

Y.1564 - Ethernet Service Activation Test

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Y.1564 - Ethernet Service Activation Test

With the deployment of Ethernet in service provider networks, ethernet services have evolved significantly. Not only is ethernet found at the User Network Interface (UNI) but can also be deployed anywhere in the network, creating a Network-to-Network Interface (NNI). With the capability to prioritize traffic, high availability, and its built-in resiliency, service providers are now using this technology to deliver advanced services. In the absence of any standardized test methodologies that can measure delay, jitter, loss, and throughput at a port, the ITU-T recommendation Y.1564 addresses the gap

Y.1564 - Ethernet Service Activation Test (or performance test methodology) is a testing procedure which tests service turn-up, installation, and troubleshooting of Ethernet-based services. This test methodology was created to have a standard way of measuring Ethernet-based services in the industry.

This testing procedure is supported on Cisco NCS 5500 and NCS 5700 fixed-port routers.

On NCS 5700 Series NCS-57B1-5DSE-SYS/NCS-57B1-6D24-SYS fixed chassis, Service Activation/Deactivation Test (SAT/SADT) and its related features will not function for ETM-enabled optics controller interfaces.

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 as designed.

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- 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 are collected to ensure that the configured SLAs are met for the service or stream.

- 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.
- 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.

The use case of SADT primarily focuses on the non-drop rate, which refers to the rate at which packet loss does not occur, as well as the maximum rate under stress conditions. Packet count has not traditionally been a factor taken into consideration.



Note In Cisco IOS XR Release 7.3.1, for 10G interfaces on the following NCS 540 variants, the maximum transmission rate is 8G. This rate cannot be changed.

- N540X-6Z18G-SYS-A/D
- N540X-8Z16G-SYS-A/D

Supported Modes

Table 1: Feature History Table

Feature Name	Release Information	Feature Description
Default Encapsulation Mode of ITU-T Y.1564	Release 24.2.1	Introduced in this release on:NCS 5500 fixed port routers The default encapsulation mode helps to set a baseline to know how the Ethernet service behaves for default operations in Service Activation Test.

The mode of operation that is supported for Y.1564 is the Two-way statistics collection mode. In the two-way mode, the sender generates the test traffic used to perform the test, which is then looped back by the remote node. The statistics are measured and collected locally on the sender

The following encapsulations are supported by Y.1564 SADT feature:

- dot1q
- dot1q + second dot1q
- dot1ad
- dot1ad + second dot1q
- priority tagged

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- untagged
- default

Note Before Cisco IOS XR Software Release 24.2.1, default encapsulation is supported if there are no other subinterfaces configured with untagged encapsulation. Starting Cisco IOS XR Software Release 24.2.1, default encapsulation is supported.

Restrictions for Default Encapsulation for ITU-T Y.1564 Service Activation Test

The following are the restrictions for default encapsulation mode for Y.1564 Service Activation Test:

- Default encapsulation with cos value isn't supported.
- Multiple parallel sessions with default encapsulation aren't supported. Default Encapsulation packets lack VLAN priority, and the SAT engine can only differentiate sessions based on the CoS value.
- If there are subinterfaces for both encap *untagged* and *default*, then only the SAT sessions over *untagged* works. But SAT sessions over *default* encap don't work. The packets are handled by an untagged sub interface.
- If there are subinterface for both *tagged* encapsulation and *default*, then only the SAT sessions work over the *default* interface but not over the *tagged* interface. Both function only if the session over the *tagged* interface is initiated before the *default* session.
- When the *default* interface session is initiated first, the absence of VLAN priority qualifier causes tagged packets to also trigger the default PMF entry, resulting in frame loss for tagged packets.

To know more about default encapsulation refer *Configure Virtual LANs in Layer 2 VPNs* Chapter in the L2VPN Configuration Guide for NCS 5500 Series Routers.

