Configuring IP SLA—Service Performance Testing

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This chapter describes how to configure the ITU-T Y.1564 Ethernet service performance test methodology to measure the ability of a network device to enable movement of traffic at the configured data rate.

Finding Feature Information

Your software release may not support all the features documented in this module. For the latest feature information and caveats, see 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 for Configuring IP SLA—Service Performance Testing, page 9-47.

Use Cisco Feature Navigator to find information about platform support and Cisco software image support. To access Cisco Feature Navigator, go to http://www.cisco.com/go/cfn. An account on Cisco.com is not required.

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Information About Service Performance Operations

Y.1564 is an Ethernet service activation test methodology, and is the standard for turning up, installing, and troubleshooting Ethernet-based services. Y.1564 is the only standard test methodology that allows a complete validation of Ethernet service-level agreements (SLAs) in a single test.

Service performance testing is designed to measure the ability of a device under test (DUT) or a network under test to properly forward traffic in different states.

Cisco implementation of ITU-T Y.1564 has three key objectives:

- To serve as a network SLA validation tool, ensuring that a service meets its guaranteed performance settings in a controlled test time.

- To ensure that all the services carried by the network meet their SLA objectives at their maximum committed rate, proving that under maximum load, network devices and paths can support all the traffic as designed.

- To perform medium-term and long-term service testing, confirming that network elements can properly carry all the services while under stress during a soaking period.

Service performance supports four operational modes: two-way statistics collection, one-way statistics collection, passive measurement mode, and traffic generator mode. Statistics are calculated, collected, and reported to the IP SLAs module. The statistics database stores historical statistics pertaining to the operations that have been executed.

- In the context of one-way statistics collection, both the passive measurement mode and the traffic generator mode are used in conjunction with each other. One device sends traffic as the generator and another device receives traffic in the passive mode and records the statistics. The passive mode is distinct from the two-way mode, in that, the remote device records statistics instead of looping back the traffic, and the sending device records only the transmit statistics.

- In the context of two-way statistics collection, all the measurements are collected by the sender. For the two-way statistics to work, the remote target must be in the loopback mode. Loopback mode, which enables the traffic from the sender to reach the target and be returned to the sender.

- The passive measurement mode is enabled by excluding a configured traffic profile. A passive measurement operation does not generate live traffic. The operation collects only statistics for the target configured for the operation.

- The traffic generator mode records transmit statistics for the number of packets and bytes sent.

For more information, see the *Configuring IP SLA - Service Performance Testing* document on Cisco.com.

How to Configure Y.1564 to Generate and Measure Ethernet Traffic

Y.1564 is an Ethernet service activation or performance test methodology for turning up, installing, and troubleshooting Ethernet-based services. This test methodology allows for complete validation of Ethernet service-level agreements (SLAs) in a single test. Using the traffic generator performance profile, you can create the traffic based on your requirements. Network performance indicators like throughput, loss, and availability are analyzed using Layer 2 traffic with various bandwidth profiles. Availability is inversely proportional to frame loss ratio.

The figure below shows the Traffic Generator topology describing the traffic flow in the external and internal modes. The traffic is generated at the wire-side of network-to-network interface (NNI) and is transmitted to the responder through the same interface for the external mode. The traffic is generated at the user-to-network interface (UNI) and transmitted to the responder through NNI respectively for the internal mode. The external mode is used to measure the throughput and loss at the NNI port whereas internal mode is used to measure the throughput and loss at the UNI port. During traffic generation, traffic at other ports is not affected by the generated traffic and can continue to switch network traffic.

Figure 9-1   Traffic Generator Topology
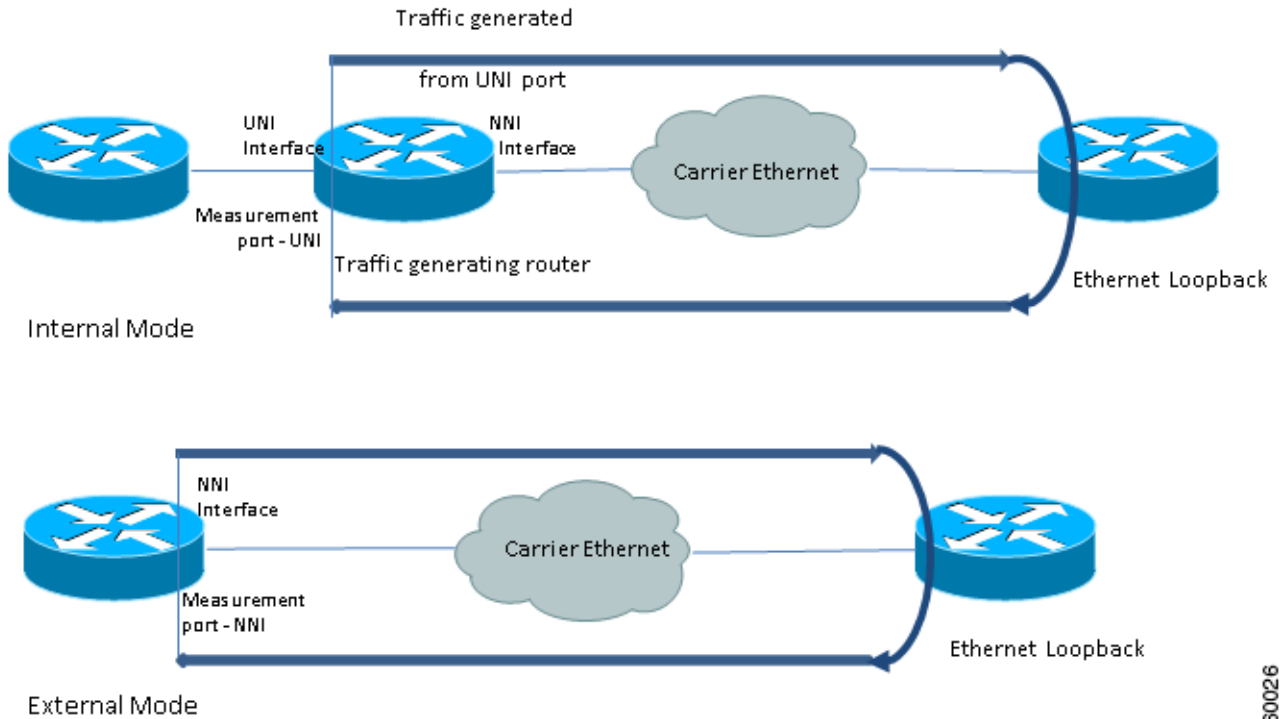
Effective Cisco IOS Release 15.4(1)S, the following features are supported on the Cisco ME 3600-24CX Switch:

- Layer 2 targets for Color-Aware Packet Generation: 802.1p class of service (CoS)
- Color-Aware Packet Measurement: 802.1p CoS

The following table provides details of the different service types and traffic directions supported for each service type:

Table 9-1   Service Types and Their Corresponding Traffic Direction

Service Type	Traffic Direction
Service instance	Internal and External
Interface	Internal and External
Bridge-domain	Internal
Vlan	Internal

To generate traffic using Y.1564, complete the following tasks:

Step 1   Configure Ethernet Virtual Circuits (EVC) on the interface path such that the Layer 2 path between the transmitter and the receiver is complete.

For more information, see the *Configuring Ethernet Virtual Connections (EVCs)* section in the *Cisco ME 3800x and ME 3600x Switches Software Configuration Guide*.

Step 2   Configure Traffic Generator on the transmitter.

The following is a sample configuration of the traffic generator:

```
Router(config)# ip sla 100
Router(config-ip-sla)# service-performance type ethernet dest-mac-addr 0001.0002.0003
interface TenGigabitEthernet0/4 service instance 100
Router(config-ip-sla-service-performance)# aggregation interval buckets 2
Router(config-ip-sla-service-performance)# frequency iteration 2 delay 10
Router(config-ip-sla-service-performance)# profile packet
Router(config-sla-service-performance-packet)# packet-size 256
Router(config-sla-service-performance-packet)# outer-vlan 100
Router(config-sla-service-performance-packet)# profile traffic direction external
Router(config-sla-service-performance-traffic)# rate-step kbps 1000
Router(config-ip-sla-service-performance)# end
Router#
```

Step 3   Configure Ethernet Loopback at the remote end. For information on Ethernet Loopback, see Understanding Ethernet Loopback, page 9-28.

Step 4   Start the IP SLA session by using the following command:

```
Router(config)# ip sla schedule [sla_id] start-time [hh:mm | hh:mm:ss | now | pending | random]
```

Note   Due to packet overhead (64-byte packets), a total of only 600 Mbit/sec of traffic is supported at a time. This bandwidth is shared by all the active sessions. For more information, see Table 9-2.

Prerequisites for Service Performance Operations

- Ensure that the values configured for the **measurement-type direction** {**internal** | **external**} and the **profile traffic direction** {**internal** | **external**} commands are the same.

Restrictions for Service Performance Operations

- Up to four non-color-aware Ethernet-based service activation sessions can run simultaneously.
- The session duration is limited to multiples of 10s; user input is rounded down to the nearest multiple of 10.
- Ingress QoS for internal sessions is supported only for service instance (EVC) targets.
- An internal SAT session and an internal loopback session cannot be started simultaneously on the same Ethernet EFP.
- Multiple active internal sessions with target type service instance are not supported on the same EFP.
- Multiple active internal sessions with target type interface are not supported on the same interface.
- For target type interface, only switchport trunk interfaces are supported. Interfaces configured with EVC for target type interface are not supported.

- For passive measurement sessions with target type Interface, all the traffic with the configured mac-DA is considered test traffic, and is diverted to the FPGA for measurement. Any other traffic on this port should use a different mac-DA.

  For the same reason, there cannot be multiple simultaneously active SLAs with the same dest_mac and the same port.

- For two-way operations, VLAN, interface, and mac-DA are used to identify returning test traffic. Therefore, when using multiple simultaneously active SLA sessions, make sure at least one of these three parameters is different for all active sessions.

- For operations with target type EFP using xconnect, only internal direction measurement and generation is supported.

- Color-aware generation is supported only for the internal direction.

