JUNIPER NETWORKS | Driven by Experience™

Network Configuration Example: AI/ML Telemetry Reference Guide

Author: Shalini Mukherjee and Mohan Kumar
Published: April 9, 2025

Juniper Networks, Inc.
1133 Innovation Way
Sunnyvale, California 94089
USA
408-745-2000
www.juniper.net

Juniper Networks, the Juniper Networks logo, Juniper, and Junos are registered trademarks of Juniper Networks, Inc. in the United States, and other countries. All other trademarks, service marks, registered marks, or registered service marks are the property of their respective owners.

Juniper Networks assumes no responsibility for any inaccuracies in this document. Juniper Networks reserves the right to change, modify, transfer, or otherwise revise this publication without notice.

Network Configuration Example: AI/ML Telemetry Reference Guide
Copyright © 2025 Juniper Networks, Inc. All rights reserved.

The information in this document is current as of the date on the title page.

YEAR 2000 NOTICE

Juniper Networks hardware and software products are Year 2000 compliant. Junos OS (Operating System) has no known time-related limitations through the year 2038. However, the NTP application is known to have some difficulty in the year 2036.

END USER LICENSE AGREEMENT
The Juniper Networks product that is the subject of this technical documentation consists of (or is intended for use with) Juniper Networks software. Use of such software is subject to the terms and conditions of the End User License Agreement (“EULA”) posted at https://support.juniper.net/support/eula/. By downloading, installing, or using such software, you agree to the terms and conditions of that EULA.

Table of Contents

Introduction

AI cluster networks demand lossless, high-throughput, low-latency connectivity. A key component of maintaining performance is collecting and analyzing data to monitor congestion, system health, and traffic patterns.

Junos OS telemetry enables detailed tracking of performance indicators, including thresholds, counters, and congestion metrics for AI workloads. The first step in telemetry is determining which data to collect. Once gathered, this data must be analyzed, structured, and visualized to support monitoring, decision-making, and network optimization.

This guide provides a structured approach to AI Cluster network monitoring, covering:

- System Health
- Interfaces
- Switching Tables
- Optics
- DDOS Protection
- Protocols
- Congestion Control

For each focus area, this guide presents:

- CLI Commands – displays and highlights key data for AI Clusters.
- Sensor Outputs – shows corresponding telemetry sensor paths and data.

By identifying and highlighting key AI Cluster data in CLI outputs and mapping it to corresponding telemetry sensor paths and data, this guide enables AI DC engineers to efficiently monitor and analyze network performance for AI workloads.

The sensor data in this guide were validated on Junos OS Release 23.4X100-D30 using QFX5230 and QFX5240, with an in-house telemetry collector to gather the sensor outputs.

System Health

EVENT	MONITOR CLI COMMAND	INDICATOR	SENSORS
CPU utilization	Show chassis routing-engine SHELL mpstat -P ALL	Review CPU utilization. This indicates the overall CPU utilized by the switch including all processes/daemons.	Critical Metrics for CPU Health Monitoring **For mean, average, max and min percent utilization (OpenConfig)** /components/component/cpu/utilization 1. **Overall CPU Usage (OpenConfig)** /system/cpus/cpu[index=*]/state/total/instant: Real-time total CPU usage. /system/cpus/cpu[index=*]/state/total/avg: Average CPU usage over a period. /system/cpus/cpu[index=*]/state/total/max: Peak CPU usage. /system/cpus/cpu[index=*]/state/total/min: Minimum CPU usage (useful to detect idle periods). 2. **CPU Time Distribution (OpenConfig)**

			/system/cpus/cpu[index=*]/state/user/instant: Real-time CPU time spent on user processes. /system/cpus/cpu[index=*]/state/kernel/instant: Real-time CPU time spent on kernel processes. /system/cpus/cpu[index=*]/state/idle/instant: Real-time idle time (high idle time means low usage; consistently low idle time can indicate over-utilization). 3. **Interval Data for Trend Analysis (OpenConfig)** /system/cpus/cpu[index=*]/state/total/interval: Total CPU usage over a defined interval. /system/cpus/cpu[index=*]/state/user/interval: User process CPU usage over a defined interval. /system/cpus/cpu[index=*]/state/kernel/interval: Kernel process CPU usage over a defined interval. 4. **Interrupt Metrics (OpenConfig)** /system/cpus/cpu[index=*]/state/hardware-interrupt/instant: Real-time hardware interrupt activity. /system/cpus/cpu[index=*]/state/software-interrupt/instant: Real-time software interrupt activity. **5. Timing Metrics for Performance Analysis (OpenConfig)** /system/cpus/cpu[index=*]/state/total/min-time: Timestamp of the lowest CPU usage. /system/cpus/cpu[index=*]/state/total/max-time: Timestamp of the highest CPU usage.
Memory	Show system memory	Indicates memory utilized by the system, capacity and percentage.	/system/memory/state/free, /system/memory/state/physical, /system/memory/state/reserved, /system/memory/state/used **(OpenConfig)**
Power Supply	show chassis power detail	Indicates PSM state, input power, voltage. Max power capacity.	/components/component/power-supply **(OpenConfig)**
Fan	Show chassis fan	Indicates measurement of Fan RPM, RPM percentage and status	/components/component/fan **(OpenConfig)**
License	Show system license	Indicates feature licenses use, installed and needed and expiry	/system/license **(OpenConfig)**
TCAM	show system packet-forwarding-options hw-resource-utilization-info	Lists Max capacity, current utilization and percentage utilization of HW resources.	/components/component/properties/property/state **(OpenConfig)**
FIB	show system packet-forwarding-options hw-resource-utilization-info	Lists Max capacity, current utilization and percentage utilization of HW resources.	/components/component/properties/property/state **(OpenConfig)**

Sensor outputs value along with its corresponding CLI output
Below are the outputs from CLI and a telemetry collector for the above listed sensors.

CPU Utilization

The following code block shows the CLI command to display the CPU utilization and idle percentage.

```
root@Qfx5230-64cd> show chassis routing-engine
Routing Engine status:
  Slot 0:
    Current state                  Master
    Election priority              Master (default)
    Temperature                 37 degrees C / 98 degrees F
    CPU temperature             45 degrees C / 113 degrees F
    DRAM                     26690 MB (32768 MB installed)
    Memory utilization          18 percent
    5 sec CPU utilization:
      User                       3 percent
      Background                 0 percent
      Kernel                     1 percent
      Interrupt                  0 percent
      Idle                      95 percent
    1 min CPU utilization:
      User                       3 percent
      Background                 0 percent
      Kernel                     1 percent
      Interrupt                  0 percent
      Idle                      95 percent
    5 min CPU utilization:
      User                       3 percent
      Background                 0 percent
      Kernel                     1 percent
      Interrupt                  0 percent
      Idle                      95 percent
    15 min CPU utilization:
      User                       3 percent
      Background                 0 percent
      Kernel                     1 percent
      Interrupt                  0 percent
      Idle                      95 percent
    Model                        RE-QFX5230-64CD
    Serial ID                    BUILTIN
    Start time                   2025-01-24 13:06:00 PST
    Uptime                       4 days, 6 minutes, 48 seconds
    Load averages:               1 minute   5 minute  15 minute
                                     3.15       2.43       1.54
    Last reboot reason           software reboot
```

The following code block shows the shell command to get detailed CPU utilization data:

```
root@Qfx5230-64cd:~# mpstat -P ALL
Linux 5.2.60-yocto-standard-g46f8a3c (Qfx5230-64cd)   01/27/25        _x86_64_        (12 CPU)

12:04:35     CPU    %usr   %nice    %sys %iowait    %irq   %soft  %steal  %guest  %gnice   %idle
12:04:35     all    3.20    0.00    1.14    0.02    0.09    0.06    0.00    0.00    0.00   95.49
12:04:35       0    3.04    0.00    1.14    0.01    0.09    0.07    0.00    0.00    0.00   95.65
```

```
12:04:35       1    2.97    0.00    1.13    0.01    0.09    0.06    0.00    0.00    0.00   95.74
12:04:35       2    3.14    0.00    1.13    0.01    0.10    0.09    0.00    0.00    0.00   95.54
12:04:35       3    3.23    0.00    1.15    0.01    0.09    0.05    0.00    0.00    0.00   95.47
12:04:35       4    3.36    0.00    1.16    0.08    0.10    0.06    0.00    0.00    0.00   95.24
12:04:35       5    3.32    0.00    1.16    0.02    0.09    0.05    0.00    0.00    0.00   95.37
12:04:35       6    3.23    0.00    1.13    0.01    0.12    0.09    0.00    0.00    0.00   95.42
12:04:35       7    3.28    0.00    1.15    0.01    0.09    0.04    0.00    0.00    0.00   95.42
12:04:35       8    3.30    0.00    1.15    0.01    0.09    0.05    0.00    0.00    0.00   95.41
12:04:35       9    3.14    0.00    1.15    0.01    0.09    0.04    0.00    0.00    0.00   95.57
12:04:35      10    3.23    0.00    1.14    0.01    0.09    0.03    0.00    0.00    0.00   95.49
12:04:35      11    3.13    0.00    1.13    0.01    0.09    0.04    0.00    0.00    0.00   95.59
```

The corresponding sensor output is in key value pairs, extracted from a telemetry collector, as shown below.

