-ttl max-vc-label-ttl] [max-fail no-response-count] [detail]`
`vccv-trace static sdp-id:vc-id [control-channel none | non-ip] [src-ip-address ipv4-address] [fc fc-name [profile in|out]] [interval interval-value] [max-fail no-response-count] [max-ttl max-vc-label-ttl] [min-ttl min-vc-label-ttl] [probe-count probe-count] [size octets] [timeout timeout-value] [detail]`
`vccv-trace spoke-sdp-fec poke-sdp-fec spoke-sdp-fec-id [saii-type2 global-id:prefix:ac-id taii-type2 global-id:prefix:ac-id][[size octets][min-ttl min-vc-label-ttl][max-ttl max-vc-label-ttl][max-fail no-response-count][probe-count probe-count][reply-mode ip-routed | control-channel][timeout timeout-value][interval interval-value][fc fc-name [profile {in | out}]]][detail]`
`vccv-trace saii-type2 global-id:prefix:ac-id taii-type2 global-id:prefix:ac-id [size octets][min-ttl min-vc-label-ttl][max-ttl max-vc-label-ttl][max-fail no-response-count][probe-count probe-count][reply-mode ip-routed| control-channel][timeout timeout-value][interval interval-value][fc fc-name [profile {in | out}]]][detail]`

Context oam
config>saa>test>type

Description This command, when used with the **static** option, configures a Virtual Circuit Connectivity Verification (VCCV) automated trace test for static MPLS-TP pseudowires used in a VLL service. The automated VCCV-trace can trace the entire path of a PW with a single command issued at the T-PE or at an S-PE. This is equivalent to LSP-Trace and is an iterative process by which the source T-PE or S-PE node sends successive VCCV-Ping messages with incrementing the TTL value, starting from TTL=1.

VCCV trace for MPLS-TP pseudowires always uses the VCCV control word (associated channel header) with either an IPv4 channel type (0x0021) or on-demand CV message channel type (0x0025).

In each iteration, the T-PE builds the MPLS echo request message in a way similar to vccv-ping. Each S-PE which terminates and processes the message will include in the MPLS echo reply message the Static PW FEC TLV corresponding the PW segment to its downstream node. The source T-PE node can then build the next echo reply message with TTL=2 to test the next-next hop for the MS-PW. It will copy the FEC TLV it received in the echo reply message into the new echo request message. The process is terminated when the reply is from the egress T-PE or when a timeout occurs.

Note that **vccv-trace static** can only be initiated on a T-PE. Both the echo request and reply messages are sent using the same, in-band, encapsulation. The target FEC stack contains a static PW FEC TLV. The contents of this TLV are populated based on the source Node ID, source Global ID, and Destination Global ID and Destination Node ID taken from the pseudowire context.

Parameters `sdpid:vcid` — The VC ID of the pseudowire being tested must be indicated with this parameter. The VC ID needs to exist on the local router and the far-end peer needs to indicate that it supports VCCV to allow the user to send vccv-ping message.

Values 1-17407:1 — 4294967295

control-channel {none | non-ip} — The encapsulation format to use for the VCCV ping echo request and

echo reply packet.

Values none — IPv4 encapsulation in an IPv4 pseudowire associated channel (channel type 0x0021)

Values non-ip — MPLS-TP encapsulation without UDP/IP headers, in pseudowire associated channel using channel type 0x025.

Default non-ip

spoke-sdp-fec *spoke-sdp-fec-id* — If a FEC 129 PW is being tested, then its *spoke-sdp-fec-id* must be indicated with this parameter. The *spoke-sdp-fec-id* must exist on the local router and the far-end peer needs to indicate that it supports VCCV to allow the user to send vccv-ping messages.

spoke-sdp-fec is mutually exclusive with the *sdp-id:vc-id* parameter.

Values 1 — 4294967295

saii-type2 *global-id:prefix:ac-id* — If a FEC129 AII Type 2 pseudowire is being tested, then the source attachment individual identifier (SAII) must be indicated.

The **saii-type2** parameter is mutually exclusive with the *sdp-id:vc-id* parameter.

Syntax: *global-id* — The global ID of this 7x50 T-PE node.

Values: 1 — 4294967295

prefix — The prefix on this 7x50 T-PE node that the spoke-SDP is associated with.

ac-id — An unsigned integer representing a locally unique identifier for the spoke-SDP.

Values: 1 — 4294967295

taii-type2 *global-id:prefix:ac-id* — If a FEC129 AII Type 2 pseudowire is being tested, then the target attachment individual identifier (TAII) must be indicated. The **taii-type2** parameter is mutually exclusive with *sdp-id:vc-id*.

Syntax: *global-id* — The global ID of the far end T-PE of the FEC129 pseudowire.

Values: 1 — 4294967295

prefix — The prefix on far end T-PE that the pseudowire being tested is associated with.

Values: ipv4-formatted address: a.b.c.d

ac-id — An unsigned integer representing a locally unique identifier for the pseudowire being tested at the far end T-PE.

Values: 1 — 4294967295

reply-mode {*ip-routed* | *control-channel*} — The **reply-mode** parameter indicates to the far-end how to send the reply message. The option *control-channel* indicates a reply mode in-band using vccv control channel.

Note that when a VCCV trace message is originated from an S-PE node, the user should use the IPv4 reply mode as the replying node does not know how to set the TTL to reach the sending S-PE node. If the user attempts this, a warning is issued to use the ipv4 reply mode.

Default control-channel

fc *fc-name* [**profile** {*in* | *out*}] — The *fc* and *profile* parameters are used to indicate the forwarding class of the VCCV trace echo request packets. The actual forwarding class encoding is controlled by the network egress LSP-EXP mappings.

The LSP-EXP mappings on the receive network interface controls the mapping back to the internal forwarding class used by the far-end router that receives the message request. The egress mappings of the

egress network interface on the far-end router controls the forwarding class markings on the return reply message. The LSP-EXP mappings on the receive network interface controls the mapping of the message reply back at the originating router.

fc-name — The *fc* and *profile* parameters are used to indicate the forwarding class and profile of the MPLS echo request packet.

When an MPLS echo request packet is generated in CPM and is forwarded to the outgoing interface, the packet is queued in the egress network queue corresponding to the specified *fc* and *profile* parameter values. The marking of the packet's EXP is dictated by the LSP-EXP mappings on the outgoing interface.

When the MPLS echo request packet is received on the responding node, The *fc* and *profile* parameter values are dictated by the LSP-EXP mappings of the incoming interface.

When an MPLS echo reply packet is generated in CPM and is forwarded to the outgoing interface, the packet is queued in the egress network queue corresponding to the *fc* and *profile* parameter values determined by the classification of the echo request packet, which is being replied to, at the incoming interface. The marking of the packet's EXP is dictated by the LSP-EXP mappings on the outgoing interface. The TOS byte is not modified. The following table summarizes this behavior:

Table 11: Request Packet and Behavior

cpm (sender node)	echo request packet: <ul style="list-style-type: none"> packet{tos=1, fc1, profile1} fc1 and profile1 are as entered by user in OAM command or default values tos1 as per mapping of {fc1, profile1} to IP precedence in network egress QoS policy of outgoing interface
outgoing interface (sender node)	echo request packet: <ul style="list-style-type: none"> pkt queued as {fc1, profile1} ToS field=tos1 not remarked EXP=exp1, as per mapping of {fc1, profile1} to EXP in network egress QoS policy of outgoing interface
Incoming interface (responder node)	echo request packet: <ul style="list-style-type: none"> packet{tos1, exp1} exp1 mapped to {fc2, profile2} as per classification in network QoS policy of incoming interface
cpm (responder node)	echo reply packet: <ul style="list-style-type: none"> packet{tos=1, fc2, profile2}
outgoing interface (responder node)	echo reply packet: <ul style="list-style-type: none"> pkt queued as {fc2, profile2} ToS field= tos1 not remarked (reply inband or out-of-band) EXP=exp2, if reply is inband, remarked as per mapping of {fc2, profile2} to EXP in network egress QoS policy of outgoing interface
Incoming interface (sender node)	echo reply packet: <ul style="list-style-type: none"> packet{tos1, exp2} exp2 mapped to {fc1, profile1} as per classification in network QoS policy of incoming interface

Values be, l2, af, l1, h2, ef, h1, nc

Default be

profile {in | out} — The profile state of the VCCV trace echo request packet.

Default out

size octets — The size in octets, expressed as a decimal integer, of the MPLS echo request packet, including the IP header but not the label stack. The request payload is padded with zeroes to the specified size.

Note that an OAM command is not failed if the user entered a size lower than the minimum required to

build the packet for the echo request message. The payload is automatically padded to meet the minimum size.

Values 1 — 9198

Default 1

probe-count *probes-per-hop* — The number of VCCV trace echo request messages to send per TTL value.

Values 1 — 10

Default 1

timeout *timeout* — The timeout parameter in seconds, expressed as a decimal integer. This value is used to override the default timeout value and is the amount of time that the router will wait for a message reply after sending the message request. Upon the expiration of message timeout, the requesting router assumes that the message response will not be received. A request timeout message is displayed by the CLI for each message request sent that expires. Any response received after the request times out will be silently discarded.

Values 1 — 60

Default 3

interval *interval* — The interval parameter in seconds, expressed as a decimal integer. This parameter is used to override the default request message send interval and defines the minimum amount of time that must expire before the next message request is sent.

If the interval is set to 1 second, and the timeout value is set to 10 seconds, then the maximum time between message requests is 10 seconds and the minimum is 1 second. This depends upon the receipt of a message reply corresponding to the outstanding message request.

Values 1 — 255

Default 1

min-ttl *min-vc-label-ttl* — The TTL value for the VC label of the echo request message for the first hop of the MS-PW for which the results are to be displayed. This is expressed as a decimal integer. Note that the outer label TTL is still set to the default of 255 regardless of the value of the VC label.

Values 1 — 255

Default 1

max-ttl *max-vc-label-ttl* — The TTL value for the VC label of the echo request message for the last hop of the MS-PW for which the results are to be displayed. This is expressed as a decimal integer. Note that the outer label TTL is still set to the default of 255 regardless of the value of the VC label.

Values 1 — 255

Default 8

max-fail *no-response-count* — The maximum number of consecutive VCCV trace echo requests, expressed as a decimal integer that do not receive a reply before the trace operation fails for a given TTL value.

