IP SLAs Random Scheduler

The IP SLAs Random Scheduler feature is an enhancement to the existing IP SLAs Multiple Operation Scheduling feature introduced in Cisco IOS Release 12.3(8)T. The IP SLAs Multiple Operation Scheduling feature provided the capability to easily schedule multiple IP SLAs operations to begin at intervals equally distributed over a specified duration of time and to restart at a specified frequency. With the IP SLAs Random Scheduler feature, you can now schedule multiple IP SLAs operations to begin at random intervals uniformly distributed over a specified duration of time and to restart at uniformly distributed random frequencies within a specified frequency range. Random scheduling improves the statistical metrics for assessing network performance.

History for the IP SLAs Random Scheduler Feature

Release	Modification
12.4(2)T	This feature was introduced.

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.

Contents

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Restrictions for the IP SLAs Random Scheduler

This feature is not in compliance with RFC2330, because it does not account for inter-packet randomness.

Information About the IP SLAs Random Scheduler

To enable the IP SLAs random scheduler option, you should understand the following concept:

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IP SLAs Random Scheduler

The IP SLAs random scheduler option is disabled by default. To enable the random scheduler option, you must set a frequency range when configuring the **ip sla monitor group schedule** command in global configuration mode. The group of operations restarts at uniformly distributed random frequencies within the specified frequency range. The following guidelines apply for setting the frequency range:

- The starting value of the frequency range should be greater than the timeout values of all the operations in the group operation.
- The starting value of the frequency range should be greater than the schedule period (amount of time for which the group operation is scheduled). This guideline ensures that the same operation does not get scheduled more than once within the schedule period.

The following guidelines apply if the random scheduler option is enabled:

- The individual operations in a group operation will be uniformly distributed to begin at random intervals over the schedule period.
- The group of operations restarts at uniformly distributed random frequencies within the specified frequency range.
- The minimum time interval between the start of each operation in a group operation is 100 milliseconds (0.1 seconds). If the random scheduler option is disabled, the minimum time interval is 1 second.
- Only one operation can be scheduled to begin at any given time. If the random scheduler option is disabled, multiple operations can begin at the same time.
- The first operation will always begin at 0 milliseconds of the schedule period.
- The order in which each operation in a group operation begins is random.

How to Enable the IP SLAs Random Scheduler

This section contains the following task:

- Enabling the IP SLAs Random Scheduler, page 3

Enabling the IP SLAs Random Scheduler

Perform this task to schedule multiple IP SLAs operations to begin at random intervals uniformly distributed over a specified duration of time and to restart at uniformly distributed random frequencies within a specified frequency range.

Prerequisites

Before scheduling a group of operations, you should configure all the IP SLAs operations that will be used in that group. For information on configuring IP SLAs operations, see the "Related Documents" section on page 4.

SUMMARY STEPS

1. **enable**
2. **configure terminal**
3. **ip sla monitor group schedule** *group-operation-number operation-id-numbers* **schedule-period** *seconds* [**ageout** *seconds*] [**frequency** [*seconds* | **range** *random-frequency-range*]] [**life** {**forever** | *seconds*}] [**start-time** {*hh:mm*[*:ss*] [*month day* | *day month*] | **pending** | **now** | **after** *hh:mm:ss*}]
4. **exit**

DETAILED STEPS

	Command or Action	Purpose
Step 1	**enable** **Example:** `Router> enable`	Enables privileged EXEC mode. • Enter your password if prompted.
Step 2	**configure terminal** **Example:** `Router# configure terminal`	Enters global configuration mode.
Step 3	**ip sla monitor group schedule** *group-operation-number operation-id-numbers* **schedule-period** *seconds* [**ageout** *seconds*] [**frequency** [*seconds* | **range** *random-frequency-range*]] [**life** {**forever** | *seconds*}] [**start-time** {*hh:mm*[*:ss*] [*month day* | *day month*] | **pending** | **now** | **after** *hh:mm:ss*}] **Example:** `Router# ip sla monitor group schedule 2 1-3 schedule-period 50 frequency range 80-100`	Specifies the scheduling parameters of a group of IP SLAs operations. • To enable the IP SLAs random scheduler option, you must configure the **frequency range** *random-frequency-range* keywords and argument.
Step 4	**exit** **Example:** `Router# exit`	Exits global configuration mode and returns to privileged EXEC mode.

Configuration Examples for the IP SLAs Random Scheduler

This section contains the following configuration example:

Enabling the IP SLAs Random Scheduler: Example

The following example shows how to schedule IP SLAs operations 1 to 3 as a group (identified as group 2). In this example, the operations are scheduled to begin at uniformly distributed random intervals over a schedule period of 50 seconds. The first operation is scheduled to start immediately. The random scheduler option is enabled and the uniformly distributed random frequencies at which the group of operations will restart is chosen within the range of 80-100 seconds.

```
ip sla monitor group schedule 2 1-3 schedule-period 50 frequency range 80-100 start-time now
```

Additional References

The following sections provide references related to the IP SLAs Random Scheduler feature.

