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icmp-echo

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

icmp-echo {*destination-ip-address*| *destination-hostname*} [**source-ip** {*ip-address*| *hostname*}| **source-interface** *interface-name*]

Syntax Description

destination-ip-address | *destination-hostname*	Destination IPv4 or IPv6 address or hostname.
source-ip {*ip-address* | *hostname*}	(Optional) Specifies the source IP v4 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-interface *interface-name*	(Optional) Specifies the source interface for the operation.

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. This command replaces the **type echo protocol ipIcmpEcho**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 echo protocol ipIcmpEcho** 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 echo protocol ipIcmpEcho**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 echo protocol ipIcmpEcho**command. The keyword source-interface is not supported.

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 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 ICMP echo operations support both IPv4 and IPv6 addresses.

Examples

In the following example, IP SLAs operation 10 is created and configured as an echo operation using the ICMP protocol and the destination IPv4 address 172.16.1.175:

```
ip sla 10
 icmp-echo 172.16.1.175
!
ip sla schedule 10 start-time now
```

In the following example, IP SLAs operation 11 is created and configured as an echo operation using the ICMP protocol and the destination IPv6 address 2001:DB8:100::1:

```
ip sla 11
 icmp-echo 2001:DB8:100::1
!
ip sla schedule 11 start-time now
```

Related Commands

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

icmp-jitter

To configure an IP Service Level Agreements (SLAs) Internet Control Message Protocol (ICMP) jitter operation, use the **icmp-jitter** command in IP SLA configuration mode.

icmp-jitter {*destination-ip-address*| *destination-hostname*} [**interval** *milliseconds*] [**num-packets** *packet-number*] [**source-ip** {*ip-address*| *hostname*}]

Syntax Description

destination-ip-address | *destination-hostname*	Destination IP address or hostname.
interval *milliseconds*	(Optional) Specifies the time interval between packets (in milliseconds). The default value is 20 ms.
num-packets *packet-number*	(Optional) Specifies the number of packets to be sent in each operation. The default value is 10 packets per operation.
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.

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(6)T	This command was introduced.
12.0(32)SY	This command was integrated into Cisco IOS Release 12.0(32)SY.

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 ICMP jitter operation:

```
ip sla 1
 icmp-jitter 172.18.1.129 interval 40 num-packets 100 source-ip 10.1.2.34
 frequency 50
!
ip sla reaction-configuration 1 react jitterAvg threshold-value 5 2 action-type trap
threshold-type immediate
!
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.

ip sla

To begin configuring a Cisco IOS IP Service Level Agreements (SLAs) operation and enter IP SLA configuration mode, use the **ip sla**command in global configuration mode. To remove all configuration information for an operation, including the schedule of the operation, reaction configuration, and reaction triggers, use the no form of this command.

ip sla *operation-number*

no ip sla *operation-number*

Syntax Description

operation-number	Operation number used for the identification of the IP SLAs operation you want to configure.

Command Default

No IP SLAs operation is configured.

Command Modes

Global configuration

Command History

Release	Modification
12.4(4)T	This command was introduced. This command replaces the **ip sla monitor**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 **rtr** command.
12.2(33)SB	This command was integrated into Cisco IOS Release 12.2(33)SB. This command replaces the **ip sla monitor**command.
12.2(33)SXI	This command was integrated into Cisco IOS Release 12.2(33)SXI. This command replaces the **ip sla monitor**command.
12.2(52)SE	This command was integrated into Cisco IOS Release 12.2(52)SE.
15.1(1)SG	This command was integrated into Cisco IOS Release 15.1(1)SG.
Cisco IOS XE Release 3.3SG	This command was integrated into Cisco IOS XE Release 3.3SG.

Usage Guidelines

The **ip sla**command is used to begin configuration for an IP SLAs operation. Use this command to specify an identification number for the operation you are about to configure. After you enter this command, the router will enter IP SLA configuration mode.

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

IP SLAs allows a maximum of 2000 operations.

Debugging is supported only on the first 32 operation numbers.

After you configure an operation, you must schedule the operation. For information on scheduling an operation, refer to the **ip sla schedule** and **ip sla group schedule**global configuration commands. You can also optionally set reaction triggers for the operation. For information on reaction triggers, refer to the **ip sla reaction-configuration** and **ip sla reaction-trigger** global configuration commands.

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

Note After you schedule an operation, you cannot modify the configuration of the operation. To modify the configuration of the operation after it is scheduled, you must first delete the IP SLAs operation (using the **no ip sla**command) and then reconfigure the operation with the new operation parameters.

To display the current configuration settings of the operation, use the **show ip sla configuration**command in user EXEC or privileged EXEC mode.

Examples

In the following example, operation 99 is configured as a UDP jitter operation in an IPv4 network and scheduled to start running in 5 hours. The example shows the **ip sla** command being used in an IPv4 network.