- Only CoS-based marking is supported for Ethernet Target operations.

- Only DSCP-based marking is supported for IP Target operations.

- Marking is only supported when the egress interface is configured with rewrite.

- In the color-aware mode, Above EIR packet classification is not supported.

- Only one color-aware session is supported. The non-color-aware sessions scale remains at four sessions.

- For EVC with Xconnect targets, CoS marking based on color for the color-aware cases is done on the outer Layer 2 header VLAN tags (if applicable). Thus, this marking should be retained across the network so that it is available on the packet, which is being received at the remote end (passive measurement mode) or the same end after loopback at the remote end (two-way mode). If this CoS marking is not retained, there is no way in which to identify the color of the different packets and perform color-aware measurement.

- IMIX traffic generation is supported at a maximum aggregate rate of 98 Mbps across all IMIX streams.

- Non-IMIX traffic generation is supported at a maximum aggregate rate of 600 Mbps across all IMIX streams.

- For IP Target traffic generation and measurement on interface targets, only routed interfaces are supported. To send Layer 3 traffic on a switchport, configure an Ethernet Target operation and set the Ethertype in the packet profile to **ipv4** or **ipv6**.

- An active service performance session uses Ingress VLAN Translation entries. As a result, the scale of the EFPs supported on the Cisco ME3600-24CX are affected when there are active SAT sessions.

- The VLAN match feature on the egress service policy is only supported when the traffic ingresses the layer 2 interface with pop 0, pop1, or pop 2 rewrite tags. The feature is unable to match the traffic that ingresses on a layer 3 interface.

Configuring Ethernet Target Traffic Generation

SUMMARY STEPS

1. **enable**

2. **configure terminal**

3. **ip sla** *sla_id*

4. **service-performance type ethernet dest-mac-addr** *dest-mac* {**service instance** | **interface** | **vlan** | **bridge**}

5. **aggregation | default | description | duration | exit | frequency | no | profile | signature**

6. **measurement-type direction**

7. **default | exit | loss | no | throughput | receive**

8. **exit**

9. **profile packet**

10. **default | exit | inner-cos | inner-vlan | no | outer-cos | outer-vlan | packet-size | src-mac-addr**

11. **exit**

12. **profile traffic direction** {**external** | **internal**}

13. **default | exit | no | rate step kbps**

14. **exit**

DETAILED STEPS

	Command or Action	Purpose

Step 1	`enable`
	
	Example:
	`Router> enable`
		Enables the privileged EXEC mode.
		
		• Enter your password if prompted.

Step 2	`configure terminal`
	
	Example:
	`Router# configure terminal`
		Enters the global configuration mode.

Step 3	`ip sla` *sla_id* **Example:** `Router(config)# ip sla 100`	Specifies the SLA ID to start the IP SLA session.
Step 4	`service-performance type ethernet dest-mac-addr` *dest-mac* {`service instance` | `interface` | `vlan` | `bridge`} **Example:** `Router(config-ip-sla)# service-performance type ethernet dest-mac-addr 0001.0001.0001 interface gigabitEthernet0/10 service instance 10`	Specifies the service performance type as Ethernet and the destination MAC address in H.H.H format. Specifies the target for the SLA session. The options are: • service instance • interface • vlan • bridge

	Command or Action	Purpose
Step 5	`aggregation	default	description	duration	exit	frequency	no	profile	signature`  **Example:** `Router(config-ip-sla-service-performance)# duration time 60`	Specifies the type of service performance. The options are: • **aggregation**—Represents the statistics aggregation. • **default**—Sets a command to its defaults. • **description**—Describes the operation. • **duration**—Sets the service performance duration configuration. • **frequency**—Represents the scheduled frequency. The options available are iteration and time. The range is 20 to 65535 seconds. • **profile**—Specifies the service performance profile. If you use the packet or traffic options, go to Step 9 or Step 12 respectively. • **signature**—Specifies the payload contents.

Step 6	`measurement-type direction`
	
	Example:
	`Router(config-ip-sla-service-performance)# measurement-type direction`
		Specifies the statistics to measure traffic. The options available are external or internal; the default option is internal.

Step 7	`default	exit	loss	no	throughput	receive`  **Example:** `Router(config-ip-sla-service-performance-measurement)# throughput`	Specifies the measurement type based on the service performance is calculated. The options are: • **default**—Sets a command to its default values. • **loss**—Specifies the measurement, such as frame loss. • **throughput**—Specifies the measurement such as average rate of successful frame delivery. • **receive**—Specifies the passive measurement mode.
Step 8	`exit`	Exits the measurement mode.

Step 9	`profile packet`
	
	Example:
	`Router(config-ip-sla-service-performance)# profile packet`
		Specifies the packet profile. A packet profile defines the packets to be generated.

	Command or Action	Purpose
Step 10	`default	exit	inner-cos	inner-vlan	no	outer-cos	outer-vlan	packet-size	src-mac-addr`  **Example:** `Router(config-ip-sla-service-performance-packet)# src-mac-addr 4055.3989.7b56`	**Note** Ensure that the value of the configured packet profile matches the target configuration of the session. Specifies the packet type. The options are: • **default**—Sets a command to its defaults • **inner-cos**—Specifies the CoS value for the inner VLAN tag of the interface from which the message will be sent. • **inner-vlan**—Specifies the VLAN ID for the inner VLAN tag of the interface from which the message will be sent. • **outer-cos**—Specifies the CoS value that will be populated in the outer VLAN tag of the packet. • **outer-vlan**—Specifies the VLAN ID that will be populated in the outer VLAN tag of the packet. • **packet-size**—Specifies the packet size; the default size is 64 bytes. The supported packet sizes are 64 bytes, 128 bytes, 256 bytes, 512 bytes, 1280 bytes, and 1518 bytes. • **src-mac-addr**—Specifies the source MAC address in H.H.H format.

Step 11	`exit`
	
	Example:
	`Router(config-ip-sla-service-performance-packet)# exit`
		Exits the packet mode.

Step 12	`profile traffic direction {external	internal}`  **Example:** `Router(config-ip-sla-service-performance)# profile traffic direction external`	Specifies the direction of the profile traffic. The options are external and internal. **Note** This command is required to configure the **rate step kbps** command.

Step 13	`default`
	or
	`exit`
	or
	`no`
	or
	`rate step kbps`
	
	Example:
	`Router(config-ip-sla-service-performance-traffic)# rate-step kbps 1000`
		Specifies the traffic type. The options are:
		
		• **default**—Sets a command to its defaults
		
		• **rate step kbps**—Specifies the transmission rate in kbps. The rate-step range is from 1-1000000 (1 Kbps to 1Gbps).

Step 14	`exit`	Exits the traffic mode.

Note For vrf targets, the vrf-id specified in the SLA configuration should be the label value derived from the output of the **show platform ip unicast table**:

```
Router# show platform ip unicast table

Platform unicast IPv4 Table dump (# of entries 3)
Name                         ID        Label
IPv4:Default                 0         0
IPv4:test                    1         1
IPv4:x                       2         2
Router#
```

Configuring Ethernet Target Color-Aware Traffic Generation

SUMMARY STEPS

1. **enable**

2. **configure terminal**

3. **ip sla** *sla_id*

4. **service-performance type ethernet dest-mac-addr** *dest_mac_addr* {**vlan** *vlan_id* | **bridge-domain** *domain_id* | **interface** *interface* [**service instance** *efp-id*]

5. **frequency iteration** *number* **delay** *number*

6. **duration time** *seconds*

7. **profile packet**

8. **default | exit | inner-cos | inner-vlan | no | outer-cos | outer-vlan | packet-size | src-mac-addr**

9. **exit**

10. **profile traffic direction** [**internal** | **external**]

    cir *number* **eir** *number*

    conform-color [**drop** | **set-cos-transmit** *cos_value* | **transmit**]

    exceed-color [**drop** | **set-cos-transmit** *cos_value* | **transmit**]

    default

    exit

    no

    rate step kbps *number number*

DETAILED STEPS

	Command or Action	Purpose
Step 1	**enable** **Example:** Router> enable	Enables the privileged EXEC mode. • Enter your password if prompted.
Step 2	**configure terminal** **Example:** Router# configure terminal	Enters the global configuration mode.
Step 3	**ip sla** *sla_id* **Example:** Router(config)# ip sla 100	Specifies the SLA ID to start the IP SLA session.
Step 4	**service-performance type ethernet dest-mac-addr** *dest_mac_addr* {**vlan** *vlan_id* | **bridge-domain** *domain_id* | **interface** *interface* [**service instance** *efp-id*] **Example:** Router(config-ip-sla)# service-performance type ethernet dest-mac-addr 0001.0001.0001 interface gigabitEthernet0/10 service instance 10	Specifies the service performance type as Ethernet and the destination MAC address in H.H.H format. Specifies the target for the SLA session. The options are: • service instance • interface • vlan • bridge
Step 5	**frequency iteration** *number* **delay** *number* **Example:** Router(config-ip-sla)# frequency iteration 1 delay 2	Specifies the number of interactions and delay between the iteration.
Step 6	**duration time** *seconds* **Example:** Router(config-ip-sla)# duration time 30	Specifies the time period to send packets.
Step 7	**profile packet** **Example:** Router(config-ip-sla-service-performance)# profile packet	Specifies the packet profile. A packet profile defines the packets to be generated.

Command or Action	Purpose
Step 8 `default	exit	inner-cos	inner-vlan	no	outer-cos	outer-vlan	packet-size	src-mac-addr`  **Example:** `Router(config-ip-sla-service-performance-packet)# src-mac-addr 4055.3989.7b56`	**Note** Ensure that the value of the configured packet profile matches the target configuration of the session. Specifies the packet type. The options are: • **default**—Sets a command to its defaults • **inner-cos**—Specifies the class of service (CoS) value for the inner VLAN tag of the interface from which the message will be sent. • **inner-vlan**—Specifies the VLAN ID for the inner vlan tag of the interface from which the message will be sent. • **outer-cos**—Specifies the CoS value that will be populated in the outer VLAN tag of the packet. • **outer-vlan**—Specifies the VLAN ID that will be populated in the outer VLAN tag of the packet. • **packet-size**—Specifies the packet size; the default size is 64 bytes. The supported packet sizes are 64 bytes, 128 bytes, 256 bytes, 512 bytes, 1280 bytes, and 1518 bytes. • **src-mac-addr**—Specifies the source MAC address in H.H.H format.

