# IP SLA Command Reference, Cisco IOS XE Release 3SE (Catalyst 3850 Switches)

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# data-pattern

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

**data-pattern** *hex-pattern*

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

## Syntax Description

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

## Command Default

The default *hex-pattern* is ABCD.

## Command Modes

**IP SLA Configuration**

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

**IP SLA Monitor Configuration**

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

## Command History

| Release | Modification |
|---|---|
| 12.1(1)T | This command was introduced. |
| 12.2(33)SRA | This command was integrated into Cisco IOS Release 12.2(33)SRA. |
| 12.2SX | This command is supported in the Cisco IOS Release 12.2SX train. Support in a specific 12.2SX release of this train depends on your feature set, platform, and platform hardware. |

## Usage Guidelines

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

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

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

**IP SLAs Operation Configuration Dependence on Cisco IOS Release**

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

The configuration mode for the **data-pattern** command varies depending on the Cisco IOS release you are running (see the table below) and the operation type configured. For example, if you are running Cisco IOS Release 12.4 and the UDP echo operation type is configured, you would enter the **data-pattern** command in UDP echo configuration mode (config-sla-monitor-udp) within IP SLA monitor configuration mode.

***Table 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

The following examples show how to specify 1234ABCD5678 as the data pattern. Note that the Cisco IOS command used to begin configuration for an IP SLAs operation varies depending on the Cisco IOS release you are running (see the table above).

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

## Examples

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

## Examples

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

## Related Commands

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

# dhcp (IP SLA)

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

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

## Syntax Description

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

## Command Default

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

## Command Modes

IP SLA configuration (config-ip-sla)

## Command History

| Release | Modification |
|---|---|
| 12.4(4)T | This command was introduced. This command replaces the **type dhcp** command. |
| 12.2(33)SRB | This command was integrated into Cisco IOS Release 12.2(33)SRB. This command replaces the **type dhcp** command. |
| 12.2(33)SB | This command was integrated into Cisco IOS Release 12.2(33)SB. This command replaces the **type dhcp**command. |
| 12.2(33)SXI | This command was integrated into Cisco IOS Release 12.2(33)SXI. This command replaces the **type dhcp**command. |

## Usage Guidelines

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

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

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

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

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

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

## Examples

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

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

## Related Commands

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

# dns (IP SLA)

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

**dns** {*destination-ip-address*| *destination-hostname*} **name-server** *ip-address* [**source-ip** {*ip-address*| *hostname*} **source-port** *port-number*]

## Syntax Description

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

## Command Default

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

## Command Modes

IP SLA configuration (config-ip-sla)

## Command History

| Release | Modification |
|---|---|
| 12.4(4)T | This command was introduced. This command replaces the **type dns target-addr**command. |
| 12.0(32)SY | This command was integrated into Cisco IOS Release 12.0(32)SY. |
| 12.2(33)SRB | This command was integrated into Cisco IOS Release 12.2(33)SRB. This command replaces the **type dns target-addr** command. |
| 12.2(33)SB | This command was integrated into Cisco IOS Release 12.2(33)SB. This command replaces the **type dns target-addr**command. |
| 12.2(33)SXI | This command was integrated into Cisco IOS Release 12.2(33)SXI. This command replaces the **type dns target-addr**command. |
| 15.2(3)T | This command was modified. Support for IPv6 addresses was added. |
| Cisco IOS XE Release 3.7S | This command was integrated into Cisco IOS XE Release 3.7S. |

| Release | Modification |
|---|---|
| 15.1(2)SG | This command was integrated into Cisco IOS Release 15.1(2)SG. |
| Cisco IOS XE Release 3.4SG | This command was integrated into Cisco IOS XE Release 3.4SG. |

## Usage Guidelines

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

## Examples

In the following example, IP SLAs operation 7 is configured as a DNS operation using the target IPv4 address 172.20.2.132:

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

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

```
ip sla 1
 dns host1 name-server 2001:10:10:10::3
!
ip sla schedule 1 start-time now
```

## Related Commands

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

# flow-label (IP SLA)

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

**flow-label** *number*

**no flow-label**

## Syntax Description

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

## Command Default

The default flow label value is 0.

## Command Modes

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

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

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

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

## Command History

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

## Usage Guidelines

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

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

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

**Note** This command is applicable only to IPv6 networks.

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

## Examples

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

```
ip sla 1
 icmp-echo 2001:DB8:100::1
 flow-label 0x1B669
!
ip sla schedule 1 start-time now
```

## Related Commands

| Command | Description |
|---|---|
| **ip sla** | Begins configuration for an IP SLAs operation and enters IP SLA configuration mode. |
| **show ip sla configuration** | Displays configuration values including all defaults for all Cisco IOS IP SLAs operations or a specified operation. |

# frequency (IP SLA)

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

**frequency** *seconds*

**no frequency**

## Syntax Description

| | |
|---|---|
| *seconds* | Number of seconds between the IP SLAs operations. The default is 60. |

## Command Default

60 seconds

## Command Modes

IP SLA Configuration

DHCP configuration (config-ip-sla-dhcp)

DLSw configuration (config-ip-sla-dlsw)

DNS configuration (config-ip-sla-dns)

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

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

FTP configuration (config-ip-sla-ftp)

HTTP configuration (config-ip-sla-http)

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

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

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

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

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

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

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

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

VCCV configuration (config-sla-vccv)

VoIP configuration (config-ip-sla-voip)

**IP SLA Monitor Configuration**

DHCP configuration (config-sla-monitor-dhcp)

DLSw configuration (config-sla-monitor-dlsw)

DNS configuration (config-sla-monitor-dns)

FTP configuration (config-sla-monitor-ftp)

HTTP configuration (config-sla-monitor-http)

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

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

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

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

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

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

VoIP configuration (config-sla-monitor-voip)

## Command History

| Release | Modification |
|---|---|
| 11.2 | This command was introduced. |
| 12.2(33)SRA | This command was integrated into Cisco IOS Release 12.2(33)SRA. |
| 12.2(33)SRB | The Ethernet echo and Ethernet jitter configuration modes were added. |
| 12.2SX | This command is supported in the Cisco IOS Release 12.2SX train. Support in a specific 12.2SX release of this train depends on your feature set, platform, and platform hardware. |
| 12.2(33)SRC | The VCCV configuration mode was added. |
| 12.2(33)SB | The following configuration modes were added:<br>• Ethernet echo<br>• Ethernet jitter<br>• VCCV |
| 12.4(20)T | The Ethernet echo and Ethernet jitter configuration modes were added. |
| 12.2(33)SXI | The Ethernet echo and Ethernet jitter configuration modes were added. |
| 15.2(4)M | This command was modified. The multicast UDP jitter configuration mode was added. |

## Usage Guidelines

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

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

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

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

where N = (**num-packets***number-of-packets* ) * (**interval***interpacket-interval* ). Use the **udp-jitter** command to configure the **num-packets***number-of-packets* and **interval***interpacket-interval* values.

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

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

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

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

**IP SLAs Operation Configuration Dependence on Cisco IOS Release**

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

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

***Table 2: Command Used to Begin Configuration of an IP SLAs Operation Based on Cisco IOS Release***

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

## Examples

The following examples show how to configure an IP SLAs ICMP echo operation (operation 10) to repeat every 90 seconds. Note that the Cisco IOS command used to begin configuration for an IP SLAs operation varies depending on the Cisco IOS release you are running (see the table above).