```
ip sla 99
 udp-jitter 172.29.139.134 dest-port 5000 num-packets 20
!
ip sla schedule 99 life 300 start-time after 00:05:00
```

Note If operation 99 already exists and has not been scheduled, the command line interface will enter IP SLA configuration mode for operation 99. If the operation already exists and has been scheduled, this command will fail.

Related Commands

Command	Description
ip sla group schedule	Configures the group scheduling parameters for multiple IP SLAs operations.
ip sla reaction-configuration	Configures certain actions to occur based on events under the control of IP SLAs.

Command	Description
ip sla reaction-trigger	Defines a second IP SLAs operation to make the transition from a pending state to an active state when one of the trigger action type options are defined with the **ip sla reaction-configuration** command.
ip sla schedule	Configures the scheduling parameters for a single IP SLAs operation.
show ip sla configuration	Displays configuration values including all defaults for all IP SLAs operations or the specified operation.
show ip sla statistics	Displays the current operational status and statistics of all IP SLAs operations or a specified operation.
show ip sla statistics aggregated	Displays the aggregated statistical errors and distribution information for all IP SLAs operations or a specified operation.

ip sla group schedule

To perform multioperation scheduling for Cisco IOS IP Service Level Agreements (SLAs) operations, use the **ip sla group schedule** command in global configuration mode. To cause all the IP SLAs operations belonging to a multioperation schedule to become inactive, use the **no** form of this command.

ip sla group schedule *group-id* {*operation-ids*| **add** *operation-ids*| **delete** *operation-ids*| **reschedule**} **schedule-period** *seconds* [**ageout** *seconds*] [**frequency** [*seconds*| **range** *random-frequency-range*]] [**life** {**forever**| *seconds*}] [**start-time** {*hh* : *mm* [: *ss*] [*month day*| *day month*]| **pending**| **now**| **after** *hh* : *mm* : *ss*| **random** *milliseconds*}]

no ip sla group schedule *group-id*

Syntax Description

group-id	Identification number for the group of IP SLAs operation to be scheduled. The range is from 0 to 65535.
operation-ids	List of one or more identification (ID) numbers of the IP SLAs operations to be included in a new multioperation schedule. The length of this argument is up to 125 characters. Indicate ranges of operation ID numbers with a hyphen. Individual ID numbers and ranges of ID numbers are delimited by a comma. For example, enter a list of operation ID numbers in any of the following ways: • 2, 3, 4, 9, 20 • 10-20, 30-35, 60-70 • 2, 3, 4, 90-100, 105-115 In Cisco IOS Release 15.2(4)T and later releases and in Cisco IOS Release 15.1(1)T: A single operation ID is a valid option for this argument.
add *operation-ids*	Specifies the ID numbers of one or more IP SLAs operations to be added to an existing multioperation schedule.
delete *operation-ids*	Specifies the ID numbers of one or more IP SLAs operations to be removed from an existing multioperation schedule.

reschedule	Recalculates the start time for each IP SLAs operation within the multioperation schedule based on the number of operations and the schedule period. Use this keyword after an operation has been added to or removed from an existing multioperation schedule.
schedule-period *seconds*	Specifies the amount of time (in seconds) for which the group of IP SLAs operations is scheduled. The range is from 1 to 604800.
ageout *seconds*	(Optional) Specifies the number of seconds to keep the IP SLAs operations in memory when they are not actively collecting information. The default is 0 (never ages out).
frequency *seconds*	(Optional) Specifies the number of seconds after which each IP SLAs operation is restarted. The frequency of all operations belonging to the multioperation schedule is overridden and set to the specified frequency. The range if from 1 to 604800. **Note** The default frequency is the value specified for the schedule period.
frequency range *random-frequency-range*	(Optional) Enables the random scheduler option. See the "Usage Guidelines" section for more information. The random scheduler option is disabled by default. The frequencies at which the IP SLAs operations within the multioperation schedule will restart are chosen randomly within the specified frequency range (in seconds). Separate the lower and upper values of the frequency range with a hyphen (for example, 80-100).
life forever	(Optional) Schedules the IP SLAs operations to run indefinitely.
life *seconds*	(Optional) Specifies the number of seconds the IP SLAs operations will actively collect information. The default is 3600 (one hour).
start-time	(Optional) Indicates the time at which the group of IP SLAs operations will start collecting information. If the **start-time** is not specified, no information is collected until the **start-time** is configured or a trigger occurs that performs a **start-time now**.

hh **:** *mm* [**:** *ss*]	(Optional) Specifies an absolute start time for the multioperation schedule using hours, minutes, and (optionally) seconds. Use the 24-hour clock notation. For example, **start-time 01:02** means "start at 1:02 a.m.," and **start-time 13:01:30** means "start at 1:01 p.m. and 30 seconds." The current day is implied unless you specify a *month* and *day*.
month	(Optional) Specifies the name of the month in which to start the multioperation schedule. If month is not specified, the current month is used. Use of this argument requires that a day be specified. You can specify the month by using either the full English name or the first three letters of the month.
day	(Optional) Specifies the number of the day (in the range 1 to 31) on which to start the multioperation schedule. If a day is not specified, the current day is used. Use of this argument requires that a month be specified.
pending	(Optional) Indicates that no information is being collected. This is the default value.
now	(Optional) Indicates that the multioperation schedule should start immediately.
after *hh* **:** *mm* **:** *ss*	(Optional) Indicates that the multioperation schedule should start *hh* hours, *mm* minutes, and *ss* seconds after this command was entered.
random *milliseconds*	(Optional) Adds a random number of milliseconds (between 0 and the specified value) to the current time, after which the operation will start. The range is from 0 to 10000.

Command Default

The multioperation schedule is placed in a **pending** state (that is, the group of IP SLAs operations are enabled but are not actively collecting information).

Command Modes

Global configuration

Command History

Release	Modification
12.4(4)T	This command was introduced. This command replaces the **ip sla monitor group schedule** command.

Release	Modification
12.4(6)T	The following arguments and keywords were added: • **add** *operation-ids* • **delete** *operation-ids* • **reschedule**
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 **rtr group schedule** command. The **range** keyword and *random-frequency-range* argument were added.
12.2(33)SB	This command was integrated into Cisco IOS Release 12.2(33)SB. This command replaces the **ip sla monitor group schedule**command. The **range** keyword and *random-frequency-range* argument were added.
12.2(33)SXI	This command was integrated into Cisco IOS Release 12.2(33)SXI. This command replaces the **ip sla monitor group schedule**command. The **range** keyword and *random-frequency-range* argument were added.
12.2(52)SE	This command was integrated into Cisco IOS Release 12.2(52)SE.
15.1(1)T	This command was modified. Support for scheduling a single operation was added.
15.1(4)M	This command was modified. A random scheduler will not schedule an IP SLAs probe for which enhanced-history is configured. A fixed frequency multioperation scheduler will not schedule an IP SLAs probe for which enhanced history is configured if the enhanced-history interval is not a multiple of the scheduler frequency.
15.1(1)SG	This command was integrated into Cisco IOS Release 15.1(1)SG.
Cisco IOS XE Release 3.3SG	This command was integrated into Cisco IOS XE Release 3.3SG.
15.2(4)T	This command was modified. Support for scheduling a single operation was added.
15.3(1)T	This command was modified. The **random** keyword was added for scheduling a random start time.

Though the IP SLAs multioperation scheduling functionality helps in scheduling thousands of operations, you should be cautious when specifying the number of operations, the schedule period, and the frequency to avoid any significant CPU impact.

For example, consider a scenario where you are scheduling 1 to 780 operations at a schedule period of 60 seconds. The command would be as follows:

ip sla group schedule 2 1-780 schedule-period 60 start-time now

IP SLAs calculates how many operations it should start in each 1-second interval by dividing the number of operations by the schedule period (780 operations divided by 60 seconds, which is 13 operations per second). Operations 1 to 13 in multioperation group 2 start after 0 seconds, operations 14 to 26 start after 1 second, operations 27 to 40 start after 2 seconds, and the iteration continues until operations 768 to 780 start after 59 seconds. This high value of operations starting at every 1-second interval (especially for jitter operations) can load the CPU to very high values.

On a Cisco 2600 router, the maximum recommended value of operations per second is 6 or 7 (approximately 350 to 400 operations per minute). Exceeding this value of 6 or 7 operations per second could cause major performance (CPU) impact. Note that the maximum recommended value of operations per second varies from platform to platform.

Note No warning messages will be displayed if IP SLAs multiple operations scheduling leads to a high number of operations starting per second.

When you reboot the router, the IP SLAs multiple operations scheduling functionality schedules the operations in the same order as was done before the reboot. For example, assume the following operation had been scheduled:

ip sla group schedule 2 1-20 schedule-period 40 start-time now

Over a range of 40 seconds, 20 operations have to be started (that is, one operation every 2 seconds). After the system reboot, operation 1 will start at *t* seconds and operation 2 starts at *t* +2 seconds, operation 3 starts at *t* +4 seconds, and so on.

The IP SLAs multiple operations scheduling functionality schedules the maximum number of operations possible without aborting. However, this functionality skips those IP SLAs operations that are already running or those that are not configured and hence do not exist. The total number of operations will be calculated based on the number of operations specified in the command, irrespective of the number of operations that are missing or already running. The IP SLAs multiple operations scheduling functionality displays a message showing the number of active and missing operations. However, these messages are displayed only if you schedule operations that are not configured or are already running.

Use the **random** keyword with the **start-time** keyword to randomly choose a scheduled start time for the operation. A random number of milliseconds between 0 and the specified value will be added to the current time to define the start time. The value provided for the random start time applies only to the first time the operation runs after which normal frequency rules apply.

In Cisco IOS Release 15.2(4)T and later releases, and in Cisco IOS Release 15.1(1)T, a single operation ID is a valid option for the *operation-ids* argument. Before Cisco IOS Release 15.1(1)T and in releases between Cisco IOS Release 15.1(1)T and 15.2(4)T, the **ip sla group schedule** command was not used to schedule a single operation because the only valid options for the *operation-ids* argument were a list (id,id,id) of IDs, a range (id-id) of IDs, or a combination of lists and ranges. If you attempted to use this command to schedule a single operation, the following messages were displayed:

