Configure Controllers

This chapter describes the controllers and procedures to configure the controllers.

Verify a Card State

Before you begin

A card should be inserted on the chassis before verifying a card state.

Procedure

Step 1 **show platform**

Example:

```
RP/0/RP0:hostname # show platform
```

Verifies the card details on all the nodes.

Step 2 **show platform**

Example:

```
RP/0/RP0:hostname # admin
```

Enters the admin mode.

Step 3 **show platform**

Example:

```
sysadmin-vm: 0_RP1 # show platform
```

Verifies the card details on all the nodes.

Example: Verifying a Card State Using XR Prompt

Example: Verifying a Card State Using System Admin Prompt

The following example shows how to verify a card state using Cisco IOS XR commands:

```
RP/0/RP0:hostname# show platform
```

```
Wed Apr 15 21:28:10.626 UTC
Node name      Node type        Node state    Admin state   Config state
-----------------------------------------------------------------------------
0/0          NCS4K-24LR-O-S     OPERATIONAL      UP           NSHUT
0/1          NCS4K-20T-O-S      OPERATIONAL      UP           NSHUT
0/RP0        NCS4K-RP           OPERATIONAL      UP           NSHUT
0/RP1        NCS4K-RP           OPERATIONAL      UP           NSHUT
0/FC0        NCS4016-FC-M       OPERATIONAL      UP           NSHUT
0/FC1        NCS4016-FC-M       OPERATIONAL      UP           NSHUT
0/FC2        NCS4016-FC-M       OPERATIONAL      UP           NSHUT
0/FC3        NCS4016-FC-M       OPERATIONAL      UP           NSHUT
0/FT0        NCS4K-FTA          OPERATIONAL      UP           NSHUT
0/FT1        NCS4K-FTA          OPERATIONAL      UP           NSHUT
0/EC0        NCS4K-ECU          OPERATIONAL      UP           NSHUT
```

The following example shows how to verify a card state using System Admin Prompt:

```
sysadmin-vm: 0_RP1 # show platform
```

```
Wed Apr  15 21:27:40.651 UTC
Location  Card Type                HW State      SW State      Config State
-------------------------------------------------------------------------
0/1       NCS4K-20T-O-S            OPERATIONAL   N/A           NSHUT
```

```
0/RP0     NCS4K-RP                OPERATIONAL   OPERATIONAL   NSHUT
0/RP1     NCS4K-RP                OPERATIONAL   OPERATIONAL   NSHUT
0/FC0     NCS4016-FC-M            OPERATIONAL   N/A           NSHUT
0/FC2     NCS4016-FC-M            OPERATIONAL   N/A           NSHUT
0/FC3     NCS4016-FC-M            OPERATIONAL   N/A           NSHUT
0/FT0     NCS4K-FTA               OPERATIONAL   N/A           NSHUT
0/FT1     NCS4K-FTA               OPERATIONAL   N/A           NSHUT
0/EC0     NCS4K-ECU               OPERATIONAL   N/A           NSHUT
```

Verify the FPGA Firmware Version Using System Admin Prompt

Before you begin

A card should be inserted on the chassis before verifying the firmware version.

Procedure

show hw-module fpd

Example:

```
sysadmin-vm: 0_RP1 # show hw-module fpd
```

Verifies the hardware version on all the cards.

Example: Verifying the Firmware Version Using System Admin Prompt

The following example shows how to verify the firmware version on a card using System Admin Prompt:

```
sysadmin-vm: 0_RP1 # show hw-module fpd
```

```
Wed Apr  15 21:30:22.527 UTC
                                                                FPD Versions
                                                               ==============
Location   Card type      HWver FPD device       ATR Status  Run   Programd
------------------------------------------------------------------------------
0/1      NCS4K-20T-O-S     0.1   CCC-FPGA          CURRENT   3.23    3.23
0/1      NCS4K-20T-O-S     0.1   CCC-Power-On      CURRENT   1.11    1.11
0/1      NCS4K-20T-O-S     0.1   Ethernet-Switch   CURRENT   1.39    1.39
0/RP0    NCS4K-RP          0.1   Backup BIOS       NEED UPGD         13.06
0/RP0    NCS4K-RP          0.1   Backup-CCC-PwrOn  CURRENT           1.12
0/RP0    NCS4K-RP          0.1   Backup-EthSwitch  CURRENT           1.36
0/RP0    NCS4K-RP          0.1   BP-FPGA           CURRENT   3.16    3.16
0/RP0    NCS4K-RP          0.1   CCC-Bootloader    CURRENT           4.08
0/RP0    NCS4K-RP          0.1   CCC-FPGA          CURRENT   4.08    4.08
0/RP0    NCS4K-RP          0.1   CCC-Power-On      CURRENT   1.12    1.12
0/RP0    NCS4K-RP          0.1   CPU-Complex-Boot  CURRENT           2.04
0/RP0    NCS4K-RP          0.1   CPU-Complex-FPGA  CURRENT   2.04    2.04
0/RP0    NCS4K-RP          0.1   Ethernet-Switch   CURRENT   1.36    1.36
0/RP0    NCS4K-RP          0.1   Primary BIOS      CURRENT   13.08   13.08
0/RP0    NCS4K-RP          0.1   Timing-FPGA       CURRENT   3.13    3.13
```

```
0/RP1    NCS4K-RP          0.1   Backup BIOS       NEED UPGD         13.06
0/RP1    NCS4K-RP          0.1   Backup-CCC-PwrOn  CURRENT           1.12
0/RP1    NCS4K-RP          0.1   Backup-EthSwitch  CURRENT           1.36
0/RP1    NCS4K-RP          0.1   BP-FPGA           CURRENT   3.16    3.16
0/RP1    NCS4K-RP          0.1   CCC-Bootloader    CURRENT           4.08
0/RP1    NCS4K-RP          0.1   CCC-FPGA          CURRENT   4.08    4.08
0/RP1    NCS4K-RP          0.1   CCC-Power-On      CURRENT   1.12    1.12
0/RP1    NCS4K-RP          0.1   CPU-Complex-Boot  CURRENT           2.04
0/RP1    NCS4K-RP          0.1   CPU-Complex-FPGA  CURRENT   2.04    2.04
0/RP1    NCS4K-RP          0.1   Ethernet-Switch   CURRENT   1.36    1.36
0/RP1    NCS4K-RP          0.1   Primary BIOS      CURRENT   13.08   13.08
0/RP1    NCS4K-RP          0.1   Timing-FPGA       CURRENT   3.13    3.13
0/FC0    NCS4016-FC-M      0.1   CCC-FPGA          CURRENT   4.34    4.34
0/FC0    NCS4016-FC-M      0.1   CCC-Power-On      CURRENT   1.11    1.11
0/FC2    NCS4016-FC-M      0.1   CCC-FPGA          CURRENT   4.34    4.34
0/FC2    NCS4016-FC-M      0.1   CCC-Power-On      CURRENT   1.11    1.11
0/FT0    NCS4K-FTA         0.1   Fantray-FPGA      CURRENT   2.08    2.08
0/FT1    NCS4K-FTA         0.1   Fantray-FPGA      CURRENT   2.08    2.08
0/EC0    NCS4K-ECU         0.1   ECU-FPGA          CURRENT   2.08    2.08
```

Verify the FPGA Firmware Version Using XR Prompt

Before you begin

A card should be inserted on the chassis before verifying the firmware version.

Procedure

show hw-module fpd

Example:

```
RP/0/RP0:hostname # show hw-module fpd
```

Verifies the hardware version on all the cards.

Example: Verifying the Firmware Version Using XR Prompt

The following example shows how to verify the firmware version on a card using Cisco IOS XR commands:

```
RP/0/RP0:hostname# show hw-module fpd
```

```
Wed Apr 15 21:29:40.934 UTC
                                                      FPD Versions
                                                     =================
Location   Card type    HWver  FPD device   ATR Status   Running  Programd
-------------------------------------------------------------------------------
0/1      NCS4K-20T-O-S   0.1    ZYNQ         CURRENT      1.51     1.51
0/1      NCS4K-20T-O-S   0.1    GENNUM       CURRENT      3.01     3.01
0/1      NCS4K-20T-O-S   0.1    DIGI2        CURRENT      2.03     2.03
```

```
0/1      NCS4K-20T-O-S   0.1    DIGI1        CURRENT      2.03     2.03
0/6      NCS4K-24LR-O-S  0.1    ZYNQ         NEED UPGD    4.04     4.04
0/7      NCS4K-24LR-O-S  0.1    ZYNQ         NEED UPGD    4.04     4.04
```

Verify Craft Firmware Version

Procedure

Step 1 Login into active RP.

Step 2 admin

Example:

```
RP/0/RP0:router# admin
```

Enters SYSADMIN mode.

Step 3 run chvrf 0 bash

Example:

```
sysadmin-vm:0_RP0# run chvrf 0 bash
```

Enters execute mode.

