Structure of YANG Models

Structure of YANG Models

YANG data models can be represented in a hierarchical, tree-based structure with nodes. This representation makes the models easy to understand.

There are two Terminal-device models for Cisco NCS 1004, such as:

- OpenConfig Terminal model
- OpenConfig Platform model

For more details on supported versions, see Supported YANG Models in NCS 1004.

The following is the tree structure of the OpenConfig Terminal model:

```
module: openconfig-terminal-device
   +--rw terminal-device
      +--ro state
      +--rw logical-channels
      |  +--rw channel* [index]
      |     +--rw index
      |     +--rw config
      |     |  +--rw index?                  uint32
      |     |  +--rw description?            string
      |     |  +--rw admin-state?            oc-opt-types:admin-state-type
      |     |  +--rw rate-class?             identityref
      |     |  +--rw trib-protocol?          identityref
      |     |  +--rw logical-channel-type?   identityref
      |     |  +--rw loopback-mode?          oc-opt-types:loopback-mode-type
      |     +--ro state
```

Structure of YANG Models

```
|      |  +--ro index?                  uint32
|      |  +--ro description?            string
|      |  +--ro admin-state?            oc-opt-types:admin-state-type
|      |  +--ro rate-class?             identityref
|      |  +--ro trib-protocol?          identityref
|      |  +--ro logical-channel-type?   identityref
|      |  +--ro loopback-mode?          oc-opt-types:loopback-mode-type
|      |  +--ro link-state?             enumeration
|      +--rw otn
|      |  +--rw config
|      |  |  +--rw tti-msg-transmit?   string
|      |  |  +--rw tti-msg-expected?   string
|      |  |  +--rw tti-msg-auto?       boolean
|      |  +--ro state
|      |     +--ro tti-msg-transmit?           string
|      |     +--ro tti-msg-expected?           string
|      |     +--ro tti-msg-recv?               string
|      |     +--ro errored-seconds?            yang:counter64
|      |     +--ro severely-errored-seconds?   yang:counter64
|      |     +--ro unavailable-seconds?        yang:counter64
|      |     +--ro fec-corrected-bits?         yang:counter64
|      |     +--ro background-block-errors?    yang:counter64
|      |     +--ro fec-uncorrectable-words
|      |     +--ro pre-fec-ber
|      |     |  +--ro instant?   decimal64
|      |     |  +--ro avg?       decimal64
|      |     |  +--ro min?       decimal64
|      |     |  +--ro max?       decimal64
|      |     +--ro post-fec-ber
|      |     |  +--ro instant?   decimal64
|      |     |  +--ro avg?       decimal64
|      |     |  +--ro min?       decimal64
|      |     |  +--ro max?       decimal64
|      +--rw ethernet
|      |  +--rw config
|      |  +--ro state
|      |     +--ro in-mac-pause-frames?      yang:counter64
|      |     +--ro in-oversize-frames?       yang:counter64
|      |     +--ro in-jabber-frames?         yang:counter64
|      |     +--ro in-fragment-frames?       yang:counter64
|      |     +--ro in-crc-errors?            yang:counter64
|      |     +--ro out-mac-pause-frames?     yang:counter64
|      +--rw ingress
|      |  +--rw config
|      |  |  +--rw transceiver?        -> /oc-platform:components/component/name
|      |  |  +--rw physical-channel*   ->
/oc-platform:components/component/oc-transceiver:transceiver/physical-channels/channel/index

|      |  +--ro state
|      |     +--ro transceiver?        -> /oc-platform:components/component/name
|      |     +--ro physical-channel*   ->
/oc-platform:components/component/oc-transceiver:transceiver/physical-channels/channel/index

|      +--rw logical-channel-assignments
|         +--rw assignment* [index]
|            +--rw index     -> ../config/index
|            +--rw config
|            |  +--rw index?             uint32
|            |  +--rw description?       string
|            |  +--rw assignment-type?   enumeration
|            |  +--rw logical-channel?   ->
/terminal-device/logical-channels/channel/index
|            |  +--rw optical-channel?   -> /oc-platform:components/component/name
|            |  +--rw allocation?        decimal64
```

```
      |           +--ro state
      |              +--ro index?             uint32
      |              +--ro description?       string
      |              +--ro assignment-type?   enumeration
      |              +--ro logical-channel?   ->
/terminal-device/logical-channels/channel/index
      |              +--ro optical-channel?   -> /oc-platform:components/component/name
      |              +--ro allocation?        decimal64
      +--rw operational-modes
         +--ro mode* [mode-id]
            +--ro mode-id    -> ../state/mode-id
            +--ro config
            +--ro state
               +--ro mode-id?       uint16
               +--ro description?   string
               +--ro vendor-id?     string
```

The following is the tree structure of the OpenConfig Platform model:

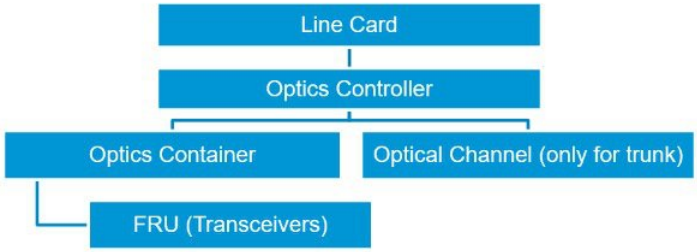
```
module: openconfig-platform
   +--rw components
      +--rw component* [name]
         +--rw name                              -> ../config/name
         +--rw config
         |  +--rw name?   string
         +--ro state
         |  +--ro name?          string
         |  +--ro type?          union
         |  +--ro id?            string
         |  +--ro description?   string
         |  +--ro mfg-name?      string
         |  +--ro version?       string
         |  +--ro serial-no?     string
         |  +--ro part-no?       string

         +--rw oc-transceiver:transceiver
         |  +--ro oc-transceiver:state
         |  |  +--ro oc-transceiver:form-factor?                identityref
         |  |  +--ro oc-transceiver:present?                    enumeration
         |  |  +--ro oc-transceiver:connector-type?             identityref
         |  |  +--ro oc-transceiver:internal-temp?              int16
         |  |  +--ro oc-transceiver:vendor?                     string
         |  |  +--ro oc-transceiver:vendor-part?                string
         |  |  +--ro oc-transceiver:vendor-rev?                 string
         |  |  +--ro oc-transceiver:ethernet-compliance-code?   identityref
         |  |  +--ro oc-transceiver:sonet-sdh-compliance-code?  identityref
         |  |  +--ro oc-transceiver:otn-compliance-code?        identityref
         |  |  +--ro oc-transceiver:serial-no?                  string
         |  |  +--ro oc-transceiver:date-code?                  yang:date-and-time
         |  |  +--ro oc-transceiver:fault-condition?            boolean
         |  +--rw oc-transceiver:physical-channels
         |     +--rw oc-transceiver:channel* [index]
         |        +--rw oc-transceiver:index     -> ../config/index
         |          +--ro oc-transceiver:output-frequency?     oc-opt-types:frequency-type

         |           +--ro oc-transceiver:output-power
         |           |  +--ro oc-transceiver:instant?   decimal64
         |           |  +--ro oc-transceiver:avg?       decimal64
         |           |  +--ro oc-transceiver:min?       decimal64
         |           |  +--ro oc-transceiver:max?       decimal64
         |           +--ro oc-transceiver:input-power
         |           |  +--ro oc-transceiver:instant?   decimal64
         |           |  +--ro oc-transceiver:avg?       decimal64
         |           |  +--ro oc-transceiver:min?       decimal64
         |           |  +--ro oc-transceiver:max?       decimal64
```

```
         |           +--ro oc-transceiver:laser-bias-current
         |              +--ro oc-transceiver:instant?   decimal64
         |              +--ro oc-transceiver:avg?       decimal64
         |              +--ro oc-transceiver:min?       decimal64
         |              +--ro oc-transceiver:max?       decimal64
         +--rw oc-opt-term:optical-channel
            +--rw oc-opt-term:config
            |  +--rw oc-opt-term:frequency?             oc-opt-types:frequency-type
            |  +--rw oc-opt-term:target-output-power?   decimal64
            |  +--rw oc-opt-term:operational-mode?      uint16
            |  +--rw oc-opt-term:line-port?             ->
/oc-platform:components/component/name
            +--ro oc-opt-term:state
               +--ro oc-opt-term:frequency?
oc-opt-types:frequency-type
               +--ro oc-opt-term:target-output-power?                        decimal64
               +--ro oc-opt-term:operational-mode?                           uint16
               +--ro oc-opt-term:line-port?                                  ->
/oc-platform:components/component/name
               +--ro oc-opt-term:chromatic-dispersion
               |  +--ro oc-opt-term:instant?   decimal64
               |  +--ro oc-opt-term:avg?       decimal64
               |  +--ro oc-opt-term:min?       decimal64
               |  +--ro oc-opt-term:max?       decimal64
               +--ro oc-opt-term:second-order-polarization-mode-dispersion
               |  +--ro oc-opt-term:instant?   decimal64
               |  +--ro oc-opt-term:avg?       decimal64
               |  +--ro oc-opt-term:min?       decimal64
               |  +--ro oc-opt-term:max?       decimal64
               +--ro oc-opt-term:polarization-dependent-loss
                  +--ro oc-opt-term:instant?   decimal64
                  +--ro oc-opt-term:avg?       decimal64
                  +--ro oc-opt-term:min?       decimal64
                  +--ro oc-opt-term:max?       decimal64
```

