
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
ipv6-address: 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.

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

detail — Displays detailed information.

tll *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
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 **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]

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 (does not apply to ICMPv6).

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
	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* — Specifies 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 *service-id* must be the same number used for every 7750 SR7710 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 | ipv6-address} group {mcast-address | mcast-v6-address} [router {router-instance | service-name service-name}] [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 **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 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

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 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 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	<i>ipv4-address</i>	<i>a.b.c.d</i>
	<i>ipv6-address</i>	<i>x::x::x::x::x::x</i> (eight 16-bit pieces)
		<i>x::x::x::x::d.d.d.d</i>
		<i>x - [0..FFFF]H</i>

		d - [0..255]D
group	<i>mcast-address</i>	
	<i>mcast-v6-address</i>	
router	<i>router-name</i>	Base management
		Default - Base
	<i>service-id</i>	[1..2147483647]
	<i>service-name</i>	[64 chars max]
sender-addr	<i>ipv4-address</i>	a.b.c.d
leaf-addr	<i>ipv4-address</i>	a.b.c.d

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 **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 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
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 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 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

Service Diagnostics

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

Service Diagnostics

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 SR7710 SR 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-7710 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 639](#) 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 `service-id:` 1 — 2147483647
`svc-name:` 64 characters maximum

`source src-ip` — 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 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]`

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 — Specifies 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 — Specifies the source MAC address that will be sent to the CPE. If not specified or set to 0, the MAC address configured for the CPMCFM 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 — This command has been deprecated. SAA test that include this deprecated command will fail the no shutdown.

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 is sent via 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.

VPLS MAC Diagnostics

Parameters	service <i>service-id</i> — The Service ID of the service to diagnose or manage. Values 1 — 2147483647 destination <i>ieee-address</i> — The MAC address to be populated. flood — Sends the OAM MAC populate to all upstream nodes. Default MAC populate only the local FIB. age <i>seconds</i> — 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 <i>sap-id</i> — 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 <i>sap-id</i> value is not specified the MAC is bound to the CPMCFM. The originating SHG is 0 (zero). When the target-sap <i>sap-id</i> 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 <i>service-id</i> target <i>ieee-address</i> [flood] [register]
Context	oam
Description	<p>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.</p> <p>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.</p> <p>If the register option is provided, the R bit in the Address Delete flags is turned on.</p> <p>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 is sent via the data plane.</p> <p>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).</p>

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 — This command has been deprecated

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*] [**ttl** *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 is sent via 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** — This command has been deprecated. SAA test that include this deprecated command will fail the no shutdown.
 - 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 via the 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 — This command has been deprecated. SAA test that include this deprecated command will fail the no shutdown.

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

vxlan-ping

Syntax `vxlan-ping test-id test-id service vpls-service-id dest-vni vxlan-network-id outer-ip-destination ipv4-address [outer-ip-source-udp udp-port-number] [outer-ip-ttl time-to-live][inner-l2 ieee-address] [inner-ip-source ipv4-address][inner-ip-destination ipv4-address] [i-flag-on] [end-system ieee-address] [send-count packets] [interval interval-time][timeout timeout-time] [padding tlv-size] [reflect-pad] [fc fc-name] [profile {in|out}] [reply-mode {overlay|udp}]`

Context oam

Description Operational command used to validate the VXLAN Tunnel Endpoint (VxLAN) connectivity between peers.

Parameters `test-id test-id` — A value to identify the originator handle of the specific request. Each active test requires a unique test identifier.

Values [1..2147483647]

Default must be specified

`service vpls-service-id` — The VPLS service used to launch the request and by extension pickup the source VNI information.

Values [1..2147483647] | *service-name:64 char max*

Default must be specified

`dest-vni vxlan-network-id` — Target Vxlan network identifier on the terminating VTEP.

Values [1..16777215]

Default must be specified

`outer-ip-destination ipv4-address` — IPv4 address of the terminating VTEP.

Values format a.b.c.d

Default must be specified

`outer-ip-source-udp udp-port-number` — Optional Outer source UDP port number.

Values [1..65535]

Default System-generated UDP port number

`outer-ip-ttl time-to-live` — Optional outer time to live.

Values [1..255]

Default 255

`inner-l2 ieee-address` — Optional destination mac address used in the inner VxLAN header.

Values xx:xx:xx:xx:xx:xx or xx-xx-xx-xx-xx-xx

Default 00:00:00:00:00:00

`inner-ip-source ipv4-address` — Optional inner source IPv4 address.

Values format a.b.c.d

Default System IPv4 Address

inner-ip-destination *ipv4-address* — Optional inner destination IPv4 address, must be in the range 127/8.

Values In the 127.0.0.0/8 range

Default 127.0.0.1

reply-mode *overlay|udp* — Optional keyword that instructs the responder how to route the VxLAN response.

udp: Respond using UDP over the IP network.

Overlay: Respond using the VXLAN overlay for the service

Default udp

i-flag-on — Optional keyword to set the VNI Validation bit to 1 indicating the OAMPDU contains a valid VNI.

Default i-flag set to “0” which prevents the OAMPDU from being forwarded beyond the terminating VTEP.

end-system *ieee-address* — Optional command to include the sub TLV to validate an end system MAC address in the FDB. Only one MAC address may be included.

Default No end system TLV included

send-count *packets* — Optional command to adjust the number of VxLAN ping requests transmitted.

Values [1..1024]

Default 1

interval *interval-time* — Optional command to adjust the probe interval.

Values [0.1 | 1..10]

Default 1 second

timeout *timeout-time* — Optional command to adjust the default 5 second packet timeout value.

Values [1..10]

Default 5 seconds

padding *tlv-size* — Optional command to include the Pad TLV. The number of octets that defines the entire size of the pad TLV, including the type(2B), the length field(2B), the padding (variable).

Values [0 | 5..2000]

Default 0 (not included)

reflect-pad — Optional keyword used to instruct the responder to include the pad-tlv in the echo response. This option is not supported when the reply mode is “UDP”.

Default pad is not reflected

fc *fc-name* — Optional command used to indicate the forwarding class that will be exposed to the QoS policy as input into generating the outer CoS.

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

Default be

profile {*in|out*} — Optional keyword used to define the frame’s disposition that will be exposed to the QoS

policy as input into generating the outer CoS.

Default in

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 router will wait for a message reply after sending the next 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 — 100

Special Cases

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.]
```

IGMP Snooping Diagnostics

```
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 efm

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* — Specifies 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] [lbm-padding padding-size] [priority priority] [interval interval-time] [timeout timeout]`

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.

Values 1 — 1024

Default 1

size *data-size* — This is the size of the data portion of the data TLV allowing for an optional octet string to be specified. If 0 is specified no data TLV is added to the packet. This is mutually exclusive with **lbm-padding**.

Values 0 — 1500

Default 0

lbm-padding *padding-size* — This is the size of the data portion of the data TLV and does not allow for an optional octet string. MSDU will not be processed when lbm-padding is in use. If 0 is specified, no data TLV is added to the packet. This is specified with an octet string. This is mutually exclusive with **size**.

Values 0|3 — 9000

Default 0

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

Values 0 — 7

Default ccm-ltm-priority for the MEP (7)

interval *interval-time* — The interval parameter in deciseconds (100 ms) increments. This parameter is used to configure the spacing between probes within the test run. A value of 0 means probes will be sent with no enforced delay. This value is only applicable to tests where the **send-count** is 5 or less.

Values [0..600]

Default 0 or 10 depending on send-count

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 — 10

Default 5

eth-test

Syntax	eth-test <i>mac-address mep mep-id domain md-index association ma-index</i> [priority <i>priority</i>] [data-length <i>data-length</i>]
Context	oam>eth-cfm
Description	This command issues an ETH-CFM 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 style="padding-left: 20px;">Values 1 — 8191</p> <p>domain <i>md-index</i> — Specifies the MD index.</p> <p style="padding-left: 20px;">Values 1 — 4294967295</p> <p>association <i>ma-index</i> — Specifies the MA index.</p> <p style="padding-left: 20px;">Values 1 — 4294967295</p> <p>data-length <i>data-length</i> — Indicates the UDP data length of the echo reply, the length starting after the IP header of the echo reply.</p> <p style="padding-left: 20px;">Values 64 — 1500</p> <p style="padding-left: 20px;">Default 64</p>

one-way-delay-test

Syntax	one-way-delay-test <i>mac-address mep mep-id domain md-index association 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 style="padding-left: 20px;">Values 1 — 8191</p> <p>domain <i>md-index</i> — Specifies the MD index.</p> <p style="padding-left: 20px;">Values 1 — 4294967295</p> <p>association <i>ma-index</i> — Specifies the MA index.</p> <p style="padding-left: 20px;">Values 1 — 4294967295</p> <p>priority <i>priority</i> — Specifies the priority.</p> <p style="padding-left: 20px;">Values 0 — 7</p> <p style="padding-left: 20px;">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 <i>mac-address</i> mep <i>mep-id</i> domain <i>md-index</i> association <i>ma-index</i> [priority <i>priority</i>] [send-count <i>send-count</i>] [size <i>data-size</i>] [timeout <i>timeout</i>] [interval <i>interval</i>]
Context	oam>eth-cfm
Description	This command configures an Ethernet CFM two-way SLM test in SAA.
Parameters	<p><i>mac-address</i> — Specifies a unicast destination 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>send-count <i>send-count</i> — 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</p>

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]

alarm-notification

Syntax **alarm-notification fng-alarm-time [*time*] fng-reset-time [*time*]**

Context config>service>vpls>eth
 config>service>epipe>sap>eth-cfm>mep
 config>service>epipe>sdp>eth-cfm>mep
 config>service>vpls>sap>eth-cfm>mep
 config>service>vpls>spoke-sdp>eth-cfm>mep
 config>service>vpls>mesh-sdp>eth-cfm>mep
 config>service>vpls>sap>eth-cfm>mep
 config>service>vpls>spoke-sdp>eth-cfm>mep
 config>service>vpls>mesh-sdp>eth-cfm>mep
 config>service>ies>if>sap>eth-cfm>mep
 config>service>ies>if>spoke-sdp>eth-cfm>mep
 config>service>ies>sub-if>grp-if>sap>eth-cfm>mep
 config>service>vprn>if>sap>eth-cfm>mep
 config>service>vprn>if>spoke-sdp>eth-cfm>mep
 config>service>vprn>sub-if>grp-if>sap>eth-cfm>mep
 config>service>ipipe>sap>eth-cfm>mep
 config>port>ethernet>eth-cfm>mep
 config>lag>eth-cfm>eth-cfm>mep
 config>router>if>eth-cfm>mep

Description This command allows the operator to configure the Fault Notification Generation time values for raising the alarm and resetting the ccm defect alarm. These timers are used for network management processes and are not tied into delaying the notification to the fault management system on the network element. These timers will not affect fault propagation mechanisms.

fng-alarm-time *time* — Specifies the time in centi-seconds (10ms intervals) a defect condition at or above the low-priority-defect must be present before raising alarm.

Values [0,250,500,1000]

Default 0

fng-rest-time *time* — Specifies the time in centi-seconds (10ms intervals) a defect condition at or above the low-priority-defect must be cleared before resetting the alarm.

Values [0,250,500,1000]

Default 0

sender-id

Syntax **sender-id [system | local *local-name*]
 no sender-id**

Context oam>eth-cfm>system

Description This command allows the operator to include the configured “system name” (chassis3) or a locally configured value in ETH-CFM PDUs sent from MEPs and MIPs. The operator may only choose one of these

ETH-CFM OAM Commands

options to use for ETH-CFM. MEPs will include the sender-id TLV for CCM (not sub second CCM enabled MEPs), LBM/LBR, and LTM/LTR. MIPs will include this value in the LBR and LTR PDUs.

Note: LBR functions reflect back all TLVs received in the LBM unchanged, including the SenderID TLV.

- Parameters**
- system** — keyword allowing ETH-CFM to use configured “system name” value as the chassis(3).
 - local** — provides the option to configure a local string that is different from the “system name” chassis(3) value that may be used for other means.
 - local-name* — Specifies alpha number string up to 45 characters.
- Default** [no] sender-id

id-permission

- Syntax** **id-permission** *chassis*
no id-permission
- Context** config>eth-cfm>domain>assoc>bridge
- Description** This command allows the operator to include the sender-id TLV information that was specified under the **config>eth>system> sender-id** configuration for Service MEPs and MIPs. When this option is present under the maintenance association, the specific MPs in the association will include the sender-id tlv information in ETH-CFM PDUs. MEPs will include the sender-id TLV for CCM (not sub second CCM enabled MEPs), LBM/LBR, and LTM/LTR. MIPs will include this value in the LBR and LTR PDUs.
- Note:** LBR functions reflect back all TLVs received in the LBM unchanged including the SenderID TLV. Transmission of the Management Domain and Management Address fields are not supported in this TLV.
- Parameters** *chassis* — Sends the configured chassis information defined under>eth-cfm>system using the sender-id option.
- Default** [no] sender-id

facility-id-permission

- Syntax** **facility-id-permission** *chassis*
no facility-id-permission
- Context** config>eth-cfm>domain>assoc
- Description** This command allows the operator to include the sender-id TLV information that was specified under the **config>eth>system> sender-id** configuration for facility base MEPs. When this option is present under the maintenance association, the specific MPs in the association will include the sender-id tlv information in ETH-CFM PDUs. MEPs will include the sender-id TLV for CCM (not sub second CCM enabled MEPs), LBM/LBR, and LTM/LTR. MIPs will include this value in the LBR and LTR PDUs.
- Note:** LBR functions reflect back all TLVs received in the LBM unchanged including the SenderID TLV. This command will produce an error when a bridge-identifier is configured under the association. Facility MEPs do not support the bridge-identifier. Transmission of the Management Domain and Management Address fields are not supported in this TLV.

Parameters *chassis* — Sends the configured chassis information defined under >eth-cfm>system using the sender-id option.

Default [no] facility-id-permission

interface-support-enable

Syntax [no] interface-support-enable

Context config>service>epipe>sap>eth-cfm>mep>ais
 config>service>epipe>spoke-sdp>eth-cfm>mep>ais
 config>service>vpls>sap>eth-cfm>mep>ais
 config>service>vpls>spoke-sdp>eth-cfm>mep>ais
 config>service>vpls>mesh-sdp>eth-cfm>mep>ais

Description This command enable the AIS function to consider the operational state of the entity on which it is configured. With this command, ETH-AIS on DOWN MEPs will be triggered and cleared based on the operational status of the entity on which it is configured. If CCM is also enabled then transmission of the AIS PDU will be based on either the non operational state of the entity or on ANY CCM defect condition. AIS generation will cease if BOTH operational state is UP and CCM has no defect conditions. If the MEP is not CCM enabled then the operational state of the entity is the only consideration assuming this command is present for the MEP.

Default [no] interface-support-enabled: AIS will not be generated or stopped based on the state of the entity on which the DOWN MEP is configured.

csf-enable

Syntax csf-enable [*multiplier multiplier-value*]
 no csf-enable

Context config>service>epipe>sap>eth-cfm>mep
 config>service>epipe>spoke-sdp>eth-cfm>mep
 config>service>ies>interface>sap>eth-cfm>mep
 config>service>ies>interface>spoke-sdp>eth-cfm>mep
 config>service>ies>subscriber-interface>group-interface>sap>eth-cfm
 config>service>vpls>mesh-sdp>eth-cfm>mep
 config>service>vpls>sap>eth-cfm>mep
 config>service>vpls>spoke-sdp>eth-cfm>mep
 config>service>vprn>interface>sap>eth-cfm>mep
 config>service>vprn>interface>spoke-sdp>eth-cfm>mep
 config>service>vprn>subscriber-interface>group-interface>sap>eth-cfm>mep

Description This command enable Enabled the reception and local processing of ETH-CSF frames.

Parameters *multiplier multiplier-value* — The multiplication factor applied to the receive time used to clear the CSF condition in increments of .5.

Values [0.0,2.0,...30.0] Value 0 means only clear when C-DCI is received.

ETH-CFM OAM Commands

Default 3.5

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

Service Assurance Agent (SAA) Commands

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	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.
	Default 0
	Values 0 — 2147483 milliseconds
	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.
	Default 0
	Values 0 — 2147483 milliseconds
	<i>direction</i> — 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

latency-event

Syntax	latency-event rising-threshold <i>threshold</i> [falling-threshold <i>threshold</i>] [direction] no latency-event
Context	config>saa>test
Description	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. 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 latency event thresholds is optional.
Parameters	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.
	Default 0
	Values 0 — 2147483 milliseconds

Service Assurance Agent (SAA) Commands

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	[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> [<i>ttl</i> <i>vc-label-ttl</i>] [return-control] [source-mac <i>ieee-address</i>] [fc <i>fc-name</i>] [profile [<i>in</i> <i>out</i>]] [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> — Specifies 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					

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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* — Specifies the source MAC address that will be sent to the CPE. If not specified or set to 0, the MAC address configured for the CPMCFM 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

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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

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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: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: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

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

Default Base

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

Values

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

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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*] [**t***tl time-to-live*] [**w***ait milli-seconds*] [**t***os type-of-service*] [**s***ource ip-address*] [**t***os type-of-service*] [**r***outer router-instance* | **s***ervice-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.