Usage Guideline and Limitations

- Rewrite with POP option is supported with Color Blind mode with Outer-Cos value of 0.
- Rewrite Push and Translate on Encapsulation Untagged is not supported.
- Y.1564 doesn't support L1 loopback.
- Y.1564 over bundle with members from multiple NPU is not supported.
- Y.1564 doesn't support measuring and analyzing jitter.
- When utilizing the SAT engine received bytes statistics feature, there can be potential inaccuracies in the following conditions:
  - During tests incorporating EMIX sequences that encounter packet drops.
  - When handling LMM packets originating from TGEN, Y.1731 protocols, or any unidentified sources.
- SAT supports a scale of four parallel sessions per system. However, all four sessions can not operate as color aware sessions simultaneously due to limitations in Class of Service (CoS) combinations.

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- SAT over bundle interface functions by selecting one of its members for transmission. Therefore, at least one member must be in the 'UP' state to initiate an SAT session. For modular chasis, bundle member from the different LCs is not supported.
- For optimal performance, it's recommended to use the Ethernet Data Plane Loopback functionality (EDPL) on the peer side for SAT. EDPL loops back and swaps the MAC addresses of Layer 2 packets generated. If the peer node doesn't support EDPL functionality, you can configure SAT to generate Layer 2 packets with the destination MAC address equal to the source MAC address. In such cases, the peer can perform an L1 loopback.
- EDPL over SRv6 is not supported on NCS 5500.
- Packets generated by SAT with PRBS payload at certain packet sizes may have PRBS errors. The user is informed about the PRBS error through the test abort reason.
    - On NCS-57B1-6D24-SYS and similar variants, packets have PRBS errors, if (packet_length + 63) / 64 is one of [4, 6, 10, 12, 13, 14] or > = 18.
    - On N540-24Q8L2DD-SYS and similar variants, packets have PRBS errors, if (packet_length + 63) / 64 equals to 6 or > = 33.
- Use unique CoS values for CIR and EIR in parallel tests.
- The actual number of packets transmitted by SADT might differ from the expected or theoretical number of packets. This deviation is seen higher in the smaller-sized packets.
- If BroadSync is not supported on any platform, then both SADT external and internal delay measurement values may be inaccurate due to the absence of Field Programmable Gate Arrays (FPGA) timing synchronization.
- On NCS 5700 fixed port routers and NCS 5700 line cards [Mode: Native], the following rewrite cases are not supported for internal SADT:
    - encapsulation combination as Rewrite Ingress Push
    - encapsulation combination as Rewrite Ingress Pop
    - encapsulation combination as Rewrite translate 1-to-1
    - encapsulation combination as Rewrite translate 1-to-2
- Bundle-related operations are not supported while EDPL sessions are active on interfaces associated with the bundle.
    - Do not add or remove bundle member interfaces while an EDPL session is active.
    - Do not perform LC reload operations that involve affected bundle member interfaces while an EDPL session is active.
    - To perform these operations, stop the EDPL session, complete the bundle or LC operation, and then restart the EDPL session.

Platform SAT Generation Rate

The following table includes the SAT generation rate for different platforms.

Note The packet generation and reception rate is determined by the device's clock rate. For example, while certain variants support a maximum throughput of 400G, others may operate at lower rates, such as 300G, based on their specific clock configurations. Refer to this for the maximum rate capacity of each device variant.

