



Configuring IP SLAs ICMP Path Jitter Operations

Last Updated: August 27, 2012

This document describes how to configure an IP Service Level Agreements (SLAs) Internet Control Message Protocol (ICMP) Path Jitter operation to monitor hop-by-hop jitter (inter-packet delay variance). This document also demonstrates how the data gathered using the Path Jitter operations can be displayed and analyzed using Cisco commands.

- [Finding Feature Information, page 1](#)
- [Prerequisites for ICMP Path Jitter Operations, page 1](#)
- [Restrictions for ICMP Path Jitter Operations, page 2](#)
- [Information About IP SLAs ICMP Path Jitter Operations, page 2](#)
- [How to Configure the IP SLAs ICMP Path Jitter Operation, page 3](#)
- [Configuration Examples for IP SLAs ICMP Path Jitter Operations, page 10](#)
- [Additional References, page 11](#)
- [Feature Information for IP SLAs ICMP Path Jitter Operations, page 12](#)

Finding Feature Information

Your software release may not support all the features documented in this module. For the latest caveats and feature information, see [Bug Search Tool](#) and 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 table at the end of this module.

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

Prerequisites for ICMP Path Jitter Operations

- Before configuring any IP SLAs application, you can use the **show ip sla application** command to verify that the operation type is supported on your software image.



Americas Headquarters:
Cisco Systems, Inc., 170 West Tasman Drive, San Jose, CA 95134-1706 USA

- In contrast with other IP SLAs operations, the IP SLAs Responder does not have to be enabled on either the target device or intermediate devices for Path Jitter operations. However, the operational efficiency may improve if you enable the IP SLAs Responder.

Restrictions for ICMP Path Jitter Operations

- IP SLAs - ICMP Path Jitter is ICMP-based. ICMP-based operations can compensate for source processing delay but cannot compensate for target processing delay. For more robust monitoring and verifying, we recommend that you use the IP SLAs UDP Jitter operation.
- The jitter values obtained using IP SLAs - ICMP Path Jitter are approximates because ICMP does not provide the capability to embed processing times on devices in the packet. If the target device does not place ICMP packets as the highest priority, then the device will not respond properly. ICMP performance also can be affected by the configuration of priority queueing on the device and by ping response.
- A path jitter operation does not support hourly statistics and hop information.
- Unlike other IP SLAs operations, the ICMP Path Jitter operation is not supported in the RTTMON MIB. Path jitter operations can only be configured using Cisco commands and statistics can only be returned using the **show ip sla** commands.
- IP SLAs - Path Jitter does not support the IP SLAs History feature (statistics history buckets) because of the large data volume involved with jitter operations.
- The following commands, available in path jitter configuration mode, do not apply to path jitter operations:
 - **history buckets-kept**
 - **history distributions-of-statistics-kept**
 - **history enhanced**
 - **history filter**
 - **history hours-of-statistics-kept**
 - **history lives-kept**
 - **history statistics-distribution-interval**
 - **samples-of-history-kept**
 - **lsr-path**
 - **tos**
 - **threshold**
 - **verify-data**

Information About IP SLAs ICMP Path Jitter Operations

- [ICMP Path Jitter Operation, page 2](#)

ICMP Path Jitter Operation

IP SLAs - ICMP Path Jitter provides hop-by-hop jitter, packet loss, and delay measurement statistics in an IP network. Path jitter operations function differently than the standard UDP Jitter operation, which provides total one-way data and total round-trip data.

An ICMP Path Jitter operation can be used as a supplement to the standard UDP Jitter operation. For example, results from a UDP Jitter operation may indicate unexpected delays or high jitter values; an ICMP Path Jitter operation could then be used to troubleshoot the network path and determine if traffic is bottlenecking in a particular segment along the transmission path.

The operation first discovers the hop-by-hop IP route from the source to the destination using a traceroute utility, and then uses ICMP echoes to determine the response times, packet loss and approximate jitter values for each hop along the path. The jitter values obtained using IP SLAs - ICMP Path Jitter are approximates because ICMP only provides round trip times.