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

Values 1 — 255

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

Values 1 — 60000

t*os type-of-service* — Specifies the service type.

Values 0 — 255

Default 5000

s*ource 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

lsp-ping

Syntax **lsp-ping** *lsp-name* [**path** *path-name*]
lsp-ping **bgp-label** **prefix** *ip-prefix/mask* [**path-destination** *ip-address* [**interface** *if-name* | **next-hop** *ip-address*]]
lsp-ping **prefix** *ip-prefix/mask* [**path-destination** *ip-address* [**interface** *if-name* | **next-hop** *ip-address*]]
lsp-ping **static** *lsp-name* [**assoc-channel** *ipv4|non-ip|none*][**dest-global-id** *global-id* **dest-node-id** *node-id*] [**path-type** *active|working|protect*]
NOTE: Options common to all **lsp-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 performs in-band LSP connectivity tests.

The **lsp-ping** 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.

The LSP ping operation is modeled after the IP ping utility which uses ICMP echo request and reply packets to determine IP connectivity.

In an LSP ping, the originating device creates an MPLS echo request packet for the LSP and path to be tested. The MPLS echo request packet is sent through the data plane 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.

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 **lsp-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 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 64 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.

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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 MPLS-TP PSC protocol for sending user plane traffic. If MPLS-TP linear protection is not configured, then this will be the working 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

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

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 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

Service Assurance Agent (SAA) Commands

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

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. When the LDP FEC prefix is IPv6, the user must enter a 127/8 IPv4 mapped IPv6 address, that is, in the range ::ffff:127/104.

interface *interface-name* — Specifies the name of an IP interface to send the MPLS echo request message to. The name must already exist in the **config>router>interface** context.

next-hop *ip-address* — Specifies the next-hop address to send the MPLS echo request message to.

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 LDP FEC.

Values <ipv4-prefix>/32 | <ipv6-prefix>/128
 ipv4-prefix - a.b.c.d
 ipv6-prefix - 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

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

This sample output is for a LDP IPv4 and IPv6 prefix FECs.

```
A:Dut-C# 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
=====
```

Service Assurance Agent (SAA) Commands

```
LDP Prefix Bindings
=====
Prefix          IngLbl      EgrLbl      EgrIntf/    EgrNextHop
  Peer
-----
4.4.4.4/32      131069N     131067      1/1/1       1.3.1.2
  3.3.3.3
4.4.4.4/32      131069U     131064      --          --
  6.6.6.6
-----
No. of Prefix Bindings: 2
=====
A:Dut-C#

*A:Dut-A# oam lsp-ping prefix fc00::a14:106/128

LSP-PING fc00::a14:106/128: 116 bytes MPLS payload

Seq=1, send from intf A_to_B, reply from fc00::a14:106

udp-data-len=32 ttl=255 rtt=7.16ms rc=3 (EgressRtr)

---- LSP fc00::a14:106/128 PING Statistics ----

1 packets sent, 1 packets received, 0.00% packet loss

round-trip min = 7.16ms, avg = 7.16ms, max = 7.16ms, stddev = 0.000ms

*A:Dut-A#
```

lsp-trace

Syntax **lsp-trace** *lsp-name* [**path** *path-name*]
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** *ipv4|non-ip|none*][**dest-global-id** *global-id* **dest-node-id** *node-id*] [**path-type** *active|working|protect*]

NOTE: Options common to all **lsp-trace** cases: [**detail**] [**downstream-map-tlv** {**dsmap** | **ddmap** | **none**}] [**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 The **lsp-trace** command performs an LSP traceroute using the protocol and data structures defined in IETF RFC 4379.

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.

The downstream mapping TLV is used in **lsp-trace** to provide a mechanism for the sender and responder nodes to exchange and validate interface and label stack information for each downstream hop in the path of the LDP FEC an RSVP LSP, or a BGP IPv4 label route.

Two downstream mapping TLVs are supported. The original Downstream Mapping (DSMAP) TLV defined in RFC 4379 and the new Downstream Detailed Mapping (DDMAP) TLV defined in RFC 6424. More details are provided in the DDMAP TLV sub-section below.

In addition, when the responder node has multiple equal cost next-hops for an LDP FEC or a BGP label IPv4 prefix, it replies in the Downstream Mapping TLV with the downstream information for each outgoing interface which is part of the ECMP next-hop set for the prefix. The downstream mapping TLV can further be used to exercise a specific path of the ECMP set using the path-destination option.

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.

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 path name 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

prefix ip-prefix/mask — Specifies the address prefix and subnet mask of the target LDP FEC.

Values <ipv4-prefix>/32 | <ipv6-prefix>/128
 ipv4-prefix - a.b.c.d

ipv6-prefix - 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

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 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

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

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 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 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 {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. When the LDP FEC prefix is IPv6, the user must enter a 127/8 IPv4 mapped IPv6 address, that is, in the range ::ffff:127/104.

interface *interface-name* — Specifies the name of an IP interface to send the MPLS echo request to. The name must already exist in the `con-fig>router>interface` context.

next-hop *ip-address* — Specifies the next-hop to send the MPLS echo request message to.

Values

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

downstream-map-tlv {*dsm*|*ddm*|*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*. When `lsp-trace` is used on a MPLS-TP LSP (static option), it can only be executed if the control-channel is set to *none*. In addition, 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**.

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

Sample Output

```
*A:Dut-A# oam lsp-trace prefix 10.20.1.6/32 downstream-map-tlv ddm 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:Dut-C#
A:Dut-C# 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
```

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```
proto=3(LDP)
2 5.5.5.5 rtt=4.77ms rc=3(EgressRtr)
A:Dut-C#
```

lsp-trace over an unnumbered IP interface

```
*A:Dut-A# oam lsp-trace prefix 10.20.1.6/32 downstream-map-tlv dmap 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
```

```
lsp-trace of a LDP IPv6 prefix FEC
```

```
*A:Dut-A# oam lsp-trace prefix fc00::a14:106/128 path-destination ::ffff:127.0.0.1
```

```
lsp-trace to fc00::a14:106/128: 0 hops min, 0 hops max, 224 byte packets
```

```
1 fc00::a14:102 rtt=1.61ms rc=8(DSRtrMatchLabel) rsc=1
2 fc00::a14:103 rtt=3.51ms rc=8(DSRtrMatchLabel) rsc=1
3 fc00::a14:104 rtt=4.65ms rc=8(DSRtrMatchLabel) rsc=1
4 fc00::a14:106 rtt=7.02ms rc=3(EgressRtr) rsc=1
```

```
*A:Dut-A# oam lsp-trace prefix fc00::a14:106/128 path-destination ::ffff:127.0.0.2
```

```
lsp-trace to fc00::a14:106/128: 0 hops min, 0 hops max, 224 byte packets
```

```
1 fc00::a14:102 rtt=1.90ms rc=8(DSRtrMatchLabel) rsc=1
2 fc00::a14:103 rtt=3.10ms rc=8(DSRtrMatchLabel) rsc=1
```

```

3 fc00::a14:105 rtt=4.61ms rc=8(DSRtrMatchLabel) rsc=1
4 fc00::a14:106 rtt=6.45ms rc=3(EgressRtr) rsc=1

```

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	<i>service-id:</i>	1 — 2147483647
	<i>svc-name:</i>	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.

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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 override 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
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

Service Assurance Agent (SAA) Commands

Field	Description	Values
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

Field	Description	Values
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
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 SR7710 SR 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
```

Service Assurance Agent (SAA) Commands

```
__ 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 ][target-fec-type static-pw-fec agi agi-value pw-path-id-saii src-
global-id:src-node-id:src-ac-id pw-path-id-taii dest-global-id:dest-node-id:dest-ac-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] [count send-count] [timeout timeout]
[interval interval] [ttl vc-label-ttl]
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 sai-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 static sdp-id:vc-id [target-fec-type pw-id-fec sender-src-address ip-address
remote-dst-address ip-address pw-id value pw-type value ] [dest-global-id global-id dest-
node-id node-id] [assoc-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]
```

Context

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

Description

This command configures a Virtual Circuit Connectivity Verification (VCCV) ping test. A vccv-ping test checks connectivity of a VLL inband. It checks to verify that the destination (target) PE is the egress for the Layer 2 FEC. It provides for a cross-check between the dataplane and the control plane. 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 reuses an lsp-ping message format and can be used to test a VLL configured over both an MPLS and a GRE SDP.

Note that VCCV ping can be initiated on TPE or SPE. If initiated on the SPE, the reply-mode parameter must be used with the ip-routed value. The ping from the TPE can have either values or can be omitted, in which case the default value is used.

If a VCCV ping is initiated from TPE to neighboring a SPE (one segment only) it is sufficient to only use the spoke-sdp-fec id parameter. However, if the ping is across two or more segments, at least the spoke-sdp-fec id, src-ip-address ip-addr, dst-ip-address ip-addr, ttl vc-label-ttl parameters are used where:

- The src-ip-address is system IP address of the router preceding the destination router.
- The vc-label-ttl must have a value equal or higher than the number of pseudowire segments.

Note that VCCV ping is a multi-segment pseudowire. For a single-hop pseudowire, only the peer VCCV CC bit of the control word is advertised when the control word is enabled on the pseudowire.

VCCV ping on multi-segment pseudowires require that the control word be enabled in all segments of the VLL. If the control word is not enabled on spoke SDP it will not be signaled peer VCCV CC bits to the far end, consequently VCCV ping cannot be successfully initiated on that specific spoke SDP.

Note that if the sai-type-2 and taii-type-2 parameters are specified by the user of this command for a FEC129 pseudowire, then these values will be used by the vccv-ping echo request message instead of the sai and taii of the spoke-sdp indexed by the spoke-sdp-fec parameter, or any sai and taii received in a

Service Assurance Agent (SAA) Commands

switching point TLV for the pseudowire. Furthermore, the user must enter the *saii* and *taii* in accordance with the direction of the pseudowire as seen from the node on which the `vccv-ping` command is executed. However, the values of the *saii* and *taii* sent in the echo request message will be swapped with respect to the user-entered values to match the order in the installed FEC on the targeted node. The output of the command for FEC129 type 2 pseudowire will reflect the order of the *saii* and *taii* stored on the targeted node.

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. 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. 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. If the `target-fec-type` option is not specified, then 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 `target-fec-type` option allows the user to test a segment of a MS-PW that does not have the same FEC type as the local segment from the T-PE where the `vccv-ping` command is issued. This is applicable for performing VCCV Ping on an MS-PW comprised of static PW FEC segments and dynamically signaled PW ID FEC segments.

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 — If a FEC 128 PW is being tested, then its VC ID 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` 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.

`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 `sdp-id:vc-id`.

global-id — The Global ID of this 7x50 T-PE.

Values 1 – 4,294,967,295

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

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

Values 1 – 4,294,967,295

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*.

global-id — The Global ID of the far end T-PE of the FEC129 pseudowire.

Values 1 – 4,294,967,295

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 – 4,294,967,295

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

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

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

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 RFE 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 the vccv control channel.

Default control-channel

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 The LSP-EXP mappings on the receive network interface controls the mapping back to the internal forwarding class used by the far-end 7750 SR 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 SR.

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

Default be

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

Table 13: 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 encapsulation.

Default out

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.

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.

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

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

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 — 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.

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

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

assoc-channel {*ipv4* | *non-ip*} — The associated channel encapsulation format to use for the VCCV ping echo request and echo reply packet for a PW that uses the static PW FEC. An associated channel type of *ipv4* must be used if a vccv-ping is performed to a remote segment of a different FEC type.

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

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

Default non-ip

target-fec-type {**pw-id-fec** | **static-pw-fec**} — The FEC type for a remote PW segment targeted by a VCCV Ping echo request. This parameter is used if VCCV Ping is used along a MS-PW where a static MPLS-TP PW segment using the static PW FEC is switched to a T-LDP signaled segment using the PW ID FEC (FEC128), or vice versa, thus requiring the user to explicitly specify a target FEC that is different from the local segment FEC.

Values **pw-id-fec** — Indicates that FEC element for the remote target PW segment is of type PW ID (FEC128).

static-pw-fec — Indicates that FEC element for the remote target PW segment is of type Static PW FEC.

agi *agi-value* — The attachment group identifier for the target FEC. This parameter is only valid in combination with the target-fec-type static-pw-fec.

Values 0 – 4,294,967,295

pw-path-id-saii *src-global-id:src-node-id:src-ac-id* — The SAII of the target FEC. This parameter is only valid in combination with the target-fec-type static-pw-fec.

Values **src-global-id** — The Global ID of the SAII of the targeted static PW FEC element.

Values 1 – 4,294,967,295

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

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

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

Values 1 – 4,294,967,295

pw-path-id-taii *dst-global-id:dst-node-id:dst-ac-id* — The SAII of the target FEC. This parameter is only valid in combination with the target-fec-type static-pw-fec.

Values **dst-global-id** — The Global ID of the TAII of the targeted static PW FEC element.

Values 1 – 4,294,967,295

dst-node-id — The node-id of the TAII on far end T-PE that the pseudowire being tested is associated with.

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

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

Values 1 – 4,294,967,295

remote-dst-address *ipv4-address* — The 4-octet IPv4 address of the far end node that is a target of the VCCV Ping echo request. This parameter is only valid in combination with the target-fec-type static-pw-fec.

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

sender-src-address *ipv4-address* — The 4-octet IPv4 address of the node originating the VCCV Ping echo request. This parameter is only valid in combination with the target-fec-type pw-id.

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

remote-dst-address *ipv4-address* — The 4-octet IPv4 address of the far end node that is a target of the

VCCV Ping echo request. This parameter is only valid in combination with the target-fec-type pw-id.

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

pw-type value — The PW Type value of the PW segment targeted on the far end node. This field must be included to populate the PW type field of the PW ID FEC in the ratert FEC static TLV, when the far end FEC type is different from the local FEC type and the target-fec-type is pw-id-fec.

Values atm-cell, atm-sdu, atm-vcc, atm-vpc, cesopsn, cesopsn-cas|ether, satop-e1, satop-t1, [1..65535].