Platform (PID)	SAT Generation Rate
NCS540	19.2 Gbps
NCS560	19.2 Gbps
NCS540L	19.2 Gbps
NCS4K	23 Gbps
NCS5501	19.2 Gbps
NCS-5501-SE	19.2 Gbps
NCS55A1-48Q6H	23 Gbps
NCS55A2_MOD_S_SE	23 Gbps
NCS-55A1-36H-SE-S	23 Gbps
NCS-55A1-36H-S	23 Gbps
NCS-55A1-24Q6H-S	23 Gbps
NCS-55A1-24Q6H-SS	23 Gbps
NCS-55A1-24H	23 Gbps
NCS-5502-SE	23 Gbps
N540X-6Z18G-SYS-A	8 Gbps
N540X-4Z14G2Q-D	8 Gbps
N540X-8Z16G-SYS-D	8 Gbps
N540-6Z14S-SYS-D	8 Gbps
NCS-57C1-48Q6-SYS	300 or 400 Gbps
NCS-57C3-MODS-SYS	400 Gbps
NCS-57B1-5DSE-SYS	400 Gbps
N540-24Q8L2DD-SYS	300 Gbps
NCS-57D2-18DD-SYS	400 Gbps

CoS DEI Support Matrix

Table 2: Class of Service (CoS) and Discard Eligibility Identifier (DEI) Matrix

		CoS							
		0	1	2	3	4	5	6	7
DEI	0	Ö	Ö	Ö	Ö	Ö	X	Ö	X
	1	Ö	Ö	X	X	X	X	X	X

Ö - Supported

X- Not Supported

Supported Bandwidth Parameters

Bandwidth Parameters	Internal Direction	External Direction
Commited Information Rate	Y	Y
Exceeded Information Rate	Y	Y

Service Activation Test Target Matrix

Target	Internal Direction	External Direction
L2 Interface over physical main/sub interfaces	Y	Y
L2 Interface over bundle main/sub interfaces	Y	Y
L2 PW VPWS over physical main/sub interfaces	Y	Y
L2 PW VPWS over bundle main/sub interfaces	Y	Y
L2 EVPN/XConnect over physical main/sub interfaces	Y	Y
L2 EVPN/XConnect over bundle main/sub interfaces	Y	Y
L2 VPLS PW	N	N
L2 EVPN Bridge-Domain	N	N

Target	Internal Direction	External Direction
L3 Interfaces	N	N

Configuration Examples

The following example shows how to start service-activation test on an interface with external direction:

```
RP/0/RP0/CPU0:router ethernet  service-activation-test start interface TenGigE 10/0/0/1
profile test destination 00ab.6009.9c3c direction external
```

The following example shows how to start service-activation test on an interface with internal direction:

```
RP/0/RP0/CPU0:routerethernet  service-activation-test start interface TenGigE 10/0/0/1
profile test destination 00ab.6009.9c3c direction internal
```

The following example shows how to stop service-activation-test on an interface:

```
RP/0/RP0/CPU0:routerethernet service-activation-test stop interface TenGigE 10/0/0/1
```

The following example shows how to stop all service-activation-tests:

```
RP/0/RP0/CPU0:routerethernet service-activation-test stop all
```

Configuring Ethernet Service Activation Test Color Profile

The following example shows how to configure a color-blind profile for ethernet service activation test:

```
RP/0/RP0/CPU0:router#configure
RP/0/RP0/CPU0:router(config)# ethernet service-activation-test
RP/0/RP0/CPU0:router(config-ethsat)#profile sattest1
RP/0/RP0/CPU0:router(config-ethsat-prf)#outer-cos 4
RP/0/RP0/CPU0:router(config-ethsat-prf)#duration 8 minutes
RP/0/RP0/CPU0:router(config-ethsat-prf)#information-rate 11800 mbps
RP/0/RP0/CPU0:router(config-ethsat-prf)#packet-size 1000
```

The following example shows how to configure a color-aware profile for ethernet service activation test:

```
RP/0/RP0/CPU0:router#configure
RP/0/RP0/CPU0:router(config)# ethernet service-activation-test
RP/0/RP0/CPU0:router(config-ethsat)#profile sattest3
RP/0/RP0/CPU0:router(config-ethsat-prf)#outer-cos 4
RP/0/RP0/CPU0:router(config-ethsat-prf)#duration 1 minutes
RP/0/RP0/CPU0:router(config-ethsat-prf)#color-aware cir 7 gbps eir-color cos 1
RP/0/RP0/CPU0:router(config-ethsat-prf)#information-rate 8 gbps
RP/0/RP0/CPU0:router(config-ethsat-prf)#packet-size 1000
```