The time displayed is in nanoseconds in **/components/component/cpu/utilization.**

```
key: "__prefix__"
str_value: "/components/component[name=\'RE0:CPU0\']/"

key: "cpu/utilization/state/instant"
uint_value: 1

key: "cpu/utilization/state/avg"
uint_value: 14

key: "cpu/utilization/state/min"
uint_value: 1

key: "cpu/utilization/state/max"
uint_value: 72

key: "cpu/utilization/state/interval"
uint_value: 60000000000

key: "cpu/utilization/state/min-time"
uint_value: 1737748217148388319

key: "cpu/utilization/state/max-time"
uint_value: 1737748187145027138
```

The time displayed is in nanoseconds for this sensor **/system/cpus/cpu/state/.**

```
key: "__prefix__"
str_value: "/system/cpus/cpu[index=\'0\']/"

key: "state/total/instant"
uint_value: 1

key: "state/total/avg"
uint_value: 1

key: "state/total/min"
uint_value: 1
```

```
key: "state/total/max"
uint_value: 2

key: "state/total/interval"
uint_value: 60000000000

key: "state/total/min-time"
uint_value: 1737748337147744406

key: "state/total/max-time"
uint_value: 1737748317147382943
```

Memory

The following code block shows the CLI command to get percentage of memory used.

```
root@Qfx5230-64cd> show system memory
re0:
--------------------------------------------------------------------------
System memory usage distribution:
        Total memory: 32412244 Kbytes (100%)
       Active memory: 3705420 Kbytes (11%)
     Inactive memory: 4933976 Kbytes (15%)
         Used memory: 10440280 Kbytes (32%)
         Free memory: 21971964 Kbytes (67%)
       Buffer memory: 391816 Kbytes (1%)
         Swap memory: 0 Kbytes (0%)
    Available memory: 27632480 Kbytes (85%)
       Cached memory: 5719468 Kbytes (17%)
```

The corresponding sensor output in key value pairs from a telemetry collector:

- /system/memory/state/free
- /system/memory/state/physical
- /system/memory/state/reserved
- /system/memory/state/used

This lists the system memory reserved, used, physical and free values. The values are in bytes.
output for **/system/memory/state**

```
key: "/system/memory/state/physical"
uint_value: 33190137856

key: "/system/memory/state/reserved"
uint_value: 401043456

key: "/system/memory/state/used"
uint_value: 10284638208

key: "/system/memory/state/free"
uint_value: 22504456192
```

Power Supply State

The following code block shows the CLI command indicating the power supply module (PSM) state, total system power (2400W) and the remaining power (1159W).

```
root@Qfx5230-64cd> show chassis power detail
Chassis Power        Voltage(V)    Power(W)

Total Input Power                    322
  PSM 0
    State: Online
    Input 1              54          322
    Output             12.01       262.79
    Capacity           2400 W (maximum 2400 W)

System:
  Zone 0:
      Capacity:          2400 W (maximum 2400 W)
      Allocated power:   1241 W (1159 W remaining)
      Actual usage:      322 W
  Total system capacity: 2400 W (maximum 2400 W)
  Total remaining power: 1159 W
```

The corresponding sensor output in key value pairs:

/components/component/power-supply

```
key: "__prefix__"
str_value: "/components/component[name=\'PSM0\']/"

key: "power-supply/state/capacity"
bytes_value: "2400"

key: "power-supply/state/input-current"
bytes_value: "6"

key: "power-supply/state/input-voltage"
bytes_value: "54"

key: "power-supply/state/output-current"
bytes_value: "22"

key: "power-supply/state/output-voltage"
bytes_value: "12"

key: "power-supply/state/output-power"
bytes_value: "264"

key: "power-supply/state/type"
str_value: "POWER_SUPPLY"

key: "power-supply/state/id"
```

```
str_value: "1GH4D290048"

key: "power-supply/state/location"
str_value: "PSM0"

key: "power-supply/state/description"
str_value: "DC AFI 2400W PSU"

key: "power-supply/state/mfg-date"
str_value: "2023-11-07"

key: "power-supply/state/hardware-version"
str_value: "REV 01"

key: "power-supply/state/serial-no"
str_value: "1GH4D290048"

key: "power-supply/state/part-no"
str_value: "740-155850"

key: "power-supply/state/removable"
bool_value: true

key: "power-supply/state/oper-status"
str_value: "ACTIVE"
```

Fan Status

The following code block shows the CLI command displaying fan status and RPM:

```
root@Qfx5230-64cd> show chassis fan
      Item                      Status    % RPM     Measurement
      Fan Tray 0 Fan 1          OK        31%       4395 RPM
      Fan Tray 0 Fan 2          OK        31%       4981 RPM
      Fan Tray 1 Fan 1          OK        33%       4688 RPM
      Fan Tray 1 Fan 2          OK        29%       4688 RPM
      Fan Tray 2 Fan 1          OK        31%       4395 RPM
      Fan Tray 2 Fan 2          OK        31%       4981 RPM
      Fan Tray 3 Fan 1          OK        33%       4688 RPM
      Fan Tray 3 Fan 2          OK        31%       4981 RPM
```

The corresponding sensor **/components/component/fan** output in key value pairs.

```
key: "__prefix__"
str_value: "/components/component[name=\'Fan Tray 0 Fan 1\']/"

key: "fan/state/speed"
uint_value: 4395

key: "__prefix__"
str_value: "/components/component[name=\'Fan Tray 0 Fan 2\']/"
```

```
key: "fan/state/speed"
uint_value: 4981

key: "__prefix__"
str_value: "/components/component[name=\'Fan Tray 1 Fan 1\']/"

key: "fan/state/speed"
uint_value: 4395

key: "__prefix__"
str_value: "/components/component[name=\'Fan Tray 1 Fan 2\']/"

key: "fan/state/speed"
uint_value: 4981

key: "__prefix__"
str_value: "/components/component[name=\'Fan Tray 2 Fan 1\']/"

key: "fan/state/speed"
uint_value: 4395

key: "__prefix__"
str_value: "/components/component[name=\'Fan Tray 2 Fan 2\']/"

key: "fan/state/speed"
uint_value: 4981

key: "__prefix__"
str_value: "/components/component[name=\'Fan Tray 3 Fan 1\']/"

key: "fan/state/speed"
uint_value: 4395

key: "__prefix__"
str_value: "/components/component[name=\'Fan Tray 3 Fan 2\']/"

key: "fan/state/speed"
uint_value: 4688
```

License Details

The following code block shows the CLI command to display license details:

```
root@Qfx5230-64cd> show system license
License usage:
                                Licensed     Licensed    Licensed
                                 Feature      Feature     Feature
  Feature name                      used    installed      needed    Expiry
  bgp                                  1            1           0    2025-03-30
17:00:00 PDT
  isis                                 0            1           0    2025-03-30
17:00:00 PDT
```

```
  filter-based-forwarding                0             1             0    2025-03-30
17:00:00 PDT
  connectivity-fault-management          0             1             0    2025-03-30
17:00:00 PDT
  vrrp                                   0             1             0    2025-03-30
17:00:00 PDT
  dot1q-tunneling                        1             1             0    2025-03-30
17:00:00 PDT
  l3vpn                                  0             1             0    2025-03-30
17:00:00 PDT
  vxlan                                  0             1             0    2025-03-30
17:00:00 PDT
  PCEP                                   0             1             0    2025-03-30
17:00:00 PDT
  mc-lag                                 0             1             0    2025-03-30
17:00:00 PDT
  esi-lag                                0             1             0    2025-03-30
17:00:00 PDT
  Timing License                         0             1             0    2025-03-30
17:00:00 PDT
  link-fault-management                  0             1             0    2025-03-30
17:00:00 PDT
  ldp                                    0             1             0    2025-03-30
17:00:00 PDT
  rsvp                                   0             1             0    2025-03-30
17:00:00 PDT
  l2circuit                              0             1             0    2025-03-30
17:00:00 PDT
  evpn-vxlan                             0             1             0    2025-03-30
17:00:00 PDT
  igmp-multicast                         0             1             0    2025-03-30
17:00:00 PDT
  evpn-mpls                              0             1             0    2025-03-30
17:00:00 PDT
  sr                                     0             1             0    2025-03-30
17:00:00 PDT
  pim                                    0             1             0    2025-03-30
17:00:00 PDT
  gre_tunnel                             0             1             0    2025-03-30
17:00:00 PDT
  static-mpls                            0             1             0    2025-03-30
17:00:00 PDT
  rip                                    0             1             0    2025-03-30
17:00:00 PDT
  ospf                                   0             1             0    2025-03-30
17:00:00 PDT
  inmon-sflow                            0             1             0    2025-03-30
17:00:00 PDT

Licenses installed:

  License identifier: TrialJUNOS451701333
  License version: 4
  Order Type: trial
  Valid for device: FU1923AN0020
  Customer ID: Juniper Internal
  Features:
    vxlan            - VxLAN
      date-based, 2025-01-28 16:00:00 PST - 2025-03-30 17:00:00 PDT
    filter-based-forwarding - Filter Based Forwarding
      date-based, 2025-01-28 16:00:00 PST - 2025-03-30 17:00:00 PDT
    connectivity-fault-management - Connectivity Fault Management
      date-based, 2025-01-28 16:00:00 PST - 2025-03-30 17:00:00 PDT
```

```
    vrrp             - Virtual Router Redundancy Protocol
      date-based, 2025-01-28 16:00:00 PST - 2025-03-30 17:00:00 PDT
    ldp              - LDP Protocol
      date-based, 2025-01-28 16:00:00 PST - 2025-03-30 17:00:00 PDT
    rsvp             - RSVP Protocol
      date-based, 2025-01-28 16:00:00 PST - 2025-03-30 17:00:00 PDT
    l2circuit        - L2 Circuit feature
      date-based, 2025-01-28 16:00:00 PST - 2025-03-30 17:00:00 PDT
    Timing License   - PTP/SyncE protocol features
      date-based, 2025-01-28 16:00:00 PST - 2025-03-30 17:00:00 PDT
    evpn-vxlan       - EVPN feature with VXLAN encapsulation
      date-based, 2025-01-28 16:00:00 PST - 2025-03-30 17:00:00 PDT
    link-fault-management - Link Fault Management
      date-based, 2025-01-28 16:00:00 PST - 2025-03-30 17:00:00 PDT
    bgp              - BGP Routing Protocol
      date-based, 2025-01-28 16:00:00 PST - 2025-03-30 17:00:00 PDT
    l3vpn            - L3VPN VRF Feature
      date-based, 2025-01-28 16:00:00 PST - 2025-03-30 17:00:00 PDT
    isis             - IS-IS Routing Protocol
      date-based, 2025-01-28 16:00:00 PST - 2025-03-30 17:00:00 PDT
    PCEP             - PATH COMPUTATION ELEMENT PROTOCOL
      date-based, 2025-01-28 16:00:00 PST - 2025-03-30 17:00:00 PDT
    mc-lag           - MC-LAG
      date-based, 2025-01-28 16:00:00 PST - 2025-03-30 17:00:00 PDT
    dot1q-tunneling  - 802.1ad
      date-based, 2025-01-28 16:00:00 PST - 2025-03-30 17:00:00 PDT
    esi-lag          - ESI-LAG
      date-based, 2025-01-28 16:00:00 PST - 2025-03-30 17:00:00 PDT
    igmp-multicast   - IGMP feature
      date-based, 2025-01-28 16:00:00 PST - 2025-03-30 17:00:00 PDT
    evpn-mpls        - EVPN feature with MPLS encapsulation
      date-based, 2025-01-28 16:00:00 PST - 2025-03-30 17:00:00 PDT
    sr               - Segment Routing feature
      date-based, 2025-01-28 16:00:00 PST - 2025-03-30 17:00:00 PDT
    pim              - PIM feature
      date-based, 2025-01-28 16:00:00 PST - 2025-03-30 17:00:00 PDT
    gre_tunnel       - GRE tunnel usage license
      date-based, 2025-01-28 16:00:00 PST - 2025-03-30 17:00:00 PDT
    static-mpls      - Static Mpls lsp feature
      date-based, 2025-01-28 16:00:00 PST - 2025-03-30 17:00:00 PDT
    rip              - RIP protocol
      date-based, 2025-01-28 16:00:00 PST - 2025-03-30 17:00:00 PDT
    ospf             - OSPF protocol
      date-based, 2025-01-28 16:00:00 PST - 2025-03-30 17:00:00 PDT
    inmon-sflow      - License for protocol sflow feature
      date-based, 2025-01-28 16:00:00 PST - 2025-03-30 17:00:00 PDT
```