	Command or Action	Purpose

Step 9	`exit`
	
	Example:
	`Router(config-ip-sla-service-performance-packet)# exit`
		Exits the profile packet mode.

Step 10	`profile traffic direction [internal	external]` `cir number` or `eir number` or `conform-color set-cos-transmit cos_value` or `exceed-color set-cos-transmit cos_value` or `default` or `exit` or `no` or `rate step kbps number number`  **Example:** `Router(config-ip-sla-service-performance)# profile traffic direction internal` `Router(config-ip-sla-service-performance-traffic)# cir 45000` `Router(config-ip-sla-service-performance-traffic)# eir 45000` `Router(config-ip-sla-service-performance-traffic)# conform-color set-cos-transmit af43` `Router(config-ip-sla-service-performance-traffic)# exceed-color set-cos-transmit af41` `Router(config-ip-sla-service-performance-traffic)# rate-step kbps 5000 9000`	Defines an upper limit on the volume of the expected service frames belonging to a particular service instance. If a Traffic profile is not specified, the Service Performance probe will be in passive measurement mode. • **cir**—Is the Committed Information Rate. • **conform-color**—Sets the color conform. **Note** **coform-color** and **exceed-color** keywords are available only when **cir** or **eir** is configured. • **default**—Sets a command to its defaults. • **drop**—Drops the packet. • **eir**—Excess Information Rate. • **exceed-color**—Sets the color-exceed. • **exit**—Exits the traffic mode. • **no**—Negates a command or sets its defaults. • **rate step kbps**—Sets the rate step. • **set-cos-transmit** *cos_value*—Sets the CoS value to a new value, and sends the packet. The valid range is from 0 to 7. • **transmit**—Sends the packet without altering it. This is the default value. **Note** This command is required to configure the **rate step kbps** command. • **default**—Sets a command to its defaults • **rate step kbps**—Specifies the transmission rate in kbps. The rate-step range is from 1-1000000 (1 Kbps to 1Gbps).

Example

```
Router(config-ip-sla-service-performance)# profile packet
Router(config-sla-service-performance-packet)# outer-vlan 100
Router(config-sla-service-performance-packet)# outer-cos 5
Router(config-sla-service-performance-packet)# exit
Router(config-ip-sla-service-performance)# profile traffic direction internal
Router(config-ip-sla-service-performance-traffic)# rate-step kbps 1000
Router(config-ip-sla-service-performance-traffic)# exit
Router(config-ip-sla)# duration time 15
Router(config-ip-sla)# frequency iteration 4 delay 1
```

Configuring Ethernet Target Two-Way Color-Aware Session

SUMMARY STEPS

1. **enable**

2. **configure terminal**

3. **ip sla** *sla_id*

4. **service-performance type ethernet dest-mac-addr** *dest_mac_addr* | **interface** *interface* [**service instance** *efp-id*]

5. **duration time** *seconds*

6. **profile packet**

7. **default | exit | inner-cos | inner-vlan | no | outer-cos | outer-vlan | packet-size | src-mac-addr**

8. **exit**

9. **profile traffic direction** [**internal** | **external**]

   cir *number*

   eir *number*

   conform-color [**drop** | **set-cos-transmit** *cos_value* | **transmit**]

   exceed-color [**drop** | **set-cos-transmit** *cos_value* | **transmit**]

   default

   exit

   no

   rate step kbps *number number*

10. **measure direction** [**internal** | **external**] **conform-color cos** *cos_value* **exceed-color cos** *cos_value*

11. **default | exit | loss | no | throughput | receive**

12. **frequency iteration** *number* **delay** *number*

Note   The default **frequency iteration** command value may cause the **duration** command to be rejected for higher values. In this case, we recommend that you use the **frequency iteration** command before the **duration** command.

DETAILED STEPS

	Command or Action	Purpose
Step 1	**enable** **Example:** Router> enable	Enables the privileged EXEC mode. • Enter your password if prompted.
Step 2	**configure terminal** **Example:** Router# configure terminal	Enters the global configuration mode.
Step 3	**ip sla** *sla_id* **Example:** Router(config)# ip sla 100	Specifies the SLA ID to start the IP SLA session.
Step 4	**service-performance type ethernet dest-mac-addr** *dest_mac_addr* | **interface** *interface* [**service instance** *efp-id*] **Example:** Router(config-ip-sla)# service-performance type ethernet dest-mac-addr 0001.0001.0001 interface gigabitEthernet0/10 service instance 10	Specifies the service performance type as Ethernet and the destination MAC address in H.H.H format. Specifies the target for the SLA session. The options are: • service instance • interface
Step 5	**duration time** *seconds* **Example:** Router(config-ip-sla)# duration time 30	Specifies the time period to send packets.
Step 6	**profile packet** **Example:** Router(config-ip-sla-service-performance)# profile packet	Specifies the packet profile. A packet profile defines the packets to be generated and also the filter for incoming packets to be measured.

	Command or Action	Purpose
Step 7	`default	exit	inner-cos	inner-vlan	no	outer-cos	outer-vlan	packet-size	src-mac-addr`  **Example:** `Router(config-ip-sla-service-performance-packet)# src-mac-addr 4055.3989.7b56`	**Note** Ensure that the value of the configured packet profile matches the target configuration of the session. Specifies the packet type. The options are: • **default**—Sets a command to its defaults • **inner-cos**—Specifies the class of service (CoS) value for the inner VLAN tag of the interface from which the message will be sent. • **inner-vlan**—Specifies the VLAN ID for the inner vlan tag of the interface from which the message will be sent. • **outer-cos**—Specifies the CoS value that will be populated in the outer VLAN tag of the packet. • **outer-vlan**—Specifies the VLAN ID that will be populated in the outer VLAN tag of the packet. • **packet-size**—Specifies the packet size; the default size is 64 bytes. The supported packet sizes are 64 bytes, 128 bytes, 256 bytes, 512 bytes, 1280 bytes, and 1518 bytes. • **src-mac-addr**—Specifies the source MAC address in H.H.H format.

Step 8	`exit`
	
	Example:
	`Router(config-ip-sla-service-performance-packet)# exit`
		Exits the profile packet mode.

	Command or Action	Purpose
Step 9	`profile traffic direction [internal	external]` `cir` *number* or `eir` *number* or `conform-color set-cos-transmit` *cos_value* or `exceed-color set-cos-transmit` *cos_value* or `default` or `exit` or `no` or `rate step kbps` **Example:** Router(config-ip-sla-service-performance)# profile traffic direction internal Router(config-ip-sla-service-performance-traffic)# cir 45000 Router(config-ip-sla-service-performance-traffic)# eir 45000 Router(config-ip-sla-service-performance-traffic)# conform-color set-cos-transmit 4 Router(config-ip-sla-service-performance-traffic)# exceed-color set-cos-transmit 5 Router(config-ip-sla-service-performance-traffic)# rate-step kbps 1000	Specifies the in-line traffic profile or enables the selection of a preconfigured traffic profile. A traffic profile defines an upper limit on the volume of the expected service frames belonging to a particular service instance. If a Traffic profile is not specified, the Service Performance probe will be in passive measurement mode. • **cir**—Is the Committed Information Rate. • **conform-color**—Sets the color-conform. • **default**—Set a command to its defaults. • **drop**—Drops the packet. • **eir**—Excess Information Rate. • **exceed-color**—Sets the color-exceed. • **exit**—Exits the traffic mode. • **no—**Negates a command or sets its defaults. • **rate step kbps—**Sets the rate step. • **set-cos-transmit** *cos_value*—Sets the CoS value to a new value, and sends the packet. The valid range is from 0 to 7. • **transmit**—Sends the packet without altering it. This is the default value. **Note** This command is required to configure the **rate step kbps** command. • **default**—Sets a command to its defaults • **rate step kbps**—Specifies the transmission rate in kbps. The rate-step range is from 1 to 1000000 (1 Kbps to 1Gbps).
Step 10	`measure direction [internal	external]` `conform-color cos` *cos_value* `exceed-color cos` *cos_value* **Example:** Router(config-ip-sla)# measure direction internal cod 7	Specifies the direction of measurement.

	Command or Action	Purpose
Step 11	`default	exit	loss	throughput	receive`  **Example:** `Router(config-ip-sla-service-performance-measur` `ement)# throughput`	Specifies the measurement type based on which the service performance is calculated. The options are: • **default**—Sets a command to its default values. • **loss**—Specifies the measurement such as frame loss. • **throughput**—Specifies the measurement such as average rate of successful frame delivery. • **receive**—Specifies the passive measurement mode.

Step 12	`frequency iteration` *number* `delay` *number*
	
	Example:
	`Router(config-ip-sla)# frequency iteration 1`
	`delay 2`
		Specifies the number of interactions and delay between the iterations.

