Configuring WAN-PHY Controllers

This module describes the configuration of WAN-PHY controllers on the Cisco NCS 5500 Series Routers.

Table 1: Feature History for Configuring WAN-PHY Controllers

Release	Modification
Release 7.2.1	This feature was introduced.

- WAN-PHY Controller , on page 1
- Restrictions, on page 2
- Configuring SONET Mode on an Interface, on page 2
- Configuring SDH Mode on an Interface, on page 4
- TSoP Smart SFP for SDH and SONET Encapsulation, on page 7
- Prerequisites for TSoP, on page 8
- Restrictions for TSoP, on page 8
- Guidelines for TSoP Smart SFP, on page 8
- De-jitter Buffer , on page 9
- Configuration for TSoP, on page 10

WAN-PHY Controller

Table 2: Feature History Table

Feature Name	Release Information	Feature Description
WAN-PHY SONET Controller	Release 7.2.1	WAN-PHY renders 10 Gigabit Ethernet frames compatible with the SONET OC-192 or SDH STM-64 container format as defined by ANSI. In this release WAN-PHY supports only SONET OC-192 format.
Support for SDH mode under WAN-PHY Controller	Release 7.2.2	In this release, support of SDH STM-64 format is added for WAN-PHY Controllers. Support of SONET OC-192 formats existed in earlier releases.

WAN-PHY renders 10 Gigabit Ethernet compatible with the SONET STS-192c and SDH STM-64 container format as defined by ANSI. WAN-PHY effectively bridges the asynchronous world of Ethernet data with synchronous SONET/SDH transport allowing 10 Gigabit Ethernet to be transparently carried over current DWDM networks without having to directly map the Ethernet frames into SONET/SDH.

To achieve this compatibility, a WAN Interface Sublayer (WIS) is inserted between the 10 Gigabit Ethernet Physical Coding Sublayer (PCS) and the serial Physical Medium Attachment sublayer/Physical Medium Dependent sublayer (PMA/PMD).

When the controller is in SONET mode the WIS sublayer transports 10 Gigabit Ethernet frames in an OC-192c SONET payload which can interoperate with SONET section or line level repeaters.

When the controller is in SDH mode the WIS sublayer transports 10 Gigabit Ethernet frames in an STM-64 payload which can interoperate with SDH section or line level repeaters.

WAN-PHY is supported on NC55-MPA-12T-S card and 10G pluggables.

This table lists modular line cards and 2-RU systems that support NC55-MPA-12T-S card:

Table 3: Supported MOD Line Cards and 2-RU Systems:

Modular Line Card	2-RU Systems
• NC55-MOD-A-S • NC55-MOD-A-SE-S	• NCS-55A2-MOD-S • NCS-55A2-MOD-SE-S • NCS-55A2-MOD-HX-S • NCS-55A2-MOD-SE-H-S • NCS-55A2-MOD-HD-S

Restrictions

Consider these limitations before configuring WAN-PHY mode:

- WAN-PHY feature works on these 10G pluggables:
  - SFP-10G-SR-X
  - SFP-10G-LR-X
  - SFP-10G-ZR
- SONET or SDH configurations are rejected if the port has 1G optics.
- SONET or SDH configurations are rejected if MACsec is already configured on that port.

Configuring SONET Mode on an Interface

This task describes how to configure WAN-PHY in the SONET mode on the NC55-MPA-12T-S.

To enable WAN-PHY in SONET mode on an interface, configure **port-mode sonet framing WIS** command in the controller optics mode:

```
controller Optics 0/0/1/10
 port-mode sonet framing WIS
!
```

Verification

To verify the WHY-PHY SONET configuration, run these show coomands:

- **show portmode all**
- **show controllers OC192 0/0/1/10**
- **show controllers STS192c 0/0/1/10**

```
RP/0/RP0/CPU0:ios#show portmode all
Tue Apr 28 11:45:55.671 UTC

Portmode Information
------------------------------------------------
Port Name       Portmode Type   Framing                Mapping                 PT type
                                      Rate
None
Optics0_0_1_10  Sonet          WIS framing type      None mapping type            NA
                                        None
```

In above show command, the Framing column confirms that the framing type is WIS (WAN Interface Sublayer). When the controller is in WAN-PHY mode the WIS sublayer transports 10 Gigabit Ethernet frames in an OC-192c SONET payload.

