



# ITU-T Y.1731 Performance Monitoring in a Service Provider Network

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ITU-T Y.1731 performance monitoring provides standard-based Ethernet performance monitoring that encompasses the measurement of Ethernet frame delay, frame-delay variation, and throughput as outlined in the ITU-T Y.1731 specification and interpreted by the Metro Ethernet Forum (MEF). Service providers offer service level agreements (SLAs) that describe the level of performance customers can expect for services. This document describes the Ethernet performance management aspect of SLAs.

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## Prerequisites for ITU-T Y.1731 Performance Monitoring in a Service Provider Network

- IEEE-compliant connectivity fault management (CFM) must be configured and enabled for Y.1731 performance monitoring to function.



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**Note** Y1731 is supported over Port Channel interfaces.

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## Restrictions for ITU-T Y.1731 Performance Monitoring in a Service Provider Network

- A frame-delay measurement message (DMM) with CFMoXconnect on a Cisco ASR 920 router works only if the **control-word** command is enabled. If the remote end of the pseudowire does not enable the **control-word** command by default, enable the command to get the DMM time stamp working. Cisco

ASR 9000 Series Routers and ALU 7450 are examples of peer platforms where the **control-word** command needs to be enabled.

- When the core network has multiple paths, the Tx and Rx DMM/DMR packets can be sent and received on different ports. If the ports belong to a different interface module (IM), time stamping can be out of sync and in certain cases the Rx value can be lower than the Tx value. This value will be displayed as 0 in the raw database output. As a workaround, configure Precision Time Protocol (PTP) between the two connectivity fault management (CFM) endpoint routers.
- Y1731 is supported with the **rewrite** command configuration on Ethernet Flow Points (EFPs) throughout the Layer 2 circuit. However, the configuration may be in such a way that the Y1731 PDUs may be transmitted without a tag. This results in the other end of the Layer 2 circuit not being able to ascertain the CoS value which determines the SLA session to which the PDUs belong. Therefore, the **rewrite** command configuration is not supported
- Y.1731 Performance Monitoring (PM) is not supported on MEPs that are configured on TEFP.
- Y.1731 Performance Monitoring (PM) is not supported on MEPs that are configured on ports.




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**Note** In ITU-T Y1731, 1DM measurement should mandate only PTP to have clock sync between sender & receiver.

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## Information About ITU-T Y.1731 Performance Monitoring in a Service Provider Network

### Frame Delay and Frame-Delay Variation

The Frame Delay parameter can be used for on-demand OAM measurements of frame delay and frame-delay variation. When a maintenance end point (MEP) is enabled to generate frames with frame-delay measurement (ETH-DM) information, it periodically sends frames with ETH-DM information to its peer MEP in the same maintenance entity. Peer MEPs perform frame-delay and frame-delay variation measurements through this periodic exchange during the diagnostic interval.

An MEP requires the following specific configuration information to support ETH-DM:

- MEG level—MEG level at which the MEP exists
- Priority
- Drop eligibility—marked drop ineligible
- Transmission rate
- Total interval of ETH-DM
- MEF10 frame-delay variation algorithm

A MEP transmits frames with ETH-DM information using the TxTimeStampf information element. TxTimeStampf is the time stamp for when the ETH-DM frame was sent. A receiving MEP can compare the TxTimeStampf value with the RxTimef value, which is the time the ETH-DM frame was received, and calculate one-way delay using the formula  $frame\ delay = RxTimef - TxTimeStampf$ .

One-way frame-delay measurement (1DM) requires that clocks at both the transmitting MEP and the receiving MEPs are synchronized. Measuring frame-delay variation does not require clock synchronization and the variation can be measured using 1DM or a frame-delay measurement message (DMM) and a frame-delay measurement reply (DMR) frame combination.

