Configuring Performance Monitoring

Performance monitoring (PM) parameters are used by service providers to gather, store, set thresholds for, and report performance data for early detection of problems. The user can retrieve both current and historical PM counters for the various controllers in 10 seconds, 15 minutes and 1 day intervals.

PM for optical parameters include laser bias current, transmit and receive optical power, mean polarization mode dispersion, accumulated chromatic dispersion, and received optical signal-to-noise ratio (OSNR). These parameters simplify troubleshooting operations and enhance data that can be collected directly from the equipment.

TCA (Threshold Crossing Alerts) are not supported in 10 sec PM interval.

Note The supported MTU of data plane is as follows:

- Range: 60 bytes to 10 kilobytes
- Jumbo: 10 kilobytes
- Undersize: 60 to 64 bytes

For descriptions of optics, Ethernet, fec, and otn parameters, see the *Command Reference for Cisco NCS 1000 Series*.

- Configure PM Parameters, on page 2
- View PM Parameters, on page 4
- Pseudo Random Binary Sequence, on page 7

Configure PM Parameters

Table 1: Feature History

Feature Name	Release Information	Feature Description
10sec PM buckets	Cisco IOS XR Release 7.3.1	Performance monitoring parameters for the Optics, Ethernet, and Coherent DSP controllers in 10 second intervals are available. This new bucket for performance monitoring allows you to gather, store, and report performance data with higher granularity. Commands modified: • pm • controller optics • controller GigECtrlr • controller coherentDSP • show controllers

You can configure the performance monitoring parameters for the Optics, Ethernet, and coherent DSP controllers. The coherent DSP controller is created on the trunk port when the slice is provisioned using the **hw-module** command. To configure PM parameters, use the following commands.

configure

controller *controllertype R/S/I/P* { **pm** { **15-min** | **30-sec** | **24-hour** | **flex-bin**} { **optics** | **ether** | **fec** | **otn** } { **report** | **threshold** } *value* }

commit

Examples

The following is a sample in which the performance monitoring parameters of Optics controller is configured in 24 hour intervals.

```
configure
controller optics 0/0/0/0 pm 24-hour optics report cd max-tca enable
commit
```

The following is a sample in which the performance monitoring parameters of Ethernet controller is configured in 15 minute intervals.

```
configure
controller HundredGigECtrlr 0/0/0/1 pm 15-min ether report 1024-1518-octets enable
commit
```

The following is a sample in which the performance monitoring parameters of Coherent DSP controller is configured in 15 minute intervals.

```
configure
controller coherentDSP 0/0/0/12 pm 15-min otn threshold es-ne
commit
```

Configure FEC BER Thresholds

Pre-forward error correction (FEC) bit error rate (BER) or post-FEC BER values are represented in numerical values. BER value is multiplied by 1E-15 to derive numerical value. For example, 2.1e-4 is displayed as 210000000000(2.1e+11).

The following is a sample to enable minimum and maximum TCAs for pre-FEC BER.

```
configure
controller coherentDSP 0/0/0/6 pm 30-sec fec report pre-fec-ber min-tca enable
controller coherentDSP 0/0/0/6 pm 30-sec fec report pre-fec-ber max-tca enable
commit
```

The following is a sample to enable minimum and maximum TCAs for post-FEC BER.

```
configure
controller coherentDSP 0/0/0/6 pm 30-sec fec report post-fec-ber min-tca enable
controller coherentDSP 0/0/0/6 pm 30-sec fec report post-fec-ber max-tca enable
commit
```

The following is a sample to configure pre-FEC BER thresholds of Coherent DSP controller in 30 second intervals.

```
configure
controller coherentDSP 0/0/0/6 pm 30-sec fec threshold pre-fec-ber max 320000000000
commit
```

The following is a sample to configure post-FEC BER thresholds of Coherent DSP controller in 30 second intervals.

```
configure
controller coherentDSP 0/0/0/6 pm 30-sec fec threshold post-fec-ber max 320000000000
commit
```