Step 4 /opt/cisco/calvados/sbin/ccc_driver_client

Example:

```
bash-3.2# /opt/cisco/calvados/sbin/ccc_driver_client
```

Displays the CCC Test Client Main Menu.

```
CCC Test client main menu - Version 0.3 - handle with care

  0 ] Refresh menu
  1 ] Watchdog Menu
  2 ] Console Menu
  3 ] CCC Info Menu (Card/Chassis Info/OIR etc)
  4 ] I2C Menu
  5 ] SPI Menu
  6 ] MDIO Menu (PHY's and Marvell)
  7 ] Reset Menu
  8 ] Peek 'n' Poke
  9 ] LED test
  10] EID Menu
  11] Power Control
  12] Craft Panel Tests
  13] Upgrade Bao
  14] PLX eeprom
  15] Sensor Device Menu
  16] Dispaly I2C Logical Config Table
  17] CRE Menu
  18] Atris Config Menu
```

Step 5 Type 12 and press Enter key

Example:

```
12
```

Selects Craft Panel Test option to display the Craft Panel Tests Menu.

```
Craft Panel Tests
        0] Return to the main menu
        1] Transmit a message
        2] Register for receive notifications
        3] Enable/Disable CRAFT UART Loopback
        4] Register for OIR notifications
        5] Get craft panel info
        6] Poke the Craft Panel
        7] Peek the Craft Panel
        8] Read Craft Panel IDPROM
        9] Read Craft Panel Firmware
```

Step 6 Type 9 and press Enter key Select **Read Craft Firmware** from options displayed.

Example:

```
9
```

Dumps the craft firmware number into ccc_driver logs.

```
Server indicated successful craft transmit.
```

Step 7 quit

Exits the execute mode.

Step 8 show controller ccc trace craft_ccc_plugin location "***" | inc CRAFT_FW_VERSION

Example:

```
sysadmin-vm:0_RP0# show controller 1 ccc trace craft_ccc_plugin location "***" | inc
CRAFT_FW_VERSION
```

Note Alternatively execute **show tech ctrace** command and grep for "CRAFT_FW_VERSION" under ccc-driver logs.

```
Tue May  8  08:52:13.685 UTC
2018-05-08:08.51.36.221561844:CR_DLL:_LOG_:craft_decode_rx_msg :[CRAFT_FW_VERSION]<--
"2.9.46tft/hc/L SLCD43 "AT043TN24""
```

Upgrade FPD

Procedure

Step 1 **show hw-module fpd**

Example:

```
RP/0/RP0:FPD#show hw-module fpd
```

```
or
```

```
RP/0/RP0:FPD#show hw-module fpd CCC-FPGA
```

```
or

RP/0/RP0:FPD#show hw-module location 0/FC3 fpd

or

RP/0/RP0:FPD#show hw-module location 0/FC3 fpd CCC-FPGA
```

Displays the current FPD image version. This information determines whether FPD upgrade is required.

Step 2 **show fpd package**

Example:

```
RP/0/RP0:FPD# show fpd package
```

Displays FPD versions compatible with the current software version.

Step 3 **upgrade hw-module location {all | *slot*} fpd {all | *fpga-type*} [force]**

Example:

```
RP/0/RP0:FPD# upgrade hw-module location 0/3 fpd all
```

Upgrades the FPD images that need upgrade. If force option is selected then upgrades/downgrades all FPD images.

Note The following FPD's do not have a fallback image:

- Craft FPD

  If the craft FPD upgrade does not complete or fails, the craft might display a blank screen. In such a case rerun the upgrade command.

- PEM FPD

  If the PEM FPD upgrade fails, the module might not work as expected. In such a case rerun the upgrade command.

Step 4 **admin**

Example:

```
RP/0/RP0:FPD# admin
```

Enters into administration exec mode.

Step 5 **hw-module location { *slot* } reload**

Example:

```
RP/0/RP0:FPD# hw-module location 0/3 reload
```

(*Optional*) Reloads the card. Required when post upgrade FPD shows RLOAD REQ.

Mapping Type Supported

The following table describes the mapping type supported for NCS4k-24LR-OS line card :

User Provided Info				**Derived Info**	
Port Number	Port Mode	Mapping Type	Framing Type	Payload Type	Data Path
0-23 (1)	ethernet	gmp	opu0	07	24 x 1 GbE over ODU0 over CBRI/GMP mapped on CBRI CBRB ODU0 GMP TTT CPB GE-PMON-Passthrough
10,11, (4) 22,23 (4)	ethernet (LAN)	gfp-f (defined by g.sup43-6.2)	opu2	05	4 x 10GE G.Sup43, 6.2 over ODU2 over CBRI mapped on CBRI CBRB ODU2 GFP-F CPB 10GE-MAC 10GE-PCS
10,11, (4) 22,23 (4)	ethernet (LAN)	bmp (defined by g.sup43-7.1)	opu2e	03	4 x 10GE G.Sup43, 7.1 over ODU2e over CBRI mapped on CBRI CBRB ODU2e BMP CPB 10GERXPMON-Passthrough
10,11, (4) 22,23 (4)	ethernet (LAN)	bmp (defined by g.sup43-7.2)	opu1e	03	4 x 10GE G.Sup43, 7.2 over ODU1e over CBRI mapped on CBRI CBRB ODU2e BMP CPB 10GERXPMON-Passthrough
10,11, (4) 22,23 (4)	ethernet (LAN)	gfp-f-extended (defined by g.sup43-7.3)	opu2	09	4 x 10GE G.Sup43, 7.3 over ODU2 over CBRI (now G.709) mapped on CBRI CBRB ODU2 GFP-F CPB GSUP43-7.3-PCS 10GE_PCS
10,11, (4) 22,23 (4)	ethernet (WAN)	wis (defined by g.sup43-6.1)	opu2	02	4 x 10GE WAN Over Sonet mapped on CBRI CBRB ODU2 GFP-F CPB 10GEMAC WIS(Map/Dem) Sonet-PP STS-192/STM-64
0-3, (2) 6-9, (2) 12-15, (3) 18-21 (3	sonet	bmp	opu1	03	16 x STS-48/STM16 Over ODU1 over CBRI/BMP mapped on CBRI CBRB ODU1 BMP CPB STS-STM-PMON
10,11, (4) 22,23 (4)	sonet	amp	opu2	02	4 x STS-192/STM64 Over ODU2 over CBRI/AMP mapped on CBRI CBRB ODU2 AMP CPB STS-STM-PMON XFI
10,11, (4) 22,23 (4)	sonet	bmp	opu2	03	4 x STS-192/STM64 Over ODU2 over CBRI/BMP mapped on CBRI CBRB ODU2 BMP CPB STS-STM-PMON XFI

User Provided Info				Derived Info	
0-3, [7] 6-9, [7] 12-15, [8] 18-21 [8]	otn	-	opu1	20 or 21 (user provided)	16 x OTU1
10,11, [5] 22,23 [6]	otn	-	opu1e	20 or 21 (user provided)	4 x OTU1e
10,11, [5] 22,23 [6]	otn	-	opu2	20 or 21 (user provided)	4 x OTU2
10,11, [5] 22,23 [6]	otn	-	opu2e	20 or 21 (user provided)	4 x OTU2e
10,11, [5] 22,23 [6]	otn	-	opu1f	20 or 21 (user provided)	4 x OTU1F
10,11, [5] 22,23 [6]	otn	-	opu2f	20 or 21 (user provided)	4 x OTU2F

Following are the limitations for NCS4k-24LR-O-S card:

Note

1. On LR/SFP ports 0..3, GE can be allocated only if 10GE/OC192 traffic is not configured on SFP+ 22; on port 4 GE can be allocated only if OC48 is not configured on port 0; on port 22 GE can be allocated only if OC48 is not configured on port 1. On LR/SFP ports 6..9, GE can be allocated only if 10GE/OC192 traffic is not configured on SFP+ 10; on port 5 GE can be allocated only if OC48 is not configured on port 6; on port 10 GE can be allocated only if OC48 is not configured on port 7.

   On LR/SFP ports 12..15, GE can be allocated only if 10GE/OC192 traffic is not configured on SFP+ 23; on port 16 GE can be allocated only if OC48 is not configured on port 12; on port 23 GE can be allocated only if OC48 is not configured on port 13. On LR/SFP ports 18..21, GE can be allocated only if 10GE/OC192 traffic is not configured on SFP+ 11; on port 17 GE can be allocated only if OC48 is not configured on port 18; on port 11 GE can be allocated only if OC48 is not configured on port 19.

2. OC48 traffic on port 0 can be allocated only if 1GE traffic is not allocated on port 4; OC48 traffic can be allocated on port 1 only if 1GE traffic is not allocated on port 22; OC48 traffic on ports 0..3 can be allocated only if one of 10GE or OC192 is not configured on port 22.

   OC48 traffic on port 6 can be allocated only if 1GE traffic is not allocated on port 5; OC48 traffic can be allocated on port 7 only if 1GE traffic is not allocated on port 10; OC48 traffic on ports 6..9 can be allocated only if one of 10GE or OC192 is not configured on port 10.

3. OC48 traffic on port 12 can be allocated only if 1GE traffic is not allocated on port 16; OC48 traffic can be allocated on port 13 only if 1GE traffic is not allocated on port 23; OC48 traffic on ports 12..15 can be allocated only if one of 10GE or OC192 is not configured on port 23.

   OC48 traffic on port 18 can be allocated only if 1GE traffic is not allocated on port 17; OC48 traffic can be allocated on port 19 only if 1GE traffic is not allocated on port 11; OC48 traffic on ports 18..21 can be allocated only if one of 10GE or OC192 is not configured on port 11.

