



# IP SLAs—Analyzing IP Service Levels Using the UDP Echo Operation

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This module describes how to use the Cisco IOS IP Service Level Agreements (SLAs) User Datagram Protocol (UDP) Echo operation to monitor end-to-end response time between a Cisco router and devices using IP. 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. UDP echo accuracy is enhanced by using the IP SLAs Responder at the destination Cisco router. This module also demonstrates how the results of the UDP echo operation can be displayed and analyzed to determine how a UDP application is 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 UDP Echo Operation](#)” section on page 14.

## **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 UDP Echo Operation

Before configuring the IP SLAs UDP 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 UDP 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 UDP Echo Operation

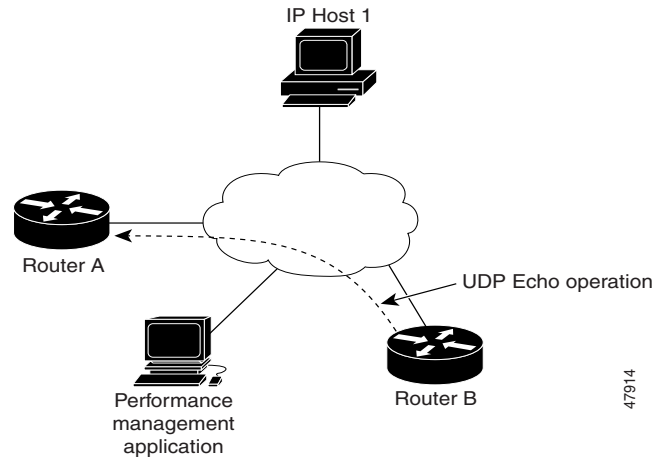
To perform the tasks required to monitor UDP performance using IP SLA, you should understand the following concept:

- [UDP Echo Operation, page 2](#)

## UDP Echo Operation

The UDP echo operation measures end-to-end response time between a Cisco router and devices using IP. UDP is a network layer (Layer 3) Internet protocol that is used for many IP services. UDP echo is used to measure response times and test end-to-end connectivity.

In [Figure 1](#) Router A has been configured as an IP SLAs Responder and Router B is configured as the source IP SLAs device.

**Figure 1** UDP Echo Operation

Response time (round-trip time) is computed by measuring the time taken between sending a UDP echo request message from Router B to the destination router—Router A—and receiving a UDP echo reply from Router A. UDP echo accuracy is enhanced by using the IP SLAs Responder at Router A, the destination Cisco router. If the destination router is a Cisco router, then IP SLAs sends a UDP datagram to any port number that you specified. Using the IP SLAs Responder is optional for a UDP echo operation when using Cisco devices. The IP SLAs Responder cannot be configured on non-Cisco devices.

The results of a UDP echo operation can be useful in troubleshooting issues with business-critical applications by determining the round-trip delay times and testing connectivity to both Cisco and non-Cisco devices.

## How to Configure the IP SLAs UDP Echo Operation

This section contains the following procedures:

- [Configuring the IP SLAs Responder on the Destination Device, page 3](#)
- [Configuring and Scheduling a UDP Echo Operation on the Source Device, page 4](#) (required)

### Configuring the IP SLAs Responder on the Destination Device

Perform this task to enable the IP SLAs Responder on the destination Cisco device of a UDP echo operation. A UDP echo operation measures round-trip delay times and tests connectivity to Cisco and non-Cisco devices.

#### Prerequisites

If you are using the IP SLAs Responder, ensure that the networking device to be used as the responder is a Cisco device and that you have connectivity to that device through the network.

**SUMMARY STEPS**

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

**DETAILED STEPS**

	<b>Command or Action</b>	<b>Purpose</b>
<b>Step 1</b>	<b>enable</b>  <b>Example:</b> Router> enable	Enables privileged EXEC mode. <ul style="list-style-type: none"> <li>• Enter your password if prompted.</li> </ul>
<b>Step 2</b>	<b>configure terminal</b>  <b>Example:</b> Router# configure terminal	Enters global configuration mode.
<b>Step 3</b>	<b>ip sla monitor responder</b>  <b>Example:</b> Router(config)# ip sla monitor responder	Enables IP SLAs Responder functionality on a Cisco device.
<b>Step 4</b>	<b>exit</b>  <b>Example:</b> Router(config)# exit	(Optional) Exits global configuration mode and returns to privileged EXEC mode.

**Configuring and Scheduling a UDP Echo Operation on the Source Device**

To monitor UDP performance on a device, use the IP SLAs UDP echo operation. A UDP echo operation measures round-trip delay times and tests connectivity to Cisco and non-Cisco devices.