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)
=====
```

Service Assurance Agent (SAA) Commands

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 [reply-mode ip-routed|control-channel] [target-fec-type static-pw-fec agi attachment-group-identifier pw-path-id-saii global-id:node-id:ac-id pw-path-id-taii global-id:node-id:ac-id]`
`vccv-trace saii-type2 global-id:prefix:ac-id taii-type2 global-id:prefix:ac-id [reply-mode ip-routed|control-channel] vccv-trace spoke-sdp-fec spoke-sdp-fec-id [reply-mode ip-routed|control-channel] [saii-type2 global-id:prefix:ac-id taii-type2 global-id:prefix:ac-id]`
`vccv-trace static sdp-id:vc-id [assoc-channel ipv4|non-ip] [src-ip-address ipv4-address] [target-fec-type pw-id-fec sender-src-address ipv4-address remote-dst-address ipv4-address pw-id pw-id pw-type pw-type]`
options common to all vccv-trace cases: `[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]`

Context oam
 config>saa>test>type

Description This command configures a Virtual Circuit Connectivity Verification (VCCV) automated trace test. 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. In each iteration, the T-PE builds the MPLS echo request message in a way similar to VCCV-Ping. The first message with TTL=1 will have the next-hop S-PE T-LDP session source address in the Remote PE Address field in the PW FEC TLV. Each S-PE which terminates and processes the message will include in the MPLS echo reply message the FEC 128 TLV corresponding the PWsegment to its downstream node. The source T-PE or S-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.

The user can specify to display the result of the VCCV-trace for a fewer number of PW segments of the end-to-end MS-PW path. In this case, the min-ttl and max-ttl parameters are configured accordingly. However, the T-PE/S-PE node will still probe all hops up to min-ttl in order to correctly build the FEC of the desired subset of segments.

Note that if the saii-type-2 and taii-type-2 parameters are specified by the user of this command for a FEC129 pseudowire, then these values will be used by the vccv-ping echo request message instead of the saii and taii of the spoke-sdp indexed by the spoke-sdp-fec parameter, or any saii and taii received in a switching point TLV for the pseudowire. Furthermore, the user must enter the saii and taii in accordance with the direction of pseudowire as seen from the node on which the vccv-trace command is executed. However, the values of the saii and taii sent in the echo request message will be swapped with respect to the user-entered values to match the order in the installed FEC on the targeted node. The output of the command for a FEC129 type 2 pseudowire will reflect the order of the saii and taii stored on the targeted node.

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. 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).

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 con-

Service Assurance Agent (SAA) Commands

tents 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.

The `target-fec-type` option allows the user to perform a `vccv-trace` to a segment of a MS-PW that does not have the same FEC type as the local segment from the T-PE where the `vccv-trace` command is issued. This is applicable for performing VCCV Ping on an MS-PW comprised of static PW FEC segments and dynamically signaled PW ID FEC segments.

Parameters

`sdpid:vcid` — If a FEC 128 PW is being tested, then its VC ID 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` 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.

`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* parameter.

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 SPE 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.

Values *fc-name* — The forwarding class of the VCCV trace echo request encapsulation.

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.

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

Default *be*

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

Table 14: 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

Table 14: Request Packet and Behavior (Continued)

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 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)	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

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 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

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

assoc-channel {**ipv4** | **non-ip**} — the associated channel encapsulation format to use for the VCCV trace echo request and echo reply packet for a PW that uses the static PW FEC. An associated channel type of **ipv4** must be used if a **vcv-ping** is performed to a remote segment of a different FEC type.

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

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

Default non-ip

target-fec-type {**pw-id-fec** | **static-pw-fec**} — The FEC type for a remote PW segment targeted by a VCCV trace echo request. This parameter is used if VCCV trace is used along a MS-PW where a static MPLS-TP PW segment using the static PW FEC is switched to a T-LDP signaled segment using the PW ID FEC (FEC128), or vice versa, thus requiring the user to explicitly specify a target FEC that is different from the local segment FEC.

Values **pw-id-fec** — Indicates that FEC element for the remote target PW segment is of type PW ID (FEC128).

static-pw-fec — Indicates that FEC element for the remote target PW segment is of type Static PW FEC.

agi *agi-value* — The attachment group identifier for the target FEC. This parameter is only valid in combination with the **target-fec-type static-pw-fec**.

Values 0 – 4,294,967,295

pw-path-id-saii *src-global-id:src-node-id:src-ac-id* — The SAI of the target FEC. This parameter is only

valid in combination with the target-fec-type static-pw-fec.

Values *src-global-id* — The Global ID of the SAAI of the targeted static PW FEC element.

Values 1 – 4,294,967,295

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

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

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

Values 1 – 4,294,967,295

pw-path-id-taii *dst-global-id:dst-node-id:dst-ac-id* — The SAAI of the target FEC. This parameter is only valid in combination with the target-fec-type static-pw-fec.

Values *dst-global-id* — The Global ID of the TAI of the targeted static PW FEC element.

Values 1 – 4,294,967,295

dst-node-id — The node-id of the TAI on far end T-PE that the pseudowire being tested is associated with.

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

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

Values 1 – 4,294,967,295

remote-dst-address *ipv4-address* — The 4-octet IPv4 address of the far end node that is a target of the VCCV Ping echo request. This parameter is only valid in combination with the target-fec-type static-pw-fec.

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

sender-src-address *ipv4-address* — The 4-octet IPv4 address of the node originating the VCCV Ping echo request. This parameter is only valid in combination with the target-fec-type pw-id.

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

remote-dst-address *ipv4-address* — The 4-octet IPv4 address of the far end node that is a target of the VCCV Ping echo request. This parameter is only valid in combination with the target-fec-type pw-id.

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

pw-type *value* — The PW Type of the PW segment targeted on the far end node. This field must be included to populate the PW type field of the PW ID FEC in the FEC static TLV, when the far end FEC type is different from the local FEC type and the target-fec-type is pw-id-fec.

Values atm-cell, atm-sdu, atm-vcc, atm-vpc, cesopsn, cesopsn-cas|ether, satop-e1, satop-t1, [1..65535].

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 that is not configured as continuous.

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 CLI”.

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.

OAM Performance Monitoring and Binning Commands

oam-pm

Syntax **oam-pm session** *session-name* {dmm | lmm | slm | twamp-light} {start | stop}

Context oam

Description This command allows the operator to start and stop on-demand OAM-PM sessions. .

Parameters **session** *session-name* — Identifies the session name that the test is associated with
session-name — Specifies the session name, up to 32 characters in length
dmm — Specifies the DMM test that will be affected by the command
lmm — Specifies the LMM test that will be affected by the command
slm — Specifies the SLM test that will be affected by the command
twamp-light — Specifies the TWAMP-light test that will be affected by the command
start — Manually starts the test
stop — Manually stops the test

oam-pm

Syntax **oam-pm**

Context config

Description This is the top level context that contains the configuration parameters that defines storage parameters (including binning structures), availability/resiliency and the individual proactive, and on-demand tests used to gather the performance/statistical information.

bin-group

Syntax **bin-group** *bin-group-number* [**fd-bin-count** *fd-bin-count* **fdr-bin-count** *fdr-bin-count* **ifdv-bin-count** *ifdv-bin-count* **create**]

Context config>oam-pm

Description This command allows the operator to configure the parameters for a specific bin group. Bin-group 1 is a default bin-group and cannot be modified. If no bin group is assigned to an oam-pm session this will be assigned by default. The default values for bin-group 1 are (fd-bin-count 3 bin 1 lower-bound 5000us, bin 2 lower-bound 10000us fdr-bin-count 2 bin 1 lower-bound 5000us and ifdv-bin-count 2 bin 1 lower-bound 5000us)

OAM Performance Monitoring and Binning Commands

- Parameters** *bin-group-number* — Numerical identifier for a bin-group that is referenced by oam-pm sessions. A bin group can only shutdown and modified when all the PM Sessions referencing the bin group have been shutdown. The only exception is the description parameter.
- Values** [1..255]
- fd-bin-count** *fd-bin-count* — Specifies the number of fd bins that will be created.
- Values** [2..10]
- fdr-bin-count** *fdr-bin-count* — Specifies the number of fdr bins that will be created.
- Values** [2..10]
- ifdv-bin-count** *ifdv-bin-count* — Specifies the number of ifdv bins that will be created.
- Values** [2..10]
- create** — Keyword that instantiates the bin group.

description

- Syntax** **description** *description-string*
no description
- Context** config>oam-pm>bin-group
- 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 the command removes the string from the configuration
- Parameters** *description-string* — The description character string. Allowed values are any characters 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 in double quotes.

bin-type

- Syntax** **bin-type** {**fd** | **fdr** | **ifdv**}
- Context** config>oam-pm>bin-group
- Description** This command is the start of the hierarchy where the specific delay metric bin structure will be defined.
- Parameters** **fd** — keyword to enter the frame delay bin threshold configuration.
- fdr** — keyword to enter the frame delay range bin threshold configuration.
- ifdv** — keyword to enter the inter-frame delay variation bin thresholds configuration.

bin

Syntax `bin bin-number lower-bound microseconds`

Context `config>oam-pm>bin-group>bin-type`

Description This command allows the operator specify the individual floors thresholds for the bins. The operator does not have to specific a lower threshold for every bin that was previously defined by the bin-count for the specific type. By default each bin will be the bin-number * 5000 microseconds. Lower thresholds in the previous adjacent bin must be lower than the threshold of the next higher bin threshold. A separate line per bin is required to configured an operator specific threshold. An error will prevent the bin from entering the active state if this is not maintained, at the time the “no shutdown” is issued. Bin 0 is the result of the difference between 0 and the configured lower-threshold of bin 1. The highest bin in the bin-count will capture every result above the threshold. Any negative delay metric result will be treated as zero and placed in bin 0.

The **no** form of the lower-bound removes the user configured threshold value and applies the default for the bin.

Parameters *bin-number* — Specifies bin to configure.

Values [1..9]

lower-bound microseconds — The threshold that defines the floor of the bin. The bin range is the difference between its configured threshold and the threshold of the next higher bin in microsecond threshold value.

Values [1..4294967295]

Default bin-number * 5000

delay-event

Syntax `delay-event {forward | backward | round-trip} lowest-bin bin-number threshold raise-threshold [clear clear-threshold] [no] delay-event {forward | backward | round-trip}`

Context `config>oam-pm>bin-group>bin-type`

Description This command sets the bin number, the threshold and the direction that is monitored to determine if a delay metric threshold crossing event has occurred or has cleared. It requires a bin number, a rising threshold value and a direction. If the [**clear threshold**] is not specified, the traffic crossing alarm will be stateless. Stateless means the state is not carried forward to other measurement intervals. Each measurement interval is analyzed independently and without regard to any previous window. When a raise threshold is reached, the log event is generated. Each unique threshold can only be raised once for the threshold within measurement interval. If the optional clear threshold is specified, the traffic crossing alarm uses stateful behavior. Stateful means each unique previous event state is carried forward to following measurement intervals. If a threshold crossing event is raised another will not be raised until a measurement interval completes, and the clear threshold has not been exceeded. A clear event will be raised under that condition. In general, alarms are generated when there is a state change. The thresholds configured will be applied to the count in specified bin and all higher number bins.

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The **no** version of this command removes thresholding for this delay metric. The complete command must be configured in order to remove the specific threshold.

Default [no] delay-events

Parameters

- forward** — The threshold is applied to the forward direction bin.
- backward** — The threshold is applied to the backward direction bin.
- round-trip** — The threshold is applied to the roundtrip direction bin.
- lowest-bin** *bin-number* — The number of the bin that the threshold is applied to. This bin and all higher bins will be monitoring to determine if the sum total results in these bins have reached or crossed the configured threshold.
 - Values** {0..9}
- threshold** *raise-threshold* — The rising value that determines when the event is to be generated, when value reached.
 - raise-threshold* the numerical value in the range
 - Values** {1..864000}
- clear** *clear-threshold* — An optional threshold used to indicate stateful behavior that allows the operator to configure a lower value than the rising threshold that determines when the clear event should be generated. Clear is generated when the end of measurement interval count is less than or equal to the configured value. If this option is not configured the behavior is stateless.
 - clear-threshold* a numerical value in the range. Zero means no results can existing in the lower bin or any higher.
 - Values** {0..863999}
 - Default** Clear threshold disabled

shutdown

Syntax [no] shutdown

Context config>oam-pm>bin-group

Description This command activates and deactivates the bin group. Only the description of the bin group can be modified when the bin group is in a “no shutdown” state. No other changes can be made while the bin group is active. The bin group can only be shutdown and modified when all references in the various PM Sessions or individual tests have been shutdown. If an active PM session is referencing the bin-group, it will generate an error indicating there are x number of active tests referencing the bin-group, and it cannot be shutdown.

The **no** form of the command activates the bin group as available for PM Sessions and tests to utilize.

Default shutdown

session

Syntax **session** *session-name* **test-family** {**ethernet** | **ip**} [**session-type** {**proactive** | **on-demand**}]
create
no session *session-name*

Context config>oam-pm

Description This command creates the individual session containers that will house the test specific configuration parameters. Since this session context provides only a container abstract to house the individual test functions, it cannot be shutdown. Individual tests sessions within the container may be shutdown. No values, parameters, or configuration within this context may be changed if any individual test is active. Changes may only be made when all tests within the context are shutdown. The only exception to this is the description value.

The **no** form of the command deletes the session.

Parameters *session-name* — Identifies the session container.

test-family — Indicates the type family and sets the context for the individual parameters.

ethernet — Keyword that indicates the test will be based on the Ethernet layer.

ip — Keyword that indicates the test will be based on the IP layer.

session-type — Specifies how to set the Type bit in the Flags byte, and influences how different test criteria may be applied to the individual test. Not all test-families carry this information in the PDU.

proactive — Keyword setting the type to always on with immediate start and no stop.

on-demand — Keyword setting the type a demand function with an immediate start and no stop, or stop based on offset.

Default proactive

create — Instantiates the PM session.

description

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

Context config>oam-pm>session

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 the command removes the string from the configuration.

Parameters *description-string* — The description character string. Allowed values are any characters 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 in double quotes.

bin-group

Syntax	bin-group <i>bin-group-number</i> no bin-group
Context	config>oam-pm>session
Description	This command links the individual test to the group of bins that map the probe responses. The no form of this command installs the default bin-group 1 as the bin-group for the session.
Parameters	<i>bin-group-number</i> — The number that was used to create the specific bin-group that will be referenced for this session. Values [1..255] Default 1

meas-interval

Syntax	meas-interval {5-mins 15-mins 1-hour 1-day} create no meas-interval {5-mins 15-mins 1-hour 1-day}
Context	config>oam-pm>session
Description	This command establishes the parameters of the individual measurement intervals utilized by the session. Multiple measurement intervals may be specified within the session. A maximum of three different measurement intervals may be configured under each session. The no form of the command deletes the specified measurement interval.
Parameters	{5-mins 15-mins 1-hour 1-day} — Keywords used to specifies the duration of the measurement interval. create — Keyword the instantiates the measurement interval.

accounting-policy

Syntax	accounting-policy <i>acct-policy-id</i> no accounting-policy
Context	config>oam-pm>session>meas-interval
Description	This optional command allows the operator to assign an accounting policy and the policy-id (configured under the config>log>accounting-policy) with a record-type of complete-pm. This runs the data collection process for completed measurement intervals in memory, file storage, and maintenance functions moving data from memory to flash. A single accounting policy can be applied to a measurement interval. The no form of the command removes the accounting policy.

Parameters *acct-policy-id* — Specifies the accounting policy to be applied to the measurement interval.

Values [1..99]

boundary-type

Syntax **boundary-type** {**clock-aligned** | **test-relative**}
no boundary-type

Context config>oam-pm>session>meas-interval

Description This command establishes the alignment of the start of the measurement interval with either the time of day clock or the start of the test. Alignment with the time of day clock always defaults to the representative top of the hour. Clock aligned 15-minute measurement intervals will divide the hour into four equal sections 00, 15, 30, 45. Clock aligned 1-hour measurement intervals will start at 00. Clock aligned 1-day measurement intervals will start at midnight. Test relative start times will launch the measurement interval when the individual test enters the active (no shutdown) state. It is typical for the first measurement interval of a clock aligned test to have the suspect flag set to yes because it is unlikely the **no shutdown** will exactly correspond to the clock based measurement interval start time. Clock aligned measurement intervals can include an additional offset. See clock-offset command option under this context.

The **no** form of the command sets the boundary to the default clock-aligned.

Parameters **clock-aligned** — Keyword that aligns the start of the measurement interval with the time of day clock.

test-relative — Keyword that aligns the start of the measurement interval with the start of the test.

clock-offset

Syntax **clock-offset** *seconds*
no clock-offset

Context config>oam-pm>session>meas-interval

Description This command allows measurement intervals with a boundary-type of clock aligned to be offset from the default time of day clock. The configured offset must be smaller than the size of the measurement interval. As an example, an offset of 300 (seconds) will shift the start times of the measurement intervals by five minutes from their default alignments with respect to the time of day clock.

The **no** form of the command sets the offset to 0.

Parameters *seconds* — The number of seconds to offset a clock-alignment measurement interval from its default.

Values [0..86399]

Default 0

event-mon

Syntax `event-mon`

Context `config>oam-pm>session>measurement-interval`

Description This hierarchy allows for enabling of the different threshold events on a specific measurement interval. Only one measurement interval with a configured OAM PM session can have events enabled using the `no shutdown` command.

delay-events

Syntax `delay-events`
`[no] delay-events`

Context `config>oam-pm>session>measurement-interval>event-monitoring`

Description This enables and disables the monitoring of all configured delay events. Adding this functionality will start the monitoring of the configured delay events at the start of the next measurement interval. If the function is removed using the `no` command, all monitoring of configured delay events, logging, and recording of new events for that session will be suspended. Any existing events at the time of the shutdown will be maintained until the active measurement window in which the removal was performed has completed. The state of this monitoring function can be changed without having to shutdown all the tests in the session.

Default `[no] delay-events`

loss-events

Syntax `loss-events`
`[no] loss-events`

Context `config>oam-pm>session>measurement-interval>event-monitoring`

Description This enables and disables the monitoring of all configured loss events. Adding this functionality will start the monitoring of the configured loss events at the start of the next measurement interval. If the function is removed using the `no` command, all monitoring of configured loss events, logging, and recording of new events for that session will be suspended. Any existing events at the time of the shutdown will be maintained until the active measurement window in which the removal was performed has completed. The state of this monitoring function can be changed without having to shutdown all the tests in the session.

Default `[no] loss-events`

shutdown

Syntax [no] shutdown

Context config>oam-pm>session>measurement-interval>event-monitoring

Description Issuing a **no shutdown** command will start the monitoring of the configured events at the start of the next measurement interval. If a **shutdown** is issued, all monitoring of configured events, logging, and recording of new events for that session will be suspended. Any existing events at the time of the shutdown will be maintained until the active measurement window in which the **event-mon** shutdown was issued has completed. The state of this monitoring function can be changed without having to shutdown all the tests in the session.

Default shutdown

intervals-stored

Syntax intervals-stored *intervals*
no intervals-stored

Context config>oam-pm>session>meas-interval

Description This command defines the number of completed measurement intervals per session to be stored in volatile system memory. The entire block of memory is allocated for the measurement interval when the test is active (no shutdown) to ensure memory is available. The numbers are increasing from 1 to the configured value + 1. The active pm data will be stored in the interval number 1 and older runs are stored, in order, to the upper most number with the oldest rolling off when the number of completed measurement intervals exceeds the configured value+1. As new test measurement intervals complete for the session, the stored intervals will get renumbered to maintain the described order. Care must be taken when setting this value. There must be a balance between completed runs stored in volatile memory and the use of the write to flash function of the accounting policy.

The 5-mins and 15-mins measurement intervals share the same [1..96] retention pool. In the unlikely event both intervals are required the sum total of both cannot exceed 96. The 1-hour and 1-day measurement intervals utilizes their own ranges.

If this command is omitted when configuring the measurement interval, the default values will be used.

Parameters *intervals* — Specifies the measurement interval.

5-mins — Specifies 5 minutes measurement interval.

Values [1..96]

Default 32

15-mins — Specifies 15 minutes measurement interval.

Values [1..96]

Default 32

