Configuring IP SLAs for Metro-Ethernet

This module describes how to configure an IP Service Level Agreements (SLAs) for Metro-Ethernet to gather network performance metrics in service-provider Ethernet networks. Available statistical measurements for the IP SLAs Ethernet operation include round-trip time, jitter (interpacket delay variance), and packet loss.

- Finding Feature Information, on page 1
- Prerequisites for IP SLAs for Metro-Ethernet, on page 1
- Restrictions for IP SLAs for Metro-Ethernet, on page 1
- Information About IP SLAs for Metro-Ethernet, on page 2
- How to Configure IP SLAs for Metro-Ethernet, on page 3
- Configuration Examples for IP SLAs for Metro-Ethernet, on page 10
- Additional References, on page 11
- Feature Information for IP SLAs for Metro-Ethernet, on page 12

Finding Feature Information

Your software release may not support all the features documented in this module. For the latest caveats and feature information, see Bug Search Tool and 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.

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.

Prerequisites for IP SLAs for Metro-Ethernet

It is recommended that the IEEE 802.1ag standard is supported on the destination devices in order to obtain complete error reporting and diagnostics information.

Restrictions for IP SLAs for Metro-Ethernet

- Memory and performance may be impacted for a given Ethernet CFM maintenance domain and Ethernet Virtual Circuit (EVC) or VLAN that has a large number of maintenance endpoints (MEPs).

- In case of PW redundancy, we need to have 2 different CFM/Y1731 sessions on active and backup PW. We cannot expect the same mpid and Y1731 session to work after PW switchover.
- Y1731 is not supported for port meps.
- CFM ans Y1731 is not supported for vpls cases, untagged EFP as well.

Information About IP SLAs for Metro-Ethernet

IP SLAs Ethernet Operation Basics

The IP SLAs for Metro-Ethernet integrates IP SLAs with the Ethernet Connectivity Fault Management (CFM) feature. Ethernet CFM is an end-to-end per-service-instance Ethernet-layer operation, administration, and management (OAM) protocol.

The IP SLAs for Metro-Ethernet feature provides the capability to gather statistical measurements by sending and receiving Ethernet data frames between Ethernet CFM maintenance endpoints (MEPs). The performance metrics for IP SLAs Ethernet operations are measured between a source MEP and a destination MEP. Unlike existing IP SLAs operations that provide performance metrics for the IP layer, the IP SLAs Ethernet operation provides performance metrics for Layer 2.

IP SLAs Ethernet operations may be configured using the command-line interface (CLI) or Simple Network Management Protocol (SNMP).

You can manually configure individual Ethernet ping or Ethernet jitter operations by specifying the destination MEP identification number, name of the maintenance domain, and EVC or VLAN identifier or port level option.

You also have the option to configure an IP SLAs auto Ethernet operation (ping or jitter) that will query the Ethernet CFM database for all maintenance endpoints in a given maintenance domain and EVC or VLAN. When an IP SLAs auto Ethernet operation is configured, individual Ethernet ping or Ethernet jitter operations are automatically created based on the MEPs that were discovered. A notification mechanism exists between the IP SLAs and Ethernet CFM subsystems to facilitate the automatic creation of Ethernet ping or Ethernet jitter operations for applicable MEPs that are added to a given maintenance domain and EVC or VLAN while an auto Ethernet operation is running.

The IP SLAs for Metro-Ethernet feature supports multioperation scheduling of IP SLAs operations and proactive threshold violation monitoring through SNMP trap notifications and syslog messages.

Statistics Measured by the IP SLAs Ethernet Operation

The network performance metrics supported by the IP SLAs Ethernet operation is similar to the metrics supported by existing IP SLAs operations. The statistical measurements supported by the IP SLAs Ethernet jitter operation include the following:

- Round-trip time latency
- Unprocessed packets
- Packet loss (source-to-destination and destination-to-source)
- Out-of-sequence, tail-dropped, and late packets

How to Configure IP SLAs for Metro-Ethernet

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

Configuring an IP SLAs Auto Ethernet Operation with Endpoint Discovery on the Source Device

SUMMARY STEPS

1. **enable**
2. **configure terminal**
3. **ip sla ethernet-monitor** *operation-number*
4. **type echo domain** *domain-name* {**evc** *evc-id* | **vlan** *vlan-id*} [**exclude-mpids** *mp-ids*]
5. **cos** *cos-value*
6. **owner** *owner-id*
7. **request-data-size** *bytes*
8. **tag** *text*
9. **threshold** *milliseconds*
10. **timeout** *milliseconds*
11. **end**
12. **show ip sla ethernet-monitor 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 ethernet-monitor** *operation-number* **Example:** `Device(config)# ip sla ethernet-monitor 1`	Begins configuration for an IP SLAs auto Ethernet operation and enters IP SLA Ethernet monitor configuration mode.
Step 4	**type echo domain** *domain-name* {**evc** *evc-id* | **vlan** *vlan-id*} [**exclude-mpids** *mp-ids*]	• **domain** *domain-name*—Specify the name of the created domain.

