source-ip (tplt)

To specify an source IP address in an auto IP Service Level Agreements (SLAs) operation template, use the **source-ip** command in the appropriate submode of IP SLA template configuration mode. To remove the specified address from the configuration, use the **no** form of the command.

source-ip {*ip-address* | *hostname*}

no source-ip {*ip-address* | *hostname*}

Syntax Description

ip-address | *hostname*	IPv4 address or hostname of source.

Defaults

The source address for the operation template is the IP address closest to the destination.

Command Modes

IP SLA Template Configuration

ICMP echo configuration (config-tplt-icmp-ech
ICMP jitter configuration (config-tplt-icmp-jtr)
TCP connect configuration (config-tplt-tcp-conn)
UDP echo configuration (config-tplt-udp-ech)
UDP jitter configuration (config-tplt-udp-jtr)

Command History

Release	Modification
15.1(1)T	This command was introduced.

Usage Guidelines

This command adds the specified source address to the configuration of an auto IP SLAs operation template. When a source IP address or hostname is not specified, auto IP SLAs chooses the IP address nearest to the destination.

You must configure the type of IP SLAs operation, such as User Datagram Protocol (UDP) jitter or Internet Control Message Protocol (ICMP) echo, before you can configure any of the other parameters of the operation.

Examples

The following example shows how to configure the IP address and port number of the source in an auto IP SLAs operation template:

```
Router(config)#ip sla auto template type ip udp-jitter 1
Router(config-tplt-udp-jtr)# source-ip 10.1.1.1
Router(config-tplt-udp-jtr)# source-port 23
Router(config-tplt-udp-jtr# end
Router# show ip sla auto template type ip udp-jitter
IP SLAs Auto Template: 1
    Measure Type: udp-jitter (control enabled)
    Description:
    IP options:
        Source IP: 10.1.1.1 Source Port: 23
        VRF:    TOS: 0x0
```

```
Operation Parameters:
    Request Data Size: 16   Verify Data: false
    Timeout: 5000           Threshold: 5000
Statistics Aggregation option:
    Hours of statistics kept: 2
History options:
    History filter: none
    Max number of history records kept: 15
    Lives of history kept: 0
Statistics Distributions options:
    Distributions characteristics: RTT
    Distributions bucket size: 20
    Max number of distributions buckets: 1
Reaction Configuration: None
```

Related Commands

Command	Description
ip sla auto template	Begins configuration for an auto IP SLAs operation template and enters IP SLA template configuration mode.

source-port

To specify a source-port number in an auto Service Level Agreements (SLAs) operation template, use the **source-port** command in the appropriate submode of IP SLA template configuration mode. To remove the specified port from the configuration, use the **no** form of the command.

source-port *port-number*

no source-port *port-number*

Syntax Description

port-number	Port number of source.

Command Default

Auto IP SLAs chooses an available port.

Command Modes

IP SLA Template Configuration

TCP connect configuration (config-tplt-tcp-conn)
UDP echo configuration (config-tplt-udp-ech)
UDP jitter configuration (config-tplt-udp-jtr)

Command History

Release	Modification
15.1(1)T	This command was introduced.

Usage Guidelines

This command adds the specified source-port number to the configuration of an auto IP SLAs operation template. When a source-port number is not specified, auto IP SLAs chooses an available port.

You must configure the type of IP SLAs operation, such as User Datagram Protocol (UDP) jitter or Internet Control Message Protocol (ICMP) echo, before you can configure any of the other parameters of the operation.

Examples

The following example shows how to configure the IP address and port number of the source in an auto IP SLAs operation template:

```
Router(config)#ip sla auto template type ip udp-jitter 1
Router(config-tplt-udp-jtr)# source-ip 10.1.1.1
Router(config-tplt-udp-jtr)# source-port 23
Router(config-tplt-udp-jtr# end
Router# show ip sla auto template type ip udp-jitter
IP SLAs Auto Template: 1
    Measure Type: udp-jitter (control enabled)
    Description:
    IP options:
        Source IP: 10.1.1.1 Source Port: 23
        VRF:    TOS: 0x0
    Operation Parameters:
        Request Data Size: 16   Verify Data: false
        Timeout: 5000           Threshold: 5000
```

```
Statistics Aggregation option:
    Hours of statistics kept: 2
History options:
    History filter: none
    Max number of history records kept: 15
    Lives of history kept: 0
Statistics Distributions options:
    Distributions characteristics: RTT
    Distributions bucket size: 20
    Max number of distributions buckets: 1
Reaction Configuration: None
```

Related Commands

Command	Description
ip sla auto template	Begins configuration for an auto IP SLAs operation template and enters IP SLA template configuration mode.

start-time

To specify the start time in an auto IP Service Level Agreement (SLAs) scheduler, use the **start-time** command in IP SLAs auto-measure schedule configuration mode.

start-time {*hh*:*mm*[:*ss*] [*month day* | *day month*] | **pending** | **now** | **after** *hh*:*mm*:*ss*}

Syntax Description

hh:*mm*[:*ss*]	Absolute start time, in 24-hour clock format with hours (*hh*), minutes (*mm*), and seconds (*ss*) separated by a colon (**:**). Seconds (:ss) are optional. Range is from 00:00:00 to 23:59:59, with 00:00 being midnight and 23:59 being 11:59 p.m. The colons (:) are required. Current month and day is default.
month day	(Optional) Start day other than today, in month then day format. Value for month is either the full English name or the first three letters of the month. Range for day is from 1 to 31.
day month	(Optional) Start day other than today, in day then month format. Range for day is from 1 to 31. Value for the month is either the full English name or the first three letters of the month.
pending	Spcifies that no information is collected. This is the default.
now	Spcifies that this operation starts immediately after this command is configured.
after *hh*:*mm*:*ss*	Specifies that start time is up to one 24-hour day after this command is configured, with hours (*hh*), minutes (*mm*), and seconds (*ss*) separated by a colon (**:**). Range is from 00:00:00 to 23:59:59. The colons (:) are required.

Command Default

The auto IP SLAs scheduler is enabled and the state of the scheduler is pending.

Command Modes

IP SLAs auto-measure schedule configuration (config-am-schedule)

Command History

Release	Modification
15.1(1)T	This command was introduced.

Usage Guidelines

This command changes the value of the start-time characteristic in the IP SLAs schedule from the default (pending) to the specified value.

If the operation being controlled by an auto IP SLAs scheduler is in a pending trigger (default) state, you can define the conditions under which the operation makes the transition from pending to active with the **react** command.

After you configure this command to specify a start time other than the default (pending), you cannot modify the auto IP SLAs scheduler. If you attempt to modify a scheduler with a specified start-time, the following message appears:

```
%Entry already scheduled and cannot be modified
```

To change the configuration of an auto IP SLAs scheduler in which the start time is other than the default, use the **no** form of the **ip slan auto schedule** command to remove the scheduler configuration and reenter the configuration information.

Examples

The following example shows how to configure an auto IP SLAs scheduler that will cause an auto IP SLAs operation to actively collect data at 3:00 p.m. on April 5. The operation will age out after 12 hours of inactivity, which can be before it starts or after it has finished its life. When the operation ages out, all configuration information for the operation is removed from the running configuration in RAM:

```
Router(config)#ip sla auto schedule apr5
Router(config-am-schedule)#ageout 43200
Router(config-am-schedule)#frequency 70
Router(config-am-schedule)#life 43200
Router(config-am-schedule)#probe-interval 1500
Router(config-am-schedule)#start-time 15:00 apr 5
Router(config-am-schedule)#end
Router#
Router# show ip sla auto schedule apr5
Group sched-id: apr5
    Probe Interval (ms) : 1500
    Group operation frequency (sec): 70
    Status of entry (SNMP RowStatus): Active
    Next Scheduled Start Time: P15:00 apr 5
    Life (sec): 43200
    Entry Ageout (sec): 43200
Router#
```

Related Commands

Command	Description
ip sla auto schedule	Begins configuration for an auto IP SLAs scheduler and enters IP SLA auto-measure schedule configuration mode.
schedule	Specifies an auto IP SLAs scheduler for an IP SLAs auto-measure group.
react	Configures certain actions to occur based on events under the control of auto IP SLAs.
show ip sla auto schedule	Displays the configuration including default values of auto IP SLAs schedulers.

statistics-distribution-interval

Note Effective with Cisco IOS Release 12.4(4)T, 12.2(33)SRB, 12.2(33)SB, and 12.2(33)SXI, the **statistics-distribution-interval** command is replaced by the **history statistics-distribution-interval** command. See the **history statistics-distribution-interval** command for more information.

To set the time interval for each statistics distribution kept for a Cisco IOS IP Service Level Agreements (SLAs) operation, use the **statistics-distribution-interval** command in the appropriate submode of IP SLA monitor configuration mode. To return to the default value, use the **no** form of this command.

statistics-distribution-interval *milliseconds*

no statistics-distribution-interval

Syntax Description

milliseconds	Number of milliseconds (ms) used for each statistics distribution kept. The default is 20.

Defaults

20 ms

Command Modes

DHCP configuration (config-sla-monitor-dhcp)
DLSw configuration (config-sla-monitor-dlsw)
DNS configuration (config-sla-monitor-dns)
FTP configuration (config-sla-monitor-ftp)
HTTP configuration (config-sla-monitor-http)
ICMP echo configuration (config-sla-monitor-echo)
ICMP path echo configuration (config-sla-monitor-pathEcho)
ICMP path jitter configuration (config-sla-monitor-pathJitter)
TCP connect configuration (config-sla-monitor-tcp)
UDP echo configuration (config-sla-monitor-udp)
UDP jitter configuration (config-sla-monitor-jitter)
VoIP configuration (config-sla-monitor-voip)

Command History

Release	Modification
11.2	This command was introduced.
12.4(4)T	This command was replaced by the **history statistics-distribution-interval** command.
12.2(33)SRB	This command was replaced by the **history statistics-distribution-interval** command.
12.2SX	This command is supported in the Cisco IOS Release 12.2SX train. Support in a specific 12.2SX release of this train depends on your feature set, platform, and platform hardware.

Release	Modification
12.2(33)SB	This command was replaced by the **history statistics-distribution-interval** command.
12.2(33)SXI	This command was replaced by the **history statistics-distribution-interval** command.

Usage Guidelines

In most situations, you do not need to change the time interval for each statistics distribution or number of distributions kept. Only change these parameters when distributions are needed, for example, when performing statistical modeling of your network. To set the number of statistics distributions kept, use the **distributions-of-statistics-kept** command.

Note You must configure the type of IP SLAs operation (such as User Datagram Protocol [UDP] jitter or Internet Control Message Protocol [ICMP] echo) before you can configure any of the other parameters of the operation.

Examples

In the following example, the statistics distribution is set to five and the distribution interval is set to 10 ms for IP SLAs ICMP echo operation 1. Consequently, the first distribution will contain statistics from 0 to 9 ms, the second distribution will contain statistics from 10 to 19 ms, the third distribution will contain statistics from 20 to 29 ms, the fourth distribution will contain statistics from 30 to 39 ms, and the fifth distribution will contain statistics from 40 ms to infinity.

```
ip sla monitor 1
 type echo protocol ipIcmpEcho 172.16.161.21
 distributions-of-statistics-kept 5
 statistics-distribution-interval 10
!
ip sla monitor schedule 1 life forever start-time now
```

Related Commands

Command	Description
distributions-of-statistics-kept	Sets the number of statistics distributions kept per hop during the IP SLAs operation's lifetime.
hops-of-statistics-kept	Sets the number of hops for which statistics are maintained per path for the IP SLAs operation.
hours-of-statistics-kept	Sets the number of hours for which statistics are maintained for the IP SLAs operation.
ip sla monitor	Begins configuration for an IP SLAs operation and enters IP SLA monitor configuration mode.
paths-of-statistics-kept	Sets the number of paths for which statistics are maintained per hour for the IP SLAs operation.

tag (IP SLA)

To create a user-specified identifier for a Cisco IOS IP Service Level Agreements (SLAs) operation, use the **tag** (IP SLA) command in the appropriate submode of IP SLA configuration, auto IP SLA MPLS configuration, or IP SLA monitor configuration mode. To remove a tag from an operation, use the **no** form of this command.

tag *text*

no tag

Syntax Description

text	Name of a group to which the operation belongs. In Cisco IOS Release 12.2(33)SXF and earlier releases, the length of the tag is limited to 90 characters, including spaces.

Command Default

No tag identifier is specified.

Command Modes

IP SLA Configuration

DHCP configuration (config-ip-sla-dhcp)
DLSw configuration (config-ip-sla-dlsw)
DNS configuration (config-ip-sla-dns)
Ethernet echo (config-ip-sla-ethernet-echo)
Ethernet jitter (config-ip-sla-ethernet-jitter)
FTP configuration (config-ip-sla-ftp)
HTTP configuration (config-ip-sla-http)
ICMP echo configuration (config-ip-sla-echo)
ICMP jitter configuration (config-ip-sla-icmpjitter)
ICMP path echo configuration (config-ip-sla-pathEcho)
ICMP path jitter configuration (config-ip-sla-pathJitter)
TCP connect configuration (config-ip-sla-tcp)
UDP echo configuration (config-ip-sla-udp)
UDP jitter configuration (config-ip-sla-jitter)
VCCV configuration (config-sla-vccv)
VoIP configuration (config-ip-sla-voip)

Auto IP SLA MPLS Configuration

MPLS parameters configuration (config-auto-ip-sla-mpls-params)

IP SLA Auto Ethernet Configuration

Ethernet parameters configuration (config-ip-sla-ethernet-params)

IP SLA Monitor Configuration

DHCP configuration (config-sla-monitor-dhcp)
DLSw configuration (config-sla-monitor-dlsw)
DNS configuration (config-sla-monitor-dns)
FTP configuration (config-sla-monitor-ftp)
HTTP configuration (config-sla-monitor-http)

ICMP echo configuration (config-sla-monitor-echo)
ICMP path echo configuration (config-sla-monitor-pathEcho)
ICMP path jitter configuration (config-sla-monitor-pathJitter)
TCP connect configuration (config-sla-monitor-tcp)
UDP echo configuration (config-sla-monitor-udp)
UDP jitter configuration (config-sla-monitor-jitter)
VoIP configuration (config-sla-monitor-voip)

Command History

Release	Modification
11.2	This command was introduced.
12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.
12.2(33)SRB	The Ethernet echo, Ethernet jitter, and Ethernet parameters configuration modes were added.
12.2SX	This command is supported in the Cisco IOS Release 12.2SX train. Support in a specific 12.2SX release of this train depends on your feature set, platform, and platform hardware.
12.2(33)SRC	The VCCV configuration mode was added.
12.2(33)SB	The following configuration modes were added: • Ethernet echo • Ethernet jitter • Ethernet parameters • VCCV
12.4(20)T	This command was modified. The 90-character limit on the length of the *text* argument was removed and the Ethernet echo, Ethernet jitter, and Ethernet parameters configuration modes were added.
12.2(33)H	This command was modified. The 90-character limit on the length of the *text* argument was removed.
12.2(33)SXI	This command was modified. The Ethernet echo, Ethernet jitter, and Ethernet parameters configuration modes were added.

Usage Guidelines

An operation tag is normally used to logically link operations in a group.

Tags can be used to support automation (for example, by using the same tag for two different operations on two different routers echoing the same target).

In releases prior to Cisco IOS Release 12.2(33)SXH, the length of the *text* argument is limited to 90 characters, including spaces. If you configure a tag that is longer than 90 characters, including spaces, the device crashes because of a block overrun. In Cisco IOS Release 12.2(33)SXF and earlier releases, we recommend that you limit the length of the tag to approximately 80 characters, including spaces.

In Cisco IOS Release 12.2(33)SXH and Cisco IOS Release 12.4(20)T, the 90-character limitation for the *text* argument was removed.

The **tag** (IP SLA) command is supported in IPv4 networks. This command is also supported in IPv6 networks when configuring an IP SLAs operation that supports IPv6 addresses.

IP SLAs Operation Configuration Dependence on Cisco IOS Release

The Cisco IOS command used to begin configuration for an IP SLAs operation varies depending on the Cisco IOS release you are running (see Table 72). Note that if you are configuring an IP SLAs label switched path (LSP) Health Monitor operation, see Table 73 for information on Cisco IOS release dependencies. You must configure the type of IP SLAs operation, such as User Datagram Protocol (UDP) jitter or Internet Control Message Protocol (ICMP) echo, before you can configure any of the other parameters of the operation.

The configuration mode for the **tag** (IP SLA) command varies depending on the Cisco IOS release you are running and the operation type configured.

Table 72 Command Used to Begin Configuration of an IP SLAs Operation Based on Cisco IOS Release

Cisco IOS Release	Global Configuration Command	Command Mode Entered
12.4(4)T, 12.0(32)SY, 12.2(33)SRB, 12.2(33)SB, 12.2(33)SXI , 12.2(58)SE, or later releases	**ip sla**	IP SLA configuration
12.3(14)T, 12.4, 12.4(2)T, 12.2(31)SB2, or 12.2(33)SXH	**ip sla monitor**	IP SLA monitor configuration

Table 73 Command Used to Begin Configuration of an IP SLAs LSP Health Monitor Operation Based on Cisco IOS Release

Cisco IOS Release	Global Configuration Command	Command Mode Entered
12.4(6)T, 12.0(32)SY, 12.2(31)SB2, 12.2(33)SRB, 12.2(33)SXH, or later releases	**auto ip sla mpls-lsp-monitor**	Auto IP SLA MPLS configuration

Examples

In the following examples, an IP SLAs ICMP echo operation is tagged with the label testoperation.

IP SLA Configuration

This example shows the **tag** (IP SLA) command being used in an IPv4 network in ICMP echo configuration mode within IP SLA configuration mode:

```
ip sla 1
 icmp-echo 172.16.1.176
 tag testoperation
!
ip sla schedule 1 life forever start-time now
```

IP SLA Monitor Configuration

This example shows the **tag** (IP SLA) command being used in an IPv4 network in ICMP echo configuration mode within IP SLA monitor configuration mode:

```
ip sla monitor 1
 type echo protocol ipIcmpEcho 172.16.1.176
 tag testoperation
!
ip sla monitor schedule 1 life forever start-time now
```

Related Commands

Command	Description
auto ip sla mpls-lsp-monitor	Begins configuration for an IP SLAs LSP Health Monitor operation and enters auto IP SLA MPLS configuration mode.
ip sla	Begins configuration for an IP SLAs operation and enters IP SLA configuration mode.
ip sla monitor	Begins configuration for an IP SLAs operation and enters IP SLA monitor configuration mode.

tcp-connect

To define a Cisco IOS IP Service Level Agreements (SLAs) Transmission Control Protocol (TCP) connection operation, use the **tcp-connect** command in IP SLA configuration mode.

tcp-connect {*destination-ip-address* | *destination-hostname*} *destination-port* [**source-ip** {*ip-address* | *hostname*} **source-port** *port-number*] [**control** {**enable** | **disable**}]

Syntax Description

destination-ip-address | *destination-hostname*	Destination IPv4 or IPv6 address or hostname.
destination-port	Specifies the destination port number.
source-ip {*ip-address* | *hostname*}	(Optional) Specifies the source IPv4 or IPv6 address or hostname. When a source IP address or hostname is not specified, IP SLAs chooses the IP address nearest to the destination.
source-port *port-number*	(Optional) Specifies the source port number. When a port number is not specified, IP SLAs chooses an available port.
control {**enable** | **disable**}	(Optional) Enables or disables the IP SLAs control protocol to send a control message to the IP SLAs Responder prior to sending an operation packet. By default, IP SLAs control messages are sent to the destination device to establish a connection with the IP SLAs Responder.

Defaults

No IP SLAs operation type is associated with the operation number being configured.

Command Modes

IP SLA configuration (config-ip-sla)

Command History

Release	Modification
12.4(4)T	This command was introduced. This command replaces the **type tcpConnect dest-ipaddr** command.
12.0(32)SY	This command was integrated into Cisco IOS Release 12.0(32)SY.
12.2(33)SRB	This command was integrated into Cisco IOS Release 12.2(33)SRB. This command replaces the **type tcpConnect dest-ipaddr** command.
12.2(33)SRC	Support for IPv6 addresses was added.
12.2(33)SB	This command was integrated into Cisco IOS Release 12.2(33)SB. This command replaces the **type tcpConnect dest-ipaddr** command. Support for IPv6 addresses was added.
12.4(20)T	Support for IPv6 addresses was added.
12.2(33)SXI	This command was integrated into Cisco IOS Release 12.2(33)SXI. This command replaces the **type tcpConnect dest-ipaddr** command.

