A through H

access-list (epl-disc)

To add a list of discovered endpoints to an auto IP Service Level Agreements (SLAs) endpoint list, use the **access-list** command in IP SLA endpoint-list auto-discovery configuration mode. To remove the list, use the **no** form of this command.

access-list *standard-list-numberexpanded-list-number*
no access-list

Syntax Description

standard-list-number	Unique identifier of list. Range is from 1 to 99.
expanded-list-number	Unique identifier of list. Range is from 1300 to 1999.

Command Default

No access list is specified in the auto IP SLAs endpoint list being configured.

Command Modes

IP SLA endpoint-list auto-discovery configuration (config-epl-disc)

Command History

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

Usage Guidelines

This command assigns a name to a list of discovered IP addresses of IP SLAs destination devices and Cisco IOS IP SLAs Responder endpoints and adds the list to the auto IP SLAs endpoint list being configured.

Before you use this command, you must use the **discover**command in IP SLA endpoint-list configuration mode to build the list of endpoints on target Cisco devices.

To apply an endpoint list to an IP SLAs auto-measure group, use the **destination** command in IP SLA auto-measure group configuration mode.

Examples

The following example shows how to configure an endpoint list using the auto discovery method:

```
Router(config)# ip sla auto discovery
Router(config)# ip sla auto endpoint-list type ip autolist
Router(config-epl)# discover port 5000
Router(config-epl-disc)# access-list 3
Router(config-epl-disc)# end
Router# show ip sla auto endpoint-list
Endpoint-list Name: autolist
    Description:
    Auto Discover Parameters
        Destination Port: 5000
        Access-list: 3
        Ageout: 3600    Measurement-retry: 3
    5 endpoints are discovered for autolist
```

Related Commands

Command	Description
destination (am-group)	Specifies an IP SLAs endpoint list for an IP SLAs auto-measure group.

Command	Description
discover (epl)	Builds a list of endpoints.
ip sla auto discovery	Enables auto discovery in Cisco IP SLAs Engine 3.0.
ip sla responder auto-register	Enables the Cisco device or Cisco IP SLAs Responder to automatically register with the source upon configuration
show ip sla auto endpoint-list	Displays the configuration including default values of auto IP SLAs endpoint lists.

access-list (IP SLA)

To specify the access list to apply to a Cisco IOS IP Service Level Agreements (SLAs) label switched path (LSP) Health Monitor operation, use the **access-list** command in auto IP SLA MPLS parameters configuration mode. To remove the access list, use the **no** form of this command.

access-list *access-list-number*
no access-list *access-list-number*

Syntax Description

access-list-number	Number of an access list. This value is a decimal number from 1 to 99 or from 1300 to 1999.

Command Default

No access list is specified.

Command Modes

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

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

Standard IP access lists can be configured (using the **access-list** [IP standard] command in global configuration mode) to restrict the number of IP SLAs operations that are automatically created by the IP SLAs LSP Health Monitor. When the IP SLAs access list parameter is configured, the list of Border Gateway Protocol (BGP) next hop neighbors discovered by the LSP Health Monitor is filtered based on the conditions defined by the associated standard IP access list. In other words, the LSP Health Monitor will automatically create IP SLAs operations only for those BGP next hop neighbors with source addresses that satisfy the criteria permitted by the standard IP access list.

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 BGP next hop neighbors in use by all VPN routing and forwarding (VRF) instances associated with the source Provider Edge (PE) router. Standard IP access list 10 is specified to restrict the number of IP SLAs operations to be created by LSP Health Monitor operation 1.

```
!Configure standard IP access list in global configuration mode
access-list 10 permit 10.10.10.8
!
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
 access-list 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
access-list (IP standard)	Defines a standard IP access list.
auto ip sla mpls-lsp-monitor	Begins configuration for an IP SLAs LSP Health Monitor operation and enters auto IP SLA MPLS configuration mode.

ageout

To add an ageout timer to an auto IP Service Level Agreements (SLAs) scheduler or endpoint list, use the **ageout** command in IP SLA auto-measure schedule configuration or IP SLA endpoint-list auto-discovery configuration mode. To remove the timer, use the **no** form of this command.

ageout *seconds*
no **ageout**

Syntax Description	*seconds*	Length of time to keep an entry in memory, in seconds. Range is from 0 to 2073600. Default is 0.

Command Default

The entry is never saved in memory.

Command Modes

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

IP SLA endpoint-list auto-discovery configuration (config-epl-disc)

Command History

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

Usage Guidelines

This command changes the length of time an entry is kept in memory when either the operation or destination is inactive from the default (0) to the specified number, after which the entry is deleted from memory.

An operation can age out before it executes. To ensure that this does not happen, the difference between the time that the IP SLA auto-measure group is configured and the time at which the operation becomes active must be less than the value of the ageout timer.

Note

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

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#
```

	Command	Description
Related Commands	**frequency**	Specifies how often an auto IP SLAs operation will repeat once it is started.
	life	Specifies length of time that an auto IP SLAs operation will run.
	probe-interval	Specifies interval for staggering the start times of auto IP SLAs operations
	show ip sla auto schedule	Displays configuration including default values of auto IP SLAs schedulers.
	start-time	Specifies when an auto IP SLAs operation will start running.

aggregate interval

To configure an aggregate interval for an IP Service Level Agreements (SLAs) Metro-Ethernet 3.0 (Y.1731) operation, use the **aggregate interval** command in IP SLA Y.1731 delay or IP SLA Y.1731 loss configuration mode. To return to the default, use the **no** form of this command.

aggregate interval *seconds*
no aggregate interval

Syntax Description

seconds	Length of time in seconds. The range is from 1 to 65535. The default is 900.

Command Default

The default aggregate interval is 900 seconds.

Command Modes

IP SLA Y.1731 delay configuration (config-sla-y1731-delay)

IP SLA Y.1731 loss configuration (config-sla-y1731-loss)

Command History

Release	Modification
15.1(2)S	This command was introduced.
15.3(2)S	This command was implemented on the Cisco ASR 901 Series Aggregation Services Routers.

Usage Guidelines

An aggregate interval is the length of time during which the performance measurements are conducted and the results stored. Use this command to change the number of intervals for a delay, delay variation, or frame loss operation from the default (900 seconds) to the specified value.

The aggregate interval value must be less than the life value of the IP SLAs schedule. The default life value for an IP SLAs schedule or IP SLAs multioperation group scheduler configuration is 3600 seconds.

Examples

The following example shows how to configure a single-ended IP SLAs Ethernet delay operation with an aggregate interval of 1500 seconds:

```
Router(config)# ip sla 10
Router(config-ip-sla)# ethernet y7131 delay dmm domain xxx evc yyy mpid 101 cos 3 source
mpid 100
Router(config-sla-y1731-delay)# aggregate interval 1500
Router(config-sla-y1731-delay)#
```

Related Commands

Command	Description
distribution	Configures statistics distributions for an IP SLAs Metro-Ethernet 3.0 (ITU-T Y.1731) operation.
history interval	Sets the number of statistics distributions kept during the lifetime of an IP SLAs Metro Ethernet 3.0 (ITU-T Y.1731) operation.
ip sla group schedule	Configures multioperation scheduling for IP SLAs operations.

Command	Description
ip sla schedule	Configures the scheduling parameters for a single IP SLAs operation.
show ip sla statistics	Displays the current operational status and statistics of all IP SLAs operations or a specified operation.

aggregation interval

To set the number of interval buckets that are kept during the lifetime of a Cisco IOS IP Service Level Agreements (SLAs) service performance operation, use the **aggregation interval** command in IP SLA service performance configuration mode. To return to the default, use the **no** form of this command.

aggregation interval buckets *buckets*
no aggregation interval buckets

Syntax Description

buckets *buckets*	Specifies the number of buckets kept. The range is from 1 to 30. The default is 1.

Command Default

One interval bucket per service performance operation is kept.

Command Modes

IP SLA service performance configuration (config-ip-sla-service-performance)

Command History

Release	Modification
15.3(2)S	This command was introduced.

Usage Guidelines

Performance measurements for an IP SLAs service performance operation are stored in interval buckets. Each time IP SLAs starts an operation, a new bucket is created until the number of buckets matches the specified number or the operation's lifetime expires. Buckets do not wrap (that is, the oldest information is not replaced by newer information).

```
IP SLAs Infrastructure Engine-III
Entry number: 1
Service Performance Operation
Type: ethernet
Destination
MAC Address: 4055.398d.8bd2
VLAN:
Interface: GigabitEthernet0/4
Service Instance: 10
EVC Name:
Duration Time: 20
Interval Buckets: 5

Signature:
05060708

Description: this is with all operation modes

Measurement Type:
throughput, loss
Direction: internal

Profile Traffic:
Direction: internal
CIR: 0
EIR: 0
CBS: 0
EBS: 0
Burst Size: 3
```

```
Burst Interval: 20
Rate Step (kbps): 1000 2000

Profile Packet:
Inner COS: 6
Outer COS: 6
Inner VLAN: 100
Outer VLAN: 100
Source MAC Address: 4055.398d.8d4c
Packet Size: 512
Schedule:
   Operation frequency (seconds): 64   (not considered if randomly scheduled)
   Next Scheduled Start Time: Start Time already passed
   Group Scheduled : FALSE
   Randomly Scheduled : FALSE
   Life (seconds): Forever
   Entry Ageout (seconds): never
   Recurring (Starting Everyday): FALSE
   Status of entry (SNMP RowStatus): Active
```

auto ip sla mpls-lsp-monitor

To begin configuration for an IP Service Level Agreements (SLAs) label switched path (LSP) Health Monitor operation and enter auto IP SLA MPLS configuration mode, use the **auto ip sla mpls-lsp-monitor** command in global configuration mode. To remove all configuration information for an LSP Health Monitor operation, use the **no** form of this command.

auto ip sla mpls-lsp-monitor *operation-number*
no auto ip sla mpls-lsp-monitor *operation-number*

Syntax Description

operation-number	Number used for the identification of the LSP Health Monitor operation you want to configure.

Command Default

No LSP Health Monitor operation is configured.

Command Modes

Global configuration

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.
12.2(31)SB2	This command was integrated into Cisco IOS Release 12.2(31)SB2. This command replaces the **rtr mpls-lsp-monitor** command.
12.2(33)SRB	This command was integrated into Cisco IOS Release 12.2(33)SRB. This command replaces the **rtr mpls-lsp-monitor** command.
12.2(33)SXH	This command was integrated into Cisco IOS Release 12.2(33)SXH.
15.1(2)SNH	This command was implemented on the Cisco ASR 901 Series Aggregation Services Routers.

Usage Guidelines

Entering this command automatically enables the **mpls discovery vpn next-hop** command.

After you configure an LSP Health Monitor operation, you must schedule the operation. To schedule an LSP Health Monitor operation, use the **auto ip sla mpls-lsp-monitor schedule** command in global configuration mode. You can also optionally set reaction configuration for the operation (see the **auto ip sla mpls-lsp-monitor reaction-configuration** command).

To display the current configuration settings of an LSP Health Monitor operation, use the **show ip sla mpls-lsp-monitor configuration** command in EXEC 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, 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.

```
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
!
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 reaction-configuration	Configures certain actions to occur based on events under the control of the IP SLAs LSP Health Monitor.
auto ip sla mpls-lsp-monitor reset	Removes all IP SLAs LSP Health Monitor configuration from the running configuration.
auto ip sla mpls-lsp-monitor schedule	Configures the scheduling parameters for an IP SLAs LSP Health Monitor operation.
mpls discovery vpn next-hop	Enables the MPLS VPN BGP next hop neighbor discovery process.
show ip sla mpls-lsp-monitor configuration	Displays configuration settings for IP SLAs LSP Health Monitor operations.
type echo (MPLS)	Configures the parameters for a Cisco IOS IP SLAs LSP ping operation using the LSP Health Monitor.
type pathEcho (MPLS)	Configures the parameters for a Cisco IOS IP SLAs LSP traceroute operation using the LSP Health Monitor.

auto ip sla mpls-lsp-monitor reaction-configuration

To configure proactive threshold monitoring parameters for a Cisco IOS IP Service Level Agreements (SLAs) label switched path (LSP) Health Monitor operation, use the **auto ip sla mpls-lsp-monitor reaction-configuration** command in global configuration mode. To clear all threshold monitoring configuration for a specified LSP Health Monitor operation, use the **no** form of this command.

LSP Health Monitor Without LSP Discovery
auto ip sla mpls-lsp-monitor reaction-configuration *operation-number* **react connectionLoss** |
timeout [**action-type** *option*] [**threshold-type consecutive** [*occurrences*] | **immediate** | **never**]
no auto ip sla mpls-lsp-monitor reaction-configuration *operation-number*

LSP Health Monitor with LSP Discovery
auto ip sla mpls-lsp-monitor reaction-configuration *operation-number* **react lpd lpd-group** [**retry**
number] | **tree-trace** [**action-type trapOnly**]
no auto ip sla mpls-lsp-monitor reaction-configuration *operation-number*

Syntax Description		
operation-number	Number of the LSP Health Monitor operation for which reactions are to be configured.
react connectionLoss	Enables monitoring of one-way connection loss events.
react timeout	Enables monitoring of one-way timeout events.
action-type *option*	(Optional) Specifies what action is performed when threshold events occur. If the **threshold-type never** keywords are defined, the **action-type** keyword is disabled. The *option* argument can be one of the following keywords: • **none** --No action is taken. This option is the default value. • **trapOnly** --SNMP trap notification is sent.
threshold-type consecutive [*occurrences*]	(Optional) When a threshold violation for the monitored element (such as a timeout) are met consecutively for a specified number of times, perform the action defined by the **action-type** keyword. The default number of 5 consecutive occurrences can be changed using the *occurrences* argument. The range is from 1 to 16.
threshold-type immediate	(Optional) When a threshold violation for the monitored element (such as a timeout) are met, immediately perform the action defined by the **action-type** keyword.
threshold-type never	(Optional) Do not calculate threshold violations. This option is the default threshold type.
lpd	(Optional) Specifies the LSP discovery option.
lpd-group	(Optional) Enables monitoring of LSP discovery group status changes.

retry *number*	(Optional) Specifies the number of times the equal-cost multipaths belonging to an LSP discovery group are retested when a failure is detected. After the specified number of retests have been completed, an SNMP trap notification may be sent depending on the current status of the LSP discovery group. See the "Usage Guidelines" section for more information. The value of the *number* argument is zero by default.
	Use the **secondary frequency** command to increase the frequency at which failed paths belonging to an LSP discovery group are retested. This command is not applicable if the retry value is set to zero.
tree-trace	(Optional) Enables monitoring of situations where LSP discovery to a Border Gateway Protocol (BGP) next hop neighbor fails.
action-type trapOnly	(Optional) Enables SNMP trap notifications.

Command Default IP SLAs proactive threshold monitoring is disabled.

Command Modes Global configuration

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.
12.2(31)SB2	This command was integrated into Cisco IOS Release 12.2(31)SB2. This command replaces the **rtr mpls-lsp-monitor reaction-configuration**command.
12.2(33)SRB	This command was integrated into Cisco IOS Release 12.2(33)SRB. This command replaces the **rtr mpls-lsp-monitor reaction-configuration**command.
12.2(33)SXH	This command was integrated into Cisco IOS Release 12.2(33)SXH.

Usage Guidelines You can configure the **auto ip sla mpls-lsp-monitor reaction-configuration** command multiple times to enable proactive threshold monitoring for multiple elements for the same operation. However, disabling of individual monitored elements is not supported. In other words, the **no auto ip sla mpls-lsp-monitor reaction-configuration** command will disable all proactive threshold monitoring configuration for the specified IP SLAs operation.

SNMP traps for IP SLAs are supported by the CISCO-RTTMON-MIB and CISCO-SYSLOG-MIB. Depending on the Cisco IOS software release that you are running, use the **ip sla logging traps** or **ip sla monitor logging traps**command to enable the generation of SNMP system logging messages specific to IP SLAs trap notifications. Use the **snmp-server enable traps rtr** command to enable the sending of IP SLAs SNMP trap notifications.

To display the current threshold monitoring configuration settings for an LSP Health Monitor operation, use the **show ip sla mpls-lsp-monitor configuration** command.

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. As specified by the proactive threshold monitoring configuration, when three consecutive connection loss or timeout events occur, an SNMP trap notification is sent.

```
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
!
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 logging traps	Enables the generation of SNMP system logging messages specific to IP SLAs trap notifications.
ip sla monitor logging traps	Enables the generation of SNMP system logging messages specific to IP SLAs trap notifications.
show ip sla mpls-lsp-monitor configuration	Displays configuration settings for IP SLAs LSP Health Monitor operations.
snmp-server enable traps rtr	Enables the sending of IP SLAs SNMP trap notifications.

auto ip sla mpls-lsp-monitor reset

To remove all IP Service Level Agreements (SLAs) label switched path (LSP) Health Monitor configuration from the running configuration, use the **auto ip sla mpls-lsp-monitor reset**command in global configuration mode.

auto ip sla mpls-lsp-monitor reset [**lpd** *group-number*]

Syntax Description

lpd *group-number*	(Optional) Specifies the number used to identify the LSP discovery group you want to configure.

Command Default   None

Command Modes   Global configuration

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.
12.2(31)SB2	This command was integrated into Cisco IOS Release 12.2(31)SB2. The **lpd** keyword and *lpd-group* argument was added.
12.2(33)SRB	This command was integrated into Cisco IOS Release 12.2(33)SRB.
12.2(33)SXH	This command was integrated into Cisco IOS Release 12.2(33)SXH.

Usage Guidelines   Use the **auto ip sla mpls-lsp-monitor reset lpd** *group-number* command to remove all the stored network connectivity statistics for the specified LSP discovery group from the LSP discovery group database. The non-statistical LSP discovery group data will be set to default values or zero. However, the IP address of the associated Border Gateway Protocol (BGP) next hop neighbor, the list of LSP discovery group IP SLAs operations, and the list of LSP selector IP addresses will be preserved. After the **auto ip sla mpls-lsp-monitor reset lpd** *group-number* command is entered, statistical data for the group will start aggregating again with new data only.

To clear IP SLAs configuration information (not including IP SLAs LSP Health Monitor configuration) from the running configuration, use the **ip sla reset** command in global configuration mode.

