



## IP SLA—Service Performance Testing

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

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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 <https://cfngn.cisco.com/>. An account on Cisco.com is not required.

### Information About Service Performance Operations

Y.1564 is an Ethernet service activation test methodology. It is the standard for turning up, installing, and troubleshooting Ethernet and IP-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 forward traffic in different states.

Effective with Cisco IOS XE Everest Release 16.5.1, 10 Gigabit (10G) SAT External session is supported. Any SAT session with a rate-step greater than or equal to 1 Gbps is considered as 10G SAT session.

Effective with Cisco IOS XE Everest Release 16.12.1, 10 Gigabit (10G) SAT Internal session is supported. Any SAT session with a rate-step greater than or equal to 1 Gbps is considered as 10G SAT session.

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 services carried by the network, meet their SLA objectives at their maximum committed rate. Thus, proving that under maximum load, network devices, and paths can support all traffic.
- To perform medium-term and long-term service testing, confirming that network elements can properly carry all services while under stress during a soaking period.

The following Key Performance Indicators (KPI) metrics indicate the configured SLAs for the service or stream. These following service acceptance criteria metrics are:

- Information Rate (IR) or throughput—Measures the maximum rate at which none of the offered frames are dropped by the device under test (DUT). This measurement translates into the available bandwidth of the Ethernet virtual connection (EVC).
- Frame Transfer Delay (FTD) or latency—Measures the round-trip time (RTT) taken by a test frame to travel through a network device, or across the network and back to the test port.



**Note** If the delay is more than 4.2 sec, then the software is not capable of capturing it in SADT statistics.

- Frame Loss Ratio (FLR)—Measures the number of packets lost from the total number of packets sent. Frame loss can be due to a number of issues such as network congestion or errors during transmissions.
- Frame Delay Variation (FDV) or jitter—Measures the variations in the time delays between packet deliveries.

**Table 1: Supported Key Performance Indicators Matrix**

KPI	FPGA- Based SADT	
	Internal Direction	External Direction
Delay	Y	Y
Jitter	Y	Y
Loss	Y	Y
Throughput	Y	Y

Because they interconnect segments, forwarding devices (switches and routers) and network interface units are the basis of any network. Incorrect configuration of a service on any of these devices within the end-to-end path, can affect the network performance. This could also lead to potential service outages and network-wide issues such as congestion and link failures. Service performance testing is designed to measure the ability of

DUT or network under test, to forward traffic in different states. The Cisco implementation of ITU-T Y.1564 includes the following service performance tests:

- Minimum data rate to CIR—Generates bandwidth from the minimum data rate to the committed information rate (CIR) for the test stream. Measures KPI for Y.1564 to meet configured service acceptance criteria (SAC).
- CIR to EIR—Ramps up bandwidth from the CIR to the excess information rate (EIR) for the test stream. Measures the transfer rate to ensure that CIR meets the minimum bandwidth of the maximum EIR. Other KPI is not measured.



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**Note** In SADT configuration, if the rate of EIR is greater than CIR + EIR, then above EIR is not measured. The stats for *Above EIR* remains 0 in following command: **show ip sla statistics**

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Service performance supports four operational modes:

- Two-way statistics collection
- One-way statistics collection
- Passive measurement mode
- 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 are executed.

- One-way statistics collection—Both the passive measurement mode and the traffic generator mode are used along 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, where the remote device records the statistics instead of looping back the traffic. The sending device records only the transmit statistics.
- Two-way statistics collection—The sender collects all the measurements. The remote target must be in the loopback mode for the two-way statistics to work. Loopback mode enables the traffic from the sender to reach the target and sent back to the sender.
- Passive measurement mode—This 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.
- Traffic generator mode—This mode records statistics for the number of packets and bytes transmitted.