Sensor output for license details **/system/license**

```
key: "__prefix__"
str_value: "/system/license/licenses/license[license-id=\'TrialJUNOS451701333\']/"

key: "state/license-id"
str_value: "TrialJUNOS451701333"

key: "state/license-data"
str_value: "TrialJUNOS451701333 aeaqia qmizkt cojsgn au4mbq giyaqb ycsbjm 5foo2i
gbastv nzuxaz lsebew 45dfoj xgc3ah fbr5m3 h5n46i jwmxfy bgmemr g4mnrq 7676g6 cd3sku
njndjr gwfmot qzw62e ctwcuy w2w"

key: "state/active"
bool_value: true
```

```
key: "state/description"
str_value: "PCEP;Timing License;bgp;connectivity-fault-management;dot1q-tunneling;esi-
lag;evpn-mpls;evpn-vxlan;filter-based-forwarding;gre_tunnel;igmp-multicast;inmon-
sflow;isis;l2circuit;l3vpn;ldp;link-fault-management;mc-
lag;ospf;pim;rip;rsvp;sr;static-mpls;vrrp;vxlan"

key: "state/expiration-date"
uint_value: 1743408000

key: "state/in-use"
bool_value: false

key: "state/expired"
bool_value: false

key: "state/valid"
bool_value: true
```

Ternary Content Addressable Memory (TCAM)

The following code block shows the CLI command indicating max and current utilization of hardware resources. Below we can see the TCAM usage is 14% across VFP, IFP, EFP, Vxlan, IfpVxlan, StromControl, and System Filters.

```
root@Qfx5240-q01> show system packet-forwarding-options hw-resource-utilization-info
--------------------------------|--------------|---------------------|----------------
-----
HW Resource Name                | Max Capacity | Current Utilization | Current
Utilization %
--------------------------------|--------------|---------------------|----------------
-----
L3 NextHop                       32768          19                    1
Host V4                          16384          0                     1
Host V6                          8192           8                     1
LPM V4                           880640         44                    1
LPM V6                           880640         6                     1
VFI                              4096           5                     1
Virtual Port                     8192           3                     1
Tunnel                           8191           2                     1
MC Replication NextHop           511            4                     1
Egress Interface                 8192           13                    1
Overlay ECMP Group               4096           1                     1
Underlay ECMP Group              4095           2                     1
Overlay ECMP Member              16384          1                     1
Underlay ECMP Member             49152          8                     1
L2 Mac                           8192           8                     1
My Mac                           511            7                     1
My Tunnel Mac                    127            1                     1
VFP                              16384          0                     1
IFP                              24576          1032                  4
EFP                              4096           8                     1
EfpVxlan                         511            1                     1
IfpVxlan                         2559           5                     1
System Filters                   1023           62                    6
```

The sensor output for hardware resource utilization information:

/components/component/properties/property/state

```
key: "__prefix__"
str_value: "/components/component[name=\'FPC0:NPU0\']/"

key: "properties/property[name=\'mem-util-l3-nexthop-size\']/state/value"
uint_value: 32768

key: "properties/property[name=\'mem-util-l3-nexthop-allocated\']/state/value"
uint_value: 7

key: "properties/property[name=\'mem-util-l3-nexthop-utilization\']/state/value"
uint_value: 1

key: "properties/property[name=\'mem-util-l3-nexthop-lower-threshold\']/state/value"
uint_value: 50

key: "properties/property[name=\'mem-util-l3-nexthop-upper-threshold\']/state/value"
uint_value: 90

key: "properties/property[name=\'mem-util-l3-nexthop-health\']/state/value"
uint_value: 1

key: "properties/property[name=\'mem-util-host-v4-size\']/state/value"
uint_value: 16384

key: "properties/property[name=\'mem-util-host-v4-utilization\']/state/value"
uint_value: 1

key: "properties/property[name=\'mem-util-host-v4-lower-threshold\']/state/value"
uint_value: 50

key: "properties/property[name=\'mem-util-host-v4-upper-threshold\']/state/value"
uint_value: 90

key: "properties/property[name=\'mem-util-host-v4-health\']/state/value"
uint_value: 1

key: "properties/property[name=\'mem-util-host-v6-size\']/state/value"
uint_value: 8192
```

Forwarding Information Base (FIB)

The following code block shows the CLI command indicating max and current utilization of hardware resources. Below we can see the FIB usage is 12% for L3 NextHop, Host V4, Host V6, LPM V4, LPM V6, Overlay ECMP Group, Underlay ECMP Group, Overlay ECMP Member, Underlay ECMP Member, L2 Mac, My Mac, and My Tunnel Mac 12%.

```
root@Qfx5230-64cd> show system packet-forwarding-options hw-resource-utilization-info
--------------------------------|--------------|---------------------|-----------------
-----
HW Resource Name                | Max Capacity | Current Utilization | Current
Utilization %
```

```
--------------------------------|-------------|--------------------|----------------
-----
L3 NextHop                      32768         7                    1
Host V4                         16384         0                    1
Host V6                         8192          9                    1
LPM V4                          737280        23                   1
LPM V6                          737280        6                    1
VFI                             4096          8                    1
Virtual Port                    8192          1                    1
Tunnel                          8191          0                    1
MC Replication NextHop          511           2                    1
Egress Interface                8192          11                   1
Overlay ECMP Group              4096          0                    1
Underlay ECMP Group             4095          0                    1
Overlay ECMP Member             16384         0                    1
Underlay ECMP Member            32768         0                    1
L2 Mac                          8192          0                    1
My Mac                          511           9                    1
My Tunnel Mac                   127           0                    1
VFP                             4096          0                    1
IFP                             12288         502                  4
EFP                             2048          0                    1
IRACL+IFTF+LO-Pipe-0            767           2                    1
System Filters                  511           62                   12
```

Sensor output

/components/component/properties/property/state

```
key: "__prefix__"
str_value: "/components/component[name=\'FPC0:NPU0\']/"

key: "properties/property[name=\'mem-util-l3-nexthop-size\']/state/value"
uint_value: 32768

key: "properties/property[name=\'mem-util-l3-nexthop-allocated\']/state/value"
uint_value: 7

key: "properties/property[name=\'mem-util-l3-nexthop-utilization\']/state/value"
uint_value: 1

key: "properties/property[name=\'mem-util-l3-nexthop-lower-threshold\']/state/value"
uint_value: 50

key: "properties/property[name=\'mem-util-l3-nexthop-upper-threshold\']/state/value"
uint_value: 90

key: "properties/property[name=\'mem-util-l3-nexthop-health\']/state/value"
uint_value: 1

key: "properties/property[name=\'mem-util-host-v4-size\']/state/value"
uint_value: 16384

key: "properties/property[name=\'mem-util-host-v4-utilization\']/state/value"
```

```
uint_value: 1

key: "properties/property[name=\'mem-util-host-v4-lower-threshold\']/state/value"
uint_value: 50

key: "properties/property[name=\'mem-util-host-v4-upper-threshold\']/state/value"
uint_value: 90

key: "properties/property[name=\'mem-util-host-v4-health\']/state/value"
uint_value: 1

key: "properties/property[name=\'mem-util-host-v6-size\']/state/value"
uint_value: 8192
```

Interface Details

EVENT	MONITOR CLI COMMAND	INDICATOR	SENSORS
Interface state	Show interface <>	Interface admin/oper-status, ifindex, description, last change	/interfaces/interface/ **(OpenConfig)**
Input and output stats	Show interface <> extensive	Interface stats like input and output octets and packets for ingress and egress	/interfaces/interface[name=et-0/0/x]/state/counters/ **(OpenConfig)**
Input and output discards	Show interface <> extensive	Interface input and output discards	/interfaces/interface[name=et-0/0/x]/state/counters/ **(OpenConfig)**
Input and output errors	Show interface <> extensive	Input and output errors.	/interfaces/interface[name=et-0/0/x]/state/counters/ **(OpenConfig)**