**Prerequisites**

If you are using the IP SLAs Responder, ensure that you have completed the [“Configuring the IP SLAs Responder on the Destination Device”](#) section on page 3 before you start this task.

Perform one of the following tasks in this section, depending on whether you want to configure a basic UDP echo operation or configure a UDP echo operation with optional parameters:

- [Configuring and Scheduling a Basic UDP Echo Operation on the Source Device, page 4](#)
- [Configuring and Scheduling a UDP Echo Operation with Optional Parameters on the Source Device, page 7](#)

**Configuring and Scheduling a Basic UDP Echo Operation on the Source Device**

Perform this task to enable a UDP 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 udpEcho dest-ipaddr** {*ip-address* | *ip-hostname*} **dest-port** *port-number*
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**
9. **show ip sla monitor configuration** [*operation-number*]

**DETAILED STEPS**

	Command or Action	Purpose
Step 1	<b>enable</b>  <b>Example:</b> Router> enable	Enables privileged EXEC mode. <ul style="list-style-type: none"> <li>• Enter your password if prompted.</li> </ul>
Step 2	<b>configure terminal</b>  <b>Example:</b> Router# configure terminal	Enters global configuration mode.
Step 3	<b>ip sla monitor</b> <i>operation-number</i>  <b>Example:</b> Router(config)# ip sla monitor 10	Begins configuration for an IP SLAs operation and enters IP SLA monitor configuration mode.

	Command or Action	Purpose
Step 4	<pre>type udpEcho dest-ipaddr {ip-address   ip-hostname} dest-port port-number</pre> <p><b>Example:</b> Router(config-sla-monitor)# type udpEcho dest-ipaddr 172.29.139.134 dest-port 5000</p>	<p>Defines a UDP echo operation and enters IP SLA Monitor UDP configuration mode.</p> <ul style="list-style-type: none"> <li>Use the <b>dest-ipaddr</b> keyword and associated options to specify an IP address or designated IP name as the destination of the UDP operation.</li> <li>Use the <b>dest-port</b> keyword and <i>port-number</i> value to specify the destination port number in the range from 1 to 65535.</li> </ul> <p><b>Note</b> Only partial syntax is used in this example. For more details about the options available in the FTP operation syntax, see the “<a href="#">Configuring and Scheduling a UDP Echo Operation with Optional Parameters on the Source Device</a>” section on <a href="#">page 7</a>.</p>
Step 5	<pre>frequency seconds</pre> <p><b>Example:</b> Router(config-sla-monitor-udp)# frequency 30</p>	<p>(Optional) Sets the rate at which a specified IP SLAs operation repeats.</p>
Step 6	<pre>exit</pre> <p><b>Example:</b> Router(config-sla-monitor-udp)# exit</p>	<p>Exits IP SLA monitor UDP configuration mode and returns to global configuration mode.</p>
Step 7	<pre>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]</pre> <p><b>Example:</b> Router(config)# ip sla monitor schedule 5 start-time now life forever</p>	<p>Configures the scheduling parameters for an individual IP SLAs operation.</p>
Step 8	<pre>exit</pre> <p><b>Example:</b> Router(config)# exit</p>	<p>(Optional) Exits global configuration mode and returns to privileged EXEC mode.</p>
Step 9	<pre>show ip sla monitor configuration [operation-number]</pre> <p><b>Example:</b> Router# show ip sla monitor configuration 10</p>	<p>(Optional) Displays configuration values including all defaults for all IP SLAs operations or a specified operation.</p>

## Examples

The following example shows the configuration of an IP SLAs operation type of UDP echo that will start immediately and run indefinitely.

```
ip sla monitor 5
  type udpEcho dest-ipaddr 172.29.139.134 dest-port 5000
  frequency 30
!
ip sla monitor schedule 5 start-time now life forever.
```

## 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.

## Configuring and Scheduling a UDP Echo Operation with Optional Parameters on the Source Device

Perform this task to enable a UDP echo operation on the source device and configure some optional IP SLAs parameters. The source device is the location at which the measurement statistics are stored.