## Examples

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

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

## Examples

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

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

## Related Commands

| Command | Description |
|---|---|
| **ip sla** | Begins configuration for an IP SLAs operation and enters IP SLA configuration mode. |
| **ip sla monitor** | Begins configuration for an IP SLAs operation and enters IP SLA monitor configuration mode. |
| **timeout (IP SLA)** | Sets the amount of time the IP SLAs operation waits for a response from its request packet. |

# ftp get

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

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

## Syntax Description

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

## Command Default

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

## Command Modes

IP SLA configuration (config-ip-sla)

## Command History

| Release | Modification |
|---|---|
| 12.4(4)T | This command was introduced. This command replaces the **type ftp operation get url**command. |
| 12.2(33)SRB | This command was integrated into Cisco IOS Release 12.2(33)SRB. This command replaces the **type ftp operation get url** command. |
| 12.2(33)SB | This command was integrated into Cisco IOS Release 12.2(33)SB. This command replaces the **type ftp operation get url**command. |
| 12.2(33)SXI | This command was integrated into Cisco IOS Release 12.2(33)SXI. This command replaces the **type ftp operation get url**command. |
| 15.2(3)T | This command was modified. Support for IPv6 addresses was added. |
| Cisco IOS XE Release 3.7S | This command was integrated into Cisco IOS XE Release 3.7S. |
| 15.1(2)SG | This command was integrated into Cisco IOS Release 15.1(2)SG. |
| Cisco IOS XE Release 3.4SG | This command was integrated into Cisco IOS XE Release 3.4SG. |

## Usage Guidelines

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

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

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

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

## Examples

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

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

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

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

## Related Commands

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

# history buckets-kept

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

**history buckets-kept** *size*

**no history buckets-kept**

## Syntax Description

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

## Command Default

The default number of buckets kept is 50 buckets.

## Command Modes

**IP SLA Configuration**

DHCP configuration (config-ip-sla-dhcp)

DLSw configuration (config-ip-sla-dlsw)

DNS configuration (config-ip-sla-dns)

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

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

FTP configuration (config-ip-sla-ftp)

HTTP configuration (config-ip-sla-http)

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

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

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

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

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

VCCV configuration (config-sla-vccv)

VoIP configuration (config-ip-sla-voip)

**IP SLA Template Parameters Configuration**

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

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

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

## Command History

| Release | Modification |
|---|---|
| 12.4(4)T | This command was introduced. This command replaces the **buckets-of-history-kept** command. |
| 12.0(32)SY | This command was integrated into Cisco IOS Release 12.0(32)SY. |
| 12.2(33)SRB | This command was integrated into Cisco IOS Release 12.2(33)SRB. This command replaces the **buckets-of-history-kept** command. The Ethernet echo and Ethernet jitter configuration modes were added. |
| 12.2(33)SRC | The VCCV configuration mode was added. |
| 12.2(33)SB | This command was integrated into Cisco IOS Release 12.2(33)SB. This command replaces the **buckets-of-history-kept**command. The following configuration modes were added:<br>• Ethernet echo<br>• Ethernet jitter<br>• VCCV |
| 12.4(20)T | The Ethernet echo and Ethernet jitter configuration modes were added. |
| 12.2(33)SXI | This command was integrated into Cisco IOS Release 12.2(33)SXI. This command replaces the **buckets-of-history-kept** command. The Ethernet echo and Ethernet jitter configuration modes were added. |
| 15.1(1)T | This command was modified. The ICMP echo, TCP connect, and UDP echo configuration submodes in IP SLA template parameters configuration mode were added. |

## Usage Guidelines

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

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

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

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

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

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

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

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

## Examples

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

## Examples

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

## Examples

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

## Related Commands

| Command | Description |
|---|---|
| **history filter** | Defines the type of information kept in the history table for the IP SLAs operation. |
| **history lives-kept** | Sets the number of lives maintained in the history table for the IP SLAs operation. |
| **ip sla** | Begins configuration for an IP SLAs operation and enters IP SLA configuration mode. |

| Command | Description |
|---|---|
| **ip sla auto template** | Begins configuration for an auto IP SLAs operation template and enters IP SLA template configuration mode. |
| **life** | Specifies the lifetime characteristic in an auto IP SLAs scheduler |
| **samples-of-history-kept** | Sets the number of entries kept in the history table per bucket. |

# history distributions-of-statistics-kept

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

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

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

## Syntax Description

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

## Command Default

One distribution is kept per hop.

## Command Modes

DHCP configuration (config-ip-sla-dhcp)

DLSw configuration (config-ip-sla-dlsw)

DNS configuration (config-ip-sla-dns)

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

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

FTP configuration (config-ip-sla-ftp)

HTTP configuration (config-ip-sla-http)

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

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

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

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

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

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

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

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

VCCV configuration (config-sla-vccv)

Video configuration (config-ip-sla-video)

VoIP configuration (config-ip-sla-voip)

## 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 |
|---|---|
| 12.4(4)T | This command was introduced. This command replaces the **distributions-of-statistics-kept**command. |
| 12.0(32)SY | This command was integrated into Cisco IOS Release 12.0(32)SY. |
| 12.2(33)SRB | This command was integrated into Cisco IOS Release 12.2(33)SRB. This command replaces the **distributions-of-statistics-kept** command. The Ethernet echo and Ethernet jitter configuration modes were added. |
| 12.2(33)SRC | The VCCV configuration mode was added. |
| 12.2(33)SB | This command was integrated into Cisco IOS Release 12.2(33)SB. This command replaces the **distributions-of-statistics-kept**command. The following configuration modes were added:<br>• Ethernet echo<br>• Ethernet jitter<br>• VCCV |
| 12.4(20)T | The Ethernet echo and Ethernet jitter configuration modes were added. |
| 12.2(33)SXI | This command was integrated into Cisco IOS Release 12.2(33)SXI. This command replaces the **distributions-of-statistics-kept** command. The Ethernet echo and Ethernet jitter configuration modes were added. |
| 15.1(1)T | This command was modified. The ICMP echo, ICMP jitter, TCP connect, UDP echo, and UDP jitter configuration submodes of IP SLA template parameters configuration mode were added. |
| 12.2(58)SE | This command was modified. Support for the video configuration submode of IP SLA configuration mode was added. |
| 15.2(2)T | This command was integrated into Cisco IOS Release 15.2(2)T. |
| 15.1(1)SG | This command was integrated into Cisco IOS Release 15.1(1)SG. |
| Cisco IOS XE Release 3.3SG | This command was integrated into Cisco IOS XE Release 3.3SG. |
| 15.2(4)M | This command was modified. The multicast UDP jitter configuration mode was added. |
| 15.3(1)S | This command was integrated into Cisco IOS Release 15.3(1)S. |

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

## Usage Guidelines

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

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

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

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

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

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

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

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

## Examples

In the following examples, the statistics distribution is set to five and the distribution interval is set to 10 ms for an ICMP echo operation. Consequently, the first distribution will contain statistics from 0 to 9 ms, the second distribution will contain statistics from 10 to 19 ms, the third distribution will contain statistics from 20 to 29 ms, the fourth distribution will contain statistics from 30 to 39 ms, and the fifth distribution will contain statistics from 40 ms to infinity. The examples show the **history distributions-of-statistics-kept** command being used in an IPv4 network.

## Examples

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

## Examples

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

## Related Commands

| Command | Description |
|---|---|
| **history hours-of-statistics-kept** | Sets the number of hours for which statistics are maintained for the IP SLAs operation. |
| **history statistics-distribution-interval** | Sets the time interval for each statistics distribution kept for the IP SLAs operation. |
| **hops-of-statistics-kept** | Sets the number of hops for which statistics are maintained per path for the IP SLAs operation. |
| **ip sla** | Begins configuration for an IP SLAs operation and enters IP SLA configuration mode. |
| **ip sla auto template** | Begins configuration for an auto IP SLAs operation template and enters IP SLA template configuration mode. |
| **paths-of-statistics-kept** | Sets the number of paths for which statistics are maintained per hour for the IP SLAs operation. |

# history enhanced

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

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

## Syntax Description

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

## Command Default

Enhanced history gathering is disabled.