Inventory Details of Terminal-device Model

The hierarchy of Cisco NCS 1004 inventory is shown below:

Figure 1: Hierarchy of Cisco NCS 1004 Inventory



The inventory details and the naming convention of the components used in the Cisco NCS 1004 Terminal-device model are as follows:

Table 1: Inventory Details

Components	Naming Convention
Optics Controller	R/S-OpticsCtlrR/S/I/P
Optics Container	R/S-OpticsContainerR/S/I/P
Transceivers	R/S-OpticsR/S/I/P
Optical Channel Module	R/S-OpticalChannelR/S/I/P

The following table lists all the valid transceivers and optical channels that can be used for configuring Cisco NCS 1004 using Terminal-device model:

Table 2: Transceiver and Optical Channel Details

Components	Applicable Channels
Transceivers	0/0-Optics0/0/0/0 to 0/0-Optics0/0/0/13 0/1-Optics0/1/0/0 to 0/1-Optics0/1/0/13 0/2-Optics0/2/0/0 to 0/2-Optics0/2/0/13 0/3-Optics0/3/0/0 to 0/3-Optics0/3/0/13
Optical Channels	• 0/0-OpticalChannel0/0/0/0 • 0/0-OpticalChannel0/0/0/1 • 0/1-OpticalChannel0/1/0/0 • 0/1-OpticalChannel0/1/0/1 • 0/2-OpticalChannel0/2/0/0 • 0/2-OpticalChannel0/2/0/1 • 0/3-OpticalChannel0/3/0/0 • 0/3-OpticalChannel0/3/0/1

Note Only the optical channels of trunk ports must be mapped to the line ports. For more information about the port details, see Slice and Port Numbering.

Configuring Cisco NCS1004 Using Terminal-device Model

The following configurations are supported on the 1.2 Tbps line card. Client port operate at 100GE and OTU4 and map to trunk ports operating at 200G, 300G, 400G, 500G, or 600G.

You can configure the client port to OTU4 only in the muxponder configuration. LLDP drop, L1 encryption, and AINS are not supported on the OTU4 configuration.

The following table displays the client and trunk ports that are enabled for the muxponder configuration.

Trunk Data Rate	Client Data Rate (100GE/OTU4)	Trunk Ports	Client Ports
200	100GE/OTU4	0, 1	2,3, 4, 5
300	100GE/OTU4	0, 1	2, 3, 4, 5, 6, 7
400	100GE	0, 1	2, 3, 4, 5, 6, 7, 8, 9
500	100GE	0, 1	2, 3, 4, 5, 6, 7, 8, 9, 10, 11
600	100GE	0,1	2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13

The following table displays the client and trunk ports that are enabled for the muxponder slice 0 configuration.

Trunk Data Rate	Client Data Rate	Trunk Ports	Client Ports
200	100	0	2, 3
300	100	0	2, 3, 4
400	100	0	2, 3, 4, 5
500	100	0	2, 3, 4, 5, 6
600	100	0	2, 3, 4, 5, 6, 7

The following table displays the client and trunk ports that are enabled for the muxponder slice 1 configuration.

Trunk Data Rate	Client Data Rate	Trunk Ports	Client Ports
200	100	1	8, 9
300	100	1	8, 9, 10
400	100	1	8, 9, 10, 11
500	100	1	8, 9, 10, 11, 12
600	100	1	8, 9, 10, 11, 12, 13

All configurations can be accomplished using appropriate values for client bitrate and trunk bitrate parameters of the **hw-module** command.

The following table displays the trunk parameter ranges.

Trunk Payload	FEC	Min BPS	Max BPS	Min GBd	Max GBd
200G	27%	2	4.40625	31.51	69.43
300G	27%	2.8984375	6	34.7175497	71.8681352
400G	27%	3.8671875	6	46.2900663	71.8197392

Trunk Payload	FEC	Min BPS	Max BPS	Min GBd	Max GBd
500G	27%	4.8281250	6	57.8625828	71.9068991
600G	15%	5.2578125	-	-	71.9552971

Migrating CLI to Terminal-device Configuration

Cisco NCS 1004 supports migration from CLI to OC configuration only, vice-versa is not supported. The transition from CLI to terminal-device must be done via merge-config operation in gRPC.

To migrate from CLI configuration to the terminal-device configuration, perform the following:

Step 1 Enable the transition from CLI configuration to the terminal-device configuration, using the following command:

terminal-device transition cli-to-yang enable

Step 2 You must configure a slice using the CLI configuration command. For more details, see Configure the Slice.

Note Do not use all keyword to configure all slices, instead you must configure each slice individually.

Note Configure the trunk port frequencies with 100MHz spacing as after the migration to OC Models only 100MHz spacing is supported.

Note Ignore this step if you are migrating a configured slice. You cannot change the slice configuration while performing migration. For example, if you have configured 100G to 200 G traffic on a slice using CLI, then you can perform OC configuration for the same 100G to 200G slice configuration.

Step 3 Apply OC configuration using Netconf or gRPC. For more details, see Configuring Cisco NCS1004 Using Terminal-device Model, on page 5.

Step 4 Remove the slice configuration for the migrated slice. This configuration does not impact the traffic as OC configuration is already applied.