Verification

To verify the interfaces on which Y.1564 (ethernet service activation test) is enabled, use the **show ethernet service-activation-test brief** command. The following is a sample output of an enabled device:

```
RP/0/RP0/CPU0:router#show ethernet service-activation-test brief
Interface TenGigE0/0/0/14.1
  Service activation tests permitted (external only)
  Test completed:
    Duration 1 minute(s)
```

```
  Information rate 1 Gbps
  Color-aware, CIR: 900 Mbps, EIR: DEI set, CoS 1
  External, Two-way, Destination 00:11:00:22:00:33
  Packet size EMIX, Sequence 'abceg', Pattern hex 0x00
  Packet format: SAT MEF-49
  Outer CoS 2

Results:
  Step 1, Information Rate 1 Gbps
    CIR packets:
      Tx packets: 11276845, bytes: 6743553310
      Rx packets: 11276845, bytes: 6743553310
      FL: 0, FLR: 0%
      FD: Min 5.144us, Mean 6.681us, Max 9.576us
      IFDV: Not supported
      Out of order packets: 0 (0%)
      Error packets: 0 (0%)

    EIR packets:
      Tx packets: 1252895, bytes: 749231210
      Rx packets: 1252895, bytes: 749231210
      FL: 0, FLR: 0%
      FD: Min 5.160us, Mean 6.679us, Max 8.800us
      IFDV: Not supported
      Out of order packets: 0 (0%)
      Error packets: 0 (0%)
```

Optional Source MAC Address for Y.1564 Service Activation Test

Table 3: Feature History Table

Feature Name	Release Information	Feature Description
Optional Source MAC Address for Y.1564 Service Activation Test	Release 24.1.1	Introduced in this release on: NCS 5500 fixed port routers; NCS 5700 fixed port routers By specifying the source MAC address to the ITU-T Y.1564 SAT, you can ensure that the test results are relevant and applicable to the specific service configuration for use in production and before deployment for your customers. This feature introduces the following change: **Modified CLI:** The **source** keyword is added to the **ethernet service-activation-test** command. **YANG DATA Model**: • New XPaths for Cisco-IOS-XR-ethernet-sat-act.yang (see Github, YANG Data Models Navigator)

Prior to Cisco IOS XR Software Release 24.1.1, the default local interface MAC address was automatically employed as the source MAC address for the test traffic. This approach lacked flexibility and customization options, as you were restricted to the default address. With the optional source MAC address extension, you can specify the exact source MAC address you wish to use in the test traffic. This functionality empowers you to tailor the test sessions according to your specific requirements and network configurations.

Add Source MAC Address for a Y.1564 Service Activation Test

Use the **source** keyword in the **ethernet service-activation-test** command to specify a source MAC address for a Y.1564 Service Activation Test.

Procedure

Step 1 Use the **ethernet service-activation-test** command to configure a profile.

```
Router(config)#ethernet service-activation-test
Router(config-ethsat)#profile prof1
Router(config-ethsat-prf)#duration 1 minutes
Router(config-ethsat-prf)#information-rate 1 mbps
Router(config-ethsat-prf)#root
Router(config)#interface TenGigE0/0/0/1
Router(config-if)#ethernet service-activation-test
Router(config-if-ethsat)#permit all
Router(config-if-ethsat)#commit
```

Step 2 Run the **ethernet service-activation-test** command in exec mode to specify source MAC address for an SAT:

```
Router#ethernet service-activation-test start interface TenGigE0/0/0/1 profile prof1
destination 00ab.6009.9c3c source 0000.1000.001d direction external
```