Usage Guidelines

The TCP connection operation is used to discover the time required to connect to the target device. This operation can be used to test virtual circuit availability or application availability. If the target is a Cisco router, then IP SLAs makes a TCP connection to any port number specified by the user. If the destination is a non-Cisco IP host, then the user must specify a known target port number (for example, 21 for FTP, 23 for Telnet, or 80 for HTTP server). This operation is useful in testing Telnet or HTTP connection times.

You must configure the type of IP SLAs operation (such as User Datagram Protocol [UDP] jitter or Internet Control Message Protocol [ICMP] echo) before you can configure any of the other parameters of the operation. To change the operation type of an existing IP SLAs operation, you must first delete the IP SLAs operation (using the **no ip sla** global configuration command) and then reconfigure the operation with the new operation type.

You must enable the IP SLAs Responder on the target router before you can configure a TCP Connect operation.

Control protocol is required when the target device is a Cisco router that does not natively provide the UDP or TCP Connect service. Prior to sending an operation packet to the target router, IP SLAs sends a control message to the IP SLAs Responder to enable the destination port. If you disable control by using the **control disable** keyword combination with this command, you must define the IP address of the source for the Cisco IOS IP SLAs Responder by using the **ip sla responder tcp-connect ipaddress** command on the destination device.

IP SLAs TCP connect operations support both IPv4 and IPv6 addresses.

Examples

In the following example, IP SLAs operation 11 is configured as a TCP connection operation using the destination IP address 172.16.1.175 and the destination port 2400:

```
ip sla 11
 tcp-connect 172.16.1.175 2400
!
ip sla schedule 11 start-time now life forever
```

In the following example, IP SLAs operation 12 is configured as a TCP connection operation using the destination IPv6 address 2001:0DB8:200::FFFE and the destination port 2400:

```
ip sla 12
 tcp-connect 2001:0DB8:200::FFFE
!
ip sla schedule 12 start-time now life forever
```

Related Commands

Command	Description
ip sla	Begins configuration for an IP SLAs operation and enters IP SLA configuration mode.
ip sla responder tcp-connect ipaddress	Permanently enables IP SLAs Responder functionality on specified IP address and port.

template (am-group)

To add a auto IP Service Level Agreements (SLAs) operation template to the configuration of an IP SLAs auto-measure group, use the **template** command in IP SLA auto-measure group configuration mode. To remove the template from the configuration and restore the default, use the **no** form of this command.

template *operation*

no template

Syntax Description

operation	Type of IP operation. Use one of the following keywords: • **icmp-echo**—Internet Control Message Protocol (ICMP) echo operation • **icmp-jitter—**Internet Control Message Protocol (ICMP) jitter operation • **tcp-connect—**Transmission Control Protocol (TCP) connection operation • **udp-echo—**User Datagram Protocol (UDP) echo operation • **udp-jitter—**User Datagram Protocol (UDP) jitter operation

Command Default

Type of operation for the auto-measure group being configured is ICMP jitter.

Command Modes

IP SLA auto-measure group configuration (config-am-grp)

Command History

Release	Modification
15.1(1)T	This command was introduced.

Usage Guidelines

This command changes the operation for the auto-measure group being configured from the default (ICMP jitter) to the operation defined in the specified template.

Only one auto IP SLAs operation template can be specified for each IP SLAs auto-measure group. Each operation template can be referenced by more than one group.

If no auto IP SLAs operation template is specified for an auto-measure group, the operation for the group is ICMP jitter (default).

If you issue this command and the specified template does not exist, the auto-measure group operations cannot start. If you configure the specified template after using this command, the template is added to the group configuration and scheduling can proceed.

To change the operation of an existing auto-measure group, first use the **no** form of this command to delete the auto IP SLAs operation template from the group configuration and then reconfigure the group with either a different or no operation template.

To configure an auto IP SLAs operation template, use the **ip sla auto template** command.

Examples

The following example shows how to add an auto IP SLAs endpoint list to the configuration of an IP SLAs auto-measure group:

```
Router(config)#ip sla auto group type ip 1
Router(config-am-grp)#template 1
Router(config-am-grp)#destination 1
Router(config-am-grp)#schedule 1
Router(config-am-grp)#end
Router#
Router#show ip sla auto group
Group Name: 1
    Description:
    Activation Trigger: Immediate
    Destination: 1
    Schedule: 1

IP SLAs Auto Template: 1
    Measure Type: icmp-jitter
    Description:
    IP options:
        Source IP: 0.0.0.0
        VRF:    TOS: 0x0
    Operation Parameters:
        Number of Packets: 10   Inter packet interval: 20
        Timeout: 5000           Threshold: 5000
    Statistics Aggregation option:
        Hours of statistics kept: 2
    Statistics Distributions options:
        Distributions characteristics: RTT
        Distributions bucket size: 20
        Max number of distributions buckets: 1
    Reaction Configuration: None

IP SLAs auto-generated operations of group 1
    no operation created
```

Related Commands

Command	Description
ip sla auto template	Enters IP SLA auto-measure template configuration mode and begins creating an auto IP SLAs operation template.

threshold (IP SLA)

To set the upper threshold value for calculating network monitoring statistics created by a Cisco IOS IP Service Level Agreements (SLAs) operation, use the **threshold** command in the appropriate submode of IP SLA configuration, auto IP SLA MPLS configuration, IP SLA auto Ethernet configuration, IP SLA monitor configuration, or IP SLA template parameters configuration mode. To return to the default value, use the **no** form of this command.

threshold *milliseconds*

no threshold

Syntax Description

milliseconds	Length of time required for a rising threshold to be declared, in milliseconds (ms). Range is 0 to 60000. Default is 5000.

Command Default

The default is 5000 ms.

Command Modes

IP SLA Configuration

DHCP configuration (config-ip-sla-dhcp)
DLSw configuration (config-ip-sla-dlsw)
DNS configuration (config-ip-sla-dns)
Ethernet echo (config-ip-sla-ethernet-echo)
Ethernet jitter (config-ip-sla-ethernet-jitter)
FTP configuration (config-ip-sla-ftp)
HTTP configuration (config-ip-sla-http)
ICMP echo configuration (config-ip-sla-echo)
ICMP jitter configuration (config-ip-sla-icmpjitter)
ICMP path echo configuration (config-ip-sla-pathEcho)
ICMP path jitter configuration (config-ip-sla-pathJitter)
TCP connect configuration (config-ip-sla-tcp)
UDP echo configuration (config-ip-sla-udp)
UDP jitter configuration (config-ip-sla-jitter)
VCCV configuration (config-sla-vccv)
VoIP configuration (config-ip-sla-voip)

Auto IP SLA MPLS Configuration

MPLS parameters configuration (config-auto-ip-sla-mpls-params)

IP SLA auto Ethernet Configuration

Ethernet parameters configuration (config-ip-sla-ethernet-params)

IP SLA Monitor Configuration

DHCP configuration (config-sla-monitor-dhcp)
DLSw configuration (config-sla-monitor-dlsw)
DNS configuration (config-sla-monitor-dns)
FTP configuration (config-sla-monitor-ftp)
HTTP configuration (config-sla-monitor-http)

ICMP echo configuration (config-sla-monitor-echo)
ICMP path echo configuration (config-sla-monitor-pathEcho)
ICMP path jitter configuration (config-sla-monitor-pathJitter)
TCP connect configuration (config-sla-monitor-tcp)
UDP echo configuration (config-sla-monitor-udp)
UDP jitter configuration (config-sla-monitor-jitter)
VoIP configuration (config-sla-monitor-voip)

IP SLA Template Parameters Configuration

ICMP echo configuration (config-icmp-ech-params)
TCP connect configuration (config-tcp-conn-params)
UDP echo configuration (config-udp-ech-params)
UDP jitter configuration (config-udp-jtr-params)

Command History

Release	Modification
11.2	This command was introduced.
12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.
12.2(33)SRB	The Ethernet echo, Ethernet jitter, and Ethernet parameters configuration modes were added.
12.2SX	This command is supported in the Cisco IOS Release 12.2SX train. Support in a specific 12.2SX release of this train depends on your feature set, platform, and platform hardware.
12.2(33)SRC	The VCCV configuration mode was added.
12.2(33)SB	The following configuration modes were added: • Ethernet echo • Ethernet jitter • Ethernet parameters • VCCV
12.4(20)T	The Ethernet echo, Ethernet jitter, and Ethernet parameters configuration modes were added.
12.2(33)SXI	The Ethernet echo, Ethernet jitter, and Ethernet parameters configuration modes were added.
15.1(1)T	This command was modified. The IP SLA template parameters configuration mode was added.

Usage Guidelines

The value specified for this command must not exceed the value specified for the **timeout** command.

The threshold value configured by this command is used only to calculate network monitoring statistics created by a Cisco IOS IP SLAs operation. This value is not used for generating Simple Network Management Protocol (SNMP) trap notifications. Use the **ip sla reaction-configuration** command in global configuration mode to configure the thresholds for generating IP SLAs SNMP trap notifications. For auto IP SLAs in Cisco IOS IP SLA Engine 3.0, use the **react** command to configure the thresholds for generating IP SLAs SNMP trap notifications.

For the IP SLAs User Datagram Protocol (UDP) jitter operation, the **threshold** (IP SLA) command sets the upper threshold value for the average jitter calculation. For all other IP SLAs operations, the **threshold** (IP SLA) command sets the upper threshold value for the round-trip time (RTT) measurement. IP SLAs will calculate the number of times the average jitter or RTT measurement exceeds the specified threshold value.

Consider the following guidelines before configuring the **frequency** (IP SLA), **timeout** (IP SLA), and **threshold** (IP SLA) commands. For the IP SLAs UDP jitter operation, the following guidelines are recommended:

- (**frequency** *seconds*) > ((**timeout** *milliseconds*) + N)
- (**timeout** *milliseconds*) > (**threshold** *milliseconds*)

where N = (**num-packets** *number-of-packets*) * (**interval** *interpacket-interval*). If you are running Cisco IOS IP SLAs Engine 3.0, use the **num-packets** command and the **interval** (params) commands to configure the values that define N. Otherwise, use the **udp-jitter** command to configure the **num-packets** *number-of-packets* and **interval** *interpacket-interval* values.

For all other IP SLAs operations, the following configuration guideline is recommended:

(**frequency** *seconds*) > (**timeout** *milliseconds*) > (**threshold** *milliseconds*)

The **threshold** (IP SLA) command is supported in IPv4 networks. This command is also supported in IPv6 networks to configure an IP SLAs operation that supports IPv6 addresses.

IP SLAs Operation Configuration Dependence on Cisco IOS Release

The Cisco IOS command used to begin configuration for an IP SLAs operation varies depending on the Cisco IOS release you are running (see Table 74). If you are configuring an IP SLAs label switched path (LSP) Health Monitor operation, see Table 75 for information on Cisco IOS release dependencies. You must configure the type of IP SLAs operation, such as User Datagram Protocol (UDP) jitter or Internet Control Message Protocol (ICMP) echo, before you can configure any of the other parameters of the operation.

The configuration mode for the **threshold** command varies depending on the Cisco IOS release you are running and the operation type configured.

If you are running Cisco IOS IP SLAs Engine 3.0, you must enter the **parameters** command in IP SLA template configuration mode before you can use the **threshold** command.

Table 74 Command Used to Begin Configuration of an IP SLAs Operation Based on Cisco IOS Release

Cisco IOS Release	Global Configuration Command	Command Mode Entered
12.4(4)T, 12.0(32)SY, 12.2(33)SRB, 12.2(33)SB, 12.2(33)SXI, or later releases	**ip sla**	IP SLA configuration
12.3(14)T, 12.4, 12.4(2)T, 12.2(31)SB2, or 12.2(33)SXH	**ip sla monitor**	IP SLA monitor configuration
15.1(1)T	**ip sla auto template**	IP SLA template configuration

Table 75 Command Used to Begin Configuration of an IP SLAs LSP Health Monitor Operation Based on Cisco IOS Release

Cisco IOS Release	Global Configuration Command	Command Mode Entered
12.4(6)T, 12.0(32)SY, 12.2(31)SB2, 12.2(33)SRB, 12.2(33)SXH, or later releases	**auto ip sla mpls-lsp-monitor**	Auto IP SLA MPLS configuration

Examples

The following examples show how to configure the threshold of the IP SLAs ICMP echo operation to 2500.

IP SLA Configuration

```
ip sla 1
 icmp-echo 172.16.1.176
 threshold 2500
!
ip sla schedule 1 start-time now
```

IP SLA Monitor Configuration

```
ip sla monitor 1
 type echo protocol ipIcmpEcho 172.16.1.176
 threshold 2500
!
ip sla monitor schedule 1 start-time now
```

IP SLA Template Parameters Configuration

```
Router(config)# ip sla auto template type ip icmp-echo 1
Router(config-tplt-icmp-ech)# parameters
Router(config-icmp-ech-params)# timeout 2500
Router(config-icmp-ech-params)# threshold 2500
Router(config-icmp-ech-params)# end
Router#
00:02:26: %SYS-5-CONFIG_I: Configured from console by console
Router# show ip sla auto template type ip udp-echo
IP SLAs Auto Template: 1
    Measure Type: udp-echo (control enabled)
    Description:
.
.
.
    Operation Parameters:
        Request Data Size: 16   Verify Data: false
        Timeout: 2500 Threshold: 2500
    Statistics Aggregation option:
        Hours of statistics kept: 2
    History options:
        History filter: none
        Max number of history records kept: 15
        Lives of history kept: 0
    Statistics Distributions options:
        Distributions characteristics: RTT
        Distributions bucket size: 20
        Max number of distributions buckets: 1
    Reaction Configuration: None
```

Related Commands

Command	Description
auto ip sla mpls-lsp-monitor	Begins configuration for an IP SLAs LSP Health Monitor operation and enters auto IP SLA MPLS configuration mode.
ip sla	Begins configuration for an IP SLAs operation and enters IP SLA configuration mode.
ip sla monitor	Begins configuration for an IP SLAs operation and enters IP SLA monitor configuration mode.
ip sla monitor reaction-configuration	Configures proactive threshold monitoring parameters for an IP SLAs operation.
ip sla reaction-configuration	Configures proactive threshold monitoring parameters for an IP SLAs operation.
react	Configures reaction and proactive threshold monitoring parameters in an auto IP SLAs operation template
timeout	Sets the amount of time the IP SLAs operation waits for a response from its request packet.

timeout (IP SLA)

To set the amount of time a Cisco IOS IP Service Level Agreements (SLAs) operation waits for a response from its request packet, use the **timeout** (IP SLA) command in the appropriate submode of IP SLA configuration, auto IP SLA MPLS configuration, IP SLA auto Ethernet configuration, IP SLA monitor configuration or IP SLA template parameters configuration mode. To return to the default value, use the **no** form of this command.

timeout *milliseconds*

no timeout

Syntax Description

milliseconds	Length of time the operation waits to receive a response from its request packet, in milliseconds (ms). Range is 0 to 604800000. We recommend that the value of the *milliseconds* argument be based on the sum of both the maximum round-trip time (RTT) value for the packets and the processing time of the IP SLAs operation.

Command Default

The default timeout value varies depending on the type of IP SLAs operation you are configuring.

Command Modes

IP SLA Configuration

DHCP configuration (config-ip-sla-dhcp)
DLSw configuration (config-ip-sla-dlsw)
DNS configuration (config-ip-sla-dns)
Ethernet echo (config-ip-sla-ethernet-echo)
Ethernet jitter (config-ip-sla-ethernet-jitter)
FTP configuration (config-ip-sla-ftp)
HTTP configuration (config-ip-sla-http)
ICMP echo configuration (config-ip-sla-echo)
ICMP jitter configuration (config-ip-sla-icmpjitter)
ICMP path echo configuration (config-ip-sla-pathEcho)
ICMP path jitter configuration (config-ip-sla-pathJitter)
TCP connect configuration (config-ip-sla-tcp)
UDP echo configuration (config-ip-sla-udp)
UDP jitter configuration (config-ip-sla-jitter)
VCCV configuration (config-sla-vccv)
VoIP configuration (config-ip-sla-voip)

Auto IP SLA MPLS Configuration

MPLS parameters configuration (config-auto-ip-sla-mpls-params)

IP SLA auto Ethernet Configuration

Ethernet parameters configuration (config-ip-sla-ethernet-params)

IP SLA Monitor Configuration

DHCP configuration (config-sla-monitor-dhcp)
DLSw configuration (config-sla-monitor-dlsw)
DNS configuration (config-sla-monitor-dns)
FTP configuration (config-sla-monitor-ftp)
HTTP configuration (config-sla-monitor-http)
ICMP echo configuration (config-sla-monitor-echo)
ICMP path echo configuration (config-sla-monitor-pathEcho)
ICMP path jitter configuration (config-sla-monitor-pathJitter)
TCP connect configuration (config-sla-monitor-tcp)
UDP echo configuration (config-sla-monitor-udp)
UDP jitter configuration (config-sla-monitor-jitter)
VoIP configuration (config-sla-monitor-voip)

IP SLA Template Parameters Configuration

ICMP echo configuration (config-icmp-ech-params)
ICMP jitter configuration (config-icmp-jtr-params)
TCP connect configuration (config-tcp-conn-params)
UDP echo configuration (config-udp-ech-params)
UDP jitter configuration (config-udp-jtr-params)

Command History

Release	Modification
11.2	This command was introduced.
12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.
12.2(33)SRB	The Ethernet echo, Ethernet jitter, and Ethernet parameters configuration modes were added.
12.2SX	This command is supported in the Cisco IOS Release 12.2SX train. Support in a specific 12.2SX release of this train depends on your feature set, platform, and platform hardware.
12.2(33)SRC	The VCCV configuration mode was added.
12.2(33)SB	The following configuration modes were added: • Ethernet echo • Ethernet jitter • Ethernet parameters • VCCV
12.4(20)T	The Ethernet echo, Ethernet jitter, and Ethernet parameters configuration modes were added.
12.2(33)SXI	The Ethernet echo, Ethernet jitter, and Ethernet parameters configuration modes were added.
15.1(1)T	This command was modified. The IP SLA template parameters configuration mode was added.

Usage Guidelines

We recommend that the value of the *milliseconds* argument be based on the sum of both the maximum round-trip time (RTT) value for the packets and the processing time of the IP SLAs operation.

Use the **timeout** (IP SLA) command to set how long the operation waits to receive a response from its request packet, and use the **frequency** (IP SLA) command to set the rate at which the IP SLAs operation restarts. The value specified for the **timeout** (IP SLA) command cannot be greater than the value specified for the **frequency** (IP SLA) command.

Consider the following guidelines before configuring the **frequency** (IP SLA), **timeout** (IP SLA), and **threshold** (IP SLA) commands. For the IP SLAs User Datagram Protocol (UDP) jitter operation, the following guidelines are recommended:

- (**frequency** *seconds*) > ((**timeout** *milliseconds*) + N)
- (**timeout** *milliseconds*) > (**threshold** *milliseconds*)

where N = (**num-packets** *number-of-packets*) * (**interval** *interpacket-interval*). If you are running Cisco IOS IP SLAs Engine 3.0, use the **num-packets** command and the **interval** (params) commands to configure the values that define N. Otherwise, use the **udp-jitter** command to configure the **num-packets** *number-of-packets* and **interval** *interpacket-interval* values.

For all other IP SLAs operations, the following configuration guideline is recommended:

(**frequency** *seconds*) > (**timeout** *milliseconds*) > (**threshold** *milliseconds*)

The **timeout** (IP SLA) command is supported in IPv4 networks. This command is also supported in IPv6 networks to configure an IP SLA operation that supports IPv6 addresses.

IP SLAs Operation Configuration Dependence on Cisco IOS Release

The Cisco IOS command used to begin configuration for an IP SLAs operation varies depending on the Cisco IOS release you are running (see Table 76). Note that if you are configuring an IP SLAs label switched path (LSP) Health Monitor operation, see Table 77 for information on Cisco IOS release dependencies. You must configure the type of IP SLAs operation, such as User Datagram Protocol (UDP) jitter or Internet Control Message Protocol (ICMP) echo, before you can configure any of the other parameters of the operation.

The configuration mode for the **timeout** command varies depending on the Cisco IOS release you are running and the operation type configured.

If you are running Cisco IOS IP SLAs Engine 3.0, you must enter the **parameters** command in IP SLA template configuration mode before you can use the **timeout** command.