The following is a sample of the show controllers command.

```
show controllers coherentDSP 0/0/0/6 pm current 30-sec fec

Mon Feb 25 05:29:20.980 UTC

g709 FEC in the current interval [05:29:00 - 05:29:21 Mon Feb 25 2019]

FEC current bucket type : Valid
    EC-BITS   : 1196208549              Threshold : 903330                TCA(enable)  :
NO
    UC-WORDS  : 0                       Threshold : 5                     TCA(enable)  :
YES

                MIN       AVG        MAX    Threshold   TCA     Threshold   TCA
                                              (min)    (enable)   (max)    (enable)
PreFEC BER  :   0E-15     0E-15     0E-15       0        NO   320000000000       YES
PostFEC BER :   0E-15     0E-15     0E-15       0        NO   320000000000       YES
```

Associated Commands

- pm
- controller optics
- controller GigECtrlr
- controller coherentDSP
- show controllers

View PM Parameters

Use this procedure to view the performance monitoring parameters for Optics, Ethernet, and coherent DSP controllers.

Procedure

show controllers *controllertype R/S/I/P* { **pm** { **current** | **history** } { **15-min | 30-sec | 24-hour | flex-bin** } { **optics** | **ether** | **fec** | **otn** } *linenumber* }

Example:

```
RP/0/RP0/CPU0:ios# show controllers optics 0/0/0/1 pm current 15-min optics 1
```

Displays the current performance monitoring parameters of the Optics controller in 15 minute intervals.

Client optics has four lanes and trunk optics has one lane.

```
Fri Aug 21 09:28:57.608 UTC

Optics in the current interval [ 9:15:00 - 09:28:57 Fri Aug 21 2015]

Optics current bucket type : Valid
             MIN       AVG       MAX     Threshold  TCA     Threshold  TCA
                                           (min)    (enable)    (max)    (enable)
LBC[% ]    : 0.0       0.0       0.0       0.0      NO        0.0      NO
OPT[dBm]   : -inf      -inf      -inf      0.00     NO        0.00     NO
OPR[dBm]   : -inf      -inf      -inf      0.00     NO        0.00     NO

Last clearing of "show controllers OPTICS" counters never
```

Example:

```
RP/0/RP0/CPU0:ios# show controllers hundredGigECtrlr 0/0/0/3 pm current 15-min ether
```