4. This traffic (10GE/OC192) can be allocated on port 10 only if ports 5..9 do not have any of 1GE or OC48 traffic; 10GE or OC192 can be allocated on port 11 only if ports 17..21 do not have any of 1GE or OC48 traffic; 10GE or OC192 can be allocated on port 22 only if ports 0..4 do not have any of 1GE or OC48 traffic; 10GE or OC192 can be allocated on port 23 only if ports 12..16 do not have any of 1GE or OC48 traffic.
5. This traffic can be configured if the total bandwidth of allocation for OTN traffic on ports 6-9 and 10 is not over 10GBit/Sec, for example, if any OTU2* is allocated on port 10 none of OTU1 can be allocated on ports 6-9; the same is applicable if any of OTU2* is allocated on port 11 none of OTU1 can be allocated on ports 18-21.
6. This traffic can be configured if the total bandwidth of allocation for OTN traffic on ports 0-3 and 22 is not over 10GBit/Sec, for example, if any OTU2* is allocated on port 22 none of OTU1 can be allocated on ports 0-3; the same is applicable if any of OTU2* is allocated on port 23 none of OTU1 can be allocated on ports 12-15.
7. OTU1 traffic can be allocated on ports 0-3 only if ports 22 is not configured with OTU2* traffic; same OTU1 traffic can be allocated on ports 6-9 only if port 10 is not configured with OTU2* traffic.
8. OTU1 traffic can be allocated on ports 12-15 only if ports 23 is not configured with OTU2* traffic; same OTU1 traffic can be allocated on ports 18-21 only if port 11 is not configured with OTU2* traffic.

User Provided Info				**Derived Info**	
Port Number	Port Mode	Mapping Type	Framing Type	Payload Type	Data Path

User Provided Info				Derived Info	
0-19	sonet	amp	opu2	02	OC-192/STM-64 SFP+ over ODU2 mapped to PMON, CPB, AMP Map, Interlaken(CBRI-ODU2)
0-19	sonet	amp	opu2	03	OC-192/STM-64 SFP+ over ODU2 mapped to PMON, CPB, BMP Map, Interlaken(CBRI-ODU2)
0-19	ethernet (LAN)	gfp-f (defined by g.sup43-6.2)	opu2	05	10GE SFP+ over ODU2 mapped to Rx MAC+PCS, CPB, GFP-F Map (G.Sup43 6.2)
0-19	ethernet (LAN)	gfp-f (defined by g.sup43-7.1)	opu2e	03	10GE SFP+ over ODU2e mapped to PMON, 10GE Rx Passthru, CPB, BMP Map (G.Sup43 7.1), Interlaken(CBRI - ODU2e)
0-19	ethernet (LAN)	gfp-f (defined by g.sup43-7.3)	opu2	09	10GE SFP+ over ODU2 mapped to PMON, 10GE Rx Passthru, CPB, GFP-F Map (G.Sup43 7.3), Interlaken(CBRI - ODU2)
0-19	ethernet (WAN)	gfp-f	opuflex	09	10GE SFP+ over ODUFlex mapped to Rx MAC+PCS, CPB, GFP-F Map Interlaken(CBRI - ODUflex)
0-19	otn	-	opu1e	20 or 21 (user provided)	OTU1e
0-19	otn	-	opu2	20 or 21 (user provided)	OTU2
0-19	otn	-	opu2e	20 or 21 (user provided)	OTU2e
0-19	otn	-	opu1f	20 or 21 (user provided)	OTU1F
0-19	otn	-	opu2f	20 or 21 (user provided)	OTU2F

User Provided Info				Derived Info	
Port Number	Port Mode	Mapping Type	Framing Type	Payload Type	Data Path
0,1	ethernet	gfp-f	opu4	05	100GE NCS4K-2H-O-K over ODU4 mapped to Rx MAC+PCS, CPB, GFP-F Map (G.Sup43 6.2)
0,1	ethernet	amp	opu4	09	100GE NCS4K-2H-O-K over ODU4 mapped to PMON, 100GE Rx Passthru, CPB, GMP Map, Interlaken(CBRI – ODU4)
0,1	ethernet	gfp-f	opuflex	05	100GE NCS4K-2H-O-K over ODUFlex mapped to Rx MAC+PCS, CPB, GFP-F Map Interlaken(CBRI - ODUflex)
0,1	otn	-	opu4	21	OTU4

Configure an OTN Controller

Before you begin

Optics controller should be created before configuring an OTN controller and must be in UP state.

Procedure

Step 1 **configure**

Step 2 controller **optics** *Rack/Slot/Instance/Port*

Example:

```
RP/0/RP0:hostname# controller optics 0/0/0/0
```

Enters the Optics controller mode.

Step 3 **port-mode {Ethernet | FC | OTN | SDH | Sonet} framing** *framing-type* **mapping** *mapping-type*

Example:

```
RP/0/RP0:hostname(config-optics)# port-mode sdh framing opu1 mapping amp
```

Configures the port-mode for the sdh controller. Mapping is not required for otn controllers.

Step 4 **commit**

Example: Configure Port Mode as OTN

The following example shows how to configure port mode as otn using Cisco IOS XR commands:

```
RP/0/RP0:hostname# configure terminal
RP/0/RP0:hostname# controller optics 0/0/0/0
```

```
RP/0/RP0:hostname(config-optics)# port-mode otn framing opu2
RP/0/RP0:hostname(config-optics)# exit
```

Configure the LAN PHY Controller

Procedure

Step 1 **configure**

Example:

```
RP/0/RP0:hostname# configure
```

Enters the configuration mode.

Step 2 **controller optics** *R/S/I/P*

Example:

```
RP/0/RP0:hostname(config)# controller optics 0/6/0/1
```

Enters the optics controller configuration mode.

Step 3 **port-mode Ethernet framing packet rate** *rate*

Example:

```
RP/0/RP0:hostname (config-Optics)# port-mode Ethernet framing packet rate 100GE
```

Configures the port-mode for the Ethernet controller.

Step 4 **commit**

Example:

```
RP/0/RP0:hostname(config-Optics)# commit
```

Example: Configure LAN PHY controller interface:

The following example shows how to configure a 100GE LAN PHY controller interface HundredGigE0/6/0/1 using Cisco IOS XR commands:

```
RP/0/RP0:hostname# configure
RP/0/RP0:hostname(config)# controller optics 0/6/0/1
RP/0/RP0:hostname(config-Optics)# port-mode Ethernet framing packet rate 100GE
RP/0/RP0:hostname(config-Optics)# commit
```

The following example shows how to configure a 10GE LAN PHY controller interface TenGigE0/14/0/2 using Cisco IOS XR commands:

```
RP/0/RP0:hostname# configure
RP/0/RP0:hostname(config)# controller optics 0/14/0/2
RP/0/RP0:hostname(config-Optics)# port-mode Ethernet framing packet rate 10GE
RP/0/RP0:hostname(config-Optics)# commit
```

Configure the Ethernet terminated OTN Controller (without Breakout)

Procedure

Step 1 **configure**

Example:

```
RP/0/RP0:hostname# configure
```

Enters the configuration mode.

Step 2 **controller optics** *R/S/I/P*

Example:

```
RP/0/RP0:hostname(config)# controller optics 0/6/0/1
```

Enters the optics controller configuration mode.

Step 3 **port-mode OTN framing** *framing type*

Example:

```
RP/0/RP0:hostname (config-Optics)# port-mode OTN framing opu4
```

Configures the port-mode for the OTN controller.

Step 4 **exit**

Example:

```
RP/0/RP0:hostname (config-Optics)# exit
```

Exits the sub mode.

Step 5 **controller** *payload-type R/S/I/P*

Example:

```
RP/0/RP0:hostname(config)# controller ODU4 0/6/0/1
```

Enters the odu controller configuration mode.

Step 6 **terminate ether mapping** *mapping-type*

Example:

```
RP/0/RP0:hostname(config - odu4)# terminate ether mapping GfpF
```

Step 7 **commit**

Example:

```
RP/0/RP0:hostname(config-odu4)# commit
```

Example: Configure LAN PHY controller interface:

The following example shows how to configure a 100GE Ethernet terminated OTN controller interface HundredGigE0/6/0/1 using Cisco IOS XR commands:

```
RP/0/RP0:hostname# configure
RP/0/RP0:hostname(config)# controller optics 0/6/0/1
RP/0/RP0:hostname(config-Optics)# port-mode OTN framing opu4
RP/0/RP0:hostname(config-Optics)# exit
RP/0/RP0:hostname(config)# controller ODU4 0/6/0/1
RP/0/RP0:hostname(config-odu4)# terminate ether mapping GfpF
RP/0/RP0:hostname(config-odu4)# commit
```

The following example shows how to configure a 10GE Ethernet terminated OTN controller interface TenGigE0/14/0/2 using Cisco IOS XR commands:

```
RP/0/RP0:hostname# configure
RP/0/RP0:hostname(config)# controller optics 0/14/0/2
RP/0/RP0:hostname(config-Optics)# port-mode OTN framing opu2e
RP/0/RP0:hostname(config-Optics)# exit
RP/0/RP0:hostname(config)# controller ODU2E 0/14/0/2
RP/0/RP0:hostname(config-odu2e)# terminate ether mapping bmp
RP/0/RP0:hostname(config-odu2e)# commit
```

Configure the Ethernet terminated OTN Controller (with Breakout)

Procedure

Step 1 **configure**

Example:

```
RP/0/RP0:hostname# configure
```

Enters the configuration mode.

Step 2 **controller optics** *R/S/I/P* **breakout-mode** *lane id* **otn framing** *framing type*

Note All lanes should be configured in same mode.

Only opu2 and opu2e framing type are supported.

Example:

```
RP/0/RP0:hostname(config)# controller optics 0/0/0/1 breakout-mode 3 otn framing opu2
```

Step 3 **exit**

Example:

```
RP/0/RP0:hostname (config-Optics)# exit
```

Exits the sub mode.

