



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

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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, page 1](#)
- [Prerequisites for ITU-T Y.1731 Operations, page 1](#)
- [Restrictions for IP SLAs Metro-Ethernet 3.0 \(ITU-T Y.1731\), page 2](#)
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### Finding Feature Information

Your software release may not support all the features documented in this module. For the latest caveats and feature information, see [Bug Search Tool](#) and the release notes for your platform and software release. To find information about the features documented in this module, and to see a list of the releases in which each feature is supported, see the feature information table.

Use Cisco Feature Navigator to find information about platform support and Cisco software image support. To access Cisco Feature Navigator, go to [www.cisco.com/go/cfn](http://www.cisco.com/go/cfn). 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.

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

- Depending on your Cisco software release, SNMP is not supported for reporting threshold events or collecting performance statistics for IP SLAs Metro-Ethernet 3.0 (ITU-T Y.1731) operations.
- 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.
- Frame Loss Measurement is not supported on Cisco ME 3600X Series and 3800X Series Ethernet Access Switches.
- P2 IMs are to be used for CFM and Y1731
- Do not configure rewrite on the EFPs throughout the I2 circuit to avoid losing the cos value.
- CFMoXconnect on ASR903 works only if the control-word is switched on. To start DM timestamping, switch on the control-word if the remote end is not switched on.
- To avoid errors in RX and TX timestamping, ensure to have Y1731 sender as PTP master, and the Y1731 responder as PTP slave.
- Reconfigure IP SLA Y1731 while doing online insertion removal (OIR) of IM or router reload because local MEP is deleted during the course.

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

## 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.

### SUMMARY STEPS

1. **enable**
2. **configure terminal**
3. **ip sla operation-number**
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*}
5. **aggregate interval** *seconds*
6. **distribution** {**delay** | **delay-variation**} **one-way** *number-of-bins* *boundary*[,...,*boundary*]
7. **frame offset** *offset-value*
8. **history interval** *intervals-stored*
9. **max-delay** *milliseconds*
10. **owner** *owner-id*
11. **end**

### DETAILED STEPS

|        | Command or Action                                 | Purpose                                                                 |
|--------|---------------------------------------------------|-------------------------------------------------------------------------|
| Step 1 | <b>enable</b>                                     | Enables privileged EXEC mode.<br><br>• Enter your password if prompted. |
|        | <b>Example:</b><br><br>Router> enable             |                                                                         |
| Step 2 | <b>configure terminal</b>                         | Enters global configuration mode.                                       |
|        | <b>Example:</b><br><br>Router# configure terminal |                                                                         |

|               | Command or Action                                                                                                                                                                                                                                                              | Purpose                                                                                                                                                                                                                                                                            |
|---------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Step 3</b> | <b>ip sla operation-number</b><br><br><b>Example:</b><br><pre>Router(config-term)# ip sla 501</pre>                                                                                                                                                                            | Begins configuring an IP SLAs operation and enters IP SLA configuration mode.                                                                                                                                                                                                      |
| <b>Step 4</b> | <b>ethernet y1731 delay receive 1DM domain domain-name {evc evc-id   vlan vlan-id} cos cos {mpid source-mp-id   mac-address source-address}</b><br><br><b>Example:</b><br><pre>Router(config-ip-sla)# ethernet y1731 delay receive 1DM domain xxx evc yyy cos 3 mpid 101</pre> | Begins configuring the receiver on the responder and enters IP SLA Y.1731 delay configuration mode. <ul style="list-style-type: none"> <li>The <i>source-mp-id</i> or <i>source-address</i> configured by this command corresponds to that of the MEP being configured.</li> </ul> |
| <b>Step 5</b> | <b>aggregate interval seconds</b><br><br><b>Example:</b><br><pre>Router(config-sla-y1731-delay)# aggregate interval 900</pre>                                                                                                                                                  | (Optional) Configures the length of time during which the performance measurements are conducted and the results stored.                                                                                                                                                           |
| <b>Step 6</b> | <b>distribution {delay   delay-variation} one-way number-of-bins boundary[,...,boundary]</b><br><br><b>Example:</b><br><pre>Router(config-sla-y1731-delay)# distribution delay-variation one-way 5 5000,10000,15000,20000,-1</pre>                                             | (Optional) Specifies measurement type and configures bins for statistics distributions kept.                                                                                                                                                                                       |
| <b>Step 7</b> | <b>frame offset offset-value</b><br><br><b>Example:</b><br><pre>Router(config-sla-y1731-delay)# frame offset 1</pre>                                                                                                                                                           | (Optional) Sets the value for calculating delay variation rates.                                                                                                                                                                                                                   |
| <b>Step 8</b> | <b>history interval intervals-stored</b><br><br><b>Example:</b><br><pre>Router(config-sla-y1731-delay)# history interval 2</pre>                                                                                                                                               | (Optional) Sets the number of statistics distributions kept during the lifetime of an IP SLAs Ethernet operation.                                                                                                                                                                  |

