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 IP. 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 in This Module

Your Cisco IOS software release may not support all of the features documented in this module. To reach links to specific feature documentation in this module and to see a list of the releases in which each feature is supported, use the "Feature Information for the IP SLAs ICMP Echo Operation" section on page 12.

Finding Support Information for Platforms and Cisco IOS Software Images

Use Cisco Feature Navigator to find information about platform support and Cisco IOS software image support. Access Cisco Feature Navigator at http://www.cisco.com/go/fn. You must have an account on Cisco.com. If you do not have an account or have forgotten your username or password, click **Cancel** at the login dialog box and follow the instructions that appear.

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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*, Release 12.4.

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

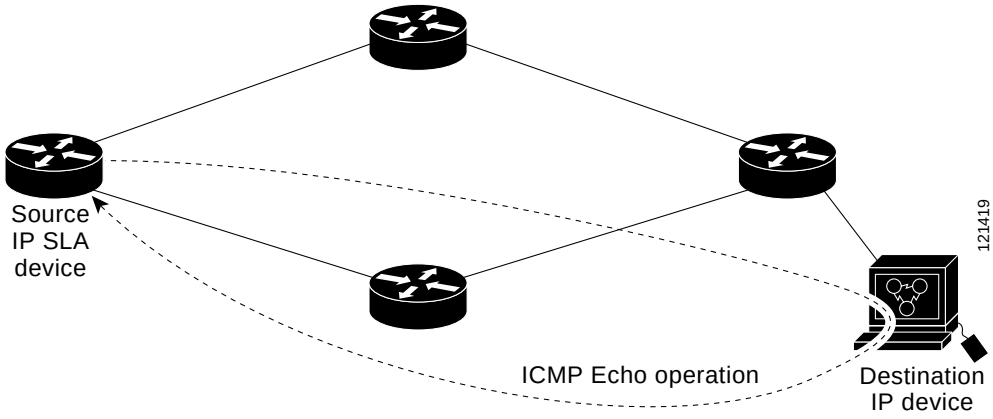
To perform the tasks required to analyze ICMP Echo performance using IP SLA, you should understand the following concept:

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.

Note For information on scheduling a group of operations, see the "IP SLAs—Multiple Operation Scheduling" chapter of the *Cisco IOS IP SLAs Configuration Guide*, Release 12.4.

SUMMARY STEPS

1. **enable**
2. **configure terminal**
3. **ip sla monitor** *operation-number*
4. **type echo protocol ipIcmpEcho** {*destination-ip-address* | *destination-hostname*} [**source-ipaddr** {*ip-address* | *hostname*} | **source-interface** *interface-name*]
5. **frequency** *seconds*
6. **exit**
7. **ip sla monitor 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. • Enter your password if prompted.
Step 2	**configure terminal** **Example:** `Router# configure terminal`	Enters global configuration mode.
Step 3	**ip sla monitor** *operation-number* **Example:** `Router(config)# ip sla monitor 10`	Begins configuration for an IP SLAs operation and enters IP SLA monitor configuration mode.
Step 4	**type echo protocol ipIcmpEcho** {*destination-ip-address* | *destination-hostname*} [**source-ipaddr** {*ip-address* | *hostname*} | **source-interface** *interface-name*] **Example:** `Router(config-sla-monitor)# type echo protocol ipIcmpEcho 172.29.139.134`	Defines an ICMP Echo operation and enters IP SLA Monitor ICMP Echo configuration mode.
Step 5	**frequency** *seconds* **Example:** `Router(config-sla-monitor-echo)# frequency 300`	(Optional) Sets the rate at which a specified IP SLAs operation repeats.
Step 6	**exit** **Example:** `Router(config-sla-monitor-echo)# exit`	Exits IP SLA Monitor ICMP Echo configuration mode and returns to global configuration mode.

	Command or Action	Purpose
Step 7	**ip sla monitor 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 monitor schedule 10 start-time now life forever`	Configures the scheduling parameters for an individual IP SLAs operation.
Step 8	**exit** **Example:** `Router(config)# exit`	(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 monitor 6
 type echo protocol ipIcmpEcho 172.29.139.134 source-ipaddr 172.29.139.132
 frequency 300
!
ip sla monitor 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 monitor 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 For information on scheduling a group of operations, see the "IP SLAs—Multiple Operation Scheduling" chapter of the *Cisco IOS IP SLAs Configuration Guide*, Release 12.4.