Examples   The following example shows how to remove all the LSP Health Monitor configurations from the running configuration:

```
auto ip sla mpls-lsp-monitor reset
```

Related Commands

Command	Description
ip sla reset	Stops all IP SLAs operations, clears IP SLAs configuration information, and returns the IP SLAs feature to the startup condition.

auto ip sla mpls-lsp-monitor schedule

To configure the scheduling parameters for an IP Service Level Agreements (SLAs) label switched path (LSP) Health Monitor operation, use the **auto ip sla mpls-lsp-monitor 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.

auto ip sla mpls-lsp-monitor schedule *operation-number* **schedule-period** *seconds* [**frequency** [*seconds*]] [**start-time after** *hh* : *mm* : *ss* | *hh* : *mm* [: *ss*] [*month day* | *day month*] | **now** | **pending**]
no auto ip sla mpls-lsp-monitor schedule *operation-number*

Syntax Description

operation-number	Number of the LSP Health Monitor operation to be scheduled.
schedule-period *seconds*	Specifies the amount of time (in seconds) for which the LSP Health Monitor is scheduled.
frequency *seconds*	(Optional) Specifies the number of seconds after which each IP SLAs operation is restarted. The default frequency is the value specified for the schedule period.
start-time	(Optional) Time when the operation starts collecting information. If the start time is not specified, no information is collected.
after *hh* : *mm* : *ss*	(Optional) Indicates that the operation should start *hh* hours, *mm* minutes, and *ss* seconds after this command was entered.
hh : *mm* [: *ss*]	(Optional) Specifies an absolute start time using hours, minutes, and 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) Name of the month in which to start the operation. If a 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) on which to start the operation. If a day is not specified, the current day is used. Use of this argument requires that a month be specified.
now	(Optional) Indicates that the operation should start immediately.
pending	(Optional) No information is collected. This option is the default value.

Command Default

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

Command Modes

Global configuration

Command History

Release	Modification
12.4(6)T	This command was introduced.

Release	Modification
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. This command replaces the **rtr mpls-lsp-monitor schedule**command.
12.2(33)SRB	This command was integrated into Cisco IOS Release 12.2(33)SRB. This command replaces the **rtr mpls-lsp-monitor schedule**command.
12.2(33)SXH	This command was integrated into Cisco IOS Release 12.2(33)SXH.

Usage Guidelines

After you schedule an LSP Health Monitor operation with the **auto ip sla mpls-lsp-monitor schedule** command, you cannot change the configuration of the operation. To change the configuration of the operation, use the **no auto ip sla mpls-lsp-monitor** *operation-number* command in global configuration mode and then enter the new configuration information.

To display the current configuration settings of an LSP Health Monitor operation, use the **show ip sla mpls-lsp-monitor configuration** command in user EXEC or privileged EXEC 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, 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 schedule period for LSP Health Monitor operation 1 is set to 60 seconds and the operation is scheduled to start immediately.

```
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
!
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.
show ip sla mpls-lsp-monitor configuration	Displays configuration settings for IP SLAs LSP Health Monitor operations.

availability algorithm

To configure the availability algorithm for an IP Service Level Agreements (SLAs) Metro-Ethernet 3.0 (Y.1731) frame loss ratio operation, use the **availability algorithm** command in global configuration mode. To return to the default value, use the **no** form of this command.

availability algorithm sliding-window | **static-window**
no availability algorithm sliding-window | **static-window**

Syntax Description

sliding-window	Specifies a sliding-window control algorithm.
static-window	Specifies static-window control algorithm.

Command Default

The availability algorithm is static-window.

Command Modes

IP SLA Y.1731 loss configuration (config-sla-y1731-loss)

Command History

Release	Modification
15.1(2)S	This command was introduced.
15.3(2)S	This command was implemented on the Cisco ASR 901 Series Aggregation Services Routers.

Usage Guidelines

Use this command to change the availability algorithm for determining frame loss ratio to the specified value.

Examples

The following example shows how to change the availability algorithm for an already configured IP SLAs Metro-Ethernet 3.0 (Y.1731) frame loss ratio operation from the default (static-window) to sliding-window:

```
Router (config-term)# ip sla 11
Router(config-sla-y1731-loss)# availability algorithm sliding-window
Router (config-sla-y1731-loss)#
```

bitrate

To configure the maximum bit-rate or bit-rate window size parameter in a predefined or custom synthetic video traffic profile for an IP Service Level Agreements (SLAs) video operation, use the **bitrate** command in the appropriate IP SLA VO profile endpoint configuration submode. To return the bit-rate values to the default, use the **no** form of this command.

bitrate maximum *max-bitrate* | **window-size** *window-size*
no   bitrate maximum *max-bitrate* | **window-size** *window-size*

Syntax Description		
maximum *max-bitrate*	Specifies maximum bit-rate in kilobits per second (kb/s). The following values are valid for the video traffic profile being configured: • For CP-9900: The range is from 60 to 1000. • For CTS: The valid options are 1000, 1500, 2250, 3000, 3500, 4000, or 936. • For custom: The range is from 10 to 4000. For a description of each traffic profile type, see the "Usage Guidelines" section.
window-size *window-size*	Specifies the bit-rate window size in milliseconds. The range is from 0 to 5000. The default is 500.

Command Default   There is no maximum bit-rate parameter configured. The default value for bit-rate window size is 500 milliseconds.

Command Modes   IP SLA VO CP9900 profile endpoint configuration (cfg-ipslavo-cp9900-profile)

IP SLA VO CTS profile endpoint configuration (cfg-ipslavo-cts-profile)

IP SLA VO custom profile endpoint configuration (cfg-ipslavo-custom-profile)

Command History

Release	Modification
15.2(2)T	This command was introduced.

Usage Guidelines   Use the **bitrate** command to configure the maximum bit-rate parameter, or change the value of the bit-rate window-size parameter from the default (500) to the specificd value, in a video profile for the following video endpoint types:

• CP-9900—Cisco Unified 9900 Series IP Phone System (CP-9900).

• CTS—Cisco Telepresence System 1000/3000 (CTS-1000/3000)

• custom—Customized video endpoint type.

There are restrictions based on the relationships between maximum bit rate, frame rate, and resolution, also known as bandwidth. For the user-defined endpoint types, the table below includes the maximum bit rates allowable in relation to the frame per second (fps) rates and resolution. Cisco IOS software allows you to enter the values of these three parameters in any order and verifies that their combination is within a valid

range, as specified. For example, if a 1080 pixels (p) resolution at 30 fps is chosen, the valid maximum bit-rate range is between 1500 and 4000 kb/s.

Table 1: Maximum Bit Rates Allowable for Frame Rates and Resolution in Custom Endpoints

Resolution and Frame Rate	30/24 fps	15 fps	10 fps	7.5 fps	5 fps
QCIF	60–256 kb/s	32–160 kb/s	20–118 kb/s	15–96 kb/s	10–74 kb/s
CIF/SIG/QVGA	128–1000 kb/s	64–564 kb/s	43–397 kb/s	32–314 kb/s	22–230 kb/s
VGA/4CIF/4SIF	384–2000 kb/s	192–1128 kb/s	128–795 kb/s	96–628 kb/s	64–461 kb/s
720p	800–2500 kb/s	400–1506 kb/s	267–1089 kb/s	200–881 kb/s	133–673 kb/s
1080p	1500–4000 kb/s	750–2512 kb/s	500–1845 kb/s	375–1512 kb/s	250–1179 kb/s

Examples

The following example shows how to use the **bitrate** command to configure the maximum bit-rate and to change the bitrate widow-size parameters in a user-defined custom synthetic video traffic profile:

```
Router> enable
Router# configure terminal
Router(config)# ip sla profile video my-profile
Router(cfg-ipslavo-profile)# endpoint custom
Router(cfg-ipslavo-custom-profile)# bitrate maximum 1000
Router(cfg-ipslavo-custom-profile)# bitrate window-size 400
```

Related Commands

Command	Description
frame (VO profile)	Configures frame parameters in user-defined video profile.
resolution	Configures the resolution in user-defined video profile.
show ip sla profile video	Displays a summary of IP SLAs video traffic profiles.

buckets-of-history-kept

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

To set the number of history buckets that are kept during the lifetime of a Cisco IOS IP Service Level Agreements (SLAs) operation, use the **buckets-of-history-kept**command in the appropriate submode of IP SLA monitor configuration mode. To return to the default value, use the no form of this command.

buckets-of-history-kept *size*
no buckets-of-history-kept

Syntax Description

| *size* | Number of history buckets kept during the lifetime of the operation. The default is 50. |

Command Default 50 buckets

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)

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 buckets-kept**command.
12.2(33)SRB	This command was replaced by the **history buckets-kept**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 buckets-kept** command.
12.2(33)SXI	This command was replaced by the **history buckets-kept** command.

Usage Guidelines

Each time IP SLAs starts an operation, a new bucket is created until the number of history buckets matches the specified size or the operation's lifetime expires. History buckets do not wrap (that is, the oldest information is not replaced by newer information). The operation's lifetime is defined by the **ip sla monitor schedule** global configuration command.

Note The **buckets-of-history-kept** command does not support the IP SLAs User Datagram Protocol (UDP) jitter operation.

An IP SLAs operation can collect history and capture statistics. By default, the history for an IP SLAs operation is not collected. If history is collected, each history bucket contains one or more history entries from the operation. When the operation type is ICMP path echo, an entry is created for each hop along the path that the operation takes to reach its destination. The type of entry stored in the history table is controlled by the **filter-for-history** command. The total number of entries stored in the history table is controlled by the combination of the **samples-of-history-kept**, **buckets-of-history-kept**, and **lives-of-history-kept** commands.

Note Collecting history increases the RAM usage. Collect history only when you think there is a problem in the network.

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

The following example shows how to configure IP SLAs ICMP echo operation 1 to keep 25 history buckets during the operation lifetime.

```
ip sla monitor 1
 type echo protocol ipIcmpEcho 172.16.161.21
 buckets-of-history-kept 25
 lives-of-history-kept 1
!
ip sla monitor schedule 1 start-time now life forever
```

Related Commands

Command	Description
filter-for-history	Defines the type of information kept in the history table for the IP SLAs operation.
ip sla monitor	Begins configuration for an IP SLAs operation and enters IP SLA monitor configuration mode.

Command	Description
lives-of-history-kept	Sets the number of lives maintained in the history table for the IP SLAs operation.
samples-of-history-kept	Sets the number of entries kept in the history table per bucket for the IP SLAs operation.

clock-tolerance ntp oneway

To set the acceptable Network Time Protocol (NTP) clock synchronization tolerance for a one-way Cisco IOS IP Service Level Agreements (SLAs) operation measurement, use the **clock-tolerancentponeway** command in the appropriate UDP jitter 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.

clock-tolerance ntp oneway absolute *value* | **percent** *value*
no clock-tolerance ntp oneway

Syntax Description		
absolute *value*	Sets the NTP synchronization tolerance value to an absolute number, in microseconds. The range is from 0 to 100000.	
percent *value*	Sets the NTP synchronization tolerance value as a percentage of the one-way IP SLAs operation delay measurement. The range is from 0 to 100. The NTP clock synchronization tolerance is set to 0 percent by default.	

Command Default The NTP clock synchronization tolerance is set to 0 percent.

Command Modes **IP SLA Configuration**

UDP jitter configuration (config-ip-sla-jitter)

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

IP SLA Monitor Configuration

UDP jitter configuration (config-sla-monitor-jitter)

IP SLA Template Parameters Configuration

UDP jitter configuration (config-udp-jtr-params)

Command History

Release	Modification
12.3(14)T	This command was introduced.
12.2(33)SRB	This command was integrated into Cisco IOS Release 12.2(33)SRB.
12.2(33)SB	This command was integrated into Cisco IOS Release 12.2(33)SB.
12.2(33)SXI	This command was integrated into Cisco IOS Release 12.2(33)SXI.
15.1(1)T	This command was modified. The IP SLA template parameters configuration mode was added.
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.

Release	Modification
Cisco IOS XE 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 **precisionmicroseconds** command must be configured before the **clock-tolerancentponeway** command is used.

Note This command is supported by the IP SLAs User Datagram Protocol (UDP) jitter operation only.

If the NTP running state is true and the total offset (sum of the offset for the sender and responder) is within the specified tolerance value (defined using the **clock-tolerancentponeway** command) of a one-way IP SLAs operation measurement for all the packets in a stream, the NTP synchronization status is determined to be synchronized. If these conditions are not met, the status is determined to be not synchronized.

The following guidelines apply to the displayed output:

- If the NTP synchronization status is determined to be synchronized, the one-way IP SLAs delay measurement values will be displayed.

- If the NTP synchronization status is determined to be not synchronized, the one-way values will be zero.

- The total number of operational packets that are not synchronized will be tracked during the collection period and reported.

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

If you are using auto IP SLAs in Cisco IOS IP SLAs Engine 3.0, you must enter the **parameters** command in IP SLA template configuration mode before you can use the **clock-tolerancentponeway** command.

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, 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 enable microsecond precision, configure the NTP synchronization offset tolerance to 10 percent, and set the packet priority to high for IP SLAs UDP jitter operation 1. 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).

IP SLA Configuration

```
ip sla 1
 udp-jitter 205.199.199.2 dest-port 9006
 precision microseconds
 clock-tolerance ntp oneway percent 10
 probe-packet priority high
 frequency 300
!
ip sla schedule 1 life forever start-time after 00:00:06
```

IP SLA Monitor Configuration

```
ip sla monitor 1
 type jitter dest-ipaddr 205.199.199.2 dest-port 9006
 precision microseconds
 clock-tolerance ntp oneway percent 10
 probe-packet priority high
 frequency 300
!
ip sla monitor schedule 1 life forever start-time after 00:00:06
```

IP SLA Template Parameters Configuration

```
Router(config)# ip sla auto template type ip udp-jitter 1
Router(config-udp-jtr-tplt)# parameters
Router(config-udp-jtr-params)# precision microseconds
Router(config-udp-jtr-params)# clock-tolerance ntp oneway percent 10
Router(config-udp-jtr-params)# operation-packet high
Router(config-udp-jtr-params)# end
Router#
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: 0.0.0.0     Source Port: 0
        VRF:    TOS: 0x0
    Operation Parameters:
        Request Data Size: 32   Verify Data: false
        Number of Packets: 10   Inter packet interval: 20
        Timeout: 5000           Threshold: 5000
        Granularity: usec       Operation packet priority: high
        NTP Sync Tolerance: 10 percent
    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
```

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

codec (tplt)

To configure codec in an auto IP Service Level Agreements (SLAs) operation template for a User Datagram Protocol (UDP) jitter operation that returns VoIP scores, use the **codec**command in UDP jitter submode of the IP SLA template configuration mode.

codec *codec-type* [**advantage-factor** *value*] [**codec-numpackets** *number-of-packets*] [**codec-interval** *milliseconds*] [**codec-size** *number-of-bytes*]

Syntax Description

codec-type	The following codec-type keywords are valid: • **g711alaw** --The G.711 a-law codec (64 kbps transmission) • **g711ulaw** --The G.711 mu-law codec (64 kbps transmission) • **g729a** --The G.729A codec (8 kbps transmission)
advantage-factor	(Optional) Specifies expectation factor to be used for ICPIF calculations.
value	Range is from 0 to 20. Default is 0. For recommended values, see the Advantage Factor Recommended Maximum Values table below.
codec-numpackets	(Optional) Specifies number of packets to be transmitted per operation.
number-of-packets	Range is from 1 to 60000. Default is 1000.
codec-interval	(Optional) Specifies interval between packets in operation.
milliseconds	Length of interval, in milliseconds (ms). Range is from 1 to 60000. Default is 20.
codec-size	(Optional) Specifies number of bytes in each packet transmitted.
number-of-bytes	Range is from 16 to 1500. Default varies by codec. For default values, see the Default UDP Jitter Operation Parameters by Codec table below.

Command Default

A codec is not configured in the auto IP SLAs operation template being configured.

Command Modes

IP SLA UDP jitter template configuration (config-tplt-udp-jtr)

Command History

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

Usage Guidelines

This command configures the codec in an auto IP SLAs operation template for a UDP jitter operation and generates ICPIF and MOS scores, based on the specified codec type.

The specified *codec-type* should match the encoding algorithm being used for VoIP transmissions.

You must configure the type of auto 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.

A UDP jitter operation computes statistics by sending n UDP packets, each of size s, sent t msec apart, from a given source router to a given target router, at a given frequency f. Based on the type of codec you configure for the operation, the number of packets (n), the size of each payload (s), the interpacket time interval (t), and the operational frequency (f) are auto-configured with default values or you can manually configure these parameters using the keyword and argument combinations in this command.

Note　You should not specify values for the interval, size, and number of packet options unless you have a specific reason to override the defaults; for example, to approximate a different codec.

The table below lists the default values for each parameter by codec.

Table 3: 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.

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

Table 4: 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 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 the table above should be considered as the absolute upper limits for A. The default Advantage/Expectation factor for UDP jitter operations is always zero.

Examples

In the following example, an auto IP SLAs operation template for a UDP jitter (codec) operation is configured to use the default 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.

```
Router(config)# ip slas auto template type ip udp-jitter voip
Router(config-tplt)# codec g711alaw
Router(config-tplt)# end
Router# show ip sla auto template type ip udp-jitter voip
IP SLAs Auto Template: voip
   Measure Type: udp-jitter (control enabled)
   Description:
   IP options:
       Source IP: 0.0.0.0      Source Port: 0
       VRF:    TOS: 0x0
   Operation Parameters:
       Verify Data: false
       Timeout: 5000          Threshold: 5000
       Codec: g711alaw Number of packets: 1000
       Interval: 20    Payload size: 16        Advantage factor: 0
       Granularity: msec      Operation packet priority: normal
   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 auto template	Enters IP SLA template configuration mode for defining an auto IP SLAs operation template.
show ip sla auto template	Displays configuration including default values of auto IP SLAs operation templates.

codec (VO profile)

To configure the codec parameter in a custom video traffic profile for an IP Service Level Agreements (SLAs) video operation, use the **codec** command in the IP SLA VO custom profile endpoint configuration mode. To remove the codec configuration, use the **no** form of this command.

codec *video-codec* **profile baseline**
no codec *video-codec* **profile baseline**

Syntax Description

video-codec	Value of the synthetic video code profile parameter. **h.264** is the only valid value for the video-codec argument.
profile baseline	Sets a baseline profile.

Command Default
No codec is defined in the custom video profile.

Command Modes
IP SLA VO custom profile endpoint configuration (cfg-ipslavo-custom-profile)

Command History

Release	Modification
15.2(2)T	This command was introduced.

Usage Guidelines
Use the **codec** command to configure the codec parameter in a user-defined custom video traffic profile.

IP SLAs video operations support one baseline profile.

Examples
```
Router> enable
Router# configure terminal
Router(config)# ip sla profile video my-profile
Router(cfg-ipslavo-profile)# endpoint custom
Router(cfg-ipslavo-custom-profile)# codec h.264 profile baseline
```

Related Commands

Command	Description
show ip sla profile video	Displays a summary of IP SLAs video traffic profiles.

control

To configure the control interface type and number for a redundancy group, use the **control**command in redundancy application group configuration mode. To remove the control interface for the redundancy group, use the **no** form of this command.

control *interface-type* *interface-number* **protocol** *id*
no **control**

Syntax Description

interface-type	Interface type.
interface-number	Interface number.
protocol	Specifies redundancy group protocol media.
id	Redundancy group protocol instance. The range is from 1 to 8.

Command Default   The control interface is not configured.

Command Modes   Redundancy application group configuration (config-red-app-grp)

Command History

Release	Modification
Cisco IOS XE Release 3.1S	This command was introduced.