To disable the transition from CLI configuration to the terminal-device configuration, use the following command:

terminal-device transition cli-to-yang disable

OpenConfig Terminal Device

OC-terminal MDT data for Trunk Controller is as follows:

```
"openconfig": {
  "terminal-device": {
    "logical-channels": {
      "channel": {
        "30000": {
          "logical-channel-assignments": {
            "assignment": {
              "1": {
```

```
      "state": {
        "allocation": 500,
        "assignment-type": "OPTICAL_CHANNEL",
        "description": "Coherent to optical assignemnt",
        "index": 1,
        "optical-channel": "0_0-OpticalChannel0_0_0_0"
      }
    }
  }
},
"otn": {
  "state": {
    "background-block-errors": 0,
    "errored-seconds": 0,
    "esnr": {
      "avg": 0,
      "instant": 0,
      "interval": 30000000000,
      "max": 0,
      "max-time": 1573537980083123944,
      "min": 0,
      "min-time": 1573537980083123944
    },
    "fec-corrected-bits": 0,
    "fec-uncorrectable-words": 0,
    "post-fec-ber": {
      "avg": 0,
      "instant": 0,
      "interval": 30000000000,
      "max": 0,
      "max-time": 0,
      "min": 0,
      "min-time": 0
    },
    "pre-fec-ber": {
      "avg": 0,
      "instant": 0,
      "interval": 30000000000,
      "max": 0,
      "max-time": 0,
      "min": 0,
      "min-time": 0
    },
    "q-value": {
      "avg": 0,
      "instant": 0,
      "interval": 30000000000,
      "max": 0,
      "max-time": 0,
      "min": 0,
      "min-time": 0
    },
    "severely-errored-seconds": 0,
    "unavailable-seconds": 0
  }
},
"state": {
  "admin-state": "DISABLED",
  "description": "Coherent Logical Channel",
  "index": 30000,
  "link-state": "DOWN",
  "logical-channel-type": "openconfig-transport-types:PROT_OTN",
  "loopback-mode": "NONE"
```

```
        }
      },
```

OC-terminal-device client MDT data is as follows:

```
      "30002": {
        "ethernet": {
          "state": {
            "in-crc-errors": 0,
            "in-fragment-frames": 0,
            "in-jabber-frames": 0,
            "in-mac-pause-frames": 0,
            "in-oversize-frames": 0,
            "in-pcs-bip-errors": 0,
            "in-pcs-errored-seconds": 0,
            "in-pcs-severely-errored-seconds": 0,
            "in-pcs-unavailable-seconds": 0,
            "out-mac-pause-frames": 0
          }
        },
        "ingress": {
          "state": {
            "transceiver": "Optics0_0_0_2"
          }
        },
        "logical-channel-assignments": {
          "assignment": {
            "1": {
              "state": {
                "allocation": 100,
                "assignment-type": "LOGICAL_CHANNEL",
                "description": "ETH to ODU4 assignemnt",
                "index": 1,
                "logical-channel": 30020
              }
            }
          }
        },
        "state": {
          "admin-state": "ENABLED",
          "description": "ETH Logical Channel",
          "index": 30002,
          "link-state": "UP",
          "logical-channel-type": "openconfig-transport-types:PROT_ETHERNET",
          "loopback-mode": "NONE",
          "rate-class": "openconfig-transport-types:TRIB_RATE_100G",
          "trib-protocol": "openconfig-transport-types:PROT_100G_MLG"
        }
      },
```

OC-transceiver data for trunk is as follows:

```
"openconfig-platform": {
  "components": {
    "component": {
      "0/0-Optics0/0/0/0": {
        "openconfig-platform-transceiver:transceiver": {
          "physical-channels": {
            "channel": {
              "1": {
                "state": {
                  "index": 1,
                  "input-power": {
                    "avg": -1.68,
                    "instant": -1.69,
```

```
            "interval": 30000000000,
            "max": -1.64,
            "max-time": 1574223676071500740,
            "min": -1.71,
            "min-time": 1574223669071573554
          },
          "laser-bias-current": {
            "avg": 0,
            "instant": 0,
            "interval": 30000000000,
            "max": 0,
            "max-time": 1574223660072966799,
            "min": 0,
            "min-time": 1574223660072966799
          },
          "output-frequency": 193100000,
          "output-power": {
            "avg": -1.49,
            "instant": -1.5,
            "interval": 30000000000,
            "max": -1.45,
            "max-time": 1574223664071514654,
            "min": -1.54,
            "min-time": 1574223686071572161
          }
        }
      }
    }
  },
  "state": {
    "fault-condition": false,
    "fec-corrected-bits": 3886,
    "fec-uncorrectable-words": 0,
    "present": "PRESENT"
  }
}
```


OC-transceiver data for client port is as follows:


```
"0/0-Optics0/0/0/2": {
  "openconfig-platform-transceiver:transceiver": {
    "physical-channels": {
      "channel": {
        "1": {
          "state": {
            "index": 1,
            "input-power": {
              "avg": -40,
              "instant": -40,
              "interval": 30000000000,
              "max": -40,
              "max-time": 1574223660072988517,
              "min": -40,
              "min-time": 1574223660072988517
            },
            "laser-bias-current": {
              "avg": 42.01,
              "instant": 42.04,
              "interval": 30000000000,
              "max": 42.05,
              "max-time": 1574223662071529895,
              "min": 41.96,
              "min-time": 1574223677071538621
            },
            "output-frequency": 231399800,
```

```
      "output-power": {
        "avg": 2.89,
        "instant": 2.91,
        "interval": 30000000000,
        "max": 2.92,
        "max-time": 1574223665071507015,
        "min": 2.87,
        "min-time": 1574223667071599738
      }
    }
  },
  "2": {
    "state": {
      "index": 2,
      "input-power": {
        "avg": -40,
        "instant": -40,
        "interval": 30000000000,
        "max": -40,
        "max-time": 1574223660072993271,
        "min": -40,
        "min-time": 1574223660072993271
      },
      "laser-bias-current": {
        "avg": 41.73,
        "instant": 41.74,
        "interval": 30000000000,
        "max": 41.76,
        "max-time": 1574223661071554206,
        "min": 41.66,
        "min-time": 1574223666071512088
      },
      "output-frequency": 230598900,
      "output-power": {
        "avg": 2.94,
        "instant": 2.94,
        "interval": 30000000000,
        "max": 2.97,
        "max-time": 1574223670071513829,
        "min": 2.92,
        "min-time": 1574223663071555469
      }
    }
  },
  "3": {
    "state": {
      "index": 3,
      "input-power": {
        "avg": -40,
        "instant": -40,
        "interval": 30000000000,
        "max": -40,
        "max-time": 1574223660072997439,
        "min": -40,
        "min-time": 1574223660072997439
      },
      "laser-bias-current": {
        "avg": 42.07,
        "instant": 42.07,
        "interval": 30000000000,
        "max": 42.14,
        "max-time": 1574223689071519875,
        "min": 42.02,
        "min-time": 1574223680071519773
```

```
            },
            "output-frequency": 229798200,
            "output-power": {
              "avg": 3.11,
              "instant": 3.12,
              "interval": 30000000000,
              "max": 3.14,
              "max-time": 1574223671071530318,
              "min": 3.08,
              "min-time": 1574223677071549246
            }
          }
        },
        "4": {
          "state": {
            "index": 4,
            "input-power": {
              "avg": -40,
              "instant": -40,
              "interval": 30000000000,
              "max": -40,
              "max-time": 1574223660073001092,
              "min": -40,
              "min-time": 1574223660073001092
            },
            "laser-bias-current": {
              "avg": 41.88,
              "instant": 41.86,
              "interval": 30000000000,
              "max": 41.95,
              "max-time": 1574223669071611563,
              "min": 41.83,
              "min-time": 1574223664071551968
            },
            "output-frequency": 230255300,
            "output-power": {
              "avg": 3.32,
              "instant": 3.29,
              "interval": 30000000000,
              "max": 3.35,
              "max-time": 1574223687071561519,
              "min": 3.3,
              "min-time": 1574223664071551968
            }
          }
        }
      },
      "state": {
        "connector-type": "openconfig-transport-types:LC_CONNECTOR",
        "date-code": "190807",
        "fault-condition": false,
        "form-factor": "openconfig-transport-types:QSFP28",
        "otn-compliance-code": "openconfig-transport-types:OTN_NOT_SET",
        "present": "PRESENT",
        "serial-no": "FNS23320KEK",
        "sonet-sdh-compliance-code": "openconfig-transport-types:SONET_NOT_SET",
        "vendor": "CISCO-FINISAR",
        "vendor-part": "FTLC1151SDPL-C1",
        "vendor-rev": "B"
      }
    }
  },
```