ICMP Path Jitter operations function by tracing the IP path from a source device to a specified destination device, then sending N number of Echo probes to each hop along the traced path, with a time interval of T milliseconds between each Echo probe. The operation as a whole is repeated at a frequency of once every F seconds. The attributes are user-configurable, as shown here:

Path Jitter Operation Parameter	Default	Configured Using:
Number of echo probes (N)	10 echos	path-jitter command, num-packets option
Time between Echo probes, in milliseconds (T)	20 ms	path-jitter command, interval option Note The operation's frequency is different than the operation's interval.
The frequency of how often the operation is repeated (F)	once every 60 seconds	frequency command

How to Configure the IP SLAs ICMP Path Jitter Operation

- [Configuring the IP SLAs Responder on a Destination Device, page 3](#)
- [Configuring an ICMP Path Jitter Operation on the Source Device, page 4](#)
- [Scheduling IP SLAs Operations, page 8](#)

Configuring the IP SLAs Responder on a Destination Device



Note

An IP SLAs Responder is not required on either the target device or intermediate devices for path jitter operations. However, operational efficiency may improve if you enable the IP SLAs Responder.

The networking device to be used as the responder must be a Cisco device and you must have connectivity to that device through the network.

SUMMARY STEPS

1. enable
2. configure terminal
3. ip sla responder
4. exit

DETAILED STEPS

	Command or Action	Purpose
Step 1	enable Example: Device> enable	Enables privileged EXEC mode. <ul style="list-style-type: none"> Enter your password if prompted.
Step 2	configure terminal Example: Device# configure terminal	Enters global configuration mode.
Step 3	ip sla responder Example: Example: Device(config)# ip sla responder	(Optional) Temporarily enables IP SLAs Responder functionality on a Cisco device in response to control messages from source. <ul style="list-style-type: none"> Control is enabled by default.
Step 4	exit Example: Device(config)# exit	(Optional) Exits global configuration mode and returns to privileged EXEC mode.

Configuring an ICMP Path Jitter Operation on the Source Device

Perform only one of the following procedures in this section:

- [Configuring a Basic ICMP Path Jitter Operation, page 4](#)
- [Configuring an ICMP Path Jitter Operation with Additional Parameters, page 6](#)

Configuring a Basic ICMP Path Jitter Operation

SUMMARY STEPS

1. **enable**
2. **configure terminal**
3. **ip sla *operation-number***
4. **path-jitter** {*destination-ip-address* | *destination-hostname*} [**source-ip** {*ip-address* | *hostname*}] [**num-packets** *packet-number*] [**interval** *milliseconds*] [**targetOnly**]
5. **frequency** *seconds*
6. **end**

DETAILED STEPS

	Command or Action	Purpose
Step 1	enable Example: Device> enable	Enables privileged EXEC mode. <ul style="list-style-type: none"> Enter your password if prompted.
Step 2	configure terminal Example: Device# configure terminal	Enters global configuration mode.
Step 3	ip sla <i>operation-number</i> Example: Device(config)# ip sla 10	Begins configuration for an IP SLAs operation and enters IP SLA configuration mode.
Step 4	path-jitter { <i>destination-ip-address</i> <i>destination-hostname</i> } [source-ip { <i>ip-address</i> <i>hostname</i> }] [num-packets <i>packet-number</i>] [interval <i>milliseconds</i>] [targetOnly] Example: Device(config-ip-sla)# path-jitter 172.31.1.129 source-ip 10.2.30.1 num-packets 12 interval 22	Enters IP SLA Path Jitter configuration mode for configuring an ICMP Path Jitter operation.
Step 5	frequency <i>seconds</i> Example: Device(config-ip-sla-pathJitter)# frequency 30	(Optional) Sets the rate at which a specified IP SLAs operation repeats.

Command or Action	Purpose
Step 6 <code>end</code> Example: <code>Device(config-ip-sla-pathJitter)# end</code>	Exits to privileged EXEC mode.

Example

In the following example, the **targetOnly** keyword is used to bypass the hop-by-hop measurements. With this version of the command, echo probes will be sent to the destination only.

```
Device(config)# ip sla 1
Device(config-ip-sla)# path-jitter 172.17.246.20 num-packets 50 interval 30 targetOnly
```

Configuring an ICMP Path Jitter Operation with Additional Parameters

SUMMARY STEPS

1. `enable`
2. `configure terminal`
3. `ip sla operation-number`
4. `path-jitter {destination-ip-address | destination-hostname} [source-ip {ip-address | hostname}] [num-packets packet-number] [interval milliseconds] [targetOnly]`
5. `frequency seconds`
6. `owner owner-id`
7. `request-data-size bytes`
8. `tag text`
9. `timeout milliseconds`
10. `vrf vrf-name`
11. `end`

DETAILED STEPS

Command or Action	Purpose
Step 1 <code>enable</code> Example: <code>Device> enable</code>	Enables privileged EXEC mode. <ul style="list-style-type: none"> • Enter your password if prompted.

