Configuring Controllers

There are three types of controllers for the line card. The controllers are the optics controller, the ethernet controller, and the coherent DSP controller. This chapter describes the procedures used to configure these controllers.

Automatic-In-Service

Automatic-In-Service (AINS) is a controller feature that:

- allows the controller to automatically transition to the in-service state after the maintenance window,
- associates a soak time period with the automatic-in-service (AINS) state, and
- suppresses alarms from propagating to EMS/NMS monitoring systems during the AINS maintenance window.

You can configure AINS on the client ports of the QXP, 1.2T, 2.4T, and 2.4TX cards.

AINS states

If there are any service-affecting alarms when AINS is running on ethernet or optics controllers, the AINS state moves to Pending state. When the alarms are cleared, the AINS state moves to Running state.

The AINS soak time period restarts when there are line card reloads, XR reloads, line card warm reloads, power cycles, or alarm conditioning.

This table lists the AINS states.

State	Description
None	AINS is not enabled on the controller or the soak time period is complete.
Pending	AINS is configured on the controller. However, the soak time period has not started because either the primary state of the controller is in Shutdown, Admin down, or Not ready state or the secondary state is in Maintenance state. AINS can also move to Pending state if alarms are raised during the soak time period.
Running	AINS is enabled on the controller. The primary state of the controller is Up and the secondary state is AINS.

Soak time periods

A soak time period is a port timing parameter that:

- suppresses alarms during the Automatic In Service (AINS) state,
- begins when all optical and Ethernet alarms on the port are cleared, and
- specifies the time before a port transitions from AINS to In Service (IS) state.

You can configure the soak time period to be between 1 minute to 48 hours.

All alarms are suppressed during the AINS state. If optical or Ethernet alarms are raised during the soak time period, the AINS state moves to Pending. These alarms are shown in the output of the `show alarms brief card location 0/RP0/CPU0 conditions` command, not in `show alarms brief card location 0/RP0/CPU0 active`. After all alarms are cleared, the soak time period initiates, and the AINS state moves to Running. When the soak time period expires, the port transitions to the IS state.

Configure Automatic In-Service (AINS)

Use this task to enable and set the soak time for Automatic In-Service (AINS) on a controller, a muxponder slice, or globally within the system.

AINS allows specific hardware components or the entire system to automatically transition to an in-service state after a defined soak time and reduces manual intervention.

Procedure

Step 1 Run the **automatic-in-service controller** *controller rate controller* **hours** *hours* **minutes** *minutes* command to configure AINS on a controller.

Example:

This is a sample to configure AINS globally.

```
RP/0/RP0/CPU0:ios#configure
RP/0/RP0/CPU0:ios(config)#ains-soak hours 0 minutes 15
RP/0/RP0/CPU0:ios(config)#commit
```

Step 2 Run the **hw-module location** *location* **mxponder-slice** *slice-number* **client-port-ains-soak hours** *hours* **minutes** *minutes* command to configure AINS on a muxponder slice.

Example:

This example shows how to configure slice 0 client ports with AINS, setting the soak time to 40 minutes.

```
RP/0/RP0/CPU0:ios#configure
RP/0/RP0/CPU0:ios(config)#hw-module location 0/3/nxr0 mxponder-slice 0 client-port-ains-soak hours
0 minutes 40
RP/0/RP0/CPU0:ios(config)#commit
```

Step 3 Run the **ains-soak hours** *hours* **minutes** *minutes* command to configure AINS globally.

Example:

This is a sample to configure AINS globally.

```
RP/0/RP0/CPU0:ios#configure
RP/0/RP0/CPU0:ios(config)#ains-soak hours 0 minutes 15
RP/0/RP0/CPU0:ios(config)#commit
```

Disable AINS

Use this task to disable the AINS on a muxponder slice, which affects all client ports within that slice.

Procedure

Step 1 Run the **hw-module location** *location* **mxponder-slice** *slice-number* **client-port-ains-soak hours** *hours* **minutes** *minutes* command to disable AINS on all muxponder client ports. Set the hours and minutes to 0.

Example:

This is a sample in which AINS is disabled on all client ports.

```
RP/0/RP0/CPU0:ios#configure
RP/0/RP0/CPU0:ios(config)#hw-module location 0/3/nxr0 mxponder-slice 0 client-port-ains-soak hours
0 minutes 0
RP/0/RP0/CPU0:ios(config)#commit
```

Step 2 Run the **hw-module location** *location* **mxponder-slice** *slice-number* **client-port-ains-soak hours** *hours* **minutes** *minutes*command to disable AINS on a muxponder slice. Set the hours and minutes to 0.

Example:

This is a sample in which AINS is disabled on all client ports of slice 0.

```
RP/0/RP0/CPU0:ios(config)#hw-module location 0/3/nxr0 mxponder-slice 0 client-port-ains-soak hours
0 minutes 0
RP/0/RP0/CPU0:ios(config)#commit
```

Display AINS configuration

Use this task to view the current AINS configuration status, including the soak state and remaining duration, for various controller types.

The AINS Soak field in the output indicates the current state of AINS. The current state can be None, Pending, or Running. The Total Duration field indicates the total soak time period that is configured. The Remaining Duration field indicates the soak time that remains, after which, the AINS state moves to None.

Procedure

Run the `show controller` command for the desired interface type and location.

Example:

This example shows the Ethernet controller statistics with AINS Soak in running state.

```
RP/0/RP0/CPU0:ios#show controller HundredGigECtrlr 0/1/0/2
Thu Feb 21 19:52:55.001 UTC
Operational data for interface HundredGigECtrlr0/1/0/2:
State:
    Administrative state: enabled
    Operational state: Up
    LED state: Green On
    Maintenance: Disabled
```

```
    AINS Soak: Running
    Total Duration: 0 hour(s) 15 minute(s)
    Remaining Duration: 0 hour(s) 5 minute(s) 37 second(s)
    Laser Squelch: Disabled
Phy:
    Media type: Not known
Autonegotiation disabled.
Operational values:
    Speed: 100Gbps
    Duplex: Full Duplex
    Flowcontrol: None
    Loopback: None (or external)
    BER monitoring:
        Not supported
    Holdoff Time: 0ms
```

Example:

This example shows the Ethernet controller statistics with AINS Soak in pending state.

```
RP/0/RP0/CPU0:ios#show controllers HuC 0/0/0/2
Thu Mar 12 13:52:12.129 UTC
Operational data for interface HundredGigECtrlr0/0/0/2:
State:
    Administrative state: enabled
    Operational state: Down (Reason: State undefined)
    LED state: Red On
    Maintenance: Disabled
    AINS Soak: Pending
    Total Duration: 0 hour(s) 30 minute(s)
    Remaining Duration: 0 hour(s) 30 minute(s) 0 second(s)
    Laser Squelch: Disabled
Phy:
    Media type: Not known
    Alarms:
        Current:
            Local Fault
    Statistics:
        FEC:
            Corrected Codeword Count: 0
            Uncorrected Codeword Count: 9
Autonegotiation disabled.
Operational values:
    Speed: 100Gbps
    Duplex: Full Duplex
    Flowcontrol: None
    Loopback: None (or external)
    BER monitoring:
        Not supported
    Forward error correction: Standard (Reed-Solomon)
    Holdoff Time: 0ms
```

Example:

This example shows the optics controller statistics with AINS Soak in running state.

```
RP/0/RP0/CPU0:ios#show controller optics 0/1/0/3
Thu Feb 21 19:45:41.088 UTC
Controller State: Up
 Transport Admin State: Automatic In Service
 Laser State: On
 LED State: Green
 Optics Status
```

```
        Optics Type:  400G QSFP-DD DR4
        Alarm Status:
        -------------
        Detected Alarms: None
        LOS/LOL/Fault Status:
        Alarm Statistics:
        -------------
        HIGH-RX-PWR = 0            LOW-RX-PWR = 0
        HIGH-TX-PWR = 0            LOW-TX-PWR = 0
        HIGH-LBC = 0               HIGH-DGD = 0
        OOR-CD = 0                 OSNR = 0
        WVL-OOL = 0                MEA  = 0
        IMPROPER-REM = 0
        TX-POWER-PROV-MISMATCH = 0
        Performance Monitoring: Enable
        THRESHOLD VALUES
        ----------------

        Parameter                High Alarm  Low Alarm  High Warning  Low Warning
        -----------------------  ----------  ---------  ------------  -----------
        Rx Power Threshold(dBm)          4.9      -12.0           0.0          0.0
        Tx Power Threshold(dBm)          3.5      -10.1           0.0          0.0
        LBC Threshold(mA)                N/A        N/A          0.00         0.00

        LBC High Threshold = 98 %
        Polarization parameters not supported by optics

       Total TX Power = 6.39 dBm
       Total RX Power = 5.85 dBm
        Lane  Laser Bias    TX Power    RX Power  Output Frequency
        ----  ----------  ----------  ----------  ----------------
          1      75.0 %    0.59 dBm    0.63 dBm  230.43 THz
          2      68.6 %    0.06 dBm   -0.68 dBm  230.43 THz
          3      69.0 %    0.26 dBm   -0.63 dBm  230.43 THz
          4      69.1 %    0.56 dBm   -0.10 dBm  230.43 THz
 Transceiver Vendor Details
  Form Factor   : QSFP-DD
  Name    : INNOLIGHT
  Part Number   : T-DP4CNT-NGL
  Rev Number   : 1A
  Serial Number   : INLBFI940027
  PID    : T-DP4CNT-NGL
  VID    : 1A
  Date Code(yy/mm/dd)  : 21/08/21
  Fiber Connector Type: MPO
  Otn Application Code: Not Set
  Sonet Application Code: Not Set
  Ethernet Compliance Code: 400GBASE-DR4
 Transceiver Temperature : 32 Celsius
 AINS Soak               : Running
 AINS Timer              : 0h, 15m
 AINS remaining time     : 771 seconds
```

When the soak time expires, AINS state changes from Running to None. The Transport Admin State of optics controller changes from Automatic In Service to In Service.

```
RP/0/RP0/CPU0:ios# show controllers optics 0/1/0/3
Thu Feb 21 20:02:34.126 UTC
Controller State: Up
 Transport Admin State: In Service
 Laser State: On
 LED State: Green
 Optics Status
```

```
        Optics Type:  Grey optics
        Alarm Status:
        -------------
        Detected Alarms: None
        LOS/LOL/Fault Status:
        Alarm Statistics:
        -------------
        HIGH-RX-PWR = 0            LOW-RX-PWR = 0
        HIGH-TX-PWR = 0            LOW-TX-PWR = 0
        HIGH-LBC = 0               HIGH-DGD = 0
        OOR-CD = 0                 OSNR = 0
        WVL-OOL = 0                MEA  = 0
        IMPROPER-REM = 0
        TX-POWER-PROV-MISMATCH = 0
        Performance Monitoring: Enable
        THRESHOLD VALUES
        ----------------

        Parameter                 High Alarm  Low Alarm  High Warning  Low Warning
        ------------------------  ----------  ---------  ------------  -----------
        Rx Power Threshold(dBm)          4.9      -12.0           0.0          0.0
        Tx Power Threshold(dBm)          3.5      -10.1           0.0          0.0
        LBC Threshold(mA)                N/A        N/A          0.00         0.00
        LBC High Threshold = 98 %
        Polarization parameters not supported by optics
       Total TX Power = 6.41 dBm
       Total RX Power = 5.85 dBm
        Lane  Laser Bias    TX Power    RX Power  Output Frequency
        ----  ----------  ----------  ----------  ----------------
          1      74.9 %    0.60 dBm    0.63 dBm  230.43 THz
          2      68.6 %    0.06 dBm   -0.70 dBm  230.43 THz
          3      69.0 %    0.30 dBm   -0.63 dBm  230.43 THz
          4      69.1 %    0.57 dBm   -0.11 dBm  230.43 THz
Transceiver Vendor Details
        Form Factor             : QSFP28
        Name                    : CISCO-FINISAR
        Part Number             : FTLC1152RGPL-C2
        Rev Number              : CISCO-FINISAR
        Serial Number           : FNS22150LEC
        PID                     : QSFP-100G-CWDM4-S
        VID                     : V02
        CISCO-FINISAR
        Date Code(yy/mm/dd)     : 18/04/11
        Fiber Connector Type: LC
        Sonet Application Code: Not Set
        Ethernet Compliance Code: 100GBASE-CWDM4
Transceiver Temperature : 32 Celsius
AINS Soak               : None
AINS Timer              : 0h, 0m
AINS remaining time     : 0 seconds
```

This example displays the coherentDSP controller statistics with AINS Soak in running state for a 2.4TX card.

```
RP/0/RP0/CPU0:ios#show controllers coherentDSP 0/0/0/7
Port                                          : CoherentDSP 0/0/0/7
Controller State                              : Up
Inherited Secondary State                     : Automatic-In-Service
Configured Secondary State                    : Normal
Derived State                                 : Automatic-In-Service
Loopback mode                                 : None
BER Thresholds                                : SF = 1.0E-5  SD = 1.0E-7
Performance Monitoring                        : Enable
Bandwidth                                     : 800.0Gb/s
Alarm Information:
```

```
LOS = 0 LOF = 0 LOM = 0
OOF = 0 OOM = 0 AIS = 0
IAE = 0 BIAE = 0        SF_BER = 0
SD_BER = 0      BDI = 0 TIM = 1
FECMISMATCH = 0 FEC-UNC = 0     FLEXO_GIDM = 1
FLEXO-MM = 0    FLEXO-LOM = 0   FLEXO-RDI = 1
FLEXO-LOF = 1
Detected Alarms                                 : None
Bit Error Rate Information
PREFEC  BER                                     : 2.95E-04
POSTFEC BER                                     : 0.00E+00
Q-Factor                                        : 10.70 dB
Q-Margin                                        : 4.40 dB
Instantaneous Q-Margin                          : 4.40 dB
TTI :
        Remote hostname                         : chassisA164
        Remote interface                        : CoherentDSP 0/1/0/7
        Remote IP addr                          : 0.0.0.0
FEC mode                                        : Soft-Decision 15
Flexo-Mode                                      : Enable
Flexo Details:
        Tx GID                                  : 1
        TX IID                                  : 1, 2, 3, 4, 5, 6, 7, 8,
        Rx GID                                  : 1
        RX IID                                  : 1, 2, 3, 4, 5, 6, 7, 8,

AINS Soak                                       : Running
AINS Timer                                      : 0h, 20m
AINS remaining time                             : 1196 seconds
```

FEC

Forward Error Correction (FEC) is a method for controlling errors during data transmission that:

- adds data redundancy to the transmitted message using an algorithm, and
- enables the receiver to detect and correct a limited number of errors occurring anywhere in the message, thereby eliminating the need for the transmitter to resend the message.

This feature can be enabled on 1.2T and 2.4T cards. FEC is automatically enabled on the pluggables installed in the NCS 1014.

Note When you upgrade the software of an NCS 1014 with pluggables in the FEC disabled mode, traffic is affected.

FEC states for CoherentDSP controller

This table lists the FEC states for the coherentDSP controllers.

Table 1: FEC state for CoherentDSP controllers

State	Description
EnhancedSD15	FEC Soft-Decision 15. (Default)

Q-Margin support

Q-margin is an important optical parameter that characterizes the health of an optical link. The Q-margin value is calculated based on the average bit error rate (BER) in the optical link.

Enhanced Q-Margin support

Enhanced Q-Margin is supported for Forward Error Correction (FEC) and Performance Monitoring on CoherentDSP controllers for 2.4T cards. Enhanced Q-margin provides a better error free signal in the optical link. The enhanced Q-margin value is calculated based on the maximum number of errors per frame.

An attribute that is called instantaneous Q-margin is displayed in the output of the **show controllers coherentDSP** command. The lower the delta value between the instantaneous Q-margin value with the Q-margin value, the better the FEC performance of the NCS 1014 system.

The instantaneous Q-margin values thus help you to optimize the system with continuous error correction in subsea transport networks.

Configure FEC on the Ethernet controller

Use this task to configure FEC on the CoherentDSP controller.

Procedure

Run the **controller { HundredGigECtrlr | fourHundredGigECtrlr }** *R/S/I/P* **fec { none | standard }** command.

Example:

This sample shows how to configure FEC on the Ethernet controller.

```
RP/0/RP0/CPU0:ios#configure
RP/0/RP0/CPU0:ios(config)#controller HundredGigECtrlr 0/1/0/6/ fec standard
RP/0/RP0/CPU0:ios(config)#commit
```

This sample shows the running FEC configuration on the Ethernet controller.

```
RP/0/RP0/CPU0:BH-SIT2#show controller HundredGigECtrlr 0/1/0/6
Tue Jul 16 15:30:30.165 IST
Operational data for interface HundredGigECtrlr0/1/0/6/2:

State:
    Administrative state: enabled
    Operational state: Down (Reason: State undefined)
    LED state: Red On
    Maintenance: Disabled
    AINS Soak: None
      Total Duration: 0 hour(s) 0 minute(s)
      Remaining Duration: 0 hour(s) 0 minute(s) 0 second(s)
    Laser Squelch: Disabled

Phy:
    Media type: Not known
    Alarms:
        Current:
            Loss of Frequency Sync Data
    Statistics:
        FEC:
```

```
            Corrected Codeword Count: 0
            Uncorrected Codeword Count: 0
Autonegotiation disabled.
Operational values:
    Speed: 100Gbps
    Duplex: Full Duplex
    Flowcontrol: None
    Loopback: None (or external)
    BER monitoring:
        Not supported
    Forward error correction: Standard (Reed-Solomon)
    Holdoff Time: 0ms
```

From Release 24.2.11, the **show controllers** command output displays post FEC BER and pre FEC BER for the Ethernet controllers of the 2.4T and 2.4TX cards.

```
RP/0/RP0/CPU0:ios#show controllers fourHundredGigEctrlr 0/1/0/2
Thu Jan 18 18:58:03.846 UTC
Operational data for interface FourHundredGigECtrlr0/1/0/2:
State:
    Administrative state: enabled
    Operational state: Up
    LED state: Green On
    Maintenance: Disabled
    AINS Soak: None
      Total Duration: 0 hour(s) 0 minute(s)
      Remaining Duration: 0 hour(s) 0 minute(s) 0 second(s)
    Laser Squelch: Disabled
    Insert Idle Ingress: Disabled
    Insert Idle Egress: Disabled
Phy:
    Media type: Not known
    Statistics:
        FEC:
            Corrected Codeword Count: 358543                  Valid: True       Start time: 18:54:03
 Thu Jan 18 2024
            Uncorrected Codeword Count: 0                     Valid: True       Start time: 18:54:03
 Thu Jan 18 2024
        PCS:
            Total BIP errors: 0                               Valid: True       Start time: 18:54:03
 Thu Jan 18 2024
            Total frame errors: 0                             Valid: False      Start time: 18:54:03
 Thu Jan 18 2024
            Total Bad SH: 0                                   Valid: False      Start time: 18:54:03
 Thu Jan 18 2024
Autonegotiation disabled.
Operational values:
    Speed: 400Gbps
    Duplex: Full Duplex
    Flowcontrol: None
    Loopback: None (or external)
    Pre FEC BER: 9.1E-10
    Post FEC BER: 0.0E+00
    BER monitoring:
        Not supported
    Forward error correction: Standard (Reed-Solomon)
    Holdoff Time: 0ms
```

Configure FEC on CoherentDSP controllers

Use this task to configure FEC on the CoherentDSP controller.

Procedure

Run the **controller coherentDSP** *R/S/I/P* **fec** {**EnhancedSD15**} command.