	Command or Action	Purpose
	Example: `Device(config-ip-sla-ethernet-monitor)# type echo domain testdomain vlan 34`	• **vlan***vlan-id*—Enter the service provider VLAN ID or IDs as a VLAN-ID (1 to 4094), a range of VLAN-IDs separated by a hyphen, or a series of VLAN IDs separated by comma. • **exclude-mpids***mp-ids*—Enter a maintenance end point identifier (mpid). The identifier must be unique for each VLAN (service instance). The range is 1 to 8191. For Echo operations only: Configures an auto Ethernet operation for Ethernet ping operations. **Note** Depending on your release, the **evc** *evc-id* keyword and argument combination may not be available for this command.
Step 5	**cos** *cos-value* **Example:** `Device(config-ip-sla-ethernet-params)# cos 2`	(Optional) Sets the class of service for an IP SLAs Ethernet operation.
Step 6	**owner** *owner-id* **Example:** `Device(config-ip-sla-ethernet-params)# owner admin`	(Optional) Configures the Simple Network Management Protocol (SNMP) owner of an IP SLAs operation.
Step 7	**request-data-size** *bytes* **Example:** `Device(config-ip-sla-ethernet-params)# request-data-size 64`	(Optional) Sets the padding size for the data frame of an IP SLAs Ethernet operation. • The default value for IP SLAs Ethernet ping operations is 66 bytes. • The default value for IP SLAs Ethernet jitter operations is 51 bytes.
Step 8	**tag** *text* **Example:** `Device(config-ip-sla-ethernet-params)# tag TelnetPollSever1`	(Optional) Creates a user-specified identifier for an IP SLAs operation.
Step 9	**threshold** *milliseconds* **Example:** `Device(config-ip-sla-ethernet-params)# threshold 10000`	(Optional) Sets the upper threshold value for calculating network monitoring statistics created by an IP SLAs operation.
Step 10	**timeout** *milliseconds* **Example:**	(Optional) Sets the amount of time an IP SLAs operation waits for a response from its request packet.

	Command or Action	Purpose
	`Device(config-ip-sla-ethernet-params)# timeout 10000`	
Step 11	**end** **Example:** `Device(config-ip-sla-ethernet-params)# end`	Exits to privileged EXEC configuration mode.
Step 12	**show ip sla ethernet-monitor configuration** [*operation-number*] **Example:** `Device# show ip sla ethernet-monitor configuration 1`	(Optional) Displays configuration settings for all IP SLAs auto Ethernet operations or a specified auto Ethernet 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.

Manually Configuring an IP SLAs Ethernet Ping or Jitter Operation on the Source Device

SUMMARY STEPS

1. **enable**
2. **configure terminal**
3. **ip sla** *operation-number*
4. **ethernet echo mpid** *mp-id* **domain** *domain-name* {**evc** *evc-id* | **port** | **vlan** *vlan-id*}
5. **ethernet jitter mpid** *mp-id* **domain** *domain-name* {**evc** *evc-id* | **port** | **vlan** *vlan-id*} [**interval** *interframe-interval*] [**num-frames** *frames-number*]
6. **cos** *cos-value*
7. **frequency** *seconds*
8. **history** *history-parameter*
9. **owner** *owner-id*
10. **request-data-size** *bytes*
11. **tag** *text*
12. **threshold** *milliseconds*
13. **timeout** *milliseconds*
14. **end**
15. **show ip sla configuration** [*operation-number*]
16. **show ip sla application**