When the online help funtion (?) on the router is used against the **show controllers oc192** or **show controllers STS192c** command, the list of WAN-PHY enabled card locations are displayed. This is a simple way to verify if WAN-PHY is enabled on the router.

For example:

```
RP/0/RP0/CPU0:ios # show controllers oc192 ?
0/0/1/10  OC192 Interface Instance
R/S/I/P  Forward interface in Rack/Slot/Instance/Port format


RP/0/RP0/CPU0:ios#show controllers OC192 0/0/1/10
Port OC1920/0/1/10:


 Status:
 Primary State: Up
 Configured Sec admin State: Normal
 Inherited Sec admin State: Normal
 Derived State: In Service
 performace_monitoring enabled

Loopback: None

SECTION
  LOF = 0          LOS    = 0          TIM-S = 0          BIP(B1) = 0
Overhead
J0 Transmit:    (0)
J0 Receive:     (0)
```

```
J0 Expected:    (0)

LINE
  AIS = 0          RDI    = 0          FEBE = 0          BIP(B2) = 0

Last clearing of "show controllers SONET" counters never

Detected Alarms: None
Masked Alarms: None
Detected Alerts: None
Masked Alerts: None

Framing: SONET
BER thresholds:  SF = 1.0E-3  SD = 1.0E-6
TCA thresholds:  B1 = 1.0E-6  B2 = 1.0E-6
  Clock source: internal (actual) line (configured)
```

Finally, the **show controllers STS192c 0/0/1/10** command is used to check SONET STS-192c format and data rate:

```
RP/0/RP0/CPU0:ios#show controllers STS192c 0/0/1/10

 Primary State: Up

 Sec Admin State: Normal

 Derived State: In Service

PATH
  FEBE   = 0          BIP(B3) = 0
  NEWPTR = 0          PSE    = 0          NSE  = 0
Detected Alarms:       None

Mask for Detected->Asserted:      None

Detected Alerts: None
Mask for Detected->Reported: None
Payload Scrambling: Disabled
C2 State: Stable   C2_rx = 0x0 (0)   C2_tx = 0x0 (0) / Scrambling Derived
B3 = 10e-6
Overhead J1
Transmit        : (0)
Received        : (0)
Expected        : (0)

 performace_monitoring enabled
```

The purpose of WAN-PHY is to render 10 Gigabit Ethernet compatible with the SONET STS-192c format and data rate, as defined by ANSI.

Configuring SDH Mode on an Interface

This task describes how to configure SDH mode on the NC55-MPA-12T-S:

```
controller Optics 0/0/2/1
 port-mode sdh framing WIS
!
```

Verification

To verify the SDH configuration, run these show coomands:

- show portmode all
- show controllers STM64 0/0/2/1
- show controllers vc4-64c 0/0/2/1

```
RP/0/RP0/CPU0:ios#show portmode all

Portmode Information
-------------------------------------------------
Port Name       Portmode Type   Framing                 Mapping                 PT type
   Rate
Optics0_0_2_1   SDH        WIS framing type        None mapping type         NA
None
```

The show command confirms that the Portmode type is SDH. When the controller is in SDH mode, WIS transports 10GE frames in an STM-64 payload.

