Configuring IP SLAs Metro-Ethernet 3.0 (ITU-T Y.1731) Operations

This module describes how to configure an IP SLAs Metro-Ethernet 3.0 (ITU-T Y.1731) operation to gather the following performance measurements for Ethernet service:

- Ethernet Delay
- Ethernet Delay Variation
- Ethernet Frame Loss Ratio

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 https://cfnng.cisco.com/. An account on Cisco.com is not required.

Prerequisites for ITU-T Y.1731 Operations

IEEE-compliant Connectivity Fault Management (CFM) must be configured and enabled for Y.1731 performance monitoring to function.

Note Y1731 is supported on Port Channel interfaces.

Restrictions for IP SLAs Metro-Ethernet 3.0 (ITU-T Y.1731)

- SNMP is not supported for reporting threshold events or collecting performance statistics for IP SLAs Metro-Ethernet 3.0 (ITU-T Y.1731) operations.

  SNMP is partially supported; the results for DM/LM can be polled for some attributes. However MIB support for all parameters is not supported.

- Continuity Check Message (CCM)-based dual-ended Ethernet frame loss operations are not supported.
- In a single-ended Ethernet operation, performance measurement statistics can be retrieved only at the device on which the sender Ethernet Connectivity Fault Management (CFM) Maintenance End Point (MEP) is configured.
- To avoid losing the CoS value configured on the frames, do not configure **rewrite** on the EFPs throughout the Layer2 circuit. The CoS value is preserved, if the Y.1731 frames are marked with specific CoS value.
- CFM over cross-connect on the routers works only if the **control-word** is configured. To start DM timestamping, switch ON the control-word if the remote end is not switched ON.

Note RSP3 module does not support Y1731 DMM when all the below configurations are enabled together on the router:

- Two VLAN tag configurations
- Two or more MPLS tag configurations
- the **control-word** configurations

- To avoid errors in RX and TX timestamping, ensure to have Y1731 sender as primary PTP, and the Y1731 responder as subordinate PTP.
- Reconfigure IP SLA Y1731 while doing online insertion removal (OIR) of IM or router reload because local MEP is deleted during the course.
- A delay may be observed after issuing the **ip sla schedule** command after a reload of the router is performed, to populate with the Y.1731 PM measurements.
- The dot1q tag contains class of service (CoS) bits, which are used by IPSLA Y.1731 PM session to test delay or loss of packets with a specific CoS. This CoS cannot be a non-zero value when using EPM over untagged EFPs.

How to Configure IP SLAs Metro-Ethernet 3.0 (ITU-T Y.1731) Operations

Configuring a Dual-Ended Ethernet Delay or Delay Variation Operation

Perform the tasks for configuring a dual-ended operation in the order presented.

Note To remove the MEP configurations in an already-configured dual-ended operation, always remove the MEPs in the reverse order in which they were configured. That is, remove the scheduler first, then the threshold monitoring configuration, and then the sender MEP configuration on the source device before removing the scheduler, proactive threshold monitoring, and receiver MEP configuration on the destination device.

Configuring a Receiver MEP on the Destination Device

Before you begin

Time synchronization is required between the source and destination devices in order to provide accurate one-way delay (latency) or delay-variation measurements. Configure either Precision Time Protocol (PTP) or Network Time Protocol (NTP) on both the source and destination devices.

Procedure

	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** *operation-number* **Example:** `Router(config-term)# ip sla 501`	Begins configuring an IP SLAs operation and enters IP SLA configuration mode.

	Command or Action	Purpose
Step 4	**ethernet y1731 delay receive 1DM domain** *domain-name* {**evc** *evc-id* | **vlan** *vlan-id*} **cos** *cos* {**mpid** *source-mp-id* | **mac-address** *source-address*} **Example:** `Router(config-ip-sla)# ethernet y1731 delay receive 1DM domain xxx evc yyy cos 3 mpid 101`	Begins configuring the receiver on the responder and enters IP SLA Y.1731 delay configuration mode. • The *source-mp-id* or *source-address* configured by this command corresponds to that of the MEP being configured. **Note** The session with mac-address will not be inactivated when there is CFM error.
Step 5	**aggregate interval** *seconds* **Example:** `Router(config-sla-y1731-delay)# aggregate interval 900`	(Optional) Configures the length of time during which the performance measurements are conducted and the results stored.
Step 6	**distribution** {**delay** | **delay-variation**} **one-way** *number-of-bins* *boundary*[**,...,***boundary*] **Example:** `Router(config-sla-y1731-delay)# distribution delay-variation one-way 5 5000,10000,15000,20000,-1`	(Optional) Specifies measurement type and configures bins for statistics distributions kept.
Step 7	**frame offset** *offset-value* **Example:** `Router(config-sla-y1731-delay)# frame offset 1`	(Optional) Sets the value for calculating delay variation rates.
Step 8	**history interval** *intervals-stored* **Example:** `Router(config-sla-y1731-delay)# history interval 2`	(Optional) Sets the number of statistics distributions kept during the lifetime of an IP SLAs Ethernet operation.
Step 9	**max-delay** *milliseconds* **Example:** `Router(config-sla-y1731-delay)# max-delay 5000`	(Optional) Sets the amount of time an MEP waits for a frame.

	Command or Action	Purpose
Step 10	**owner** *owner-id* **Example:** `Router(config-sla-y1731-delay)# owner admin`	(Optional) Configures the owner of an IP SLAs operation.
Step 11	**end** **Example:** `Router(config-sla-y1731-delay)# end`	Exits to privileged EXEC mode.

What to do next

To add proactive threshold conditions and reactive triggering for generating traps, see the "Configuring Proactive Threshold Monitoring" module of the *IP SLAs Configuration Guide*.

When you are finished configuring proactive threshold monitoring for this MEP, see the "Scheduling IP SLAs Operations" section to schedule the operation.

Configuring the Sender MEP on the Source Router

Before you begin

- Time synchronization is required between the source and destination devices in order to provide accurate one-way delay (latency) or delay-variation measurements. Configure either Precision Time Protocol (PTP) or Network Time Protocol (NTP) on both the source and destination devices.
- The receiver MEP must be configured, including proacive threshold monitoring, and scheduled before you configure the sender MEP.

Procedure

	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 operation-number** **Example:**	Begins configuring an IP SLAs operation and enters IP SLA configuration mode.

