S through V

samples-of-history-kept

To set the number of entries kept in the history table per bucket for a Cisco IOS IP Service Level Agreements (SLAs) operation, use the **samples-of-history-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.

samples-of-history-kept *samples*

no samples-of-history-kept

Syntax Description

samples	Number of entries kept in the history table per bucket. The default is 16.

Command Default

16 entries

Command Modes

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

Command Modes

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

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
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

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 This command is supported by the IP SLAs ICMP path echo operation only.

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

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 **samples-of-history-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 **samples-of-history-kept** command in ICMP path echo configuration mode (config-sla-monitor-pathEcho) within IP SLA monitor configuration mode.

Table 1: Command Used to Begin Configuration of an IP SLAs Operation Based on Cisco IOS Release

Cisco IOS Release	Global Configuration Command	Command Mode Entered
12.4(4)T, 12.0(32)SY, 12.2(33)SRB, 12.2(33)SB, 12.2(33)SXI , 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, ten entries are kept in the history table for each of the lives of IP SLAs ICMP path echo 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).

Examples

```
ip sla 1
 path-Echo 172.16.1.176
 history lives-kept 3
 samples-of-history-kept 10
!
ip sla schedule 1 life forever start-time now
```

Examples

```
ip sla monitor 1
 type pathecho protocol ipIcmpEcho 172.16.1.176
 lives-of-history-kept 3
 samples-of-history-kept 10
```

```
!
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.
filter-for-history	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 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.

show ip sla configuration

To display configuration values including all defaults for all Cisco IOS IP Service Level Agreements (SLAs) operations or a specified operation, use the **show ip sla configuration** command in user EXEC or privileged EXEC mode.

show ip sla configuration [*operation*]

Syntax Description

operation	(Optional) Number of the IP SLAs operation for which the details will be displayed.

Command Modes

User EXEC (>)

Privileged EXEC (#)

Command History

Release	Modification
12.4(4)T	This command was introduced. This command replaces the **show ip sla monitor configuration** 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 **show rtr configuration** command.
12.2(33)SB	This command was integrated into Cisco IOS Release 12.2(33)SB. This command replaces the **show ip sla monitor configuration**command.
12.2(33)SRD	The command output has been modified to include information on IP SLAs Ethernet operation EVC support.
12.2(33)SXI	This command was integrated into Cisco IOS Release 12.2(33)SXI. This command replaces the **show ip sla monitor configuration**command.
12.2(33)SRE	This command was modified. The command output has been modified to include information on IP SLAs Ethernet operation port level support.
12.2(58)SE	This command was modified. The command output has been modified to include information about IP SLAs video operations.
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.

Release	Modification
15.2(3)T	This command was modified. The command output has been modified to display IPv4 and IPv6 addresses for DNS, FTP, HTTP, Path Echo, and Path Jitter IP SLAs operations.
Cisco IOS XE 3.7S	This command was integrated into Cisco IOS XE Release 3.7S.
15.2(4)M	This command was modified. The command output has been modified to display multicast UDP jitter operations.
15.3(1)S	This command was integrated into Cisco IOS Release 15.3(1)S.
Cisco IOS XE Release 3.8S	This command was integrated into Cisco IOS XE Release 3.8S.
15.1(2)SG	This command was integrated into Cisco IOS Release 15.1(2)SG.
Cisco IOS XE Release 3.4SG	This command was integrated into Cisco IOS XE Release 3.4SG.

Examples

The following sections show sample output from the **show ip sla configuration** command for different IP SLAs operations in IPv4 and IPv6 networks.

Examples

IP SLAs Internet Control Message Protocol (ICMP) echo operations support both IPv4 and IPv6 addresses.

The following example shows output from the **show ip sla configuration** command when the specified operation is an ICMP echo operation in an IPv4 network:

```
Router# show ip sla configuration 3
Entry number: 3
Owner:
Tag:
Type of operation: echo
Target address/Source address: 1.1.1.1/0.0.0.0
Operation timeout (milliseconds): 5000
Type Of Service parameters: 0x0
Vrf Name:
Request size (ARR data portion): 28
Verify data: No
Schedule:
   Next Scheduled Start Time: Start Time already passed
   Group Scheduled: False
   Operation frequency (seconds): 60
   Life/Entry Ageout (seconds): Forever/never
   Recurring (Starting Everyday): FALSE
   Status of entry (SNMP RowStatus): Active
Threshold (ms): 5000
Distribution Statistics:
   Number of statistic hours kept: 2
   Number of statistic distribution buckets kept: 5
   Statistic distribution interval (milliseconds): 10
Number of history Lives kept: 0
Number of history Buckets kept: 15
History Filter Type: None
Enhanced History:
```

The following example shows output from the **show ip sla configuration** command when the specified operation is an ICMP echo operation in an IPv6 network:

```
Router# show ip sla configuration 1
IP SLAs, Infrastructure Engine-II.
```

```
Entry number: 1
Owner:
Tag:
Type of operation to perform: echo
Target address/Source address: 2001:DB8:100::1/2001:0DB8:200::FFFE
Traffic-Class parameter: 0x80
Flow-Label parameter: 0x1B669
Request size (ARR data portion): 28
Operation timeout (milliseconds): 5000
Verify data: No
Vrf Name:
Schedule:
    Operation frequency (seconds): 60
    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): 5000
```

Examples

The following example shows output from the **show ip sla configuration** command when the specified operation is a Hypertext Transfer Protocol (HTTP) operation:

```
Router# show ip sla configuration 3
Entry number: 3
Owner:
Tag:
Type of operation: http
Target address/Source address: 1.1.1.1/0.0.0.0
Operation timeout (milliseconds): 5000
Type Of Service parameters: 0x0
HTTP Operation: get
HTTP Server Version: 1.0
URL: http://www.cisco.com
Proxy:
Raw String(s):
Cache Control: enable
Schedule:
   Next Scheduled Start Time: Start Time already passed
   Group Scheduled: False
   Operation frequency (seconds): 60
   Life/Entry Ageout (seconds): Forever/never
   Recurring (Starting Everyday): FALSE
   Status of entry (SNMP RowStatus): Active
Threshold (ms): 5000
Distribution Statistics:
   Number of statistic hours kept: 2
   Number of statistic distribution buckets kept: 5
   Statistic distribution interval (milliseconds): 10
Number of history Lives kept: 0
Number of history Buckets kept: 15
History Filter Type: None
```

Examples

The following example shows output from the **show ip sla configuration** command when the specified operation is an ICMP path jitter operation:

```
Router# show ip sla configuration 3
Entry number: 3
Owner:
Tag:
Type of operation: pathJitter
Target address/Source address: 1.1.1.1/0.0.0.0
Packet Interval/Number of Packets: 20 ms/10
Target Only: Disabled
Operation timeout (milliseconds): 5000
Type Of Service parameters: 0x0
```

```
Loose Source Routing: Disabled
LSR Path:
Vrf Name:
Request size (ARR data portion): 28
Verify data: No
Schedule:
   Next Scheduled Start Time: Start Time already passed
   Group Scheduled: False
   Operation frequency (seconds): 60
   Life/Entry Ageout (seconds): Forever/never
   Recurring (Starting Everyday): FALSE
   Status of entry (SNMP RowStatus): Active
Threshold (ms): 5000
```

Examples

The following example shows output from the **show ip sla configuration** command when the specified operation is an ICMP path echo operation:

```
Router# show ip sla configuration 3
Entry number: 3
Owner:
Tag:
Type of operation: pathEcho
Target address/Source address: 1.1.1.1/0.0.0.0
Packet Interval/Number of Packets: 20 ms/10
Operation timeout (milliseconds): 5000
Type Of Service parameters: 0x0
Loose Source Routing: Disabled
Vrf Name:
LSR Path:
Request size (ARR data portion): 28
Verify data: No
Schedule:
   Next Scheduled Start Time: Start Time already passed
   Group Scheduled: False
   Operation frequency (seconds): 60
   Life/Entry Ageout (seconds): Forever/never
   Recurring (Starting Everyday): FALSE
   Status of entry (SNMP RowStatus): Active
Threshold (ms): 5000
Distribution Statistics:
   Number of statistic hours kept: 2
   Number of statistic paths kept: 5
   Number of statistic hops kept: 16
   Number of statistic distribution buckets kept: 5
   Statistic distribution interval (milliseconds): 10
Number of history Lives kept: 0
Number of history Buckets kept: 15
History Filter Type: None
```

Examples

The following example shows output from the **show ip sla configuration** command when the specified operation is a Domain Name System (DNS) operation:

```
Router# show ip sla configuration 3
Entry number: 3
Owner:
Tag:
Type of operation: dns
Target Address/Source address: 1.1.1.1/0.0.0.0
Target Port/Source Port: 1111/0
Operation timeout (milliseconds): 5000
Type Of Service parameters: 0x0
Schedule:
   Next Scheduled Start Time: Start Time already passed
   Group Scheduled: False
   Operation frequency (seconds): 60
   Life/Entry Ageout (seconds): Forever/never
   Recurring (Starting Everyday): FALSE
   Status of entry (SNMP RowStatus): Active
```

```
Threshold (ms): 5000
Distribution Statistics:
   Number of statistic hours kept: 2
   Number of statistic distribution buckets kept: 5
   Statistic distribution interval (milliseconds): 10
Number of history Lives kept: 0
Number of history Buckets kept: 15
History Filter Type: None
```

Examples

IP SLAs User Datagram Protocol (UDP) echo operations support both IPv4 and IPv6 addresses.

The following example shows output from the **show ip sla configuration** command when the specified operation is a UDP echo operation in an IPv4 network:

```
Router# show ip sla configuration 3
Entry number: 3
Owner:
Tag:
Type of operation: udpEcho
Target address/Source address: 1.1.1.1/0.0.0.0
Target Port/Source Port: 1111/0
Operation timeout (milliseconds): 5000
Type Of Service parameters: 0x0
Data Pattern:
Vrf Name:
Request size (ARR data portion): 28
Verify data: No
Control Packets: enabled
Schedule:
   Next Scheduled Start Time: Start Time already passed
   Group Scheduled: False
   Operation frequency (seconds): 60
   Life/Entry Ageout (seconds): Forever/never
   Recurring (Starting Everyday): FALSE
   Status of entry (SNMP RowStatus): Active
Threshold (ms): 5000
Distribution Statistics:
   Number of statistic hours kept: 2
   Number of statistic distribution buckets kept: 5
   Statistic distribution interval (milliseconds): 10
Number of history Lives kept: 0
Number of history Buckets kept: 15
History Filter Type: None
Enhanced History:
```

The following example shows output from the **show ip sla configuration** command when the specified operation is a UDP echo operation in an IPv6 network:

```
Router# show ip sla configuration 1
IP SLAs, Infrastructure Engine-II.
Entry number: 1
Owner:
Tag:
Type of operation to perform: udp-echo
Target address/Source address: 2001:DB8:100::1/2001:0DB8:200::FFFE
Target port/Source port: 3/7
Traffic-Class parameter: 0x80
Flow-Label parameter: 0x1B669
Request size (ARR data portion): 16
Operation timeout (milliseconds): 5000
Verify data: No
Data pattern:
Vrf Name:
Control Packets: enabled
Schedule:
    Operation frequency (seconds): 60
    Next Scheduled Start Time: Pending trigger
    Group Scheduled : FALSE
    Randomly Scheduled : FALSE
    Life (seconds): 3600
    Entry Ageout (seconds): never
```

Examples

IP SLAs Transmission Control Protocol (TCP) connect operations support both IPv4 and IPv6 addresses.

The following example shows output from the **show ip sla configuration** command when the specified operation is a TCP connect operation in an IPv4 network:

```
Router# show ip sla configuration 3
Entry number: 3
Owner:
Tag:
Type of operation: tcpConnect
Target Address/Source address: 1.1.1.1/0.0.0.0
Target Port/Source Port: 1111/0
Operation timeout (milliseconds): 5000
Type Of Service parameters: 0x0
Control Packets: enabled
Schedule:
   Next Scheduled Start Time: Start Time already passed
   Group Scheduled: False
   Operation frequency (seconds): 60
   Life/Entry Ageout (seconds): Forever/never
   Recurring (Starting Everyday): FALSE
   Status of entry (SNMP RowStatus): Active
Threshold (ms): 5000
Distribution Statistics:
   Number of statistic hours kept: 2
   Number of statistic distribution buckets kept: 5
   Statistic distribution interval (milliseconds): 10
Number of history Lives kept: 0
Number of history Buckets kept: 15
History Filter Type: None
Enhanced History:
```

The following example shows output from the **show ip sla configuration** command when the specified operation is a TCP connect operation in an IPv6 network:

```
Router# show ip sla configuration 1
IP SLAs, Infrastructure Engine-II.
Entry number: 1
Owner:
Tag:
Type of operation to perform: tcp-connect
Target address/Source address: 2001:DB8:100::1/2001:0DB8:200::FFFE
Target port/Source port: 3/7
Traffic-Class parameter: 0x80
Flow-Label parameter: 0x1B669
Operation timeout (milliseconds): 60000
Control Packets: enabled
Schedule:
    Operation frequency (seconds): 60
    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): 5000
Distribution Statistics:
```

Examples

The following example shows output from the **show ip sla configuration** command when the specified operation is a Dynamic Host Configuration Protocol (DHCP) operation:

```
Router# show ip sla configuration 3
Entry number: 3
Owner:
Tag:
Type of operation: dhcp
Target Address/Source address: 1.1.1.1/0.0.0.0
Operation timeout (milliseconds): 5000
Dhcp option:
Schedule:
   Next Scheduled Start Time: Start Time already passed
   Group Scheduled: False
```

```
   Operation frequency (seconds): 60
   Life/Entry Ageout (seconds): Forever/never
   Recurring (Starting Everyday): FALSE
   Status of entry (SNMP RowStatus): Active
Threshold (ms): 5000
Distribution Statistics:
   Number of statistic hours kept: 2
   Number of statistic distribution buckets kept: 5
   Statistic distribution interval (milliseconds): 10
Number of history Lives kept: 0
Number of history Buckets kept: 15
History Filter Type: None
```

Examples

The following example shows output from the **show ip sla configuration** command when the specified operation is a File Transfer Protocol (FTP) operation:

```
Router# show ip sla configuration 3
Entry number: 3
Owner:
Tag:
Type of operation: ftp
Source address: 0.0.0.0
FTP URL: ftp://ipsla:ipsla@172.19.192.109/test.txt
Operation timeout (milliseconds): 5000
Type Of Service parameters: 0x0
Schedule:
   Next Scheduled Start Time: Start Time already passed
   Group Scheduled: False
   Operation frequency (seconds): 60
   Life/Entry Ageout (seconds): Forever/never
   Recurring (Starting Everyday): FALSE
   Status of entry (SNMP RowStatus): Active
Threshold (ms): 5000
Distribution Statistics:
   Number of statistic hours kept: 2
   Number of statistic distribution buckets kept: 5
   Statistic distribution interval (milliseconds): 10
Number of history Lives kept: 0
Number of history Buckets kept: 15
History Filter Type: None
```

Examples

IP SLAs User Datagram Protocol (UDP) jitter connect operations support both IPv4 and IPv6 addresses.

The following example shows output from the **show ip sla configuration** command when the specified operation is a UDP jitter operation in an IPv4 network:

```
Router# show ip sla configuration 3
Entry number: 3
Owner:
Tag:
Type of operation: jitter
Target Address/Source address: 1.1.1.1/0.0.0.0
Target Port/Source Port: 1111/0
Packet Interval/Number of Packets: 20 ms/10
Operation timeout (milliseconds): 5000
Type Of Service parameters: 0x0
Vrf Name:
Request size (ARR data portion): 28
Verify data: No
Control Packets: enabled
Schedule:
   Next Scheduled Start Time: Start Time already passed
   Group Scheduled: False
   Operation frequency (seconds): 60
   Life/Entry Ageout (seconds): Forever/never
   Recurring (Starting Everyday): FALSE
   Status of entry (SNMP RowStatus): Active
Threshold (ms): 5000
```

```
Distribution Statistics:
   Number of statistic hours kept: 2
   Number of statistic distribution buckets kept: 5
   Statistic distribution interval (milliseconds): 10
Enhanced History:
```

The following example shows output from the **show ip sla configuration** command when the specified operation is a UDP jitter operation in an IPv6 network:

```
Router# show ip sla configuration 1
IP SLAs, Infrastructure Engine-II.
Entry number: 1
Owner:
Tag:
Type of operation to perform: udp-jitter
Target address/Source address: 2001:DB8:100::1/2001:0DB8:200::FFFE
Target port/Source port: 3/7
Traffic-Class parameter: 0x0
Flow-Label parameter: 0x0
Request size (ARR data portion): 32
Operation timeout (milliseconds): 5000
Packet Interval (milliseconds)/Number of packets: 30/15
Verify data: No
Vrf Name:
Control Packets: enabled
Schedule:
    Operation frequency (seconds): 60
    Next Scheduled Start Time: Pending trigger
    Group Scheduled : FALSE
    Randomly Scheduled : FALSE
    Life (seconds): 3600
    Entry Ageout (seconds): never
```

The following example shows output from the **show ip sla configuration** command when the specified operation is a multicast UDP jitter operation. The output includes the list of responders associated with the multicast UDP jitter operation, extracted from the endpoint list for this operation. Each multicast responder has a corresponding operation ID (oper-id) generated for the responder by the multicast operation.