|                | Command or Action                                                                                                        | Purpose                                                      |
|----------------|--------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------|
| <b>Step 9</b>  | <b>max-delay</b> <i>milliseconds</i><br><br><b>Example:</b><br><pre>Router(config-sla-y1731-delay)# max-delay 5000</pre> | (Optional) Sets the amount of time an MEP waits for a frame. |
| <b>Step 10</b> | <b>owner</b> <i>owner-id</i><br><br><b>Example:</b><br><pre>Router(config-sla-y1731-delay)# owner admin</pre>            | (Optional) Configures the owner of an IP SLAs operation.     |
| <b>Step 11</b> | <b>end</b><br><br><b>Example:</b><br><pre>Router(config-sla-y1731-delay)# end</pre>                                      | 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 proactive threshold monitoring, and scheduled before you configure the sender MEP.

## SUMMARY STEPS

1. **enable**
2. **configure terminal**
3. **ip sla operation-number**
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*}}**
5. **aggregate interval *seconds***
6. **frame interval *milliseconds***
7. **frame size *bytes***
8. **history interval *intervals-stored***
9. **owner *owner-id***
10. **end**

## DETAILED STEPS

|               | Command or Action                                                                                                                                                                                                                                                                                                                                                              | Purpose                                                                                                                   |
|---------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------|
| <b>Step 1</b> | <b>enable</b><br><br><b>Example:</b><br>Router> enable                                                                                                                                                                                                                                                                                                                         | Enables privileged EXEC mode.<br><br><ul style="list-style-type: none"> <li>• Enter your password if prompted.</li> </ul> |
| <b>Step 2</b> | <b>configure terminal</b><br><br><b>Example:</b><br>Router# configure terminal                                                                                                                                                                                                                                                                                                 | Enters global configuration mode.                                                                                         |
| <b>Step 3</b> | <b>ip sla operation-number</b><br><br><b>Example:</b><br>Router(config)# ip sla 500                                                                                                                                                                                                                                                                                            | Begins configuring an IP SLAs operation and enters IP SLA configuration mode.                                             |
| <b>Step 4</b> | <b>ethernet y1731 delay 1DM domain domain-name {evc <i>evc-id</i>   vlan <i>vlan-id</i>} {mpid <i>target-mp-id</i>   mac-address <i>target-address</i>} cos <i>cos</i> {source {mpid <i>source-mp-id</i>   mac-address <i>source-address</i>}}</b><br><br><b>Example:</b><br>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.               |

|                | Command or Action                                                                                                                       | Purpose                                                                                                                  |
|----------------|-----------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------|
| <b>Step 5</b>  | <b>aggregate interval</b> <i>seconds</i><br><br><b>Example:</b><br><pre>Router(config-sla-y1731-delay)# aggregate interval 900</pre>    | (Optional) Configures the length of time during which the performance measurements are conducted and the results stored. |
| <b>Step 6</b>  | <b>frame interval</b> <i>milliseconds</i><br><br><b>Example:</b><br><pre>Router(config-sla-y1731-delay)# frame interval 100</pre>       | (Optional) Sets the gap between successive frames.                                                                       |
| <b>Step 7</b>  | <b>frame size</b> <i>bytes</i><br><br><b>Example:</b><br><pre>Router(config-sla-y1731-delay)# frame size 64</pre>                       | (Optional) Sets the padding size for frames.                                                                             |
| <b>Step 8</b>  | <b>history interval</b> <i>intervals-stored</i><br><br><b>Example:</b><br><pre>Router(config-sla-y1731-delay)# history interval 2</pre> | (Optional) Sets the number of statistics distributions kept during the lifetime of an IP SLAs Ethernet operation.        |
| <b>Step 9</b>  | <b>owner</b> <i>owner-id</i><br><br><b>Example:</b><br><pre>Router(config-sla-y1731-delay)# owner admin</pre>                           | (Optional) Configures the owner of an IP SLAs operation.                                                                 |
| <b>Step 10</b> | <b>end</b><br><br><b>Example:</b><br><pre>Router(config-sla-y1731-delay)# end</pre>                                                     | 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.