Example

```
ip sla 3
service-performance type ether des 0033.3333.3333 interface gig 0/7 service instance 1
 profile packet
  outer-vlan 100
  outer-cos 5
  packet-size 128
  ethertype ipv4
  exit
 profile traffic direction internal
  cir 45000
  eir 45000
  conform-color set-cos-transmit 7
  exceed-color set-cos-transmit 5
  rate-step kbps 30000 45000 65000 90000
  exit
 measure direction internal conform-color cos 7 exceed-color cos 5
  receive
  throughput
  loss
 duration time 20
 frequency iteration 1 delay 2
```

Configuring Ethernet Target Passive Color-Aware Measurement

SUMMARY STEPS

1. **enable**

2. **configure terminal**

3. **ip sla** *sla_id*

4. **service-performance type ethernet dest-mac-addr** *dest_mac_addr* {**vlan** *vlan_id* | **bridge-domain** *domain_id* | **interface** *interface* [**service instance** *efp-id*]

5. **duration time** *seconds*

6. **profile packet**

7. **default | exit | inner-cos | inner-vlan | no | outer-cos | outer-vlan | packet-size | src-mac-addr**

8. **exit**

9. **measure direction** [**internal** | **external**] **conform-color cos** *cos_value* **exceed-color cos** *cos_value*

10. **default** | **exit** | **loss** | **no** | **throughput** | **receive**

11. **frequency iteration** *number* **delay** *number*

DETAILED STEPS

	Command or Action	Purpose
Step 1	**enable** **Example:** Router> enable	Enables the privileged EXEC mode. • Enter your password if prompted.
Step 2	**configure terminal** **Example:** Router# configure terminal	Enters the global configuration mode.
Step 3	**ip sla** *sla_id* **Example:** Router(config)# ip sla 100	Specifies the SLA ID to start the IP SLA session.
Step 4	**service-performance type ethernet dest-mac-addr** *dest_mac_addr* {**vlan** *vlan_id* | **bridge-domain** *domain_id* | **interface** *interface* [**service instance** *efp-id*] **Example:** Router(config-ip-sla)# service-performance type ethernet dest-mac-addr 0001.0001.0001 interface gigabitEthernet0/10 service instance 10	Specifies the service performance type as Ethernet and the destination MAC address in H.H.H format. Specifies the target for the SLA session. The options are: • service instance • interface • vlan • bridge
Step 5	**duration time** *seconds* **Example:** Router(config-ip-sla)# duration time 30	Specifies the time period to send packets.
Step 6	**profile packet** **Example:** Router(config-ip-sla-service-performance)# profile packet	Specifies the packet profile. A packet profile defines the filter for incoming packets to be measured.

Command or Action	Purpose
Step 7 `default	exit	inner-cos	inner-vlan	no	outer-cos	outer-vlan	packet-size	src-mac-addr`  **Example:** `Router(config-ip-sla-service-performance-packet)# src-mac-addr 4055.3989.7b56`	**Note** Ensure that the value of the configured packet profile matches the target configuration of the session. Specifies the packet type. The options are: • **default**—Sets a command to its defaults • **inner-cos**—Specifies the class of service (CoS) value for the inner VLAN tag of the interface from which the message will be sent. • **inner-vlan**—Specifies the VLAN ID for the inner vlan tag of the interface from which the message will be sent. • **outer-cos**—Specifies the CoS value that will be populated in the outer VLAN tag of the packet. • **outer-vlan**—Specifies the VLAN ID that will be populated in the outer VLAN tag of the packet. • **packet-size**—Specifies the packet size; the default size is 64 bytes. The supported packet sizes are 64 bytes, 128 bytes, 256 bytes, 512 bytes, 1280 bytes, and 1518 bytes. • **src-mac-addr**—Specifies the source MAC address in H.H.H format.
Step 8 `exit` **Example:** `Router(config-ip-sla-service-performance-packet)# exit`	Exits the profile packet mode.
Step 9 `measure direction [internal	external] conform-color cos` *cos_value* `exceed-color cos` *cos_value*  **Example:** `Router(config-ip-sla)# measure direction internal cod 7`	• Specifies the direction of measurement.

	Command or Action	Purpose

Step 10	`default` | `exit` | `loss` | `throughput` | `receive`
	
	Example:
	`Router(config-ip-sla-service-performance-measurement)# throughput`
		Specifies the measurement type based on which the service performance is calculated. The options are:
		
		• **default**—Sets a command to its default values.
		• **loss**—Specifies the measurement such as frame loss.
		• **throughput**—Specifies the measurement such as average rate of successful frame delivery.
		• **receive**—Specifies the passive measurement mode.

Step 11	`frequency iteration` *number* `delay` *number* **Example:** `Router(config-ip-sla)# frequency iteration 1 delay 2`	Specifies the number of interactions and delay between the interations.

Example

```
ip sla 3
service-performance type ether dest-mac-addr 0033.3333.3333 interface gig 0/7 service
instance 1
 profile packet
  outer-vlan 100
  outer-cos 5
  packet-size 128
  ethertype ipv4
  exit
 measure direction internal conform-color cos 7 exceed-color cos 5
  receive
  throughput
  loss
 duration time 20
 frequency iteration 1 delay 2
```

Configuring Ethernet Target for Color-Aware Traffic Generation with IMIX

SUMMARY STEPS

1. **enable**

2. **configure terminal**

3. **ip sla** *sla_id*

4. **service-performance type Ethernet dest-mac-addr** *dest_mac_addr* {**vlan** *vlan_id* | **bridge-domain** *domain_id* | **interface** *interface* [**service instance** *efp-id*]

5. **duration time** *seconds*

6. **profile packet**

7. **default | exit | inner-cos | inner-vlan | no | outer-cos | outer-vlan | packet-size imix | src-mac-addr**

8. **exit**

9. **profile traffic direction** [**internal** | **external**]

      cir *number*

      eir *number*

      conform-color [**drop** | **set-cos-transmit** *cos_value* | **transmit**]

      exceed-color [**drop** | **set-cos-transmit** *cos_value* | **transmit**]

      default

      exit

      no

      rate step kbps *number number*

    10. **frequency iteration** *number* **delay** *number*

DETAILED STEPS

	Command or Action	Purpose

Step 1	`enable`
	
	Example:
	`Router> enable`
		Enables the privileged EXEC mode.
		
		• Enter your password if prompted.

Step 2	`configure terminal`
	
	Example:
	`Router# configure terminal`
		Enters the global configuration mode.

Step 3	`ip sla` *sla_id* **Example:** `Router(config)# ip sla 100`	Specifies the SLA ID to start the IP SLA session.
Step 4	`service-performance type ethernet dest-mac-addr` *dest_mac_addr* {**vlan** *vlan_id* | **bridge-domain** *domain_id* | **interface** *interface* [**service instance** *efp-id*] **Example:** `Router(config-ip-sla)# service-performance type ethernet dest-mac-addr 0001.0001.0001 interface gigabitEthernet0/10 service instance 10`	Specifies the service performance type as Ethernet and the destination MAC address in H.H.H format. Specifies the target for the SLA session. The options are: • service instance • interface • vlan • bridge
Step 5	`duration time` *seconds* **Example:** `Router(config-ip-sla)# duration time 30`	Specifies the time period to send packets.

Step 6	`profile packet`
	
	Example:
	`Router(config-ip-sla-service-performance)# profile packet`
		Specifies the packet profile. A packet profile defines the packets to be generated.

	Command or Action	Purpose
Step 7	`default	exit	inner-cos	inner-vlan	no	outer-cos	outer-vlan	packet-size imix	src-mac-addr`  **Example:** `Router(config-ip-sla-service-performance-packet)# packet-size imix`	**Note** Ensure that the value of the configured packet profile matches the target configuration of the session. Specifies the packet type. The options are: • **default**—Sets a command to its defaults • **inner-cos**—Specifies the CoS value for the inner VLAN tag of the interface from which the message will be sent. • **inner-vlan**—Specifies the VLAN ID for the inner VLAN tag of the interface from which the message will be sent. • **outer-cos**—Specifies the CoS value that will be populated in the outer VLAN tag of the packet. • **outer-vlan**—Specifies the VLAN ID that will be populated in the outer VLAN tag of the packet. • **packet-size**—Specifies the packet size; the default size is 64 bytes. The supported packet sizes are 64 bytes, 128 bytes, 256 bytes, 512 bytes, 1280 bytes, and 1518 bytes. **Note** For IMIX, the packet-size should be explicitly mentioned as IMIX. • **src-mac-addr**—Specifies the source MAC address in H.H.H format.
Step 8	`exit`	Exits the profile packet mode.

	Command or Action	Purpose

Step 9	**profile traffic direction** [**internal** | **external**] **cir** *number* or **eir** *number* or **conform-color set-cos-transmit** *cos_value* or **exceed-color set-cos-transmit** *cos_value* or **default** or **exit** or **no** or **rate step kbps**
	
	Example:
	`Router(config-ip-sla-service-performance)# profile traffic direction internal`
	`Router(config-ip-sla-service-performance-traffic)# cir 45000`
	`Router(config-ip-sla-service-performance-traffic)# eir 45000`
	`Router(config-ip-sla-service-performance-traffic)# conform-color set-cos-transmit af43`
	`Router(config-ip-sla-service-performance-traffic)# exceed-color set-cos-transmit af41`
	`Router(config-ip-sla-service-performance-traffic)# rate-step kbps 1000`
		Specifies the in-line traffic profile or enables the selection of a preconfigured traffic profile. A traffic profile defines an upper limit on the volume of the expected service frames belonging to a particular service instance. If a Traffic profile is not specified, the Service Performance probe will be in passive measurement mode.
		
		• **cir**—Is the Committed Information Rate.
		• **conform-color**—Sets the color-conform.
		• **default**—Set a command to its defaults.
		• **drop**—Drops the packet.
		• **eir**—Excess Information Rate.
		• **exceed-color**—Sets the color-exceed.
		• **exit**—Exits the traffic mode.
		• **no**—Negates a command or sets its defaults.
		• **rate step kbps**—Sets the rate step.
		• **set-cos-transmit** *cos_value*—Sets the CoS value to a new value, and sends the packet. The valid range is from 0 to 7.
		• **transmit**—Sends the packet without altering it. This is the default value.
		
		Note This command is required to configure the **rate step kbps** command.
		
		• **default**—Sets a command to its defaults
		• **rate step kbps**—Specifies the transmission rate in kbps. The rate-step range is from 1-1000000 (1 Kbps to 1Gbps).

Step 10	**frequency iteration** *number* **delay** *number* **Example:** `Router(config-ip-sla)# frequency iteration 1 delay 2`	Specifies the number of interactions and delay between the iterations.