```
R1# show ip sla config 10

IP SLAs Infrastructure Engine-III
Entry number: 10
Owner:
Tag:
Operation timeout (milliseconds): 5000
Type of operation to perform: udp-jitter
Target address/Source address: 239.1.1.1/3000 !<---multicast address
Target port/Source port: 2460/0
Type Of Service parameter: 0x0
Request size (ARR data portion): 32
Packet Interval (milliseconds)/Number of packets: 20/10
Verify data: No
Vrf Name:
Control Packets: enabled
Schedule:
   Operation frequency (seconds): 60  (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): 5000
Distribution Statistics:
   Number of statistic hours kept: 2
   Number of statistic distribution buckets kept: 1
   Statistic distribution interval (milliseconds): 20
Enhanced History:

  sno     oper-id              dest-ip-addr    !<---responders in endpoint list
    1   728338               1.2.3.4
    2   728339               1.2.3.5
```

```
     3  2138021658              3.3.3.3
```

Examples

IP SLAs video operations support only IPv4 addresses.

The following example shows output from the **show ip sla configuration** command when the specified operation is a video operation:

```
Router# show ip sla configuration 600
IP SLAs Infrastructure Engine-III
Entry number: 600
Owner:
Tag:
Operation timeout (milliseconds): 5000
Type of operation to perform: video
Video profile name: TELEPRESENCE
Target address/Source address: 192.168.2.1/192.168.2.2
Target port/Source port: 1/1
Vrf Name:
Control Packets: enabled
Schedule:
   Operation frequency (seconds): 60  (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): 5000
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
ip sla	Begins configuration for an IP SLAs operation and enters IP SLA configuration mode.

show ip sla group schedule

To display the group schedule details for Cisco IOS IP Service Level Agreements (SLAs) operations, use the **showipslagroupschedule**command in user EXEC or privileged EXEC mode.

show ip sla group schedule [*group-operation-number*]

Syntax Description

group-operation-number	(Optional) Number of the IP SLAs group operation to display.

Command Modes

User EXEC Privileged EXEC

Command History

Release	Modification
12.4(4)T	This command was introduced. This command replaces the **showipslamonitorgroupschedule** 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 **showrtrgroupschedule**command.
12.2(33)SB	This command was integrated into Cisco IOS Release 12.2(33)SB. This command replaces the **showipslamonitorgroupschedule**command.
12.2(33)SXI	This command was integrated into Cisco IOS Release 12.2(33)SXI. This command replaces the **showipslamonitorgroupschedule**command.
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.

Examples

The following is sample output from the **showipslagroupschedule** command that shows information about group (multiple) scheduling. The last line in the example indicates that the IP SLAs operations are multiple scheduled (TRUE):

```
Router# show ip sla group schedule
Multi-Scheduling Configuration:
Group Entry Number: 1
Probes to be scheduled: 2,3,4,9-30,89
Schedule period :60
Group operation frequency: 30
Multi-scheduled: TRUE
```

The following is sample output from the **showipslagroupschedule** command that shows information about group (multiple) scheduling, with the frequency value the same as the schedule period value, the life value as 3600 seconds, and the ageout value as never:

```
Router# show ip sla group schedule
Group Entry Number: 1
Probes to be scheduled: 3,4,6-10
Total number of probes: 7
Schedule period: 20
Group operation frequency: Equals schedule period
Status of entry (SNMP RowStatus): Active
Next Scheduled Start Time: Start Time already passed
Life (seconds): 3600
Entry Ageout (seconds): never
```

The table below describes the significant fields shown in the displays.

Table 2: show ip sla group schedule Field Descriptions

Field	Description
Group Entry Number	The operation group number specified for IP SLAs multiple operations scheduling.
Probes to be scheduled	The operations numbers specified in the operation group 1.
Scheduled period	The time (in seconds) for which the IP SLAs group is scheduled.
Group operation frequency	The frequency at which each operation is started.
Multi-scheduled	The value TRUE shows that group scheduling is active.

Related Commands

Command	Description
show ip sla configuration	Displays the configuration details for IP SLAs operations.

show ip sla reaction-configuration

To display the configured proactive threshold monitoring settings for all Cisco IOS IP Service Level Agreements (SLAs) operations or a specified operation, use the **showipslareaction-configuration** command in user EXEC or privileged EXEC mode.

show ip sla reaction-configuration [*operation-number*]

Syntax Description

operation-number	(Optional) Number of the operation for which the reaction configuration characteristics is displayed.

Command Default

Displays configured proactive threshold monitoring settings for all IP SLAs operations.

Command Modes

User EXEC Privileged EXEC

Command History

Release	Modification
12.4(4)T	This command was introduced. This command replaces the **showipslamonitorreaction-configuration** 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 **showrtrreaction-configuration**command.
12.2(33)SB	This command was integrated into Cisco IOS Release 12.2(33)SB. This command replaces the **showipslamonitorreaction-configuration**command.
12.2(33)SXI	This command was integrated into Cisco IOS Release 12.2(33)SXI. This command replaces the **showipslamonitorreaction-configuration**command.

Usage Guidelines

Use the **ipslareaction-configuration** command in global configuration mode to configure the proactive threshold monitoring parameters for an IP SLAs operations.

Examples

In the following example, multiple monitored elements (indicated by the Reaction values) are configured for a single IP SLAs operation:

```
Router# show ip sla reaction-configuration

Entry Number: 1
Reaction: RTT
Threshold type: Never
```

```
Rising (milliseconds): 5000
Falling (milliseconds): 3000
Threshold Count: 5
Threshold Count2: 5
Action Type: None
Reaction: jitterDSAvg
Threshold type: average
Rising (milliseconds): 5
Falling (milliseconds): 3
Threshold Count: 5
Threshold Count2: 5
Action Type: triggerOnly
Reaction: jitterDSAvg
Threshold type:  immediate
Rising (milliseconds): 5
Falling (milliseconds): 3
Threshold Count: 5
Threshold Count2: 5
Action Type: trapOnly
Reaction: PacketLossSD
Threshold type:  immediate
Rising (milliseconds): 5
Threshold Falling (milliseconds): 3
Threshold Count: 5
Threshold Count2: 5
Action Type: trapOnly
```

The table below describes the significant fields shown in the display.

Table 3: show ip sla reaction-configuration Field Descriptions

Field	Description
Reaction	The monitored element configured for the specified IP SLAs operation. Corresponds to the **react**{**connectionLoss** | **jitterAvg** | **jitterDSAvg** | **jitterSDAvg** | **mos** | **PacketLossDS** | **PacketLossSD** | **rtt** | **timeout** | **verifyError**} syntax in the **ipslareaction-configuration** command.
Threshold type	The configured threshold type. Corresponds to the **threshold-type** {**never** | **immediate** | **consecutive** | **xofy** | **average**} syntax in the **ipslareaction-configuration** command.
Rising (milliseconds)	The *upper-threshold* value. Corresponds to the **threshold-value***upper-thresholdlower-threshold* syntax in the **ipslareaction-configuration** command.
Falling (milliseconds)	The *lower-threshold* value. Corresponds to the **threshold-value***upper-thresholdlower-threshold* syntax in the **ipslareaction-configuration** command.
Threshold Count	The *x-value* in the **xofy** threshold type, or the *number-of-measurements* value for the **average** threshold type.

Field	Description
Threshold Count2	The *y-value* in the **xofy** threshold type.
Action Type	The reaction to be performed when the violation conditions are met. Corresponds to the **action-type** {**none** | **trapOnly** | **triggerOnly** | **trapAndTrigger**} syntax in the **ipslareaction-configuration** command.

Related Commands

Command	Description
ip sla reaction-configuration	Configures proactive threshold monitoring parameters for an IP SLAs operation.

show ip sla reaction-trigger

To display the reaction trigger information for all Cisco IOS IP Service Level Agreements (SLAs) operations or the specified operation, use the **show ip sla reaction-trigger** command in user EXEC or privileged EXEC mode.

show ip sla reaction-trigger [*operation-number*]

Syntax Description

operation-number	(Optional) Number of the IP SLAs operation to display.