Examples   The following example shows how to configure the redundancy group protocol media and instance for the control Gigabit Ethernet interface:

```
Router# configure terminal
Router(config)# redundancy
Router(config-red)# application redundancy
Router(config-red-app)# group 1
Router(config-red-app-grp)# control GigabitEthernet 0/0/0 protocol
 1
```

Related Commands

Command	Description
application redundancy	Enters redundancy application configuration mode.
authentication	Configures clear text authentication and MD5 authentication for a redundancy group.
data	Configures the data interface type and number for a redundancy group.
group(firewall)	Enters redundancy application group configuration mode.
name	Configures the redundancy group with a name.
preempt	Enables preemption on the redundancy group.

Command	Description
protocol	Defines a protocol instance in a redundancy group.

control (IP SLA)

To configure the parameters for a control protocol message for a Cisco IOS IP Service Level Agreements (SLAs) UDP jitter operation, use the **control** command in multicast UDP jitter configuration mode. To return to the default values, use the **no** form of this command.

control   retry *retries* | **timeout** *seconds*
no   control

Syntax Description

retry *retries*	Specifies the number of times a sending device will resend a control protocol message. The range is 1 to 5 . The default is 3.
timeout *seconds*	Specifies the length of time, in seconds, that a destination device will wait for a control protocol message. The range is to 1 to 1000. The default is 5.

Command Default The timeout value is 5 seconds and the retry value is 3.

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

Command History

Release	Modification
15.2(4)M	This command was introduced.
15.3(1)S	This command was integrated into Cisco IOS Release 15.3(1)S.
Cisco IOS XE 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 Use this command to change the values of the control protocol message retry and timeout from the defaults (3 retires and 5 seconds respectively) to a specified value.

Examples
```
Device> enable
Device# configure terminal
Device(config)# ip sla 10
Device(config-ip-sla)# udp-jitter 239.1.1.1 5000 endpoint-list mcast-rcvrs source-ip
10.10.10.106 source-port 7012 num-packets 50 interval 25
Device(config-ip-sla-multicast-jitter-oper)# control retry 2
Device(config-ip-sla-multicast-jitter-oper)# control timeout 4
```

Related Commands

Command	Description
udp-jitter	Configures an IP SLAs UDP jitter or multicast jitter operation.

cos

To set the class of service (CoS) for a Cisco IOS IP Service Level Agreements (SLAs) Ethernet operation, use the **cos** command in the appropriate submode of IP SLA configuration or IP SLA Ethernet monitor configuration mode. To return to the default value, use the **no** form of this command.

cos *cos-value*
no cos

Syntax Description

cos-value	Class of service (CoS) value. The range is from 0 to 7. The default is 0.

Command Default

The CoS value for the IP SLAs Ethernet operation is set to 0.

Command Modes

IP SLA configuration

Ethernet echo configuration (config-ip-sla-ethernet-echo)

Ethernet jitter configuration (config-ip-sla-ethernet-jitter)

IP SLA Ethernet monitor configuration

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

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)SXI	This command was integrated into Cisco IOS Release 12.2(33)SXI.

Usage Guidelines

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

The configuration mode for the **cos** command varies depending on the operation type configured. For example, if you are running Cisco IOS Release 12.2(33)SRB and the Ethernet ping operation type is configured using the **ethernet echo mpid** command in IP SLA configuration mode, you would enter the **cos** command in Ethernet echo configuration mode (config-ip-sla-ethernet-echo).

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. The class of service for each Ethernet ping operation is set to 3. 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
 cos 3
!
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	Begins configuration for an IP SLAs operation and enters IP SLA configuration mode.
ip sla ethernet-monitor	Begins configuration for an IP SLAs auto Ethernet operation and enters IP SLA Ethernet monitor configuration mode.

data-pattern

To specify the data pattern in a Cisco IOS IP Service Level Agreements (SLAs) operation to test for data corruption, use the **datapattern** command in the appropriate submode of IP SLA configuration or IP SLA monitor configuration mode. To remove the data pattern specification, use the **no** form of this command.

data-pattern *hex-pattern*
no data-pattern *hex-pattern*

Syntax Description

hex-pattern	Hexadecimal string to use for monitoring the specified operation.

Command Default
The default *hex-pattern* is ABCD.

Command Modes
IP SLA Configuration

UDP echo configuration (config-ip-sla-udp)

IP SLA Monitor Configuration

UDP echo configuration (config-sla-monitor-udp)

Command History

Release	Modification
12.1(1)T	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
The **data-pattern** command allows users to specify an alphanumeric character string to verify that operation payload does not get corrupted in either direction (source-to-destination [SD] or destination-to-source [DS]).

Note
The **data-pattern** command is supported by the IP SLAs User Datagram Protocol (UDP) echo operation only.

This command is supported in IPv4 networks and in IPv6 networks.

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 **data-pattern** 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 UDP echo operation type is configured, you would enter the **data-pattern** command in UDP echo configuration mode (config-sla-monitor-udp) within IP SLA monitor configuration mode.

Table 5: 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 specify 1234ABCD5678 as the data pattern. 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).

The examples show the **data-pattern** command being used in an IPv4 network.

IP SLA Configuration

```
ip sla 1
 udp-echo 10.0.54.205 dest-port 101
 data-pattern 1234ABCD5678
!
ip sla schedule 1 life forever start-time now
```

IP SLA Monitor Configuration

```
ip sla monitor 1
 type udpEcho dest-ipaddr 10.0.54.205 dest-port 101
 data-pattern 1234ABCD5678
!
ip sla monitor schedule 1 life forever start-time now
```

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.

delete-scan-factor

To specify the number of times the IP Service Level Agreements (SLAs) label switched path (LSP) Health Monitor should check the scan queue before automatically deleting IP SLAs operations for Border Gateway Protocol (BGP) next hop neighbors that are no longer valid, use the **delete-scan-factor** command in auto IP SLA MPLS parameters configuration mode. To return to the default value, use the **no** form of this command.

delete-scan-factor *factor*
no delete-scan-factor

Syntax Description

factor	Number of times the LSP Health Monitor should check the scan queue before automatically deleting IP SLAs operations for BGP next hop neighbors that are no longer valid.

Command Default

The default scan factor is 1. In other words, each time the LSP Health Monitor checks the scan queue for updates, it deletes IP SLAs operations for BGP next hop neighbors that are no longer valid.

Command Modes

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

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

This command must be used with the **scan-interval** command. Use the **scan-interval** command to specify the time interval at which the LSP Health Monitor checks the scan queue for BGP next hop neighbor updates.

Note   If the scan factor is set to 0, IP SLAs operations will not be automatically deleted by the LSP Health Monitor. This configuration is not recommended.

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 delete scan factor is set to 2. In other words, every other time the LSP Health Monitor checks the scan queue for updates, it deletes IP SLAs operations for BGP next hop neighbors that are no longer valid.

```
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.
scan-interval	Specifies the time interval (in minutes) at which the LSP Health Monitor checks the scan queue for BGP next hop neighbor updates.
show ip sla mpls-lsp-monitor scan-queue	Displays information about adding or deleting BGP next hop neighbors from a particular MPLS VPN of an IP SLAs LSP Health Monitor operation.

description (IP SLA)

To add a description to the configuration of an IP Service Level Agreements (SLAs) auto-measure group, auto IP SLAs operation template, or auto IP SLAs endpoint list, use the **description** command in IP SLA auto-measure group configuration, IP SLA endpoint-list configuration, or IP SLA service performance configuration mode, or the appropriate submode of IP SLA template configuration mode. To remove the description, use the **no** form of this command.

description *description*
no description

Syntax Description

description	String of 1 to 64 ASCII characters.

Command Default

No description is added to configuration.

Command Modes

IP SLA Configuration

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

IP SLA endpoint-list configuration(config-epl)

IP SLA performance service configuration (config-ip-sla-service-performance)

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.
15.3(2)S	This command was modified. Support was added for IP SLA service performance configuration mode.

Usage Guidelines

This command adds descriptive text to the configuration of an IP SLAs auto-measure group, auto IP SLAs operation template, auto IP SLAs endpoint list, or service performance operation. The description appears in the **show** command output and does not affect the operation of the template.

Examples

The following example shows how to configure this command for an auto IP SLAs operation template:

```
Router(config)# ip sla auto template type ip icmp-jitter 1
Router(config-tplt-icmp-jtr)# description default oper temp for icmp jitter
Router# end
```

```
Router# show ip sla auto template type ip icmp-jitter
IP SLAs Auto Template: 1
    Measure Type: icmp-jitter
    Description: default oper temp for icmp jitter
    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
```

Related Commands	Command	Description
	show ip sla auto group	Displays configuration including default values of IP SLAs auto-measure groups.
	show ip sla auto endpoint-list	Displays configuration including default values of auto IP SLAs endpoint lists.
	show ip sla auto schedule	Displays configuration including default values of auto IP SLAs schedulers.
	show ip sla auto template	Displays configuration including default values of auto IP SLAs operation templates.
	show ip sla configuration	Displays configuration including default values of all IP SLAs operations or a specified operation.

description (VO profile)

To add a description to the configuration of a user-defined video traffic profile for an IP Service Level Agreements (SLAs) video operation, use the **description** command in the appropriate IP SLA VO configuration submode. To return to the default, use the **no** form of this command.

description *description*
no **description**

Syntax Description

description	String of 1 to 64 ASCII characters.

Command Default   No description is added to the profile.

Command Modes   IP SLA VO profile CP9900 endpoint configuration (cfg-ipslavo-cp9900-profile)

IP SLA VO profile CTS endpoint configuration (cfg-ipslavo-cts-profile)

IP SLA VO profile custom endpoint configuration (cfg-ipslavo-custom-profile)

Command History

Release	Modification
15.2(2)T	This command was introduced.

Usage Guidelines   This command adds descriptive text to the configuration of a user-defined video traffic profile. The description appears in the **show** command output and does not affect the operation of the video operation.

Examples

```
Router> enable
Router# configure terminal
Router(config)# ip sla profile video my-profile
Router(cfg-ipslavo-profile)# endpoint custom
Router(cfg-ipslavo-custom-profile)# description my video profile
```

Related Commands

Command	Description
show ip sla profile video	Displays a summary of IP SLAs video traffic profiles.

destination (am-group)

To add an auto IP Service Level Agreements (SLAs) endpoint list to the configuration of an IP SLAs auto-measure group, use the **destination** command in IP SLA auto-measure group configuration mode. To remove the endpoint list from the group configuration, use the **no** form of this command.

destination *template-name*
no **destination**

Syntax Description

template-name	Name of an already-configured endpoint list.

Command Default

No endpoints are defined for the IP SLAs auto-measure group being configured.

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 specifies an auto IP SLAs endpoint list as a reference for the IP SLAs auto-measure group being configured. An endpoint list contains IP addresses for IP SLAs endpoints.

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

To change the auto IP SLAs endpoint list in the configuration of an existing auto-measure group, first use the **no** form of this command to remove the endpoint list from the group configuration and then reconfigure the group with a different endpoint list.

To create an auto IP SLAs endpoint list, use the **ip sla auto endpoint-list**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)# 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: default
    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 endpoint-list	Enters IP SLA endpoint-list configuration mode for creating an auto IP SLAs endpoint list.

dhcp (IP SLA)

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

dhcp *destination-ip-addressdestination-hostname* [**source-ip** *ip-addresshostname*] [**option-82** [**circuit-id** *circuit-id*] [**remote-id** *remote-id*] [**subnet-mask** *subnet-mask*]]

Syntax Description

destination-ip-address | *destination-hostname*	D estination 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.
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.

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 dhcp** command.
12.2(33)SRB	This command was integrated into Cisco IOS Release 12.2(33)SRB. This command replaces the **type dhcp** command.
12.2(33)SB	This command was integrated into Cisco IOS Release 12.2(33)SB. This command replaces the **type dhcp**command.
12.2(33)SXI	This command was integrated into Cisco IOS Release 12.2(33)SXI. This command replaces the **type dhcp**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** 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 4
 dhcp option-82 circuit-id 10005A6F1234
ip dhcp-server 172.16.20.3
!
ip sla 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	Begins configuration for an IP SLAs operation and enters IP SLA configuration mode.

discover (epl)

To enter IP SLA endpoint-list auto-discovery configuration mode for building a list of destination IP addresses for Cisco routing devices or Cisco IP Service Level Agreements (SLAs) Responders, use the **discover** command in IP SLA endpoint-list configuration mode. To remove the list, use the **no** form of this command.

discover [**port** *port*]
no discover [**port** *port*]

Syntax Description

port	(Optional) Specifies port on source IP SLAs device.
port	Port number. Range is from 1 to 65535. Default is 5000.

Command Default

No destination IP addresses are identified.

Command Modes

IP SLA endpoint-list configuration (config-epl)

Command History

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

Usage Guidelines

This command discovers and builds a list of destination IP addresses to be added to an endpoint list for IP SLAs auto-measure groups.

Before using this command, use the **ip sla auto discovery** command to enable auto-discovery.

Before using this command, use the **ip sla responder auto-register** command on the destination Cisco device to enable endpoints to register with source upon configuration.

Destination IP addresses can either be automatically discovered by using this command or manually configured using the **ip-address** command. If you use this command to build an endpoint list, you cannot use the **ip-address** command to manually add or remove IP addresses in an endpoint list.

To add the discovered list of destination IP addresses to the endpoint list being configured, use the **access-list** command in IP SLA endpoint-list auto-discovery configuration mode.

Examples

The following example shows how to configure an endpoint list using the auto discovery method:

Destination Router

```
Router(config)# ip sla responder auto-register 10.1.1.25
Router(config)#
```

Source Router

```
Router(config)# ip sla auto discovery
Router(config)# ip sla auto endpoint-list type ip autolist
```

```
Router(config-epl)# discover port 5000
Router(config-epl-disc)# access-list 3
Router(config-epl-disc)# end
Router# show ip sla auto endpoint-list
Endpoint-list Name: autolist
    Description:
    Auto Discover Parameters
        Destination Port: 5000
        Access-list: 3
        Ageout: 3600     Measurement-retry: 3
.
.
.
```

Related Commands	Command	Description
	access-list	Adds a list of discovered endpoints to an auto IP SLAs endpoint list.
	ip sla auto discovery	Enables IP SLAs auto discovery for auto IP SLAs in Cisco IOS IP SLAs Engine 3.0.
	ip sla responder auto-register	Configures a Cisco IP SLAs Responder to automatically register with the source.
	show ip sla auto discovery	Displays the status of IP SLAs auto discovery and the configuration of auto IP SLAs endpoint lists configured using auto discovery.
	show ip sla auto endpoint-list	Displays the configuration including default values of auto IP SLAs endpoint lists.

distribution

To configure statistics distributions for an IP Service Level Agreements (SLAs) Metro-Ethernet 3.0 (ITU-T Y.1731) operation, use the **distribution** command in IP SLA Y.1731 delay configuration mode. To return to the default value, use the **no** form of the command.

distribution **delay** | **delay-variation** **one-way** | **two-way** *number-of-bins* *boundary*[*,...,boundary*]
no **distribution** **delay** | **delay-variation** **one-way** | **two-way**

Syntax Description		
delay		Specifies that the performance measurement type is delay. This is the default value, along with delay variation.
delay-variation		Specifies that the performance measurement type is delay variation. This is the default value, along with delay.
one-way		Specifies one-way measurement values. This is the default for a dual-ended operation.
two-way		Specifies two-way measurement values. This is the default for a single-ended operation.
number-of-bins		Number of bins kept during an aggregate interval. Range is from 1 to 10. Default is 10.
boundary [*,...,boundary*]		List of upper boundaries for bins in microseconds. Minimum number of boundaries required is one. Maximum allowed value for the uppermost boundary is -1 microsecond. Multiple values must be separated by a comma (,). Default is 5000,10000,15000,20000,25000,30000,35000,40000,45000, -1.

Command Default

The default for distribution is 10 bins with upper boundaries of 5000, 10000,15000,20000,25000,30000,35000,40000,45000,-1, for both delay and delay-variation performance measurements.

Command Modes

IP SLA Y.1731 delay configuration (config-sla-y1731-delay)

Command History

Release	Modification
15.1(2)S	This command was introduced.
15.3(2)S	This command was implemented on the Cisco ASR 901 Series Aggregation Services Routers.

Usage Guidelines

Use this command change the type of performance measurements to be calculated and the number and range of distribution bins from the defaults (10 bins with upper boundaries of 5000,10000,15000,20000,25000,30000,35000,40000,45000,-1, for both delay and delay-variation performance measurements) to the specified values.

Configure this command on the Maintenance End Point (MEP) that performs the performance measurement calculation. For single-ended operations, calculations are performed at the sender MEP. For dual-ended operations, calculations are performed at the receiver MEP on the responder.

Statistics distributions are defined by number and range of bins per interval.

A bin is a counter that counts the number of measurements initiated and completed during a specified length of time for each operation. The results of performance measurements falling within a specified range are stored in each bin. When the number of distributions reaches the number and range specified, no further distribution-based information is stored.

The lower bound value for the first upper boundary is always 0 microseconds, such as 0 to 5000 microseconds for the default first upper boundary.

The maximum allowed value for the uppermost boundary is -1 microsecond.

An aggregate interval is the length of time during which the performance measurements are conducted and the results stored. You can configure the interval by using the **aggregate interval** command.

To avoid significant impact on router memory, careful consideration should be used when configuring distribution.

Examples

The following example shows how to configure the sender MEP to calculate two-way, delay-variation performance measurements for a single-ended IP SLAs Metro-Ethernet 3.0 (ITU-T Y.1731) operation, and store the statistics in five bins:

```
Router(config-term)# ip sla 10
Router(config-ip-sla)# ethernet y1731 delay dmm domain xxx evc yyy mpid 101 cos 3 source
mpid 100
Router(config-sla-y1731-delay)# distribution delay-variation two-way 5
5000,10000,15000,20000-1
Router(config-sla-y1731-delay)#
```

Related Commands

Command	Description
aggregate interval	Configures the aggregate interval.
history interval	Sets the number of statistics distributions kept during the lifetime of an IP SLAs Metro Ethernet 3.0 (ITU-T Y.1731) operation.

distributions-of-statistics-kept

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

To set the number of statistics distributions kept per hop during a Cisco IOS IP Service Level Agreements (SLAs) operation, use the **distributions-of-statistics-kept**command in the appropriate submode of IP SLA monitor configuration mode. To return to the default value, use the **no** form of this command.

distributions-of-statistics-kept *size*
no distributions-of-statistics-kept

Syntax Description

| *size* | Number of statistics distributions kept per hop. The default is 1 distribution. |

Command Default the default is 1 distribution.

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 distributions-of-statistics-kept**command.
12.2(33)SRB	This command was replaced by the **history distributions-of-statistics-kept**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 distributions-of-statistics-kept** command.
12.2(33)SXI	This command was replaced by the **history distributions-of-statistics-kept** command.

Usage Guidelines

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

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

For the IP SLAs Internet Control Message Protocol (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.

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

The following example shows how to set the statistics distribution to 5 and the distribution interval 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
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.
statistics-distribution-interval	Sets the time interval for each statistics distribution kept for the IP SLAs operation.

dlsw peer-ipaddr

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

dlsw peer-ipaddr *ip-address*

Syntax Description

ip-address	IP address of the peer 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 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**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 10
 dlsw peer-ipaddr 172.21.27.11
 request-data-size 15
!
ip sla schedule 4 start-time now
```

Related Commands

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

dscp (IP SLA)

To configure the differentiated services code point (DSCP) value for an IP Service Level Agreements (SLAs) multicast UDP jitter operation, use the **dscp** command in multicast UDP jitter configuration mode. To return to the default, use the **no** form of this command.

dscp *dscp-value*

Syntax Description

dscp-value	Number from 0 to 63. The default is 0.