Displays the current performance monitoring parameters of the Ethernet controller in 15 minute intervals.

```
Mon Jan 28 07:20:28.170 IST

ETHER in the current interval [07:15:00 - 07:20:29 Mon Jan 28 2019]

ETHER current bucket type : Valid
RX-UTIL[%]                : 2.90              Threshold : 0.00         TCA(enable) : NO
TX-UTIL[%]                : 2.84              Threshold : 0.00         TCA(enable) : NO
RX-PKT                    : 78662810          Threshold : 0            TCA(enable) : NO
```

```
STAT-PKT                  : 0                   Threshold : 0           TCA(enable) : NO
OCTET-STAT                : 117994199787        Threshold : 0           TCA(enable) : NO
OVERSIZE-PKT              : 0                   Threshold : 0           TCA(enable) : NO
FCS-ERR                   : 0                   Threshold : 0           TCA(enable) : NO
LONG-FRAME                : 0                   Threshold : 0           TCA(enable) : NO
JABBER-STATS              : 0                   Threshold : 0           TCA(enable) : NO
64-OCTET                  : 0                   Threshold : 0           TCA(enable) : NO
65-127-OCTET              : 0                   Threshold : 0           TCA(enable) : NO
128-255-OCTET             : 0                   Threshold : 0           TCA(enable) : NO
256-511-OCTET             : 0                   Threshold : 0           TCA(enable) : NO
512-1023-OCTET            : 0                   Threshold : 0           TCA(enable) : NO
1024-1518-OCTET           : 0                   Threshold : 0           TCA(enable) : NO
IN-UCAST                  : 78662799            Threshold : 0           TCA(enable) : NO
IN-MCAST                  : 11                  Threshold : 0           TCA(enable) : NO
IN-BCAST                  : 0                   Threshold : 0           TCA(enable) : NO
OUT-UCAST                 : 0                   Threshold : 0           TCA(enable) : NO
OUT-BCAST                 : 0                   Threshold : 0           TCA(enable) : NO
OUT-MCAST                 : 0                   Threshold : 0           TCA(enable) : NO
TX-PKT                    : 76889333            Threshold : 0           TCA(enable) : NO
OUT-OCTET                 : 115333999500        Threshold : 0           TCA(enable) : NO
IFIN-ERRORS               : 0                   Threshold : 0           TCA(enable) : NO
IFIN-OCTETS               : 0                   Threshold : 0           TCA(enable) : NO
STAT-MULTICAST-PKT        : 0                   Threshold : 0           TCA(enable) : NO
STAT-BROADCAST-PKT        : 0                   Threshold : 0           TCA(enable) : NO
STAT-UNDERSIZED-PKT       : 0                   Threshold : 0           TCA(enable) : NO
IN_GOOD_BYTES             : 117994199787        Threshold : 0           TCA(enable) : NO
IN_GOOD_PKTS              : 78662810            Threshold : 0           TCA(enable) : NO
IN_DROP_OTHER             : 0                   Threshold : 0           TCA(enable) : NO
IN_ERROR_FRAGMENTS        : 0                   Threshold : 0           TCA(enable) : NO
IN_PKT_64_OCTET           : 0                   Threshold : 0           TCA(enable) : NO
IN_PKTS_65_127_OCTETS     : 11                  Threshold : 0           TCA(enable) : NO
IN_PKTS_128_255_OCTETS    : 0                   Threshold : 0           TCA(enable) : NO
IN_PKTS_256_511_OCTETS    : 0                   Threshold : 0           TCA(enable) : NO
IN_PKTS_512_1023_OCTETS   : 0                   Threshold : 0           TCA(enable) : NO
IN_PKTS_1024_1518_OCTETS  : 78662799            Threshold : 0           TCA(enable) : NO
TX_UNDERSIZED_PKT         : 0                   Threshold : 0           TCA(enable) : NO
TX_OVERSIZED_PKT          : 0                   Threshold : 0           TCA(enable) : NO
TX_FRAGMENTS              : 0                   Threshold : 0           TCA(enable) : NO
TX_JABBER                 : 0                   Threshold : 0           TCA(enable) : NO
TX_BAD_FCS                : 0                   Threshold : 0           TCA(enable) : NO

Last clearing of "show controllers ETHERNET" counters never
```

Example:

```
RP/0/RP0/CPU0:ios# show controllers coherentDSP 0/0/0/13 pm current 15-min otn
```

Displays the current performance monitoring parameters of the Coherent DSP controller in 15 minute intervals.

```
Tue Feb 13 15:43:00.173 UTC

g709 OTN in the current interval [15:30:00 - 15:43:00 Tue Feb 13 2001]

OTN current bucket type : Valid
    ES-NE   : 0         Threshold : 500      TCA(enable)  : YES
    ESR-NE  : 0.00000   Threshold : 0.00000  TCA(enable)  : NO
    SES-NE  : 0         Threshold : 500      TCA(enable)  : YES
    SESR-NE : 0.00000   Threshold : 0.00000  TCA(enable)  : NO
    UAS-NE  : 0         Threshold : 500      TCA(enable)  : YES
    BBE-NE  : 0         Threshold : 10000    TCA(enable)  : YES
    BBER-NE : 0.00000   Threshold : 0.00000  TCA(enable)  : NO
    FC-NE   : 0         Threshold : 10       TCA(enable)  : YES
```

```
    ES-FE   : 0          Threshold : 500      TCA(enable)  : YES
    ESR-FE  : 0.00000    Threshold : 0.00000  TCA(enable)  : NO
    SES-FE  : 0          Threshold : 500      TCA(enable)  : YES
    SESR-FE : 0.00000    Threshold : 0.00000  TCA(enable)  : NO
    UAS-FE  : 0          Threshold : 500      TCA(enable)  : YES
    BBE-FE  : 0          Threshold : 10000    TCA(enable)  : YES
    BBER-FE : 0.00000    Threshold : 0.00000  TCA(enable)  : NO
    FC-FE   : 0          Threshold : 10       TCA(enable)  : YES

Last clearing of "show controllers OTU" counters never
```