	Command or Action	Purpose
	`Router(config)# ip sla 500`	
Step 4	**ethernet y1731 delay 1DM domain domain-name** {**evc** *evc-id* | **vlan** *vlan-id*} {**mpid** *target-mp-id* | **mac-address** *target-address*} **cos** *cos* {**source** {**mpid** *source-mp-id* | **mac-address** *source-address*}} **Example:** `Router(config-ip-sla)# ethernet y1731 delay 1DM domain xxx evc yyy mpid 101 cos 3 source mpid 100`	Begins configuring a dual-ended Ethernet delay operation and enters IP SLA Y.1731 delay configuration mode. **Note** The session with mac-address will not be inactivated when there is CFM error.
Step 5	**aggregate interval** *seconds* **Example:** `Router(config-sla-y1731-delay)# aggregate interval 900`	(Optional) Configures the length of time during which the performance measurements are conducted and the results stored.
Step 6	**frame interval** *milliseconds* **Example:** `Router(config-sla-y1731-delay)# frame interval 100`	(Optional) Sets the gap between successive frames.
Step 7	**frame size** *bytes* **Example:** `Router(config-sla-y1731-delay)# frame size 64`	(Optional) Sets the padding size for frames.
Step 8	**history interval** *intervals-stored* **Example:** `Router(config-sla-y1731-delay)# history interval 2`	(Optional) Sets the number of statistics distributions kept during the lifetime of an IP SLAs Ethernet operation.
Step 9	**owner** *owner-id* **Example:** `Router(config-sla-y1731-delay)# owner admin`	(Optional) Configures the owner of an IP SLAs operation.

	Command or Action	Purpose
Step 10	**end** **Example:** `Router(config-sla-y1731-delay)# end`	Exits to privileged EXEC mode.

What to do next

To add proactive threshold conditions and reactive triggering for generating traps, see the "Configuring Proactive Threshold Monitoring" module of the *IP SLAs Configuration Guide*.

When you are finished configuring proactive threshold monitoring for this MEP, see the "Scheduling IP SLAs Operations" section to schedule the operation.

Configuring a Sender MEP for a Single-Ended Ethernet Delay or Delay Variation Operation

Perform this task to configure a sender MEP on the source device.

Before you begin

- Time synchronization is required between the source and destination devices in order to provide accurate one-way delay (latency) or delay-variation measurements. Configure either Precision Time Protocol (PTP) or Network Time Protocol (NTP) on both the source and destination devices.

Note To display information about remote (target) MEPs on destination devices, use the **show ethernet cfm maintenance-points remote** command.

Procedure

	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:**	Begins configuring an IP SLAs operation and enters IP SLA configuration mode.

	Command or Action	Purpose
	`Device(config-term)# ip sla 10`	
Step 4	**ethernet y1731 delay** {**DMM** | **DMMv1**} [**burst**] **domain** *domain-name* {**evc** *evc-id* | **vlan** *vlan-id*} {**mpid** *target-mp-id* | **mac-address** *target-address*} **cos** *cos* {**source** {**mpid** *source-mp-id* | **mac-address** *source-address*}} **Example:** `Device(config-ip-sla)# ethernet y1731 delay dmm domain xxx evc yyy mpid 101 cos 4 source mpid 100`	Begins configuring a single-ended Ethernet delay operation and enters IP SLA Y.1731 delay configuration mode. • To configure concurrent operations, use the **DMMv1** keyword with this command. Repeat the preceding two steps to each concurrent operation, to be added to a single IP SLA operation number. Concurrent operations are supported for a given EVC, CoS, and remote MEP combination, or for multiple MEPs for a given multipoint EVC. **Note** The session with mac-address will not be inactivated when there is CFM error.
Step 5	**clock sync** **Example:** `Device(config-sla-y1731-delay)# clock sync`	(Optional) Indicates that the end points are synchronized and thus allows the operation to calculate one-way delay measurements.
Step 6	**aggregate interval** *seconds* **Example:** `Device(config-sla-y1731-delay)# aggregate interval 900`	(Optional) Configures the length of time during which the performance measurements are conducted and the results stored.
Step 7	**distribution** {**delay** | **delay-variation**} **one-way** *number-of-bins boundary*[**,...,***boundary*] **Example:** `Device(config-sla-y1731-delay)# distribution delay-variation one-way 5 5000, 10000,15000,20000,-1`	(Optional) Specifies measurement type and configures bins for statistics distributions kept.
Step 8	**frame interval** *milliseconds* **Example:** `Device(config-sla-y1731-delay)# frame`	(Optional) Sets the gap between successive frames.

	Command or Action	Purpose
	`interval 100`	
Step 9	**frame offset** *offset-value* **Example:** `Device(config-sla-y1731-delay)# frame offset 1`	(Optional) Sets value for calculating delay variation values.
Step 10	**frame size** *bytes* **Example:** `Device(config-sla-y1731-delay)# frame size 32`	(Optional) Configures padding size for frames.
Step 11	**history interval** *intervals-stored* **Example:** `Device(config-sla-y1731-delay)# history interval 2`	(Optional) Sets the number of statistics distributions kept during the lifetime of an IP SLAs Ethernet operation.
Step 12	**max-delay** *milliseconds* **Example:** `Device(config-sla-y1731-delay)# max-delay 5000`	(Optional) Sets the amount of time an MEP waits for a frame.
Step 13	**owner** *owner-id* **Example:** `Device(config-sla-y1731-delay)# owner admin`	(Optional) Configures the owner of an IP SLAs operation.
Step 14	**end** **Example:** `Device(config-sla-y1731-delay)# end`	Exits to privileged EXEC mode.

What to do next

To add proactive threshold conditions and reactive triggering for generating traps, see the "Configuring Proactive Threshold Monitoring" module of the *IP SLAs Configuration Guide*.

When you are finished configuring proactive threshold monitoring for this operation, see the "Scheduling IP SLAs Operations" section to schedule the operation.

Configuring a Sender MEP for a Single-Ended Ethernet Frame Loss Ratio Operation

Note To display information about remote (target) MEPs on destination devices, use the **show ethernet cfm maintenance-points remote** command.

Perform this task to configure a sender MEP on the source device.

Before you begin

- Class of Service (CoS)-level monitoring must be enabled on MEPs associated to the Ethernet frame loss operation by using the **monitor loss counter** command on the devices at both ends of the operation. See the *Cisco IOS Carrier Ethernet Command Reference* for command information. See the "Configuration Examples for IP SLAs Metro-Ethernet 3.0 (ITU-T Y.1731) Operations" section for configuration information.

Note Cisco IOS Y.1731 implementation allows monitoring of frame loss for frames on an EVC regardless of the CoS value (any CoS or Aggregate CoS cases). See the "Configuration Examples for IP SLAs Metro-Ethernet 3.0 (ITU-T Y.1731) Operations" section for configuration information.

Procedure

	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-term)# ip sla 11`	Begins configuring an IP SLAs operation and enters IP SLA configuration mode.
Step 4	**ethernet y1731 loss** {**LMM** | **SLM**} [**burst**] **domain** *domain-name* {**evc** *evc-id* | **vlan** *vlan-id*} {**mpid** *target-mp-id* | **mac-address**	Begins configuring a single-ended Ethernet frame loss ratio operation and enters IP SLA Y.1731 loss configuration mode.