Command Default

The DSCP is 0.

Command Modes

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

Command History

Release	Modification
15.2(4)M	This command was introduced.
15.3(1)S	This command was integrated into Cisco IOS Release 15.3(1)S.
Cisco IOS XE 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

Use the **dscp** command to change the value of DSCP from the default (0) to the specified value. The default value is for best-effort traffic.

Examples

```
Device> enable
Device# configure terminal
Device(config)# ip sla 10
Device(config-ip-sla)# udp-jitter 239.1.1.1 5000 endpoint-list mcast-rcvrs source-ip
10.10.10.106 source-port 7012 num-packets 50 interval 25
Device(config-ip-sla-multicast-jitter-oper)# dscp 10
Device(config-ip-sla-multicast-jitter-oper)#
```

Related Commands

Command	Description
udp-jitter	Configures an IP SLAs UDP jitter or multicast UDP jitter operation.

dscp (IP SLA video)

To configure the differentiated services code point (DSCP) value for an IP Service Level Agreements (SLAs) video operation, use the **dscp** command in IP SLA video configuration mode. To return to the default, use the **no** form of this command.

dscp *dscp-value*
no dscp *dscp-value*

Syntax Description

dscp-value	Number from 0 to 63 or a valid keyword for a DSCP marking. See the table in the "Usage Guidelines" section for more information. The default is 0.

Command Default   The default is 0.

Command Modes   IP SLA video configuration (config-ip-sla-video)

Command History

Release	Modification
15.2(2)T	This command was introduced.

Usage Guidelines   Use the **dscp** command to change the value of DSCP from the default (0) to the specified value. The default value is for best-effort traffic.

Valid values for the *dscp-value* argument are a decimal number from 0 to 64 or a keyword from the following table.

Table 6: Decimal Values with Corresponding Keywords for the dscp-value Argument

Bit Pattern	Decimal Value	DSCP Marking (keyword)
000000	0	Default
001010	10	AF11
001100	12	AF12
001110	14	AF13
010010	18	AF21
010100	20	AF22
010110	22	AF23
011010	26	AF31
011100	28	AF32
011110	30	AF33
100010	34	AF41

Bit Pattern	Decimal Value	DSCP Marking (keyword)
100100	36	AF42
100110	38	AF43
001000	8	CS1
010000	16	CS2
011000	24	CS3
100000	32	CS4
101000	40	CS5
110000	48	CS6
111000	56	CS7
101110	46	EF

Examples

```
Router> enable
Router# configure terminal
Router(config)# ip sla 1
Router(config-ip-sla-video)# dscp 10
```

Related Commands

Command	Description
show ip sla profile video	Displays a summary of IP SLAs video traffic profiles.

dns (IP SLA)

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

dns *destination-ip-addressdestination-hostname* **name-server** *ip-address* [**source-ip** *ip-addresshostname* **source-port** *port-number*]

Syntax Description

destination-ip-address | *destination-hostname*	Destination IP address or hostname.
name-server *ip-address*	Specifies the IP address of the DNS server.
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.

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 dns target-addr**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 dns target-addr** command.
12.2(33)SB	This command was integrated into Cisco IOS Release 12.2(33)SB. This command replaces the **type dns target-addr**command.
12.2(33)SXI	This command was integrated into Cisco IOS Release 12.2(33)SXI. This command replaces the **type dns target-addr**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 7 is configured as a DNS operation using the target IPv4 address 172.20.2.132:

```
ip sla 7
 dns host1 name-server 172.20.2.132
!
ip sla schedule 7 start-time now
```

In the following example, IP SLAs operation 1 is configured in Cisco IOS Release 15.2(3)T and later releases as a DNS operation using an IPv6 address, 2001:10:10:10::3, as the target address.

```
ip sla 1
 dns host1 name-server 2001:10:10:10::3
!
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.

duration (IP SLA video)

To set the amount of time that video traffic is generated for an IP Service Level Agreements (SLAs) video operation, use the **duration** command in IP SLA video configuration mode. To return to the default value, use the **no** form of this command.

duration *seconds*
no duration

Syntax Description

seconds	Length of time, in seconds (sec), during which platform-assisted video traffic is generated by the Cisco device. The range is from 1 to 600. The default is 20.

Command Default
Video traffic is generated for 20 seconds.

Command Modes
IP SLA video configuration (config-ip-sla-video)

Command History

Release	Modification
12.2(58)SE	This command was introduced.
15.2(2)T	This command 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.

Usage Guidelines
This command changes the duration value in an IP SLAs video profile from the default (20 seconds) to the specified value.

Platform-assisted video packets are transmitted for the length of time specified by this command and the transmission is repeated as often as is specified by the **frequency** (IP SLA video) command. The duration value must be less than the frequency value.

The **duration** (IP SLA video) command is supported in IPv4 networks.

Use the **show ip sla configuration** command to display configuration command to display configuration values, including all defaults, for all Cisco IOS IP SLAs operations or for a specified operation.

Examples
The following example shows how to configure an IP SLAs video operation to generate traffic for 40 seconds:

```
Router(config-term)# ip sla 10
Router(config-ip-sla)# video 192.168.2.10 555 source-ip 192.168.2.17 source-port 24 profile
 iptv
Router(config-ip-sla-video)# duration 40
Router(config-ip-sla-video)# frequency 90
Router(config-ip-sla-video)# timeout 45000
Router(config-ip-sla-video)# threshold 40000
Router(config-ip-sla-video)# end
Router#
4d23h: %SYS-5-CONFIG_I: Configured from console by console
```

```
Router# show ip sla configuration 10
IP SLAs Infrastructure Engine-III
Entry number: 10
Owner:
Tag:
Operation timeout (milliseconds): 45000
Type of operation to perform: video
Video profile name: IPTV
Target address/Source address: 192.168.2.10/192.168.2.17
Target port/Source port: 555/24
Vrf Name:
Control Packets: enabled
Schedule:
   Operation frequency (seconds): 90  (not considered if randomly scheduled)
   Next Scheduled Start Time: Pending trigger
   Group Scheduled : FALSE
   Randomly Scheduled : FALSE
   Life (seconds): 3600
   Entry Ageout (seconds): never
   Recurring (Starting Everyday): FALSE
   Status of entry (SNMP RowStatus): notInService
Threshold (milliseconds): 40000
Distribution Statistics:
   Number of statistic hours kept: 2
   Number of statistic distribution buckets kept: 1
   Statistic distribution interval (milliseconds): 20
Enhanced History:
```

Related Commands	Command	Description
	frequency (IP SLA video)	Sets the rate at which an IP SLAs video operation repeats.
	show ip sla configuration	Displays configuration values, including all defaults, for all IP SLAs operations or for a specified operation.
	threshold (IP SLA video)	Sets the upper threshold value for calculating network monitoring statistics created by an IP SLAs video operation.
	timeout (IP SLA video)	Sets the amount of time that an IP SLAs video operation waits for a response to its request packet.

duration time

To set the amount of time that traffic is generated for an IP Service Level Agreements (SLAs) service performance operation, use the **duration time** command in IP SLA service performance configuration mode. To return to the default value, use the**no** no form of this command.

duration **time** *seconds*
no **duration** **time**

Syntax Description	*seconds*	Length of time, in seconds (sec), during which traffic is generated for an operation. The range is from 1 to 65535. The default is 30.

Command Default   Traffic is generated for 30 sec.

Command Modes   IP SLA service performance configuration (config-ip-sla-service-performance)

Command History

Release	Modification
15.3(2)S	This command was introduced.

Usage Guidelines

This command changes the duration value for an IP SLAs service performance operation from the default (30 seconds) to the specified value. Use this command to configure the length of time for which the operation runs.

To configure the size and frequency of bursts to be transmitted by the operation is specified by the **frequency** (IP SLA service performance) command. The duration value must be less than the frequency value.

Use the **show ip sla configuration** command to display configuration command to display configuration values, including all defaults, for all Cisco IOS IP SLAs operations or for a specified operation.

```
IP SLAs Infrastructure Engine-III
Entry number: 1
Service Performance Operation
Type: ethernet
Destination
MAC Address: 4055.398d.8bd2
VLAN:
Interface: GigabitEthernet0/4
Service Instance: 10
EVC Name:
Duration Time: 20
Interval Buckets: 5

Signature:
05060708

Description: this is with all operation modes

Measurement Type:
throughput, loss
Direction: internal

Profile Traffic:
```

```
Direction: internal
CIR: 0
EIR: 0
CBS: 0
EBS: 0
Burst Size: 3
Burst Interval: 20
Rate Step (kbps): 1000 2000

Profile Packet:
Inner COS: 6
Outer COS: 6
Inner VLAN: 100
Outer VLAN: 100
Source MAC Address: 4055.398d.8d4c
Packet Size: 512
Schedule:
   Operation frequency (seconds): 64  (not considered if randomly scheduled)
   Next Scheduled Start Time: Start Time already passed
   Group Scheduled : FALSE
   Randomly Scheduled : FALSE
   Life (seconds): Forever
   Entry Ageout (seconds): never
   Recurring (Starting Everyday): FALSE
   Status of entry (SNMP RowStatus): Active
```

Related Commands	Command	Description
	frequency (IP SLA service performance)	Configures rate at which the operation repeats.
	show ip sla configuration	Displays configuration values including all defaults for all IP SLAs operations or a specified operation.

endpoint

To specify an endpoint type and enter the appropriate IP SLA VO endpoint profile configuration submode to begin configuring a user-defined video traffic profile for an IP Service Level Agreements (SLAs) video operation, use the **endpoint** command in the the IP SLA VO endpoint profile configuration mode.

endpoint *endpoint-type*

Syntax Description	*endpoint-type*	The following keywords are valid options for the endpoint-type argument:
		• **CP-9900**—Cisco Unified 9900 Series IP Phone System (CP-9900).
		• **CTS**—Cisco Telepresence System 1000/3000 (CTS-1000/3000).
		• **custom**—Customized video endpoint type.

Command Default   The endpoint type is not specified in the video profile.

Command Modes   IP SLA VO endpoint profile configuration (cfg-ipslavo-profile)

Command History

Release	Modification
15.2(2)T	This command was introduced.

Usage Guidelines   Use the **endpoint** command to specify the endpoint type for the profile to be configured and enter the appropriate IP SLA VO endpoint configuration submode, based on the specified endpoint type.

Once the endpoint profile type is configured, it cannot be changed. For a different endpoint type, you must create a new profile.

For the CP-9900 and CTS profiles, you must configure the three mandatory parameters: resolution, frame rate, and maximum bit rate. These endpoint types do not allow the configuration of any other video parameters.

For a custom profile, you can also configure certain other video profile parameters, in addition to the three mandatory parameters.

If the bit-rate, frame, and resolution values are not configured, the video profile remains in the shutdown state and the video profile operation is not initiated.

The keywords for this command are not case sensitive. The keywords in online help contain uppercase letters to enhance readability only.

Examples
```
Router(config)# ip sla video profile my-profile
Router(cfg-ipslavo-profile)# endpoint cts
Router(cfg-ipslavo-cts-profile)#
```

Related Commands

Command	Description
bitrate (VO profile)	Configures the max bit rate or bit-rate window size parameter in a user-defined video profile.
frame	Configures frame parameters in a user-defined video profile.
resolution	Configures the resolution in user-defined video profile.
show ip sla profile video	Displays a summary of IP SLAs video traffic profiles.

enhanced-history

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

To enable enhanced history gathering for a Cisco IOS IP Service Level Agreements (SLAs) operation, use the **enhanced-history** command in the appropriate submode of IP SLA monitor configuration mode.

enhanced-history [**interval** *seconds*] [**buckets** *number-of-buckets*]

Syntax Description

interval *seconds*	(Optional) Number of seconds that enhanced history should be gathered in each bucket. When this time expires, enhanced history statistics are gathered in a new bucket. The default is 900 (15 minutes).
buckets *number-of-buckets*	(Optional) Number of history buckets that should be retained in system memory. When this number is reached, statistic gathering for the operation ends. The default is 100.

Command Default   900 seconds and 100 buckets

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
12.2(11)T	This command was introduced.
12.2(25)S	This command was integrated into Cisco IOS Release 12.2(25)S.

Release	Modification
12.2(27)SBC	This command was integrated into Cisco IOS Release 12.2(27)SBC.
12.4(4)T	This command was replaced by the **history enhanced** command.
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 **history enhanced** 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 **history enhanced** command.
12.2(33)SXI	This command was replaced by the **history enhanced** command.

Usage Guidelines   Performance statistics are stored in "buckets" that separate the accumulated data. Each bucket consists of data accumulated over the specified time interval.

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, Internet Control Message Protocol (ICMP) echo operation 3 is configured with the standard enhanced history characteristics.

```
ip sla monitor 3
 type echo protocol ipIcmpEcho 172.16.1.175
 enhanced-history interval 900 buckets 100
!
ip sla monitor schedule 3 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.
show ip sla monitor enhanced-history collection-statistics	Displays data for all collected history buckets for the specified IP SLAs operation, with data for each bucket shown individually.
show ip sla monitor enhanced-history distribution-statistics	Displays enhanced history data for all collected buckets in a summary table.

enhanced timestamp

To improve the accuracy for Round-trip time (RTT) measurements, in milliseconds, during IP Service Level Agreements (SLAs) UDP jitter operations, use the **enhanced timestamp** command in UDP jitter configuration mode. To return to the default value, use the **no** form of this command.

enhanced   timestamp
no   enhanced   timestamp

Syntax Description   This command has no arguments or keywords.

Command Default   This command is disabled.

Command Modes   UDP jitter configuration (config-ip-sla-jitter)

Command History

Release	Modification
Cisco IOS XE Fuji 16.8.1	This command was introduced.

Usage Guidelines   If this command is configured, the measurements for an IP SLAs operation will be displayed with the granularity of 1 millisecond with improved accuracy.

ethernet echo mpid

To manually configure an individual Cisco IOS IP Service Level Agreements (SLAs) Ethernet ping operation, use the **ethernet echo mpid** command in IP SLA configuration mode.

ethernet echo mpid *mp-id* **domain** *domain-name* **evc** *evc-id* | **port** | **vlan** *vlan-id*

Syntax Description	

mp-id	Maintenance endpoint identification number.
domain *domain-name*	Specifies the name of the Ethernet Connectivity Fault Management (CFM) maintenance domain.
evc *evc-id*	Specifies the Ethernet Virtual Circuit (EVC) identification name.
port	Enables port level statistical measurements for two directly connected maintenance endpoints (MEPs).
vlan *vlan-id*	Specifies the VLAN identification number.

Command Default   No IP SLAs Ethernet ping operation is configured.

Command Modes   IP SLA configuration (config-ip-sla)

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.
12.2(33)SRE	This command was modified. The **port** keyword was added.

Usage Guidelines   Unlike the EVC and VLAN statistical measurements, the port level measurement is performed at the physical layer level and does not cross a bridge boundary.

You must configure the type of IP SLAs 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** global configuration command) and then reconfigure the operation with the new operation type.

Examples   The following example shows how to configure an IP SLAs Ethernet ping operation. In this example, the maintenance endpoint identification number is 23, the maintenance domain name is testdomain, and the VLAN identification number is 34. Operation 1 is scheduled to start immediately.

```
ip sla 1
```

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ethernet echo mpid

```
 ethernet echo mpid 23 domain testdomain vlan 34
!
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.

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ethernet jitter mpid

To manually configure an individual Cisco IOS IP Service Level Agreements (SLAs) Ethernet jitter operation, use the **ethernet jitter mpid** command in IP SLA configuration mode.

ethernet jitter mpid *mp-id* **domain** *domain-name* **evc** *evc-id* | **port** | **vlan** *vlan-id* [**interval** *interframe-interval*] [**num-frames** *frames-number*]

Syntax Description

mp-id	Maintenance endpoint identification number.
domain *domain-name*	Specifies the 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.
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

No IP SLAs Ethernet jitter operation is configured.

Command Modes

IP SLA configuration (config-ip-sla)

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.
12.2(33)SRE	This command was modified. The **port** keyword was added.

Usage Guidelines

Unlike the EVC and VLAN statistical measurements, the port level measurement is performed at the physical layer level and does not cross a bridge boundary.

You must configure the type of IP SLAs 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** global configuration command) and then reconfigure the operation with the new operation type.

Examples

The following example shows how to configure an IP SLAs Ethernet jitter operation. In this example, the maintenance endpoint identification number is 23, the maintenance domain name is testdomain,

the VLAN identification number is 34, the interframe interval is 20 ms, and the number of frames to be sent is 30. Operation 2 is scheduled to start immediately.