## Command Modes

**IP SLA Configuration**

DHCP configuration (config-ip-sla-dhcp)

DLSw configuration (config-ip-sla-dlsw)

DNS configuration (config-ip-sla-dns)

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

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

FTP configuration (config-ip-sla-ftp)

HTTP configuration (config-ip-sla-http)

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

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

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

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

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

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

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

VCCV configuration (config-sla-vccv)

Video (config-ip-sla-video)

VoIP configuration (config-ip-sla-voip)

**IP SLA Template Parameters Configuration**

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

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

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

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

## Command History

| Release | Modification |
|---|---|
| 12.4(4)T | This command was introduced. This command replaces the **enhanced-history** command. |
| 12.0(32)SY | This command was integrated into Cisco IOS Release 12.0(32)SY. |
| 12.2(33)SRB | This command was integrated into Cisco IOS Release 12.2(33)SRB. This command replaces the **enhanced-history** command. The Ethernet echo and Ethernet jitter configuration modes were added. |
| 12.2(33)SRC | The VCCV configuration mode was added. |
| 12.2(33)SB | This command was integrated into Cisco IOS Release 12.2(33)SB. This command replaces the **enhanced-history**command. The following configuration modes were added:<br>• Ethernet echo<br>• Ethernet jitter<br>• VCCV |
| 12.4(20)T | The Ethernet echo and Ethernet jitter configuration modes were added. |
| 12.2(33)SXI | This command was integrated into Cisco IOS Release 12.2(33)SXI. This command replaces the **enhanced-history** command. The Ethernet echo and Ethernet jitter configuration modes were added. |
| 15.1(1)T | This command was modified. The ICMP echo, TCP connect, UDP echo, and UDP jitter configuration submodes in IP SLA template parameters configuration mode were added. |
| 12.2(58)SE | This command was modified. Support for the video configuration submode of IP SLA configuration mode was added. |
| 15.2(2)T | This command was integrated into Cisco IOS Release 15.2(2)T. |
| 15.1(1)SG | This command was integrated into Cisco IOS Release 15.1(1)SG. |
| Cisco IOS XE Release 3.3SG | This command was integrated into Cisco IOS XE Release 3.3SG. |
| 15.2(4)M | This command was modified. The multicast UDP jitter configuration mode was added. |
| 15.3(1)S | This command was integrated into Cisco IOS Release 15.3(1)S. |

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

## Usage Guidelines

This command enables enhanced history for the IP SLAs operation.

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

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

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

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

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

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

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

## Examples

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

## Examples

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

## Examples

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

```
    Enhanced aggregation interval: 900 seconds
    Max number of enhanced interval buckets: 100
History options:
    History filter: none
    Max number of history records kept: 15
    Lives of history kept: 0
Statistics Distributions options:
    Distributions characteristics: RTT
    Distributions bucket size: 20
    Max number of distributions buckets: 1
Reaction Configuration: None
```

## Related Commands

| Command | Description |
|---|---|
| **ip sla** | Begins configuration for an IP SLAs operation and enters IP SLA configuration mode. |
| **ip sla auto template** | Begins configuration for an auto IP SLAs operation template and enters IP SLA template configuration mode. |
| **show ip sla auto summary-statistics** | Displays the current operational status and statistics for IP SLAs auto-measure groups. |
| **show ip sla auto template** | Displays configuration including default values of auto IP SLAs operation templates. |
| **show ip sla enhanced-history collection-statistics** | Displays data for all collected history buckets for the specified IP SLAs operation, with data for each bucket shown individually. |
| **show ip sla enhanced-history distribution-statistics** | Displays enhanced history data for all collected buckets in a summary table. |

# history filter

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

**history filter** {**none**| **all**| **overThreshold**| **failures**}

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

## Syntax Description

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

## Command Default

No IP SLAs history is kept for an operation.

## Command Modes

**IP SLA Configuration**

DHCP configuration (config-ip-sla-dhcp)

DLSw configuration (config-ip-sla-dlsw)

DNS configuration (config-ip-sla-dns)

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

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

FTP configuration (config-ip-sla-ftp)

HTTP configuration (config-ip-sla-http)

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

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

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

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

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

VCCV configuration (config-sla-vccv)

VoIP configuration (config-ip-sla-voip)

**IP SLA Template Parameters Configuration**

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

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

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

## Command History

| Release | Modification |
|---|---|
| 12.4(4)T | This command was introduced. This command replaces the **filter-for-history** command. |
| 12.0(32)SY | This command was integrated into Cisco IOS Release 12.0(32)SY. |
| 12.2(33)SRB | This command was integrated into Cisco IOS Release 12.2(33)SRB. This command replaces the **filter-for-history** command. The Ethernet echo and Ethernet jitter configuration modes were added. |
| 12.2(33)SRC | The VCCV configuration mode was added. |
| 12.2(33)SB | This command was integrated into Cisco IOS Release 12.2(33)SB. This command replaces the **filter-for-history**command. The following configuration modes were added:<br>• Ethernet echo<br>• Ethernet jitter<br>• VCCV |
| 12.4(20)T | The Ethernet echo and Ethernet jitter configuration modes were added. |
| 12.2(33)SXI | This command was integrated into Cisco IOS Release 12.2(33)SXI. This command replaces the **filter-for-history** command. The Ethernet echo and Ethernet jitter configuration modes were added. |
| 15.1(1)T | This command was modified. The ICMP echo, TCP connect, and UDP echo configuration submodes in IP SLA template parameters configuration mode were added. |

## Usage Guidelines

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

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

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

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

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

## Examples

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

## Examples

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

## Examples

```
Router(config)# ip sla auto template type ip icmp-echo 1
Router(config-tplt-icmp-ech)# parameters
Router(config-icmp-ech-params)# history filter failures

Router(config-icmp-ech-params)# end
Router# show ip sla auto template type ip icmp-echo
IP SLAs Auto Template: 1
    Measure Type: icmp-echo
.
.
.
Statistics Aggregation option:
        Hours of statistics kept: 2
    History options:
        History filter: failures
        Max number of history records kept: 15
        Lives of history kept: 0
    Statistics Distributions options:
        Distributions characteristics: RTT
        Distributions bucket size: 20
        Max number of distributions buckets: 1
    Reaction Configuration: None
```

## Related Commands

| Command | Description |
|---|---|
| **history buckets-kept** | Sets the number of history buckets that are kept during the lifetime of the IP SLAs operation. |
| **history lives-kept** | Sets the number of lives maintained in the history table for the IP SLAs operation. |
| **ip sla** | Begins configuration for an IP SLAs operation and enters IP SLA configuration mode. |
| **ip sla auto template** | Begins configuration for an auto IP SLAs operation template and enters IP SLA template configuration mode. |

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

# history hours-of-statistics-kept

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

**history hours-of-statistics-kept** *hours*

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

## Syntax Description

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

## Command Default

Statistics are kept in platform memory for 2 hours.