Related Documents

Related Topic	Document Title
How to use the Cisco IOS IP SLAs Multiple Operation Scheduling feature to schedule multiple operations at once	*IP SLAs—Multiple Operation Scheduling* Cisco IOS module of the *Cisco IOS IP SLAs Configuration Guide*, Release 12.4
Cisco IOS IP SLAs configuration tasks	*Cisco IOS IP SLAs Configuration Guide*, Release 12.4
Cisco IOS IP SLAs commands	*Cisco IOS IP SLAs Command Reference*, Release 12.4T

Standards

Standard	Title
No new or modified standards are supported by this feature, and support for existing standards has not been modified by this feature.	—

MIBs

MIB	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

RFC	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 Technical Support website contains thousands of 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.	http://www.cisco.com/techsupport

Command Reference

This section documents one modified command only.

- **ip sla monitor group schedule**

ip sla monitor group schedule

To perform group scheduling for IP SLAs operations, use the **ip sla monitor group schedule** command in global configuration mode. To stop the operation and place it in the default state of normal scheduling, use the **no** form of this command.

ip sla monitor group schedule *group-operation-number operation-id-numbers*
schedule-period *seconds* [**ageout** *seconds*] [**frequency** [*seconds* | **range** *random-frequency-range*]] [**life** {**forever** | *seconds*}] [**start-time** {*hh*:*mm*[:*ss*] [*month day* | *day month*] | **pending** | **now** | **after** *hh*:*mm*:*ss*}]

no ip sla monitor group schedule

Syntax Description

group-operation-number	Group configuration or group schedule number of the IP SLAs operation to be scheduled. • Valid values range from 0 to 65535.
operation-id-numbers	The list of IP SLAs operation ID numbers in the scheduled operation group. Indicate ranges of operation ID numbers with a hyphen. Individual ID numbers and ranges of ID numbers are delimited by a comma. For example, enter a list of operation ID numbers in any of the following ways: • 2, 3, 4, 9, 20 • 10-20, 30-35, 60-70 • 2, 3, 4, 90-100, 105-115 The *operation-id-numbers* argument can include a maximum of 125 characters.
schedule-period *seconds*	Time (in seconds) for which the IP SLAs operation group is scheduled. • Valid values are from 1 to 604800 seconds.
ageout *seconds*	(Optional) Number of seconds to keep the operation in memory when it is not actively collecting information. The default is 0 seconds (never ages out).
frequency *seconds*	(Optional) Number of seconds after which each IP SLAs operation is restarted. • Valid values are from 1 to 604800 seconds.
frequency range *random-frequency-range*	(Optional) Enables the random scheduler option. The random scheduler option is disabled by default. The uniformly distributed random frequencies at which the group of operations will restart is chosen within the specified frequency range (in seconds). Separate the lower and upper frequency values with a hyphen (for example, 80-100).
life forever	(Optional) Schedules the operation to run indefinitely.
life *seconds*	(Optional) Number of seconds the operation actively collects information. The default is 3600 seconds (one hour).

start-time	(Optional) Time when the operation starts collecting information. If the **start-time** is not specified, no information is collected until the **start-time** is configured or a trigger occurs that performs a **start-time now**.
hh:*mm*[:*ss*]	(Optional) Specifies an absolute start time using hours, minutes, and (optionally) seconds. Use the 24-hour clock notation. For example, **start-time 01:02** means "start at 1:02 a.m.," and **start-time 13:01:30** means "start at 1:01 p.m. and 30 seconds." The current day is implied unless you specify a *month* and *day*.
month	(Optional) Name of the month to start the operation in. If month is not specified, the current month is used. Use of this argument requires that a day be specified. You can specify the month by using either the full English name or the first three letters of the month.
day	(Optional) Number of the day (in the range 1 to 31) to start the operation on. If a day is not specified, the current day is used. Use of this argument requires that a month be specified.
pending	(Optional) No information is collected. This is the default value.
now	(Optional) Indicates that the operation should start immediately.
after *hh*:*mm*:*ss*	(Optional) Indicates that the operation should start *hh* hours, *mm* minutes, and *ss* seconds after this command was entered.

Defaults

The operation is placed in a **pending** state (that is, the operation is enabled but is not actively collecting information).

Command Modes

Global configuration

Command History

Release	Modification
12.3(14)T	This command was introduced to replace the **rtr group schedule** command.
12.4(2)T	The **range** keyword and *random-frequency-range* argument were introduced.