Table 76 Command Used to Begin Configuration of an IP SLAs Operation Based on Cisco IOS Release

Cisco IOS Release	Global Configuration Command	Command Mode Entered
12.4(4)T, 12.0(32)SY, 12.2(33)SRB, 12.2(33)SB, 12.2(33)SXI, or later releases	**ip sla**	IP SLA configuration
12.3(14)T, 12.4, 12.4(2)T, 12.2(31)SB2, or 12.2(33)SXH	**ip sla monitor**	IP SLA monitor configuration
15.1(1)T	**ip sla auto template**	IP SLA template configuration

Table 77 Command Used to Begin Configuration of an IP SLAs LSP Health Monitor Operation Based on Cisco IOS Release

Cisco IOS Release	Global Configuration Command	Command Mode Entered
12.4(6)T, 12.0(32)SY, 12.2(31)SB2, 12.2(33)SRB, 12.2(33)SXH, or later releases	**auto ip sla mpls-lsp-monitor**	Auto IP SLA MPLS configuration

Examples

In the following examples, the timeout value for an IP SLAs operation 1 is set for 2500 ms:

IP SLA Configuration

```
ip sla 1
 icmp-echo 172.16.1.176
 timeout 2500
!
ip sla schedule 1 start-time now
```

IP SLA Monitor Configuration

```
ip sla monitor 1
 type echo protocol ipIcmpEcho 172.16.1.176
 timeout 2500
!
ip sla monitor schedule 1 start-time now
```

IP SLA Template Parameters Configuration

```
Router(config)#ip sla auto template type ip icmp-echo 1
Router(config-tplt-icmp-ech)#parameters
Router(config-icmp-ech-params)#timeout 2500
Router(config-icmp-ech-params)#end
Router#
00:02:26: %SYS-5-CONFIG_I: Configured from console by console
Router# show ip sla auto template type ip udp-echo
IP SLAs Auto Template: 1
    Measure Type: udp-echo (control enabled)
    Description:
.
.
.
    Operation Parameters:
        Request Data Size: 16   Verify Data: false
        Timeout: 2500 Threshold: 5000
    Statistics Aggregation option:
        Hours of statistics kept: 2
    History options:
        History filter: none
        Max number of history records kept: 15
        Lives of history kept: 0
    Statistics Distributions options:
        Distributions characteristics: RTT
        Distributions bucket size: 20
        Max number of distributions buckets: 1
    Reaction Configuration: None
```

Related Commands

Command	Description
auto ip sla mpls-lsp-monitor	Begins configuration for an IP SLAs LSP Health Monitor operation and enters auto IP SLA MPLS configuration mode.
frequency	Sets the rate at which the IP SLAs operation restarts.
ip sla	Begins configuration for an IP SLAs operation and enters IP SLA configuration mode.
ip sla auto template	Begins configuration for an auto IP SLAs operation template and enters IP SLA template configuration mode.
ip sla monitor	Begins configuration for an IP SLAs operation and enters IP SLA monitor configuration mode.

timeout (LSP discovery)

To set the amount of time the label switched path (LSP) discovery process for a Cisco IOS IP Service Level Agreements (SLAs) LSP Health Monitor operation waits for a response to its echo request packets, use the **timeout** command in auto IP SLA MPLS LSP discovery parameters configuration mode. To return to the default value, use the **no** form of this command.

timeout *seconds*

no timeout

Syntax Description

seconds	The amount of time (in seconds) the LSP discovery process waits for a response to its echo request packets. The default value is 5 seconds.

Command Default

5 seconds

Command Modes

Auto IP SLA MPLS LSP discovery parameters configuration (config-auto-ip-sla-mpls-lpd-params)

Command History

Release	Modification
12.2(31)SB2	This command was introduced.
12.2(33)SRB	This command was integrated into Cisco IOS Release 12.2(33)SRB.

Usage Guidelines

If no response is received for echo request packets sent along a particular LSP within the specified time limit, the LSP is considered to have had an operation failure.

Use the **path-discover** command to enable the LSP discovery option for an IP SLAs LSP Health Monitor operation and enter auto IP SLA MPLS LSP discovery parameters configuration mode.

Examples

The following example shows how to configure operation parameters, proactive threshold monitoring, and scheduling options using the LSP Health Monitor. In this example, the LSP discovery option is enabled for LSP Health Monitor operation 1. Operation 1 is configured to automatically create IP SLAs LSP ping operations for the equal-cost multipaths to all Border Gateway Protocol (BGP) next hop neighbors in use by all VPN routing and forwarding (VRF) instances associated with the source Provider Edge (PE) router. The timeout value for the echo request packets sent during the LSP discovery process is 4 seconds.

```
auto ip sla mpls-lsp-monitor 1
 type echo ipsla-vrf-all
 path-discover
!
 maximum-sessions 2
 session-timeout 60
 interval 2
 timeout 4
 force-explicit-null
 hours-of-statistics-kept 1
```

```
 scan-period 30
!
auto ip sla mpls-lsp-monitor schedule 1 schedule-period 60 frequency 100 start-time now
!
auto ip sla mpls-lsp-monitor reaction-configuration 1 react lpd tree-trace action-type
trapOnly
auto ip sla mpls-lsp-monitor reaction-configuration 1 react lpd lpd-group retry 3
action-type trapOnly
```

Related Commands

Command	Description
auto ip sla mpls-lsp-monitor	Begins configuration for an IP SLAs LSP Health Monitor operation and enters auto IP SLA MPLS configuration mode.
path-discover	Enables the LSP discovery option for an IP SLAs LSP Health Monitor operation and enters auto IP SLA MPLS LSP discovery parameters configuration mode.

tos (IP SLA)

To define a type of service (ToS) byte in the IPv4 header of a Cisco IOS IP Service Level Agreements (SLAs) operation, use the **tos** (IP SLA) command in the appropriate submode of IP SLA configuration, IP SLA monitor configuration, or IP SLA template configuration mode. To return to the default value, use the **no** form of this command.

tos *number*

no tos

Syntax Description

number	Service type byte in the IPv4 header. The range is from 0 to 255. The default is 0.

Command Default

The default type-of-service value is 0.

Command Modes

IP SLA Configuration

HTTP configuration (config-ip-sla-http)
ICMP echo configuration (config-ip-sla-echo)
ICMP jitter configuration (config-ip-sla-icmpjitter)
ICMP path echo configuration (config-ip-sla-pathEcho)
ICMP path jitter configuration (config-ip-sla-pathJitter)
TCP connect configuration (config-ip-sla-tcp)
UDP echo configuration (config-ip-sla-udp)
UDP jitter configuration (config-ip-sla-jitter)

IP SLA Monitor Configuration

HTTP configuration (config-sla-monitor-http)
ICMP echo configuration (config-sla-monitor-echo)
ICMP path echo configuration (config-sla-monitor-pathEcho)
ICMP path jitter configuration (config-sla-monitor-pathJitter)
TCP connect configuration (config-sla-monitor-tcp)
UDP echo configuration (config-sla-monitor-udp)
UDP jitter configuration (config-sla-monitor-jitter)

IP SLA Template Configuration

ICMP echo configuration (config-tplt-icmp-ech)
ICMP jitter configuration (config-tplt-icmp-ech)
TCP connect configuration (config-tplt-tcp-conn)
UDP echo configuration (config-tplt-udp-ech)
UDP jitter configuration (config-tplt-udp-ech)

Command History

Release	Modification
12.0(3)T	This command was introduced.
12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.

Release	Modification
12.2SX	This command is supported in the Cisco IOS Release 12.2SX train. Support in a specific 12.2SX release of this train depends on your feature set, platform, and platform hardware.
15.1(1)T	This command was modified. The IP SLA template configuration mode was added.

Usage Guidelines

The ToS value is stored in an 8-bit field in the IPv4 packet header. This value contains information such as precedence and ToS. This information is useful for policy routing and for features like Committed Access Rate (CAR), where routers examine ToS values. This value is similar to the IPv6 traffic-class value that is stored in IPv6 packet headers using the **traffic-class** (IP SLA) command, but the two fields use different codes.

Note This command is applicable only to IPv4 networks. In an IPv6 network, use the **traffic-class** (IP SLA) command to define a traffic-class byte in the IPv6 header of a Cisco IOS IP SLAs ICMP echo operation.

When the type of service is defined for an operation, the IP SLAs Responder will reflect the ToS value it receives.

To display the ToS value for all Cisco IOS IP SLAs operations or a specified operation, use the **show ip sla configuration** command. To display the ToS value for all or an auto IP SLAs operation template, use the **show ip sla auto template** command.

IP SLAs Operation Configuration Dependence on Cisco IOS Release

The Cisco IOS command used to begin configuration for an IP SLAs operation varies depending on the Cisco IOS release you are running (see Table 78). You must configure the type of IP SLAs operation, such as User Datagram Protocol (UDP) jitter or Internet Control Message Protocol (ICMP) echo, before you can configure any of the other parameters of the operation.

The configuration mode for the **tos** command varies depending on the Cisco IOS release you are running (see Table 78) and the operation type configured.

Table 78 Command Used to Begin Configuration of an IP SLAs Operation Based on Cisco IOS Release

Cisco IOS Release	Global Configuration Command	Command Mode Entered
12.4(4)T, 12.0(32)SY, 12.2(33)SRB, 12.2(33)SB, 12.2(33)SXI, or later releases	**ip sla**	IP SLA configuration
12.3(14)T, 12.4, 12.4(2)T, 12.2(31)SB2, or 12.2(33)SXH	**ip sla monitor**	IP SLA monitor configuration
15.1(1)T	**ip sla auto template**	IP SLA template configuration

Examples

In the following examples, IP SLAs operation 1 is configured as an ICMP echo operation with destination IP address 172.16.1.176. The ToS value is set to 0x80. Note that the Cisco IOS command used to begin configuration for an IP SLAs operation varies depending on the Cisco IOS release you are running (see Table 78).

The examples show the **tos** (IP SLA) command being used in an IPv4 network.

IP SLA Configuration

```
ip sla 1
 icmp-echo 172.16.1.176
 tos 0x80
!
ip sla schedule 1 start-time now
```

IP SLA Monitor Configuration

```
ip sla monitor 1
 type echo protocol ipIcmpEcho 172.16.1.176
 tos 0x80
!
ip sla monitor schedule 1 start-time now
```

IP SLA Template Configuration

```
Router(config)#ip sla auto template type ip udp-echo 1
Router(config-tplt-udp-ech)# source-ip 10.1.1.1
Router(config-tplt-udp-ech)# tos 80
Router(config-tplt-udp-ech# end
Router# show ip sla auto template type ip udp-echo
IP SLAs Auto Template: 1
    Measure Type: udp-echo (control enabled)
    Description:
    IP options:
        Source IP: 10.1.1.1 Source Port: 0
        VRF:    TOS: 0x80
    Operation Parameters:
        Request Data Size: 16   Verify Data: false
        Timeout: 5000           Threshold: 5000
    Statistics Aggregation option:
        Hours of statistics kept: 2
    History options:
        History filter: none
        Max number of history records kept: 15
        Lives of history kept: 0
    Statistics Distributions options:
        Distributions characteristics: RTT
        Distributions bucket size: 20
        Max number of distributions buckets: 1
    Reaction Configuration: None
```

Related Commands

Command	Description
ip sla	Begins configuration for an IP SLAs operation and enters IP SLA configuration mode.
ip sla auto template	Begins configuration for an auto IP SLAs operation template and enters IP SLA template configuration mode.
ip sla monitor	Begins configuration for an IP SLAs operation and enters IP SLA monitor configuration mode.
show ip sla configuration	Displays configuration values including all defaults for all Cisco IOS IP SLAs operations or a specified operation.
show ip sla auto template	Displays configuration values including all defaults for all auto IP SLAs operation templates or a specified template.
traffic-class (IP SLA)	Defines a traffic-class byte in the IPv6 header of a Cisco IOS IP SLAs ICMP echo operation in an IPv6 network.

track ip sla

To track the state of a Cisco IOS IP Service Level Agreements (SLAs) operation and to enter tracking configuration mode, use the **track ip sla** command in global configuration mode. To remove the tracking, use the **no** form of this command.

track *object-number* **ip sla** *operation-number* [**state** | **reachability**]

no track *object-number* **ip sla** *operation-number* [**state** | **reachability**]

Syntax Description

object-number	Object number representing the object to be tracked. The range is from 1 to 1000.
operation-number	Number used for the identification of the IP SLAs operation you are tracking.
state	(Optional) Tracks the operation return code.
reachability	(Optional) Tracks whether the route is reachable.

Command Default

IP SLAs tracking is disabled.

Command Modes

Global configuration (config)

Command History

Release	Modification
12.4(20)T	This command was introduced. This command replaces the **track rtr** command.
12.2(33)SXI1	This command was integrated into Cisco IOS Release 12.2(33)SXI1. This command replaces the **track rtr** command.
Cisco IOS XE Release 2.4	This command was integrated into Cisco IOS XE Release 2.4. This command replaces the **track rtr** command.
12.2(33)SRE	This command was integrated into Cisco IOS XE 12.2(33)SRE. This command replaces the **track rtr** command.
15.1(3)T	This command was modified. The valid range of the *object-number* argument increased to 1000.
15.1(1)S	This command was modified. The valid range for the *object-number* argument increased to 1000.

Usage Guidelines

Every IP SLAs operation maintains an operation return-code value. This return code is interpreted by the tracking process. The return code may return OK, OverThreshold, and several other return codes. Different operations may have different return-code values, so only values common to all operation types are used.

Two aspects of an IP SLAs operation can be tracked: state and reachability. The difference between these aspects relates to the acceptance of the OverThreshold return code. Table 79 shows the state and reachability aspects of IP SLAs operations that can be tracked.

Table 79 Comparison of State and Reachability Operations

Tracking	Return Code	Track State
State	OK	Up
	(all other return codes)	Down
Reachability	OK or over threshold	Up
	(all other return codes)	Down

As of Cisco IOS Release 15.1(3)T, a maximum of 1000 objects can be tracked. Although 1000 tracked objects can be configured, each tracked object uses CPU resources. The amount of available CPU resources on a router is dependent upon variables such as traffic load and how other protocols are configured and run. The ability to use 1000 tracked objects is dependent upon the available CPU. Testing should be conducted on site to ensure that the service works under the specific site traffic conditions.

Examples

The following example shows how to configure the tracking process to track the state of IP SLAs operation 2:

```
Router(config)# track 1 ip sla 2 state
```

The following example shows how to configure the tracking process to track the reachability of IP SLAs operation 3:

```
Router(config)# track 2 ip sla 3 reachability
```

Related Commands

Command	Description
track ip route	Tracks the state of an IP route and enters tracking configuration mode.

track rtr

Note Effective with Cisco IOS Release 12.4(20)T, 12.2(33)SXI1, 12.2(33)SRE and Cisco IOS XE Release 2.4, the **track rtr** command is replaced by the **track ip sla** command. See the **track ip sla** command for more information.

To track the state of a Cisco IOS IP Service Level Agreements (SLAs) operation and to enter tracking configuration mode, use the **track rtr** command in global configuration mode. To remove the tracking, use the **no** form of this command.

track *object-number* **rtr** *operation-number* {**state** | **reachability**}

no track *object-number* **rtr** *operation-number* {**state** | **reachability**}

Syntax Description

object-number	Object number representing the object to be tracked. The range is from 1 to 500.
operation-number	Number used for the identification of the IP SLAs operation you are tracking.
state	Tracks the operation return code.
reachability	Tracks whether the route is reachable.

Command Default

IP SLAs tracking is disabled.

Command Modes

Global configuration (config)

Command History

Release	Modification
12.3(4)T	This command was introduced.
12.2(25)S	This command was integrated into Cisco IOS Release 12.2(25)S.
12.2(27)SBC	This command was integrated into Cisco IOS Release 12.2(27)SBC.
12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.
12.2(33)SXH	This command was integrated into Cisco IOS Release 12.2(33)SXH.
Cisco IOS XE Release 2.1	This command was integrated into Cisco IOS XE Release 2.1.
12.4(20)T	This command was replaced. This command was replaced by the **track ip sla** command.
12.2(33)SXI1	This command was replaced. This command was replaced by the **track ip sla** command.
Cisco IOS XE Release 2.4	This command was replaced. This command was replaced by the **track ip sla** command.
12.2(33)SRE	This command was replaced. This command was replaced by the **track ip sla** command.

Usage Guidelines

Every IP SLAs operation maintains an operation return-code value. This return code is interpreted by the tracking process. The return code may return OK, OverThreshold, and several other return codes. Different operations may have different return-code values, so only values common to all operation types are used.

Two aspects of an IP SLAs operation can be tracked: state and reachability. The difference between these aspects relates to the acceptance of the OverThreshold return code. Table 79 shows the state and reachability aspects of IP SLAs operations that can be tracked.

Table 80 Comparison of State and Reachability Operations

Tracking	Return Code	Track State
State	OK	Up
	(all other return codes)	Down
Reachability	OK or over threshold	Up
	(all other return codes)	Down

Examples

The following example shows how to configure the tracking process to track the state of IP SLAs operation 2:

```
track 1 rtr 2 state
```

The following example shows how to configure the tracking process to track the reachability of IP SLAs operation 3:

```
track 2 rtr 3 reachability
```

traffic-class (IP SLA)

To define the traffic-class field in the IPv6 header of a Cisco IOS IP Service Level Agreements (SLAs) operation, use the **traffic-class** (IP SLA) command in the appropriate submode of IP SLA configuration or IP SLA monitor configuration mode. To return to the default value, use the **no** form of this command.

traffic-class *number*

no traffic-class

Syntax Description

number	Value in the traffic-class field of the IPv6 header. The range is from 0 to 255 (or FF in hexadecimal). This value can be preceded by "0x" to indicate hexadecimal notation. The default is 0.

Defaults

The default traffic-class value is 0.

Command Modes

ICMP echo configuration (config-ip-sla-echo)
TCP connect configuration (config-ip-sla-tcp)
UDP echo configuration (config-ip-sla-udp)
UDP jitter configuration (config-ip-sla-jitter)

Note The configuration mode varies depending on the operation type configured.

Command History

Release	Modification
12.2(33)SRC	This command was introduced.
12.2(33)SB	This command was integrated into Cisco IOS Release 12.2(33)SB.
12.4(20)T	This command was integrated into Cisco IOS Release 12.4(20)T.

Usage Guidelines

The traffic-class value is stored in an 8-bit field in the IPv6 packet header and designates the IPv6 traffic class. This field is similar to the IPv4 type-of-service (ToS) field that is configured in IPv4 packet headers using the **tos** (IP SLA) command, but the two fields use different codes.

Note The **traffic-class** command is supported only in IPv6 networks. In an IPv4 network, use the **tos** (IP SLA) command to define a ToS byte in the IPv4 header of a Cisco IOS IP SLAs operation.

When the traffic-class value is defined for an operation, the IP SLAs Responder will reflect the traffic-class value it receives.

To display the traffic class value for all Cisco IOS IP SLAs operations or a specified operation, use the **show ip sla configuration** command.

Examples

In the following example for an IPv6 network, IP SLAs operation 1 is configured as an ICMP echo operation with destination IPv6 address 2001:DB8:100::1. The value in the traffic-class field of the IPv6 header is set to 0x80.

```
ip sla 1
 icmp-echo 2001:DB8:100::1
 traffic-class 0x80
!
ip sla schedule 1 start-time now
```

Related Commands

Command	Description
ip sla	Begins configuration for an IP SLAs operation and enters IP SLA configuration mode.
show ip sla configuration	Displays configuration values including all defaults for all Cisco IOS IP SLAs operations or a specified operation.
tos (IP SLA)	Defines the ToS value in the IPv4 header of a Cisco IOS IP SLAs operation in an IPv4 network.

ttl (IP SLA)

To specify the maximum hop count for an echo request packet of a Cisco IOS IP Service Level Agreements (SLAs) operation, use the **ttl** command in the appropriate submode of auto IP SLA MPLS configuration or IP SLA configuration mode. To return to the default value, use the **no** form of this command.

ttl *time-to-live*

no ttl

Syntax Description

time-to-live	Specifies the maximum hop count for an echo request packet. For IP SLAs LSP ping operations, valid values are from 1 to 255 and the default is 255. For IP SLAs LSP traceroute operations, the range is from 1 to 30. The default is 30.

Command Default

For IP SLAs LSP ping operations, the default time-to-live value is 255.
For IP SLAs LSP traceroute operations, the default time-to-live value is 30.

Command Modes

Auto IP SLA MPLS Configuration

MPLS parameters configuration (config-auto-ip-sla-mpls-params)

IP SLA Configuration and IP SLA Monitor Configuration

LSP ping configuration (config-sla-monitor-lspPing)
LSP trace configuration (config-sla-monitor-lspTrace)

Note The configuration mode varies depending on the Cisco IOS release you are running and the operation type configured. See the "Usage Guidelines" section for more information.

Command History

Release	Modification
12.2(27)SBC	This command was introduced.
12.4(6)T	This command was integrated into Cisco IOS Release 12.4(6)T.
12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.
12.0(32)SY	This command was integrated into Cisco IOS Release 12.0(32)SY.
12.2(31)SB2	This command was integrated into Cisco IOS Release 12.2(31)SB2.
12.2(33)SXH	This command was integrated into Cisco IOS Release 12.2(33)SXH.

