Configuring Y.1731 Performance Monitoring

This chapter describes how to configure the Y.1731 Performance Monitoring on the Cisco ME 3400 switches and includes the following sections:

Understanding Y.1731 Performance Monitoring

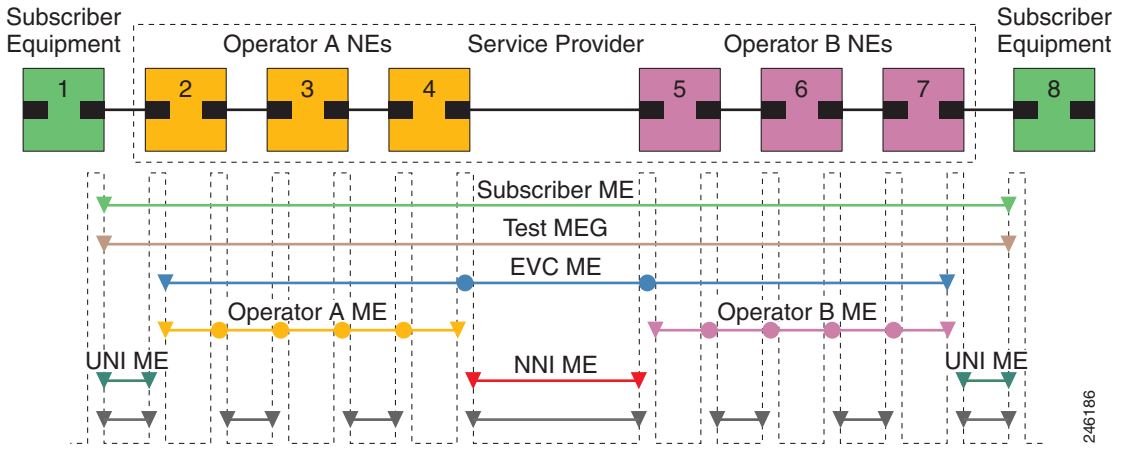
When service providers sell connectivity services to a subscriber, a Service Level Agreement (SLA) is reached between the buyer and seller of the service. The SLA defines the attributes offered by a provider and serves as a legal obligation on the service provider. As the level of performance required by subscribers increases, service providers need to monitor the performance parameters being offered. To capture the needs of the service providers, organizations have defined various standards such as IEEE 802.1ag and ITU-T Y.1731 that define the methods and frame formats used to measure performance parameters.

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. As per recommendations, the ME 3400 switches should be able to send, receive and process PM frames in intervals of 1000ms (1000 frames per second) with the maximum recommended transmission period being 1000ms (1000 frames per second) for any given service.

To measure SLA parameters such as frame delay or frame delay variation, a small number of synthetic frames are transmitted along with the service to the end point of the maintenance region, where the Maintenance End Point (MEP) responds to the synthetic frame. For a function such as connectivity fault management, the messages are sent less frequently, while performance monitoring frames are sent more frequently.

Figure 46-1 illustrates Maintenance Entities (ME) and Maintenance End Points (MEP) typically involved in a point-to-point metro ethernet deployment for the Y.1731 standard.

Figure 46-1 A Point-to-Point Metro Ethernet Deployment with Typical Maintenance Entities and Maintenance Points



Performance monitoring parameters include

- Connectivity, page 41-2
- Frame Delay and Frame Delay Variation, page 41-2
- Frame Loss Ratio and Availability

Connectivity

The first step to performance monitoring is verifying the connectivity. Continuity check messages (CCM) are best suited for connectivity verification. Since they are optimized for fault recovery operation, they are not usually accepted as a component of an SLA due to the timescale difference between SLA and fault recovery. Instead, Connectivity Fault Management (CFM) and Continuity Check Database (CCDB) are used to verify connectivity. For more information on CFM see, Configuring Ethernet OAM, CFM, and E-LMI, page 45-1.

Frame Delay and Frame Delay Variation

Ethernet frame delay measurement (ETH-DM) is used for on-demand ethernet Operations, Administration, and Maintenance (OAM) to measure frame delay and frame delay variation.

Ethernet frame delay and frame delay variation are measured by sending periodic frames with ETH-DM information to the peer MEP and receiving frames with ETH-DM information from the peer MEP. During the interval, each MEP measures the frame delay and frame delay variation.

ETH-DM also collects information, such as worst and best case delays, average delay, and average delay variation. It provides a runtime display of delay statistics during a two-way delay measurement. ETH-DM records the last 100 samples collected per remote Maintenance End Point (MEP) or per CFM session.