```
Router(config)# sla group schedule 1 1 schedule-period 5 start-time now
%Group Scheduler: probe list wrong syntax
%Group schedule string of probe ID's incorrect
```

Before Cisco IOS Release 15.1(4)M, if an IP SLAs probe that included the **history enhanced** command was added to a multioperation scheduler and the enhanced-history interval was not a multiple of the scheduler frequency, the enhanced-history interval was overwritten and set to a multiple of the scheduler frequency.

In Cisco IOS Release 15.1(4)M and later releases, if an IP SLAs probe that includes the **history enhanced** command is added to a multioperation scheduler and the enhanced-history interval is not a multiple of the scheduler frequency, the probe is not scheduled and the following message is displayed:

```
Warning, some probes not scheduled because they have Enhanced History Interval which not
multiple of group frequency.
```

The IP SLAs random scheduler option provides the capability to schedule multiple IP SLAs operations to begin at random intervals over a specified duration of time. The random scheduler option is disabled by default. To enable the random scheduler option, you must configure the **frequency range** *random-frequency-range* keywords and argument. The operations within the multioperation schedule restart at uniformly distributed random frequencies within the specified frequency range. The following guidelines apply for setting the frequency range:

- The starting value of the frequency range should be greater than the timeout values of all the operations in the multioperation schedule.
- The starting value of the frequency range should be greater than the schedule period (amount of time for which the group of operations is scheduled). This guideline ensures that the same operation does not get scheduled more than once within the schedule period.

The following guidelines apply if the random scheduler option is enabled:

- The individual operations in a multioperation schedule will be uniformly distributed to begin at random intervals over the schedule period.
- The operations within the multioperation schedule restart at uniformly distributed random frequencies within the specified frequency range.
- The minimum time interval between the start of each operation in a multioperation schedule is 100 milliseconds (0.1 seconds). If the random scheduler option is disabled, the minimum time interval is 1 second.
- Only one operation can be scheduled to begin at any given time. If the random scheduler option is disabled, multiple operations can begin at the same time.
- The first operation will always begin at 0 milliseconds of the schedule period.
- The order in which each operation in a multioperation schedule begins is random.
- Before Cisco IOS Release 15.1(4)M, if an IP SLAs probe that includes the **history enhanced** command is added to a random scheduler, the probe may or may not be scheduled.

- In Cisco IOS Release 15.1(4)M and later releases, if an IP SLAs probe that includes the **history enhanced** command is added to a random scheduler, the probe is not scheduled and the following message is displayed:

```
Warning, some probes not scheduled because they have Enhanced History configured.
```

The following guidelines apply when an IP SLAs operation is added to or deleted from an existing multioperation schedule:

- If an operation is added that already belongs to the multioperation schedule, no action is taken.
- If two or more operations are added after the multioperation schedule has started, then the start times of the newly added operations will be uniformly distributed based on a time interval that was calculated prior to the addition of the new operations. If two or more operations are added before the multioperation schedule has started, then the time interval is recalculated based on both the existing and newly added operations.
- If an operation is added to a multioperation schedule in which the random scheduler option is enabled, then the start time and frequency of the newly added operation will be randomly chosen within the specified parameters.
- If an operation is added to a multioperation schedule in which the existing operations have aged out or the lifetimes of the existing operations have ended, the newly added operation will start and remain active for the amount of time specified by the multioperation schedule.
- If an active operation is deleted, then the operation will stop collecting information and become inactive.
- If the **ip sla group schedule** *group-id* **reschedule** command is entered after an operation is added or deleted, the time interval between the start times of the operations is recalculated based on the new number of operations belonging to the multioperation schedule.

Examples

The following example shows how to schedule IP SLAs operations 3, 4, and 6 to 10 (identified as group 1) using multioperation scheduling. In this example, the operations are scheduled to begin at equal intervals over a schedule period of 20 seconds. The first operation (or set of operations) is scheduled to start immediately. Since the frequency is not specified, it is set to the value of the schedule period (20 seconds) by default.

```
ip sla group schedule 1 3, 4, 6-10 schedule-period 20 start-time now
```

The following example shows how to schedule IP SLAs operations 1 to 3 (identified as group 2) using the random scheduler option. In this example, the operations are scheduled to begin at random intervals over a schedule period of 50 seconds. The first operation is scheduled to start immediately. The frequency at which each operation will restart will be chosen randomly within the range of 80 to 100 seconds.