Step 4 **controller { ODU2 | ODU2E }** *R/S/I/P/lane-id* **terminate ether mapping** *{ GfpF | bmp }*

Example:

```
RP/0/RP0:hostname(config)# controller ODU2 0/0/0/1/3 terminate ether mapping GfpF
```

Step 5 **commit**

Example:

```
RP/0/RP0:hostname(config-odu2)# commit
```

Example

The following examples show how to configure a TenGigE0/0/0/1/3 interface using Cisco IOS XR commands:

```
RP/0/RP0:hostname# configure
RP/0/RP0:hostname(config)# controller optics 0/0/0/1 breakout-mode 3 otn framing opu2
RP/0/RP0:hostname(config-Optics)# exit
RP/0/RP0:hostname(config)# controller ODU2 0/0/0/1/3 terminate ether mapping GfpF
RP/0/RP0:hostname(config-odu2)# commit
```

```
RP/0/RP0:hostname# configure
RP/0/RP0:hostname(config)# controller optics 0/0/0/1 breakout-mode 3 otn framing opu2e
RP/0/RP0:hostname(config-Optics)# exit
RP/0/RP0:hostname(config)# controller ODU2e 0/0/0/1/3 terminate ether mapping bmp
RP/0/RP0:hostname(config-odu2)# commit
```

The following examples show how to configure a fourty gigabit interface using Cisco IOS XR commands:

```
RP/0/RP0:hostname# configure
RP/0/RP0:hostname(config)# controller Optics0/4/0/5
breakout-mode 1 Otn framing opu2
breakout-mode 2 Otn framing opu2
breakout-mode 3 Otn framing opu2
breakout-mode 4 Otn framing opu2
!
RP/0/RP0:hostname(config-Optics)# exit
RP/0/RP0:hostname(config)# controller ODU20/4/0/5/1
 terminate ether mapping GfpF
!
controller ODU20/4/0/5/2
 terminate ether mapping GfpF
!
controller ODU20/4/0/5/3
 terminate ether mapping GfpF
!
controller ODU20/4/0/5/4
 terminate ether mapping GfpF
!

RP/0/RP0:hostname(config-odu2)# commit
```

Configure the Clock Controller

Procedure

Step 1 **configure**

Example:

```
RP/0/RP0:hostname# configure
```

Enters the configuration mode.

Step 2 **clock-interface** [**Rack0-Bits0-In** | **Rack0-Bits0-Out** | **Rack0-Bits1-In** | **Rack0-Bits1-Out**]

Example:

```
RP/0/RP0:hostname(config)# clock-interface Rack0-Bits0-Out
```

Enters the clock interface configuration mode.

Step 3 **port-parameters** [**Interface Type**] [**bits-input** | **bits-output**] **[BITS mode]**

Note Refer following table for configuring port parameters:

BITS mode	Interface Type	QL Option	Supported as Input	SSM Rx Supported	Supported as Output	SSM Tx Supported
T1 D4 AMI	ANSI (Wirewrap)	O2 G1	Yes	No - use receive exact	Yes	No - ssm disabled
T1 D4 B8ZS	ANSI (Wirewrap)	O2 G1	Yes	No - use receive exact	Yes	No - ssm disabled
T1 ESF AMI	ANSI (Wirewrap)	O2 G1	Yes	Yes	Yes	Yes
T1 ESF B8ZS	ANSI (Wirewrap)	O2 G1	Yes	Yes	Yes	Yes
J1 D4 AMI	ANSI (Wirewrap)	O2 G1	Yes	No - use receive exact	Yes	No - ssm disabled
J1 D4 B8ZS	ANSI (Wirewrap)	O2 G1	Yes	No - use receive exact	Yes	No - ssm disabled
J1 ESF AMI	ANSI (Wirewrap)	O2 G1	Yes	Yes	Yes	Yes
J1 ESF B8ZS	ANSI (Wirewrap)	O2 G1	Yes	Yes	Yes	Yes
E1 FAS AMI	ETSI (BNC)	O1	Yes	Yes	Yes	Yes

E1 FAS HDB3	ETSI (BNC)	O1	Yes	Yes	Yes	Yes
E1 CRC4 AMI	ETSI (BNC)	O1	Yes	Yes	Yes	Yes
E1 CRC4 HDB3	ETSI (BNC)	O1	Yes	Yes	Yes	Yes
E1 G.703 2048KHz	ETSI	O1	Yes	No - use receive exact	Yes	No - ssm disabled
64KHz + 8KHz Composite Clock (Includes GR378 and G.703)	ANSI & ETSI	O1/O2	Yes	No - use receive exact	No	No

Example:

```
RP/0/RP0:hostname (config-clock-if)# port-parameters etsi bits-output e1 crc-4 sa4 ami
```

Configures the port-parameters for the clock controller.

Step 4 **commit**

Example:

```
RP/0/RP0:hostname(config-clock-if)# commit
```

Example: Configure Clock controller interface:

The following example shows how to configure a clock interface:

```
RP/0/RP0:hostname# configure
RP/0/RP0:hostname(config)# clock-interface Rack0-Bits0-Out
RP/0/RP0:hostname(config-Optics)#  port-parameters etsi bits-output e1 crc-4 sa4 ami
RP/0/RP0:hostname(config-Optics)# commit
```

Configure 100MHZ Flex Grid for NCS4K-4H-OPW-QC2 Line Card

Table 1: Feature History

Feature Name	Release Information	Feature Description
100MHz Grid Spacing for NCS4K-4H-OPW-QC2 line card	Cisco IOS XR Release 6.5.33	In addition to the 50GHZ flex-grid-spacing, you can now configure 100MHz flex-grid-spacing on the CFP2 trunk ports of the NCS4K-4H-OPW-QC2 card. The setup can be done by Cisco Transport Controller (CTC) or CLI. With 100MHz flex-grid-spacing, you can configure up to 761 different wavelengths; which is more than 96 wavelengths that can be done with 50GHZ flex-grid-spacing. Commands added: • dwdm-carrier Commands modified: • show controller optics

The trunk ports 10 and 11 with coherent CFP2 optics in the NCS4K-4H-OPW-QC2 card currently support 50GHz grid spacing. However, the coherent CFP2 optics supports 100MHz grid spacing. From Release 6.5.33, you can configure 100MHz flex grid spacing. The 100MHz grid spacing enables you to configure the frequencies with a granularity of 7 digits, and therefore 761 different wavelengths can be configured on the colored optics, whereas 50GHz grid spacing can support only 96 wavelengths.

You can also configure the 100MHz grid spacing through CTC. See Configure 100MHz Grid Spacing for NCS4K-4H-OPW-QC2 Line Card Using CTC.

Procedure

Step 1 **configure**

```
RP/0/RP0:hostname# configure
```

Enters the configuration mode.

Step 2 **controller optics** *Rack/Slot/Instance/Port*

```
RP/0/RP0:hostname(config)#controller optics 0/0/0/11
```

Enters the optics controller configuration mode.

Step 3 **shutdown**

```
RP/0/RP0:ios(config-Optics)#shutdown
```

Shuts down the controller.

Step 4 **sec-admin-state maintenance**

```
RP/0/RP0:ios(config-Optics)#sec-admin-state maintenance
```

Configures the administrative state of the controller to maintenance mode.

Step 5 **dwdm-carrier 100MHz-grid frequency** <*frequency-value*>

The frequency range is 1911500-1961000. In 100MHz grid spacing, enter the 7-digit frequency value in the range of 1911500 to 1961000 THz. For example, enter 1913501 to specify 191.3501 THz.

```
RP/0/RP0:ios(config-Optics)#dwdm-carrier 100MHz-grid frequency 1960810
```

Configures the wavelength in 100MHz (0.1GHz) grid spacing in accordance with ITU definition.

Step 6 **commit**

Step 7 **no shutdown**

```
RP/0/RP0:ios(config-Optics)# no shutdown
```

Brings up the controller.

Step 8 **commit**

Step 9 **show controller optics** *R/S/I/P* **dwdm-carrier-map flexi-grid**

```
RP/0/RP0:ios#show controller Optics0/0/0/11 dwdm-carrier-map flexi-grid
Mon Mar 20 07:12:36.764 UTC
DWDM Carrier Band:: OPTICS_C_BAND
Frequency range supported: 196.10000 THz ~ 191.30630 THz

DWDM Carrier Map table
------------------------------------------------------
Channel     G.694.1     Frequency     Wavelength
 index      Ch Num        (THz)          (nm)
------------------------------------------------------
     1       480        196.10000      1528.773
------------------------------------------------------
     2       479        196.09380      1528.822
------------------------------------------------------
     3       478        196.08750      1528.871
------------------------------------------------------
     4       477        196.08130      1528.919
------------------------------------------------------
     5       476        196.07500      1528.968
------------------------------------------------------
     6       475        196.06880      1529.017
------------------------------------------------------
     7       474        196.06250      1529.066
------------------------------------------------------
     8       473        196.05630      1529.114
------------------------------------------------------
     9       472        196.05000      1529.163
------------------------------------------------------
    10       471        196.04380      1529.212
------------------------------------------------------
    11       470        196.03750      1529.261
------------------------------------------------------
    12       469        196.03130      1529.309
------------------------------------------------------
    13       468        196.02500      1529.358
```

```
-------------------------------------------------
    14       467        196.01880      1529.407
-------------------------------------------------
    15       466        196.01250      1529.456
-------------------------------------------------
    16       465        196.00630      1529.504

 --More--
```

Displays the wavelength and channel mapping with flexible grid channel spacing enabled.

Configure an OTU (HO/LO) Controller

Before you begin

Optics controller should be created before configuring an OTU (HO/LO) controller and must be in UP state.

Procedure

Step 1 **configure**

Step 2 **controller otu** [HO | LO] *R/S/I/P*

Example:

```
RP/0/RP0:hostname (config)# controller OTU1 0/0/0/1
```

Enters the otu controller configuration mode.