	Command or Action	Purpose
Step 2	configure terminal Example: Device# configure terminal	Enters global configuration mode.
Step 3	ip sla operation-number Example: Device(config)# ip sla 10	Begins configuration for an IP SLAs operation and enters IP SLA configuration mode.
Step 4	path-jitter {destination-ip-address destination-hostname} [source-ip {ip-address hostname}] [num-packets packet-number] [interval milliseconds] [targetOnly] Example: Device(config-ip-sla)# path-jitter 172.31.1.129 source-ip 10.2.30.1 num-packets 12 interval 22	Enters IP SLA Path Jitter configuration mode for defining an ICMP Path Jitter operation.
Step 5	frequency seconds Example: Device(config-ip-sla-pathJitter)# frequency 30	(Optional) Sets the rate at which a specified IP SLAs operation repeats.
Step 6	owner owner-id Example: Device(config-ip-sla-pathJitter)# owner admin	(Optional) Configures the Simple Network Management Protocol (SNMP) owner of an IP SLAs operation.
Step 7	request-data-size bytes Example: Device(config-ip-sla-pathJitter)# request-data-size 64	(Optional) Sets the protocol data size in the payload of an IP SLAs operation's request packet.
Step 8	tag text Example: Device(config-ip-sla-pathJitter)# tag TelnetPollServer1	(Optional) Creates a user-specified identifier for an IP SLAs operation.

	Command or Action	Purpose
Step 9	timeout <i>milliseconds</i> Example: Device(config-ip-sla-pathJitter)# timeout 10000	(Optional) Sets the amount of time an IP SLAs operation waits for a response from its request packet.
Step 10	vrf <i>vrf-name</i> Example: Device(config-ip-sla-pathJitter)# vrf vpn-A	(Optional) Allows monitoring within Multiprotocol Label Switching (MPLS) Virtual Private Networks (VPNs) using IP SLAs operations.
Step 11	end Example: Device(config-ip-sla-pathJitter)# end	Exits to privileged EXEC mode.

Scheduling IP SLAs Operations



Note

- All IP SLAs operations to be scheduled must be already configured.
- The frequency of all operations scheduled in a multioperation group must be the same.
- The list of one or more operation ID numbers to be added to a multioperation group is limited to a maximum of 125 characters in length, including commas (,).

SUMMARY STEPS

1. **enable**
2. **configure terminal**
3. Do one of the following:
 - **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**]
 - **ip sla group schedule** *group-operation-number* *operation-id-numbers* **schedule-period** *schedule-period-range* [**ageout** *seconds*] [**frequency** *group-operation-frequency*] [**life** {**forever** | *seconds*}] [**start-time**{*hh:mm[:ss]* [*month day* | *day month*] | **pending** | **now** | **after** *hh:mm[:ss]*}]
4. **exit**
5. **show ip sla group schedule**
6. **show ip sla configuration**

DETAILED STEPS

Command or Action	Purpose
Step 1 enable Example: <pre>Device> enable</pre>	Enables privileged EXEC mode. <ul style="list-style-type: none"> Enter your password if prompted.
Step 2 configure terminal Example: <pre>Device# configure terminal</pre>	Enters global configuration mode.
Step 3 Do one of the following: <ul style="list-style-type: none"> ip sla schedule <i>operation-number</i> [life {forever <i>seconds</i>}] [start-time {<i>hh:mm:ss</i> <i>month day day month</i>} pending now after <i>hh:mm:ss</i>] [ageout <i>seconds</i>] [recurring] ip sla group schedule <i>group-operation-number</i> <i>operation-id-numbers</i> schedule-period <i>schedule-period-range</i> [ageout <i>seconds</i>] [frequency <i>group-operation-frequency</i>] [life {forever <i>seconds</i>}] [start-time {<i>hh:mm:ss</i> <i>month day day month</i>} pending now after <i>hh:mm:ss</i>}] Example: <pre>Device(config)# ip sla schedule 10 life forever start-time now</pre> Example: <pre>Device(config)# ip sla group schedule 1 3,4,6-9 life forever start-time now</pre>	<ul style="list-style-type: none"> Configures the scheduling parameters for an individual IP SLAs operation. Specifies an IP SLAs operation group number and the range of operation numbers for a multioperation scheduler.
Step 4 exit Example: <pre>Device(config)# exit</pre>	Exits to privileged EXEC mode.
Step 5 show ip sla group schedule Example: <pre>Device# show ip sla group schedule</pre>	(Optional) Displays IP SLAs group schedule details.

Command or Action	Purpose
Step 6 <code>show ip sla configuration</code> Example: Device# <code>show ip sla configuration</code>	(Optional) Displays IP SLAs configuration details.