These are the two methods of delay measurement, as defined by the ITU-T Y.1731 standard: One-way ETH-DM and Two-way ETH-DM. However, only Two-way ETH-DM is supported.

Two-way ETH-DM:

Each MEP transmits frames with ETH-DM request information to its peer MEP and receives frames with ETH-DM reply information from its peer MEP. Two way frame delay and frame delay variation are measured using delay measurement message (DMM) and delay measurement reply (DMR) frames.

Synthetic Loss Measurement

Synthetic Loss Measurement (ETH-SLM) is a mechanism to measure frame loss using synthetic frames, rather than data traffic. A number of synthetic frames are sent and received, and the number that are lost is calculated between a pair of MEPs. This number is used as a statistical sample to approximate the frame loss ratio of data traffic.

ETH-SLM transmits synthetic frames with ETH-SLM information to a peer MEP and similarly receives synthetic frames with ETH-SLM information from the peer MEP. Each MEP performs frame loss measurements which contribute to unavailable time.

A near-end frame loss refers to frame loss associated with ingress data frames. Far-end frame loss refers to frame loss associated with egress data frames. Both near-end and far-end frame loss measurements contribute to near-end severely errored seconds and far end severely errored seconds which together contribute to unavailable time.

ETH-SLM is measured using SLM and SLR frames. Although ITU-T Y.1731 defines two methods of frame loss measure, only Single-ended ETH-SLM is supported.

With Single-ended ETH-SLM, each MEP transmits frames with the ETH-SLM request information to its peer MEP and receives frames with ETH-SLM reply information from its peer MEP to complete synthetic loss measurements.

Supported Interfaces

Y.1731 PM supports these interfaces:

- SLM and DMM on Switchport on OFM
- SLM and DMM on Switchport on IFM
- SLM and DMM on PC Switchport OFM
- SLM and DMM on PC Switchport IFM

Restrictions and Usage Guidelines

Follow these restrictions and usage guidelines when you configure Y.1731 PM on the switch:

- Y.1731 PM is not supported on these interfaces:
  - mLACP
  - Port MEPs
  - L2VFI
- Y.1731 PM is not supported on customer VLANs (C-VLANs). PM is only supported on service provider VLANs (S-VLANs).
- PM does not support SNMP, although CLI and system-logging is supported.
- Frame throughput measurements are not supported.

- Clock synchronization is not mandatory for Two-way delay measurement.
- For PM support on port-channels. adding or deleting a member link renders the session invalid.
- SLM supports the following modes for sending frames:
  - Continues Mode
  - Burst Mode
- SLM supports frame interval of 1 sec and 100 ms.

Configuring Two-way Delay Measurement

To configure a two-way delay measurement, complete these steps:

	Command	Purpose
Step 1	**enable**	Enables privileged EXEC mode. Enter your password if prompted.
Step 2	**configure terminal**	Enters global configuration mode.
Step 3	**ip sla** *n*	Enables the IP SLA configuration.
Step 4	**ethernet y1731 delay DMM domain** *domain* {{**vlan** | **evc**} *value*}{**mpid** | **mac-address**} *value* **cos** *value* **source** {**mpid** | **mac-address**} *value*	Configures a two-way delay measurement on the sender. • **evc**—Specifies the ethernet virtual circuit identifier. • **vlan**—Specifies the VLAN. • **cos** —Specifies the class of service. The value ranges between 0 and 7. • **mpid**—Specifies the destination MP ID. The value ranges between 1 and 8191. • **mac-address**—Specifies the destination mac-address. • **source**—Specifies the source MP ID or mac-address.
Step 5	**frame {interval | offset | size}** *value*	Configures Y.1731 frame parameters. • **interval**—Specifies the number of intervals. • **offset**—Specifies the frame offset to be used for calculations. The value ranges between 1 and 10. • **size**—Specifies the frame size. The value ranges between 64 and 384.
Step 6	**history {interval}** *value*	Configures Y.1731 history parameters. • **interval**—Specifies the number of intervals. The interval ranges between 1 and 10.
Step 7	**aggregate {interval}** *value*	Configures Y.1731 aggregation parameters. • **interval**—Specifies the number of intervals. The aggregation period, in seconds, ranges between 1 and 65535.