Step 3 **fec** *{EnhancedHG20 | EnhancedHG7 | EnhancedI4 | EnhancedI7 | EnhancedSwizzle | Standard | None}*

Example:

```
RP/0/RP0:hostname (config-otu1)# fec EnhancedHG20
```

Configures FEC on the otu controller.

Step 4 **gcc0**

Example:

```
RP/0/RP0:hostname (config-otu1)# gcc0
```

Configures GCC on the otu controller.

Step 5 **secondary-admin-state** *[Automatic-in-service | Maintenance | Normal]*

Example:

```
RP/0/RP0:hostname (config-otu1)# secondary-admin-state maintenance
```

Configures the secondary administrative state of an otu controller.

Step 6 **loopback** *[internal | line]*

Example:

```
RP/0/RP0:hostname (config-otu1)# loopback internal
```

Configures loopback mode of an otu controller.

Step 7 **threshold {sd | sf | sm-tca}** *value*

Example:

```
RP/0/RP0:hostname (config-otu1)# threshold sf 7
```

Configures the threshold for signal failure and signal degrade on the OTUk controller.

The valid range of signal failure is from 1 to 9 and for signal degrade is from 3 to 9.

The valid range of sm-tca is from 3 to 9. The default range is 3.

Step 8 **tti [expected | sent]** *{ascii | dapi | hex | operator-specific | sapi} value*

Example:

```
RP/0/RP0:hostname (config-otu1)#  tti expected ascii abc
```

Configures the trail trace identifier (TTI) of an otu controller. The maximum length of the ascii text is 64 characters.

Step 9 **srlg set** *index-of-the-srlg value-of-the-network-srlg*

Example:

```
RP/0/RP0:hostname (config-otu1)#  srlg set 5 8 6 7 8 9 7
```

Configures the SRLG for network. The valid range of index is from 1 to 17.

The valid range of values is from 0 to 4294967294. You can set a maximum of six values in one set.

Step 10 **commit**

Example: Configure an otu Controller

The following example shows how to configure an otu controller using Cisco IOS XR commands:

```
RP/0/RP0:hostname# configure terminal
RP/0/RP0:hostname(config)# controller otu1 0/0/0/1
RP/0/RP0:hostname(config-otu1)# fec EnhancedHG20
RP/0/RP0:hostname(config-otu1)# gcc0
RP/0/RP0:hostname(config-otu1)# secondary-admin-state maintenance
RP/0/RP0:hostname(config-otu1)# loopback internal
RP/0/RP0:hostname(config-otu1)#threshold sf 7
RP/0/RP0:hostname(config-otu1)#tti expected ascii abc
RP/0/RP0:hostname(config-otu1)#srlg set 5 8 6 7 8 9 7
RP/0/RP0:hostname(config-otu1)#exit
```

Configure an ODU (HO/LO) Controller

Before you begin

Optics controller should be created before configuring an ODU (HO/LO) controller and must be in UP state.

Procedure

Step 1 **configure**

Step 2 **controller odu***[HO | LO] R/S/I/P*

Example:

```
RP/0/RP0:hostname (config)# controller ODU1 0/0/0/1
```

Enters the ODU controller configuration mode.

Step 3 **gcc1**

Example:

```
RP/0/RP0:hostname (config-odu1)# gcc1
```

Configures GCC on the ODU controller. To remove gcc use no form of this command.

Step 4 **secondary-admin-state** *[Automatic-in-service | Maintenance | Normal]*

Example:

```
RP/0/RP0:hostname (config-odu1)# secondary-admin-state maintenance
```

Configures the secondary administrative state of the ODU controller. Administrative state can be normal and maintenance.

Step 5 **loopback** *[internal | line]*

Example:

```
RP/0/RP0:hostname (config-odu1)# loopback internal
```

Configures loopback mode of the ODU controller. You can configure the line and internal loopback modes.

Step 6 **threshold {pm-tca | sf | sd}** *value*

Example:

```
RP/0/RP0:hostname (config-odu1)# threshold sf 7
RP/0/RP0:hostname (config-odu1)# threshold sd 5
RP/0/RP0:hostname (config-odu1)# threshold pm-tca 6
```

Configures the threshold for signal failure, signal degrade and pm-tca on the ODU controller.

Sets the signal fail bit error rate. The range is for NCS4K-20T-O-S and NCS4K-20T-O-S is from 1E-6 to 1E-9. The default value is 6. The range for other cards is from 1E-5 to 1E-9. The default value is 5.

Sets the signal degrade bit error rate. The range is from 1E-3 to 1E-9. The range is for NCS4K-20T-O-S and NCS4K-20T-O-S is from 1E-6 to 1E-9. The default value is 7. The range for other cards is from 1E-5 to 1E-9. The default value is 7

The valid range of pm-tca is from 3 to 9. The default value is 6.

Step 7 **tsg** *[1.25G | 2.5G]*

Example:

```
RP/0/RP0:hostname (config-odu1)# tsg 1.25G
```

Configures TSG of the ODU controller. The valid values are 1.25G and 2.5G.

Step 8 **tti [expected | sent]** *{ascii | dapi | hex | operator-specific | sapi} value*

Example:

```
RP/0/RP0:hostname (config-odu1)# tti expected ascii abc
```

Configures the TTI of the ODU controller. The maximum length of the ascii text is 64 characters.

Step 9 **tcm id** *value*

Example:

```
RP/0/RP0:hostname (config-odu1)# tcm id 4
```

Configures the TCM level for the ODU controller and enters the TCM mode. The valid range is from 1 to 6.

Step 10 **threshold {pm-tca | sf | sd}** *value*

Example:

```
RP/0/RP0:hostname (config-odu1-tcm0x4)# threshold sd 5
RP/0/RP0:hostname (config-odu1-tcm0x4)# threshold sf 7
RP/0/RP0:hostname (config-odu1-tcm0x4)# threshold pm-tca 7
```

Configures the threshold for signal failure and signal degrade in the TCM connection.

The valid range of signal failure is from 1 to 9. The default value is 3.

The valid range of signal degrade is from 3 to 9. The default value is 6.

The valid range of pm-tca is from 3 to 9. The default value is 3.

Step 11 **tti [expected | sent] {ascii | dapi | hex | operator-specific | sapi}** *value*

Example:

```
RP/0/RP0:hostname (config-odu1-tcm0x4)# tti expected ascii abc
```

Configures the TTI of the TCM controller. The maximum length of the ascii text is 64 characters.

Step 12 **commit**

Example: Configure an ODUk Controller

The following example shows how to configure an ODU controller using Cisco IOS XR commands:

```
RP/0/RP0:hostname# configure terminal
RP/0/RP0:hostname(config)#controller ODU1 0/0/0/1
RP/0/RP0:hostname(config-odu1)#gcc1
RP/0/RP0:hostname(config-odu1)#secondary-admin-state maintenance
RP/0/RP0:hostname(config-odu1)#loopback internal
RP/0/RP0:hostname(config-odu1)#threshold sf 7
RP/0/RP0:hostname(config-odu1)#tsg 1.25G
RP/0/RP0:hostname(config-odu1)#tti expected ascii abc
RP/0/RP0:hostname(config-odu1)#tcm id 4
RP/0/RP0:hostname(config-odu1-tcm0x4)#threshold sd 5
RP/0/RP0:hostname(config-odu1-tcm0x4)#tti expected ascii abc
RP/0/RP0:hostname(config-odu1-tcm0x4)#exit
```

Configure Squelch for ODU Controller

Procedure

Step 1 **configure**

Enters the global configuration mode.

Step 2 **controller ODU2** *R/S/I/P*

Example:

```
RP/0/RP0:hostname(config)#controller ODU2 0/1/0/1
```

Enters the ODU2 controller mode.

Step 3 **opu ca laser-squelch** *hold-off timer*

Example:

```
RP/0/RP0:hostname(config-odu2)#opu ca laser-squelch 20
```

Configures squelch hold-off time. The range is 20ms to 10000 ms.

Step 4 **commit**

Configure Idle Frame for ODU Controller

Procedure

Step 1 **configure**

Enters the global configuration mode.

Step 2 **controller ODU2** *R/S/I/P*

Example:

```
RP/0/RP0:hostname(config)#controller ODU2 0/1/0/1
```

Enters the ODU2 controller mode.

Step 3 **opu ca idle-frame** *hold-off timer*

Example:

```
RP/0/RP0:hostname(config-odu2)#opu ca laser-squelch 20
```

Configures idle frame hold-off time. The range is 20ms to 10000 ms.

Step 4 **commit**

Configure an ODU Group Controller

Before you begin

Optics controller should be created before configuring an ODU controller and must be in UP state.

Procedure

Step 1 **configure**

Step 2 **controller [odu-group-mp | odu-group-te]***group-id* **signal {Ethernet | FC | OTN | SDH | Sonet} odu-type** *type-of-the-odu*

Example:

```
RP/0/RP0:hostname# controller odu-group-mp 5 signal OTN odu-type odu1
```

This creates the ODU group controller. The ODU Group MP value ranges from 1 to 65535.

Step 3 **commit**

Configure the Ethernet Controller

Before you begin

Optics controller should be created before configuring an Ethernet controller and must be in UP state.

Procedure

Step 1 **configure terminal**

Example:

Router# configure terminal

Enters the global configuration mode.

Step 2 controller **optics** *R/S/I/P* **port-mode ethernet framing** *type* **mapping** *type* **rate** *rate*

Note The **rate** parameter will appear only if the framing type is opuflex.

Example:

```
RP/0/RP0:hostname# controller optics 0/0/0/0 port-mode ethernet framing opuflex mapping
GfpF rate 100GE
```

Configures the port-mode for the ethernet controller.