## Information About Configuring Y.1564 to Generate and Measure Ethernet Traffic

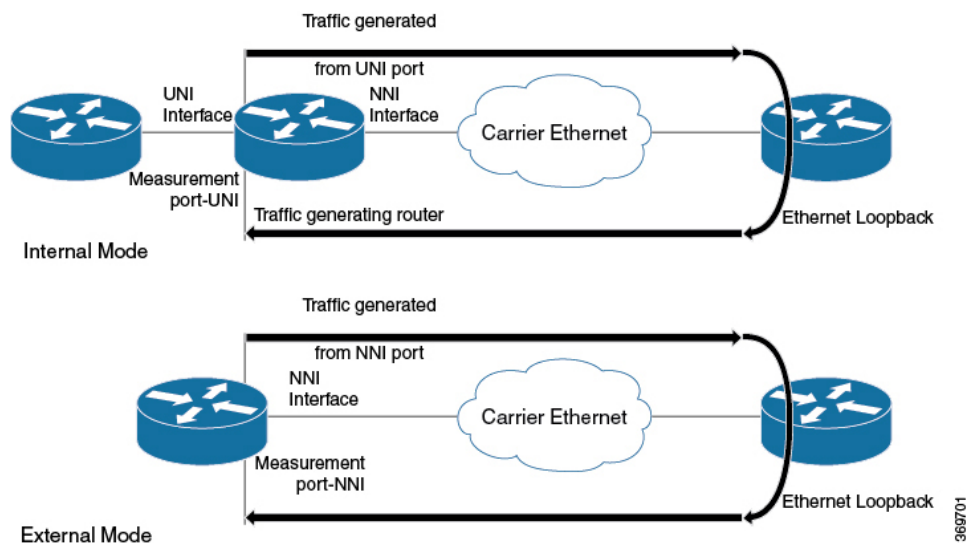
Y.1564 is an ethernet service activation or performance test methodology for turning up, installing, and troubleshooting ethernet and IP based services. This test methodology allows for complete validation of ethernet service-level agreements (SLAs) in a single test. Using the traffic generator performance 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.

Effective from the Cisco IOS XE 16.12.x release, 10G SAT External is supported on the Cisco Router.

**Figure 1: Traffic Generator Topology**



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

**Table 2: Service Types and Their Corresponding Traffic Direction for IP Target SLA**

Service Type	Traffic Direction for IP Target SLA
Service Instance	Internal
Interface (Physical)	Internal
Bridge Domain	Internal
VRF	Internal

**Table 3: Service Types and Their Corresponding Traffic Direction for Ethernet Target SLA**

Service Type	Traffic Direction for Ethernet Target SLA
Service Instance	Internal and External
Bridge Domain	Internal

## Prerequisites for IP SLA - Service Performance Testing

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

## Scale and Limitations for Configuring IP SLA - Service Performance Operation

The following table lists the Y.1564 two-way throughput measurement.

*Table 4: Y.1564 Throughput Measurement for Each Packet Size*

Packet Size (Bytes)	Max Rate (kbps)
64	650000
128	820000
256	860000
512	860000
1024	880000
1280	900000
1518	970000
9216	980000



**Note** Higher order 1-GigabitEthernet ports and 10-GigabitEthernet port could have few packet loss in 9216 packet size. The above measurements are taken with external mode. Measured throughput value could be higher than configured rate upto 2%.

### Traffic Generator

- Supports eight simultaneous transmit sessions on device with a maximum rate of 1 Gbps .
- Supports color-blind traffic generation.
- SAT traffic is always generated in a burst.

Default q-limit values are not adequate to handle the burst and thus leading to packet drops. You need to use the **platform qos-qlimit-disable** command to disable q-limit on the router and this would enable dynamic sharing of resources on all ports.

The **platform qos-qlimit-disable** command disables the QoS q-limit functionality and enables the functionality again once the **platform qos-qlimit-disable** command is removed.

### Measurement

The default ether-type to configure SAT endpoint is 0x8904. The measurement can only match packets with ether-type of 0x8904.

NCS 520 traffic generation happens with ether-type of 0x8904 by default. The measurement works if the traffic generator is also NCS 520 or its two-way statistics. The measurement cannot be used if there are devices other than NCS 520 on the other side as the traffic generator. Ether-types IPv4 and IPv6 are user configurable option (ether-type) supported. With the configuration set, you can perform measurement of packets from other devices with ether-type as IPv4 or IPv6.