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 1`	Begins configuration for an IP SLAs operation and enters IP SLA configuration mode.
Step 4	**ethernet echo mpid** *mp-id* **domain** *domain-name* {**evc** *evc-id* | **port** | **vlan** *vlan-id*} **Example:** `Device(config-ip-sla)# ethernet echo mpid 23 domain testdomain vlan 34`	For a ping operation only: Configures the IP SLAs operation as an Ethernet ping operation and enters Ethernet echo configuration mode. **Note** Depending on your release, the **evc** evc-id keyword and argument combination may not be available for this command.
Step 5	**ethernet jitter mpid** *mp-id* **domain** *domain-name* {**evc** *evc-id* | **port** | **vlan** *vlan-id*} [**interval** *interframe-interval*] [**num-frames** *frames-number*] **Example:** `Device(config-ip-sla)# ethernet jitter mpid 23 domain testdomain evc testevc interval 20 num-frames 30`	For a jitter operation only: Configures the IP SLAs operation as an Ethernet jitter operation and enters Ethernet jitter configuration mode. **Note** Depending on your release, the **evc** evc-id keyword and argument combination may not be available for this command.
Step 6	**cos** *cos-value* **Example:** `Device(config-ip-sla-ethernet-echo)# cos 2`	(Optional) Sets the class of service for an IP SLAs Ethernet operation. **Note** For this and the remaining steps, the configuration mode shown in the example is for configuring an Ethernet echo operation. However, the commands are the same in the Ethernet jitter configuration mode.
Step 7	**frequency** *seconds* **Example:** `Device(config-ip-sla-ethernet-echo)# frequency 30`	(Optional) Sets the rate at which a specified IP SLAs operation repeats.

	Command or Action	Purpose
Step 8	**history** *history-parameter* **Example:** `Device(config-ip-sla-ethernet-echo)# history hours-of-statistics-kept 3`	(Optional) Specifies the parameters used for gathering statistical history information for an IP SLAs operation.
Step 9	**owner** *owner-id* **Example:** `Device(config-ip-sla-ethernet-echo)# owner admin`	(Optional) Configures the Simple Network Management Protocol (SNMP) owner of an IP SLAs operation.
Step 10	**request-data-size** *bytes* **Example:** `Device(config-ip-sla-ethernet-echo)# request-data-size 64`	(Optional) Sets the padding size for the data frame of an IP SLAs Ethernet operation. The default value for IP SLAs Ethernet ping operations is 66 bytes. The default value for IP SLAs Ethernet jitter operations is 51 bytes.
Step 11	**tag** *text* **Example:** `Device(config-ip-sla-ethernet-echo)# tag TelnetPollSever1`	(Optional) Creates a user-specified identifier for an IP SLAs operation.
Step 12	**threshold** *milliseconds* **Example:** `Device(config-ip-sla-ethernet-echo)# threshold 10000`	(Optional) Sets the upper threshold value for calculating network monitoring statistics created by an IP SLAs operation.
Step 13	**timeout** *milliseconds* **Example:** `Device(config-ip-sla-ethernet-echo)# timeout 10000`	(Optional) Sets the amount of time an IP SLAs operation waits for a response from its request packet.
Step 14	**end** **Example:** `Device(config-ip-sla-ethernet-echo)# end`	Exits to privileged EXEC mode.
Step 15	**show ip sla configuration** [*operation-number*] **Example:** `Device# show ip sla configuration 1`	(Optional) Displays configuration values including all defaults for all IP SLAs operations or a specified operation.
Step 16	**show ip sla application** **Example:** `Device# show ip sla application`	(Optional) Displays global information about supported IP SLAs features.

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.

Scheduling IP SLAs Operations

Note

- All IP SLAs operations to be scheduled must be already configured.
- The frequency of all operations scheduled in an operation group must be the same unless you are enabling the random scheduler option for a multioperation scheduler.

SUMMARY STEPS

1. **enable**
2. **configure terminal**
3. Do one of the following:
   - **ip sla ethernet-monitor schedule** *operation-number* **schedule-period** *seconds* [**frequency** [*seconds*]] [**start-time** {**after** *hh* **:** *mm* **:** *ss* | *hh* **:** *mm*[**:** *ss*] [*month day* | *day month*] | **now** | **pending**}]
   - **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
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	Do one of the following: • **ip sla ethernet-monitor schedule** *operation-number* **schedule-period** *seconds* [**frequency** [*seconds*]] [**start-time** {**after** *hh* **:** *mm* **:** *ss*	*hh* **:** *mm*[**:** *ss*] [*month day*	*day month*]	**now**	**pending**}]	• The first example shows how to configure scheduling parameters for an IP SLAs auto Ethernet operation. • The second example shows how to configure the scheduling parameters for an individual IP SLAs operation.

	Command or Action	Purpose

	• **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*}]
	Example:
	`Device(config)# ip sla ethernet-monitor schedule 10 schedule-period 60 start-time now`
	`Device(config)# ip sla schedule 1 start-time now life forever`
	`Device(config)# ip sla group schedule 1 3,4,6-9`
		• The third example shows how to specifiy an IP SLAs operation group number and range of operation numbers to be scheduled for a multioperation scheduler.