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1-hour — Specifies 1 hour measurement interval.

Values [1..24]

Default 8

1-day — Specifies 1 day measurement interval.

Values [1..1]

Default 1

ethernet

Syntax ethernet

Context config>oam-pm>session

Description This command allows the operator to enter the hierarchy to configure the Ethernet specific source and destination information, the priority, and the Ethernet tests tools on the launch point.

dest-mac

Syntax dest-mac *ieee-address*
no dest-mac

Context config>oam-pm>session>ethernet

Description This command defines the destination MAC address of the peer MEP and sets the destination MAC address in the layer two header to match. This must be a unicast address.

The **no** form of the command removes session parameter.

Parameters *ieee-address* — Specifies the layer two unicast MAC address of the destination MEP.

Values 6-byte unicast mac-address (xx:xx:xx:xx:xx:xx or xx-xx-xx-xx-xx-xx)

priority

Syntax priority *priority*

Context config>oam-pm>session>ethernet

Description This command defines the CoS priority across all tests configured under this session. This CoS value is exposed to the various QoS policies the frame will pass through and does not necessarily map directly to the CoS value on the wire.

The **no** form of the command removes changes the priority to the default value.

Parameters *priority* — Specifies the CoS value.

Values [0..7]

Default 0

source

Syntax **source mep** *mep-id* **domain** *md-index* **association** *ma-index*
no source

Context config>oam-pm>session>ethernet

Description This command defines the source launch point identification Y.1731 parameters that will be used by the individual tests within the session. If an MEP matching the configuration does not exist, the session will be allowed to become active, however the frames sent frames and received as seen under the “show oam-pm statistics session *session-name* ...” will be zero.

The **no** form of the command removes this session parameter.

Parameters **mep** *mep-id* — Specifies the maintenance association end point identifier of the launch point.

Values 1 – 8191

domain *md-index* — Specifies the maintenance domain (MD) index value of the launch point.

Values 1 — 4294967295

association *ma-index* — Specifies the maintenance association (MA) index value of the launch point.

Values 1 — 4294967295

slm

Syntax **slm** [*test-id test-id*] **create**
no slm

Context config>oam-pm>session>ethernet

Description This command defines the test-id to be assigned to the synthetic loss test and creates the container to allow the individual test parameters to be configured.

The **no** form of the command removes the SLM test function from the PM Session.

Parameters *test-id* — Specifies the value to be placed in the 4-byte test id field of an ETH-SLM PDU.

Values 0 - 2,147,483,647

create — Keyword to create the test.

dmm

Syntax	dmm [test-id test-id] create no dmm
Context	config>oam-pm>session>ethernet
Description	This command defines the test-id to be assigned to the delay test and creates the container to allow the individual test parameters to be configured. The no form of the command removes the DMM test function from the PM Session.
Parameters	<i>test-id</i> — Specifies the value to be placed in the 4-byte test id field of an ETH-DMM PDU. Values 0 - 2,147,483,647 create — Keyword to create the test.

lmm

Syntax	lmm [test-id test-id] create no lmm
Context	config>oam-pm>session>ethernet
Description	This command defines the test-id to be assigned to the Tx and Rx counter-based loss test and creates the individual test. LMM does not carry this test-id in the PDU; the value is of local significance. The no form of the command removes the LMM test function from the PM Session.
Parameters	<i>test-id</i> — Specifies the value to be placed in the 4-byte test id field of an ETH-DMM PDU. Values 0 - 2,147,483,647 create — Keyword to create the test.

data-tlv-size

Syntax	data-tlv-size octets no data-tlv-size
Context	config>oam-pm>session>ethernet>slm config>oam-pm>session>ethernet>dmm
Description	This command allows the operator to add an optional Data TLV to PDU and increase the frame on the wire by the specified amount. This value is not the size of the frame on the wire. It is the size of the addition padding added to the PDU. The no form of the command removes the optional TVL.
Parameters	<i>octets</i> — Octet size of the optional Data TLV. Values [0 3.. 2000]

Default 0

shutdown

Syntax [no] shutdown

Context config>oam-pm>session>ethernet>slm
config>oam-pm>session>ethernet>dmm
config>oam-pm>session>ethernet>lmm

Description This command activates and deactivates the individual test. When the test is shutdown, no active measurements are being made and any outstanding requests are ignored. If the test is started or stopped during a measurement interval, the suspect flag will be set to yes to indicate that the data for the specific data set is in questionable.

The **no** form of the command activates the individual test.

Default shutdown

test-duration

Syntax test-duration *seconds*
no test-duration

Context config>oam-pm>session>ethernet>slm
config>oam-pm>session>ethernet>dmm
config>oam-pm>session>ethernet>lmm

Description This optional command defines the length of time the test will run before stopping automatically. This command is only a valid option when a session has been configured with a session-type of on-demand. This is not an option when the session-type is configured as proactive. On-demand tests do not start until the **config>oam-pm>session>start** command has been issued and they will stop when the **config>oam-pm>session>stop** command is issued.

The **no** form of the command will remove a previously configured test-duration and allow the test to execute until manually stopped.

Default no test-duration

Parameters *seconds* — The number of seconds the test will execute from its start time.

Values [1..86400]

flr-threshold

Syntax	flr-threshold <i>percentage</i> no flr-threshold				
Context	config>oam-pm>session>ethernet>slm				
Description	This command defines the frame loss threshold used to determine if the delta-t is available or unavailable. An individual delta-t with a frame loss threshold equal to or higher than the configured threshold will be marked unavailable. An individual delta-t with a frame loss threshold lower than the configured threshold will be marked as available. The no form of the command restores the default value of 50%.				
Parameters	<i>percentage</i> — The percentage of the threshold. <table border="0" style="margin-left: 20px;"> <tr> <td style="vertical-align: top;">Values</td> <td>[1..100]</td> </tr> <tr> <td style="vertical-align: top;">Default</td> <td>50 percent</td> </tr> </table>	Values	[1..100]	Default	50 percent
Values	[1..100]				
Default	50 percent				

timing

Syntax	timing <i>frames-per-delta-t frames consec-delta-t deltas interval milliseconds chli-threshold threshold</i> no timing								
Context	config>oam-pm>session>ethernet>slm								
Description	This command defines various availability parameters and the probe spacing (interval) for the SLM frames. The maximum size of the availability window cannot exceed 10s (10,000ms). The no form of the command will install the default values for all timing parameters and use those values to compute availability and set the SLM frequency. If an SLM test is in “no shutdown” it will always have timing parameters, default or operator configured.								
Parameters	frames-per-delta-t — Defines the size of the small measurement window. Each delta-t will be marked as available or unavailable based on the flr-threshold. The size of the delta-t measurement is the product of the number of frames and the interval. <i>frames</i> — The number of SLM frames that define the size of the delta-t. <table border="0" style="margin-left: 20px;"> <tr> <td style="vertical-align: top;">Values</td> <td>[1.. 50]</td> </tr> <tr> <td style="vertical-align: top;">Default</td> <td>10</td> </tr> </table> consec-delta-t — The number of consecutive delta-t small measurement intervals that make up the sliding window over which availability and unavailability will be determined. Transitions from one state to another will occur when the consec-delta-t are now in a new state. <i>deltas</i> — The number of consecutive delta-t used for the sliding window. <table border="0" style="margin-left: 20px;"> <tr> <td style="vertical-align: top;">Values</td> <td>[2..10]</td> </tr> <tr> <td style="vertical-align: top;">Default</td> <td>10</td> </tr> </table>	Values	[1.. 50]	Default	10	Values	[2..10]	Default	10
Values	[1.. 50]								
Default	10								
Values	[2..10]								
Default	10								

interval — The message period, or probe spacing, for the transmission of the SLM frame.

milliseconds — The number of milliseconds between the transmission of the SLM frames. The default value for the SLM interval is different than the default interval for DMM. This is intentional

Values [100 | 1000]

Default 100

chli-threshold — Number of consecutive high loss intervals (unavailable delta-t) that when equal to or exceeded will increment the CHLI counter. A CHLI counter is an indication that the sliding window is available but has crossed a threshold consecutive of unavailable delta-t intervals. A CHLI can only be incremented once during a sliding window and will only be incremented during times of availability.

threshold — The number of consecutive unavailable delta-t that will cause the CHLI counter to be incremented

Values [1..9]

Default 5

interval

Syntax **interval** *milliseconds*
no interval

Context config>oam-pm>session>ethernet>dmm
config>oam-pm>session>ethernet>lmm

Description This command defines the message period or probe spacing for the transmission of the DMM or LMM frame.

The **no** form of the command sets the interval to the default. If an LMM test is in **no shutdown** it will always have timing parameters, whether default or operator configured.

Parameters *milliseconds* — The number of milliseconds between the transmission of the DMM or LMM frames. The default value for the DMM or LMM interval is different than the default interval for SLM. This is intentional.

Values [100 | 1000 | 10000]

Default 1000

loss-events

Syntax **loss-events**

Context config>oam-pm>session>ethernet>slm
config>oam-pm>session>ethernet>lmm
config>oam-pm>session>ip>twamp-light

Description This context allows the operator to define the loss events and thresholds that are to be tracked.

avg-flr-event

Syntax **avg-flr-event** {**forward** | **backward**} **threshold** *raise-threshold-percent* [**clear** *clear-threshold-percent*]
[no] avg-flr-event

Context config>oam-pm>session>ethernet>slm
 config>oam-pm>session>ethernet>lmm
 config>oam-pm>session>ip>twamp-light

Description This command sets the frame loss ratio threshold configuration that will be applied and checked at the end of the measurement interval for the specified direction. This is a percentage based on average frame loss ratio over the entire measurement interval. If the [**clear** *clear-threshold-percent*] is not specified the traffic crossing alarm will be stateless. Stateless means the state is not carried forward to other measurement intervals. Each measurement interval is analyzed independently and without regard to any previous window. Each unique event can only be raised once within measurement interval. If the optional clear threshold is specified the traffic crossing alarm uses stateful behavior. Stateful means each unique previous event state is carried forward to following measurement intervals. If a threshold crossing event is raised another will not be raised until a measurement interval completes and the clear threshold has not been exceeded. A clear event will be raised under that condition.

The **no** version of this command removes the event threshold for frame loss ratio. The direction must be included with the **no** command.

Default no avg-flr-event forward
 no avg-flr-event backward

Parameters **forward** — The threshold is applied to the forward direction value
backward — The threshold is applied to the backward direction value
threshold — The rising percentage that determines when the event is to be generated.

raise-threshold-percent: The percentage of loss

Values 0.001 .. 100.000

clear — An optional value used for stateful behavior that allows the operator to configure a value lower than the rising percentage to indicate when the clear event should be generated.

clear-threshold-percent The percentage of loss

Values {0.000 .. 99.999} A value 0.000 means there FLR must be 0.000.

chli-event

Syntax **chli-event** {forward|backward|aggregate} **threshold** *raise-threshold* [**clear** *clear-threshold*]
[no] chli-event

Context config>oam-pm>session>ethernet>slm>loss
 config>oam-pm>session>ip>twamp-light>loss

Description This command sets the consecutive high loss interval (CHLI) threshold to be monitored and the associated thresholds using the counter of the specified direction. The aggregate is a function of summing forward and backward. This value is only used as a threshold mechanism and is not part of the stored statistics. If the [**clear** *clear-threshold*] is not specified the traffic crossing alarm will be stateless. Stateless means the state is not carried forward to other measurement intervals. Each measurement interval is analyzed independently and without regard to any previous window. Each unique event can only be raised once within measurement interval. If the optional clear threshold is specified the traffic crossing alarm uses stateful behavior. Stateful means each unique previous event state is carried forward to following measurement intervals. If a threshold crossing event is raised another will not be raised until a measurement interval completes and the clear threshold has not been exceeded. A clear event will be raised under that condition.

The **no** version of this command removes the event threshold for frame loss ratio. The direction must be included with the **no** command.

Default no chli-event forward
 no chli-event backward
 no chli-event aggregate

Parameters **forward** — The threshold is applied to the forward direction count.
backward — The threshold is applied to the backward direction count
aggregate — The threshold is applied to the aggregate count (sum of forward and backward).
threshold — The rising threshold that determines when the event is to be generated, when value reached.

raise-threshold A numerical value compared to the CHLI counter

Values 1 .. 864000

clear — An optional value used for stateful behavior that allows the operator to configure a value lower than the rising percentage to indicate when the clear event should be generated.

clear-threshold A numerical value compared to the CHLI counter

Values 0 .. 863999 A value of zero means the CHLI counter must be 0.

hli-event

Syntax **hli-event** {forward|backward|aggregate} threshold *raise-threshold* [**clear** *clear-threshold*]
[no] hli-event

Context config>oam-pm>session>ethernet>slm>loss
 config>oam-pm>session>ip>twamp-light>loss

Description This command sets the high loss interval (HLI) threshold to be monitored and the associated thresholds using the counter of the specified direction. The aggregate is a function of summing forward and backward. This value is only used as a threshold mechanism and is not part of the stored statistics. If the [**clear** *clear-threshold*] is not specified the traffic crossing alarm will be stateless. Stateless means the state is not carried forward to other measurement intervals. Each measurement interval is analyzed independently and without regard to any previous window. Each unique event can only be raised once within measurement interval. If the optional clear threshold is specified the traffic crossing alarm uses stateful behavior. Stateful means each unique previous event state is carried forward to following measurement intervals. If a threshold crossing event is raised another will not be raised until a measurement interval completes and the clear threshold has not been exceeded. A clear event will be raised under that condition.

The **no** version of this command removes the event threshold for frame loss ratio. The direction must be included with the **no** command.

Default no hli-event backward
 no hli-event aggregate

Parameters **forward** — The threshold is applied to the forward direction count.
backward — The threshold is applied to the backward direction count
aggregate — The threshold is applied to the aggregate count (sum of forward and backward).
threshold — The rising threshold that determines when the event is to be generated, when value reached.

raise-threshold The percentage of loss

Values 1 .. 864000

clear — An optional value used for stateful behavior that allows the operator to configure a value lower than the rising percentage to indicate when the clear event should be generated.

clear-threshold The percentage of loss

Values 0 .. 863999 A value of zero means the HLI counter must be 0.

unavailability-event

Syntax `unavailability-event {forward|backward|aggregate} threshold raise-threshold [clear clear-threshold]`
[no] unavailability-event

Context `config>oam-pm>session>ethernet>slm>loss`
`config>oam-pm>session>ip>twamp-light>loss`

Description This command sets the threshold to be applied to the overall count of the unavailability indicators, not transitions, per configured direction. This value is compared to the 32 bit unavailability counter specific to the direction which tracks the number of individual delta-ts that have been recorded as unavailable. The aggregate is a function of summing forward and backward. This value is only used as a threshold mechanism and is not part of the stored statistics. If the [**clear** *clear-threshold*] is not specified, the traffic crossing alarm will be stateless. Stateless means the state is not carried forward to other measurement intervals. Each measurement interval is analyzed independently and without regard to any previous window. Each unique event can only be raised once within measurement interval. If the optional clear threshold is specified the traffic crossing alarm uses stateful behavior. Stateful means each unique previous event state is carried forward to following measurement intervals. If a threshold crossing event is raised, another will not be raised until a measurement interval completes and the clear threshold has not been exceeded. A clear event will be raised under that condition.

The **no** version of this command removes the event threshold for frame loss ratio. The direction must be included with the **no** command.

Default `no unavailability-event forward`
`no unavailability-event backward`
`no unavailability-event aggregate`

Parameters **forward** — The threshold is applied to the forward direction count.
backward — The threshold is applied to the backward direction count
aggregate — The threshold is applied to the aggregate count (sum of forward and backward).
threshold — The rising threshold that determines when the event is to be generated, when value reached.

raise-threshold A numerical value compared to the unavailability counter

Values 1 .. 864000

clear — An optional value used for stateful behavior that allows the operator to configure a value lower than the rising percentage to indicate when the clear event should be generated.

clear-threshold A numerical value compared to the unavailability counter

Values 0 .. 863999 A value of zero means the unavailability counter must be 0

undet-availability-event

Syntax `undet-availability-event {forward|backward|aggregate} threshold raise-threshold [clear clear-threshold]`
[no] undet-availability-event

Context `config>oam-pm>session>ethernet>slm>loss`
`config>oam-pm>session>ip>twamp-light>loss`

Description This command sets the threshold to be applied to the overall count of the undetermined availability indicators, not transitions, per configured direction. This value is compared to the 32 bit unavailability counter specific to the direction which tracks the number of individual delta-ts that have been recorded as undetermined available. The aggregate is a function of summing forward and backward. This value is only used as a threshold mechanism and is not part of the stored statistics. If the **[clear *clear-threshold*]** is not specified the traffic crossing alarm will be stateless. Stateless means the state is not carried forward to other measurement intervals. Each measurement interval is analyzed independently and without regard to any previous window. Each unique event can only be raised once within measurement interval. If the optional clear threshold is specified the traffic crossing alarm uses stateful behavior. Stateful means each unique previous event state is carried forward to following measurement intervals. If a threshold crossing event is raised another will not be raised until a measurement interval completes and the clear threshold has not been exceeded. A clear event will be raised under that condition.

The **no** version of this command removes the event threshold for frame loss ratio. The direction must be included with the **no** command.

Default `no undetermined-available-event forward`
`no undetermined-available-event backward`
`no undetermined-available-event aggregate`

Parameters **forward** — The threshold is applied to the forward direction count.
backward — The threshold is applied to the backward direction count
aggregate — The threshold is applied to the aggregate count (sum of forward and backward).
threshold — The rising threshold that determines when the event is to be generated, when value reached.

raise-threshold A numerical value compared to the undetermined availability counter

Values 1 .. 864000

clear — An optional value used for stateful behavior that allows the operator to configure a value lower than the rising percentage to indicate when the clear event should be generated.

clear-threshold A numerical value compared to the unavailability counter

Values 0 .. 863999 A value of zero means the undetermined availability counter must be 0.

undet-unavailability-event

Syntax **undet-availability-event** {**forward**|**backward**|**aggregate**} **threshold** *raise-threshold* [**clear** *clear-threshold*]
[no] undet-availability-event

Context config>oam-pm>session>ethernet>slm>loss
 config>oam-pm>session>ip>twamp-light>loss

Description This command sets the threshold to be applied to the overall count of the undetermined unavailability indicators, not transitions, per configured direction. This value is compared to the 32 bit unavailability counter specific to the direction which tracks the number of individual delta-ts that have been recorded as undetermined unavailable. The aggregate is a function of summing forward and backward. This value is only used as a threshold mechanism and is not part of the stored statistics. If the [**clear** *clear-threshold*] is not specified the traffic crossing alarm will be stateless. Stateless means the state is not carried forward to other measurement intervals. Each measurement interval is analyzed independently and without regard to any previous window. Each unique event can only be raised once within measurement interval. If the optional clear threshold is specified the traffic crossing alarm uses stateful behavior. Stateful means each unique previous event state is carried forward to following measurement intervals. If a threshold crossing event is raised another will not be raised until a measurement interval completes and the clear threshold has not been exceeded. A clear event will be raised under that condition.

The **no** version of this command removes the event threshold for frame loss ratio. The direction must be included with the **no** command.

Default no undet-unavailable-event forward
 no undet-unavailable-event backward
 no undet-unavailable-event aggregate

Parameters **forward** — The threshold is applied to the forward direction count.
backward — The threshold is applied to the backward direction count
aggregate — The threshold is applied to the aggregate count (sum of forward and backward).
threshold — The rising threshold that determines when the event is to be generated, when value reached.

raise-threshold A numerical value compared to the undetermined unavailability counter

Values 1 .. 864000

clear — An optional value used for stateful behavior that allows the operator to configure a value lower than the rising percentage to indicate when the clear event should be generated.

clear-threshold A numerical value compared to the undetermined unavailability counter

Values 0 .. 863999 A value of zero means the undetermined availability counter must be 0.

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 15](#) summarizes this behavior:

Table 15: 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

LDP TreeTrace Commands

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 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.

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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 16: 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 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)	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

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

LDP TreeTrace Commands

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

LDP TreeTrace Commands

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	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. The no option resets the timeout to its default value.
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	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. If rfc4379 is selected, then the timestamp is in seconds and microseconds since 1900, otherwise it is in seconds and microseconds since 1970. 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.
Default	unix
Parameters	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). 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).

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 `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 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.

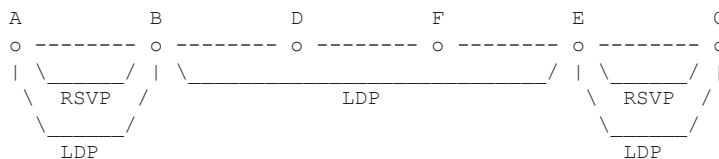
When the user configures the use of the DDMAP TLV on a trace for an LSP that does not undergo stitching or tunneling operation in the network, the procedures at the sender and responder nodes are the same as in the case of the DSMAP TLV.

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)
    
```