## Command Modes

**IP SLA Configuration**

DHCP configuration (config-ip-sla-dhcp)

DLSw configuration (config-ip-sla-dlsw)

DNS configuration (config-ip-sla-dns)

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

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

FTP configuration (config-ip-sla-ftp)

HTTP configuration (config-ip-sla-http)

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

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

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

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

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

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

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

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

VCCV configuration (config-sla-vccv)

Video (config-ip-sla-video)

VoIP configuration (config-ip-sla-voip)

**IP SLA Template Parameters Configuration**

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

ICMP jitter configuration (config-icmp-jtr-params)

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

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

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

## Command History

| Release | Modification |
|---|---|
| 12.4(4)T | This command was introduced. This command replaces the **hours-of-statistics-kept** command. |
| 12.0(32)SY | This command was integrated into Cisco IOS Release 12.0(32)SY. |
| 12.2(33)SRB | This command was integrated into Cisco IOS Release 12.2(33)SRB. This command replaces the **hours-of-statistics-kept**command. The Ethernet echo and Ethernet jitter configuration modes were added. |
| 12.2(33)SRC | The VCCV configuration mode was added. |
| 12.2(33)SB | This command was integrated into Cisco IOS Release 12.2(33)SB. This command replaces the **hours-of-statistics-kept** command. The following configuration modes were added:<br>• Ethernet echo<br>• Ethernet jitter<br>• VCCV |
| 12.4(20)T | The Ethernet echo and Ethernet jitter configuration modes were added. |
| 12.2(33)SXI | This command was integrated into Cisco IOS Release 12.2(33)SXI. This command replaces the **hours-of-statistics-kept**command. The Ethernet echo and Ethernet jitter configuration modes were added. |
| 15.1(1)T | This command was modified. The ICMP echo, ICMP jitter, TCP connect, UDP echo, and UDP jitter configuration submodes in IP SLA template parameters configuration mode were added. |
| 12.2(58)SE | This command was modified. Support for the video configuration submode of IP SLA configuration mode was added. |
| 15.2(2)T | This command was modified. Support for the video configuration submode of IP SLA configuration mode was added. |
| 15.1(1)SG | This command was integrated into Cisco IOS Release 15.1(1)SG. |
| Cisco IOS XE Release 3.3SG | This command was integrated into Cisco IOS XE Release 3.3SG. |

| Release | Modification |
|---|---|
| 15.2(4)M | This command was modified. The multicast UDP jitter configuration mode was added. |
| 15.3(1)S | This command was integrated into Cisco IOS Release 15.3(1)S. |
| Cisco IOS XE 3.8S | This command was integrated into Cisco IOS XE Release 3.8S. |
| 15.1(2)SG | This command was integrated into Cisco IOS Release 15.1(2)SG. |
| Cisco IOS XE Release 3.4SG | This command was integrated into Cisco IOS XE Release 3.4SG. |

## Usage Guidelines

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

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

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

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

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

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

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

## Examples

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

## Examples

```
ip sla 2
 icmp-echo 172.16.1.177
```

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

## Examples

```
Router(config)# ip sla auto template type ip icmp-echo 2
Router(config-tplt-icmp-ech)# parameters
Router(config-icmp-ech-params)# history hours-of-statistics-kept 3
Router(config-icmp-ech-params)# end
Router# show ip sla auto template type ip icmp-echo
IP SLAs Auto Template: 2
    Measure Type: icmp-echo
.
.
.
Statistics Aggregation option:
        Hours of statistics kept: 3
    History options:
        History filter: none
        Max number of history records kept: 15
        Lives of history kept: 0
    Statistics Distributions options:
        Distributions characteristics: RTT
        Distributions bucket size: 20
        Max number of distributions buckets: 1
    Reaction Configuration: None
```

## Related Commands

| Command | Description |
|---|---|
| **history distributions-of-statistics-kept** | Sets the number of statistics distributions kept per hop during the lifetime of the IP SLAs operation. |
| **history statistics-distribution-interval** | Sets the time interval for each statistics distribution kept for the IP SLAs operation. |
| **hops-of-statistics-kept** | Sets the number of hops for which statistics are maintained per path for the IP SLAs operation. |
| **ip sla** | Begins configuration for an IP SLAs operation and enters IP SLA configuration mode. |
| **ip sla auto template** | Begins configuration for an auto IP SLAs operation template and enters IP SLA template configuration mode. |
| **paths-of-statistics-kept** | Sets the number of paths for which statistics are maintained per hour for the IP SLAs operation. |

# history lives-kept

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

**history lives-kept** *lives*

**no history lives-kept**

## Syntax Description

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

## Command Default

The default is 0 lives.

## Command Modes

**IP SLA Configuration**

DHCP configuration (config-ip-sla-dhcp)

DLSw configuration (config-ip-sla-dlsw)

DNS configuration (config-ip-sla-dns)

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

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

FTP configuration (config-ip-sla-ftp)

HTTP configuration (config-ip-sla-http)

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

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

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

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

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

VCCV configuration (config-sla-vccv)

VoIP configuration (config-ip-sla-voip)

**IP SLA Template Configuration**

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

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

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

## Command History

| Release | Modification |
|---|---|
| 12.4(4)T | This command was introduced. This command replaces the **lives-of-history-kept**command. |
| 12.0(32)SY | This command was integrated into Cisco IOS Release 12.0(32)SY. |
| 12.2(33)SRB | This command was integrated into Cisco IOS Release 12.2(33)SRB. This command replaces the **lives-of-history-kept** command. The Ethernet echo and Ethernet jitter configuration modes were added. |
| 12.2(33)SRC | The VCCV configuration mode was added. |
| 12.2(33)SB | This command was integrated into Cisco IOS Release 12.2(33)SB. This command replaces the **lives-of-history-kept**command. The following configuration modes were added:<br>• Ethernet echo<br>• Ethernet jitter<br>• VCCV |
| 12.4(20)T | The Ethernet echo and Ethernet jitter configuration modes were added. |
| 12.2(33)SXI | This command was integrated into Cisco IOS Release 12.2(33)SXI. This command replaces the **lives-of-history-kept** command. The Ethernet echo and Ethernet jitter configuration modes were added. |
| 15.1(1)T | This command was modified. The ICMP echo, TCP connect, and UDP echo configuration submodes in IP SLA template parameters configuration mode were added. |

## Usage Guidelines

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

- The number of lives you can specify is dependent on the type of operation you are configuring.
- The default value of 0 lives means that history is not collected for the operation.
- When the number of lives exceeds the specified value, the history table wraps (that is, the oldest information is replaced by newer information).
- When an operation makes a transition from a pending to active state, a life starts. When the life of an operation ends, the operation makes a transition from an active to pending state.

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

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

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

## Examples

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

## Examples

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

## Related Commands

| Command | Description |
|---|---|
| **history buckets-kept** | Sets the number of history buckets that are kept during the lifetime of the IP SLAs operation. |
| **history filter** | Defines the type of information kept in the history table for the IP SLAs operation. |
| **ip sla** | Begins configuration for an IP SLAs operation and enters IP SLA configuration mode. |
| **ip sla auto template** | Begins configuration for an auto IP SLAs operation template and enters IP SLA template configuration mode. |
| **samples-of-history-kept** | Sets the number of entries kept in the history table per bucket for the IP SLAs operation. |

# history statistics-distribution-interval

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

**history statistics-distribution-interval** *milliseconds*

**no history statistics-distribution-interval**

## Syntax Description

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

## Command Default

A statistics distribution is kept for 20 ms.

## Command Modes

**IP SLA Configuration**

DHCP configuration (config-ip-sla-dhcp)

DLSw configuration (config-ip-sla-dlsw)

DNS configuration (config-ip-sla-dns)

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

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

FTP configuration (config-ip-sla-ftp)

HTTP configuration (config-ip-sla-http)

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

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

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

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

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

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

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

VCCV configuration (config-sla-vccv)

Video configuration (config-ip-sla-video)

VoIP configuration (config-ip-sla-voip)

**IP SLA Template Parameters Configuration**

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

ICMP jitter configuration (config-icmp-jtr-params)