Example

```
ip sla 3
service-performance type ether des 0033.3333.3333 interface gig 0/7 service instance 1
 profile packet
   imix
   outer-vlan 100
   outer-cos 5
   packet-
   ethertype ipv4
   exit
 profile traffic direction internal
   cir 45000
   eir 45000
```

```
   conform-color set-cos-transmit 7
   exceed-color set-cos-transmit 5
   rate-step kbps 30000 45000 65000 90000
   exit
 duration time 20
frequency iteration 1 delay 2
```

Configuration Examples for Configuring Y.1564 to Generate and Measure Ethernet Traffic

This section shows sample configurations for traffic generation:

```
Router(config)# ip sla 100
Router(config-ip-sla)# service-performance type ethernet dest-mac-addr 0001.0002.0003
interface TenGigabitEthernet0/4 service instance 100
Router(config-ip-sla-service-performance)# profile packet
Router(config-sla-service-performance-packet)# packet-size 256
Router(config-sla-service-performance-packet)# outer-vlan 100
Router(config-sla-service-performance-packet)# profile traffic direction external
Router(config-sla-service-performance-traffic)# rate-step kbps 1000
Router(config-sla-service-performance-traffic)# aggregation interval buckets 2
Router(config-ip-sla-service-performance)# frequency iteration 2 delay 10
Router(config-ip-sla-service-performance)# end
Router#
```

Example: Traffic Generation—Target Interface

This section shows sample configuration for traffic generation – target interface:

```
Router(config)# ip sla 100
Router(config-ip-sla)# service-performance type ethernet dest-mac-addr 0001.0002.0003
interface TenGigabitEthernet0/4
Router(config-ip-sla-service-performance)# profile packet
Router(config-sla-service-performance-packet)# packet-size 256
Router(config-sla-service-performance-packet)# outer-vlan 100
Router(config-sla-service-performance-packet)# profile traffic direction external
Router(config-sla-service-performance-traffic)# rate-step kbps 1000
Router(config-sla-service-performance-traffic)# aggregation interval buckets 2
Router(config-ip-sla-service-performance)# frequency iteration 2 delay 10
Router(config-ip-sla-service-performance)# end
Router#
```

Example: Two-Way Session—Target Service Instance

The following is a sample configuration for a two-way measurement session of service instance internal target type:

```
Router(config)#ip sla 100
Router(config-ip-sla)#service-performance type ethernet dest-mac-addr 0001.0002.0003
interface TenGigabitEthernet0/2 service instance 100
Router(config-ip-sla-service-performance)#measurement-type direction internal
Router(config-sla-service-performance-measurement)#loss
Router(config-sla-service-performance-measurement)#throughput
Router(config-sla-service-performance-measurement)#profile packet
Router(config-sla-service-performance-packet)#packet-size 64
Router(config-sla-service-performance-packet)#outer-vlan 100
Router(config-sla-service-performance-packet)#inner-vlan 200
```

```
Router(config-sla-service-performance-packet)#profile traffic direction internal
Router(config-sla-service-performance-traffic)#rate-step kbps 1000
Router(config-sla-service-performance-traffic)#aggregation interval buckets 2
Router(config-ip-sla-service-performance)#frequency iteration 2 delay 10
Router(config-ip-sla-service-performance)#end
Router#
```

Example: Two-Way Session—Target VLAN

The following is a sample configuration for a two-way internal measurement and generation session with target type VLAN:

```
Router(config)#ip sla 100
Router(config-ip-sla)#service-performance type ethernet dest-mac-addr 0001.0002.0003
interface TenGigabitEthernet0/2 vlan 100
Router(config-ip-sla-service-performance)#measurement-type direction internal
Router(config-sla-service-performance-measurement)#loss
Router(config-sla-service-performance-measurement)#throughput
Router(config-sla-service-performance-measurement)#profile packet
Router(config-sla-service-performance-packet)#packet-size 64
Router(config-sla-service-performance-packet)#outer-vlan 100
Router(config-sla-service-performance-packet)#inner-vlan 200
Router(config-sla-service-performance-packet)#profile traffic direction internal
Router(config-sla-service-performance-traffic)#rate-step kbps 1000
Router(config-sla-service-performance-traffic)#aggregation interval buckets 2
Router(config-ip-sla-service-performance)#frequency iteration 2 delay 10
Router(config-ip-sla-service-performance)#end
Router#
```

Example: Passive Measurement Mode—Target Service Instance

The following is a sample configuration for passive measurement session:

```
Router(config)#ip sla 100
Router(config-ip-sla)#service-performance type ethernet dest-mac-addr 0001.0002.0003
interface TenGigabitEthernet0/4 service instance 100
Router(config-ip-sla-service-performance)#measurement-type direction external
Router(config-sla-service-performance-measurement)# loss
Router(config-sla-service-performance-measurement)# throughput
Router(config-sla-service-performance-packet)# aggregation interval buckets 2
Router(config-sla-service-performance-packet)# frequency iteration 2 delay 10
Router(config-ip-sla-service-performance)# end
Router#
```

Example: Traffic Generation Mode—Target Service Instance

The following is a sample configuration for traffic generation mode:

```
Router(config)#ip sla 100
Router(config-ip-sla)#service-performance type ethernet dest-mac-addr 0001.0002.0003
interface TenGigabitEthernet0/4 service instance 100
Router(config-ip-sla-service-performance)#profile packet
Router(config-sla-service-performance-packet)#packet-size 256
Router(config-sla-service-performance-packet)#outer-vlan 100
Router(config-sla-service-performance-packet)#profile traffic direction external
Router(config-sla-service-performance-traffic)#rate-step kbps 1000
Router(config-sla-service-performance-traffic)#aggregation interval buckets 2
Router(config-ip-sla-service-performance)#frequency iteration 2 delay 10
Router(config-ip-sla-service-performance)#end
Router#
```

Example: Traffic Generation Mode—Color Aware

The following is a sample output for traffic generation mode—color aware:

```
ip sla 3
service-performance type ether des 0033.3333.3333 int gig 0/7 service instance 1
 profile packet
  outer-vlan 100
  outer-cos 5
  packet-size 128
  ethertype ipv4
  exit
 profile traffic dir int
  cir 45000
  eir 45000
  conform-color set-cos-transmit 7
  exceed-color set-cos-transmit 5
  rate-step kbps 30000 45000 65000 90000
  exit
 duration time 20
 frequency iteration 1 delay 2
```

Example: Traffic Generation Mode with IMIX—Color Aware

The following is a sample output for traffic generation mode with IMIX—color aware:

```
ip sla 3
service-performance type ether des 0033.3333.3333 int gig 0/7 service instance 1
 profile packet
  outer-vlan 100
  outer-cos 5
  packet-size imix
  ethertype ipv4
  exit
 profile traffic dir int
  cir 45000
  eir 45000
  conform-color set-cos-transmit 7
  exceed-color set-cos-transmit 5
  rate-step kbps 30000 45000 65000 90000
  exit
 duration time 20
 frequency iteration 1 delay 2
```

Example: Two-way Color-Aware Measurement Session

The following is a sample output for a two-way color-aware measurement session:

```
ip sla 3
service-performance type ether des 0033.3333.3333 int gig 0/7 service instance 1
 profile packet
  outer-vlan 100
  outer-cos 5
  packet-size 128
  ethertype ipv4
  exit
 profile traffic dir int
  cir 45000
  eir 45000
  conform-color set-cos-transmit 7
  exceed-color set-cos-transmit 5
  rate-step kbps 30000 45000 65000 90000
  exit
```

```
measure dir internal conform-color cos 7 exceed-color cos 5
 receive
 throughput
 loss
duration time 20
frequency iteration 1 delay 2
```

Example: Passive Color-Aware Measurement Session

The following is a sample output for a passive color-aware measurement session:

```
ip sla 3
service-performance type ether des 0033.3333.3333 int gig 0/7 service instance 1
 profile packet
  outer-vlan 100
  outer-cos 5
  packet-size 128
  ethertype ipv4
  exit
 measure dir internal conform-color cos 7 exceed-color cos 5
  receive
  throughput
  loss
 duration time 20
 frequency iteration 1 delay 2
```

Example: Two-way Session

The following is a sample output for a two-way session:

```
Router# show ip sla statistics 100

IPSLAs Latest Operation Statistics

IPSLA operation id: 100
Type of operation: Ethernet Service Performance
Test mode: Two-way Measurement
Steps Tested (kbps): 1000
Test duration: 30 seconds

Latest measurement: 00:00:00.000 UTC Mon Jan 1 1900
Latest return code: OK

Overall Throughput: In Progress

Step 1 (1000 kbps):
Stats:
IR(kbps) FL FLR Avail
1049 0 0.00% 100.00%
Tx Packets: 9932 Tx Bytes: 675376
Rx Packets: 9954 Rx Bytes: 676872
Step Duration: 5 seconds
```

Note   Since the test is in progress in the above example, the Rx statistics exceed the Tx statistics. This is due to latency in collection of statistics, where the Rx statistics are updated more quickly than the Tx statistics.

Note   Statistics are cumulative over a period of time and not specific to any particular time instance.

Understanding Ethernet Loopback

The local aggregated Ethernet, Fast Ethernet, Tri-Rate Ethernet copper, and Gigabit Ethernet interfaces connect to a remote system. The **ethernet loopback** command is used to place any of these types of interfaces into loopback mode. Packets that are received on the specified interface, service instance, and that also match the specified VLAN tag, are looped back and sent back through the same interface. Ethernet Loopback can be enabled in either internal or external mode.

External loopback is the process of looping frames coming from the port on the wire side. Internal loopback is the process of looping frames coming from the port on the relay side.

Ethernet Loopback is used with two-way generation and measurement sessions, looping traffic back to the sending device so that it may receive the traffic and execute the test.

You can use per-port and per VLAN Ethernet Loopback to test connectivity at initial startup, to test throughput, and to test quality of service in both directions. The RFC2544 for latency testing specifies that the throughput must be measured by sending frames at increasing rate, representing the percentage of frames received as graphs, and reporting the frames dropping rate. This rate is dependent on the frame size. This throughput measurement at traffic generator requires the Ethernet Loopback support on the responder.

Ethernet Loopback can be achieved with external or internal loopback. External loopback is the process of looping frames coming from the port on wire side. Internal loopback is the process of looping frames coming from the port on relay side.