```
ip sla group schedule 2 1-3 schedule-period 50 frequency range 80-100 start-time now
```

Related Commands

Command	Description
ip sla schedule	Configures the scheduling parameters for a single IP SLAs operation.

Command	Description
show ip sla configuration	Displays the configuration details of the IP SLAs operation.
show ip sla group schedule	Displays the group scheduling details of the IP SLAs operations.

ip sla logging traps

To enable the generation of Simple Network Management Protocol (SNMP) system logging messages specific to Cisco IOS IP Service Level Agreements (SLAs) trap notifications, use the **ip sla logging traps** command in global configuration mode. To disable IP SLAs system logging SNMP traps, use the **no** form of this command.

ip sla logging traps

no ip sla logging traps

Syntax Description

This command has no arguments or keywords.

Command Default

SNMP system logging messages specific to IP SLAs trap notifications are not generated.

Command Modes

Global configuration

Command History

Release	Modification
12.4(4)T	This command was introduced. This command replaces the **ip sla monitor logging traps**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 **rtr logging traps** command.
12.2(33)SB	This command was integrated into Cisco IOS Release 12.2(33)SB. This command replaces the **ip sla monitor logging traps**command.
12.2(33)SXI	This command was integrated into Cisco IOS Release 12.2(33)SXI. This command replaces the **ip sla monitor logging traps**command.
12.2(52)SE	This command was integrated into Cisco IOS Release 12.2(52)SE.
15.1(1)SG	This command was integrated into Cisco IOS Release 15.1(1)SG.
Cisco IOS XE Release 3.3SG	This command was integrated into Cisco IOS XE Release 3.3SG.

Usage Guidelines

SNMP trap notifications for IP SLAs can be configured as a triggered action, to be sent when monitored values exceed an upper threshold or fall below a lower threshold, or when a set of defined conditions are met. For example, an SNMP trap can be triggered by five consecutive timeouts during an IP SLAs operation. The sending of SNMP traps is one of the options for triggered actions that can be configured for IP SLAs threshold

violations. To configure proactive threshold monitoring parameters for an IP SLAs operation, use the **ip sla reaction-configuration**command in global configuration mode.

SNMP traps for IP SLAs are supported by the CISCO-RTTMON-MIB and CISCO-SYSLOG-MIB. Use the **snmp-server enable traps rtr** command to enable the sending of IP SLAs SNMP trap notifications.

Examples

The following example shows the configuration of IP SLAs traps to be triggered for round-trip time (RTT) violations and Voice over IP (VoIP) mean opinion score (MOS) violations, and the necessary SNMP configuration for enabling these SNMP logging traps:

```
ip sla 1
 udp-jitter 209.165.200.225 dest-port 9234
!
ip sla schedule 1 start now life forever
ip sla reaction-configuration 1 react rtt threshold-type immediate threshold-value 3000
2000 action-type trapOnly
ip sla reaction-configuration 1 react MOS threshold-type consecutive 4 threshold-value 390
 220 action-type trapOnly
!
ip sla logging traps
snmp-server enable traps rtr
```

Related Commands

Command	Description
ip sla reaction-configuration	Configures proactive threshold monitoring parameters for an IP SLAs operation.
logging on	Controls (enables or disables) system message logging globally.

ip sla low-memory

To specify how much unused memory must be available to allow Cisco IOS IP Service Level Agreements (SLAs) configuration, use the **ip sla low-memory**command in global configuration mode. To remove the type configuration for the operation, use the **no** form of this command.

ip sla low-memory *bytes*

no ip sla low-memory

Syntax Description

bytes	Specifies amount of memory, in bytes, that must be available to configure IP SLA. The range is from 0 to the maximum amount of free memory bytes available.

Command Default

The default amount of memory is 25 percent of the memory available on the system.

Command Modes

Global configuration

Command History

Release	Modification
12.4(4)T	This command was introduced. This command replaces the **ip sla monitor low-memory** 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 **rtr low-memory** command.
12.2(33)SB	This command was integrated into Cisco IOS Release 12.2(33)SB. This command replaces the **ip sla monitor low-memory**command.
12.2(33)SXI	This command was integrated into Cisco IOS Release 12.2(33)SXI. This command replaces the **ip sla monitor low-memory**command.
12.2(52)SE	This command was integrated into Cisco IOS Release 12.2(52)SE.

Usage Guidelines

The **ip sla low-memory** command allows you to specify the amount of memory that the IP SLAs can use. If the amount of available free memory falls below the value specified in the **ip sla low-memory** command, then the IP SLAs will not allow new operations to be configured. If this command is not used, the default low-memory value is 25 percent. This means that if 75 percent of system memory has been utilized you will not be able to configure any IP SLAs characteristics.

The value of the **ip sla low-memory** command should not exceed the amount of free memory available on the system. To determine the amount of free memory available on the system, use the **show memory** user EXEC or privileged EXEC command.

Examples

In the following example, the router is configured so that no less than 2 MB of memory will be free for IP SLAs configuration:

```
ip sla low-memory 2097152
```

Related Commands

Command	Description
ip sla	Begins configuration for an IP SLAs operation and enters IP SLA configuration mode.
show memory	Displays statistics about memory, including memory-free pool statistics.

ip sla reaction-trigger

To define a second Cisco IOS IP Service Level Agreements (SLAs) operation to make the transition from a pending state to an active state when one of the trigger action type options are defined with the **ip sla reaction-configuration** command, use the **ip sla reaction-trigger** command in global configuration mode. To remove the trigger combination, use the no form of this command.

ip sla reaction-trigger *operation-number target-operation*

no ip sla reaction-trigger *operation*

Syntax Description

operation-number	Number of the operation for which a trigger action type is defined (using the **ip sla reaction-configuration** globalconfiguration command).
target-operation	Number of the operation that will be triggered into an active state.

Command Default

No trigger combination is defined.

Command Modes

Global configuration

Command History

Release	Modification
12.4(4)T	This command was introduced. This command replaces the **ip sla monitor reaction-trigger** 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 **rtr reaction-trigger** command.
12.2(33)SB	This command was integrated into Cisco IOS Release 12.2(33)SB. This command replaces the **ip sla monitor reaction-trigger**command.
12.2(33)SXI	This command was integrated into Cisco IOS Release 12.2(33)SXI. This command replaces the **ip sla monitor reaction-trigger**command.
12.2(52)SE	This command was integrated into Cisco IOS Release 12.2(52)SE.
15.1(1)SG	This command was integrated into Cisco IOS Release 15.1(1)SG.
Cisco IOS XE Release 3.3SG	This command was integrated into Cisco IOS XE Release 3.3SG.

Usage Guidelines

Triggers are usually used for diagnostics purposes and are not intended for use during normal operation conditions.

Examples

In the following example, a trigger action type is defined for IP SLAs operation 2. When operation 2 experiences certain user-specified threshold violation events while it is actively collecting statistical information, the operation state of IP SLAs operation 1 will be triggered to change from pending to active.