Note Github Link for OpenConfig-terminal-device :
https://github.com/openconfig/public/blob/master/release/models/optical-transport/openconfig-terminal-device.yang

Github link for OpenConfig-transceiver:
https://github.com/openconfig/public/blob/master/release/models/platform/openconfig-platform-transceiver.yang


```
{
  "Calaeum.Caluem_@123^": {
    "openconfig": {
      "terminal-device": {
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                      "description": "Coherent to optical assignemnt",
                      "index": 1,
                      "optical-channel": "0_0-OpticalChannel0_0_0_0"
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                  "errored-seconds": 0,
                  "esnr": {
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            "optical-channel": "0_0-OpticalChannel0_0_0_1"
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        "in-jabber-frames": 0,
        "in-mac-pause-frames": 0,
        "in-oversize-frames": 0,
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        "in-pcs-errored-seconds": 0,
        "in-pcs-severely-errored-seconds": 0,
        "in-pcs-unavailable-seconds": 0,
        "out-mac-pause-frames": 0
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    "ingress": {
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      }
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            "description": "ETH to ODU4 assignemnt",
            "index": 1,
            "logical-channel": 30020
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      "description": "ETH Logical Channel",
      "index": 30002,
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      "in-mac-pause-frames": 0,
      "in-oversize-frames": 0,
      "in-pcs-bip-errors": 0,
      "in-pcs-errored-seconds": 0,
      "in-pcs-severely-errored-seconds": 0,
      "in-pcs-unavailable-seconds": 30,
      "out-mac-pause-frames": 0
    }
  },
  "ingress": {
    "state": {
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    }
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          "assignment-type": "LOGICAL_CHANNEL",
          "description": "ETH to ODU4 assignemnt",
          "index": 1,
          "logical-channel": 30021
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      }
    }
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    "description": "ETH Logical Channel",
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    "trib-protocol": "openconfig-transport-types:PROT_100G_MLG"
  }
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      "in-jabber-frames": 0,
      "in-mac-pause-frames": 0,
      "in-oversize-frames": 0,
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      "in-pcs-errored-seconds": 0,
      "in-pcs-severely-errored-seconds": 0,
      "in-pcs-unavailable-seconds": 30,
      "out-mac-pause-frames": 0
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            "allocation": 100,
            "assignment-type": "LOGICAL_CHANNEL",
            "description": "ETH to ODU4 assignemnt",
            "index": 1,
            "logical-channel": 30022
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      "description": "ETH Logical Channel",
      "index": 30004,
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        "in-mac-pause-frames": 0,
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        "in-pcs-bip-errors": 0,
        "in-pcs-errored-seconds": 0,
        "in-pcs-severely-errored-seconds": 0,
        "in-pcs-unavailable-seconds": 30,
        "out-mac-pause-frames": 0
      }
    },
    "ingress": {
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    },
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            "assignment-type": "LOGICAL_CHANNEL",
            "description": "ETH to ODU4 assignemnt",
            "index": 1,
            "logical-channel": 30023
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    "state": {
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        "in-pcs-bip-errors": 0,
        "in-pcs-errored-seconds": 0,
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        "in-pcs-unavailable-seconds": 30,
        "out-mac-pause-frames": 0
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    },
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            "logical-channel": 30024
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        "in-jabber-frames": 0,
        "in-mac-pause-frames": 0,
        "in-oversize-frames": 0,
        "in-pcs-bip-errors": 0,
        "in-pcs-errored-seconds": 0,
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        "in-pcs-severely-errored-seconds": 0,
        "in-pcs-unavailable-seconds": 30,
        "out-mac-pause-frames": 0
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    },
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            "description": "ETH to ODU4 assignemnt",
            "index": 1,
            "logical-channel": 30025
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            "logical-channel": 30026
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        "in-pcs-errored-seconds": 0,
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        "in-pcs-unavailable-seconds": 30,
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            "index": 1,
            "logical-channel": 30027
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      "description": "ETH Logical Channel",
      "index": 30009,
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      "trib-protocol": "openconfig-transport-types:PROT_100G_MLG"
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        "in-jabber-frames": 0,
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        "in-oversize-frames": 0,
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        "in-pcs-severely-errored-seconds": 0,
        "in-pcs-unavailable-seconds": 30,
        "out-mac-pause-frames": 0
      }
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            "description": "ETH to ODU4 assignemnt",
            "index": 1,
            "logical-channel": 30028
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        }
      }
    },
    "state": {
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      "description": "ETH Logical Channel",
      "index": 30010,
      "link-state": "DOWN",
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      "loopback-mode": "NONE",
      "rate-class": "openconfig-transport-types:TRIB_RATE_100G",
      "trib-protocol": "openconfig-transport-types:PROT_100G_MLG"
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        "in-fragment-frames": 0,
        "in-jabber-frames": 0,
        "in-mac-pause-frames": 0,
        "in-oversize-frames": 0,
        "in-pcs-bip-errors": 0,
        "in-pcs-errored-seconds": 0,
        "in-pcs-severely-errored-seconds": 0,
        "in-pcs-unavailable-seconds": 0,
        "out-mac-pause-frames": 0
      }
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            "logical-channel": 30029
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      }
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      "description": "ETH Logical Channel",
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      "link-state": "DOWN",