```
ip sla 2
 ethernet jitter mpid 23 domain testdomain vlan 34 interval 20 num-frames 30
!
ip sla schedule 2 start-time now
```

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

ethernet y1731 delay

To configure a sender Maintenance End Point (MEP) for an IP Service Level Agreements (SLAs) Metro Ethernet 3.0 (UTI-T Y.1731) delay or delay variation operation, use the **ethernet y1731 delay** command in IP SLA configuration mode.

ethernet y1731 delay DMM [**burst**] **domain** *domain-name* **evc** *evc-id* | **vlan** *vlan-id***mpid** *target-mp-id* | **mac-address** *target-address* **cos** *cos* **source mpid** *source-mp-id* | **mac-address** *source-address*

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ethernet y1731 delay DMM [**burst**] **domain** *domain-name* **evc** *evc-id* | **vlan** *vlan-id***mpid** *target-mp-id* | **mac-address** *target-address* **cos** *cos* **source mpid** *source-mp-id* | **mac-address** *source-address*

Syntax Description		
1DM		Specifies that the frames sent are one-way Delay Message (1DM) synthetic frames.
DMM		Specifies that the frames sent are Delay Measurement Message (DMM) synthetic frames.
DMMv1		Specifies that the frames sent are concurrent Ethernet frame Delay Measurement (ETH-DM) synthetic frames.
burst		(Optional) Enables burst mode for this operation.
domain *domain-name*		Specifies the name of the Ethernet maintenance Operations, Administration & Maintenance (OAM) domain.
evc *evc-id*		Specifies the Ethernet Virtual Circuit (EVC) identification name.
vlan *vlan-id*		Specifies the VLAN identification number. The range is from 1 to 4096.
mpid *target-mp-id*		Specifies the identification numbers of the MEP at the destination. The range is from 1 to 8191.
mac-address *target-address*		Specifies the MAC address of the MEP at the destination.

cos *cos*	Specifies, for this MEP, which class of service (CoS) will be sent in the Ethernet message. The range is from 0 to 7.
source mpid *source-mp-id*	Specifies the identification numbers of the MEP being configured. The range is from 1 to 8191.
mac-address *source-address*	Specifies the MAC address of the MEP being configured.

Command Default A sender MEP is not configured for the IP SLAs Metro Ethernet 3.0 (ITU-T Y.1731) operation.

Command Modes IP SLA configuration (config-ip-sla)

Command History

Release	Modification
15.1(2)S	This command was introduced.
15.3(1)S	This command was modified. The **DMMv1** and **burst** keywords were added.
Cisco IOS XE Release 3.8S	This command was integrated into Cisco IOS XE Release 3.8S.
15.3(2)S	This command was implemented on the Cisco ASR 901 Series Aggregation Services Routers.

Usage Guidelines This command begins configuring a sender MEP for an Ethernet Frame Delay (ETH-DM: FD) or Ethernet Frame Delay Variation (ETH-DM: FDV) operation and enters IP SLA Y.1731 delay configuration mode.

The **1DM**, **DMM**, and **DMMv1** keywords for this command are not case sensitive. The keywords in online help contain uppercase letters to enhance readability only.

The operation is identified as a dual-ended or single-ended operation by specifying the type of synthetic frames to be sent. One-way Delay Message (1DM) frames are sent during dual-ended operations; Delay Measurement Message (DMM) frames are sent during single-ended operations. For concurrent operations, use the DMMv1 keyword to specify that are sent.

A receiver MEP on the responder device is required for dual-ended operations.

The **no** form of this command is unsupported. To change the operation type of an existing IP SLAs operation, you must first use the **no ip sla** command to delete the IP SLAs operation and then reconfigure the operation with the new operation type.

The dot1q tag contains class of service (CoS) bits, which are used by IPSLA Y.1731 PM session to test delay or loss of packets with a specific CoS. This CoS cannot be a non-zero value when using EPM over untagged EFPs.

The following example shows how to configure a sender MEP for a dual-ended Ethernet delay or delay variation operation:

```
Router(config)# ip sla 500
Router(config-ip-sla)# ethernet y7131 delay 1DM domain xxx evc yyy mpid 101 cos 3 source
mpid 100
```

```
Router(config-sla-y1731-delay)#
```

The following sample output shows the configuration, including default values, of a sender MEP for a dual-ended Ethernet delay or delay variation operation:

```
Router# show ip sla configuration 500

IP SLAs Infrastructure Engine-III
Entry number: 500
Owner:
Tag:
Operation timeout (milliseconds): 5000
Ethernet Y1731 Delay Operation
Frame Type: 1DM
Domain: yyy
ReceiveOnly: FALSE
Evc: xxx
Target Mpid: 101
Source Mpid: 100
CoS: 3
   Request size (Padding portion): 64
   Frame Interval: 1000
Threshold (milliseconds): 5000
.
.
.
Statistics Parameters
  Aggregation Period: 900
  Frame offset: 1
History
  Number of intervals: 22
```

Related Commands

Command	Description
ethernet y1731 delay receive	Configures a receiver MEP on the responder for a dual-ended IP SLAs Metro Ethernet 3.0 (ITU-T Y.1731) delay or delay variation operation.
no ip sla	Deletes an existing configuration for a Cisco IP SLAs operation.

ethernet y1731 delay receive

To configure a receiver Maintenance End Point (MEP) on the responder for a dual-ended IP Service Level Agreements (SLAs) Metro Ethernet 3.0 (ITU-T Y.1731) delay or delay variation operation, use the **ethernet y1731 delay receive** command in IP SLA configuration mode.

ethernet y1731 delay receive 1DM domain *domain-name* **evc** *evc-id* | **vlan** *vlan-id***cos** *cos* **mpid** *source-mp-id* | **mac-address** *source-address*

Syntax Description

1DM	Specifies that the frames sent are one-way Delay Message (1DM) synthetic frames.
domain *domain-name*	Specifies the 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. The range is from 1 to 4096.
cos *cos*	Specifies, for this MEP, which class of service (CoS) will be sent in the Ethernet connectivity fault management (CFM) message. The range is from 0 to 7.
mpid *source-mp-id*	Specifies the maintenance endpoint identification numbers of the MEP being configured. The range is from 1 to 8191.
mac-address *source-address*	Specifies the MAC address of the MEP being configured.

Command Default

A receiver MEP is not configured on the responder for the dual-ended IP SLAs Metro Ethernet 3.0 (ITU-T Y.1731) delay or delay variation operation.

Command Modes

IP SLA configuration (config-ip-sla)

Command History

Release	Modification
15.1(2)S	This command was introduced.

Usage Guidelines

This command begins configuring a receiver MEP on the responder device for a dual-ended Ethernet Frame Delay (ETH-DM: FD) or Ethernet Frame Delay Variation (ETH-DM: FDV) operation and enters IP SLA Y.1731 delay configuration mode. A receiver MEP on the responder device is required for dual-ended operations.

The **1DM** keyword for this command is not case sensitive. The keywords in online help contain uppercase letters to enhance readability only.

The **no** form of this command is unsupported. To change the operation type of an existing IP SLAs operation, you must first use the **no ip sla** command to delete the IP SLAs operation and then reconfigure the operation with the new operation type.

Examples

```
Router(config)# ip sla 501
Router(config-ip-sla)# ethernet y1731 delay receive 1DM domain xxx evc yyy cos 3 mpid 101
Router(config-sla-y1731-delay)#
```

The following sample output shows the configuration, including default values, of a receiver MEP on the responder device for a dual-ended Ethernet delay or delay variation operation:

```
Router# show ip sla configuration 501

IP SLAs Infrastructure Engine-III
Entry number: 501
Owner: admin
Tag:
Operation timeout (milliseconds): 5000
Ethernet Y1731 Delay Operation
Frame Type: 1DM
Domain: xxx
ReceiveOnly: TRUE
Evc: yyy
Local Mpid: 101
CoS: 3
   Max Delay: 5000
Threshold (milliseconds): 5000
.
.
.
Statistics Parameters
  Aggregation Period: 900
  Frame offset: 1
  Distribution Delay One-Way:
   Number of Bins 10
   Bin Boundaries: 5000,10000,15000,20000,25000,30000,35000,40000,45000,-1
  Distribution Delay-Variation One-Way:
   Number of Bins 10
   Bin Boundaries: 5000,10000,15000,20000,25000,30000,35000,40000,45000,-1
History
  Number of intervals: 2
```

Related Commands

Command	Description
ethernet y1731 delay	Configures a sender MEP for an IP SLAs Metro Ethernet 3.0 (ITU-T Y.1731) delay or delay variation operation.
no ip sla	Deletes an existing configuration for a Cisco IP SLAs operation.

ethernet y1737 loss

To configure a sender Maintenance End Point (MEP) for an IP Service Level Agreements (SLAs) Metro Ethernet 3.0 (UTI-T Y.1731) frame loss operation, use the **ethernet y1731 loss** command in IP SLA configuration mode.

ethernet y1731 loss LMM | **SLM** [**burst**] **domain** *domain-name* **evc** *evc-id* | **vlan** *vlan-id***mpid** *target-mp-id* | **mac-address** *target-address* **cos** *cos* **source mpid** *source-mp-id* | **mac-address** *source-address*

Syntax Description		
LMM		Specifies that the frames sent are Loss Measurement Message (LMM) synthetic frames.
	Note	LMM frames are not supported for concurrent operations.
SLM		Specifies that the frames sent are Synthetic Loss Measurement (SLM) frames.
	Note	SLM frames are supported for concurrent operations.
burst		(Optional) Enables burst mode for this operation.
domain *domain-name*		Specifies the 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. The range is from 1 to 4096.
mpid *target-mp-id*		Specifies the identification numbers of the MEP at the destination. The range is from 1 to 8191.
mac-address *target-address*		Specifies the MAC address of the MEP at the destination.
cos *cos*		Specifies, for this MEP, which class of service (CoS) that will be sent in the Ethernet CFM message. The range is from 0 to 7.

source mpid *source-mp-id*	Specifies the identification numbers of the MEP being configured. The range is from 1 to 8191.
source mac-address *source-address*	Specifies the MAC address of the MEP being configured.

Command Default

A sender MEP is not configured for the IP SLAs Metro Ethernet 3.0 (ITU-T Y.1731) operation.

Command Modes

IP SLA configuartion (config-ip-sla)

Command History

Release	Modification
15.1(2)S	This command was introduced.
15.3(1)S	This command was modified, The **burst** keyword was added.
Cisco IOS XE Release 3.8S	This command was integrated into Cisco IOS XE Release 3.8S.
15.3(2)S	This command was implemented on the Cisco ASR 901 Series Aggregation Services Routers.

Usage Guidelines

This command begins configuring a sender MEP for a single-ended Ethernet Frame Loss ratio (ETH-LM: FLR) operation and enters IP SLA Y.1731 loss configuration mode.

The **LMM** and **SLM** keywords for this command is not case sensitive. The keywords that are displayed in the online help contain uppercase letters to enhance readability only.

For Y.1731 Ethernet frame loss probes, you must enable CoS-level monitoring on both MEPs (sender and destination) associated to the probe by using the **monitor loss counters** command.

The **no** form of this command is unsupported. To change the operation type of an existing IP SLAs operation, you must first use the **no ip sla** command to delete the IP SLAs operation and then reconfigure the operation with the new operation type.

The dot1q tag contains class of service (CoS) bits, which are used by IPSLA Y.1731 PM session to test delay or loss of packets with a specific CoS. This CoS cannot be a non-zero value when using EPM over untagged EFPs.

Examples

The following example shows how to configure a sender MEP for an Ethernet frame loss operation:

```
Router(config)# ip sla 11
Router(config-ip-sla)# ethernet y1731 loss LMM domain xxx vlan 12 mpid 34 cos 4 source mpid
 23
Router(config-sla-y1731-loss)#
```

The following sample output shows the configuration, including default values, of a sender MEP for an Ethernet frame loss operation:

```
Router# show ip sla configuration 11

IP SLAs Infrastructure Engine-III
Entry number: 11
Owner:
Tag:
```

```
Operation timeout (milliseconds): 5000
Ethernet Y1731 Loss Operation
Frame Type: LMM
Domain: xxx
Vlan: 12
Target Mpid: 34
Source Mpid: 23
CoS: 4
   Request size (Padding portion): 0
   Frame Interval: 1000
Schedule:
   Operation frequency (seconds): 60  (not considered if randomly scheduled)
   Next Scheduled Start Time: Start Time already passed
   Group Scheduled : FALSE
   Randomly Scheduled : FALSE
   Life (seconds): 3600
   Entry Ageout (seconds): never
   Recurring (Starting Everyday): FALSE
   Status of entry (SNMP RowStatus): ActiveThreshold (milliseconds): 5000
Statistics Parameters
   Aggregation Period: 900
   Frame consecutive: 10
   Availability algorithm: static-window
History
   Number of intervals: 2
```

Related Commands

Command	Description
monitor loss counters	Enables COS-level monitoring.
no ip sla	Deletes an existing configuration for an IP SLAs operation.

exp (IP SLA)

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

exp *exp-bits*
no exp

Syntax Description

exp-bits	Specifies the experimental field value in the header for an echo request packet. The range is from 0 to 7. The default is 0.

Command Default The experimental field value is set to 0.

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)

VCCV configuration (config-sla-vccv)

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.
12.2(33)SRC	Support for MPLS Pseudo-Wire Emulation Edge-to-Edge (PWE3) services via Virtual Circuit Connectivity Verification (VCCV) was added.
12.2(33)SB	Support for MPLS Pseudo-Wire Emulation Edge-to-Edge (PWE3) services via Virtual Circuit Connectivity Verification (VCCV) was added.

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 the Command Used to Begin Configuration of an IP SLAs Operation Based on Cisco IOS Release table). Note that if you are configuring an IP SLAs label switched path (LSP) Health Monitor operation, refer to 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 LSP ping) before you can configure any of the other parameters of the operation.

The configuration mode for the **exp** (IP SLA) 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 **exp** (IP SLA) command in LSP ping configuration mode (config-sla-monitor-lspPing) within IP SLA configuration mode.

Table 7: 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 8: 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 experimental field value for each IP SLAs operations created by LSP Health Monitor operation 1 is set to 5.

```
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
 exp 5
!
```

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

filter-for-history

✎

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

To define the type of information kept in the history table for a Cisco IOS IP Service Level Agreements (SLAs) operation, use the **filter-for-history**command in the appropriate submode of IP SLA monitor configuration mode. To return to the default value, use the no form of this command.

filter-for-history **none** | **all** | **overThreshold** | **failures**
no **filter-for-history** **none** | **all** | **overThreshold** | **failures**

Syntax Description

none	No history kept. This is the default.
all	All operations attempted are kept in the history table.
overThreshold	Only packets that are over the threshold are kept in the history table.
failures	Only packets that fail for any reason are kept in the history table.

Command Default No IP SLAs history is kept for an operation.

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)

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 filter**command.

Release	Modification
12.2(33)SRB	This command was replaced by the **history filter**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 **history filter** command.
12.2(33)SXI	This command was replaced by the **history filter** command.

Usage Guidelines

Use the **filter-for-history** command to control what gets stored in the history table for an IP SLAs operation. To control how much history gets saved in the history table, use the **lives-of-history-kept**, **buckets-of-history-kept**, and the **samples-of-history-kept**commands.

Note   The **filter-for-history** command does not support the IP SLAs User Datagram Protocol (UDP) jitter operation.

An IP SLAs operation can collect history and capture statistics. By default, the history for an IP SLAs operation is not collected. If history is collected, each history bucket contains one or more history entries from the operation. When the operation type is ICMP path echo, an entry is created for each hop along the path that the operation takes to reach its destination. The type of entry stored in the history table is controlled by the **filter-for-history** command. The total number of entries stored in the history table is controlled by the combination of the **samples-of-history-kept**, **buckets-of-history-kept**, and **lives-of-history-kept** commands.

Note   Collecting history increases the RAM usage. Collect history only when you think there is a problem in the network.

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, only operation packets that fail are kept in the history table.

```
ip sla monitor 1
 type echo protocol ipIcmpEcho 172.16.161.21
 lives-of-history-kept 1
 filter-for-history failures
!
ip sla monitor schedule 1 life forever start-time now
```

Related Commands

Command	Description
buckets-of-history-kept	Sets the number of history buckets that are kept during the lifetime of the IP SLAs operation.

Command	Description
ip sla monitor	Begins configuration for an IP SLAs operation and enters IP SLA monitor configuration mode.
lives-of-history-kept	Sets the number of lives maintained in the history table for the IP SLAs operation.
samples-of-history-kept	Sets the number of entries kept in the history table per bucket for the IP SLAs operation.

flow-label (IP SLA)

To define the flow label field in the IPv6 header of a Cisco IOS IP Service Level Agreements (SLAs) operation, use the **flow-label** (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.

flow-label *number*
no flow-label

Syntax Description	*number*	Value in the flow label field of the IPv6 header. The range is from 0 to 1048575 (or FFFFF hexadecimal). This value can be preceded by "0x" to indicate hexadecimal notation. The default value is 0.

Command Default The default flow label 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)

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 flow label value is stored in a a 20-bit field in the IPv6 packet header and is used by a source to label packets of a flow.

A flow label value of zero is used to indicate packets that are not part of any flow.

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

Note This command is applicable only to IPv6 networks.

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

Examples In the following example, IP SLAs operation 1 is configured as an Internet Control Message Protocol (ICMP) echo operation with destination IPv6 address 2001:DB8:100::1. The value in the flow label field of the IPv6 header is set to 0x1B669.

```
ip sla 1
 icmp-echo 2001:DB8:100::1
 flow-label 0x1B669
!
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.

force-explicit-null

To add an explicit null label to all echo request packets of a Cisco IOS IP Service Level Agreements (SLAs) LSP Health Monitor operation, use the **force-explicit-null** command in the appropriate submode of auto IP SLA MPLS configuration mode. To return to the default value, use the **no** form of this command.

force-explicit-null
no force-explicit-null

Syntax Description   This command has no arguments or keywords.

Command Default   An explicit null label is not added.

Command Modes   **Auto IP SLA MPLS Configuration**

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

LSP discovery parameters configuration (config-auto-ip-sla-mpls-lpd-params)

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.
12.2(31)SB2	This command was integrated into Cisco IOS Release 12.2(31)SB2. Support for this command in MPLS label switched path (LSP) discovery parameters configuration mode was added.
12.2(33)SRB	This command was integrated into Cisco IOS Release 12.2(33)SRB.
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.