	Command or Action	Purpose
	target-address} **CoS** *CoS* {**source** {**mpid** *source-mp-id* | **mac-address** *source-address*}} **Example:** `Device(config-ip-sla)# ethernet y1731 loss LMM domain xxx vlan 12 mpid 34 CoS 4 source mpid 23`	• To configure concurrent operations, use the **SLM** keyword with this command. Repeat the preceding two steps to configure each concurrent operation to be added to a single IP SLA operation number. Concurrent operations are supported for a given EVC, CoS, and remote-MEP combination, or for multiple MEPs for a given multipoint EVC. **Note** The session with mac-address will not be inactivated when there is CFM error.
Step 5	**aggregate interval** *seconds* **Example:** `Device(config-sla-y1731-loss)# aggregate interval 900`	(Optional) Configures the length of time during which performance measurements are conducted and the results stored.
Step 6	**availability algorithm** {**sliding-window** | **static-window**} **Example:** `Device(config-sla-y1731-loss)# availability algorithm static-window`	(Optional) Specifies availability algorithm used.
Step 7	**frame consecutive** *value* **Example:** `Device(config-sla-y1731-loss)# frame consecutive 10`	(Optional) Specifies number of consecutive measurements to be used to determine availability or unavailability status.
Step 8	**frame interval** *milliseconds* **Example:** `Device(config-sla-y1731-loss)# frame interval 100`	(Optional) Sets the gap between successive frames.
Step 9	**history interval** *intervals-stored* **Example:** `Device(config-sla-y1731-loss)# history interval 2`	(Optional) Sets the number of statistics distributions kept during the lifetime of an IP SLAs Ethernet operation.

	Command or Action	Purpose
Step 10	**owner** *owner-id* **Example:** `Device(config-sla-y1731-delay)# owner admin`	(Optional) Configures the owner of an IP SLAs operation.
Step 11	**exit** **Example:** `Device(config-sla-y1731-delay)# exit`	Exits to IP SLA configuration mode.
Step 12	**exit** **Example:** `Device(config-ip-sla)# exit`	Exits to global configuration mode.
Step 13	**exit** **Example:** `Device(config)# exit`	Exits to privileged EXEC mode.

What to do next

When you are finished configuring this MEP, see the "Scheduling IP SLAs Operations" section to schedule the 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 (,).

Procedure

	Command or Action	Purpose
Step 1	**enable** **Example:** `Device> enable`	Enables privileged EXEC mode. • Enter your password if prompted.

	Command or Action	Purpose
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** {**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`
		• 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.

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:**	(Optional) Displays IP SLAs configuration details.

	Command or Action	Purpose
	`Device# show ip sla configuration`	

Enabling NTP Time of Day Synchronization

Perform additional NTP Time Of Day synchronization configuration when NTP is chosen for time synchronization for one-way delay or delay-variation measurements on source and destination devices.

Note PTP should *not* be configured when NTP Time Of Day synchronization is used as they are mutually-exclusive configuration options for time synchronization.

For information on configuring NTP, see Configuring NTP section in Cisco IOS Network Management Configuration Guide.

Procedure

	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	**platfrom time-source ntp** **Example:** `Router(config)# platform time-source ntp`	Initiates Time of Day (ToD) synchronization on the ethernet ports.
Step 4	**exit** **Example:** `Router(config)# exit`	Exits the configuration.

Configuration Examples for IP SLAs Metro-Ethernet 3.0 (ITU-T Y.1731) Operations

Example: Dual-Ended Ethernet Delay Operation

The following sample output shows the configuration, including default values, of a receiver MEP on the responder device for a dual-ended Ethernet delay or delay variation operation:

```
Device# show ip sla configuration 501

IP SLAs Infrastructure Engine-III
Entry number: 501
Owner: admin
Tag:
Operation timeout (milliseconds): 5000
Ethernet Y1731 Delay Operation
Frame Type: 1DM
Domain: xxx
ReceiveOnly: TRUE
Evc: yyy
Local Mpid: 101
CoS: 3
   Max Delay: 5000
Threshold (milliseconds): 5000
.
.
.
Statistics Parameters
  Aggregation Period: 900
  Frame offset: 1
  Distribution Delay One-Way:
   Number of Bins 10
   Bin Boundaries: 5000,10000,15000,20000,25000,30000,35000,40000,45000,-1
  Distribution Delay-Variation One-Way:
   Number of Bins 10
   Bin Boundaries: 5000,10000,15000,20000,25000,30000,35000,40000,45000,-1
History
  Number of intervals: 2
```

The following sample output shows the configuration, including default values, of the sender MEP for a dual-ended IP SLAs Ethernet delay or delay variation operation:

```
Device# show ip sla configuration 500

IP SLAs Infrastructure Engine-III
Entry number: 500
Owner:
Tag:
Operation timeout (milliseconds): 5000
Ethernet Y1731 Delay Operation
Frame Type: 1DM
Domain: yyy
ReceiveOnly: FALSE
Evc: xxx
Target Mpid: 101
Source Mpid: 100
CoS: 3
   Request size (Padding portion): 64
   Frame Interval: 1000
Threshold (milliseconds): 5000
.
.
.
Statistics Parameters
  Aggregation Period: 900
  Frame offset: 1
History
  Number of intervals: 22
```

Verification Example for Dual-ended or 1DM Measurement

The following sample output shows the performance measurement statistics output in Receiver:

```
Router(config)# do show ip sla statis 10 details
IPSLAs Latest Operation Statistics

IPSLA operation id: 10
Delay Statistics for Y1731 Operation 10
Type of operation: Y1731 Delay Measurement
Latest operation start time: *13:44:06.408 UTC Thu May 11 2017
Latest operation return code: OK
Distribution Statistics:


Interval
 Start time:  *13:44:06.408 UTC Thu May 11 2017
 Elapsed time: 88 seconds
 Number of measurements initiated: 0
 Number of measurements completed: 88
 Flag: OK


Delay:
  Number of forward observations: 82
    Min/Avg/Max forward: 0/0/0 (microsec)
  Time of occurrence forward:
    Min - *13:44:08.627 UTC Thu May 11 2017
    Max - *13:45:28.748 UTC Thu May 11 2017

 Bin forward:
        Bin Range (microsec)            Total observations
                  0 - < 5000                    82
               5000 - < 10000                   0
              10000 - < 15000                   0
              15000 - < 20000                   0
              20000 - < 25000                   0
              25000 - < 30000                   0
              30000 - < 35000                   0
              35000 - < 40000                   0
              40000 - < 45000                   0
              45000 - < 4294967295              0

Delay Variance:
  Number of forward positive observations: 64
    Min/Avg/Max forward positive: 0/0/0 (microsec)
  Time of occurrence forward positive:
    Min - *13:44:08.627 UTC Thu May 11 2017
    Max - *13:45:28.748 UTC Thu May 11 2017
  Number of forward negative observations: 17
    Min/Avg/Max forward negative: 0/0/0 (microsec)
  Time of occurrence forward negative:
    Min - *13:44:13.628 UTC Thu May 11 2017
    Max - *13:45:28.748 UTC Thu May 11 2017

 Bin forward positive:
        Bin Range (microsec)            Total observations
                  0 - < 5000                    64
               5000 - < 10000                   0
              10000 - < 15000                   0
              15000 - < 20000                   0
              20000 - < 4294967295              0

 Bin forward negative:
```

```
        Bin Range (microsec)            Total observations
                  0 - < 5000                    17
               5000 - < 10000                   0
              10000 - < 15000                   0
              15000 - < 20000                   0
              20000 - < 4294967295              0
Operation time to live: 3311 sec
Operational state of entry: Active
Last time this entry was reset: Never
```