LDP Treetrace Commands

```

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

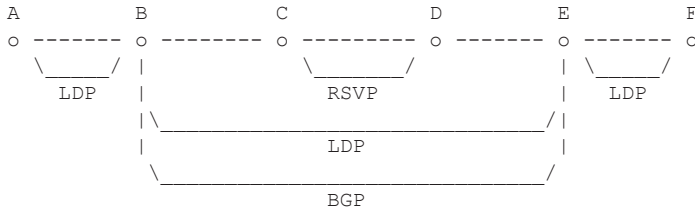
```

```

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

```


(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 Commands

twamp

Syntax	twamp
Context	config>test-oam
Description	This command enables TWAMP functionality.
Default	TWAMP is disabled.

server

Syntax	retry-count <i>retry-count</i>
Context	config>test-oam>twamp
Description	This command configures the node for TWAMP server functionality.
Default	TWAMP is disabled.

prefix

Syntax	prefix <i>address/prefix-length</i> [create] no prefix <i>address/prefix-length</i>				
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.				
Default	no prefix				
Parameters	<i>address</i> — An IPv4 or IPv6 address prefix (with host bits set to 0). <i>prefix length</i> — The prefix length. <table><tr><td>Values</td><td>0—128</td></tr><tr><td>Default</td><td>none</td></tr></table>	Values	0—128	Default	none
Values	0—128				
Default	none				

description

Syntax	description <i>text</i> no description
Context	config>test-oam>twamp>server>prefix
Description	Use this command to configure a description for the TWAMP server prefix table. The no form of the command removes the configuration.
Default	no description
Parameters	<i>text</i> — The TWAMP server description, up to 80 characters in length.

max-conn-prefix

Syntax	max-conn-prefix <i>count</i> 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	<i>count</i> — The maximum number of control connections.
	Values 0 — 64
	Default 32

max-conn-server

Syntax	max-conn-server <i>count</i> 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

TWAMP Commands

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 sets the default value (1800 s.)

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 sets the default value (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

TWAMP Light Commands

twamp-light

Syntax `twamp-light`

Context `config>router`
`config>service>vprn`
`config>test-oam>twamp`

Description This command enables the context for configuring TWAMP Light parameters.

inactivity-timeout

Syntax `inactivity-timeout time`
`no inactivity-timeout`

Context `config>test-oam>twamp>twamp-light`

Description This command configures the length of time to maintain stale state on the session reflector. Stale state is test data that has not been refreshed or updated by newly arriving probes for that specific test in a predetermined length of time. Any single reflector can maintain up state for a maximum of 12,000 tests. If the maximum value is exceeded, the session reflector will not have memory to allocate to new tests.

The **no** form of the command sets the default value of 100.

Parameters *time* — The value in seconds for maintaining stale state.

Values 10 — 100

Default 100

reflector

Syntax `reflector [udp-port udp-port-number] [create]`
`no reflector`

Context `config>router>twamp-light`
`config>service>vprn>twamp-light`

Description Use this command to configure TWAMP Light session reflector parameters and to enable TWAMP Light functionality with the **no shutdown** command. The **udp-port** keyword and value must be specified with the **create** keyword. An error message is generated if the specific UDP port is unavailable.

Parameters *udp-port* — Specifies the UDP port number. A strictly enforced restricted range has been introduced. The TWAMP Light session reflector must be brought in line with this new restriction prior upgrading or rebooting from any previous release if there is an active TWAMP Light session reflector configured.

Failure to do so will prevent an ISSU operation from proceeding and will fail to activate any reflector outside of the enforced range. Refer to the appropriate "Note:" in the Two-Way Active Measurement Protocol Light (TWAMP Light) section for a complete description. This parameter is required and specifies the destination udp-port that the session reflector will use to listen for TWAMP Light packets. The session controller launching the TWAMP Light packets must be configured with the same destination UDP port as part of the TWAMP Light test. The IES service will use the destination UDP port that is configured under the **router** context. Only one udp-port may be configured per unique context.

Values 64364 — 64373

prefix

Syntax **prefix** *ip-prefix/prefix-length* [**create**]
no prefix

Context config>router>twamp-light>reflector
config>service>vprn>twamp-light>reflector

Description Use this command to define which TWAMP Light packet prefixes the reflector will process. The **no** form of the command with the specific prefix removes the accepted source.

Parameters **create** — Instantiates the prefix list

ip-prefix/prefix-length — The IPv4 or IPv6 address and length

Values

ipv4-prefix:	a.b.c.d (host bits must be 0)
ipv4-prefix-le:	0 — 32
ipv6-prefix:	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
ipv6-prefix-le:	0 — 128
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

description

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

Context config>router>twamp-light>reflector>prefix
config>service>vprn>twamp-light>reflector>prefix
config>router>twamp-light>reflector
config>service>vprn>twamp-light>reflector

Description Use this command to configure a text description that gets 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 the command removes the string from the configuration.

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

shutdown

Syntax **shutdown**
no shutdown

Context config>router>twamp-light>reflector
config>service>vprn>twamp-light>reflector

Description Use this command to disable or enable TWAMP Light functionality within the context where the configuration exists, either the base router instance or the service. Enabling the base router context enables the IES prefix list since the IES service uses the configuration under the base router instance.

The **no** form of the command allows the router instance or the service to accept TWAMP Light packets for processing.

Default shutdown

ip

Syntax **ip**

Context config>oam-pm>session>ip

Description Use this command to enter the context to configure the IP-specific source and destination information, the priority, and the IP test tools on the launch point.

twamp-light

Syntax	twamp-light [<i>test-id test-id</i>] [create] no twamp-light
Context	config>oam-pm>session>ip
Description	This command assigns an identifier to the TWAMP Light test and creates the individual test. The no form of the command removes the TWAMP Light test function from the OAM-PM session.
Default	no twamp-light
Parameters	<i>test-id</i> — Specifies the value of the 4-byte local test identifier not sent in the TWAMP Light packets Values 0 — 2,147,483,647 create — Keyword to create the test

SOURCE

Syntax	source <i>ip-address</i> no source
Context	config>oam-pm>session>ip
Description	Use this command to define the source IP address that the session controller (launch point) will use for the test. The source address must be a local resident IP address in the context; otherwise, the response packets will not be processed by the TWAMP Light application. Only source addresses configured as part of TWAMP tests will be able to process the reflected TWAMP packets from the session reflector. The no form of the command removes the source address parameters.
Parameters	source — Keyword that indicates the launch point <i>ip-address</i> — This mandatory parameter is required in order to validate the TWAMP Light response received from the reflector. The initial source must be the destination in the response. Values IPv4 address in the form a.b.c.d Values IPv6 address in the form x: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 (no multicast addresses)

destination

Syntax **destination** *ip-address*
no destination

Context config>oam-pm>session>ip

Description Use this command to define the destination IP address that will be assigned to the TWAMP Light packets. The destination address must be included in the prefix list on the session reflector within the configured context in order to allow the reflector to process the inbound TWAMP Light packets.
 The **no** form of the command removes the destination parameters.

Default no destination

Parameters **destination** — Keyword that indicates the destination of the packet
ip-address — Parameter that specifies the IP address of the IP peer to which the packet is directed.

Values IPv4 address in the form a.b.c.d

Values IPv6 address in the form x: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

(no multicast addresses)

dest-udp-port

Syntax **dest-udp-port** *udp-port-number*
no dest-udp-port

Context config>oam-pm>session>ip

Description Use this command to define the destination UDP port on outbound TWAMP Light packets sent from the session controller. The destination UDP port must match the UDP port value configured on the TWAMP Light reflector that will be responding to this specific TWAMP Light test.
 The **no** form of the command removes the destination UDP port setting.

Default no dest-udp port

Parameters *udp-port-number* — The numerical value above the range

Values 1 — 65535

source-udp-port

Syntax **source-udp-port** *udp-port-number*
no source-udp-port

Context config>oam-pm>session>ip

Description Optional command that should only be used if a TWAMP Client is used to establish a TCP connection and communicate the test parameters to a TWAMP Server over TWAMP TCP Control and the test is launched from OAM-PM (Session-Sender). This command should NOT be used when the reflection point is a TWAMP Light reflector that does not require TCP TWAMP Control. When this command is included the source udp range is restricted. When this command is omitted the source udp port is dynamically allocated by the system.

The **no** form of the command removes the source UDP port setting when the default allocation is used.

Default dynamic source udp port allocation

Parameters *udp-port-number* — The udp source port.

Values 64374 — 64383

forwarding

Syntax **forwarding** {**next-hop** *ip-address* | **interface** *interface-name* | **bypass-routing**}
no forwarding

Context config>oam-pm>session>ip

Description Use this optional command to influence the forwarding decision of the TWAMP Light packet. When this command is used, only one of the forwarding options can be enabled at any time.

The **no** form of the command removes the options and enables the default forwarding logic.

Default no forwarding

Parameters **next-hop** — Specifies the IP next hop on the path

ip-address — Specifies the address

Values IPv4 address in the form a.b.c.d

Values IPv6 address in the form x:x:x:x:x:x:x (eight 6--bit pieces)

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

x: [0 — FFFF]H

d: [0 — 255]D

(no multicast addresses)

interface — Specifies the name used to refer to the interface from which the packet will be sent. The name must already exist in the **config>router>interface** context or within the appropriate **config>service** context.

bypass-routing — Specifies to send the packet to a host on a directly attached network, bypassing the rout-

TWAMP Light Commands

ing table.

fc

Syntax **fc** {**be** | **l2** | **af** | **l1** | **h2** | **ef** | **h1** | **nc**}
no fc

Context config>oam-pm>session>ip

Description Use this command to set the forwarding class designation for TWAMP Light packets that will be sent through the node and exposed to the various QoS functions on the network element.
The **no** form of the command restores the default value.

Default be

Parameters **be** — Specifies best effort
l2 — Specifies low-2
af — Specifies assured
l1 — Specifies low-1
h2 — Specifies high-2
ef — Specifies expedited
h1 — Specifies high-1
nc — Specifies network control

profile

Syntax **profile** {**in** | **out**}
no profile

Context config>oam-pm>session>ip

Description Use this command to define whether the TWAMP Light PDU packet should be treated as in-profile or out-of-profile. The default has been selected because the forwarding class defaults to best effort.
The **no** form of the command restores the default value.

Default out

Parameters **in** — Specifies that the TWAMP Light PDU packet will be sent as in-profile
out — Specifies that the TWAMP Light PDU packet will be sent as out-of-profile

ttl

Syntax	ttl <i>time-to-live</i> no ttl
Context	config>oam-pm>session>ip
Description	Use this command to define the value of the TTL field of the packet header. The no form of the command restores the default value.
Default	225
Parameters	<i>time-to-live</i> — Specifies the value to be used in the TTL field Values 1 — 255

router

Syntax	router { base <i>routing-instance</i> service-name <i>service-name</i> } no router
Context	config>oam-pm>session>ip
Description	Use this command to define the source context from which the TWAMP Light packet will be launched. The routing instance and service name must be a VPRN instance. The no form of the command restores the default value.
Default	base
Parameters	base — Specifies that the TWAMP Light packet will be launched from the base routing instance. <i>routing-instance</i> — Specifies the service identifier from which the TWAMP Light packet is launched service-name — Specifies the that the TWAMP Light packet will be launched from a service context <i>service-name</i> — Specifies the service from which the TWAMP Light packet is launched Values up to 64 characters in length

pad-size

Syntax	pad-size <i>padding</i> no pad-size
Context	config>oam-pm>session>ip>twamp-light
Description	Use this command to define the amount by which the TWAMP Light packet will be padded. TWAMP session controller packets are 27 bytes smaller than TWAMP session reflector packets. If symmetrical packet

TWAMP Light Commands

sizes in the forward and backward direction are required, the pad size must be configured to a minimum of 27 bytes.

The **no** form of the command removes all padding.

Default 0

Parameters *padding* — Specifies the value, in octets, to pad the TWAMP Light packet

Values 0 — 2000

record-stats

Syntax **record-stats {delay|loss|delay-and-loss}**
[no] record-stats

Context config>oam-pm>session>ip>twamp-light

Description This option provides the ability to determine which statistics are recorded. The TWAMP-Light PDU can report on both delay and loss using a single packet. The operator may choose which statistics they would like to report. Only delay recording is on by default. All other metrics are ignored. In order to change what is being recorded and reported, the TWAMP-Light session must be shutdown. This is required because the single packet approach means the base statistics are shared between the various datasets. Issuing a “no shutdown” will clear previous all non-volatile memory for the session and allocate new memory blocks. All the parameters under this context are mutually exclusive.