```
ip sla reaction-trigger 2 1
```

Related Commands

Command	Description
ip sla	Begins configuration for an IP SLAs operation and enters IP SLA configuration mode.
ip sla reaction-configuration	Configures certain actions to occur based on events under the control of the IP SLA.
ip sla schedule	Configures the time parameters for an IP SLAs operation.

ip sla reset

To perform a shutdown and restart of the Cisco IOS IP Service Level Agreements (SLAs) engine, use the **ip sla reset**command in global configuration mode.

ip sla reset

Syntax Description

This command has no arguments or keywords.

Command Default

None

Command Modes

Global configuration

Command History

Release	Modification
12.4(4)T	This command was introduced. This command replaces the **ip sla monitor reset** 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 **rtr reset** command.
12.2(33)SB	This command was integrated into Cisco IOS Release 12.2(33)SB. This command replaces the **ip sla monitor reset**command.
12.2(33)SXI	This command was integrated into Cisco IOS Release 12.2(33)SXI. This command replaces the **ip sla monitor reset**command.
12.2(52)SE	This command was integrated into Cisco IOS Release 12.2(52)SE.

Usage Guidelines

The **ip sla reset** command stops all IP SLAs operations, clears IP SLAs configuration information, and returns the IP SLAs feature to the startup condition. This command does not reread the IP SLAs configuration stored in the startup configuration in NVRAM. You must retype the configuration or load a previously saved configuration file.

Note The **ip sla reset** command does not remove IP SLAs label switched path (LSP) Health Monitor configurations from the running configuration. Use the **auto ip sla mpls-lsp-monitor reset** command to remove LSP Health Monitor configurations from the running configuration.

Note Use the **ip sla reset** command only in extreme situations such as the incorrect configuration of a number of operations.

Examples

The following example shows how to reset the Cisco IOS IP SLAs engine, clearing all stored IP SLAs information and configuration:

```
ip sla reset
```

Related Commands

Command	Description
ip sla restart	Restarts a stopped IP SLAs operation.

ip sla responder

To enable the Cisco IOS IP Service Level Agreements (SLAs) Responder for general IP SLAs operations, use the **ip sla responder** command in global configuration mode. To disable the IP SLAs Responder, use the **no** form of this command.

ip sla responder

no ip sla responder

Syntax Description

This command has no arguments or keywords.

Command Default

The IP SLAs Responder is disabled.

Command Modes

Global configuration

Command History

Release	Modification
12.4(4)T	This command was introduced. This command replaces the **ip sla monitor responder** 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 **rtr responder** command.
12.2(33)SB	This command was integrated into Cisco IOS Release 12.2(33)SB. This command replaces the **ip sla monitor responder**command.
12.2(33)SXI	This command was integrated into Cisco IOS Release 12.2(33)SXI. This command replaces the **ip sla monitor responder**command.
12.2(52)SE	This command was integrated into Cisco IOS Release 12.2(52)SE.
15.1(1)SG	This command was integrated into Cisco IOS Release 15.1(1)SG.
Cisco IOS XE Release 3.3SG	This command was integrated into Cisco IOS XE Release 3.3SG.

Usage Guidelines

This command is used on the destination device for IP SLAs operations to enable the sending and receiving of IP SLAs control packets. Enabling the IP SLAs Responder allows the generation of packet loss statistics on the device sending IP SLAs operations.

Prior to sending an operation packet to the IP SLAs Responder, the IP SLAs operation sends a control message to the IP SLAs Responder to enable the destination port.

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

Examples

The following example shows how to enable the IP SLAs Responder:

```
ip sla responder
```

Related Commands

Command	Description
ip sla	Begins configuration for an IP SLAs operation and enters IP SLA configuration mode.
ip sla responder type tcpConnect ipaddress	Enables the IP SLAs Responder for TCP Connect operations.
ip sla responder type udpEcho ipaddress	Enables the IP SLAs Responder for UDP echo and jitter operations.

ip sla responder udp-echo ipaddress

To enable the Cisco IOS IP Service Level Agreements (SLAs) Responder for User Datagram Protocol (UDP) echo or jitter operations, use the **ip sla responder udp-echo ipaddress**command in global configuration mode. To disable the IP SLAs Responder, use the **no** form of this command.

ip sla responder udp-echo ipaddress *ip-address* **port** *port-number*

no ip sla responder udp-echo ipaddress *ip-address* **port** *port-number*

Syntax Description

ip-address	Destination IP address.
port *port-number*	Specifies the destination port number.

Command Default

The IP SLAs Responder is disabled.

Command Modes

Global configuration (config)

Command History

Release	Modification
12.4(4)T	This command was introduced. This command replaces the **ip sla monitor responder type udpEcho ipaddress**command.
12.0(32)SY	This command was integrated into Cisco IOS Release 12.0(32)SY.

Command History

12.2(33)SRB	This command was integrated into Cisco IOS Release 12.2(33)SRB. This command replaces the **rtr responder type udpEcho**command.
12.2(33)SB	This command was integrated into Cisco IOS Release 12.2(33)SB. This command replaces the **ip sla monitor responder type udpEcho ipaddress**command.
12.2(33)SXI	This command was integrated into Cisco IOS Release 12.2(33)SXI. This command replaces the **ip sla monitor responder type udpEcho ipaddress**command.

Usage Guidelines

This command is used on the destination device for IP SLAs operations to enable UDP echo and jitter (UDP+) operations with control disabled.

Examples

The following example shows how to enable the IP SLAs Responder for jitter operations:

```
ip sla responder udp-echo ipaddress A.B.C.D port 1
```

Related Commands

Command	Description
ip sla	Begins configuration for an IP SLAs operation and enters IP SLA configuration mode.
ip sla responder	Enables the IP SLAs Responder for nonspecific IP SLAs operations.

ip sla schedule

To configure the scheduling parameters for a single Cisco IOS IP Service Level Agreements (SLAs) operation, use the **ip sla schedule**command in global configuration mode. To stop the operation and place it in the default state (pending), use the **no** form of this command.

ip sla schedule *operation-number* [**life** {**forever**| *seconds*}] [**start-time** {*hh* : *mm* [: *ss*] [*month day*| *day month*]| **pending**| **now**| **after** *hh* : *mm* : *ss*| **random** *milliseconds*}] [**ageout** *seconds*] **[recurring]**

no ip sla schedule *operation-number*

Syntax Description

operation-number	Number of the IP SLAs operation to schedule.
life forever	(Optional) Schedules the operation to run indefinitely.
life *seconds*	(Optional) Number of seconds the operation actively collects information. The default is 3600 seconds (one hour).
start-time	(Optional) Time when the operation starts.
hh **:** *mm* [**:** *ss*]	Specifies an absolute start time using hour, minute, and (optionally) second. Use the 24-hour clock notation. For example, **start-time 01:02** means "start at 1:02 a.m.," and **start-time 13:01:30** means "start at 1:01 p.m. and 30 seconds." The current day is implied unless you specify a *month* and *day*.
month	(Optional) Name of the month to start the operation in. If month is not specified, the current month is used. Use of this argument requires that a day be specified. You can specify the month by using either the full English name or the first three letters of the month.
day	(Optional) Number of the day (in the range 1 to 31) to start the operation on. If a day is not specified, the current day is used. Use of this argument requires that a month be specified.
pending	(Optional) No information is collected. This is the default value.
now	(Optional) Indicates that the operation should start immediately.
after *hh* **:** *mm* **:** *ss*	(Optional) Indicates that the operation should start *hh* hours, *mm* minutes, and *ss* seconds after this command was entered.

random *milliseconds*	(Optional) Adds a random number of milliseconds (between 0 and the specified value) to the current time, after which the operation will start. The range is from 0 to 10000.
ageout *seconds*	(Optional) Number of seconds to keep the operation in memory when it is not actively collecting information. The default is 0 seconds (never ages out).
recurring	(Optional) Indicates that the operation will start automatically at the specified time and for the specified duration every day.

Command Default

The operation is placed in a pending state (that is, the operation is enabled but not actively collecting information).

Command Modes

Global configuration

Command History

Release	Modification
12.4(4)T	This command was introduced. This command replaces the **ip sla monitor schedule** 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 **rtr schedule** command.
12.2(33)SB	This command was integrated into Cisco IOS Release 12.2(33)SB. This command replaces the **ip sla monitor schedule**command.
12.2(33)SXI	This command was integrated into Cisco IOS Release 12.2(33)SXI. This command replaces the **ip sla monitor schedule**command.
12.2(52)SE	This command was integrated into Cisco IOS Release 12.2(52)SE.
15.1(1)SG	This command was integrated into Cisco IOS Release 15.1(1)SG.
Cisco IOS XE Release 3.3SG	This command was integrated into Cisco IOS XE Release 3.3SG.
15.3(1)T	This command was modified. The **random** keyword was added for scheduling a random start time.

Usage Guidelines

After you schedule the operation with the **ip sla schedule** command, you cannot change the configuration of the operation. To change the configuration of the operation, use the **no** form of the **ip sla**global configuration command and reenter the configuration information.

If the operation is in a pending state, you can define the conditions under which the operation makes the transition from pending to active with the **ip sla reaction-trigger**and **ip sla reaction-configuration** global configuration commands. When the operation is in an active state, it immediately begins collecting information.

Use the **random** keyword with the **start-time** keyword to randomly choose a scheduled start time for the operation. A random number of milliseconds between 0 and the specified value will be added to the current time to define the start time. The value provided for the random start time applies only to the first time the operation runs after which normal frequency rules apply.

The following time line shows the age-out process of the operation:

```
W----------------------X----------------------Y----------------------Z
```

where:

- W is the time the operation was configured with the **ip sla**global configuration command.
- X is the start time or start of life of the operation (that is, when the operation became “active”).
- Y is the end of life as configured with the **ip sla schedule** global configuration command (life seconds have counted down to zero).
- Z is the age out of the operation.

Age out starts counting down at W and Y, is suspended between X and Y, and is reset to its configured size at Y.

The operation to can age out before it executes (that is, Z can occur before X). To ensure that this does not happen, configure the difference between the operation’s configuration time and start time (X and W) to be less than the age-out seconds.

Note The total RAM required to hold the history and statistics tables is allocated at the time of scheduling the IP SLAs operation. This prevents router memory problems when the router gets heavily loaded and lowers the amount of overhead an IP SLAs operation causes on a router when it is active.

The **recurring** keyword is supported only for scheduling single IP SLAs operations. You cannot schedule multiple IP SLAs operations using the **ip sla schedule** command. The **life** value for a recurring IP SLAs operation should be less than one day. The **ageout** value for a recurring operation must be “never” (which is specified with the value 0), or the sum of the **life** and **ageout**values must be more than one day. If the **recurring** option is not specified, the operations are started in the existing normal scheduling mode.

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

Examples

In the following example, operation 25 begins actively collecting data at 3:00 p.m. on April 5. This operation will age out after 12 hours of inactivity, which can be before it starts or after it has finished with its life. When

this operation ages out, all configuration information for the operation is removed (that is, the configuration information is no longer in the running configuration in RAM).

```
ip sla schedule 25 life 43200 start-time 15:00 apr 5 ageout 43200
```

In the following example, operation 1 begins collecting data after a 5-minute delay:

```
ip sla schedule 1 start-time after 00:05:00
```

In the following example, operation 3 begins collecting data immediately and is scheduled to run indefinitely:

```
ip sla schedule 3 start-time now life forever
```

In the following example, operation 15 begins automatically collecting data every day at 1:30 a.m.:

```
ip sla schedule 15 start-time 01:30:00 recurring
```

Related Commands

Command	Description
ip sla	Begins configuration for an IP SLAs operation and enters IP SLA configuration mode.
ip sla group schedule	Performs group scheduling for IP SLAs operations.
ip sla reaction-configuration	Configures certain actions to occur based on events under the control of the IP SLA.
ip sla reaction-trigger	Defines a second IP SLAs operation to make the transition from a pending state to an active state when one of the trigger action-type options is defined with the **ip sla reaction-configuration** global configuration command.
show ip sla configuration	Displays the configuration details of the IP SLAs operation.

owner

To configure the Simple Network Management Protocol (SNMP) owner of a Cisco IOS IP Service Level Agreements (SLAs) operation, use the **owner**command in the appropriate submode of IP SLA configuration, IP SLA auto Ethernet configuration, IP SLA monitor configuration, or IP SLA Y.1737 configuration mode. To return to the default value, use the **no** form of this command.

owner *text*

no owner

Syntax Description

text	Name of the SNMP owner. Value is from 0 to 255 ASCII characters.

Command Default

No owner 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)

Multicast UDP jitter configuration (config-ip-sla-multicast-jitter-oper)

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)

Video (config-ip-sla-video)

VoIP configuration (config-ip-sla-voip)

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 Y.1731 Configuration

Delay configuration (config-sla-y1731-delay)

Loss configuration (config-sla-y1731-loss)

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.

Release	Modification
12.2(33)SXI	The Ethernet echo, Ethernet jitter, and Ethernet parameters configuration modes were added.
12.2(58)SE	This command was modified. Support for the video configuration submode of IP SLA configuration mode was added.
15.1(2)S	This command was modified. Support for the IP SLA Y.1731 configuration mode was added.
15.2(2)T	This command with support for the video configuration submode of IP SLA configuration mode was integrated into Cisco IOS Release 15.2(2)T.
15.1(1)SG	This command was integrated into Cisco IOS Release 15.1(1)SG.
Cisco IOS XE Release 3.3SG	This command was integrated into Cisco IOS XE Release 3.3SG.
15.2(4)M	This command was modified. The multicast UDP jitter configuration mode was added.
15.3(1)S	This command was integrated into Cisco IOS Release 15.3(1)S.
Cisco IOS XE Release 3.8S	This command was integrated into Cisco IOS XE Release 3.8S.
15.1(2)SG	This command was integrated into Cisco IOS Release 15.1(2)SG.
Cisco IOS XE Release 3.4SG	This command was integrated into Cisco IOS XE Release 3.4SG.

Usage Guidelines

The owner name contains one or more of the following: ASCII form of the network management station's transport address, network management station name (that is, the domain name), and network management personnel's name, location, or phone number. In some cases, the agent itself will be the owner of the operation. In these cases, the name can begin with "agent."

The **owner** 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 the table below). 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 **owner** command varies depending on the Cisco IOS release you are running (see the table below) and the operation type configured.

Table 1: 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

Examples

The following examples show how to set the owner of an IP SLAs ICMP echo operation to 172.16.1.189 cwb.cisco.com User1 RTP 555-0100.

Examples

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

```
Router# show ip sla configuration 1

ip sla 1
 icmp-echo 172.16.1.176
 owner 172.16.1.189 cwb.cisco.com User1 RTP 555-0100
!
ip sla schedule 1 life forever start-time now
```

Examples

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

```
Router# show ip sla configuration 1

ip sla monitor 1
 type echo protocol ipIcmpEcho 172.16.1.176
 owner 172.16.1.189 cwb.cisco.com User1 RTP 555-0100
!
ip sla monitor schedule 1 life forever start-time now
```

Examples

This example shows the **owner** command being used in the configuration for an IP SLAs Metro 3.0 (ITU-T Y.1731) delay operation:

```
Router# show ip sla configuration 10

IP SLAs Infrastructure Engine-III
Entry number: 10
Owner: 172.16.1.189 cwb.cisco.com User1 RTP 555-0100
Tag:
Operation timeout (milliseconds): 5000
Ethernet Y1731 Delay Operation
Frame Type: DMM
Domain: xxx
Vlan: yyy
Target Mpid: 101
Source Mpid: 100
CoS: 4
   Max Delay: 5000
   Request size (Padding portion): 64
   Frame Interval: 1000
```

```
   Clock: Not In Sync
Threshold (milliseconds): 5000
.
.
.
```

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.

path-echo

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

path-echo {*destination-ip-address*| *destination-hostname*} [**source-ip** {*ip-address*| *hostname*}]

Syntax Description

destination-ip-address | *destination-hostname*	Destination IP address or hostname.
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.

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. This command replaces the **type pathEcho protocol ipIcmpEcho**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 pathEcho protocol ipIcmpEcho** command.
12.2(33)SB	This command was integrated into Cisco IOS Release 12.2(33)SB. This command replaces the **type pathEcho protocol ipIcmpEcho**command.
12.2(33)SXI	This command was integrated into Cisco IOS Release 12.2(33)SXI. This command replaces the **type pathEcho protocol ipIcmpEcho**command.
15.2(3)T	This command was modified. Support for IPv6 addresses was added.
Cisco IOS XE Release 3.7S	This command was integrated into Cisco IOS XE Release 3.7S.
15.1(2)SG	This command was integrated into Cisco IOS Release 15.1(2)SG.
Cisco IOS XE Release 3.4SG	This command was integrated into Cisco IOS XE Release 3.4SG.

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

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 10
 path-echo 172.16.1.175
!
ip sla schedule 10 start-time now
```

In the following example, IP SLAs operation 1 is configured as an ICMP path echo operation in Cisco IOS Release 15.2(3)T using the IP/ICMP protocol and an IPv6 destination address:

```
ip sla 1
 path-echo 2001:10:10:10::3
!
ip sla schedule 10 start-time now
```

Related Commands

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

path-jitter

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

path-jitter {*destination-ip-address*| *destination-hostname*} [**source-ip** {*ip-address*| *hostname*}] [**num-packets** *packet-number*] [**interval** *milliseconds*] **[targetOnly]**

Syntax Description

destination-ip-address | *destination-hostname*	Destination IP address or hostname.
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.
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 is 20.
targetOnly	(Optional) Sends test packets to the destination only (path is not traced).

Command Default

No IP SLAs operation type is configured for 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 pathJitter 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 pathJitter dest-ipaddr** command.
12.2(33)SB	This command was integrated into Cisco IOS Release 12.2(33)SB. This command replaces the **type pathJitter dest-ipaddr**command.
12.2(33)SXI	This command was integrated into Cisco IOS Release 12.2(33)SXI. This command replaces the **type pathJitter dest-ipaddr**command.

Release	Modification
15.2(3)T	This command was modified. Support for IPv6 addresses was added.
Cisco IOS XE Release 3.7S	This command was integrated into Cisco IOS XE Release 3.7S.
15.1(2)SG	This command was integrated into Cisco IOS Release 15.1(2)SG.
Cisco IOS XE Release 3.4SG	This command was integrated into Cisco IOS XE Release 3.4SG.