Usage Guidelines

Though IP SLAs multiple operations scheduling functionality helps in scheduling thousands of operations, you should be cautious while specifying the number of operations, the schedule period, and the operation group frequency to avoid any significant CPU impact.

For example, consider a scenario where you are scheduling 1 to 780 operations at a schedule period of 60 seconds. The command would be as follows:

ip sla monitor group schedule 2 1-780 schedule-period 60 start-time now

IP SLAs calculates how many operations it should start in each 1-second interval by dividing the number of operations by the schedule period (780 operations divided by 60 seconds, which is 13 operations per second). Operations 1 to 13 in operation group 2 start after 0 seconds, operations 14 to 26 start after 1 second, operations 27 to 40 start after 2 seconds, and the iteration continues until operations 768 to 780 start after 59 seconds. This high value of operations starting at every 1-second interval (especially for jitter operations) can load the CPU to very high values.

On a Cisco 2600 router, the maximum recommended value of operations per second is 6 or 7 (approximately 350 to 400 operations per minute). Exceeding this value of 6 or 7 operations per second could cause major performance (CPU) impact. Note that the maximum recommended value of operations per second varies from platform to platform.

Note No warning messages will be displayed if IP SLAs multiple operations scheduling leads to a high number of operations starting per second.

When you reboot the router, the IP SLAs multiple operations scheduling functionality schedules the operations in the same order as was done before the reboot. For example, assume the following operation had been scheduled:

ip sla monitor group schedule 2 1-20 schedule-period 40 start-time now

Over a range of 40 seconds, 20 operations have to be started (that is, one operation every 2 seconds). After the system reboot, operation 1 will start at *t* seconds and operation 2 starts at *t*+2 seconds, operation 3 starts at *t*+4 seconds, and so on.

The IP SLAs multiple operations scheduling functionality schedules the maximum number of operations possible without aborting. However, this functionality skips those IP SLAs operations that are already running or those that are not configured and hence do not exist. The total number of operations will be calculated based on the number of operations specified in the command, irrespective of the number of operations that are missing or already running. The IP SLAs multiple operations scheduling functionality displays a message showing the number of active and missing operations. However, these messages are displayed only if you schedule operations that are not configured or are already running.

IP SLAs Random Scheduler

The IP SLAs random scheduler option provides the capability to schedule multiple IP SLAs operations to begin at random intervals over a specified duration of time. The random scheduler option is disabled by default. To enable the random scheduler option, you must configure the **frequency range** *random-frequency-range* keywords and argument. The group of operations restarts at uniformly distributed random frequencies within the specified frequency range. The following guidelines apply for setting the frequency range:

- The starting value of the frequency range should be greater than the timeout values of all the operations in the group operation.
- The starting value of the frequency range should be greater than the schedule period (amount of time for which the group operation is scheduled). This guideline ensures that the same operation does not get scheduled more than once within the schedule period.

The following guidelines apply if the random scheduler option is enabled:

- The individual operations in a group operation will be uniformly distributed to begin at random intervals over the schedule period.
- The group of operations restarts at uniformly distributed random frequencies within the specified frequency range.
- The minimum time interval between the start of each operation in a group operation is 100 milliseconds (0.1 seconds). If the random scheduler option is disabled, the minimum time interval is 1 second.
- Only one operation can be scheduled to begin at any given time. If the random scheduler option is disabled, multiple operations can begin at the same time.
- The first operation will always begin at 0 milliseconds of the schedule period.
- The order in which each operation in a group operation begins is random.

Examples

The following example shows how to schedule IP SLAs operations 3, 4, and 6 to 10 as a group (identified as group 1). In this example, the operations are scheduled to begin at equal intervals over a schedule period of 20 seconds. The first operation (or set of operations) is scheduled to start immediately. Since the frequency is not specified, it is set to the value of the schedule period (20 seconds) by default.

```
ip sla monitor group schedule 1 3, 4, 6-10 schedule-period 20 start-time now
```

The following example shows how to schedule IP SLAs operations 1 to 3 as a group (identified as group 2). In this example, the operations are scheduled to begin at random intervals over a schedule period of 50 seconds. The first operation is scheduled to start immediately. The random scheduler option is enabled and the frequency at which the group of operations will restart will be chosen randomly within the range of 80-100 seconds.

```
ip sla monitor group schedule 2 1-3 schedule-period 50 frequency range 80-100 start-time
now
```

Related Commands

Command	Description
ip sla monitor schedule	Enters IP SLAs scheduling mode.
show ip sla monitor collection	Displays the collection details of the IP SLAs operation.
show ip sla monitor configuration	Displays the configuration details of the IP SLAs operation.
show ip sla monitor group schedule	Displays the group scheduling details of the IP SLAs operations.
show ip sla monitor operation	Displays the operation details of the IP SLAs operation.