Example:

```
RP/0/RP0/CPU0:ios# show controllers optics 0/0/0/0 pm current flex-bin optics 1


Mon Dec  7 15:57:42.886 IST

Optics in the current interval [15:57:40 - 15:57:42 Mon Dec 7 2020]

Flexible bin interval size: 10 seconds

Optics current bucket type : Valid
           MIN    AVG    MAX  Operational   Configured       TCA  Operational  Configured    TCA
                              Threshold(min)Threshold(min)   (min)Threshold(max)Threshold(max)(max)
LBC[% ]  : 53.0   53.0   53.0   0.0            NA           NO     0.0             NA          NO
OPT[dBm] : 0.91   0.92   0.92   0.00           NA           NO     0.00            NA          NO
OPR[dBm] : -0.46  -0.41  -0.38  0.00           NA           NO     0.00            NA          NO
Last clearing of "show controllers OPTICS" counters never
```

Example:

```
RP/0/RP0/CPU0:ios# show controllers hundredGigECtrlr 0/0/0/0 pm current flex-bin ether


Mon Dec  7 15:58:56.007 IST
ETHER in the current interval [15:58:50 - 15:58:55 Mon Dec 7 2020]
Flexible bin interval size: 10 seconds
ETHER current bucket type : Valid
 RX-UTIL[%]               : 4.89               Threshold : 0.00         TCA(enable) : NO
 TX-UTIL[%]               : 4.89               Threshold : 0.00         TCA(enable) : NO
 RX-PKT                   : 24828201           Threshold : 0            TCA(enable) : NO
 STAT-PKT                 : 0                  Threshold : 0            TCA(enable) : NO
 OCTET-STAT               : 3178009728         Threshold : 0            TCA(enable) : NO
 OVERSIZE-PKT             : 0                  Threshold : 0            TCA(enable) : NO
 FCS-ERR                  : 0                  Threshold : 0            TCA(enable) : NO
 LONG-FRAME               : 0                  Threshold : 0            TCA(enable) : NO
 JABBER-STATS             : 0                  Threshold : 0            TCA(enable) : NO
 64-OCTET                 : 0                  Threshold : 0            TCA(enable) : NO
 65-127-OCTET             : 0                  Threshold : 0            TCA(enable) : NO
 128-255-OCTET            : 0                  Threshold : 0            TCA(enable) : NO
 256-511-OCTET            : 0                  Threshold : 0            TCA(enable) : NO
 512-1023-OCTET           : 0                  Threshold : 0            TCA(enable) : NO
 1024-1518-OCTET          : 0                  Threshold : 0            TCA(enable) : NO
 IN-UCAST                 : 24828201           Threshold : 0            TCA(enable) : NO
 IN-MCAST                 : 0                  Threshold : 0            TCA(enable) : NO
 IN-BCAST                 : 0                  Threshold : 0            TCA(enable) : NO
 OUT-UCAST                : 0                  Threshold : 0            TCA(enable) : NO
 OUT-BCAST                : 0                  Threshold : 0            TCA(enable) : NO
 OUT-MCAST                : 0                  Threshold : 0            TCA(enable) : NO
 TX-PKT                   : 24826715           Threshold : 0            TCA(enable) : NO
 OUT-OCTET                : 3177819520         Threshold : 0            TCA(enable) : NO
 IFIN-ERRORS              : 0                  Threshold : 0            TCA(enable) : NO
 IFIN-OCTETS              : 0                  Threshold : 0            TCA(enable) : NO
 STAT-MULTICAST-PKT       : 0                  Threshold : 0            TCA(enable) : NO
 STAT-BROADCAST-PKT       : 0                  Threshold : 0            TCA(enable) : NO
```

```
 STAT-UNDERSIZED-PKT       : 0                    Threshold : 0            TCA(enable) : NO
 IN_GOOD_BYTES             : 3178009728           Threshold : 0            TCA(enable) : NO
 IN_GOOD_PKTS              : 24828201             Threshold : 0            TCA(enable) : NO
 IN_DROP_OTHER             : 0                    Threshold : 0            TCA(enable) : NO
 OUT_GOOD_BYTES            : 0                    Threshold : 0            TCA(enable) : NO
 OUT_GOOD_PKTS             : 0                    Threshold : 0            TCA(enable) : NO
 IN_ERROR_FRAGMENTS        : 0                    Threshold : 0            TCA(enable) : NO
 IN_PKT_64_OCTET           : 0                    Threshold : 0            TCA(enable) : NO
 IN_PKTS_65_127_OCTETS     : 0                    Threshold : 0            TCA(enable) : NO
 IN_PKTS_128_255_OCTETS    : 24828201             Threshold : 0            TCA(enable) : NO
 IN_PKTS_256_511_OCTETS    : 0                    Threshold : 0            TCA(enable) : NO
 IN_PKTS_512_1023_OCTETS   : 0                    Threshold : 0            TCA(enable) : NO
 IN_PKTS_1024_1518_OCTETS  : 0                    Threshold : 0            TCA(enable) : NO
 TX_UNDERSIZED_PKT         : 0                    Threshold : 0            TCA(enable) : NO
 TX_OVERSIZED_PKT          : 0                    Threshold : 0            TCA(enable) : NO
 TX_FRAGMENTS              : 0                    Threshold : 0            TCA(enable) : NO
 TX_JABBER                 : 0                    Threshold : 0            TCA(enable) : NO
 TX_BAD_FCS                : 0                    Threshold : 0            TCA(enable) : NO

Last clearing of "show controllers ETHERNET" counters never
```