The following sample output shows the performance measurement statistics output in the Sender:

```
Router(config)# do show ip sla statis 10 details
IPSLAs Latest Operation Statistics

IPSLA operation id: 10
Delay Statistics for Y1731 Operation 10
Type of operation: Y1731 Delay Measurement
Latest operation start time: *13:42:37.165 UTC Thu May 11 2017
Latest operation return code: OK
Distribution Statistics:


Interval
 Start time:  *13:42:37.165 UTC Thu May 11 2017
 End time:  *13:43:57.476 UTC Thu May 11 2017
 Number of measurements initiated: 81
 Number of measurements completed: 0
 Flag: OK


Delay:
  Number of forward observations: 0
    Min/Avg/Max forward: 0/0/0 (microsec)
  Time of occurrence forward:
    Min - *00:00:00.000 UTC Mon Jan 1 1900
    Max - *00:00:00.000 UTC Mon Jan 1 1900

 Bin forward:
        Bin Range (microsec)            Total observations
                  0 - < 5000                    0
               5000 - < 10000                   0
              10000 - < 15000                   0
              15000 - < 20000                   0
              20000 - < 25000                   0
              25000 - < 30000                   0
              30000 - < 35000                   0
              35000 - < 40000                   0
              40000 - < 45000                   0
              45000 - < 4294967295              0

Delay Variance:
  Number of forward positive observations: 0
    Min/Avg/Max forward positive: 0/0/0 (microsec)
  Time of occurrence forward positive:
    Min - *00:00:00.000 UTC Mon Jan 1 1900
    Max - *00:00:00.000 UTC Mon Jan 1 1900
  Number of forward negative observations: 0
    Min/Avg/Max forward negative: 0/0/0 (microsec)
  Time of occurrence forward negative:
    Min - *00:00:00.000 UTC Mon Jan 1 1900
    Max - *00:00:00.000 UTC Mon Jan 1 1900

 Bin forward positive:
        Bin Range (microsec)            Total observations
```

```
                0 - < 5000                    0
             5000 - < 10000                   0
            10000 - < 15000                   0
            15000 - < 20000                   0
            20000 - < 4294967295              0

 Bin forward negative:
        Bin Range (microsec)           Total observations
                0 - < 5000                    0
             5000 - < 10000                   0
            10000 - < 15000                   0
            15000 - < 20000                   0
            20000 - < 4294967295              0
Operation time to live: 3317 sec
Operational state of entry: Active
Last time this entry was reset: Never
```

Configuration Example for Single-ended or Two-Way Delay Measurement (DMM)

The following sample output shows the configuration of two-way delay measurement without clock synchronization (near end and far end measurments are notavailable):

```
Router(config)# do show run | sec ip sla 11
ip sla 11
 ethernet y1731 delay DMM domain MD1 evc MA1 mpid 2220 cos 5 source mpid 3331
 owner RTR
  history interval 10
  aggregate interval 100
  distribution delay-variation one-way 5 5000,10000,15000,20000,-1

Router(config)# do show ip sla configuration 11
IP SLAs Infrastructure Engine-III
Entry number: 11
Owner: RTR
Tag:
Operation timeout (milliseconds): 5000
Ethernet Y1731 Delay Operation
Frame Type: DMM
Domain: MD1
Evc: MA1
Target Mpid: 2220
Source Mpid: 3331
CoS: 5
   Owner: RTR
   Max Delay: 5000
   Request size (Padding portion): 64
   Frame Interval: 1000
   Clock: Not In Sync
Threshold (milliseconds): 5000
Schedule:
   Operation frequency (seconds): 100  (not considered if randomly scheduled)
   Next Scheduled Start Time: Start Time already passed
   Group Scheduled : FALSE
   Randomly Scheduled : FALSE
   Life (seconds): 3600
   Entry Ageout (seconds): never
   Recurring (Starting Everyday): FALSE
   Status of entry (SNMP RowStatus): Active
```

```
Statistics Parameters
  Frame offset: 1
  Distribution Delay Two-Way:
   Number of Bins 10
   Bin Boundaries: 5000,10000,15000,20000,25000,30000,35000,40000,45000,-1
  Distribution Delay-Variation Two-Way:
   Number of Bins 10
   Bin Boundaries: 5000,10000,15000,20000,25000,30000,35000,40000,45000,-1
  Aggregation Period: 100
History
  Number of intervals: 10
```