Interface State

The following code block shows the CLI command for interface stats like status, description, and speed

```
root@Qfx5230-64cd> show interfaces et-0/0/26
Physical interface: et-0/0/26, Enabled, Physical link is Up
  Interface index: 1270, SNMP ifIndex: 541
  Description: Qfx-32cd-04-et-0/0/15
  Link-level type: Ethernet, MTU: 1514, LAN-PHY mode, Speed: 100Gbps, BPDU Error:
None, Loop Detect PDU Error: None, Ethernet-Switching Error: None, MAC-REWRITE Error:
None, Loopback: Disabled,
  Source filtering: Disabled, Flow control: Disabled, Auto-negotiation: Disabled,
Media type: Fiber
  Device flags   : Present Running
  Interface flags: SNMP-Traps
  CoS queues     : 0 supported, 0 maximum usable queues
  Current address: d0:81:c5:ec:7c:6f, Hardware address: d0:81:c5:ec:7c:6f
  Last flapped   : 2025-01-24 13:08:29 PST (00:24:40 ago)
```

```
  Input rate     : 0 bps (0 pps)
  Output rate    : 0 bps (0 pps)
  Active alarms  : None
  Active defects : None
  PCS statistics                      Seconds
    Bit errors                             0
    Errored blocks                         0
  Ethernet FEC Mode  :                  FEC91
    FEC Codeword size                     528
    FEC Codeword rate                   0.973
  Ethernet FEC statistics              Errors
    FEC Corrected Errors                   0
    FEC Uncorrected Errors                 5
    FEC Corrected Errors Rate              0
    FEC Uncorrected Errors Rate            0
  Interface transmit statistics: Disabled
  Link Degrade :
    Link Monitoring                   :  Disable

  Logical interface et-0/0/26.0 (Index 1065) (SNMP ifIndex 664)
    Flags: Up SNMP-Traps Encapsulation: ENET2 DF
    Input packets : 210
    Output packets: 346
    Protocol inet
    Max nh cache: 100000, New hold nh limit: 100000, Curr nh cnt: 1, Curr new hold
cnt: 0, NH drop cnt: 0, Hold NH RED drop cnt: 0
    MTU: 1500
      Flags: Sendbcast-pkt-to-re
      Addresses, Flags: Is-Preferred Is-Primary
        Destination: 192.168.16.4/31, Local: 192.168.16.4
    Protocol multiservice, MTU: Unlimited
      Flags: None
```

Corresponding sensor output displaying admin status and operational status:

/interfaces/interface

```
key: "__prefix__"
str_value: "/interfaces/interface[name=\'et-0/0/26\']/"

key: "state/counters/carrier-transitions"
uint_value: 1

key: "state/name"
str_value: "et-0/0/26"

key: "state/type"
str_value: "ethernetCsmacd"

key: "state/mtu"
uint_value: 1514

key: "state/loopback-mode"
```

```
str_value: "NONE"

key: "state/description"
str_value: "Qfx5220-32cd-04-et-0/0/15"

key: "state/enabled"
bool_value: true

key: "state/id"
uint_value: 0

key: "state/ifindex"
uint_value: 541

key: "state/admin-status"
str_value: "UP"

key: "state/oper-status"
str_value: "UP"

key: "state/last-change"
uint_value: 1737752909245944000

key: "state/logical"
bool_value: false

key: "state/management"
bool_value: false

key: "state/cpu"
bool_value: false

key: "state/forwarding-viable"
bool_value: true

key: "state/high-speed"
uint_value: 100000

key: "hold-time/state/up"
uint_value: 0
```

Input and Output Stats

The following code block shows the CLI command:

```
root@Qfx5240-q01> show interfaces et-0/0/64 extensive
Physical interface: et-0/0/64, Enabled, Physical link is Up
  *snip*
  Statistics last cleared: 2025-01-30 23:24:39 PST (00:28:31 ago)
  Traffic statistics:
   Input  bytes  :                21278                    0 bps
```

```
   Output bytes  :                21000                    0 bps
   Input  packets:                   63                    0 pps
   Output packets:                   60                    0 pps
*snip*
  MAC statistics:                      Receive         Transmit
    Total octets                         21278            21000
    Total packets                           63               60
    Unicast packets                          0                0
    Broadcast packets                        0                0
    Multicast packets                       63               60
```

Sensor output

/interfaces/interface[name=et-0/0/x]/state/counters/


```
"prefix": "interfaces/interface[name=et-0/0/64]/state/counters",
"updates": [
{
"Path": "in-pkts",
"values": {
"in-pkts": 0
}
},
{
"Path": "in-octets",
"values": {
"in-octets": 0
}
},
{
"Path": "in-unicast-pkts",
"values": {
"in-unicast-pkts": 0
}
},
{
"Path": "in-multicast-pkts",
"values": {
"in-multicast-pkts": 0
}
},
{
"Path": "in-broadcast-pkts",
"values": {
"in-broadcast-pkts": 0
}
},
{
"Path": "in-pause-pkts",
"values": {
"in-pause-pkts": 0
}
},
{
```

```
"Path": "out-pkts",
"values": {
"out-pkts": 148
}
},
{
"Path": "out-octets",
"values": {
"out-octets": 48396
}
},
{
"Path": "out-unicast-pkts",
"values": {
"out-unicast-pkts": 0
}
},
{
"Path": "out-multicast-pkts",
"values": {
"out-multicast-pkts": 148
}
},
{
"Path": "out-broadcast-pkts",
"values": {
"out-broadcast-pkts": 0
}
},
{
```

Input and Output Drops

The following code block shows the CLI command:

```
root@Qfx5240-q01> show interfaces et-0/0/64 extensive
Physical interface: et-0/0/64, Enabled, Physical link is Up
*snip*
Input errors:
    Errors: 0, Drops: 0, Framing errors: 0, Runts: 0, Policed discards: 0, L3
incompletes: 0, L2 channel errors: 0, L2 mismatch timeouts: 0, FIFO errors: 0,
Resource errors: 0
  Output errors:
    Carrier transitions: 0, Errors: 0, Drops: 0, Collisions: 0, Aged packets: 0, FIFO
errors: 0, HS link CRC errors: 0, MTU errors: 0, Resource errors: 0, ECN Marked
packets: 0
```

Sensor output

/interfaces/interface[name=et-0/0/x]/state/counters/

```
"prefix": "interfaces/interface[name=et-0/0/64]/state/counters",
"updates": [
{
*snip*
```

```
"Path": "in-discards",
"values": {
"in-discards": 0
}
},
{
"Path": "out-discards",
"values": {
"out-discards": 0
}
}
```

Input and Output Errors

The following code block shows the CLI command

```
root@Qfx5240-q01> show interfaces et-0/0/64 extensive
Physical interface: et-0/0/64, Enabled, Physical link is Up
  *snip*
  Input errors:
    Errors: 0, Drops: 0, Framing errors: 0, Runts: 0, Policed discards: 0, L3
incompletes: 0, L2 channel errors: 0, L2 mismatch timeouts: 0, FIFO errors: 0,
Resource errors: 0
  Output errors:
    Carrier transitions: 0, Errors: 0, Drops: 0, Collisions: 0, Aged packets: 0, FIFO
errors: 0, HS link CRC errors: 0, MTU errors: 0, Resource errors: 0, ECN Marked
packets: 0
```

Sensor output

/interfaces/interface[name=et-0/0/x]/state/counters/

```
"prefix": "interfaces/interface[name=et-0/0/64]/state/counters",
"updates": [
*snip*

{
"Path": "in-errors",
"values": {
"in-errors": 0
}
},
{
"Path": "out-errors",
"values": {
"out-errors": 0
}
},
```

Switching Table

EVENT	MONITOR CLI COMMAND	INDICATOR	SENSORS
MAC table	show ethernet-switching table	Lists the MAC addresses and VLANs learnt on this switch.	/network-instances/network-instance/fdb/mac-table/ **(OpenConfig)**

MAC Addresses

The following code block shows the CLI command to see the list of MAC addresses learnt by the switch and its VLAN.

```
root@Qfx5230-64cd> show ethernet-switching table

Ethernet switching table : 1 entries, 1 learned
Routing instance : default-switch
    Vlan                 MAC                 MAC         Age    GBP      Logical
NH        MAC        RTR
    name                 address             flags             Tag      interface
Index     property   ID
    vlan100              2c:4c:15:ef:16:75   D             -           et-0/0/26.0
0                    0
```

The corresponding sensor for listing the MAC addresses **network-instances/network-instance/fdb/mac-table/**

```
key: "__prefix__"
str_value: "/network-instances/network-instance[name=\'default-switch\']/fdb/mac-
table/entries/entry[mac-address=\'2c:4c:15:ef:16:75\' and vlan=\'100\']/"

key: "state/mac-address"
str_value: "2c:4c:15:ef:16:75"

key: "state/vlan"
uint_value: 100

key: "state/entry-type"
str_value: "DYNAMIC"

key: "state/evi"
uint_value: 0

key: "interface/interface-ref/state/interface"
str_value: "et-0/0/26"
```

Optics

EVENT	MONITOR CLI COMMAND	INDICATOR	SENSORS
PCS statistics	Show interface <> extensive	Lists the PCS statistics like bit errors and errors blocks	/state/interfaces/interface[name=et-0/0/28]/ **(Native)**
PRE-FEC BER	Show interface <> extensive	Indicates a deteriorating link, could lead to uncorrectable errors.	/state/interfaces/interface/ **(Native)-Supported S/W version: 23.4X100-D31.5-EVO**
FEC Histogram	Show interface <> extensive	Movement toward higher error correction bins — signals worsening signal integrity.	/state/interfaces/interface/ **(Native)-Supported S/W version: 23.4X100-D31.5-EVO**
Interface diagnostics	Show interface diagnostic optics <>	Lists all the optic diagnostics like temperature, power, current voltage etc.	/junos/system/linecard/optics/ **(Native)**

PCS

The following code block shows the CLI command:

```
root@Qfx5230-64cd> show interfaces et-0/0/28:0 extensive
*snip*

  Active alarms  : None
  Active defects : None
  PCS statistics                      Seconds
    Bit errors                              0
    Errored blocks                          0
  Ethernet FEC Mode  :            FEC91-RS544
    FEC Codeword size                       544
    FEC Codeword rate                     0.945
  Ethernet FEC statistics              Errors
    FEC Corrected Errors                183434
    FEC Uncorrected Errors                   0
    FEC Corrected Errors Rate              489
    FEC Uncorrected Errors Rate              0
```

