



IP SLAs—Analyzing IP Service Levels Using the ICMP Echo Operation

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This module describes how to use the Cisco IOS IP Service Level Agreements (SLAs) Internet Control Message Protocol (ICMP) Echo operation to monitor end-to-end response time between a Cisco router and devices using IPv4 or IPv6. ICMP Echo is useful for troubleshooting network connectivity issues. IP SLAs is a portfolio of technology embedded in most devices that run Cisco IOS software, which allows Cisco customers to analyze IP service levels for IP applications and services, to increase productivity, to lower operational costs, and to reduce the frequency of network outages. IP SLAs uses active traffic monitoring—the generation of traffic in a continuous, reliable, and predictable manner—for measuring network performance. This module also demonstrates how the results of the ICMP Echo operation can be displayed and analyzed to determine how the network IP connections are performing.

Finding Feature Information

Your software release may not support all the features documented in this module. For the latest feature information and caveats, see the release notes for your platform and software release. To find information about the features documented in this module, and to see a list of the releases in which each feature is supported, see the “[Feature Information for the IP SLAs ICMP Echo Operation](#)” section on page 13.

Use Cisco Feature Navigator to find information about platform support and Cisco IOS and Catalyst OS software image support. To access Cisco Feature Navigator, go to <http://www.cisco.com/go/cfn>. An account on Cisco.com is not required.

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Prerequisites for the IP SLAs ICMP Echo Operation

Before configuring the IP SLAs ICMP Echo operation you should be familiar with the “[Cisco IOS IP SLAs Overview](#)” chapter of the *Cisco IOS IP SLAs Configuration Guide*.

Restrictions for the IP SLAs ICMP Echo Operation

We recommend using a Cisco networking device as the destination device although any networking device that supports RFC 862, Echo protocol, can be used.

Information About the IP SLAs ICMP Echo Operation

To perform the tasks required to analyze ICMP Echo performance using IP SLA, you should understand the following concept:

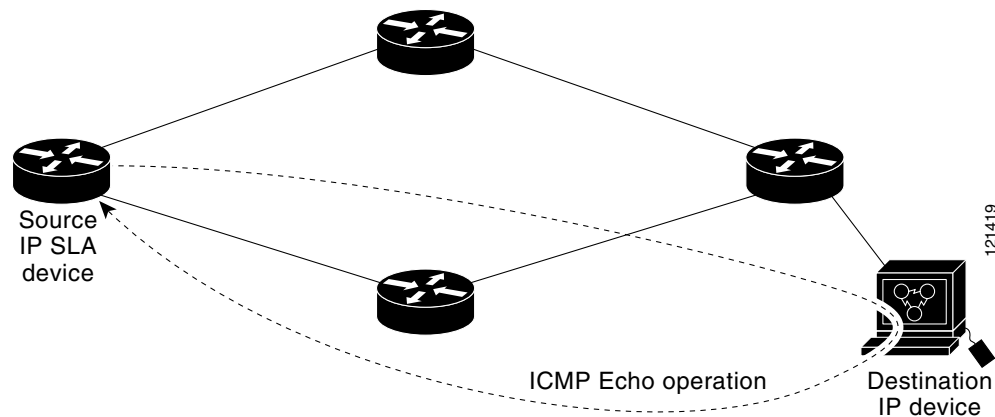
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ICMP Echo Operation

The ICMP Echo operation measures end-to-end response time between a Cisco router and any devices using IP. Response time is computed by measuring the time taken between sending an ICMP Echo request message to the destination and receiving an ICMP Echo reply.

In [Figure 1](#) ping is used by the ICMP Echo operation to measure the response time between the source IP SLAs device and the destination IP device. Many customers use IP SLAs ICMP-based operations, in-house ping testing, or ping-based dedicated probes for response time measurements.

Figure 1 ICMP Echo Operation



The IP SLAs ICMP Echo operation conforms to the same IETF specifications for ICMP ping testing and the two methods result in the same response times.