The following is a sample output of the performance measurement statistics (two-way delay measurement without clock synchronization):

```
Router(config)# do show ip sla statis 11 details
IPSLAs Latest Operation Statistics

IPSLA operation id: 11
Delay Statistics for Y1731 Operation 11
Type of operation: Y1731 Delay Measurement
Latest operation start time: *13:56:08.437 UTC Thu May 11 2017
Latest operation return code: OK
Distribution Statistics:
Interval
 Start time:  *13:56:08.437 UTC Thu May 11 2017
 Elapsed time: 78 seconds
 Number of measurements initiated: 76
 Number of measurements completed: 76
 Flag: OK


Delay:
  Number of TwoWay observations: 70
    Min/Avg/Max TwoWay: 0/0/0 (microsec)
  Time of occurrence TwoWay:
    Min - *13:57:19.456 UTC Thu May 11 2017
    Max - *13:57:04.456 UTC Thu May 11 2017

 Bin TwoWay:
        Bin Range (microsec)            Total observations
                  0 - < 5000                    70
               5000 - < 10000                   0
              10000 - < 15000                   0
              15000 - < 20000                   0
              20000 - < 25000                   0
              25000 - < 30000                   0
              30000 - < 35000                   0
              35000 - < 40000                   0
              40000 - < 45000                   0
              45000 - < 4294967295              0

Delay Variance:
  Number of TwoWay positive observations: 41
    Min/Avg/Max TwoWay positive: 0/0/0 (microsec)
  Time of occurrence TwoWay positive:
    Min - *13:56:14.401 UTC Thu May 11 2017
    Max - *13:57:04.456 UTC Thu May 11 2017
  Number of TwoWay negative observations: 27
    Min/Avg/Max TwoWay negative: 0/0/0 (microsec)
  Time of occurrence TwoWay negative:
    Min - *13:56:14.401 UTC Thu May 11 2017
    Max - *13:56:14.401 UTC Thu May 11 2017

 Bin TwoWay positive:
```

```
        Bin Range (microsec)            Total observations
                 0 - < 5000                     41
              5000 - < 10000                    0
             10000 - < 15000                    0
             15000 - < 20000                    0
             20000 - < 25000                    0
             25000 - < 30000                    0
             30000 - < 35000                    0
             35000 - < 40000                    0
             40000 - < 45000                    0
             45000 - < 4294967295               0

 Bin TwoWay negative:
        Bin Range (microsec)            Total observations
                 0 - < 5000                     27
              5000 - < 10000                    0
             10000 - < 15000                    0
             15000 - < 20000                    0
             20000 - < 25000                    0
             25000 - < 30000                    0
             30000 - < 35000                    0
             35000 - < 40000                    0
             40000 - < 45000                    0
             45000 - < 4294967295               0
Operation time to live: 3521 sec
Operational state of entry: Active
Last time this entry was reset: Never
```

The following is a sample output of the two-way delay measurement with clock synchronization (near end and far end measurments are available):

```
Router(config)# do show runn | sec ip sla 11
ip sla 11
 ethernet y1731 delay DMM domain MD1 evc MA1 mpid 2220 cos 5 source mpid 3331
  clock sync
 owner RTR
  history interval 10
  aggregate interval 100
  distribution delay-variation one-way 5 5000,10000,15000,20000,-1

Router(config)# do show ip sla configuration 11
IP SLAs Infrastructure Engine-III
Entry number: 11
Owner: RTR
Tag:
Operation timeout (milliseconds): 5000
Ethernet Y1731 Delay Operation
Frame Type: DMM
Domain: MD1
Evc: MA1
Target Mpid: 2220
Source Mpid: 3331
CoS: 5
   Owner: RTR
   Max Delay: 5000
   Request size (Padding portion): 64
   Frame Interval: 1000
   Clock: In Sync
Threshold (milliseconds): 5000
Schedule:
   Operation frequency (seconds): 100  (not considered if randomly scheduled)
   Next Scheduled Start Time: Start Time already passed
   Group Scheduled : FALSE
```

```
   Randomly Scheduled : FALSE
   Life (seconds): 3600
   Entry Ageout (seconds): never
   Recurring (Starting Everyday): FALSE
   Status of entry (SNMP RowStatus): Active
Statistics Parameters
  Frame offset: 1
  Distribution Delay One-Way:
   Number of Bins 10
   Bin Boundaries: 5000,10000,15000,20000,25000,30000,35000,40000,45000,-1
  Distribution Delay Two-Way:
   Number of Bins 10
   Bin Boundaries: 5000,10000,15000,20000,25000,30000,35000,40000,45000,-1
  Distribution Delay-Variation One-Way:
   Number of Bins 5
   Bin Boundaries: 5000,10000,15000,20000,-1
  Distribution Delay-Variation Two-Way:
   Number of Bins 10
   Bin Boundaries: 5000,10000,15000,20000,25000,30000,35000,40000,45000,-1
  Aggregation Period: 100
History
  Number of intervals: 10
```