Command Modes

User EXEC Privileged EXEC

Command History

Release	Modification
12.4(4)T	This command was introduced. This command replaces the **show ip sla monitor reaction-trigger** command.
12.0(32)SY	This command was integrated into Cisco IOS Release 12.0(32)SY.
12.2(33)SRB	This command was integrated into Cisco IOS Release 12.2(33)SRB. This command replaces the **show rtr reaction-trigger** command.
12.2(33)SB	This command was integrated into Cisco IOS Release 12.2(33)SB. This command replaces the **show ip sla monitor reaction-trigger**command.
12.2(33)SXI	This command was integrated into Cisco IOS Release 12.2(33)SXI. This command replaces the **show ip sla monitor reaction-trigger**command.

Usage Guidelines

Use the **show ip sla reaction-trigger** command to display the configuration status and operational state of target operations that will be triggered as defined with the **ip sla reaction-configuration** global configuration command.

Examples

The following is sample output from the **show ip sla reaction-trigger** command:

```
Router# show ip sla reaction-trigger 1
        Reaction Table
Entry Number: 1
Target Entry Number: 2
Status of Entry (SNMP RowStatus): active
Operational State: pending
```

Related Commands

Command	Description
show ip sla configuration	Displays configuration values including all defaults for all IP SLAs operations or the specified operation.

show ip sla statistics

To display the current operational status and statistics of all Cisco IOS IP Service Level Agreements (SLAs) operations or a specified operation, use the **showipslastatistics** command in user EXEC or privileged EXEC mode.

show ip sla statistics [*operation-number*] **[details]**

Syntax Description

operation-number	(Optional) Number of the operation for which operational status and statistics are displayed. **Note** For Multicast UDP jitter operations: Valid operation numbers include the operation IDs (oper-id) for each responder in the endpoint list for the operation.
details	(Optional) Operational status and statistics are displayed in greater detail.

Command Default

Displays output for all running IP SLAs operations.

Command Modes

User EXEC (>)

Privileged EXEC (#)

Command History

Release	Modification
12.4(4)T	This command was introduced. This command replaces the **showipslamonitorstatistics**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 **showrtroperational-state**command.
12.2(33)SB	This command was integrated into Cisco IOS Release 12.2(33)SB. This command replaces the **showipslamonitorstatistics**command.
12.2(33)SXI	This command was integrated into Cisco IOS Release 12.2(33)SXI. This command replaces the **showipslamonitorstatistics**command.
12.2(58)SE	This command was modified. The command output has been modified to include information about IP SLAs video operations.
15.2(2)T	This command was integrated into Cisco IOS Release 15.2(2)T.

Release	Modification
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 command output has been modified to include information about multicast UDP jitter operations.
15.3(1)S	This command was integrated into Cisco IOS Release 15.3(1)S.
Cisco IOS XE Release 3.8S	This command was integrated into Cisco IOS XE Release 3.8S.
15.1(2)SG	This command was integrated into Cisco IOS Release 15.1(2)SG.
Cisco IOS XE Release 3.4SG	This command was integrated into Cisco IOS XE Release 3.4SG.

Usage Guidelines

Use the **showipslastatistics** command to display the current state of IP SLAs operations, including how much life the operation has left, whether the operation is active, and the completion time. The output will also include the monitoring data returned for the last (most recently completed) operation.

For multicast UDP jitter operations with an endpoint-list: Operation IDs (oper-id) are generated for each destination responder that is associated with the multicast UDP jitter operation. This generated operation ID is displayed when you use the **show ip sla configuration** command for the base multicast operation, and as part of the summery statistics for the entire operation.

Doing a show on the specific operation ID will allow details for that one responder to be displayed.

Examples

The following is sample output from the **showipslastatistics** command:

```
Router# show ip sla statistics          Current Operational State
Entry Number: 3
Modification Time: *22:15:43.000 UTC Sun Feb 11 2001
Diagnostics Text:
Last Time this Entry was Reset: Never
Number of Octets in use by this Entry: 1332
Number of Operations Attempted: 2
Current Seconds Left in Life: 3511
Operational State of Entry: active
Latest Completion Time (milliseconds): 544
Latest Operation Start Time: *22:16:43.000 UTC Sun Feb 11 2001
Latest Oper Sense: ok
Latest Sense Description: 200  OK
Total RTT: 544
DNS RTT: 12
TCP Connection RTT: 28
HTTP Transaction RTT: 504
HTTP Message Size: 9707
```

The following is sample output from the **showipslastatistics** command when the specified operation is a UDP jitter (codec) operation. The values shown indicate the values for the last IP SLAs operation.

```
Router# show ip sla statistics          Current Operational State
Entry number: 10
Modification time: 12:57:45.690 UTC Sun Oct 26 2003
Number of operations attempted: 3
Number of operations skipped: 0
Current seconds left in Life: 3570
```

```
Operational state of entry: Active
Last time this entry was reset: Never
Connection loss occurred: FALSE
Timeout occurred: FALSE
Over thresholds occurred: FALSE
Latest RTT (milliseconds): 19
Latest operation start time: 12:57:45.723 Sun Oct 26 2003
Latest operation return code: OK
Voice Scores:
 ICPIF:  20          MOS Score:  3.20
RTT Values:
 NumOfRTT: 10     RTTAvg: 19      RTTMin: 19     RTTMax: 20
 RTTSum:  191    RTTSum2: 3649
Packet Loss Values:
 PacketLossSD: 0 PacketLossDS: 0
 PacketOutOfSequence: 0  PacketMIA: 0    PacketLateArrival: 0
 InternalError: 0        Busies: 0
Jitter Values:
 NumOfJitterSamples: 9
 MinOfPositivesSD: 0     MaxOfPositivesSD: 0
 NumOfPositivesSD: 0     SumOfPositivesSD: 0     Sum2PositivesSD: 0
 MinOfNegativesSD: 0     MaxOfNegativesSD: 0
 NumOfNegativesSD: 0     SumOfNegativesSD: 0     Sum2NegativesSD: 0
 MinOfPositivesDS: 1     MaxOfPositivesDS: 1
 NumOfPositivesDS: 1     SumOfPositivesDS: 1     Sum2PositivesDS: 1
 MinOfNegativesDS: 1     MaxOfNegativesDS: 1
 NumOfNegativesDS: 1     SumOfNegativesDS: 1     Sum2NegativesDS: 1
 Interarrival jitterout: 0       Interarrival jitterin: 0
One Way Values:
 NumOfOW: 0
 OWMinSD: 0      OWMaxSD: 0      OWSumSD: 0      OWSum2SD: 0
 OWMinDS: 0      OWMaxDS: 0      OWSumDS: 0      OWSum2DS: 0
```

The following is sample output from the **showipslastatistics detail** command when the specified operation is an IP SLAs Metro-Ethernet 3.0 (ITU-T Y.1731) delay operation (3). The values shown indicate the values for the last operation.

```
Router# show ip sla statistics 3 details

IPSLA operation id: 3
Delay Statistics for Y1731 Operation 3
Type of operation: Y1731 Delay Measurement
Latest operation start time: *02:12:49.772 PST Thu Jul 1 2010
Latest operation return code: OK
Distribution Statistics:
Interval
 Start time:  *02:12:49.772 PST Thu Jul 1 2010
 End time:  *00:00:00.000 PST Mon Jan 1 1900
 Number of measurements initiated: 31
 Number of measurements completed: 31
 Flag: OK


Delay:
 Max/Avg/Min TwoWay: 2014/637/0
 Time of occurrence TwoWay: Max - *02:13:11.210 PST Thu Jul 1 2010/Min - *02:17:51.339 PST
 Thu Jul 1 2010

 Bucket TwoWay:
  Bucket Range: 0 - < 5000 microseconds
   Total observations: 22
  Bucket Range: 5000 - < 10000 microseconds
   Total observations: 0
  Bucket Range: 10000 - < 15000 microseconds
   Total observations: 0
  Bucket Range: 15000 - < 20000 microseconds
   Total observations: 0
  Bucket Range: 20000 - < 25000 microseconds
   Total observations: 0
  Bucket Range: 25000 - < 30000 microseconds
   Total observations: 0
  Bucket Range: 30000 - < 35000 microseconds
   Total observations: 0
```

```
  Bucket Range: 35000 - < 40000 microseconds
   Total observations: 0
  Bucket Range: 40000 - < 45000 microseconds
   Total observations: 0
  Bucket Range: 45000 - < 4294967295 microseconds
   Total observations: 0

Delay Variance:
 Max/Avg TwoWay positive: 0/0
 Time of occurrence TwoWay positive: Max - *00:00:00.000 PST Mon Jan 1 1900
 Max/Avg TwoWay negative: 0/0
 Time of occurrence TwoWay negative: Max - *00:00:00.000 PST Mon Jan 1 1900

 Bucket TwoWay positive:
  Bucket Range: 0 - < 5000 microseconds
   Total observations: 0
  Bucket Range: 5000 - < 10000 microseconds
   Total observations: 0
  Bucket Range: 10000 - < 15000 microseconds
   Total observations: 0
  Bucket Range: 15000 - < 20000 microseconds
   Total observations: 0
  Bucket Range: 20000 - < 25000 microseconds
   Total observations: 0
  Bucket Range: 25000 - < 30000 microseconds
   Total observations: 0
  Bucket Range: 30000 - < 35000 microseconds
   Total observations: 0
  Bucket Range: 35000 - < 40000 microseconds
   Total observations: 0
  Bucket Range: 40000 - < 45000 microseconds
   Total observations: 0
  Bucket Range: 45000 - < 4294967295 microseconds
   Total observations: 0

 Bucket TwoWay negative:
  Bucket Range: 0 - < 5000 microseconds
   Total observations: 0
  Bucket Range: 5000 - < 10000 microseconds
   Total observations: 0
  Bucket Range: 10000 - < 15000 microseconds
   Total observations: 0
  Bucket Range: 15000 - < 20000 microseconds
   Total observations: 0
  Bucket Range: 20000 - < 25000 microseconds
   Total observations: 0
  Bucket Range: 25000 - < 30000 microseconds
   Total observations: 0
  Bucket Range: 30000 - < 35000 microseconds
   Total observations: 0
  Bucket Range: 35000 - < 40000 microseconds
   Total observations: 0
  Bucket Range: 40000 - < 45000 microseconds
   Total observations: 0
  Bucket Range: 45000 - < 4294967295 microseconds
   Total observations: 0

 Bucket TwoWay negative:
```