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      "loopback-mode": "NONE",
      "rate-class": "openconfig-transport-types:TRIB_RATE_100G",
      "trib-protocol": "openconfig-transport-types:PROT_100G_MLG"
    }
  },
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          "state": {
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            "assignment-type": "LOGICAL_CHANNEL",
            "description": "Assignment: ODU4 to Coherent",
            "index": 1,
            "logical-channel": 30000
          }
        }
      }
    },
    "state": {
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      "description": "ODU4 logical channel",
      "index": 30020,
      "link-state": "DOWN",
      "logical-channel-type": "openconfig-transport-types:PROT_OTN",
      "loopback-mode": "NONE",
      "trib-protocol": "openconfig-transport-types:PROT_ODU4"
    }
  },
  "30021": {
    "logical-channel-assignments": {
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            "assignment-type": "LOGICAL_CHANNEL",
            "description": "Assignment: ODU4 to Coherent",
            "index": 1,
            "logical-channel": 30000
          }
        }
      }
    },
    "state": {
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      "description": "ODU4 logical channel",
      "index": 30021,
      "link-state": "DOWN",
      "logical-channel-type": "openconfig-transport-types:PROT_OTN",
      "loopback-mode": "NONE",
      "trib-protocol": "openconfig-transport-types:PROT_ODU4"
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    }
  },
  "30022": {
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            "description": "Assignment: ODU4 to Coherent",
            "index": 1,
            "logical-channel": 30000
          }
        }
      }
    },
    "state": {
      "admin-state": "ENABLED",
      "description": "ODU4 logical channel",
      "index": 30022,
      "link-state": "DOWN",
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      "loopback-mode": "NONE",
      "trib-protocol": "openconfig-transport-types:PROT_ODU4"
    }
  },
  "30023": {
    "logical-channel-assignments": {
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            "allocation": 100,
            "assignment-type": "LOGICAL_CHANNEL",
            "description": "Assignment: ODU4 to Coherent",
            "index": 1,
            "logical-channel": 30000
          }
        }
      }
    },
    "state": {
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      "description": "ODU4 logical channel",
      "index": 30023,
      "link-state": "DOWN",
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      "loopback-mode": "NONE",
      "trib-protocol": "openconfig-transport-types:PROT_ODU4"
    }
  },
  "30024": {
    "logical-channel-assignments": {
      "assignment": {
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          "state": {
            "allocation": 100,
            "assignment-type": "LOGICAL_CHANNEL",
            "description": "Assignment: ODU4 to Coherent",
            "index": 1,
            "logical-channel": 30000
          }
        }
      }
    },
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      "description": "ODU4 logical channel",
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      "loopback-mode": "NONE",
      "trib-protocol": "openconfig-transport-types:PROT_ODU4"
    }
  },
  "30025": {
    "logical-channel-assignments": {
      "assignment": {
        "1": {
          "state": {
            "allocation": 100,
            "assignment-type": "LOGICAL_CHANNEL",
            "description": "Assignment: ODU4 to Coherent",
            "index": 1,
            "logical-channel": 30001
          }
        }
      }
    },
    "state": {
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      "description": "ODU4 logical channel",
      "index": 30025,
      "link-state": "DOWN",
      "logical-channel-type": "openconfig-transport-types:PROT_OTN",
      "loopback-mode": "NONE",
      "trib-protocol": "openconfig-transport-types:PROT_ODU4"
    }
  },
  "30026": {
    "logical-channel-assignments": {
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            "allocation": 100,
            "assignment-type": "LOGICAL_CHANNEL",
            "description": "Assignment: ODU4 to Coherent",
            "index": 1,
            "logical-channel": 30001
          }
        }
      }
    },
    "state": {
      "admin-state": "ENABLED",
      "description": "ODU4 logical channel",
      "index": 30026,
      "link-state": "DOWN",
      "logical-channel-type": "openconfig-transport-types:PROT_OTN",
      "loopback-mode": "NONE",
      "trib-protocol": "openconfig-transport-types:PROT_ODU4"
    }
  },
  "30027": {
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      "assignment": {
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          "state": {
            "allocation": 100,
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          "index": 1,
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        }
      }
    }
  },
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    "description": "ODU4 logical channel",
    "index": 30027,
    "link-state": "DOWN",
    "logical-channel-type": "openconfig-transport-types:PROT_OTN",
    "loopback-mode": "NONE",
    "trib-protocol": "openconfig-transport-types:PROT_ODU4"
  }
},
"30028": {
  "logical-channel-assignments": {
    "assignment": {
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        "state": {
          "allocation": 100,
          "assignment-type": "LOGICAL_CHANNEL",
          "description": "Assignment: ODU4 to Coherent",
          "index": 1,
          "logical-channel": 30001
        }
      }
    }
  },
  "state": {
    "admin-state": "ENABLED",
    "description": "ODU4 logical channel",
    "index": 30028,
    "link-state": "DOWN",
    "logical-channel-type": "openconfig-transport-types:PROT_OTN",
    "loopback-mode": "NONE",
    "trib-protocol": "openconfig-transport-types:PROT_ODU4"
  }
},
"30029": {
  "logical-channel-assignments": {
    "assignment": {
      "1": {
        "state": {
          "allocation": 100,
          "assignment-type": "LOGICAL_CHANNEL",
          "description": "Assignment: ODU4 to Coherent",
          "index": 1,
          "logical-channel": 30001
        }
      }
    }
  },
  "state": {
    "admin-state": "ENABLED",
    "description": "ODU4 logical channel",
    "index": 30029,
    "link-state": "DOWN",
    "logical-channel-type": "openconfig-transport-types:PROT_OTN",
    "loopback-mode": "NONE",
    "trib-protocol": "openconfig-transport-types:PROT_ODU4"
```

```
    }
  },
  "40000": {
    "logical-channel-assignments": {
      "assignment": {
        "1": {
          "state": {
            "allocation": 600,
            "assignment-type": "OPTICAL_CHANNEL",
            "description": "Coherent to optical assignemnt",
            "index": 1,
            "optical-channel": "0_1-OpticalChannel0_1_0_0"
          }
        }
      }
    },
    "otn": {
      "state": {
        "background-block-errors": 0,
        "errored-seconds": 0,
        "esnr": {
          "avg": 20.25,
          "instant": 20.3,
          "interval": 30000000000,
          "max": 20.3,
          "max-time": 1573537980480579044,
          "min": 20.1,