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

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

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

## Command History

| Release | Modification |
|---|---|
| 12.4(4)T | This command was introduced. This command replaces the **statistics-distribution-interval**command. |
| 12.0(32)SY | This command was integrated into Cisco IOS Release 12.0(32)SY. |
| 12.2(33)SRB | This command was integrated into Cisco IOS Release 12.2(33)SRB. This command replaces the **statistics-distribution-interval**command. The Ethernet echo and Ethernet jitter configuration modes were added. |
| 12.2(33)SRC | The VCCV configuration mode was added. |
| 12.2(33)SB | This command was integrated into Cisco IOS Release 12.2(33)SB. This command replaces the **statistics-distribution-interval**command. The following configuration modes were added:<br>• Ethernet echo<br>• Ethernet jitter<br>• VCCV |
| 12.4(20)T | The Ethernet echo and Ethernet jitter configuration modes were added. |
| 12.2(33)SXI | This command was integrated into Cisco IOS Release 12.2(33)SXI. This command replaces the **statistics-distribution-interval** command. The Ethernet echo and Ethernet jitter configuration modes were added. |
| 15.1(1)T | This command was modified. The ICMP echo, ICMP jitter, TCP connect, UDP echo, and UDP jitter configuration submodes in IP SLA template parameters configuration mode were added. |
| 12.2(58)SE | This command was modified. Support for the video configuration submode of IP SLA configuration mode was added. |
| 15.2(2)T | This command with support for the video configuration submode of IP SLA configuration mode was integrated into Cisco IOS Release 15.2(2)T. |
| 15.1(1)SG | This command was integrated into Cisco IOS Release 15.1(1)SG. |
| Cisco IOS XE Release 3.3SG | This command was integrated into Cisco IOS XE Release 3.3SG. |

## Usage Guidelines

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

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

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

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

## Examples

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

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

## Examples

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

## Examples

```
Router(config)# ip sla auto template type ip icmp-echo 3
Router(config-tplt-icmp-ech)# parameters
Router(config-icmp-ech-params)# history enhanced interval 900 buckets 100
Router(config-icmp-ech-params)# end
Router# show ip sla auto template type ip udp-echo
IP SLAs Auto Template: 5
    Measure Type: icmp-echo
.
.
.
History options:
        History filter: none
        Max number of history records kept: 15
        Lives of history kept: 0
    Statistics Distributions options:
        Distributions characteristics: RTT
        Distributions bucket size: 10
        Max number of distributions buckets: 1
    Reaction Configuration: None
```

## Related Commands

| Command | Description |
|---|---|
| **history distributions-of-statistics-kept** | Sets the number of statistics distributions kept per hop during the IP SLAs operation's lifetime. |

| Command | Description |
|---|---|
| **history hours-of-statistics-kept** | Sets the number of hours for which statistics are maintained for the IP SLAs operation. |
| **hops-of-statistics-kept** | Sets the number of hops for which statistics are maintained per path for the IP SLAs operation. |
| **ip sla** | Begins configuration for an IP SLAs operation and enters IP SLA configuration mode. |
| **ip sla auto template** | Begins configuration for an auto IP SLAs operation template and enters IP SLA template configuration mode. |
| **paths-of-statistics-kept** | Sets the number of paths for which statistics are maintained per hour for the IP SLAs operation. |

# hours-of-statistics-kept

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

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

**hours-of-statistics-kept** *hours*

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

## Syntax Description

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

## Command Default

2 hours

## Command Modes

DHCP configuration (config-sla-monitor-dhcp)

DLSw configuration (config-sla-monitor-dlsw)

DNS configuration (config-sla-monitor-dns)

FTP configuration (config-sla-monitor-ftp)

HTTP configuration (config-sla-monitor-http)

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

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

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

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

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

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

VoIP configuration (config-sla-monitor-voip)

## Command History

| Release | Modification |
|---|---|
| 11.2 | This command was introduced. |
| 12.4(4)T | This command was replaced by the **history hours-of-statistics-kept** command. |

| Release | Modification |
|---|---|
| 12.2(33)SRB | This command was replaced by the **history hours-of-statistics-kept** command. |
| 12.2SX | This command is supported in the Cisco IOS Release 12.2SX train. Support in a specific 12.2SX release of this train depends on your feature set, platform, and platform hardware. |
| 12.2(33)SB | This command was replaced by the **history hours-of-statistics -kept** command. |
| 12.2(33)SXI | This command was replaced by the **history hours-of-statistics -kept** command. |

## Usage Guidelines

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

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

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

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

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

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

## Examples

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

```
ip sla monitor 2
 type pathecho protocol ipIcmpEcho 172.16.1.177
```

```
 hours-of-statistics-kept 3
!
ip sla monitor schedule 2 life forever start-time now
```

## Related Commands

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

# hours-of-statistics-kept (LSP discovery)

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

**hours-of-statistics-kept** *hours*

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

## Syntax Description

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

## Command Default

2 hours

## Command Modes

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

## Command History

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

## Usage Guidelines

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

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

## Examples

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

```
auto ip sla mpls-lsp-monitor 1
 type echo ipsla-vrf-all
 path-discover
```

```
!
 maximum-sessions 2
 session-timeout 60
 interval 2
 timeout 4
 force-explicit-null
 hours-of-statistics-kept 1
 scan-period 30
!
auto ip sla mpls-lsp-monitor schedule 1 schedule-period 60 frequency 100 start-time now
!
auto ip sla mpls-lsp-monitor reaction-configuration 1 react lpd tree-trace action-type
trapOnly
auto ip sla mpls-lsp-monitor reaction-configuration 1 react lpd lpd-group retry 3 action-type
 trapOnly
```

## Related Commands

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

# http (IP SLA)

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

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

## Syntax Description

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

## Command Default

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

## Command Modes

IP SLA configuration (config-ip-sla)

## Command History

| Release | Modification |
|---|---|
| 12.4(4)T | This command was introduced. This command replaces the **type http operation**command. |
| 12.0(32)SY | This command was integrated into Cisco IOS Release 12.0(32)SY. |

| Release | Modification |
|---|---|
| 12.2(33)SRB | This command was integrated into Cisco IOS Release 12.2(33)SRB. This command replaces the **type http operation** command. |
| 12.2(33)SB | This command was integrated into Cisco IOS Release 12.2(33)SB. This command replaces the **type http operation**command. |
| 12.2(33)SXI | This command was integrated into Cisco IOS Release 12.2(33)SXI. This command replaces the **type http operation**command. |
| 15.2(3)T | This command was modified. Support for IPv6 addresses was added. |
| Cisco IOS XE Release 3.7S | This command was integrated into Cisco IOS XE Release 3.7S. |
| 15.1(2)SG | This command was integrated into Cisco IOS Release 15.1(2)SG. |
| Cisco IOS XE Release 3.4SG | This command was integrated into Cisco IOS XE Release 3.4SG. |

## Usage Guidelines

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

## Examples

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

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

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

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

## Related Commands

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

# http-raw-request

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

**http-raw-request**

## Syntax Description

This command has no arguments or keywords.

## Command Default

No options are specified for a GET request.

## Command Modes

**IP SLA Configuration**

HTTP configuration (config-ip-sla-http)

**IP SLA Monitor Configuration**

HTTP configuration (config-sla-monitor-http)

## Command History

| Release | Modification |
|---|---|
| 12.0(5)T | This command was introduced. |
| 12.2(33)SRA | This command was integrated into Cisco IOS Release 12.2(33)SRA. |
| 12.2SX | This command is supported in the Cisco IOS Release 12.2SX train. Support in a specific 12.2SX release of this train depends on your feature set, platform, and platform hardware. |

## Usage Guidelines

Use the **http-raw-request** command to explicitly specify the content of an HTTP request. Use HTTP version 1.0 commands after entering the **http-raw-request** command.

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

**IP SLAs Operation Configuration Dependence on Cisco IOS Release**

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

The configuration mode for the **http-raw-request** command varies depending on the Cisco IOS release you are running (see the table below) and the operation type configured. For example, if you are running Cisco

IOS Release 12.4 and the HTTP operation type is configured, you would enter the **http-raw-request** command in HTTP configuration mode (config-sla-monitor-http) within IP SLA monitor configuration mode.

***Table 3: Command Used to Begin Configuration of an IP SLAs Operation Based on Cisco IOS Release***

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

## Examples

In the following examples, IP SLAs operation 6 is created and configured as an HTTP operation. The HTTP **GET** command is explicitly specified. Note that the Cisco IOS command used to begin configuration for an IP SLAs operation varies depending on the Cisco IOS release you are running (see the table above).