The following is sample output from the **showipslastatistics** command when the specified operation is a multicast UDP jitter operation and includes statistics for each multicast responder in the endpoint list associated with the multicast UDP jitter operation:

```
Router# show ip sla statistics 100

Operation id: 22
mcast-ip-address/port: 239.1.1.1/3000
Latest operation start time: 18:32:36 PST Thu Aug 4 2011
Number of successes: 11
Number of failures: 0
Operation time to live: 2965 sec
```

```
status DSCP delay jitter loss
OK 000 1/2/5 1/2/3 0/0/0

Multicast responder statistics:

Seq#  oper-id   responder-ip   status               delay   jitter   loss
1        728338     1.2.3.4         OK                    1/2/5    1/2/3 0
2        728339     1.2.3.5         NO_RESPONSE  1/2/5   1/2/3 0
3        728340     1.2.3.6         OK                     1/2/5   1/2/3 0
4        728343     1.2.3.7        ERROR               1/2/5   1/2/3 0
```

The table below describes the significant fields shown in the display.

Table 4: show ip sla statistics Field Descriptions

Field	Description
Voice Scores	Indicates that Voice over IP statistics appear on the following lines. Voice score data is computed when the operation type is configured as **udp-jitter** (codec).
ICPIF	The Calculated Planning Impairment Factor (ICPIF) value for the operation. The ICPIF value is computed by IP SLAs using the formula *Icpif=Io+Iq+Idte+Idd+Ie-A*, where • The values for *Io* , *Iq* , and *Idte* are set to zero. • The value *Idd* is computed based on the measured one-way delay. • The value *Ie* is computed based on the measured packet loss. • The value of A is specified by the user. ICPIF values are expressed in a typical range of 5 (very low impairment) to 55 (very high impairment). ICPIF values numerically lower than 20 are generally considered “adequate.” **Note** This value is intended only for relative comparisons, and may not match ICPIF values generated using alternate methods.
MOS Score	The estimated Mean Opinion Score (Conversational Quality, Estimated) for the latest iteration of the operation. The MOS-CQE is computed by IP SLAs as a function of the ICPIF. MOS values are expressed as a number from 1 (1.00) to 5 (5.00), with 5 being the highest level of quality, and 1 being the lowest level of quality. A MOS value of 0 (zero) indicates that MOS data could not be generated for the operation.
RTT Values	Indicates that round-trip-time statistics appear on the following lines.

Field	Description
NumOfRTT	The number of successful round-trips.
RTTSum	The sum of all successful round-trip values (in milliseconds).
RTTSum2	The sum of squares of those round-trip values (in milliseconds).
PacketLossSD	The number of packets lost from source to destination.
PacketLossDS	The number of packets lost from destination to source.
PacketOutOfSequence	The number of packets returned out of order.
PacketMIA	The number of packets lost where the direction (SD/DS) cannot be determined.
PacketLateArrival	The number of packets that arrived after the timeout.
InternalError	The number of times an operation could not be started due to other internal failures.
Busies	The number of times this operation could not be started because the previously scheduled run was not finished.
Jitter Values	Indicates that jitter statistics appear on the following lines. Jitter is interpacket delay variance.
NumOfJitterSamples	The number of jitter samples collected. This is the number of samples that are used to calculate the following jitter statistics.
MinOfPositivesSD MaxOfPositivesSD	The minimum and maximum positive jitter values from source to destination, in milliseconds.
NumOfPositivesSD	The number of jitter values from source to destination that are positive (that is, network latency increases for two consecutive test packets).
SumOfPositivesSD	The sum of those positive values (in milliseconds).
Sum2PositivesSD	The sum of squares of those positive values.
MinOfNegativesSD MaxOfNegativesSD	The minimum and maximum negative jitter values from source to destination. The absolute value is given.

Field	Description
NumOfNegativesSD	The number of jitter values from source to destination that are negative (that is, network latency decreases for two consecutive test packets).
SumOfNegativesSD	The sum of those values.
Sum2NegativesSD	The sum of the squares of those values.
Interarrival jitterout	The source-to-destination (SD) jitter value calculation, as defined in RFC 1889.
Interarrival jitterin	The destination-to-source (DS) jitter value calculation, as defined in RFC 1889.
One Way Values	Indicates that one-way measurement statistics appear on the following lines. One Way (OW) values are the amount of time required for the packet to travel from the source router to the target router (SD) or from the target router to the source router (DS).
NumOfOW	Number of successful one-way time measurements.
OWMinSD	Minimum time (in milliseconds) from the source to the destination.
OWMaxSD	Maximum time (in milliseconds) from the source to the destination.
OWSumSD	Sum of the OWMinSD and OWMaxSD values.
OWSum2SD	Sum of the squares of the OWMinSD and OWMaxSD values.

Related Commands

Command	Description
show ip sla configuration	Displays configuration values including all defaults for all IP SLAs operations or the specified operation.

show ip sla summary

To display summary statistics for IP Service Level Agreements (SLAs) operations, use the **show ip sla summary** command in privileged EXEC mode.

show ip sla summary [**destination** {*ip-address*| *hostname*}]

Syntax Description

destination	(Optional) Displays destination-address-based statistics.
destination-ip-address	IP address of the destination device.
destination-hostname	Hostname of the destination device.

Command Modes

Privileged EXEC (#)

Command History

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

This command displays summary statisics for multicast operations and for unicast on which multiple operations are configured on the same destination IP address or hostname.

Examples

```
Device# show ip sla summary
ID       Type      Destination   Stats(ms)  ReturnCode    LastRun
---      ----      -----------   -------    ----------    -------
100    icmp-jitter  192.0.2.2      100      OK            22:49:53 PST Tue May 3 2011
101    udp-jitter   192.0.2.3      100      OK            22:49:53 PST Tue May 3 2011
102    tcp-connect  192.0.2.4      -        NoConnection  22:49:53 PST Tue May 3 2011
```

```
Device# show ip sla summary destination 192.0.2.2
ID       Type      Destination  State   Stats(ms)  ReturnCode  LastRun
---      ----      -----------  -----   -------  ----------  -------
100   icmp-jitter   192.0.2.2    Active   100      OK       22:49:53 PST Tue May 3 2011
101   udp-jitter    192.0.2.2    Active   100      OK       22:49:53 PST Tue May 3 2011
102   tcp-connect   192.0.2.2    Active    -      NoConnection  22:49:53 PST Tue May 3 2011
103   video         1232:232     Active   100      OK       22:49:53 PST Tue May 3 2011
                      ::222
```

```
104    video          1232:232      Active   100       OK        22:49:53 PST Tue May 3 2011
                        ::222
```

The table below describes the significant fields shown in the display.

Table 5: show ip sla summary Field Descriptions

Field	Description
ID	IP SLAs operation identifier.
Destination	IP address or hostname of the destination device for the listed operation.
Stats	Round trip time in millisecoconds.

tag (IP SLA)

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

tag *text*

no tag

Syntax Description

text	Name of a group to which the operation belongs from 0 to 16 ASCII characters.

Command Default

No tag identifier is specified.