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. In this example, an explicit null label will be added to all the echo request packets of IP SLAs operations created by LSP Health Monitor operation 1.

```
mpls discovery vpn interval 60
mpls discovery vpn next-hop
!
auto ip sla mpls-lsp-monitor 1
 type echo ipsla-vrf-all
 force-explicit-null
 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.

frame (VO profile)

To configure the frame rate, maximum intra-frame size, or maximum intra refresh interval parameters in a user-defined video traffic profile for an IP Service Level Agreements (SLAs) video operation, use the **frame** command in the appropriate IP SLA VO profile endpoint configuration submode. To remove the configured frame values, use the **no** form of this command.

frame rate *rate* | **intra size maximum** *max-size* | **refresh interval** *seconds*
no frame rate *seconds* | **intra size maximum** *max-size* | **refresh interval** *seconds*

Syntax Description		
rate *rate*	Specifies the frame rate in frames per second (fps). The following values are valid for the video traffic profile being configured: • For CP-9900: 10, 15, or 30. • For CTS: 30. • For custom: 10, 15, 24, 30, 5, or 7.5. For a description of each traffic profile type, see the "Usage Guidelines" section.
intra	Configures the maximum size or the refresh interval for intra-frame.
size maximum *max-size*	Specifies the maximum size of the intra-frame in kilobytes (KB/s). The range is from 0 to 250. The default is 50.
refresh interval *interval*	Specifies the refresh interval of the intra-frame in seconds. The range is from 0 to 300. The default is 0.

Command Default The default values are as follows:

• No frame rate is specified in the video profile.

• The maximum size of the intra-frame is 50 KB/s.

• The refresh interval of the intra-frame is 0 seconds.

Command Modes IP SLA VO CP9900 profile endpoint configuration (cfg-ipslavo-cp9900-profile)

IP SLA VO CTS profile endpoint configuration (cfg-ipslavo-cts-profile)

IP SLA VO custom profile endpoint configuration (cfg-ipslavo-custom-profile)

Command History	Release	Modification
	15.2(2)T	This command was introduced.

Usage Guidelines Use the **frame** command to configure the frame rate per second parameter in a video profile for the following video endpoint types:

• CP-9900—Cisco Unified 9900 Series IP Phone System (CP-9900).

- CTS—Cisco Telepresence System 1000/3000 (CTS-1000/3000)

- custom—Customized video endpoint type.

You can also use this command to change the value of the maximum size or the refresh interval parameter from the default (50 KB/s or 0 seconds, respectively) to the specified value.

There are restrictions based on the relationships between maximum bit rate, frame rate, and resolution, also known as bandwidth. For the user-defined endpoint types, the table below includes the maximum bit rates allowable in relation to the frame per second (fps) rates and resolution. Cisco IOS software allows you to enter the values of these three parameters in any order and verifies that their combination is within a valid range, as specified. For example, if a 1080 pixels (p) resolution at 30 fps is chosen, the valid maximum bit-rate range is between 1500 and 4000 kb/s.

Table 9: Maximum Bit Rates Allowable for Frame Rates and Resolution in Custom Endpoints

Resolution and Frame Rate	30/24 fps	15 fps	10 fps	7.5 fps	5 fps
QCIF	60–256 kb/s	32–160 kb/s	20–118 kb/s	15–96 kb/s	10–74 kb/s
CIF/SIG/QVGA	128–1000 kb/s	64–564 kb/s	43–397 kb/s	32–314 kb/s	22–230 kb/s
VGA/4CIF/4SIF	384–2000 kb/s	192–1128 kb/s	128–795 kb/s	96–628 kb/s	64–461 kb/s
720p	800–2500 kb/s	400–1506 kb/s	267–1089 kb/s	200–881 kb/s	133–673 kb/s
1080p	1500–4000 kb/s	750–2512 kb/s	500–1845 kb/s	375–1512 kb/s	250–1179 kb/s

Examples

```
Router> enable
Router# configure terminal
Router(config)# ip sla profile video my-profile
Router(cfg-ipslavo-profile)# endpoint custom
Router(cfg-ipslavo-custom-profile)# frame intra refresh interval 40
Router(cfg-ipslavo-custom-profile)# frame intra size maximum 250
Router(cfg-ipslavo-custom-profile)# frame rate maximum 30
```

Related Commands

Command	Description
bitrate (VO profile)	Configures the max bit rate or bit rate window size parameter in a user-defined video profile.
resolution	Configures the resolution in user-defined video profile.
show ip sla profile video	Displays a summary of IP SLAs video traffic profiles.

frame consecutive

To configure the number of consecutive measurements to be used to determine status for an IP Service Level Agreements (SLAs) Metro-Ethernet 3.0 (ITU-T Y.1731) frame loss operation, use the **frame consecutive** command in IP SLA Y.1731 loss configuration mode. To return to the default, use the **no** form of the command.

frame **consecutive** *number*
no **frame** **consecutive** *number*

Syntax Description

number	Number of consecutive measurements. The range is from 1 to 10. The default is 10.

Command Default

The default is ten consecutive frames.

Command Modes

IP SLA Y.1731 loss configuration (config-sla-y1731-loss)

Command History

Release	Modification
15.1(2)S	This command was introduced.
15.3(2)S	This command was implemented on the Cisco ASR 901 Series Aggregation Services Routers.

Usage Guidelines

Availability is defined in terms of the ratio of frames lost to frames sent, or Frame Loss Ratio (FLR). Use this command to change the number of consecutive FLR measurements used to evaluate the status of an availability indicator from the default (10) to the specified number.

Examples

```
Router(config)# ip sla 11
Router(config-ip-sla)# ethernet y1731 loss LMM domain xxx vlan 12 mpid 34 cos 4 source mpid
 23
Router(config-sla-y1731-loss)# frame consecutive 5
Router(config-sla-y1731-loss)#
```

frame interval

To configure the rate at which an IP Service Level Agreements (SLAs) Metro-Ethernet 3.0 (ITU-T Y.1731) operation sends synthetic frames, use the **frame interval** command in the IP SLA Y.1731 delay or IP SLA Y.1731 loss configuration mode. To return to the default, use the **no** form of the command.

frame interval *milliseconds*
no frame interval *milliseconds*

Syntax Description	*milliseconds*	Length of time in milliseconds (ms) between successive synthetic frames. The default is 1000. The valid values are:
		• 10—Frame interval is 10 ms
		• 100—Frame interval is 100 ms
		• 1000—Frame interval is 1000 ms (1 second)
		• 20—Frame interval is 20 ms
		• 25—Frame interval is 25 ms
		• 50—Frame interval is 50 ms

Command Default   The default for the frame interval is 1000 milliseconds.

Command Modes   IP SLA Y.1731 delay configuration (config-sla-y1731-delay)

IP SLA Y.1731 loss configuration (config-sla-y1731-loss)

Command History

Release	Modification
15.1(2)S	This command was introduced.
15.3(2)S	This command was implemented on the Cisco ASR 901 Series Aggregation Services Routers.

Usage Guidelines   Use this command to change the gap between successive synthetic frames sent in an Ethernet delay, delay variation, or frame loss operation from the default (1000 ms) to the specified value.

Frames will be sent at a given frequency for the lifetime of the operation. For example, a delay operation with a frame interval of 1000 ms sends a frame once every second, for the lifetime of the operation.

Configure this command on the sender Maintenance End Point (MEP).

Note   The value range of this command on the Cisco ASR 901 router is 100 to 1000.

Examples   The following example shows how to configure the sender MEP for a single-ended IP SLAs Ethernet delay operation with a frame interval of 100 ms:

A through H

```
Router(config)# ip sla 10
Router(config-ip-sla)# ethernet y7131 delay dmm domain xxx evc yyy mpid 101 cos 3 source
mpid 100
Router(config-sla-y1731-delay)# frame interval 100
Router(config-sla-y1731-delay)# frame size 32
Router(config-sla-y1731-delay)#
```

Command	Description
frame size	Configures the padding for synthetic frames in an Ethernet delay or delay variation operation.

frame offset

To configure the frame offset to be used to calculate statistics for an IP Service Level Agreements (SLAs) Metro-Ethernet 3.0 (ITU-T Y.1731) delay variation operation, use the **frame offset** command in IP SLA Y.1731 delay configuration mode. To return to the default, use the **no** form of this command.

frame offset *offset*
no frame offset *offset*

Syntax Description

offset	Value used for calculating delay variation rates. The range is form 1 (consecutive) to 10. The default is 1.

Command Default

The default for frame offset is consecutive (1).

Command Modes

IP SLA Y.1731 delay configuration (config-sla-y1731-delay)

Command History

Release	Modification
15.1(2)S	This command was introduced.
15.3(2)S	This command was implemented on the Cisco ASR 901 Series Aggregation Services Routers.

Usage Guidelines

Use this command to change the value of frame offset from the default (1) to the specified value.

Configure this command on the maintenance End Point (MEP) that performs the performance measurement calculation. For single-ended operations, calculations are performed at the sender MEP. For dual-ended operations, calculations are performed at the receiver MEP on the responder.

Use the **distribution** command to set the performance measurement type to delay variation.

Examples

The following example shows how to configure the sender MEP to calculate the statistics for two-way, delay-variation performance measurements in a single-ended IP SLAs Metro-Ethernet 3.0 (ITU-T Y.1731) operation:

```
Router(config-term)# ip sla 10
Router(config-ip-sla)# ethernet y1731 delay dmm domain xxx evc yyy mpid 101 cos 3 source
mpid 100
Router(config-sla-y1731-delay)# distribution delay-variation two-way 5
5000,10000,15000,20000-1
Router(config-sla-y1731-delay)# frame offset 2
```

Related Commands

Command	Description
distribution	Configures statistics distributions for an IP SLAs Metro-Ethernet 3.0 (ITU-T Y.1731) operation.

frame size

To configure the padding for synthetic frames for an IP Service Level Agreements (SLAs) Metro-Ethernet 3.0 (ITU-T Y.1731) delay or delay variation operation, use the **frame size** command in IP SLA Y.1731 delay configuration mode. To return to the default, use the **no** form of this command.

frame size *bytes*
no frame size *bytes*

Syntax Description

bytes	Padding size, in four-octet increments, for the synthetic frames. The range is from 64 to 384. The default is 64.

Command Default

The default for the frame size is 64 bytes.

Command Modes

IP SLA Y.1731 delay configuration (config-sla-y1731-delay)

Command History

Release	Modification
15.1(2)S	This command was introduced.
15.3(2)S	This command was implemented on the Cisco ASR 901 Series Aggregation Services Routers.

Usage Guidelines

This command is used to change the padding size of synthetic frames sent during an Ethernet delay or delay variation operation from the default (64 bytes) to the specified value.

Configure this command on the sender Maintenance Endpoint (MEP).

Examples

The following example shows how to configure the sender MEP for a single-ended IP SLAs Ethernet delay operation with a frame size of 32 bytes:

```
Router(config)# ip sla 10
Router(config-ip-sla)# ethernet y7131 delay dmm domain xxx evc yyy mpid 101 cos 3 source
mpid 100
Router(config-sla-y1731-delay)# frame interval 100
Router(config-sla-y1731-delay)# frame size 32
Router(config-sla-y1731-delay)#
```

Related Commands

Command	Description
frame interval	Configures statistics distributions for an IP SLAs Metro-Ethernet 3.0 (ITU-T Y.1731) operation.

frequency (am-schedule)

To set the frequency characteristic in an auto IP Service Level Agreements (SLAs) scheduler for restarting auto IP SLAs operations, use the **frequency** command in IP SLA auto-measure schedule configuration mode. To return to the default value, use the **no** form of this command.

frequency *seconds* | **range** *random-frequency-range*
no frequency

Syntax Description

seconds	Length of time before an operation repeats, in seconds (sec). Range is from 0 to 604800. Default is 60.
range	Specifies frequencies at which auto IP SLAs operations that share the same schedule will restart are chosen randomly within the specified frequency range. Default is disabled.
random-frequency-range	Lower and upper limits of the range, in seconds, and separated by a hyphen (**-**), such as 80-100. The hyphen (-) is required.

Command Default

Auto IP SLAs operations restart every 60 sec.

Command Modes

IP SLA 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 frequency in an auto IP SLAs scheduler from the default (every 60 sec) to the specified value. The frequency characteristic determines how often an operation in an IP SLAs auto-measure group will repeat once it is started.

Use the **probe-interval** command to configure the interval between the start time of one operation and the start time of the next operation being controlled by the same auto IP SLAs scheduler.

Random Scheduler

The random scheduler option provides the capability to schedule auto IP SLAs operations that share the same scheduler 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 **range** *random-frequency-range* keyword and argument combination. Auto IP SLAs operations being controlled by a random scheduler restart at uniformly distributed random frequencies within the specified frequency range. The following guidelines apply for setting the random frequency range:

- The starting value of the range should be greater than the timeout value of the operations controlled by the scheduler being configured.

- The starting value of the frequency range should be greater than the schedule period (amount of time for which the operations are 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 being controlled by the same auto IP SLAs scheduler will be uniformly distributed to begin at random intervals over the schedule period.

- The operations being controlled by the same auto IP SLAs scheduler restart at uniformly distributed random frequencies within the specified frequency range.

- The minimum interval between the start of each operation being controlled by the same auto IP SLAs scheduler is 100 ms (0.1 sec).

- 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 ms of the schedule period.

- The order in which each operation in a multioperation schedule begins is random.

Multioperation Scheduling

Note A multioperation schedule is created by specifying the same auto IP SLA scheduler for two or more IP SLA auto-measure groups.

The following guidelines apply when you add or delete an operation from an existing multioperation schedule by modifying the configuration of an IP SLAs auto-measure group to add or remove the auto IP SLAs scheduler:

- 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.

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# 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
```

The following example shows how to schedule auto IP SLAs operations 3, 4, and 6 using multioperation scheduling. In this example, the operations are scheduled to begin at equal intervals over a schedule period of 200 milliseconds. The first operation (or set of operations) is scheduled to start immediately.

```
Router(config)# ip sla auto schedule multi
Router(config-am-schedule)# probe-interval 200
Router(config-am-schedule)# start-time now
Router(config-am-schedule)# end
Router#
Router# show ip sla auto schedule multi
Group sched-id: multi
    Probe Interval (ms) : 200
    Group operation frequency (sec): 60
 Status of entry (SNMP RowStatus): Active
    Next Scheduled Start Time: Now
    Life (sec): 3600
    Entry Ageout (sec): never
Router#configure terminal
Router(config)# ip sla auto group type ip icmp-echo 3
Router(config-am-group)# template 3
Router(config-am-group)# schedule multi
Router(config-am-group)# destination 3
Router(config-am-group)# exit
Router(config)# ip sla auto group type ip icmp-echo 4
Router(config-am-group)# template 4
Router(config-am-group)# schedule multi
Router(config-am-group)# destination 4
Router(config-am-group)# exit
Router(config)# ip sla auto group type ip icmp-echo 6
Router(config-am-group)# template 6
Router(config-am-group)# schedule multi
Router(config-am-group)# destination 6
Router(config-am-group)# exit
Router(config)#
```

Related Commands	Command	Description
	probe-interval	Specifies interval for staggering the start times of auto IP SLAs operations
	show ip sla auto schedule	Displays configuration including default values of auto IP SLAs schedulers.

frequency (IP SLA)

To set the rate at which a specified IP Service Level Agreements (SLAs) operation repeats, use the **frequency (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.

frequency *seconds*
no frequency

Syntax Description		
	seconds	Number of seconds between the IP SLAs operations. The default is 60.

Command Default

60 seconds

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)

VoIP configuration (config-ip-sla-voip)

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 and Ethernet jitter 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 • VCCV
12.4(20)T	The Ethernet echo and Ethernet jitter configuration modes were added.
12.2(33)SXI	The Ethernet echo and Ethernet jitter configuration modes were added.
15.2(4)M	This command was modified. The multicast UDP jitter configuration mode was added.

Usage Guidelines

A single IP SLAs operation will repeat at a given frequency for the lifetime of the operation. For example, a User Datagram Protocol (UDP) jitter operation with a frequency of 60 sends a collection of data packets (simulated network traffic) once every 60 seconds, for the lifetime of the operation. The default simulated traffic for a UDP jitter operation consists of ten packets sent 20 milliseconds apart. This "payload" is sent when the operation is started, then is sent again 60 seconds later.

If an individual IP SLAs operation takes longer to execute than the specified frequency value, a statistics counter called "busy" is incremented rather than immediately repeating the operation.

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*). 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*)

Note   We recommend that you do not set the frequency value to less than 60 seconds because the potential overhead from numerous active operations could significantly affect network performance.

The **frequency** (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 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 **frequency** (IP SLA) 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 echo operation type is configured, you would enter the **frequency** (IP SLA) command in ICMP echo configuration mode (config-sla-monitor-echo) within IP SLA monitor configuration mode.

Table 10: 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 configure an IP SLAs ICMP echo operation (operation 10) to repeat every 90 seconds. 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).

IP SLA Configuration

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

```
ip sla 10
```

```
 icmp-echo 172.16.1.175
 frequency 90
!
ip sla schedule 10 life 300 start-time after 00:05:00
```

IP SLA Monitor Configuration

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

```
ip sla monitor 10
 type echo protocol ipIcmpEcho 172.16.1.175
 frequency 90
!
ip sla monitor schedule 10 life 300 start-time after 00:05:00
```

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.
	timeout (IP SLA)	Sets the amount of time the IP SLAs operation waits for a response from its request packet.

frequency (IP SLA service performance)

To specify how often an IP Service Level Agreements (SLAs) service performance operation generates groups of packets, use the **frequency** command in IP SLA service performance configuration mode. To return to the default, use the **no** form of this command.

frequency interation *number***delay** *seconds* | **time** *seconds*
no frequency interation | **time**

Syntax Description		
	interation *number*	Specifies the number of bursts, or groups of packets, to be generated. The range is from 1 to 100. The default is 1.
	delay *seconds*	Specifies the length of time to transmit the burst, in seconds (sec), The range is from 0 to 10. The default is 3
	time *seconds*	The amount of time between bursts, in seconds (sec). The range is from 20 to 65535. The default is 20.

Command Default

The operation has a frequency of one 3-second burst every 20 seconds.

Command Modes

IP SLA service performance (config-ip-sla-service-performance)

Command History

Release	Modification
15.3(2)S	This command was introduced.

Usage Guidelines

Use this command to configure the size and frequency of bursts to be transmitted by a service performance operation.

Use the **duration** command to configure the length of time during which the operation runs.

The duration value must be less than the frequency value.

```
IP SLAs Infrastructure Engine-III
Entry number: 1
Service Performance Operation
Type: ethernet
Destination
MAC Address: 4055.398d.8bd2
VLAN:
Interface: GigabitEthernet0/4
Service Instance: 10
EVC Name:
Duration Time: 20
Interval Buckets: 5

Signature:
05060708

Description: this is with all operation modes

Measurement Type:
throughput, loss
```

```
Direction: internal

Profile Traffic:
Direction: internal
CIR: 0
EIR: 0
CBS: 0
EBS: 0
Burst Size: 3
Burst Interval: 20
Rate Step (kbps): 1000 2000

Profile Packet:
Inner COS: 6
Outer COS: 6
Inner VLAN: 100
Outer VLAN: 100
Source MAC Address: 4055.398d.8d4c
Packet Size: 512
Schedule:
   Operation frequency (seconds): 64  (not considered if randomly scheduled)
   Next Scheduled Start Time: Start Time already passed
   Group Scheduled : FALSE
   Randomly Scheduled : FALSE
   Life (seconds): Forever
   Entry Ageout (seconds): never
   Recurring (Starting Everyday): FALSE
   Status of entry (SNMP RowStatus): Active
```

Related Commands

Command	Description
duration	Configure operation run time.
show ip sla configuration	Displays configuration values including all defaults for all IP SLAs operations or a specified operation.

frequency (IP SLA video)

To set the rate at which an IP Service Level Agreements (SLAs) video operation repeats, use the **frequency** command in IP SLA video configuration mode. To return to the default value, use the **no** form of this command.

frequency *seconds*
no frequency *seconds*

Syntax Description

seconds	Length of time, in seconds (sec), between video operations.The range is from1 to 604800. The default is 60.

Command Default

The IP SLAs video operation repeats every 60 seconds.

Command Modes

IP SLA video configuration (config-ip-sla-video)

Command History

Release	Modification
12.2(58)SE	This command was introduced.
15.2(3)T	This command 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.

Usage Guidelines

The frequency setting in the IP SLAs video profile determines how often the video operation will repeat once it is started. This command changes the frequency value from the default (60 seconds) to the specified value.

If an individual IP SLAs operation takes longer to execute than the specified frequency value, a statistics counter called "busy" is incremented rather than immediately repeating the operation.

The frequency value must be greater than the value of the **timeout** (IP SLA video) command. The following guideline is recommended for configuring the frequency, timeout, and threshold settings in the IP SLAs video profile:

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

The frequency value must also be greater than the value of the **duration** (IP SLA video) command.

The **frequency** (IP SLA video) command is supported in IPv4 networks.