### SUMMARY STEPS

1. **enable**
2. **configure terminal**
3. **ip sla operation-number**
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}}**
5. **clock sync**
6. **aggregate interval seconds**
7. **distribution {delay | delay-variation} one-way number-of-bins boundary[,...,boundary]**
8. **frame interval milliseconds**
9. **frame offset offset-value**
10. **frame size bytes**
11. **history interval intervals-stored**
12. **max-delay milliseconds**
13. **owner owner-id**
14. **end**

### DETAILED STEPS

|               | Command or Action                                      | Purpose                                                                                                                 |
|---------------|--------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------|
| <b>Step 1</b> | <b>enable</b><br><br><b>Example:</b><br>Device> enable | Enables privileged EXEC mode.<br><br><ul style="list-style-type: none"> <li>Enter your password if prompted.</li> </ul> |

|               | Command or Action                                                                                                                                                                                                                                                                                                                               | Purpose                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
|---------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Step 2</b> | <b>configure terminal</b><br><br><b>Example:</b><br>Device# configure terminal                                                                                                                                                                                                                                                                  | Enters global configuration mode.                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| <b>Step 3</b> | <b>ip sla operation-number</b><br><br><b>Example:</b><br>Device(config-term)# ip sla 10                                                                                                                                                                                                                                                         | Begins configuring an IP SLAs operation and enters IP SLA configuration mode.                                                                                                                                                                                                                                                                                                                                                                                                                            |
| <b>Step 4</b> | <b>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}}</b><br><br><b>Example:</b><br>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. <ul style="list-style-type: none"> <li>To configure concurrent operations, use the <b>DMMv1</b> 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.</li> </ul> |
| <b>Step 5</b> | <b>clock sync</b><br><br><b>Example:</b><br>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.                                                                                                                                                                                                                                                                                                                                                                         |
| <b>Step 6</b> | <b>aggregate interval seconds</b><br><br><b>Example:</b><br>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.                                                                                                                                                                                                                                                                                                                                                                                 |
| <b>Step 7</b> | <b>distribution {delay   delay-variation} one-way number-of-bins boundary[,...boundary]</b><br><br><b>Example:</b><br>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.                                                                                                                                                                                                                                                                                                                                                                                                             |

|                | Command or Action                                                                                                                       | Purpose                                                                                                           |
|----------------|-----------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------|
| <b>Step 8</b>  | <b>frame interval</b> <i>milliseconds</i><br><br><b>Example:</b><br><pre>Device(config-sla-y1731-delay)# frame interval 100</pre>       | (Optional) Sets the gap between successive frames.                                                                |
| <b>Step 9</b>  | <b>frame offset</b> <i>offset-value</i><br><br><b>Example:</b><br><pre>Device(config-sla-y1731-delay)# frame offset 1</pre>             | (Optional) Sets value for calculating delay variation values.                                                     |
| <b>Step 10</b> | <b>frame size</b> <i>bytes</i><br><br><b>Example:</b><br><pre>Device(config-sla-y1731-delay)# frame size 32</pre>                       | (Optional) Configures padding size for frames.                                                                    |
| <b>Step 11</b> | <b>history interval</b> <i>intervals-stored</i><br><br><b>Example:</b><br><pre>Device(config-sla-y1731-delay)# history interval 2</pre> | (Optional) Sets the number of statistics distributions kept during the lifetime of an IP SLAs Ethernet operation. |
| <b>Step 12</b> | <b>max-delay</b> <i>milliseconds</i><br><br><b>Example:</b><br><pre>Device(config-sla-y1731-delay)# max-delay 5000</pre>                | (Optional) Sets the amount of time an MEP waits for a frame.                                                      |
| <b>Step 13</b> | <b>owner</b> <i>owner-id</i><br><br><b>Example:</b><br><pre>Device(config-sla-y1731-delay)# owner admin</pre>                           | (Optional) Configures the owner of an IP SLAs operation.                                                          |
| <b>Step 14</b> | <b>end</b><br><br><b>Example:</b><br><pre>Device(config-sla-y1731-delay)# end</pre>                                                     | 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**