Command Modes

IP SLA Configuration

DHCP configuration (config-ip-sla-dhcp)

DLSw configuration (config-ip-sla-dlsw)

DNS configuration (config-ip-sla-dns)

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

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

FTP configuration (config-ip-sla-ftp)

HTTP configuration (config-ip-sla-http)

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

ICMP jitter configuration (config-ip-sla-icmpjitter)

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

ICMP path jitter configuration (config-ip-sla-pathJitter)

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)

Auto IP SLA MPLS Configuration

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

IP SLA Auto Ethernet Configuration

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

IP SLA Monitor Configuration

DHCP configuration (config-sla-monitor-dhcp)

DLSw configuration (config-sla-monitor-dlsw)

DNS configuration (config-sla-monitor-dns)

FTP configuration (config-sla-monitor-ftp)

HTTP configuration (config-sla-monitor-http)

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

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

ICMP path jitter configuration (config-sla-monitor-pathJitter)

TCP connect configuration (config-sla-monitor-tcp)

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

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

VoIP configuration (config-sla-monitor-voip)

Command History

Release	Modification
11.2	This command was introduced.
12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.
12.2(33)SRB	The Ethernet echo, Ethernet jitter, and Ethernet parameters configuration modes were added.
12.2SX	This command is supported in the Cisco IOS Release 12.2SX train. Support in a specific 12.2SX release of this train depends on your feature set, platform, and platform hardware.
12.2(33)SRC	The VCCV configuration mode was added.
12.2(33)SB	The following configuration modes were added: • Ethernet echo • Ethernet jitter • Ethernet parameters • VCCV
12.4(20)T	This command was modified. The Ethernet echo, Ethernet jitter, and Ethernet parameters configuration modes were added.
12.2(33)SXI	This command was integrated into Cisco IOS Release 12.2(33)SXI.
12.2(58)SE	This command was modified. Support for the video configuration submode of the IP SLA configuration mode was added.

Release	Modification
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 Release 3.8S	This command was integrated into Cisco IOS XE Release 3.8S.

Usage Guidelines

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

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

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

IP SLAs Operation Configuration Dependence on Cisco IOS Release

The Cisco IOS command used to begin configuration for an IP SLAs operation varies depending on the Cisco IOS release you are running (see 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, see the Command Used to Begin Configuration of an IP SLAs LSP Health Monitor Operation Based on Cisco IOS Release table for information on Cisco IOS release dependencies. You must configure the type of IP SLAs operation, such as User Datagram Protocol (UDP) jitter or Internet Control Message Protocol (ICMP) echo, before you can configure any of the other parameters of the operation.

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

Table 6: Command Used to Begin Configuration of an IP SLAs Operation Based on Cisco IOS Release

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

Table 7: Command Used to Begin Configuration of an IP SLAs LSP Health Monitor Operation Based on Cisco IOS Release

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

Examples

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

Examples

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

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

Examples

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

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

Related Commands

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

tcp-connect

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

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

Syntax Description

destination-ip-address | *destination-hostname*	Destination IP v4 or IPv6 address or hostname .
destination-port	Specifies the destination port number. The range is from 1 to 65353 or for a non-Cisco IP host, a known post number (for example, 21 for FTP, 23 for Telnet, or 80 for HTTP server). • In Cisco IOS Release 15.2(3)T and later releases, the value of the *destination-port* variable is selected by the responder if you do not specify a port number.
source-ip {*ip-address* | *hostname*}	(Optional) Specifies the source IP v4 or IPv6 address or hostname . When a source IP address or hostname is not specified, IP SLAs chooses the IP address nearest to the destination.
source-port *port-number*	(Optional) Specifies the source port number. When a port number is not specified, IP SLAs chooses an available port.
control enable | **disable**	(Optional) Enables or disables the IP SLAs control protocol to send a control message to the IP SLAs Responder prior to sending an operation packet. By default, IP SLAs control messages are sent to the destination device to establish a connection with the IP SLAs Responder.

Command Default

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

Command Modes

IP SLA configuration (config-ip-sla)

Command History

Release	Modification
12.4(4)T	This command was introduced. This command replaces the **type tcpConnect dest-ipaddr**command.
12.0(32)SY	This command was integrated into Cisco IOS Release 12.0(32)SY.
12.2(33)SRB	This command was integrated into Cisco IOS Release 12.2(33)SRB. This command replaces the **type tcpConnect dest-ipaddr** command.
12.2(33)SRC	Support for IPv6 addresses was added.
12.2(33)SB	This command was integrated into Cisco IOS Release 12.2(33)SB. This command replaces the **type tcpConnect dest-ipaddr**command. Support for IPv6 addresses was added.
12.4(20)T	Support for IPv6 addresses was added.
12.2(33)SXI	This command was integrated into Cisco IOS Release 12.2(33)SXI. This command replaces the **type tcpConnect dest-ipaddr**command.
15.2(3)T	This command was modified. A value for the *destination-port* variable is selected by the responder if you do not specify a port number.

Usage Guidelines

The TCP connection operation is used to discover the time required to connect to the target device. This operation can be used to test virtual circuit availability or application availability and is useful for testing Telnet or HTTP connection times.

If the target is a Cisco router, then IP SLAs makes a TCP connection to any port number specified by using the *destination-port* variable. If the destination is a non-Cisco IP host, you must specify a known target port number (for example, 21 for FTP, 23 for Telnet, or 80 for HTTP server).

In Cisco IOS Release 15.2(3)T and later releases, if you do not specifiy a destination port number using the *destination-port* variable, the responder selects a port number on the target device and sends the port number back to the sender for use during the operation.

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

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

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

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

Examples

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

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

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

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

Related Commands

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

threshold (IP SLA)

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

threshold *milliseconds*

no threshold

Syntax Description

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

Command Default

The default is 5000 ms.

Command Modes

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

Command Modes

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

Command Modes

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

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 Modes

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

Command History

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

Usage Guidelines

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

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

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

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

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

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

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

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

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

IP SLAs Operation Configuration Dependence on Cisco IOS Release

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

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

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

Table 8: Command Used to Begin Configuration of an IP SLAs Operation Based on Cisco IOS Release

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

Table 9: Command Used to Begin Configuration of an IP SLAs LSP Health Monitor Operation Based on Cisco IOS Release

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

Examples

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

Examples

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

Examples

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

Examples

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

Related Commands

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

Command	Description
ip sla monitor reaction-configuration	Configures proactive threshold monitoring parameters for an IP SLAs operation.
ip sla reaction-configuration	Configures proactive threshold monitoring parameters for an IP SLAs operation.
react	Configures reaction and proactive threshold monitoring parameters in an auto IP SLAs operation template
timeout	Sets the amount of time the IP SLAs operation waits for a response from its request packet.

timeout (IP SLA)

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

timeout *milliseconds*

no timeout

Syntax Description

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

Command Default

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

Command Modes

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)

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

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

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

Command History

Release	Modification
11.2	This command was introduced.
12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.
12.2(33)SRB	The Ethernet echo, Ethernet jitter, and Ethernet parameters configuration modes were added.
12.2SX	This command is supported in the Cisco IOS Release 12.2SX train. Support in a specific 12.2SX release of this train depends on your feature set, platform, and platform hardware.
12.2(33)SRC	The VCCV configuration mode was added.

Release	Modification
12.2(33)SB	The following configuration modes were added: • Ethernet echo • Ethernet jitter • Ethernet parameters • VCCV
12.4(20)T	The Ethernet echo, Ethernet jitter, and Ethernet parameters configuration modes were added.
12.2(33)SXI	The Ethernet echo, Ethernet jitter, and Ethernet parameters configuration modes were added.
15.1(1)T	This command was modified. The IP SLA template parameters configuration mode was added.
15.2(4)M	This command was modified. The multicast UDP jitter configuration mode was added.
15.3(1)S	This command was integrated into Cisco IOS Release 15.3(1)S.
Cisco IOS XE Release 3.8S	This command was integrated into Cisco IOS XE Release 3.8S.
15.1(2)SG	This command was integrated into Cisco IOS Release 15.1(2)SG.
Cisco IOS XE Release 3.4SG	This command was integrated into Cisco IOS XE Release 3.4SG.

Usage Guidelines

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

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

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

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

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

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

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

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

IP SLAs Operation Configuration Dependence on Cisco IOS Release

The Cisco IOS command used to begin configuration for an IP SLAs operation varies depending on the Cisco IOS release you are running (see 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, see the Command Used to Begin Configuration of an IP SLAs LSP Health Monitor Operation Based on Cisco IOS Release table for information on Cisco IOS release dependencies. You must configure the type of IP SLAs operation, such as User Datagram Protocol (UDP) jitter or Internet Control Message Protocol (ICMP) echo, before you can configure any of the other parameters of the operation.