The **show controllers STM64** command is used to check STM64 format and data rate:

```
RP/0/RP0/CPU0:ios#show controllers STM64 0/0/2/1
Mon Dec  7 11:13:31.697 UTC


Port STM640/0/2/1:

Status:
 Primary State: Down

 Configured Sec admin State: Normal

 Inherited Sec admin State: Normal

 Derived State: In Service

 performace_monitoring enabled

Loopback: None

REGENERATOR SECTION
  LOF = 1          LOS    = 0          RS-TIM = 0     RS-BIP = 0
Overhead
J0 Transmit:    (0)
J0 Receive:     (0)
J0 Expected:    (0)

MULTIPLEX SECTION
  AIS = 0          RDI    = 0          FEBE = 0          MS-BIP  = 0

Last clearing of "show controllers SDH" counters never

Detected Alarms: LOF
Masked Alarms: None
Detected Alerts: None
Masked Alerts: None

Framing: SDH
BER thresholds:  SF = 1.0E-3  SD = 1.0E-6
TCA thresholds:  B1 = 1.0E-6  B2 = 1.0E-6
  Clock source: internal (actual) line (configured)
```

```
RP/0/RP0/CPU0:ios#show controllers vc4-64c 0/0/2/1
Mon Dec  7 11:15:26.535 UTC

 Primary State: Down

 Sec Admin State: Normal

 Derived State: In Service

PATH
  FEBE   = 0          BIP(B3) = 0
  NEWPTR = 0          PSE    = 0          NSE  = 0
Detected Alarms: AU-LOP

Mask for Detected->Asserted:      None

Detected Alerts: None
Mask for Detected->Reported: None
Payload Scrambling: Disabled
C2 State: Stable   C2_rx = 0x0 (0)   C2_tx = 0x0 (0) / Scrambling Derived
B3 = 10e-6
Overhead J1
Transmit        : (0)
Received        : (0)
Expected        : (0)

 performace_monitoring enabled
```

TSoP Smart SFP for SDH and SONET Encapsulation

Table 4: Feature History Table

Feature Name	Release	Description
TSoP Smart SFP for SDH and SONET Encapsulation	Release 7.11.1	Introduced in this release on NCS 5500 fixed port routers This release introduces support for the Clear Channel Synchronous Transport Module Level-1 (STM1) Smart SFP (SFP-TS-OC3STM1-I) for the Transparent SONET or SDH over Packet (TSoP) protocol. This allows you to leverage your existing packet-switched network to transport traditional time-division multiplexing (TDM) traffic. TSoP Smart SFPs offer the following advantages: • Encapsulation of SDH or SONET bit streams into packet-switched network format • Improved suitability for pseudowire transport over an Ethernet network

The TSoP Smart SFP (SFP-TS-OC3STM1-I) is a special type of optical transceiver that allows for the transparent encapsulation of SDH or SONET bit streams into a packet format. This format is suitable for transporting pseudowires over an Ethernet network. The TSoP pseudowires can be manually configured or set up using the PWE3 control protocol [RFC4447].

TSoP provides packetization, de-packetization, and clock recovery. It translates the TDM bit stream into fixed-size data blocks (810 octets) and vice versa.

TSoP follows the SAToP method described in [RFC4553] for transporting E1/DS1 pseudowires over a packet-switched network. With TSoP, the entire OC-3 or STM-1 is encapsulated in a single circuit emulating pseudowire traffic. This traffic is then transported to a single destination across the Ethernet network.

.

Note The TSoP Smart SFP is used on any of the front panel ports of the 8-port Gigabit Ethernet SFP Interface Module (8x1GE).

- The Smart SFP transceivers are compatible with the Small Form Factor Pluggable 20-pin Multi-Source Agreement (MSA).
- TSoP Smart SFP (SFP-TS-OC3STM1-I) transports up to 155 Mbps on a L1.1 (40km) optical data link.

Prerequisites for TSoP

This section provides information about the prerequisites that apply to TSoP.

- Single mode optical fiber must be used to connect TSoP Smart SFP with the OC-3 port.
- The TSoP smart SFP pseudowire endpoints must use the same configuration parameters.

Restrictions for TSoP

This section provides information about the restrictions that apply to TSoP.