Corresponding sensor output **/state/interfaces/interface[name=et-0/0/28]/"**

```
"prefix": "state/interfaces/interface[name=et-0/0/28]",
"updates": [
{
"Path": "ethernet/fec-codeword-size",
"values": {
"ethernet/fec-codeword-size": 0
}
},
{
"Path": "ethernet/fec-codeword-rate",
"values": {
```

```
"ethernet/fec-codeword-rate": 0
}
},
{
"Path": "ethernet/counters/in-pcs-errored-seconds",
"values": {
"ethernet/counters/in-pcs-errored-seconds": 0
}
},
{
"Path": "ethernet/counters/fec-corrected-words",
"values": {
"ethernet/counters/fec-corrected-words": 0
}
},
{
"Path": "ethernet/counters/fec-uncorrectable-words",
"values": {
"ethernet/counters/fec-uncorrectable-words": 0
}
}
```


Interface Diagnostics

The following code block shows the CLI command to display interface diagnostics:

```
root@Qfx5230-64cd>show interfaces diagnostics optics et-0/0/65
Physical interface: et-0/0/65
    Module temperature                         :  36 degrees C / 96 degrees F
    Module voltage                             :  3.358 V
    Module max power                           :  1.5 W
    Module temperature high alarm              :  Off
    Module temperature low alarm               :  Off
    Module temperature high warning            :  Off
    Module temperature low warning             :  Off
    Module voltage high alarm                  :  Off
    Module voltage low alarm                   :  Off
    Module voltage high warning                :  Off
    Module voltage low warning                 :  Off
    Module temperature high alarm threshold    :  90 degrees C / 194 degrees F
    Module temperature low alarm threshold     :  -5 degrees C / 23 degrees F
    Module temperature high warning threshold  :  85 degrees C / 185 degrees F
    Module temperature low warning threshold   :  0 degrees C / 32 degrees F
    Module voltage high alarm threshold        :  3.63 V
    Module voltage low alarm threshold         :  2.97 V
    Module voltage high warning threshold      :  3.464 V
    Module voltage low warning threshold       :  3.134 V
    Laser bias current high alarm threshold    :  10.5 mA
    Laser bias current low alarm threshold     :  2.5 mA
    Laser bias current high warning threshold  :  10.5 mA
    Laser bias current low warning threshold   :  2.5 mA
    Laser output power high alarm threshold    :  2 mW / 3.01 dBm
    Laser output power low alarm threshold     :  0.126 mW / -8.99 dBm
    Laser output power high warning threshold  :  0.79 mW / -1.02 dBm
    Laser output power low warning threshold   :  0.317 mW / -4.98 dBm
```

```
    Laser rx power high alarm threshold       :  1.584 mW / 2.00 dBm
    Laser rx power low alarm threshold        :  0.04 mW / -13.90 dBm
    Laser rx power high warning threshold     :  0.794 mW / -1.00 dBm
    Laser rx power low warning threshold      :  0.102 mW / -9.90 dBm
    Laser temperature high alarm threshold    :  90 degrees C / 194 degrees F
    Laser temperature low alarm threshold     :  -5 degrees C / 23 degrees F
    Laser temperature high warning threshold  :  85 degrees C / 185 degrees F
    Laser temperature low warning threshold   :  0 degrees C / 32 degrees F
  Lane 0
    Laser bias current                        :  7.823 mA
    Laser output power                        :  0.595 mW / -2.25 dBm
    Laser temperature                         :  36 degrees C / 96 degrees F
    Laser receiver power                      :  0 mW / -40.00 dBm
    Laser bias current high alarm             :  Off
    Laser bias current low alarm              :  Off
    Laser bias current high warning           :  Off
    Laser bias current low warning            :  Off
    Laser temperature high alarm              :  Off
    Laser temperature low alarm               :  Off
    Laser temperature high warning            :  Off
    Laser temperature low warning             :  Off
    Laser receiver power high alarm           :  Off
    Laser receiver power low alarm            :  On
    Laser receiver power high warning         :  Off
    Laser receiver power low warning          :  On
    Laser output power high alarm             :  Off
    Laser output power low alarm              :  Off
    Laser output power high warning           :  Off
    Laser output power low warning            :  Off
    Tx loss of signal functionality alarm     :  Off
    Rx loss of signal alarm                   :  On
    Tx laser disabled alarm                   :  Off
```

Sensor outputs showing optic parameters **/junos/system/linecard/optics/**

```
"prefix": "interfaces/interface[name=et-0/0/65]",
"updates": [
{
"Path": "snmp_if_index",
"values": {
"snmp_if_index": 635
}
},
{
"Path": "optics/optics_type",
"values": {
"optics/optics_type": 32
}
},
{
"Path": "optics/module_temp",
"values": {
"optics/module_temp": 33
}
},
{
"Path": "optics/module_temp_high_alarm_threshold",
"values": {
"optics/module_temp_high_alarm_threshold": 100
}
},
{
```

```
"Path": "optics/module_temp_low_alarm_threshold",
"values": {
"optics/module_temp_low_alarm_threshold": -15
}
},
{
"Path": "optics/module_temp_high_warning_threshold",
"values": {
"optics/module_temp_high_warning_threshold": 95
}
},
{
"Path": "optics/module_temp_low_warning_threshold",
"values": {
"optics/module_temp_low_warning_threshold": -10
}
},
{
"Path": "optics/laser_output_power_high_alarm_threshold_dbm",
"values": {
"optics/laser_output_power_high_alarm_threshold_dbm": 1.49
}
},
{
"Path": "optics/laser_output_power_low_alarm_threshold_dbm",
"values": {
"optics/laser_output_power_low_alarm_threshold_dbm": -10.5
}
},
{
"Path": "optics/laser_output_power_high_warning_threshold_dbm",
"values": {
"optics/laser_output_power_high_warning_threshold_dbm": -0.49
}
},
{
"Path": "optics/laser_output_power_low_warning_threshold_dbm",
"values": {
"optics/laser_output_power_low_warning_threshold_dbm": -8.49
}
},
{
"Path": "optics/laser_rx_power_high_alarm_threshold_dbm",
"values": {
"optics/laser_rx_power_high_alarm_threshold_dbm": 1.49
}
},
{
"Path": "optics/laser_rx_power_low_alarm_threshold_dbm",
"values": {
"optics/laser_rx_power_low_alarm_threshold_dbm": -16
}
},
{
"Path": "optics/laser_rx_power_high_warning_threshold_dbm",
"values": {
"optics/laser_rx_power_high_warning_threshold_dbm": -0.5
}
},
{
"Path": "optics/laser_rx_power_low_warning_threshold_dbm",
"values": {
"optics/laser_rx_power_low_warning_threshold_dbm": -14
```

```
}
},
{
"Path": "optics/laser_bias_current_high_alarm_threshold",
"values": {
"optics/laser_bias_current_high_alarm_threshold": 15
}
},
{
"Path": "optics/laser_bias_current_low_alarm_threshold",
"values": {
"optics/laser_bias_current_low_alarm_threshold": 1
}
},
{
"Path": "optics/laser_bias_current_high_warning_threshold",
"values": {
"optics/laser_bias_current_high_warning_threshold": 14
}
},
{
"Path": "optics/laser_bias_current_low_warning_threshold",
"values": {
"optics/laser_bias_current_low_warning_threshold": 1.2
}
},
{
"Path": "optics/module_temp_high_alarm",
"values": {
"optics/module_temp_high_alarm": false
}
},
{
"Path": "optics/module_temp_low_alarm",
"values": {
"optics/module_temp_low_alarm": false
}
},
{
"Path": "optics/module_temp_high_warning",
"values": {
"optics/module_temp_high_warning": false
}
},
{
"Path": "optics/module_temp_low_warning",
"values": {
"optics/module_temp_low_warning": false
}
},
{
"Path": "optics/wavelength_channel",
"values": {
"optics/wavelength_channel": "NA"
}
},
{
"Path": "optics/wavelength_setpoint",
"values": {
"optics/wavelength_setpoint": "NA"
}
},
{
```

```
"Path": "optics/tx_dither",
"values": {
"optics/tx_dither": "NA"
}
},
{
"Path": "optics/frequency_error",
"values": {
"optics/frequency_error": "NA"
}
},
{
"Path": "optics/wavelength_error",
"values": {
"optics/wavelength_error": "NA"
}
},
{
"Path": "optics/tec_fault",
"values": {
"optics/tec_fault": "NA"
}
},
{
"Path": "optics/w_unlocked_alarm",
"values": {
"optics/w_unlocked_alarm": "NA"
}
},
{
"Path": "optics/tx_tune_alarm",
"values": {
"optics/tx_tune_alarm": "NA"
}
},
{
"Path": "optics/lanediags/lane[lane_number=0]/lane_laser_temperature",
"values": {
"optics/lanediags/lane/lane_laser_temperature": 33
}
},
{
"Path": "optics/lanediags/lane[lane_number=0]/lane_laser_output_power_dbm",
"values": {
"optics/lanediags/lane/lane_laser_output_power_dbm": "z"
}
},
{
"Path": "optics/lanediags/lane[lane_number=0]/lane_laser_receiver_power_dbm",
"values": {
"optics/lanediags/lane/lane_laser_receiver_power_dbm": ""
}
},
{
"Path": "optics/lanediags/lane[lane_number=0]/lane_laser_bias_current",
"values": {
"optics/lanediags/lane/lane_laser_bias_current": 7.861
}
},
{
"Path": "optics/lanediags/lane[lane_number=0]/lane_laser_output_power_high_alarm",
"values": {
"optics/lanediags/lane/lane_laser_output_power_high_alarm": false
```

```
}
},
{
"Path": "optics/lanediags/lane[lane_number=0]/lane_laser_output_power_low_alarm",
"values": {
"optics/lanediags/lane/lane_laser_output_power_low_alarm": false
}
},
{
"Path": "optics/lanediags/lane[lane_number=0]/lane_laser_output_power_high_warning",
"values": {
"optics/lanediags/lane/lane_laser_output_power_high_warning": false
}
},
{
"Path": "optics/lanediags/lane[lane_number=0]/lane_laser_output_power_low_warning",
"values": {
"optics/lanediags/lane/lane_laser_output_power_low_warning": false
}
},
{
"Path": "optics/lanediags/lane[lane_number=0]/lane_laser_receiver_power_high_alarm",
"values": {
"optics/lanediags/lane/lane_laser_receiver_power_high_alarm": false
}
},
{
"Path": "optics/lanediags/lane[lane_number=0]/lane_laser_receiver_power_low_alarm",
"values": {
"optics/lanediags/lane/lane_laser_receiver_power_low_alarm": false
}
},
{
"Path": "optics/lanediags/lane[lane_number=0]/lane_laser_receiver_power_high_warning",
"values": {
"optics/lanediags/lane/lane_laser_receiver_power_high_warning": false
}
},
{
"Path": "optics/lanediags/lane[lane_number=0]/lane_laser_receiver_power_low_warning",
"values": {
"optics/lanediags/lane/lane_laser_receiver_power_low_warning": false
}
},
{
"Path": "optics/lanediags/lane[lane_number=0]/lane_laser_bias_current_high_alarm",
"values": {
"optics/lanediags/lane/lane_laser_bias_current_high_alarm": false
}
},
{
"Path": "optics/lanediags/lane[lane_number=0]/lane_laser_bias_current_low_alarm",
"values": {
"optics/lanediags/lane/lane_laser_bias_current_low_alarm": false
}
},
{
"Path": "optics/lanediags/lane[lane_number=0]/lane_laser_bias_current_high_warning",
"values": {
"optics/lanediags/lane/lane_laser_bias_current_high_warning": false
}
},
{
```

```
"Path": "optics/lanediags/lane[lane_number=0]/lane_laser_bias_current_low_warning",
"values": {
"optics/lanediags/lane/lane_laser_bias_current_low_warning": false
}
},
{
"Path": "optics/lanediags/lane[lane_number=0]/lane_tx_loss_of_signal_alarm",
"values": {
"optics/lanediags/lane/lane_tx_loss_of_signal_alarm": false
}
},
{
"Path": "optics/lanediags/lane[lane_number=0]/lane_rx_loss_of_signal_alarm",
"values": {
"optics/lanediags/lane/lane_rx_loss_of_signal_alarm": false
}
},
{
"Path": "optics/lanediags/lane[lane_number=0]/lane_tx_laser_disabled_alarm",
"values": {
"optics/lanediags/lane/lane_tx_laser_disabled_alarm": false
}
},
{
"Path": "optics/lanediags/lane[lane_number=0]/media_fec_corr_bits",
"values": {
"optics/lanediags/lane/media_fec_corr_bits": 0
}
},
{
"Path": "optics/lanediags/lane[lane_number=0]/media_fec_uncorr_blocks",
"values": {
"optics/lanediags/lane/media_fec_uncorr_blocks": 0
}
```