SAT on NCS520 is supported only for Ethernet mode.

### Loopback

NCS 520 does not support ethernet loopback or latching loopback.

NCS 520 supports loopback on SAT, and IP SLA configuration itself is used.

Use the **loopback direction** for the session along with packet profile. Source MAC address and destination MAC address are not same for loopback session. If an IP SLA session is configured as loopback mode, then the session should not have measurement or traffic profile parameters, otherwise the configuration fails.

Loopback sessions does not support statistics.

## Restrictions for IP SLA - Service Performance Operation

- Layer 3 fields such as IP, DSCP, and Layer 4 ports are not supported as packet parameter.
- Measurement is supported only for throughput and loss. Delay and jitter measurement are not supported.
- Service types are supported only for EFPs and not for bridge-domain and Layer 3 interfaces.
- Maximum number of sessions supported is 8 and these 8 sessions can run simultaneously.
- Color aware statistics is not supported.
- Port-channel testing is not supported.
- When a configuration performed on EFP or interface is shutdown, the packets do not egress out of any interface on the device, and after unshut, the traffic does not resume to egress direction. You need to restart the configuration manually.
- On test EFP or BD removal on the test interface, traffic does not egress out of any of the interfaces in the device, and traffic flow resumes only after reconfiguring. After which, the test is rescheduled.
- Each session should have an unique encapsulation, and if sessions have same encapsulations or match keys might impact the statistics.
- Packets that use SAT internal MAC (0xf244493930ec) as destination MAC addresss and internal VLAN (0xdd4) have problem with forwarding.
- Loopback or measurement with packet size of 1518 at ingress direction does not work. This is due to the extra headers being added at ingress direction. To overcome this, MTU size of the interface has to be increased.
- Span on the SAT configured interface is not supported.

Rx statistics work only after 10 seconds and you need to use the **platform qos-qlimit-disable** command to disable the q-limit on the router before starting the SLA session.

- SLA measurement in 10-Gigabit Ethernet port is supported with maximum rate of 1-Gigabit Ethernet. Higher the order of 1-Gigabit Ethernet ports, 10-Gigabit Ethernet ports have few packets loss for higher packet size.
- Interface statistics and SLA statistics might not match in higher order ports.
- The following table shows the supported egress and ingress QOS on the sender side core interface for Ethernet and IP target SLA.

**Table 5: IP SLA and Type of QOS supported**

Type	Policy-map at interface (Ingress)	Policy-map at interface (Egress)	Policy-map at EFP (Ingress)	Policy-map at EFP (Egress)
Internal Mode 2-way measurement	Yes	Yes	Yes	Yes
Internal Receive Mode	No	Yes	No	Yes
Internal Loopback Target Interface	Yes	Yes	Yes	Yes
External Mode 2-way measurement	No	No	No	No
External Receive Mode	Yes	No	Yes	No
External Loopback Target Interface	Yes	No	Yes	No



**Note** Ingress classification does not work for match on VLAN for SADT traffic.

- The following table shows how Ethernet Target SLA with multicast or broadcast source MAC address is supported on different operational modes.

Table 6: Multicast or Broadcast MAC support criteria for SLA

Source or destination MAC address	Operational mode	Support for Ethernet Target SLA
Multicast or broadcast source MAC address	Traffic generator mode	Not supported
	Passive measurement mode	
	Two-way statistics collection mode	
Multicast or broadcast destination MAC address	Traffic generator mode	SLA generates the traffic
	Passive measurement mode	SLA receives the traffic
	Two-way statistics collection mode	Not supported

## Generating Traffic Using Y.1564

Follow these steps to generate traffic using Y.1564:

### SUMMARY STEPS

1. Configure Ethernet Virtual Circuits (EVC).
2. Configure Traffic Generator on the transmitter.
3. Configure Ethernet Loopback at the remote end.
4. Start the IP SLA session:

### DETAILED STEPS

	Command or Action	Purpose
<b>Step 1</b>	Configure Ethernet Virtual Circuits (EVC).	EVC is configured 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 <i>Carrier Ethernet Configuration Guide, Cisco IOS XE Release</i> .
<b>Step 2</b>	Configure Traffic Generator on the transmitter. <b>Example:</b> The following is a sample configuration of the traffic generator.  <pre>Device(config)# ip sla 100 Device(config-ip-sla)# service-performance type ethernet dest-mac-addr 0001.0002.0003 interface TenGigabitEthernet0/0/4 service instance 100 Device(config-ip-sla-service-performance)# aggregation interval buckets 2 Device(config-ip-sla-service-performance)#</pre>	



	Command or Action	Purpose
	<pre>frequency iteration 2 delay 10 Device(config-ip-sla-service-performance)# profile packet Device(config-sla-service-performance-packet)# packet-size 256 Device(config-sla-service-performance-packet)# outer-vlan 100 Device(config-sla-service-performance-packet)# profile traffic direction external Device(config-sla-service-performance-traffic)# rate-step kbps 1000 Device(config-ip-sla-service-performance)# end Device #</pre>	
<b>Step 3</b>	Configure Ethernet Loopback at the remote end.	For information on Ethernet Loopback, see "Understanding Ethernet Loopback" section in the <i>Layer 2 Configuration Guide, Cisco IOS XE Release</i> .
<b>Step 4</b>	<p>Start the IP SLA session:</p> <p><b>Example:</b></p> <pre>Router(config)# ip sla schedule [sla_id] start-time [hh:mm   hh:mm:ss   now   pending   random]</pre>	<p><b>Note</b> Due to packet overhead (64-byte packets), a total of only 469 Mbit/sec of traffic is supported at a time. This bandwidth is shared by all active sessions. This is applicable only for Cisco RSP2 module. For more information, see Table 4.</p>

## How to Configure IP SLA - Service Performance Testing

Table 7: Feature History

Feature Name	Release Information	Feature Description
Y.1564 support on dot1ad	Cisco IOS XE Cupertino 17.8.1	<p>This feature enables Y.1564 Ethernet service activation test methodology support on interfaces that are configured with 802.1ad encapsulation. It allows you to perform medium-term and long-term service testing, confirming that the interfaces that are configured with 802.1ad can properly carry all services while under stress during a soaking period.</p> <p>The following commands are introduced:</p> <ul style="list-style-type: none"> <li>- <b>inner-eth-type</b></li> <li>- <b>outer-eth-type</b></li> </ul>

## Configuring Ethernet Target Two-Way Color Blind Session

Perform the following steps to configure ethernet target color blind 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 | bridge}**
5. **aggregation | default | description | duration | exit | frequency | no | profile**
6. **measurement-type direction {internal | external}**
7. **default | exit | loss | no | throughput | receive | delay | jitter**
8. **exit**
9. **profile packet**
10. **default | exit | inner-cos | inner-vlan | no | outer-cos | outer-vlan | packet-size | src-mac-addr | outer-eth-type | inner-eth-type**
11. **exit**
12. **profile traffic direction {external | internal}**
13. **default or exit or no or rate step kbps | pps**
14. **exit**

### DETAILED STEPS

	Command or Action	Purpose
<b>Step 1</b>	<b>enable</b> <b>Example:</b> 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> <b>Example:</b> Device# configure terminal	Enters global configuration mode.
<b>Step 3</b>	<b>ip sla <i>sla_id</i></b> <b>Example:</b> Device(config)# ip sla 100	Specifies the SLA ID to start the IP SLA session.
<b>Step 4</b>	<b>service-performance type ethernet dest-mac-addr <i>dest-mac</i> { service instance   bridge}</b> <b>Example:</b> Device(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: <ul style="list-style-type: none"><li>• service instance</li><li>• bridge</li></ul> Only service instance is supported as target-type on 10G SAT.