The **no** version of the command restores the default “delay” only

Default record-stats delay

Parameters **delay** — Delay only recording (the default).

loss — Loss only recording.

delay-and-loss — Delay and loss reporting.

flr-threshold

Syntax **[no] flr-threshold *percentage***

Context config>oam-pm>session>ip>twamp-light>loss

Description This command defines the frame loss threshold used to determine if the delta-t is available or unavailable. An individual delta-t with a frame loss threshold equal to or higher than the configured threshold will be marked unavailable. An individual delta-t with a frame loss threshold lower than the configured threshold will be marked as available.

The **no** form of the command restores the default value of 50%.

Parameters *percentage* — The percentage of the threshold.

Values [0..100]

Default 50 percent

timing

Syntax `[no] timing frames-per-delta-t frames consec-delta-t deltas chli-threshold threshold`

Context `config>oam-pm>session>ip>twamp-light>loss`

Description This command defines various availability parameters but not the probe interval. A single TWAMP-Light frame is used to collect both delay and loss metrics the interval is common to both and as such not unique per metric type. Any TWAMP light test that is attempting to become active will validate the configuration of the timing parameter regardless of which statistics are being recorded.

The **no** form of the command will restore the default values for all timing parameters and use those values to compute availability and set the loss frequency.

Parameters **frames-per-delta-t** — Defines the size of the small measurement window. Each delta-t will be marked as available or unavailable based on the flr-threshold. The size of the delta-t measurement is the product of the number of frames and the interval. This value defaults to a different value than single probe per metric approaches.

frames is the number of twamp-light frames that define the size of the delta-s.

Values [1.. 50]

Default 1

consec-delta-t — The number of consecutive delta-t small measurement intervals that make up the sliding window over which availability and unavailability will be determined. Transitions from one state to another will occur when the consec-delta-t are now in a new state. The sliding window cannot exceed 100s.

deltas is the number of consecutive delta-t used for the sliding window

Values [2..10]

Default 10

chli-threshold — Number of consecutive high loss intervals (unavailable delta-t) that when equal to or exceeded will increment the CHLI counter. A CHLI counter is an indication that the sliding window is available but has crossed a threshold consecutive of unavailable delta-t intervals. A CHLI can only be incremented once during a sliding window and will only be incremented during times of availability.

threshold is the number of consecutive unavailable delta-t that will cause the CHLI counter to be incremented.

Values [1..9]

Default 5

interval

Syntax	interval <i>milliseconds</i> no interval
Context	config>oam-pm>session>ip>twamp-light
Description	Use this command to define the message period, or probe spacing, for transmitting a TWAMP Light frame. The no form of the command sets the interval to the default value.
Default	1000
Parameters	<i>milliseconds</i> — Specifies the number of milliseconds between TWAMP Light frame transmission Values [100 1000 10000]

test-duration

Syntax	test-duration <i>seconds</i> no test-duration
Context	config>oam-pm>session>ip>twamp-light
Description	This optional command defines the length of time the test will run before stopping automatically. This command is only a valid option when a session has been configured with a session-type of on-demand. This is not an option when the session-type is configured as proactive. On-demand tests do not start until the config>oam-pm>session>start command has been issued and they will stop when the config>oam-pm>session>stop command is issued. The no form of the command removes a previously configured test-duration value and allows the TWAMP Light test to execute until it is stopped manually.
Default	0
Parameters	<i>seconds</i> — Specifies the length of time, in seconds, that the TWAMP Light test will run Values 1 — 86400

shutdown

Syntax	[no] shutdown
Context	config>oam-pm>session>ip>twamp-light
Description	Use this command to stop a TWAMP Light test. The no form of the command starts a TWAMP Light test.
Default	shutdown

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:bk sim130>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
```


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```

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
    
```

Show Commands

```

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:
  
```

OAM, SAA, and OAM-PM Command Reference

```

=====
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

```

Show Commands

```

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
...
=====

```

twamp

Syntax **twamp**

Context show>test-oam

Description This command enables the context for displaying OAM-PM TWAMP information.

server

Syntax **server {all | prefix *ip-prefix/prefix-length*}**

Context show>test-oam

Description This command displays OAM-PM TWAMP information.

Parameters **all** — Displays all server information

prefix — Displays the address prefix of the TWAMP server

ip-prefix/prefix-length — Specifies the IP address prefix of the TWAMP server

Sample Output

```

*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
=====Prefix
: 10.0.0.0/8
Tests Abort : 0

```

Show Commands

```

TstPktsRx   : 999                               TstPktsTx   : 999
=====Prefix
: 10.0.0.0/8
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
=====
=====Prefix
: 10.0.0.0/16
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
-----
=====

```

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	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
Probe State      : OK           Failed Hops     : 0
                               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
=====

Show Commands

```

PathDest          Egr-NextHop      Remote-RtrAddr   Discovery-time
  DiscoveryTtl      ProbeState       ProbeTmOutCnt    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
=====Prefix
: 10.0.0.0/8
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
=====
=====Prefix
: 10.0.0.0/16
Description : NMS-West-Special
=====
Admin State : Up                      Oper State : Up
Curr Conn   : 0                       Max Conn   : 32

```



```

Conn Reject : 0
Curr Sess   : 0
Tests Done  : 0
Tests Abort : 0
TstPktsRx  : 0
Max Sess    : 32
Tests Rej   : 0
TstPktsTx  : 0
-----
Client      Sessions      Idle    TstPktsRx  TstPktsTx
            Curr/Done/Rej/Abort
-----
=====

```

twamp-light

Syntax twamp-light

Context show>test-oam>twamp

Description This command enables the context to display WAMP-Light information.

reflectors

Syntax reflectors

Context show>test-oam>twamp>twamp-light

Description This command shows TWAMP-Light reflector information.

Sample Output

```

show test-oam twamp twamp-light reflectors
=====
TWAMP-Light Reflectors
=====
Router/VPRN   Admin   UDP Port   Prefixes   Frames Rx   Frames Tx
-----
Base          Up      15000     1          0           0
500           Up      15000     2          6340        6340
-----
No. of TWAMP-Light Reflectors: 2
=====

```

Show Commands

twamp-light

Syntax twamp-light

Context show>router
show>service

Description This command shows TWAMP-Light reflector information, either for the base router or for a specific service.

Sample Output

```
show router twamp-light
```

```
-----  
TWAMP-Light Reflector
```

```
-----  
Admin State           : Up                UDP Port           : 15000  
Description           : (Not Specified)  
Up Time               : 0d 00:02:24  
Test Frames Received  : 0                 Test Frames Sent   : 0  
-----
```

```
-----  
TWAMP-Light Reflector Prefixes
```

```
-----  
Prefix                Description  
-----  
172.16.1.0/24  
-----
```

```
No. of TWAMP-Light Reflector Prefixes: 1  
-----
```

```
show service id 500 twamp-light
```

```
-----  
TWAMP-Light Reflector
```

```
-----  
Admin State           : Up                UDP Port           : 15000  
Description           : TWAMP Light reflector VPRN 500  
Up Time               : 0d 01:47:12  
Test Frames Received  : 6431             Test Frames Sent   : 6431  
-----
```

```
-----  
TWAMP-Light Reflector Prefixes
```

```
-----  
Prefix                Description  
-----  
10.2.1.1/32           Process only 10.2.1.1 TWAMP Light  
Packets  
172.16.1.0/24         Process all 172.16.1.0 TWAMP  
Light packets  
-----
```

```
No. of TWAMP-Light Reflector Prefixes: 2  
-----
```

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 collect-lmm-stats
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 (U)| down (D) — 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, L = CSF LOS Rx, F = CSF AIS/FDI rx, r = CSF RDI rx
=====
CFM SAP Stack Table
=====
Sap                Lvl Dir Md-index  Ma-index  MepId  Mac-address  Defect
-----
1/1/6:20.0         4 B      14      803  MIP  d8:1c:01:01:00:06  -----
1/1/6:3000.1001    4 B      14      800  MIP  00:00:00:00:00:28  -----
1/1/6:2000.1002    4 B      14      802  MIP  d8:1c:01:01:00:06  -----
```

```

1/1/6:0.*          4 B      14      805 MIP d8:1c:01:01:00:06 -----
1/1/9:300         2 U      12      300  28 00:00:00:00:00:28 -----
1/1/9:401         2 U      12      401  28 00:00:00:00:00:28 -----
1/1/9:600         2 U      12      600  28 00:00:00:00:00:28 -----
1/1/9:600         5 B      15      666 MIP 00:10:11:00:00:1c -----
1/1/10:4.*        2 U      12       4   28 00:00:00:00:00:28 --C----
1/1/10:1000.*     5 U      15     1000 28 00:00:00:00:00:28 -----
1/1/10:1001.*    5 U      15     1001 28 00:00:00:00:00:28 -----
=====

```

```

=====
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
-----

```

```

1/2/4     0          0 D      10          1   28 00:00:00:00:00:28 -----
=====

```

```

=====
CFM Facility LAG Stack Table
=====

```

```

Lag      Tunnel  Lvl Dir Md-index  Ma-index  MepId  Mac-address  Defect
-----

```

```

No Matching Entries
=====

```

```

=====
CFM Facility Tunnel Stack Table
=====

```

```

Port/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
-----

```

```

v28-v33        1 D      11          1   28 00:00:00:00:00:28 -----
=====

```

Show Commands

```
CFM SAP Primary VLAN Stack Table
=====
Sap
  Primary VlanId   Lvl Dir Md-index   Ma-index MepId Mac-address   Defect
-----
1/1/6:20.*
   21              4 B      14      804 MIP d8:1c:01:01:00:06  -----
=====

CFM SDP Stack Table
=====
Sdp
      Lvl Dir Md-index   Ma-index MepId Mac-address   Defect
-----
1:1000      4 D      14      1000  28 00:00:00:00:00:28  -----
2:777      4 D      14      777   28 d8:1c:ff:00:00:00  -----
400:800    4 B      14      800 MIP 00:00:00:00:01:28  -----
=====

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
```

Show Commands

```
Eth-1Dm Threshold : 3(sec)           MD-Level           : 3
Eth-Ais:           : Enabled          Eth-Ais Rx Ais:    : No
Eth-Ais Tx Priorit*: 7                Eth-Ais Rx Interv*: 1
Eth-Ais Tx Interva*: 1                 Eth-Ais Tx Counte*: 388
Eth-Ais Tx Levels : 5
Eth-Tst:           : Disabled
```

```
Redundancy:
  MC-LAG State   : active
```

```
CcmLastFailure Frame:
  None
```

```
XconCcmFailure Frame:
  None
```

```
=====
show eth-cfm mep <mep-id> domain <md-index> association <ma-index> all-remote-mepids
detail
```

```
show eth-cfm mep 28 domain 14 association 2 all-remote-mepids detail
```

```
=====
Eth-CFM Remote-MEP Information
=====
```

```
Remote MEP ID   : 30                State              : True/Grace
Auto Discovered : True              RDI                : False
Port Status TLV : Up                I/F Status TLV    : Up
MAC Address     : 00:00:00:00:00:30 CCM Last Change   : 02/06/2014 21:37:00
Chass. ID SubType: local
Chassis ID      : access-012-west
Man Addr Domain : (Not Specified)
```

```
Remote MEP ID   : 32                State              : True/Grace
Auto Discovered : True              RDI                : False
Port Status TLV : Up                I/F Status TLV    : Up
MAC Address     : 00:00:00:00:00:32 CCM Last Change   : 02/06/2014 21:37:00
Chass. ID SubType: chassisComponent
Chassis ID      : (Not Specified)
Man Addr Domain : (Not Specified)
=====
```

```
show eth-cfm mep <mep-id> domain <md-index> association <ma-index> {all-remote-mepids |
remote-mepid <mep-id>} detail
```

```
show eth-cfm mep 28 domain 14 association 2 remote-mepid 30 detail
```

```
=====
Eth-CFM Remote-MEP Information
=====
```

```
Remote MEP ID   : 30                State              : True/Grace
Auto Discovered : True              RDI                : False
Port Status TLV : Up                I/F Status TLV    : Up
MAC Address     : 00:00:00:00:00:30 CCM Last Change   : 02/06/2014 21:37:00
Chass. ID SubType: local
Chassis ID      : access-012-west
Man Addr Domain : (Not Specified)
=====
```


OAM, SAA, and OAM-PM Command Reference

```

show eth-cfm mep 28 domain 14 association 2 remote-mepid 30
=====
Eth-CFM Remote-Mep Table
=====
R-mepId AD Rx CC RxRdi Port-Tlv If-Tlv Peer Mac Addr      CCM status since
-----
30      T True False Up      Up      00:00:00:00:00:30 02/06/2014 21:37:00
=====
Entries marked with a 'T' under the 'AD' column have been auto-discovered.

*A:cses-V28# show eth-cfm system-config
=====
CFM System Configuration
=====
Redundancy
  MC-LAG Standby MEP Shutdown: false
  MC-LAG Hold-Timer           :   1 second(s)

Synthetic Loss Measurement
  Inactivity Timer            : 100 second(s)

ETH-CCM Grace-Period
  Transmit Enabled            : true

Sender ID Information
  ChassisID Subtype           : local
  ChassisID                    : access-012-north
-----
ETH-CFM System Configuration Limits
-----
Component                               Current Usage      System Limit
-----
Maintenance Domain (MD)                  3                   50
Maintenance Association (MA)              8                  25000
  Extended MA (up to 400 MEPs)           0                   10
Maintenance Endpoint (MEP)               4                  25000
  One-second MEP                          3                   5000
  Sub-second MEP                          0                   5000
Alarm Indication Signal (AIS)             0                  25000
Client Signal Fail (CSF)                  0                  25000
Primary Vlan Ingress MP                   1                  19999
Primary Vlan Egress MP                    1                  19999
-----
=====

oam eth-cfm linktrace 00:00:00:00:00:30 mep 28 domain 14 association 2
Index Ingress Mac          Egress Mac          Relay      Action
-----
1      00:00:00:00:00:00    00:00:00:00:00:30  n/a       terminate
SenderId TLV: ChassisId (local)
          access-012-west
-----

No more responses received in the last 6 seconds.

show eth-cfm association
=====
CFM Association Table

```

Show Commands

```

=====
Md-index  Ma-index  Name                               Int  Hold  Bridge-id  MEPS TxSid
-----
12         1         epipe01-ovcmeg-circuit0*  10   n/a   1           0    yes
12         4         vpls4-0000001             1     n/a   4           2    yes
12         16        abcdefgh                   10   n/a   none        0    no
14         1         123456789abce             1     n/a   3           3    no
14         2         epipe00000005             1     n/a   5           3    yes
14         3         ivpls-000006              10   n/a   6           1    no
14         5         service4001                10   n/a   5           0    no
15         3         12345678                   10   n/a   3           0    no
=====

```

* indicates that the corresponding row element may have been truncated.

```
show eth-cfm domain 14 association 2 detail
```

```

=====
Domain 14
Md-index      : 14                               Level           : 4
                                           MHF Creation    : defMHFnone
Name Format    : none                               Next Ma Index   : 4
Name          : (Not Specified)
Creation Origin : manual
=====

```

Domain 14 Associations:

```

Md-index      : 14                               Ma-index        : 2
Name Format    : icc-based                         CCM-interval    : 1
Auto Discover  : True                             CCM-hold-time   : n/a
Name          : epipe00000005
Permission     : sendIdChassis
Bridge-id     : 5                               MHF Creation    : defMHFnone
PrimaryVlan   : 0                               Num Vids        : 0
MIP LTR Priority : 7
Total MEP Count : 3
Remote Mep Id : 30 (AutoDiscovered)             Remote MAC Addr : default
Remote Mep Id : 32 (AutoDiscovered)             Remote MAC Addr : default
=====

```

```
show eth-cfm mep 28 domain 12 association 2
```

```

=====
Eth-Cfm MEP Configuration Information
=====
Md-index      : 12                               Direction       : Down
Ma-index      : 2                               Admin           : Enabled
MepId        : 28                               CCM-Enable     : Disabled
IfIndex      : 35979264                         PrimaryVid     : 268369924
Description   : (Not Specified)
FngAlarmTime : 0                               FngResetTime   : 0
FngState     : fngReset                         ControlMep     : False
LowestDefectPri : macRemErrXcon                 HighestDefect   : none
Defect Flags  : None
Mac Address   : 00:00:00:00:00:28
CcmLtmPriority : 7                               CcmPaddingSize : 0 octets
CcmTx        : 0                               CcmSequenceErr : 0
CcmIgnoreTLVs : (Not Specified)
Fault Propagation: disabled                       FacilityFault   : n/a
MA-CcmInterval : 10                             MA-CcmHoldTime : 0ms
=====

```

```

MA-Primary-Vid   : Disabled
Eth-1Dm Threshold: 3(sec)
Eth-Ais          : Enabled
If Support Enable: True
Eth-Ais Tx Prior*: 7
Eth-Ais Tx Inter*: 1
Eth-Ais Tx Levels: 3
Eth-Tst          : Disabled
Eth-CSF          : Disabled

MD-Level          : 2
Eth-Ais Rx Ais   : No
Eth-Ais Rx Interv*: 1
Eth-Ais Tx Counter: 452
Eth-Ais Tx Fail   : 0
    
```

```

Redundancy:
  MC-LAG State : n/a
    
```

```

CcmLastFailure Frame:
  None
    
```

```

XconCcmFailure Frame:
  None
    
```

```

=====
* indicates that the corresponding row element may have been truncated.
    