          "min-time": 1573537987470421480
        },
        "fec-corrected-bits": 17436506376,
        "fec-uncorrectable-words": 0,
        "post-fec-ber": {
          "avg": 0,
          "instant": 0,
          "interval": 30000000000,
          "max": 0,
          "max-time": 1573537980480852141,
          "min": 0,
          "min-time": 1573537980480852141
        },
        "pre-fec-ber": {
          "avg": 0.00671,
          "instant": 0.0068,
          "interval": 30000000000,
          "max": 0.00738,
          "max-time": 1573537994470526801,
          "min": 0.00655,
          "min-time": 1573537995470571723
        },
        "q-value": {
          "avg": 7.8,
          "instant": 0.078,
          "interval": 30000000000,
          "max": 7.8,
          "max-time": 1573537980480852141,
          "min": 7.8,
          "min-time": 1573537980480852141
        },
        "severely-errored-seconds": 0,
        "unavailable-seconds": 0
      }
    },
    "state": {
      "admin-state": "ENABLED",
```

```
    "description": "Coherent Logical Channel",
    "index": 40000,
    "link-state": "UP",
    "logical-channel-type": "openconfig-transport-types:PROT_OTN",
    "loopback-mode": "NONE"
  }
},
"40001": {
  "logical-channel-assignments": {
    "assignment": {
      "1": {
        "state": {
          "allocation": 600,
          "assignment-type": "OPTICAL_CHANNEL",
          "description": "Coherent to optical assignemnt",
          "index": 1,
          "optical-channel": "0_1-OpticalChannel0_1_0_1"
        }
      }
    }
  },
  "otn": {
    "state": {
      "background-block-errors": 0,
      "errored-seconds": 0,
      "esnr": {
        "avg": 20.02,
        "instant": 20.1,
        "interval": 30000000000,
        "max": 20.1,
        "max-time": 1573537980480723522,
        "min": 19.9,
        "min-time": 1573537984470478041
      },
      "fec-corrected-bits": 50377421964,
      "fec-uncorrectable-words": 0,
      "post-fec-ber": {
        "avg": 0,
        "instant": 0,
        "interval": 30000000000,
        "max": 0,
        "max-time": 1573537980481194932,
        "min": 0,
        "min-time": 1573537980481194932
      },
      "pre-fec-ber": {
        "avg": 0.00825,
        "instant": 0.0085,
        "interval": 30000000000,
        "max": 0.00897,
        "max-time": 1573537994470555826,
        "min": 0.008,
        "min-time": 1573538007470595227
      },
      "q-value": {
        "avg": 7.52,
        "instant": 0.075,
        "interval": 30000000000,
        "max": 7.6,
        "max-time": 1573537980481194932,
        "min": 7.5,
        "min-time": 1573537980481194932
      },
      "severely-errored-seconds": 0,
```

```
      "unavailable-seconds": 0
    }
  },
  "state": {
    "admin-state": "ENABLED",
    "description": "Coherent Logical Channel",
    "index": 40001,
    "link-state": "UP",
    "logical-channel-type": "openconfig-transport-types:PROT_OTN",
    "loopback-mode": "NONE"
  }
},
"40002": {
  "ethernet": {
    "state": {
      "in-crc-errors": 0,
      "in-fragment-frames": 0,
      "in-jabber-frames": 0,
      "in-mac-pause-frames": 0,
      "in-oversize-frames": 0,
      "in-pcs-bip-errors": 0,
      "in-pcs-errored-seconds": 0,
      "in-pcs-severely-errored-seconds": 0,
      "in-pcs-unavailable-seconds": 0,
      "out-mac-pause-frames": 0
    }
  },
  "ingress": {
    "state": {
      "transceiver": "Optics0_1_0_2"
    }
  },
  "logical-channel-assignments": {
    "assignment": {
      "1": {
        "state": {
          "allocation": 100,
          "assignment-type": "LOGICAL_CHANNEL",
          "description": "ETH to ODU4 assignemnt",
          "index": 1,
          "logical-channel": 40020
        }
      }
    }
  },
  "state": {
    "admin-state": "ENABLED",
    "description": "ETH Logical Channel",
    "index": 40002,
    "link-state": "UP",
    "logical-channel-type": "openconfig-transport-types:PROT_ETHERNET",
    "loopback-mode": "NONE",
    "rate-class": "openconfig-transport-types:TRIB_RATE_100G",
    "trib-protocol": "openconfig-transport-types:PROT_100G_MLG"
  }
},
"40003": {
  "ethernet": {
    "state": {
      "in-crc-errors": 18446744073709551580,
      "in-fragment-frames": 0,
      "in-jabber-frames": 3,
      "in-mac-pause-frames": 0,
      "in-oversize-frames": 0,
```

```
        "in-pcs-bip-errors": 0,
        "in-pcs-errored-seconds": 0,
        "in-pcs-severely-errored-seconds": 0,
        "in-pcs-unavailable-seconds": 0,
        "out-mac-pause-frames": 0
      }
    },
    "ingress": {
      "state": {
        "transceiver": "Optics0_1_0_3"
      }
    },
    "logical-channel-assignments": {
      "assignment": {
        "1": {
          "state": {
            "allocation": 100,
            "assignment-type": "LOGICAL_CHANNEL",
            "description": "ETH to ODU4 assignemnt",
            "index": 1,
            "logical-channel": 40021
          }
        }
      }
    },
    "state": {
      "admin-state": "ENABLED",
      "description": "ETH Logical Channel",
      "index": 40003,
      "link-state": "UP",
      "logical-channel-type": "openconfig-transport-types:PROT_ETHERNET",
      "loopback-mode": "NONE",
      "rate-class": "openconfig-transport-types:TRIB_RATE_100G",
      "trib-protocol": "openconfig-transport-types:PROT_100G_MLG"
    }
  },
  "40004": {
    "ethernet": {
      "state": {
        "in-crc-errors": 18446744073709551531,
        "in-fragment-frames": 0,
        "in-jabber-frames": 7,
        "in-mac-pause-frames": 0,
        "in-oversize-frames": 0,
        "in-pcs-bip-errors": 0,
        "in-pcs-errored-seconds": 0,
        "in-pcs-severely-errored-seconds": 0,
        "in-pcs-unavailable-seconds": 0,
        "out-mac-pause-frames": 0
      }
    },
    "ingress": {
      "state": {
        "transceiver": "Optics0_1_0_4"
      }
    },
    "logical-channel-assignments": {
      "assignment": {
        "1": {
          "state": {
            "allocation": 100,
            "assignment-type": "LOGICAL_CHANNEL",
            "description": "ETH to ODU4 assignemnt",
            "index": 1,
```

```
          "logical-channel": 40022
        }
      }
    }
  },
  "state": {
    "admin-state": "ENABLED",
    "description": "ETH Logical Channel",
    "index": 40004,
    "link-state": "UP",
    "logical-channel-type": "openconfig-transport-types:PROT_ETHERNET",
    "loopback-mode": "NONE",
    "rate-class": "openconfig-transport-types:TRIB_RATE_100G",
    "trib-protocol": "openconfig-transport-types:PROT_100G_MLG"
  }
},
"40005": {
  "ethernet": {
    "state": {
      "in-crc-errors": 18446744073709551581,
      "in-fragment-frames": 0,
      "in-jabber-frames": 3,
      "in-mac-pause-frames": 0,
      "in-oversize-frames": 0,
      "in-pcs-bip-errors": 0,
      "in-pcs-errored-seconds": 0,
      "in-pcs-severely-errored-seconds": 0,
      "in-pcs-unavailable-seconds": 0,
      "out-mac-pause-frames": 0
    }
  },
  "ingress": {
    "state": {
      "transceiver": "Optics0_1_0_5"
    }
  },
  "logical-channel-assignments": {
    "assignment": {
      "1": {
        "state": {
          "allocation": 100,
          "assignment-type": "LOGICAL_CHANNEL",
          "description": "ETH to ODU4 assignemnt",
          "index": 1,
          "logical-channel": 40023
        }
      }
    }
  },
```