Example:

```
RP/0/RP0/CPU0:ios# show controllers coherentDSP 0/0/0/5 pm current flex-bin fec


Mon Dec  7 16:00:20.005 IST
g709 FEC in the current interval [16:00:10 - 16:00:19 Mon Dec 7 2020]
Flexible bin interval size: 10 seconds
FEC current bucket type : Valid
    EC-BITS   : 24852481632            Threshold : 0                    TCA(enable)  : NO
    UC-WORDS  : 0                      Threshold : 0                    TCA(enable)  : NO

              MIN       AVG        MAX      Threshold   TCA   Threshold   TCA
                                  (min)     (enable)    (max)   (enable)
PreFEC BER    7.1E-03   7.7E-03    8.4E-03   0E-15        NO     0E-15      NO
PostFEC BER   0E-15     0E-15      0E-15     0E-15        NO     0E-15      NO
Last clearing of "show controllers OTU" counters never
```

Associated Commands

- pm
- show controllers
- controller optics
- controller GigECtrlr
- controller coherentDSP

Pseudo Random Binary Sequence

The Pseudo Random Binary Sequence (PRBS) feature allows you to perform data integrity checks between the NCS1002 trunk links without enabling the actual client traffic.

You can configure NCS 1002 trunk port in any one of the following modes for PRBS on the 1.2T card:

- **Source mode —** The NCS 1002 at trunk port generates PRBS signal on the line continuously as per the configured PRBS pattern.
- **Sink mode —** The NCS 1002 at trunk port gets locked to the ingress signal according to the configured pattern, analyzes and reports the errors.
- **Source-Sink mode —** The NCS 1002 at trunk port acts as both the PRBS transmitter and receiver, that is, it generates PRBS signal as per the configured pattern, and also gets locked to the ingress signal with the same pattern, and reports the errors.

- **PRBS31 —** Sequence length is from 2^31 -1 bits.
- **PRBS23 —** Sequence length is from 2^23 -1 bits.
- **PRBS15 —** Sequence length is from 2^15 -1 bits.
- **PRBS11 —**Sequence length is from 2^11 -1 bits.

