

Network Configuration Example: AI/ML Telemetry Reference Guide

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Network Configuration Example: AI/ML Telemetry Reference Guide
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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
- Liquid Cool

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, and liquid cooled sensors were tested on 25.2X100-D21 using QFX5250-64oe-l 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:

```

Feature name	Licensed Feature used	Licensed Feature installed	Licensed Feature 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-mps	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-mps	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 cojsqn 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 Degradate :
  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
```

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/mln 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 rsvp3/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 neighborhood 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

```

Address	State	Interface	Detect Time	Transmit 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:
```

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            :          11135547477732        39810440248 bps
  Transmitted:
    Packets          :          2675527986          1195652 pps
    Bytes            :          11135547477732        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            :          13978261838582        49762139064 bps
  Transmitted:
    Packets          :          3358544411          1494538 pps
    Bytes            :          13978261838582        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       :          12135510467590        49762139064 bps

*snip*

Queue: 7, Forwarding classes: network_control
  Queued:
    Packets          :          2676877136          1195850 pps
    Bytes            :          11141162756756        39817344848 bps
  Transmitted:
    Packets          :          67049978             30035 pps
    Bytes            :          279062000300          1000075360 bps
    Tail-dropped packets :          2609827158          1165815 pps
    Tail-dropped bytes  :          10862100756456        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
    }
  }
]
```

The sensor data in this section were validated on Junos OS Release 25.2X100-D21 using Qfx5250-64oe-I with an in-house telemetry collector to gather the sensor outputs.

Liquid Cooling Parameters

EVENT	MONITOR CLI COMMAND	INDICATOR	SENSORS
Liquid Cooling temperature			<u>Coolant temperature sensors:</u> /components/component[name=FPC0]/properties/property[name=Inlet Fluid Temp]/state/value /components/component[name=FPC0]/properties/property[name=Outlet Fluid Temp]/state/value (OpenConfig)
Liquid Cooling pressure		.	<u>Coolant pressure sensors:</u> /components/component[name=FPC0]/properties/property[name=Pressure Sensor Inlet]/state/value /components/component[name=FPC0]/properties/property[name=Pressure Sensor Outlet]/state/value (OpenConfig)
Liquid Cooling leak detection			<u>Coolant Leak detect sensors:</u> /components/component[name=FPC0]/properties/property[name=Leakage Sensor Loop1]/state/value /components/component[name=FPC0]/properties/property[name=Leakage Sensor Loop2]/state/value /components/component[name=FPC0]/properties/property[name=Leakage Sensor Loop3]/state/value

			/components/component[name=FPC0]/properties/property[name=Leakage Sensor Loop4]/state/value (OpenConfig)
Liquid Cooling humidity detection			<u>Humidity sensor:</u> /components/component[name=FPC0]/properties/property[name=Humidity sensor]/state/value 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.

Liquid cooling temperature

The following code block shows the CLI command to display the liquid cooling temperature.

```
jnpr@Leaf1> show chassis environment | no-more. (Output trimmed)
Class Item                               Status      Measurement
Temp    FPC 0 Inlet Fluid Temp                OK          33 degrees C / 91 degrees F
        FPC 0 Outlet Fluid Temp            OK          39 degrees C / 102 degrees F
Humidity FPC 0 Humidity sensor              OK          39 %
Pressure FPC 0 Pressure Sensor Inlet        OK          3172 mBar / 46 psi
        FPC 0 Pressure Sensor Outlet      OK          2806 mBar / 40 psi
Leakage  FPC 0 Leakage Sensor Loop1          OK          No Leakage (Leakage Score: 0/100)
        FPC 0 Leakage Sensor Loop2        OK          No Leakage (Leakage Score: 0/100)
        FPC 0 Leakage Sensor Loop3        OK          No Leakage (Leakage Score: 0/100)
        FPC 0 Leakage Sensor Loop4        OK          No Leakage (Leakage Score: 0/100)
```

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

```
"prefix": "components/component[name=FPC0]/properties/property[name=Inlet Fluid Temp]",
"updates": [
  {
    "Path": "state/value",
    "values": {
      "state/value": "33"
    }
  }
]
}
{
  "source": "10.221.86.65:50051",
  "subscription-name": "sub1",
  "timestamp": 1782966042979043564,
  "time": "2026-07-02T12:20:42.979043564+08:00",
  "prefix": "components/component[name=FPC0]/properties/property[name=Outlet Fluid Temp]",
  "updates": [
    {
      "Path": "state/value",
      "values": {
        "state/value": "39"
      }
    }
  ]
}
```