- [Troubleshooting Tips, page 10](#)
- [What to Do Next, page 10](#)

Troubleshooting Tips

- If the IP SLAs operation is not running and not 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 data verification is 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 add proactive threshold conditions and reactive triggering for generating traps (or for starting another operation) to an IP SLAs operation, see the “Configuring Proactive Threshold Monitoring” section.

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

Configuration Examples for IP SLAs ICMP Path Jitter Operations

- [Example Configuring a Path Jitter Operation, page 10](#)

Example Configuring a Path Jitter Operation

The following example shows the output when the ICMP Path Jitter operation is configured. Because the path jitter operation does not support hourly statistics and hop information, the output for the **show ip sla statistics** command for the path jitter operation displays only the statistics for the first hop.

The following example shows the output when the ICMP Path Jitter operation is configured.

```
Device# configure terminal
Device(config)# ip sla 15011
```

```

Device(config-sla-monitor)# path-jitter 10.222.1.100 source-ip 10.222.3.100 num-packets 20
Device(config-sla-monitor-pathJitter)# frequency 30
Device(config-sla-monitor-pathJitter)# exit
Device(config)# ip sla schedule 15011 life forever start-time now
Device(config)# exit
Device# show ip sla statistics 15011
Round Trip Time (RTT) for          Index 15011
      Latest RTT: 1 milliseconds
Latest operation start time: 15:37:35.443 EDT Mon Jun 16 2008
Latest operation return code: OK
---- Path Jitter Statistics ----
Hop IP 10.222.3.252:
Round Trip Time milliseconds:
      Latest RTT: 1 ms
      Number of RTT: 20
      RTT Min/Avg/Max: 1/1/3 ms
Jitter time milliseconds:
      Number of jitter: 2
      Jitter Min/Avg/Max: 2/2/2 ms
Packet Values:
      Packet Loss (Timeouts): 0
      Out of Sequence: 0
      Discarded Samples: 0
Operation time to live: Forever

```

Additional References

Related Documents

Related Topic	Document Title
Cisco IOS commands	Cisco IOS Master Commands List, All Releases
Cisco IOS IP SLAs commands	Cisco IOS IP SLAs Command Reference

Standards and RFCs

Standard/RFC	Title
RFC 1889 ¹	<i>RTP: A Transport Protocol for Real-Time Applications</i> ; see the section “Estimating the Interarrival Jitter”

MIBs

MIBs	MIBs Link
MIB support for the Path Jitter operation is not provided.	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

¹ Support for the listed RFC is not claimed; listed as a reference only.

Technical Assistance

Description	Link
The Cisco Support and Documentation website provides online resources to download documentation, software, and tools. Use these resources to install and configure the software and to troubleshoot and resolve technical issues with Cisco products and technologies. Access to most tools on the Cisco Support and Documentation website requires a Cisco.com user ID and password.	http://www.cisco.com/cisco/web/support/index.html

Feature Information for IP SLAs ICMP Path Jitter Operations

The following table provides release information about the feature or features described in this module. This table lists only the software release that introduced support for a given feature in a given software release train. Unless noted otherwise, subsequent releases of that software release train also support that feature.

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

Table 1 *Feature Information for IP SLAs ICMP Path Jitter Operations*

Feature Name	Releases	Feature Information
IP SLAs Path Jitter Operation	12.2(31)SB2	The Cisco IOS IP SLAs Internet Control Message Protocol (ICMP) path jitter operation allows you to measure hop-by-hop jitter (inter-packet delay variance).
	12.2(33)SRB1	
	12.2(33)SXH	
	12.3(14)T	
	Cisco IOS XE Release 2.1	
	15.0(1)S	
IPSLA 4.0 - IP v6 phase2	Cisco IOS XE 3.1.0SG	Support was added for operability in IPv6 networks. The following commands are introduced or modified: path-jitter , show ip sla configuration , show ip sla summary .
	15.2(3)T	
	Cisco IOS XE Release 3.7S	

Cisco and the Cisco logo are trademarks or registered trademarks of Cisco and/or its affiliates in the U.S. and other countries. To view a list of Cisco trademarks, go to this URL: www.cisco.com/go/trademarks.

Third-party trademarks mentioned are the property of their respective owners. The use of the word partner does not imply a partnership relationship between Cisco and any other company. (1110R)

Any Internet Protocol (IP) addresses and phone numbers used in this document are not intended to be actual addresses and phone numbers. Any examples, command display output, network topology diagrams, and other figures included in the document are shown for illustrative purposes only. Any use of actual IP addresses or phone numbers in illustrative content is unintentional and coincidental.

© 2012 Cisco Systems, Inc. All rights reserved.