Step 3 **exit**

Example:

Router(config-oc3)# exit

Exits the OC controller configuration mode.

Example: Configure Port Mode as Ethernet

The following example shows how to configure port mode as ethernet using Cisco IOS XR commands:

```
RP/0/RP0:hostname# configure terminal
RP/0/RP0:hostname(config)# controller optics 0/0/0/0 port-mode Ethernet framing opuflex
mapping GfpF rate 100GE
RP/0/RP0:hostname(config)# commit
```

Configure a SONET or SDH Controller

Before you begin

Optics controller should be created before configuring a SONET or SDH controller and must be in UP state.

Procedure

Step 1 **configure**

Step 2 controller **optics** *Rack/Slot/Instance/Port*

Example:

```
RP/0/RP0:hostname# controller optics 0/0/0/2
```

Enters the optics controller mode.

Step 3 **port-mode {Ethernet | FC | OTN | SDH | SONET} framing** *framing-type* **mapping** *mapping-type* **rate** *{ OC3 | OC12 | STM1 | STM4 }*

Example:

```
RP/0/RP0:hostname(config-optics)# port-mode sonet framing opu1 mapping bmp
```

Configures the port-mode for the SONET or SDH controller. New parameter rate is introduced for oc3, oc12, stm1 and stm4 controllers.

Note You can create SONET controller when the mapping type is amp and framing type is opu1 only (optics->sonet -> sonet sdh -> odu1).

Step 4 **commit**

Example: Configure Port Mode as SONET

The following example shows how to configure port mode as SONET using Cisco IOS XR commands:

```
RP/0/RP0:hostname# configure terminal
RP/0/RP0:hostname# controller optics 0/0/0/2
RP/0/RP0:hostname(config-optics)# port-mode SONET framing opu1 mapping bmp
RP/0/RP0:hostname(config-optics)# exit
```

Configure an OCn controller

Before you begin

Optics controller should be created before configuring an OCn controller and must be in UP state.

Procedure

Step 1 **configure**

Step 2 controller **oc***n Rack/Slot/Instance/Port*

Example:

```
RP/0/RP0:hostname# controller oc48 0/0/0/2
```

Enters the oc48 controller mode.

Step 3 **clock source [internal | line]**

Example:

```
RP/0/RP0:hostname (config-oc48)# clock source internal
```

Configures the clock source on an OCn controller.

Step 4 **threshold {b1-tca | b2-tca | sd-ber | sf-ber}** *value*

Example:

```
RP/0/RP0:hostname (config-oc48)# threshold b1-tca 6
```

Configures the bit error rate (BER) on threshold crossing alert (TCA) of a controller. The BER value ranges from 3 to 9 and default value is 6 for b1-tca and b2-tca. For sd-ber it ranges from 5 to 9 and default value is 6. BER value for sf-ber ranges from 3 to 5 and default value is 3.

Step 5 **overhead j0 [expected | send] [16Bytes | 1Byte]** *value*

Example:

```
RP/0/RP0:hostname (config-oc48)# overhead j0 extected 1Byte 45
```

Configures a 1 Byte path trace on OCn controller. The byte value ranges from 0 to 255.

Step 6 **commit**

Example: Configure OCn controller

The following example shows how to configure OCn controller using Cisco IOS XR commands:

```
RP/0/RP0:hostname# configure terminal
```

```
RP/0/RP0:hostname(config)# controller oc48 0/0/0/2
RP/0/RP0:hostname(config-oc48)# clock source internal
RP/0/RP0:hostname(config-oc48)# threshold b1-tca 6
RP/0/RP0:hostname(config-oc48)# overhead j0 expected 1Byte 45
RP/0/RP0:hostname(config-oc48)# exit
```

Configure a STSn Controller

Before you begin

Optics controller should be created before configuring a STSn controller and must be in UP state.

Note STSn path can be configured on WIS port only

Procedure

Step 1 **configure**

Step 2 **controller sts***n R/S/I/P*

Example:

```
RP/0/RP0:hostname (config)# controller sts48 0/0/0/2
```

Enters the STS48 controller configuration mode.

Step 3 **threshold b3-tca** *value*

Example:

```
RP/0/RP0:hostname (config-sts48)# threshold b3-tca 7
```

Configures the bit error rate (BER) on threshold crossing alert (TCA) of the controller. The BER value ranges from 3 to 9 and default value is 6.

Step 4 **overhead j1 [expected | send] [16Bytes | 64Bytes]** *ASCII text*

Example:

```
RP/0/RP0:hostname (config-sts48)# overhead j1 expected 64Bytes abcx
```

Configures the 64Bytes path trace on the STSn controller.

Step 5 **commit**

Example: Configure an STSn Controller

The following example shows how to configure an STSn controller using Cisco IOS XR commands:

```
RP/0/RP0:hostname# configure terminal
RP/0/RP0:hostname(config)# controller sts48n 0/0/0/2
RP/0/RP0:hostname(config-sts48)# threshold b3-tca 7
RP/0/RP0:hostname(config-sts48)# overhead j1 expected 64Bytes abcx
```

```
RP/0/RP0:hostname(config-sts48)# exit
```

Configure a STMn controller

Before you begin

Optics controller should be created before configuring a STMn controller and must be in UP state.

Procedure

Step 1 **configure**

Step 2 **controller stm***n R/S/I/P*

Example:

```
RP/0/RP0:hostname (config)# controller stm64 0/0/0/2
```

Enters the STM64 controller configuration mode.

Step 3 **clock source [internal | line]**

Example:

```
RP/0/RP0:hostname (config-stm64)# clock source internal
```

Configures the clock source on an stm controller.

Step 4 **threshold {b1-tca | b2-tca | sd-ber | sf-ber}** *value*

Example:

```
RP/0/RP0:hostname (config-stm64)# threshold b2-tca 7
```

Configures the bit error rate (BER) on threshold crossing alert (TCA) of a controller. The BER value ranges from 3 to 9 and default value is 6 for b1-tca and b2-tca. For sd-ber it ranges from 5 to 9 and default value is 6. BER value for sf-ber ranges from 3 to 5 and default value is 3.

Step 5 **overhead j0 [expected | send] [16Bytes | 1Byte]** *Ascii value*

Example:

```
RP/0/RP0:hostname (config-stm64)# overhead j0 expected 16Bytes abcx
```

Configures a 16 Bytes path trace on the stm controller.

Step 6 **commit**

Example: Configure STM controller

The following example shows how to configure STM controller using Cisco IOS XR commands:

```
RP/0/RP0:hostname# configure terminal
RP/0/RP0:hostname(config)# controller stm64 0/0/0/2
RP/0/RP0:hostname(config-stm64)# clock source internal
```

```
RP/0/RP0:hostname(config-stm64)# threshold b2-tca 7
RP/0/RP0:hostname(config-stm64)# overhead j0 expected 16Bytes abcx
RP/0/RP0:hostname(config-stm64)# exit
```

Configure a VCn Controller

Optics controller should be created before configuring a VCn controller and must be in UP state.

Note VCk path can be configured on WIS port.

Procedure

Step 1 **configure**

Step 2 **controller vc***n R/S/I/P*

Example:

```
RP/0/RP0:hostname (config)# controller vc4-64c 0/0/0/10
```

Enters the vc4-64c configuration mode.

Step 3 **threshold b3-tca** *value*

Example:

```
RP/0/RP0:hostname (config-vc4-64c)# threshold b3-tca 8
```

Configures the bit error rate (BER) on threshold crossing alert (TCA) of the controller.

Step 4 **overhead j1 [expected | send] [16Bytes | 64Bytes]** *Ascii value*

Example:

```
RP/0/RP0:hostname (config-vc4-64c)# overhead j1 send 64Bytes abcz
```

Configures a 64Bytes path trace on the VCk controller.

Step 5 **commit**

Example: Configure a VCk Controller

The following example shows how to configure a VCn controller using Cisco IOS XR commands:

```
RP/0/RP0:hostname# configure terminal
RP/0/RP0:hostname(config)# controller vc4-64c 0/0/0/10
RP/0/RP0:hostname(config-vc4-64c)# threshold b3-tca 8
RP/0/RP0:hostname(config-vc4-64c)# overhead j1 send 64Bytes abcz
RP/0/RP0:hostname(config-vc4-64c)# exit
```

Channelize an ODU (LO) Controller

Before you begin

Optics controller should be created before configuring an ODU (LO) controller.

Procedure

Step 1 **configure**

Step 2 **controller odu** *j R/S/I/P*

Example:

```
RP/0/RP0:hostname (config)# controller odu4 0/0/0/2
```

Enters the ODUj controller configuration mode.

Step 3 **odu** *j* **tpn** *number-of-the-tributary-port* **ts** *slot-of-the-tributary*

Example:

```
RP/0/RP0:hostname (config)# (config-odu4)# ODU3 tpn 4 ts 1-2
```

Creates a lower order ODU controller and configures tributary port number (TPN) and tributary slots (TS) for that ODU controller. The valid range of TPN is from 1 to 80.

The TS string can be separated from 1 to the number of TS in the parent controller by a colon (:) or an en-dash (-). If a TS string is separated using a colon (:), this indicates individual tributary slot. If a TS string is separated using an en-dash (-), this indicates a range of tributary slots.

Note To configure the packet interface, you need to terminate the configurations using command: **terminate ether mapping GfpF/bmp**

Step 4 **commit**

Configure AINS

This task configures AINS for the controller. For more information on AINS support, see AINS Support for Controllers.

Procedure

Step 1 **automatic-in-service controller** ***controller-name R/S/I/P*** **hours** ***x*** **minutes** ***y***

Configures AINS with a soak timer of 15 minutes.