Step 3 The **show ethernet service-activation-test in-progress** command displays the source MAC address.

```
Router#show ethernet service-activation-test in-progress
Fri Oct 21 03:50:55.658 PDT
Interface TenGigE0/0/0/1
  Service activation tests permitted
  Test in progress, 1 minute(s) remaining:
    Duration 1 minute(s)
    Information rate 1 Mbps
    External, Two-way, Destination 00ab.6009.9c3c, Source 0000.1000.001d
```

Loopback Frames for Y.1564 Service Activation Test

Table 4: Feature History Table

Feature Name	Release Information	Feature Description
Loopback Frames for Y.1564 Service Activation Test	Release 24.1.1	Introduced in this release on: NCS 5500 fixed port routers; NCS 5700 fixed port routers This feature enables the redirection of test traffic from the destination router to the source router in loopback message (LBM) format. Loopback message enables the measurement of various parameters and performance metrics, such as frame delay, frame loss rates, and QoS settings, after the traffic has completed its round trip. Such comprehensive measurement helps identify issues within the network setup. You can also use it to ensure the service is running and meets the SLA. This feature introduces the following change: **CLI:** The **packet-format lbm** keyword is added to the **ethernet service-activation-test profile** command. **YANG DATA Model**: New XPaths for Cisco-IOS-XR-ethernet-sat-cfg.yang (see Github, YANG Data Models Navigator)

In a typical Y.1564 Service Activation Test scenario, traffic flows from a source router to a destination router. However, with the inclusion of the loopback-message packet-format configuration, the traffic that reaches the destination router can be redirected back to the source router through a loopback interface. Now, the data packets are used in LBM format.

The collection of statistics start once the source router receives the test traffic from the destination.

Prior to Cisco IOS XR Software Release 24.1.1, tests were conducted independently in each direction, with traffic flowing from the source to the destination router. The data packets were used in Loss Measurement Message (LMM) format for Frame Loss (FL).

To enable this functionality, use the **packet-format lbm** keyword in the **ethernet service-activation-test profile** command. Once **packet-format lbm** is configured, data packets are used as per MEF-49.

Configure Loopback for Test Traffic in a Y.1564 Service Activation Test

The following configuration example shows how to configure loopback frames for Y.1564 Service Activation Test.

Procedure

Step 1 Use the **ethernet service-activation-test profile** command to configure loopbback for a test traffic.

```
Router(config)#ethernet service-activation-test
Router(config-ethsat)#profile p1
Router(config-ethsat-prf)#duration 2 minutes
Router(config-ethsat-prf)#information-rate 5 gbps
Router(config-ethsat-prf)#packet-format lbm
Router(config-ethsat-prf)#root
Router(config)#interface TenGigE0/0/0/12
Router(config-if)#ethernet service-activation-test
Router(config-if-ethsat)#permit all
Router(config-if-ethsat)#commit
```

Example of SAT results:

```
 Results:
    Step 1, Information Rate 5 Gbps
      CIR packets:
        Tx packets: 313509436, bytes: 160516831232
        Rx packets: 313464074, bytes: 160493605888
        FL: 45362, FLR: 0%
        FD: Min 5.244us, Mean 6.122us, Max 8.188us
        IFDV: Not supported
        Out of order packets: 0 (0%)
        Error packets: 0 (0%)

      EIR packets:
        Tx packets: 0, bytes: 0
        Rx packets: 0, bytes: 0
        FL: 0, FLR: 0%
        FD: Min 0.000us, Mean 0.000us, Max 0.000us
        IFDV: Min 0.000us, Mean 0.000us, Max 0.000us
        Out of order packets: 0 (0%)
        Error packets: 0 (0%)
```

Step 2 Use the **show running-config** command for the running configuration

```
Router#show running-config
Wed Feb 14 14:37:59.418 UTC
!
ethernet service-activation-test
 profile p1
  duration 2 minutes
  information-rate 5 gbps
  packet-format lbm
 !
!
interface TenGigE0/0/0/12
 ethernet service-activation-test
```

```
 permit all
!
```