- TSoP is not supported on the 25GE ports, but it’s supported only on 1GE and 10GE ports.
- The RTP clock source value is Ethernet, by default. The **Clock source internal/line** under the **controller STM1** *r/s/i/p*, is not applicable.
- Ensure that there is at least 2 minutes time-delay between the swaps, during a quick OIR of TSoP smart SFP with other SFPs on the same port.
- Before you insert TSoP, always ensure that the Ethernet interface is in a **shutdown** state. If TSoP doesn't come up when the Ethernet interface is accidentally present in **no shut**, then remove TSoP and insert Gigabit Ethernet SFP to move it to the shutdown state, and then reinsert TSoP as a workaround.
- TSoP only supports Differential Clock Recovery (DCR) by default and doesn’t support any other clock configuration.
- Both sides of PE only support TSoP. Currently, interoperability with other devices is not supported.

Guidelines for TSoP Smart SFP

The TSoP is compatible with the following SFPs supported on the OC-3 interface module. We recommend using the specified attenuator:

- ONS-SI-155-I1 - For a cable length of 15km, use a 2 dB attenuator. Use an 8 dB attenuator for short distances to avoid receiver overload.
- ONS-SI-155-L1 - For a cable length of 40km, no attenuator is needed. Use a 10 dB attenuator for short distances to avoid receiver overload.

- ONS-SI-155-L2 - For a cable length of 40km, use a 2 dB attenuator. Use a 10 dB attenuator for short distances to avoid receiver overload.

Note Multimode SFP is not supported with TSoP.

De-jitter Buffer

A de-jitter buffer is a component in a packet-based network that helps mitigate the effects of jitter. Jitter refers to the variation in the arrival time of packets, which can lead to inconsistent delays and packet loss in real-time applications like voice or video.

The de-jitter buffer works by temporarily storing incoming packets and then releasing them at a regulated pace. It smooths out the variations in packet arrival times and ensures a more consistent and reliable stream of packets for playback.

The primary purpose of the de-jitter buffer is to ensure a steady and continuous playback of real-time data, such as voice packets in a voice-over-IP (VoIP) call. By absorbing and compensating for the variable delay, it helps maintain a stable voice quality without noticeable gaps or interruptions in the audio stream.

The size of the de-jitter buffer is a critical parameter to consider in network design. It should be large enough to handle the maximum expected delay variation (jitter) while still providing an acceptable level of delay. However, the buffer cannot be too large, as excessive buffering can introduce additional delay and affect the real-time nature of the application.

The de-jitter buffer for the TSoP can be configured to the following values:

- 292
- 627
- 810
- 1296
- 2633

Example configuration

This example shows how to configure De-jitter buffer.

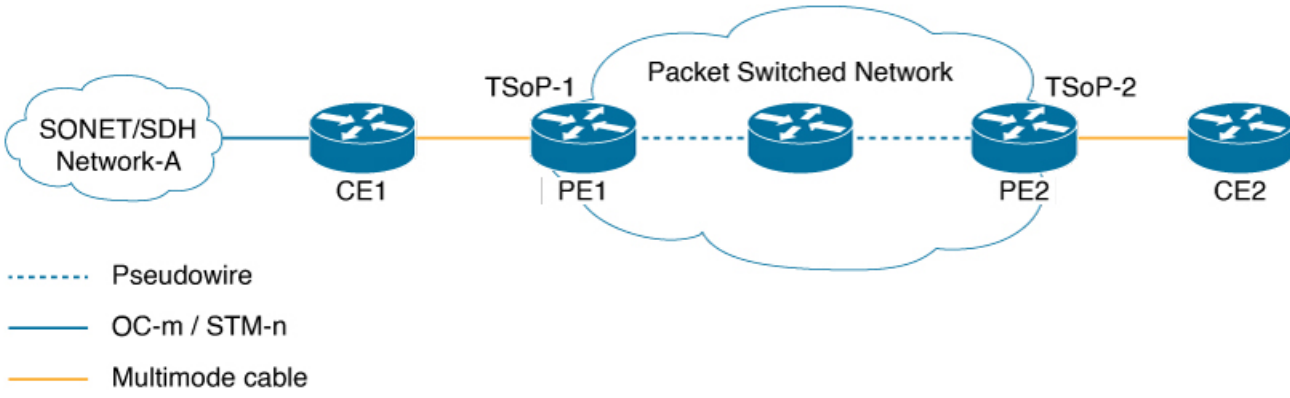
```
sh controll cem 0/0/0/10 payload-dejitter-mapping
Thu Jan 19 12:40:16.206 UTC
Client type : STM1
Client rate (in kbps) : 155000
Client default payload (in bytes) : 810
Client default dejitter (in usec) : 1296

Payload (in bytes) Possible dejitter values (in microseconds)
-----------------------------------------------------------
810 2633, 1296, 627, 292

For configuring out of range, we will get the below error:
Int CEM <>
```

```
cem payload 810 dejitter 696
!
```

