



## Configuring IP SLAs DHCP Operations

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This module describes how to configure an IP Service Level Agreements (SLAs) Dynamic Host Control Protocol (DHCP) operation to measure the response time between a Cisco device and a DHCP server to obtain an IP address.

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## 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 Table at the end of this document.

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

## Information About IP SLAs DHCP Operations

- [DHCP Operation, page 2](#)
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## DHCP Operation

DHCP provides a mechanism for allocating IP addresses dynamically so that addresses can be reused when hosts no longer need them. The DHCP operation measures the round-trip time (RTT) taken to discover a DHCP server and obtain a leased IP address from it. IP SLAs releases the leased IP address after the operation.

You can use the RTT information to determine DHCP performance levels.

There are two modes for the DHCP operation. By default, the DHCP operation sends discovery packets on every available IP interface on the router. If a specific server is configured on the router, discovery packets are sent only to the specified DHCP server.

## IP SLAs DHCP Relay Agent Options

A DHCP relay agent is any host that forwards DHCP packets between clients and servers. Relay agents are used to forward requests and replies between clients and servers when they are not on the same physical subnet. Relay agent forwarding is distinct from the normal forwarding of an IP router, where IP packets are switched between networks somewhat transparently. Relay agents receive DHCP messages and then generate a new DHCP message to send out on another interface.

The IP SLAs DHCP operation contains a relay agent information option--Option 82--which is inserted by the DHCP relay agent when forwarding client-originated DHCP packets to a DHCP server. Servers recognizing the relay agent information option may use the information to implement IP address or other parameter assignment policies. The DHCP server echoes the option back verbatim to the relay agent in server-to-client replies, and the relay agent strips the option before forwarding the reply to the client.

Option 82 includes three suboptions that convey information known by the relay agent:

- **circuit-id** --identifies the incoming circuit.
- **remote-id** --provides a trusted identifier for a remote high-speed modem.
- **subnet-mask** --identifies the mask of the logical IP subnet from which the relay agent received the client DHCP packet.

## How to Configure IP SLAs DHCP Operations

**Note**

There is no need to configure an IP SLAs responder on the destination device.

- [Configuring a DHCP Operation on the Source Device, page 2](#)
- [Scheduling IP SLAs Operations, page 6](#)

## Configuring a DHCP Operation on the Source Device

Perform one of the following tasks:

- [Configuring a Basic DHCP Operation, page 3](#)
- [Configuring a DHCP Operation with Optional Parameters, page 4](#)

## Configuring a Basic DHCP Operation

### SUMMARY STEPS

1. **enable**
2. **configure terminal**
3. **ip sla *operation-number***
4. **dhcp** {*destination-ip-address* | *destination-hostname*} [**source-ip** {*ip-address* | *hostname*}] [**option-82** [**circuit-id** *circuit-id*] [**remote-id** *remote-id*] [**subnet-mask** *subnet-mask*]]
5. **frequency *seconds***
6. **end**

### 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 <i>operation-number</i></b>  <b>Example:</b> Router(config)# ip sla 10	Begins configuration for an IP SLAs operation and enters IP SLA configuration mode.
Step 4	<b>dhcp</b> { <i>destination-ip-address</i>   <i>destination-hostname</i> } [ <b>source-ip</b> { <i>ip-address</i>   <i>hostname</i> }] [ <b>option-82</b> [ <b>circuit-id</b> <i>circuit-id</i> ] [ <b>remote-id</b> <i>remote-id</i> ] [ <b>subnet-mask</b> <i>subnet-mask</i> ]]  <b>Example:</b> Router(config-ip-sla)# dhcp 10.10.10.3	Defines a DHCP operation and enters IP SLA DHCP configuration mode.
Step 5	<b>frequency <i>seconds</i></b>  <b>Example:</b> Router(config-ip-sla-dhcp)# frequency 30	(Optional) Sets the rate at which a specified IP SLAs operation repeats.
Step 6	<b>end</b>	Exits to privileged EXEC mode.