Usage Guidelines

IP SLAs Operation Configuration Dependence on Cisco IOS Release

The Cisco IOS command used to begin configuration for an IP SLAs operation varies depending on the Cisco IOS release you are running (see Table 81). Note that if you are configuring an IP SLAs LSP Health Monitor operation, see Table 82 for information on Cisco IOS release dependencies. You must configure the type of IP SLAs operation (such as LSP ping) before you can configure any of the other parameters of the operation.

The configuration mode for the **ttl** command varies depending on the Cisco IOS release you are running and the operation type configured. For example, if you are running Cisco IOS Release 12.4(6)T and the LSP ping operation type is configured (without using the LSP Health Monitor), you would enter the **ttl** command in LSP ping configuration mode (config-sla-monitor-lspPing) within IP SLA configuration mode.

Table 81 Command Used to Begin Configuration of an IP SLAs Operation Based on Cisco IOS Release

Cisco IOS Release	Global Configuration Command	Command Mode Entered
12.4(4)T, 12.0(32)SY, 12.2(33)SRB, 12.2(33)SB, or later releases	**ip sla**	IP SLA configuration
12.3(14)T, 12.4, 12.4(2)T, 12.2(31)SB2, or 12.2(33)SXH	**ip sla monitor**	IP SLA monitor configuration

Table 82 Command Used to Begin Configuration of an IP SLAs LSP Health Monitor Operation Based on Cisco IOS Release

Cisco IOS Release	Global Configuration Command	Command Mode Entered
12.4(6)T, 12.0(32)SY, 12.2(31)SB2, 12.2(33)SRB, 12.2(33)SXH, or later releases	**auto ip sla mpls-lsp-monitor**	Auto IP SLA MPLS configuration

Examples

The following example shows how to configure operation parameters, proactive threshold monitoring, and scheduling options using the LSP Health Monitor. In this example, LSP Health Monitor operation 1 is configured to automatically create IP SLAs LSP ping operations for all Border Gateway Protocol (BGP) next hop neighbors in use by all VPN routing and forwarding (VRF) instances associated with the source Provider Edge (PE) router. The maximum hop count for echo request packets of IP SLAs operations created by LSP Health Monitor operation 1 is set to 200 hops.

```
mpls discovery vpn interval 60
mpls discovery vpn next-hop
!
auto ip sla mpls-lsp-monitor 1
 type echo ipsla-vrf-all
 timeout 1000
 scan-interval 1
 secondary-frequency connection-loss 10
 secondary-frequency timeout 10
 delete-scan-factor 2
 ttl 200
!
auto ip sla mpls-lsp-monitor reaction-configuration 1 react connectionLoss threshold-type
consecutive 3 action-type trapOnly
```

```
auto ip sla mpls-lsp-monitor reaction-configuration 1 react timeout threshold-type
consecutive 3 action-type trapOnly
ip sla logging traps
!
auto ip sla mpls-lsp-monitor schedule 1 schedule-period 60 start-time now
```

Related Commands

Command	Description
auto ip sla mpls-lsp-monitor	Begins configuration for an IP SLAs LSP Health Monitor operation and enters auto IP SLA MPLS configuration mode.
ip sla	Begins configuration for an IP SLAs operation and enters IP SLA configuration mode.

type dhcp

Note Effective with Cisco IOS Release 12.4(4)T, 12.2(33)SRB, 12.2(33)SB, and 12.2(33)SXI, the **type dhcp** command is replaced by the **dhcp** (IP SLA) command. See the **dhcp** (IP SLA) command for more information.

To configure a Cisco IOS IP Service Level Agreements (SLAs) Dynamic Host Configuration Protocol (DHCP) operation, use the **type dhcp** command in IP SLA monitor configuration mode.

type dhcp [**source-ipaddr** {*ip-address* | *hostname*}] [**dest-ipaddr** {*ip-address* | *hostname*}] [**option 82** [**circuit-id** *circuit-id*] [**remote-id** *remote-id*] [**subnet-mask** *subnet-mask*]]

Syntax Description

source-ipaddr {*ip-address* | *hostname*}	(Optional) Specifies the source IP address or hostname. When a source IP address or hostname is not specified, IP SLAs chooses the IP address nearest to the destination.
dest-ipaddr {*ip-address* | *hostname*}	(Optional) Specifies the destination IP address or hostname.
option 82	(Optional) Specifies DHCP option 82 for the destination DHCP server.
circuit-id *circuit-id*	(Optional) Specifies the circuit ID in hexadecimal.
remote-id *remote-id*	(Optional) Specifies the remote ID in hexadecimal.
subnet-mask *subnet-mask*	(Optional) Specifies the subnet mask IP address. The default subnet mask is 255.255.255.0.

Defaults

No IP SLAs operation type is configured for the operation being configured.

Command Modes

IP SLA monitor configuration (config-sla-monitor)

Command History

Release	Modification
12.0(5)T	This command was introduced.
12.1(1)T	The following keywords were added: • **source-ipaddr** • **dest-ipaddr** • **option 82**
12.4(4)T	This command was replaced by the **dhcp** (IP SLA) command.
12.2(33)SRB	This command was replaced by the **dhcp** (IP SLA) command.
12.2SX	This command is supported in the Cisco IOS Release 12.2SX train. Support in a specific 12.2SX release of this train depends on your feature set, platform, and platform hardware.
12.2(33)SB	This command was replaced by the **dhcp** (IP SLA) command.
12.2(33)SXI	This command was replaced by the **dhcp** (IP SLA) command.

Usage Guidelines

If the source IP address is configured, then packets will be sent with that source address.

You may configure the **ip dhcp-server** global configuration command to identify the DHCP server that the DHCP operation will measure. If the target IP address is configured, then only that device will be measured. If the **ip dhcp-server** command is not configured and the target IP address is not configured, then DHCP discover packets will be sent on every available IP interface.

Option 82 is called the Relay Agent Information option and is inserted by the DHCP relay agent when client-originated DHCP packets are forwarded to a DHCP server. Servers recognizing the Relay Agent Information option may use the information to implement IP address or other parameter assignment policies. The DHCP server echoes the option back verbatim to the relay agent in server-to-client replies, and the relay agent strips the option before forwarding the reply to the client.

The Relay Agent Information option is organized as a single DHCP option that contains one or more suboptions that convey information known by the relay agent. The initial suboptions are defined for a relay agent that is colocated in a public circuit access unit. These suboptions are as follows: a circuit ID for the incoming circuit, a remote ID that provides a trusted identifier for the remote high-speed modem, and a subnet mask designation for the logical IP subnet from which the relay agent received the client DHCP packet.

Note If an odd number of characters are specified for the circuit ID, a zero will be added to the end of the string.

You must configure the type of IP SLAs operation (such as User Datagram Protocol [UDP] jitter or Internet Control Message Protocol [ICMP] echo) before you can configure any of the other parameters of the operation. To change the operation type of an existing IP SLAs operation, you must first delete the IP SLAs operation (using the **no ip sla monitor** global configuration command) and then reconfigure the operation with the new operation type.

Examples

In the following example, IP SLAs operation number 4 is configured as a DHCP operation enabled for DHCP server 172.16.20.3.

```
ip sla monitor 4
 type dhcp option 82 circuit-id 10005A6F1234
ip dhcp-server 172.16.20.3
!
ip sla monitor schedule 4 start-time now
```

Related Commands

Command	Description
ip dhcp-server	Specifies which DHCP servers to use on a network, and specifies the IP address of one or more DHCP servers available on the network.
ip sla monitor	Begins configuration for an IP SLAs operation and enters IP SLA monitor configuration mode.

type dlsw peer-ipaddr

Note Effective with Cisco IOS Releases 12.4(4)T, the **type dlsw peer-ipaddr** command is replaced by the **dlsw peer-ipaddr** command. See the **dlsw peer-ipaddr** command for more information.

To configure a Cisco IOS IP Service Level Agreements (SLAs) Data Link Switching Plus (DLSw+) operation, use the **type dlsw peer-ipaddr** command in IP SLA monitor configuration mode.

type dlsw peer-ipaddr *ip-address*

Syntax Description

ip-address	IP address of the peer destination.

Defaults

No IP SLAs operation type is configured for the operation being configured.

Command Modes

IP SLA monitor configuration (config-sla-monitor)

Command History

Release	Modification
12.0(5)T	This command was introduced.
12.4(4)T	This command was replaced by the **dlsw peer-ipaddr** command.

Usage Guidelines

To configure an IP SLAs DLSw+ operation, the DLSw feature must be configured on the local and target routers.

For DLSw+ operations, the default request packet data size is 0 bytes (use the **request-data-size** command to modify this value) and the default amount of time the operation waits for a response from the request packet is 30 seconds (use the **timeout** command to modify this value).

You must configure the type of IP SLAs operation (such as User Datagram Protocol [UDP] jitter or Internet Control Message Protocol [ICMP] echo) before you can configure any of the other parameters of the operation. To change the operation type of an existing IP SLAs operation, you must first delete the IP SLAs operation (using the **no ip sla monitor** global configuration command) and then reconfigure the operation with the new operation type.

Examples

In the following example, IP SLAs operation number 10 is configured as a DLSw+ operation enabled for remote peer IP address 172.21.27.11. The data size is 15 bytes.

```
ip sla monitor 10
 type dlsw peer-ipaddr 172.21.27.11
 request-data-size 15
!
ip sla monitor schedule 10 start-time now
```

Related Commands

Command	Description
ip sla monitor	Begins configuration for an IP SLAs operation and enters IP SLA monitor configuration mode.
request-data-size	Sets the protocol data size in the payload of the IP SLAs operation's request packet.
show dlsw peers	Displays DLSw peer information.

type dns target-addr

Note Effective with Cisco IOS Release 12.4(4)T, 12.2(33)SRB, 12.2(33)SB, and 12.2(33)SXI, the **type dns target-addr** command is replaced by the **dns** (IP SLA) command. See the **dns** (IP SLA) command for more information.

To configure a Cisco IOS IP Service Level Agreements (SLAs) Domain Name System (DNS) operation, use the **type dns target-addr** command in IP SLA monitor configuration mode.

type dns target-addr {*target-hostname* | *target-ip-address*} **name-server** *ip-address*
[**source-ipaddr** {*ip-address* | *hostname*} **source-port** *port-number*]

Syntax Description

target-hostname | *target-ip-address*	Target (destination) IP address or hostname.
name-server *ip-address*	Specifies the IP address of the DNS server.
source-ipaddr {*ip-address* | *hostname*}	(Optional) Specifies the source IP address or hostname. When a source IP address or hostname is not specified, IP SLAs chooses the IP address nearest to the destination.
source-port *port-number*	(Optional) Specifies the source port number. When a port number is not specified, IP SLAs chooses an available port.

Defaults

No IP SLAs operation type is configured for the operation being configured.

Command Modes

IP SLA monitor configuration (config-sla-monitor)

Command History

Release	Modification
12.0(5)T	This command was introduced.
12.4(4)T	This command was replaced by the **dns** (IP SLA) command.
12.2(33)SRB	This command was replaced by the **dns** (IP SLA) command.
12.2SX	This command is supported in the Cisco IOS Release 12.2SX train. Support in a specific 12.2SX release of this train depends on your feature set, platform, and platform hardware.
12.2(33)SB	This command was replaced by the **dns** (IP SLA) command.
12.2(33)SXI	This command was replaced by the **dns** (IP SLA) command.

Usage Guidelines

You must configure the type of IP SLAs operation (such as User Datagram Protocol [UDP] jitter or Internet Control Message Protocol [ICMP] echo) before you can configure any of the other parameters of the operation. To change the operation type of an existing IP SLAs operation, you must first delete the IP SLAs operation (using the **no ip sla monitor** global configuration command) and then reconfigure the operation with the new operation type.

Examples

In the following example, IP SLAs operation 7 is configured as a DNS operation using the target IP address 172.20.2.132.

```
ip sla monitor 7
 type dns target-addr host1 name-server 172.20.2.132
!
ip sla monitor schedule 7 start-time now
```

Related Commands

Command	Description
ip sla monitor	Begins configuration for an IP SLAs operation and enters IP SLA monitor configuration mode.

type echo (MPLS)

To configure Cisco IOS IP Service Level Agreements (SLAs) label switched path (LSP) ping operations using the LSP Health Monitor, use the **type echo** command in auto IP SLA MPLS configuration mode.

type echo [**ipsla-vrf-all** | **vrf** *vpn-name*]

Syntax Description

ipsla-vrf-all	(Optional) Specifies that LSP ping operations should be automatically created for all Border Gateway Protocol (BGP) next hop neighbors in use by a VPN routing or forwarding instance (VRF) corresponding to all the Virtual Private Networks (VPNs) in which the originating Provider Edge (PE) router belongs. This option is the default.
vrf *vpn-name*	(Optional) Specifies that LSP ping operations should be automatically created for only those BGP next hop neighbors associated with the specified VPN name.

Command Default

No IP SLAs operation type is configured for the operation being configured.

Command Modes

Auto IP SLA MPLS configuration (config-auto-ip-sla-mpls)

Command History

Release	Modification
12.2(27)SBC	This command was introduced.
12.4(6)T	This command was integrated into Cisco IOS Release 12.4(6)T.
12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.
12.0(32)SY	This command was integrated into Cisco IOS Release 12.0(32)SY.
12.2(31)SB2	This command was integrated into Cisco IOS Release 12.2(31)SB2.
12.2(33)SXH	This command was integrated into Cisco IOS Release 12.2(33)SXH.

Usage Guidelines

You must configure the type of LSP Health Monitor operation (such as LSP ping) before you can configure any of the other parameters of the operation.

Note When an IP SLAs LSP ping operation is created by the LSP Health Monitor, an operation number (identification number) is automatically assigned to the operation. The operation numbering starts at 100001.

Examples

The following example shows how to configure operation parameters, proactive threshold monitoring, and scheduling options using the LSP Health Monitor. In this example, LSP Health Monitor operation 1 is configured to automatically create IP SLAs LSP ping operations for all Border Gateway Protocol (BGP) next hop neighbors in use by all VPN routing and forwarding (VRF) instances associated with the source PE router.

```
mpls discovery vpn interval 60
mpls discovery vpn next-hop
!
auto ip sla mpls-lsp-monitor 1
 type echo ipsla-vrf-all
 timeout 1000
 scan-interval 1
 secondary-frequency connection-loss 10
 secondary-frequency timeout 10
 delete-scan-factor 2
!
auto ip sla mpls-lsp-monitor reaction-configuration 1 react connectionLoss threshold-type
consecutive 3 action-type trapOnly
auto ip sla mpls-lsp-monitor reaction-configuration 1 react timeout threshold-type
consecutive 3 action-type trapOnly
ip sla logging traps
!
auto ip sla mpls-lsp-monitor schedule 1 schedule-period 60 start-time now
```

Related Commands

Command	Description
auto ip sla mpls-lsp-monitor	Begins configuration for an IP SLAs LSP Health Monitor operation and enters auto IP SLA MPLS configuration mode.

type echo domain

To configure a Cisco IOS IP Service Level Agreements (SLAs) auto Ethernet operation to create Ethernet ping operations, use the **type echo domain** command in IP SLA Ethernet monitor configuration mode.

type echo domain *domain-name* {**evc** *evc-id* | **vlan** *vlan-id*} [**exclude-mpids** *mp-ids*]

Syntax Description

domain-name	Name of the Ethernet Connectivity Fault Management (CFM) maintenance domain.
evc *evc-id*	Specifies the Ethernet Virtual Circuit (EVC) identification name.
vlan *vlan-id*	Specifies the VLAN identification number.
exclude-mpids *mp-ids*	(Optional) Specifies the list of maintenance endpoint identification numbers to be excluded from the operation.

Command Default

Ethernet ping operations are not configured.

Command Modes

IP SLA Ethernet monitor (config-ip-sla-ethernet-monitor)

Command History

Release	Modification
12.2(33)SRB	This command was introduced.
12.2(33)SB	This command was integrated into Cisco IOS Release 12.2(33)SB.
12.4(20)T	This command was integrated into Cisco IOS Release 12.4(20)T.
12.2(33)SRD	The **evc** *evc-id* keyword and argument were added.
12.2(33)SXI	This command was integrated into Cisco IOS Release 12.2(33)SXI.

Usage Guidelines

Note When an IP SLAs Ethernet ping operation is created by an auto Ethernet operation, an operation number (identification number) is automatically assigned to the ping operation. The operation numbering starts at 100001.

You must configure the type of auto Ethernet operation (such as Ethernet ping) before you can configure any of the other parameters of the operation.

To change the operation type of an existing IP SLAs operation, you must first delete the IP SLAs operation (using the **no ip sla ethernet-monitor** global configuration command) and then reconfigure the operation with the new operation type.

Examples

The following example shows how to configure operation parameters, proactive threshold monitoring, and scheduling options using an IP SLAs auto Ethernet operation. In this example, operation 10 is configured to automatically create IP SLAs Ethernet ping operations for all the discovered maintenance endpoints in the domain named testdomain and VLAN identification number 34. As specified by the proactive threshold monitoring configuration, when three consecutive connection loss events occur, a Simple Network Management Protocol (SNMP) trap notification should be sent. The schedule period for operation 10 is 60 seconds, and the operation is scheduled to start immediately.

```
ip sla ethernet-monitor 10
 type echo domain testdomain vlan 34
!
ip sla ethernet-monitor reaction-configuration 10 react connectionLoss threshold-type
consecutive 3 action-type trapOnly
!
ip sla ethernet-monitor schedule 10 schedule-period 60 start-time now
```

Related Commands

Command	Description
ip sla ethernet-monitor	Begins configuration for an IP SLAs auto Ethernet operation and enters Ethernet monitor configuration mode.

type echo protocol ipIcmpEcho

Note Effective with Cisco IOS Release 12.4(4)T, 12.2(33)SRB, 12.2(33)SB, and 12.2(33)SXI, the **type echo protocol ipIcmpEcho** command is replaced by the **icmp-echo** command. See the **icmp-echo** command for more information.

To configure an IP Service Level Agreements (SLAs) Internet Control Message Protocol (ICMP) echo operation, use the **type echo protocol ipIcmpEcho** command in IP SLA monitor configuration mode.

type echo protocol ipIcmpEcho {*destination-ip-address* | *destination-hostname*} [**source-ipaddr** {*ip-address* | *hostname*} | **source-interface** *interface-name*]

Syntax Description

destination-ip-address | *destination-hostname*	Destination IP address or hostname for the operation.
source-ipaddr {*ip-address* | *hostname*}	(Optional) Specifies the source IP address or hostname. When a source IP address or hostname is not specified, IP SLAs chooses the IP address nearest to the destination.
source-interface *interface-name*	(Optional) Specifies the source interface for the operation.

Defaults

No IP SLAs operation type is configured for the operation being configured.

Command Modes

IP SLA monitor configuration (config-sla-monitor)

Command History

Release	Modification
11.2	This command was introduced.
12.0(5)T	The following keyword and arguments were added: • **source-ipaddr** {*ip-address* | *hostname*}
12.3(7)XR	The **source-interface** keyword and *interface-name* argument were added.
12.3(11)T	The **source-interface** keyword and *interface-name* argument were added.
12.4(4)T	This command was replaced by the **icmp-echo** command.
12.2(33)SRB	This command was replaced by the **icmp-echo** command.
12.2SX	This command is supported in the Cisco IOS Release 12.2SX train. Support in a specific 12.2SX release of this train depends on your feature set, platform, and platform hardware.
12.2(33)SB	This command was replaced by the **icmp-echo** command.
12.2(33)SXI	This command was replaced by the **icmp-echo** command.

Usage Guidelines

The default request packet data size for an ICMP echo operation is 28 bytes. Use the **request-data-size** command to modify this value. This data size is the payload portion of the ICMP packet, which makes a 64-byte IP packet.

You must configure the type of IP SLAs operation (such as User Datagram Protocol [UDP] jitter or Internet Control Message Protocol [ICMP] echo) before you can configure any of the other parameters of the operation. To change the operation type of an existing IP SLAs operation, you must first delete the IP SLAs operation (using the **no ip sla monitor** global configuration command) and then reconfigure the operation with the new operation type.

Examples

In the following example, IP SLAs operation 10 is created and configured as an echo operation using the IP/ICMP protocol and the destination IP address 172.16.1.175.

```
ip sla monitor 10
 type echo protocol ipIcmpEcho 172.16.1.175
!
ip sla monitor schedule 10 start-time now
```

Related Commands

Command	Description
ip sla monitor	Begins configuration for an IP SLAs operation and enters IP SLA monitor configuration mode.

type ftp operation get url

Note Effective with Cisco IOS Release 12.4(4)T, 12.2(33)SRB, 12.2(33)SB, and 12.2(33)SXI, the **type ftp operation get url** command is replaced by the **ftp get** command. See the **ftp get** command for more information.