Step 3 The **show ethernet service-activation-test** command shows that **packet-format lbm** is configured.

```
Router#show ethernet service-activation-test
Thu Feb 29 06:38:33.435 UTC
Interface TenGigE0/0/0/19
Service activation tests permitted
Test in progress, 179 minute(s) remaining:
Duration 2 minute(s)
Information rate 5 Gbps
Color-blind
External, Two-way, Destination 0A:AA:0B:BB:0C:CC
Packet size 512, Pattern hex 0x00
Packet format: Y.1731 LBM
CoS not set
```

Combined Frame Delay and Frame Loss Measurement for Y.1564 Service Activation Test

Table 5: Feature History Table

Feature Name	Release Information	Feature Description
Combined Frame Delay and Frame Loss Measurement for Y.1564 Service Activation Test	Release 24.1.1	Introduced in this release on: NCS 5500 fixed port routers; NCS 5700 fixed port routers We have enhanced the ITU-T Y.1564 Service Activation Testing (SAT) capabilities by enabling a comprehensive service quality measurement that includes network responsiveness, congestion, and other issues degrading network performance. This feature also allows a holistic testing of the QoS SLAs, which helps identify potential issues faster and troubleshoot effectively. This feature introduces the following change: **CLI:** The **measurement combined** keyword is added to the **ethernet service-activation-test profile** command. **YANG DATA Model**: • New XPaths for Cisco-IOS-XR-ethernet-sat-cfg.yang (see Github, YANG Data Models Navigator)

You can configure the SAT test to measure both delay and loss simultaneously for each frame transmitted and received. This configuration allows for the consolidated calculation of both delay and loss using Frame Delay (FD) packets . By setting the Frame Loss (FL) rate to 0% in the generator function, the test focuses solely on calculating delay and loss metrics using Delay Measurement Message (DMM) frames. This means that every frame sent and received is analyzed for delay and loss characteristics.

Prior to Cisco IOS XR Software Release 24.1.1 release, either FD or FL could be measured at a time

Furthermore, the configuration treats out-of-order packets in the same manner as the transmitted packets since there is no sequence numbering on the DMM packets. This approach ensures that all frames, regardless of their order of arrival, are accounted for in the measurement of delay and loss.

Configure Measurement Combined for a Y.1564 Service Activation Test

The following configuration example shows how to configure combined frame delay and frame loss measurements for Y.1564 Service Activation Test.

Procedure

Step 1 Use the **ethernet service-activation-test profile** command to configure **measurement combined** for a test traffic.

```
Router(config)#ethernet service-activation-test
Router(config-ethsat)#profile p1
Router(config-ethsat-prf)#duration 10 minutes
Router(config-ethsat-prf)#information-rate 1 gbps
Router(config-ethsat-prf)#measurement combined
Router(config-ethsat-prf)#root
Router(config)#interface TenGigE0/0/0/12
Router(config-if)#ethernet service-activation-test
Router(config-if-ethsat)#permit all
Router(config-if-ethsat)#commit
```

Example of SAT results:

```
 Results:
    Step 1, Information Rate 1 Gbps
      CIR packets:
        Tx packets: 2929519174, bytes: 1499913817088
        Rx packets: 20696794, bytes: 10596758528
        FL: 2908822380, FLR: 99%
        FD: Min 5.232us, Mean 18.642us, Max 63.032us
        IFDV: Not supported
        Out of order packets: 0 (0%)
        Error packets: 0 (0%)

      EIR packets:
        Tx packets: 0, bytes: 0
        Rx packets: 0, bytes: 0
        FL: 0, FLR: 0%
        FD: Min 0.000us, Mean 0.000us, Max 0.000us
        IFDV: Min 0.000us, Mean 0.000us, Max 0.000us
        Out of order packets: 0 (0%)
        Error packets: 0 (0%)
```