	Command	Purpose
Step 8	**distribution {delay | delay-variation} {one-way | two-way}** *value*	Configures Y.1731 distribution parameters. • **delay**—Specifies delay distribution parameters. • **delay-variation**—Specifies delay-variation distribution parameters. • **one-way**—Specifies one-way distribution parameters. • **two-way**—Specifies two-way distribution parameters.
Step 9	**clock sync**	Checks whether the clocks are synchronized on the sender and receiver.
Step 10	**max-delay** *value*	Configures the maximum delay in milliseconds. The value ranges between 1 and 65535.
Step 11	**owner** *value*	Specifies the operation owner.
Step 12	**exit**	Exits the Y.1731 submode and enters the global configuration mode.
Step 13	**ip sla schedule** *n* {**life | ageout | recurring | start-time**} *value* **start-time** *start time*	Schedules the two-way delay measurement on the sender. • **Life**—Specifies the period time to execute in seconds. • **Ageout**—Specifies the period time to keep the entry when inactive. • **Recurring**—Specifies the probe to be scheduled automatically every day. • **Start-time**—Specifies the time to start the entry. The options available are: – after – hh:mm – hh:mm:ss – now – pending
Step 14	**exit**	Exits the global configuration mode.

Configuration Example

The following example shows a two-way frame delay measurement configuration:

```
Switch# enable
Switch# configure terminal
Switch(config)# ip sla 1
Switch(config-ip-sla)# ethernet y1731 delay DMM domain ifm_400 evc e1 mpid 401 cos 4
source mpid 1
Switch(config-sla-y1731-delay)# history interval 5
Switch(config-sla-y1731-delay)# aggregate interval 60
Switch(config-sla-y1731-delay)# exit
Switch(config)# ip sla schedule 1 start-time after 00:00:30
Switch(config)# exit
```

Configuring Single Ended Synthetic Loss Measurement

To configure single ended synthetic loss measurement, complete the steps in this section.

Note Before you begin, configure the interfaces for loss monitoring by using the **monitor loss counter** [**priority** *cos range*] command under the EVC CFM sub-config mode.

Configuring SLM on the Sender

	Command	Purpose
Step 1	**enable**	Enables privileged EXEC mode. Enter your password if prompted.
Step 2	**configure terminal**	Enters global configuration mode.
Step 3	**ip sla** *n*	Enables the IP SLA configuration.
Step 4	**ethernet y1731 loss SLM** {**burst**} **domain** *domain* {{**vlan** | **evc**} *value*}{**mpid** | **mac-address**} *value* **cos** *value* **source** {**mpid** | **mac-address**} *value*	Configures single ended frame loss measurement on the sender. • **burst**—(Optional) Specifies the number of frames to be sent in the cycle. • **vlan**—Specifies the VLAN. • **evc**—Specifies the ethernet virtual circuit identifier. • **cos** —Specifies the class of service. The value ranges between 0 and 7. The cos value 7 is for aggregated cos and is used when LMM is configured for routed port sub interface. • **source**—Specifies the source MP ID or mac-address. • **mpid**—Specifies the destination MP ID. The value ranges between 1 and 8191. • **mac-address**—Specifies the destination mac-address.
Step 5	**aggregate** {**interval**} *value*	Configures the Y.1731 aggregation parameters. • **interval—**Specifies the number of intervals. The aggregation period ranges between 1 and 65535 seconds.
Step 6	**frame consecutive** *value*	Specifies the number of consecutive measurements used to determine availability or unavailability status.
Step 7	**frame consecutive loss-ratio** *value*	Specifies the number of frames over which to calculate frame-loss ratio.
Step 8	**owner** *value*	Specifies the operation owner.
Step 9	**exit**	Exits the Y.1731 submode and enters the global configuration mode.
Step 10	**exit**	Exits the global configuration mode.