Example:

This sample shows how to configure FEC on the CoherentDSP controller.

```
RP/0/RP0/CPU0:ios#configure
RP/0/RP0/CPU0:ios(config)#controller coherentDSP 0/0/0/0
RP/0/RP0/CPU0:ios(config-CoDSP)#fec EnhancedSD15
Tue Feb 25 11:25:52.670 UTC
WARNING! Changing FEC mode can impact traffic
RP/0/RP0/CPU0:ios(config-CoDSP)#commit
```

Verify FEC on CoherentDSP controllers

This sample shows the FEC configuration on the CoherentDSP controller.

```
RP/0/RP0/CPU0:ios#show controllers coherentDSP 0/0/0/0

Tue Feb 25 11:26:08.235 UTC


Port                                          : CoherentDSP 0/0/0/0
Controller State                              : Up
Inherited Secondary State                     : Normal
Configured Secondary State                    : Normal
Derived State                                 : In Service
Loopback mode                                 : None
BER Thresholds                                : SF = 1.0E-5  SD = 1.0E-7
Performance Monitoring                        : Enable
Bandwidth                                     : 50.0Gb/s
Alarm Information:
LOS = 1 LOF = 0 LOM = 0
OOF = 0 OOM = 0 AIS = 0
IAE = 0 BIAE = 0        SF_BER = 0
SD_BER = 0      BDI = 0 TIM = 0
FECMISMATCH = 0 FEC-UNC = 0
Detected Alarms                               : None
Bit Error Rate Information
PREFEC  BER                                   : 0.00E+00
POSTFEC BER                                   : 0.00E+00
Q-Factor                                      : 0.00 dB
Q-Margin                                      : -5.00dB
Instantaneous Q_margin                      :  0 dB
TTI :
Remote IP addr                                : 0.0.0.0
FEC mode                                      : Soft-Decision 15

AINS Soak                                     : None
AINS Timer                                    : 0h, 0m
```

```
AINS remaining time                          : 0 seconds
```

Laser squelching

You can enable laser squelching on Ethernet controllers. Laser squelching can be enabled on QXP, 1.2T, 2.4T, and 2.4T-X cards which shuts down the laser in the event of trunk faults (LOS, LOF), and a SQUELCHED alarm is raised on the mapped client port.

Laser squelching uses an interrupt based method. Therefore, squelching occurs faster than in previous releases.

Beyond trunk faults, squelching occurs in 1.2T cards, for the client alarms Ingress LF, LOA, and CSF (ingress only).

Configure laser squelching

Enable or disable the laser squelch feature for specific optical cards, enhancing operational control and safety.

Laser squelch disables the laser output on designated ports/faults to prevent unwanted signal transmission during error conditions or maintenance.

Procedure

Step 1 Configure laser squelching for the desired card type:

For 1.2T cards, enter **controller HundredGigECtrlr** *Rack/Slot/Instance/Port/Lane* **laser-squelch** command.

For 2.4T or 2.4TX cards, enter **controller HundredGigECtrlr** | **controller fourHundredGigECtrlr** *Rack/Slot/Instance/Port/Lane* **laser-squelch** command.

Example:

This is a sample where laser squelching is enabled on the Ethernet controller of a 2.4T card and a 2.4TX card.

```
RP/0/RP0/CPU0:ios#configure
RP/0/RP0/CPU0:ios(config)#controller fourHundredGigECtrlr 0/1/0/1
RP/0/RP0/CPU0:ios(config-eth-ctrlr)#laser-squelch
RP/0/RP0/CPU0:ios(config-eth-ctrlr)#commit
```

This is a sample to view the laser squelch status on the controller of a 2.4T card and a 2.4TX card.

Example:

Note
In case of muxponder configuration on the 2.4T-X card, and if laser squelch is configured on the split port, whenever a fault is received on any one trunk, the corresponding split port will be squelched.

Step 2 Verify the laser squelch status on the controller of a 2.4T card or a 2.4TX card.

Example:

```
RP/0/RP0/CPU0:ios#show controllers fourHundredGigEctrlr 0/0/0/4
Fri Nov 17 14:26:43.213 UTC
Operational data for interface FourHundredGigECtrlr0/0/0/4:
```

```
State:
    Administrative state: enabled
    Operational state: Up
    LED state: Green On
    Maintenance: Disabled
    AINS Soak: Running
      Total Duration: 0 hour(s) 5 minute(s)
      Remaining Duration: 0 hour(s) 3 minute(s) 34 second(s)
    Laser Squelch: Enabled
    Insert Idle Ingress: Disabled
    Insert Idle Egress: Disabled

Phy:
    Media type: Not known
    Statistics:
        FEC:
            Corrected Codeword Count: 580070472              Valid: False      Start time: 13:12:29
 Fri Nov 17 2023
            Uncorrected Codeword Count: 0                    Valid: False      Start time: 13:12:29
 Fri Nov 17 2023
        PCS:
            Total BIP errors: 0                              Valid: False      Start time: 13:12:29
 Fri Nov 17 2023
            Total frame errors: 0                            Valid: False      Start time: 13:12:29
 Fri Nov 17 2023
            Total Bad SH: 0                                  Valid: False      Start time: 13:12:29
 Fri Nov 17 2023

Autonegotiation disabled.

Operational values:
    Speed: 400Gbps
    Duplex: Full Duplex
    Flowcontrol: None
    Loopback: None (or external)
    BER monitoring:
        Not supported
    Forward error correction: Standard (Reed-Solomon)
    Holdoff Time: 0ms
```

Laser squelching is enabled on the specified optical card(s). The system disables laser output in response to faults or based on maintenance needs.

Protection switching use cases for Fast-Squelching

Table 2: Feature History

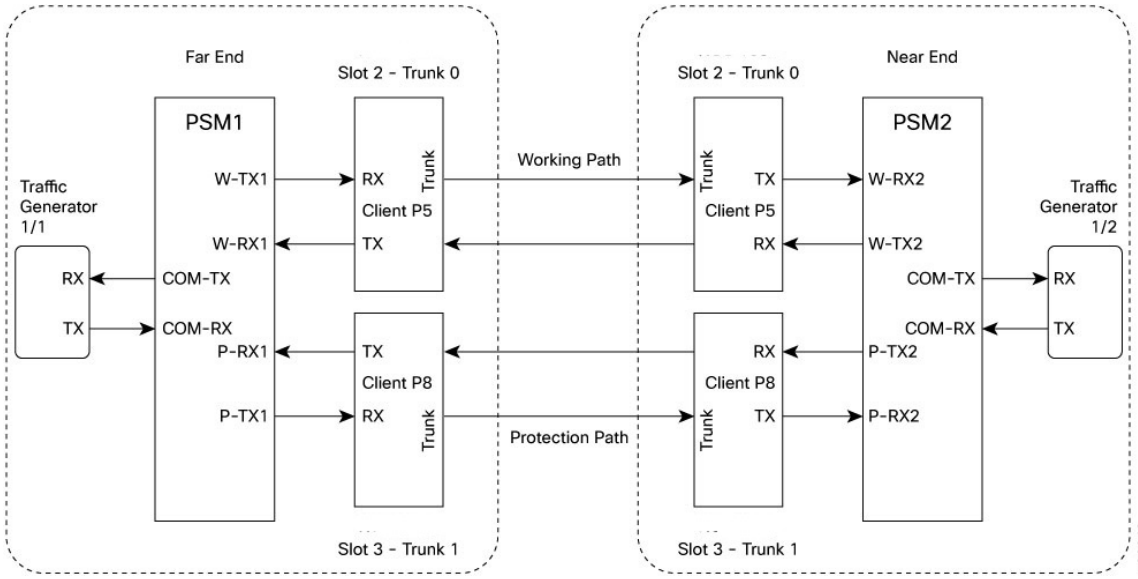
Feature Name	Release Information	Description
Client side PSM support for NCS1K14-2.4T-K9 and NCS1K14-2.4T-X-K9 cards configured with fast -squelching	Cisco IOS-XR Release 26.2.1	In addition to the NCS1K4-1.2T-K9 cards, now protection switching is supported on NCS1K14-2.4T-K9, and NCS1K14-2.4T-X-K9 cards with the client pluggables QDD-400G-FR4-S and the QDD-400G-LR4-S pluggables that are configured with fast-squelching. The supported datapath configurations for NCS1K14-2.4T-K9 and NCS1K14-2.4T-X-K9 cards include: • Slice mode (only for 400GE client rate) • Bundle mode configuration This update enhances network reliability by providing automated failover and signal protection for 2.4T and 2.4T-X cards, ensuring consistent uptime for high-bandwidth services.

When implementing protection switching in NCS 1014 deployments that have Fast-Squelching configured, fast-squelching increases protection switching speed during trunk or client faults.

Note Protection Switching is supported on 1.2T cards and not supported on 2.4T line cards.

This sample topology includes a Far End station (FE station) and a Near End station (NE station). Each station includes an NCS 1014 node with two line cards. The nodes are connected to the respective traffic generators through a Protection Switching Module (PSM).

Figure 1: Reference topology for protection Switching



Protection switching principle (Trunk fault)

If there is a fiber cut in the trunk working path from the FE station to the NE station, an LOS alarm is raised on the NE working trunk. This results in the squelching of all client ports mapped to the working NE trunk port. As the laser of the client port is squelched, LOS is reported on the W-RX2 port of the PSM2. As the received optical power on the W-RX2 port of PSM is below the threshold, PSM2 switches to receive the optical signal in the P-RX2 port instead of the W-RX2 port. Hence switching happens for traffic from work to protect in FE station to NE station direction.

In the case of a unidirectional trunk fault, switching happens in one direction as explained above. In the other direction, when LOS is received at the W-RX2 port of PSM2, W-TX2 sends LOS for 25 milliseconds. When LOS is reported on the NE client port, fault gets propagated over the trunk, resulting in the squelching of FE station client ports. Finally, the LOS on the PSM port results in switching in this direction as well. In this way, bidirectional switching is implemented.

Protection switching principle (Client fault)

When a client failure happens on the FE station, a Client Signal Failure (CSF) alarm is raised on the NE station trunk. The CSF on the trunk results in the squelching of the corresponding client port, and the PSM switching happens. In summary, a fault on the NE station client RX port results in CSF on the FE station trunk, and the switching happens. And, a fault on the NE station client TX port results in LOS on the PSM ports, and the switching happens.

Guidelines and limitations:

- PSM must be in the standalone mode.
- PSM alarm threshold must be set to +/ –3 dBm from the actual power received in the PSM RX port.
- If line card protection is required, the working and protect path must be configured in two different line cards.
- If only client protection is required, the working and protection path can be configured in the same line card.

- If the LC trunk configuration is x50 rate, then you cannot use a single line card for work and protection due to x50 coupled mode limitations (coupled trunk)..
- Manual switch, force switch, and lock-out protection on PSM result in bidirectional switching.

Hold-off timer

When a fault occurs on the trunk port, you can hold the propagation of local faults using the hold-off time feature. This feature is can be enabled on the Ethernet controllers of 1.2T and 2.4T 1.2T, 2.4T, 2.4Tx, and QXP-K9 1.2T, 2.4T, 2.4Tx, QXP, and 2-QDD-C cards by configuring the hold-off timer.

When the fault occurs on the trunk, idles are inserted in the traffic stream from the trunk port to the client port for the duration of the configured holdoff-time. If the trunk port remains faulty beyond the configured holdoff-time, a local fault is transmitted towards the client device. If the trunk recovers from the fault before the holdoff-time expires, traffic resumes.

This feature can be used on customer deployments to prevent reset of client ports during a PSM switchover.

Configure holdoff-time on QXP Card

Use this task to configure holdoff-time on 100GE or 400GE controllers for the QXP card.

Procedure

Step 1 Run the **controller HundredGigECtrlr** *Rack/Slot/Instance/Port* **holdoff-time trunk-fault** *time-value* command to configure holdoff-time on the 100GE controllers for the QXP card.

The range of *timevalue* is from 0 ms to 3000 ms.

Example:

This is a sample where holdoff-time is enabled on the 100GE controller for the QXP card.

```
RP/0/RP0/CPU0:ios#configure
RP/0/RP0/CPU0:ios(config)#controller HundredGigECtrlr 0/1/0/1
RP/0/RP0/CPU0:ios(config-eth-ctrlr)#holdoff-time trunk-fault 3000
RP/0/RP0/CPU0:ios(config-eth-ctrlr)#commit
```

Example:

This is a sample to view the holdoff-time status on the 100GE controller.

```
RP/0/RP0/CPU0:ios#show controller hundredGigECtrlr 0/1/0/1
Fri Jul 23 16:07:11.541 UTC
Operational data for interface HundredGigECtrlr0/1/0/1:

State:
    Administrative state: enabled
    Operational state: Up
    LED state: Green On
    Maintenance: Disabled
    AINS Soak: None
      Total Duration: 0 hour(s) 0 minute(s)
```

```
      Remaining Duration: 0 hour(s) 0 minute(s) 0 second(s)
    Laser Squelch: Enabled

Phy:
    Media type: Not known
Statistics:
FEC:
Corrected Codeword Count: 134967789
Uncorrected Codeword Count: 0

Autonegotiation disabled.

Operational values:
    Speed: 100Gbps
    Duplex: Full Duplex
    Flowcontrol: None
    Loopback: None (or external)
    BER monitoring:
        Not supported
        Forward error correction: Standard (Reed-Solomon)
    Holdoff Time: 3000ms
```

Step 2 Run the **controller fourHundredGigECtrlr** *Rack/Slot/Instance/Port* **holdoff-time trunk-fault** *time-value* command to configure holdoff-time on the 400GE controllers for the QXP card.

Example:

This is a sample where holdoff-time is enabled on the 400GE controller for the NCS1K4-QXP-K9 card.

```
RP/0/RP0/CPU0:ios#configure
RP/0/RP0/CPU0:ios(config)#controller fourHundredGigECtrlr 0/0/0/10
RP/0/RP0/CPU0:ios(config-eth-ctrlr)#holdoff-time trunk-fault 2000
RP/0/RP0/CPU0:ios(config-eth-ctrlr)#commit
```

Example:

This is a sample to view the holdoff-time status on the 400GE controller.

```
RP/0/RP0/CPU0:ios#show controller fourhundredGigECtrlr 0/0/0/10
Fri Jul 23 16:07:11.541 UTC
Operational data for interface fourHundredGigECtrlr0/0/0/10:

State:
    Administrative state: enabled
    Operational state: Up
    LED state: Green On
    Maintenance: Disabled
    AINS Soak: None
      Total Duration: 0 hour(s) 0 minute(s)
      Remaining Duration: 0 hour(s) 0 minute(s) 0 second(s)
    Laser Squelch: Enabled

Phy:
    Media type: Not known
Statistics:
FEC:
Corrected Codeword Count: 134967789
Uncorrected Codeword Count: 0

Autonegotiation disabled.

Operational values:
```

```
Speed: 400Gbps
Duplex: Full Duplex
Flowcontrol: None
Loopback: None (or external)
BER monitoring:
    Not supported
    Forward error correction: Standard (Reed-Solomon)
Holdoff Time: 2000ms
```

Idle Insertion for Ethernet controllers

Idle insertion for Ethernet controllers feature allows you to perform end-to-end link verification between 100GE or 400GE or Ethernet controllers before bringing up the actual traffic. This feature enables you to perform pre-provisioning checks to isolate link errors in advance without any Ethernet testers.

Note OTU4 client rate is not supported.

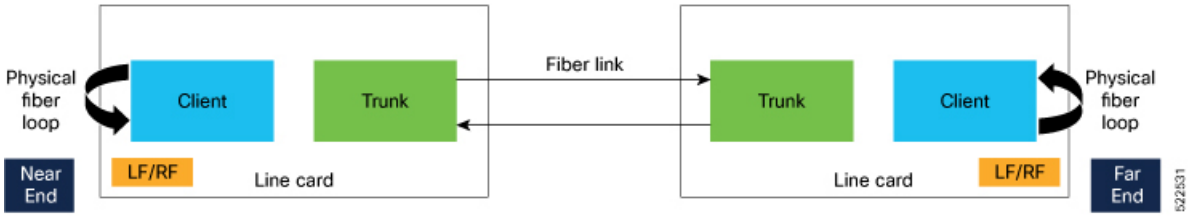
Idle frames can be inserted in both the ingress and egress directions on Ethernet controllers and the LOCAL-FAULT and REMOTE-FAULT alarms are cleared. The performance monitoring counters on the pcs layer are monitored to check for any errors on the link.

Note Do not configure the Idle insertion for Ethernet controllers feature on the link that carries live traffic.

Recommended topology for link verification

This diagram describes the recommended topology for link verification.

Figure 2: Topology for link verification



These steps describe the sequence for link verification using this topology:

1. Both the near-end and far-end clients have the LOCAL-FAULT alarm if the trunk is up on both the ends.
2. Enable idle ingress on the near-end client. The idle frame transmits toward the trunk link and reaches the far-end client. The LOCAL-FAULT alarm is then cleared on the far-end client.
3. As the far-end client has fiber loop, the idle frame is inserted again into the same client RX toward the trunk link and reaches the near-end client. The LOCAL-FAULT alarm is then cleared on the near-end client as well.

4. When you enable idle insertion on any client and in any direction, the idle frame transmits in loop similar to this topology and all the LOCAL-FAULT and the REMOTE-FAULT alarms are cleared.
5. The link can be monitored after all the alarms are cleared. The link has a problem if any alarm is reported during the link test.

Configure idle insertion on Ethernet controllers

Use this task to configure or disable idle insertion on Ethernet controllers.

Note Do not configure idle frame insertion with hold-off timer.

Procedure

Step 1 Run the **controller hundredGigECtrlr** *Rack/Slot/Instance/Port/***insert-idle ingressinsert-idle egress** command to enable this feature.

Example:

This is a sample for enabling the idle ingress and idle egress in 100GE controllers.

```
RP/0/RP0/CPU0:ios#configure
RP/0/RP0/CPU0:ios(config)#controller hundredGigECtrlr 0/2/0/2
RP/0/RP0/CPU0:ios(config-eth-ctrlr)#insert-idle ingress
RP/0/RP0/CPU0:ios(config-eth-ctrlr)#insert-idle egress
RP/0/RP0/CPU0:ios(config-eth-ctrlr)#commit
RP/0/RP0/CPU0:ios(config-eth-ctrlr)#end
```

Step 2 Run the **controller hundredGigECtrlr** *Rack/Slot/Instance/Port***no insert-idle ingressno insert-idle egress** command to disable this feature.

After disabling the idle frame insertion feature, the LOCAL-FAULT or REMOTE-FAULT alarm may not appear again because the idle frames are in loop. Hence, you must break the idle frame loop in the link by performing either one of the following.

These are the limitations:

- Perform fiber OIR on either the near-end or far-end client port.
- Perform shut and unshut operation on any client port.

Verify idle insertion configuration for Ethernet controllers

Use this task to verify idle insertion for Ethernet controllers.

Note Do not configure idle frame insertion with hold-off timer.

Procedure

Run the **show controllers hundredGigECtrlr** *Rack/Slot/Instance/Port* command to verify the *idle ingress* and *idle egress* that is configured on the Ethernet controllers of a 1.2T card.

Example:

This is a sample to verify idle insertion for 800GE controllers.

Example:

This is a sample to verify idle insertion for 100GE controllers.

```
RP/0/RP0/CPU0:ios#show controllers hundredGigECtrlr 0/2/0/2
Wed Mar 30 06:56:58.878 UTC
Operational data for interface HundredGigECtrlr0/2/0/2:
State:
    Administrative state: enabled
    Operational state: Up
    LED state: Green On
    Maintenance: Disabled
    AINS Soak: None
      Total Duration: 0 hour(s) 0 minute(s)
      Remaining Duration: 0 hour(s) 0 minute(s) 0 second(s)
    Laser Squelch: Disabled

    Insert Idle Ingress: Enabled
    Insert Idle Egress: Enabled

Phy:
    Media type: Not known
    Statistics:
        FEC:
            Corrected Codeword Count: 0
            Uncorrected Codeword Count: 0
Autonegotiation disabled.
Operational values:
    Speed: 100Gbps
    Duplex: Full Duplex
    Flowcontrol: None
    Loopback: None (or external)
    BER monitoring:
        Not supported
    Forward error correction: Standard (Reed-Solomon)
    Holdoff Time: 0ms
```

FlexO GID and IID

The 2.4T and 2.4TX cards use are equipped with flexible OTN (flexO) interfaces on their trunk ports. These flexO interfaces enable the efficient and interoperable transport of OTU signals by aggregating multiple standard lower-rate interfaces.