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**global configuration command) and then reconfigure the operation with the new operation type.

Examples

The following example show 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 2
 path-jitter 172.69.5.6 num-packets 50 interval 30
!
ip sla schedule 2 start-time now
```

The following example show how to enable the ICMP path jitter operation in an IPv6 network to trace the IP path to the destination 2001:10:10:10::3 and send 50 test packets to each hop with an interval of 30 ms between each test packe. IPv6 addresses are supported in Cisco IOS Release 15.2(3)T and later releases.

```
ip sla 20
 path-jitter 2001:10:10:10::3 num-packets 50 interval 30
!
ip sla schedule 20 start-time now
```

Related Commands

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

paths-of-statistics-kept

To set the number of paths for which statistics are maintained per hour for a Cisco IOS IP Service Level Agreements (SLAs) operation, use the **paths-of-statistics-kept**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.

paths-of-statistics-kept *size*

no paths-of-statistics-kept

Syntax Description

size	Number of paths for which statistics are maintained per hour. The default is 5.

Command Default

5 paths

Command Modes

IP SLA Configuration

ICMP path echo configuration (config-ip-sla-pathEcho)

IP SLA Monitor Configuration

ICMP path echo configuration (config-sla-monitor-pathEcho)

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.

Usage Guidelines

A path is the route the request packet of the operation traverses through the network to get to its destination. The packet may take a different path to reach the same destination for each IP SLAs operation.

When the number of paths reaches the size specified, no further path-based information is stored.

Note This command is supported by the IP SLAs Internet Control Message Protocol (ICMP) path echo operation only.

For the IP SLAs ICMP path echo operation, the amount of router memory required to maintain the distribution statistics table is based on multiplying all of the values set by the following four commands:

- **distributions-of-statistics-kept**
- **hops-of-statistics-kept**
- **paths-of-statistics-kept**
- **hours-of-statistics-kept**

The general equation used to calculate the memory requirement to maintain the distribution statistics table for an ICMP path echo operation is as follows: Memory allocation = (160 bytes) * (**distributions-of-statistics-kept***size*) * (**hops-of-statistics-kept***size*) * (**paths-of-statistics-kept***size*) * (**hours-of-statistics-kept***hours*)

Note To avoid significant impact on router memory, careful consideration should be used when configuring the **distributions-of-statistics-kept**, **hops-of-statistics-kept**, **paths-of-statistics-kept**, and **hours-of-statistics-kept** commands.

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 the table below). 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 **paths-of-statistics-kept** command varies depending on the Cisco IOS release you are running (see the table below) and the operation type configured. For example, if you are running Cisco IOS Release 12.4 and the ICMP path echo operation type is configured, you would enter the **paths-of-statistics-kept** command in ICMP path echo configuration mode (config-sla-monitor-pathEcho) within IP SLA monitor configuration mode.

Table 2: 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

Examples

The following examples show how to maintain statistics for only three paths for IP SLAs ICMP path echo operation 2. 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 the table above).

Examples

```
ip sla 2
 path-echo 172.16.1.177
 paths-of-statistics-kept 3
```

```
!
ip sla schedule 2 life forever start-time now
```

Examples

```
ip sla monitor 2
 type pathEcho protocol ipIcmpEcho 172.16.1.177
 paths-of-statistics-kept 3
!
ip sla monitor schedule 2 life forever start-time now
```

Related Commands

Command	Description
distributions-of-statistics-kept	Sets the number of statistics distributions kept per hop during the lifetime of the IP SLAs operation.
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	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.
statistics-distribution-interval	Sets the time interval for each statistics distribution kept for the IP SLAs operation.

request-data-size

To set the protocol data size in the payload of a Cisco IOS IP Service Level Agreements (SLAs) operation's request packet, use the **request-data-size**command in the appropriate submode of IP SLA configuration, auto IP SLA MPLS 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.

request-data-size *bytes*

no request-data-size

Syntax Description

bytes	Size of the protocol data in the payload of the request packet of the operation, in bytes. Range is from 0 to the maximum supported by the protocol.

Command Default

The default data size varies depending on the type of IP SLAs operation you are configuring. See the CISCO-RTTMON-MIB documentation for more details.

Command Modes

DLSw configuration (config-ip-sla-dlsw) 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) VCCV configuration (config-sla-vccv)

Command Modes

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

Command Modes

DLSw configuration (config-sla-monitor-dlsw) 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)

Command Modes

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

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.
12.2(33)SRC	The VCCV configuration mode was added.
12.2(33)SB	The VCCV configuration mode was added.
15.1(1)T	This command was modified. The IP SLA template-parameters configuration mode was added.

Usage Guidelines

The **request-data-size** command can be used to set the padding size for the data frame of an IP SLAs Ethernet operation. See the documentation for the **request-data-size** (Ethernet) command for more information.

The **request-data-size** 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 the Command Used to Begin Configuration of an IP SLAs Operation Based on Cisco IOS Release table). If you are configuring an IP SLAs label switched path (LSP) Health Monitor operation, see the Command Used to Begin Configuration of an IP SLAs LSP Health Monitor Operation Based on Cisco IOS Release table 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 **request-data-size** 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 **request-datasize** command.

Table 3: 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

Table 4: 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
15.1(1)T	ip sla auto template	IP SLA template configuration

Examples

The following examples show how to set the request packet size to 40 bytes for an IP SLAs ICMP echo operation. 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 the Command Used to Begin Configuration of an IP SLAs Operation Based on Cisco IOS Release table).

Examples

```
ip sla 3
 icmp-echo 172.16.1.175
 request-data-size 40
!
ip sla schedule 3 life forever start-time now
```

Examples

```
ip sla monitor 3
 type echo protocol ipIcmpEcho 172.16.1.175
 request-data-size 40
!
ip sla monitor schedule 3 life forever start-time now
```

Examples

```
Router(config)# ip sla auto template type ip icmp-echo 1
Router(config-icmp-ech-tplt)# parameters
Router(config-icmp-ech-params)# request-data-size 40
Router(config-icmp-ech-params)# end
Router#
Router# show ip sla auto template type ip icmp-echo
IP SLAs Auto Template: 1
Measure Type: icmp-echo (control enabled)
    Description:
    IP options:
        Source IP: 0.0.0.0      Source Port: 0
        VRF:    TOS: 0x0
    Operation Parameters:
        Request Data Size: 40 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
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 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.