



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 IPv4 or IPv6. 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

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 UDP Echo Operation](#)” section on page 14.

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 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*.

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

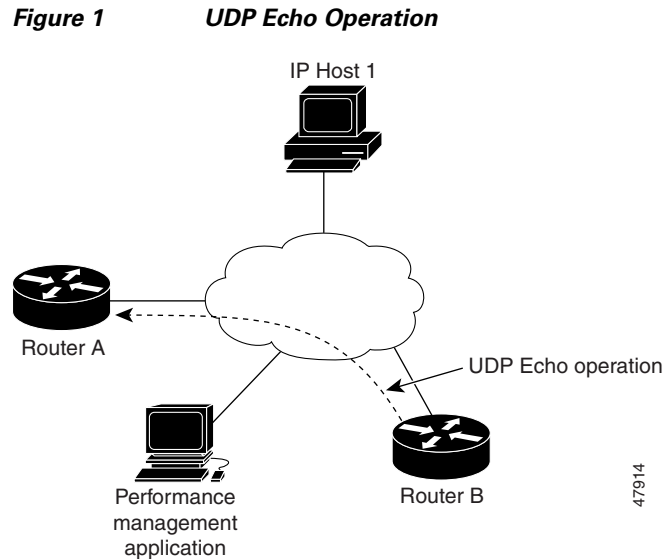
To perform the tasks required to monitor UDP performance using IP SLA, you should understand the following concept:

- [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.



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 responder**
4. **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 responder Example: Router(config)# ip sla responder	Enables IP SLAs Responder functionality on a Cisco device.
Step 4	exit Example: 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.

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](#)

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.

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.

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. **udp-echo** {*destination-ip-address* | *destination-hostname*} *destination-port* [**source-ip** {*ip-address* | *hostname*} **source-port** *port-number*] [**control** {**enable** | **disable**}]
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**
9. **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.
Step 3	ip sla operation-number Example: Router(config)# ip sla 10	Begins configuration for an IP SLAs operation and enters IP SLA configuration mode.
Step 4	udp-echo { <i>destination-ip-address</i> <i>destination-hostname</i> } <i>destination-port</i> [source-ip { <i>ip-address</i> <i>hostname</i> } source-port <i>port-number</i>] [control { enable disable }] Example: Router(config-ip-sla)# udp-echo 172.29.139.134 5000	Defines a UDP echo operation and enters IP SLA UDP configuration mode. <ul style="list-style-type: none"> • The control disable keyword combination should only be used if you are disabling the IP SLAs control protocol on both the source and target routers. The IP SLAs control protocol is enabled by default. • After entering this command, the command-line interface (CLI) enters IP SLA UDP echo configuration mode to allow you to specify optional characteristics for the operation.