Configuring Ethernet Loopback

This section contains the following topics:

Restrictions for Ethernet Loopback

- Loopback is not supported on a routed port.
- When Ethernet Loopback is enabled, the Layer 2 Control Protocol (L2CP) forward and L2CP tunnel protocols are not functional on any ports.

Enabling Ethernet Loopback

SUMMARY STEPS

1. **enable**
2. **configure terminal**
3. **interface** *type* **number**
4. **switchport trunk allowed vlan** {*vlan-list* **all** | **none** [**add** | **except** | **none** | **remove** {*vlan-list*}]
5. **switchport mode** {**access** | **trunk**}
6. **service instance** *instance-number* **ethernet**

7. **ethernet loopback permit** [**internal** | **external**]

8. **encapsulation** *dotlq-number*

9. **rewrite ingress tag pop 1 symmetric** [Optional]

10. **bridge** *domain-number*

11. **end**

12. **ethernet loopback start local interface** *interface-name* **service instance** *instance-number* **facility source mac-address** *source-mac-address* **destination mac-address** *destination-mac-address* **timeout** *time-in-seconds*

13. **ethernet loopback stop local interface** *type number* **service instance** *instance-number*

DETAILED STEPS

	Command or Action	Purpose

Step 1	`enable`
	
	Example:
	`Router> enable`
		Enables the privileged EXEC mode.
		
		• Enter your password if prompted.

Step 2	`configure terminal`
	
	Example:
	`Router# configure terminal`
		Enters the global configuration mode.

Step 3	`interface type number`
	
	Example:
	`Router(config)# interface gigabitEthernet0/1`
		Specifies an interface type and number to enter the interface configuration mode.

Step 4	`switchport trunk allowed vlan {vlan-list all | none [add | except | none | remove {vlan-list}]`
	
	Example:
	`Router(config-if)# switchport trunk allow vlan 15-20`
		Sets allowed VLANs for the trunk interface. The default is to allow all VLANs on the trunk interface: 1 to 3967 and 4048 to 4094. VLANs 3968 to 4047 are the default VLANs reserved for internal use by default; this group of VLANs is configurable. By default, all VLANs are allowed on all trunk interfaces.
		
		Note You cannot add internally allocated VLANs as allowed VLANs on trunk ports. The system returns a message if you attempt to list an internally allocated VLAN as an allowed VLAN.

Step 5	`switchport mode {access | trunk}`
	
	Example:
	`Router(config-if)# switchport mode trunk`
		Sets the interface as an Ethernet trunk port. A trunk port can carry traffic in one or more VLANs on the same physical link (VLANs are based on the trunk-allowed VLANs list). By default, a trunk interface can carry traffic for all VLANs.

Step 6	`service instance instance-number ethernet`
	
	Example:
	`Router(config-if)# service instance 10 ethernet`
		Creates a service instance on an interface and enters service instance configuration mode.

	Command or Action	Purpose
Step 7	**ethernet loopback permit** [**internal** | **external**}] **Example:** Router(config-if)# ethernet loopback permit external vlan 100	Configures Ethernet permit external loopback on a switchport interface. External loopback allows loopback of traffic from wire. This command is supported under a service instance.
Step 8	**encapsulation** *dot1q-number* **Example:** Router(config-if-srv)# encapsulation dot1q 10	Defines the matching criteria to be used in order to map the ingress dot1q frames on an interface to the appropriate service instance.
Step 9	**rewrite ingress tag pop 1 symmetric** **Example:** Router(config-if-srv)# rewrite ingress tag pop1 symmetric	[Optional] Specifies the tag manipulation that is to be performed on the frame ingress to the service instance.
Step 10	**bridge** *domain-number* **Example:** Router(config-if-srv)# bridge domain 10	Binds the service instance to a bridge domain.
Step 11	**end** **Example:** Router(config-if-srv)# end	Returns to privileged EXEC mode.
Step 12	**ethernet loopback start local interface** *type number* **service instance** *instance-number* **facility source mac-address** *source mac-address* **destination mac-address** *destination-mac-address* **timeout** *time-in-seconds* **Example:** Router# ethernet loopback start local interface gigabitEthernet 0/1 service instance 10 facility source mac-address 0123.4567.89ab destination mac-address 255.255.255 timeout 9000	Starts the loopback process on the service instance. Destination MAC address is an optional field. Source MAC address is the destination MAC address, and the destination MAC address is assigned as the source MAC address.
Step 13	**ethernet loopback stop local interface** *type number* **service instance** *instance-number* **Example:** Router# ethernet loopback stop local interface gigabitEthernet 0/1 service instance 10	Stops Ethernet Loopback.

Configuration Example

Configuring the External Ethernet Loopback

1. Configure external Ethernet Loopback under the EVC under the interface on which the Ethernet Loopback should be started:

```
Router(config)#interface TenGigabitEthernet0/1
Router(config-if)#switchport trunk allowed vlan none
Router(config-if)#switchport mode trunk
Router(config-if)#interface TenGigabitEthernet0/1
Router(config-if)#service instance 100 ethernet
Router(config-if-srv)#encapsulation dot1q 100
Router(config-if-srv)#rewrite ingress tag pop 1 symmetric
Router(config-if-srv)#bridge-domain 100
Router(config-if-srv)#ethernet loopback permit external
Router(config-if-srv)#end
```

2. Start the external Ethernet Loopback:

```
Router#ethernet loopback start local interface te0/1 service instance 100 external dot1q
100 timeout none
This is an intrusive loopback and the packets matched with the service will not be able to
pass through. Continue? (yes/[no]): yes
Router#
```

Note   EVC ID and dot1q ID must be the same as configured under the interface of interest.

Configuring the Internal Ethernet Loopback

1. Configure the Ethernet Loopback under the EVC under the interface on which Ethernet Loopback should be started:

```
Router(config)#interface TenGigabitEthernet0/1
Router(config-if)#switchport trunk allowed vlan none
Router(config-if)#switchport mode trunk
Router(config-if)#interface TenGigabitEthernet0/1
Router(config-if)#service instance 100 ethernet
Router(config-if-srv)#encapsulation dot1q 100
Router(config-if-srv)#rewrite ingress tag pop 1 symmetric
Router(config-if-srv)#bridge-domain 100
Router(config-if-srv)#ethernet loopback permit internal
Router(config-if-srv)#end
```

2. Start the internal Ethernet Loopback:

```
Router#ethernet loopback start local interface te0/1 service instance 100 internal dot1q
100 timeout none
This is an intrusive loopback and the packets matched with the service will not be able to
pass through. Continue? (yes/[no]): yes
Router#
```

Note   EVC ID and dot1q ID must be the same as configured under the interface of interest.

How to Configure Y.1564 to Generate and Measure IP Traffic

Effective Cisco IOS Release 15.4(1)S, the following features are supported on the Cisco ME 3600-24CX Switch:

- IP flow parameters (DA/SA) Generation

- IP flow parameters (DA/SA) Measurement

- Color-Aware IP flow Generation: differentiated services code point (DSCP) based

- Color-Aware IP flow measurement: DSCP based

- IMIX Traffic Generation type (combination of 64, 512, and 1518 byte packets)

Configuring IP Target Color-Aware Traffic Generation

SUMMARY STEPS

1. **enable**

2. **configure terminal**

3. **ip sla** *sla_id*

4. **service-performance type ip dest-ip** *dest_ip_addr* {**vlan** *vlan_id* | **bridge-domain** *domain_id* | **interface** *interface* [**service instance** *efp-id*] | **vrf** *vrf_id*}

5. **frequency iteration** *number* **delay** *number*

6. **duration time** *seconds*

7. **profile packet**

8. **default | exit | no | packet-size | source-ip-addr**

9. **exit**

10. **profile traffic direction** [**internal** | **external**]

    cir *number*

    eir *number*

    conform-color [**drop** | **set-dscp_transmit** *dscp_value* | **transmit**]

    exceed-color [**drop** | **set-dscp_transmit** *dscp_value* | **transmit**]

    default

    exit

    no

    rate-step kbps *number number*

DETAILED STEPS

	Command or Action	Purpose

Step 1	`enable`
	
	Example:
	`Router> enable`
		Enables the privileged EXEC mode.
		
		• Enter your password if prompted.

Step 2	`configure terminal`
	
	Example:
	`Router# configure terminal`
		Enters the global configuration mode.

Step 3	`ip sla` *sla_id* **Example:** `Router(config)# ip sla 100`	Specifies the SLA ID to start the IP SLA session.
Step 4	`service-performance type ip dest-ip` *dest_ip_addr* {`vlan` *vlan_id* | `bridge-domain` *domain_id* | `interface` *interface* [`service instance` *efp-id*] | `vrf` *vrf_id*} **Example:** `Router(config-ip-sla)# service-performance type ip dest-ip 194.168.1.1 interface gigabitEthernet0/10 service instance 10`	Specifies the service performance type as Ethernet and the destination MAC address in H.H.H format. Specifies the target for the SLA session. The options are: • service instance • interface • vlan • bridge
Step 5	`frequency iteration` *number* `delay` *number* **Example:** `Router(config-ip-sla)# frequency iteration 1 delay 2`	Specifies the number of interactions and delay between the iterations.
Step 6	`duration time` *seconds* **Example:** `Router(config-ip-sla)# duration time 30`	Specifies the time period to send packets.

Step 7	`profile packet`
	
	Example:
	`Router(config-ip-sla-service-performance)# profile packet`
		Specifies the packet profile. A packet profile defines the packets to be generated.

	Command or Action	Purpose

Step 8	`default` | `exit` | `no` | `packet-size` | `source-ip-addr`
	
	Example:
	`Router(config-ip-sla-service-performance-packet)# src-ip-addr 193.168.1.1`
		Note Ensure that the value of the configured packet profile matches the target configuration of the session.
		
		Specifies the packet type. The options are:
		• **default**—Sets a command to its defaults.
		• **exit**—Exits the packet mode.
		• **no**—Negates a command or set its defaults.
		• **packet-size**—Specifies the packet size; the default size is 64 bytes. The supported packet sizes are 64 bytes, 128 bytes, 256 bytes, 512 bytes, 1280 bytes, and 1518 bytes.
		• **source-ip-addr**—Specifies the source IP address.