Values 1 — 255

Default 5

Sample Output

```
*A:138.120.214.60# oam vccv-trace 1:33
VCCV-TRACE 1:33 with 88 bytes of MPLS payload
1 1.1.63.63 rtt<10ms rc=8 (DSRtrMatchLabel)
2 1.1.62.62 rtt<10ms rc=8 (DSRtrMatchLabel)
3 1.1.61.61 rtt<10ms rc=3 (EgressRtr)
```

Trace with detail:

```
*A:138.120.214.60>oam vccv-trace 1:33 detail

VCCV-TRACE 1:33 with 88 bytes of MPLS payload
1 1.1.63.63 rtt<10ms rc=8 (DSRtrMatchLabel)
   Next segment: VcId=34 VcType=AAL5SDU Source=1.1.63.63 Remote=1.1.62.62
2 1.1.62.62 rtt<10ms rc=8 (DSRtrMatchLabel)
   Next segment: VcId=35 VcType=AAL5SDU Source=1.1.62.62 Remote=1.1.61.61
3 1.1.61.61 rtt<10ms rc=3 (EgressRtr)
SAA:
```

```
*A:multisim3>config>saa# info
```

```
-----
test "vt1"
  shutdown
  type
    vccv-trace 1:2 fc "af" profile in timeout 2 interval 3 size 200
min-ttl 2 max-ttl 5 max-fail 2 probe-count 3
  exit
exit
```

```
..
```

```
-----
*A:multisim3>config>saa#
```

OAM SAA Commands

saa

Syntax `saa test-name [owner test-owner] {start | stop} [no-accounting]`

Context oam

Description Use this command to start or stop an SAA test.

test-name — Name of the SAA test. The test name must already be configured in the **config>saa>test** context.

owner test-owner — Specifies the owner of an SAA operation up to 32 characters in length.

Values If a *test-owner* value is not specified, tests created by the CLI have a default owner “TiMOS CLP”.

start — This keyword starts the test. A test cannot be started if the same test is still running.

A test cannot be started if it is in a shut-down state. An error message and log event will be generated to indicate a failed attempt to start an SAA test run. A test cannot be started if it is in a continuous state.

stop — This keyword stops a test in progress. A test cannot be stopped if it is not in progress. A log message will be generated to indicate that an SAA test run has been aborted. A test cannot be stopped if it is in a continuous state.

no-accounting — This parameter disables the recording results in the accounting policy. When specifying **no-accounting** then the MIB record produced at the end of the test will not be added to the accounting file. It will however use up one of the three MIB rows available for the accounting module to be collected.

LDP Treetrace Commands

ldp-treetrace

Syntax `ldp-treetrace {prefix ip-prefix/mask} [max-ttl tll-value] [max-path max-paths] [timeout timeout] [retry-count retry-count] [fc fc-name] [profile profile]] [downstream-map-tlv {dsmap|ddmap}]`

Context oam

Description This command allows the user to perform a single run of the LDP ECMP OAM tree trace to discover all ECMP paths of an LDP FEC.

Parameters `prefix ip-prefix/mask` — Specifies the address prefix and subnet mask of the target BGP IPv4 label route.
`max-ttl max-label-ttl` — The maximum TTL value in the MPLS label for the LSP trace test, expressed as a decimal integer.

Values 1 — 255

Default 30

`max-paths max-paths` — The maximum number of paths for a ldp-treetrace test, expressed as a decimal integer.

Values 1 — 255

Default 128

`timeout timeout` — The **timeout** parameter in seconds, expressed as a decimal integer. This value is used to override the default timeout value and is the amount of time that the router will wait for a message reply after sending the message request. Upon the expiration of message timeout, the requesting router assumes that the message response will not be received. Any response received after the request times out will be silently discarded.

Values 1 — 60

Default 3

`fc fc-name` — The `fc` and `profile` parameters are used to indicate the forwarding class and profile of the MPLS echo request packet.

When an MPLS echo request packet is generated in CPM and is forwarded to the outgoing interface, the packet is queued in the egress network queue corresponding to the specified `fc` and `profile` parameter values. The marking of the packet's EXP is dictated by the LSP-EXP mappings on the outgoing interface.

When the MPLS echo request packet is received on the responding node, The `fc` and `profile` parameter values are dictated by the LSP-EXP mappings of the incoming interface.

When an MPLS echo reply packet is generated in CPM and is forwarded to the outgoing interface, the packet is queued in the egress network queue corresponding to the `fc` and `profile` parameter values determined by the classification of the echo request packet, which is being replied to, at the incoming interface. The marking of the packet's EXP is dictated by the LSP-EXP mappings on the outgoing interface. The TOS byte is not modified. [Table 12](#) summarizes this behavior:

Table 12: Request Packet and Behavior

cpm (sender node)	echo request packet: <ul style="list-style-type: none"> packet{tos=1, fc1, profile1} fc1 and profile1 are as entered by user in OAM command or default values tos1 as per mapping of {fc1, profile1} to IP precedence in network egress QoS policy of outgoing interface
outgoing interface (sender node)	echo request packet: <ul style="list-style-type: none"> pkt queued as {fc1, profile1} ToS field=tos1 not remarked EXP=exp1, as per mapping of {fc1, profile1} to EXP in network egress QoS policy of outgoing interface
Incoming interface (responder node)	echo request packet: <ul style="list-style-type: none"> packet{tos1, exp1} exp1 mapped to {fc2, profile2} as per classification in network QoS policy of incoming interface
cpm (responder node)	echo reply packet: <ul style="list-style-type: none"> packet{tos=1, fc2, profile2}
outgoing interface (responder node)	echo reply packet: <ul style="list-style-type: none"> pkt queued as {fc2, profile2} ToS field= tos1 not remarked (reply inband or out-of-band) EXP=exp2, if reply is inband, remarked as per mapping of {fc2, profile2} to EXP in network egress QoS policy of outgoing interface
Incoming interface (sender node)	echo reply packet: <ul style="list-style-type: none"> packet{tos1, exp2} exp2 mapped to {fc1, profile1} as per classification in network QoS policy of incoming interface

Values be, l2, af, l1, h2, ef, h1, nc

Default be

profile *profile* — The profile state of the MPLS echo request packet.

Values in, out

Default out

retry-count *retry-count* — Specifies the maximum number of consecutive MPLS echo requests, expressed as a decimal integer that do not receive a reply before the trace operation fails for a given TTL.

Values 1 — 255

Default 5

downstream-map-tlv {*dsmap*|*ddmap*} — Specifies which format of the downstream mapping TLV to use in the LSP trace packet. The DSMAP TLV is the original format in RFC 4379. The DDMAP is the new enhanced format specified in RFC 6424.

Default Inherited from global configuration of downstream mapping TLV in option **mpls-echo-request-downstream-map** {*dsmap* | *ddmap*}.

Sample Output

```
*A:Dut-A# oam ldp-treetrace prefix 10.20.1.6/32

ldp-treetrace for Prefix 10.20.1.6/32:

      127.0.0.1, ttl = 3 dst = 127.1.0.255 rc = EgressRtr status = Done
Hops: 127.0.0.1          127.0.0.1

      127.0.0.1, ttl = 3 dst = 127.2.0.255 rc = EgressRtr status = Done
Hops: 127.0.0.1          127.0.0.1

ldp-treetrace discovery state: Done
ldp-treetrace discovery status: ' OK '
Total number of discovered paths: 2
Total number of failed traces: 0
```

test-oam

Syntax **test-oam**

Context config

Description This command enables the context to configure Operations, Administration, and Maintenance test parameters.

ldp-treetrace

Syntax [**no**] **ldp-treetrace**

Context config>test-oam

Description This command creates the context to configure the the LDP ECMP OAM tree trace which consists of an LDP ECMP path discovery and an LDP ECMP path probing features.

The **no** option deletes the configuration for the LDP ECMP OAM tree discovery and path probing under this context.

Sample Output

Sample output over a numbered IP interface

```
*A:Dut-B# oam ldp-treetrace prefix 10.20.1.5/32

ldp-treetrace for Prefix 10.20.1.5/32:

    10.10.131.2, ttl = 2 dst = 127.1.0.253 rc = EgressRtr status = Done
Hops: 11.1.0.2

    10.10.132.2, ttl = 2 dst = 127.1.0.255 rc = EgressRtr status = Done
Hops: 11.1.0.2

    10.10.131.2, ttl = 2 dst = 127.2.0.255 rc = EgressRtr status = Done
Hops: 11.2.0.2

    10.10.132.2, ttl = 2 dst = 127.2.0.253 rc = EgressRtr status = Done
Hops: 11.2.0.2

ldp-treetrace discovery state: Done
ldp-treetrace discovery status: ' OK '
Total number of discovered paths: 4
Total number of failed traces: 0
```

Sample output over an unnumbered IP interface

```
*A:Dut-A# oam ldp-treetrace prefix 10.20.1.6/32 downstream-map-tlv dsmmap

ldp-treetrace for Prefix 10.20.1.6/32:

    127.0.0.1, ttl = 3 dst = 127.1.0.255 rc = EgressRtr status = Done
Hops: 127.0.0.1 127.0.0.1

    127.0.0.1, ttl = 3 dst = 127.2.0.255 rc = EgressRtr status = Done
Hops: 127.0.0.1 127.0.0.1

ldp-treetrace discovery state: Done
ldp-treetrace discovery status: ' OK '
Total number of discovered paths: 2
Total number of failed traces: 0
```

fc

Syntax **fc** *fc-name* [**profile** {**in** | **out**}]
no fc

Context config>test-oam>ldp-treetrace

Description This command indicates the forwarding class and profile of the MPLS echo request packet. When an MPLS echo request packet is generated in CPM and is forwarded to the outgoing interface, the packet is queued in the egress network queue corresponding to the specified fc and profile parameter values. The marking of the packet's EXP is dictated by the LSP-EXP mappings on the outgoing interface.

When the MPLS echo request packet is received on the responding node, The fc and profile parameter values are dictated by the LSP-EXP mappings of the incoming interface.