Configuration for TSoP

Here is a sample configuration for TSoP:

Figure 1: TSoP in Packet Switched Network



Pre-requisites

These are the prerequisites for configuring PE routers and CE (SONET or SDH) routers for TSoP:

- The following are the pre-requisites on CE routers ASR 903:
  - The CE side routers must be ASR 903 operating on RSP4 or RSP3
  - SFP-OC3-SR must be plugged into ASR 903 for transmitting SONET or SDH packets
  - Supported Interface modules are:
    - NCS4200-1T8S-20CS
    - A900-IMA3G-1MSG
- The PE side routers must be NCS 5500.
- PE and CE routers must be connected using multimode cable
- Only static L2VPN tunnel configuration is supported
- Sync-E should be operational

Note Traffic switch over is not supported even when multiple links are available. Traffic flow occurs as per the adjacent labels or hops defined by the user during static L2VPN tunnel configuration

Configuration for

1. This example shows how to configure clock synchronization on the PE routers.

   - Configuring Smart SFP in PE1

   ```
   Router(config)# frequency synchronization quality itu-t option 1
   Router(config)# interface GigabitEthernet0/0/0/5
   Router(config)# no shut
   Router(config)# frequency synchronization
   Router(config)# quality transmit exact itu-t option 1 PRC
   ```

   - Configuring Smart SFP in PE2

   ```
   Router(config)# frequency synchronization quality itu-t option 1
   Router(config)# interface GigabitEthernet0/0/0/18
   Router(config)# frequency synchronization
   Router(config)# selection input
   Router(config)# priority 1
   Router(config)# wait-to-restore 0
   ```

2. This example shows how to configure PE and CE interfaces.

   - Configuration at CE1

   ```
   Router(config)# interface CEM0/0/0/10
   Router(config)# l2transport
   ```

   - Configuration at PE1

   ```
   Router(config)# interface GigabitEthernet0/0/0/5
   Router(config)# ipv4 address 10.1.1.1 255.255.255.0
   Router(config)# no shut
   ```

   - Configuration at CE2

   ```
   Router(config)# interface CEM0/0/0/17
   Router(config)# l2transport
   ```

   - Configuration at PE2

   ```
   Router(config)# interface GigabitEthernet0/0/0/18
   Router(config)# ipv4 address 10.1.1.2 255.255.255.0
   Router(config)# no shut
   ```

3. This example shows how to configure loopback interface.

   - Configuration at PE1

   ```
   Router(config)# interface Loopback0
   Router(config)# ipv4 address 1.1.1.1 255.255.255.255
   ```

   - Configuration at PE2

   ```
   Router(config)# interface Loopback0
   Router(config)# ipv4 address 1.1.1.4 255.255.255.255
   ```

