IP SLAs Multicast Support

This module describes how to configure and schedule an IP Service Level Agreements (SLAs) multicast UDP jitter operation for measuring and reporting statistics such as one way latency, jitter, and packet loss for each multicast receiver in a user-specified multicast group. .

Prerequisites for IP SLAs Multicast Support

- Time synchronization, such as that provided by Network Time Protocol (NTP), is required between the source and the target device in order to provide accurate one-way delay (latency) measurements. To configure NTP on the source and target devices, perform the tasks in the "Performing Basic System Management" chapter of the *Network Management Configuration Guide*. Time synchronization is not required for the one-way jitter and packet loss measurements. However, if the time is not synchronized between the source and target devices, one-way jitter and packet loss data will be returned, but values of "0" will be returned for the one-way delay measurements provided by the UDP jitter operation.

- All devices must be part of the same VRF in order for IP SLAs multicast operations to succeed.

- The devices on which the responder and probe are to configured must both be running Cisco software images that support the IP SLAs Multicast Support feature. Before configuring any IP SLAs application, use the **show ip sla application** command to verify that the operation type is supported on your software image.

Restrictions for IP SLAs Multicast Support

The multicast UDP Jitter operation can provide only One Way (OW) data.

Information About IP SLAs Multicast Support

Multicast UDP Jitter Operations

A multicast UDP jitter operation measures and reports statistics, such as one way latency, jitter, and packet loss, for each multicast receiver in a user-specified multicast group. Multicast UDP jitter operations enable you to perform the following tasks:

- Analyze and evaluate the performance of a multicast network after deploying a new multicast network application or implementing new multicast-based protocols on the network.

- Check the network behavior for multicast before actually utilizing the multicast network for an important event.

- Take a proactive approach to monitoring a network to isolate possible problem areas.

The sender in a multicast UDP jitter operation sends UDP packets at a specified interval from the source device to a multicast IP address. During the initial configuration, a specified endpoint list provides a list of all the responders to be contacted for a given multicast operation. The multicast subsystem sends a unicast control packet to each of the multicast receivers in the endpoint list, utilizing the unicast path. A control message is sent to each receiver so that it can join the multicast group.

The IP SLAs multicast responder on the multicast receiver receives the UDP packets and records the time-stamp data.

A list of valid responders that have completed a successful IGMP join is maintained on the sender side. Once the responder list is received, multicast packet generation can proceed.

Because all multicast traffic is one way, from sender on the source to responder on the receiver, each responder that is part of the operation is responsible for performing local calculations and for storing the statistics. The statistics are sent back to the sender to be displayed at the end of each cycle of the operation (after all packets have been transmitted to the responder). Because the responder does not maintain a history of the statistics, and also releases all associated memory after sending the information to the sender, each scheduled operation (based on the frequency) is considered a new operation by the multicast responder, with no relationship to the previous one.

Multicast UDP jitter operations are supported in IPv4 networks.

How to Configure IP SLAs Multicast Support

Configuring the IP SLAs Responder on a Destination Device

Note   A responder should not configure a permanent port for a sender. If the responder configures a permanent port for a sender, even if the packets are successfully sent (no timeout or packet-loss issues), the jitter value is zero.

SUMMARY STEPS

1. **enable**
2. **configure terminal**
3. Enter one of the following commands:

   - **ip sla responder**
   - **ip sla responder udp-echo ipaddress** *ip-address* **port** *port***vrf** *vrf*

4. **end**

DETAILED STEPS

	Command or Action	Purpose
Step 1	**enable** **Example:** Device> enable	Enables privileged EXEC mode. • Enter your password if prompted.
Step 2	**configure terminal** **Example:** Device# configure terminal	Enters global configuration mode.
Step 3	Enter one of the following commands: • **ip sla responder** • **ip sla responder udp-echo ipaddress** *ip-address* **port** *port***vrf** *vrf* **Example:** Device(config)# ip sla responder Device(config)# ip sla responder udp-echo ipaddress 192.0.2.132 port 5000 vrf vrf1	(Optional) Temporarily enables IP SLAs responder functionality on a Cisco device in response to control messages from the source. (Optional; required only if protocol control is disabled on the source.) Enables IP SLAs responder functionality on the specified IP address, port and VRF. • Protocol control is enabled by default.
Step 4	**end** **Example:** Device(config)# end	Exits global configuration mode and returns to privileged EXEC mode.

Creating a List of Multicast Responders on the Source Device

Before you begin

All responders to be added to the endpoint list (of responders) must first be configured on the destination device. For configuration information, see the "Configuring an IP SLAs Responder on the Destination Device" section.