	Command	Purpose
Step 11	**ip sla** *n*	Enables the IP SLA configuration.
Step 12	**ethernet y1731 loss SLM** {**burst**} **domain** *domain* {{**vlan** | **evc**} *value*}{**mpid** | **mac-address**} *value* **cos** *value* **source** {**mpid** | **mac-address**} *value*	Configures single ended frame loss measurement on the sender. • **burst**—(Optional) Specifies the number of frames to be sent in the cycle. • **vlan**—Specifies the VLAN. • **evc**—Specifies the ethernet virtual circuit identifier. • **mpid**—Specifies the destination MP ID. The value ranges between 1 and 8191. • **mac-address**—Specifies the destination mac-address. • **cos** —Specifies the class of service. The value ranges between 0 and 7. The cos value 7 is for aggregated cos and is used when LMM is configured for routed port sub interface. • **source**—Specifies the source MP ID or mac-address.
Step 13	**frequency** *seconds*	Configures the frequency of the burst cycles. The range is 1 to 900 seconds.
Step 14	**aggregate** {**interval**} **burst-cycles** *value*	Configures the Y.1731 aggregation parameters. • **interval—**Specifies the number of intervals. The aggregation period ranges between 1 and 65535 seconds. • **burst-cycles**—Specifies the number of burst cycles which to aggregate. The range is from 1 to 900 seconds. **Note** The burst-cycles parameter appears only if you configure the burst value in Step 12.
Step 15	**frame consecutive** *value*	Specifies the number of consecutive measurements used to determine availability or unavailability status.
Step 16	**ip sla reaction-configuration** *operation-number* {**react** {**unavailableDS** | **unavailableSD**} {**loss-ratioDS** | **loss-ratioSD**} [**threshold -type** {**average** [*number-of-measurements*] | **consecutive** [*occurrences*] | **immediate**}] [**threshold-value** *upper-thresholdlower-threshold*]	Configures proactive threshold monitoring for frame loss measurements.

	Command	Purpose
Step 17	**ip sla schedule** *n* {**life** | **ageout** | **recurring** | **start-time**} *value* **start-time** *start time*	Schedules the single ended frame loss measurement on • **Life**—Specifies the period time to execute in seconds. • **Ageout**—Specifies the period time to keep the entry when inactive. • **Recurring**—Specifies the probe to be scheduled automatically every day. • **Start-time**—Specifies the time to start the entry. The options available are: – after – hh:mm – hh:mm:ss – now – pending
Step 18	**exit**	Exits the Y.1731 submode and enters the global configuration mode.
Step 19	**exit**	Exits the global configuration mode.

Configuring SLM on the Responder

	Command	Purpose
Step 1	**enable**	Enables privileged EXEC mode. Enter your password if prompted.
Step 2	**configure terminal**	Enters global configuration mode.
Step 3	**ethernet cfm slm max** *number_of_slm_sessions*	Specifies the maximum number of SLM sessions that a responder maintains. Range is 100 through 32000.
Step 4	**ethernet cfm slm timeout** *timeout_minutes*	Specifies the timeout value for idle SLM sessions. Range is 5 to 2400 minutes.
Step 5	**exit**	Exits the global configuration mode.

Configuration Example

This example shows the configuration of single ended frame loss measurement:

```
Switch# enable
Switch# configure terminal
Switch(config)# ip sla 1
Switch(config-ip-sla)# ethernet y1731 loss SLM domain r3 vlan 10 mpid 3 cos 1 source
mpid
1
Switch(config-sla-y1731-loss)# aggregate interval 35
Switch(config-sla-y1731-loss)# frame consecutive 4
Switch(config-sla-y1731-loss)# frame consecutive loss-ratio 7
```

```
Switch(config-sla-y1731-loss)# exit
Switch(config-ip-sla)# exit
Switch(config)# ip sla 2
Switch(config-ip-sla)# ethernet y1731 loss SLM burst domain r3 vlan 10 mpid 3 cos 2
source
mpid 1
Switch(config-sla-y1731-loss)# frequency 20
Switch(config-sla-y1731-loss)# aggregate interval burst-cycles 6
Switch(config-sla-y1731-loss)# frame consecutive 4
Switch(config-sla-y1731-loss)# exit
Switch(config-ip-sla)# exit
Switch(config-ip-sla)# exit
Switch(config-ip-sla)# ip sla reaction-configuration 1 react loss-ratioSD
threshold-type
immediate threshold-value 55 50
Switch(config-ip-sla)# ip sla reaction-configuration 2 react loss-ratioDS
threshold-type
immediate threshold-value 55 50
Switch(config-ip-sla)# exit
Switch(config)# ip sla schedule 1 life forever start-time now
Switch(config)# ip sla schedule 2 life forever start-time now
Switch(config)# exit
```