4. This example shows how to configure the ISIS IGP and advertise loopback and core interfaces.

   - Configuration at PE1

   ```
   Router(config)# router isis core
   Router(config)#is-type level-2-only
   Router(config)#net 49.0000.0000.0000.0001.00
   Router(config)#nsr
   ```

```
Router(config)#nsf cisco
Router(config)#log adjacency changes
Router(config)#address-family ipv4 unicast
Router(config)#metric-style wide
Router(config)#segment-routing mpls sr-prefer
Router(config)#segment-routing bundle-member-adj-sid
Router(config)#address-family ipv6 unicast
Router(config)#metric-style wide
Router(config)#segment-routing mpls sr-prefer
Router(config)#segment-routing bundle-member-adj-sid
Router(config)#interface Loopback0
Router(config)#point-to-point
Router(config)#address-family ipv4 unicast
Router(config)#prefix-sid index 1
Router(config)#address-family ipv6 unicast
Router(config)#interface GigabitEthernet0/0/0/5
Router(config)#point-to-point
Router(config)#address-family ipv4 unicast
Router(config)#adjacency-sid absolute 28121
Router(config)#address-family ipv6 unicast
```

- Configuration at PE2

```
Router(config)#router isis core
Router(config)#is-type level-2-only
Router(config)#net 49.0000.0000.0000.0004.00
Router(config)#nsr
Router(config)#nsf cisco
Router(config)#log adjacency changes
Router(config)#address-family ipv4 unicast
Router(config)#metric-style wide
Router(config)#segment-routing mpls sr-prefer
Router(config)#segment-routing bundle-member-adj-sid
Router(config)#address-family ipv6 unicast
Router(config)#metric-style wide
Router(config)#segment-routing mpls sr-prefer
Router(config)#segment-routing bundle-member-adj-sid
Router(config)#interface Loopback0
Router(config)#point-to-point
Router(config)#address-family ipv4 unicast
Router(config)#prefix-sid index 4
Router(config)#address-family ipv6 unicast
Router(config)#interface GigabitEthernet0/0/0/18
Router(config)#point-to-point
Router(config)#address-family ipv4 unicast
Router(config)#adjacency-sid absolute 28211
Router(config)#address-family ipv6 unicast
```

5. This example shows how to configure Circuit-styled Segment routing traffic engineering tunnels.

- Configuration at PE1

```
Router(config)#segment-routing
Router(config)#global-block 80000 111999
Router(config)#local-block 25000 28999
Router(config)#traffic-eng
Router(config)#segment-list pe1-pe2-forward-path
Router(config)#index 1 mpls label 28121
Router(config)#segment-list pe1-pe2-reverse-path
Router(config)#index 1 mpls label 28211
Router(config)#policy pe1-pe2-circuit-styled-srte
Router(config)#color 10 end-point ipv4 1.1.1.4
```

```
Router(config)#path-protection
Router(config)#candidate-paths
Router(config)#preference 10
Router(config)#explicit segment-list pe1-pe2-forward-path
Router(config)#reverse-path segment-list pe1-pe2-reverse-path
```

- Configuration at PE2

```
Router(config)#segment-routing
Router(config)#global-block 80000 111999
Router(config)#local-block 25000 28999
Router(config)#traffic-eng
Router(config)#segment-list pe1-pe2-forward-path
Router(config)#index 1 mpls label 28121
Router(config)#segment-list pe1-pe2-reverse-path
Router(config)#index 1 mpls label 28211
Router(config)#policy pe1-pe2-circuit-styled-srte
Router(config)#color 10 end-point ipv4 1.1.1.4
Router(config)#path-protection
Router(config)#candidate-paths
Router(config)#preference 10
Router(config)#explicit segment-list pe1-pe2-forward-path
Router(config)#reverse-path segment-list pe1-pe2-reverse-path
```

6. This example shows how to configure BGP EVPN neighbor session.

- Configuration at PE1

```
Router(config)#router bgp 100
Router(config)#bgp router-id 1.1.1.1
Router(config)#bgp graceful-restart
Router(config)#address-family ipv4 unicast
Router(config)#address-family l2vpn evpn
Router(config)#neighbor 1.1.1.4
Router(config)#remote-as 100
Router(config)#update-source Loopback0
Router(config)#graceful-restart
Router(config)#address-family l2vpn evpn
```