	Command or Action	Purpose
Step 5	<p><b>aggregation   default   description   duration   exit   frequency   no   profile</b></p> <p><b>Example:</b></p> <pre>Device(config-ip-sla-service-performance)# duration time 60</pre>	<p>Specifies the type of service performance. The options are:</p> <ul style="list-style-type: none"> <li>• <b>aggregation</b> - Represents the statistics aggregation.</li> <li>• <b>default</b> - Sets a command to its defaults.</li> <li>• <b>description</b> - Describes the operation.</li> <li>• <b>duration</b> - Sets the service performance duration configuration.</li> <li>• <b>frequency</b> - Represents the scheduled frequency. The options available are iteration and time. The range in seconds is from 20 to 65535.</li> <li>• <b>profile</b> - Specifies the service performance profile. If you use the packet or traffic options, go to Step 9 or Step 12, respectively.</li> </ul>
Step 6	<p><b>measurement-type direction {internal   external}</b></p> <p><b>Example:</b></p> <pre>Device(config-ip-sla-service-performance)# measurement-type direction</pre>	<p>Specifies the statistics to measure traffic. The options available are external or internal; the default option is internal.</p> <p>Only external measurement-type direction is supported for 10G.</p>
Step 7	<p><b>default   exit   loss   no   throughput   receive   delay   jitter</b></p> <p><b>Example:</b></p> <pre>Device(config-ip-sla-service-performance-measurement)# throughput</pre>	<p>Specifies the measurement type based on the service performance is calculated. The options are:</p> <ul style="list-style-type: none"> <li>• <b>default</b> - Sets a command to its defaults.</li> <li>• <b>loss</b> - Specifies the measurement, such as frame loss.</li> <li>• <b>throughput</b> - Specifies the measurement such as average rate of successful frame delivery.</li> <li>• <b>receive</b> - Specifies the passive measurement mode.</li> <li>• <b>delay</b> - Specifies the measurement that is frame delay (FTD). This is not supported on 10G.</li> <li>• <b>jitter</b> - Specifies the measurement that is frame delay variation (FDV). This is not supported on 10G.</li> </ul>
Step 8	<b>exit</b>	Exits the measurement mode.
Step 9	<p><b>profile packet</b></p> <p><b>Example:</b></p> <pre>Device(config-ip-sla-service-performance)#profile packet</pre>	Specifies the packet profile. A packet profile defines the packets to be generated.
Step 10	<p><b>default   exit   inner-cos   inner-vlan   no   outer-cos   outer-vlan   packet-size   src-mac-addr   outer-eth-type   inner-eth-type</b></p>	<p>Specifies the packet type. The options are:</p> <ul style="list-style-type: none"> <li>• <b>default</b> - Sets a command to its defaults.</li> </ul>

	Command or Action	Purpose
	<p><b>Example:</b></p> <pre>Device(config-ip-sla-service-performance-packet)#src-mac-addr 4055.3989.7b56</pre>	<ul style="list-style-type: none"> <li>• <b>inner-cos</b> - Specifies the class of service (CoS) value for the inner VLAN tag of the interface from which the message will be sent.</li> <li>• <b>inner-vlan</b> - Specifies the VLAN ID for the inner vlan tag of the interface from which the message will be sent.</li> <li>• <b>outer-cos</b> - Specifies the CoS value that will be populated in the outer VLAN tag of the packet.</li> <li>• <b>outer-vlan</b> - Specifies the VLAN ID that will be populated in the outer VLAN tag of the packet.</li> <li>• <b>packet-size</b> - Specifies the packet size; the default size is 64 bytes. The supported packet sizes are 64 bytes, 128 bytes, 256 bytes, 512 bytes, 1024 bytes, 1280 bytes, 1518 bytes, 9216 bytes, and IMIX.</li> <li>• <b>src-mac-addr</b> - Specifies the source MAC address in H.H.H format.</li> <li>• <b>outer-eth-type</b> - Specifies the encapsulation type for the outer VLAN tag of the packet as dot1ad or dot1q.</li> <li>• <b>inner-eth-type</b> - Specifies the encapsulation type for the inner VLAN tag of the interface from which the message is sent as dot1ad or dot1q.</li> </ul> <p><b>Note</b> Ensure that the value of the configured packet profile matches the target configuration of the session.</p> <p><b>Note</b> If you do not specify the encapsulation type in the packet profile, dot1q is used by default.</p>
<b>Step 11</b>	<p><b>exit</b></p> <p><b>Example:</b></p> <pre>Device(config-ip-sla-service-performance-packet)# exit</pre>	Exits the packet mode.
<b>Step 12</b>	<p><b>profile traffic direction {external   internal}</b></p> <p><b>Example:</b></p> <pre>Device(config-ip-sla-service-performance)#profile traffic direction external</pre>	<p>Specifies the direction of the profile traffic. The options are external and internal.</p> <p>Only external profile traffic direction is supported for 10G.</p> <p><b>Note</b> This command is required to configure the <b>rate step kbps</b> command.</p>
<b>Step 13</b>	<p><b>default or exit or no or rate step kbps   pps</b></p> <p><b>Example:</b></p> <pre>Device(config-ip-sla-service-performance-traffic)#rate-step kbps 1000</pre>	<p>Specifies the traffic type. The options are:</p> <ul style="list-style-type: none"> <li>• <b>default</b> - Sets a command to its defaults.</li> </ul>