SUMMARY STEPS

1. **enable**
2. **configure   terminal**
3. **ip sla endpoint-list   type ip** *template-name*
4. **description** *description*
5. **ip-address** *address* [**-***address* | **, ... ,** *address*] **port** *port*
6. **end**
7. **show ip sla endpoint-list** [**type ip** [*template-name*]]

DETAILED STEPS

	Command or Action	Purpose
Step 1	**enable** **Example:** `Device> enable`	Enables privileged EXEC mode. • Enter your password if prompted.
Step 2	**configure terminal** **Example:** `Device# configure terminal`	Enters global configuration mode.

Step 3	**ip sla endpoint-list type ip** *template-name*
	
	Example:
	
	`Device(config)# ip sla endpoint-list type ip`
	`mcast-rcvrs`
		Begins configuring an endpoint list and enters endpoint-list configuration mode.

Step 4	**description** *description* **Example:** `Device(config-epl)# description list of receivers`	(Optional) Adds descriptive text to the template being configured.

Step 5	**ip-address** *address* [**-***address*	**, ... ,** *address*] **port** *port*
		
		Example:
		
		`Device(config-epl)# ip-address 10.1.1.1-13 port`
		`6500`
			Adds the IPv4 or IPv6 address of a multicast responder to the endpoint list being configured.
			
			• Repeat this command until all desired addresses are configured.
			
			• Use the **no** from of this command to modify the endpoint list by removing one or more addresses.

Step 6	**end** **Example:** `Device(config-epl)# end`	Returns to privileged EXEC mode.

	Command or Action	**Purpose**

Step 7	**show ip sla endpoint-list** [**type ip** [*template-name*]]
	
	Example:
	
	`Device# show ip sla endpoint-list type ip`
	`mcast-rcvrs`
		(Optional) Displays the configuration of the endpoint list.

Configuring Multicast UDP Jitter Operations

> **Note**
> - The IP SLAs UDP jitter operation does not support the IP SLAs History feature (statistics history buckets) because of the large data volume involved with UDP jitter operations. Therefore, the following commands are not supported for UDP jitter operations: **history buckets-kept**, **history filter**, **history lives-kept**, **samples-of-history-kept**, and **show ip sla history**.
> - The MIB used by IP SLAs (CISCO-RTTMON-MIB) limits the hours-of-statistics kept for the UDP jitter operation to two hours. Configuring a larger value using the **history hours-of-statistics** *hours* global configuration change will not increase the value beyond two hours. However, the Data Collection MIB can be used to collect historical data for the operation. For information, see the CISCO-DATA-COLLECTION-MIB at http://www.cisco.com/go/mibs).

SUMMARY STEPS

1. **enable**
2. **configure terminal**
3. **ip sla** *operation-number*
4. **udp-jitter** {*destination-ip-address* | *destination-hostname*} *destination-port* **endpoint-list** *endpoint-list* [**ssm**] [**source-ip** *ip-address*] [**source-port** *port-number*] [**num-packets** *number-of-packets*] [**interval** *interpacket-interval*]
5. **control retry** *retries*
6. **control timeout** *seconds*
7. **dscp** *dscp-value*
8. **tree-init** *number*
9. **history distributions-of-statistics-kept** *size*
10. **history enhanced** [**interval** *seconds*] [**buckets** *number-of-buckets*]
11. **frequency** *seconds*
12. **history hours-of-statistics-kept** *hours*
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*
20. **verify-data**

21. **vrf** *vrf-name*
22. **end**
23. **show ip sla configuration** [*operation-number*]

DETAILED STEPS

	Command or Action	**Purpose**
Step 1	**enable** **Example:** `Device> enable`	Enables privileged EXEC mode. • Enter your password if prompted.
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	**udp-jitter** {*destination-ip-address* | *destination-hostname*} *destination-port* **endpoint-list** *endpoint-list* [**ssm**] [**source-ip** *ip-address*] [**source-port** *port-number*] [**num-packets** *number-of-packets*] [**interval** *interpacket-interval*] **Example:** `Device(config-ip-sla)# udp-jitter 239.1.1.1 5000 endpoint-list mcast-rcvrs source-ip 10.10.10.106 source-port 7012 num-packets 50 interval 25`	Configures the IP SLAs operation as a multicast UDP jitter operation and enters multicast UDP jitter configuration mode.
Step 5	**control retry** *retries* **Example:** `Device(config-ip-sla-multicast-jitter-oper)# control retry 2`	(Optional) Configures the number of times a sending device will resend a control protocol message.
Step 6	**control timeout** *seconds* **Example:** `Device(config-ip-sla-multicast-jitter)# control timeout 4`	(Optional) Configures the number of seconds that the destination device will wait for a control protocol message.
Step 7	**dscp** *dscp-value* **Example:** `Device(config-ip-sla-multicast-jitter-oper)# dscp 10`	(Optional) Configures the DSCP value for the operation.

