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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- Restrictions for the IP SLAs ICMP Echo Operation, page 2
- Information About the IP SLAs ICMP Echo Operation, page 2
- How to Configure the IP SLAs ICMP Echo Operation, page 3
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, page 2

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

<table>
<thead>
<tr>
<th>Command or Action</th>
<th>Purpose</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Step 1</strong> enable</td>
<td>Enables privileged EXEC mode.</td>
</tr>
<tr>
<td><strong>Example:</strong> Router&gt; enable</td>
<td>• Enter your password if prompted.</td>
</tr>
<tr>
<td><strong>Step 2</strong> configure terminal</td>
<td>Enters global configuration mode.</td>
</tr>
<tr>
<td><strong>Example:</strong> Router# configure terminal</td>
<td></td>
</tr>
<tr>
<td><strong>Step 3</strong> ip sla monitor operation-number</td>
<td>Begins configuration for an IP SLAs operation and enters IP SLA monitor configuration mode.</td>
</tr>
<tr>
<td><strong>Example:</strong> Router(config)# ip sla monitor 10</td>
<td></td>
</tr>
<tr>
<td><strong>Step 4</strong> type echo protocol ipIcmpEcho {destination-ip-address</td>
<td>destination-hostname} [source-ipaddr {ip-address</td>
</tr>
<tr>
<td><strong>Example:</strong> Router(config-sla-monitor)# type echo protocol ipIcmpEcho 172.29.139.134</td>
<td></td>
</tr>
<tr>
<td><strong>Step 5</strong> frequency seconds</td>
<td>(Optional) Sets the rate at which a specified IP SLAs operation repeats.</td>
</tr>
<tr>
<td><strong>Example:</strong> Router(config-sla-monitor-echo)# frequency 300</td>
<td></td>
</tr>
<tr>
<td><strong>Step 6</strong> exit</td>
<td>Exits IP SLA Monitor ICMP Echo configuration mode and returns to global configuration mode.</td>
</tr>
<tr>
<td><strong>Example:</strong> Router(config-sla-monitor-echo)# exit</td>
<td></td>
</tr>
</tbody>
</table>
IP SLAs—Analyzing IP Service Levels Using the ICMP Echo Operation

How to Configure the IP SLAs ICMP Echo Operation

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 icmpEcho 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.

SUMMARY STEPS

1. `enable`
2. `configure terminal`
3. `ip sla monitor operation-number`
4. `type echo protocol icmpEcho {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`

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.
### How to Configure the IP SLAs ICMP Echo Operation

Command or Action | Purpose
--- | ---
**Step 1**
enable | Enables privileged EXEC mode.  
- Enter your password if prompted.

**Example:**
Router> enable

**Step 2**
c configure terminal | Enters global configuration mode.

**Example:**
Router# configure terminal

**Step 3**
ip sla monitor operation-number | Begins configuration for an IP SLAs operation and enters IP SLA monitor configuration mode.

**Example:**
Router(config)# ip sla monitor 10

**Step 4**
type echo protocol ipIcmpEcho  
(destination-ip-address | destination-hostname)  
[source-ipaddr]  
(source-interface interface-name) | Defines an Echo operation and enters IP SLA Monitor Echo configuration mode.