Use the **show ip sla configuration** command to display configuration values, including all defaults, for all Cisco IOS IP SLAs operations or for a specified operation.

Examples

The following example shows how to configure an IP SLAs video operation to repeat every 90 seconds:

```
Router(config-term)# ip sla 10
Router(config-ip-sla)# video 192.168.2.10 555 source-ip 192.168.2.17 source-port 24 profile
 iptv
Router(config-ip-sla-video)# duration 40
Router(config-ip-sla-video)# frequency 90
Router(config-ip-sla-video)# timeout 45000
```

```
Router(config-ip-sla-video)# threshold 40000
Router(config-ip-sla-video)# end
Router#
4d23h: %SYS-5-CONFIG_I: Configured from console by console


Router# show ip sla configuration 10
IP SLAs Infrastructure Engine-III
Entry number: 10
Owner:
Tag:
Operation timeout (milliseconds): 45000
Type of operation to perform: video
Video profile name: IPTV
Target address/Source address: 192.168.2.10/192.168.2.17
Target port/Source port: 555/24
Vrf Name:
Control Packets: enabled
Schedule:
   Operation frequency (seconds): 90  (not considered if randomly scheduled)
   Next Scheduled Start Time: Pending trigger
   Group Scheduled : FALSE
   Randomly Scheduled : FALSE
   Life (seconds): 3600
   Entry Ageout (seconds): never
   Recurring (Starting Everyday): FALSE
   Status of entry (SNMP RowStatus): notInService
Threshold (milliseconds): 40000
Distribution Statistics:
   Number of statistic hours kept: 2
   Number of statistic distribution buckets kept: 1
   Statistic distribution interval (milliseconds): 20
Enhanced History:
```

Related Commands

Command	Description
duration (IP SLA video)	Sets the amount of time that platform-assisted video traffic is generated for a Cisco IP SLAs video operation.
show ip sla configuration	Displays configuration values, including all defaults, for all Cisco IP SLAs operations or for a specified operation.
threshold (IP SLA video)	Sets the upper threshold value for calculating network monitoring statistics created by a Cisco IP SLAs video operation.
timeout (IP SLA video)	Sets the amount of time that a Cisco IP SLAs video operation waits for a response from its request packet.

ftp get

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

ftp get *ur l* [source-ip *ip-address hostname*][mode]active|passive

Syntax Description

url	URL location information for the file to be retrieved.
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.
mode passive / **active**	(Optional) Specifies the FTP transfer mode as either passive or active. The default is passive transfer mode.

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 ftp operation get url**command.
12.2(33)SRB	This command was integrated into Cisco IOS Release 12.2(33)SRB. This command replaces the **type ftp operation get url** command.
12.2(33)SB	This command was integrated into Cisco IOS Release 12.2(33)SB. This command replaces the **type ftp operation get url**command.
12.2(33)SXI	This command was integrated into Cisco IOS Release 12.2(33)SXI. This command replaces the **type ftp operation get url**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   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**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 3
 ftp get ftp://user1:password1@host1/file1
!
ip sla schedule 3 start-time now
```

In the following example, the source url of the file to be retrieved includes an IPv6 address. IPv6 addessing is supported in Cisco IOS Release 15.2(3)T and later releases.

```
ip sla 3
 ftp get ftp://root:lablab@2001:10:10:10::3/tmp/saatest.log
!
ip sla schedule 3 start-time now
```

Related Commands

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

history buckets-kept

To set the number of history buckets that are kept during the lifetime of a Cisco IOS IP Service Level Agreements (SLAs) operation, use the **history buckets-kept**command in the appropriate submode of IP SLA configuration or IP SLA template parameters configuration mode. To return to the default value, use the no form of this command.

history buckets-kept *size*
no history buckets-kept

Syntax Description

| *size* | Number of history buckets kept during the lifetime of the operation. The default is 50. |

Command Default

The default number of buckets kept is 50 buckets.

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 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)

VCCV configuration (config-sla-vccv)

VoIP configuration (config-ip-sla-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)

Command History

Release	Modification
12.4(4)T	This command was introduced. This command replaces the **buckets-of-history-kept** command.

Release	Modification
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 **buckets-of-history-kept** command. The Ethernet echo and Ethernet jitter configuration modes were added.
12.2(33)SRC	The VCCV configuration mode was added.
12.2(33)SB	This command was integrated into Cisco IOS Release 12.2(33)SB. This command replaces the **buckets-of-history-kept**command. The following configuration modes were added: • Ethernet echo • Ethernet jitter • VCCV
12.4(20)T	The Ethernet echo and Ethernet jitter configuration modes were added.
12.2(33)SXI	This command was integrated into Cisco IOS Release 12.2(33)SXI. This command replaces the **buckets-of-history-kept** command. The Ethernet echo and Ethernet jitter configuration modes were added.
15.1(1)T	This command was modified. The ICMP echo, TCP connect, and UDP echo configuration submodes in IP SLA template parameters configuration mode were added.

Usage Guidelines   Each time IP SLAs starts an operation, a new bucket is created until the number of history buckets matches the specified size or the lifetime of the operation expires. History buckets do not wrap.

To define the lifetime of an IP SLAs operation, use the **ip sla schedule** global configuration command. To define the lifetime of an auto IP SLAs operation template in Cisco IP SLAs Engine 3.0, use the **life**command in IP SLAs auto-measure schedule configuration mode.

Before you can use this command to configure auto IP SLAs operation templates, you must enter the **parameters** command in IP SLA template configuration mode.

The **history buckets-kept** command is supported in IPv4 networks. This command is also supported in IPv6 networks to configure an IP SLAs operation that supports IPv6 addresses.

By default, the history for an IP SLAs operation is not collected. If history is collected, each bucket contains one or more history entries from the operation. When the operation type is Internet Control Message Protocol (ICMP) path echo, an entry is created for each hop along the path that the operation takes to reach its destination.

The type of entry stored in the history table is controlled by the **history filter** command.

The total number of entries stored in the history table is controlled by the combination of the **samples-of-history-kept**, **history buckets-kept**, and **history lives-kept** commands.

Note   Collecting history increases the RAM usage. Collect history only if you think there is a problem in the network.

Examples

The following example shows how to configure an ICMP echo operation to keep 25 history buckets during the operation lifetime. The example shows the **history buckets-kept** command being used in an IPv4 network.

IP SLA Configuration

```
ip sla schedule 1 start-time now life forever
ip sla 1
 icmp-echo 172.16.161.21
 history buckets-kept 25
 history lives-kept 1
!
ip sla schedule 1 start-time now life forever
```

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)# history buckets-kept 25
Router(config-icmp-ech-params)# end
Router# show ip sla auto template type ip icmp-echo 1
IP SLAs Auto Template: 1
    Measure Type: icmp-echo
.
.
.
Statistics Aggregation option:
        Hours of statistics kept: 5
    History options:
        History filter: none
        Max number of history records kept: 25
        Lives of history kept: 1
    Statistics Distributions options:
        Distributions characteristics: RTT
        Distributions bucket size: 20
        Max number of distributions buckets: 1
    Reaction Configuration: None
```

Related Commands

Command	Description
history filter	Defines the type of information kept in the history table for the IP SLAs operation.
history lives-kept	Sets the number of lives maintained in the history table for the IP SLAs operation.
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.
life	Specifies the lifetime characteristic in an auto IP SLAs scheduler

Command	Description
samples-of-history-kept	Sets the number of entries kept in the history table per bucket.

history distributions-of-statistics-kept

To set the number of statistics distributions kept per hop during a Cisco IOS IP Service Level Agreements (SLAs) operation, use the **history distributions-of-statistics-kept**command in the appropriate submode of IP SLA configuration or IP SLA template parameters configuration mode. To return to the default value, use the **no** form of this command.

history distributions-of-statistics-kept *size*
no history distributions-of-statistics-kept

Syntax Description

size	Number of statistics distributions kept per hop. The range is from 1 to 20. The default is 1.

Command Default   One distribution is kept per hop.

Command Modes   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 configuration (config-ip-sla-video)

VoIP configuration (config-ip-sla-voip)

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
12.4(4)T	This command was introduced. This command replaces the **distributions-of-statistics-kept**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 **distributions-of-statistics-kept** command. The Ethernet echo and Ethernet jitter configuration modes were added.
12.2(33)SRC	The VCCV configuration mode was added.
12.2(33)SB	This command was integrated into Cisco IOS Release 12.2(33)SB. This command replaces the **distributions-of-statistics-kept**command. The following configuration modes were added: • Ethernet echo • Ethernet jitter • VCCV
12.4(20)T	The Ethernet echo and Ethernet jitter configuration modes were added.
12.2(33)SXI	This command was integrated into Cisco IOS Release 12.2(33)SXI. This command replaces the **distributions-of-statistics-kept** command. The Ethernet echo and Ethernet jitter configuration modes were added.
15.1(1)T	This command was modified. The ICMP echo, ICMP jitter, TCP connect, UDP echo, and UDP jitter configuration submodes of IP SLA template parameters configuration mode were added.
12.2(58)SE	This command was modified. Support for the video configuration submode of IP SLA configuration mode was added.
15.2(2)T	This command 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 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

This command changes the value of distributions kept per hop for the IP SLAs operation from the default (1) to the specified value. When the number of distributions reaches the size specified, no further distribution-based information is stored in memory.

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

Before you can use this command to configure auto IP SLAs operation templates, you must enter the **parameters** command in IP SLA template configuration mode.

The **history distributions-of-statistics-kept** command is supported in IPv4 networks. This command is also supported in IPv6 networks to configure an IP SLAs operation that supports IPv6 addresses.

For the IP SLAs Internet Control Message Protocol (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:

- **history distributions-of-statistics-kept**

- **hops-of-statistics-kept**

- **paths-of-statistics-kept**

- **history 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) * (**history distributions-of-statistics-kept** *size*) * (**hops-of-statistics-kept** *size*) * (**paths-of-statistics-kept** *size*) * (**history hours-of-statistics-kept** *hours*)

Note

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

Examples

In the following examples, the statistics distribution is set to five and the distribution interval is set to 10 ms for an ICMP echo operation. 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. The examples show the **history distributions-of-statistics-kept** command being used in an IPv4 network.

IP SLA Configuration

```
ip sla 1
 icmp-echo 172.16.161.21
 history distributions-of-statistics-kept 5
 history statistics-distribution-interval 10
!
ip sla schedule 1 life forever 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)# history distributions-of-statistics-kept 5
Router(config-icmp-ech-params)# history statistics-distribution-interval 10
Router(config-icmp-ech-params)# end
Router# show ip sla auto template type ip icmp-echo 1
IP SLAs Auto Template: 1
    Measure Type: icmp-echo (control enabled)
    Description:
.
.
.
Statistics Distributions options:
        Distributions characteristics: RTT
        Distributions bucket size: 10
        Max number of distributions buckets: 5
```

Related Commands	**Command**	**Description**
	history hours-of-statistics-kept	Sets the number of hours for which statistics are maintained for the IP SLAs operation.
	history statistics-distribution-interval	Sets the time interval for each statistics distribution kept for 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.
	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.
	paths-of-statistics-kept	Sets the number of paths for which statistics are maintained per hour for the IP SLAs operation.

history enhanced

To enable enhanced history gathering for a Cisco IOS IP Service Level Agreements (SLAs) operation, use the **history enhanced** command in the appropriate submode of IP SLA configuration or IP SLA template parameters configuration mode.

history enhanced [**interval** *seconds*] [**buckets** *number-of-buckets*]

<table>
<tr>
<td>**Syntax Description**</td>
<td>**interval** *seconds*</td>
<td>(Optional) Specifies the length of time, in seconds (sec), that enhanced history is gathered in each bucket. The range is from 1 to 3600. The default is 900.</td>
</tr>
<tr>
<td></td>
<td>**buckets** *number-of-buckets*</td>
<td>(Optional) Specifies the number of history buckets that are retained in system memory. The range is from 1 to 100. The default is 100.</td>
</tr>
</table>

Command Default Enhanced history gathering is disabled.

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 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 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
	12.4(4)T	This command was introduced. This command replaces the **enhanced-history** 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 **enhanced-history** command. The Ethernet echo and Ethernet jitter configuration modes were added.
	12.2(33)SRC	The VCCV configuration mode was added.
	12.2(33)SB	This command was integrated into Cisco IOS Release 12.2(33)SB. This command replaces the **enhanced-history**command. The following configuration modes were added: • Ethernet echo • Ethernet jitter • VCCV
	12.4(20)T	The Ethernet echo and Ethernet jitter configuration modes were added.
	12.2(33)SXI	This command was integrated into Cisco IOS Release 12.2(33)SXI. This command replaces the **enhanced-history** command. The Ethernet echo and Ethernet jitter configuration modes were added.
	15.1(1)T	This command was modified. The ICMP echo, TCP connect, UDP echo, and UDP jitter configuration submodes in IP SLA template parameters configuration mode were added.
	12.2(58)SE	This command was modified. Support for the video configuration submode of IP SLA configuration mode was added.
	15.2(2)T	This command 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 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.

Release	Modification
Cisco IOS XE Release 3.4SG	This command was integrated into Cisco IOS XE Release 3.4SG.

Usage Guidelines

This command enables enhanced history for the IP SLAs operation.

Performance statistics are stored in buckets that separate the accumulated data. Each bucket consists of data accumulated over the specified time interval. When the interval expires, history statistics are gathered in a new bucket. When the specified number of buckets is reached, statistic gathering for the operation ends.

By default, IP SLAs maintains two hours of aggregated statistics for each operation. Values from each operation cycle are aggregated with the previously available data within a given hour. The Enhanced History feature in IP SLAs allows for the aggregation interval to be shorter than one hour.

The **history enhanced** command is supported in IPv4 networks. This command is also supported in IPv6 networks to configure an IP SLAs operation that supports IPv6 addresses.

Prior to Cisco IOS Release 12.4(24)T, you can configure this command for IP SLAs VoIP RTP operation but operations are unaffected.

In Cisco IOS Release 12.4(24)T and later releases, you cannot configure this command for IP SLAs VoIP RTP operations. If you attempt to configure this command in VoIP RTP configuration mode, the following message appears.

```
Router(config-ip-sla-voip-rtp)# history enhanced interval 1200 buckets 99
%enhanced-history cannot be set for this probe
```

Before you can use this command to configure auto IP SLAs operation templates, you must enter the **parameters** command in IP SLA template configuration mode.

Examples

In the following examples, an Internet Control Message Protocol (ICMP) echo operation is configured with the standard enhanced history settings. The example shows the **history enhanced** command being used in an IPv4 network.

IP SLA Configuration

```
ip sla 3
 icmp-echo 172.16.1.175
 history enhanced interval 900 buckets 100
!
ip sla schedule 3 start-time now life forever
```

IP SLA Template Parameters Configuration

```
Router(config)# ip sla auto template type ip icmp-echo 3
Router(config-tplt-icmp-ech)# parameters
Router(config-icmp-ech-params)# history enhanced interval 900 buckets 100
Router(config-icmp-ech-params)# end
Router# show ip sla auto template type ip icmp-echo
IP SLAs Auto Template: 3
    Measure Type: icmp-echo (control enabled)
.
.
.
Statistics Aggregation option:
        Hours of statistics kept: 2
```

```
     Enhanced aggregation interval: 900 seconds
     Max number of enhanced interval buckets: 100
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.
	show ip sla auto summary-statistics	Displays the current operational status and statistics for IP SLAs auto-measure groups.
	show ip sla auto template	Displays configuration including default values of auto IP SLAs operation templates.
	show ip sla enhanced-history collection-statistics	Displays data for all collected history buckets for the specified IP SLAs operation, with data for each bucket shown individually.
	show ip sla enhanced-history distribution-statistics	Displays enhanced history data for all collected buckets in a summary table.

history filter

To define the type of information kept in the history table for a Cisco IOS IP Service Level Agreements (SLAs) operation, use the **history filter**command in the appropriate submode of IP SLA configuration or IP SLA template parameters configuration mode. To return to the default value, use the no form of this command.

history filter none | **all** | **overThreshold** | **failures**
no history filter none | **all** | **overThreshold** | **failures**

Syntax Description		
none	No history is kept. This is the default.
all	All operations attempted are kept in the history table.
overThreshold	Only packets that are over the threshold are kept in the history table.
failures	Only packets that fail for any reason are kept in the history table.

Command Default   No IP SLAs history is kept for an operation.

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 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)

VCCV configuration (config-sla-vccv)

VoIP configuration (config-ip-sla-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)

Command History

Release	Modification
12.4(4)T	This command was introduced. This command replaces the **filter-for-history** 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 **filter-for-history** command. The Ethernet echo and Ethernet jitter configuration modes were added.
12.2(33)SRC	The VCCV configuration mode was added.
12.2(33)SB	This command was integrated into Cisco IOS Release 12.2(33)SB. This command replaces the **filter-for-history**command. The following configuration modes were added: • Ethernet echo • Ethernet jitter • VCCV
12.4(20)T	The Ethernet echo and Ethernet jitter configuration modes were added.
12.2(33)SXI	This command was integrated into Cisco IOS Release 12.2(33)SXI. This command replaces the **filter-for-history** command. The Ethernet echo and Ethernet jitter configuration modes were added.
15.1(1)T	This command was modified. The ICMP echo, TCP connect, and UDP echo configuration submodes in IP SLA template parameters configuration mode were added.

Usage Guidelines   Use the **history filter**command to control what gets stored in the history table for an IP SLAs operation. To control how much history gets saved in the history table, use the **history lives-kept**, **history buckets-kept**, and the **samples-of-history-kept**commands.

The **history filter** command is supported in IPv4 networks. This command is also supported in IPv6 networks to configure an IP SLAs operation that supports IPv6 addresses.

For auto IP SLAs in Cisco IOS IP SLAs Engine 3.0--Before you can use this command to configure auto IP SLAs operation templates, you must enter the **parameters** command in IP SLA template configuration mode.

An IP SLAs operation can collect history and capture statistics. By default, the history for an IP SLAs operation is not collected. When a problem arises where history is useful (for example, a large number of timeouts are occurring), use the **history lives-kept** command to enable history collection.

Note   Collecting history increases the RAM usage. Collect history only when you think there is a problem in the network.

Examples   In the following example, only operation packets that fail are kept in the history table. The example shows the **history filter** command being used in an IPv4 network.

IP SLA auto-Measure Template