- Configuration at PE2

```
Router(config)#bgp router-id 1.1.1.4
Router(config)#bgp graceful-restart
Router(config)#address-family ipv4 unicast
Router(config)#address-family l2vpn evpn
Router(config)#neighbor 1.1.1.1
Router(config)#remote-as 100
Router(config)#update-source Loopback0
Router(config)#graceful-restart
Router(config)#address-family l2vpn evpn
```

7. This example shows how to configure EVPN xconnect.

- Configuration at PE1

```
Router(config)#l2vpn
Router(config)#pw-class pw-cs-srte
Router(config)#encapsulation mpls
Router(config)#preferred-path sr-te policy pe1-pe2-circuit-styled-srte
Router(config)#xconnect group evpn_vpws
Router(config)#p2p p1
Router(config)#interface CEM0/0/0/10
```

```
Router(config)#neighbor evpn evi 10 target 1 source 2
Router(config)#pw-class pw-cs-srte
```

- Configuration at PE2

```
Router(config)#l2vpn
Router(config)#pw-class pw-cs-srte
Router(config)#encapsulation mpls
Router(config)#preferred-path sr-te policy pe1-pe2-circuit-styled-srte
Router(config)#xconnect group evpn_vpws
Router(config)#p2p p1
Router(config)#interface CEM0/0/0/17
Router(config)#neighbor evpn evi 10 target 2 source 1
Router(config)#pw-class pw-cs-srte
```

8. This example shows how to configure Dejitter.

- Configuration at PE1

```
Router(config)#int cem0/0/0/10
Router(config)#cem payload 810 dejitter 696
```

- Configuration at PE2

```
Router(config)#int cem0/0/0/17
Router(config)#cem payload 810 dejitter 696
```

Verification

Use the **show inventory** command to display all TSoP Smart SFPs installed on the router.

```
Router#show inventory
NAME: "GigabitEthernet0/0/0/17", DESCR: "Cisco SFP TSOP STM1 Pluggable Optics Module"
PID: SFP-TS-OC3STM1-I , VID: V01, SN: OEA2536001J
```

Use the **show hw-module fpd** command to display TSoP Smart SFPs FPD version.

```
Router#show hw-module fpd
Auto-upgrade:Disabled
FPD Versions
==============
Location Card type HWver FPD device ATR Status Running Programd
--------------------------------------------------------------------------------------------
0/RP0 NCS-55A2-MOD-SE-S 1.0 MB-MIFPGA CURRENT 0.21 0.21
0/RP0 NCS-55A2-MOD-SE-S 1.0 SSFP_OC3_STM1_6 CURRENT 12.01 12.01
0/RP0 NCS-55A2-MOD-SE-S 1.0 SSFP_STM1_TSOP_17 CURRENT 13.00 13.00  <<<<
0/RP0 NCS-55A2-MOD-SE-S 1.0 Bootloader CURRENT 1.18 1.18
0/RP0 NCS-55A2-MOD-SE-S 1.0 CPU-IOFPGA CURRENT 1.27 1.27
0/RP0 NCS-55A2-MOD-SE-S 1.0 MB-IOFPGA NEED UPGD 0.18 0.18
0/RP0 NCS-55A2-MOD-SE-S 1.0 SATA-INTEL_240G NEED UPGD 1120.00 1120.00
0/PM0 NC55-1200W-ACFW 1.0 LIT-PriMCU-ACFW CURRENT 2.09 2.09
0/PM1 NC55-1200W-ACFW LIT-PriMCU-ACFW NOT READY
RP/0/RP0/CPU0:ios#
```