SUMMARY STEPS

1. **enable**
2. **configure terminal**
3. **ip sla monitor** *operation-number*
4. **type echo protocol ipIcmpEcho** {*destination-ip-address* | *destination-hostname*} [**source-ipaddr** {*ip-address* | *hostname*} | **source-interface** *interface-name*]
5. **buckets-of-history-kept** *size*
6. **distributions-of-statistics-kept** *size*

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

DETAILED STEPS

	Command or Action	Purpose
Step 1	**enable** **Example:** `Router> enable`	Enables privileged EXEC mode. • Enter your password if prompted.
Step 2	**configure terminal** **Example:** `Router# configure terminal`	Enters global configuration mode.
Step 3	**ip sla monitor** *operation-number* **Example:** `Router(config)# ip sla monitor 10`	Begins configuration for an IP SLAs operation and enters IP SLA monitor configuration mode.
Step 4	**type echo protocol ipIcmpEcho** {*destination-ip-address* | *destination-hostname*} [**source-ipaddr** {*ip-address* | *hostname*} | **source-interface** *interface-name*] **Example:** `Router(config-sla-monitor)# type echo protocol ipIcmpEcho 172.29.139.134 source-ipaddr 172.29.139.132`	Defines an Echo operation and enters IP SLA Monitor Echo configuration mode.

	Command or Action	Purpose
Step 5	**buckets-of-history-kept** *size* **Example:** `Router(config-sla-monitor-echo)# buckets-of-history-kept 25`	(Optional) Sets the number of history buckets that are kept during the lifetime of an IP SLAs operation.
Step 6	**distributions-of-statistics-kept** *size* **Example:** `Router(config-sla-monitor-echo)# distributions-of-statistics-kept 5`	(Optional) Sets the number of statistics distributions kept per hop during an IP SLAs operation.
Step 7	**enhanced-history** [**interval** *seconds*] [**buckets** *number-of-buckets*] **Example:** `Router(config-sla-monitor-echo)# enhanced-history interval 900 buckets 100`	(Optional) Enables enhanced history gathering for an IP SLAs operation.
Step 8	**filter-for-history** {**none** | **all** | **overThreshold** | **failures**} **Example:** `Router(config-sla-monitor-echo)# filter-for-history failures`	(Optional) Defines the type of information kept in the history table for an IP SLAs operation.
Step 9	**frequency** *seconds* **Example:** `Router(config-sla-monitor-echo)# frequency 30`	(Optional) Sets the rate at which a specified IP SLAs operation repeats.
Step 10	**hours-of-statistics-kept** *hours* **Example:** `Router(config-sla-monitor-echo)# hours-of-statistics-kept 4`	(Optional) Sets the number of hours for which statistics are maintained for an IP SLAs operation.
Step 11	**lives-of-history-kept** *lives* **Example:** `Router(config-sla-monitor-echo)# lives-of-history-kept 5`	(Optional) Sets the number of lives maintained in the history table for an IP SLAs operation.
Step 12	**owner** *owner-id* **Example:** `Router(config-sla-monitor-echo)# owner admin`	(Optional) Configures the Simple Network Management Protocol (SNMP) owner of an IP SLAs operation.
Step 13	**request-data-size** *bytes* **Example:** `Router(config-sla-monitor-echo)# request-data-size 64`	(Optional) Sets the protocol data size in the payload of an IP SLAs operation's request packet.