```
]
}
{
```

Liquid cooling pressure

```
jnpr@Leaf1> show chassis environment | no-more. (Output trimmed)
Class Item                               Status      Measurement
Temp  FPC 0 Inlet Fluid Temp             OK          33 degrees C / 91 degrees F
      FPC 0 Outlet Fluid Temp           OK          39 degrees C / 102 degrees F
Humidity FPC 0 Humidity sensor           OK          39 %
Pressure FPC 0 Pressure Sensor Inlet     OK          3172 mBar / 46 psi
      FPC 0 Pressure Sensor Outlet      OK          2806 mBar / 40 psi
Leakage FPC 0 Leakage Sensor Loop1       OK          No Leakage (Leakage Score: 0/100)
      FPC 0 Leakage Sensor Loop2       OK          No Leakage (Leakage Score: 0/100)
      FPC 0 Leakage Sensor Loop3       OK          No Leakage (Leakage Score: 0/100)
      FPC 0 Leakage Sensor Loop4       OK          No Leakage (Leakage Score: 0/100)
```

```
"prefix": "components/component[name=FPC0]/properties/property[name=Pressure Sensor Inlet]",
  "updates": [
    {
      "Path": "state/value",
      "values": {
        "state/value": "3172 mbar"
      }
    }
  ]
}
{
  "source": "10.221.86.65:50051",
  "subscription-name": "sub1",
  "timestamp": 1782966043001888189,
  "time": "2026-07-02T12:20:43.001888189+08:00",
  "prefix": "components/component[name=FPC0]/properties/property[name=Pressure Sensor Outlet]",
  "updates": [
    {
      "Path": "state/value",
      "values": {
        "state/value": "2806 mbar"
      }
    }
  ]
}
}
```

Liquid cooling leak detection

```
jnpr@Leaf1> show chassis environment | no-more. (Output trimmed)
Class Item                               Status      Measurement
Temp  FPC 0 Inlet Fluid Temp             OK          33 degrees C / 91 degrees F
      FPC 0 Outlet Fluid Temp           OK          39 degrees C / 102 degrees F
Humidity FPC 0 Humidity sensor           OK          39 %
Pressure FPC 0 Pressure Sensor Inlet     OK          3172 mBar / 46 psi
      FPC 0 Pressure Sensor Outlet      OK          2806 mBar / 40 psi
```

Leakage	FPC 0 Leakage Sensor Loop1	OK	No Leakage (Leakage Score: 0/100)
	FPC 0 Leakage Sensor Loop2	OK	No Leakage (Leakage Score: 0/100)
	FPC 0 Leakage Sensor Loop3	OK	No Leakage (Leakage Score: 0/100)
	FPC 0 Leakage Sensor Loop4	OK	No Leakage (Leakage Score: 0/100)

```

"prefix": "components/component[name=FPC0]/properties/property[name=Leakage Sensor Loop1]",
  "updates": [
    {
      "Path": "state/value",
      "values": {
        "state/value": "0"
      }
    }
  ]
}
{
  "source": "10.221.86.65:50051",
  "subscription-name": "sub1",
  "timestamp": 1782966042988850163,
  "time": "2026-07-02T12:20:42.988850163+08:00",
  "prefix": "components/component[name=FPC0]/properties/property[name=Leakage Sensor Loop2]",
  "updates": [
    {
      "Path": "state/value",
      "values": {
        "state/value": "0"
      }
    }
  ]
}
{
  "source": "10.221.86.65:50051",
  "subscription-name": "sub1",
  "timestamp": 1782966042992097331,
  "time": "2026-07-02T12:20:42.992097331+08:00",
  "prefix": "components/component[name=FPC0]/properties/property[name=Leakage Sensor Loop3]",
  "updates": [
    {
      "Path": "state/value",
      "values": {
        "state/value": "0"
      }
    }
  ]
}
{
  "source": "10.221.86.65:50051",
  "subscription-name": "sub1",
  "timestamp": 1782966042995347530,
  "time": "2026-07-02T12:20:42.99534753+08:00",
  "prefix": "components/component[name=FPC0]/properties/property[name=Leakage Sensor Loop4]",
  "updates": [
    {
      "Path": "state/value",
      "values": {
        "state/value": "0"
      }
    }
  ]
}

```

```
]
}
```

Liquid cooling humidity detection

```
jnpr@Leaf1> show chassis environment | no-more. (Output trimmed)
Class Item                               Status      Measurement
Temp  FPC 0 Inlet Fluid Temp              OK          33 degrees C / 91 degrees F
      FPC 0 Outlet Fluid Temp            OK          39 degrees C / 102 degrees F
Humidity FPC 0 Humidity sensor            OK          39 %
Pressure FPC 0 Pressure Sensor Inlet      OK          3172 mBar / 46 psi
      FPC 0 Pressure Sensor Outlet        OK          2806 mBar / 40 psi
Leakage FPC 0 Leakage Sensor Loop1        OK          No Leakage (Leakage Score: 0/100)
      FPC 0 Leakage Sensor Loop2          OK          No Leakage (Leakage Score: 0/100)
      FPC 0 Leakage Sensor Loop3          OK          No Leakage (Leakage Score: 0/100)
      FPC 0 Leakage Sensor Loop4          OK          No Leakage (Leakage Score: 0/100)
```

```
"prefix": "components/component[name=FPC0]/properties/property[name=Humidity sensor]",
"updates": [
  {
    "Path": "state/value",
    "values": {
      "state/value": "39 %"
    }
  }
]
}
```