	Command or Action	Purpose
Step 5	<code>frequency seconds</code> Example: Router(config-ip-sla-udp)# frequency 30	(Optional) Sets the rate at which a specified IP SLAs operation repeats.
Step 6	<code>exit</code> Example: Router(config-ip-sla-udp)# exit	Exits IP SLA UDP configuration mode and returns to global configuration mode.
Step 7	<code>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]</code> Example: Router(config)# ip sla schedule 5 start-time now life forever	Configures the scheduling parameters for an individual IP SLAs operation.
Step 8	<code>exit</code> Example: Router(config)# exit	(Optional) Exits global configuration mode and returns to privileged EXEC mode.
Step 9	<code>show ip sla configuration [operation-number]</code> 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 example shows the configuration of an IP SLAs operation type of UDP echo that will start immediately and run indefinitely.

```
ip sla 5
  udp-echo 172.29.139.134 5000
  frequency 30
!
ip sla 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 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.

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

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. **udp-echo** {*destination-ip-address* | *destination-hostname*} *destination-port* [**source-ip** {*ip-address* | *hostname*} **source-port** *port-number*] [**control** {**enable** | **disable**}]
5. **history buckets-kept** *size*
6. **data-pattern** *hex-pattern*
7. **history distributions-of-statistics-kept** *size*
8. **history enhanced** [**interval** *seconds*] [**buckets** *number-of-buckets*]
9. **history filter** {**none** | **all** | **overThreshold** | **failures**}
10. **frequency** *seconds*
11. **history hours-of-statistics-kept** *hours*
12. **history lives-kept** *lives*
13. **owner** *owner-id*
14. **request-data-size** *bytes*
15. **history statistics-distribution-interval** *milliseconds*
16. **tag** *text*
17. **threshold** *milliseconds*
18. **timeout** *milliseconds*
19. **tos** *number*
or
traffic-class *number*
20. **flow-label** *number*
21. **verify-data**
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.
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	udp-echo (<i>destination-ip-address</i> <i>destination-hostname</i>) <i>destination-port</i> [source-ip { <i>ip-address</i> <i>hostname</i> } source-port <i>port-number</i>] [control { enable disable }] Example: Router(config-ip-sla)# udp-echo 172.29.139.134 5000	Defines a UDP echo operation and enters IP SLA UDP configuration mode. <ul style="list-style-type: none"> • Use the dest-ipaddr keyword and associated options to specify an IP address or designated IP name as the destination of the UDP probe. • Use the dest-port keyword and <i>port-number</i> value to specify the destination port number in the range from 1 to 65535. • Use the optional source-ipaddr 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. • Use the optional source-port keyword and <i>port-number</i> value to specify a source port number. • Use the optional control 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 disable keyword when you want to disable the control protocol. The control protocol is enabled by default.
Step 5	history buckets-kept <i>size</i> Example: Router(config-ip-sla-udp)# history buckets-kept 25	(Optional) Sets the number of history buckets that are kept during the lifetime of an IP SLAs operation.

	Command or Action	Purpose
Step 6	data-pattern <i>hex-pattern</i> Example: Router(config-ip-sla-udp)# data-pattern	(Optional) Specifies the data pattern in an IP SLAs operation to test for data corruption.
Step 7	history distributions-of-statistics-kept <i>size</i> Example: Router(config-ip-sla-udp)# history distributions-of-statistics-kept 5	(Optional) Sets the number of statistics distributions kept per hop during an IP SLAs operation.
Step 8	history enhanced [interval <i>seconds</i>] [buckets <i>number-of-buckets</i>] Example: Router(config-ip-sla-udp)# history enhanced interval 900 buckets 100	(Optional) Enables enhanced history gathering for an IP SLAs operation.
Step 9	history filter { none all overThreshold failures } Example: Router(config-ip-sla-udp)# history filter failures	(Optional) Defines the type of information kept in the history table for an IP SLAs operation.
Step 10	frequency <i>seconds</i> Example: Router(config-ip-sla-udp)# frequency 30	(Optional) Sets the rate at which a specified IP SLAs operation repeats.
Step 11	history hours-of-statistics-kept <i>hours</i> Example: Router(config-ip-sla-udp)# history hours-of-statistics-kept 4	(Optional) Sets the number of hours for which statistics are maintained for an IP SLAs operation.
Step 12	history lives-kept <i>lives</i> Example: Router(config-ip-sla-udp)# history lives-kept 5	(Optional) Sets the number of lives maintained in the history table for an IP SLAs operation.
Step 13	owner <i>owner-id</i> Example: Router(config-ip-sla-udp)# owner admin	(Optional) Configures the Simple Network Management Protocol (SNMP) owner of an IP SLAs operation.
Step 14	request-data-size <i>bytes</i> Example: Router(config-ip-sla-udp)# 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 15	<p>history statistics-distribution-interval <i>milliseconds</i></p> <p>Example: Router(config-ip-sla-udp)# history statistics-distribution-interval 10</p>	(Optional) Sets the time interval for each statistics distribution kept for an IP SLAs operation.
Step 16	<p>tag <i>text</i></p> <p>Example: Router(config-ip-sla-udp)# tag TelnetPollServer1</p>	(Optional) Creates a user-specified identifier for an IP SLAs operation.
Step 17	<p>threshold <i>milliseconds</i></p> <p>Example: Router(config-ip-sla-udp)# threshold 10000</p>	(Optional) Sets the upper threshold value for calculating network monitoring statistics created by an IP SLAs operation.
Step 18	<p>timeout <i>milliseconds</i></p> <p>Example: Router(config-ip-sla-udp)# timeout 10000</p>	(Optional) Sets the amount of time an IP SLAs operation waits for a response from its request packet.
Step 19	<p>tos <i>number</i> or traffic-class <i>number</i></p> <p>Example: Router(config-ip-sla-jitter)# tos 160 or Example: Router(config-ip-sla-jitter)# traffic-class 160</p>	<p>(Optional) In an IPv4 network only, defines the ToS byte in the IPv4 header of an IP SLAs operation.</p> <p>or</p> <p>(Optional) In an IPv6 network only, defines the traffic class byte in the IPv6 header for a supported IP SLAs operation.</p>
Step 20	<p>flow-label <i>number</i></p> <p>Example: Router(config-ip-sla-udp)# flow-label 112233</p>	(Optional) In an IPv6 network only, defines the flow label field in the IPv6 header for a supported IP SLAs operation.
Step 21	<p>verify-data</p> <p>Example: Router(config-ip-sla-udp)# verify-data</p>	(Optional) Causes an IP SLAs operation to check each reply packet for data corruption.
Step 22	<p>exit</p> <p>Example: Router(config-ip-sla-udp)# exit</p>	Exits UDP configuration submenu and returns to global configuration mode.

	Command or Action	Purpose
Step 23	<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 5 start-time now life forever</p>	Configures the scheduling parameters for an individual IP SLAs operation.
Step 24	<pre>exit</pre> <p>Example: Router(config)# exit</p>	(Optional) Exits global configuration mode and returns to privileged EXEC mode.
Step 25	<pre>show ip sla configuration [operation-number]</pre> <p>Example: Router# show ip sla configuration 10</p>	(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 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 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 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 5
udp-echo 172.29.139.134 5000
frequency 30
request-data-size 160
tos 128
timeout 1000
tag FLL-RO
ip sla schedule 5 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 UDP echo operations using IP SLA.

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>	http://www.cisco.com/techsupport

Feature Information for the IP SLAs UDP 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 UDP Echo Operation

Feature Name	Releases	Feature Information
IP SLAs UDP Jitter 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 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.
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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