Ethernet Stats Addition for OpenConfig

The PCS performance monitoring counter details are mentioned in the following table.

PCS Counter	Influencing Alarm	Influencing Counter
PCS-ES	None	BIP>0 or FRM-ERR>0 or BAD-SH>0 And does not meet SES condition.
PCS-SES	SIGLOSS or SYNCLOSS, or LF	BIP>15% (Based on G.8201)
PCS-UAS	10 seconds of consecutive SES	10 seconds of consecutive SES
PCS-ES-FE	None	None
PCS-SES-FE	RF	None
PCS-UAS-FE	10 seconds of consecutive SES	10 seconds of consecutive SES

The MDT output is as follows:

```
"20002": {
              "ethernet": {
                "state": {
                  "in-crc-errors": 0,
                  "in-fragment-frames": 0,
                  "in-jabber-frames": 0,
                  "in-mac-pause-frames": 0,
                  "in-oversize-frames": 0,
                  "in-pcs-bip-errors": 0,
                  "in-pcs-errored-seconds": 0,
                  "in-pcs-severely-errored-seconds": 0,
                  "in-pcs-unavailable-seconds": 0,
                  "out-mac-pause-frames": 0
```

CLI for Ethernet PCS Stats

```
P/0/RP0/CPU0:BH1_P2A4#show controllers hundredGigECtrlr 0/1/0/2 pm current 15-min pcs
Thu Jan 30 11:28:16.370 UTC

Ethernet PCS in the current interval [11:15:00 - 11:28:16 Thu Jan 30 2020]

Ethernet PCS current bucket type : Valid
BIP[00]                    : 0                          Threshold : 0
   TCA(enable) : NO
 BIP[01]                     : 0                          Threshold : 0
    TCA(enable) : NO
 BIP[02]                     : 0                          Threshold : 0
    TCA(enable) : NO
 BIP[03]                     : 0                          Threshold : 0
    TCA(enable) : NO
 BIP[04]                     : 0                          Threshold : 0
    TCA(enable) : NO
 BIP[05]                     : 0                          Threshold : 0
    TCA(enable) : NO
 BIP[06]                     : 0                          Threshold : 0
    TCA(enable) : NO
 BIP[07]                     : 0                          Threshold : 0
    TCA(enable) : NO
 BIP[08]                     : 0                          Threshold : 0
```

```
   TCA(enable) : NO
BIP[09]                  : 0                          Threshold : 0
   TCA(enable) : NO
BIP[10]                  : 0                          Threshold : 0
   TCA(enable) : NO
BIP[11]                  : 0                          Threshold : 0
   TCA(enable) : NO
BIP[12]                  : 0                          Threshold : 0
   TCA(enable) : NO
BIP[13]                  : 0                          Threshold : 0
   TCA(enable) : NO
BIP[14]                  : 0                          Threshold : 0
   TCA(enable) : NO
BIP[15]                  : 0                          Threshold : 0
   TCA(enable) : NO
BIP[16]                  : 0                          Threshold : 0
   TCA(enable) : NO
BIP[17]                  : 0                          Threshold : 0
   TCA(enable) : NO
BIP[18]                  : 0                          Threshold : 0
   TCA(enable) : NO
BIP[19]                  : 0                          Threshold : 0
   TCA(enable) : NO
FRM-ERR[00]              : 0                          Threshold : 0
   TCA(enable) : NO
FRM-ERR[01]              : 0                          Threshold : 0
   TCA(enable) : NO
FRM-ERR[02]              : 0                          Threshold : 0
   TCA(enable) : NO
FRM-ERR[03]              : 0                          Threshold : 0
   TCA(enable) : NO
FRM-ERR[04]              : 0                          Threshold : 0
   TCA(enable) : NO
FRM-ERR[05]              : 0                          Threshold : 0
   TCA(enable) : NO
FRM-ERR[06]              : 0                          Threshold : 0
   TCA(enable) : NO
FRM-ERR[07]              : 0                          Threshold : 0
   TCA(enable) : NO
FRM-ERR[08]              : 0                          Threshold : 0
   TCA(enable) : NO
FRM-ERR[09]              : 0                          Threshold : 0
   TCA(enable) : NO
FRM-ERR[10]              : 0                          Threshold : 0
   TCA(enable) : NO
FRM-ERR[11]              : 0                          Threshold : 0
   TCA(enable) : NO
FRM-ERR[12]              : 0                          Threshold : 0
   TCA(enable) : NO
FRM-ERR[13]              : 0                          Threshold : 0
   TCA(enable) : NO
FRM-ERR[14]              : 0                          Threshold : 0
   TCA(enable) : NO
FRM-ERR[15]              : 0                          Threshold : 0
   TCA(enable) : NO
FRM-ERR[16]              : 0                          Threshold : 0
   TCA(enable) : NO
FRM-ERR[17]              : 0                          Threshold : 0
   TCA(enable) : NO
FRM-ERR[18]              : 0                          Threshold : 0
   TCA(enable) : NO
FRM-ERR[19]              : 0                          Threshold : 0
   TCA(enable) : NO
BAD-SH[00]               : 0                          Threshold : 0
```

```
   TCA(enable) : NO
BAD-SH[01]                : 0                       Threshold : 0
   TCA(enable) : NO
BAD-SH[02]                : 0                       Threshold : 0
   TCA(enable) : NO
BAD-SH[03]                : 0                       Threshold : 0
   TCA(enable) : NO
BAD-SH[04]                : 0                       Threshold : 0
   TCA(enable) : NO
BAD-SH[05]                : 0                       Threshold : 0
   TCA(enable) : NO
BAD-SH[06]                : 0                       Threshold : 0
   TCA(enable) : NO
BAD-SH[07]                : 0                       Threshold : 0
   TCA(enable) : NO
BAD-SH[08]                : 0                       Threshold : 0
   TCA(enable) : NO
BAD-SH[09]                : 0                       Threshold : 0
   TCA(enable) : NO
BAD-SH[10]                : 0                       Threshold : 0
   TCA(enable) : NO
BAD-SH[11]                : 0                       Threshold : 0
   TCA(enable) : NO
BAD-SH[12]                : 0                       Threshold : 0
   TCA(enable) : NO
BAD-SH[13]                : 0                       Threshold : 0
   TCA(enable) : NO
BAD-SH[14]                : 0                       Threshold : 0
   TCA(enable) : NO
BAD-SH[15]                : 0                       Threshold : 0
   TCA(enable) : NO
BAD-SH[16]                : 0                       Threshold : 0
   TCA(enable) : NO
BAD-SH[17]                : 0                       Threshold : 0
   TCA(enable) : NO
BAD-SH[18]                : 0                       Threshold : 0
   TCA(enable) : NO
BAD-SH[19]                : 0                       Threshold : 0
   TCA(enable) : NO
ES                        : 0                       Threshold : 0
   TCA(enable) : NO
SES                       : 0                       Threshold : 0
   TCA(enable) : NO
UAS                       : 796                     Threshold : 0
   TCA(enable) : NO
ES-FE                     : 0                       Threshold : 0
   TCA(enable) : NO
SES-FE                    : 0                       Threshold : 0
   TCA(enable) : NO
UAS-FE                    : 0                       Threshold : 0
   TCA(enable) : NO
```

Configure LLDP on Management Port

Table 3: Feature History

Feature Name	Release	Description
OC (Open Configuration) Support for LLDP (Link Layer Discovery Protocol) on Management Port	Cisco IOS XR Release 7.3.1	The OC support for configuring LLDP on a management port is available. This feature enables you to perform the configuration using scripts, which is less time-consuming. Also, the Open Configuration model supports the use of vendor-neutral data models to configure and manage the network.