To configure a Cisco IOS IP Service Level Agreements (SLAs) File Transfer Protocol (FTP) GET operation, use the **type ftp operation get url** command in IP SLA monitor configuration mode.

type ftp operation get url *url* [**source-ipaddr** {*ip-address* | *hostname*}] [**mode** {**passive** | **active**}]

Syntax Description

url	URL location information for the file to be retrieved.
source-ipaddr {*ip-address* | *hostname*}	(Optional) Specifies the source IP address or hostname. When a source IP address or hostname is not specified, IP SLAs chooses the IP address nearest to the destination.
mode {**passive** | **active**}	(Optional) Specifies the FTP transfer mode as either passive or active. The default is passive transfer mode.

Defaults

No IP SLAs operation type is configured for the operation being configured.

Command Modes

IP SLA monitor configuration (config-sla-monitor)

Command History

Release	Modification
12.1(1)T	This command was introduced.
12.4(4)T	This command was replaced by the **ftp get** command.
12.2(33)SRB	This command was replaced by the **ftp get** command.
12.2SX	This command is supported in the Cisco IOS Release 12.2SX train. Support in a specific 12.2SX release of this train depends on your feature set, platform, and platform hardware.
12.2(33)SB	This command was replaced by the **ftp get** command.
12.2(33)SXI	This command was replaced by the **ftp get** command.

Usage Guidelines

The *url* argument must be in one of the following formats:

- ftp://username:password@host/filename
- ftp://host/filename

If the username and password are not specified, the defaults are anonymous and test, respectively.

You must configure the type of IP SLAs operation (such as User Datagram Protocol [UDP] jitter or Internet Control Message Protocol [ICMP] echo) before you can configure any of the other parameters of the operation. To change the operation type of an existing IP SLAs operation, you must first delete the IP SLAs operation (using the **no ip sla monitor** global configuration command) and then reconfigure the operation with the new operation type.

Examples

In the following example, an FTP operation is configured. User1 is the username and password1 is the password; host1 is the host and file1 is the filename.

```
ip sla monitor 3
 type ftp operation get url ftp://user1:password1@host1/file1
!
ip sla monitor schedule 3 start-time now
```

Related Commands

Command	Description
ip sla monitor	Begins configuration for an IP SLAs operation and enters IP SLA monitor configuration mode.

type http operation

Note Effective with Cisco IOS Release 12.4(4)T, 12.2(33)SRB, 12.2(33)SB, and 12.2(33)SXI, the **type http operation** command is replaced by the **http** (IP SLA) command. See the **http** (IP SLA) command for more information.

To configure a Cisco IOS IP Service Level Agreements (SLAs) HTTP operation, use the **type http operation** command in IP SLA monitor configuration mode.

type http operation {**get** | **raw**} **url** *url* [**name-server** *ip-address*] [**version** *version-number*] [**source-ipaddr** {*ip-address* | *hostname*}] [**source-port** *port-number*] [**cache** {**enable** | **disable**}] [**proxy** *proxy-url*]

Syntax Description

get	Specifies an HTTP GET operation.
raw	Specifies an HTTP RAW operation.
url *url*	Specifies the URL of destination HTTP server.
name-server *ip-address*	(Optional) Specifies the destination IP address of a Domain Name System (DNS) Server.
version *version-number*	(Optional) Specifies the version number.
source-ipaddr {*ip-address*| *hostname*}	(Optional) Specifies the source IP address or hostname. When a source IP address or hostname is not specified, IP SLAs chooses the IP address nearest to the destination.
source-port *port-number*	(Optional) Specifies the source port number. When a port number is not specified, IP SLAs chooses an available port.
cache {**enable** | **disable**}	(Optional) Enables or disables download of a cached HTTP page.
proxy *proxy-url*	(Optional) Specifies proxy information or URL.

Defaults

No IP SLAs operation type is configured for the operation being configured.

Command Modes

IP SLA monitor configuration (config-sla-monitor)

Command History

Release	Modification
12.0(5)T	This command was introduced.
12.4(4)T	This command was replaced by the **http** (IP SLA) command.
12.2(33)SRB	This command was replaced by the **http** (IP SLA) command.
12.2SX	This command is supported in the Cisco IOS Release 12.2SX train. Support in a specific 12.2SX release of this train depends on your feature set, platform, and platform hardware.
12.2(33)SB	This command was replaced by the **http** (IP SLA) command.
12.2(33)SXI	This command was replaced by the **http** (IP SLA) command.

Usage Guidelines

You must configure the type of IP SLAs operation (such as User Datagram Protocol [UDP] jitter or Internet Control Message Protocol [ICMP] echo) before you can configure any of the other parameters of the operation. To change the operation type of an existing IP SLAs operation, you must first delete the IP SLAs operation (using the **no ip sla monitor** global configuration command) and then reconfigure the operation with the new operation type.

Examples

In the following example, IP SLAs HTTP operation 6 is configured as an HTTP RAW operation. The destination URL is http://www.cisco.com.

```
ip sla monitor 6
 type http operation raw url http://www.cisco.com
 http-raw-request
 GET /index.html HTTP/1.0\r\n
 \r\n
!
ip sla monitor schedule 6 start-time now
```

Related Commands

Command	Description
ip sla monitor	Begins configuration for an IP SLAs operation and enters IP SLA monitor configuration mode.

type jitter dest-ipaddr

Note Effective with Cisco IOS Release 12.4(4)T, 12.2(33)SRB, 12.2(33)SB, and 12.2(33)SXI, the **type jitter dest-ipaddr** command is replaced by the **udp-jitter** command. See the **udp-jitter** command for more information.

To configure a Cisco IOS IP Service Level Agreements (SLAs) User Datagram Protocol (UDP) jitter operation, use the **type jitter dest-ipaddr** command in IP SLA monitor configuration mode.

type jitter dest-ipaddr {*destination-ip-address* | *destination-hostname*} **dest-port** *port-number* [**source-ipaddr** {*ip-address* | *hostname*}] [**source-port** *port-number*] [**control** {**enable** | **disable**}] [**num-packets** *number-of-packets*] [**interval** *interval-packet-interval*]

Syntax Description

destination-ip-address | *destination-hostname*	Destination IP address or hostname.
dest-port *port-number*	Specifies the destination port number.
source-ipaddr {*ip-address*| *hostname*}	(Optional) Specifies the source IP address or hostname. When a source IP address or hostname is not specified, IP SLAs chooses the IP address nearest to the destination.
source-port *port-number*	(Optional) Specifies the source port number. When a port number is not specified, IP SLAs chooses an available port.
control {**enable** | **disable**}	(Optional) Enables or disables the sending of IP SLAs control messages to the IP SLAs Responder. By default, IP SLAs control messages are sent to the destination device to establish a connection with the IP SLAs Responder.
num-packets *number-of-packets*	(Optional) Number of packets, as specified by the number argument. The default value is 10.
interval *interpacket-interval*	(Optional) Interpacket interval in milliseconds. The default value is 20 ms.

Defaults

No IP SLAs operation type is configured for the operation being configured.

Command Modes

IP SLA monitor configuration (config-sla-monitor)

Command History

Release	Modification
12.0(5)T	This command was introduced.
12.4(4)T	This command was replaced by the **udp-jitter** command.
12.2(33)SRB	This command was replaced by the **udp-jitter** command.
12.2SX	This command is supported in the Cisco IOS Release 12.2SX train. Support in a specific 12.2SX release of this train depends on your feature set, platform, and platform hardware.

Release	Modification
12.2(33)SB	This command was replaced by the **udp-jitter** command.
12.2(33)SXI	This command was replaced by the **udp-jitter** command.

Usage Guidelines

The **type jitter dest-ipaddr** command configures an IP SLAs UDP Plus operation. The UDP Plus operation is a superset of the UDP echo operation. In addition to measuring UDP round-trip time, the UDP Plus operation measures per-direction packet loss and jitter. Jitter is interpacket delay variance. Jitter statistics are useful for analyzing traffic in a Voice over IP (VoIP) network.

You must enable the IP SLAs Responder on the target router before you can configure a UDP jitter operation. Prior to sending an operation packet to the target router, IP SLAs sends a control message to the IP SLAs Responder to enable the destination port.

The default request packet data size for an IP SLAs UDP jitter operation is 32 bytes. Use the **request-data-size** command to modify this value.

Note You must configure the type of IP SLAs operation (such as User Datagram Protocol [UDP] jitter or Internet Control Message Protocol [ICMP] echo) before you can configure any of the other parameters of the operation. To change the operation type of an existing IP SLAs operation, you must first delete the IP SLAs operation (using the **no ip sla monitor** global configuration command) and then reconfigure the operation with the new operation type.

IP SLAs VoIP UDP Jitter (codec) Operation

When you specify the codec in the command syntax of the **type jitter dest-ipaddr** command, the standard configuration options are replaced with codec-specific keywords and arguments. The codec-specific command syntax is documented separately from the command syntax for the standard implementation of the **type jitter dest-ipaddr** command. For information about the codec-specific command syntax, see the documentation for the **type jitter dest-ipaddr** (codec) command.

Examples

In the following example, operation 6 is configured as a UDP jitter operation with the destination IP address 172.30.125.15, the destination port number 2000, 20 packets, and an interpacket interval of 20 ms.

```
ip sla monitor 6
 type jitter dest-ipaddr 172.30.125.15 dest-port 2000 num-packets 20 interval 20
!
ip sla monitor schedule 6 start-time now
```

Related Commands

Command	Description
ip sla monitor	Begins configuration for an IP SLAs operation and enters IP SLA monitor configuration mode.
request-data-size	Sets the payload size for IP SLAs operation request packets.
type jitter dest-ipaddr (codec)	Configures an IP SLAs UDP jitter operation that returns VoIP scores.

type jitter dest-ipaddr (codec)

Note Effective with Cisco IOS Release 12.4(4)T, 12.2(33)SRB, 12.2(33)SB, and 12.2(33)SXI, the **type jitter dest-ipaddr** (codec) command is replaced by the **udp-jitter** (codec) command. See the **udp-jitter** (codec) command for more information.

To configure a Cisco IOS IP Service Level Agreements (SLAs) User Datagram Protocol (UDP) jitter operation that returns Voice over IP (VoIP) scores, use the **type jitter dest-ipaddr** command in IP SLA monitor configuration mode.

type jitter dest-ipaddr {*destination-ip-address* | *destination-hostname*} **dest-port** *port-number* **codec** *codec-type* [**codec-numpackets** *number-of-packets*] [**codec-size** *number-of-bytes*] [**codec-interval** *milliseconds*] [**advantage-factor** *value*] [**source-ipaddr** {*ip-address* | *hostname*}] [**source-port** *port-number*] [**control** {**enable** | **disable**}]

Syntax Description

destination-ip-address | *destination-hostname*	Specifies the destination IP address or hostname.
dest-port *port-number*	Specifies the destination port number. For UDP jitter (codec) operations, the port number should be an even number in the range of 16384 to 32766 or 49152 to 65534.
codec *codec-type*	Enables the generation of estimated voice-quality scores in the form of Calculated Planning Impairment Factor (ICPIF) and Mean Opinion Score (MOS) values. The codec type should match the encoding algorithm you are using for VoIP transmissions. The following codec-type keywords are available: • **g711alaw**—The G.711 a-law codec (64 kbps transmission) • **g711ulaw**—The G.711 muHmm-law codec (64 kbps transmission) • **g729a**—The G.729A codec (8 kbps transmission) Configuring the codec type sets default values for the variables **codec-numpackets**, **codec-size**, and **codec-interval** in this command. See Table 83 for details.
codec-numpackets *number-of-packets*	(Optional) Specifies the number of packets to be transmitted per operation. The valid range is from 1 to 60000 packets. The default is 1000 packets.
codec-size *number-of-bytes*	(Optional) Specifies the number of bytes in each packet transmitted. (Also called the payload size or request size.) The valid range is from 16 to 1500 packets. The default varies by codec (see Table 83).
codec-interval *milliseconds*	Specifies the interval (delay) between packets that should be used for the operation, in milliseconds (ms). The valid range is from 1 to 60000 ms. By default, packets are sent 20 ms apart.
advantage-factor *value*	Specifies the expectation factor to be used for ICPIF calculations. This value is subtracted from the measured impairments to yield the final ICPIF value (and corresponding MOS value). See the "Usage Guidelines" section for recommended values. The valid range is from 0 to 20. The default is 0.

source-ipaddr {*ip-address* | *hostname*}	(Optional) Specifies the source IP address or hostname. When a source IP address or hostname is not specified, IP SLAs chooses the IP address nearest to the destination.
source-port *port-number*	(Optional) Specifies the source port number. When a port number is not specified, IP SLAs chooses an available port.
control {**enable** | **disable**}	(Optional) Enables or disables the sending of IP SLAs control messages to the IP SLAs Responder. By default, IP SLAs control messages are sent to the destination device to establish a connection with the IP SLAs Responder. **Note** Control messages are enabled by default. Disabling the IP SLAs control messages for UDP jitter operations is not recommended. If you disable IP SLAs control messages, packet loss statistics and IP telephony scores will not be generated accurately.

Defaults

No IP SLAs operation type is associated with the operation number being configured.

Command Modes

IP SLA monitor configuration (config-sla-monitor)

Command History

Release	Modification
12.0(5)T	The **type jitter dest-ipaddr** command was introduced.
12.3(4)T	The codec-specific keywords and arguments were added to the **type jitter dest-ipaddr** command to support the IP SLAs VoIP UDP jitter operation.
12.4(4)T	This command was replaced by the **udp-jitter** (codec) command.
12.2(25)S	This command was integrated into Cisco IOS Release 12.2(25)S.
12.2(27)SBC	This command was integrated into Cisco IOS Release 12.2(27)SBC.
12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.
12.2(33)SRB	This command was replaced by the **udp-jitter** (codec) command.
12.2SX	This command is supported in the Cisco IOS Release 12.2SX train. Support in a specific 12.2SX release of this train depends on your feature set, platform, and platform hardware.
12.2(33)SB	This command was replaced by the **udp-jitter** (codec) command.
12.2(33)SXI	This command was replaced by the **udp-jitter** (codec) command.

Usage Guidelines

When you specify the codec in the command syntax of the **type jitter dest-ipaddr** command, the standard configuration options are replaced with codec-specific keywords and arguments. The codec-specific command syntax is documented separately from the command syntax for the standard implementation of the **type jitter dest-ipaddr** command. For information about the command syntax for the standard implementation, see the documentation for the **type jitter dest-ipaddr** command.

You must enable the IP SLAs Responder on the target router before you can configure a UDP jitter (codec) operation. Prior to sending an operation packet to the target router, IP SLAs sends a control message to the IP SLAs Responder to enable the destination port.

Note You must configure the type of IP SLAs operation (such as User Datagram Protocol [UDP] jitter or Internet Control Message Protocol [ICMP] echo) before you can configure any of the other parameters of the operation. To change the operation type of an existing IP SLAs operation, you must first delete the IP SLAs operation (using the **no ip sla monitor** global configuration command) and then reconfigure the operation with the new operation type.

IP SLAs VoIP UDP Jitter (codec) Statistics

The IP SLAs UDP jitter operation computes statistics by sending *n* UDP packets, each of size *s*, sent *t* milliseconds apart, from a given source router to a given target router, at a given frequency *f*.

To generate MOS and ICPIF scores, you specify the codec type used for the connection when configuring the UDP jitter operation. Based on the type of codec you configure for the operation, the number of packets (*n*), the size of each payload (*s*), the inter-packet time interval (*t*), and the operational frequency (*f*) will be auto-configured with default values. (See Table 83 for specific information.) However, you are given the option, if needed, to manually configure these parameters in the syntax of the **type jitter dest-ipaddr** (codec) command.

Table 83 shows the default parameters that are configured for the operation by codec.

Table 83 Default UDP Jitter Operation Parameters by Codec

Codec	Default Number of Packets (*n*); [codec-numpackets]	Packet Payload (*s*) [codec-size][1]	Default Interval Between Packets (*t*) [codec-interval]	Frequency of Operations (*f*)
G.711 mu-law (g711ulaw)	1000	160 bytes	20 ms	Once every 60 seconds
G.711 a-law (g711alaw)	1000	160 bytes	20 ms	Once every 60 seconds
G.729A (g729a)	1000	20 bytes	20 ms	Once every 60 seconds

1. The actual data size of each request packet will contain an additional 12 bytes of Real-Time Transport Protocol (RTP) header data in order to simulate the RTP/UDP/IP/Layer 2 protocol stack.

For example, if you configure the UDP jitter operation to use the characteristics for the g711ulaw codec, by default an operation will be sent once a minute (*f*). Each operation would consist of 1000 packets (*n*), with each packet containing 160 bytes (plus 12 header bytes) of synthetic data (*s*), sent 20 ms apart (*t*).

The **advantage-factor** *value* keyword and argument allow you to specify an access Advantage Factor (also called the Expectation Factor). Table 84, adapted from ITU-T Rec. G.113, defines a set of provisional maximum values for Advantage Factors in terms of the service provided.

Table 84 Advantage Factor Recommended Maximum Values

Communication Service	Maximum Value of Advantage/ Expectation Factor (*A*):
Conventional wire line (land line)	0
Mobility (cellular connections) within a building	5

Table 84 Advantage Factor Recommended Maximum Values

Communication Service	Maximum Value of Advantage/ Expectation Factor (*A*):
Mobility within a geographical area or moving within a vehicle	10
Access to hard-to-reach location; (for example, via multihop satellite connections)	20

These values are only suggestions. To be meaningful, the use of the Advantage/Expectation factor (*A*) and its selected value in a specific application should be used consistently in any planning model you adopt. However, the values in Table 84 should be considered as the absolute upper limits for *A*. The default Advantage/Expectation factor for IP SLAs UDP jitter operations is always zero.

Examples

In the following example, IP SLAs operation 10 is configured as a UDP jitter (codec) operation with the destination IP address 209.165.200.225 and the destination port number 3000. The operation is configured to use the characteristics of the G.711 a-law codec, which means the operation will consist of 1000 packets, each of 172 bytes (160 plus 12 header bytes), sent 20 ms apart. The default value for the Advantage Factor and operation frequency is used.

```
ip sla monitor 10
 type jitter dest-ipaddr 209.165.200.225 dest-port 3000 codec g711alaw
!
ip sla monitor schedule 10 start-time now
```

Related Commands

Command	Description
ip sla monitor	Begins configuration for an IP SLAs operation and enters IP SLA monitor configuration mode.
type jitter dest-ipaddr	Configures an IP SLAs UDP jitter operation.

type jitter domain

To configure a Cisco IOS IP Service Level Agreements (SLAs) auto Ethernet operation to create Ethernet jitter operations, use the **type jitter domain** command in IP SLA Ethernet monitor configuration mode.

type jitter domain *domain-name* {**evc** *evc-id* | **vlan** *vlan-id*} [**exclude-mpids** *mp-ids*] [**interval** *interframe-interval*] [**num-frames** *frames-number*]

Syntax Description

domain-name	Name of the Ethernet Connectivity Fault Management (CFM) maintenance domain.
evc *evc-id*	Specifies the Ethernet Virtual Circuit (EVC) identification name.
vlan *vlan-id*	Specifies the VLAN identification number.
exclude-mpids *mp-ids*	(Optional) Specifies the list of maintenance endpoint identification numbers to be excluded from the operation.
interval *interframe-interval*	(Optional) Specifies the interframe interval (in milliseconds). The default is 20.
num-frames *frames-number*	(Optional) Specifies the number of frames to be sent. The default is 10.

Command Default

Ethernet jitter operations are not configured.

Command Modes

IP SLA Ethernet monitor (config-ip-sla-ethernet-monitor)

Command History

Release	Modification
12.2(33)SRB	This command was introduced.
12.2(33)SB	This command was integrated into Cisco IOS Release 12.2(33)SB.
12.4(20)T	This command was integrated into Cisco IOS Release 12.4(20)T.
12.2(33)SRD	The **evc** *evc-id* keyword and argument were added.
12.2(33)SXI	This command was integrated into Cisco IOS Release 12.2(33)SXI.

Usage Guidelines

Note When an IP SLAs Ethernet jitter operation is created by an auto Ethernet operation, an operation number (identification number) is automatically assigned to the jitter operation. The operation numbering starts at 100001.

You must configure the type of auto Ethernet operation (such as Ethernet jitter) before you can configure any of the other parameters of the operation.

To change the operation type of an existing IP SLAs operation, you must first delete the IP SLAs operation (using the **no ip sla ethernet-monitor** global configuration command) and then reconfigure the operation with the new operation type.