Note To clear the AINS configuration set the hours and minutes to 0.

Example:

```
RP/0/RP0:hostname# automatic-in-service controller optics 0/6/0/2 hours 0 minutes 15
```

Step 2 **show controller** *controller -name R/S/I/P*

Displays the AINS parameters that have been configured.

Example:

```
RP/0/RP0:hostname# sh controllers optics 0/6/0/2
Tue Aug 14 03:52:22.279 UTC
 Controller State: Up
 Transport Admin State: Automatic In Service
 Laser State: On
  Optics Status
         Optics Type:  Grey optics
         Wavelength = 850.00 nm
         Alarm Status:
         -------------
         Detected Alarms: None
         LOS/LOL/Fault Status:
         Alarm Statistics:
         -------------
         HIGH-RX-PWR = 0            LOW-RX-PWR = 0
         HIGH-TX-PWR = 0            LOW-TX-PWR = 1
         HIGH-LBC = 0               HIGH-DGD = 0
         OOR-CD = 0                 OSNR = 0
         WVL-OOL = 0                MEA  = 0
         IMPROPER-REM = 0
         TX-POWER-PROV-MISMATCH = 0
         Laser Bias Current = 52.0 %
         Actual TX Power = -2.41 dBm
         RX Power = -3.55 dBm
         Performance Monitoring: Enable
         THRESHOLD VALUES
         ----------------
         Parameter                High Alarm  Low Alarm  High Warning  Low Warning
         -----------------------  ----------  ---------  ------------  -----------
         Rx Power Threshold(dBm)          1.5      -12.4           0.0          0.0
         Tx Power Threshold(dBm)          1.2       -9.8           0.0          0.0
         LBC Threshold(mA)                N/A        N/A          0.00         0.00
         LBC High Threshold = 98 %
         Polarization parameters not supported by optics
 Transceiver Vendor Details
         Form Factor            : SFP+
AINS Soak                : Running
AINS Timer               : 0h, 15m
AINS remaining time      : 896 seconds
```

Clear the Traffic from a Resource in an ODU Group Controller

Perform this task to clear the traffic from a resource in an odu group controller.

Procedure

Step 1 **configure**

Step 2 **odu-group {mp | te} group id-of-the-odu-group-mp | te clear odu-dest** *name-of-the-controller Rack/Slot/Instance/Port*

Example:

```
RP/0/RP0:hostname Router# controller odu-group-mp 1 manual odu-dest odu0 0/0/0/1
```

Clears the traffic from the ODU0 controller in a network

Step 3 **commit**

Aggregation of Traffic in OTN

An OTN circuit carries multiple data streams from various sources. It also carries non-OTN data streams (SONET) coming at any rate. These multiple data streams from various sources are combined and transmitted over a single data stream and this is done through multiplexers.

During multiplexing, various weak data streams are converted into a single strong data stream and then a de-multiplexer is used to transmit the data in their respective formats to the destination. This entire process is called OTN aggregation.

Remove and Install Fabric Card Using System Admin Prompt

Before you begin

A card should be inserted on the chassis before you remove it or plug it to another chassis.

Procedure

Step 1 **controllers fabric plane** ***plane-id*** **shutdown**

Example:

```
sysadmin-vm: 0_RP0 # conf t
```

Enters the configuration mode terminal.

Example:

```
sysadmin-vm: 0_RP0 # controller fabric plane 3 shutdown
```

Example:

```
sysadmin-vm: 0_RP0 # commit
```

Step 2 Remove the card physically.

Step 3 Insert the card manually.

Example:

```
sysadmin-vm: 0_RP0(config) # show controller sfe driver rack 0
```

When the output of this command displays DONE and NRML entry for all the fabric cards, perform the next step. Else, there might be traffic loss.

Example:

```
+-------------------------------------------------------------------------------+
| Asic inst.|card|HP|Asic| Admin|plane| Fgid| Asic State |DC| Last  |PON|HR |
|  (R/S/A)  |pwrd|  |type| /Oper|/grp | DL  |            |  | init  |(#)|(#)|
+-------------------------------------------------------------------------------+
| 0/FC3/0   | UP | 1|s123| UP/UP| 3/A | DONE| NRML       | 0| PON   |  1|  0|
| 0/FC3/1   | UP | 1|s123| UP/UP| 3/A | DONE| NRML       | 0| PON   |  1|  0|
| 0/FC3/2   | UP | 1|s123| UP/UP| 3/A | DONE| NRML       | 0| PON   |  1|  0|
+-------------------------------------------------------------------------------+
```

Step 4 **no controllers fabric plane *plane-id* shutdown**

Example:

```
sysadmin-vm: 0_RP0(config) # no controller fabric plane 3 shutdown
```

Restarts the admin plane for fabric card.

Example:

```
sysadmin-vm: 0_RP0 # commit
```

Upgrade to 400G Fabric Card Using IOS XR

This task enables the user to upgrade from a 200G fabric card (NCS4016-FC-M) to a 400G fabric card (NCS4016-FC2-M). Mixed mode (where 200G and 400G fabric cards co-exist) is recommended only while performing the upgrade. The user is required to upgrade all the FCs to 400G before making any configuration change(s).

Before you begin

The prerequisites before starting with the upgrade procedure are:

- Check for error-free traffic for at least five minutes.
- Verify the status of all the planes using the **show controller fabric plane all** command; the administration and the operational states should be displayed as **UP**.

```
sysadmin-vm:0_RP0# show controller fabric plane all
Mon Mar  14 06:50:33.720 UTC

Plane Admin Plane  Plane  up->dn  up->mcast
Id    State State  Mode   counter   counter
--------------------------------------
0     UP    UP       SC          0         0
1     UP    UP       SC          0         0
2     UP    UP       SC          0         0
3     UP    UP       SC          0         0
```

Procedure

Step 1 **admin**

Enters the administration mode.

Step 2 **config**

Enters the configuration mode.

Step 3 **controller fabric plane** *plane-id*

Example:

```
sysadmin-vm:0_RP0(config) # controller fabric plane 0
```

Checks the current state of the fabric plane. The fabric plane of the desired card needs to be shutdown before the upgrade. For example, if the selected FC is FC0, plane 0 needs to be shutdown.

Step 4 **shutdown**

Example:

```
sysadmin-vm:0_RP0(config-plane-0) # shutdown
```

Shuts down the fabric plane.

Step 5 **commit**

Step 6 **hw-module shutdown location** *card-location*

Example:

```
sysadmin-vm:0_RP0(config) # hw-module shutdown location 0/FC0
```

Powers down the card.

Note It is mandatory to use the **commit** command after this step to power down the card.

Step 7 **commit**

Step 8 Remove the existing 200G FC and replace it with a 400G FC.

Step 9 **no hw-module shutdown location** *card-location*

Example:

```
sysadmin-vm:0_RP0(config) #  no hw-module shutdown location 0/FC0
```

Powers on the card.

Note It is mandatory to use the **commit** command after this step to power on the card.

Step 10 **commit**

Step 11 **exit**

Exits the configuration mode.

Step 12 **show platform**

Example:

```
sysadmin-vm:0_RP0 # show platform
```

Verify that the newly inserted FC is in operational state.

```
Location Card Type     HW State    SW State Config State
------------------------------------------------------------------------------
0/0      NCS4K-20T-O-S OPERATIONAL N/A      NSHUT
0/1      NCS4K-20T-O-S OPERATIONAL N/A      NSHUT
0/2      NCS4K-20T-O-S OPERATIONAL N/A      NSHUT
0/3      NCS4K-20T-O-S OPERATIONAL N/A      NSHUT
0/4      NCS4K-20T-O-S OPERATIONAL N/A      NSHUT
```

```
0/5      NCS4K-20T-O-S OPERATIONAL N/A      NSHUT
0/6      NCS4K-20T-O-S OPERATIONAL N/A      NSHUT
0/7      NCS4K-20T-O-S OPERATIONAL N/A      NSHUT
0/8      NCS4K-24LR-O-S OPERATIONAL N/A     NSHUT
0/9      NCS4K-24LR-O-S OPERATIONAL N/A     NSHUT
0/10     NCS4K-2H-O-K OPERATIONAL   N/A     NSHUT
0/11     NCS4K-2H-O-K OPERATIONAL   N/A     NSHUT
0/12     NCS4K-2H10T-OP-KS OPERATIONAL N/A  NSHUT
0/13     NCS4K-2H10T-OP-KS OPERATIONAL N/A  NSHUT
0/14     NCS4K-2H10T-OP-KS OPERATIONAL N/A  NSHUT
0/15     NCS4K-2H10T-OP-KS OPERATIONAL N/A  NSHUT
0/RP0    NCS4K-RP OPERATIONAL OPERATIONAL   NSHUT
0/RP1    NCS4K-RP OPERATIONAL OPERATIONAL   NSHUT
0/FC0    NCS4016-FC2-M OPERATIONAL    N/A   NSHUT
0/FC1    NCS4016-FC2-M OPERATIONAL    N/A   NSHUT
0/FC2    NCS4016-FC2-M OPERATIONAL    N/A   NSHUT
0/FC3    NCS4016-FC2-M OPERATIONAL    N/A   NSHUT
0/CI0    NCS4K-CRAFT OPERATIONAL      N/A   NSHUT
0/FT0    NCS4K-FTA OPERATIONAL        N/A   NSHUT
0/FT1    NCS4K-FTA OPERATIONAL        N/A   NSHUT
0/PT1    NCS4K-AC-PEM OPERATIONAL     N/A   NSHUT
0/EC0    NCS4K-ECU OPERATIONAL        N/A   NSHUT


For a specific FC, we can use:
show platform | include 0/FC0

0/FC0 NCS4016-FC2-M OPERATIONAL N/A NSHUT
```

Step 13 **show hw-module location** *location* **fpd**

Example:

```
sysadmin-vm:0_RP0 # show hw-module location 0/FC0 fpd
```

Verify to check the status of the FPDs.

```
FPD Versions
===============
Location Card type  HWver FPD device ATR Status Run Programd
--------------------------------------------------------------------------------
0/FC0 NCS4016-FC2-M 0.1 CCC-FPGA     NEED UPGD 1.12 1.12
0/FC0 NCS4016-FC2-M 0.1 CCC-Power-On CURRENT   1.01 1.01
0/FC0 NCS4016-FC2-M 0.1 PLX-8649     CURRENT 0.08 0.08
```

Note The **NEED UPGD** keyword in the Status column indicates that an FPD upgrade is required. To update an FPD, use the **upgrade hw-module location** *location* **fpd** *fpd-name* command.