This task is not supported on Cisco ME 3600X Series and 3800X Series Ethernet Access Switches

**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.

## SUMMARY STEPS

1. **enable**
2. **configure terminal**
3. **ip sla operation-number**
4. **ethernet y1731 loss {LMM | SLM} [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}}**
5. **aggregate interval seconds**
6. **availability algorithm {sliding-window | static-window}**
7. **frame consecutive value**
8. **frame interval milliseconds**
9. **history interval intervals-stored**
10. **owner owner-id**
11. **exit**
12. **exit**
13. **ip sla reaction-configuration operation-number {react {unavailableDS | unavailableSD} [threshold-type {average [number-of-measurements] | consecutive [occurrences] | immediate}] [threshold-value upper-threshold lower-threshold]}**
14. **ip sla logging traps**
15. **exit**

## DETAILED STEPS

|               | Command or Action                                                                                                                                      | Purpose                                                                                                                   |
|---------------|--------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------|
| <b>Step 1</b> | <b>enable</b><br><br><b>Example:</b><br>Device> enable                                                                                                 | Enables privileged EXEC mode.<br><br><ul style="list-style-type: none"> <li>• Enter your password if prompted.</li> </ul> |
| <b>Step 2</b> | <b>configure terminal</b><br><br><b>Example:</b><br>Device# configure terminal                                                                         | Enters global configuration mode.                                                                                         |
| <b>Step 3</b> | <b>ip sla operation-number</b><br><br><b>Example:</b><br>Device(config-term)# ip sla 11                                                                | Begins configuring an IP SLAs operation and enters IP SLA configuration mode.                                             |
| <b>Step 4</b> | <b>ethernet y1731 loss {LMM   SLM} [burst] domain domain-name {evc evc-id   vlan vlan-id} {mpid target-mp-id   mac-address target-address} CoS CoS</b> | Begins configuring a single-ended Ethernet frame loss ratio operation and enters IP SLA Y.1731 loss configuration mode.   |

|                | Command or Action                                                                                                                                                                                                      | Purpose                                                                                                                                                                                                                                                                                                                                                                                           |
|----------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                | <p><b>{source {mpid <i>source-mp-id</i>   mac-address <i>source-address</i>}}</b></p> <p><b>Example:</b></p> <pre>Device(config-ip-sla)# ethernet y1731 loss LMM domain xxx vlan 12 mpid 34 CoS 4 source mpid 23</pre> | <ul style="list-style-type: none"> <li>To configure concurrent operations, use the <b>SLM</b> 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.</li> </ul> |
| <b>Step 5</b>  | <p><b>aggregate interval <i>seconds</i></b></p> <p><b>Example:</b></p> <pre>Device(config-sla-y1731-loss)# aggregate interval 900</pre>                                                                                | (Optional) Configures the length of time during which performance measurements are conducted and the results stored.                                                                                                                                                                                                                                                                              |
| <b>Step 6</b>  | <p><b>availability algorithm {sliding-window   static-window}</b></p> <p><b>Example:</b></p> <pre>Device(config-sla-y1731-loss)# availability algorithm static-window</pre>                                            | (Optional) Specifies availability algorithm used.                                                                                                                                                                                                                                                                                                                                                 |
| <b>Step 7</b>  | <p><b>frame consecutive <i>value</i></b></p> <p><b>Example:</b></p> <pre>Device(config-sla-y1731-loss)# frame consecutive 10</pre>                                                                                     | (Optional) Specifies number of consecutive measurements to be used to determine availability or unavailability status.                                                                                                                                                                                                                                                                            |
| <b>Step 8</b>  | <p><b>frame interval <i>milliseconds</i></b></p> <p><b>Example:</b></p> <pre>Device(config-sla-y1731-loss)# frame interval 100</pre>                                                                                   | (Optional) Sets the gap between successive frames.                                                                                                                                                                                                                                                                                                                                                |
| <b>Step 9</b>  | <p><b>history interval <i>intervals-stored</i></b></p> <p><b>Example:</b></p> <pre>Device(config-sla-y1731-loss)# history interval 2</pre>                                                                             | (Optional) Sets the number of statistics distributions kept during the lifetime of an IP SLAs Ethernet operation.                                                                                                                                                                                                                                                                                 |
| <b>Step 10</b> | <p><b>owner <i>owner-id</i></b></p> <p><b>Example:</b></p> <pre>Device(config-sla-y1731-delay)# owner admin</pre>                                                                                                      | (Optional) Configures the owner of an IP SLAs operation.                                                                                                                                                                                                                                                                                                                                          |