Verifying the Frame Delay Configurations

To verify and monitor the frame delay and frame delay variation measurement configuration, use this command in privileged EXEC mode:

```
Switch# show ip sla statistics n
Delay Statistics for       Operation n
Type of operation: Y1731 Delay Measurement
Latest operation start time: *21:37:08.895 PST Thu Aug 20 2009
Latest operation return code:
Distribution Statistics:
Interval <n>
  Start time:
  Elapsed/End time:
  Number of measurements initiated: <x>
  Number of measurements completed: <x>
  Flag: OK
  Delay:
   Max/Avg/Min forward: x/y/z     -> Min is only shown if clocks are in sync
   Max/Avg/Min backward: x/y/z    -> Only for two-way
   Max/Avg/Min: x/y/z            -> Only for two-way
   Timestamps forward: Max - 21:37:08.895 PST Thu Aug 20 2009/Min - 21:37:08.995 PST
Thu Aug 20 2009
   Timestamps backward: Max - xxx/Min - yyy
   Timestamps: Max - xxx/Min - yyy
   Bucket Forward:
    Bucket Range: 0-9 ms:
     Total observations: <x>
    Bucket Range: 10-19 ms:
     Total observations: <x>
    Bucket Range: 20-29 ms:
     Total observations: <x>
    Bucket Range: 30-39 ms:
     Total observations: <x>
   Delay Variance
    Max/Avg/Min forward: x/y/z     -> Min is only shown if clocks are in sync
    Max/Avg/Min backward: x/y/z    -> Only for two-way
    Max/Avg/Min: x/y/z             -> Only for two-way
```

```
    Bucket Forward:
     Bucket Range: 0-9 ms:
      Total observations: <x>
     Bucket Range: 10-19 ms:
      Total observations: <x>
     Bucket Range: 20-29 ms:
      Total observations: <x>
     Bucket Range: 30-39 ms:
      Total observations: <x>
Operation time to live: Forever
```