How to Configure the IP SLAs ICMP Echo Operation

This section contains the following procedure:

- [Configuring and Scheduling an ICMP Echo Operation, page 3](#) (required)

Configuring and Scheduling an ICMP Echo Operation

To monitor IP connections on a device, use the IP SLAs ICMP Echo operation. An ICMP Echo operation measures end-to-end response times between a Cisco router and devices using IP. ICMP Echo is useful for troubleshooting network connectivity issues. This operation does not require the IP SLAs Responder to be enabled.

Perform one of the following procedures in this section, depending on whether you want to configure and schedule a basic ICMP Echo operation or configure and schedule an ICMP Echo operation with optional parameters:

- [Configuring and Scheduling a Basic ICMP Echo Operation on the Source Device, page 3](#)
- [Configuring and Scheduling an ICMP Echo Operation with Optional Parameters on the Source Device, page 5](#)

Configuring and Scheduling a Basic ICMP Echo Operation on the Source Device

Perform this task to enable and schedule an ICMP Echo operation without any optional parameters.

For information on scheduling a group of operations, see the “[IP SLAs—Multioperation Scheduling of IP SLAs Operations](#)” chapter of the *Cisco IOS IP SLAs Configuration Guide*.

SUMMARY STEPS

1. **enable**
2. **configure terminal**

3. **ip sla** *operation-number*
4. **icmp-echo** {*destination-ip-address* | *destination-hostname*} [**source-ip** {*ip-address* | *hostname*} | **source-interface** *interface-name*]
5. **frequency** *seconds*
6. **exit**
7. **ip sla schedule** *operation-number* [**life** {**forever** | *seconds*}] [**start-time** {*hh:mm[:ss]* [*month day* | *day month*] | **pending** | **now** | **after** *hh:mm:ss*}] [**ageout** *seconds*] [**recurring**]
8. **exit**

DETAILED STEPS

	Command or Action	Purpose
Step 1	enable Example: Router> enable	Enables privileged EXEC mode. <ul style="list-style-type: none"> • Enter your password if prompted.
Step 2	configure terminal Example: Router# configure terminal	Enters global configuration mode.
Step 3	ip sla <i>operation-number</i> Example: Router(config)# ip sla 10	Begins configuration for an IP SLAs operation and enters IP SLA configuration mode.
Step 4	icmp-echo { <i>destination-ip-address</i> <i>destination-hostname</i> } [source-ip { <i>ip-address</i> <i>hostname</i> } source-interface <i>interface-name</i>] Example: Router(config-ip-sla)# icmp-echo 172.29.139.134	Defines an ICMP Echo operation and enters IP SLA ICMP Echo configuration mode.
Step 5	frequency <i>seconds</i> Example: Router(config-ip-sla-echo)# frequency 300	(Optional) Sets the rate at which a specified IP SLAs operation repeats.
Step 6	exit Example: Router(config-ip-sla-echo)# exit	Exits IP SLA ICMP Echo configuration mode and returns to global configuration mode.

	Command or Action	Purpose
Step 7	<pre>ip sla schedule operation-number [life {forever seconds}] [start-time {hh:mm[:ss] [month day day month] pending now after hh:mm:ss}] [ageout seconds] [recurring]</pre> <p>Example: Router(config)# ip sla schedule 10 start-time now life forever</p>	Configures the scheduling parameters for an individual IP SLAs operation.
Step 8	<pre>exit</pre> <p>Example: Router(config)# exit</p>	(Optional) Exits global configuration mode and returns to privileged EXEC mode.

Example

The following example shows the configuration of the IP SLAs ICMP Echo operation number 6 that will start immediately and run indefinitely.

```
ip sla 6
 icmp-echo 172.29.139.134 source-ip 172.29.139.132
 frequency 300
 !
 ip sla schedule 6 life forever start-time now
```

What to Do Next

To view and interpret the results of an IP SLAs operation use the **show ip sla statistics** command. Checking the output for fields that correspond to criteria in your service level agreement will help you determine whether the service metrics are acceptable.

Configuring and Scheduling an ICMP Echo Operation with Optional Parameters on the Source Device

Perform this task to enable an ICMP Echo operation on the source device and configure some optional IP SLAs parameters.



Note

The **tos** command defines the type of service (ToS) byte in the IPv4 header of an IP SLAs operation and is valid only in IPv4 networks. The **traffic-class** command defines the traffic class byte in the IPv6 header for a supported IP SLAs operation.