When an MPLS echo reply packet is generated in CPM and is forwarded to the outgoing interface, the packet is queued in the egress network queue corresponding to the fc and profile parameter values determined by the classification of the echo request packet, which is being replied to, at the incoming interface. The marking of the packet's EXP is dictated by the LSP-EXP mappings on the outgoing interface. The TOS byte is not modified. The following table summarizes this behavior:

Table 13: Request Packet and Behavior

cpm (sender node)	<p>echo request packet:</p> <ul style="list-style-type: none"> packet{tos=1, fc1, profile1} fc1 and profile1 are as entered by user in OAM command or default values tos1 as per mapping of {fc1, profile1} to IP precedence in network egress QoS policy of outgoing interface
outgoing interface (sender node)	<p>echo request packet:</p> <ul style="list-style-type: none"> pkt queued as {fc1, profile1} ToS field=tos1 not remarked EXP=exp1, as per mapping of {fc1, profile1} to EXP in network egress QoS policy of outgoing interface
Incoming interface (responder node)	<p>echo request packet:</p> <ul style="list-style-type: none"> packet{tos1, exp1} exp1 mapped to {fc2, profile2} as per classification in network QoS policy of incoming interface
cpm (responder node)	<p>echo reply packet:</p> <ul style="list-style-type: none"> packet{tos=1, fc2, profile2}
outgoing interface (responder node)	<p>echo reply packet:</p> <ul style="list-style-type: none"> pkt queued as {fc2, profile2} ToS filed= tos1 not remarked (reply inband or out-of-band) EXP=exp2, if reply is inband, remarked as per mapping of {fc2, profile2} to EXP in network egress QoS policy of outgoing interface
Incoming interface (sender node)	<p>echo reply packet:</p> <ul style="list-style-type: none"> packet{tos1, exp2} exp2 mapped to {fc1, profile1} as per classification in network QoS policy of incoming interface

Default be

Parameters *fc-name* — Specifies the forwarding class of the MPLS echo request packets.

Values be, l2, af, l1, h2, ef, h1, nc

profile {**in** | **out**} — Specifies the profile value to be used with the forwarding class specified in the *fc-name* parameter.

path-discovery

Syntax path-discovery

Context config>test-oam>ldp-treetrace

Description This command creates the context to configure the LDP ECMP OAM path discovery.

The ingress LER builds the ECM tree for a given FEC (egress LER) by sending LSP Trace messages and including the LDP IPv4 Prefix FEC TLV as well as the downstream mapping TLV. It inserts an IP address range drawn from the 127/8 space. When received by the downstream LSR, it uses this range to determine which ECMP path is exercised by any IP address or a sub-range of addresses within that range based on its internal hash routine. When the MPLS Echo reply is received by the ingress LER, it records this information and proceeds with the next echo request message targeted for a node downstream of the first LSR node along one of the ECMP paths. The sub-range of IP addresses indicated in the initial reply is used since the objective is to have the LSR downstream of the ingress LER pass this message to its downstream node along the first ECMP path.

The user configures the frequency of running the tree discovery using the command **config>test-oam>ldp-treetrace>path-discovery> interval**.

The ingress LER gets the list of FECs from the LDP FEC database. New FECs will be added to the discovery list at the next tree discovery and not when they are learnt and added into the FEC database. The maximum number of FECs to be discovered with the tree building feature is limited to 500. The user can configure FECs he/she wishes to include or exclude using a policy profile by applying the command **config>test-oam>ldp-treetrace>path-discovery>policy-statement**.

interval

Syntax interval *minutes*
no interval

Context config>test-oam>ldp-treetrace>path-discovery

Description This command configures the frequency of the LDP ECMP OAM path discovery. Every interval, the node will send LSP trace messages to attempt to discover the entire ECMP path tree for a given destination FEC.

The **no** option resets the interval to its default value.

Default 60

Parameters *minutes* — Specifies the number of minutes to wait before repeating the LDP tree auto discovery process.

Values 60 — 1440

max-path

Syntax	max-path <i>max-paths</i>
Context	config>test-oam>ldp-treetrace>path-discovery
Description	This command configures the maximum number of ECMP paths the path discovery will attempt to discover for each run every interval minutes. The no option resets the timeout to its default value.
Default	128
Parameters	<i>max-paths</i> — Specifies the tree discovery maximum path. Values 1 — 128

max-ttl

Syntax	max-ttl <i>ttl-value</i>
Context	config>test-oam>ldp-treetrace>path-discovery
Description	This command configures the maximum number of hops the path discovery will trace in the path of each FEC to be discovered. The no option resets the timeout to its default value.
Default	255
Parameters	<i>ttl-value</i> — Specifies the maximum label time-to-live value for an LSP trace request during the tree discovery. Values 1 — 255

policy-statement

Syntax	policy-statement <i>policy-name</i> [...(up to 5 max)]
Context	config>test-oam>ldp-treetrace>path-discovery
Description	This command configures the FEC policy to determine which routes are imported from the LDP FEC database for the purpose of discovering its paths and probing them. If no policy is specified, the ingress LER imports the full list of FECs from the LDP FEC database. New FECs will be added to the discovery list at the next path discovery and not when they are learnt and added into the FEC database. The maximum number of FECs to be discovered with path discovery is limited to 500. The user can configure FECs he/she wishes to include or exclude. Policies are configured in the config>router>policy-options context. A maximum of five policy names can be specified.

The **no** form of the command removes the policy from the configuration.

Default no policy-statement

Parameters *policy-name* — Specifies the route policy name to filter LDP imported address FECs. Allowed values are any string up to 32 characters long composed of printable, 7-bit ASCII characters. If the string contains special characters (#, \$, spaces, etc.), the entire string must be enclosed within double quotes. The specified policy name(s) must already be defined.

retry-count

Syntax **retry-count** *retry-count*
no **retry-count**

Context config>oam-test>ldp-treetrace>path-discovery
config>oam-test>ldp-treetrace>path-probing

Description In the path discovery phase of the LDP tree trace feature, this command configures the number of retransmissions of an LSP trace message to discover the path of an LDP FEC when no response is received within the **timeout** parameter.

In the path-probing phase of the LDP tree trace, this command configures the number of retransmissions of an LSP ping message to probe the path of an LDP FEC when no response is received within the **timeout** parameter.

The **no** option resets the retry count to its default value

Default 3

Parameters *retry-count* — Specifies the maximum number of consecutive timeouts allowed before failing a path probe (ping).

Values 1 — 10

timeout

Syntax **timeout** *timeout*
no **timeout**

Context config>test-oam>ldp-treetrace>path-discovery

Description This command configures the time the node waits for the response to an LSP Trace message discovering the path of an LDP FEC before it declares failure. After consecutive failures equal to the **retry-count** parameter, the node gives up.

The **no** option resets the timeout to its default value.

Default 30

Parameters *timeout* — Specifies the timeout parameter, in seconds, within a range of 1 to 60, expressed as a decimal integer.

Values 1—60

path-probing

Syntax **path-probing**

Context config>test-oam>ldp-treetrace

Description This command creates the context to configure the LDP tree trace path probing phase.

The periodic path exercising runs in the background to test the LDP ECMP paths discovered by the path discovery capability. The probe used is an LSP Ping message with an IP address drawn from the sub-range of 127/8 addresses indicated by the output of the tree discovery for this FEC.

The user configures the frequency of running the path probes using the command **config>test-oam>ldp-treetrace> path-probing> interval**. If an I/F is down on the ingress LER performing the LDP tree trace, then LSP Ping probes that normally go out this interface will not be sent but the ingress LER node will not raise alarms.

The LSP Ping routine should update the content of the MPLS echo request message, specifically the IP address, as soon as the LDP ECMP path discovery phase has output the results of a new computation for the path in question.

interval

Syntax **interval** *minutes*
no interval

Context config>test-oam>ldp-treetrace>path-probing

Description This command configures the frequency of the LSP Ping messages used in the path probing phase to probe the paths of all LDP FECs discovered by by the LDP tree trace path discovery.

The no option resets the interval to its default value.

Default 1

Parameters *minutes* — Specifies the number of minutes to probe all active ECMP paths for each LDP FEC.

Values 1 — 60

timeout

Syntax	timeout <i>timeout</i> no timeout
Context	config>test-oam>ldp-treetrace>path-probing
Description	<p>This command configures the time the node waits for the response to an LSP Ping message probing the path of an LDP FEC before it declares failure. After consecutive failures equal to the retry-count parameter, the node gives up.</p> <p>The no option resets the timeout to its default value.</p>
Default	1
Parameters	<i>timeout</i> — Specifies the timeout parameter, in minutes, with a range of 1 to 3 minutes, expressed as a decimal integer.
Values	1—3

mpls-time-stamp-format

Syntax	mpls-time-stamp-format { rfc4379 unix }
Context	config>test-oam
Description	<p>This command configures the format of the timestamp used by for lsp-ping, lsp-trace, p2mp-lsp-ping and p2mp-lsp-trace, vccv-ping, vccv-trace, and lsp-trace.</p> <p>If rfc4379 is selected, then the timestamp is in seconds and microseconds since 1900, otherwise it is in seconds and microseconds since 1970.</p> <p>Changing this system-wide setting does not affect tests that are currently in progress, but SAAs will start to use the new timestamp when they are restarted. When an SR OS node receives an echo request, it will reply with the locally configured timestamp format, and will not try to match the timestamp format of the incoming echo request message.</p>
Default	unix
Parameters	<p>rfc4379 — specifies the RFC 4379 time stamp format. The time stamp's <i>seconds</i> field holds the integral number of seconds since 1-Jan-1900 00:00:00 UTC. The time stamp's <i>microseconds</i> field contains a microseconds value in the range 0 — 999999. This setting is used to interoperate with network elements which are fully compliant with RFC 4379, <i>Detecting Multi-Protocol Label Switched (MPLS) Data Plane Failures</i>, (such as an SR-OS system with the same setting, or any other RFC 4379 compliant router).</p> <p>unix — specifies the Unix time stamp format. The time stamps <i>seconds</i> field holds a Unix time, the integral number of seconds since 1-Jan-1970 00:00:00 UTC. The time stamps <i>microseconds</i> field contains a microseconds value in the range 0 — 999999. This setting is used to interoperate with network elements which send and expect a 1970-based timestamp in MPLS Echo Request/Reply PDUs (such as an SR-OS system with the same setting, or an SROS system running software earlier than R8.0 R4).</p>

mpls-echo-request-downstream-map

Syntax **mpls-echo-request-downstream-map {dsmap | ddmap}**
no mpls-echo-request-downstream-map

Context config>test-oam

Description This command specifies which format of the downstream mapping TLV to use in all LSP trace packets and LDP tree trace packets originated on this node. The Downstream Mapping (DSMAP) TLV is the original format in RFC 4379 and is the default value. The new Downstream Detailed Mapping (DDMAP) TLV is the new enhanced format specified in RFC 6424.