	Command or Action	Purpose
	<b>Example:</b> Router(config-ip-sla-dhcp)# end	

## Configuring a DHCP Operation with Optional Parameters

### SUMMARY STEPS

1. **enable**
2. **configure terminal**
3. **ip sla operation-number**
4. **dhcp** { *destination-ip-address* | *destination-hostname* } [**source-ip** { *ip-address* | *hostname* }] [**option-82** [**circuit-id** *circuit-id*] [**remote-id** *remote-id*] [**subnet-mask** *subnet-mask*]]
5. **history buckets-kept** *size*
6. **history distributions-of-statistics-kept** *size*
7. **history enhanced** [**interval** *seconds*] [**buckets** *number-of-buckets*]
8. **history filter** { **none** | **all** | **overThreshold** | **failures** }
9. **frequency** *seconds*
10. **history hours-of-statistics-kept** *hours*
11. **history lives-kept** *lives*
12. **owner** *owner-id*
13. **history statistics-distribution-interval** *milliseconds*
14. **tag** *text*
15. **threshold** *milliseconds*
16. **timeout** *milliseconds*
17. **end**

### DETAILED STEPS

	Command or Action	Purpose
<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.

	Command or Action	Purpose
<b>Step 3</b>	<p><b>ip sla operation-number</b></p> <p><b>Example:</b></p> <pre>Router(config)# ip sla 10</pre>	Begins configuration for an IP SLAs operation and enters IP SLA configuration mode.
<b>Step 4</b>	<p><b>dhcp {destination-ip-address   destination-hostname} [source-ip {ip-address   hostname}] [option-82 [circuit-id circuit-id] [remote-id remote-id] [subnet-mask subnet-mask]]</b></p> <p><b>Example:</b></p> <pre>Router(config-ip-sla)# dhcp 10.10.10.3 option-82 circuit-id 10005A6F1234</pre>	Defines a DHCP operation and enters IP SLA DHCP configuration mode.
<b>Step 5</b>	<p><b>history buckets-kept size</b></p> <p><b>Example:</b></p> <pre>Router(config-ip-sla-dhcp)# history buckets-kept 25</pre>	(Optional) Sets the number of history buckets that are kept during the lifetime of an IP SLAs operation.
<b>Step 6</b>	<p><b>history distributions-of-statistics-kept size</b></p> <p><b>Example:</b></p> <pre>Router(config-ip-sla-dhcp)# history distributions-of-statistics-kept 5</pre>	(Optional) Sets the number of statistics distributions kept per hop during an IP SLAs operation.
<b>Step 7</b>	<p><b>history enhanced [interval seconds] [buckets number-of-buckets]</b></p> <p><b>Example:</b></p> <pre>Router(config-ip-sla-dhcp)# history enhanced interval 900 buckets 100</pre>	(Optional) Enables enhanced history gathering for an IP SLAs operation.
<b>Step 8</b>	<p><b>history filter {none   all   overThreshold   failures}</b></p> <p><b>Example:</b></p> <pre>Router(config-ip-sla-dhcp)# history filter failures</pre>	(Optional) Defines the type of information kept in the history table for an IP SLAs operation.
<b>Step 9</b>	<p><b>frequency seconds</b></p> <p><b>Example:</b></p> <pre>Router(config-ip-sla-dhcp)# frequency 30</pre>	(Optional) Sets the rate at which a specified IP SLAs operation repeats.
<b>Step 10</b>	<p><b>history hours-of-statistics-kept hours</b></p> <p><b>Example:</b></p> <pre>Router(config-ip-sla-dhcp)# history hours-of-statistics-kept 4</pre>	(Optional) Sets the number of hours for which statistics are maintained for an IP SLAs operation.