The **flow-label** command defines the value in the flow label field in the IPv6 header for a supported IP SLAs operation and is valid only in IPv6 networks.

For information on scheduling a group of operations, see the “[IP SLAs—Multioperation Scheduling of IP SLAs Operations](#)” chapter of the *Cisco IOS IP SLAs Configuration Guide*.

SUMMARY STEPS

1. **enable**
2. **configure terminal**

3. **ip sla** *operation-number*
4. **icmp-echo** {*destination-ip-address* | *destination-hostname*} [**source-ip** {*ip-address* | *hostname*} | **source-interface** *interface-name*]
5. **history buckets-kept** *size*
6. **history distributions-of-statistics-kept** *size*
7. **history enhanced** [**interval** *seconds*] [**buckets** *number-of-buckets*]
8. **history filter** {*none* | *all* | *overThreshold* | *failures*}
9. **frequency** *seconds*
10. **history hours-of-statistics-kept** *hours*
11. **history lives-kept** *lives*
12. **owner** *owner-id*
13. **request-data-size** *bytes*
14. **history statistics-distribution-interval** *milliseconds*
15. **tag** *text*
16. **threshold** *milliseconds*
17. **timeout** *milliseconds*
18. **tos** *number*
or
traffic-class *number*
19. **flow-label** *number*
20. **verify-data**
21. **vrf** *vrf-name*
22. **exit**
23. **ip sla schedule** *operation-number* [**life** {*forever* | *seconds*}] [**start-time** {*hh:mm[:ss]* [*month day* | *day month*] | *pending* | *now* | *after hh:mm:ss*}] [**ageout** *seconds*] [**recurring**]
24. **exit**
25. **show ip sla configuration** [*operation-number*]

DETAILED STEPS

	Command or Action	Purpose
Step 1	enable Example: Router> enable	Enables privileged EXEC mode. <ul style="list-style-type: none"> • Enter your password if prompted.
Step 2	configure terminal Example: Router# configure terminal	Enters global configuration mode.

	Command or Action	Purpose
Step 3	ip sla <i>operation-number</i> Example: Router(config)# ip sla 10	Begins configuration for an IP SLAs operation and enters IP SLA configuration mode.
Step 4	icmp-echo { <i>destination-ip-address</i> <i>destination-hostname</i> } [source-ip { <i>ip-address</i> <i>hostname</i> } source-interface <i>interface-name</i>] Example: Router(config-ip-sla)# icmp-echo 172.29.139.134 source-ip 172.29.139.132	Defines an Echo operation and enters IP SLA Echo configuration mode.
Step 5	history buckets-kept <i>size</i> Example: Router(config-ip-sla-echo)# history buckets-kept 25	(Optional) Sets the number of history buckets that are kept during the lifetime of an IP SLAs operation.
Step 6	history distributions-of-statistics-kept <i>size</i> Example: Router(config-ip-sla-echo)# history distributions-of-statistics-kept 5	(Optional) Sets the number of statistics distributions kept per hop during an IP SLAs operation.
Step 7	history enhanced [interval <i>seconds</i>] [buckets <i>number-of-buckets</i>] Example: Router(config-ip-sla-echo)# history enhanced interval 900 buckets 100	(Optional) Enables enhanced history gathering for an IP SLAs operation.
Step 8	history filter { none all overThreshold failures } Example: Router(config-ip-sla-echo)# history filter failures	(Optional) Defines the type of information kept in the history table for an IP SLAs operation.
Step 9	frequency <i>seconds</i> Example: Router(config-ip-sla-echo)# frequency 30	(Optional) Sets the rate at which a specified IP SLAs operation repeats.
Step 10	history hours-of-statistics-kept <i>hours</i> Example: Router(config-ip-sla-echo)# history hours-of-statistics-kept 4	(Optional) Sets the number of hours for which statistics are maintained for an IP SLAs operation.
Step 11	history lives-kept <i>lives</i> Example: Router(config-ip-sla-echo)# history lives-kept 5	(Optional) Sets the number of lives maintained in the history table for an IP SLAs operation.