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

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

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

Table 11: Command Used to Begin Configuration of an IP SLAs LSP Health Monitor Operation Based on Cisco IOS Release

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

Examples

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

Examples

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

Examples

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

Examples

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

Related Commands

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

timeout (IP SLA video)

To set the amount of time that a Cisco IOS IP Service Level Agreements (SLAs) video operation waits for a response to its request packet, use the **timeout** command in IP SLA video configuration mode. To return to the default value, use the **no** form of this command.

timeout *milliseconds*

no timeout *milliseconds*

Syntax Description

milliseconds	Length of time, in milliseconds (ms), that the operation waits to receive a response from its request packet. The range is from 0 to 604800000. The default is 5000.

Command Default

The IP SLAs video operation waits 5000 ms for a response to its request packet.

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 timeout value in the video profile for an IP SLAs video operation from the default (5000 ms) to the specified value.

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

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

The **timeout** (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 timeout in 45 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 an IP SLAs video operation.
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.

traffic-class (IP SLA)

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

traffic-class *number*

no traffic-class

Syntax Description

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

Command Default

The default traffic-class value is 0.

Command Modes

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

TCP connect configuration (config-ip-sla-tcp)

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

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

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

Command History

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

Usage Guidelines

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

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

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

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

Examples

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

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

Related Commands

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

udp-echo

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

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

Syntax Description

destination-ip-address | *destination-hostname*	Destination IP v4 or IPv6 address or hostname of the operation .
destination-port	Specifies the destination port number. The range is from 1 to 65535. • In Cisco IOS Release 15.2(3)T and later releases, the value of the *destination-port* variable is selected by the responder if you do not specify a port number.
source-ip {*ip-address* | *hostname*}	(Optional) Specifies the source IPv4 or IPv6 address or hostname. When a source IP address or hostname is not specified, IP SLAs chooses the IP address nearest to the destination.
source-port *port-number*	(Optional) Specifies the source port number. When a port number is not specified, IP SLAs chooses an available UDP port.
control enable | **disable**	(Optional) Enables or disables the IP SLAs control protocol to send a control message to the IP SLAs Responder prior to sending an operation packet. By default, IP SLAs control messages are sent to the destination device to establish a connection with the IP SLAs Responder.

Command Default

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

Command Modes

IP SLA configuration (config-ip-sla)

Command History

Release	Modification
12.4(4)T	This command was introduced. This command replaces the **type udpEcho dest-ipaddr**command.

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 **type udpEcho dest-ipaddr** command.
12.2(33)SRC	Support for IPv6 addresses was added.
12.2(33)SB	This command was integrated into Cisco IOS Release 12.2(33)SB. This command replaces the **type udpEcho dest-ipaddr**command. Support for IPv6 addresses was added.
12.4(20)T	Support for IPv6 addresses was added.
12.2(33)SXI	This command was integrated into Cisco IOS Release 12.2(33)SXI. This command replaces the **type udpEcho dest-ipaddr**command.
15.2(3)T	This command was modified. A value for the *destination-port* variable is selected by the responder if you do not specify a port number.

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.

In Cisco IOS Release 15.2(3)T and later releases, if you do not specifiy a destination port number using the *destination-port* variable, the responder selects a port number on the target device and sends the port number back to the sender for use during the operation.

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

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

Examples

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

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

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

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

Related Commands

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

udp-jitter

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

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

Syntax Description

destination-ip-address | *destination-hostname*	Destination IPv4 or IPv6 address or hostname. • For a multicast UDP jitter operation, this must be a multicast IP address.
destination-port	Specifies the destination port number. The range is from 1 to 65535. • In Cisco IOS Release 15.2(3)T and later releases, the default value of 10000 for the *destination-port* variable is selected by the responder if you do not specify a port number.
endpint-list *endpoint-list*	(Optional) Required for multicast UDP jitter operations. Specifies the unique identifier of an endpoint list for a multicast UDP jitter operation.
ssm	(Optional) For multicast UDP jitter operations only. Specifies that the source IP address is a source specific multicast address. **Note** The **source-ip** *ip-address* keyword and argument combination is required with this keyword.
source-ip {*ip-address* | *hostname*}	(Optional) Specifies the source IPv4 or IPv6 address or hostname. When a source IP address or hostname is not specified, IP SLAs chooses the IP address nearest to the destination. **Note** The **source-ip** *ip-address* keyword and argument combination is required **ssm** keyword. The value of the *ip-address* argument must be an SSM address
source-port *port-number*	(Optional) Specifies the source port number. When a port number is not specified, IP SLAs chooses an available port.

control { **enable** | **disable**}	(Optional) Enables or disables the sending of IP SLAs control messages to the IP SLAs Responder. By default, IP SLAs control messages are sent to the destination device to establish a connection with the IP SLAs responder. **Note** This keyword combination is not supported for multicast UDP jitter operations.
num-packets *number-of-packets*	(Optional) Specifies the number of packets. The default is 10.
interval *interpacket-interval*	(Optional) Specifies the interpacket interval in milliseconds. The default is 20.

Command Default

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

Command Modes

IP SLA configuration (config-ip-sla)

Command History

12.4(4)T	This command was introduced. This command replaces the **type jitter dest-ipaddr**command.
12.0(32)SY	This command was integrated into Cisco IOS Release 12.0(32)SY.
12.2(33)SRB	This command was integrated into Cisco IOS Release 12.2(33)SRB. This command replaces the **type jitter dest-ipaddr** command.
12.2(33)SRC	Support for IPv6 addresses was added.
12.2(33)SB	This command was integrated into Cisco IOS Release 12.2(33)SB. This command replaces the **type jitter dest-ipaddr**command. Support for IPv6 addresses was added.
12.4(20)T	Support for IPv6 addresses was added.
12.2(33)SXI	This command was integrated into Cisco IOS Release 12.2(33)SXI. This command replaces the **type jitter dest-ipaddr**command.
15.2(3)T	This command was modified. A default port number for the *destination-port* variable is selected by the responder if you do not specify a port number.
15.2(4)M	This command was modified. Support for multicast UDP jitter operations was added. The *endpoint-list* argument and optional **ssm** keyword were added for multicast UDP jitter operations only.
15.3(1)S	This command was integrated into Cisco IOS Release 15.3(1)S.

Cisco IOS XE Release 3.8S	This command was integrated into Cisco IOS XE Release 3.8S.
15.1(2)SG	This command was integrated into Cisco IOS Release 15.1(2)SG.
Cisco IOS XE Release 3.4SG	This command was integrated into Cisco IOS XE Release 3.4SG.

Usage Guidelines

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

This command with an IP multicast address for the *destination-ip-address* argument configures an IP SLAs multicast UDP jitter operation and enters multicast UDP jitter operations configuration mode. The **endpoint-list** *endpoint-list* keyword and argument identifies an endpoint list of multicast responders to be used for the multicast UDP jitter operation being configured. Use the**ip sla endpoint-list** command in global configuration mode to configure a list of multicast responders.

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

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

Fo multicast UDP jitter operations: The **control** keyword is not supported for multicast UDP jitter operations because control is always enabled for multicast UDP jitter operations.

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

In Cisco IOS Release 15.2(3)T and later releases, if you do not specifiy a destination port number using the *destination-port* variable, the responder sends the default port number (10000) back to the sender for use during the operation.

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

IP SLAs VoIP UDP Jitter (codec) Operation

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

Examples

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

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

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

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

The following example shows how to configure a multicast UDP jitter operation. Note that the IP address of the destination device is a multicast address.

```
ip sla 2
 udp-jitter 239.1.1.1 5000 mcast source-ip 10.10.10.106 source-port 7012 num-packets 50
interval 25
!
ip sla schedule 2 start-time now
```

Related Commands

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

udp-jitter (codec)

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

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

Syntax Description

destination-ip-address | *destination-hostname*	Specifies the destination IP address or hostname. • For a multicast UDP jitter operation, this must be a multicast IP address.
destination-port	Specifies the destination port number. For UDP jitter (codec) operations, the port number should be an even number in the range of 16384 to 32766 or 49152 to 65534.
codec *codec-type*	Enables the generation of estimated voice-quality scores in the form of Calculated Planning Impairment Factor (ICPIF) and Mean Opinion Score (MOS) values. The codec type should match the encoding algorithm you are using for VoIP transmissions. The following codec-type keywords are available: • **g711alaw** --The G.711 a-law codec (64 kbps transmission) • **g711ulaw** --The G.711 muHmm-law codec (64 kbps transmission) • **g729a** --The G.729A codec (8 kbps transmission) Configuring the codec type sets default values for the variables **codec-numpackets**, **codec-size**, and **codec-interval** in this command. See the Default UDP Jitter Operation Parameters by Codec table below for details.
codec-numpackets *number-of-packets*	(Optional) Specifies the number of packets to be transmitted per operation. The range is from 1 to 60000. The default is 1000.