To display all details of frame delay and frame delay variation measurements, use the **show ip sla statistics detail** command.

```
Switch# show ip sla statistics detail
IPSLAs Latest Operation Statistics
IPSLA operation id: 3
Delay Statistics for Y1731 Operation 3
Type of operation: Y1731 Delay Measurement
Latest operation start time: *00:00:00.000 PST Mon Jan 1 1900
Latest operation return code: OK
Distribution Statistics:
Interval 1
 Type: Delay
 Start time:  *00:00:00.000 PST Mon Jan 1 1900
 Elapsed/End time:  *00:00:00.000 PST Mon Jan 1 1900
 Number of measurements initiated: 0
 Number of measurements completed: 0
 Flag: OK


Delay:
 Max/Avg/Min TwoWay: 140116936/140116944/140116952
 Timestamps TwoWay: Max - *00:00:00.000 PST Mon Jan 1 1900/Min - *00:00:00.000 PST Mon
Jan 1 1900

 Bucket forward:
  Bucket Range: 0-4999 microsecond
   Total observations: 0
  Bucket Range: 5000-9999 microsecond
   Total observations: 0
  Bucket Range: 10000-14999 microsecond
   Total observations: 0
  Bucket Range: 15000-19999 microsecond
   Total observations: 0
  Bucket Range: 20000-24999 microsecond
   Total observations: 0
  Bucket Range: 25000-29999 microsecond
   Total observations: 0
  Bucket Range: 30000-34999 microsecond
   Total observations: 0
  Bucket Range: 35000-39999 microsecond
   Total observations: 0
  Bucket Range: 40000-44999 microsecond
   Total observations: 0
  Bucket Range: 45000--2 microsecond
   Total observations: 0

 Bucket backward:
  Bucket Range: 0-4999 microsecond
   Total observations: 0
  Bucket Range: 5000-9999 microsecond
   Total observations: 0
```

```
  Bucket Range: 10000-14999 microsecond
   Total observations: 0
  Bucket Range: 15000-19999 microsecond
   Total observations: 0
  Bucket Range: 20000-24999 microsecond
   Total observations: 0
  Bucket Range: 25000-29999 microsecond
   Total observations: 0
  Bucket Range: 30000-34999 microsecond
   Total observations: 0
  Bucket Range: 35000-39999 microsecond
   Total observations: 0
  Bucket Range: 40000-44999 microsecond
   Total observations: 0
  Bucket Range: 45000--2 microsecond
   Total observations: 0

 Bucket TwoWay:
  Bucket Range: 0-0 microsecond
   Total observations: 0
  Bucket Range: 1-1 microsecond
   Total observations: 0
  Bucket Range: 2-2 microsecond
   Total observations: 0
  Bucket Range: 3-3 microsecond
   Total observations: 0
  Bucket Range: 4--2 microsecond
   Total observations: 0

Delay Variance:
 Max/Avg backward positive: 140116936/140116944
 Timestamp backward positive: Max - *00:00:00.000 PST Mon Jan 1 1900
 Max/Avg backward negative: 140116936/140116944
 Timestamp backward negative: Max - *00:00:00.000 PST Mon Jan 1 1900
 Max/Avg TwoWay positive: 140116936/140116944
 Timestamp TwoWay positive: Max - *00:00:00.000 PST Mon Jan 1 1900
 Max/Avg TwoWay negative: 140116936/140116944
 Timestamp TwoWay negative: Max - *00:00:00.000 PST Mon Jan 1 1900


 Bucket forward positive:
  Bucket Range: 0-4999 microsecond
   Total observations: 0
  Bucket Range: 5000-9999 microsecond
   Total observations: 0
  Bucket Range: 10000-14999 microsecond
   Total observations: 0
  Bucket Range: 15000-19999 microsecond
   Total observations: 0
  Bucket Range: 20000-24999 microsecond
   Total observations: 0
  Bucket Range: 25000-29999 microsecond
   Total observations: 0
  Bucket Range: 30000-34999 microsecond
   Total observations: 0
  Bucket Range: 35000-39999 microsecond
   Total observations: 0
  Bucket Range: 40000-44999 microsecond
   Total observations: 0
  Bucket Range: 45000--2 microsecond
   Total observations: 0

 Bucket forward negative:
  Bucket Range: 0-4999 microsecond
```

```
  Total observations: 0
 Bucket Range: 5000-9999 microsecond
  Total observations: 0
 Bucket Range: 10000-14999 microsecond
  Total observations: 0
 Bucket Range: 15000-19999 microsecond
  Total observations: 0
 Bucket Range: 20000-24999 microsecond
  Total observations: 0
 Bucket Range: 25000-29999 microsecond
  Total observations: 0
 Bucket Range: 30000-34999 microsecond
  Total observations: 0
 Bucket Range: 35000-39999 microsecond
  Total observations: 0
 Bucket Range: 40000-44999 microsecond
  Total observations: 0
 Bucket Range: 45000--2 microsecond
  Total observations: 0

Bucket backward positive:
 Bucket Range: 0-4999 microsecond
  Total observations: 0
 Bucket Range: 5000-9999 microsecond
  Total observations: 0
 Bucket Range: 10000-14999 microsecond
  Total observations: 0
 Bucket Range: 15000-19999 microsecond
  Total observations: 0
 Bucket Range: 20000-24999 microsecond
  Total observations: 0
 Bucket Range: 25000-29999 microsecond
  Total observations: 0
 Bucket Range: 30000-34999 microsecond
  Total observations: 0
 Bucket Range: 35000-39999 microsecond
  Total observations: 0
 Bucket Range: 40000-44999 microsecond
  Total observations: 0
 Bucket Range: 45000--2 microsecond
  Total observations: 0

Bucket backward negative:
 Bucket Range: 0-4999 microsecond
  Total observations: 0
 Bucket Range: 5000-9999 microsecond
  Total observations: 0
 Bucket Range: 10000-14999 microsecond
  Total observations: 0
 Bucket Range: 15000-19999 microsecond
  Total observations: 0
 Bucket Range: 20000-24999 microsecond
  Total observations: 0
 Bucket Range: 25000-29999 microsecond
  Total observations: 0
 Bucket Range: 30000-34999 microsecond
  Total observations: 0
 Bucket Range: 35000-39999 microsecond
  Total observations: 0
 Bucket Range: 40000-44999 microsecond
  Total observations: 0
 Bucket Range: 45000--2 microsecond
  Total observations: 0
```

```
 Bucket TwoWay positive:
  Bucket Range: 0-4999 microsecond
   Total observations: 0
  Bucket Range: 5000-9999 microsecond
   Total observations: 0
  Bucket Range: 10000-14999 microsecond
   Total observations: 0
  Bucket Range: 15000-19999 microsecond
   Total observations: 0
  Bucket Range: 20000-24999 microsecond
   Total observations: 0
  Bucket Range: 25000-29999 microsecond
   Total observations: 0
  Bucket Range: 30000-34999 microsecond
   Total observations: 0
  Bucket Range: 35000-39999 microsecond
   Total observations: 0
  Bucket Range: 40000-44999 microsecond
   Total observations: 0
  Bucket Range: 45000--2 microsecond
   Total observations: 0
```