Step 2 Use the **show running-configuration** command for the running configuration

```
Router#show running-config
Wed Feb 14 14:37:59.418 UTC
!
ethernet service-activation-test
 profile p1
  duration 10 minutes
  information-rate 1 gbps
  measurement combined
 !
!
interface TenGigE0/0/0/12
 ethernet service-activation-test
  permit all
 !
```

Step 3 The **show ethernet service-activation-test** command shows frame loss and frame delay are measured on every frame.

```
Router#show ethernet service-activation-test in-progress
Tue Dec 14 08:18:22.981 PST
Interface TenGigE0/0/0/12
  Service activation tests permitted
  Test in progress, 10 minute(s) remaining:
    Duration 10 minute(s)
    Information rate 1 gbps
    Color-blind
    External, Two-way, Destination Source 2001:DB8:0:ABCD::1
    Packet size 1024, Pattern hex 0x00
    Packet format: SAT MEF-48
    Delay and loss measured on every frame
    CoS not set
```

Frame Delay Range for ITU-T Y.1564 Test

Table 6: Feature History Table

Feature Name	Release Information	Feature Description
Frame Delay Range for ITU-T Y.1564 Test	Release 24.2.1	Introduced in this release on:NCS 5500 fixed port routers You now have the ability to conduct a finer analysis of frame delay by measuring the Frame Delay Range (FDR) within a designated percentile. This metric captures the variation between the minimum frame delay observed and the delay at your chosen percentile. Also, delay times are organized into bins, which you can configure in terms of width and count to suit your analysis needs. By customizing these parameters, you can obtain an in-depth look at the distribution of observed delays, providing a nuanced understanding of network performance. This feature introduces these changes: **CLI:** The following keywords are added to the **frame delay** command: • **bins** • **width** • **frame- delay-range percentile** • **minimum-delay** **Yang Data Models:** The following data models are enhanced for this feature: • `Cisco-IOS-XR-ethernet-sat-oper.yang` • `Cisco-IOS-XR-ethernet-sat-cfg.yang`

Earlier, when assessing the performance of a network through Service Activation Tests, only the minimum and maximum frame delays were typically reported. These two extremes provided a basic understanding of the best and worst-case latencies that data packets could experience as they traveled through the network. However, this approach lacked detail and didn't offer much insight into the typical or varying delays that most packets encountered.

Starting Cisco IOS XR Software Release 24.2.1, you can set up bins of varying widths, for organizing frame delays. You can configure the number of bins and their sizes and observe the spread of frame delays across the network in greater detail. You can also configure minimum delay parameters. Minimum delay refers to the shortest time required for a frame or packet to traverse the network from its origin to its destination. There is an optional allowance for the initial bin to have a distinct size compared to subsequent ones. This provision accommodates scenarios where a particular network segment might have different characteristics.

The Frame Delay Range (FDR) is calculated for a specific percentile that can be configured based on the needs of the analysis. This means that instead of just knowing the extreme ends of the delay spectrum, you can now determine the delay experienced by a certain proportion of the frames, providing a clearer picture of the network's performance. The percentile is optional and is 99% by default. The percentile must be an integer.

Restrictions for Frame Delay Range for ITU-T Y.1564 Test

This feature is not supported on the following hardware variants:

- NCS-55A1-36H-S
- NCS-55A1-36H-SE-S
- NCS-55A1-24H
- NCS-55A2-MOD-SE-H-S
- NCS-55A2-MOD-HD-S
- NCS-55A2-MOD-HX-S
- NCS-55A1-48Q6H
- NCS-55A1-24Q6H-S
- NCS-55A1-24Q6H-SS
- NCS 5700 fixed port routers

Configure Frame Delay Range for ITU-T Y.1564 Test

Procedure

Step 1 Configure frame delay range using the **frame delay** command with **bins** and **width** to get the granual analysis of frame delay range.