Limitations of PRBS

There are following limitations with the PRBS feature:

- There is no SNMP support to fetch the PRBS status or Performance Monitoring (PM).
- 30-secs current/historic PMs are not supported for PRBS feature.
- PRBS PM TCAs are not supported.
- Apply PRBS configuration only after coherentDSP upgrade is complete.

Configuring Pseudo Random Binary Sequence

To enable the PRBS on the trunk port, use the following configuration command at the coherentDSP controller:

controller coherentDSP *R/S/I/P* **prbs mode** {**source | sink | source-sink**} **pattern** {**pn31 | pn23 | pn15 | pn11**}

When the PRBS is enabled on the trunk ports, you can view the following impacts in the corresponding client ports:

- Client traffic is dropped in the direction of source to sink as the frames are overwritten by the PRBS pattern.
- Remote fault is raised on the client ports nearer to the PRBS sink.
- Client ports on both the sides are squelched when PRBS is enabled on the trunks and when laser-squelch is configured on the clients.
- Line Loopback on the client ports works without any issues.
- Internal Loopback on the client ports does not work when PRBS is enabled on the trunk ports.

Viewing PRBS Performance Monitoring Parameters

PRBS PM parameters are not available for the controllers in Source mode. PRBS PM parameters are reset when PRBS configuration changes on the controller.

To view the PRBS PM parameters on the coherentDSP controller, use the following command:

show controllers coherentDSP | ODU4 *R/S/I/P* **pm** {**current | history** }{**15-min|24-hour**} **prbs**

```
RP/0/RP0/CPU0:PROD15#sh controllers coherentDSP 0/0/0/6 pm current 15-min prbs
Sat Jun 24 14:04:25.260 UTC
 PRBS in the current interval [14:00:00 - 14:04:25 Sat Jun 24 2017]
 PRBS current bucket type : Valid
 EBC          : 306
 FOUND-COUNT  : 5                    FOUND-AT-TS : 14:04:16 Sat Jun 24 2017
 LOST-COUNT   : 5                    LOST-AT-TS  : 14:04:10 Sat Jun 24 2017
 CONFIG-PTRN  : PRBS_PATTERN_PN31
 STATUS : LOCKED
Last clearing of "show controllers OTU" counters never
RP/0/RP0/CPU0:PROD15
```

The following tables describes the fields of PRBS PM parameters.

Table 2: PRBS PM Parameters

PM Parameter	Description
EBC	Cumulative count of PRBS bit errors in the sampling interval (15-minute or 24-hour). PRBS bit errors are accumulated only if PRBS signal is locked.
FOUND-COUNT	Number of state transitions from signal unlocked state to signal locked state in the sampling interval. If state change is not observed in the interval, the count is 0.
LOST-COUNT	Number of state transitions from signal locked state to signal unlocked state in the sampling interval. If state change is not observed in the interval, the count is 0.
FOUND-AT-TS	Latest timestamp when the PRBS state moves from unlocked state to locked state in the sampling interval. If state change is not observed in the interval, the value is null.
CONFIG-PTRN	Configured PRBS pattern on the port.

Verifying PRBS

R/S/I/P **prbs-details**

```
RP/0/RP0/CPU0:PROD15#show controllers coherentDSP 0/0/0/6 prbs-details
Sat Jun 24 13:28:57.549 UTC
 -------------------------PRBS details-----------------------------------
PRBS Test               : Enable
PRBS Mode               : Source-Sink
PRBS Pattern            : PN31
PRBS Status             : Locked
------------------------------------------------
RP/0/RP0/CPU0:PROD15#
```

- You cannot view any details, if the PRBS is not enabled on the trunk.

- PRBS status is shown as **Not Applicable**, when the mode is **Source**.
- PRBS status is shown as **unlocked**, when the signal is not locked on the receiving side in the **Sink** or **Source-Sink** mode.