The following is a sample output of the performance measurement statistics (two-way delay measurement without clock synchronization):

```
Router(config)# do show ip sla statis 11 details
IPSLAs Latest Operation Statistics

IPSLA operation id: 11
Delay Statistics for Y1731 Operation 11
Type of operation: Y1731 Delay Measurement
Latest operation start time: *14:00:44.257 UTC Thu May 11 2017
Latest operation return code: OK
Distribution Statistics:


Interval
 Start time:  *14:00:44.257 UTC Thu May 11 2017
 Elapsed time: 90 seconds
 Number of measurements initiated: 81
 Number of measurements completed: 81
 Flag: OK


Delay:
  Number of forward observations: 75
    Min/Avg/Max forward: 0/0/0 (microsec)
  Time of occurrence forward:
    Min - *14:01:59.800 UTC Thu May 11 2017
    Max - *14:01:54.801 UTC Thu May 11 2017
  Number of backward observations: 75
    Min/Avg/Max backward: 0/0/0 (microsec)
  Time of occurrence backward:
    Min - *14:00:49.680 UTC Thu May 11 2017
    Max - *14:01:54.801 UTC Thu May 11 2017
  Number of TwoWay observations: 75
    Min/Avg/Max TwoWay: 0/0/0 (microsec)
  Time of occurrence TwoWay:
    Min - *14:01:49.736 UTC Thu May 11 2017
    Max - *14:01:54.801 UTC Thu May 11 2017

 Bin forward:
        Bin Range (microsec)            Total observations
                  0 - < 5000                    75
```

```
              5000 - < 10000                    0
             10000 - < 15000                    0
             15000 - < 20000                    0
             20000 - < 25000                    0
             25000 - < 30000                    0
             30000 - < 35000                    0
             35000 - < 40000                    0
             40000 - < 45000                    0
             45000 - < 4294967295               0

 Bin backward:
        Bin Range (microsec)            Total observations
                  0 - < 5000                    75
               5000 - < 10000                   0
              10000 - < 15000                   0
              15000 - < 20000                   0
              20000 - < 25000                   0
              25000 - < 30000                   0
              30000 - < 35000                   0
              35000 - < 40000                   0
              40000 - < 45000                   0
              45000 - < 4294967295              0

 Bin TwoWay:
        Bin Range (microsec)            Total observations
                  0 - < 5000                    75
               5000 - < 10000                   0
              10000 - < 15000                   0
              15000 - < 20000                   0
              20000 - < 25000                   0
              25000 - < 30000                   0
              30000 - < 35000                   0
              35000 - < 40000                   0
              40000 - < 45000                   0
              45000 - < 4294967295              0

Delay Variance:
  Number of forward positive observations: 54
    Min/Avg/Max forward positive: 0/0/0 (microsec)
  Time of occurrence forward positive:
    Min - *14:00:49.680 UTC Thu May 11 2017
    Max - *14:01:59.800 UTC Thu May 11 2017
  Number of forward negative observations: 19
    Min/Avg/Max forward negative: 0/0/0 (microsec)
  Time of occurrence forward negative:
    Min - *14:00:49.680 UTC Thu May 11 2017
    Max - *14:01:54.801 UTC Thu May 11 2017
  Number of backward positive observations: 56
    Min/Avg/Max backward positive: 0/0/0 (microsec)
  Time of occurrence backward positive:
    Min - *14:00:49.680 UTC Thu May 11 2017
    Max - *14:01:54.801 UTC Thu May 11 2017
  Number of backward negative observations: 17
    Min/Avg/Max backward negative: 0/0/0 (microsec)
  Time of occurrence backward negative:
    Min - *14:00:54.680 UTC Thu May 11 2017
    Max - *14:01:54.801 UTC Thu May 11 2017
  Number of TwoWay positive observations: 49
    Min/Avg/Max TwoWay positive: 0/0/0 (microsec)
  Time of occurrence TwoWay positive:
    Min - *14:00:49.680 UTC Thu May 11 2017
    Max - *14:01:54.801 UTC Thu May 11 2017
  Number of TwoWay negative observations: 24
    Min/Avg/Max TwoWay negative: 0/0/0 (microsec)
```

```
 Time of occurrence TwoWay negative:
   Min - *14:00:49.680 UTC Thu May 11 2017
   Max - *14:01:54.801 UTC Thu May 11 2017

Bin forward positive:
       Bin Range (microsec)            Total observations
                 0 - < 5000                    54
              5000 - < 10000                   0
             10000 - < 15000                   0
             15000 - < 20000                   0
             20000 - < 4294967295              0

Bin forward negative:
       Bin Range (microsec)            Total observations
                 0 - < 5000                    19
              5000 - < 10000                   0
             10000 - < 15000                   0
             15000 - < 20000                   0
             20000 - < 4294967295              0

Bin backward positive:
       Bin Range (microsec)            Total observations
                 0 - < 5000                    56
              5000 - < 10000                   0
             10000 - < 15000                   0
             15000 - < 20000                   0
             20000 - < 4294967295              0

Bin backward negative:
       Bin Range (microsec)            Total observations
                 0 - < 5000                    17
              5000 - < 10000                   0
             10000 - < 15000                   0
             15000 - < 20000                   0
             20000 - < 4294967295              0

Bin TwoWay positive:
       Bin Range (microsec)            Total observations
                 0 - < 5000                    49
              5000 - < 10000                   0
             10000 - < 15000                   0
             15000 - < 20000                   0
             20000 - < 25000                   0
             25000 - < 30000                   0
             30000 - < 35000                   0
             35000 - < 40000                   0
             40000 - < 45000                   0
             45000 - < 4294967295              0

Bin TwoWay negative:
       Bin Range (microsec)            Total observations
                 0 - < 5000                    24
              5000 - < 10000                   0
             10000 - < 15000                   0
             15000 - < 20000                   0
             20000 - < 25000                   0
             25000 - < 30000                   0
             30000 - < 35000                   0
             35000 - < 40000                   0
             40000 - < 45000                   0
             45000 - < 4294967295              0
Operation time to live: 3509 sec
Operational state of entry: Active
```

```
Last time this entry was reset: Never
```

Example for Synthetic Loss Measurement (SLM)

The following sample output shows the configuration of Synthetic Loss Measurement (SLM):

```
Router(config)# do show runn | sec ip sla 12
ip sla 12
 ethernet y1731 loss SLM domain MD1 evc MA1 mpid 2220 cos 5 source mpid 3331
 owner RTR
  history interval 10
  aggregate interval 100

Router(config)# do show ip sla configuration 12
IP SLAs Infrastructure Engine-III
Entry number: 12
Owner: RTR
Tag:
Operation timeout (milliseconds): 0
Ethernet Y1731 Loss Operation
Frame Type: SLM
Domain: MD1
Evc: MA1
Target Mpid: 2220
Source Mpid: 3331
CoS: 5
    Owner: RTR
   Request size (Padding portion): 64
   Frame Interval: 1000
Schedule:
   Operation frequency (seconds): 100  (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): 0
Statistics Parameters
  Aggregation Period: 100
  Frame consecutive: 10
  Frame consecutive loss-ratio: 10
  Availability algorithm: sliding-window
History
  Number of intervals: 10


Router(config)# ip sla sched 12 start now
```

The following sample output shows te performance measurement statistics for SLM configuration:

```
Router(config)#do show ip sla statistics 12 details
IPSLAs Latest Operation Statistics

IPSLA operation id: 12
Loss Statistics for Y1731 Operation 12
Type of operation: Y1731 Loss Measurement
Latest operation start time: *14:04:55.510 UTC Thu May 11 2017
Latest operation return code: OK
Distribution Statistics:
```

```
Interval
 Start time:  *14:04:55.510 UTC Thu May 11 2017
 Elapsed time: 46 seconds
 Number of measurements initiated: 40
 Number of measurements completed: 40
 Flag: OK

Forward
  Number of observations: 4
  Available indicators: 0
  Unavailable indicators: 4
  Tx frame count: 40
  Rx frame count: 40
    Min/Avg/Max - (FLR % ): 0:9/000.00%/0:9
  Cumulative - (FLR % ): 000.0000%
  Timestamps forward:
    Min - *14:05:34.512 UTC Thu May 11 2017
    Max - *14:05:34.512 UTC Thu May 11 2017
Backward
  Number of observations: 4
  Available indicators: 0
  Unavailable indicators: 4
  Tx frame count: 40
  Rx frame count: 40
    Min/Avg/Max - (FLR % ): 0:9/000.00%/0:9
  Cumulative - (FLR % ): 000.0000%
  Timestamps backward:
    Min - *14:05:34.512 UTC Thu May 11 2017
    Max - *14:05:34.512 UTC Thu May 11 2017
Operation time to live: 3553 sec
Operational state of entry: Active
Last time this entry was reset: Never
```

Example: Frame Delay and Frame Delay Variation Measurement Configuration

The following sample output shows the performance monitoring session summary:

```
Device# show ethernet cfm pm session summary

Number of Configured Session : 2
Number of Active Session: 2
Number of Inactive Session: 0
```