Example:

```
Router(config)#ethernet service-activation-test profile foo
Router(config-ethsat-prf)#frame-delay bins 4 width 24
Router(config-ethsat-prf)#commit
```

Step 2 (Optional) Configure minimum delay and/or frame delay range percentile using the **frame delay** command with the **minimum-delay** and/or **frame-delay-range percentile** options. You can configure any or both of minimum-delay and frame-delay-range percentile.

Example:

```
Router(config-ethsat-prf)#frame-delay minimum-delay 2 frame-delay-range percentile percent
 99
Router(config-ethsat-prf)#commit
```

Step 3 Display the running configuration using the **show running configuration** command.

Example:

```
Router#show running-config
...
ethernet service-activation-test
 profile foo
  frame-delay bins 4 width 23 minimum-delay 2 frame-delay-range percentile percent 99
 !
!
```

Step 4 Verify that frame delay bins, width, minimum-delay, and frame-delay-range percentile are configured using the **show ethernet service-activation test** command.

Example:

```
Router#show ethernet service-activation-test
...
 Results:
    Step 1, Information Rate 1 Mbps
      CIR packets:
...
        FDR(99): 4ms
        Delay aggregation:
          Range              Samples
          ------------------ --------------------
               0 -     23 ms                   11
              23 -     46 ms                  263
              46 -     69 ms                66151
              69 -    MAX ms                   15
...
```

In the above example, you can notice that 263 packets had a frame delay between 23 and 46ms. And 4ms is the difference between the minimum frame delay and the 99th percentile of frame delay.

User-Specified MTU Support for EMIX Traffic in Service Activation Tests

Table 7: Feature History Table

Feature Name	Release Information	Feature Description
User-Specified MTU Support for EMIX Traffic in Service Activation Tests	Release 24.2.1	Introduced in this release on:NCS 5500 fixed port routers Defining the MTU packet size in Service Activation Tests (SAT) allows for tailored testing that matches the network's maximum frame capacity. This precision testing ensures accurate service performance validation and a reliable network service rollout. This feature introduces the following changes: **CLI:** **packet-size emix Sequence h**

In the context of a Service Activation Test (SAT), packet size refers to the size of the Ethernet frames or IP packets that are sent across the network to validate the performance of a network service against its specifications. These tests typically involve sending packets of varying sizes to simulate different types of network traffic and to ensure the service can handle the range of packet sizes it will encounter in a live environment.

Packet sizes in SATs can range from the smallest allowed Ethernet frame size, typically 64 bytes (including headers and trailers), to the Maximum Transmission Unit (MTU) size, which is often 1500 bytes for standard Ethernet networks. Some tests may also use larger packet sizes if the network supports jumbo frames (with an MTU size greater than 1500 bytes). The choice of packet sizes for a test will depend on the specific requirements of the service being activated and the capabilities of the network equipment.

With the capability introduced in Cisco IOS XR Software Release 24.2.1, you can configure packet size as sequence h. It means you have the flexibility to define a packet size that matches the MTU value of the interface for the EMIX traffic sequence. This means that the largest packet sent during the SAT will be equal to the configured MTU size of the network interface, ensuring compatibility with the network's maximum frame size handling capability.

The following table lists the Ethernet Frame Sized and Size Designations for reference:

Table 8: Ethernet Frame Sizes and Size Designations

a	b	c	d	e	f	g	h	u
64	128	256	512	1024	1280	1518	MTU	User Defined

Configure Sequence h value as EMIX Packet Size

Procedure

Step 1 Configure sequence h value as EMIX packet size, using the **packet-size emix sequence h** command.

Example:

```
Router#configure
Router(config)#ethernet service activation test profile p1
Router(config-ethsat-prf)#packet-size emix sequence h
Router(config-ethsat-prf)#commit
```

Step 2 Verify that the configuration is successful using the **show running configuration** command.

Example:

```
Router#show running config
ethernet service-activation-test
  profile p1
    packet-size emix sequence h
    !
   !
 !
```