### 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 udpEcho dest-ipaddr** {*ip-address* | *ip-hostname*} **dest-port** *port-number* [**source-ipaddr** {*ip-address* | *ip-hostname*} **source-port** *port-number*] [**control** {**enable** | **disable**}]
5. **buckets-of-history-kept** *size*
6. **data-pattern** *hex-pattern*
7. **distributions-of-statistics-kept** *size*
8. **enhanced-history** [**interval** *seconds*] [**buckets** *number-of-buckets*]
9. **filter-for-history** {**none** | **all** | **overThreshold** | **failures**}
10. **frequency** *seconds*
11. **hours-of-statistics-kept** *hours*

12. **lives-of-history-kept** *lives*
13. **owner** *owner-id*
14. **request-data-size** *bytes*
15. **statistics-distribution-interval** *milliseconds*
16. **tag** *text*
17. **threshold** *milliseconds*
18. **timeout** *milliseconds*
19. **tos** *number*
20. **verify-data**
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	<b>enable</b>  <b>Example:</b> Router> enable	Enables privileged EXEC mode. <ul style="list-style-type: none"> <li>Enter your password if prompted.</li> </ul>
Step 2	<b>configure terminal</b>  <b>Example:</b> Router# configure terminal	Enters global configuration mode.
Step 3	<b>ip sla monitor</b> <i>operation-number</i>  <b>Example:</b> Router(config)# ip sla monitor 10	Begins configuration for an IP SLAs operation and enters IP SLA monitor configuration mode.

	Command or Action	Purpose
Step 4	<pre>type udpEcho dest-ipaddr {ip-address   ip-hostname} dest-port port-number [source-ipaddr {ip-address   ip-hostname} source-port port-number] [control {enable   disable}]</pre> <p><b>Example:</b> Router(config-sla-monitor)# type udpEcho dest-ipaddr 172.29.139.134 dest-port 5000</p>	<p>Defines a UDP echo operation and enters IP SLA Monitor UDP configuration mode.</p> <ul style="list-style-type: none"> <li>Use the <b>dest-ipaddr</b> keyword and associated options to specify an IP address or designated IP name as the destination of the UDP probe.</li> <li>Use the <b>dest-port</b> keyword and <i>port-number</i> value to specify the destination port number in the range from 1 to 65535.</li> <li>Use the optional <b>source-ipaddr</b> keyword and associated options to specify an IP address or designated IP name as the source of the UDP operation. This configuration is useful when IP SLAs packets are to be routed within an IPSec or GRE tunnel.</li> <li>Use the optional <b>source-port</b> keyword and <i>port-number</i> value to specify a source port number.</li> <li>Use the optional <b>control</b> keyword to specify that the IP SLAs control protocol should be used when running this operation. The control protocol is required when the target device is a Cisco router that does not natively provide the UDP service. Use the <b>disable</b> keyword when you want to disable the control protocol. The control protocol is enabled by default.</li> </ul>
Step 5	<pre>buckets-of-history-kept size</pre> <p><b>Example:</b> Router(config-sla-monitor-udp)# buckets-of-history-kept 25</p>	<p>(Optional) Sets the number of history buckets that are kept during the lifetime of an IP SLAs operation.</p>
Step 6	<pre>data-pattern hex-pattern</pre> <p><b>Example:</b> Router(config-sla-monitor-udp)# data-pattern</p>	<p>(Optional) Specifies the data pattern in an IP SLAs operation to test for data corruption.</p>
Step 7	<pre>distributions-of-statistics-kept size</pre> <p><b>Example:</b> Router(config-sla-monitor-udp)# distributions-of-statistics-kept 5</p>	<p>(Optional) Sets the number of statistics distributions kept per hop during an IP SLAs operation.</p>
Step 8	<pre>enhanced-history [interval seconds] [buckets number-of-buckets]</pre> <p><b>Example:</b> Router(config-sla-monitor-udp)# enhanced-history interval 900 buckets 100</p>	<p>(Optional) Enables enhanced history gathering for an IP SLAs operation.</p>

	Command or Action	Purpose
Step 9	<b>filter-for-history</b> {none   all   overThreshold   failures}  <b>Example:</b> Router(config-sla-monitor-udp)# filter-for-history failures	(Optional) Defines the type of information kept in the history table for an IP SLAs operation.
Step 10	<b>frequency</b> seconds  <b>Example:</b> Router(config-sla-monitor-udp)# frequency 30	(Optional) Sets the rate at which a specified IP SLAs operation repeats.
Step 11	<b>hours-of-statistics-kept</b> hours  <b>Example:</b> Router(config-sla-monitor-udp)# hours-of-statistics-kept 4	(Optional) Sets the number of hours for which statistics are maintained for an IP SLAs operation.
Step 12	<b>lives-of-history-kept</b> lives  <b>Example:</b> Router(config-sla-monitor-udp)# lives-of-history-kept 5	(Optional) Sets the number of lives maintained in the history table for an IP SLAs operation.
Step 13	<b>owner</b> owner-id  <b>Example:</b> Router(config-sla-monitor-udp)# owner admin	(Optional) Configures the Simple Network Management Protocol (SNMP) owner of an IP SLAs operation.
Step 14	<b>request-data-size</b> bytes  <b>Example:</b> Router(config-sla-monitor-udp)# request-data-size 64	(Optional) Sets the protocol data size in the payload of an IP SLAs operation's request packet.
Step 15	<b>statistics-distribution-interval</b> milliseconds  <b>Example:</b> Router(config-sla-monitor-udp)# statistics-distribution-interval 10	(Optional) Sets the time interval for each statistics distribution kept for an IP SLAs operation.
Step 16	<b>tag</b> text  <b>Example:</b> Router(config-sla-monitor-udp)# tag TelnetPollServer1	(Optional) Creates a user-specified identifier for an IP SLAs operation.
Step 17	<b>threshold</b> milliseconds  <b>Example:</b> Router(config-sla-monitor-udp)# threshold 10000	(Optional) Sets the upper threshold value for calculating network monitoring statistics created by an IP SLAs operation.