Each group of flexO interfaces is assigned a unique flexO group identification (GID) number, which can range from 1 to 1,048,576. Within each group, individual interfaces are identified by a flexO instance identification (IID) number. Note that the IID for each member is fixed and cannot be modified.

Configure FlexO GID and IID

Use this task to configure flexO GID and IID on the coherentDSP controller.

Procedure

Step 1 Run the **configure** command to enter the global configuration mode.

Example:

This sample shows how to configure flexO GID on the CoherentDSP controller.

```
RP/0/RP0/CPU0:ios#configure terminal
Mon Feb  5 05:14:42.919 UTC
RP/0/RP0/CPU0:ios(config)#controller coherentDSP 0/0/0/0
RP/0/RP0/CPU0:ios(config-CoDSP)#flexo gid 1048575
RP/0/RP0/CPU0:ios(config-CoDSP)#commit
```

Step 2 Run the **show controllers** command to verify the configuration.

Example:

This sample shows the flexO GID configuration on the CoherentDSP controller.

```
RP/0/RP0/CPU0:ios#show controllers coherentDSP 0/0/0/0
Mon Feb  5 05:20:01.660 UTC

Port                                        : CoherentDSP 0/0/0/0
Controller State                            : Up
Inherited Secondary State                   : Normal
Configured Secondary State                  : Normal
Derived State                               : In Service
Loopback mode                               : None
BER Thresholds                              : SF = 1.0E-5  SD = 1.0E-7
Performance Monitoring                      : Enable
Bandwidth                                   : 1200.0Gb/s

Alarm Information:
LOS = 1 LOF = 0 LOM = 0
OOF = 0 OOM = 0 AIS = 0
IAE = 0 BIAE = 0        SF_BER = 0
SD_BER = 0      BDI = 0 TIM = 0
FECMISMATCH = 0 FEC-UNC = 1     FLEXO_GIDM = 0
FLEXO-MM = 0    FLEXO-LOM = 0   FLEXO-RDI = 0
FLEXO-LOF = 0
```

```
Detected Alarms                                 : None

Bit Error Rate Information
PREFEC  BER                                     : 1.23E-02
POSTFEC BER                                     : 0.00E+00
Q-Factor                                        : 7.00 dB

Q-Margin                                        : 0.80 dB

Instantaneous Q-Margin                          : 0.80 dB

TTI :
        Remote hostname                         : ios
        Remote interface                        : CoherentDSP 0/0/0/7
        Remote IP addr                          : 0.0.0.0

FEC mode                                        : Soft-Decision 15

Flexo-Mode                                      : Enable
Flexo Details:
        Tx GID                                  : 1
        TX IID                                  : 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12,
        Rx GID                                  : 1
        RX IID                                  : 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12,

AINS Soak                                       : None
AINS Timer                                      : 0h, 0m
AINS remaining time                             : 0 seconds
```

Step 3 Run the **commit** command to apply the changes.

LLDP Drop

Link Layer Discovery Protocol (LLDP) Snooping is enabled by default on all ethernet controllers.

Note LLDP drop feature is not supported on NCS1K14-2.4T-K9, NCS1K14-2.4T-X-K9, and NCS1K4-QXP-K9 line cards.

Configure LLDP drop

Use this task to configure the LLDP Drop for a muxponder or muxponder slice. By default, the LLDP drop status is set to False. On enabling the LLDP Drop, the status is set to True.

Procedure

Step 1 Run the **hw-module location** *location* **mxponder drop-lldp** command to configure LLDP drop on a muxponder.

Example:

```
RP/0/RP0/CPU0:ios#configure
RP/0/RP0/CPU0:ios#hw-module location 0/1 mxponder drop-lldp
```

Note
Use the **no** form of the command to disable LLDP drop.

Limitation

- When you disable LLDP globally, the LLDP gets disabled on all the interfaces.

Note
By default, LLDP is enabled for NCS 1014. But when you enable and disable LLDP in the global configuration mode, LLDP gets disabled on all the interfaces.

Workaround : You must enable LLDP globally or reload the Router.

Step 2 Run the **hw-module location** *location* **mxponder-slice** *slice-number* **drop-lldp** command to configure LLDP drop on a muxponder slice.

Example:

This sample shows slice 0 client ports enabled with LLDP drop.

```
RP/0/RP0/CPU0:ios#configure
RP/0/RP0/CPU0:ios(config)#hw-module location 0/1 mxponder-slice 0 drop-lldp
```

Step 3 Run the **commit** command to apply the changes.

Example:

```
RP/0/RP0/CPU0:ios#commit
```

Verify the LLDP Drop status and LLPD neighbours

Use this task to verify the LLDP drop status and LLDP neighbours status.

Procedure

Step 1 Run the **hw-module location** *location* **mxponder** command to verify the LLDP Drop status.

Example:

```
RP/0/RP0/CPU0:ios#show hw-module location all mxponder
Fri Feb 22 13:22:19.281 UTC
Location:             0/0
Client Bitrate:       NONE
Trunk  Bitrate:       NONE
Status:               Not Provisioned
Location:             0/1
Slice ID:             0
Client Bitrate:       100GE
Trunk  Bitrate:       500G
```

```
Status:               Provisioned  LLDP Drop Enabled: FALSE
Client Port                       Mapper/Trunk Port          CoherentDSP0/1/0/0
Traffic Split Percentage
HundredGigECtrlr0/1/0/2/1           ODU40/1/0/0/1/2                      100
HundredGigECtrlr0/1/0/3/2           ODU40/1/0/0/1/4                      100
HundredGigECtrlr0/1/0/4/3           ODU40/1/0/0/2/3                      100
HundredGigECtrlr0/1/0/5/4           ODU40/1/0/0/3/2                      100
HundredGigECtrlr0/1/0/6/4           ODU40/1/0/0/4/1                      100
Location:             0/1
Slice ID:             1
Client Bitrate:       100GE
Trunk  Bitrate:       500G
Status:               Provisioned
LLDP Drop Enabled:    FALSE
Client Port                       Mapper/Trunk Port          CoherentDSP0/1/0/1
Traffic Split Percentage
HundredGigECtrlr0/1/0/1/2           ODU40/1/0/1/1/1                      100
HundredGigECtrlr0/1/0/4/3           ODU40/1/0/1/1/2                      100
HundredGigECtrlr0/1/0/1/3          ODU40/1/0/1/2/3                      100
HundredGigECtrlr0/1/0/3/2          ODU40/1/0/1/3/4                      100
HundredGigECtrlr0/1/0/3/4          ODU40/1/0/1/4/5                      100
Location:             0/2
Slice ID:             0
Client Bitrate:       100GE
Trunk  Bitrate:       500G
Status:               Provisioned
LLDP Drop Enabled: FALSE
Client Port                       Mapper/Trunk Port          CoherentDSP0/2/0/0
Traffic Split Percentage
HundredGigECtrlr0/2/0/2         ODU40/2/0/0/1                      100
HundredGigECtrlr0/2/0/3         ODU40/2/0/0/1                      100
HundredGigECtrlr0/2/0/4         ODU40/2/0/0/2                      100
HundredGigECtrlr0/2/0/5         ODU40/2/0/0/3                      100
HundredGigECtrlr0/2/0/6         ODU40/2/0/0/4                      100
Location:             0/2
Slice ID:             1
Client Bitrate:       100GE
Trunk  Bitrate:       500G
Status:               Provisioned
LLDP Drop Enabled:    FALSE
Client Port                       Mapper/Trunk Port          CoherentDSP0/2/0/1
Traffic Split Percentage
HundredGigECtrlr0/2/0/1/2           ODU40/2/0/1/0/1                      100
HundredGigECtrlr0/2/0/4/3           ODU40/2/0/1/1/1                      100
HundredGigECtrlr0/2/0/1/2          ODU40/2/0/1/2/2                      100
HundredGigECtrlr0/2/0/3/2          ODU40/2/0/1/3/4                      100
HundredGigECtrlr0/2/0/3/1          ODU40/2/0/1/4/2                      100
Location:             0/3
Slice ID:             0
Client Bitrate:       100GE
Trunk  Bitrate:       300G
Status:               Provisioned
LLDP Drop Enabled: TRUE
Client Port                       Mapper/Trunk Port          CoherentDSP0/3/0/0
Traffic Split Percentage
HundredGigECtrlr0/3/0/2/1           ODU40/3/0/0/0/2                      100
HundredGigECtrlr0/3/0/3/2           ODU40/3/0/0/1/1                      100
HundredGigECtrlr0/3/0/4/1           ODU40/3/0/0/2/3                      100
```

Step 2 Run the **show lldp neighbors detail** and **show lldp neighbors** commands to verify the LLDP neighbor details.

Example:

```
RP/0/RP0/CPU0:ios#show lldp neighbors detail
Tue Mar 12 11:49:20.819 IST
Capability codes:
(R) Router, (B) Bridge, (T) Telephone, (C) DOCSIS Cable Device
(W) WLAN Access Point, (P) Repeater, (S) Station, (O) Other
 ------------------------------------------------
Local Interface: HundredGigECtrlr0/1/0/6/4
Chassis id: 008a.96cd.34e1
Port id: Hu0/0/0/4
Port Description - not advertised
System Name: ncs5500_node

System Description:
6.1.4, NCS-5500

Time remaining: 116 seconds
Hold Time: 120 seconds
System Capabilities: R
Enabled Capabilities: R
Management Addresses - not advertised
Peer MAC Address: 00:8a:96:cd:34:10

 ------------------------------------------------
Local Interface: HundredGigECtrlr0/1/0/1/2
Chassis id: 008a.96cd.34e1
Port id: Hu0/0/0/5
Port Description - not advertised
System Name: ncs5500_node

System Description:
6.1.4, NCS-5500
Time remaining: 90 seconds
Hold Time: 120 seconds
System Capabilities: R
Enabled Capabilities: R
Management Addresses - not advertised
Peer MAC Address: 00:8a:96:cd:34:14
Total entries displayed: 2
```

```
RP/0/RP0/CPU0:ios#show lldp neighbors
Tue Mar 12 16:17:56.713 IST
Capability codes:
(R) Router, (B) Bridge, (T) Telephone, (C) DOCSIS Cable Device
(W) WLAN Access Point, (P) Repeater, (S) Station, (O) Other
Device ID       Local Intf            Hold-time  Capability     Port ID
ncs5500_node    HundredGigECtrlr0/1/0/6/4  120        R              Hu0/0/0/4
ncs5500_node    HundredGigECtrlr0/1/0/1/2 120        R              Hu0/0/0/5

Total entries displayed: 2
```

When you enable LLDP drop on the client controller ports of the muxponder or muxponder slice, the LLDP frames drop on the ports without forwarding.

Note
LLDP on 400GE is not supported on the OTN-XP card.

Link Layer Discovery Protocol (LLDP) support on management interface

The LLDP can be configured on management interface of 1.2T, 2.4T, and 2.4TX cards. It requires a system to form LLDP neighborship over the system management interface, through which it advertises and learns LLDP neighbor information. This information about neighbors is used to learn about the neighbors and in turn the topology of the devices for Operations, Administration, and Maintenance (OAM) purposes.

Advantages of LLDP

- Provides support on non-Cisco devices.
- Enables neighbor discovery between non-Cisco devices.

Limitation

- When you disable LLDP globally, the LLDP gets disabled on all the interfaces.

Note By default, LLDP is enabled for NCS 1014. But when you enable and disable LLDP in the global configuration mode, LLDP gets disabled on all the interfaces.

Workaround : You must enable LLDP globally or reload the Router.

Cisco Discovery Protocol (CDP) vs LLDP

The CDP is a device discovery protocol that runs over Layer 2. Layer 2 is also known as the data link layer that runs on all Cisco devices, such as routers, bridges, access servers, and switches. This protocol allows the network management applications to automatically discover and learn about other Cisco devices that connect to the network.

The LLDP is also a device discovery protocol that runs over Layer 2. This protocol allows the network management applications to automatically discover and learn about other non-Cisco devices that connect to the network.

Interoperability between non-Cisco devices using LLDP

LLDP is also a neighbor discovery protocol that is used by network devices to advertise information about themselves to other devices on the network. This protocol runs over the data link layer, which allows two systems running different network layer protocols to learn about each other.

With LLDP, the user can also access the information about a particular physical network connection. If the user uses a non-Cisco monitoring tool (through SNMP), LLDP helps you identify the Object Identifiers (OIDs) that the system supports. The following OIDs are supported:

- 1.0.8802.1.1.2.1.4.1.1.4
- 1.0.8802.1.1.2.1.4.1.1.5
- 1.0.8802.1.1.2.1.4.1.1.6
- 1.0.8802.1.1.2.1.4.1.1.7
- 1.0.8802.1.1.2.1.4.1.1.8

- 1.0.8802.1.1.2.1.4.1.1.9
- 1.0.8802.1.1.2.1.4.1.1.10
- 1.0.8802.1.1.2.1.4.1.1.11
- 1.0.8802.1.1.2.1.4.1.1.12

Neighbor discovery

System advertises the LLDP TLV (Type Length Value) details over the management network using which other devices in the management network can learn about this device.

Configuring LLDP

- LLDP full stack functionality is supported on all three management interfaces supported in NCS 1014.
- You can selectively enable or disable LLDP on any of the management interfaces on demand.
- You can selectively enable or disable LLDP transmit or receive functionality at the management interface level.
- Information gathered using LLDP can be stored in the device Management Information Database (MIB) and queried with the Simple Network Management protocol (SNMP).
- LLDP operational data are available in both Command Line Interface and netconf-yang interface.

Enabling LLDP globally

When you enable LLDP globally, all interfaces that support LLDP are automatically enabled for both transmit and receive operations.

Note You can override this default operation at the interface to disable receive or transmit operations.

This table describes the global LLDP attributes that the user can configure:

Table 3: Global LLDP attributes

Attribute	Default	Range	Description
Holdtime	120	0–65535	Specifies the hold time (in sec). Hold time refers to the time or duration that an LLDP device maintains the neighbor information before discarding.
Reinit	2	2–5	Delay (in sec) for LLDP initialization on any interface
Timer	30	5-65534	Specifies the rate at which LLDP packets are sent (in sec)

Debugging LLDP issues

These commands are used for debugging issues in the LLDP functionality.

- **show lldp traffic**
- **debug lldp all**
- **debug lldp errors**
- **debug lldp events**
- **debug lldp packets**
- **debug lldp tlvs**
- **debug lldp trace**
- **debug lldp verbose**

Configure LLDP

Use this task to configure LLDP globally.

Before you begin

- LLDP full stack functionality is supported on all three management interfaces supported in NCS 1014.
- You can selectively enable or disable LLDP on any of the management interfaces on demand.
- You can selectively enable or disable LLDP transmit or receive functionality at the management interface level.
- Information gathered using LLDP can be stored in the device Management Information Database (MIB) and queried with the Simple Network Management protocol (SNMP).
- LLDP operational data are available in both Command Line Interface and netconf-yang interface.

Procedure

Run the `configure terminal` command to enter the configuration mode.

Example:

This example shows the commands to configure LLDP globally. The global LLDP configuration enables LLDP on all the three management interfaces.

```
RP/0/RP0/CPU0:regen#configure terminal
RP/0/RP0/CPU0:regen(config)#lldp management enable
RP/0/RP0/CPU0:regen(config)#lldp holdtime 30
RP/0/RP0/CPU0:regen(config)#lldp reinit 2
RP/0/RP0/CPU0:regen(config)#commit
```

Example:

This example shows the commands to configure LLDP at the management interface level.

```
RP/0/RP0/CPU0:ios(config)#interface mgmtEth 0/RP0/CPU0/X
RP/0/RP0/CPU0:ios(config-if)#lldp enable
RP/0/RP0/CPU0:ios(config-if)#commit
```

Example:

This example shows the commands to disable the LLDP transmit operations at the specified management interface.

```
RP/0/RP0/CPU0:ios(config)#interface mgmtEth 0/RP0/CPU0/X
RP/0/RP0/CPU0:ios(config-if)#lldp transmit disable
RP/0/RP0/CPU0:ios(config-if)#commit
```

Example:

This example shows the commands to disable the LLDP receive operations at the specified management interface.

```
RP/0/RP0/CPU0:ios(config)#interface mgmtEth 0/RP0/CPU0/X
RP/0/RP0/CPU0:ios(config-if)#lldp receive disable
RP/0/RP0/CPU0:ios(config-if)#commit
```

Verify LLDP configuration

Use this task to verify LLDP configuration.

Procedure

Step 1 Run the **show running-config lldp** command to verify the LLDP configuration.

Example:

```
RP/0/RP0/CPU0:regen#show running-config lldp
Tue Dec 10 10:36:11.567 UTC
lldp
timer 30
reinit 2
holdtime 120
management enable
!
```

Step 2 Run the **show lldp interface** and **show lldp neighbors** commands to verify the LLDP data.

Example:

```
RP/0/RP0/CPU0:regen#show lldp interface
Thu Nov  7 08:45:22.934 UTC
MgmtEth0/RP0/CPU0/0:
        Tx: enabled
        Rx: enabled
        Tx state: IDLE
        Rx state: WAIT FOR FRAME
MgmtEth0/RP0/CPU0/1:
        Tx: enabled
        Rx: enabled
        Tx state: IDLE
        Rx state: WAIT FOR FRAME
```

Example:

```
RP/0/RP0/CPU0:M-131#show lldp neighbors
Mon Dec  2 11:01:20.143 CET
Capability codes:
        (R) Router, (B) Bridge, (T) Telephone, (C) DOCSIS Cable Device
        (W) WLAN Access Point, (P) Repeater, (S) Station, (O) Other
Device ID       Local Intf              Hold-time  Capability     Port ID
[DISABLED]      MgmtEth0/RP0/CPU0/0     120        B               gi19
MYS-130         MgmtEth0/RP0/CPU0/1     120        R               MgmtEth0/RP0/CPU0/1
```

where [DISABLED] shows that the LLDP is disabled on the interface MgmtEth0/RP0/CPU0/0.

When you enable LLDP drop on the client controller ports of the muxponder or muxponder slice, the LLDP frames drop on the ports without forwarding.

Note
LLDP on 400GE is not supported on the OTN-XP card.

MAC address snooping on client ports

A MAC address snooping on client ports feature is a network monitoring capability that:

- learns the MAC address of the connected neighbor on 1.2T cards at client ports
- enables ARP snooping across all client ports through CLI, and
- helps overcome environments where LLDP cannot be used for neighbor discovery.

This feature overcomes the limitation, where LLDP (Link Layer Discovery protocol) cannot be enabled in some networks.

Limitations

- When you enable or disable MAC address snooping on any slice, few packets are dropped during configuration.
- Open config interface for enabling or disabling MAC address snooping is not supported.
- SNMP MIB is not supported for the MAC address attribute.

Note When you enable MAC address snooping on client ports, it overrides LLDP.

Configure MAC address snooping on client ports

Use this task to configure MAC address or ARP snoop on slice in muxponder slice mode.

Procedure

Run the **hw-module location** *location* **mxponder-slice** *slice-number* **client-rate 100GE trunk-rate 600G { 100G | 150G | 200G | 250G | 300G | 350G | 400G | 450G | 500G | 550G | 600G } arp-snoop** command.