	Command or Action	Purpose
Step 11	<b>history lives-kept</b> <i>lives</i>  <b>Example:</b> Router(config-ip-sla-dhcp)# history lives-kept 5	(Optional) Sets the number of lives maintained in the history table for an IP SLAs operation.
Step 12	<b>owner</b> <i>owner-id</i>  <b>Example:</b> Router(config-ip-sla-dhcp)# owner admin	(Optional) Configures the Simple Network Management Protocol (SNMP) owner of an IP SLAs operation.
Step 13	<b>history statistics-distribution-interval</b> <i>milliseconds</i>  <b>Example:</b> Router(config-ip-sla-dhcp)# history statistics-distribution-interval 10	(Optional) Sets the time interval for each statistics distribution kept for an IP SLAs operation.
Step 14	<b>tag</b> <i>text</i>  <b>Example:</b> Router(config-ip-sla-dhcp)# tag TelnetPollServer1	(Optional) Creates a user-specified identifier for an IP SLAs operation.
Step 15	<b>threshold</b> <i>milliseconds</i>  <b>Example:</b> Router(config-ip-sla-dhcp)# threshold 10000	(Optional) Sets the upper threshold value for calculating network monitoring statistics created by an IP SLAs operation.
Step 16	<b>timeout</b> <i>milliseconds</i>  <b>Example:</b> Router(config-ip-sla-dhcp)# timeout 10000	(Optional) Sets the amount of time an IP SLAs operation waits for a response from its request packet.
Step 17	<b>end</b>  <b>Example:</b> Router(config-ip-sla-dhcp)# 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.
- List of one or more operation ID numbers to be added to a multioperation group is limited to a maximum of 125 characters, 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
<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>	Do one of the following: <ul style="list-style-type: none"> <li>• <b>ip sla schedule</b> <i>operation-number</i> [<b>life</b> {<b>forever</b>   <i>seconds</i>}] [<b>start-time</b> {<i>hh : mm[: ss]</i> [<i>month day</i>   <i>day month</i>]   <b>pending</b>   <b>now</b>   <b>after</b> <i>hh : mm : ss</i>}] [<b>ageout</b> <i>seconds</i>] [<b>recurring</b>]</li> <li>• <b>ip sla group schedule</b> <i>group-operation-number</i> <i>operation-id-numbers</i> <b>schedule-period</b> <i>schedule-period-range</i> [<b>ageout</b> <i>seconds</i>] [<b>frequency</b> <i>group-operation-frequency</i>] [<b>life</b>{<b>forever</b>   <i>seconds</i>}] [<b>start-time</b>{<i>hh:mm[:ss]</i> [<i>month day</i>   <i>day month</i>]   <b>pending</b>   <b>now</b>   <b>after</b> <i>hh:mm:ss</i>}]</li> </ul>	For individual IP SLAs operations only: Configures the scheduling parameters for an individual IP SLAs operation. or For multioperation scheduler only: Specifies an IP SLAs operation group number and the range of operation numbers to be scheduled in global configuration mode.

	Command or Action	Purpose
	<p><b>Example:</b></p> <pre>Router(config)# ip sla schedule 10 start-time now life forever</pre> <p><b>Example:</b></p> <pre>Router(config)# ip sla group schedule 1 3,4,6-9</pre>	
<b>Step 4</b>	<p><b>exit</b></p> <p><b>Example:</b></p> <pre>Router(config)# exit</pre>	Exits to privileged EXEC mode.
<b>Step 5</b>	<p><b>show ip sla group schedule</b></p> <p><b>Example:</b></p> <pre>Router# show ip sla group schedule</pre>	(Optional) Displays the IP SLAs group schedule details.
<b>Step 6</b>	<p><b>show ip sla configuration</b></p> <p><b>Example:</b></p> <pre>Router# show ip sla configuration</pre>	(Optional) Displays the IP SLAs configuration details.

- [Troubleshooting Tips, page 8](#)
- [What to Do Next, page 8](#)

## 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 **debugipsla 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 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 IP SLAs DHCP Operations

- [Example Configuration for an IP SLAs DHCP Operation, page 9](#)

## Example Configuration for an IP SLAs DHCP Operation

In the following example, IP SLAs operation number 12 is configured as a DHCP operation enabled for DHCP server 172.16.20.3. Note that DHCP option 82 is used to specify the circuit ID.

### Router B Configuration

```
ip dhcp-server 172.16.20.3
!
ip sla 12
  dhcp 10.10.10.3 option-82 circuit-id 10005A6F1234
  frequency 30
  timeout 5000
  tag DHCP_Test
!
ip sla schedule 12 start-time now
```

## Additional References

### Related Documents

Related Topic	Document Title
Cisco IOS commands	<a href="#">Cisco IOS Master Commands List, All Releases</a>
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: <a href="http://www.cisco.com/go/mibs">http://www.cisco.com/go/mibs</a>

**RFCs**

RFCs	Title
No new or modified RFCs are supported by this feature, and support for existing RFCs has not been modified by this feature.	--

**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.	<a href="http://www.cisco.com/cisco/web/support/index.html">http://www.cisco.com/cisco/web/support/index.html</a>

## Feature Information for IP SLAs DHCP 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 <http://www.cisco.com/go/cfn>. An account on Cisco.com is not required.

**Table 1: Feature Information for the IP SLAs DHCP Operation**

Feature Name	Releases	Feature Information
IP SLAs DHCP Operation	Cisco IOS XE Release 2.1	The IP SLAs Dynamic Host Control Protocol (DHCP) operation allows you to schedule and measure the network response time between a Cisco device and a DHCP server to obtain an IP address.

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