## Examples

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

## Examples

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

## Related Commands

| Command | Description |
|---|---|
| **http (IP SLA)** | Configures an HTTP IP SLAs operation in IP SLA configuration mode. |
| **ip sla** | Begins configuration for an IP SLAs operation and enters IP SLA configuration mode. |
| **ip sla monitor** | Begins configuration for an IP SLAs operation and enters IP SLA monitor configuration mode. |
| **type http operation** | Configures an HTTP IP SLAs operation in IP SLA monitor configuration mode. |

# I through R

# icmp-echo

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

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

## Syntax Description

| | |
|---|---|
| *destination-ip-address* \| *destination-hostname* | Destination IPv4 or IPv6 address or hostname. |
| **source-ip** {*ip-address* \| *hostname*} | (Optional) Specifies the source IP v4 or IPv6 address or hostname . When a source IP address or hostname is not specified, IP SLAs chooses the IP address nearest to the destination. |
| **source-interface** *interface-name* | (Optional) Specifies the source interface for the operation. |

## Command Default

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

## Command Modes

IP SLA configuration (config-ip-sla)

## Command History

| Release | Modification |
|---|---|
| 12.4(4)T | This command was introduced. This command replaces the **type echo protocol ipIcmpEcho**command. |
| 12.0(32)SY | This command was integrated into Cisco IOS Release 12.0(32)SY. |
| 12.2(33)SRB | This command was integrated into Cisco IOS Release 12.2(33)SRB. This command replaces the **type echo protocol ipIcmpEcho** command. |
| 12.2(33)SRC | Support for IPv6 addresses was added. |
| 12.2(33)SB | This command was integrated into Cisco IOS Release 12.2(33)SB. This command replaces the **type echo protocol ipIcmpEcho**command.<br>Support for IPv6 addresses was added. |
| 12.4(20)T | Support for IPv6 addresses was added. |
| 12.2(33)SXI | This command was integrated into Cisco IOS Release 12.2(33)SXI. This command replaces the **type echo protocol ipIcmpEcho**command. The keyword source-interface is not supported. |

## Usage Guidelines

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

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

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

## Examples

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

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

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

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

## Related Commands

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

# icmp-jitter

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

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

## Syntax Description

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

## Command Default

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

## Command Modes

IP SLA configuration (config-ip-sla)

## Command History

| Release | Modification |
|---|---|
| 12.4(6)T | This command was introduced. |
| 12.0(32)SY | This command was integrated into Cisco IOS Release 12.0(32)SY. |

## Usage Guidelines

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

## Examples

The following example shows how to configure an IP SLAs ICMP jitter operation:

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

## Related Commands

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

# ip sla

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

**ip sla** *operation-number*

**no ip sla** *operation-number*

## Syntax Description

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

## Command Default

No IP SLAs operation is configured.

## Command Modes

Global configuration

## Command History

| Release | Modification |
|---|---|
| 12.4(4)T | This command was introduced. This command replaces the **ip sla monitor**command. |
| 12.0(32)SY | This command was integrated into Cisco IOS Release 12.0(32)SY. |
| 12.2(33)SRB | This command was integrated into Cisco IOS Release 12.2(33)SRB. This command replaces the **rtr** command. |
| 12.2(33)SB | This command was integrated into Cisco IOS Release 12.2(33)SB. This command replaces the **ip sla monitor**command. |
| 12.2(33)SXI | This command was integrated into Cisco IOS Release 12.2(33)SXI. This command replaces the **ip sla monitor**command. |
| 12.2(52)SE | This command was integrated into Cisco IOS Release 12.2(52)SE. |
| 15.1(1)SG | This command was integrated into Cisco IOS Release 15.1(1)SG. |
| Cisco IOS XE Release 3.3SG | This command was integrated into Cisco IOS XE Release 3.3SG. |

## Usage Guidelines

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

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

IP SLAs allows a maximum of 2000 operations.

Debugging is supported only on the first 32 operation numbers.

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

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

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

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

## Examples

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

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

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

## Related Commands

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

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

# ip sla group schedule

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

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

**no ip sla group schedule** *group-id*

## Syntax Description

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

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

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

## Command Default

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

## Command Modes

Global configuration

## Command History

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

| Release | Modification |
|---|---|
| 12.4(6)T | The following arguments and keywords were added:<br>• **add** *operation-ids*<br>• **delete** *operation-ids*<br>• **reschedule** |
| 12.0(32)SY | This command was integrated into Cisco IOS Release 12.0(32)SY. |
| 12.2(33)SRB | This command was integrated into Cisco IOS Release 12.2(33)SRB. This command replaces the **rtr group schedule** command.<br>The **range** keyword and *random-frequency-range* argument were added. |
| 12.2(33)SB | This command was integrated into Cisco IOS Release 12.2(33)SB. This command replaces the **ip sla monitor group schedule**command.<br>The **range** keyword and *random-frequency-range* argument were added. |
| 12.2(33)SXI | This command was integrated into Cisco IOS Release 12.2(33)SXI. This command replaces the **ip sla monitor group schedule**command.<br>The **range** keyword and *random-frequency-range* argument were added. |
| 12.2(52)SE | This command was integrated into Cisco IOS Release 12.2(52)SE. |
| 15.1(1)T | This command was modified. Support for scheduling a single operation was added. |
| 15.1(4)M | This command was modified. A random scheduler will not schedule an IP SLAs probe for which enhanced-history is configured. A fixed frequency multioperation scheduler will not schedule an IP SLAs probe for which enhanced history is configured if the enhanced-history interval is not a multiple of the scheduler frequency. |
| 15.1(1)SG | This command was integrated into Cisco IOS Release 15.1(1)SG. |
| Cisco IOS XE Release 3.3SG | This command was integrated into Cisco IOS XE Release 3.3SG. |
| 15.2(4)T | This command was modified. Support for scheduling a single operation was added. |
| 15.3(1)T | This command was modified. The **random** keyword was added for scheduling a random start time. |

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

## Examples

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

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

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

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

## Related Commands

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

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

# ip sla logging traps

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

**ip sla logging traps**

**no ip sla logging traps**

## Syntax Description

This command has no arguments or keywords.

## Command Default

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

## Command Modes

Global configuration

## Command History

| Release | Modification |
|---|---|
| 12.4(4)T | This command was introduced. This command replaces the **ip sla monitor logging traps**command. |
| 12.0(32)SY | This command was integrated into Cisco IOS Release 12.0(32)SY. |
| 12.2(33)SRB | This command was integrated into Cisco IOS Release 12.2(33)SRB. This command replaces the **rtr logging traps** command. |
| 12.2(33)SB | This command was integrated into Cisco IOS Release 12.2(33)SB. This command replaces the **ip sla monitor logging traps**command. |
| 12.2(33)SXI | This command was integrated into Cisco IOS Release 12.2(33)SXI. This command replaces the **ip sla monitor logging traps**command. |
| 12.2(52)SE | This command was integrated into Cisco IOS Release 12.2(52)SE. |
| 15.1(1)SG | This command was integrated into Cisco IOS Release 15.1(1)SG. |
| Cisco IOS XE Release 3.3SG | This command was integrated into Cisco IOS XE Release 3.3SG. |

## Usage Guidelines

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

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

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

## Examples

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

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

## Related Commands

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

# ip sla low-memory

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

**ip sla low-memory** *bytes*

**no ip sla low-memory**

## Syntax Description

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

## Command Default

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

## Command Modes

Global configuration

## Command History

| Release | Modification |
|---|---|
| 12.4(4)T | This command was introduced. This command replaces the **ip sla monitor low-memory** command. |
| 12.0(32)SY | This command was integrated into Cisco IOS Release 12.0(32)SY. |
| 12.2(33)SRB | This command was integrated into Cisco IOS Release 12.2(33)SRB. This command replaces the **rtr low-memory** command. |
| 12.2(33)SB | This command was integrated into Cisco IOS Release 12.2(33)SB. This command replaces the **ip sla monitor low-memory**command. |
| 12.2(33)SXI | This command was integrated into Cisco IOS Release 12.2(33)SXI. This command replaces the **ip sla monitor low-memory**command. |
| 12.2(52)SE | This command was integrated into Cisco IOS Release 12.2(52)SE. |

## Usage Guidelines

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

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

## Examples

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

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

## Related Commands

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

# ip sla reaction-trigger

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

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

**no ip sla reaction-trigger** *operation*

## Syntax Description

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

## Command Default

No trigger combination is defined.