This command applies to LSP trace of an RSVP P2P LSP, a MPLS-TP LSP, or LDP unicast FEC, and to LDP tree trace of a unicast LDP FEC. It does not apply to LSP trace of an RSVP P2MP LSP which always uses the DDMAP TLV.

The global DSMAP/DDMAP setting impacts the behavior of both OAM LSP trace packets and SAA test packets of type lsp-trace and is used by the sender node when one of the following events occurs:

1. An SAA test of type **lsp-trace** is created (not modified) and no value is specified for the per-test **downstream-map-tlv {dsmap|ddmap|none}** option. In this case, the SAA test **downstream-map-tlv** value defaults to the global **mpls-echo-request-downstream-map** value.
2. An OAM test of type **lsp-trace** test is executed and no value is specified for the per-test **downstream-map-tlv {dsmap|ddmap|none}** option. In this case, the OAM test **downstream-map-tlv** value defaults to the global **mpls-echo-request-downstream-map** value.

A consequence of the rules above is that a change to the value of **mpls-echo-request-downstream-map** option does not affect the value inserted in the downstream mapping TLV of existing tests.

Following are the details of the processing of the new DDMAP TLV:

1. When either the DSMAP TLV or the DDMAP TLV is received in an echo request message, the responder node will include the same type of TLV in the echo reply message with the proper downstream interface information and label stack information.
2. If an echo request message without a Downstream Mapping TLV (DSMAP or DDMAP) expires at a node which is not the egress for the target FEC stack, the responder node always includes the DSMAP TLV in the echo reply message. This can occur in the following cases:
 - a. The user issues a LSP trace from a sender node with a **min-ttl** value higher than 1 and a **max-ttl** value lower than the number of hops to reach the egress of the target FEC stack. This is the sender node behavior when the global configuration or the per-test setting of the DSMAP/DDMAP is set to DSMAP.
 - b. The user issues a LSP ping from a sender node with a **tth** value lower than the number of hops to reach the egress of the target FEC stack. This is the sender node behavior when the global configuration of the DSMAP/DDMAP is set to DSMAP.
 - c. The behavior in (a) is changed when the global configuration or the per-test setting of the Downstream Mapping TLV is set to DDMAP. The sender node will include in this case the DDMAP TLV with the Downstream IP address field set to the all-routers multicast address as per Section 3.3 of RFC 4379. The responder node then bypasses the interface and label stack validation and replies with a DDMAP TLV with the correct downstream information for the target FEC stack.

3. A sender node never includes the DSMAP or DDMAP TLV in an lsp-ping message.

In addition to performing the same features as the DSMAP TLV, the new DDMAP TLV addresses the following scenarios:

1. Full validation of an LDP FEC stitched to a BGP IPv4 label route. In this case, the LSP trace message is inserted from the LDP LSP segment or from the stitching point.
2. Full validation of a BGP IPv4 label route stitched to an LDP FEC. This includes the case of explicit configuration of the LDP-BGP stitching in which the BGP label route is active in Route Table Manager (RTM) and the case of a BGP IPv4 label route resolved to the LDP FEC due to the IGP route of the same prefix active in RTM. In this case, the LSP trace message is inserted from the BGP LSP segment or from the stitching point.
3. Full validation of an LDP FEC which is stitched to a BGP LSP and stitched back into an LDP FEC. In this case, the LSP trace message is inserted from the LDP segments or the or from the stitching points.
4. Full validation of an LDP FEC tunneled over an RSVP LSP using LSP trace.

In order to properly check a target FEC which is stitched to another FEC (stitching FEC) of the same or a different type, or which is tunneled over another FEC (tunneling FEC), it is necessary for the responding nodes to provide details about the FEC manipulation back to the sender node. This is achieved via the use of the new FEC stack change sub-TLV in the Downstream Detailed Mapping TLV (DDMAP) defined in RFC 6424.

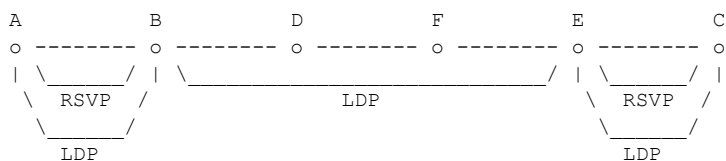
When the user configures the use of the DDMAP TLV on a trace for an LSP that does not undergo stitching or tunneling operation in the network, the procedures at the sender and responder nodes are the same as in the case of the DSMAP TLV.

This feature however introduces changes to the target FEC stack validation procedures at the sender and responder nodes in the case of LSP stitching and LSP hierarchy. These changes pertain to the processing of the new FEC stack change sub-TLV in the new DDMAP TLV and the new return code of value 15 Label switched with FEC change.

The **no** form of this command reverts to the default behavior of using the DSMAP TLV in a LSP trace packet and LDP tree trace packet.

Default **dsmap**

Output **LDP-over-RSVP**



Testing LDP FEC of Node C with DSMAP TLV

```

-----
*A:Dut-A#
*A:Dut-A# oam lsp-trace prefix 10.20.1.3/32 downstream-map-tlv dsmap detail
lsp-trace to 10.20.1.3/32: 0 hops min, 0 hops max, 104 byte packets
1 10.20.1.2 rtt=3.90ms rc=8(DSRtrMatchLabel) rsc=1
   DS 1: ipaddr=10.10.4.4 ifaddr=10.10.4.4 iftype=ipv4Numbered MRU=1500
        label[1]=131068 protocol=3(LDP)
2 10.20.1.4 rtt=5.69ms rc=8(DSRtrMatchLabel) rsc=1
   DS 1: ipaddr=10.10.9.6 ifaddr=10.10.9.6 iftype=ipv4Numbered MRU=1500
        label[1]=131066 protocol=3(LDP)

```



```

3 10.20.1.6 rtt=7.88ms rc=8(DSRtrMatchLabel) rsc=1
   DS 1: ipaddr=10.10.10.5 ifaddr=10.10.10.5 iftype=ipv4Numbered MRU=1500
         label[1]=131060 protocol=3(LDP)
4 10.20.1.5 rtt=23.2ms rc=8(DSRtrMatchLabel) rsc=1
   DS 1: ipaddr=10.10.5.3 ifaddr=10.10.5.3 iftype=ipv4Numbered MRU=1496
         label[1]=131071 protocol=3(LDP)
5 10.20.1.3 rtt=12.0ms rc=3(EgressRtr) rsc=1
*A:Dut-A#

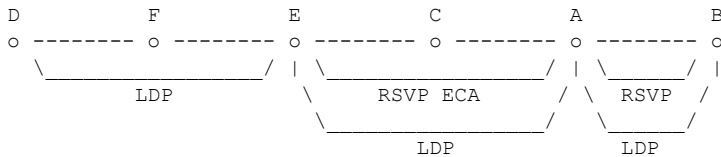
```

Testing LDP FEC of Node C with DDMAP TLV

```

-----
*A:Dut-A# oam lsp-trace prefix 10.20.1.3/32 downstream-map-tlv ddmmap detail
lsp-trace to 10.20.1.3/32: 0 hops min, 0 hops max, 136 byte packets
1 10.20.1.2 rtt=4.00ms rc=3(EgressRtr) rsc=2
1 10.20.1.2 rtt=3.48ms rc=8(DSRtrMatchLabel) rsc=1
   DS 1: ipaddr=10.10.4.4 ifaddr=10.10.4.4 iftype=ipv4Numbered MRU=1500
         label[1]=131068 protocol=3(LDP)
2 10.20.1.4 rtt=5.34ms rc=8(DSRtrMatchLabel) rsc=1
   DS 1: ipaddr=10.10.9.6 ifaddr=10.10.9.6 iftype=ipv4Numbered MRU=1500
         label[1]=131066 protocol=3(LDP)
3 10.20.1.6 rtt=7.78ms rc=8(DSRtrMatchLabel) rsc=1
   DS 1: ipaddr=10.10.10.5 ifaddr=10.10.10.5 iftype=ipv4Numbered MRU=1500
         label[1]=131060 protocol=3(LDP)
4 10.20.1.5 rtt=12.8ms rc=15(LabelSwitchedWithFecChange) rsc=1
   DS 1: ipaddr=10.10.5.3 ifaddr=10.10.5.3 iftype=ipv4Numbered MRU=1496
         label[1]=131054 protocol=4(RSVP-TE)
         label[2]=131071 protocol=3(LDP)
         fecchange[1]=PUSH fectype=RSVP IPv4 prefix=10.20.1.3 remotepeer=10.10.5.3
5 10.20.1.3 rtt=12.8ms rc=3(EgressRtr) rsc=2
5 10.20.1.3 rtt=13.4ms rc=3(EgressRtr) rsc=1
*A:Dut-A#