If it is not practical to have clocks synchronized, only two-way frame-delay measurements can be made. In this case, the MEP transmits a frame containing ETH-DM request information and the TxTimeStampf element, and the receiving MEP responds with a frame containing ETH-DM reply information and the TxTimeStampf value copied from the ETH-DM request information.

Two-way frame delay is calculated as  $(RxTimeb - TxTimeStampf) - (TxTimeStampb - RxTimeStampf)$ , where RxTimeb is the time that the frame with ETH-DM reply information was received. Two-way frame delay and variation can be measured using only DMM and DMR frames.

To allow more precise two-way frame-delay measurement, the MEP replying to a frame with ETH-DM request information can also include two additional time stamps in the ETH-DM reply information:

- RxTimeStampf—Time stamp of the time at which the frame with ETH-DM request information was received.
- TxTimeStampb—Time stamp of the time at which the transmitting frame with ETH-DM reply information was sent.
- The timestamping happens at the hardware level for DMM operations.

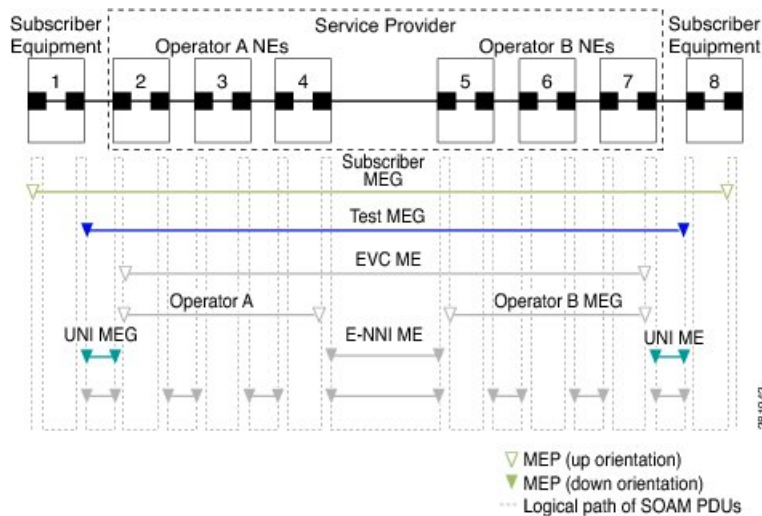


**Note** The frame-loss, frame-delay, and frame-delay variation measurement processes are terminated when faults related to continuity and availability occur or when known network topology changes occur.

An MIP is transparent to the frames with ETH-DM information; therefore, an MIP does not require information to support the ETH-DM function.

The figure below shows a functional overview of a typical network in which Y.1731 performance monitoring is used.

**Figure 1: Y.1731 Performance Monitoring**



## Benefits of ITU-T Y.1731 Performance Monitoring

Combined with IEEE-compliant connectivity fault management (CFM), Y.1731 performance monitoring provides a comprehensive fault management and performance monitoring solution for service providers. This comprehensive solution in turn lessens service providers' operating expenses, improves their service-level agreements (SLAs), and simplifies their operations.

## How to Configure ITU-T Y.1731 Performance Monitoring in a Service Provider Network

### Configuring Performance Monitoring Parameters

The following new commands were introduced that can be used to configure and display performance monitoring parameters: **debug ethernet cfm pm**, **monitor loss counters**, and **show ethernet cfm pm**.

For more information about CFM and Y.1731 performance monitoring commands, see the *Cisco IOS Carrier Ethernet Command Reference*. For more information about debug commands, see the *Cisco IOS Debug Command Reference*.

## Configuration Examples for Configuring ITU-T Y.1731 Performance Monitoring Functions

### Example: Configuring Performance Monitoring

For Y.1731 performance monitoring configuration examples, see [Configuring IP SLAs Metro-Ethernet 3.0 \(ITU-T Y.1731\) Operations](#). For information on Y.1731 On-Demand and Concurrent Operations see, [IPSLA Y1731 On-Demand and Concurrent Operations](#).