## Command Modes

Global configuration

## Command History

| Release | Modification |
|---|---|
| 12.4(4)T | This command was introduced. This command replaces the **ip sla monitor reaction-trigger** command. |
| 12.0(32)SY | This command was integrated into Cisco IOS Release 12.0(32)SY. |
| 12.2(33)SRB | This command was integrated into Cisco IOS Release 12.2(33)SRB. This command replaces the **rtr reaction-trigger** command. |
| 12.2(33)SB | This command was integrated into Cisco IOS Release 12.2(33)SB. This command replaces the **ip sla monitor reaction-trigger**command. |
| 12.2(33)SXI | This command was integrated into Cisco IOS Release 12.2(33)SXI. This command replaces the **ip sla monitor reaction-trigger**command. |
| 12.2(52)SE | This command was integrated into Cisco IOS Release 12.2(52)SE. |
| 15.1(1)SG | This command was integrated into Cisco IOS Release 15.1(1)SG. |
| Cisco IOS XE Release 3.3SG | This command was integrated into Cisco IOS XE Release 3.3SG. |

## Usage Guidelines

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

## Examples

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

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

## Related Commands

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

# ip sla reset

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

**ip sla reset**

## Syntax Description

This command has no arguments or keywords.

## Command Default

None

## Command Modes

Global configuration

## Command History

| Release | Modification |
|---|---|
| 12.4(4)T | This command was introduced. This command replaces the **ip sla monitor reset** command. |
| 12.0(32)SY | This command was integrated into Cisco IOS Release 12.0(32)SY. |
| 12.2(33)SRB | This command was integrated into Cisco IOS Release 12.2(33)SRB. This command replaces the **rtr reset** command. |
| 12.2(33)SB | This command was integrated into Cisco IOS Release 12.2(33)SB. This command replaces the **ip sla monitor reset**command. |
| 12.2(33)SXI | This command was integrated into Cisco IOS Release 12.2(33)SXI. This command replaces the **ip sla monitor reset**command. |
| 12.2(52)SE | This command was integrated into Cisco IOS Release 12.2(52)SE. |

## Usage Guidelines

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

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

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

## Examples

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

```
ip sla reset
```

## Related Commands

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

# ip sla responder

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

**ip sla responder**

**no ip sla responder**

## Syntax Description

This command has no arguments or keywords.

## Command Default

The IP SLAs Responder is disabled.

## Command Modes

Global configuration

## Command History

| Release | Modification |
|---|---|
| 12.4(4)T | This command was introduced. This command replaces the **ip sla monitor responder** command. |
| 12.0(32)SY | This command was integrated into Cisco IOS Release 12.0(32)SY. |
| 12.2(33)SRB | This command was integrated into Cisco IOS Release 12.2(33)SRB. This command replaces the **rtr responder** command. |
| 12.2(33)SB | This command was integrated into Cisco IOS Release 12.2(33)SB. This command replaces the **ip sla monitor responder**command. |
| 12.2(33)SXI | This command was integrated into Cisco IOS Release 12.2(33)SXI. This command replaces the **ip sla monitor responder**command. |
| 12.2(52)SE | This command was integrated into Cisco IOS Release 12.2(52)SE. |
| 15.1(1)SG | This command was integrated into Cisco IOS Release 15.1(1)SG. |
| Cisco IOS XE Release 3.3SG | This command was integrated into Cisco IOS XE Release 3.3SG. |

## Usage Guidelines

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

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

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

## Examples

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

```
ip sla responder
```

## Related Commands

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

# ip sla responder udp-echo ipaddress

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

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

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

## Syntax Description

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

## Command Default

The IP SLAs Responder is disabled.

## Command Modes

Global configuration (config)

## Command History

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

## Command History

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

## Usage Guidelines

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

## Examples

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

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

## Related Commands

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

# ip sla schedule

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

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

**no ip sla schedule** *operation-number*

## Syntax Description

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

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

## Command Default

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

## Command Modes

Global configuration

## Command History

| Release | Modification |
|---|---|
| 12.4(4)T | This command was introduced. This command replaces the **ip sla monitor schedule** command. |
| 12.0(32)SY | This command was integrated into Cisco IOS Release 12.0(32)SY. |
| 12.2(33)SRB | This command was integrated into Cisco IOS Release 12.2(33)SRB. This command replaces the **rtr schedule** command. |
| 12.2(33)SB | This command was integrated into Cisco IOS Release 12.2(33)SB. This command replaces the **ip sla monitor schedule**command. |
| 12.2(33)SXI | This command was integrated into Cisco IOS Release 12.2(33)SXI. This command replaces the **ip sla monitor schedule**command. |
| 12.2(52)SE | This command was integrated into Cisco IOS Release 12.2(52)SE. |
| 15.1(1)SG | This command was integrated into Cisco IOS Release 15.1(1)SG. |
| Cisco IOS XE Release 3.3SG | This command was integrated into Cisco IOS XE Release 3.3SG. |
| 15.3(1)T | This command was modified. The **random** keyword was added for scheduling a random start time. |

## Usage Guidelines

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

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

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

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

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

where:

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

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

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

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

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

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

## Examples

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

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

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

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

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

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

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

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

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

## Related Commands

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

# owner

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

**owner** *text*

**no owner**

## Syntax Description

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

## Command Default

No owner is specified.

## Command Modes

**IP SLA Configuration**

DHCP configuration (config-ip-sla-dhcp)

DLSw configuration (config-ip-sla-dlsw)

DNS configuration (config-ip-sla-dns)

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

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

FTP configuration (config-ip-sla-ftp)

HTTP configuration (config-ip-sla-http)

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

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

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

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

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

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

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

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

VCCV configuration (config-sla-vccv)

Video (config-ip-sla-video)

VoIP configuration (config-ip-sla-voip)

**IP SLA Auto Ethernet Configuration**

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

**IP SLA Monitor Configuration**

DHCP configuration (config-sla-monitor-dhcp)

DLSw configuration (config-sla-monitor-dlsw)

DNS configuration (config-sla-monitor-dns)

FTP configuration (config-sla-monitor-ftp)

HTTP configuration (config-sla-monitor-http)

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

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

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

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

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

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

VoIP configuration (config-sla-monitor-voip)

**IP SLA Y.1731 Configuration**

Delay configuration (config-sla-y1731-delay)

Loss configuration (config-sla-y1731-loss)

## Command History

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

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

## Usage Guidelines

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

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

**IP SLAs Operation Configuration Dependence on Cisco IOS Release**

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

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

*Table 4: Command Used to Begin Configuration of an IP SLAs Operation Based on Cisco IOS Release*

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

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

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

```
Router# show ip sla configuration 1

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

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