```



Testing LDP FEC of Node B with DDMAP TLV

```

-----
*A:Dut-D#
*A:Dut-D# oam lsp-trace prefix 10.20.1.2/32 downstream-map-tlv ddmmap detail
lsp-trace to 10.20.1.2/32: 0 hops min, 0 hops max, 108 byte packets
1 10.20.1.6 rtt=3.17ms rc=8(DSRtrMatchLabel) rsc=1
   DS 1: ipaddr=10.10.10.5 ifaddr=10.10.10.5 iftype=ipv4Numbered MRU=1500
         label[1]=131065 protocol=3(LDP)
2 10.20.1.5 rtt=8.27ms rc=15(LabelSwitchedWithFecChange) rsc=1
   DS 1: ipaddr=10.10.5.3 ifaddr=10.10.5.3 iftype=ipv4Numbered MRU=1496
         label[1]=131068 protocol=4(RSVP-TE)
         label[2]=131065 protocol=3(LDP)
         fecchange[1]=PUSH fectype=RSVP IPv4 prefix=10.20.1.1 remotepeer=10.10.5.3
3 10.20.1.3 rtt=9.50ms rc=8(DSRtrMatchLabel) rsc=2
   DS 1: ipaddr=10.10.2.1 ifaddr=10.10.2.1 iftype=ipv4Numbered MRU=1500
         label[1]=131068 protocol=4(RSVP-TE)
4 10.20.1.1 rtt=10.4ms rc=3(EgressRtr) rsc=2

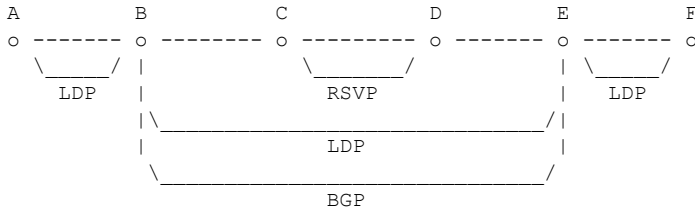
```

```

4 10.20.1.1 rtt=10.2ms rc=15(LabelSwitchedWithFecChange) rsc=1
   DS 1: ipaddr=10.10.1.2 ifaddr=10.10.1.2 iftype=ipv4Numbered MRU=1496
       label[1]=131066 protocol=4(RSVP-TE)
       label[2]=131071 protocol=3(LDP)
       fecchange[1]=PUSH fectype=RSVP IPv4 prefix=10.20.1.2 remotepeer=10.10.1.2
5 10.20.1.2 rtt=13.7ms rc=3(EgressRtr) rsc=2
5 10.20.1.2 rtt=13.6ms rc=3(EgressRtr) rsc=1
*A:Dut-D#

```

LDP-BGP Stitching



Testing LDP FEC of Node F with DSMAP TLV

```

-----
*A:Dut-A# *A:Dut-A# oam lsp-trace prefix 10.20.1.6/32 downstream-map-tlv dsmap detail lsp-
trace to 10.20.1.6/32: 0 hops min, 0 hops max, 104 byte packets
1 10.20.1.2 rtt=2.65ms rc=8(DSRtrMatchLabel) rsc=1
2 10.20.1.3 rtt=4.89ms rc=8(DSRtrMatchLabel) rsc=1
3 10.20.1.4 rtt=6.49ms rc=5(DSMappingMismatched) rsc=1
*A:Dut-A#

```

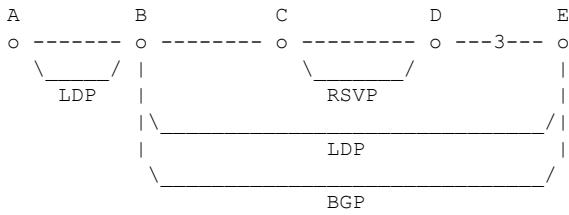
Testing LDP FEC of Node F with DDMAP TLV

```

-----
*A:Dut-A# oam lsp-trace prefix 10.20.1.6/32 downstream-map-tlv ddmmap detail lsp-trace to
10.20.1.6/32: 0 hops min, 0 hops max, 108 byte packets
1 10.20.1.2 rtt=3.50ms rc=15(LabelSwitchedWithFecChange) rsc=1
   DS 1: ipaddr=10.10.3.3 ifaddr=10.10.3.3 iftype=ipv4Numbered MRU=1496
       label[1]=131068 protocol=3(LDP)
       label[2]=131060 protocol=2(BGP)
       fecchange[1]=POP fectype=LDP IPv4 prefix=10.20.1.6 remotepeer=0.0.0.0
(Unknown)
       fecchange[2]=PUSH fectype=BGP IPv4 prefix=10.20.1.6 remotepeer=10.20.1.5
       fecchange[3]=PUSH fectype=LDP IPv4 prefix=10.20.1.5 remotepeer=10.10.3.3
2 10.20.1.3 rtt=6.53ms rc=15(LabelSwitchedWithFecChange) rsc=2
   DS 1: ipaddr=10.10.11.4 ifaddr=10.10.11.4 iftype=ipv4Numbered MRU=1496
       label[1]=131060 protocol=4(RSVP-TE)
       label[2]=131070 protocol=3(LDP)
       label[3]=131060 protocol=2(BGP)
       fecchange[1]=PUSH fectype=RSVP IPv4 prefix=10.20.1.4 remotepeer=10.10.11.4
3 10.20.1.4 rtt=7.94ms rc=3(EgressRtr) rsc=3
3 10.20.1.4 rtt=6.69ms rc=8(DSRtrMatchLabel) rsc=2
   DS 1: ipaddr=10.10.6.5 ifaddr=10.10.6.5 iftype=ipv4Numbered MRU=1500
       label[1]=131071 protocol=3(LDP)
       label[2]=131060 protocol=2(BGP)
4 10.20.1.5 rtt=10.1ms rc=3(EgressRtr) rsc=2
4 10.20.1.5 rtt=8.97ms rc=15(LabelSwitchedWithFecChange) rsc=1
   DS 1: ipaddr=10.10.10.6 ifaddr=10.10.10.6 iftype=ipv4Numbered MRU=1500
       label[1]=131071 protocol=3(LDP)
       fecchange[1]=POP fectype=BGP IPv4 prefix=10.20.1.6 remotepeer=0.0.0.0
(Unknown)
       fecchange[2]=PUSH fectype=LDP IPv4 prefix=10.20.1.6 remotepeer=10.10.10.6

```

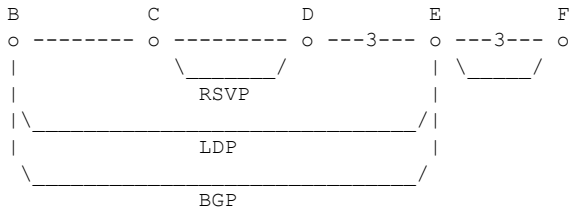
5 10.20.1.6 rtt=11.8ms rc=3(EgressRtr) rsc=1 *A:Dut-A#



Testing BGP Label Route of Node E with DDMAP TLV

```

-----
*A:Dut-B# oam lsp-trace prefix 11.20.1.5/32 bgp-label downstream-map-tlv ddmap detail lsp-
trace to 11.20.1.5/32: 0 hops min, 0 hops max, 124 byte packets
1 10.20.1.3 rtt=2.35ms rc=15(LabelSwitchedWithFecChange) rsc=2
  DS 1: ipaddr=10.10.11.4 ifaddr=10.10.11.4 iftype=ipv4Numbered MRU=1496
        label[1]=131060 protocol=4(RSVP-TE)
        label[2]=131070 protocol=3(LDP)
        label[3]=131070 protocol=2(BGP)
        fecchange[1]=PUSH fectype=RSVP IPv4 prefix=10.20.1.4 remotepeer=10.10.11.4
2 10.20.1.4 rtt=4.17ms rc=3(EgressRtr) rsc=3
2 10.20.1.4 rtt=4.50ms rc=8(DSRtrMatchLabel) rsc=2
  DS 1: ipaddr=10.10.6.5 ifaddr=10.10.6.5 iftype=ipv4Numbered MRU=1500
        label[1]=131071 protocol=3(LDP)
        label[2]=131070 protocol=2(BGP)
3 10.20.1.5 rtt=7.78ms rc=3(EgressRtr) rsc=2
3 10.20.1.5 rtt=6.80ms rc=3(EgressRtr) rsc=1 *A:Dut-B#
    
```



Testing with DDMAP TLV LDP FEC of Node F when stitched to a BGP Label Route

```

-----
*A:Dut-B# oam lsp-trace prefix 10.20.1.6/32 bgp-label downstream-map-tlv ddmap detail lsp-
trace to 10.20.1.6/32: 0 hops min, 0 hops max, 124 byte packets
1 10.20.1.3 rtt=3.21ms rc=15(LabelSwitchedWithFecChange) rsc=2
  DS 1: ipaddr=10.10.11.4 ifaddr=10.10.11.4 iftype=ipv4Numbered MRU=1496
        label[1]=131060 protocol=4(RSVP-TE)
        label[2]=131070 protocol=3(LDP)
        label[3]=131060 protocol=2(BGP)
        fecchange[1]=PUSH fectype=RSVP IPv4 prefix=10.20.1.4 remotepeer=10.10.11.4
2 10.20.1.4 rtt=5.50ms rc=3(EgressRtr) rsc=3
2 10.20.1.4 rtt=5.37ms rc=8(DSRtrMatchLabel) rsc=2
  DS 1: ipaddr=10.10.6.5 ifaddr=10.10.6.5 iftype=ipv4Numbered MRU=1500
        label[1]=131071 protocol=3(LDP)
        label[2]=131060 protocol=2(BGP)
3 10.20.1.5 rtt=7.82ms rc=3(EgressRtr) rsc=2
3 10.20.1.5 rtt=6.11ms rc=15(LabelSwitchedWithFecChange) rsc=1
  DS 1: ipaddr=10.10.10.6 ifaddr=10.10.10.6 iftype=ipv4Numbered MRU=1500
        label[1]=131071 protocol=3(LDP)
        fecchange[1]=POP fectype=BGP IPv4 prefix=10.20.1.6 remotepeer=0.0.0.0
    
```

```
(Unknown)
fecchange[2]=PUSH fectype=LDP IPv4 prefix=10.20.1.6 remotepeer=10.10.10.6
4 10.20.1.6 rtt=10.2ms rc=3(EgressRtr) rsc=1 *A:Dut-B#
```

twamp

Syntax **twamp**

Context config>oam-test

Description This command enables TWAMP functionality.

Default TWAMP is disabled.

server

Syntax **retry-count** *retry-count*

Context config>test-oam>twamp

Description This command configures the node for TWAMP server functionality.

Default TWAMP is disabled.

prefix

Syntax **prefix** *address/prefix-length* [**create**]
no prefix *address/prefix-length*

Context config>test-oam>twamp>server

Description This command configures an IP address prefix containing one or more TWAMP clients. In order for a TWAMP client to connect to the TWAMP server (and subsequently conduct tests) it must establish the control connection using an IP address that is part of a configured prefix. The server must be shutdown in order to add or delete a prefix.

Default no prefix

Parameters *address* — An IPv4 or IPv6 address prefix (with host bits set to 0).

prefix length — The prefix length.

Values 0—128

Default none

max-conn-prefix

Syntax **max-conn-prefix** *count*
no max-conn-prefix

Context config>test-oam>twamp>server>prefix

Description This command configures the maximum number of control connections by clients with an IP address in a specific prefix. A new control connection is rejected if accepting it would cause either the prefix limit defined by this command or the server limit (max-conn-server) to be exceeded.