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

Troubleshooting Tips

Use the **debug ip sla trace** and **debug ip sla error** commands to help troubleshoot issues with an individual IP SLAs Ethernet ping or Ethernet jitter operation. Use the **debug ip sla ethernet-monitor** command to help troubleshoot issues with an IP SLAs auto Ethernet 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.

operation)

To display and interpret the results of an IP SLAs operation, use the **show ip sla statistics** command. Check the output for fields that correspond to criteria in your service level agreement to determine whether the service metrics are acceptable.

Configuration Examples for IP SLAs for Metro-Ethernet

Example IP SLAs Auto Ethernet Operation with Endpoint Discovery

The following examples shows the operation parameters, proactive threshold monitoring, and scheduling options for an IP SLAs auto Ethernet operation. In Configuration A, operation 10 is configured to automatically create IP SLAs Ethernet ping operations for all the discovered maintenance endpoints in the domain named testdomain and VLAN identification number 34. In Configuration B, operation 20 is configured to automatically create IP SLAs Ethernet ping operations for all the discovered maintenance endpoints in the domain named testdomain and EVC identified as testevc. In both configurations, the proactive threshold monitoring configuration specifies that when three consecutive connection loss events occur, an SNMP trap notification should be sent. The schedule period for operation 10 and operation 20 is 60 seconds, and both operations are scheduled to start immediately.

Configuration A

```
ip sla ethernet-monitor 10
 type echo domain testdomain vlan 34
!
ip sla ethernet-monitor reaction-configuration 10 react connectionLoss threshold-type
consecutive 3 action-type trapOnly
!
ip sla ethernet-monitor schedule 10 schedule-period 60 start-time now
```

Configuration B

```
ip sla ethernet-monitor 20
 type echo domain testdomain evc testevc
!
ip sla ethernet-monitor reaction-configuration 20 react connectionLoss threshold-type
consecutive 3 action-type trapOnly
!
ip sla ethernet-monitor schedule 20 schedule-period 60 start-time now
```

Example Individual IP SLAs Ethernet Ping Operation

The following example show the configuration for an IP SLAs Ethernet ping operation. In Configuration C, the maintenance endpoint identification number is 23, the maintenance domain name is testdomain, and the VLAN identification number is 34. In Configuration D, the maintenance endpoint identification number is 23, the maintenance domain name is testdomain, and the EVC is identified as testevc. In both configurations, the proactive threshold monitoring configuration specifies that when three consecutive connection loss events occur, an SNMP trap notification should be sent. Operation 1 and operation 5 are scheduled to start immediately.

Configuration C

```
ip sla 1
 ethernet echo mpid 23 domain testdomain vlan 34
!
ip sla reaction-configuration 1 react connectionLoss threshold-type consecutive 3 action-type
 trapOnly
!
ip sla schedule 1 start-time now
```

Configuration D

```
ip sla 5
 ethernet echo mpid 23 domain testdomain evc testevc
!
ip sla reaction-configuration 5 react connectionLoss threshold-type consecutive 3 action-type
 trapOnly
!
ip sla schedule 5 start-time now
```

Additional References

Related Documents

Related Topic	Document Title
Cisco IOS commands	Cisco IOS Master Commands List, All Releases
Cisco IOS IP SLAs commands	Cisco IOS IP SLAs Command Reference, All Releases
Cisco IOS IP SLAs: general information	"Cisco IOS IP SLAs Overview" module of the *Cisco IOS IP SLAs Configuration Guide*.
Multioperation scheduling for IP SLAs	"Configuring Multioperation Scheduling of IP SLAs Operations" module of the *Cisco IOS P SLAs Configuration Guide*
Proactive threshold monitoring for IP SLAs	"Configuring Proactive Threshold Monitoring of IP SLAs Operations" module of the *Cisco IOS IP SLAs Configuration Guide*

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

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 IP SLAs for Metro-Ethernet

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 IP SLAs for Metro-Ethernet

Feature Name	Releases	Feature Information
IP SLAs for Metro-Ethernet		The IP Service Level Agreements (SLAs) for Metro-Ethernet feature provides the capability to gather Ethernet-layer network performance metrics. Available statistical measurements for the IP SLAs Ethernet operation include round-trip time, jitter (interpacket delay variance), and packet loss.
IP SLAs Metro-Ethernet 2.0 (EVC)		Support for Ethernet Virtual Circuits (EVCs) was added.
IP SLAs Metro-Ethernet 3.0 (CFM d8.1)		Support for the Standards Based EOAM Performance Monitoring CFM base feature was added. In Cisco IOS XE Release 3.5S, support was added for the Cisco ASR 900 Series.