```
Router# show ip sla configuration 1

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

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

```
Router# show ip sla configuration 10

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

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

## Related Commands

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

# path-echo

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

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

## Syntax Description

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

## Command Default

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

## Command Modes

IP SLA configuration (config-ip-sla)

## Command History

| Release | Modification |
|---|---|
| 12.4(4)T | This command was introduced. This command replaces the **type pathEcho protocol ipIcmpEcho**command. |
| 12.0(32)SY | This command was integrated into Cisco IOS Release 12.0(32)SY. |
| 12.2(33)SRB | This command was integrated into Cisco IOS Release 12.2(33)SRB. This command replaces the **type pathEcho protocol ipIcmpEcho** command. |
| 12.2(33)SB | This command was integrated into Cisco IOS Release 12.2(33)SB. This command replaces the **type pathEcho protocol ipIcmpEcho**command. |
| 12.2(33)SXI | This command was integrated into Cisco IOS Release 12.2(33)SXI. This command replaces the **type pathEcho protocol ipIcmpEcho**command. |
| 15.2(3)T | This command was modified. Support for IPv6 addresses was added. |
| Cisco IOS XE Release 3.7S | This command was integrated into Cisco IOS XE Release 3.7S. |
| 15.1(2)SG | This command was integrated into Cisco IOS Release 15.1(2)SG. |
| Cisco IOS XE Release 3.4SG | This command was integrated into Cisco IOS XE Release 3.4SG. |

## Usage Guidelines

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

## Examples

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

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

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

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

## Related Commands

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

# path-jitter

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

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

## Syntax Description

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

## Command Default

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

## Command Modes

IP SLA configuration (config-ip-sla)

## Command History

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

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

## Usage Guidelines

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

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

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

## Examples

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

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

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

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

## Related Commands

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

# paths-of-statistics-kept

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

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

**no paths-of-statistics-kept**

## Syntax Description

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

## Command Default

5 paths

## Command Modes

**IP SLA Configuration**

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

**IP SLA Monitor Configuration**

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

## Command History

| Release | Modification |
|---|---|
| 11.2 | This command was introduced. |
| 12.2(33)SRA | This command was integrated into Cisco IOS Release 12.2(33)SRA. |
| 12.2SX | This command is supported in the Cisco IOS Release 12.2SX train. Support in a specific 12.2SX release of this train depends on your feature set, platform, and platform hardware. |

## Usage Guidelines

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

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

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

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

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

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

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

**IP SLAs Operation Configuration Dependence on Cisco IOS Release**

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

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

***Table 5: Command Used to Begin Configuration of an IP SLAs Operation Based on Cisco IOS Release***

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

## Examples

The following examples show how to maintain statistics for only three paths for IP SLAs ICMP path echo operation 2. Note that the Cisco IOS command used to begin configuration for an IP SLAs operation varies depending on the Cisco IOS release you are running (see the table above).

## Examples

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

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

## Examples

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

## Related Commands

| Command | Description |
|---|---|
| **distributions-of-statistics-kept** | Sets the number of statistics distributions kept per hop during the lifetime of the IP SLAs operation. |
| **hops-of-statistics-kept** | Sets the number of hops for which statistics are maintained per path for the IP SLAs operation. |
| **hours-of-statistics-kept** | Sets the number of hours for which statistics are maintained for the IP SLAs operation. |
| **ip sla** | Begins configuration for an IP SLAs operation and enters IP SLA configuration mode. |
| **ip sla monitor** | Begins configuration for an IP SLAs operation and enters IP SLA monitor configuration mode. |
| **statistics-distribution-interval** | Sets the time interval for each statistics distribution kept for the IP SLAs operation. |

# request-data-size

To set the protocol data size in the payload of a Cisco IOS IP Service Level Agreements (SLAs) operation's request packet, use the **request-data-size**command in the appropriate submode of IP SLA configuration, auto IP SLA MPLS configuration, IP SLA monitor configuration, or IP SLA template parameters configuration mode. To return to the default value, use the **no** form of this command.

**request-data-size** *bytes*

**no request-data-size**

## Syntax Description

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

## Command Default

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

## Command Modes

DLSw configuration (config-ip-sla-dlsw) ICMP echo configuration (config-ip-sla-echo) ICMP path echo configuration (config-ip-sla-pathEcho) ICMP path jitter configuration (config-ip-sla-pathJitter) UDP echo configuration (config-ip-sla-udp) UDP jitter configuration (config-ip-sla-jitter) VCCV configuration (config-sla-vccv)

## Command Modes

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

## Command Modes

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

## Command Modes

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

## Command History

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

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

## Usage Guidelines

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

The **request-data-size** command is supported in IPv4 networks. This command is also supported in IPv6 networks to configure an IP SLAs operation that supports IPv6 addresses.

**IP SLAs Operation Configuration Dependence on Cisco IOS Release**

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

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

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

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

## Examples

The following examples show how to set the request packet size to 40 bytes for an IP SLAs ICMP echo operation. Note that the Cisco IOS command used to begin configuration for an IP SLAs operation varies depending on the Cisco IOS release you are running (see the Command Used to Begin Configuration of an IP SLAs Operation Based on Cisco IOS Release table).

## Examples

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

## Examples

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

## Examples

```
Router(config)# ip sla auto template type ip icmp-echo 1
Router(config-icmp-ech-tplt)# parameters
Router(config-icmp-ech-params)# request-data-size 40
Router(config-icmp-ech-params)# end
Router#
Router# show ip sla auto template type ip icmp-echo
IP SLAs Auto Template: 1
Measure Type: icmp-echo (control enabled)
    Description:
    IP options:
        Source IP: 0.0.0.0      Source Port: 0
        VRF:    TOS: 0x0
    Operation Parameters:
        Request Data Size: 40 Verify Data: false
  Timeout: 5000           Threshold: 5000
    Statistics Aggregation option:
        Hours of statistics kept: 2
    History options:
        History filter: none
        Max number of history records kept: 15
        Lives of history kept: 0
    Statistics Distributions options:
        Distributions characteristics: RTT
        Distributions bucket size: 20
        Max number of distributions buckets: 1
    Reaction Configuration: None
```

## Related Commands

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

# 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 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 |

## 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 9: 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 10: show ip sla reaction-configuration Field Descriptions***

| Field | Description |
|---|---|
| Reaction | The monitored element configured for the specified IP SLAs operation.<br>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.<br>Corresponds to the **threshold-type** {**never** \| **immediate** \| **consecutive** \| **xofy** \| **average**} syntax in the **ipslareaction-configuration** command. |
| Rising (milliseconds) | The *upper-threshold* value.<br>Corresponds to the **threshold-value***upper-thresholdlower-threshold* syntax in the **ipslareaction-configuration** command. |
| Falling (milliseconds) | The *lower-threshold* value.<br>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.<br>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.<br>**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 11: 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<br>• The values for *Io* , *Iq* , and *Idte* are set to zero.<br>• The value *Idd* is computed based on the measured one-way delay.<br>• The value *Ie* is computed based on the measured packet loss.<br>• The value of A is specified by the user.<br>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.”<br>**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.<br>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.<br>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 12: 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:<br>• Ethernet echo<br>• Ethernet jitter<br>• Ethernet parameters<br>• 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 13: 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 14: 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).<br>• 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.<br>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.<br>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:<br>• Ethernet echo<br>• Ethernet jitter<br>• Ethernet parameters<br>• 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 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(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 16: 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.<br>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:<br>• Ethernet echo<br>• Ethernet jitter<br>• Ethernet parameters<br>• 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 17: 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 18: 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.<br>• 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.<br>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.<br>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.<br>• 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.<br>• 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.<br>**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.<br>**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.<br>By default, IP SLAs control messages are sent to the destination device to establish a connection with the IP SLAs responder.<br>**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.<br>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.<br>• 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.<br>The following codec-type keywords are available:<br>• **g711alaw** --The G.711 a-law codec (64 kbps transmission)<br>• **g711ulaw** --The G.711 muHmm-law codec (64 kbps transmission)<br>• **g729a** --The G.729A codec (8 kbps transmission)<br>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.<br>**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.<br>**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.<br>By default, IP SLAs control messages are sent to the destination device to establish a connection with the IP SLAs Responder.<br>**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 19: 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 20: 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 21: 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 22: 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. |