Pre-FEC BER and FEC Histogram

The following code block shows the CLI command to display Pre-FEC BER and FEC Histogram:

```
root@stqc-q5240-q02> show interfaces et-0/0/60:0 extensive
 **snippet**
  Ethernet FEC Mode  :                 FEC119
    FEC Codeword size                    544
    FEC Codeword rate                  0.945
  Ethernet FEC statistics              Errors
    FEC Corrected Errors          118362102644
    FEC Uncorrected Errors                   6
    FEC Corrected Errors Rate           153699
    FEC Uncorrected Errors Rate              0
    PRE FEC BER                 4.0241874899039e-07
  Symbol Error Per Code Word          Code Words    Total Code Words    Last Changed
    Bin0                             162280607       56031109595759    00:00:02 ago
    Bin1                                641533         234442006023    00:00:02 ago
    Bin2                                  2670           1054205770    00:00:02 ago
    Bin3                                    20              7552930    00:00:02 ago
    Bin4                                     0                88875    00:00:06 ago
    Bin5                                     0                 1554    00:03:06 ago
    Bin6                                     0                   23    03:00:24 ago
    Bin7                                     0                    0           Never
    Bin8                                     0                    0           Never
```

```
    Bin9                                    0                   0           Never
    Bin10                                   0                   0           Never
    Bin11                                   0                   0           Never
    Bin12                                   0                   0           Never
    Bin13                                   0                   0           Never
    Bin14                                   0                   0           Never
    Bin15                                   0                   0           Never
```

The following sensor sample outputs show the optic parameters (Pre-FEC BER and FEC Histogram) **/state/interfaces/interface/:**


```
 "prefix": "state/interfaces/interface[name=et-0/0/48:0]/ethernet",
  "updates": [
    {
      "Path": "fec-mode",
      "values": {
        "fec-mode": "FEC119"
      }
    },
    {
      "Path": "fec-codeword-size",
      "values": {
        "fec-codeword-size": 544
      }
    },
    {
      "Path": "fec-codeword-rate",
      "values": {
        "fec-codeword-rate": 0.945
      }
    },
    {
      "Path": "pre-fec-ber",
      "values": {
        "pre-fec-ber": 7.882875e-8
      }
    }
  ]
}

  "prefix": "state/interfaces/interface[name=et-
0/0/48:0]/ethernet/fec/errors/symbol[bin=0]",
  "updates": [
    {
      "Path": "current-code-words",
      "values": {
        "current-code-words": 162801668
      }
    },
    {
      "Path": "total-code-words",
      "values": {
        "total-code-words": 55147542594258
      }
    },
    {
      "Path": "last-change",
      "values": {
        "last-change": 1744223500
      }
    }
  ]
```

```
}
```

DDOS

EVENT	MONITOR CLI COMMAND	INDICATOR	SENSORS
DDOS stats	show ddos-protection statistics	Displays violation stats per protocol.	/junos/system/linecard/ddos/ **(Native)**

The following code block shows the CLI command to see DDOS violations per protocol:

```
root@Qfx5230-64cd> show ddos-protection protocols statistics
Packet types: 46, Received traffic: 0, Currently violated: 0
Protocol Group: Virtual-Chassis

  Packet type: aggregate (Aggregate for vccpd PDU traffic)
    System-wide information:
      Aggregate bandwidth is never violated
      Received:  0                  Arrival rate:     0 pps
      Dropped:   0                  Max arrival rate: 0 pps

  Packet type: unclassified (Unclassified virtual chassis traffic)
    System-wide information:
      Bandwidth is never violated
      Received:  0                  Arrival rate:     0 pps
      Dropped:   0                  Max arrival rate: 0 pps

Protocol Group: IGMP

  Packet type: aggregate (Aggregate for all igmp/mld traffic)
    System-wide information:
      Aggregate bandwidth is never violated
      Received:  0                  Arrival rate:     0 pps
      Dropped:   0                  Max arrival rate: 0 pps

Protocol Group: OSPF

  Packet type: aggregate (Aggregate for all ospf LSA traffic)
    System-wide information:
      Aggregate bandwidth is never violated
      Received:  0                  Arrival rate:     0 pps
      Dropped:   0                  Max arrival rate: 0 pps

Protocol Group: RSVP

  Packet type: aggregate (Aggregate for all rsvpv3/v6 traffic)
    System-wide information:
      Aggregate bandwidth is never violated
      Received:  0                  Arrival rate:     0 pps
      Dropped:   0                  Max arrival rate: 0 pps
```

Sensor output in key value pair **/junos/system/linecard/ddos/**

```
key: "__prefix__"
```

```
str_value: "/ddos-stats/group[group-name=\'Virtual-Chassis\']/protocol-
stats/protocol[protocol-name=\'aggregate\']/"

key: "protocol-id"
uint_value: 2048

key: "__prefix__"
str_value: "/ddos-stats/group[group-name=\'Virtual-Chassis\']/protocol-
stats/protocol[protocol-name=\'aggregate\']/locale-stats/locale[location=\'FPC Slot
0\']/"

key: "violation/policer-state"
str_value: "STATE_NEVER_VIOLATED"

key: "__prefix__"
str_value: "/ddos-stats/group[group-name=\'Virtual-Chassis\']/protocol-
stats/protocol[protocol-name=\'unclassified\']/"

key: "protocol-id"
uint_value: 2049

key: "__prefix__"
str_value: "/ddos-stats/group[group-name=\'Virtual-Chassis\']/protocol-
stats/protocol[protocol-name=\'unclassified\']/locale-stats/locale[location=\'FPC Slot
0\']/"

key: "violation/policer-state"
str_value: "STATE_NEVER_VIOLATED"

key: "__prefix__"
str_value: "/ddos-stats/group[group-name=\'IGMP\']/"

key: "group-id"
uint_value: 10

key: "__prefix__"
str_value: "/ddos-stats/group[group-name=\'IGMP\']/protocol-stats/protocol[protocol-
name=\'aggregate\']/"

key: "protocol-id"
uint_value: 2560

key: "__prefix__"
str_value: "/ddos-stats/group[group-name=\'IGMP\']/protocol-stats/protocol[protocol-
name=\'aggregate\']/locale-stats/locale[location=\'FPC Slot 0\']/"

key: "violation/policer-state"
str_value: "STATE_NEVER_VIOLATED"
```

Protocols

EVENT	MONITOR CLI COMMAND	INDICATOR	SENSORS
BGP	Show bgp summary Show bgp neighbor <>	Displays neighbor address, peer AS, state and all other BGP aspects	/network-instances/network-instance/protocols/protocol/bgp **(OpenConfig)**

BFD	show bfd session <> extensive	Lists the active BFD sessions with peer address, state, interval	/bfd/interfaces/interface/ **(OpenConfig)**
LLDP	Show lldp neighbors	Indicates the LLDP neighborship details	/lldp **(OpenConfig)**

BGP

The following code block shows the CLI command to get BGP data:

```
root@Qfx5230-64cd-01> show bgp summary


Threading mode: BGP I/O
Default eBGP mode: advertise - accept, receive - accept
Groups: 2 Peers: 1 Down peers: 0
Table          Tot Paths  Act Paths Suppressed    History Damp State    Pending
inet.0
                       4          4          0          0          0          0
Peer                     AS      InPkt     OutPkt    OutQ   Flaps Last Up/Dwn
State|#Active/Received/Accepted/Damped...
192.168.16.5          64522         27         22       0       0        9:19 Establ
  inet.0: 4/4/4/0
```