```

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
=====
    
```

Show Commands

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)
=====
```

OAM Performance Monitoring and Binning Commands

bin-group

Syntax `bin-group bin-group-number`

Context `show>oam-pm`

Description Show the configuration data for one or all OAM Performance Monitoring bin groups.

Parameters *bin-group-number* — Specifies an OAM Performance Monitoring bin group.

Values 1 — 255

Output Sample

```
show oam-pm bin-group
-----
Configured Lower Bounds for Delay Measurement (DMM) Tests, in microseconds
-----
Group Description                               Admin Bin   FD(us)    FDR(us)   IFDV(us)
-----
1   OAM PM default bin group (not*             Up    0         0         0         0
                                                1         5000      5000      5000
                                                2        10000      -         -
-----
2                                             Up    0         0         0         0
                                                1         1000      5000      100
                                                2         2000      -         200
                                                3         3000      -         300
                                                4         4000      -         400
                                                5         5000      -         500
                                                6         6000      -         600
                                                7         7000      -         700
                                                8         8000      -         800
                                                9        10000      -        1000
-----
3                                             Down  0         0         0         0
                                                1         6000      5000      8000
                                                2        10000     10000     10000
                                                3        15000     15000      -
                                                4        22000      -         -
-----
10  base                                         Up    0         0         0         0
                                                1         5000      5000      5000
                                                2        10000     10000     10000
-----
```

* indicates that the corresponding row element may have been truncated.

```
show oam-pm bin-group 2
-----
Configured Lower Bounds for Delay Measurement (DMM) Tests, in microseconds
```

OAM Performance Monitoring and Binning Commands

Group	Description	Admin	Bin	FD (us)	FDR (us)	IFDV (us)
2		Up	0	0	0	0
			1	1000	5000	100
			2	2000	-	200
			3	3000	-	300
			4	4000	-	400
			5	5000	-	500
			6	6000	-	600
			7	7000	-	700
			8	8000	-	800
			9	10000	-	1000

bin-group-using

Syntax `bin-group-using [bin-group bin-group-number]`

Context `show>oam-pm`

Description Show the list of sessions configured against one or all OAM Performance Monitoring bin groups.

Parameters *bin-group-number* — Specifies an OAM Performance Monitoring bin group.

Values 1 — 255

Output **Sample Output**

```
show oam-pm bin-group-using
=====
OAM Performance Monitoring Bin Group Configuration for Sessions
=====
Bin Group      Admin    Session                               Session State
-----
2              Up      eth-vpls-00005                        Inact
              eth-pm-service-4                      Act
-----
3              Down    eth-epipe-000001                      Inact
-----
10             Up      eth-epipe-00002                        Inact
-----
Admin: State of the bin group
Session State: The state of session referencing the bin-group
```

```
show oam-pm bin-group-using bin-group 2
=====
OAM Performance Monitoring Bin Group Configuration for Sessions
=====
Bin Group      Admin    Session                               Session State
-----
2              Up      eth-vpls-00005                        Inact
              eth-pm-service-4                      Act
```

```
-----
=====
Admin: State of the bin group
Session State: The state of session referencing the bin-group
```

session

Syntax `session session-name [all | base | bin-group | event-mon | meas-interval]`

Context `show>oam-pm`

Description Show the configuration and status information for an OAM Performance Monitoring session.

Parameters

- session-name* — Specifies the session name up to 32 characters in length.
- all** — Displays all attributes
- base** — The base configuration option for the session
- bin-group** — The associated bin group and its attributes
- event-mon** — Configured event monitoring and last TCA
- meas-interval** — Configured event monitoring and last TCA

Sample Output

```
show oam-pm session "eth-pm-service-4" all
-----
Basic Session Configuration
-----
Session Name       : eth-pm-service-4
Description        : (Not Specified)
Test Family        : ethernet           Session Type       : proactive
Bin Group          : 2
-----
Ethernet Configuration
-----
Source MEP         : 28                 Priority            : 0
Source Domain      : 12                 Dest MAC Address   : 00:00:00:00:00:30
Source Assoc'n     : 4
-----
DMM Test Configuration and Status
-----
Test ID            : 10004               Admin State        : Up
Oper State         : Up                 Data TLV Size     : 1000 octets
On-Demand Duration: Not Applicable     On-Demand Remaining: Not Applicable
Interval           : 1000 ms
-----
SLM Test Configuration and Status
-----
Test ID            : 10004               Admin State        : Up
Oper State         : Up                 Data TLV Size     : 1000 octets
```

OAM Performance Monitoring and Binning Commands

```
On-Demand Duration: Not Applicable      On-Demand Remaining: Not Applicable
Interval           : 100 ms
CHLI Threshold    : 4 HLIs
Consec Delta-Ts   : 10
Frames Per Delta-T : 10 SLM frames
FLR Threshold     : 50%
```

15-mins Measurement Interval Configuration

```
Duration           : 15-mins           Intervals Stored   : 32
Boundary Type     : clock-aligned      Clock Offset       : 0 seconds
Accounting Policy : none
```

Configured Lower Bounds for Delay Measurement (DMM) Tests, in microseconds

Group Description	Admin Bin	FD(us)	FDR(us)	IFDV(us)
2	Up	0	0	0
	1	1000	5000	100
	2	2000	-	200
	3	3000	-	300
	4	4000	-	400
	5	5000	-	500
	6	6000	-	600
	7	7000	-	700
	8	8000	-	800
	9	10000	-	1000

```
show oam-pm session "eth-pm-service-4" base
```

Basic Session Configuration

```
Session Name      : eth-pm-service-4
Description       : (Not Specified)
Test Family       : ethernet           Session Type      : proactive
Bin Group        : 2
```

Ethernet Configuration

```
Source MEP        : 28                 Priority          : 0
Source Domain     : 12                 Dest MAC Address : 00:00:00:00:00:30
Source Assoc'n    : 4
```

DMM Test Configuration and Status

```
Test ID          : 10004               Admin State      : Up
Oper State       : Up                  Data TLV Size    : 1000 octets
On-Demand Duration: Not Applicable     On-Demand Remaining: Not Applicable
Interval        : 1000 ms
```

SLM Test Configuration and Status

```
Test ID          : 10004               Admin State      : Up
```



```

Oper State           : Up           Data TLV Size       : 1000 octets
On-Demand Duration  : Not Applicable On-Demand Remaining: Not Applicable
Interval            : 100 ms
CHLI Threshold      : 4 HLIs        Frames Per Delta-T  : 10 SLM frames
Consec Delta-Ts     : 10           FLR Threshold       : 50%

```

```
-----
show oam-pm session "eth-pm-service-4" bin-group

```

```
-----
Configured Lower Bounds for Delay Measurement (DMM) Tests, in microseconds

```

Group Description	Admin Bin	FD(us)	FDR(us)	IFDV(us)
2	Up	0	0	0
	1	1000	5000	100
	2	2000	-	200
	3	3000	-	300
	4	4000	-	400
	5	5000	-	500
	6	6000	-	600
	7	7000	-	700
	8	8000	-	800
	9	10000	-	1000

```
-----
show oam-pm session "eth-pm-service-4" meas-interval

```

```
-----
15-mins Measurement Interval Configuration

```

```

Duration           : 15-mins      Intervals Stored    : 32
Boundary Type      : clock-aligned Clock Offset         : 0 seconds
Accounting Policy  : none

```

sessions

Syntax `sessions [test-family {ethernet | ip}] event-mon`

Context `show>oam-pm`

Description Show a summary of the OAM Performance Monitoring sessions.

Parameters `test-family` — when optional filter is include, it will shows all the sessions that match the specified test family type.

`ethernet` — Ethernet session types.

`ip` — IP session types

`event-mon` — A summary of all event monitoring and current state for each session.

Output **Sample Output**

```
show oam-pm sessions
```

OAM Performance Monitoring and Binning Commands

```

=====
OAM Performance Monitoring Session Summary for the Ethernet Test Family
=====
Session                               State   Bin Group   Sess Type   Test Types
-----
ip-base-v28-v33                       Act     2           proactive   LMM
eth-pm-service-4                      Act     2           proactive   DMM  SLM
eth-pm-service-1000                   Inact   3           proactive   LMM
eth-pm-service-1100                   Act     4           proactive   DMM  SLM
=====

```

```

=====
OAM Performance Monitoring Session Summary for the IP Test Family
=====
Session                               State   Bin Group   Sess Type   Test Types
-----
ip-vprn-500                           Act     2           proactive   TWL
vprn-500-ippm-01                      Inact   1           proactive
=====

```

```
show oam-pm sessions event-mon
```

```

=====
OAM Performance Monitoring Event Summary for the Ethernet Test Family
=====
Event Monitoring Table Legend:
F = Forward, B = Backward, R = Round Trip, A = Aggregate,
- = Threshold Not Config, c = Threshold Config, * = TCA Active, P = Pending
=====
Session                               Test    FD  FDR  IFDV  FLR  CHLI  HLI  UNAV  UDAV  UDUN
Type    FBR  FBR   FBR   FB   FBA  FBA  FBA  FBA  FBA
-----
ip-base-v28-v33                       LMM
eth-pm-service-4                      DMM  ---  ---  ---
eth-pm-service-4                      SLM
eth-pm-service-1000                   LMM
eth-pm-service-1100                   DMM  --c  ---  --*
eth-pm-service-1100                   SLM  cc   ---  ---  ---
=====

```

```

=====
OAM Performance Monitoring Event Summary for the IP Test Family
=====
Event Monitoring Table Legend:
F = Forward, B = Backward, R = Round Trip, A = Aggregate,
- = Threshold Not Config, c = Threshold Config, * = TCA Active, P = Pending
=====
Session                               Test    FD  FDR  IFDV  FLR  CHLI  HLI  UNAV  UDAV  UDUN
Type    FBR  FBR   FBR   FB   FBA  FBA  FBA  FBA  FBA
-----
ip-vprn-500                           TWL  ---  ---  ---  --  ---  ---  ---  ---  ---
=====

```

```
show oam-pm sessions test-family ethernet
```

```

=====
OAM Performance Monitoring Session Summary for the Ethernet Test Family
=====

```

```

=====
Session                               State   Bin Group  Sess Type  Test Types
-----
ip-base-v28-v33                       Act     2          proactive  LMM
eth-pm-service-4                       Act     2          proactive  DMM   SLM
eth-pm-service-1000                    Inact   3          proactive  LMM
eth-pm-service-1100                    Act     4          proactive  DMM   SLM
=====

```

```
show oam-pm sessions test-family ip
```

```
=====
OAM Performance Monitoring Session Summary for the IP Test Family
=====
```

```

Session                               State   Bin Group  Sess Type  Test Types
-----
ip-vprn-500                           Act     2          proactive  TWL
vprn-500-ippm-01                       Inact   1          proactive
=====

```

statistics

Syntax `statistics session session-name {dmm | lmm | slm | twamp-light} meas-interval {raw | 5-mins | 15-mins | 1-hour | 1-day} [all | bins | summary] interval-number interval-number [delay|loss]`

Context `show>oam-pm`

Description Show OAM Performance Monitoring delay or loss statistics.

Output **Sample Output**

```
show oam-pm statistics session "eth-pm-service-4" dmm meas-interval 15-mins all interval-number 2
```

```

-----
Start (UTC)           : 2014/02/01 10:15:00      Status           : completed
Elapsed (seconds)    : 900                          Suspect          : no
Frames Sent          : 900                          Frames Received  : 900
-----

```

```

-----
Bin Type   Direction   Minimum (us)   Maximum (us)   Average (us)
-----
FD         Forward     0              11670          779
FD         Backward   0              7076           1746
FD         Round Trip 1109           13222          2293
FDR        Forward     0              11670          779
FDR        Backward   0              7076           1738
FDR        Round Trip 0              12104          1178
IFDV       Forward     0              10027          489
IFDV       Backward   0              5444           742
IFDV       Round Trip 0              11853          1088
-----

```

```
-----
Frame Delay (FD) Bin Counts
-----
```

```

Bin      Lower Bound   Forward   Backward   Round Trip
-----

```

OAM Performance Monitoring and Binning Commands

```
-----
```

0	0 us	625	244	0
1	1000 us	194	356	465
2	2000 us	50	153	244
3	3000 us	11	121	119
4	4000 us	10	17	40
5	5000 us	5	6	20
6	6000 us	4	2	5
7	7000 us	0	1	3
8	8000 us	0	0	3
9	10000 us	1	0	1

```
-----
```

Frame Delay Range (FDR) Bin Counts

```
-----
```

Bin	Lower Bound	Forward	Backward	Round Trip
0	0 us	890	891	889
1	5000 us	10	9	11

```
-----
```

Inter-Frame Delay Variation (IFDV) Bin Counts

```
-----
```

Bin	Lower Bound	Forward	Backward	Round Trip
0	0 us	398	255	102
1	100 us	82	88	89
2	200 us	79	57	59
3	300 us	60	63	61
4	400 us	39	37	54
5	500 us	31	24	42
6	600 us	26	30	43
7	700 us	29	20	34
8	800 us	54	47	67
9	1000 us	102	279	349

```
-----
```

```
show oam-pm statistics session "eth-pm-service-4" dmm meas-interval 15-mins bins interval-
number 2
```

```
-----
```

Start (UTC)	: 2014/02/01 10:30:00	Status	: completed
Elapsed (seconds)	: 900	Suspect	: no
Frames Sent	: 900	Frames Received	: 900

```
-----
```

Frame Delay (FD) Bin Counts

```
-----
```

Bin	Lower Bound	Forward	Backward	Round Trip
0	0 us	699	167	0
1	1000 us	169	312	456
2	2000 us	24	228	274
3	3000 us	3	136	111
4	4000 us	3	48	41
5	5000 us	1	7	10
6	6000 us	1	1	3
7	7000 us	0	1	2
8	8000 us	0	0	3

```
-----
```

OAM, SAA, and OAM-PM Command Reference

```

9          10000 us          0          0          0
-----
-----

```

Frame Delay Range (FDR) Bin Counts

```

-----
Bin      Lower Bound      Forward      Backward      Round Trip
-----
0          0 us          898          891          892
1          5000 us          2           9           8
-----

```

Inter-Frame Delay Variation (IFDV) Bin Counts

```

-----
Bin      Lower Bound      Forward      Backward      Round Trip
-----
0          0 us          462          217          107
1          100 us          63           99           80
2          200 us          64           85           71
3          300 us          63           74           53
4          400 us          34           53           45
5          500 us          37           24           50
6          600 us          34           17           41
7          700 us          35           23           57
8          800 us          46           32           60
9          1000 us          62          276          336
-----

```

```

show oam-pm statistics session "eth-pm-service-4" dmm meas-interval 15-mins summary inter-
val-number 2
-----

```

```

Start (UTC)      : 2014/02/01 10:30:00      Status      : completed
Elapsed (seconds) : 900                      Suspect     : no
Frames Sent      : 900                      Frames Received : 900
-----

```

```

-----
Bin Type      Direction      Minimum (us)      Maximum (us)      Average (us)
-----
FD            Forward          0                 6379              518
FD            Backward          0                 7856              2049
FD            Round Trip      1118             9879              2241
FDR           Forward          0                 6379              518
FDR           Backward          0                 7856              2049
FDR           Round Trip          9                 8770              1132
IFDV          Forward          0                 6021              328
IFDV          Backward          0                 5800              732
IFDV          Round Trip          2                 7758              984
-----

```

```

show oam-pm statistics session "eth-pm-service-4" dmm meas-interval raw
-----

```

```

Start (UTC)      : 2014/02/01 09:43:58      Status      : in-progress
Elapsed (seconds) : 3812                      Suspect     : yes
Frames Sent      : 3812                      Frames Received : 3812
-----

```

```

-----
Bin Type      Direction      Minimum (us)      Maximum (us)      Average (us)
-----

```

OAM Performance Monitoring and Binning Commands

FD	Forward	0	11670	629
FD	Backward	0	11710	2156
FD	Round Trip	1109	14902	2497
FDR	Forward	0	11670	617
FDR	Backward	0	11710	2156
FDR	Round Trip	0	13784	1360
IFDV	Forward	0	10027	404
IFDV	Backward	0	10436	768
IFDV	Round Trip	0	13542	1056

Frame Delay (FD) Bin Counts

Bin	Lower Bound	Forward	Backward	Round Trip
0	0 us	2815	661	0
1	1000 us	803	1287	1591
2	2000 us	127	971	1227
3	3000 us	21	639	623
4	4000 us	25	181	232
5	5000 us	12	42	72
6	6000 us	7	14	28
7	7000 us	0	4	13
8	8000 us	1	12	19
9	10000 us	1	1	7

Frame Delay Range (FDR) Bin Counts

Bin	Lower Bound	Forward	Backward	Round Trip
0	0 us	3792	3740	3751
1	5000 us	21	73	62

Inter-Frame Delay Variation (IFDV) Bin Counts

Bin	Lower Bound	Forward	Backward	Round Trip
0	0 us	1815	884	410
1	100 us	338	439	354
2	200 us	280	313	282
3	300 us	241	313	268
4	400 us	162	193	231
5	500 us	134	141	202
6	600 us	126	102	178
7	700 us	127	97	153
8	800 us	208	165	276
9	1000 us	381	1165	1458