The **no** form of the command sets the default value (32).

Default no max-conn-prefix

Parameters *count* — The maximum number of control connections.

Values 0 — 64

Default 32

max-conn-server

Syntax **max-conn-server** *count*
no max-conn-server

Context config>test-oam>twamp>server

Description This command configures the maximum number of TWAMP control connections from all TWAMP clients. A new control connection is rejected if accepting it would cause either this limit or a prefix limit (max-conn-prefix) to be exceeded.

The **no** form of the command sets the default value (32).

Default no max-conn-server

Parameters *count* — The maximum number of control connections.

Values 0 — 64

Default 32

inactivity-timeout

Syntax **inactivity-timeout** *seconds*
no inactivity-timeout

Context config>test-oam>twamp>server

Description This command configures the inactivity timeout for all TWAMP-control connections. If no TWAMP control message is exchanged over the TCP connection for this duration of time the connection is closed and all in-progress tests are terminated.

The no form of the command instructs the system to go with the default value of 1800 seconds.

Default no inactivity-timeout

Parameters *retry-count* — The duration of the inactivity timeout.

Values 0 — 3600

Default 1800

max-sess-prefix

Syntax **max-sess-prefix** *count*
no max-sess-prefix

Context config>test-oam>twamp>server>prefix

Description This command configures the maximum number of concurrent TWAMP-Test sessions by clients with an IP address in a specific prefix. A new test session (described by a Request-TW-Session message) is rejected if accepting it would cause either the limit defined by this command or the server limit (max-sess-server) to be exceeded.

The **no** form of the command means to go with a default value of 32.

Default no max-sess-prefix

Parameters *count* — The maximum number of concurrent test sessions.

Values 0 — 128

Default 32

max-sess-server

Syntax **max-sess-server** *count*
no max-sess-server

Context config>test-oam>twamp>server

Description This command configures the maximum number of concurrent TWAMP-Test sessions across all allowed clients. A new test session (described by a Request-TW-Session message) is rejected if accepting it would cause either the limit defined by this command or a prefix limit (max-sess-prefix) to be exceeded.

The **no** form of the command means to go with a default value of 32.

Default no max-sessions

Parameters *count* — The maximum number of concurrent test sessions.

Values 0 — 128

Default 32

Show Commands

saa

Syntax `saa [test-name] [owner test-owner]`

Context `show>saa`

Description Use this command to display information about the SAA test.
 If no specific test is specified a summary of all configured tests is displayed.
 If a specific test is specified then detailed test results for that test are displayed for the last three occurrences that this test has been executed, or since the last time the counters have been reset via a system reboot or clear command.

Parameters *test-name* — Enter the name of the SAA test for which the information needs to be displayed. The test name must already be configured in the `config>saa>test` context.

This is an optional parameter.

owner test-owner — Specifies the owner of an SAA operation up to 32 characters in length.

Values 32 characters maximum.

Default If a *test-owner* value is not specified, tests created by the CLI have a default owner “TIMOS CLP”.

Output **SAA Output** — The following table provides SAA field descriptions.

Label	Description
Test Name	Specifies the name of the test.
Owner Name	Specifies the owner of the test.
Description	Specifies the description for the test type.
Accounting policy	Specifies the associated accounting policy ID.
Administrative status	Specifies whether the administrative status is enabled or disabled.
Test type	Specifies the type of test configured.
Trap generation	Specifies the trap generation for the SAA test.
Test runs since last clear	Specifies the total number of tests performed since the last time the tests were cleared.
Number of failed tests run	Specifies the total number of tests that failed.

Label	Description (Continued)
Last test run	Specifies the last time a test was run.
Threshold type	Indicates the type of threshold event being tested, jitter-event, latency-event, or loss-event, and the direction of the test responses received for a test run: in — inbound out — outbound rt — roundtrip
Direction	Indicates the direction of the event threshold, rising or falling.
Threshold	Displays the configured threshold value.
Value	Displays the measured crossing value that triggered the threshold crossing event.
Last event	Indicates the time that the threshold crossing event occurred.
Run #	Indicates what test run produced the specified values.

Sample Output

```
*A:bksim130>config>saa>test>trap-gen# show saa mySaaPingTest1
=====
SAA Test Information
=====
Test name           : mySaaPingTest1
Owner name          : TiMOS CLI
Description         : N/A
Accounting policy   : None
Administrative status : Disabled
Test type           : icmp-ping 11.22.33.44
Trap generation     : probe-fail-enable probe-fail-threshold 3
                   : test-fail-enable test-fail-threshold 2
                   : test-completion-enable

Test runs since last clear : 0
Number of failed test runs : 0
Last test result        : Undetermined
-----
Threshold
Type      Direction Threshold Value      Last Event      Run #
-----
Jitter-in Rising      None      None      Never           None
          Falling    None      None      Never           None
Jitter-out Rising      None      None      Never           None
          Falling    None      None      Never           None
Jitter-rt  Rising      None      None      Never           None
          Falling    None      None      Never           None
Latency-in Rising      None      None      Never           None
          Falling    None      None      Never           None
Latency-out Rising      None      None      Never           None
          Falling    None      None      Never           None
```



```

Latency-rt  Rising   None    None    Never   None
             Falling  None    None    Never   None
Loss-in     Rising   None    None    Never   None
             Falling  None    None    Never   None
Loss-out    Rising   None    None    Never   None
             Falling  None    None    Never   None
Loss-rt     Rising   None    None    Never   None
             Falling  None    None    Never   None
    
```

```

=====
*A:bksim130>config>saa>test>trap-gen#
    
```

```

*A:bksim130>config>saa>test>trap-gen$ show saa mySaaTraceRouteTest1
    
```

```

=====
SAA Test Information
=====
    
```

```

Test name           : mySaaTraceRouteTest1
Owner name          : TiMOS CLI
Description         : N/A
Accounting policy   : None
Administrative status : Disabled
Test type           : icmp-trace 11.22.33.44
Trap generation     : test-fail-enable test-completion-enable
Test runs since last clear : 0
Number of failed test runs : 0
Last test result    : Undetermined
    
```

```

-----
Threshold
    
```

Type	Direction	Threshold	Value	Last Event	Run #
Jitter-in	Rising	None	None	Never	None
	Falling	None	None	Never	None
Jitter-out	Rising	None	None	Never	None
	Falling	None	None	Never	None
Jitter-rt	Rising	None	None	Never	None
	Falling	None	None	Never	None
Latency-in	Rising	None	None	Never	None
	Falling	None	None	Never	None
Latency-out	Rising	None	None	Never	None
	Falling	None	None	Never	None
Latency-rt	Rising	None	None	Never	None
	Falling	None	None	Never	None
Loss-in	Rising	None	None	Never	None
	Falling	None	None	Never	None
Loss-out	Rising	None	None	Never	None
	Falling	None	None	Never	None
Loss-rt	Rising	None	None	Never	None
	Falling	None	None	Never	None

```

=====
*A:bksim130>config>saa>test>trap-gen$
    
```

```

show saa <test-name>
    
```

```

CFM Loopback:
    
```

```

=====
SAA Test Information
=====
    
```

```

Test name           : CFMLoopbackTest
    
```

```

Owner name           : TiMOS CLI
Description          : N/A
Accounting policy    : 1
Continuous           : Yes
Administrative status : Enabled
Test type            : eth-cfm-loopback 00:01:01:01:01:01 mep 1 domain 1 asso-
ciation 1 interval 1 count 10
Trap generation      : None
Test runs since last clear : 1
Number of failed test runs : 0
Last test result     : Success

```

```
-----
```

Threshold Type	Direction	Threshold	Value	Last Event	Run #
Jitter-in	Rising	None	None	Never	None
	Falling	None	None	Never	None
Jitter-out	Rising	None	None	Never	None
	Falling	None	None	Never	None
Jitter-rt	Rising	None	None	Never	None
	Falling	None	None	Never	None
Latency-in	Rising	None	None	Never	None
	Falling	None	None	Never	None
Latency-out	Rising	None	None	Never	None
	Falling	None	None	Never	None
Latency-rt	Rising	None	None	Never	None
	Falling	None	None	Never	None
Loss-in	Rising	None	None	Never	None
	Falling	None	None	Never	None
Loss-out	Rising	None	None	Never	None
	Falling	None	None	Never	None
Loss-rt	Rising	None	None	Never	None
	Falling	None	None	Never	None

```
-----
```

```

Test Run: 1
Total number of attempts: 10
Number of requests that failed to be sent out: 0
Number of responses that were received: 10
Number of requests that did not receive any response: 0
Total number of failures: 0, Percentage: 0

```

(in us)	Min	Max	Average	Jitter
Outbound :	0.000	0.000	0.000	0
Inbound :	0.000	0.000	0.000	0
Roundtrip :	10200	10300	10250	100

```
Per test packet:
```

Sequence	Result	Delay(us)
1	Response Received	10300
2	Response Received	10300
3	Response Received	10300
4	Response Received	10200
5	Response Received	10300
6	Response Received	10200
7	Response Received	10300
8	Response Received	10200
9	Response Received	10300
10	Response Received	10300

```
-----
```

```
CFM Traceroute:
```

```

=====
SAA Test Information
=====
Test name           : CFMLinkTraceTest
Owner name          : TiMOS CLI
Description         : N/A
Accounting policy   : None
Continuous         : Yes
Administrative status : Enabled
Test type          : eth-cfm-linktrace 8A:DB:01:01:00:02 mep 1 domain 1
association 1 interval 1
Trap generation     : None
Test runs since last clear : 1
Number of failed test runs : 0
Last test result    : Success
=====

```

```

-----
Threshold
-----

```

Type	Direction	Threshold	Value	Last Event	Run #
Jitter-in	Rising	None	None	Never	None
	Falling	None	None	Never	None
Jitter-out	Rising	None	None	Never	None
	Falling	None	None	Never	None
Jitter-rt	Rising	None	None	Never	None
	Falling	None	None	Never	None
Latency-in	Rising	None	None	Never	None
	Falling	None	None	Never	None
Latency-out	Rising	None	None	Never	None
	Falling	None	None	Never	None
Latency-rt	Rising	None	None	Never	None
	Falling	None	None	Never	None
Loss-in	Rising	None	None	Never	None
	Falling	None	None	Never	None
Loss-out	Rising	None	None	Never	None
	Falling	None	None	Never	None
Loss-rt	Rising	None	None	Never	None
	Falling	None	None	Never	None

```

-----