Examples

The following example shows how to configure operation parameters, proactive threshold monitoring, and scheduling options using an IP SLAs auto Ethernet operation. In this example, operation 20 is configured to automatically create IP SLAs Ethernet jitter operations for all the discovered maintenance endpoints in the domain named testdomain and VLAN identification number 34. For each Ethernet jitter operation, the interframe interval is set to 20 ms and the number of frames to be sent is 30. As specified by the proactive threshold monitoring configuration, when three consecutive connection loss events occur, a Simple Network Management Protocol (SNMP) trap notification should be sent. The schedule period for operation 20 is 60 seconds, and the operation is scheduled to start immediately.

```
ip sla ethernet-monitor 20
 type jitter domain testdomain vlan 34 interval 20 num-frames 30
!
ip sla ethernet-monitor reaction-configuration 20 react connectionLoss threshold-type
consecutive 3 action-type trapOnly
!
ip sla ethernet-monitor schedule 20 schedule-period 60 start-time now
```

Related Commands

Command	Description
ip sla ethernet-monitor	Begins configuration for an IP SLAs auto Ethernet operation and enters Ethernet monitor configuration mode.

type mpls lsp ping ipv4

Note Effective with Cisco IOS Release 12.2(33)SRB and 12.2(33)SB, the **type mpls lsp ping ipv4** command is replaced by the **mpls lsp ping ipv4** command. See the **mpls lsp ping ipv4** command for more information.

To manually configure an individual Cisco IOS IP Service Level Agreements (SLAs) label switched path (LSP) ping IPv4 operation, use the **type mpls lsp ping ipv4** command in IP SLA monitor configuration mode.

type mpls lsp ping ipv4 *destination-address destination-mask* [**force-explicit-null**] [**lsp-selector** *ip-address*] [**src-ip-addr** *source-address*] [**reply** {**dscp** *dscp-value* | **mode** {**ipv4** | **router-alert**}}]

Syntax Description

destination-address	Address prefix of the target to be tested.
destination-mask	Number of bits in the network mask of the target address.
force-explicit-null	(Optional) Adds an explicit null label to all echo request packets.
lsp-selector *ip-address*	(Optional) Specifies a local host IP address used to select the LSP. The default address is 127.0.0.1.
src-ip-addr *source-address*	(Optional) Specifies a source IP address for the echo request originator.
reply dscp *dscp-value*	(Optional) Specifies the differentiated services codepoint (DSCP) value of an echo reply packet. The default DSCP value is 0.
reply mode	(Optional) Specifies the reply mode for the echo request packet.
ipv4	(Optional) Replies with an IPv4 UDP packet (default).
router-alert	(Optional) Replies with an IPv4 UDP packet with router alert.

Command Default

No IP SLAs operation type is configured for the operation being configured.

Command Modes

IP SLA monitor configuration (config-sla-monitor)

Command History

Release	Modification
12.2(27)SBC	This command was introduced.
12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.
12.2(31)SB2	The **force-explicit-null** keyword was added.
12.2(33)SRB	This command was replaced by the **mpls lsp ping ipv4** command.
12.2(33)SXH	This command was integrated into Cisco IOS Release 12.2(33)SXH.
12.2(33)SB	This command was replaced by the **mpls lsp ping ipv4** command.

Usage Guidelines

The **lsp-selector** keyword is used to force an IP SLAs operation to use a specific LSP to obtain its response time measurement. This option is useful if there are multiple equal cost paths between Provider Edge (PE) routers.

You must configure the type of IP SLAs operation (such as LSP ping) before you can configure any of the other parameters of the operation. To change the operation type of an existing IP SLAs operation, you must first delete the IP SLAs operation (using the **no ip sla monitor** global configuration command) and then reconfigure the operation with the new operation type.

Note This command supports only single path connectivity measurements between the source PE router and associated Border Gateway Protocol (BGP) next hop neighbors.

Examples

The following examples show how to manually configure operation parameters, proactive threshold monitoring, and scheduling options for IP SLAs LSP ping operation 1.

```
ip sla monitor 1
type mpls lsp ping ipv4 192.168.1.4 255.255.255.255 lsp-selector 127.1.1.1
frequency 120
secondary-frequency timeout 30
exit
!
ip sla monitor reaction-configuration 1 react connectionLoss threshold-type consecutive 3
action-type trapOnly
ip sla monitor reaction-configuration 1 react timeout threshold-type consecutive 3
action-type trapOnly
ip sla monitor logging traps
!
ip sla monitor schedule 1 start-time now life forever
```

Related Commands

Command	Description
ip sla monitor	Begins configuration for an IP SLAs operation and enters IP SLA monitor configuration mode.

type mpls lsp trace ipv4

Note Effective with Cisco IOS Release 12.2(33)SRB and 12.2(33)SB, the **type mpls lsp trace ipv4** command is replaced by the **mpls lsp trace ipv4** command. See the **mpls lsp trace ipv4** command for more information.

To manually configure an individual Cisco IOS IP Service Level Agreements (SLAs) label switched path (LSP) traceroute IPv4 operation, use the **type mpls lsp trace ipv4** command in IP SLA monitor configuration mode.

type mpls lsp trace ipv4 *destination-address destination-mask* [**force-explicit-null**] [**lsp-selector** *ip-address*] [**src-ip-addr** *source-address*] [**reply** {**dscp** *dscp-value* | **mode** {**ipv4** | **router-alert**}}]

Syntax Description

destination-address	Address prefix of the target to be tested.
destination-mask	Number of bits in the network mask of the target address.
force-explicit-null	(Optional) Adds an explicit null label to all echo request packets.
lsp-selector *ip-address*	(Optional) Specifies a local host IP address used to select the LSP. The default address is 127.0.0.1.
src-ip-addr *source-address*	(Optional) Specifies a source IP address for the echo request originator.
reply dscp *dscp-value*	(Optional) Specifies the differentiated services codepoint (DSCP) value of an echo reply. The default DSCP value is 0.
reply mode	(Optional) Specifies the reply mode for the echo request packet.
ipv4	(Optional) Replies with an IPv4 UDP packet (default).
router-alert	(Optional) Replies with an IPv4 UDP packet with router alert.

Command Default

No IP SLAs operation type is configured for the operation being configured.

Command Modes

IP SLA monitor configuration (config-sla-monitor)

Command History

Release	Modification
12.2(27)SBC	This command was introduced.
12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.
12.2(31)SB2	The **force-explicit-null** keyword was added.
12.2(33)SRB	This command was replaced by the **mpls lsp trace ipv4** command.
12.2(33)SXH	This command was integrated into Cisco IOS Release 12.2(33)SXH.
12.2(33)SB	This command was replaced by the **mpls lsp trace ipv4** command.

Usage Guidelines

The **lsp-selector** keyword is used to force an IP SLAs operation to use a specific LSP to obtain its response time measurement. This option is useful if there are multiple equal cost paths between Provider Edge (PE) routers.

You must configure the type of IP SLAs operation (such as LSP ping) before you can configure any of the other parameters of the operation. To change the operation type of an existing IP SLAs operation, you must first delete the IP SLAs operation (using the **no ip sla monitor** global configuration command) and then reconfigure the operation with the new operation type.

Note This command supports only single path connectivity measurements between the source PE router and associated Border Gateway Protocol (BGP) next hop neighbors.

Examples

The following examples show how to manually configure operation parameters, proactive threshold monitoring, and scheduling options for IP SLAs LSP traceroute operation 1.

```
ip sla monitor 1
type mpls lsp trace ipv4 192.168.1.4 255.255.255.255 lsp-selector 127.1.1.1
frequency 120
exit
!
ip sla monitor reaction-configuration 1 react connectionLoss threshold-type consecutive 3
action-type trapOnly
ip sla monitor reaction-configuration 1 react timeout threshold-type consecutive 3
action-type trapOnly
ip sla monitor logging traps
!
ip sla monitor schedule 1 start-time now life forever
```

Related Commands

Command	Description
ip sla monitor	Begins configuration for an IP SLAs operation and enters IP SLA monitor configuration mode.

type pathEcho (MPLS)

To configure Cisco IOS IP Service Level Agreements (SLAs) label switched path (LSP) LSP traceroute operations using the LSP Health Monitor, use the **type pathEcho** command in auto IP SLA MPLS configuration mode.

type pathEcho [**ipsla-vrf-all** | **vrf** *vpn-name*]

Syntax Description

ipsla-vrf-all	(Optional) Specifies that LSP traceroute operations should be automatically created for all Border Gateway Protocol (BGP) next hop neighbors in use by a VPN routing or forwarding instance (VRF) corresponding to all the Virtual Private Networks (VPNs) in which the originating Provider Edge (PE) router belongs. This option is the default.
vrf *vpn-name*	(Optional) Specifies that LSP traceroute operations should be automatically created for only those BGP next hop neighbors associated with the specified VPN name.

Command Default

No IP SLAs operation type is configured for the operation being configured.

Command Modes

Auto IP SLA MPLS configuration (config-auto-ip-sla-mpls)

Command History

Release	Modification
12.2(27)SBC	This command was introduced.
12.4(6)T	This command was integrated into Cisco IOS Release 12.4(6)T.
12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.
12.0(32)SY	This command was integrated into Cisco IOS Release 12.0(32)SY.
12.2(31)SB2	This command was integrated into Cisco IOS Release 12.2(31)SB2.
12.2(33)SXH	This command was integrated into Cisco IOS Release 12.2(33)SXH.

Usage Guidelines

You must configure the type of LSP Health Monitor operation (such as LSP ping) before you can configure any of the other parameters of the operation.

You must configure the type of IP SLAs operation (such as LSP ping) before you can configure any of the other parameters of the operation. To change the operation type of an existing LSP Health Monitor operation, you must first delete the operation (using the **no auto ip sla mpls-lsp-monitor** global configuration command) and then reconfigure the operation with the new operation type.

Note When an IP SLAs LSP traceroute operation is created by the LSP Health Monitor, an operation number (identification number) is automatically assigned to the operation. The operation numbering starts at 100001.

Note This command supports only single path connectivity measurements between the source PE router and associated BGP next hop neighbors.

Examples

The following example shows how to configure operation parameters, proactive threshold monitoring, and scheduling options using the LSP Health Monitor. In this example, LSP Health Monitor operation 1 is configured to automatically create IP SLAs LSP traceroute operations for all BGP next hop neighbors in use by all VRFs associated with the source PE router.

```
mpls discovery vpn interval 60
mpls discovery vpn next-hop
!
auto ip sla mpls-lsp-monitor 1
 type pathEcho ipsla-vrf-all
 timeout 1000
 scan-interval 1
 secondary-frequency connection-loss 10
 secondary-frequency timeout 10
!
auto ip sla mpls-lsp-monitor reaction-configuration 1 react connectionLoss threshold-type
consecutive 3 action-type trapOnly
auto ip sla mpls-lsp-monitor reaction-configuration 1 react timeout threshold-type
consecutive 3 action-type trapOnly
ip sla logging traps
!
auto ip sla mpls-lsp-monitor schedule 1 schedule-period 60 start-time now
```

Related Commands

Command	Description
auto ip sla mpls-lsp-monitor	Begins configuration for an IP SLAs LSP Health Monitor operation and enters auto IP SLA MPLS configuration mode.

type pathEcho protocol ipIcmpEcho

Note Effective with Cisco IOS Release 12.4(4)T, 12.2(33)SRB, 12.2(33)SB, and 12.2(33)SXI, the **type pathEcho protocol ipIcmpEcho** command is replaced by the **path-echo** command. See the **path-echo** command for more information.

To configure a Cisco IOS IP Service Level Agreements (SLAs) Internet Control Message Protocol (ICMP) path echo operation, use the **type pathEcho protocol ipIcmpEcho** command in IP SLA monitor configuration mode.

type pathEcho protocol ipIcmpEcho {*destination-ip-address* | *destination-hostname*} [**source-ipaddr** {*ip-address* | *hostname*}]

Syntax Description

destination-ip-address | *destination-hostname*	Destination IP address or hostname.
source-ipaddr {*ip-address* | *hostname*}	(Optional) Specifies the source IP address or hostname. When a source IP address or hostname is not specified, IP SLAs chooses the IP address nearest to the destination.

Defaults

No IP SLAs operation type is configured for the operation being configured.

Command Modes

IP SLA monitor configuration (config-sla-monitor)

Command History

Release	Modification
11.2	This command was introduced.
12.4(4)T	This command was replaced by the **path-echo** command.
12.2(33)SRB	This command was replaced by the **path-echo** command.
12.2SX	This command is supported in the Cisco IOS Release 12.2SX train. Support in a specific 12.2SX release of this train depends on your feature set, platform, and platform hardware.
12.2(33)SB	This command was replaced by the **path-echo** command.
12.2(33)SXI	This command was replaced by the **path-echo** command.

Usage Guidelines

You must configure the type of IP SLAs operation (such as User Datagram Protocol [UDP] jitter or Internet Control Message Protocol [ICMP] echo) before you can configure any of the other parameters of the operation. To change the operation type of an existing IP SLAs operation, you must first delete the IP SLAs operation (using the **no ip sla monitor** global configuration command) and then reconfigure the operation with the new operation type.

Examples

In the following example, IP SLAs operation 10 is configured as an ICMP path echo operation using the IP/ICMP protocol and the destination IP address 172.16.1.175.

```
ip sla monitor 10
 type pathEcho protocol ipIcmpEcho 172.16.1.175
!
ip sla monitor schedule 10 start-time now
```

Related Commands

Command	Description
ip sla monitor	Begins configuration for an IP SLAs operation and enters IP SLA monitor configuration mode.

type pathJitter dest-ipaddr

Note Effective with Cisco IOS Release 12.4(4)T, 12.2(33)SRB, 12.2(33)SB, and 12.2(33)SXI, the **type pathJitter dest-ipaddr** command is replaced by the **path-jitter** command. See the **path-jitter** command for more information.

To configure a Cisco IOS IP Service Level Agreements (SLAs) Internet Control Message Protocol (ICMP) path jitter operation, use the **type pathJitter dest-ipaddr** command in IP SLA monitor configuration mode.

type pathJitter dest-ipaddr {*destination-ip-address* | *destination-hostname*} [**source-ipaddr** {*ip-address* | *hostname*}] [**num-packets** *packet-number*] [**interval** *milliseconds*] [**targetOnly**]

Syntax Description

destination-ip-address | *destination-hostname*	Destination IP address or hostname.
source-ipaddr {*ip-address* | *hostname*}	(Optional) Specifies the source IP address or hostname. When a source IP address or hostname is not specified, IP SLAs chooses the IP address nearest to the destination.
num-packets *packet-number*	(Optional) Specifies the number of packets to be transmitted in each operation. The default value is 10 packets per operation.
interval *milliseconds*	(Optional) Time interval between packets (in milliseconds). The default value is 20 ms.
targetOnly	(Optional) Sends test packets to the destination only (path is not traced).

Defaults

No IP SLAs operation type is configured for the operation number being configured.

Command Modes

IP SLA monitor configuration (config-sla-monitor)

Command History

Release	Modification
12.2(2)T	This command was introduced.
12.4(4)T	This command was replaced by the **path-jitter** command.
12.0(26)S	This command was integrated into Cisco IOS Release 12.0(26)S.
12.2(20)S	This command was integrated into Cisco IOS Release 12.2(20)S.
12.2(27)SBC	This command was integrated into Cisco IOS Release 12.2(27)SBC.
12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.
12.2(33)SRB	This command was replaced by the **path-jitter** command.
12.2SX	This command is supported in the Cisco IOS Release 12.2SX train. Support in a specific 12.2SX release of this train depends on your feature set, platform, and platform hardware.
12.2(33)SB	This command was replaced by the **path-jitter** command.
12.2(33)SXI	This command was replaced by the **path-jitter** command.

Usage Guidelines

If the **targetOnly** keyword is used, the ICMP path jitter operation will send echoes to the destination only (the path from the source to the destination is not traced).

If the **targetOnly** keyword is not used, the IP SLAs ICMP path jitter operation will trace a "hop-by-hop" IP path from the source to the destination and then send a user-specified number of test packets to each hop along the traced path at user-specified time intervals.

You must configure the type of IP SLAs operation (such as User Datagram Protocol [UDP] jitter or Internet Control Message Protocol [ICMP] echo) before you can configure any of the other parameters of the operation. To change the operation type of an existing IP SLAs operation, you must first delete the IP SLAs operation (using the **no ip sla monitor** global configuration command) and then reconfigure the operation with the new operation type.

Examples

The following example shows how to enable the ICMP path jitter operation to trace the IP path to the destination 172.69.5.6 and send 50 test packets to each hop with an interval of 30 ms between each test packet.

```
ip sla monitor 2
 type pathJitter dest-ipaddress 172.69.5.6 num-packets 50 interval 30
!
ip sla monitor schedule 2 start-time now
```

Related Commands

Command	Description
ip sla monitor	Begins configuration for an IP SLAs operation and enters IP SLA monitor configuration mode.

type tcpConnect dest-ipaddr

Note Effective with Cisco IOS Release 12.4(4)T, 12.2(33)SRB, 12.2(33)SB, and 12.2(33)SXI, the **type tcpConnect dest-ipaddr** command is replaced by the **tcp-connect** command. See the **tcp-connect** command for more information.

To define a Cisco IOS IP Service Level Agreements (SLAs) Transmission Control Protocol (TCP) connection operation, use the **type tcpConnect dest-ipaddr** command in IP SLA monitor configuration mode.

type tcpConnect dest-ipaddr {*destination-ip-address* | *destination-hostname*} **dest-port** *port-number* [**source-ipaddr** {*ip-address* | *hostname*} **source-port** *port-number*] [**control** {**enable** | **disable**}]

Syntax Description

destination-ip-address | *destination-hostname*	Destination IP address or hostname.
dest-port *port-number*	Specifies the destination port number.
source-ipaddr {*ip-address* | *hostname*}	(Optional) Specifies the source IP address or hostname. When a source IP address or hostname is not specified, IP SLAs chooses the IP address nearest to the destination.
source-port *port-number*	(Optional) Specifies the source port number. When a port number is not specified, IP SLAs chooses an available port.
control {**enable** | **disable**}	(Optional) Enables or disables the IP SLAs control protocol to send a control message to the IP SLAs Responder prior to sending an operation packet. By default, IP SLAs control messages are sent to the destination device to establish a connection with the IP SLAs Responder.

Defaults

No IP SLAs operation type is associated with the operation number being configured.

Command Modes

IP SLA monitor configuration (config-sla-monitor)

Command History

Release	Modification
12.0(3)T	This command was introduced.
12.4(4)T	This command was replaced by the **tcp-connect** command.
12.2(33)SRB	This command was replaced by the **tcp-connect** command.
12.2SX	This command is supported in the Cisco IOS Release 12.2SX train. Support in a specific 12.2SX release of this train depends on your feature set, platform, and platform hardware.
12.2(33)SB	This command was replaced by the **tcp-connect** command.
12.2(33)SXI	This command was replaced by the **tcp-connect** command.

Usage Guidelines

The TCP connection operation is used to discover the time required to connect to the target device. This operation can be used to test virtual circuit availability or application availability. If the target is a Cisco router, then IP SLAs makes a TCP connection to any port number specified by the user. If the destination is a non-Cisco IP host, then the user must specify a known target port number (for example, 21 for FTP, 23 for Telnet, or 80 for HTTP server). This operation is useful in testing Telnet or HTTP connection times.

You must configure the type of IP SLAs operation (such as User Datagram Protocol [UDP] jitter or Internet Control Message Protocol [ICMP] echo) before you can configure any of the other parameters of the operation. To change the operation type of an existing IP SLAs operation, you must first delete the IP SLAs operation (using the **no ip sla monitor** global configuration command) and then reconfigure the operation with the new operation type.

Examples

In the following example, IP SLAs operation 11 is configured as a TCP connection operation using the destination IP address 172.16.1.175 and the destination port 2400.

```
ip sla monitor 11
 type tcpConnect dest-ipaddr 172.16.1.175 dest-port 2400
!
ip sla monitor schedule 11 start-time now life forever
```

Related Commands

Command	Description
ip sla monitor	Begins configuration for an IP SLAs operation and enters IP SLA monitor configuration mode.

type udpEcho dest-ipaddr

Note Effective with Cisco IOS Release 12.4(4)T, 12.2(33)SRB, 12.2(33)SB, and 12.2(33)SXI, the **type udpEcho dest-ipaddr** command is replaced by the **udp-echo** command. See the **udp-echo** command for more information.

To define a Cisco IOS IP Service Level Agreements (SLAs) User Datagram Protocol (UDP) echo operation, use the **type udpEcho dest-ipaddr** command in IP SLA monitor configuration mode.

type udpEcho dest-ipaddr {*ip-address* | *hostname*} **dest-port** *port-number* [**source-ipaddr** {*ip-address* | *hostname*} **source-port** *port-number*] [**control** {**enable** | **disable**}]

Syntax Description

ip-address | *hostname*	Destination IP address or hostname of the operation.
dest-port *port-number*	Specifies the destination port number.
source-ipaddr {*ip-address* | *hostname*}	(Optional) Specifies the source IP address or hostname. When a source IP address or hostname is not specified, IP SLAs chooses the IP address nearest to the destination.
source-port *port-number*	(Optional) Specifies the source port number. When a port number is not specified, IP SLAs chooses an available UDP port.
control {**enable** | **disable**}	(Optional) Enables or disables the IP SLAs control protocol to send a control message to the IP SLAs Responder prior to sending an operation packet. By default, IP SLAs control messages are sent to the destination device to establish a connection with the IP SLAs Responder.