```
show oam-pm statistics session "eth-pm-service-4" slm meas-interval 15-mins interval-number 2
```

```
-----
Start (UTC)           : 2014/02/01 10:30:00      Status           : completed
Elapsed (seconds)    : 900                      Suspect          : no
Frames Sent           : 9000                      Frames Received  : 9000
```

OAM, SAA, and OAM-PM Command Reference

```
-----
-----
              Frames Sent      Frames Received
-----
Forward                9000                9000
Backward              9000                9000
-----
```

Frame Loss Ratios

```
-----
              Minimum      Maximum      Average
-----
Forward      0.000%      0.000%      0.000%
Backward     0.000%      0.000%      0.000%
-----
```

Availability Counters (Und = Undetermined)

```
-----
              Available      Und-Avail  Unavailable  Und-Unavail      HLI      CHLI
-----
Forward          900            0            0            0            0            0
Backward         900            0            0            0            0            0
-----
```

show oam-pm statistics session "eth-pm-service-4" slm meas-interval raw

```
-----
Start (UTC)       : 2014/02/01 09:44:03      Status       : in-progress
Elapsed (seconds) : 4152                Suspect      : yes
Frames Sent      : 41523                Frames Received : 41523
-----
```

```
-----
              Frames Sent      Frames Received
-----
Forward                41369                41369
Backward              41369                41369
-----
```

Frame Loss Ratios

```
-----
              Minimum      Maximum      Average
-----
Forward      0.000%      0.000%      0.000%
Backward     0.000%      0.000%      0.000%
-----
```

Availability Counters (Und = Undetermined)

```
-----
              Available      Und-Avail  Unavailable  Und-Unavail      HLI      CHLI
-----
Forward          4137            0            0            0            0            0
Backward         4137            0            0            0            0            0
-----
```

show oam-pm statistics session "eth-pm-service-1000" lmm meas-interval 15-mins interval-number 2

```
-----
Start (UTC)       : 2014/07/08 03:15:00      Status       : completed
Elapsed (seconds) : 900                Suspect      : no
-----
```

OAM Performance Monitoring and Binning Commands

```

Frames Sent      : 90                      Frames Received : 90
-----
Data Frames Sent  Data Frames Received
-----
Forward           900                      900
Backward         18900                    18900
-----
Frame Loss Ratios
-----
Minimum    Maximum    Average
-----
Forward    0.000%    0.000%    0.000%
Backward   0.000%    0.000%    0.000%
-----

```

```

show oam-pm statistics session "ip-vprn-500" twamp-light meas-interval 15-mins interval-
number 1
-----

```

```

Start (UTC)      : 2014/06/26 17:15:00      Status          : in-progress
Elapsed (seconds) : 836                    Suspect         : no
Frames Sent      : 835                      Frames Received : 835
-----

```

Bin Type	Direction	Minimum (us)	Maximum (us)	Average (us)
FD	Forward	0	8242	1116
FD	Backward	0	9796	532
FD	Round Trip	604	11308	1315
FDR	Forward	0	8242	1116
FDR	Backward	0	9796	532
FDR	Round Trip	20	10724	731
IFDV	Forward	0	8242	1058
IFDV	Backward	0	9796	674
IFDV	Round Trip	0	10447	686

Frame Delay (FD) Bin Counts

Bin	Lower Bound	Forward	Backward	Round Trip
0	0 us	427	633	404
1	1000 us	283	179	314
2	2000 us	93	19	87
3	3000 us	14	2	12
4	4000 us	7	1	7
5	5000 us	7	0	8
6	6000 us	2	0	1
7	7000 us	1	0	1
8	8000 us	1	1	0
9	10000 us	0	0	1

Frame Delay Range (FDR) Bin Counts

Bin	Lower Bound	Forward	Backward	Round Trip
-----	-------------	---------	----------	------------

OAM, SAA, and OAM-PM Command Reference

```

0          0 us          824          834          830
1         5000 us         11           1           5
  
```

Inter-Frame Delay Variation (IFDV) Bin Counts

Bin	Lower Bound	Forward	Backward	Round Trip
0	0 us	84	214	168
1	100 us	39	50	132
2	200 us	46	59	97
3	300 us	48	53	62
4	400 us	35	58	40
5	500 us	38	35	41
6	600 us	57	40	42
7	700 us	47	34	33
8	800 us	89	54	51
9	1000 us	354	240	171

```
show oam-pm statistics session "ip-vprn-500" meas-interval 15-mins interval-number 2"
```

```

Start (UTC)          : 2014/07/14 02:00:00          Status           : completed
Elapsed (seconds)   : 900                          Suspect          : no
Frames Sent         : 900                          Frames Received  : 900
  
```

Bin Type	Direction	Minimum (us)	Maximum (us)	Average (us)
FD	Forward	0	7937	1230
FD	Backward	0	4137	861
FD	Round Trip	795	7725	1648
FDR	Forward	0	7194	1045
FDR	Backward	0	4137	861
FDR	Round Trip	16	6946	869
IFDV	Forward	0	6206	686
IFDV	Backward	0	4085	517
IFDV	Round Trip	0	6304	639

Frame Delay (FD) Bin Counts

Bin	Lower Bound	Forward	Backward	Round Trip
0	0 us	458	529	93
1	1000 us	220	255	605
2	2000 us	136	96	162
3	3000 us	58	18	23
4	4000 us	22	2	10
5	5000 us	3	0	5
6	6000 us	1	0	1
7	7000 us	2	0	1
8	8000 us	0	0	0
9	10000 us	0	0	0

OAM Performance Monitoring and Binning Commands

```
-----
Frame Delay Range (FDR) Bin Counts
-----
```

Bin	Lower Bound	Forward	Backward	Round Trip
0	0 us	895	900	897
1	5000 us	5	0	3

```
-----
```

```
-----
Inter-Frame Delay Variation (IFDV) Bin Counts
-----
```

Bin	Lower Bound	Forward	Backward	Round Trip
0	0 us	191	291	133
1	100 us	70	66	127
2	200 us	69	63	84
3	300 us	65	73	67
4	400 us	56	47	82
5	500 us	52	51	66
6	600 us	45	43	52
7	700 us	55	42	46
8	800 us	67	57	80
9	1000 us	230	167	163

```
-----
```

```
-----
Frame Loss Ratios
-----
```

	Minimum	Maximum	Average
Forward	0.000%	0.000%	0.000%
Backward	0.000%	0.000%	0.000%

```
-----
```

```
-----
Availability Counters (Und = Undetermined)
-----
```

	Available	Und-Avail	Unavailable	Und-Unavail	HLI	CHLI
Forward	900	0	0	0	0	0
Backward	900	0	0	0	0	0

```
-----
```

show oam-pm statistics session "ip-vprn-500" meas-interval 15-mins interval-number 2 delay

```
-----
Start (UTC)      : 2014/07/14 02:00:00      Status      : completed
Elapsed (seconds) : 900                    Suspect     : no
Frames Sent      : 900                    Frames Received : 900
-----
```

```
-----
```

Bin Type	Direction	Minimum (us)	Maximum (us)	Average (us)
FD	Forward	0	7937	1230
FD	Backward	0	4137	861
FD	Round Trip	795	7725	1648

```
-----
```

OAM, SAA, and OAM-PM Command Reference

FDR	Forward	0	7194	1045
FDR	Backward	0	4137	861
FDR	Round Trip	16	6946	869
IFDV	Forward	0	6206	686
IFDV	Backward	0	4085	517
IFDV	Round Trip	0	6304	639

----- Frame Delay (FD) Bin Counts

Bin	Lower Bound	Forward	Backward	Round Trip
0	0 us	458	529	93
1	1000 us	220	255	605
2	2000 us	136	96	162
3	3000 us	58	18	23
4	4000 us	22	2	10
5	5000 us	3	0	5
6	6000 us	1	0	1
7	7000 us	2	0	1
8	8000 us	0	0	0
9	10000 us	0	0	0

----- Frame Delay Range (FDR) Bin Counts

Bin	Lower Bound	Forward	Backward	Round Trip
0	0 us	895	900	897
1	5000 us	5	0	3

----- Inter-Frame Delay Variation (IFDV) Bin Counts

Bin	Lower Bound	Forward	Backward	Round Trip
0	0 us	191	291	133
1	100 us	70	66	127
2	200 us	69	63	84
3	300 us	65	73	67
4	400 us	56	47	82
5	500 us	52	51	66
6	600 us	45	43	52
7	700 us	55	42	46
8	800 us	67	57	80
9	1000 us	230	167	163

show oam-pm statistics session "ip-vprn-500" meas-interval 15-mins interval-number 2 loss

```
-----
Start (UTC)           : 2014/07/14 02:00:00      Status           : completed
Elapsed (seconds)    : 900                      Suspect          : no
Frames Sent          : 900                      Frames Received  : 900
-----
```

OAM Performance Monitoring and Binning Commands

Frame Loss Ratios

	Minimum	Maximum	Average
Forward	0.000%	0.000%	0.000%
Backward	0.000%	0.000%	0.000%

Availability Counters (Und = Undetermined)

	Available	Und-Avail	Unavailable	Und-Unavail	HLI	CHLI
Forward	900	0	0	0	0	0
Backward	900	0	0	0	0	0

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.

session

Syntax `session session-name {dmm | lmm | slm | twamp-light}`

Context clear>oam-pm

Description This command clears the raw measurement interval for the specified session and test.

auto-mep-discovered

Syntax `auto-mep-discovery [mep-id] domain md-index association ma-index`

Context clear>eth-cfm

Description This clear command provides the necessary mechanism to clear a remote MEP that was auto discovered. The function will clear a specific auto-discovered MEP learned within an association or all auto-discovered MEPs in the association. When the *mep-id* representing the auto-discovered MEP is omitted and only the

Clear Commands

domain *md-index* and association *ma-index* are provided, ALL auto-discovered MEPs in the association will be cleared. At a minimum the domain *md-index* and the association *ma-index* must be provided.

Only auto-discovered MEPs may be cleared. This command has no affect on manually configured MEPs.

Default Clear all auto discovered MEPids

Parameters *mep-id* — Specifies the MEP-ID of the remote mep that was auto-discovered.

Values [1..8191]

md-index — Specifies domain context in which the remote MEP was auto-discovered .

Values [1..4294967295]

ma-index — Specifies association context in which the remote MEP was auto-discovered.

Values [1..4294967295]

Monitor Commands

session

Syntax `session session-name {dmm | lmm | slm | twamp-light}`

Context `monitor>oam-pm`

Description This command monitors the raw measurement interval for the specified session and test.

Output **Sample Output**

```
monitor oam-pm session "eth-pm-service-4" dmm
```

```
-----
At time t = 0 sec (Base Statistics)
-----
```

```
-----
Frame Delay (FD) Bin Counts
-----
```

Bin	Lower Bound	Forward	Backward	Round Trip
0	0 us	3928	1125	0
1	1000 us	1197	1855	2611
2	2000 us	183	1361	1565
3	3000 us	36	762	778
4	4000 us	30	214	280
5	5000 us	14	45	81
6	6000 us	8	17	35
7	7000 us	1	5	16
8	8000 us	5	15	26
9	10000 us	1	4	11

```
-----
Frame Delay Range (FDR) Bin Counts
-----
```

Bin	Lower Bound	Forward	Backward	Round Trip
0	0 us	5374	5317	5321
1	5000 us	29	86	82

```
-----
Inter-Frame Delay Variation (IFDV) Bin Counts
-----
```

Bin	Lower Bound	Forward	Backward	Round Trip
0	0 us	2475	1268	625
1	100 us	516	676	554
2	200 us	395	479	417
3	300 us	338	451	398
4	400 us	224	291	340
5	500 us	185	212	280
6	600 us	187	137	234
7	700 us	185	134	208
8	800 us	315	223	392

Monitor Commands

```

9          1000 us          582          1531          1954
-----
-----

```

At time t = 10 sec (Mode: Delta)

Frame Delay (FD) Bin Counts

Bin	Lower Bound	Forward	Backward	Round Trip
0	0 us	0	7	0
1	1000 us	10	2	6
2	2000 us	0	1	3
3	3000 us	0	0	1
4	4000 us	0	0	0
5	5000 us	0	0	0
6	6000 us	0	0	0
7	7000 us	0	0	0
8	8000 us	0	0	0
9	10000 us	0	0	0

Frame Delay Range (FDR) Bin Counts

Bin	Lower Bound	Forward	Backward	Round Trip
0	0 us	10	10	10
1	5000 us	0	0	0

Inter-Frame Delay Variation (IFDV) Bin Counts

Bin	Lower Bound	Forward	Backward	Round Trip
0	0 us	5	4	2
1	100 us	2	2	2
2	200 us	2	1	1
3	300 us	1	0	0
4	400 us	0	0	1
5	500 us	0	0	0
6	600 us	0	0	0
7	700 us	0	0	1
8	800 us	0	0	0
9	1000 us	0	3	3

At time t = 20 sec (Mode: Delta)

Frame Delay (FD) Bin Counts

Bin	Lower Bound	Forward	Backward	Round Trip
0	0 us	9	0	0
1	1000 us	0	7	6
2	2000 us	0	3	3
3	3000 us	1	0	0
4	4000 us	0	0	0
5	5000 us	0	0	1

OAM, SAA, and OAM-PM Command Reference

6	6000 us	0	0	0
7	7000 us	0	0	0
8	8000 us	0	0	0
9	10000 us	0	0	0

Frame Delay Range (FDR) Bin Counts

Bin	Lower Bound	Forward	Backward	Round Trip
0	0 us	10	10	10
1	5000 us	0	0	0

Inter-Frame Delay Variation (IFDV) Bin Counts

Bin	Lower Bound	Forward	Backward	Round Trip
0	0 us	5	3	2
1	100 us	0	2	2
2	200 us	0	1	0
3	300 us	0	3	1
4	400 us	2	0	0
5	500 us	1	0	0
6	600 us	0	1	2
7	700 us	0	0	0
8	800 us	0	0	0
9	1000 us	2	0	3

```
monitor oam-pm session "eth-pm-service-4" slm
```

At time t = 0 sec (Base Statistics)

	Frames Sent	Frames Received
Forward	54749	54749
Backward	54749	54749

Availability Counters (Und = Undetermined)

	Available	Und-Avail	Unavailable	Und-Unavail	HLI	CHLI
Forward	5475	0	0	0	0	0
Backward	5475	0	0	0	0	0

At time t = 10 sec (Mode: Delta)

	Frames Sent	Frames Received
Forward	100	100
Backward	100	100

Monitor Commands

Availability Counters (Und = Undetermined)

	Available	Und-Avail	Unavailable	Und-Unavail	HLI	CHLI
Forward	10	0	0	0	0	0
Backward	10	0	0	0	0	0

At time t = 20 sec (Mode: Delta)

	Frames Sent	Frames Received
Forward	100	100
Backward	100	100

Availability Counters (Und = Undetermined)

	Available	Und-Avail	Unavailable	Und-Unavail	HLI	CHLI
Forward	10	0	0	0	0	0
Backward	10	0	0	0	0	0

monitor oam-pm session "ip-vprn-500" twamp-light

At time t = 0 sec (Base Statistics)

Frame Delay (FD) Bin Counts

Bin	Lower Bound	Forward	Backward	Round Trip
0	0 us	89719	113813	82529
1	1000 us	51728	43288	62811
2	2000 us	19304	7882	16979
3	3000 us	5207	1300	3067
4	4000 us	1166	335	1280
5	5000 us	469	255	781
6	6000 us	227	129	361
7	7000 us	121	166	152
8	8000 us	83	253	114
9	10000 us	125	728	75

Frame Delay Range (FDR) Bin Counts

Bin	Lower Bound	Forward	Backward	Round Trip
0	0 us	167124	166618	167138
1	5000 us	1025	1531	1011

Inter-Frame Delay Variation (IFDV) Bin Counts

Bin	Lower Bound	Forward	Backward	Round Trip
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OAM, SAA, and OAM-PM Command Reference

0	0 us	29284	45291	36062
1	100 us	9615	10793	28238
2	200 us	9289	9827	20379
3	300 us	8933	8733	14325
4	400 us	8597	8362	10257
5	500 us	8216	7789	7635
6	600 us	8178	7606	5893
7	700 us	7782	7345	4963
8	800 us	14799	14500	8416
9	1000 us	63455	47902	31980

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.