```
ip sla auto template type ip icmp-echo
 icmp-echo 172.16.161.21
  history lives-kept 1
  history filter failures
!
```

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)# history filter failures

Router(config-icmp-ech-params)# end
Router# show ip sla auto template type ip icmp-echo
IP SLAs Auto Template: 1
    Measure Type: icmp-echo
.
.
.
Statistics Aggregation option:
        Hours of statistics kept: 2
    History options:
        History filter: failures
        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
history buckets-kept	Sets the number of history buckets that are kept during the lifetime of the IP SLAs operation.
history lives-kept	Sets the number of lives maintained in the history table for the IP SLAs operation.
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.
samples-of-history-kept	Sets the number of entries kept in the history table per bucket for the IP SLAs operation.

history hours-of-statistics-kept

To set the number of hours for which statistics are maintained for a Cisco IOS IP Service Level Agreements (SLAs) operation, use the **history hours-of-statistics-kept**command in the appropriate submode of IP SLA configuration or IP SLA template parameters configuration mode. To return to the default value, use the **no** form of this command.

history hours-of-statistics-kept *hours*
no history hours-of-statistics-kept

Syntax Description

hours	Length of time, in hours, for which statistics are maintained in memory. The range is from 0 to 25. The default is 2.

Command Default   Statistics are kept in platform memory for 2 hours.

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 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**
	12.4(4)T	This command was introduced. This command replaces the **hours-of-statistics-kept** 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 **hours-of-statistics-kept**command. The Ethernet echo and Ethernet jitter configuration modes were added.
	12.2(33)SRC	The VCCV configuration mode was added.
	12.2(33)SB	This command was integrated into Cisco IOS Release 12.2(33)SB. This command replaces the **hours-of-statistics-kept** command. The following configuration modes were added: • Ethernet echo • Ethernet jitter • VCCV
	12.4(20)T	The Ethernet echo and Ethernet jitter configuration modes were added.
	12.2(33)SXI	This command was integrated into Cisco IOS Release 12.2(33)SXI. This command replaces the **hours-of-statistics-kept**command. The Ethernet echo and Ethernet jitter configuration modes were added.
	15.1(1)T	This command was modified. The ICMP echo, ICMP jitter, TCP connect, UDP echo, and UDP jitter configuration submodes in IP SLA template parameters configuration mode were added.
	12.2(58)SE	This command was modified. Support for the video configuration submode of IP SLA configuration mode was added.
	15.2(2)T	This command was modified. Support for the video configuration submode of IP SLA configuration mode was added.
	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.

Release	Modification
15.3(1)S	This command was integrated into Cisco IOS Release 15.3(1)S.
Cisco IOS XE 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

This command changes the value of history hours in the IP SLAs operation from the default (2) to the specified value. When the number of hours exceeds the specified value, the statistics table wraps and the oldest information is replaced by newer information.

For the IP SLAs Internet Control Message Protocol (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:

- **history distributions-of-statistics-kept**
- **hops-of-statistics-kept**
- **paths-of-statistics-kept**
- **history 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) * (**history distributions-of-statistics-kept** *size*) * (**hops-of-statistics-kept** *size*) * (**paths-of-statistics-kept** *size*) * (**history hours-of-statistics-kept** *hours*)

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

The **history hours-of-statistics-kept** command is supported in IPv4 networks. This command is also supported in IPv6 networks to configure an IP SLAs operation that supports IPv6 addresses.

For auto IP SLAs in Cisco IOS IP SLAs Engine 3.0, before you can use this command to configure auto IP SLAs operation templates, you must enter the **parameters** command in IP SLA template configuration mode.

Examples

The following examples show how to maintain 3 hours of statistics for an ICMP echo operation. The example shows the **history hours-of-statistics-kept** command being used in an IPv4 network.

IP SLA Configuration

```
ip sla 2
 icmp-echo 172.16.1.177
 history hours-of-statistics-kept 3
!
ip sla schedule 2 life forever start-time now
```

IP SLA Template Parameters Configuration

```
Router(config)# ip sla auto template type ip icmp-echo 2
Router(config-tplt-icmp-ech)# parameters
Router(config-icmp-ech-params)# history hours-of-statistics-kept 3
Router(config-icmp-ech-params)# end
Router# show ip sla auto template type ip icmp-echo
IP SLAs Auto Template: 2
    Measure Type: icmp-echo
.
.
.
Statistics Aggregation option:
        Hours of statistics kept: 3
    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
history distributions-of-statistics-kept	Sets the number of statistics distributions kept per hop during the lifetime of the IP SLAs operation.
history statistics-distribution-interval	Sets the time interval for each statistics distribution kept for 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.
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.
paths-of-statistics-kept	Sets the number of paths for which statistics are maintained per hour for the IP SLAs operation.

history interval

To set the number of statistics distributions kept during the lifetime of an IP Service Level Agreements (SLAs) Metro Ethernet 3.0 (ITU-T Y.1731) operation, use the **history interval** command in the IP SLA Y.1731 delay configuration or IP SLA Y.1731 loss configuration mode. To return to the default value, use the **no** form of this command.

history interval *intervals-stored*
no history interval *intervals-stored*

Syntax Description

intervals-stored	Number of statistics distributions. Range is 1 to 10. Default is 2.

Command Default

The default history interval is 2 distributions.

Command Modes

IP SLA Y.1731 delay configuration (config-sla-y1731-delay)

IP SLA Y.1731 loss configuration (config-sla-y1731-loss)

Command History

Release	Modification
15.1(2)S	This command was introduced.
15.3(2)S	This command was implemented on the Cisco ASR 901 Series Aggregation Services Routers.

Usage Guidelines

Use this command to change the number of distribution statistics kept from the default (2) to the specified number.

Use the **distribution** command to configure the number and range of distribution bins to calculate delay and delay-variation performance measurements per interval.

Use the **aggregate interval** command to configure the length of time during which the performance measurements are conducted and the results stored for an Ethernet operation.

Examples

```
        Router(config-term)# ip sla 10
Router(config-ip-sla)# ethernet y1731 delay dmm domain xxx evc yyy mpid 101 cos 3 source
mpid 100
Router(config-sla-y1731-delay)# history interval 1
```

Related Commands

Command	Description
aggregate interval	Configures the aggregate interval.
distribution	Specifies measurement type and configures bins for statistics distributions kept for an Ethernet delay or delay variation operation.

history lives-kept

To set the number of lives maintained in the history table for a Cisco IOS IP Service Level Agreements (SLAs) operation, use the **history lives-kept**command in the appropriate submode of IP SLA configuration or IP SLA template parameters configuration mode. To return to the default value, use the **no** form of this command.

history lives-kept *lives*
no history lives-kept

Syntax Description	

lives	Number of lives maintained in the history table for the operation. If you specify 0 lives, history is not collected for the operation.

Command Default The default is 0 lives.

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 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)

VCCV configuration (config-sla-vccv)

VoIP configuration (config-ip-sla-voip)

IP SLA Template Configuration

ICMP echo configuration (config-icmp-ech-params)

TCP connect configuration (config-tcp-conn-params)

UDP echo configuration (config-udp-ech-params)

Command History

Release	Modification
12.4(4)T	This command was introduced. This command replaces the **lives-of-history-kept**command.

Release	Modification
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 **lives-of-history-kept** command. The Ethernet echo and Ethernet jitter configuration modes were added.
12.2(33)SRC	The VCCV configuration mode was added.
12.2(33)SB	This command was integrated into Cisco IOS Release 12.2(33)SB. This command replaces the **lives-of-history-kept**command. The following configuration modes were added: • Ethernet echo • Ethernet jitter • VCCV
12.4(20)T	The Ethernet echo and Ethernet jitter configuration modes were added.
12.2(33)SXI	This command was integrated into Cisco IOS Release 12.2(33)SXI. This command replaces the **lives-of-history-kept** command. The Ethernet echo and Ethernet jitter configuration modes were added.
15.1(1)T	This command was modified. The ICMP echo, TCP connect, and UDP echo configuration submodes in IP SLA template parameters configuration mode were added.

Usage Guidelines

The following rules apply to the **history lives-kept** command:

- The number of lives you can specify is dependent on the type of operation you are configuring.

- The default value of 0 lives means that history is not collected for the operation.

- When the number of lives exceeds the specified value, the history table wraps (that is, the oldest information is replaced by newer information).

- When an operation makes a transition from a pending to active state, a life starts. When the life of an operation ends, the operation makes a transition from an active to pending state.

The **history lives-kept** command is supported in IPv4 networks. This command is also supported in IPv6 networks to configure an IP SLAs operation that supports IPv6 addresses.

Before you can use this command to configure auto IP SLAs operation templates, you must enter the **parameters** command in IP SLA template configuration mode.

To disable history collection, use the **no history lives-kept** command rather than the **history filter none** command. The **no history lives-kept**command disables history collection before an IP SLAs operation is attempted. The **history filter** command checks for history inclusion after the operation attempt is made.

Examples

The following example shows how to maintain the history for five lives of an ICMP echo operation. The example shows the **history lives-kept** command being used in an IPv4 network.

IP SLA Configuration

```
ip sla 1
 icmp-echo 172.16.1.176
 history lives-kept 5
!
ip sla schedule 1 life forever 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)# history lives-kept 5
Router(config-icmp-ech-params)# end
Router# show ip sla auto template type ip icmp-echo
IP SLAs Auto Template: 1
    Measure Type: icmp-echo
.
.
.
Statistics Aggregation option:
        Hours of statistics kept: 2
    History options:
        History filter: none
        Max number of history records kept: 15
        Lives of history kept: 5
    Statistics Distributions options:
        Distributions characteristics: RTT
        Distributions bucket size: 20
        Max number of distributions buckets: 1
    Reaction Configuration: None
```

Related Commands	Command	Description
	history buckets-kept	Sets the number of history buckets that are kept during the lifetime of the IP SLAs operation.
	history filter	Defines the type of information kept in the history table for the IP SLAs operation.
	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.
	samples-of-history-kept	Sets the number of entries kept in the history table per bucket for the IP SLAs operation.

history statistics-distribution-interval

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

history statistics-distribution-interval *milliseconds*
no history statistics-distribution-interval

Syntax Description

milliseconds	Length of time, in milliseconds (ms), for which each statistics distribution is kept. The range is from 1 to 100. The default is 20.

Command Default

A statistics distribution is kept for 20 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)

Video configuration (config-ip-sla-video)

VoIP configuration (config-ip-sla-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
12.4(4)T	This command was introduced. This command replaces the **statistics-distribution-interval**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 **statistics-distribution-interval**command. The Ethernet echo and Ethernet jitter configuration modes were added.
12.2(33)SRC	The VCCV configuration mode was added.
12.2(33)SB	This command was integrated into Cisco IOS Release 12.2(33)SB. This command replaces the **statistics-distribution-interval**command. The following configuration modes were added: • Ethernet echo • Ethernet jitter • VCCV
12.4(20)T	The Ethernet echo and Ethernet jitter configuration modes were added.
12.2(33)SXI	This command was integrated into Cisco IOS Release 12.2(33)SXI. This command replaces the **statistics-distribution-interval** command. The Ethernet echo and Ethernet jitter configuration modes were added.
15.1(1)T	This command was modified. The ICMP echo, ICMP jitter, TCP connect, UDP echo, and UDP jitter configuration submodes in IP SLA template parameters configuration mode were added.
12.2(58)SE	This command was modified. Support for the video configuration submode of IP SLA 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.

Usage Guidelines

This command changes the value of distribution interval for the IP SLAs operation from the default (20 ms) to the specified value.

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

The **history statistics-distribution-interval** command is supported in IPv4 networks. This command is also supported in IPv6 networks to configure an IP SLAs operation that supports IPv6 addresses.

Before you can use this command to configure auto IP SLAs operation templates, you must enter the **parameters** command in IP SLA template configuration mode.

Examples

In the following examples, the statistics distribution is set to five and the distribution interval is set to 10 ms for an IP SLAs operation. 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.

The example shows the **history statistics-distribution-interval** command being used in an IPv4 network.

IP SLA Configuration

```
ip sla 1
 icmp-echo 172.16.161.21
 history distributions-of-statistics-kept 5
 history statistics-distribution-interval 10
!
ip sla schedule 1 life forever start-time now
```

IP SLA Template Parameters Configuration

```
Router(config)# ip sla auto template type ip icmp-echo 3
Router(config-tplt-icmp-ech)# parameters
Router(config-icmp-ech-params)# history enhanced interval 900 buckets 100
Router(config-icmp-ech-params)# end
Router# show ip sla auto template type ip udp-echo
IP SLAs Auto Template: 5
    Measure Type: icmp-echo
.
.
.
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: 10
        Max number of distributions buckets: 1
    Reaction Configuration: None
```

Related Commands

Command	Description
history distributions-of-statistics-kept	Sets the number of statistics distributions kept per hop during the IP SLAs operation's lifetime.
history hours-of-statistics-kept	Sets the number of hours for which statistics are maintained for 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.
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.
paths-of-statistics-kept	Sets the number of paths for which statistics are maintained per hour for the IP SLAs operation.

hops-of-statistics-kept

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

hops-of-statistics-kept *size*
no hops-of-statistics-kept

Syntax Description

size	Number of hops for which statistics are maintained per path. The default is 16.

Command Default   16 hops

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   When the number of hops reaches the size specified, no further hop-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 **hops-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
hops-of-statistics-kept command in ICMP path echo configuration mode (config-sla-monitor-pathEcho)
within IP SLA monitor configuration mode.

Table 11: 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 monitor the statistics of IP SLAs ICMP path echo operation
2 for ten hops only. 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).

IP SLA Configuration

```
ip sla 2
 path-echo 172.16.1.177
 hops-of-statistics-kept 10
!
ip sla schedule 2 life forever start-time now
```

IP SLA Monitor Configuration

```
ip sla monitor 2
 type pathecho protocol ipIcmpEcho 172.16.1.177
 hops-of-statistics-kept 10
```

```
!
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.
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.
paths-of-statistics-kept	Sets the number of paths for which statistics are maintained per hour for the IP SLAs operation.
statistics-distribution-interval	Sets the time interval for each statistics distribution kept for the IP SLAs operation.

hours-of-statistics-kept

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

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

hours-of-statistics-kept *hours*
no hours-of-statistics-kept

Syntax Description

hours	Number of hours that statistics are maintained. The default is 2.

Command Default   2 hours

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 hours-of-statistics-kept** command.
12.2(33)SRB	This command was replaced by the **history hours-of-statistics-kept** 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 hours-of-statistics -kept** command.
12.2(33)SXI	This command was replaced by the **history hours-of-statistics -kept** command.

Usage Guidelines

When the number of hours exceeds the specified value, the statistics table wraps (that is, the oldest information is replaced by newer information).

For the IP SLAs Internet Control Message Protocol (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.

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

The following example shows how to maintain 3 hours of statistics for IP SLAs ICMP path echo operation 2.

```
ip sla monitor 2
 type pathecho protocol ipIcmpEcho 172.16.1.177
 hours-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.

Command	Description
hops-of-statistics-kept	Sets the number of hops for which statistics are maintained per path 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.
statistics-distribution-interval	Sets the time interval for each statistics distribution kept for the IP SLAs operation.

hours-of-statistics-kept (LSP discovery)

To set the number of hours for which label switched path (LSP) discovery group statistics are maintained for a Cisco IOS IP Service Level Agreements (SLAs) LSP Health Monitor operation, use the **hours-of-statistics-kept** command in auto IP SLA MPLS LSP discovery parameters configuration mode. To return to the default value, use the **no** form of this command.

hours-of-statistics-kept *hours*
no hours-of-statistics-kept

Syntax Description

hours	Number of hours that statistics are maintained. The default is 2.

Command Default

2 hours

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

The LSP discovery group statistics are distributed in one-hour increments. Since the number of LSP discovery groups for a single LSP Health Monitor operation can be significantly large, the collection of group statistics is restricted to a maximum of 2 hours. If the *number* argument is set to zero, no LSP discovery group statistics are maintained.

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. LSP discovery group statistics are collected every 1 hour.

```
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.

http (IP SLA)

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

http get | **raw** *url* [**name-server** *ip-address*] [**version** *version-number*] [**source-ip** *ip-addresshostname*] [**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 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-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.
cache **enable**	**disable**	(Optional) Enables or disables download of a cached HTTP page.
proxy *proxy-url*	(Optional) Specifies proxy information or URL.

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 http operation**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 http operation** command.
12.2(33)SB	This command was integrated into Cisco IOS Release 12.2(33)SB. This command replaces the **type http operation**command.
12.2(33)SXI	This command was integrated into Cisco IOS Release 12.2(33)SXI. This command replaces the **type http operation**command.
15.2(3)T	This command was modified. Support for IPv6 addresses was added.

Release	Modification
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 HTTP operation 6 is configured as an HTTP RAW operation. The destination URL of the HTTP server is http://www.cisco.com.

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

In the following example, IP SLAs HTTP operation 7 is configured as an HTTP GET operation. The destination URL of the HTTP server is 2001:10:10:10::3.

```
ip sla 7
 http get http://2001:10:10:10::3
 http-get-request
 GET /index.html HTTP/1.0\r\n
 \r\n
!
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.

http-raw-request

To explicitly specify the options for a GET request for a Cisco IOS IP Service Level Agreements (SLAs) Hypertext Transfer Protocol (HTTP) operation, use the **http-raw-request** command in the appropriate submode of IP SLA configuration or IP SLA monitor configuration mode.

http-raw-request

Syntax Description	This command has no arguments or keywords.

Command Default   No options are specified for a GET request.

Command Modes   **IP SLA Configuration**

HTTP configuration (config-ip-sla-http)

IP SLA Monitor Configuration

HTTP configuration (config-sla-monitor-http)

Command History

Release	Modification
12.0(5)T	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   Use the **http-raw-request** command to explicitly specify the content of an HTTP request. Use HTTP version 1.0 commands after entering the **http-raw-request** command.

IP SLAs will specify the content of an HTTP request if you use the **typehttpoperationget** command. IP SLAs will send the HTTP request, receive the reply, and report round-trip time (RTT) statistics (including the size of the page returned).

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 **http-raw-request** 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 HTTP operation type is configured, you would enter the **http-raw-request** command in HTTP configuration mode (config-sla-monitor-http) within IP SLA monitor configuration mode.

Table 12: 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

In the following examples, IP SLAs operation 6 is created and configured as an HTTP operation. The HTTP **GET** command is explicitly specified. 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).

IP SLA Configuration

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

IP SLA Monitor Configuration

```
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
http (IP SLA)	Configures an HTTP IP SLAs operation in IP SLA 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.
type http operation	Configures an HTTP IP SLAs operation in IP SLA monitor configuration mode.

http-status-code-ignore

To enable IP Service Level Agreements (SLA) HTTP operation to consider the HTTP status code for deciding the IP SLA operation latest return code, use the **http-status-code-ignore** command in IP SLA configuration or IP SLA HTTP probe configuration mode. To return to the default value, use the **no** form of this command.

http-status-code-ignore
no http-status-code-ignore

Syntax Description   This command has no arguments or keywords.

Command Default   The HTTP status code will be considered for deciding the IP SLA operation latest return code.

Command Modes   IP SLA Configuration (config-ip-sla)

IP SLA HTTP Probe configuration (config-ip-sla-http)

Command History

Release	Modification
Cisco IOS XE Fuji 16.8.1	This command was introduced.

Usage Guidelines   Use this command for an HTTP operation to consider the HTTP status code for deciding the IP SLA operation latest return code on a Cisco IOS IP Service Level Agreements (SLAs) HTTP operation.