```

```

=====
Test Run: 1
HopIdx: 1
Total number of attempts: 3
Number of requests that failed to be sent out: 0
Number of responses that were received: 3
Number of requests that did not receive any response: 0
Total number of failures: 0, Percentage: 0
(in ms)           Min           Max           Average       Jitter
Outbound  :           0.000       0.000       0.000       0.000
Inbound   :           0.000       0.000       0.000       0.000
Roundtrip :           2.86        3.67        3.15        0.047
Per test packet:
  Sequence   Outbound   Inbound   RoundTrip Result
           1         0.000     0.000     3.67 Response Received
           2         0.000     0.000     2.92 Response Received
           3         0.000     0.000     2.86 Response Received
=====

```

```

HopIdx: 2
Total number of attempts: 3
Number of requests that failed to be sent out: 0
Number of responses that were received: 3
=====

```

Number of requests that did not receive any response: 0

Total number of failures: 0, Percentage: 0

(in ms)	Min	Max	Average	Jitter
Outbound :	0.000	0.000	0.000	0.000
Inbound :	0.000	0.000	0.000	0.000
Roundtrip :	4.07	4.13	4.10	0.005

Per test packet:

Sequence	Outbound	Inbound	RoundTrip	Result
1	0.000	0.000	4.10	Response Received
2	0.000	0.000	4.13	Response Received
3	0.000	0.000	4.07	Response Received

=====
CFM Two Way Delay Measurement:
=====

SAA Test Information
=====

Test name : CFMTwoWayDelayTest
Owner name : TiMOS CLI
Description : N/A
Accounting policy : None
Continuous : Yes
Administrative status : Enabled
Test type : eth-cfm-two-way-delay 00:01:01:01:01:01 mep 1 domain
1 association 1 interval 1
Trap generation : None
Test runs since last clear : 1
Number of failed test runs : 0
Last test result : Success

Threshold

Type	Direction	Threshold	Value	Last Event	Run #
Jitter-in	Rising	None	None	Never	None
	Falling	None	None	Never	None
Jitter-out	Rising	None	None	Never	None
	Falling	None	None	Never	None
Jitter-rt	Rising	None	None	Never	None
	Falling	None	None	Never	None
Latency-in	Rising	None	None	Never	None
	Falling	None	None	Never	None
Latency-out	Rising	None	None	Never	None
	Falling	None	None	Never	None
Latency-rt	Rising	None	None	Never	None
	Falling	None	None	Never	None
Loss-in	Rising	None	None	Never	None
	Falling	None	None	Never	None
Loss-out	Rising	None	None	Never	None
	Falling	None	None	Never	None
Loss-rt	Rising	None	None	Never	None
	Falling	None	None	Never	None

...
=====

Test Run: 1

HopIdx: 1

Total number of attempts: 3

Number of requests that failed to be sent out: 0

Number of responses that were received: 3

Number of requests that did not receive any response: 0

Total number of failures: 0, Percentage: 0

```

Total number of failures: 0, Percentage: 0
(in us)           Min           Max           Average       Jitter
Outbound  :       5095         5095         5095          0
Inbound   :       5095         5095         0.000         0
Roundtrip :      10190        10190        10190         0
Per test packet:
  Sequence (in us) Outbound   Inbound   Delay   Delay variation
      1           5195         5195    10190         0
      2           5195         5195    10190         0
      3           5195         5195    10190         0
...
=====

```

ldp-treetrace

Syntax `ldp-treetrace [prefix ip-prefix/mask] [detail]`

Context `show>test-oam`

Description This command displays OAM LDP treetrace information.

Parameters `prefix ip-prefix/mask` — Specifies the address prefix and subnet mask of the destination node.
detail — Displays detailed information.

Sample Output

```

*A:ALA-48# show test-oam ldp-treetrace
Admin State           : Up           Discovery State       : Done
Discovery-intvl (min) : 60           Probe-intvl (min)   : 2
Probe-timeout (min)  : 1            Probe-retry          : 3
Trace-timeout (sec)  : 60           Trace-retry          : 3
Max-TTL               : 30           Max-path             : 128
Forwarding-class (fc) : be           Profile              : Out
Total Fecs            : 400         Discovered Fecs     : 400
Last Discovery Start  : 12/19/2006 05:10:14
Last Discovery End    : 12/19/2006 05:12:02
Last Discovery Duration : 00h01m48s
Policy1               : policy-1
Policy2               : policy-2

*A:ALA-48# show test-oam ldp-treetrace detail
Admin State           : Up           Discovery State       : Done
Discovery-intvl (min) : 60           Probe-intvl (min)   : 2
Probe-timeout (min)  : 1            Probe-retry          : 3
Trace-timeout (sec)  : 60           Trace-retry          : 3
Max-TTL               : 30           Max-path             : 128
Forwarding-class (fc) : be           Profile              : Out
Total Fecs            : 400         Discovered Fecs     : 400
Last Discovery Start  : 12/19/2006 05:10:14
Last Discovery End    : 12/19/2006 05:12:02
Last Discovery Duration : 00h01m48s
Policy1               : policy-1
Policy2               : policy-2

```

=====
 Prefix (FEC) Info
 =====

Prefix	Path Num	Last Discovered	Time	Probe State	Discov State	Discov Status
11.11.11.1/32	54	12/19/2006	05:10:15	OK	Done	OK
11.11.11.2/32	54	12/19/2006	05:10:15	OK	Done	OK
11.11.11.3/32	54	12/19/2006	05:10:15	OK	Done	OK
.....						
14.14.14.95/32	72	12/19/2006	05:11:13	OK	Done	OK
14.14.14.96/32	72	12/19/2006	05:11:13	OK	Done	OK
14.14.14.97/32	72	12/19/2006	05:11:15	OK	Done	OK
14.14.14.98/32	72	12/19/2006	05:11:15	OK	Done	OK
14.14.14.99/32	72	12/19/2006	05:11:18	OK	Done	OK
14.14.14.100/32	72	12/19/2006	05:11:20	OK	Done	OK

=====
 Legend: uP - unexplored paths, tO - trace request timed out
 mH - max hop exceeded, mP - max path exceeded
 nR - no internal resource

```
*A:ALA-48# show test-oam ldp-treetrace prefix 12.12.12.10/32
Discovery State : Done                Last Discovered : 12/19/2006 05:11:02
Discovery Status : ' OK '
Discovered Paths : 54                 Failed Hops      : 0
Probe State      : OK                 Failed Probes    : 0
```

```
*A:ALA-48# show test-oam ldp-treetrace prefix 12.12.12.10/32 detail
Discovery State : Done                Last Discovered : 12/19/2006 05:11:02
Discovery Status : ' OK '
Discovered Paths : 54                 Failed Hops      : 0
Probe State      : OK                 Failed Probes    : 0
```

=====
 Discovered Paths
 =====

PathDest	DiscoveryTtl	Egr-NextHop	ProbeState	Remote-RtrAddr	ProbeTmOutCnt	Discovery-time	RtnCode
127.1.0.5		10.10.1.2		12.12.12.10		12/19/2006 05:11:01	
	7	OK		0		EgressRtr	
127.1.0.9		10.10.1.2		12.12.12.10		12/19/2006 05:11:01	
	7	OK		0		EgressRtr	
127.1.0.15		10.10.1.2		12.12.12.10		12/19/2006 05:11:01	
	7	OK		0		EgressRtr	
127.1.0.19		10.10.1.2		12.12.12.10		12/19/2006 05:11:01	
	7	OK		0		EgressRtr	
127.1.0.24		10.10.1.2		12.12.12.10		12/19/2006 05:11:01	
	7	OK		0		EgressRtr	
127.1.0.28		10.10.1.2		12.12.12.10		12/19/2006 05:11:01	
.....							
127.1.0.252		10.10.1.2		12.12.12.10		12/19/2006 05:11:01	
	7	OK		0		EgressRtr	
127.1.0.255		10.10.1.2		12.12.12.10		12/19/2006 05:11:01	
	7	OK		0		EgressRtr	

=====
 =====

```

*A:ALA-48#

*A:ALA-48# show test-oam twamp server
=====
TWAMP Server (port 862)
=====
Admin State : Up                               Oper State : Up
Up Time     : 0d 00:00:05
Curr Conn   : 1                               Max Conn   : 32
ConnTimeout : 1800                           Conn Reject : 2
Curr Sess   : 2                               Max Sess   : 32
Tests Done  : 5                               Tests Rej   : 0
Tests Abort : 0
TstPktsRx  : 999                             TstPktsTx  : 999
=====
: 10.0.0.0/8                                     Prefix
Description : NMS-West
=====
Admin State : Up                               Oper State : Up
Curr Conn   : 1                               Max Conn   : 32
Conn Reject : 0
Curr Sess   : 2                               Max Sess   : 32
Tests Done  : 5                               Tests Rej   : 0
Tests Abort : 0
TstPktsRx  : 999                             TstPktsTx  : 999
-----
Client      Sessions      Idle    TstPktsRx  TstPktsTx
          Curr/Done/Rej/Abort
-----
10.1.1.1    2/5/0/0          920     999        999
=====
: 10.0.0.0/16                                     Prefix
Description : NMS-West-Special
=====
Admin State : Up                               Oper State : Up
Curr Conn   : 0                               Max Conn   : 32
Conn Reject : 0
Curr Sess   : 0                               Max Sess   : 32
Tests Done  : 0                               Tests Rej   : 0
Tests Abort : 0
TstPktsRx  : 0                                 TstPktsTx  : 0
-----
Client      Sessions      Idle    TstPktsRx  TstPktsTx
          Curr/Done/Rej/Abort
-----
=====

```

eth-cfm

Syntax eth-cfm

Context show

Description This command enables the context to display CFM information.

association

Syntax **association** [*ma-index*] [**detail**]

Context show>eth-cfm

Description This command displays eth-cfm association information.

Parameters *ma-index* — Specifies the MA index.

Values 1— 4294967295

detail — Displays detailed information for the eth-cfm association.