How to Configure the IP SLAs ICMP Echo Operation

	Command or Action	Purpose
Step 12	owner <i>owner-id</i> Example: Router(config-ip-sla-echo)# owner admin	(Optional) Configures the Simple Network Management Protocol (SNMP) owner of an IP SLAs operation.
Step 13	request-data-size <i>bytes</i> Example: Router(config-ip-sla-echo)# request-data-size 64	(Optional) Sets the protocol data size in the payload of an IP SLAs operation's request packet.
Step 14	history statistics-distribution-interval <i>milliseconds</i> Example: Router(config-ip-sla-echo)# history statistics-distribution-interval 10	(Optional) Sets the time interval for each statistics distribution kept for an IP SLAs operation.
Step 15	tag <i>text</i> Example: Router(config-ip-sla-echo)# tag TelnetPollServer1	(Optional) Creates a user-specified identifier for an IP SLAs operation.
Step 16	threshold <i>milliseconds</i> Example: Router(config-ip-sla-echo)# threshold 10000	(Optional) Sets the upper threshold value for calculating network monitoring statistics created by an IP SLAs operation.
Step 17	timeout <i>milliseconds</i> Example: Router(config-ip-sla-echo)# timeout 10000	(Optional) Sets the amount of time an IP SLAs operation waits for a response from its request packet.
Step 18	tos <i>number</i> or traffic-class <i>number</i> Example: Router(config-ip-sla-jitter)# tos 160 or Example: Router(config-ip-sla-jitter)# traffic-class 160	(Optional) In an IPv4 network only, defines the ToS byte in the IPv4 header of an IP SLAs operation. or (Optional) In an IPv6 network only, defines the traffic class byte in the IPv6 header for a supported IP SLAs operation.
Step 19	flow-label <i>number</i> Example: Router(config-ip-sla-echo)# flow-label 112233	(Optional) In an IPv6 network only, defines the flow label field in the IPv6 header for a supported IP SLAs operation.

	Command or Action	Purpose
Step 20	verify-data Example: Router(config-ip-sla-echo)# verify-data	(Optional) Causes an IP SLAs operation to check each reply packet for data corruption.
Step 21	vrf vrf-name Example: Router(config-ip-sla-echo)# vrf vpn-A	(Optional) Allows monitoring within Multiprotocol Label Switching (MPLS) Virtual Private Networks (VPNs) using IP SLAs operations.
Step 22	exit Example: Router(config-ip-sla-echo)# exit	Exits ICMP Echo configuration submode and returns to global configuration mode.
Step 23	ip sla schedule operation-number [life {forever seconds}] [start-time {hh:mm[:ss] [month day day month] pending now after hh:mm:ss}] [ageout seconds] [recurring] Example: Router(config)# ip sla schedule 10 start-time now life forever	Configures the scheduling parameters for an individual IP SLAs operation.
Step 24	exit Example: Router(config)# exit	(Optional) Exits global configuration mode and returns to privileged EXEC mode.
Step 25	show ip sla configuration [operation-number] Example: Router# show ip sla configuration 10	(Optional) Displays configuration values including all defaults for all IP SLAs operations or a specified operation.

Examples

The following sample output shows the configuration of all the IP SLAs parameters (including defaults) for the ICMP Echo operation number 6.

```
Router# show ip sla configuration 6

Entry number: 6
Owner: jdoe
Tag: SFO-RO
Type of operation to perform: echo
Target address: 172.29.139.134
Source address: 172.29.139.132
Request size (ARR data portion): 28
Operation timeout (milliseconds): 2000
Type Of Service parameters: 160
Verify data: No
Vrf Name:
Operation frequency (seconds): 300
Next Scheduled Start Time: Start Time already passed
Group Scheduled: FALSE
Life (seconds): Forever
Entry Ageout (seconds): never
```

```

Recurring (Starting Everyday): FALSE
Status of entry (SNMP RowStatus): Active
Threshold (milliseconds): 5000
Number of statistic hours kept: 2
Number of statistic distribution buckets kept: 1
Statistic distribution interval (milliseconds): 20
Number of history Lives kept: 0
Number of history Buckets kept: 15
History Filter Type: None
Enhanced History:

```

Troubleshooting Tips

- If the IP SLAs operation is not running and generating statistics, add the **verify-data** command to the configuration of the operation (while configuring in IP SLA configuration mode) to enable data verification. When enabled, each operation response is checked for corruption. Use the **verify-data** command with caution during normal operations because it generates unnecessary overhead.
- Use the **debug ip sla trace** and **debug ip sla error** commands to help troubleshoot issues with an IP SLAs operation.