Example:

This is a sample in which, MAC address or ARP snoop is configured on the client ports of slice 0 in Muxponder slice mode.

```
RP/0/RP0/CPU0:ios#configure
Mon Mar 16 19:30:33.933 UTC
RP/0/RP0/CPU0:ios(config)#hw-module location 0/3/nxr0 mxponder-slice 0
RP/0/RP0/CPU0:ios(config-hwmod-mxp)#client-rate 100GE
RP/0/RP0/CPU0:ios(config-hwmod-mxp)#trunk-rate 600G
RP/0/RP0/CPU0:ios(config-hwmod-mxp)#arp-snoop
RP/0/RP0/CPU0:ios(config-hwmod-mxp)#commit
Mon Mar 16 19:30:52.636 UTC
RP/0/RP0/CPU0:ios(config-hwmod-mxp)#end
```

This is a sample in which, MAC address or ARP snoop is configured in Muxponder mode.

```
RP/0/RP0/CPU0:ios#configure
Mon Mar 16 19:08:17.154 UTC
RP/0/RP0/CPU0:ios(config)#hw-module location 0/1 mxponder arp-snoop
RP/0/RP0/CPU0:ios(config)#commit
```

This sample shows the output of **show controllers hundredGigEctrlr** command, before configuring MAC address or ARP snoop on client ports.

```
RP/0/RP0/CPU0:ios#show controllers HundredGigECtrlr 0/1/0/2/1
Mon Mar 16 19:40:37.434 UTC
Operational data for interface HundredGigECtrlr0/1/0/2/1:
State:
    Administrative state: enabled
    Operational state: Up
    LED state: Green On
    Maintenance: Disabled
    AINS Soak: None
      Total Duration: 0 hour(s) 0 minute(s)
      Remaining Duration: 0 hour(s) 0 minute(s) 0 second(s)
    Laser Squelch: Disabled
Phy:
    Media type: Not known
Autonegotiation disabled.
Operational values:
    Speed: 100Gbps
    Duplex: Full Duplex
    Flowcontrol: None
    Loopback: None (or external)
    BER monitoring:
        Not supported
    Holdoff Time: 0ms
```

View neighbor MAC address

Use this task to view the neighbor's physical address after enabling MAC address or ARP snoop.

MAC address snoop output is enabled after ARP packets are received on the respective 100G client.

Procedure

Run the **show controllers hundredGigEctrlr** *R/S/I/P* command.

Example:

This sample shows the neighbor's MAC address after configuring MAC address or ARP snoop on client ports.

```
RP/0/RP0/CPU0:ios#show controllers HundredGigECtrlr 0/1/0/2/1
Mon Mar 16 19:41:08.047 UTC
Operational data for interface HundredGigECtrlr0/1/0/2/1:
State:
    Administrative state: enabled
    Operational state: Up
    LED state: Green On
    Maintenance: Disabled
    AINS Soak: None
      Total Duration: 0 hour(s) 0 minute(s)
      Remaining Duration: 0 hour(s) 0 minute(s) 0 second(s)
    Laser Squelch: Disabled
    Neighbor Address:
    0010.9400.5502
Phy:
    Media type: Not known
Autonegotiation disabled.
Operational values:
    Speed: 100Gbps
    Duplex: Full Duplex
    Flowcontrol: None
```

Transmit shutdown

Transmit shut on trunk optics controller brings down the CIM8 and PICO transmit power. You can configure transmit shut on optics controller of a 1.2T, 2.4TX, or 2.4T card.

Configure transmit shutdown on trunk optics controller

To perform transmit shutdown, enter these commands:

```
RP/0/RP0/CPU0:ios#configure
RP/0/RP0/CPU0:chassisA164(config)#controller optics 0/1/0/0
RP/0/RP0/CPU0:chassisA164(config-Optics)#transmit-shutdown
RP/0/RP0/CPU0:chassisA164(config-Optics)#commit
RP/0/RP0/CPU0:ios(config-Optics)#exit
RP/0/RP0/CPU0:ios(config)#exit
```

Verify transmit shutdown on trunk optics controller

Use this task to verify the transmit shutdown details on the trunk optics controller.

Procedure

Run the **show controllers optics***R/S/I/P* command to view the transmit shutdown details.

Example:

```
RP/0/RP0/CPU0:ios#show controllers optics 0/0/0/0
Tue Dec 12 05:38:32.416 UTC
Controller State: Up
Transport Admin State: In Service
Laser State: Off
LED State: Green
Optics Status
     Optics Type:  CIM8 DWDM
     DWDM carrier Info: C BAND, MSA ITU Channel=61, Frequency=193.10THz,
     Wavelength=1552.524nm

     Alarm Status:
     -------------
     Detected Alarms: None
     LOS/LOL/Fault Status:
     Alarm Statistics:
     -------------
     HIGH-RX-PWR = 0            LOW-RX-PWR = 0
     HIGH-TX-PWR = 0            LOW-TX-PWR = 2
     HIGH-LBC = 0               HIGH-DGD = 0
     OOR-CD = 0                 OSNR = 1
     WVL-OOL = 0                MEA  = 0
     IMPROPER-REM = 0
     TX-POWER-PROV-MISMATCH = 0
     Laser Bias Current = 0.0 %
     Actual TX Power = -40.00 dBm
     RX Power = -6.60 dBm
     RX Signal Power = -7.06 dBm
     Frequency Offset = -846 MHz
     Performance Monitoring: Enable

     THRESHOLD VALUES
     ----------------

     Parameter                 High Alarm  Low Alarm  High Warning  Low Warning
     ------------------------  ----------  ---------  ------------  -----------
     Rx Power Threshold(dBm)         13.0      -17.0           0.0          0.0
     Tx Power Threshold(dBm)          5.0      -13.0           0.0          0.0
     LBC Threshold(mA)                N/A        N/A          0.00         0.00

     LBC High Threshold = 90 %
     Configured Tx Power = 2.00 dBm
     Configured CD High Threshold = 180000 ps/nm
     Configured CD lower Threshold = -180000 ps/nm
     Configured OSNR lower Threshold = 20.50 dB
     Configured DGD Higher Threshold = 90.00 ps
     Baud Rate =  137.9783780000 GBd
     Bits per Symbol = 3.5200000000  bits/symbol
     Modulation Type: PCS
     Chromatic Dispersion 0 ps/nm
     Configured CD-MIN -10000 ps/nm  CD-MAX 48000 ps/nm
     Polarization Mode Dispersion = 0.0 ps
     Second Order Polarization Mode Dispersion = 9.00 ps^2
     Optical Signal to Noise Ratio = 36.90 dB
```

```
      SNR = 16.10 dB
      Polarization Dependent Loss = 0.90 dB
      Polarization Change Rate = 0.00 rad/s
      Differential Group Delay = 1.00 ps
      Filter Roll Off Factor : 0.100
      Rx VOA Target Power : -2.0 dBm
      NLEQ Compensation Mode : 0
      Cross Polarization Gain Mode : 10
      Proprietary Submarine Parameters
        Type : 1        Value : 0
        Type : 2        Value : 0
        Type : 3        Value : 0
        Type : 4        Value : 0
        Type : 5        Value : 10485760


 Transceiver Vendor Details

      Form Factor            : CIM8
      Name                   : CISCO-ACACIA
      Serial Number          : N/A
      PID                    : CIM8-C-K9
      VID                    : N/A
      Date Code(yy/mm/dd)    : 23/10/20
      Fiber Connector Type: LC
      Otn Application Code: Not Set
      Sonet Application Code: Not Set
      Ethernet Compliance Code: Not set

 Transceiver Temperature : 38 Celsius

AINS Soak               : None
AINS Timer              : 0h, 0m
AINS remaining time     : 0 seconds
```

Loopback

You can configure loopback on the CoherentDSP and Ethernet controllers of QXP, 1.2T, 2.4TX and 2.4T cards to identify connection problems. The loopback can be configured only in the maintenance mode. Use the **controller** ***controller-type*** and the **secondary-admin-state maintenance** commands to place the controllers in the maintenance mode.

Loopback configuration alarm details for each controller are triggered whenever there is a change in the loopback configuration. Details such as, location of the controller, severity, configuration date and time, and description are available in the output of the **show alarms brief system active** and **show alarms brief history** commands.

Configure loopback

Use this task to configure loopback on a 1.2T, 2.4T, and 2.4TX card.

Procedure

Step 1 Run the **controller***controllertype Rack/Slot/Instance/Port***sec-admin-state maintenance loopback** [**internal**] command to configure the loopback on a 1.2T card.

Example:

This example shows how a internal loopback is configured on the Ethernet controller of a 1.2T card.

```
RP/0/RP0/CPU0:ios#configure
RP/0/RP0/CPU0:ios(config)#controller HundredGigECtrlr 0/1/0/1
RP/0/RP0/CPU0:ios(config-eth-ctrlr)#sec-admin-state maintenance
RP/0/RP0/CPU0:ios(config-eth-ctrlr)#loopback internal
RP/0/RP0/CPU0:ios(config-eth-ctrlr)#commit
RP/0/RP0/CPU0:ios(config)#exit
```

Note
Line loopback is not supported on CoherentDSP controller of 1.2T card.

Example:

This example shows how to verify a internal loopback configured on the Ethernet controller of 1.2T card.

```
RP/0/RP0/CPU0:ios#show controller HundredGigECtrlr 0/1/0/1
Fri Nov 17 10:01:22.840 UTC
Operational data for interface HundredGigECtrlr0/1/0/1:

State:
    Administrative state: enabled
    Operational state: Up
    LED state: Green On
    Maintenance: Enabled
    AINS Soak: None
      Total Duration: 0 hour(s) 0 minute(s)
      Remaining Duration: 0 hour(s) 0 minute(s) 0 second(s)
    Laser Squelch: Disabled
    Insert Idle Ingress: Disabled
    Insert Idle Egress: Disabled

Phy:
    Media type: Not known
    Statistics:
        FEC:
            Corrected Codeword Count: 72671614               Valid: True       Start time: 15:53:12
 Thu Nov 16 2023
            Uncorrected Codeword Count: 12                   Valid: True       Start time: 15:53:12
 Thu Nov 16 2023
        PCS:
            Total BIP errors: 0                              Valid: True       Start time: 15:53:12
 Thu Nov 16 2023
            Total frame errors: 0                            Valid: False      Start time: 15:53:12
 Thu Nov 16 2023
            Total Bad SH: 0                                  Valid: False      Start time: 15:53:12
 Thu Nov 16 2023

Autonegotiation disabled.

Operational values:
    Speed: 400Gbps
```

```
Duplex: Full Duplex
Flowcontrol: None
Loopback: Internal
BER monitoring:
    Not supported
Forward error correction: Standard (Reed-Solomon)
Holdoff Time: 0ms
```

Step 2 Run the **controller** {**HundredGigECtrlr** *Rack/Slot/Instance/Port/Lane* | **fourHundredGigECtrlr***Rack/Slot/Instance/Port*}**sec-admin-state maintenance loopback**[**line** | **internal**] command to configure the loopback on 2.4T card and 2.4TX card.

Example:

This example shows how a line loopback is configured on coherentDSP controller of a 2.4T card and 2.4TX card.

```
RP/0/RP0/CPU0:ios#configure
RP/0/RP0/CPU0:ios(config)#controller coherentDSP 0/1/0/0
RP/0/RP0/CPU0:ios(config-eth-ctrlr)#sec-admin-state maintenance
RP/0/RP0/CPU0:ios(config-eth-ctrlr)#loopback line
RP/0/RP0/CPU0:ios(config-eth-ctrlr)#commit
RP/0/RP0/CPU0:ios(config)#exit
```

Note
In case of muxponder configuration on the 2.4TX card, internal loopback must be applied on both trunk ports for the loopback behaviour to reflect on the split ports. For direct ports, the corresponding trunk internal loopback works as expected.

Example:

This example shows how to configure internal loopback on a coherent DSP controller.

```
RP/0/RP0/CPU0:ios#configure
Fri Jul 8 10:42:51.329 UTC
RP/0/RP0/CPU0:ios(config)#controller coherentDSP 0/0/0/0
RP/0/RP0/CPU0:ios(config-CoDSP)#secondary-admin-state maintenance
RP/0/RP0/CPU0:ios(config-CoDSP)#loopback internal
RP/0/RP0/CPU0:ios(config-CoDSP)#commit
Fri Jul 8 10:43:48.644 UTC
RP/0/RP0/CPU0:ios(config-CoDSP)#end
```

This example shows how to verify the internal loopback configured on a coherent DSP controller.

```
RP/0/RP0/CPU0:ios#show controllers coherentDSP 0/0/0/0
Fri Jul 8 10:45:53.820 UTC
Port : CoherentDSP 0/0/0/0
Controller State : Down
Inherited Secondary State : Normal
Configured Secondary State : Maintenance
Derived State : Maintenance
Loopback mode : Internal
BER Thresholds : SF = 1.0E-5 SD = 1.0E-7
Performance Monitoring : Enable
Bandwidth : 400.0Gb/s
Alarm Information:
LOS = 2 LOF = 0 LOM = 0
OOF = 0 OOM = 0 AIS = 0
IAE = 0 BIAE = 0 SF_BER = 0
SD_BER = 0 BDI = 0 TIM = 0
FECMISMATCH = 0 FEC-UNC = 0 FLEXO_GIDM = 0
FLEXO-MM = 0 FLEXO-LOM = 0 FLEXO-RDI = 0
FLEXO-LOF = 0
Detected Alarms : LOS
```

```
Bit Error Rate Information
PREFEC BER : 5.00E-01
POSTFEC BER : 0.00E+00
Q-Factor : 0.00 dB
Q-Margin : 0.00dB
OTU TTI Received
FEC mode : C_FEC
Flexo-Mode : Enable
Flexo Details:
Tx GID : 0
Rx GID : 0
AINS Soak : None
AINS Timer : 0h, 0m
AINS remaining time : 0 seconds
```

Example:

This example shows how to configure line loopback on a coherent DSP controller.

```
RP/0/RP0/CPU0:ios#configure
Fri Jul 8 10:48:48.577 UTC
RP/0/RP0/CPU0:ios(config)#controller coherentDSP 0/0/0/0
RP/0/RP0/CPU0:ios(config-CoDSP)#secondary-admin-state maintenance
RP/0/RP0/CPU0:ios(config-CoDSP)#loopback line
RP/0/RP0/CPU0:ios(config-CoDSP)#commit
Fri Jul 8 10:49:26.809 UTC
RP/0/RP0/CPU0:ios(config-CoDSP)#end
```

This example shows how to verify the line loopback configured on a coherent DSP controller.

```
RP/0/RP0/CPU0:ios#show controllers coherentDSP 0/0/0/0
Fri Jul 8 10:49:44.073 UTC
Port : CoherentDSP 0/0/0/0
Controller State : Down
Inherited Secondary State : Normal
Configured Secondary State : Maintenance
Derived State : Maintenance
Loopback mode : Line
BER Thresholds : SF = 1.0E-5 SD = 1.0E-7
Performance Monitoring : Enable
Bandwidth : 400.0Gb/s
Alarm Information:
LOS = 2 LOF = 0 LOM = 0
OOF = 0 OOM = 0 AIS = 0
IAE = 0 BIAE = 0 SF_BER = 0
SD_BER = 0 BDI = 0 TIM = 0
FECMISMATCH = 0 FEC-UNC = 0 FLEXO_GIDM = 0
FLEXO-MM = 0 FLEXO-LOM = 0 FLEXO-RDI = 0
FLEXO-LOF = 0
Detected Alarms : LOS
Bit Error Rate Information
PREFEC BER : 5.00E-01
POSTFEC BER : 0.00E+00
Q-Factor : 0.00 dB
Q-Margin : 0.00dB
OTU TTI Received
FEC mode : C_FEC
Flexo-Mode : Enable
Flexo Details:
Tx GID : 0
Rx GID : 0
AINS Soak : None
AINS Timer : 0h, 0m
AINS remaining time : 0 seconds
```

Example:

This example shows how to configure internal loopback on the 400GE controller.

```
RP/0/RP0/CPU0:ios#configure
Fri Jul 8 11:19:26.286 UTC
RP/0/RP0/CPU0:ios(config)#controller FourHundredGigECtrlr 0/0/0/3
RP/0/RP0/CPU0:ios(config-eth-ctrlr)#sec-admin-state maintenance
RP/0/RP0/CPU0:ios(config-eth-ctrlr)#loopback internal
RP/0/RP0/CPU0:ios(config-eth-ctrlr)#commit
Fri Jul 8 11:19:47.496 UTC
RP/0/RP0/CPU0:ios(config-eth-ctrlr)#end
```

This example shows how to verify the internal loopback configured on the 400GE controller.

```
RP/0/RP0/CPU0:ios#show controllers FourHundredGigECtrlr 0/0/0/3
Fri Jul 8 11:19:59.597 UTC
Operational data for interface FourHundredGigECtrlr0/0/0/3:
State:
Administrative state: enabled
Operational state: Down (Reason: State undefined)
LED state: Red On
Maintenance: Enabled
AINS Soak: None
Total Duration: 0 hour(s) 0 minute(s)
Remaining Duration: 0 hour(s) 0 minute(s) 0 second(s)
Laser Squelch: Disabled
Insert Idle Ingress: Disabled
Insert Idle Egress: Disabled
Phy:
Media type: Not known
Alarms:
Current:
Loss of Signal
Statistics:
FEC:
Corrected Codeword Count: 702710
Uncorrected Codeword Count: 1147
Autonegotiation disabled.
Operational values:
Speed: 400Gbps
Duplex: Full Duplex
Flowcontrol: None
Loopback: Internal
BER monitoring:
Not supported
Forward error correction: Standard (Reed-Solomon)
Holdoff Time: 0ms
```

Example:

This example shows how to configure line loopback on the 4X100GE MXP.

```
RP/0/RP0/CPU0:ios(config)#controller hundredGigECtrlr 0/3/0/1/1
RP/0/RP0/CPU0:ios(config-eth-ctrlr)#loopback line
RP/0/RP0/CPU0:ios(config-eth-ctrlr)#sec-admin-state maintenance
RP/0/RP0/CPU0:ios(config-eth-ctrlr)#commit
```

This example shows how to verify the line loopback configured on the 4X100GE MXP.

```
RP/0/RP0/CPU0:ios#sh controllers hundredGigECtrlr 0/3/0/1/1
Fri Jul 22 10:34:39.730 UTC
Operational data for interface HundredGigECtrlr0/3/0/1/1:

State:
    Administrative state: enabled
```

```
    Operational state: Up
    LED state: Green On
    Maintenance: Enabled
    AINS Soak: None
      Total Duration: 0 hour(s) 0 minute(s)
      Remaining Duration: 0 hour(s) 0 minute(s) 0 second(s)
    Laser Squelch: Disabled
    Insert Idle Ingress: Disabled
    Insert Idle Egress: Disabled

Phy:
    Media type: Not known
    Statistics:
        FEC:
            Corrected Codeword Count: 6110368                 Valid: True       Start time: 13:10:41
 Thu Jul 21 2022
            Uncorrected Codeword Count: 2771                  Valid: True       Start time: 13:10:41
 Thu Jul 21 2022
        PCS:
            Total BIP errors: 63700992                        Valid: True       Start time: 13:10:41
 Thu Jul 21 2022
            Total frame errors: 0                             Valid: False      Start time: 13:10:41
 Thu Jul 21 2022
            Total Bad SH: 0                                   Valid: False      Start time: 13:10:41
 Thu Jul 21 2022

Autonegotiation disabled.

Operational values:
    Speed: 100Gbps
    Duplex: Full Duplex
    Flowcontrol: None
    Loopback: Line
    BER monitoring:
        Not supported
    Forward error correction: Standard (Reed-Solomon)
    Holdoff Time: 0ms
```

Example:

This example shows how to configure internal loopback on the 4X100GE MXP.

```
RP/0/RP0/CPU0:ios#conf
RP/0/RP0/CPU0:ios(config)#controller hundredGigECtrlr 0/3/0/7/1
RP/0/RP0/CPU0:ios(config-eth-ctrlr)#sec-admin-state maintenance
RP/0/RP0/CPU0:ios(config-eth-ctrlr)#loopback internal
RP/0/RP0/CPU0:ios(config-eth-ctrlr)#commit
```

This example shows how to verify the internal loopback configured on the 4X100GE MXP.

```
RP/0/RP0/CPU0:ios#show controller HundredGigECtrlr 0/3/0/7/1
Fri Jul 22 10:40:34.928 UTC

Operational data for interface HundredGigECtrlr0/3/0/7/1:

State:
    Administrative state: enabled
    Operational state: Down (Reason: State undefined)
    LED state: Red On
    Maintenance: Enabled
    AINS Soak: None
      Total Duration: 0 hour(s) 0 minute(s)
      Remaining Duration: 0 hour(s) 0 minute(s) 0 second(s)
    Laser Squelch: Disabled
    Insert Idle Ingress: Disabled
    Insert Idle Egress: Disabled
```

```
Phy:
    Media type: Not known
    Alarms:
        Current:
            Loss of Signal
    Statistics:
        FEC:
            Corrected Codeword Count: 31426046
            Uncorrected Codeword Count: 2187

Autonegotiation disabled.

Operational values:
    Speed: 100Gbps
    Duplex: Full Duplex
    Flowcontrol: None
    Loopback: Internal
    BER monitoring:
        Not supported
    Forward error correction: Standard (Reed-Solomon)
    Holdoff Time: 0ms
```

Step 3 Run the **show alarms brief system active** command to view the loopback configuration alarms.