The following sample output shows the active performance monitoring session:

```
Device# show ethernet cfm pm session active

Display of Active Session
--------------------------------------------------------------------------------
EPM-ID   SLA-ID    Lvl/Type/ID/Cos/Dir     Src-Mac-address Dst-Mac-address
--------------------------------------------------------------------------------
 0     10           3/BD-V/10/2/Down     d0c2.8216.c9d7  d0c2.8216.27a3
 1     11           3/BD-V/10/3/Down     d0c2.8216.c9d7  d0c2.8216.27a3
Total number of Active Session: 2

Device# show ethernet cfm pm session db 0

--------------------------------------------------------------------------------
      TX Time FWD                   RX Time FWD
      TX Time BWD                   RX Time BWD              Frame Delay
      Sec:nSec                      Sec:nSec                  Sec:nSec
--------------------------------------------------------------------------------
```

```
Session ID: 0
******************************************************************************
       234:526163572                 245:305791416
       245:306761904                 234:527134653            0:593
******************************************************************************
       235:528900628                 246:308528744
       246:309452848                 235:529825333            0:601
******************************************************************************
       236:528882716                 247:308511128
       247:309450224                 236:529822413            0:601
******************************************************************************
       237:526578788                 248:306207432
       248:307157936                 237:527529885            0:593
******************************************************************************
       238:527052156                 249:306681064
       249:307588016                 238:527959717            0:609
******************************************************************************
       239:526625044                 250:306254200
       250:307091888                 239:527463325            0:593
******************************************************************************
       240:528243204                 251:307872648
       251:308856880                 240:529228021            0:585
```

Configuration Example for Dual-ended or 1DM Measurement

The following sample output shows the configuration of dual-ended or 1DM measurement:

Sender Configuration

```
Router(config)# do show run | sec ip sla 10
ip sla 10
 ethernet y1731 delay 1DM domain MD1 evc MA1 mpid 3331 cos 5 source mpid 2220
 owner RTR
  history interval 10
  aggregate interval 100
  distribution delay-variation one-way 5 5000,10000,15000,20000,-1
```

```
Router(config)# do show ip sla configuration 10
IP SLAs Infrastructure Engine-III
Entry number: 10
Owner: RTR
Tag:
Operation timeout (milliseconds): 5000
Ethernet Y1731 Delay Operation
Frame Type: 1DM
Domain: MD1
ReceiveOnly: FALSE
Evc: MA1
Target Mpid: 3331
Source Mpid: 2220
CoS: 5
   Owner: RTR
   Request size (Padding portion): 64
   Frame Interval: 1000
Threshold (milliseconds): 5000
Schedule:
   Operation frequency (seconds): 100  (not considered if randomly scheduled)
   Next Scheduled Start Time: Start Time already passed
   Group Scheduled : FALSE
   Randomly Scheduled : FALSE
```

```
   Life (seconds): 3600
   Entry Ageout (seconds): never
   Recurring (Starting Everyday): FALSE
   Status of entry (SNMP RowStatus): Active
Statistics Parameters
  Frame offset: 1
  Aggregation Period: 100
History
  Number of intervals: 10
```

Receiver Configuration

```
Router(config)# do show run | sec ip sla 10
ip sla 10
 ethernet y1731 delay receive 1DM domain MD1 evc MA1 cos 5 mpid 3331
 owner RTR
  history interval 10
  aggregate interval 100
  distribution delay-variation one-way 5 5000,10000,15000,20000,-1

Router(config)# do show ip sla configuration 10
IP SLAs Infrastructure Engine-III
Entry number: 10
Owner: RTR
Tag:
Operation timeout (milliseconds): 5000
Ethernet Y1731 Delay Operation
Frame Type: 1DM
Domain: MD1
ReceiveOnly: TRUE
Evc: MA1
Local Mpid: 3331
CoS: 5
   Owner: RTR
   Max Delay: 5000
Threshold (milliseconds): 5000
Schedule:
   Operation frequency (seconds): 100  (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): Active
Statistics Parameters
  Frame offset: 1
  Distribution Delay One-Way:
   Number of Bins 10
   Bin Boundaries: 5000,10000,15000,20000,25000,30000,35000,40000,45000,-1
  Distribution Delay-Variation One-Way:
   Number of Bins 5
   Bin Boundaries: 5000,10000,15000,20000,-1
  Aggregation Period: 100
History
  Number of intervals: 10
```

Verification Example for Dual-ended or 1DM Measurement

The following sample output shows the performance measurement statistics output in Receiver:

```
Router(config)# do show ip sla statis 10 details
IPSLAs Latest Operation Statistics

IPSLA operation id: 10
Delay Statistics for Y1731 Operation 10
Type of operation: Y1731 Delay Measurement
Latest operation start time: *13:44:06.408 UTC Thu May 11 2017
Latest operation return code: OK
Distribution Statistics:


Interval
 Start time:  *13:44:06.408 UTC Thu May 11 2017
 Elapsed time: 88 seconds
 Number of measurements initiated: 0
 Number of measurements completed: 88
 Flag: OK


Delay:
  Number of forward observations: 82
    Min/Avg/Max forward: 0/0/0 (microsec)
  Time of occurrence forward:
    Min - *13:44:08.627 UTC Thu May 11 2017
    Max - *13:45:28.748 UTC Thu May 11 2017

 Bin forward:
        Bin Range (microsec)            Total observations
                  0 - < 5000                    82
               5000 - < 10000                   0
              10000 - < 15000                   0
              15000 - < 20000                   0
              20000 - < 25000                   0
              25000 - < 30000                   0
              30000 - < 35000                   0
              35000 - < 40000                   0
              40000 - < 45000                   0
              45000 - < 4294967295              0

Delay Variance:
  Number of forward positive observations: 64
    Min/Avg/Max forward positive: 0/0/0 (microsec)
  Time of occurrence forward positive:
    Min - *13:44:08.627 UTC Thu May 11 2017
    Max - *13:45:28.748 UTC Thu May 11 2017
  Number of forward negative observations: 17
    Min/Avg/Max forward negative: 0/0/0 (microsec)
  Time of occurrence forward negative:
    Min - *13:44:13.628 UTC Thu May 11 2017
    Max - *13:45:28.748 UTC Thu May 11 2017

 Bin forward positive:
        Bin Range (microsec)            Total observations
                  0 - < 5000                    64
               5000 - < 10000                   0
              10000 - < 15000                   0
              15000 - < 20000                   0
              20000 - < 4294967295              0

 Bin forward negative:
        Bin Range (microsec)            Total observations
                  0 - < 5000                    17
               5000 - < 10000                   0
              10000 - < 15000                   0
```

```
            15000 - < 20000                   0
            20000 - < 4294967295              0
Operation time to live: 3311 sec
Operational state of entry: Active
Last time this entry was reset: Never
```