Sensor output **/network-instances/network-instance/protocols/protocol/bgp**

```
key: "__prefix__"
str_value: "/network-instances/network-
instance[name=\'DEFAULT\']/protocols/protocol[identifier=\'BGP\' and
name=\'DEFAULT\']/bgp/neighbors/neighbor[neighbor-address=\'192.168.16.5\']/"

key: "snmp-peer-index"
uint_value: 4

key: "state/peer-as"
uint_value: 64522

key: "state/local-as"
uint_value: 64532

key: "state/peer-type"
str_value: "EXTERNAL"

key: "state/auth-password"
str_value: "(null)"

key: "state/route-flap-damping"
bool_value: false

key: "state/description"
str_value: "(null)"

key: "state/session-state"
str_value: "ESTABLISHED"

key: "state/last-established"
uint_value: 1738093351000000000

key: "state/established-transitions"
uint_value: 1
```

```
key: "state/supported-capabilities"
leaflist_value {
  element {
    leaflist_str_value: "MPBGP"
  }
  element {
    leaflist_str_value: "ROUTE_REFRESH"
  }
  element {
    leaflist_str_value: "ASN32"
  }
  element {
    leaflist_str_value: "GRACEFUL_RESTART"
  }
}

key: "state/messages/sent/UPDATE"
uint_value: 0

key: "state/messages/sent/NOTIFICATION"
uint_value: 0

key: "state/messages/sent/last-notification-time"
uint_value: 0

key: "state/messages/sent/last-notification-error-subcode"
str_value: "UNSPECIFIC"

key: "state/messages/received/UPDATE"
uint_value: 5
```

BFD

The following code block shows the CLI command reflecting active BFD sessions:

```
root@Qfx5230-64cd> show bfd session address 192.168.16.5 extensive
                                                  Detect   Transmit
Address                  State     Interface      Time     Interval  Multiplier
192.168.16.5             Up        et-0/0/26.0    0.900     0.300        3
 Client BGP, TX interval 0.300, RX interval 0.300
 Session up time 00:02:52
 Local diagnostic None, remote diagnostic None
 Remote state Up, version 1
 Session type: Single hop BFD
 Min async interval 0.300, min slow interval 1.000
 Adaptive async TX interval 0.300, RX interval 0.300
 Local min TX interval 0.300, minimum RX interval 0.300, multiplier 3
 Remote min TX interval 0.300, min RX interval 0.300, multiplier 3
 Local discriminator 16, remote discriminator 19
 Echo TX interval 0.000, echo detection interval 0.000
 Echo mode disabled/inactive
 Remote is control-plane independent
  Session ID: 1

1 sessions, 1 clients
Cumulative transmit rate 3.3 pps, cumulative receive rate 3.3 pps
```

Sensor output **/bfd/interfaces/interface/**

```
str_value: "/bfd/interfaces/interface[id=\'et-0/0/26.0\']/"

key: "state/id"
str_value: "et-0/0/26.0"

key: "state/enabled"
bool_value: true

key: "state/local-address"
str_value: "192.168.16.4"

key: "state/desired-minimum-tx-interval"
uint_value: 300

key: "state/required-minimum-receive"
uint_value: 300

key: "state/detection-multiplier"
uint_value: 3

key: "state/enable-per-member-link"
bool_value: false

key: "__prefix__"
str_value: "/bfd/interfaces/interface[id=\'et-0/0/26.0\']/peers/peer[local-
discriminator=\'16\']/"

key: "state/local-address"
str_value: "192.168.16.4"

key: "state/remote-address"
str_value: "192.168.16.5"

key: "state/subscribed-protocols"
leaflist_value {
  element {
    leaflist_str_value: "BGP"
  }
}

key: "state/session-state"
str_value: "UP"

key: "state/remote-session-state"
str_value: "UP"

key: "state/last-failure-time"
uint_value: 0

key: "state/failure-transitions"
uint_value: 0

key: "state/local-discriminator"
str_value: "16"

key: "state/remote-discriminator"
str_value: "19"

key: "state/local-diagnostic-code"
str_value: "NO_DIAGNOSTIC"

key: "state/remote-diagnostic-code"
```

```
str_value: "NO_DIAGNOSTIC"

key: "state/remote-minimum-receive-interval"
uint_value: 300
```

LLDP

The following code block shows the CLI command indicating active LLDP neighbors:

```
root@Qfx5230-64cd> show lldp neighbors
Local Interface  Parent Interface  Chassis Id         Port info          System Name
et-0/0/26        -                 2c:4c:15:ef:14:45  et-0/0/15          Qfx5220-32cd-04
et-0/0/50        -                 84:03:28:02:bf:d6  et-0/0/0           Qfx5220-32cd-05
```

Sensor output **/lldp**

```
key: "__prefix__"
str_value: "/lldp/interfaces/interface[name=\'et-
0/0/26\']/neighbors/neighbor[id=\'2c:4c:15:ef:14:45-et-0/0/15\']/"

key: "state/system-name"
str_value: "Qfx5220-32cd-04"

key: "state/system-description"
str_value: "Juniper Networks, Inc. qfx5220-32cd internet router, JUNOS 23.4R2.9-EVO,
Build date: 2024-06-05 14:39:24 UTC Copyright (c) 1996-2024 Juniper Networks, Inc."

key: "state/chassis-id"
str_value: "2c:4c:15:ef:14:45"

key: "state/chassis-id-type"
str_value: "MAC_ADDRESS"

key: "state/id"
str_value: "2c:4c:15:ef:14:45-et-0/0/15"

key: "state/age"
uint_value: 170694

key: "state/last-update"
int_value: 10

key: "state/ttl"
uint_value: 120

key: "state/port-id"
str_value: "et-0/0/15"

key: "state/port-id-type"
str_value: "INTERFACE_NAME"

key: "state/port-description"
str_value: "To dc-tme-qfx5230-64cd-01 et-0/0/26  "

key: "state/management-address"
str_value: "10.92.72.43"

key: "state/management-address-type"
str_value: "IPv4"
```

Congestion Parameters

EVENT	MONITOR CLI COMMAND	INDICATOR	ACTION	EXPECTED OUTCOME	SENSORS
ECN marked packets	show interfaces <int> extensive	Review “Output Errors” and “ECN Marked Packets”. This indicates that the buffer is utilized to the fill level value, and the switch requests senders to reduce the transmit rate. If this prematurely impacts application performance, tune as indicated in the Action field.	Increase the drop profile fill level value until PFC occurs. Then, reduce by decrements of 5 until PFC stops.	ECN marking occurs later in the buffer utilization, reducing the frequency of traffic throttling.	/state/interfaces/interface[name=et-0/0/x]/counters/errors/out-ecn-ce-marked-pkts **(Native)**
PFC Pause Frames	show interfaces <int> extensive	Review “Priority Flow Control Statistics” Indicates traffic is coming in at a rate greater than the shared input buffer.	Reduce drop profile fill level value until PFC no longer occurs.	ECN occurs earlier in buffer utilization to mitigate the Pause Frame and interruption of traffic transmission.	/state/interfaces/interface[name=et-0/0/17:1]/counters/pfc **(Native)**
Tail Drops & Egress queue peak buffer occupancy	show interfaces <int> extensive show interfaces queue <int> show interfaces queue bufferoccupancy <int>	Review “Egress Queues” and “Dropped Packets” Indicates packets are being dropped based on WRED profile.	Reduce the drop profile fill level values until ECN occurs before drops/PFC.	Traffic reduction should happen earlier, allowing queues to clear without drops.	/junos/system/linecard/qmon-sw/ **(Native)**
Input drops & Ingress priority-group buffer occupancy	show interfaces <int> extensive show interfaces priority-group <int> buffer-occupancy	Review “Drops” and “Resource Errors” The ingress shared buffer is being exceeded and unable to store the incoming packets. This event is common when PFCs are generated.	Increase shared buffer > ingress > bufferpartition <%> For "Resource Errors", Increase the "ingress buffer-partition lossless-headroom" percentage. If the ingress shared buffer partition is at the expected value, Reduce the fill level values until ECN occurs before drops/PFC.	More memory is allocated to the specified buffer if needed. No or minimal input drops were experienced.	/junos/system/linecard/qmon-sw/ **(Native)**

This section describes how to validate these different parameters on the CLI of the QFX Series and the corresponding sensor output in the KV pair.

ECN

The ECN-marked packets are seen in CLI under show interfaces <> extensive output, as follows:

```
jnpr@Leaf1> show interfaces et-0/0/28:0 extensive
*snip*
Output errors:
    Carrier transitions: 2, Errors: 0, Drops: 1515496280, Collisions: 0, Aged packets:
0, FIFO errors: 0, HS link CRC errors: 0, MTU errors: 0, Resource errors: 0, ECN
Marked packets: 1046954079
```

The corresponding sensor output **/state/interfaces/interface[name=et-0/0/x]/counters/errors/out-ecn-ce-marked-pkts**

```
  "prefix": "state/interfaces/interface[name=et-0/0/28:0]/counters/errors",
  "updates": [
    {
      "Path": "out-ecn-ce-marked-pkts",
      "values": {
        "out-ecn-ce-marked-pkts": 1309119992
      }
    }
  ]
}
```

PFC

The number of PFC pause frames generated for a specific priority group can be viewed using show interfaces [interface-name] extensive. This also shows any input drops due to overflowing ingress buffer (these are also counted as resource errors).