Example:

```
RP/0/RP0/CPU0:ios#show alarms brief system active
Tue Sep 13 17:43:35.212 UTC

------------------------------------------------------------------------------------------
Active Alarms
------------------------------------------------------------------------------------------
Location        Severity     Group            Set Time                    Description


------------------------------------------------------------------------------------------


                                                                        0/2             Minor
  Controller       09/13/2022 17:34:32 UTC    HundredGigECtrlr0/2/0/2 - Internal Loopback Configured
0/2             Minor        Controller       09/13/2022 17:34:32 UTC    HundredGigECtrlr0/2/0/2 -
Internal Loopback Configured
0/2             Minor        Controller       09/13/2022 17:34:32 UTC    HundredGigECtrlr0/2/0/2 -
Line Loopback Configured

0/2             Major        Ethernet         09/13/2022 17:34:31 UTC    HundredGigECtrlr0/2/0/1/2
- Loss of Synchronization The Data Interface

0/2            Minor        Controller       09/13/2022 17:39:19 UTC    CoherentDSP0/2/0/0 - Internal
 Loopback Configured
```

Loop-and-drop mechanism on Ethernet controller

Table 4: Feature History

Feature Name	Release Information	Description
Loop-and-drop mechanism on Ethernet controller	Cisco IOS XR Release 24.4.1	

Feature Name	Release Information	Description
		The internal and line loopback configurations on the Ethernet controller have been enhanced to activate a loop-and-drop mechanism. This mechanism prevents traffic from flowing beyond the client port to the near end router in case of internal loopback, and far end router in case of the line loopback. This loop-and-drop mechanism is implemented by: • Internal loopback: Shutting down the transmit power at the client Ethernet controller. • Line loopback: Inserting a local fault alarm signal toward the trunk. This feature is supported on these cards: • NCS1K14-2.4T-K9 • NCS1K14-2.4T-X-K9 • NCS1K4-QXP-K9 • NCS1K4-1.2T-K9 (supports only internal loop-and-drop) • NCS1K4-1.2TL-K9 (supports only internal loop-and-drop) This enhancement isolates traffic during loopback, preventing it from reaching the router. A practical use case for this is when using the PRBS pattern for testing. By effectively containing the PRBS traffic, the mechanism ensures that PRBS traffic does not cause unwanted events such as error bits, which could otherwise lead to misinterpretation of network status and trigger false alarms at the router ports.

From Release 24.4.1, configuring client loopback on Ethernet controllers activates a loop-and-drop mechanism, replacing the previous loop-and-continue mechanism. When you set up internal and line loopbacks under Ethernet controllers, these loopback types are automatically applied for both 100GE and 400GE traffic.

- Internal loop-and-drop
- Line loop-and-drop

Advantage

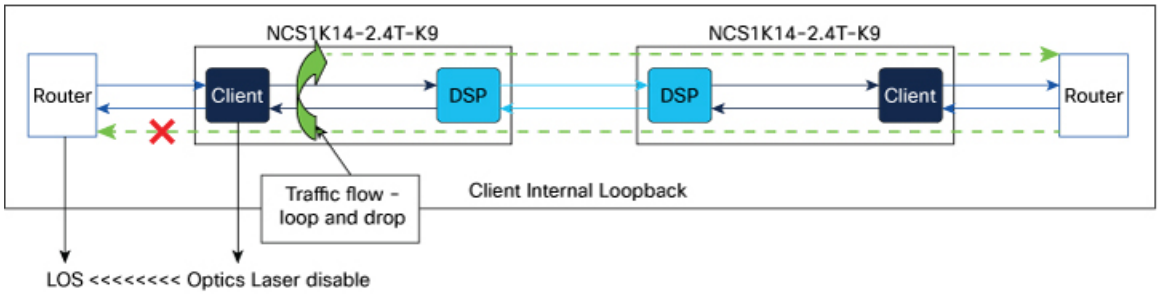
This enhancement provides a significant advantage by isolating traffic during loopback operations. It prevents traffic from reaching the router, thereby avoiding potential undesired events and alarms at the router ports. This is particularly beneficial in maintaining network stability and integrity during diagnostic activities.

A practical example of this advantage is seen when using the Pseudo-Random Bit Sequence (PRBS) pattern to evaluate network link performance and reliability. By effectively containing PRBS traffic within the loopback, the mechanism prevents unwanted events, such as error bits, from reaching the router. This containment ensures that test data does not interfere with the router's regular functions, avoiding misinterpretation of network status and preventing false alarms at the router ports.

Internal loop-and-drop

When you apply an internal loopback on a client Ethernet controller, the transmit power is disabled. This mechanism is applicable for both breakout and non-breakout setups. In a breakout setup, power is turned off on the specific lane where the loopback is configured, whereas in a non-breakout setup, power is shut down on all the lanes. This power shutdown prevents traffic from traveling beyond the client port to the near-end router as indicated by the cross mark in this image.

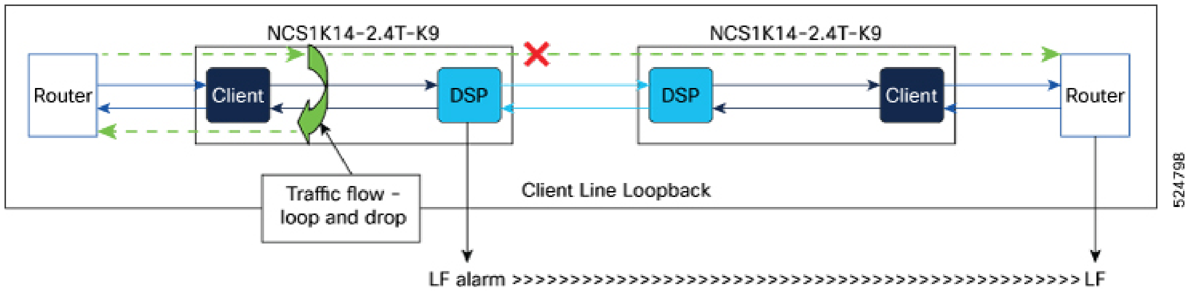
Figure 3: Internal loop-and-drop



Line loop-and-drop

When you apply a line loopback on a specific client Ethernet controller, the system forces a local fault (LF) signal on the near-end in the egress direction. This LF signal then propagates towards the far-end, preventing the traffic from flowing towards the far-end router as indicated by the cross mark in this image.

Figure 4: Line loop-and-drop



Supported cards

This mechanism is supported on these cards:

- NCS1K14-2.4T-K9
- NCS1K14-2.4T-X-K9
- NCS1K4-QXP-K9
- NCS1K4-2-QDD-C-K9
- NCS1K4-1.2T-K9 (supports only internal loop-and-drop)
- NCS1K4-1.2TL-K9 (supports only internal loop-and-drop)

Note Applying a line loopback on the client Ethernet controller of the NCS1K4-2-QDD-C-K9 card triggers a "Loss of Synchronization on Data Interface (SYNCLOSS)" alarm. This behavior is expected.

Loop-and-drop mechanism on coherentDSP controller

From Release 25.3.1, configuring trunk loopback on coherentDSP controllers activates a loop-and-drop mechanism, replacing the previous loop-and-continue mechanism. When you set up internal and line loopbacks under coherentDSP controller, these loopback types are automatically applied for the traffic:

- Internal
- Line

Table 5: Feature History

Feature Name	Release Information	Description
Loop-and-drop mechanism on coherentDSP controller	Cisco IOS XR Release 25.3.1	The internal and line loopback configurations on the coherentDSP controller are enhanced to activate a loop-and-drop mechanism. This mechanism prevents traffic from flowing beyond the trunk port to the far end router in case of internal loopback, and connected router in case of the line loopback. This loop-and-drop mechanism is implemented by: Internal: Propagating local fault to the far-end node by modifying the 64th byte of TTI. Line: Inserting a local fault alarm signal toward clients associated with the trunk where the loopback is applied in the current node. This feature is supported on these cards: • NCS1K14-2.4T-K9 • NCS1K14-2.4T-X-K9 • NCS1K14-2.4T-L-K9 • NCS1K14-2.4T-XL-K9 The loop-and-drop feature provides a clear indication to the user that if traffic is not active on the router port, it is due to either a fault or an existing configuration that is preventing the traffic from coming up.

Supported cards

This mechanism is supported on these cards:

- NCS1K14-2.4T-K9
- NCS1K14-2.4T-X-K9
- NCS1K14-2.4T-L-K9
- NCS1K14-2.4TL-X-K9

How internal loopback on a coherentDSP controller works

This process explains the effects and behavior when applying an internal loopback on the coherentDSP controller, specifically how the software handles the local fault (LF) signal propagation to the associated clients and routers.

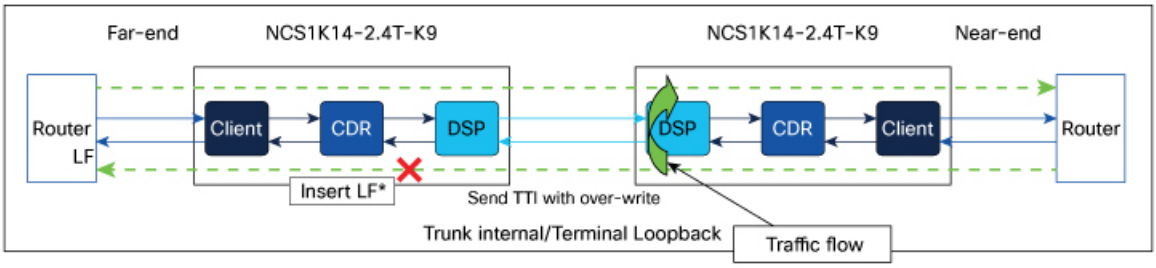
Summary

The key components that are involved in loop and drop process during the internal loopback are:

- Near-end and far-end routers
- Near-end and far-end NCS 1014 nodes with 2.4T cards.

Workflow

Figure 5: Internal loopback on Trunk port



* = LF insertion based on TTI over-write

When you apply an internal loopback on a coherentDSP controller:

1. The software overwrites the most significant bit of the 64th byte of the TTI (Trail Trace Identifier) at the near-end (NE) node.
2. This modified TTI is propagated to the far-end (FE) node.
3. The FE node detects the overwritten bit in the TTI.
4. Upon detection, the FE node raises an LF signal.
5. The LF signal is propagated to the client devices associated with the trunk on the FE node.
6. The LF signal is also sent to the FE router.

Result

As a result, loopback traffic is prevented from flowing towards the FE router, as indicated by the cross mark in the related image.

Limitation of Internal loop and drop on the trunk port

This feature is implemented exclusively with ASCII TTI, so configuring HEX TTI is not supported.

How line loopback on a coherentDSP controller works

This process explains the effects and behavior when applying a line loopback on the coherent controller, specifically how the software handles the local fault (LF) signal propagation to associated clients and routers.

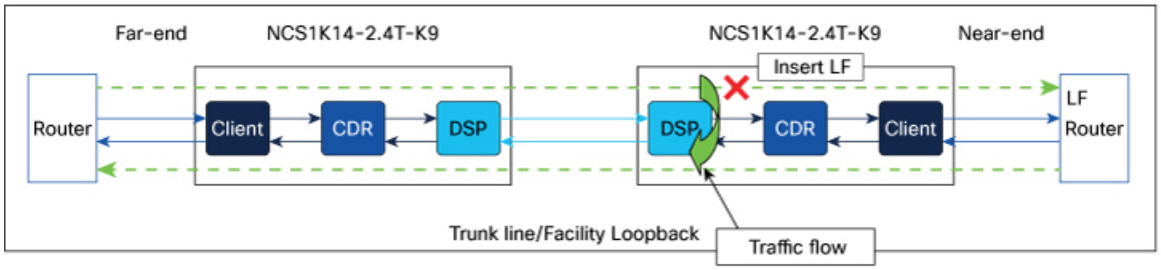
Summary

The key components that are involved in loop and drop process during the line loopback are:

- Near-end and far-end routers
- Near-end and far-end NCS 1014 nodes with 2.4T cards.

Workflow

Figure 6: Line loopback on Trunk port



When you apply an line loopback on a coherentDSP controller:

1. The software forces an LF signal towards the clients associated with the trunk in the near-end (NE) node.
2. The LF signal generated by the software is then propagated from the clients towards the connected router.

Result

This LF signal prevents the traffic from flowing towards the connected router as indicated by the cross mark in this image.

Restore factory settings

Note Perform this operation only on the console port.

Use this task to restore NCS 1014 to factory settings.

You can perform this operation only through the console port and not on the management interface.

Procedure

Run the **commit replace** command.

Example:

```
RP/0/RP0/CPU0:ios#configure
RP/0/RP0/CPU0:ios(config)#commit replace
Tue Sep 24 09:36:59.430 UTC

This commit will replace or remove the entire running configuration. This
operation can be service affecting.
Do you wish to proceed? [no]: yes
RP/0/RP0/CPU0:ios(config)#exit
RP/0/RP0/CPU0:ios#reload
Tue Sep 24 09:38:12.881 UTC

Standby card not present or not Ready for failover. Proceed? [confirm]

Preparing system for backup. This may take a few minutes especially for large configurations.
        Status report: node0_RP0_CPU0: BACKUP INPROGRESS

        Status report: node0_RP0_CPU0: BACKUP HAS COMPLETED SUCCESSFULLY
[Done]

Proceed with reload?  [confirm]
Reloading node  0/RP0/CPU0

RL: Reboot initiated with code 1, cause User initiated graceful reload reboot_timeout 30 shutdown
delay 0
RL: Shutdown initiated
Query the node to be reloaded
 NODE_IP of noded to be reloaded 198.51.100.1
sending stop hb
Cause: User initiated graceful reload
VM IP addr sent for reload 198.51.100.1

Received ack from sdrmgr for reload request.Returncode:0
successful disconnection from service
wd_disconnect_cb 548 CMP-WD disconnected successfully
Invmgr successful disconnection from service

RP/0/RP0/CPU0:ios#
Disconnecting from 'default-sdr--1' console. Continue(Y/N)?


Connecting to 'default-sdr--1' console
ÿûÿûÿûÿýbootlogd: ioctl(/dev/pts/2, TIOCCONS): Device or resource busy
/sbin/restorecon:  lstat(/etc/adjtime) failed:  No such file or directory
Configuring network interfaces... done.
Starting system message bus: dbus.
Starting OpenBSD Secure Shell server: sshd
sshd start/running, process 1739
Starting rpcbind daemon...done.
Starting random number generator daemonUnable to open file: /dev/tpm0
.
Starting system log daemon...0
Starting kernel log daemon...0
tftpd-hpa disabled in /etc/default/tftpd-hpa
Starting internet superserver: xinetd.
net.ipv4.ip_forward = 1
Libvirt not initialized for container instance
Starting crond: OK
SIOCADDRT: File exists

DBG_MSG: platform type is 0
[*] ima_policy have loaded, or IMA policy file does not exist
Start serial incoming on , Clearing ..
```

```
RP/0/RP0/CPU0:Sep 24 09:38:44.284 UTC: fpd-serv[256]: %PKT_INFRA-FM-3-FAULT_MAJOR : ALARM_MAJOR
:FPD-NEED-UPGRADE :DECLARE :0/PM0:

This (D)RP Node is not ready or active for login /configuration
.......
........
........

ios con0/RP0/CPU0 is now available

Press RETURN to get started.

!!!!!!!!!!!!!!!!!!! NO root-system username is configured. Need to configure root-system username.
 !!!!!!!!!!!!!!!!!!!
```

After the **commit replace** operation completes, you must perform the IOS XR reload operation.

The **commit best-effort** command merges the target configuration with the running configuration and commits only valid changes (best effort). Some configuration changes might fail due to semantic errors.

Headless mode

A headless mode is a system operation mode that

- enables Cisco NCS 1014 to continue forwarding traffic when the controller card is absent, failed, or being restarted
- allows fault propagation for client and trunk ports, and
- maintains errorless operation unless there is any line-level activity or the traffic is encrypted and the keys have expired beyond a predefined maximum duration.

During headless mode, the control plane will be unavailable. You cannot provision new configurations, view operational data, or perform performance monitoring without a functional controller.

Trail Trace Identifier

A trail trace identifier (TTI) is a feature that:

- helps identify a signal from its source to its destination within a network,
- supports configuration of sent or expected identifiers in both ASCII and HEX formats, and
- triggers a controller shutdown and a TIM alarm when an expected TTI string does not match the received trace string.

Configure Trail Trace Identifier

Use this task to configure TTI on the coherent DSP controllers of a 1.2T, 2.4T, or 2.4TX card.

Procedure

Step 1 Run the **controller coherentDSP** *R/S/I/P* **tti** {**sent | expected**} **ascii | hex***tti-string* command.

Note
The *tti-string* can have a maximum of 64 characters for ASCII and 128 characters for HEX.

Example:

This sample shows how to configure TTI on a coherent DSP controller with the sent and expected strings set to the same ASCII string. The state of the controller is up.

```
RP/0/RP0/CPU0:ios#config
RP/0/RP0/CPU0:ios(config)#controller coherentDSP
RP/0/RP0/CPU0:ios(config-CoDSP)#tti sent ascii hello
RP/0/RP0/CPU0:ios(config-CoDSP)#tti expected ascii hello cisco
RP/0/RP0/CPU0:ios(config-CoDSP)#commit
Thu Dec 7 14:25:43.391 IST
RP/0/RP0/CPU0:ios(config-CoDSP)#end
```

This is a sample to view the TTI details on a coherentDSP controller.

```
RP/0/RP0/CPU0:ios#show controllers coherentDSP 0/3/0/0
Thu Dec 7 14:26:37.345 IST

Port : CoherentDSP 0/3/0/0
Controller State : Down
Inherited Secondary State : Normal
Configured Secondary State : Normal
Derived State : In Service
Loopback mode : None
BER Thresholds : SF = 1.0E-5 SD = 1.0E-7
Performance Monitoring : Enable
Bandwidth : 800.0Gb/s

Alarm Information:
LOS = 0 LOF = 0 LOM = 0
OOF = 0 OOM = 0 AIS = 0
IAE = 0 BIAE = 0 SF_BER = 0
SD_BER = 0 BDI = 0 TIM = 1
FECMISMATCH = 0 FEC-UNC = 0 FLEXO_GIDM = 0
FLEXO-MM = 0 FLEXO-LOM = 0 FLEXO-RDI = 0
FLEXO-LOF = 0
Detected Alarms : TIM

Bit Error Rate Information
PREFEC BER : 2.57E-04
POSTFEC BER : 0.00E+00
Q-Factor : 10.80 dB

Q-Margin : 4.50 dB

Instantaneous Q-Margin : 4.50 dB

OTU TTI Sent

FULL TTI ASCII STRING : hello
OTU TTI Received
FULL TTI ASCII STRING : hello
```

```
OTU TTI Expected
FULL TTI ASCII STRING : hello cisco

FEC mode : Soft-Decision 15

Flexo-Mode : Enable
Flexo Details:
Tx GID : 1
TX IID : 1, 2, 3, 4, 5, 6, 7, 8,
Rx GID : 1
RX IID : 1, 2, 3, 4, 5, 6, 7, 8,

AINS Soak : None
AINS Timer : 0h, 0m
AINS remaining time : 0 seconds
```

This sample shows how to configure TTI on a coherent DSP controller with the sent and expected strings set to HEX strings.

```
RP/0/RP0/CPU0:ios#config
RP/0/RP0/CPU0:ne(config)#controller coherentDSP 0/0/0/0
RP/0/RP0/CPU0:ne(config-CoDSP)#tti sent hex 6E6E6E2A2A2A
RP/0/RP0/CPU0:ne(config-CoDSP)#tti  expected hex 3F4B4B4B3D3E3A
RP/0/RP0/CPU0:ne(config-CoDSP)#commit
RP/0/RP0/CPU0:ios(config)#exit
```

Step 2 Run the **commit** command to apply the changes.