Sample Output

```
ALU-IPD# show eth-cfm association
```

```
=====
CFM Association Table
=====
Md-index   Ma-index   Name                               CCM-intrvl Hold-time Bridge-id
-----
3          1          03-0000000100                     1          n/a      100
10         1          FacilityPrt01                       1          n/a      none
=====
ALU-IPD#
```

cfm-stack-table

Syntax **cfm-stack-table**
cfm-stack-table [{**all-ports**|**all-sdps**|**all-virtuals**}] [**level** 0..7] [**direction** up|down]
cfm-stack-table port *port-id* [**vlan** *qtag* [*qtag*]] [**level** 0..7] [**direction** up|down]
cfm-stack-table sdp *sdp-id*[:*vc-id*] [**level** 0..7] [**direction** up|down]
cfm-stack-table virtual *service-id* [**level** 0..7]
cfm-stack-table facility [{**all-ports**|**all-lags**|**all-lag-ports**|**all-tunnel-meps**|**all-router-interfaces**}] [**level** 0..7] [**direction** up|down]
cfm-stack-table facility lag *id* [**tunnel** 1..4094] [**level** 0..7] [**direction** up|down]
cfm-stack-table facility port *id* [**level** 0..7] [**direction** up|down]
cfm-stack-table facility router-interface *ip-int-name* [**level** 0..7] [**direction** up|down]

Context show>eth-cfm

Description This command displays stack-table information. This stack-table is used to display the various management points MEPs and MIPs that are configured on the system. These can be Service based or facility based. The various option allow the operator to be specific. If no parameters are include then the entire stack-table will be displayed.

Parameters **port** *port-id* — Displays the bridge port or aggregated port on which MEPs or MHFs are configured.

vlan *vlan-id* — Displays the associated VLAN ID.

level — Display the MD level of the maintenance point.

Values 0 — 7

direction up | down — Displays the direction in which the MP faces on the bridge port.

facility — Displays the CFM stack table information for facility MEPs. The base command will display all the facility MEPs. Options may be included in order to further parse the table for specific facility MEP information.

sdp *sdp-id[:vc-id]* — Displays CFM stack table information for the specified SDP.

virtual *service-id* — Displays CFM stack table information for the specified SDP.

Sample Output

```
# show eth-cfm cfm-stack-table
=====
CFM Stack Table Defect Legend:
R = Rdi, M = MacStatus, C = RemoteCCM, E = ErrorCCM, X = XconCCM, A = AisRx

=====
CFM SAP Stack Table
=====
Sap                Lvl Dir  Md-index  Ma-index  MepId  Mac-address      Defect
-----
lag-1:100.100      3 Down           3           1 101 d0:0d:1e:00:01:01 -----
=====

=====
CFM Ethernet Tunnel Stack Table
=====
Eth-tunnel         Lvl Dir  Md-index  Ma-index  MepId  Mac-address      Defect
-----
No Matching Entries
=====

=====
CFM Ethernet Ring Stack Table
=====
Eth-ring           Lvl Dir  Md-index  Ma-index  MepId  Mac-address      Defect
-----
No Matching Entries
=====

=====
CFM Facility Port Stack Table
=====
Port      Tunnel  Lvl Dir  Md-index  Ma-index  MepId  Mac-address      Defect
-----
1/1/10    0        0 Down           10           1  6 90:f4:01:01:00:0a --C---
=====

=====
CFM Facility LAG Stack Table
=====
Lag        Tunnel  Lvl Dir  Md-index  Ma-index  MepId  Mac-address      Defect
-----
```

```

No Matching Entries
=====

=====
CFM Facility Interface Stack Table
=====
Interface          Lvl Dir  Md-index  Ma-index  MepId  Mac-address  Defect
-----
No Matching Entries
=====

=====
CFM SDP Stack Table
=====
Sdp                Lvl Dir  Md-index  Ma-index  MepId  Mac-address  Defect
-----
No Matching Entries
=====

=====
CFM Virtual Stack Table
=====
Service           Lvl Dir  Md-index  Ma-index  MepId  Mac-address  Defect
-----
No Matching Entries
=====

```

domain

Syntax `domain [md-index] [association ma-index | all-associations] [detail]`

Context `show>eth-cfm`

Description This command displays domain information.

Parameters

- md-index* — Displays the index of the MD to which the MP is associated, or 0, if none.
- association *ma-index*** — Displays the index to which the MP is associated, or 0, if none.
- all-associations** — Displays all associations to the MD.
- detail** — Displays detailed domain information.

Sample Output

```

*A:node-1# show eth-cfm domain

=====
CFM Domain Table
=====
Md-index  Level Name                                     Format
-----
1         4 test-1                                       charString
2         5                                             none
25        7 AA:BB:CC:DD:EE:FF-1                         macAddressAndUint
=====

```

mep

Syntax **mep** *mep-id* **domain** *md-index* **association** *ma-index* [**loopback**] [**linktrace**]
mep *mep-id* **domain** *md-index* **association** *ma-index* [**remote-mepid** *mep-id* | **all-remote-mepids**]
mep *mep-id* **domain** *md-index* **association** *ma-index* **eth-test-results** [**remote-peer** *mac-address*]
mep *mep-id* **domain** *md-index* **association** *ma-index* **one-way-delay-test** [**remote-peer** *mac-address*]
mep *mep-id* **domain** *md-index* **association** *ma-index* **two-way-delay-test** [**remote-peer** *mac-address*]
mep *mep-id* **domain** *md-index* **association** *ma-index* **two-way-slm-test** [**remote-peer** *mac-address*]

Context show>eth-cfm

Description This command displays Maintenance Endpoint (MEP) information.

Parameters **domain** *md-index* — Displays the index of the MD to which the MP is associated, or 0, if none.
association *ma-index* — Displays the index to which the MP is associated, or 0, if none.
loopback — Displays loopback information for the specified MEP.
linktrace — Displays linktrace information for the specified MEP.
remote-mepid — Includes specified remote MEP ID information for the specified MEP.
one-way-delay-test — Includes specified MEP information for one-way-delay-test.
two-way-delay-test — Includes specified MEP information for two-way-delay-test.
two-way-slm-test — Includes specified MEP information for two-way-slm-test.
eth-test-results — Include eth-test-result information for the specified MEP.
all-remote-mepids — Includes all remote mep-id information for the specified MEP.

Sample Output

```
# show eth-cfm mep 101 domain 3 association 1
=====
Eth-Cfm MEP Configuration Information
=====
Md-index           : 3                Direction         : Down
Ma-index           : 1                Admin             : Enabled
MepId              : 101              CCM-Enable       : Enabled
IfIndex            : 1342177281        PrimaryVid        : 6553700
Description        : (Not Specified)
FngState           : fngReset          ControlMep        : False
LowestDefectPri    : macRemErrXcon        HighestDefect     : none
Defect Flags       : None
Mac Address        : d0:0d:1e:00:01:01      ControlMep        : False
CcmLtmPriority     : 7
CcmTx              : 19886              CcmSequenceErr   : 0
Fault Propagation  : disabled          FacilityFault     : n/a
MA-CcmInterval    : 1                MA-CcmHoldTime   : 0ms
```

```

Eth-1Dm Threshold : 3(sec)
Eth-Ais:           : Enabled
Eth-Ais Tx Priorit*: 7
Eth-Ais Tx Interva*: 1
Eth-Ais Tx Levels : 5
Eth-Tst:           : Disabled
MD-Level           : 3
Eth-Ais Rx Ais:   : No
Eth-Ais Rx Interv*: 1
Eth-Ais Tx Counte*: 388

```

```

Redundancy:
  MC-LAG State : active

```

```

CcmLastFailure Frame:
  None

```

```

XconCcmFailure Frame:
  None

```

```

=====

```

mip

Syntax mip

Context show>eth-cfm

Description This command displays SAPs/bindings provisioned for allowing the default MIP creation.

Sample Output

```
*A:node-1# show eth-cfm mip
```

```
=====
```

```
CFM SAP MIP Table
```

```
=====
```

Sap	Mip-Enabled	Mip Mac Address
1/1/1:1.1	yes	Not Configured

```
=====
```

```
CFM SDP MIP Table
```

```
=====
```

Sdp	Mip-Enabled	Mip Mac Address
No Matching Entries		

```
-----
```

```
No Matching Entries
```

```
=====
```

statistics

Syntax statistics**Context** show>eth-cfm**Description** This command displays the eth-cfm statistics counters.**Sample Output**

```
# show eth-cfm statistics

=====
ETH-CFM System Statistics
=====
Rx Count           : 58300           Tx Count           : 46723
Dropped Congestion : 0              Discarded Error    : 0
=====

Rx Count:                               PPS ETH-CFM CPU Receive Rate
Tx Count:                               PPS ETH-CFM CPU Transmit Rate
Dropped Congestion:                     Valid/Supported ETH-CFM packets not processed
by the CPU as a result of resource contention
Discarded Error:                         Invalid/Malformed/Unsupported ETH-CFM packets
discarded by the CPU
```

system-config

Syntax system-config**Context** show>eth-cfm**Description** This command shows various system level configuration parameters. These global eth-cfm commands are those which are configured directly under the config>eth-cfm context.**Sample Output**

```
# show eth-cfm system-config

=====
CFM System Configuration
=====
Redundancy
  MC-LAG Standby MEP Shutdown: true
  MC-LAG Hold-Timer           : 1 second(s)

Synthetic Loss Measurement
  Inactivity Timer           : 100 second(s)
=====
```

Clear Commands

saa

Syntax `saa-test [test-name [owner test-owner]]`

Context clear

Description Clear the SAA results for the latest and the history for this test. If the test name is omitted, all the results for all tests are cleared.

Parameters *test-name* — Name of the SAA test. The test name must already be configured in the `config>saa>test` context.

owner test-owner — Specifies the owner of an SAA operation up to 32 characters in length.

Default If a *test-owner* value is not specified, tests created by the CLI have a default owner “TIMOS CLI”.

statistics

Syntax `statistics`

Context clear>eth-cfm

Description This command clears the eth-cfm statistics counters maintained in clearEthCfmStatistics.

Debug Commands

lsp-ping-trace

Syntax `lsp-ping-trace [tx | rx | both] [raw | detail]`
`no lsp-ping-trace`

Context debug>oam

Description This command enables debugging for lsp-ping.

Parameters `tx | rx | both` — Specifies to enable LSP ping debugging for TX, RX, or both RX and TX for the for debug direction.
`raw | detail` — Displays output for the for debug mode.