Defaults

No IP SLAs operation type is associated with the operation number being configured.

Command Modes

IP SLA monitor configuration (config-sla-monitor)

Command History

Release	Modification
12.0(3)T	This command was introduced.
12.4(4)T	This command was replaced by the **udp-echo** command.
12.2(33)SRB	This command was replaced by the **udp-echo** command.
12.2SX	This command is supported in the Cisco IOS Release 12.2SX train. Support in a specific 12.2SX release of this train depends on your feature set, platform, and platform hardware.
12.2(33)SB	This command was replaced by the **udp-echo** command.
12.2(33)SXI	This command was replaced by the **udp-echo** command.

Usage Guidelines

You must configure the type of IP SLAs operation (such as User Datagram Protocol [UDP] jitter or Internet Control Message Protocol [ICMP] echo) before you can configure any of the other parameters of the operation. To change the operation type of an existing IP SLAs operation, you must first delete the IP SLAs operation (using the **no ip sla monitor** global configuration command) and then reconfigure the operation with the new operation type.

Examples

In the following example, IP SLAs operation 12 is configured as a UDP echo operation using the destination IP address 172.16.1.175 and destination port 2400.

```
ip sla monitor 12
 type udpEcho dest-ipaddr 172.16.1.175 dest-port 2400
!
ip sla monitor schedule 12 start-time now life forever
```

Related Commands

Command	Description
ip sla monitor	Begins configuration for an IP SLAs operation and enters IP SLA monitor configuration mode.

type voip delay gatekeeper registration

Note Effective with Cisco IOS Release 12.4(4)T, the **type voip delay gatekeeper registration** command is replaced by the **voip delay gatekeeper-registration** command. See the **voip delay gatekeeper-registration** command for more information.

To configure a Cisco IOS IP Service Level Agreements (SLAs) Voice over IP (VoIP) gatekeeper delay operation, use the **type voip delay gatekeeper registration** command in IP SLA monitor configuration mode.

type voip delay gatekeeper registration

Syntax Description

This command has no arguments or keywords.

Command Default

No IP SLAs operation type is associated with the operation number being configured.

Command Modes

IP SLA monitor configuration

Command History

Release	Modification
12.3(14)T	This command was introduced.
12.4(4)T	This command was replaced by the **voip delay gatekeeper-registration** command.

Usage Guidelines

The IP SLAs gatekeeper registration delay operation provides statistical data on the amount of time taken to register a gateway to a gatekeeper. IP SLAs was designed to gather information over time, at intervals you specify, so that statistics can be provided on key metrics often used in Service Level Agreements (SLAs). Aggregated totals, median, or average data can be viewed using the Cisco IOS command-line interface (CLI) on the device running the IP SLAs operation, or retrieved from the device by external applications using Simple Network Management Protocol (SNMP).

You must configure the type of IP SLAs operation (such as User Datagram Protocol [UDP] jitter or Internet Control Message Protocol [ICMP] echo) before you can configure any of the other parameters of the operation. To change the operation type of an existing IP SLAs operation, you must first delete the IP SLAs operation (using the **no ip sla monitor** global configuration command) and then reconfigure the operation with the new operation type.

Examples

In the following example, IP SLAs operation 10 is configured as a VoIP gatekeeper registration delay operation:

```
ip sla monitor 10
 type voip delay gatekeeper registration
!
ip sla monitor schedule 10 start-time now life forever
```

Related Commands

Command	Description
ip sla monitor	Begins configuration for an IP SLAs operation and enters IP SLA monitor configuration mode.

type voip delay post-dial

Note Effective with Cisco IOS Release 12.4(4)T, the **type voip delay post-dial** command is replaced by the **voip delay post-dial** command. See the **voip delay post-dial** command for more information.

To configure a Cisco IOS IP Service Level Agreements (SLAs) Voice over IP (VoIP) call setup (post-dial delay) operation, use the **type voip delay post-dial** command in IP SLA monitor configuration mode.

type voip delay post-dial [**detect-point** {**alert-ringing** | **connect-ok**}] **destination** *tag*

Syntax Description

detect-point alert-ringing	Sets the Voice over IP (VoIP) call setup operation to measure the response time for the called number to ring. If the **detect-point** keyword is not specified, the response time for the called number to ring is measured by default.
detect-point connect-ok	Sets the VoIP call setup operation to measure the response time for the called party to answer the call.
destination *tag*	Specifies the E.164 number or URL of the destination dial-peer.

Command Default

No IP SLAs operation type is configured for the operation being configured.

Command Modes

IP SLA monitor configuration

Command History

Release	Modification
12.3(14)T	This command was introduced.
12.4(4)T	This command was replaced by the **voip delay post-dial** command.

Usage Guidelines

In order to use the IP SLAs VoIP call setup functionality, your Cisco IOS software image must support the IP SLAs VoIP test-call application and IP SLAs VoIP Responder application. To determine if your Cisco IOS software image is configured with these applications, use the **show call application voice** command in user EXEC or privileged EXEC mode.

Note The IP SLAs VoIP Responder application is different from the IP SLAs Responder (which is configured using the **ip sla monitor responder** command in global configuration mode).

If the **detect-point** keyword is not specified, the response time for the called number to ring is measured by default.

You must configure the type of IP SLAs operation (such as User Datagram Protocol [UDP] jitter or Internet Control Message Protocol [ICMP] echo) before you can configure any of the other parameters of the operation. To change the operation type of an existing IP SLAs operation, you must first delete the IP SLAs operation (using the **no ip sla monitor** global configuration command) and then reconfigure the operation with the new operation type.

Examples

The following example shows how to configure an originating gateway to start the IP SLAs VoIP test-call application, set up the dial peer to route the test call, define the VoIP call setup operation, and schedule the VoIP call setup operation. In this example, test-call messages are generated using the Session Initiation Protocol (SIP).

```
call application session start ipsla-testcall ipsla-testcall
!
dial-peer voice 6789 voip
destination-pattern 6789
session target ipv4:172.29.129.123
session protocol sipv2
!
ip sla monitor 1
 type voip delay post-dial detect-point alert-ringing destination 6789
!
ip sla monitor schedule 1 start-time now life forever
```

The following example shows how to configure a terminating gateway to set up the dial peer and enable the IP SLAs VoIP Responder application to respond to the IP SLAs VoIP call setup test call. In this example, test-call messages are generated using the Session Initiation Protocol (SIP).

```
dial-peer voice 6789 voip
incoming called-number 6789
application ipsla-responder
session protocol sipv2
```

Related Commands

Command	Description
ip sla monitor	Begins configuration for an IP SLAs operation and enters IP SLA monitor configuration mode.
show call application voice	Displays information about configured voice applications.

udp-echo

To define a Cisco IOS IP Service Level Agreements (SLAs) User Datagram Protocol (UDP) echo operation, use the **udp-echo** command in IP SLA configuration mode.

udp-echo {*destination-ip-address* | *destination-hostname*} *destination-port* [**source-ip** {*ip-address* | *hostname*} **source-port** *port-number*] [**control** {**enable** | **disable**}]

Syntax Description

destination-ip-address | *destination-hostname*	Destination IPv4 or IPv6 address or hostname of the operation.
destination-port	Specifies the destination port number.
source-ip {*ip-address* | *hostname*}	(Optional) Specifies the source IPv4 or IPv6 address or hostname. When a source IP address or hostname is not specified, IP SLAs chooses the IP address nearest to the destination.
source-port *port-number*	(Optional) Specifies the source port number. When a port number is not specified, IP SLAs chooses an available UDP port.
control {**enable** | **disable**}	(Optional) Enables or disables the IP SLAs control protocol to send a control message to the IP SLAs Responder prior to sending an operation packet. By default, IP SLAs control messages are sent to the destination device to establish a connection with the IP SLAs Responder.

Defaults

No IP SLAs operation type is associated with the operation number being configured.

Command Modes

IP SLA configuration (config-ip-sla)

Command History

Release	Modification
12.4(4)T	This command was introduced. This command replaces the **type udpEcho dest-ipaddr** command.
12.0(32)SY	This command was integrated into Cisco IOS Release 12.0(32)SY.
12.2(33)SRB	This command was integrated into Cisco IOS Release 12.2(33)SRB. This command replaces the **type udpEcho dest-ipaddr** command.
12.2(33)SRC	Support for IPv6 addresses was added.
12.2(33)SB	This command was integrated into Cisco IOS Release 12.2(33)SB. This command replaces the **type udpEcho dest-ipaddr** command. Support for IPv6 addresses was added.
12.4(20)T	Support for IPv6 addresses was added.
12.2(33)SXI	This command was integrated into Cisco IOS Release 12.2(33)SXI. This command replaces the **type udpEcho dest-ipaddr** command.

Usage Guidelines

You must configure the type of IP SLAs operation (such as User Datagram Protocol [UDP] jitter or Internet Control Message Protocol [ICMP] echo) before you can configure any of the other parameters of the operation. To change the operation type of an existing IP SLAs operation, you must first delete the IP SLAs operation (using the **no ip sla** global configuration command) and then reconfigure the operation with the new operation type.

IP SLAs UDP echo operations support both IPv4 and IPv6 addresses.

Control protocol is required when the target device is a Cisco router that does not natively provide the UDP or TCP Connect service. If you disable control by using the **control disable** keyword combination, you must define the IP address of the source for the Cisco IOS IP SLAs Responder by using the **ip sla responder udp-echo ipaddress** command on the destination device.

Examples

In the following example, IP SLAs operation 12 is configured as a UDP echo operation using the destination IPv4 address 172.16.1.175 and destination port 2400:

```
ip sla 12
 udp-echo 172.16.1.175 2400
!
ip sla schedule 12 start-time now life forever
```

In the following example, IP SLAs operation 13 is configured as a UDP echo operation using the destination IPv6 address 2001:DB8:100::1 and destination port 2400:

```
ip sla 13
 udp-echo 2001:DB8:100::1 2400
!
ip sla schedule 13 start-time now life forever
```

Related Commands

Command	Description
ip sla	Begins configuration for an IP SLAs operation and enters IP SLA configuration mode.
ip sla responder udp-echo ipaddress	Permanently enables IP SLAs Responder functionality on specified IP address and port.

udp-jitter

To configure a Cisco IOS IP Service Level Agreements (SLAs) User Datagram Protocol (UDP) jitter operation, use the **udp-jitter** command in IP SLA configuration mode.

udp-jitter {*destination-ip-address* | *destination-hostname*} *destination-port* [**source-ip** {*ip-address* | *hostname*}] [**source-port** *port-number*] [**control** {**enable** | **disable**}] [**num-packets** *number-of-packets*] [**interval** *interpacket-interval*]

Syntax Description

destination-ip-address | *destination-hostname*	Destination IPv4 or IPv6 address or hostname.
destination-port	Specifies the destination port number.
source-ip {*ip-address* | *hostname*}	(Optional) Specifies the source IPv4 or IPv6 address or hostname. When a source IP address or hostname is not specified, IP SLAs chooses the IP address nearest to the destination.
source-port *port-number*	(Optional) Specifies the source port number. When a port number is not specified, IP SLAs chooses an available port.
control {**enable** | **disable**}	(Optional) Enables or disables the sending of IP SLAs control messages to the IP SLAs Responder. By default, IP SLAs control messages are sent to the destination device to establish a connection with the IP SLAs Responder.
num-packets *number-of-packets*	(Optional) Number of packets, as specified by the number argument. The default is 10.
interval *interpacket-interval*	(Optional) Interpacket interval in milliseconds. The default is 20.

Defaults

No IP SLAs operation type is configured for the operation being configured.

Command Modes

IP SLA configuration (config-ip-sla)

Command History

Release	Modification
12.4(4)T	This command was introduced. This command replaces the **type jitter dest-ipaddr** command.
12.0(32)SY	This command was integrated into Cisco IOS Release 12.0(32)SY.
12.2(33)SRB	This command was integrated into Cisco IOS Release 12.2(33)SRB. This command replaces the **type jitter dest-ipaddr** command.
12.2(33)SRC	Support for IPv6 addresses was added.
12.2(33)SB	This command was integrated into Cisco IOS Release 12.2(33)SB. This command replaces the **type jitter dest-ipaddr** command. Support for IPv6 addresses was added.

12.4(20)T	Support for IPv6 addresses was added.
12.2(33)SXI	This command was integrated into Cisco IOS Release 12.2(33)SXI. This command replaces the **type jitter dest-ipaddr** command.

Usage Guidelines

The **udp-jitter** command configures an IP SLAs UDP Plus operation. The UDP Plus operation is a superset of the UDP echo operation. In addition to measuring UDP round-trip time, the UDP Plus operation measures per-direction packet loss and jitter. Jitter is interpacket delay variance. Jitter statistics are useful for analyzing traffic in a Voice over IP (VoIP) network.

You must configure the type of IP SLAs operation (such as User Datagram Protocol [UDP] jitter or Internet Control Message Protocol [ICMP] echo) before you can configure any of the other parameters of the operation. To change the operation type of an existing IP SLAs operation, you must first delete the IP SLAs operation (using the **no ip sla** global configuration command) and then reconfigure the operation with the new operation type.

You must enable the IP SLAs Responder on the target router before you can configure a UDP jitter operation. Prior to sending an operation packet to the target router, IP SLAs sends a control message to the IP SLAs Responder to enable the destination port. Control protocol is required when the target device is a Cisco router that does not natively provide the UDP or TCP Connect service. If you disable control by using the **control disable** keyword combination with this command, you must define the IP address of the source for the Cisco IOS IP SLAs Responder by using the **ip sla responder udp-echo ipaddress** command on the destination device.

The default request packet data size for an IP SLAs UDP jitter operation is 32 bytes. Use the **request-data-size** command to modify this value.

IP SLAs UDP jitter operations support both IPv4 and IPv6 addresses.

IP SLAs VoIP UDP Jitter (codec) Operation

When you specify the codec in the command syntax of the **udp-jitter** command, the standard configuration options are replaced with codec-specific keywords and arguments. The codec-specific command syntax is documented separately from the command syntax for the standard implementation of the **udp-jitter** command. For information about the codec-specific command syntax, see the documentation for the **udp-jitter** (codec) command.

Examples

In the following example, operation 6 is configured as a UDP jitter operation with the destination IPv4 address 172.30.125.15, the destination port number 2000, 20 packets, and an interpacket interval of 20 ms:

```
ip sla 6
 udp-jitter 172.30.125.15 2000 num-packets 20 interval 20
!
ip sla schedule 6 start-time now
```

In the following example, operation 7 is configured as a UDP jitter operation with the destination IPv6 address 2001:0DB8:200::FFFE, the destination port number 2000, 20 packets, and an interpacket interval of 20 ms:

```
ip sla 7
 udp-jitter 2001:0DB8:200::FFFE 2000 num-packets 20 interval 20
!
ip sla schedule 7 start-time now
```

Related Commands

Command	Description
ip sla	Begins configuration for an IP SLAs operation and enters IP SLA configuration mode.
ip sla responder udp-echo ipaddress	Permanently enables IP SLAs Responder functionality on specified IP address and port.
request-data-size	Sets the payload size for IP SLAs operation request packets.
udp-jitter (codec)	Configures an IP SLAs UDP jitter operation that returns VoIP scores.

udp-jitter (codec)

To configure a Cisco IOS IP Service Level Agreements (SLAs) User Datagram Protocol (UDP) jitter operation that returns Voice over IP (VoIP) scores, use the **udp-jitter** command in IP SLA configuration mode.

udp-jitter {*destination-ip-address* | *destination-hostname*} *destination-port* **codec** *codec-type* [**codec-numpackets** *number-of-packets*] [**codec-size** *number-of-bytes*] [**codec-interval** *milliseconds*] [**advantage-factor** *value*] [**source-ip** {*ip-address* | *hostname*}] [**source-port** *port-number*] [**control** {**enable** | **disable**}]

Syntax Description

destination-ip-address | *destination-hostname*	Specifies the destination IP address or hostname.
destination-port	Specifies the destination port number. For UDP jitter (codec) operations, the port number should be an even number in the range of 16384 to 32766 or 49152 to 65534.
codec *codec-type*	Enables the generation of estimated voice-quality scores in the form of Calculated Planning Impairment Factor (ICPIF) and Mean Opinion Score (MOS) values. The codec type should match the encoding algorithm you are using for VoIP transmissions. The following codec-type keywords are available: • **g711alaw**—The G.711 a-law codec (64 kbps transmission) • **g711ulaw**—The G.711 muHmm-law codec (64 kbps transmission) • **g729a**—The G.729A codec (8 kbps transmission) Configuring the codec type sets default values for the variables **codec-numpackets**, **codec-size**, and **codec-interval** in this command. See Table 85 for details.
codec-numpackets *number-of-packets*	(Optional) Specifies the number of packets to be transmitted per operation. The range is from 1 to 60000. The default is 1000.
codec-size *number-of-bytes*	(Optional) Specifies the number of bytes in each packet transmitted. (Also called the payload size or request size.) The range is from 16 to 1500. The default varies by codec (see Table 85).
codec-interval *milliseconds*	Specifies the interval (delay) between packets that should be used for the operation, in milliseconds (ms). The range is from 1 to 60000. The default is 20.
advantage-factor *value*	Specifies the expectation factor to be used for ICPIF calculations. This value is subtracted from the measured impairments to yield the final ICPIF value (and corresponding MOS value). See the "Usage Guidelines" section for recommended values. The range is from 0 to 20. The default is 0.
source-ip {*ip-address* | *hostname*}	(Optional) Specifies the source IP address or hostname. When a source IP address or hostname is not specified, IP SLAs chooses the IP address nearest to the destination.

source-port *port-number*	(Optional) Specifies the source port number. When a port number is not specified, IP SLAs chooses an available port.
control {**enable** | **disable**}	(Optional) Enables or disables the sending of IP SLAs control messages to the IP SLAs Responder. By default, IP SLAs control messages are sent to the destination device to establish a connection with the IP SLAs Responder. **Note** Control messages are enabled by default. Disabling the IP SLAs control messages for UDP jitter operations is not recommended. If you disable IP SLAs control messages, packet loss statistics and IP telephony scores will not be generated accurately.

Defaults

No IP SLAs operation type is associated with the operation number being configured.

Command Modes

IP SLA configuration (config-ip-sla)

Command History

Release	Modification
12.4(4)T	This command was introduced. This command replaces the **type jitter dest-ipaddr** (codec) command.
12.0(32)SY	This command was integrated into Cisco IOS Release 12.0(32)SY.
12.2(33)SRB	This command was integrated into Cisco IOS Release 12.2(33)SRB**.** This command replaces the **type jitter dest-ipaddr** (codec) command.
12.2(33)SB	This command was integrated into Cisco IOS Release 12.2(33)SB. This command replaces the **type jitter dest-ipaddr** (codec) command.
12.2(33)SXI	This command was integrated into Cisco IOS Release 12.2(33)SXI. This command replaces the **type jitter dest-ipaddr** (codec) command.

Usage Guidelines

When you specify the codec in the command syntax of the **udp-jitter** command, the standard configuration options are replaced with codec-specific keywords and arguments. The codec-specific command syntax is documented separately from the command syntax for the standard implementation of the **udp-jitter** command. For information about the command syntax for the standard implementation, see the documentation for the **udp-jitter** command.

You must enable the IP SLAs Responder on the target router before you can configure a UDP jitter (codec) operation. Prior to sending an operation packet to the target router, IP SLAs sends a control message to the IP SLAs Responder to enable the destination port.

You must configure the type of IP SLAs operation (such as User Datagram Protocol [UDP] jitter or Internet Control Message Protocol [ICMP] echo) before you can configure any of the other parameters of the operation. To change the operation type of an existing IP SLAs operation, you must first delete the IP SLAs operation (using the **no ip sla** global configuration command) and then reconfigure the operation with the new operation type.

IP SLAs VoIP UDP Jitter (codec) Statistics

The IP SLAs UDP jitter operation computes statistics by sending *n* UDP packets, each of size *s*, sent *t* milliseconds apart, from a given source router to a given target router, at a given frequency *f*.

To generate MOS and ICPIF scores, you specify the codec type used for the connection when configuring the UDP jitter operation. Based on the type of codec you configure for the operation, the number of packets (*n*), the size of each payload (*s*), the inter-packet time interval (*t*), and the operational frequency (*f*) will be auto-configured with default values. (See Table 85 for specific information.) However, you are given the option, if needed, to manually configure these parameters in the syntax of the **udp-jitter** (codec) command.

Table 85 shows the default parameters that are configured for the operation by codec.