	Command or Action	Purpose
Step 8	**tree-init** *number* **Example:** Device(config-ip-sla-multicast-jitter-oper)# tree-init 1	(Optional) Sets up the multicast tree.
Step 9	**history distributions-of-statistics-kept** *size* **Example:** Device(config-ip-sla-multicast-jitter-oper)# history distributions-of-statistics-kept 5	(Optional) Sets the number of statistics distributions kept per hop during an IP SLAs operation.
Step 10	**history enhanced** [**interval** *seconds*] [**buckets** *number-of-buckets*] **Example:** Device(config-ip-sla-multicast-jitter-oper)# history enhanced interval 900 buckets 100	(Optional) Enables enhanced history gathering for an IP SLAs operation.
Step 11	**frequency** *seconds* **Example:** Device(config-ip-sla-multicast-jitter-oper)# frequency 30	(Optional) Sets the rate at which a specified IP SLAs operation repeats.
Step 12	**history hours-of-statistics-kept** *hours* **Example:** Device(config-ip-sla-multicast-jitter-oper)# history hours-of-statistics-kept 4	(Optional) Sets the number of hours for which statistics are maintained for an IP SLAs operation.
Step 13	**owner** *owner-id* **Example:** Device(config-ip-sla-multicast-jitter-oper)# owner admin	(Optional) Configures the Simple Network Management Protocol (SNMP) owner of an IP SLAs operation.
Step 14	**request-data-size** *bytes* **Example:** Device(config-ip-sla-multicast-jitter-oper)# request-data-size 64	(Optional) Sets the protocol data size in the payload of an IP SLAs operation's request packet.
Step 15	**history statistics-distribution-interval** *milliseconds* **Example:** Device(config-ip-sla-multicast-jitter-oper)# history statistics-distribution-interval 10	(Optional) Sets the time interval for each statistics distribution kept for an IP SLAs operation.

	Command or Action	**Purpose**
Step 16	**tag** *text* **Example:** Device(config-ip-sla-multicast-jitter-oper)# tag TelnetPollServer1	(Optional) Creates a user-specified identifier for an IP SLAs operation.
Step 17	**threshold** *milliseconds* **Example:** Device(config-ip-sla-multicast-jitter-oper)# threshold 10000	(Optional) Sets the upper threshold value for calculating network monitoring statistics created by an IP SLAs operation.
Step 18	**timeout** *milliseconds* **Example:** Device(config-ip-sla-multicast-jitter-oper)# timeout 10000	(Optional) Sets the amount of time an IP SLAs operation waits for a response from its request packet.
Step 19	**tos** *number* **Example:** Device(config-ip-sla-multicast-jitter-oper)# tos 160	(Optional) In an IPv4 network only, defines the ToS byte in the IPv4 header of an IP SLAs operation.
Step 20	**verify-data** **Example:** Device(config-ip-sla-multicast-jitter-oper)# verify-data	(Optional) Causes an IP SLAs operation to check each reply packet for data corruption.
Step 21	**vrf** *vrf-name* **Example:** Device(config-ip-sla-multicast-jitter-oper)# vrf vpn-A	(Optional) Allows monitoring within Multiprotocol Label Switching (MPLS) VPNs using IP SLAs operations.
Step 22	**end** **Example:** Device(config-ip-sla-multicast-jitter-oper)# end	Returns to privileged EXEC mode.
Step 23	**show ip sla configuration** [*operation-number*] **Example:** Device# show ip sla configuration 10	(Optional) Displays configuration values including all defaults for all IP SLAs operations or a specified operation.

Scheduling IP SLAs Operations

Before you begin

- All IP Service Level Agreements (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 must be limited to a maximum of 125 characters in length, including commas (,).

SUMMARY STEPS

1. **enable**
2. **configure terminal**
3. Enter one of the following commands:

    - **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* | **schedule-together**} [**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. **end**
5. **show ip sla group schedule**
6. **show ip sla configuration**

DETAILED STEPS

	Command or Action	**Purpose**
Step 1	**enable** **Example:** `Device> enable`	Enables privileged EXEC mode. • Enter your password if prompted.
Step 2	**configure terminal** **Example:** `Device# configure terminal`	Enters global configuration mode.
Step 3	Enter one of the following commands: • **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*	**schedule-together**} [**ageout** *seconds*] **frequency** *group-operation-frequency* [**life**	• 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.