	Command or Action	Purpose
Step 18	<code>timeout milliseconds</code>  <b>Example:</b> Router(config-sla-monitor-udp)# timeout 10000	(Optional) Sets the amount of time an IP SLAs operation waits for a response from its request packet.
Step 19	<code>tos number</code>  <b>Example:</b> Router(config-sla-monitor-udp)# tos 160	(Optional) Defines a type of service (ToS) byte in the IP header of an IP SLAs operation.
Step 20	<code>verify-data</code>  <b>Example:</b> Router(config-sla-monitor-udp)# verify-data	(Optional) Causes an IP SLAs operation to check each reply packet for data corruption.
Step 21	<code>exit</code>  <b>Example:</b> Router(config-sla-monitor-udp)# exit	Exits UDP configuration submode and returns to global configuration mode.
Step 22	<code>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]</code>  <b>Example:</b> Router(config)# ip sla monitor schedule 5 start-time now life forever	Configures the scheduling parameters for an individual IP SLAs operation.
Step 23	<code>exit</code>  <b>Example:</b> Router(config)# exit	(Optional) Exits global configuration mode and returns to privileged EXEC mode.
Step 24	<code>show ip sla monitor configuration [operation-number]</code>  <b>Example:</b> 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 UDP echo operation number 5.

```
Router# show ip sla monitor configuration 5

Complete configuration Table (includes defaults)
Entry number: 5
Owner: jdoe
Tag: FLL-RO
Type of operation to perform: udpEcho
Target address: 172.29.139.134
Source address: 0.0.0.0
Target port: 5000
Source port: 0
```

```

Request size (ARR data portion): 160
Operation timeout (milliseconds): 1000
Type Of Service parameters: 128
Verify data: No
Data pattern:
Vrf Name:
Control Packets: enabled
Operation frequency (seconds): 30
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
Enhanced History:
Aggregation Interval:60 Buckets:2
Number of history Lives kept: 0
Number of history Buckets kept: 15
History Filter Type: None

```

## 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 UDP Echo Operation

This section contains the following example:

- [Configuring a UDP Echo Operation: Example, page 12](#)

## Configuring a UDP Echo Operation: Example

The following example configures an IP SLAs operation type of UDP echo that will start immediately and run indefinitely.

```

ip sla monitor 5
 type udpEcho dest-ipaddr 172.29.139.134 dest-port 5000
 frequency 30
 request-data-size 160
 tos 128
 timeout 1000

```

```
tag FLL-RO
ip sla monitor schedule 5 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 UDP echo operations using IP SLA.

## Related Documents

Related Topic	Document Title
Overview of Cisco IOS IP SLAs	“ <a href="#">Cisco IOS IP SLAs Overview</a> ” chapter of the <i>Cisco IOS IP SLAs Configuration Guide</i> , Release 12.4
Cisco IOS IP SLAs commands: complete command syntax, defaults, command mode, command history, usage guidelines, and examples	<a href="#">Cisco IOS IP SLAs Command Reference</a> , 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: <a href="http://www.cisco.com/go/mibs">http://www.cisco.com/go/mibs</a>

## RFCs

RFCs	Title
RFC 862	<i>Echo Protocol</i>

## 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.	<a href="http://www.cisco.com/public/support/tac/home.shtml">http://www.cisco.com/public/support/tac/home.shtml</a>

## Feature Information for the IP SLAs UDP 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.

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### 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 UDP Echo Operation**

Feature Name	Releases	Feature Information
IP SLAs UDP Jitter Operation	12.3(14)T	The Cisco IOS IP SLAs User Datagram Protocol (UDP) jitter operation allows you to measure round-trip delay, one-way delay, one-way jitter, one-way packet loss, and connectivity in networks that carry UDP traffic.

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