Step 9	`exit`	Exits the IP SLA Service Performance packet mode.

Step 10	`profile traffic direction` [`internal` | `external`]
	`cir` *number*
	or
	`eir` *number*
	or
	`conform-color set-dscp-transmit` *dscp_value*
	or
	`exceed-color set-dscp-transmit` *dscp_value*
	or
	`default`
	or
	`exit`
	or
	`no`
	or
	`rate step kbps`
	
	Example:
	`Router(config-ip-sla-service-performance)# profile traffic direction internal`
	`Router(config-ip-sla-service-performance-traffic)# cir 45000`
	`Router(config-ip-sla-service-performance-traffic)# eir 45000`
	`Router(config-ip-sla-service-performance-traffic)# conform-color set-dscp-transmit af43`
	`Router(config-ip-sla-service-performance-traffic)# exceed-color set-dscp-transmit af41`
	`Router(config-ip-sla-service-performance-traffic)# rate-step kbps 1000`
		Specifies the in-line traffic profile or selection of a pre-configured traffic profile. A traffic profile defines an upper bound on the volume of the expected service frames belonging to a particular service instance. If a Traffic profile is not specified, the Service Performance probe will be in passive measurement mode.
		• **cir**—Committed Information Rate
		• **conform-color**—Sets the color-conform
		• **default**—Set a command to its defaults
		• **drop**—Drops the packet.
		• **eir**—Excess Information Rate
		• **exceed-color**—Sets the color-exceed
		• **exit**—Exits the traffic mode
		• **no**—Negates a command or sets its defaults
		• **rate step kbps**—Sets the rate step
		• **set-dscp-transmit** *dscp_value*—Sets the IP DSCP value to a new value, and sends the packet. The valid range is from 0 to 63. You also can enter nemonic name for a commonly-used value.
		• **transmit**—Sends the packet without altering it. This is the default value.
		Note This command is required to configure the **rate step kbps** command.
		• **default**—Sets a command to its defaults
		• **rate step kbps**—Specifies the transmission rate in kbps. The rate-step range is from 1 to 1000000 (1 Kbps to 1Gbps).

Example

```
ip sla 1
 service-performance type ip dest-ip-addr 194.168.1.1 vrf 2
  frequency iteration 1 delay 1
  duration time 50
  profile packet
   source-ip-addr 193.168.1.1
   packet-size 512
  profile traffic direction internal
   cir 45000
   eir 45000
   rate-step kbps 50000 90000
   conform-color set-dscp-transmit af43
   exceed-color set-dscp-transmit af41
```

Configuring IP Target Color Blind Traffic Generation

SUMMARY STEPS

1. **enable**

2. **configure terminal**

3. **ip sla** *sla_id*

4. **service-performance type ip dest-ip** *dest_ip_addr* {**vlan** *vlan_id* | **bridge-domain** *domain_id* | **interface** *interface* [**service instance** *efp-id*] | **vrf** *vrf_id*}

5. **frequency iteration** *number* **delay** *number*

6. **duration time** *seconds*

7. **profile packet**

8. **default | exit | no | packet-size | source-ip-addr | tunnel**

9. **exit**

10. **profile traffic direction** [**internal** | **external**]

11. **default | exit | no | rate step kbps** *number number*

DETAILED STEPS

	Command or Action	Purpose

Step 1	`enable`
	
	Example:
	`Router> enable`
		Enables the privileged EXEC mode.
		
		• Enter your password if prompted.

Step 2	`configure terminal`
	
	Example:
	`Router# configure terminal`
		Enters the global configuration mode.

Step 3	`ip sla` *sla_id* **Example:** `Router(config)# ip sla 100`	Specifies the SLA ID to start the IP SLA session.
Step 4	`service-performance type ip dest-ip` *dest_ip_addr* {**vlan** *vlan_id* | **bridge-domain** *domain_id* | **interface** *interface* [**service instance** *efp-id*] | **vrf** *vrf_id*} **Example:** `Router(config-ip-sla)# service-performance type ip dest-ip 194.168.1.1 interface gigabitEthernet0/10 service instance 10`	Specifies the service performance type as Ethernet and the destination MAC address in H.H.H format. Specifies the target for the SLA session. The options are: • service instance • interface • vlan • bridge
Step 5	`frequency iteration` *number* **delay** *number* **Example:** `Router(config-ip-sla)# frequency iteration 1 delay 2`	Specifies the number of interactions and delay between the iterations.
Step 6	`duration time` *seconds* **Example:** `Router(config-ip-sla-service-performance)# duration time 30`	Sets the service performance duration configuration.

Step 7	`profile packet`
	
	Example:
	`Router(config-ip-sla-service-performance)# profile packet`
		Specifies the packet profile. A packet profile defines the packets to be generated.

	Command or Action	Purpose
Step 8	`default	exit	no	packet-size	source-ip-addr	tunnel`  **Example:** `Router(config-ip-sla-service-performance-packet)# src-ip-addr 193.168.1.1`	**Note** Ensure that the value of the configured packet profile matches the target configuration of the session. Specifies the packet type. The options are: • **default**—Sets a command to its defaults. • **exit**—Exits the packet mode. • **no**—Negates a command or set its defaults. • **packet-size**—Specifies the packet size; the default size is 64 bytes. The supported packet sizes are 64 bytes, 128 bytes, 256 bytes, 512 bytes, 1280 bytes, and 1518 bytes. • **source-ip-addr**—Specifies the source IP address. • **tunnel**—Specifies the tunnel typ
Step 9	`exit`	Exits the IP SLA Service Performance packet mode.
Step 10	`profile traffic direction [internal	external]`  **Example:** `Router(config-ip-sla-service-performance)# profile traffic direction internal`	Specifies the in-line traffic profile or selection of a pre-configured traffic profile. A traffic profile defines an upper bound on the volume of the expected service frames belonging to a particular service instance. If a Traffic profile is not specified, the Service Performance probe will be in passive measurement mode.

Step 11	`default`
	or
	`exit`
	or
	`no`
	or
	`rate step kbps`
	
	Example:
	`Router(config-ip-sla-service-performance-traffi c)# rate-step kbps 1000`
		Specifies the traffic type. The options are:
		
		• **default**—Sets a command to its defaults
		
		• **rate step kbps**—Specifies the transmission rate in kbps. The rate-step range is from 1-1000000 (1 Kbps to 1Gbps).

Example

```
ip sla 1
 service-performance type ip dest-ip-addr 194.168.1.1 vrf 2
  frequency iteration 1 delay 1
  duration time 50
  profile packet
   source-ip-addr 193.168.1.1
   packet-size 512
  profile traffic direction internal
   rate-step kbps 50000 90000
```

Configuring IP Target Color Blind Passive Measurement

SUMMARY STEPS

1. **enable**

2. **configure terminal**

3. **ip sla** *sla_id*

4. **service-performance type ip dest-ip** *dest_ip_addr* {**vlan** *vlan_id* | **bridge-domain** *domain_id* | **interface** *interface* [**service instance** *efp-id*] | **vrf** *vrf_id*}

5. **frequency iteration** *number* **delay** *number*

6. **duration time** *seconds*

7. **profile packet**

8. **default | exit | no | packet-size | source-ip-addr | tunnel**

9. **measure direction** [**internal | external**] **conform-color cos** *dscp_value* **exceed-color cos** *dscp_value*

10. **default | exit | loss | no | throughput | receive**

DETAILED STEPS

	Command or Action	Purpose
Step 1	**enable** **Example:** Router> enable	Enables the privileged EXEC mode. • Enter your password if prompted.
Step 2	**configure terminal** **Example:** Router# configure terminal	Enters the global configuration mode.
Step 3	**ip sla** *sla_id* **Example:** Router(config)# ip sla 100	Specifies the SLA ID to start the IP SLA session.
Step 4	**service-performance type ip dest-ip** *dest_ip_addr* {**vlan** *vlan_id* | **bridge-domain** *domain_id* | **interface** *interface* [**service instance** *efp-id*] | **vrf** *vrf_id*} **Example:** Router(config-ip-sla)# service-performance type ip dest-ip 194.168.1.1 interface gigabitEthernet0/10 service instance 10	Specifies the service performance type as Ethernet and the destination MAC address in H.H.H format. Specifies the target for the SLA session. The options are: • service instance • interface • vlan • bridge

	Command or Action	Purpose
Step 5	**frequency iteration** *number* **delay** *number* **Example:** Router(config-ip-sla)# frequency iteration 1 delay 2	Specifies the number of interactions and delay between the iterations.
Step 6	**duration time** *seconds* **Example:** Router(config-ip-sla-service-performance)# dura tion time 30	Sets the service performance duration configuration.
Step 7	**profile packet** type ethernet [*profile_name*] **outer-vlan** *secondary_vlan_id* **inner-vlan** *inner_vlan_id* **packet-size** *size* **inner-cos** *cos_value* **outer-cos** *cos_value* **ethertype** [**ipv4** | **ipv6** [**profile** *profile_name*]] **dest-mac-addr** *destination mac-address* **source-mac-addr** *source mac-address* **Example:** Router(config-ip-sla)# profile packet pak-profile1 inner vlan 2733 outer vlan 931 packet-size 128	Specifies the number of packets to send for each packet profile or in-line configuration of a packet profile. Packet profile configuration is only applicable when a traffic profile is specified.
Step 8	**exit** **Example:** Router(config-ip-sla)# exit	Exits the IP SLA mode.
Step 9	**measure direction** [**internal** | **external**] **conform-color cos** *dscp_value* **exceed-color cos** *dscp_value* **Example:** Router(config-ip-sla)# measure direction internal cod 7	Specifies the direction of measurement.
Step 10	**default** | **exit** | **loss** | **throughput** | **receive** **Example:** Router(config-ip-sla-service-performance-measur ement)# throughput	Specifies the measurement type based on which the service performance is calculated. The options are: • **default**—Sets a command to its default values. • **loss**—Specifies the measurement such as frame loss. • **throughput**—Specifies the measurement such as average rate of successful frame delivery. • **receive**—Specifies the passive measurement mode.