What to Do Next

To view and interpret the results of an IP SLAs operation use the **show ip sla statistics** command. Checking the output for fields that correspond to criteria in your service level agreement will help you determine whether the service metrics are acceptable.

Configuration Examples for the IP SLAs ICMP Echo Operation

This section contains the following configuration example:

- [Configuring an ICMP Echo Operation: Example, page 10](#)

Configuring an ICMP Echo Operation: Example

The following example shows how to configure an IP SLAs operation type of ICMP Echo that will start immediately and run indefinitely.

```

ip sla 6
 icmp-echo 172.29.139.134 source-ip 172.29.139.132
 frequency 300
 request-data-size 28
 tos 160
 timeout 2000
 tag SFO-RO
 ip sla schedule 6 life forever start-time now

```

Where to Go Next

For information about other types of IP SLAs operations and IP SLAs features, see the [Cisco IOS IP SLAs Features Roadmap](#).

Additional References

The following sections provide references related to monitoring IP connections using an IP SLAs ICMP Echo operation.

Related Documents

Related Topic	Document Title
Cisco IOS IP SLAs command-line interface enhancements	<i>Cisco IOS IP Service Level Agreements Command Line Interface</i> , Cisco white paper
Cisco IOS IP SLAs commands	<i>Cisco IOS IP SLAs Command Reference</i>

Standards

Standards	Title
No new or modified standards are supported by this feature, and support for existing standards has not been modified by this feature.	—

MIBs

MIBs	MIBs Link
CISCO-RTTMON-MIB	To locate and download MIBs for selected platforms, Cisco IOS releases, and feature sets, use Cisco MIB Locator found at the following URL: http://www.cisco.com/go/mibs

RFCs

RFCs	Title
RFC 862	Echo Protocol

Technical Assistance

Description	Link
<p>The Cisco Support website provides extensive online resources, including documentation and tools for troubleshooting and resolving technical issues with Cisco products and technologies.</p> <p>To receive security and technical information about your products, you can subscribe to various services, such as the Product Alert Tool (accessed from Field Notices), the Cisco Technical Services Newsletter, and Really Simple Syndication (RSS) Feeds.</p> <p>Access to most tools on the Cisco Support website requires a Cisco.com user ID and password.</p>	<p>http://www.cisco.com/techsupport</p>

Feature Information for the IP SLAs ICMP Echo Operation

Table 1 lists the release history for this feature.

Not all commands may be available in your Cisco IOS software release. For release information about a specific command, see the command reference documentation.

Use Cisco Feature Navigator to find information about platform support and software image support. Cisco Feature Navigator enables you to determine which Cisco IOS and Catalyst OS software images support a specific software release, feature set, or platform. To access Cisco Feature Navigator, go to <http://www.cisco.com/go/cfn>. An account on Cisco.com is not required.



Note

Table 1 lists only the Cisco IOS software release that introduced support for a given feature in a given Cisco IOS software release train. Unless noted otherwise, subsequent releases of that Cisco IOS software release train also support that feature.

Table 1 Feature Information for the IP SLAs ICMP Echo Operation

Feature Name	Releases	Feature Information
IP SLAs ICMP Echo Operation	12.3(14)T, 12.2(31)SB2, 12.2(33)SRB1, 12.2(33)SXH, Cisco IOS XE Release 2.1	The Cisco IOS IP SLAs Internet Control Message Protocol (ICMP) echo operation allows you to measure end-to-end network response time between a Cisco device and other devices using IP.
IP SLAs for IPv6 (UDP Jitter, UDP Echo, ICMP Echo, TCP Connect)	12.2(33)SRC, 12.2(33)SB, 12.4(20)T	Support was added for operability in IPv6 networks.

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