Verifying Synthetic Loss Measurement Configurations

To verify the SLM configurations, use the following commands in privileged EXEC mode:

```
Switch# show ip sla statistics 2 details
IPSLAs Latest Operation Statistics

IPSLA operation id: 2
Loss Statistics for Y1731 Operation 2
Type of operation: Y1731 Loss Measurement
Latest operation start time: 14:47:36.954 IST Wed Nov 21 2012
Latest operation return code: OK
Distribution Statistics:


Interval
 Start time:  14:47:36.954 IST Wed Nov 21 2012
 Elapsed time: 23 seconds
 Number of measurements initiated: 20
 Number of measurements completed: 20
 Flag: OK

Forward
  Number of Observations 2
  Available indicators: 2
  Unavailable indicators: 0
  Tx frame count: 20
  Rx frame count: 20
    Min/Avg/Max - (FLR % ): 0:9/000.00%/0:9
  Cumulative - (FLR % ): 000.00%
  Timestamps forward:
    Min - 14:47:50.574 IST Wed Nov 21 2012
    Max - 14:47:50.574 IST Wed Nov 21 2012
Backward
  Number of Observations 2
  Available indicators: 2
  Unavailable indicators: 0
  Tx frame count: 20
```

```
  Rx frame count: 20
    Min/Avg/Max - (FLR % ): 0:9/000.00%/0:9
  Cumulative - (FLR % ): 000.00%
  Timestamps backward:
    Min - 14:47:50.574 IST Wed Nov 21 2012
    Max - 14:47:50.574 IST Wed Nov 21 2012

Switch# show ip sla history 100 interval-statistics
Loss Statistics for Y1731 Operation 100
Type of operation: Y1731 Loss Measurement
Latest operation start time: 10:36:28.610 UTC Mon May 14 2012
Latest operation return code: OK
Distribution Statistics:

Interval 1
 Start time:  10:36:28.610 UTC Mon May 14 2012
 End time:  10:37:28.610 UTC Mon May 14 2012
 Number of measurements initiated: 594
 Number of measurements completed: 594
 Flag: OK

Forward
  Number of Observations 118
  Available indicators: 118
  Unavailable indicators: 0
  Tx frame count: 590
  Rx frame count: 590
    Min/Avg/Max - (FLR % ): 0:4/000.00%/0:4
  Cumulative - (FLR % ): 000.00%
  Timestamps forward:
    Min - 10:37:28.246 UTC Mon May 14 2012
    Max - 10:37:28.246 UTC Mon May 14 2012
Backward
  Number of Observations 118
  Available indicators: 118
  Unavailable indicators: 0
  Tx frame count: 590
  Rx frame count: 590
    Min/Avg/Max - (FLR % ): 0:4/000.00%/0:4
  Cumulative - (FLR % ): 000.00%
  Timestamps backward:
    Min - 10:37:28.246 UTC Mon May 14 2012
    Max - 10:37:28.246 UTC Mon May 14 2012
```

To display the same outputs as the latest statistics detail command, use the **show ip sla history interval *n*** command. The number displayed is the number of intervals configured.

- Output for Loss Measurement:

```
Switch# show ip sla history 1 interval-statistics
Loss Statistics for Y1731 Operation 1
Type of operation: Y1731 Loss Measurement
Latest operation start time: *09:46:16.225 UTC Fri Nov 26 2010
Latest operation return code: OK
Distribution Statistics:

Interval 1
 Start time:  *09:46:16.225 UTC Fri Nov 26 2010
 End time:  *09:48:16.221 UTC Fri Nov 26 2010
 Number of measurements initiated: 12006
 Number of measurements completed: 12000
 Flag: OK

Forward
```

```
 Number of Observations 11999
 Timestamps forward:
   Max - *09:47:20.252 UTC Fri Nov 26 2010/   Min - *09:48:16.221 UTC Fri Nov 26 2010
 Tx frame count: 30000
 Rx frame count: 20000
 Available indicators: 11999
 Unavailable indicators: 0
 Max/Avg/Min - (FLR % ): 1:3/2.78%/0:0
Backward
 Number of Observations 11999
 Timestamps backward:
   Max - *09:48:16.221 UTC Fri Nov 26 2010/   Min - *09:48:16.221 UTC Fri Nov 26 2010
 Tx frame count: 10000
 Rx frame count: 10000
 Available indicators: 11999
 Unavailable indicators: 0
 Max/Avg/Min - (FLR % ): 0:0/0.0%/0:0
```