Configure Trail Trace Identifier on QXP card

Use this task to configure the TTI sent or expected string in the full ASCII format, or Source Access Point Identifier (SAPI)/Destination Access Point Identifier (DAPI) format on ODU-flex, ODU4, and coherentDSP controllers for the QXP card.

Note TTI operates only in **trunk mode OR**.

This table lists the ASCII format that is supported for TTI:

ASCII with character string	Controller
Full ASCII 64-character	CoherentDSP,odu4,odu-flex
SAPI ASCII 15-character	CoherentDSP,odu4,odu-flex
DAPI ASCII 15-character	CoherentDSP,odu4,odu-flex
Operator-specific ASCII 32-character	CoherentDSP,odu4,odu-flex

Procedure

Step 1 Run the **controller** *controller-type R/S/I/P* **tti** {**sent | expected**} {**ascii | sapi ascii | dapi ascii | operator-specific ascii** } *tti-string* to configure TTI.

Example:

This is a sample configuration for FULL TTI for coherentDSP controller.

```
RP/0/RP0/CPU0:ios(config)#controller coherentDSP 0/0/0/8
RP/0/RP0/CPU0:ios(config-CoDSP)#tti sent ascii cisco
RP/0/RP0/CPU0:ios(config-CoDSP)#tti  expected ascii cisco123
RP/0/RP0/CPU0:ios(config-CoDSP)#commit
```

This is a sample configuration for TTI HEX for coherentDSP controller.

```
RP/0/RP0/CPU0:ios(config)#controller coherentDSP 0/0/0/8
RP/0/RP0/CPU0:ios(config-CoDSP)#tti sent hex 6E6E6E2A2A2A
RP/0/RP0/CPU0:ios(config-CoDSP)#tti  expected hex 3F4B4B4B3D3E3A
RP/0/RP0/CPU0:ios(config-CoDSP)#commit
```

This is a sample configuration for Operator specific TTI for coherentDSP controller.

```
RP/0/RP0/CPU0:ios(config)#controller coherentDSP 0/0/0/8
RP/0/RP0/CPU0:ios(config-CoDSP)#tti sent operator-specific ascii hellooo
RP/0/RP0/CPU0:ios(config-CoDSP)#tti expected operator-specific ascii hellooo
RP/0/RP0/CPU0:ios(config-CoDSP)#commit
```

This is a sample configuration for Operator specific TTI HEX for coherentDSP controller.

```
RP/0/RP0/CPU0:ios(config)#controller coherentDSP 0/0/0/8
RP/0/RP0/CPU0:ios(config-CoDSP)#tti  sent operator-specific hex 6E6E6E2A2A2A3D3E3A3A6E6E6E2A2A2A3D
RP/0/RP0/CPU0:ios(config-CoDSP)#tti  expected operator-specific hex 5A5A6D3A3B3C3F4B4B4B3D3E3A
RP/0/RP0/CPU0:ios(config-CoDSP)#commit
```

This a sample configuration for SAPI for coherentDSP controller.

```
RP/0/RP0/CPU0:ios(config)#controller coherentDSP 0/0/0/8
RP/0/RP0/CPU0:ios(config-CoDSP)#tti sent operator-specific ascii hellooo
RP/0/RP0/CPU0:ios(config-CoDSP)#tti expected operator-specific ascii hellooo
RP/0/RP0/CPU0:ios(config-CoDSP)#commit
```

This is a sample configuration for DAPI for coherentDSP controller.

```
RP/0/RP0/CPU0:ios(config)#controller coherentDSP 0/0/0/8
RP/0/RP0/CPU0:ios(config-CoDSP)#tti sent dapi ascii cisco123
RP/0/RP0/CPU0:ios(config-CoDSP)#tti  expected dapi ascii hello
RP/0/RP0/CPU0:ios(config-CoDSP)#commit
```

Step 2 Run the **commit** command to apply the changes.

Configure chromatic dispersion

Use this task to configure chromatic dispersion on optics controllers of 1.2T, 2.4TX, and 2.4T cards.

When you configure the maximum and minimum values for chromatic dispersion for any data rate, ensure the minimum difference between the configured values is equal to or greater than 1500 ps/nm.

This table lists the default CD search range for a 1.2T card.

Data rate	BPS	Card support	Default CD search range
200G to 500G	BPS < = 3	1.2T, 1.2TL	-10,000 to 100,000 ps/nm
	3 < BPS <= 4	1.2T, 1.2TL	-10,000 to 80,000 ps/nm
	4 < BPS <=5	1.2T	-5,000 to 20,000 ps/nm
600G	BPS=5.2578125	1.2T	-2000 to 2,000 ps/nm

This table lists the default CD search range for 2.4T, 2.4TX, cards.

Line rate				
	138GBd	128GBd	118GBd	108GBd
1200G	4000 to -5000	4000 to -5000	—	—
1000G	20000 to -5000	20000 to -5000	20000 to -5000	—
800G	48000 to -10000	48000 to -10000	48000 to -10000	35000 to -1000
600G	74000 to -10000	74000 to -10000	74000 to -10000	60000 to -1000
500G	90000 to -10000	90000 to -10000	90000 to -10000	72000 to -1000
400G	—	90000 to -10000	90000 to -10000	72000 to -1000

Note The cd-min and cd-max values must be set for BPS values that are greater than 4 in the 1.2T card.

Note When the user provisions the cd-min and cd-max values that are outside the range through CLI, the provisioned values are accepted; however, only the actual values supported by the hardware are applied.

Procedure

Step 1 Enter the `controller optics` command in the global configuration mode.

Example:

This is a sample where chromatic dispersion is configured on the optics controller.

```
RP/0/RP0/CPU0:ios#configure
Mon Aug 19 19:31:42.115 UTC
RP/0/RP0/CPU0:ios(config)#controller  optics 0/1/0/1
RP/0/RP0/CPU0:ios(config-Optics)#cd-max 4000
RP/0/RP0/CPU0:ios(config-Optics)#cd-min -1000
RP/0/RP0/CPU0:ios(config-Optics)#commit
Mon Aug 19 19:35:24.697 UTC
RP/0/RP0/CPU0:ios(config-Optics)#exit
RP/0/RP0/CPU0:ios(config)#exit


RP/0/RP0/CPU0:ios#show run controller optics 0/1/0/*
Mon Aug 19 19:57:41.859 UTC
controller Optics0/1/0/0
 transmit-power -15
 dwdm-carrier 50GHz-grid itu-ch 55
 enh-sop-tol-mode 1
 cross-pol-gain-mode 10
 lbc-high-threshold 5
!
controller Optics0/1/0/1
 description trunk power UP
 cd-min -1000
 cd-max 4000
 enh-colorless-mode 2
 enh-sop-tol-mode 3
 nleq-comp-mode 4
 cross-pol-gain-mode 2
 cross-pol-weight-mode 3
 cpr-win-mode 3
 cpr-ext-win-mode 8
 rx-voa fixed-ratio 1200
 filter-roll-off-factor 0.035
!
controller Optics0/1/0/5
 soak-time 10
!
```

Step 2 Run the **commit** command to apply the changes.

Configure chromatic dispersion threshold

Use this task to configure the minimum and maximum acceptable chromatic dispersion for the trunk optics controllers.

The CD alarm is raised if the chromatic dispersion goes below the minimum or exceeds the maximum value.

Procedure

Step 1 Enter the **controller optics***R/S/I/P***cd-high-threshold***cd-high***cd-low-threshold***cd-low** command in the global configuration mode to configure the minimum and maximum chromatic dispersion threshold.

Example:

This sample configures the maximum and minimum acceptable CD on the controller optics:

```
RP/0/RP0/CPU0:ios#configure
RP/0/RP0/CPU0:ios(config)#controller optics 0/0/0/7
RP/0/RP0/CPU0:ios(config-Optics)#cd-high-threshold 2400
RP/0/RP0/CPU0:ios(config-Optics)#cd-low-threshold -2400
RP/0/RP0/CPU0:ios(config-Optics)#commit
```

This sample shows the maximum and minimum acceptable CD configured on the controller optics:

```
RP/0/RP0/CPU0:ios#show controllers optics 0/0/0/7
Fri Nov 12 10:58:50.595 UTC
Controller State: Up
Transport Admin State: In Service
Laser State: On
LED State: Yellow
Optics Status
         Optics Type:  CIM8 DWDM
         DWDM carrier Info: C BAND, MSA ITU Channel=61, Frequency=193.10THz,
         Wavelength=1552.524nm

         Alarm Status:
         -------------
         Detected Alarms:
                 HIGH-RX-PWR   LOW-TX-PWR
                 HIGH-DGD

         LOS/LOL/Fault Status:

         Alarm Statistics:

         -------------
         HIGH-RX-PWR = 1            LOW-RX-PWR = 0
         HIGH-TX-PWR = 0            LOW-TX-PWR = 1
         HIGH-LBC = 0               HIGH-DGD = 6
         OOR-CD = 0                 OSNR = 0
         WVL-OOL = 0                MEA  = 0
         IMPROPER-REM = 1
         TX-POWER-PROV-MISMATCH = 0
         Laser Bias Current = 0.0 %
         Actual TX Power = 0.97 dBm
         RX Power = -0.53 dBm
         RX Signal Power = -1.20 dBm
         Frequency Offset = 63 MHz

         Performance Monitoring: Enable

         THRESHOLD VALUES
         ----------------

         Parameter                High Alarm  Low Alarm  High Warning  Low Warning
         -----------------------  ----------  ---------  ------------  -----------
         Rx Power Threshold(dBm)         -2.0       -3.0           0.0          0.0
         Tx Power Threshold(dBm)          4.0        2.0           0.0          0.0
         LBC Threshold(mA)                N/A        N/A          0.00         0.00

         LBC High Threshold = 55 %
         Configured Tx Power = 1.00 dBm
         Configured CD High Threshold = 2400 ps/nm
         Configured CD lower Threshold = -2400 ps/nm
         Configured OSNR lower Threshold = 0.40 dB
         Configured DGD Higher Threshold = 0.30 ps
         Baud Rate =  63.1394679230 GBd
         Bits per Symbol = 3.0000000000  bits/symbol
         Modulation Type: 8QAM
```

```
          Chromatic Dispersion 0 ps/nm
          Configured CD-MIN -48000 ps/nm  CD-MAX 48000 ps/nm
          Polarization Mode Dispersion = 0.0 ps
          Second Order Polarization Mode Dispersion = 29.00 ps^2
          Optical Signal to Noise Ratio = 36.10 dB
          SNR = 17.50 dB
          Polarization Dependent Loss = 0.50 dB
          Polarization Change Rate = 0.00 rad/s
          Differential Group Delay = 1.00 ps

Transceiver Vendor Details

          Form Factor            : CIM8
          Name                   : CISCO-ACACIA
          Part Number            : 10-3500-01
          Rev Number             : 01
          Serial Number          : ACA24480037
          PID                    : CIM8-C-K9
          VID                    : VES1
          Date Code(yy/mm/dd)    : 23/11/10
          Fiber Connector Type: LC
          Otn Application Code: Not Set
          Sonet Application Code: Not Set
          Ethernet Compliance Code: Not set

Transceiver Temperature : 46 Celsius
AINS Soak               : None
AINS Timer              : 0h, 0m
AINS remaining time     : 0 seconds
```

Step 2 Run the **commit** command to apply the changes.

Configure Transmit Power

Use this task to configure transmit power on the trunk (CIM8 and PICO) optics within the -190 to +50 range (in units of 0.1dBm)

Procedure

Enter the `controller optics` command in the global configuration mode.

Example:

```
RP/0/RP0/CPU0:ios#configure
Mon Aug 19 19:31:42.115 UTC
RP/0/RP0/CPU0:ios(config)#controller optics 0/1/0/7
RP/0/RP0/CPU0:ios(config-Optics)#transmit-power -1.50
RP/0/RP0/CPU0:ios(config-Optics)#commit
Mon Aug 19 19:35:24.697 UTC
RP/0/RP0/CPU0:ios(config-Optics)#exit
RP/0/RP0/CPU0:ios(config)#exit
```

This is a sample in which transmit power of -1.50 dBm is configured on the CIM8 optics.

```
RP/0/RP0/CPU0:ios#show  controllers optics 0/0/0/7
```

```
Controller State: Up
Transport Admin State: Automatic In Service
Laser State: On
LED State: Green
Optics Status
        Optics Type:  CIM8 DWDM
        DWDM carrier Info: C BAND, MSA ITU Channel=61, Frequency=193.10THz,
        Wavelength=1552.524nm
        Alarm Status:
        -------------
        Detected Alarms: None
        LOS/LOL/Fault Status:
        Alarm Statistics:
        HIGH-RX-PWR = 0            LOW-RX-PWR = 2
        HIGH-TX-PWR = 0            LOW-TX-PWR = 1
        HIGH-LBC = 0               HIGH-DGD = 0
        OOR-CD = 0                 OSNR = 1
        WVL-OOL = 0                MEA  = 0
        IMPROPER-REM = 0
        TX-POWER-PROV-MISMATCH = 0
        Laser Bias Current = 0.0 %
        Actual TX Power = 1.98 dBm
        RX Power = -0.68 dBm
        RX Signal Power = -1.25 dBm
        Frequency Offset = -41 MHz
        Performance Monitoring: Enable
        THRESHOLD VALUES
        Parameter                 High Alarm  Low Alarm  High Warning  Low Warning
        ------------------------  ----------  ---------  ------------  -----------
        Rx Power Threshold(dBm)         13.0      -17.0           0.0          0.0
        Tx Power Threshold(dBm)          5.0      -13.0           0.0          0.0
        LBC Threshold(mA)                N/A        N/A          0.00         0.00
        LBC High Threshold = 90 %
        Configured Tx Power = 2.00 dBm
        Configured CD High Threshold = 180000 ps/nm
        Configured CD lower Threshold = -180000 ps/nm
        Configured OSNR lower Threshold = 20.50 dB
        Configured DGD Higher Threshold = 90.00 ps
        Baud Rate =  137.9783940000 GBd
        Bits per Symbol = 3.5200000000  bits/symbol
        Modulation Type: PCS
        Chromatic Dispersion -1 ps/nm
        Configured CD-MIN -10000 ps/nm  CD-MAX 48000 ps/nm
        Polarization Mode Dispersion = 0.0 ps
        Second Order Polarization Mode Dispersion = 13.00 ps^2
        Optical Signal to Noise Ratio = 38.10 dB
        SNR = 17.40 dB
        Polarization Dependent Loss = 2.50 dB
        Polarization Change Rate = 0.00 rad/s
        Differential Group Delay = 1.00 ps
        Filter Roll Off Factor : 0.100
        Rx VOA Target Power : -2.0 dBm
        NLEQ Compensation Mode : 0
        Cross Polarization Gain Mode : 10
        Proprietary Submarine Parameters
          Type : 1        Value : 0
          Type : 2        Value : 0
          Type : 3        Value : 0
          Type : 4        Value : 0
          Type : 5        Value : 0
          Type : 6        Value : 1000
          Type : 7        Value : 0
          Type : 8        Value : 0
```

```
Type : 9        Value : 0
Type : 10       Value : 0
```

Configure laser bias current high threshold

Use this task to laser bias current high threshold.

Procedure

Step 1 Run the **controller optics***R/S/I/P* **lbc-high-threshold***lbc-value* command to configure the laser bias current threshold.

Example:

This is a sample which configures the high laser bias threshold on the controller optics.

```
RP/0/RP0/CPU0:ios#configure
RP/0/RP0/CPU0:ios(config)#controller optics 0/0/0/7
RP/0/RP0/CPU0:ios(config-Optics)#lbc-high-threshold 55
RP/0/RP0/CPU0:ios(config-Optics)#commit
```

This is a sample which shows the high rlaser bias threshold configured on the controller optics.

```
RP/0/RP0/CPU0:ios#show controllers optics 0/0/0/7
Fri Nov 12 10:58:50.595 UTC
Controller State: Up
Transport Admin State: In Service
Laser State: On
LED State: Yellow
Optics Status
         Optics Type:  CIM8 DWDM
         DWDM carrier Info: C BAND, MSA ITU Channel=61, Frequency=193.10THz,
         Wavelength=1552.524nm

         Alarm Status:
         -------------
         Detected Alarms:
                 HIGH-RX-PWR   LOW-TX-PWR
                 HIGH-DGD

         LOS/LOL/Fault Status:
         Alarm Statistics:
         -------------
         HIGH-RX-PWR = 1            LOW-RX-PWR = 0
         HIGH-TX-PWR = 0            LOW-TX-PWR = 1
         HIGH-LBC = 0               HIGH-DGD = 6
         OOR-CD = 0                 OSNR = 0
         WVL-OOL = 0                MEA  = 0
         IMPROPER-REM = 1
         TX-POWER-PROV-MISMATCH = 0
         Laser Bias Current = 0.0 %
         Actual TX Power = 0.97 dBm
         RX Power = -0.53 dBm
         RX Signal Power = -1.20 dBm
         Frequency Offset = 63 MHz
```

```
        Performance Monitoring: Enable

        THRESHOLD VALUES
        ----------------

        Parameter                 High Alarm  Low Alarm  High Warning  Low Warning
        ------------------------  ----------  ---------  ------------  -----------
        Rx Power Threshold(dBm)         -2.0       -3.0           0.0          0.0
        Tx Power Threshold(dBm)          4.0        2.0           0.0          0.0
        LBC Threshold(mA)                N/A        N/A          0.00         0.00

        LBC High Threshold = 55 %
        Configured Tx Power = 1.00 dBm
        Configured CD High Threshold = 2400 ps/nm
        Configured CD lower Threshold = -2400 ps/nm
        Configured OSNR lower Threshold = 0.40 dB
        Configured DGD Higher Threshold = 0.30 ps
        Baud Rate =  63.1394679230 GBd
        Bits per Symbol = 3.0000000000  bits/symbol
        Modulation Type: 8QAM
        Chromatic Dispersion 0 ps/nm
        Configured CD-MIN -48000 ps/nm  CD-MAX 48000 ps/nm
        Polarization Mode Dispersion = 0.0 ps
        Second Order Polarization Mode Dispersion = 29.00 ps^2
        Optical Signal to Noise Ratio = 36.10 dB
        SNR = 17.50 dB
        Polarization Dependent Loss = 0.50 dB
        Polarization Change Rate = 0.00 rad/s
        Differential Group Delay = 1.00 ps

Transceiver Vendor Details

        Form Factor            : CIM8
        Name                   : CISCO-ACACIA
        Part Number            : 10-3500-01
        Rev Number             : 01
        Serial Number          : ACA24480037
        PID                    : CIM8-C-K9
        VID                    : VES1
        Date Code(yy/mm/dd)    : 23/11/10
        Fiber Connector Type: LC
        Otn Application Code: Not Set
        Sonet Application Code: Not Set
        Ethernet Compliance Code: Not set

Transceiver Temperature : 46 Celsius
AINS Soak               : None
AINS Timer              : 0h, 0m
AINS remaining time     : 0 seconds
```

Step 2 Run the **commit** command to apply the changes.

Configure differential group delay threshold

Use this task to configure the threshold value for the maximum acceptable differential group delay (DGD) on the trunk optics controllers.

- The DGD alarm is raised if DGD exceeds this value.

- The range is 0–18000 (in the units of 0.01 ps).

Procedure

Step 1 Run the **controller optics***R/S/I/P***dgd-high-threshold***dgd-value* command to configure to configure the maximum acceptable DGD.