	Command or Action	Purpose
Step 14	**statistics-distribution-interval** *milliseconds* **Example:** `Router(config-sla-monitor-echo)# statistics-distribution-interval 10`	(Optional) Sets the time interval for each statistics distribution kept for an IP SLAs operation.
Step 15	**tag** *text* **Example:** `Router(config-sla-monitor-echo)# tag TelnetPollServer1`	(Optional) Creates a user-specified identifier for an IP SLAs operation.
Step 16	**threshold** *milliseconds* **Example:** `Router(config-sla-monitor-echo)# threshold 10000`	(Optional) Sets the upper threshold value for calculating network monitoring statistics created by an IP SLAs operation.
Step 17	**timeout** *milliseconds* **Example:** `Router(config-sla-monitor-echo)# timeout 10000`	(Optional) Sets the amount of time an IP SLAs operation waits for a response from its request packet.
Step 18	**tos** *number* **Example:** `Router(config-sla-monitor-echo)# tos 160`	(Optional) Defines a type of service (ToS) byte in the IP header of an IP SLAs operation.
Step 19	**verify-data** **Example:** `Router(config-sla-monitor-echo)# verify-data`	(Optional) Causes an IP SLAs operation to check each reply packet for data corruption.
Step 20	**vrf** *vrf-name* **Example:** `Router(config-sla-monitor-echo)# vrf vpn-A`	(Optional) Allows monitoring within Multiprotocol Label Switching (MPLS) Virtual Private Networks (VPNs) using IP SLAs operations.
Step 21	**exit** **Example:** `Router(config-sla-monitor-echo)# exit`	Exits ICMP Echo configuration submode and returns to global configuration mode.
Step 22	**ip sla monitor 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 monitor schedule 10 start-time now life forever`	Configures the scheduling parameters for an individual IP SLAs operation.

	Command or Action	Purpose
Step 23	**exit** **Example:** `Router(config)# exit`	(Optional) Exits global configuration mode and returns to privileged EXEC mode.
Step 24	**show ip sla monitor configuration** [*operation-number*] **Example:** `Router# show ip sla monitor 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 monitor 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 monitor 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 monitor trace** and **debug ip sla monitor 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 monitor 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 monitor 6
 type echo protocol ipIcmpEcho 172.29.139.134 source-ipaddr 172.29.139.132
 frequency 300
 request-data-size 28
 tos 160
 timeout 2000
 tag SFO-RO
ip sla monitor schedule 6 life forever start-time now
```

Where to Go Next

- If you want to configure multiple Cisco IOS IP SLAs operations at once, see the "IP SLAs—Multiple Operation Scheduling" chapter of the *Cisco IOS IP SLAs Configuration Guide*, Release 12.4.
- If you want to configure threshold parameters for an IP SLAs operation, see the "IP SLAs—Proactive Threshold Monitoring" chapter of the *Cisco IOS IP SLAs Configuration Guide*, Release 12.4.
- If you want to configure other types of IP SLAs operations, see the "Where to Go Next" section of the "Cisco IOS IP SLAs Overview" chapter of the *Cisco IOS IP SLAs Configuration Guide*, Release 12.4.

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
Overview of Cisco IOS IP SLAs	"Cisco IOS IP SLAs Overview" chapter of the *Cisco IOS IP SLAs Configuration Guide*, Release 12.4
Cisco IOS IP SLAs commands: complete command syntax, defaults, command mode, command history, usage guidelines, and examples	*Cisco IOS IP SLAs Command Reference*, Release 12.4

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
Technical Assistance Center (TAC) home page, containing 30,000 pages of searchable technical content, including links to products, technologies, solutions, technical tips, and tools. Registered Cisco.com users can log in from this page to access even more content.	http://www.cisco.com/public/support/tac/home.shtml

Feature Information for the IP SLAs ICMP Echo Operation

Table 1 lists the features in this module and provides links to specific configuration information. Only features that were introduced or modified in Cisco IOS Release 12.3(14)T or a later release appear in the table. *Not all features may be supported in your Cisco IOS software release.*

For information on a feature in this technology that is not documented here, see the "Cisco IOS IP SLAs Features Roadmap."

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

Cisco IOS software images are specific to a Cisco IOS software release, a feature set, and a platform. Use Cisco Feature Navigator to find information about platform support and Cisco IOS software image support. Access Cisco Feature Navigator at http://www.cisco.com/go/fn. You must have an account on Cisco.com. If you do not have an account or have forgotten your username or password, click **Cancel** at the login dialog box and follow the instructions that appear.

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	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.