Example

```
ip sla 1
 service-performance type ip dest-ip-addr 194.168.1.1 vrf 2
  frequency iteration 1 delay 1
  duration time 50
  measurement-type direction internal
   receive
  profile packet
   source-ip-addr 193.168.1.1
   packet-size 512
```

Configuring IP Target Color-Aware IMIX Traffic Generation

SUMMARY STEPS

1. **enable**

2. **configure terminal**

3. **ip sla** *sla_id*

4. **service-performance type ip dest-ip** *dest_ip_addr* {**vlan** *vlan_id* | **bridge-domain** *domain_id* | **interface** *interface* [**service instance** *efp-id*] | **vrf** *vrf_id*}

5. **frequency iteration** *number* **delay** *number*

6. **duration time** *seconds*

7. **profile packet**

8. **default | exit | no | packet-size imix | source-ip-addr | tunnel**

9. **exit**

10. **profile traffic direction** [**internal** | **external**] **cir** *number* **eir** *number* **conform-color** [**drop** | **set-dscp_transmit** *dscp_value* | **transmit**] **exceed-color** [**drop** | **set-dscp_transmit** *dscp_value* | **transmit**]

11. **default | exit | no | rate step kbps** *number number*

DETAILED STEPS

	Command or Action	Purpose

Step 1	`enable`
	
	Example:
	`Router> enable`
		Enables the privileged EXEC mode.
		
		• Enter your password if prompted.

Step 2	`configure terminal`
	
	Example:
	`Router# configure terminal`
		Enters the global configuration mode.

Step 3	`ip sla` *sla_id* **Example:** `Router(config)# ip sla 100`	Specifies the SLA ID to start the IP SLA session.
Step 4	`service-performance type ip dest-ip` *dest_ip_addr* {`vlan` *vlan_id* | `bridge-domain` *domain_id* | `interface` *interface* [`service instance` *efp-id*] | `vrf` *vrf_id*} **Example:** `Router(config-ip-sla)# service-performance type ip dest-ip 194.168.1.1 interface gigabitEthernet0/10 service instance 10`	Specifies the service performance type as Ethernet and the destination MAC address in H.H.H format. Specifies the target for the SLA session. The options are: • service instance • interface • vlan • bridge
Step 5	`frequency iteration` *number* `delay` *number* **Example:** `Router(config-ip-sla)# frequency iteration 1 delay 2`	Specifies the number of interactions and delay between the iterations.
Step 6	`duration time` *seconds* **Example:** `Router(config-ip-sla)# duration time 30`	Specifies the time period to send packets.

Step 7	`profile packet`
	
	Example:
	`Router(config-ip-sla-service-performance)# profile packet`
		Specifies the packet profile. A packet profile defines the packets to be generated.

	Command or Action	Purpose
Step 8	`default	exit	no	packet-size imix|` `source-ip-addr	tunnel`  **Example:** `Router(config-ip-sla-service-performance-packet` `)# packet-size imix`	**Note** Ensure that the value of the configured packet profile matches the target configuration of the session. Specifies the packet type. The options are: • **default**—Sets a command to its defaults. • **exit**—Exits the packet mode. • **no**—Negates a command or set its defaults. • **packet-size imix**—Specifies the packet size for IMIX; the default size is 64 bytes. The supported packet sizes are 64 bytes, 128 bytes, 256 bytes, 512 bytes, 1280 bytes, and 1518 bytes. **Note** For IMIX, the packet-size should be explicitly mentioned as IMIX. • **source-ip-addr**—Specifies the source IP address. • **tunnel**—Specifies the tunnel typ
Step 9	`exit`	Exits the profile packet mode.

	Command or Action	Purpose
Step 10	`profile traffic direction [internal	external]` `cir` *number* or `eir` *number* or `conform-color set-cos-transmit` *cos_value* or `exceed-color set-cos-transmit` *cos_value*  **Example:** `Router(config-ip-sla-service-performance)# profile traffic direction internal` `Router(config-ip-sla-service-performance-traffic)# cir 45000` `Router(config-ip-sla-service-performance-traffic)# eir 45000` `Router(config-ip-sla-service-performance-traffic)# conform-color set-cos-transmit af43` `Router(config-ip-sla-service-performance-traffic)# exceed-color set-cos-transmit af41`	Specifies the in-line traffic profile or enables the selection of a preconfigured traffic profile. A traffic profile defines an upper limit on the volume of the expected service frames belonging to a particular service instance. If a Traffic profile is not specified, the Service Performance probe will be in passive measurement mode. • **cir**—Is the Committed Information Rate. • **conform-color**—Sets the color-conform. • **default**—Set a command to its defaults. • **drop**—Drops the packet. • **eir**—Excess Information Rate. • **exceed-color**—Sets the color-exceed. • **exit**—Exits the traffic mode. • **no**—Negates a command or sets its defaults. • **rate step kbps**—Sets the rate step. • **set-cos-transmit** *cos_value*—Sets the CoS value to a new value, and sends the packet. The valid range is from 0 to 7. • **transmit**—Sends the packet without altering it. This is the default value. **Note** This command is required to configure the **rate step kbps** command.

Step 11	`default`
	or
	`exit`
	or
	`no`
	or
	`rate step kbps`
	
	Example:
	`Router(config-ip-sla-service-performance-traffic)# rate-step kbps 1000`
		Specifies the traffic type. The options are:
		
		• **default**—Sets a command to its defaults
		• **rate step kbps**—Specifies the transmission rate in kbps. The rate-step range is from 1-1000000 (1 Kbps to 1Gbps).

Example

```
ip sla 1
 service-performance type ip dest-ip-addr 194.168.1.1 vrf 2
  frequency iteration 1 delay 1
  duration time 50
  profile packet
   source-ip-addr 193.168.1.1
   packet-size imix
  profile traffic direction internal
   cir 45000
   eir 45000
   rate-step kbps 50000 90000
   conform-color set-dscp-transmit af43
   exceed-color set-dscp-transmit af41
```

Configuration Examples for Configuring Y.1564 to Generate and Measure IP Traffic

Example: Passive Color-Aware Measurement Session

The following is a sample output for a passive color-aware measurement session:

```
ip sla 1
 service-performance type ip dest-ip-addr 194.168.1.1 vrf 2
  frequency iteration 1 delay 1
  duration time 50
  measurement-type direction internal conform-color dscp af43 exceed-color dscp af41
   receive
  profile packet
   source-ip-addr 193.168.1.1
   packet-size 512
```

Example: Color-Aware IMIX—Traffic Generation

The following is a sample output for a color-aware IMIX session:

```
ip sla 1
 service-performance type ip dest-ip-addr 194.168.1.1 vrf 2
  frequency iteration 1 delay 1
  duration time 50
  profile packet
   source-ip-addr 193.168.1.1
   packet-size imix
  profile traffic direction internal
   cir 45000
   eir 45000
   rate-step kbps 50000 90000
   conform-color set-dscp-transmit af43
   exceed-color set-dscp-transmit af41
```

Example: Color Aware—Traffic Generation

The following is a sample output for a color aware traffic generation session:

```
ip sla 1
 service-performance type ip dest-ip-addr 194.168.1.1 vrf 2
  frequency iteration 1 delay 1
  duration time 50
  profile packet
   source-ip-addr 193.168.1.1
   packet-size 512
  profile traffic direction internal
   cir 45000
   eir 45000
   rate-step kbps 50000 90000
   conform-color set-dscp-transmit af43
   exceed-color set-dscp-transmit af41
```

Example: Color Blind—Traffic Generation

The following is a sample output for a color blind traffic generation session:

```
ip sla 1
 service-performance type ip dest-ip-addr 194.168.1.1 vrf 2
  frequency iteration 1 delay 1
  duration time 50
```

```
 profile packet
  source-ip-addr 193.168.1.1
  packet-size 512
 profile traffic direction internal
  rate-step kbps 50000 90000
```

Example: Color Blind—Passive Measurement

The following is a sample output for a color blind passive measurement session:

```
ip sla 1
 service-performance type ip dest-ip-addr 194.168.1.1 vrf 2
  frequency iteration 1 delay 1
  duration time 50
  measurement-type direction internal
   receive
  profile packet
   source-ip-addr 193.168.1.1
   packet-size 512
```

Scale and Limitations for Configuring IP SLA—Service Performance Testing

- A maximum of 16 Y.1564 sessions are supported.
- A maximum of four Ethernet Color-blind sessions are supported.
- A maximum of one Ethernet Color-aware session is supported.
- A maximum of 16 IP Color-blind sessions are supported.

The following table lists the Y.1564 two-way throughput measurement for type "service instance" in the external direction:

Table 9-2   Scale and Limitations

Packet Size (Mbits)	Max Rate (kbps)
64	598714
128	748420
256	848193
512	898112
1280	948024
1518	945542

Feature Information for Configuring IP SLA—Service Performance Testing

Use Cisco Feature Navigator to find information about platform support and software image support. Cisco Feature Navigator enables you to determine which software images support a specific software release, feature set, or platform. To access Cisco Feature Navigator, go to http://www.cisco.com/go/cfn. An account on Cisco.com is not required.

Note   Table 3 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.

Table 3   Feature Information for Configuring IP SLA—Service Performance Testing

Feature Name	Release	Feature Information
Configuring IP SLA—Service Performance Testing	15.3(3)S	This feature was introduced.
Configuring IP SLA—Service Performance Testing	15.4(1)S	Support for the following features was added: • Layer 2 targets for Color-Aware Packet Generation: 802.1p Cos • Color-Aware Packet Measurement: 802.1p Cos • IMIX Traffic Generation type (combination of 64, 512, and 1518 byte packets) • Color-Aware IP flow Generation: DSCP based • Color-Aware IP flow measurement: DSCP based • IP flow parameters (DA/SA) Generation • IP flow parameters (DA/SA) Measurement

Glossary

IEEE 802.1p—IEEE 802.1p specification enables Layer 2 switches to prioritize traffic and perform dynamic multicast filtering. The prioritization specification works at the MAC framing layer (Open System Interconnection [OSI] Model Layer 2)