- Output for Delay Measurement:

```
Switch# show ip sla history 10 interval-statistics
Delay Statistics for Y1731 Operation 10
Type of operation: Y1731 Delay Measurement
Latest operation start time: 10:58:30.144 PDT Tue Jan 4 2011
Latest operation return code: Timeout
Distribution Statistics:


Interval 1
 Start time:  10:58:30.144 PDT Tue Jan 4 2011
 End time:  10:59:05.140 PDT Tue Jan 4 2011
 Number of measurements initiated: 33
 Number of measurements completed: 34
 Flag: OK


Delay:
 Number of TwoWay observations: 34
  Max/Avg/Min TwoWay: 113364/100499/100099 (microsec)
 Time of occurrence TwoWay:
   Max - 10:59:05.140 PDT Tue Jan 4 2011
   Min - 10:58:40.076 PDT Tue Jan 4 2011

 Bin TwoWay:
        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              34

Delay Variance:
 Number of TwoWay positive observations: 19
  Max/Avg TwoWay positive: 13256/706 (microsec)
 Time of occurrence TwoWay positive:
   Max - 10:59:05.140 PDT Tue Jan 4 2011
 Number of TwoWay negative observations: 14
  Max/Avg TwoWay negative: 86/11 (microsec)
 Time of occurrence TwoWay negative:
```

```
  Max - 10:58:40.076 PDT Tue Jan 4 2011

Bin TwoWay positive:
       Bin Range (microsec)            Total observations
                 0 - < 5000                    18
              5000 - < 10000                   0
             10000 - < 15000                   1
             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                    14
              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
```

To display the performance monitoring session summary, use the **show ethernet cfm pm session summary** command.

```
Switch# show ethernet cfm pm session summary
Number of Configured Session : 1
Number of Active Session: 1
Number of Inactive Session: 0
```

To display the SLM configurations, use the **show run | b ip sla** command in privileged EXEC mode.

```
Switch# show run | b ip sla
ip sla 102
ethernet y1731 loss SLM domain PROVIDER_DOMAIN_VLAN evc domain_vlan101@101 mpid 101
cos 2
source mpid 102
aggregate interval 20
ip sla 103
ethernet y1731 loss SLM burst domain PROVIDER_DOMAIN_VLAN evc domain_vlan101@101 mpid
101
cos 2 source mpid 102
frequency 20
availability algorithm static-window
ip sla schedule 103 start-time now
ip sla enable reaction-alerts


Switch# show ip sla configuration
IP SLAs Infrastructure Engine-III
Entry number: 102
Owner:
Tag:
Operation timeout (milliseconds): 0
Ethernet Y1731 Loss Operation
Frame Type: SLM
Domain: PROVIDER_DOMAIN_VLAN
Evc: domain_vlan101@101
```

```
Target Mpid: 101
Source Mpid: 102
CoS: 2
Request size (Padding portion): 64
Frame Interval: 1000
Schedule:
Operation frequency (seconds): 20 (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
Threshold (milliseconds): 0
Statistics Parameters
Aggregation Period: 20
Frame consecutive: 10
Frame consecutive loss-ratio: 10
Availability algorithm: sliding-window
History
Number of intervals: 2

Entry number: 103

Owner:
Tag:
Operation timeout (milliseconds): 0
Ethernet Y1731 Loss Operation
Frame Type: SLM
Domain: PROVIDER_DOMAIN_VLAN
Evc: domain_vlan101@101
Target Mpid: 101
Source Mpid: 102
CoS: 2
Request size (Padding portion): 64
Frame Interval: 1000
Frame Burst Number: 10
Schedule:
Operation frequency (seconds): 20 (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
Threshold (milliseconds): 0
Statistics Parameters
Aggregate interval burst-cycles: 1
Frame consecutive: 10
Frame consecutive loss-ratio: 10
Availability algorithm: static-window
History
Number of intervals: 2
```

Troubleshooting

These troubleshooting scenarios apply to the Y.1731 performance monitoring configurations:

Problem	Solution
When the IP SLA sessions do not come up.	Use the debug commands: • **debug ethernet cfm pm events** [**session** <*session id*>] • **debug ethernet cfm pm error** [**session** <*session id*>] • **debug ethernet cfm pm diagnostic** • **debug ethernet cfm pm ipc** [**session** <*session id*>] • **debug ethernet cfm pm packet** [**session** <*session id*>]