|                | Command or Action                                                                                                                                                                                                                                                                                                                                                                                                                             | Purpose                                                                           |
|----------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|
| <b>Step 11</b> | <b>exit</b><br><br><b>Example:</b><br>Device(config-sla-y1731-delay)# exit                                                                                                                                                                                                                                                                                                                                                                    | Exits to IP SLA configuration mode.                                               |
| <b>Step 12</b> | <b>exit</b><br><br><b>Example:</b><br>Device(config-ip-sla)# exit                                                                                                                                                                                                                                                                                                                                                                             | Exits to global configuration mode.                                               |
| <b>Step 13</b> | <b>ip sla reaction-configuration</b> <i>operation-number</i> { <b>react</b> { <b>unavailableDS</b>   <b>unavailableSD</b> } [ <b>threshold-type</b> { <b>average</b> [ <i>number-of-measurements</i> ]   <b>consecutive</b> [ <i>occurrences</i> ]   <b>immediate</b> }] [ <b>threshold-value</b> <i>upper-threshold lower-threshold</i> ]}<br><br><b>Example:</b><br>Device(config)# ip sla reaction-configuration 11<br>react unavailableDS | (Optional) Configures proactive threshold monitoring for frame loss measurements. |
| <b>Step 14</b> | <b>ip sla logging traps</b><br><br><b>Example:</b><br>Device(config)# ip sla logging traps                                                                                                                                                                                                                                                                                                                                                    | (Optional) Enables IP SLAs syslog messages from CISCO-RTTMON-MIB.                 |
| <b>Step 15</b> | <b>exit</b><br><br><b>Example:</b><br>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 (,).

## SUMMARY STEPS

1. **enable**
2. **configure terminal**
3. Enter one of the following commands:
  - **ip sla schedule** *operation-number* [**life** {**forever** | *seconds*}] [**start-time** {[*hh:mm:ss*] [*month day* | *day month*]} | **pending** | **now** | **after** *hh:mm:ss*] [**ageout** *seconds*] [**recurring**]
  - **ip sla group schedule** *group-operation-number* *operation-id-numbers* {**schedule-period** *schedule-period-range* | **schedule-together**} [**ageout** *seconds*] [**frequency** *group-operation-frequency*] [**life** {**forever** | *seconds*}] [**start-time** {*hh:mm* [:*ss*] [*month day* | *day month*]} | **pending** | **now** | **after** *hh:mm* [:*ss*]}]
4. **end**
5. **show ip sla group schedule**
6. **show ip sla configuration**

## DETAILED STEPS

|               | Command or Action                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | Purpose                                                                                                                                                                                                                                                 |
|---------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Step 1</b> | <b>enable</b><br><br><b>Example:</b><br>Device> enable                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | Enables privileged EXEC mode. <ul style="list-style-type: none"> <li>• Enter your password if prompted.</li> </ul>                                                                                                                                      |
| <b>Step 2</b> | <b>configure terminal</b><br><br><b>Example:</b><br>Device# configure terminal                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | Enters global configuration mode.                                                                                                                                                                                                                       |
| <b>Step 3</b> | Enter one of the following commands: <ul style="list-style-type: none"> <li>• <b>ip sla schedule</b> <i>operation-number</i> [<b>life</b> {<b>forever</b>   <i>seconds</i>}] [<b>start-time</b> {[<i>hh:mm:ss</i>] [<i>month day</i>   <i>day month</i>]}   <b>pending</b>   <b>now</b>   <b>after</b> <i>hh:mm:ss</i>] [<b>ageout</b> <i>seconds</i>] [<b>recurring</b>]</li> <li>• <b>ip sla group schedule</b> <i>group-operation-number</i> <i>operation-id-numbers</i> {<b>schedule-period</b> <i>schedule-period-range</i>   <b>schedule-together</b>} [<b>ageout</b> <i>seconds</i>] [<b>frequency</b> <i>group-operation-frequency</i>] [<b>life</b> {<b>forever</b>   <i>seconds</i>}] [<b>start-time</b> {<i>hh:mm</i> [:<i>ss</i>] [<i>month day</i>   <i>day month</i>]}   <b>pending</b>   <b>now</b>   <b>after</b> <i>hh:mm</i> [:<i>ss</i>]}]</li> </ul> | <ul style="list-style-type: none"> <li>• Configures the scheduling parameters for an individual IP SLAs operation.</li> <li>• Specifies an IP SLAs operation group number and the range of operation numbers for a multioperation scheduler.</li> </ul> |