	Command or Action	Purpose
		<ul style="list-style-type: none"> <li>• <b>rate step kbps</b> - Specifies the transmission rate in kbps. The rate-step range is from 1-10000000 (1 Kbps to 10 Gbps).</li> <li>• <b>rate step pps</b> - Specifies the transmission rate in pps. The rate-step range is from 1-1000000 (1 to 1000000 pps).</li> </ul> <p><b>Note</b> The command <b>rate-step kbps   pps number</b> is mandatory for traffic generation.</p>
Step 14	exit	Exits the traffic mode.

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

This section shows sample configurations for traffic generation.

### Example: Traffic Generation — Target Service Instance

This section shows sample configuration for traffic generation – target service instance.

```
ip sla 100
service-performance type ethernet dest-mac-addr 0001.0002.0003 interface
TenGigabitEthernet0/0/4 service instance 100
profile packet
packet-size 256
outer-vlan 100
profile traffic direction internal
rate-step kbps 1000
aggregation interval buckets 2
frequency iteration 2 delay 10
end
```

### 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.

```
ip sla 100
service-performance type ethernet dest-mac-addr 0001.0002.0003 interface
TenGigabitEthernet0/0/2 service instance 100
measurement-type direction internal
loss
throughput

delay
jitter
profile packet
packet-size 64
```

```

outer-vlan 100
inner-vlan 200
profile traffic direction internal
rate-step kbps 1000
aggregation interval buckets 2
frequency iteration 2 delay 10
end

```

## Example: Passive Measurement Mode — Target Service Instance

The following is a sample configuration for passive measurement session for target service instance.

```

ip sla 100
service-performance type ethernet dest-mac-addr 0001.0002.0003 interface
TenGigabitEthernet0/0/4 service instance 100
measurement-type direction internal
loss
throughput
aggregation interval buckets 2
frequency iteration 2 delay 10
end

```

## Example: Two-Way Session

The following is a sample configuration for a two-way session.

```

show ip sla statistics 12345

IPSLAs Latest Operation Statistics

IPSLA operation id: 12345
Type of operation: Ethernet Service Performance
Test mode: Two-way Measurement
Steps Tested (kbps): 10000 20000 25000
Test duration: 20 seconds

Latest measurement: *15:54:44.007 IST Mon May 18 2015
Latest return code: Oper End of Life

Overall Throughput: 24850 kbps

Step 1 (10000 kbps):
Stats:
IR(kbps) FL   FLR   Avail   FTD Min/Avg/Max   FDV Min/Avg/Max
9944    0    0.00% 100.00% 41.44us/46.06us/77.68us 0ns/12.08us/34.52us
Tx Packets: 16377 Tx Bytes: 24860286
Rx Packets: 16377 Rx Bytes: 24860286
Step Duration: 20 seconds

```

# Additional References for IP SLA - Service Performance Testing

## Related Documents

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

## Standards and RFCs

Standard/RFC	Title
ITU-T Y.1564	<i>Ethernet service activation test methodology</i>

## 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>