codec-size *number-of-bytes*	(Optional) Specifies the number of bytes in each packet transmitted. (Also called the payload size or request size.) The range is from 16 to 1500. The default varies by codec (see the Default UDP Jitter Operation Parameters by Codec table below).
codec-interval *milliseconds*	Specifies the interval (delay) between packets that should be used for the operation, in milliseconds (ms). The range is from 1 to 60000. The default is 20.
advantage-factor *value*	Specifies the expectation factor to be used for ICPIF calculations. This value is subtracted from the measured impairments to yield the final ICPIF value (and corresponding MOS value). See the "Usage Guidelines" section for recommended values. The range is from 0 to 20. The default is 0.
ssm	(Optional) For multicast UDP jitter operations only. Specifies that the source IP address is a source specific multicast address. **Note** The **source-ip** *ip-address* keyword and argument combination is required with this keyword.
source-ip {*ip-address* | *hostname*}	(Optional) Specifies the source IP v4 or IPv6 address or hostname. When a source IP address or hostname is not specified, IP SLAs chooses the IP address nearest to the destination. **Note** The **source-ip** *ip-address* keyword and argument combination is required **ssm** keyword. The value of the *ip-address* argument must be an SSM address
control {**enable** | **disable**}	(Optional) Enables or disables the sending of IP SLAs control messages to the IP SLAs Responder. By default, IP SLAs control messages are sent to the destination device to establish a connection with the IP SLAs Responder. **Note** Control messages are enabled by default. Disabling the IP SLAs control messages for UDP jitter operations is not recommended. If you disable IP SLAs control messages, packet loss statistics and IP telephony scores will not be generated accurately.

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

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

Command History

Release	Modification
12.4(4)T	This command was introduced. This command replaces the **typejitterdest-ipaddr** (codec) command.
12.0(32)SY	This command was integrated into Cisco IOS Release 12.0(32)SY.
12.2(33)SRB	This command was integrated into Cisco IOS Release 12.2(33)SRB. This command replaces the **typejitterdest-ipaddr** (codec) command.
12.2(33)SB	This command was integrated into Cisco IOS Release 12.2(33)SB. This command replaces the **typejitterdest-ipaddr**(codec) command.
12.2(33)SXI	This command was integrated into Cisco IOS Release 12.2(33)SXI. This command replaces the **typejitterdest-ipaddr**(codec) command.
15.2(4)M	This command was modified. Support was added for multicast UDP jitter operations for VoIP. The **ssm** keyword was added for multicast UDP jitter operations only.
15.3(1)S	This command was integrated into Cisco IOS Release 15.3(1)S.
Cisco IOS XE Release 3.8S	This command was integrated into Cisco IOS XE Release 3.8S.

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

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

You must configure the type of IP SLAs operation (such as User Datagram Protocol [UDP] jitter or Internet Control Message Protocol [ICMP] echo) before you can configure any of the other parameters of the operation. To change the operation type of an existing IP SLAs operation, you must first delete the IP SLAs operation (using the **noipsla**global configuration command) and then reconfigure the operation with the new operation type.

The *endpoint-list* argument identifies an endpoint list of multicast responders to be used for the multicast UDP jitter operation being configured. Use the **ip sla endpoint-list** command in global configuration mode to configure a list of multicast responders.

IP SLAs VoIP UDP Jitter (codec) Statistics

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

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

The table below shows the default parameters that are configured for the operation by codec.

Table 12: Default UDP Jitter Operation Parameters by Codec

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

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

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

The **advantage-factor***value* keyword and argument allow you to specify an access Advantage Factor (also called the Expectation Factor).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 13: Advantage Factor Recommended Maximum Values

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

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

Examples

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

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

Related Commands

Command	Description
ip sla endpoint-list	Assigns a name to an IP SLAs endpoint list and enters IP SLA endpoint-list configuration mode.
ip sla monitor	Begins configuration for an IP SLAs operation and enters IP SLA monitor configuration mode.
udp-jitter	Configures an IP SLAs UDP jitter operation.

verify-data (IP SLA)

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

verify-data

no verify-data

Syntax Description

This command has no arguments or keywords.

Command Default

Data is not checked for corruption.

Command Modes

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)

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

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

Command Modes

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

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

ICMP path jitter configuration (config-sla-monitor-pathJitter)

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

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

Command Modes

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

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

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

Command History

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

Release	Modification
12.2SX	This command is supported in the Cisco IOS Release 12.2SX train. Support in a specific 12.2SX release of this train depends on your feature set, platform, and platform hardware.
15.1(1)T	This command was modified. The IP SLA template 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.
Cisco IOS XE Release 3.8S	This command was integrated into Cisco IOS XE Release 3.8S.
15.1(2)SG	This command was integrated into Cisco IOS Release 15.1(2)SG.
Cisco IOS XE Release 3.4SG	This command was integrated into Cisco IOS XE Release 3.4SG.

Usage Guidelines

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

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

IP SLAs Operation Configuration Dependence on Cisco IOS Release

The Cisco IOS command used to begin configuration for an IP SLAs operation varies depending on the Cisco IOS release you are running (see 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 **verify-data** (IP SLA) command varies depending on the Cisco IOS release you are running (see the table below) and the operation type configured.

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

Table 14: Command Used to Begin Configuration of an IP SLAs Operation Based on Cisco IOS Release

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

Examples

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

Examples

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

Examples

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

Examples

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

Related Commands

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

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

vrf (IP SLA)

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

vrf *vrf-name*

Syntax Description

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

Command Default

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

Command Modes

IP SLA Configuration

DNS configuration (config-ip-sla-dns)

FTP configuration (config-ip-sla-ftp)

HTTP configuration (config-ip-sla-http)

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

ICMP jitter configuration (config-ip-sla-icmpjitter)

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

ICMP path jitter configuration (config-ip-sla-pathJitter)

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)

Video configuration (config-ip-sla-video)

IP SLA Monitor Configuration

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

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

ICMP path jitter configuration (config-sla-monitor-pathJitter)

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

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

IP SLA Template Configuration

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

ICMP jitter configuration (config-tplt-icmp-ech)

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

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

UDP jitter configuration (config-tplt-udp-ech)

Command History

Release	Modification
12.2(2)T	This command was introduced.
12.2(11)T	Syntax changed from **vrfName** to **vrf** with SAA Engine II.
12.0(26)S	This command was integrated into Cisco IOS Release 12.0(26)S. Support for this command was also added for ICMP path jitter operations.
12.3(2)T	Support for this command was added for ICMP path jitter operations.
12.2(20)S	This command was integrated into Cisco IOS Release 12.2(20)S. Support for this command was also added for ICMP path jitter operations.
12.2(27)SBC	This command was integrated into Cisco IOS Release 12.2(27)SBC.
12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.
12.2SX	This command is supported in the Cisco IOS Release 12.2SX train. Support in a specific 12.2SX release of this train depends on your feature set, platform, and platform hardware.
12.4(20)T	Support for this command was added for the IP SLAs DNS, FTP, HTTP, and TCP connect operations.
15.1(1)T	This command was modified. The IP SLA template configuration mode was added.
12.2(58)SE	This command was modified. Support for the IP SLA video 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.
15.1(1)SY	This command was integrated into Cisco IOS Release 15.1(1)SY.
15.2(4)M	This command was modified. The multicast UDP jitter configuration mode was added.
15.3(1)S	This command was integrated into Cisco IOS Release 15.3(1)S.
Cisco IOS XE Release 3.8S	This command was integrated into Cisco IOS XE Release 3.8S.

Usage Guidelines

This command identifies the VPN for the operation being configured.

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

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

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

IP SLAs Operation Configuration Dependence on Cisco IOS Release

The Cisco IOS command used to begin configuration for an IP SLAs operation varies depending on the Cisco IOS release you are running (see 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 **vrf** (IP SLA) command varies depending on the Cisco IOS release you are running (see the table below) and the operation type configured.

Table 15: 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(58)SE, or later releases	**ip sla**	IP SLA configuration
12.3(14)T, 12.4, 12.4(2)T, 12.2(31)SB2, or 12.2(33)SXH	**ip sla monitor**	IP SLA monitor configuration
15.1(1)T	**ip sla auto template**	IP SLA template configuration

Examples

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

Examples

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

Examples

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

Examples

```
Router(config)# ip sla auto template type ip icmp-echo 1
Router(config-tplt-icmp-ech)# source-ip 10.1.1.1
Router(config-tplt-icmp-ech)# vrf vpn1
Router(config-icmp-ech-params)# end
```

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

Related Commands

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