|               | Command or Action                                                                                                                                                                                                                                                                                                                       | Purpose                                                              |
|---------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------|
|               | <b>Example:</b><br><br>Device(config)# ip sla schedule 10 life forever start-time now<br><br>Device(config)# ip sla schedule 10 schedule-period frequency<br><br>Device(config)# ip sla group schedule 1 3,4,6-9 life forever start-time now<br><br>Device(config)# ip sla schedule 1 3,4,6-9 schedule-period 50 frequency range 80-100 |                                                                      |
| <b>Step 4</b> | <b>end</b><br><br><b>Example:</b><br><br>Device(config)# end                                                                                                                                                                                                                                                                            | Exits global configuration mode and returns to privileged EXEC mode. |
| <b>Step 5</b> | <b>show ip sla group schedule</b><br><br><b>Example:</b><br><br>Device# show ip sla group schedule                                                                                                                                                                                                                                      | (Optional) Displays IP SLAs group schedule details.                  |
| <b>Step 6</b> | <b>show ip sla configuration</b><br><br><b>Example:</b><br><br>Device# show ip sla configuration                                                                                                                                                                                                                                        | (Optional) Displays IP SLAs configuration details.                   |

## 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

```

## 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

```

## 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
```

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

### Related Documents

| Related Topic                       | Document Title                                               |
|-------------------------------------|--------------------------------------------------------------|
| Cisco IOS commands                  | <a href="#">Cisco IOS Master Commands List, All Releases</a> |
| Cisco IOS Carrier Ethernet commands | <a href="#">Cisco IOS Carrier Ethernet Command Reference</a> |
| Cisco IOS IP SLAs commands          | <a href="#">Cisco IOS IP SLAs Command Reference</a>          |

| Related Topic                                        | Document Title                                                                                                                                         |
|------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------|
| Ethernet CFM                                         | “Configuring Ethernet Connectivity Fault Management in a Service Provider Network” module of the <i>Cisco IOS Carrier Ethernet Configuration Guide</i> |
| Network Time Protocol (NTP)                          | “Configuring NTP” module of the <i>Cisco IOS Network Management Configuration Guide</i>                                                                |
| Proactive threshold monitoring for Cisco IOS IP SLAs | “Configuring Proactive Threshold Monitoring of IP SLAs Operations” module of the <i>Cisco IOS IP SLAs Configuration Guide</i>                          |

### Standards and RFCs

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

### MIBs

| MIB                                                                                                  | MIBs Link                                                                                                                                                                                                                              |
|------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <ul style="list-style-type: none"> <li>CISCO-IPSLA-ETHERNET-MIB</li> <li>CISCO-RTTMON-MIB</li> </ul> | <p>To locate and download MIBs for selected platforms, Cisco software releases, and feature sets, use Cisco MIB Locator found at the following URL:</p> <p><a href="http://www.cisco.com/go/mibs">http://www.cisco.com/go/mibs</a></p> |

**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. | <a href="http://www.cisco.com/cisco/web/support/index.html">http://www.cisco.com/cisco/web/support/index.html</a> |

**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](http://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) | Cisco IOS XE Release 3.8S | 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.<br><br>In Cisco IOS XE Release 3.8S, support was added for Cisco ASR 900 Series. |
| Y1731 MIB Support through existing IPSLA MIBs                             | Cisco IOS XE Release 3.8S | 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.                                                                                                                                                                                                                                    |