The following sample output shows the performance measurement statistics output in the Sender:

```
Router(config)# do show ip sla statis 10 details
IPSLAs Latest Operation Statistics

IPSLA operation id: 10
Delay Statistics for Y1731 Operation 10
Type of operation: Y1731 Delay Measurement
Latest operation start time: *13:42:37.165 UTC Thu May 11 2017
Latest operation return code: OK
Distribution Statistics:


Interval
 Start time:  *13:42:37.165 UTC Thu May 11 2017
 End time:  *13:43:57.476 UTC Thu May 11 2017
 Number of measurements initiated: 81
 Number of measurements completed: 0
 Flag: OK


Delay:
  Number of forward observations: 0
    Min/Avg/Max forward: 0/0/0 (microsec)
  Time of occurrence forward:
    Min - *00:00:00.000 UTC Mon Jan 1 1900
    Max - *00:00:00.000 UTC Mon Jan 1 1900

 Bin forward:
        Bin Range (microsec)            Total observations
                  0 - < 5000                    0
               5000 - < 10000                   0
              10000 - < 15000                   0
              15000 - < 20000                   0
              20000 - < 25000                   0
              25000 - < 30000                   0
              30000 - < 35000                   0
              35000 - < 40000                   0
              40000 - < 45000                   0
              45000 - < 4294967295              0

Delay Variance:
  Number of forward positive observations: 0
    Min/Avg/Max forward positive: 0/0/0 (microsec)
  Time of occurrence forward positive:
    Min - *00:00:00.000 UTC Mon Jan 1 1900
    Max - *00:00:00.000 UTC Mon Jan 1 1900
  Number of forward negative observations: 0
    Min/Avg/Max forward negative: 0/0/0 (microsec)
  Time of occurrence forward negative:
    Min - *00:00:00.000 UTC Mon Jan 1 1900
    Max - *00:00:00.000 UTC Mon Jan 1 1900

 Bin forward positive:
        Bin Range (microsec)            Total observations
                  0 - < 5000                    0
               5000 - < 10000                   0
              10000 - < 15000                   0
              15000 - < 20000                   0
```

```
            20000 - < 4294967295              0

 Bin forward negative:
       Bin Range (microsec)            Total observations
                 0 - < 5000                    0
              5000 - < 10000                   0
             10000 - < 15000                   0
             15000 - < 20000                   0
             20000 - < 4294967295              0
Operation time to live: 3317 sec
Operational state of entry: Active
Last time this entry was reset: Never
```

Example: Sender MEP for a Single-Ended Ethernet Delay Operation

The following sample output shows the configuration, including default values, of the sender MEP for a single-ended IP SLAs Ethernet delay operation:

```
Router# show ip sla configuration 10

IP SLAs Infrastructure Engine-III
Entry number: 10
Owner:
Tag:
Operation timeout (milliseconds): 5000
Ethernet Y1731 Delay Operation
Frame Type: DMM
Domain: xxx
Vlan: yyy
Target Mpid: 101
Source Mpid: 100
CoS: 4
   Max Delay: 5000
   Request size (Padding portion): 64
   Frame Interval: 1000
   Clock: Not In Sync
Threshold (milliseconds): 5000
.
.
.
Statistics Parameters
  Aggregation Period: 900
  Frame offset: 1
  Distribution Delay Two-Way:
   Number of Bins 10
   Bin Boundaries: 5000,10000,15000,20000,25000,30000,35000,40000,45000,-1
  Distribution Delay-Variation Two-Way:
   Number of Bins 10
   Bin Boundaries: 5000,10000,15000,20000,25000,30000,35000,40000,45000,-1
History
  Number of intervals: 2
```

Example: Sender MEP for a Single-Ended Ethernet Frame Loss Operation

The following output shows the configuration, including default values, of the sender MEP in a basic single-ended IP SLAs Ethernet frame loss ratio operation with a start-time of now:

```
Router# show ip sla configuration 11

IP SLAs Infrastructure Engine-III
Entry number: 11
Owner:
Tag:
Operation timeout (milliseconds): 5000
Ethernet Y1731 Loss Operation
Frame Type: LMM
Domain: xxx
Vlan: 12
Target Mpid: 34
Source Mpid: 23
CoS: 4
   Request size (Padding portion): 0
   Frame Interval: 1000
Schedule:
   Operation frequency (seconds): 60  (not considered if randomly scheduled)
   Next Scheduled Start Time: Start Time already passed
   Group Scheduled : FALSE
   Randomly Scheduled : FALSE
   Life (seconds): 3600
   Entry Ageout (seconds): never
   Recurring (Starting Everyday): FALSE
   Status of entry (SNMP RowStatus): ActiveThreshold (milliseconds): 5000
Statistics Parameters
  Aggregation Period: 900
  Frame consecutive: 10
  Availability algorithm: static-window
History
  Number of intervals: 2
```

Example: Verifying NTP Time Of Day Synchronization

Use the **show platform time-source** command to display information on the time source.

```
Router# show platform time-source
Time Source mode : NTP not Configured

Router# show platform time-source
Time Source mode : NTP
NTP State        : Not Synchronized

Router# show platform time-source
Time Source mode : NTP
NTP State        : Synchronized
```

Additional References for IP SLAs Metro-Ethernet 3.0 (ITU-T Y.1731) Operations

Related Documents

Related Topic	Document Title
Cisco IOS Carrier Ethernet commands	Cisco IOS Carrier Ethernet Command Reference
Cisco IOS IP SLAs commands	Cisco IOS IP SLAs Command Reference
Ethernet CFM	"Configuring Ethernet Connectivity Fault Management in a Service Provider Network" module of the *Cisco IOS Carrier Ethernet Configuration Guide*
Network Time Protocol (NTP)	"Configuring NTP" module of the *Cisco IOS Network Management Configuration Guide*
Proactive threshold monitoring for Cisco IOS IP SLAs	"Configuring Proactive Threshold Monitoring of IP SLAs Operations" module of the *Cisco IOS IP SLAs Configuration Guide*

Standards and RFCs

Standard/RFC	Title
ITU-T Y.1731	*OAM functions and mechanisms for Ethernet-based networks*
No specific RFCs are supported by the features in this document.	--

MIBs

MIB	MIBs Link
• CISCO-IPSLA-ETHERNET-MIB • CISCO-RTTMON-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 IP SLAs Metro-Ethernet 3.0 (ITU-T Y.1731) 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 www.cisco.com/go/cfn. An account on Cisco.com is not required.

Table 1: Feature Information for IP SLAs Metro-Ethernet 3.0 (ITU-T Y.1731)

Feature Name	Releases	Feature Information
IP SLA Support for ETH-SLM (Ethernet Synthetic Loss Measurement in Y1731)		Y.1731 Performance Monitoring (PM) provides a standard Ethernet PM function that includes measurement of Ethernet frame delay, frame delay variation, frame loss, and frame throughput measurements specified by the ITU-T Y-1731 standard and interpreted by the Metro Ethernet Forum (MEF) standards group.
Y1731 MIB Support through existing IPSLA MIBs		Support was added for reporting threshold events and collecting performance statistics for IP SLAs Metro-Ethernet 3.0 (ITU-T Y.1731) operations using SNMP.