Example:

This sample configures the minimum acceptable DGD on the controller optics.

```
RP/0/RP0/CPU0:ios#configure
RP/0/RP0/CPU0:ios(config)#controller optics 0/0/0/7
RP/0/RP0/CPU0:ios(config-Optics)#dgd-high-threshold 30
RP/0/RP0/CPU0:ios(config-Optics)#commit
```

This sample shows the maximum acceptable DGD configured on the controller optics.

```
RP/0/RP0/CPU0:ios#show controllers optics 0/0/0/7
Fri Nov 12 10:58:50.595 UTC
Controller State: Up
Transport Admin State: In Service
Laser State: On
LED State: Yellow
Optics Status
         Optics Type:  CIM8 DWDM
         DWDM carrier Info: C BAND, MSA ITU Channel=61, Frequency=193.10THz,
         Wavelength=1552.524nm

         Alarm Status:
         -------------
         Detected Alarms:
                 HIGH-RX-PWR   LOW-TX-PWR
                 HIGH-DGD

         LOS/LOL/Fault Status:

         Alarm Statistics:

         -------------
         HIGH-RX-PWR = 1            LOW-RX-PWR = 0
         HIGH-TX-PWR = 0            LOW-TX-PWR = 1
         HIGH-LBC = 0               HIGH-DGD = 6
         OOR-CD = 0                 OSNR = 0
         WVL-OOL = 0                MEA  = 0
         IMPROPER-REM = 1
         TX-POWER-PROV-MISMATCH = 0
         Laser Bias Current = 0.0 %
         Actual TX Power = 0.97 dBm
         RX Power = -0.53 dBm
         RX Signal Power = -1.20 dBm
         Frequency Offset = 63 MHz

         Performance Monitoring: Enable

         THRESHOLD VALUES
         ----------------

         Parameter                High Alarm  Low Alarm  High Warning  Low Warning
```

```
          ------------------------  ----------  ---------  ------------  -----------
          Rx Power Threshold(dBm)          -2.0       -3.0           0.0          0.0
          Tx Power Threshold(dBm)           4.0        2.0           0.0          0.0
          LBC Threshold(mA)                 N/A        N/A          0.00         0.00

          LBC High Threshold = 55 %
          Configured Tx Power = 1.00 dBm
          Configured CD High Threshold = 2400 ps/nm
          Configured CD lower Threshold = -2400 ps/nm
          Configured OSNR lower Threshold = 0.40 dB
          Configured DGD Higher Threshold = 0.30 ps
          Baud Rate =  63.1394679230 GBd
          Bits per Symbol = 3.0000000000  bits/symbol
          Modulation Type: 8QAM
          Chromatic Dispersion 0 ps/nm
          Configured CD-MIN -48000 ps/nm  CD-MAX 48000 ps/nm
          Polarization Mode Dispersion = 0.0 ps
          Second Order Polarization Mode Dispersion = 29.00 ps^2
          Optical Signal to Noise Ratio = 36.10 dB
          SNR = 17.50 dB
          Polarization Dependent Loss = 0.50 dB
          Polarization Change Rate = 0.00 rad/s
          Differential Group Delay = 1.00 ps

Transceiver Vendor Details

          Form Factor            : CIM8
          Name                   : CISCO-ACACIA
          Part Number            : 10-3500-01
          Rev Number             : 01
          Serial Number          : ACA24480037
          PID                    : CIM8-C-K9
          VID                    : VES1
          Date Code(yy/mm/dd)    : 23/11/10
          Fiber Connector Type: LC
          Otn Application Code: Not Set
          Sonet Application Code: Not Set
          Ethernet Compliance Code: Not set

Transceiver Temperature : 46 Celsius

AINS Soak               : None
AINS Timer              : 0h, 0m
AINS remaining time     : 0 seconds
```

Step 2 Run the **commit** command to apply the changes.

Configure optical signal to noise ratio

Use this task to configure the minimum acceptable Optical Signal to Noise ratio (OSNR) value on the 1.2T, 2.4TX, and 2.4T cards.

The OSNR alarm is raised if OSNR goes below this value.

The range is 0–4000 (in units of 0.01db).

Procedure

Step 1 Enter the **controller optics***R/S/I/P***osnr-low-threshold***osnr-valuecd-low** command to configure the minimum acceptable OSNR.

Example:

This sample configures the minimum acceptable OSNR on the controller optics.

```
RP/0/RP0/CPU0:ios#configure
RP/0/RP0/CPU0:ios(config)#controller optics 0/0/0/7
RP/0/RP0/CPU0:ios(config-Optics)#osnr-low-threshold 40
RP/0/RP0/CPU0:ios(config-Optics)#commit
```

This sample shows the minimum acceptable OSNR configured on the controller optics.

```
RP/0/RP0/CPU0:ios#show controllers optics 0/0/0/7
Fri Nov 12 10:58:50.595 UTC
Controller State: Up
Transport Admin State: In Service
Laser State: On
LED State: Yellow
Optics Status
         Optics Type:  CIM8 DWDM
         DWDM carrier Info: C BAND, MSA ITU Channel=61, Frequency=193.10THz,
         Wavelength=1552.524nm

         Alarm Status:
         -------------
         Detected Alarms:
                 HIGH-RX-PWR   LOW-TX-PWR
                 HIGH-DGD

         LOS/LOL/Fault Status:
         Alarm Statistics:
         -------------
         HIGH-RX-PWR = 1            LOW-RX-PWR = 0
         HIGH-TX-PWR = 0            LOW-TX-PWR = 1
         HIGH-LBC = 0               HIGH-DGD = 6
         OOR-CD = 0                 OSNR = 0
         WVL-OOL = 0                MEA  = 0
         IMPROPER-REM = 1
         TX-POWER-PROV-MISMATCH = 0
         Laser Bias Current = 0.0 %
         Actual TX Power = 0.97 dBm
         RX Power = -0.53 dBm
         RX Signal Power = -1.20 dBm
         Frequency Offset = 63 MHz

         Performance Monitoring: Enable

         THRESHOLD VALUES
         ----------------

         Parameter                High Alarm  Low Alarm  High Warning  Low Warning
         -----------------------  ----------  ---------  ------------  -----------
         Rx Power Threshold(dBm)         -2.0       -3.0           0.0          0.0
         Tx Power Threshold(dBm)          4.0        2.0           0.0          0.0
         LBC Threshold(mA)                N/A        N/A          0.00         0.00
```

```
          LBC High Threshold = 55 %
          Configured Tx Power = 1.00 dBm
          Configured CD High Threshold = 2400 ps/nm
          Configured CD lower Threshold = -2400 ps/nm
          Configured OSNR lower Threshold = 0.40 dB
          Configured DGD Higher Threshold = 0.30 ps
          Baud Rate =  63.1394679230 GBd
          Bits per Symbol = 3.0000000000  bits/symbol
          Modulation Type: 8QAM
          Chromatic Dispersion 0 ps/nm
          Configured CD-MIN -48000 ps/nm  CD-MAX 48000 ps/nm
          Polarization Mode Dispersion = 0.0 ps
          Second Order Polarization Mode Dispersion = 29.00 ps^2
          Optical Signal to Noise Ratio = 36.10 dB
          SNR = 17.50 dB
          Polarization Dependent Loss = 0.50 dB
          Polarization Change Rate = 0.00 rad/s
          Differential Group Delay = 1.00 ps
Transceiver Vendor Details
          Form Factor             : CIM8
          Name                    : CISCO-ACACIA
          Part Number             : 10-3500-01
          Rev Number              : 01
          Serial Number           : ACA24480037
          PID                     : CIM8-C-K9
          VID                     : VES1
          Date Code(yy/mm/dd)     : 23/11/10
          Fiber Connector Type: LC
          Otn Application Code: Not Set
          Sonet Application Code: Not Set
          Ethernet Compliance Code: Not set

Transceiver Temperature : 46 Celsius
AINS Soak                : None
AINS Timer               : 0h, 0m
AINS remaining time      : 0 seconds
```

Step 2 Run the **commit** command to apply the changes.

Configure receive power threshold

Use this task to configure the high and low threshold of the total optical signal power of the received signal on the 1.2T, 2.4TX, and 2.4T cards.

The range is –400 to 300 (in the units of 0.1 dBm).

Procedure

Step 1 Enter the **rx-high-threshold***rx-high***rx-low-threshold***rx-low**R/S/I/P command to configure the high and low receive power threshold.

Example:

This sample configures the high receive power threshold on the controller optics.

```
RP/0/RP0/CPU0:ios#configure
RP/0/RP0/CPU0:ios(config)#controller optics 0/0/0/7
RP/0/RP0/CPU0:ios(config-Optics)#rx-high-threshold -20
RP/0/RP0/CPU0:ios(config-Optics)#rx-low-threshold -30
RP/0/RP0/CPU0:ios(config-Optics)#commit
```

This sample shows the high receive power threshold configured on the controller optics.

```
RP/0/RP0/CPU0:ios#show controllers optics 0/0/0/7
Fri Nov 12 10:58:50.595 UTC
Controller State: Up
Transport Admin State: In Service
Laser State: On
LED State: Yellow
Optics Status
         Optics Type:  CIM8 DWDM
         DWDM carrier Info: C BAND, MSA ITU Channel=61, Frequency=193.10THz,
         Wavelength=1552.524nm

         Alarm Status:
         -------------
         Detected Alarms:
                 HIGH-RX-PWR   LOW-TX-PWR
                 HIGH-DGD

         LOS/LOL/Fault Status:

         Alarm Statistics:

         -------------
         HIGH-RX-PWR = 1            LOW-RX-PWR = 0
         HIGH-TX-PWR = 0            LOW-TX-PWR = 1
         HIGH-LBC = 0               HIGH-DGD = 6
         OOR-CD = 0                 OSNR = 0
         WVL-OOL = 0                MEA  = 0
         IMPROPER-REM = 1
         TX-POWER-PROV-MISMATCH = 0
         Laser Bias Current = 0.0 %
         Actual TX Power = 0.97 dBm
         RX Power = -0.53 dBm
         RX Signal Power = -1.20 dBm
         Frequency Offset = 63 MHz

         Performance Monitoring: Enable

         THRESHOLD VALUES
         ----------------

         Parameter                High Alarm  Low Alarm  High Warning  Low Warning
         -----------------------  ----------  ---------  ------------  -----------
         Rx Power Threshold(dBm)         -2.0       -3.0           0.0          0.0
         Tx Power Threshold(dBm)          4.0        2.0           0.0          0.0
         LBC Threshold(mA)                N/A        N/A          0.00         0.00

         LBC High Threshold = 55 %
         Configured Tx Power = 1.00 dBm
         Configured CD High Threshold = 2400 ps/nm
         Configured CD lower Threshold = -2400 ps/nm
         Configured OSNR lower Threshold = 0.40 dB
         Configured DGD Higher Threshold = 0.30 ps
         Baud Rate =  63.1394679230 GBd
         Bits per Symbol = 3.0000000000  bits/symbol
         Modulation Type: 8QAM
```

```
          Chromatic Dispersion 0 ps/nm
          Configured CD-MIN -48000 ps/nm  CD-MAX 48000 ps/nm
          Polarization Mode Dispersion = 0.0 ps
          Second Order Polarization Mode Dispersion = 29.00 ps^2
          Optical Signal to Noise Ratio = 36.10 dB
          SNR = 17.50 dB
          Polarization Dependent Loss = 0.50 dB
          Polarization Change Rate = 0.00 rad/s
          Differential Group Delay = 1.00 ps

Transceiver Vendor Details

          Form Factor            : CIM8
          Name                   : CISCO-ACACIA
          Part Number            : 10-3500-01
          Rev Number             : 01
          Serial Number          : ACA24480037
          PID                    : CIM8-C-K9
          VID                    : VES1
          Date Code(yy/mm/dd)    : 23/11/10
          Fiber Connector Type: LC
          Otn Application Code: Not Set
          Sonet Application Code: Not Set
          Ethernet Compliance Code: Not set

Transceiver Temperature : 46 Celsius
AINS Soak               : None
AINS Timer              : 0h, 0m
AINS remaining time     : 0 seconds
```

Step 2 Run the **commit** command to apply the changes.

Frequency

Use this task to configure the frequency on trunk ports of the transponder line cards.

This table lists the frequency range with grid spacing supported on the line card.

Line card	Frequency range (THz)	Grid spacing
1.2T	191.25 to 196.1	50GHz and 100MHz
1.2TL [1]	186.1 to 190.85	100MHz
2.4T	191.25 to 196.1	50GHz and 100MHz
2.4TX using C band trunk pluggables	191.25 to 196.1	50GHz and 100MHz
2.4TX using L band trunk pluggables	186.15 to 190.925	100MHz

Line card	Frequency range (THz)	Grid spacing
QXP	191.275 to 196.125	50GHz and 100MHz

[1] Only non-ITU channels are supported

Procedure

Step 1 Run the **controller optics***Rack/Slot/Instance/Port***dwdm-carrier** {**100MHz-grid frequency** *frequency*} | {**50GHz-grid** [**frequency** *frequency*} command to configure the wavelength.

Step 2 Run the **commit** command to apply the changes.

Change the trunk port frequency on a transponder card

Use this task when you need to modify the optical signal frequency on the trunk port on the transponder cards.

Procedure

Step 1 Run the **config** command to enter the global configuration mode.

Step 2 Run the **shutdown** command in optics configuration mode to shutdown the trunk port.

Example:

```
RP/0/RP0/CPU0:ios(config)#controller optics 0/2/0/0
RP/0/RP0/CPU0:ios(config-Optics)#shutdown
RP/0/RP0/CPU0:ios(config-Optics)#commit
Fri Jul 11 07:19:30.624 UTC
RP/0/RP0/CPU0:ios(config-Optics)#
```

The interface at trunk port 0 is shut down.

Step 3 Run the **dwdm-carrier 100MHz-grid frequency** <*frequency*> command to set the new frequency.

Example:

```
RP/0/RP0/CPU0:ios(config-Optics)#dwdm-carrier 100MHz-grid frequency 1911500
Fri Jul 11 07:20:17.234 UTC
WARNING! Changing channel/wavelength/frequency can impact traffic
RP/0/RP0/CPU0:ios(config-Optics)#commit
Fri Jul 11 07:20:19.905 UTC
RP/0/RP0/CPU0:ios(config-Optics)#
```

Note
Changing the trunk port frequency can impact traffic.

The frequency for the 100 MHz grid channel is set to 1911500.

Step 4 Run the **no shutdown** command in optics configuration mode to bring the port back up.

Example:

```
RP/0/RP0/CPU0:ios(config-Optics)#no shutdown
RP/0/RP0/CPU0:ios(config-Optics)#commit
Fri Jul 11 07:20:57.198 UTC
RP/0/RP0/CPU0:ios(config-Optics)#
```

Note
If you configure the frequency and use the no shutdown command in the same batch, the no shutdown command is processed first, followed by the new frequency. This means the trunk interface transmits at the previous frequency for a shorter time.

The channel resumes operation at the new frequency. The channel on the trunk port now operates at the configured frequency.

CCMD-16 controllers

The NCS1K14-CCMD-16-C and NCS1K14-CCMD-16-L cards have two types of controllers.

- OCH controllers
- OMS controllers

When the NCS1K14-CCMD-16-C and NCS1K14-CCMD-16-L cards become operational, both the OMS and OCH controllers are automatically created by default.

View OCH controller and parameters

Use this task to view an OCH contollers and parameters.

When you bring up the nodes with NCS1K14-CCMD-16-C and NCS1K14-CCMD-16-L cards, the OCH controllers are automatically created by default. The OCH controllers for the NCS1K14-CCMD-16-C and NCS1K14-CCMD-16-L cards are:

Table 6: Supported interfaces

Card	Port type	OCH ports	Interfaces
NCS1K14-CCMD-16-C	LC Ports	16	och R/S/I/1 to och R/S/I/16
NCS1K14-CCMD-16-L	LC Ports	16	och R/S/I/1 to och R/S/I/16

Note R/S/I/P stands for Rack/Slot/Instance/Port.

Procedure

Step 1 Run the **show controllers och** command to view the OCH controllers.

Example:

This output shows the active OCH controllers in *Slot 0* from *port 1 to 16*.

Output Example

```
0/0/0/1               Och Interface Instance
  0/0/0/10              Och Interface Instance
  0/0/0/11              Och Interface Instance
  0/0/0/12              Och Interface Instance
  0/0/0/13              Och Interface Instance
  0/0/0/14              Och Interface Instance
  0/0/0/15              Och Interface Instance
  0/0/0/16              Och Interface Instance
  0/0/0/2               Och Interface Instance
  0/0/0/3               Och Interface Instance
  0/0/0/4               Och Interface Instance
  0/0/0/5               Och Interface Instance
  0/0/0/6               Och Interface Instance
  0/0/0/7               Och Interface Instance
  0/0/0/8               Och Interface Instance
  0/0/0/9               Och Interface Instance
```

Step 2 Run the **show controllers** command to view the parameters of an OCH controller.

Example:

This output shows the parameters of the OCH controller.

Output Example

```
RP/0/RP0/CPU0:ios#show controllers och 0/1/0/1
Thu Oct 12 09:26:38.555 UTC

 Controller State: Up

 Transport Admin State: In Service

 LED State: Green

         Alarm Status:
         -------------
         Detected Alarms: None


         Alarm Statistics:
         -----------------
         RX-LOS-P = 0
         TX-POWER-FAIL-LOW = 0

         Parameter Statistics:
         ---------------------
         Tx Power = -2.30 dBm
         Rx Power = -0.70 dBm
```

View OMS controller and parameters

Use this task to view an OMS controller and parameters.

When you bring up the nodes with NCS1K14-CCMD-16-C and NCS1K14-CCMD-16-L cards, the OMS controllers are automatically created by default.

The OMS controllers for the NCS1K14-CCMD-16-C and NCS1K14-CCMD-16-L cards are:

Table 7: Supported interfaces

Card	Port type	OMS ports	Interfaces
NCS1K14-CCMD-16-C	LC Ports	1	oms R/S/I/0
NCS1K14-CCMD-16-L	LC Ports	1	oms R/S/I/0

Note R/S/I/P stands for Rack/Slot/Instance/Port.

Procedure

Step 1 Run the **show controllers oms ?** command to view the OMS controllers.

Example:

This output shows the active OMS controller in *Slot 0*.

Step 2 Run the **show controllers** command to view the parameters of an OMS controller.

Example:

This output shows the parameters of the an OMS controller.

Output Example

```
RP/0/RP0/CPU0:ios#show controllers oms 0/1/0/0
Thu Oct 12 09:23:35.297 UTC
 Controller State: Up
 Transport Admin State: In Service
 LED State: Red
         Alarm Status:
         -------------
         Detected Alarms:
                 HI-TX-BR-PWR

         Alarm Statistics:
         -----------------
         RX-LOS-P = 3
         TX-POWER-FAIL-LOW = 0
         INGRESS-AMPLI-GAIN-LOW = 0
         INGRESS-AMPLI-GAIN-HIGH = 0
         EGRESS-AUTO-LASER-SHUT = 0
         EGRESS-AMPLI-GAIN-LOW = 0
         EGRESS-AMPLI-GAIN-HIGH = 0
         HI-TX-BR-PWR = 2
```

```
Parameter Statistics:
---------------------
Tx Power = -3.40 dBm
Rx Power = -2.30 dBm
Rx Voa Attenuation = 5.0 dB
Tx Voa Attenuation = 5.0 dB
Ingress Ampli Mode = Gain
Ingress Ampli Gain = 5.0 dB
Ingress Ampli Tilt = 0.0 dB
Ingress Ampli OSRI = OFF
Egress Ampli Mode = Gain
Egress Ampli Gain = 2.0 dB
Egress Ampli Tilt = 0.0 dB
Egress Ampli Gain Range = Normal
Egress Ampli OSRI = OFF
Egress Ampli BR Power = -12.90 dBm
Egress Ampli BR Ratio = -9.39 dB


Configured Parameters:
-------------
Rx Voa Attenuation = 5.0 dB
Tx Voa Attenuation = 5.0 dB
Ingress Ampli Mode = Gain
Ingress Ampli Gain = 5.0 dB
Ingress Ampli Power = -9.0 dBm
Ingress Ampli OSRI = OFF
Egress Ampli Mode = Gain
Egress Ampli Gain = 2.0 dB
Egress Ampli Power = 0.0 dBm
Egress Ampli Gain Range = Normal
Egress Ampli OSRI = OFF
BR High Threshold = -17.0 dBm
```

Configure Controller Parameters for NCS1K14-CCMD-16-C and NCS1K14-CCMD-16-L Cards

Table 8: Feature History

Feature Name	Release Information	Feature Description
Supported Functionalities of CCMD-16-C and CCMD-16-L Line Cards	Cisco IOS XR Release 7.11.1	Supported Functionalities of CCMD-16-C and CCMD-16-L Line Cards: The software supports Variable Optical Attenuator (VoA), power monitoring and reporting of parameters to the controllers at the OCH and OMS level. It helps in configuring the amplifier parameters for optimizing signal transmissions. The software also supports in-band and out-of-band tone detection and monitoring and reporting of alarms.