**Example:**
Router(config-sla-monitor)# type echo protocol ipIcmpEcho 172.29.139.134 source-ipaddr 172.29.139.132

---

#### DETAILED STEPS

- **enhanced-history** *(interval seconds)* *(buckets number-of-buckets)*
- **filter-for-history** *(none | all | overThreshold | failures)*
- **frequency** *seconds*
- **hours-of-statistics-kept** *hours*
- **lives-of-history-kept** *lives*
- **owner** *owner-id*
- **request-data-size** *bytes*
- **statistics-distribution-interval** *milliseconds*
- **tag** *text*
- **threshold** *milliseconds*
- **timeout** *milliseconds*
- **tos** *number*
- **verify-data**
- **vrf** *vrf-name*
- **exit**
- **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]*)
- **exit**
- **show ip sla monitor configuration** *(operation-number)*
<table>
<thead>
<tr>
<th>Step</th>
<th>Command or Action</th>
<th>Purpose</th>
</tr>
</thead>
<tbody>
<tr>
<td>5</td>
<td>buckets-of-history-kept size</td>
<td>(Optional) Sets the number of history buckets that are kept during the lifetime of an IP SLAs operation.</td>
</tr>
<tr>
<td></td>
<td>Example:</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Router(config-sla-monitor-echo)# buckets-of-history-kept 25</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>distributions-of-statistics-kept size</td>
<td>(Optional) Sets the number of statistics distributions kept per hop during an IP SLAs operation.</td>
</tr>
<tr>
<td></td>
<td>Example:</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Router(config-sla-monitor-echo)# distributions-of-statistics-kept 5</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>enhanced-history [interval seconds] [buckets number-of-buckets]</td>
<td>(Optional) Enables enhanced history gathering for an IP SLAs operation.</td>
</tr>
<tr>
<td></td>
<td>Example:</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Router(config-sla-monitor-echo)# enhanced-history interval 900 buckets 100</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>filter-for-history {none</td>
<td>all</td>
</tr>
<tr>
<td></td>
<td>Example:</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Router(config-sla-monitor-echo)# filter-for-history failures</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>frequency seconds</td>
<td>(Optional) Sets the rate at which a specified IP SLAs operation repeats.</td>
</tr>
<tr>
<td></td>
<td>Example:</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Router(config-sla-monitor-echo)# frequency 30</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>hours-of-statistics-kept hours</td>
<td>(Optional) Sets the number of hours for which statistics are maintained for an IP SLAs operation.</td>
</tr>
<tr>
<td></td>
<td>Example:</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Router(config-sla-monitor-echo)# hours-of-statistics-kept 4</td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>lives-of-history-kept lives</td>
<td>(Optional) Sets the number of lives maintained in the history table for an IP SLAs operation.</td>
</tr>
<tr>
<td></td>
<td>Example:</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Router(config-sla-monitor-echo)# lives-of-history-kept 5</td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>owner owner-id</td>
<td>(Optional) Configures the Simple Network Management Protocol (SNMP) owner of an IP SLAs operation.</td>
</tr>
<tr>
<td></td>
<td>Example:</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Router(config-sla-monitor-echo)# owner admin</td>
<td></td>
</tr>
<tr>
<td>13</td>
<td>request-data-size bytes</td>
<td>(Optional) Sets the protocol data size in the payload of an IP SLAs operation’s request packet.</td>
</tr>
<tr>
<td></td>
<td>Example:</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Router(config-sla-monitor-echo)# request-data-size 64</td>
<td></td>
</tr>
</tbody>
</table>
### Command or Action

<table>
<thead>
<tr>
<th>Step</th>
<th>Command or Action</th>
<th>Purpose</th>
</tr>
</thead>
<tbody>
<tr>
<td>14</td>
<td><code>statistics-distribution-interval milliseconds</code></td>
<td>(Optional) Sets the time interval for each statistics distribution kept for an IP SLAs operation.</td>
</tr>
<tr>
<td>15</td>
<td><code>tag text</code></td>
<td>(Optional) Creates a user-specified identifier for an IP SLAs operation.</td>
</tr>
<tr>
<td>16</td>
<td><code>threshold milliseconds</code></td>
<td>(Optional) Sets the upper threshold value for calculating network monitoring statistics created by an IP SLAs operation.</td>
</tr>
<tr>
<td>17</td>
<td><code>timeout milliseconds</code></td>
<td>(Optional) Sets the amount of time an IP SLAs operation waits for a response from its request packet.</td>
</tr>
<tr>
<td>18</td>
<td><code>tos number</code></td>
<td>(Optional) Defines a type of service (ToS) byte in the IP header of an IP SLAs operation.</td>
</tr>
<tr>
<td>19</td>
<td><code>verify-data</code></td>
<td>(Optional) Causes an IP SLAs operation to check each reply packet for data corruption.</td>
</tr>
<tr>
<td>20</td>
<td><code>vrf vrf-name</code></td>
<td>(Optional) Allows monitoring within Multiprotocol Label Switching (MPLS) Virtual Private Networks (VPNs) using IP SLAs operations.</td>
</tr>
<tr>
<td>21</td>
<td><code>exit</code></td>
<td>Exits ICMP Echo configuration submode and returns to global configuration mode.</td>
</tr>
<tr>
<td>22</td>
<td>`ip sla monitor schedule operation-number [life [forever</td>
<td>seconds]] [start-time {hh:mm:ss} [month day</td>
</tr>
</tbody>
</table>