Table 85 Default UDP Jitter Operation Parameters by Codec

Codec	Default Number of Packets (*n*); [codec-numpackets]	Packet Payload (*s*) [codec-size][1]	Default Interval Between Packets (*t*) [codec-interval]	Frequency of Operations (*f*)
G.711 mu-law (g711ulaw)	1000	160 bytes	20 ms	Once every 60 seconds
G.711 a-law (g711alaw)	1000	160 bytes	20 ms	Once every 60 seconds
G.729A (g729a)	1000	20 bytes	20 ms	Once every 60 seconds

1. The actual data size of each request packet will contain an additional 12 bytes of Real-Time Transport Protocol (RTP) header data in order to simulate the RTP/UDP/IP/Layer 2 protocol stack.

For example, if you configure the UDP jitter operation to use the characteristics for the g711ulaw codec, by default an operation will be sent once a minute (*f*). Each operation would consist of 1000 packets (*n*), with each packet containing 160 bytes (plus 12 header bytes) of synthetic data (*s*), sent 20 ms apart (*t*).

The **advantage-factor** *value* keyword and argument allow you to specify an access Advantage Factor (also called the Expectation Factor). Table 86, adapted from ITU-T Rec. G.113, defines a set of provisional maximum values for Advantage Factors in terms of the service provided.

Table 86 Advantage Factor Recommended Maximum Values

Communication Service	Maximum Value of Advantage/ Expectation Factor (*A*):
Conventional wire line (land line)	0
Mobility (cellular connections) within a building	5
Mobility within a geographical area or moving within a vehicle	10
Access to hard-to-reach location; (for example, via multihop satellite connections)	20

These values are only suggestions. To be meaningful, the use of the Advantage/Expectation factor (*A*) and its selected value in a specific application should be used consistently in any planning model you adopt. However, the values in Table 86 should be considered as the absolute upper limits for *A*. The default Advantage/Expectation factor for IP SLAs UDP jitter operations is always zero.

Examples

In the following example, IP SLAs operation 10 is configured as a UDP jitter (codec) operation with the destination IP address 209.165.200.225 and the destination port number 3000. The operation is configured to use the characteristics of the G.711 a-law codec, which means the operation will consist of 1000 packets, each of 172 bytes (160 plus 12 header bytes), sent 20 ms apart. The default value for the Advantage Factor and operations frequency is used.

```
ip sla 10
 udp-jitter 209.165.200.225 3000 codec g711alaw
!
ip sla schedule 10 start-time now
```

Related Commands

Command	Description
ip sla monitor	Begins configuration for an IP SLAs operation and enters IP SLA monitor configuration mode.
udp-jitter	Configures an IP SLAs UDP jitter operation.

verify-data (IP SLA)

To cause a Cisco IOS IP Service Level Agreements (SLAs) operation to check each reply packet for data corruption, use the **verify-data** (IP SLA) command in the appropriate submode of IP SLA configuration, IP SLA monitor configuration, or IP SLA template parameters configuration mode. To return to the default value, use the **no** form of this command.

verify-data

no verify-data

Syntax Description

This command has no arguments or keywords.

Command Default

Data is not checked for corruption.

Command Modes

IP SLA Configuration

ICMP echo configuration (config-ip-sla-echo)
ICMP path echo configuration (config-ip-sla-pathEcho)
ICMP path jitter configuration (config-ip-sla-pathJitter)
UDP echo configuration (config-ip-sla-udp)
UDP jitter configuration (config-ip-sla-jitter)

IP SLA Monitor Configuration

ICMP echo configuration (config-sla-monitor-echo)
ICMP path echo configuration (config-sla-monitor-pathEcho)
ICMP path jitter configuration (config-sla-monitor-pathJitter)
UDP echo configuration (config-sla-monitor-udp)
UDP jitter configuration (config-sla-monitor-jitter)

IP SLA Template Parameters Configuration

ICMP echo configuration (config-icmp-ech-params)
UDP echo configuration (config-udp-ech-params)
UDP jitter configuration (config-udp-jtr-params)

Command History

Release	Modification
11.2	This command was introduced.
12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.
12.2SX	This command is supported in the Cisco IOS Release 12.2SX train. Support in a specific 12.2SX release of this train depends on your feature set, platform, and platform hardware.
15.1(1)T	This command was modified. The IP SLA template parameters configuration mode was added.

Usage Guidelines

Use the **verify-data** (IP SLA) command only when data corruption may be an issue. Do not enable this feature during normal operation because it can cause unnecessary network overhead.

The **verify-data** command is supported in IPv4 networks. This command can also be used when configuring an IP SLAs operation that supports IPv6 addresses.

IP SLAs Operation Configuration Dependence on Cisco IOS Release

The Cisco IOS command used to begin configuration for an IP SLAs operation varies depending on the Cisco IOS release you are running (see Table 87). You must configure the type of IP SLAs operation, such as User Datagram Protocol (UDP) jitter or Internet Control Message Protocol (ICMP) echo, before you can configure any of the other parameters of the operation.

The configuration mode for the **verify-data** (IP SLA) command varies depending on the Cisco IOS release you are running (see Table 87) and the operation type configured.

If you are running Cisco IOS IP SLAs Engine 3.0, you must enter the **parameters** command in IP SLA template configuration mode before you can use the **verify-data** command.

Table 87 Command Used to Begin Configuration of an IP SLAs Operation Based on Cisco IOS Release

Cisco IOS Release	Global Configuration Command	Command Mode Entered
12.4(4)T, 12.0(32)SY, 12.2(33)SRB, 12.2(33)SB, or later releases	**ip sla**	IP SLA configuration
12.3(14)T, 12.4, 12.4(2)T, 12.2(31)SB2, or 12.2(33)SXH	**ip sla monitor**	IP SLA monitor configuration
15.1(1)T	**ip sla auto template**	IP SLA template configuration

Examples

The following examples show how to configure an IP SLAs ICMP echo operation to verify each reply packet for data corruption. Note that the Cisco IOS command used to begin configuration for an IP SLAs operation varies depending on the Cisco IOS release you are running (see Table 87).

IP SLA Configuration

```
ip sla 5
 icmp-echo 172.16.1.174
 verify-data
!
ip sla schedule 5 start-time now life forever
```

IP SLA Monitor Configuration

```
ip sla monitor 5
 type echo protocol ipIcmpEcho 172.16.1.174
 verify-data
!
ip sla monitor schedule 5 start-time now life forever
```

IP SLA Template Configuration

```
Router(config)#ip sla auto template type ip icmp-echo 5
Router(config-tplt-icmp-ech)#parameters
Router(config-icmp-ech-params)#verify-data
Router(config-icmp-ech-params)#end
Router#
```

```
00:02:26: %SYS-5-CONFIG_I: Configured from console by console
Router# show ip sla auto template type ip icmp-echo 5
IP SLAs Auto Template: 5
    Measure Type: icmp-echo
    Description:
.
.
.
Operation Parameters:
        Request Data Size: 28   Verify Data: true
        Timeout: 5000           Threshold: 5000
    Statistics Aggregation option:
        Hours of statistics kept: 2
    History options:
        History filter: none
        Max number of history records kept: 15
        Lives of history kept: 0
    Statistics Distributions options:
        Distributions characteristics: RTT
        Distributions bucket size: 20
        Max number of distributions buckets: 1
    Reaction Configuration: None
```

Related Commands

Command	Description
ip sla	Begins configuration for an IP SLAs operation and enters IP SLA configuration mode.
ip sla auto template	Begins configuration for an auto IP SLAs operation template and enters IP SLA template configuration mode.
ip sla monitor	Begins configuration for an IP SLAs operation and enters IP SLA monitor configuration mode.

voip delay gatekeeper-registration

To configure a Cisco IOS IP Service Level Agreements (SLAs) Voice over IP (VoIP) gatekeeper delay operation, use the **voip delay gatekeeper-registration** command in IP SLA configuration mode.

voip delay gatekeeper-registration

Syntax Description

This command has no arguments or keywords.

Command Default

No IP SLAs operation type is associated with the operation number being configured.

Command Modes

IP SLA configuration

Command History

Release	Modification
12.4(4)T	This command was introduced. This command replaces the **type voip delay gatekeeper registration** command.

Usage Guidelines

The IP SLAs gatekeeper registration delay operation provides statistical data on the amount of time taken to register a gateway to a gatekeeper. IP SLAs was designed to gather information over time, at intervals you specify, so that statistics can be provided on key metrics often used in Service Level Agreements (SLAs). Aggregated totals, median, or average data can be viewed using the Cisco IOS command-line interface (CLI) on the device running the IP SLAs operation, or retrieved from the device by external applications using Simple Network Management Protocol (SNMP).

You must configure the type of IP SLAs operation (such as User Datagram Protocol [UDP] jitter or Internet Control Message Protocol [ICMP] echo) before you can configure any of the other parameters of the operation. To change the operation type of an existing IP SLAs operation, you must first delete the IP SLAs operation (using the **no ip sla** global configuration command) and then reconfigure the operation with the new operation type.

Examples

In the following example, IP SLAs operation 10 is configured as a VoIP gatekeeper registration delay operation:

```
ip sla 10
 voip delay gatekeeper-registration
!
ip sla schedule 10 start-time now life forever
```

Related Commands

Command	Description
ip sla	Begins configuration for an IP SLAs operation and enters IP SLA configuration mode.

voip delay post-dial

To configure a Cisco IOS IP Service Level Agreements (SLAs) Voice over IP (VoIP) call setup (post-dial delay) operation, use the **voip delay post-dial** command in IP SLA configuration mode.

voip delay post-dial [**detect-point** {**alert-ringing** | **connect-ok**}] **destination** *tag*

Syntax Description

detect-point alert-ringing	Sets the Voice over IP (VoIP) call setup operation to measure the response time for the called number to ring. If the **detect-point** keyword is not specified, the response time for the called number to ring is measured by default.
detect-point connect-ok	Sets the VoIP call setup operation to measure the response time for the called party to answer the call.
destination *tag*	Specifies the E.164 number or URL of the destination dial-peer.

Command Default

No IP SLAs operation type is configured for the operation being configured.

Command Modes

IP SLA configuration

Command History

Release	Modification
12.4(4)T	This command was introduced. This command replaces the **type voip delay post-dial** command.

Usage Guidelines

In order to use the IP SLAs VoIP call setup functionality, your Cisco IOS software image must support the IP SLAs VoIP test-call application and IP SLAs VoIP Responder application. To determine if your Cisco IOS software image is configured with these applications, use the **show call application voice** command in user EXEC or privileged EXEC mode.

Note The IP SLAs VoIP Responder application is different from the IP SLAs Responder (which is configured using the **ip sla responder** command in global configuration mode).

If the **detect-point** keyword is not specified, the response time for the called number to ring is measured by default.

You must configure the type of IP SLAs operation (such as User Datagram Protocol [UDP] jitter or Internet Control Message Protocol [ICMP] echo) before you can configure any of the other parameters of the operation. To change the operation type of an existing IP SLAs operation, you must first delete the IP SLAs operation (using the **no ip sla** global configuration command) and then reconfigure the operation with the new operation type.

Examples

The following example shows how to configure an originating gateway to start the IP SLAs VoIP test-call application, set up the dial peer to route the test call, define the VoIP call setup operation, and schedule the VoIP call setup operation. In this example, test-call messages are generated using the Session Initiation Protocol (SIP).

```
call application session start ipsla-testcall ipsla-testcall
!
dial-peer voice 6789 voip
destination-pattern 6789
session target ipv4:172.29.129.123
session protocol sipv2
!
ip sla 1
 voip delay post-dial detect-point alert-ringing destination 6789
!
ip sla schedule 1 start-time now life forever
```

The following example shows how to configure a terminating gateway to set up the dial peer and enable the IP SLAs VoIP Responder application to respond to the IP SLAs VoIP call setup test call. In this example, test-call messages are generated using the Session Initiation Protocol (SIP).

```
dial-peer voice 6789 voip
incoming called-number 6789
application ipsla-responder
session protocol sipv2
```

Related Commands

Command	Description
ip sla	Begins configuration for an IP SLAs operation and enters IP SLA configuration mode.
show call application voice	Displays information about configured voice applications.

voip rtp

To configure a Cisco IOS IP Service Level Agreement (SLAs) RTP-based Voice over IP (VoIP) operation, use the **voip rtp** command in IP SLA configuration mode.

voip rtp {*destination-ip-address* | *destination-hostname*} **source-ip** {*ip-address* | *hostname*} **source-voice-port** {*slot* [**/***subunit*/*port*]**:***ds0-group-number*]} [**codec** *codec-type*] [**duration** *seconds*] [**advantage-factor** *value*]

Syntax Description

destination-ip-address | *destination-hostname*	Destination IP address or hostname.
source-ip {*ip-address* | *hostname*}	Specifies the source IP address or hostname.
source-voice-port	Specifies the source voice port.
slot	Source slot number.
/*subunit*	Source subunit number. A slash must precede this value.
/*port*	Source port number. A slash must precede this value.
:*ds0-group-number*	Source DS0 group number. A colon must precede this value.
codec *codec-type*	(Optional) Enables the generation of estimated voice quality scores in the form of Calculated Planning Impairment Factor (ICPIF) and Mean Opinion Score (MOS) values. The codec type should match the encoding algorithm you are using for VoIP transmissions. The following codec type keywords are available: • **g711alaw**—The G.711 A-Law codec (64 kbps transmission) • **g711ulaw**—The G.711 muHmm-Law codec (64 kbps transmission) • **g729a**—The G.729A codec (8 kbps transmission) Default codec type is the G.729A codec.
duration *seconds*	(Optional) Specifies the duration (in seconds) of the test call. The default is 20 seconds.
advantage-factor *value*	(Optional) Specifies the expectation factor to be used for ICPIF calculations. This value is subtracted from the measured impairments to yield the final ICPIF value (and corresponding MOS value). The valid range is from 0 to 20. The default is 0.

Command Default

No IP SLAs operation type is configured for the operation being configured.

Command Modes

IP SLA configuration (config-ip-sla)

Command History

Release	Modification
12.4(4)T	This command was introduced.

Usage Guidelines

You must configure the type of IP SLAs operation (such as User Datagram Protocol [UDP] jitter or Internet Control Message Protocol [ICMP] echo) before you can configure any of the other parameters of the operation. To change the operation type of an existing IP SLAs operation, you must first delete the IP SLAs operation (using the **no ip sla** global configuration command) and then reconfigure the operation with the new operation type.

Examples

The following example shows how to configure an IP SLAs RTP-based VoIP operation:

```
ip sla 1
 voip rtp 10.2.3.4 source-ip 10.5.6.7 source-voice-port 1/0:1 codec g711alaw duration 30
advantage-factor 5
 exit
!
ip sla reaction-configuration 1 react FrameLossDS threshold-type consecutive 3 action-type
traponly
!
ip sla schedule 1 start-time now life forever
```

Related Commands

Command	Description
ip sla	Begins configuration for an IP SLAs operation and enters IP SLA configuration mode

vrf (IP SLA)

To allow monitoring within Multiprotocol Label Switching (MPLS) Virtual Private Networks (VPNs) using Cisco IOS IP Service Level Agreements (SLAs) operations, use the **vrf** command in the appropriate submode of IP SLA configuration, IP SLA monitor configuration, or IP SLA template configuration mode.

vrf *vrf-name*

Syntax Description

vrf-name	VPN routing and forwarding (VRF) name.

Command Default

The MPLS VPN parameter is not configured for the IP SLAs operation.

Command Modes

IP SLA Configuration

DNS configuration (config-ip-sla-dns)
FTP configuration (config-ip-sla-ftp)
HTTP configuration (config-ip-sla-http)
ICMP echo configuration (config-ip-sla-echo)
ICMP jitter configuration (config-ip-sla-icmpjitter)
ICMP path echo configuration (config-ip-sla-pathEcho)
ICMP path jitter configuration (config-ip-sla-pathJitter)
TCP connect configuration (config-ip-sla-tcp)
UDP echo configuration (config-ip-sla-udp)
UDP jitter configuration (config-ip-sla-jitter)

IP SLA Monitor Configuration

ICMP echo configuration (config-sla-monitor-echo)
ICMP path echo configuration (config-sla-monitor-pathEcho)
ICMP path jitter configuration (config-sla-monitor-pathJitter)
UDP echo configuration (config-sla-monitor-udp)
UDP jitter configuration (config-sla-monitor-jitter)

IP SLA Template Configuration

ICMP echo configuration (config-tplt-icmp-ech)
ICMP jitter configuration (config-tplt-icmp-ech)
TCP connect configuration (config-tplt-tcp-conn)
UDP echo configuration (config-tplt-udp-ech)
UDP jitter configuration (config-tplt-udp-ech)

Command History

Release	Modification
12.2(2)T	This command was introduced.
12.2(11)T	Syntax changed from **vrfName** to **vrf** with SAA Engine II.
12.0(26)S	This command was integrated into Cisco IOS Release 12.0(26)S. Support for this command was also added for ICMP path jitter operations.

Release	Modification
12.3(2)T	Support for this command was added for ICMP path jitter operations.
12.2(20)S	This command was integrated into Cisco IOS Release 12.2(20)S. Support for this command was also added for ICMP path jitter operations.
12.2(27)SBC	This command was integrated into Cisco IOS Release 12.2(27)SBC.
12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.
12.2SX	This command is supported in the Cisco IOS Release 12.2SX train. Support in a specific 12.2SX release of this train depends on your feature set, platform, and platform hardware.
12.4(20)T	Support for this command was added for the IP SLAs DNS, FTP, HTTP, and TCP connect operations.
15.1(1)T	This command was modified. The IP SLA template configuration mode was added.

Usage Guidelines

This command identifies the VPN for the operation being configured.

Use this command only if the response time over the VPN tunnel must be measured.

For ICMP path jitter operations, you must specify the source IP address or hostname when using the **vrf** command.

The **vrf** (IP SLA) command is supported in IPv4 networks. This command is also supported in IPv6 networks to configure an IP SLAs operation that supports IPv6 addresses.

IP SLAs Operation Configuration Dependence on Cisco IOS Release

The Cisco IOS command used to begin configuration for an IP SLAs operation varies depending on the Cisco IOS release you are running (see Table 88). You must configure the type of IP SLAs operation, such as User Datagram Protocol (UDP) jitter or Internet Control Message Protocol (ICMP) echo, before you can configure any of the other parameters of the operation.

The configuration mode for the **vrf** (IP SLA) command varies depending on the Cisco IOS release you are running (see Table 88) and the operation type configured.

Table 88 Command Used to Begin Configuration of an IP SLAs Operation Based on Cisco IOS Release

Cisco IOS Release	Global Configuration Command	Command Mode Entered
12.4(4)T, 12.0(32)SY, 12.2(33)SRB, 12.2(33)SB, or later releases	**ip sla**	IP SLA configuration
12.3(14)T, 12.4, 12.4(2)T, 12.2(31)SB2, or 12.2(33)SXH	**ip sla monitor**	IP SLA monitor configuration
15.1(1)T	**ip sla auto template**	IP SLA template configuration

Examples

The following examples show how to configure an IP SLAs operation for an MPLS VPN. These examples show how test traffic can be sent in an already existing VPN tunnel between two endpoints.

IP SLA Configuration

```
ip sla 1
 icmp-echo 10.1.1.1
 vrf vpn1
!
ip sla schedule 1 start now
```

IP SLA Monitor Configuration

```
ip sla monitor 1
 type echo protocol ipIcmpEcho 10.1.1.1
 vrf vpn1
!
ip sla monitor schedule 1 start now
```

IP SLA Template Configuration

```
Router(config)#ip sla auto template type ip icmp-echo 1
Router(config-tplt-icmp-ech)#source-ip 10.1.1.1
Router(config-tplt-icmp-ech)#vrf vpn1
Router(config-icmp-ech-params)#end
Router#
00:02:26: %SYS-5-CONFIG_I: Configured from console by console
Router# show ip sla auto template type ip icmp-echo 1
IP SLAs Auto Template: 1
    Measure Type: icmp-echo
    Description:
    IP options:
        Source IP: 10.1.1.1
        VRF: vpn1       TOS: 0x0
    Operation Parameters:
        Number of Packets: 10   Inter packet interval: 20
        Timeout: 5000           Threshold: 5000
    Statistics Aggregation option:
        Hours of statistics kept: 2
    Statistics Distributions options:
        Distributions characteristics: RTT
        Distributions bucket size: 20
        Max number of distributions buckets: 1
    Reaction Configuration: None
```

Related Commands

Command	Description
ip sla	Begins configuration for an IP SLAs operation and enters IP SLA configuration mode.
ip sla monitor	Begins configuration for an IP SLAs operation and enters IP SLA monitor configuration mode.
ip sla auto template	Begins configuration for an IP SLAs operation template and enters IP SLA template configuration mode.