Use the **show ipv4 interface brief** command to display the interface status.

```
Router#show ipv4 interface brief
Interface IP-Address Status Protocol Vrf-Name
MgmtEth0/RP0/CPU0/0 unassigned Shutdown Down default
TenGigE0/0/0/0 unassigned Shutdown Down default
GigabitEthernet0/0/0/1 unassigned Shutdown Down default
GigabitEthernet0/0/0/2 unassigned Shutdown Down default
TenGigE0/0/0/3 unassigned Shutdown Down default
```

```
TenGigE0/0/0/4 unassigned Shutdown Down default
GigabitEthernet0/0/0/5 unassigned Shutdown Down default
GigabitEthernet0/0/0/6 unassigned Up Up default
GigabitEthernet0/0/0/7 unassigned Shutdown Down default
GigabitEthernet0/0/0/8 unassigned Shutdown Down default
GigabitEthernet0/0/0/9 unassigned Shutdown Down default
GigabitEthernet0/0/0/10 unassigned Shutdown Down default
TenGigE0/0/0/11 unassigned Shutdown Down default
TenGigE0/0/0/12 unassigned Shutdown Down default
TenGigE0/0/0/13 unassigned Shutdown Down default
TenGigE0/0/0/14 unassigned Shutdown Down default
TenGigE0/0/0/15 unassigned Shutdown Down default
GigabitEthernet0/0/0/16 unassigned Up Up default
CEM0/0/0/17 unassigned Up Up default   <<<
GigabitEthernet0/0/0/18 unassigned Shutdown Down default
TenGigE0/0/0/19 unassigned Shutdown Down default
```

Use the **show controller cem** verifying TSoP smart SFP stats and Dejitter configuration.

```
Router#show controller cem 0/0/0/17
Interface : CEM0/0/0/17
Admin state : Up
Oper state : Up
Port bandwidth : 155000 kbps
Dejitter buffer (oper/in-use) : 1296/180064 usec   <<<<<<
Payload size (oper) : 810 bytes
PDV (min/max/avg) : 51589/142643/97116 usec
Dummy mode : last-frame
Dummy pattern : 0x0
Idle pattern : 0x0
Signalling : No CAS
RTP : Not Enabled
Clock type : Differential
Detected Alarms : None

Statistics Info
---------------
Ingress packets : 0, Ingress packets drop : 0
Egress packets : 0, Egress packets drop : 0
Total error : 1145472000
Missing packets : 572736000, Malformed packets : 0
Jitter buffer underrun : 572736000, Jitter buffer overrun : 0
Misorder drops : 0
Reordered packets : 0, Frames fragmented : 0
Error seconds : 0, Severely error seconds : 0
Unavailable seconds : 0, Failure counts : 0

Generated L bits : 0, Received L bits : 0
Generated R bits : 0, Received R bits : 0

Endpoint Info
-------------
Passthrough : No

//Run the same command on CEm interface of PE1 router.

Router#show controll CEM0/0/0/10
Sat Mar 25 10:49:19.471 UTC
Interface                          : CEM0/0/0/6
Admin state                        : Up
Oper  state                        : Up
Port bandwidth                     : 155000 kbps
Dejitter buffer (oper/in-use)      : 1296/180645 usec
Payload size (oper)                : 810 bytes
PDV (min/max/avg)                  : 51589/142643/97116 usec
```

```
Dummy mode                          : last-frame
Dummy pattern                       : 0xab
Idle pattern                        : 0xff
Signalling                          : No CAS
RTP                                 : Enabled
Clock type                          : Differential
Detected Alarms                     : None

Statistics Info
---------------
Ingress packets          : 0, Ingress packets drop     : 0
Egress packets           : 0, Egress packets drop      : 0
Total error              : 385536000
        Missing packets          : 192768000, Malformed packets        : 0
        Jitter buffer underrun   : 192768000, Jitter buffer overrun    : 0
        Misorder drops           : 0
Reordered packets        : 0, Frames fragmented        : 0
Error seconds            : 0, Severely error seconds   : 0
Unavailable seconds      : 0, Failure counts           : 0

Generated L bits         : 0, Received  L bits         : 0
Generated R bits         : 0, Received  R bits         : 0

Endpoint Info
-------------
Passthrough     : No
RP/0/RP0/CPU0:Router#
```