Command or Action	Purpose

{**forever** | *seconds*}] [**start-time** {*hh***:***mm* [**:***ss*] [*month day* | *day month*] | **pending** | **now** | **after** *hh***:***mm* [**:***ss*]}]
 	
Example:
 	
`Device(config)# ip sla schedule 10 life forever start-time now`
 	
`Device(config)# ip sla group schedule 10 schedule-period frequency`
 	
`Device(config)# ip sla group schedule 1 3,4,6-9 life forever start-time now`
 	
`Device(config)# ip sla schedule 1 3,4,6-9 schedule-period 50 frequency range 80-100`	

Step 4 **end** **Example:** `Device(config)# end`	Exits global configuration mode and returns to privileged EXEC mode.
Step 5 **show ip sla group schedule** **Example:** `Device# show ip sla group schedule`	(Optional) Displays IP SLAs group schedule details.
Step 6 **show ip sla configuration** **Example:** `Device# show ip sla configuration`	(Optional) Displays IP SLAs configuration details.

Troubleshooting Tips

- If the IP Service Level Agreements (SLAs) operation is not running and not generating statistics, add the **verify-data** command to the configuration (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 Service Level Agreements (SLAs) operation, see the "Configuring Proactive Threshold Monitoring" section.

Configuration Examples for IP SLAs Multicast Support

Example: Multicast UDP Jitter Operation

```
Device# show ip sla endpoint-list

Endpoint-list Name: multicast
    Description:
    ip-address 192.0.2.1 port 1111
    ip-address 192.0.2.2 port 2222
    ip-address 192.0.2.3 port 3333

Device# show ip sla configuration 22

IP SLAs Infrastructure Engine-III
Entry number: 22
Owner:
Tag:
Operation timeout (milliseconds): 5000
Type of operation to perform: udp-jitter
Target address/Source address: 224.1.1.1/0.0.0.0
Target port/Source port: 2460/0
Type Of Service parameter: 0x0
Request size (ARR data portion): 32
Packet Interval (milliseconds)/Number of packets: 20/10
Verify data: No
Vrf Name:
Control Packets: enabled
Schedule:
    Operation frequency (seconds): 60  (not considered if randomly scheduled)
    Next Scheduled Start Time: Pending trigger
    Group Scheduled : FALSE
    Randomly Scheduled : FALSE
    Life (seconds): 3600
    Entry Ageout (seconds): never
    Recurring (Starting Everyday): FALSE
    Status of entry (SNMP RowStatus): notInService
Threshold (milliseconds): 5000
Distribution Statistics:
    Number of statistic hours kept: 2
    Number of statistic distribution buckets kept: 1
    Statistic distribution interval (milliseconds): 20
Enhanced History:

  sno    oper-id          dest-ip-addr  !<---Responders in endpoint list: multicast
    1   976271337          192.0.2.1
    2  1632881300          192.0.2.2
    3  2138021658          192.0.2.3
```

Additional References for IP SLAs Multicast Support

Related Documents

Related Topic	Document Title
Cisco IOS commands	Cisco IOS Master Commands List, All Releases
IP SLAs commands	Cisco IOS IP SLAs Command Reference
Information about Cisco IP SLAs	"Cisco IOS IP SLAs Overview" module of the *IP SLAs Configuration Guide*

MIBs

MIB	MIBs Link
CISCO-IPSLA-TC-MIB	To locate and download MIBs for selected platforms, Cisco software releases, and feature sets, use Cisco MIB Locator found at the following URL: http://www.cisco.com/go/mibs

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 IPSLA Multicast Support

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 IPSLA Multicast Support

Feature Name	Releases	Feature Information
IPSLA Multicast Support	15.2(4)M 15.3(1)S Cisco IOS XE Release 3.8S 15.1(2)SG Cisco IOS XE Release 3.4SG	This feature introduced the multicast UDP jitter operation for measuring and reporting statistics such as one way latency, jitter, and packet loss for each multicast receiver in a user-specified multicast group. The following commands were introduced or modified: **clock-tolerance ntp oneway**, **control (IP SLA)**, **dscp (IP SLA)**, **history distributions-of-statistics-kept**, **history enhanced**, **history hours-of-statistics-kept**, **ip-address (endpoint list)**, **operation-packet priority**, **owner**, **precision**, **show ip sla application**, **show ip sla configuration**, **show ip sla endpoint-list**, **show ip sla statistics**, **show ip sla statistics aggregated**, **tag (IP SLA)**, **timeout (IP SLA)**, **tos**, **tree-init**, **udp-jitter**, **verify-data (IP SLA)**, **vrf**.