Step 1 You can use the following script to configure LLDP on management port.

```
"openconfig-lldp:lldp": {
"interfaces": {
  "interface": [
   {
    "name": "MgmtEth0/RP0/CPU0/0",
    "config": {
     "name": "MgmtEth0/RP0/CPU0/0",
     "enabled": true
    }
   },
   {
    "name": "MgmtEth0/RP0/CPU0/1",
    "config": {
     "name": "MgmtEth0/RP0/CPU0/1",
     "enabled": true
    }
   },
   {
    "name": "MgmtEth0/RP0/CPU0/2",
    "config": {
     "name": "MgmtEth0/RP0/CPU0/2",
     "enabled": true
    }
   }
  ]
}
}
```

Step 2 You can get the operational data through GNMI

```
"MgmtEth0/RP0/CPU0/1": {
                          "neighbors": {
                             "neighbor": {
                                 "SW-VEGA-CORBU-C4#Gi1/0/13": {
                                      "capabilities": {
```

```
                                    "capability": {
                                        "openconfig-lldp-types:MAC_BRIDGE": {
                                             "state": {
                                                 "enabled": true,
                                                 "name": "openconfig-lldp-types:MAC_BRIDGE"
                                             }
                                         },
                                         "openconfig-lldp-types:ROUTER": {
                                             "state": {
                                                 "enabled": false,
                                                 "name": "openconfig-lldp-types:ROUTER"
                                             }
                                         }
                                     }
                                },
                                 "custom-tlvs": {
                                     "tlv": {
                                         "32962": {
                                             "1": {
                                                "295": {
                                                     "state": {
                                                         "oui": "32962",
                                                        "oui-subtype": "1",
                                                         "type": 127,
                                                         "value": "Aa8="
                                                     }
                                                 }
                                             }
                                            },
                                            "4623": {
                                                 "1": {
                                                    "295": {
                                                        "state": {
                                                            "oui": "4623",
                                                             "oui-subtype": "1",
                                                             "type": 127,
                                                             "value": "A2wBAB4="
                                                         }
                                                     }
                                                 }
                                             }
                                         }
                                     },
                                     "state": {
                                        "chassis-id": "6899.cd9f.f480",
                                         "chassis-id-type": "MAC_ADDRESS",
                                         "id": "SW-VEGA-CORBU-C4",
                                         "management-address": "4.31.25.25",
                                         "management-address-type": "ipv4",
                                         "port-description": "GigabitEthernet1/0/13",
                                         "port-id": "Gi1/0/13",
                                         "port-id-type": "INTERFACE_NAME",
                                         "system-description": "Cisco IOS Software, Catalyst L3
Switch Software (CAT3K_CAA-UNIVERSALK9-M), Version 15.0(1)EX3, RELEASE SOFTWARE (fc2)\nTechnical
Support: http://www.cisco.com/techsupport\nCopyright (c) 1986-2013 by Cisco Systems, Inc.\nCompiled
 Mon 23-Sep-13 18:24 by prod_r",
                                         "system-name": "SW-VEGA-CORBU-C4"
                                     }
                                 }
                             }
                         },
                         "state": {
                             "enabled": true,
                             "name": "MgmtEth0/RP0/CPU0/1"
```

```
        }
    },
```

OpenConfig Terminal Device Revision

Table 4: Feature History

Feature Name	Release	Description
OC (Open Configuration) Terminal Device Revision	Cisco IOS XR Release 7.3.1	The Open Configuration terminal device revision to 1.7.2 allows you to provide LLDP support on the client optics. This feature allows you to learn LLDP neighbors and the topology of the devices for Operations, Administration, and Maintenance (OAM) purposes.

LLDP Support on Client Optics

The client-side LLDP is enabled by default. The LLDP state data is collected over gNMI telemetry.

Limitations

- There is no support on configuration, since LLDP is enabled by default.
- There is no support for LLDP counters.
- There is no support for leaf age and last update in LLDP neighbor discovery.

Sample gNMI telemetry output for LLDP:

```
{
  "openconfig-terminal-device": {
    "terminal-device": {
      "logical-channels": {
        "channel": {
          "10005": {
            "ethernet": {
              "lldp": {
                "neighbors": {
                  "neighbor": {
                    "nncs5500_node1#HundredGigE0/0/0/30": {
```

```
                    "state": {
                      "chassis-id": "008a.96cd.34df",
                      "chassis-id-type": "MAC_ADDRESS",
                      "id": "nncs5500_node1#HundredGigE0/0/0/30",
                      "management-address": "10.127.60.23",
                      "management-address-type": "ipv4",
                      "port-id": "HundredGigE0/0/0/30",
                      "port-id-type": "INTERFACE_NAME",
                      "system-description": " 7.2.1.36I, NCS-5500",
                      "system-name": "nncs5500_node1"
                    }
                  }
                }
              },
               "state": {
                 "enabled": true,
                 "snooping": true
               }
             }
           }
         }
       }
     }
   }
}
```

Open Configuration Model for Client FEC

Before you begin

Table 5: Feature History

Feature Name	Release	Description
OC (Open Configuration) Model for Client FEC and Laser Squelch	Cisco IOS XR Release 7.3.1	The OC model for configuring client FEC and Laser Squelch is available. This feature enables you to perform the configuration using scripts, which is less time-consuming. Also, the Open Configuration model supports the use of vendor-neutral data models to configure and manage the network.

Step 1 You can enable FEC (Forward Error Correction) on clients using the following scripts:

```
"openconfig-platform:components": {
 "component": [
  {
   "name": "0/0-Optics0/0/0/2",
   "config": {
    "name": "0/0-Optics0/0/0/2"
   },
   "openconfig-platform-transceiver:transceiver": {
    "config": {
     "fec-mode": "openconfig-platform-types:FEC_ENABLED"
    }
   }
  }
```

Step 2 You can get operational data using GNMI.

```
"state": {
    "connector-type": "openconfig-transport-types:LC_CONNECTOR",
    "date-code": "2019-08-05T00:00:00Z+00:00",
    "fault-condition": false,
    "fec-mode": "openconfig-platform-types:FEC_ENABLED",
    "fec-uncorrectable-words": 0,
    "form-factor": "openconfig-transport-types:QSFP28",
    "otn-compliance-code": "openconfig-transport-types:OTN_UNDEFINED",
    "present": "PRESENT",
    "serial-no": "INL23321878",
    "sonet-sdh-compliance-code": "openconfig-transport-types:SONET_UNDEFINED",
    "vendor": "CISCO-INNOLIGHT",
    "vendor-part": "10-3220-02",
    "vendor-rev": "1C"
}
```

Configure Laser Squelch

Step 1 You can enable laser squelching using the following scripts:

```
"openconfig-terminal-device:terminal-device": {
 "logical-channels": {
  "channel": [
   {
    "index": 30002,
    "config": {
     "index": 30002,
     "rate-class": "openconfig-transport-types:TRIB_RATE_100G",
     "admin-state": "ENABLED",
     "description": "ETH Logical Channel
                             ",
     "loopback-mode": "NONE",
     "trib-protocol": "openconfig-transport-types:PROT_100G_MLG",
     "logical-channel-type": "openconfig-transport-types:PROT_ETHERNET"
    },
    "ethernet": {
     "config": {
      "als-delay": 3000,
      "client-als": "LASER_SHUTDOWN"
     }
    },
    "ingress": {
     "config": {
      "transceiver": "0/0-Optics0/0/0/2"
     }
    },
    "logical-channel-assignments": {
     "assignment": [
      {
       "index": 1,
       "config": {
        "index": 1,
        "allocation": "100",
        "assignment-type": "LOGICAL_CHANNEL",
        "description": "ETH to ODU4 assignemnt
                                ",
        "logical-channel": 30020
       }
      }
     ]
    }
   },
```

Step 2 You can get operational data using GNMI.

```
"state": {
                                  "als-delay": 5,
                                   "client-als": "LASER_SHUTDOWN",
                                   "in-crc-errors": 18446744073709551473,
                                   "in-fragment-frames": 0,
                                  "in-jabber-frames": 2,
                                   "in-mac-pause-frames": 0,
                                   "in-oversize-frames": 0,
                                   "in-pcs-bip-errors": 0,
                                   "in-pcs-errored-seconds": 0,
                                  "in-pcs-severely-errored-seconds": 0,
```

```
                "in-pcs-unavailable-seconds": 10,
                "out-mac-pause-frames": 0
            }
        },
```