The following code block shows the CLI command indicating PFC pause frames with a priority of 3 and 2:

```
jnpr@Leaf1> show interfaces et-0/0/17:0 extensive

*snip*

Input errors:
    Errors: 0, Drops: 0, Framing errors: 0, Runts: 0, Policed discards: 0, L3
incompletes: 0, L2 channel errors: 0, L2 mismatch timeouts: 0, FIFO errors: 0,
Resource errors: 0
  Output errors:
    Carrier transitions: 9, Errors: 0, Drops: 0, Collisions: 0, Aged packets: 0, FIFO
errors: 0, HS link CRC errors: 0, MTU errors: 0, Resource errors: 0, ECN Marked
packets: 0 *snip*

MAC Priority Flow Control Statistics:
    Priority :  0                               0               0
    Priority :  1                               0               0
    Priority :  2                               0       117815989
    Priority :  3                               0       114475598
    Priority :  4                               0               0
```

```
    Priority :  5                               0               0
    Priority :  6                               0               0
    Priority :  7                               0               0
```

The corresponding sensor output **state/interfaces/interface[name=et-0/0/17:0]/counters/pfc**

```
*Snip*

  "prefix": "state/interfaces/interface[name=et-0/0/17:0]/counters/pfc[priority=2]",
  "updates": [
    {
      "Path": "in-pkts",
      "values": {
        "in-pkts": 0
      }
    },
    {
      "Path": "out-pkts",
      "values": {
        "out-pkts": 133941671
      }
    }
  ]
}
{
*snip*
  "prefix": "state/interfaces/interface[name=et-0/0/17:0]/counters/pfc[priority=3]",
  "updates": [
    {
      "Path": "in-pkts",
      "values": {
        "in-pkts": 0
      }
    },
    {
      "Path": "out-pkts",
      "values": {
        "out-pkts": 130114448
      }
    }
  ]
}
```

Peak Buffer Occupancy

For egress queue buffer utilization, the peak buffer occupancy can be viewed using show interfaces queue buffer-occupancy [interface-name], as follows:

```
jnpr@Leaf1> show interfaces queue buffer-occupancy et-0/0/17:0
Physical interface: et-0/0/17:0, Enabled, Physical link is Up
  Interface index: 2658, SNMP ifIndex: 775
Forwarding classes: 12 supported, 7 in use
Egress queues: 12 supported, 7 in use
            Queue: 0, Forwarding classes: best_effort
                Queue-depth bytes  :
                Peak               : 9398
            Queue: 1, Forwarding classes: network_mgmt
                Queue-depth bytes  :
                Peak               : 9398
            Queue: 2, Forwarding classes: rdma_storage
```

```
                Queue-depth bytes  :
                Peak               : 37592
            Queue: 3, Forwarding classes: gpu_direct
                Queue-depth bytes  :
                Peak               : 37592
            Queue: 4, Forwarding classes: no-loss
                Queue-depth bytes  :
                Peak               : 0
            Queue: 7, Forwarding classes: network_control
                Queue-depth bytes  :
                Peak               : 9906
            Queue: 8, Forwarding classes: mcast
                Queue-depth bytes  :
                Peak               : 0
```

The sensor output **/junos/system/linecard/qmon-sw/** for Queue 3

```
*snip*

  "prefix": "cos/interfaces/interface[name=et-0/0/17:0]/queues/queue[queue=3]",
  "updates": [
    {
      "Path": "txPkts",
      "values": {
        "txPkts": 524197924
      }
    },
    {
      "Path": "txBytes",
      "values": {
        "txBytes": 4793726896230
      }
    },
    {
      "Path": "tailDropPkts",
      "values": {
        "tailDropPkts": 0
      }
    },
    {
      "Path": "tailDropBytes",
      "values": {
        "tailDropBytes": 0
      }
    },
    {
      "Path": "peakBufferOccupancy",
      "values": {
        "peakBufferOccupancy": 37592
      }
    },
    {
      "Path": "peakBufferOccupancyPercent",
      "values": {
        "peakBufferOccupancyPercent": 0
      }
    },
    {
      "Path": "ecnMarkedPkts",
      "values": {
        "ecnMarkedPkts": 0
      }
    },
```

```
    {
      "Path": "ecnMarkedBytes",
      "values": {
        "ecnMarkedBytes": 0
      }
    }
  ]
}
{
```

Tail Drops

The show interface <> extensive command also shows the traffic queuing statistics, along with any tail dropped packets for a specific queue. In this case, packets are hitting queue 4 (as expected) and there are no tail drops.

```
jnpr@Leaf1> show interfaces et-0/0/28:0 extensive
Physical interface: et-0/0/28:0, Enabled, Physical link is Up
  Interface index: 2670, SNMP ifIndex: 797, Generation: 1069446863835
  Link-level type: Ethernet, MTU: 9408, LAN-PHY mode, Speed: 100Gbps, BPDU Error:
*snip*
  Output errors:
    Carrier transitions: 2, Errors: 0, Drops: 6106956969, Collisions: 0, Aged packets:
0, FIFO errors: 0, HS link CRC errors: 0, MTU errors: 0, Resource errors: 0, ECN
Marked packets: 4348083336
  Egress queues: 12 supported, 7 in use
  Queue counters:       Queued packets  Transmitted packets      Dropped packets
    0                     2222628767            447706971          1774921796
    1                     2222628625             57582973          2165045652
    2                     2221305406           2221305406                   0
    3                     2790812550           2790812550                   0
    4                              0                    0                   0
    7                     2222628395             55638874          2166989521
    8                              0                    0                   0
```

The sensor output for any tail drops seen on queue7 for **/junos/system/linecard/qmon-sw/**

```
"prefix": "cos/interfaces/interface[name=et-0/0/28:0]/queues/queue[queue=7]",
  "updates": [
    {
      "Path": "txPkts",
      "values": {
        "txPkts": 62373631
      }
    },
    {
      "Path": "txBytes",
      "values": {
        "txBytes": 259599044086
      }
    },
    {
      "Path": "tailDropPkts",
      "values": {
        "tailDropPkts": 2428349080
      }
    },
    {
      "Path": "tailDropBytes",
      "values": {
        "tailDropBytes": 10106788933390
```

```
      }
    },
    {
      "Path": "peakBufferOccupancy",
      "values": {
        "peakBufferOccupancy": 725424
      }
    },
    {
      "Path": "peakBufferOccupancyPercent",
      "values": {
        "peakBufferOccupancyPercent": 22
      }
    },
    {
      "Path": "ecnMarkedPkts",
      "values": {
        "ecnMarkedPkts": 0
      }
    },
    {
      "Path": "ecnMarkedBytes",
      "values": {
        "ecnMarkedBytes": 0
      }
    }
  ]
}
```

In addition to this, granular queuing statistics can be viewed using the show interfaces queue [interface-name] command.

```
jnpr@Leaf1> show interfaces queue et-0/0/28:0
Physical interface: et-0/0/28:0, up, Physical link is Up
  Interface index: 2670, SNMP ifIndex: 797
Forwarding classes: 12 supported, 7 in use
Egress queues: 12 supported, 7 in use
Queue: 0, Forwarding classes: best_effort
  Queued:
    Packets              :            2676877277              1195693 pps
    Bytes                :        11141160973532           39812142576 bps
  Transmitted:
    Packets              :             538605107               239112 pps
    Bytes                :         2241672106266            7961471720 bps
    Tail-dropped packets :            2138272170               956581 pps
    Tail-dropped bytes   :         8899488867266           31850670856 bps
    RED-dropped packets  :                     0                    0 pps
    RED-dropped bytes    :                     0                    0 bps
    ECN-CE packets       :                     0                    0 pps
    ECN-CE bytes         :                     0                    0 bps
Queue: 1, Forwarding classes: network_mgmt
  Queued:
    Packets              :            2676877135              1195739 pps
    Bytes                :        11141162818998           39813844376 bps
  Transmitted:
    Packets              :              68945231                29889 pps
    Bytes                :          286950051422             995210024 bps
    Tail-dropped packets :            2607931904              1165850 pps
    Tail-dropped bytes   :        10854212767576           38818634352 bps
    RED-dropped packets  :                     0                    0 pps
    RED-dropped bytes    :                     0                    0 bps
    ECN-CE packets       :                     0                    0 pps
```

```
    ECN-CE bytes          :                       0                       0 bps
Queue: 2, Forwarding classes: rdma_storage
  Queued:
    Packets               :              2675527986               1195652 pps
    Bytes                 :          111355547477732           39810440248 bps
  Transmitted:
    Packets               :              2675527986               1195652 pps
    Bytes                 :          111355547477732           39810440248 bps
    Tail-dropped packets  :                       0                       0 pps
    Tail-dropped bytes    :                       0                       0 bps
    RED-dropped packets   :                       0                       0 pps
    RED-dropped bytes     :                       0                       0 bps
    ECN-CE packets        :              2347367218               1136328 pps
    ECN-CE bytes          :           9769742361316           37835210320 bps
Queue: 3, Forwarding classes: gpu_direct
  Queued:
    Packets               :              3358544411               1494538 pps
    Bytes                 :          113978261838582           49762139064 bps
  Transmitted:
    Packets               :              3358544411               1494538 pps
    Bytes                 :          113978261838582           49762139064 bps
    Tail-dropped packets  :                       0                       0 pps
    Tail-dropped bytes    :                       0                       0 bps
    RED-dropped packets   :                       0                       0 pps
    RED-dropped bytes     :                       0                       0 bps
    ECN-CE packets        :              2915788195               1494538 pps
    ECN-CE bytes          :          112135510467590           49762139064 bps

*snip*

Queue: 7, Forwarding classes: network_control
  Queued:
    Packets               :              2676877136               1195850 pps
    Bytes                 :          111141162756756           39817344848 bps
  Transmitted:
    Packets               :                67049978                 30035 pps
    Bytes                 :            2790620000300            1000075360 bps
    Tail-dropped packets  :              2609827158               1165815 pps
    Tail-dropped bytes    :          108621007564560           38817269488 bps
    RED-dropped packets   :                       0                       0 pps
    RED-dropped bytes     :                       0                       0 bps
    ECN-CE packets        :                       0                       0 pps
    ECN-CE bytes          :                       0                       0 bps
    RED-dropped packets   :                       0                       0 pps
    RED-dropped bytes     :                       0                       0 bps
    ECN-CE packets        :                       0                       0 pps
    ECN-CE bytes          :                       0                       0 bps
*snip*
```

Input Errors

Resource Errors, which are input drops due to overflowing ingress buffer, are seen under show interface <> extensive CLI command

```
jnpr@Leaf1> show interfaces et-0/0/17:1 extensive
Physical interface: et-0/0/17:1, Enabled, Physical link is Up

*snip*

  Input errors:
```

```
    Errors: 0, Drops: 12921, Framing errors: 0, Runts: 0, Policed discards: 0, L3
incompletes: 0, L2 channel errors: 0, L2 mismatch timeouts: 0, FIFO errors: 0,
Resource errors: 12921
```

The corresponding sensor output of **state/interfaces/interface**

```
"prefix": "state/interfaces/interface[name=et-0/0/17:1]/counters/errors",
  "updates": [
    {
      "Path": "in-resource-drops",
      "values": {
        "in-resource-drops": 12921
      }
    },
    {
      "Path": "out-ecn-ce-marked-pkts",
      "values": {
        "out-ecn-ce-marked-pkts": 0
      }
    }
```