This chapter describes the controller configuration using EDFA, VoA, optical safety, and photodiode parameters which are supported on NCS1K14-CCMD-16-C and NCS1K14-CCMD-16-L line cards.

Table 9: Basic Controller Configuration Parameters

Parameter	CLI	Description
EDFA-ADD Control Mode	`controller Oms R/S/I/P` `egress-ampli-mode power-control`	Here the default mode is gain-control. Use this command to change the mode to power-control mode. You can delete this configuration to revert to gain-control mode.
EDFA-ADD Power	`controller Oms R/S/I/P` `egress-ampli-power <val in 0.1 dBm>`	This is the target output power configuration for the EDFA located on COM-Tx. If the output power is not configured, then a default value is used by the system. You can find the applied target output power by using the **show controller oms** output.

EDFA-ADD Gain Range	`controller Oms R/S/I/P` `egress-ampli-gain-range <normal | extended>`	

If you change the gain range from Normal to Extended or the opposite way, without updating the proper gain value for the new gain range, then the following may happen:

- The EDFA switches to the preconfigured or default value of the gain causing a mismatch between the operational and configured gain.
- The gain configuration is lost during the reload of software or line card, as the configured gain mismatches with the latest gain-range. This may result in traffic interruption during these reload operations.

Hence, we recommend that you explicitly configure the gain range mode as normal or extended, and the corresponding gain values for each mode to get the expected results.

The following are a few example scenarios that may not work as expected:

- Scenario 1:

  Current running config:

  ```
  controller Oms R/S/I/P
   egress-ampli-gain-range extended
   egress-ampli-gain <gain value in
  extended mode>
  ```

  New applied config:

  ```
  controller Oms R/S/I/P
   no egress-ampli-gain-range extended
   commit
  ```

- Scenario 2:

  Current running config:

  ```
  controller Oms R/S/I/P
   egress-ampli-gain-range extended
   egress-ampli-gain <gain value in
  extended mode>
  ```

  New applied config:

  ```
  controller Oms R/S/I/P
   egress-ampli-gain-range Normal
   commit
  ```

- Scenario 3:

  Current running config:

  ```
  controller Oms R/S/I/P
  egress-ampli-gain <gain value in normal
   mode>
  ```

		New applied config:
		`controller Oms R/S/I/P`
		`egress-ampli-gain-range extended`
		`commit`
		The following is another example scenario that involves commit-replace command where you replace the existing gain configuration that does not have explicitly configured gain-range, with new gain-range and gain value.
		Scenario 4:
		Current running config:
		`controller Oms R/S/I/P`
		`egress-ampli-gain <gain value in normal mode>`
		New applied config:
		`……..`
		`controller Oms R/S/I/P`
		`egress-ampli-gain-range extended`
		`egress-ampli-gain <gain value in extended mode>`
		`commit replace`

EDFA-ADD Gain	`controller Oms R/S/I/P` `egress-ampli-gain <val in 0.1 dB>`	This is used for configuring gain for the EDFA located on the COM-Tx port. If the gain is not configured, then a default value is used by the system. The **show controller oms** output can be used for finding the applied gain.
EDFA-DROP Control Mode	`controller Oms R/S/I/P` `ingress-ampli-mode power-control`	The default mode is gain-control. Use this command to change the mode to power-control mode. You can delete this configuration to revert to gain-control mode.
EDFA-DROP Power	`controller Oms R/S/I/P` `ingress-ampli-power <vale in 0.1 dBm>`	This is the target output power configuration for the EDFA located on COM-Rx. If the output power is not configured, then a default value is used by the system. You can find the applied target output power by using the **show controller oms** output.
EDFA-DROP Gain	`controller Oms R/S/I/P` `ingress-ampli-gain <val in 0.1 dB>`	This is used for configuring gain for the EDFA located on the COM-Rx port. If the gain is not configured, then a default value is used by the system. The **show controller oms** output can be used for finding the applied gain.

VoA Attenuation	`controller Oms R/S/I/P`
	`tx-voa-attenuation <val in 0.1 dB>`
	`rx-voa-attenuation <val in 01. dB>`
		This is used to configure VoA attenuation for COM-Tx and COM-Rx ports. The system picks a default value if the gain is not configured. The **show controller oms** output can be used for finding the applied attenuation.

Shutdown (COM Port)	`controller Oms R/S/I/P` `shutdown`	COM-Tx and Rx ports are put in Out of Service (OOS) when this command is executed. This turns off the EDFA devices on both COM-Tx and COM-Rx ports and the respective alarms are masked. Here the default value is 'unshut'.
Shutdown (Ch Ports)	`controller Och R/S/I/P` `shutdown`	The channel port will be marked as out-of-service.

Configure Operational Parameters

The different operational parameters supported are given below.

Table 10: Operational Parameters

Parameter	CLI	Description
Photo Diodes (COM Port)	**OMS Controller** `Tx Power and Rx Power`	Rx Power = Inband power + OOB Tx Power = Inband power + OOB It reports the power transmitted and received on the OMS port. The OOB power received on COM-Rx is looped back to COM-Tx with some loss due to the insertion-loss on the loop back path.
Photo Diodes (CH Ports)	**OCH Controller** `Tx Power and Rx Power`	It reports the power transmitted and received on the channel ports.

Amplifier Parameters	**OMS Controller**
	`Ingress Ampli Mode`
	`Ingress Ampli Gain`
	`Ingress Ampli Tilt`
	`Ingress Ampli OSRI`
	`Egress Ampli Mode`
	`Egress Ampli Gain`
	`Egress Ampli Tilt`
	`Egress Ampli Gain Range`
	`Egress Ampli OSRI`
	`Egress Ampli BR Power`
	`Egress Ampli BR Ratio`
		Egress and ingress amplifier parameters.

VoA Parameters	**OMS Controller** `Tx VoA Attenuation and Rx VoA Attenuation`	VoA attenuation parameters.

Configure Optical Safety Parameters

Use the following parameters for configuring optical safety.

Table 11: Optical Safety Parameters

Parameter	CLI	Description

OSRI	`controller Oms R/S/I/P`
	`egress-ampli-osri`
	`ingress-ampli-osri`
		Use this configuration to enable or Disable Optical Safety Remote Interlock (OSRI) on the amplifiers located on COM-Tx and COM-Rx ports. The default value is 'Off'. The **show controller oms** output can be used for finding the OSRI configuration and status.

Verify Rx VOA fixed ratio to zero

Use this task to configure the Rx VOA attenuation to a fixed ratio of zero, effectively disabling the Rx VOA entirely.

Warning Disabling Rx VOA attenuation in certain scenarios may destabilize the network. Practice caution and contact the Cisco TAC team for more information.

Procedure

Run the **configure** command to enter the global configuration mode.

Example:

This is a sample configuration which sets the rx-voa fixed-ratio to zero.

```
RP/0/RP0/CPU0:NE80#configur
Tue Aug 6 07:44:28.125 UTC
Current Configuration Session  Line       User     Date                     Lock
00001000-00001569-00000000 vty0 cisco Tue Aug 6 05:33:16 2024
RP/0/RP0/CPU0:NE80(config)#controller optics 0/2/0/0 rx-voa fixed-ratio 0
RP/0/RP0/CPU0:NE80(config)#controller optics 0/2/0/7 rx-voa fixed-ratio 0
RP/0/RP0/CPU0:NE80(config)#commit
Tue Aug 6 07:44:48.545 UTC
RP/0/RP0/CPU0:NE80(config)#end
```

Verify Rx VOA fixed ratio to zero

Use this task to verify the Rx VOA attenuation to a fixed ratio of zero, effectively disabling the Rx VOA entirely.

Warning Disabling Rx VOA attenuation in certain scenarios may destabilize the network. Practice caution and contact the Cisco TAC team for more information.

Procedure

Step 1 Run the `show running-config controller` command to verify the rx-voa fixed ratio is set to fixed ratio zero.

Example:

```
RP/0/RP0/CPU0:N112#show running-config controller optics 0/2/0/0
Thu May 16 09:19:51.223 UTC
description optics0/2/0/0
dwdm-carrier 100MHz-grid frequency 1909000
rx-voa fixed-ratio 0
```

Step 2 Run the `show controllers optics` command to verify whether the rx-voa fixed-ratio is set to fixed ratio zero.

Example:

```
RP/0/RP0/CPU0:123#show controllers optics 0/2/0/0
Controller State: Up
Transport Admin State: In Service
Laser State: On
LED State: Green
Optics Status
Optics Type: CIM8 DWDM
DWDM carrier Info: C BAND, MSA ITU Channel=61, Frequency=193.10THz,
Wavelength=1552.524nm
Alarm Status:
-------------
Detected Alarms: None
LOS/LOL/Fault Status:
Alarm Statistics:
-------------
HIGH-RX-PWR = 0 LOW-RX-PWR = 0
HIGH-TX-PWR = 0 LOW-TX-PWR = 0
HIGH-LBC = 0 HIGH-DGD = 0
OOR-CD = 0 OSNR = 0
WVL-OOL = 0 MEA = 0
IMPROPER-REM = 0
TX-POWER-PROV-MISMATCH = 0
Laser Bias Current = 0.0 %
Actual TX Power = 2.00 dBm
RX Power = -0.01 dBm
RX Signal Power = 1.94 dBm
Frequency Offset = 0 MHz
Performance Monitoring: Enable
THRESHOLD VALUES
----------------
Parameter High Alarm Low Alarm High Warning Low Warning
----------------------- ---------- --------- ------------ -----------
```

```
Rx Power Threshold(dBm) 13.0 -17.0 0.0 0.0
Tx Power Threshold(dBm) 5.0 -13.0 0.0 0.0
LBC Threshold(mA) N/A N/A 0.00 0.00
LBC High Threshold = 90 %
Configured Tx Power = 2.00 dBm
Configured CD High Threshold = 180000 ps/nm
Configured CD lower Threshold = -180000 ps/nm
Configured OSNR lower Threshold = 20.40 dB
Configured DGD Higher Threshold = 88.00 ps
Baud Rate = 137.9783940000 GBd
Bits per Symbol = 3.5200000000 bits/symbol
Modulation Type: PCS
Chromatic Dispersion 0 ps/nm
Configured CD-MIN -10000 ps/nm CD-MAX 48000 ps/nm
Polarization Mode Dispersion = 0.0 ps
Second Order Polarization Mode Dispersion = 44.00 ps^2
Optical Signal to Noise Ratio = 36.60 dB
SNR = 18.20 dB
Polarization Dependent Loss = 0.40 dB
Polarization Change Rate = 4639.00 rad/s
Differential Group Delay = 2.00 ps
Filter Roll Off Factor : 0.100
Rx VOA Fixed Ratio : 0.00 dB
NLEQ Compensation Mode : 0
Cross Polarization Gain Mode : 10
Proprietary Submarine Parameters
Type : 1 Value : 0
Type : 2 Value : 0
Type : 3 Value : 0
Type : 4 Value : 0
Type : 5 Value : 10485760
Transceiver Vendor Details
Form Factor : CIM8
Name : ACACIA
Part Number : 10-100508-01
Rev Number : 10
Serial Number : N/A
PID : CIM8-CE-K9
VID : VES1
Firmware Version : Major.Minor.Build
Active : 80.130.19
Inactive : 80.130.19
Date Code(yy/mm/dd) : 24/06/18
Fiber Connector Type: LC
Otn Application Code: Not Set
Sonet Application Code: Not Set
Ethernet Compliance Code: Not set
Transceiver Temperature : 36 Celsius
AINS Soak : None
AINS Timer : 0h, 0m
AINS remaining time : 0 seconds
```

Last link flap detection

Table 12: Feature History

Feature Name	Release Information	Feature Description
Last Link Flap Detection for Transponder Controllers	Cisco IOS XR Release 24.4.1	This feature introduces the detection of the last link flap for various transponder controllers. It provides the elapsed time since the occurrence of the last flap for each controller in the `show controllers` output. Link flap refers to the state transition of controllers from UP state to another state or from other states to UP state. This information enables network administrators to effectively monitor and troubleshoot signal stability and performance across the network. Parameter added: • **Last link flapped***value*

Link flap refers to the state transition of controllers from UP state to another state or from other states to UP state. The common cause is related to bad, unsupported, or nonstandard cable or Small Form-Factor Pluggable (SFP) or related to other link synchronization issues. The cause for link flapping can be intermittent or permanent.

NCS 1014 node detects the flapping of link in a signal for various transponder controllers. It provides the time that is elapsed from the occurrence of the last link flap through the *last link flapped* parameter in the **show controllers** output.

The **show controller** output displays the time-elapsed value for the last link flap in seconds, minutes, hours, days, weeks, and years based on the occurrence of the event.

Examples of last link flap value	Meaning of the value
00:00:10	Last link flapped 10 seconds ago.
1d12h	Last link flapped one day and 12 hours ago.
1y00w	Last link flapped one year ago.

The transponder controllers supporting the last link flap parameters are:

- Ethernet
- CoherentDSP
- ODU
- OTU
- Optics

Output examples for each controller

Ethernet controller

The output provides information about a link flap on Ethernet controller that happened one year ago. It highlights the *Last link flapped* value in *1y00w* format for **show controllers TenGigECtrlr 0/1/0/0**.

```
RP/0/0/CPU0:ios#show controllers TenGigECtrlr 0/1/0/0
Fri Sep 27 14:38:16.645 IST
Operational data for interface TenGigECtrlr0/1/0/0:
State:
    Administrative state: enabled
    Operational state: Up
    Maintenance: Enabled
    AINS Soak: None
    Insert Idle Ingress: Disabled
    Insert Idle Egress: Disabled
    Last link flapped: 1y00w
```

Optics controller

The output provides information about a link flap on optics controller that happened four seconds ago. It highlights the *Last link flapped* value in the *HH:MM:SS* format for **show controllers Optics 0/2/0/2**.

```
RP/0/0/CPU0:ios#show controllers Optics 0/2/0/2
Thu Oct 10 12:39:37.767 UTC
Controller State: Up
Transport Admin State: In Service
Laser State: On
LED State: Green
Last link flapped: 00:00:04
         Optics not present
         Optics Type: Unavailable
        DWDM Carrier Info: Unavailable, MSA ITU Channel= Unavailable, Frequency= Unavailable
 , Wavelength= Unavailable
         TX Power = Unavailable
         RX Power = Unavailable
```

OTU controller

The output provides information about a link flap on OTU controller that happened ten seconds ago. It highlights the *Last link flapped* value in the *HH:MM:SS* format **show controllers OTU4 0/0/0/6**.

```
RP/0/0/CPU0:ios#show controllers OTU4 0/0/0/6
Thu Oct 10 12:57:13.777 UTC
Port                                          : OTU4 0/0/0/6
Controller State                              : Up
LED state                                     : Not Applicable
Last link flapped                             : 00:00:10
Inherited Secondary State                     : Normal
Configured Secondary State                    : Normal
Derived State                                 : In Service
Loopback mode                                 : None
BER Thresholds                                : SF = 1.0E-6  SD = 1.0E-7
Performance Monitoring                        : Enable
Alarm Information:
LOS = 0 LOF = 0 LOM = 0
OOF = 0 OOM = 0 AIS = 0
IAE = 0 BIAE = 0        SF_BER = 0
SD_BER = 0      BDI = 0 TIM = 0
FECMISMATCH = 0 FEC-UNC = 0     FLEXO_GIDM = 0
FLEXO-MM = 0    FLEXO-LOM = 0   FLEXO-RDI = 0
FLEXO-LOF = 0
Detected Alarms                               : None
```

ODU controller

The output provides information about a link flap on ODU controller that happened 52 seconds ago. It highlights the *Last link flapped* value in the *HH:MM:SS* format **show controllers ODU4 0/0/0/6**.

```
RP/0/0/CPU0:ios#show controllers ODU4 0/0/0/6
Thu Oct 10 12:57:55.717 UTC
Port                                        : ODU4 0/0/0/6
Controller State                            : Up
LED state                                   : Not Applicable
Last link flapped                           : 00:00:52
Inherited Secondary state                   : Normal
Configured Secondary state                  : Normal
Derived State                               : In Service
Loopback mode                               : None
BER Thresholds                              : SF = 1.0E-6  SD = 1.0E-7
Performance Monitoring                      : Disable
Path Monitoring Mode                        : Non-Intrusive Monitor
PM TIM-CA state                             : Disable
Alarm Information:
AIS = 0 IAE = 0 BIAE = 0
SF_BER = 0      SD_BER = 0      BDI = 0
OCI = 0 LCK = 0 PTIM = 0
TIM = 0 CSF = 0 GFP LFD = 0
GFP LOCS = 0    GFP LOCCS = 0   GFP UPM = 0
Detected Alarms                             : None
```

ODU-FLEX controller

The output provides information about a link flap on ODU-FLEX controller that happened one minute and 35 seconds ago. It highlights the *Last link flapped* value in the *HH:MM:SS* format **show controllers ODU-FLEX 0/3/0/0/*** .

```
RP/0/RP0/CPU0:ios#show controllers ODU-FLEX 0/3/0/0/*
Thu Oct 10 16:25:20.008 IST
Port                                        : ODU-FLEX 0/3/0/0/1
Controller State                            : Up
Last link flapped                           : 00:01:35
Inherited Secondary state                   : Normal
Configured Secondary state                  : Normal
Derived State                               : In Service
Loopback mode                               : None
BER Thresholds                              : SF = 1.0E-6  SD = 1.0E-7
Performance Monitoring                      : Enable
Path Monitoring Mode                        : Operational
PM TIM-CA state                             : Disable
```

CoherentDSP controller

The output provides information about a link flap on coherentDSP controller that happened one day and 12 hours ago. It highlights the *Last link flapped* value in *1d12h* format for **show controllers coherentDSP 0/2/0/0**.

```
RP/0/RP0/CPU0:ios#show  controllers coherentDSP 0/2/0/0
Tue Nov 26 06:20:08.673 UTC

Port                                        : CoherentDSP 0/2/0/0
Controller State                            : Up
Last link flapped                           : 1d12h

Inherited Secondary State                   : Normal
Configured Secondary State                  : Normal
Derived State                               : In Service
Loopback mode                               : None
BER Thresholds                              : SF = 1.0E-5  SD = 1.0E-7
Performance Monitoring                      : Enable
```

```
Bandwidth                                          : 800.0Gb/s
Client Network mapping Type                        : Ethernet

Alarm Information:
LOS = 16        LOF = 0 LOM = 0
OOF = 0 OOM = 0 AIS = 0
IAE = 0 BIAE = 0        SF_BER = 0
SD_BER = 0      BDI = 0 TIM = 0
FECMISMATCH = 0 FEC-UNC = 2     FLEXO_GIDM = 0
FLEXO-MM = 0    FLEXO-LOM = 0   FLEXO-RDI = 15
FLEXO-LOF = 96
Detected Alarms                                    : None

Bit Error Rate Information
PREFEC  BER                                        : 1.52E-04
POSTFEC BER                                        : 0.00E+00
Q-Factor                                           : 11.20 dB

Q-Margin                                           : 4.80 dB

Instantaneous Q-Margin                             : 4.80 dB

TTI :
Remote hostname                           : Node126
Remote interface                          : CoherentDSP 0/2/0/0
Remote IP addr                            : 0.0.0.0

FEC mode                                           : Soft-Decision 15

Flexo-Mode                                         : Enable
Flexo Details:
Tx GID                                    : 1
TX IID                                    : 1, 2, 3, 4, 5, 6, 7, 8,
Rx GID                                    : 1
RX IID                                    : 1, 2, 3, 4, 5, 6, 7, 8,

AINS Soak                                          : None
AINS Timer                                         : 0h, 0m
AINS remaining time                                : 0 seconds
```