**Example:**

Router(config-sla-monitor-echo)# `statistics-distribution-interval 10`

Router(config-sla-monitor-echo)# `tag TelnetPollServer1`

Router(config-sla-monitor-echo)# `threshold 10000`

Router(config-sla-monitor-echo)# `timeout 10000`

Router(config-sla-monitor-echo)# `tos 160`

Router(config-sla-monitor-echo)# `verify-data`

Router(config-sla-monitor-echo)# `vrf vpn-A`

Router(config-sla-monitor-echo)# `exit`

Router(config)# `ip sla monitor schedule 10 start-time now life forever`
### Command or Action

<table>
<thead>
<tr>
<th>Step 23</th>
<th>exit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Example:</td>
<td>Router(config)# exit</td>
</tr>
<tr>
<td>Purpose</td>
<td>(Optional) Exits global configuration mode and returns to privileged EXEC mode.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Step 24</th>
<th>show ip sla monitor configuration [operation-number]</th>
</tr>
</thead>
<tbody>
<tr>
<td>Example:</td>
<td>Router# show ip sla monitor configuration 10</td>
</tr>
<tr>
<td>Purpose</td>
<td>(Optional) Displays configuration values including all defaults for all IP SLAs operations or a specified operation.</td>
</tr>
</tbody>
</table>

### 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

<table>
<thead>
<tr>
<th>Related Topic</th>
<th>Document Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>Overview of Cisco IOS IP SLAs</td>
<td>“Cisco IOS IP SLAs Overview” chapter of the Cisco IOS IP SLAs Configuration Guide, Release 12.4</td>
</tr>
<tr>
<td>Cisco IOS IP SLAs commands: complete command syntax, defaults, command mode, command history, usage guidelines, and examples</td>
<td>Cisco IOS IP SLAs Command Reference, Release 12.4</td>
</tr>
</tbody>
</table>

## Standards

<table>
<thead>
<tr>
<th>Standards</th>
<th>Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>No new or modified standards are supported by this feature, and support for existing standards has not been modified by this feature.</td>
<td>—</td>
</tr>
</tbody>
</table>

## MIBs

<table>
<thead>
<tr>
<th>MIBs</th>
<th>MIBs Link</th>
</tr>
</thead>
<tbody>
<tr>
<td>CISCO-RTTMON-MIB</td>
<td>To locate and download MIBs for selected platforms, Cisco IOS releases, and feature sets, use Cisco MIB Locator found at the following URL: <a href="http://www.cisco.com/go/mibs">http://www.cisco.com/go/mibs</a></td>
</tr>
</tbody>
</table>

## RFCs

<table>
<thead>
<tr>
<th>RFCs</th>
<th>Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>RFC 862</td>
<td>Echo Protocol</td>
</tr>
</tbody>
</table>
Technical Assistance

<table>
<thead>
<tr>
<th>Description</th>
<th>Link</th>
</tr>
</thead>
<tbody>
<tr>
<td>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.</td>
<td><a href="http://www.cisco.com/public/support/tac/home.shtml">http://www.cisco.com/public/support/tac/home.shtml</a></td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>Feature Name</th>
<th>Releases</th>
<th>Feature Information</th>
</tr>
</thead>
<tbody>
<tr>
<td>IP SLAs ICMP Echo Operation</td>
<td>12.3(14)T</td>
<td>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.</td>
</tr>
</tbody>
</table>