Step 14 **config**

Enters the configuration mode.

Step 15 **controller fabric plane** *plane-id*

Example:

```
sysadmin-vm:0_RP0 (config) # controller fabric plane 0
```

Allows the user to perform further configurations on the selected plane.

Step 16 **no shutdown**

Example:

```
sysadmin-vm:0_RP0(config-plane-0) # no shutdown
```

Brings up the fabric plane again.

Step 17 **commit**

Step 18 **exit**

Exits the configuration mode.

Step 19 **show controller fabric plane all**

Example:

```
sysadmin-vm:0_RP0 # show controller fabric plane all
```

Verification to check if the fabric plane status is displayed as **UP**.

What to do next

Repeat the above procedure to upgrade the remaining fabric cards.

Daisy Chain on Management Ports

Table 2: Feature History

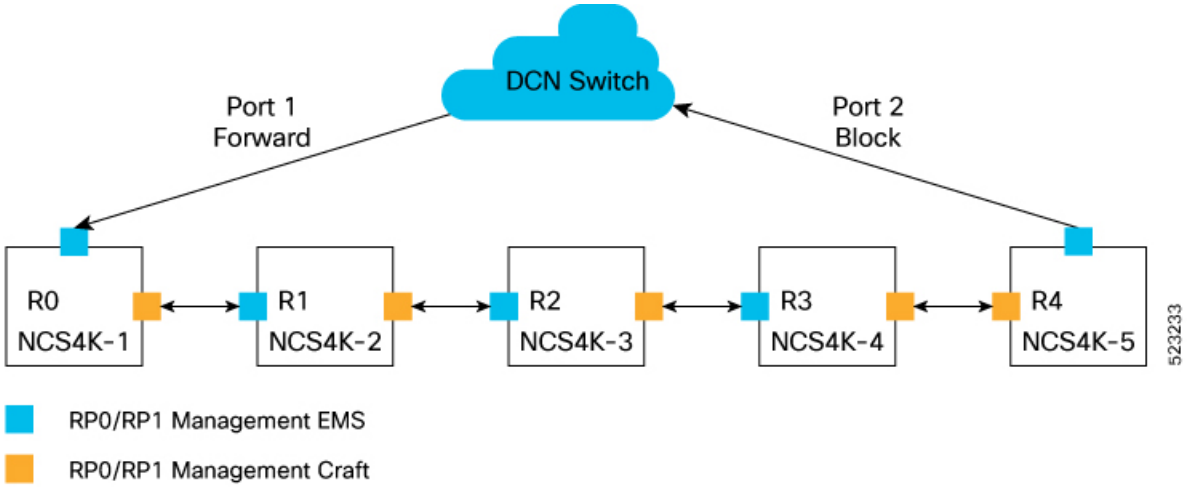
Feature Name	Release Information	Description
Daisy Chain Support on NCS 4000	Cisco IOS XR Release 6.5.33	Typically the NCS 4000 devices are connected to a switch requiring 1-to-1 connections. From this release, it will be possible to have a Daisy Chain topology. Here multiple NCS 4000 devices are connected to form a chain-like structure, and only the first and last nodes are connected to a switch, thereby reducing the number of connections. Also, there is more redundancy as data is transmitted in both directions. The first connection acts as a primary path and carries the traffic whereas the last connection acts as a backup path. If the primary connection fails, the backup path is activated which allows traffic to continue to transmit in the network.

The daisy chain arrangement allows multiple NCS 4000 nodes to be connected to each other in a ring, where the first and last nodes are connected to a switch. The switch allows management of all the NCS4000 devices in the network and also prevents traffic storm. This arrangement allows the switch to transmit data in both directions and prevents one node failure from cutting off certain network parts.

Note When the EMS or Craft management interface is administratively shutdown using the **shutdown** command, the peer router interface does not go down due to HW limitation.

The following diagram shows the Daisy Chain topology where five NCS 4000 nodes are connected to each other over the EMS and CRAFT management ports.

Figure 1: NCS4K in a Daisy Chain Network



Configuring Daisy Chain on NCS 4000 involves the following tasks:

Configure Daisy Chain on Switch

You must configure the switch by connecting the switch ports to the head and tail nodes of the NCS4K device before configuring all the NCS4K devices in a daisy chain network. To configure Daisy Chain on switch, follow these steps:

Before you begin

The following prerequisites must be met before configuring Daisy chain on NCS4000:

- Enable Storm Control on Switch.
- STP must be running on the TOR switch.
- Management port 0 must not be in shut down state and must be configured with either IPv4 address.
- Management port 1 must not be configured with IP address.
- Daisy chain must be enabled on all the NCS4000 devices in the topology.

Procedure

Step 1 To connect the port 1/0/1 of the switch with the head node of the NCS4K device, perform these steps:

a) **interface** *type* **Rack/Slot/Instance/Port**

Example:

```
RP/0/RP0:switch(config)# interface gigabitethernet 0/1/0/1
```

Sets 0/1/0/1 as Gigabit Ethernet port and enters the port configuration mode.

b) **switchport access vlan** *vlan-id*

Example:

```
RP/0/RP0:switch(config)# switchport access vlan 1526
```

Configures the VLAN id 1526 for which this access port carries the traffic.

c) **switchport mode** *mode*

Example:

```
RP/0/RP0:switch(config)# switchport mode access
```

Specifies the Ethernet port as an access port.

Step 2 To connect the port 1/0/2 of the switch with the tail node of the NCS4K device, perform these steps:

a) **interface** *type* **Rack/Slot/Instance/Port**

Example:

```
RP/0/RP0:switch(config)# interface gigabitethernet 0/1/0/2
```

Sets 0/1/0/2 as Gigabit Ethernet port and enters the interface configuration mode.

b) **switchport access vlan** *vlan-id*

Example:

```
RP/0/RP0:switch(config)# switchport access vlan 1526
```

Configures the VLAN id 1526 for which this access port carries the traffic.

c) **switchport mode** *mode*

Example:

```
RP/0/RP0:switch(config)# switchport mode access
```

Specifies the Ethernet port as an access port.

Step 3 To configure the management ports, perform these steps:

a) **interface** *type* **Rack/Slot/Instance/Port**

Example:

```
RP/0/RP0:switch(config)# interface gigabitethernet 0/1/0/24
```

Sets 0/1/0/24 as Gigabit Ethernet port and enters the interface configuration mode.

b) **switchport access vlan** *vlan-id*

Example:

```
RP/0/RP0:switch(config)# switchport access vlan 1526
```

Configures the VLAN id 1526 for which this access port carries the traffic.

Step 4 To configure the vlan port, perform these steps:

a) **interface** *type* **Rack/Slot/Instance/Port**

Example:

```
RP/0/RP0:switch(config)# interface vlan 1526
```

Sets 1526 as VLAN port and enters the interface configuration mode.

b) **ip address** *addresssubnet-mask*

Example:

```
RP/0/RP0:switch(config)# ip address 10.0.24.32 255.255.255.224
```

Configures the ip address 10.0.24.32 on the CRAFT port of the head node.

For more details about these commands, see the Cisco Nexus 9000 Series NX-OS Command Reference guide.

Configure Daisy Chain on NCS 4000

After configuring Daisy Chain on switch, you need to configure daisy chain on the NCS 4000 devices. To configure Daisy Chain on NCS 4000, follow these steps:

Procedure

Step 1 To assign IP address to the EMS port of slot RP0, perform these steps:

a) **interface** *type* **Rack/Slot/Instance/Port**

Example:

```
RP/10/RP0:ios(config)#interface MgmtEth0/RP0/EMS/0
```

b) **no shutdown**

Example:

```
RP/10/RP0:ios(config-if)#no shut
```

c) **ipv4 address odu**

Example:

```
RP/10/RP0:ios(config-if)#ipv4 address 192.168.1.12/16
```

Step 2 To configure the CRAFT port of slot RP0, perform these steps:

a) **interface** *type* **Rack/Slot/Instance/Port**

Example:

```
RP/0/RP0:Node-41(config)#interface  MgmtEth0/RP0/CRAFT/0
```

b) **bridge-port routed-interface** *type***Rack/Slot/Instance/Port**

Example:

```
RP/0/RP0:Node-41(config-if)#bridge-port routed-interface MgmtEth0/RP0/EMS/0
```

c) **no shutdown**

Example:

```
RP/0/RP0:Node-41(config-if)#no shutdown
```

Step 3 To assign IP address to the EMS port of slot RP1, perform the step 1.

Step 4 To configure the CRAFT port of slot RP1, perform the step 2.

For more details about these commands, see the Daisy Chain Network Command Reference section of Command Reference for Cisco NCS 4000 Series guide.