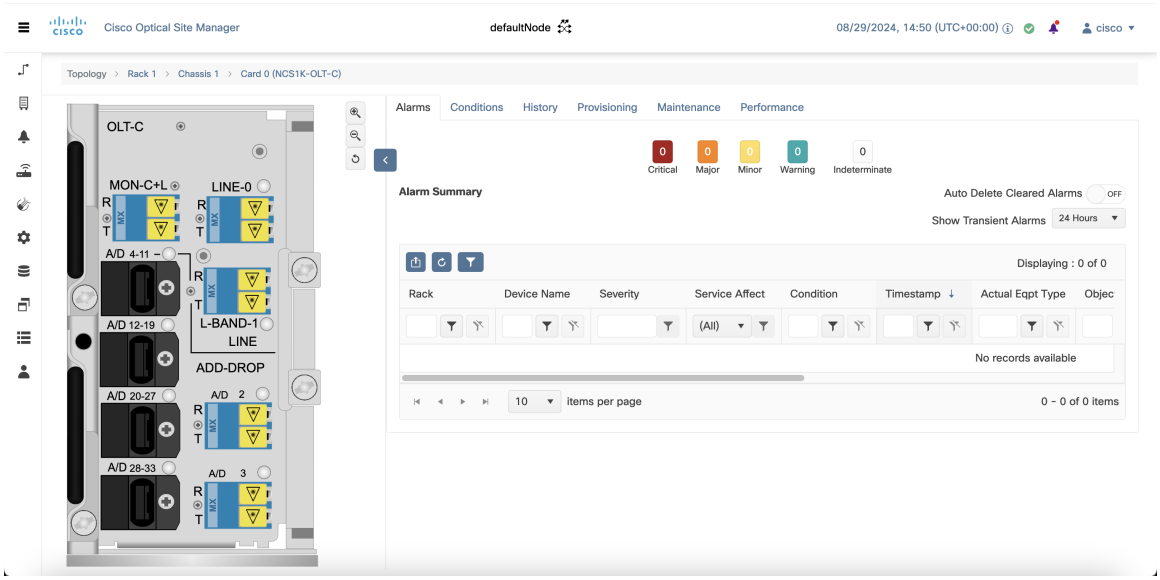


Provision Line Cards

This chapter describes the tasks related to provisioning the Cisco NCS 1000 line cards in Cisco Optical Site Manager.

Figure 1: Provision Line Cards



- Supported NCS 1000 line cards, on page 2
- Configure the administrative state of Pluggable Port Modules and line cards, on page 3
- Open the card view, on page 3
- Provision an NCS 1000 or NCS 2000 card, on page 4
- NCS 1000 line card modes, on page 5
- Configuring card modes for NCS 2000 line cards, on page 18
- Reset a line card, on page 28
- Provision SONET or SDH trace monitoring, on page 29
- Provision trail trace monitoring, on page 30
- Provision ODU interfaces, on page 32
- Provision OTU interfaces , on page 33
- Provision Ethernet interfaces, on page 35
- Provision SONET or SDH Interfaces, on page 37

• Provision optical channels, on page 40
• Change Trunk Port Parameters, on page 43
• Provision optical threshold settings, on page 43
• Configure G.709 thresholds , on page 45
• Provision FEC thresholds, on page 46
• Configure RMON thresholds, on page 47
• Configure loopback interfaces, on page 48
• Configure optical safety, on page 49
• Configure thresholds for SONET or SDH, on page 51
• Enable attention LED, on page 52
• PSM card protection mechanism, on page 54
• View performance monitoring parameters, on page 56
• SVO Card, on page 57
• View UDC details, on page 62
• View Insertion Loss Parameters, on page 63
• Manage the Protection Group, on page 63
• Provisioning Optical Amplifier Cards, on page 65
• Retrieve MAC Addresses through LLDP, on page 73
• Provision FPD Upgrade for the Ports, on page 74
• Provision FPD Upgrade for MR-MXP Card, on page 75
• Enable Proactive Protection, on page 76
• Provision ODU Circuit, on page 78
• Functional Module Group, on page 79
• Provision ZR Plus Interfaces, on page 82
• Provision ZR Plus Interfaces, on page 83
• Provision ZR Plus Trail Trace Monitoring, on page 84
• Provision ZR Plus Trail Trace Monitoring, on page 84
• Provision Pluggable Ports, on page 85
• View Circuit Protection Parameters, on page 86
• NCS 2000 Cards, on page 88

Supported NCS 1000 line cards

Cisco Optical Site Manager supports configuration and management of line cards for these NCS 1000 devices.

- Cisco NCS 1014
- Cisco NCS 1010
- Cisco NCS 1004
- Cisco NCS 1001

For detailed information about the supported cards, refer to these topics:

- Cisco NCS 1014
- Cisco NCS 1010

- Cisco NCS 1004
- Cisco NCS 1001

Configure the administrative state of Pluggable Port Modules and line cards

Use this task to configure the administrative state of ports on Pluggable Port Modules (PPM) and line cards.

Pluggable port modules extend the port capacity of line cards in Cisco Optical Site Manager.

You can provision ports on PPM or line cards by setting their administrative state, which determines whether the ports are operational or shut down.

- Administrative state changes take effect immediately after the configuration is applied.

Before you begin

- Log into Cisco Optical Site Manager
- Open the card view, on page 3

Follow these steps to provision PPM ports or a line card in Cisco Optical Site Manager.

Procedure

Step 1 Click the **Provisioning** tab.

Step 2 Click the **Pluggable Port Modules** section to expand it.

Step 3 Click **Edit**.

The fields in the table become editable.

Step 4 Select an administrative state from the **Admin State** column and click **Apply**.

Alternatively, you can also right-click a PPM or a line card in the rack from the **Topology** page, and choose **Change Admi State** to change the administrative state.

The ports on the pluggable port module or line card become operational or non-operational based on the selected administrative state.

Open the card view

Access detailed information and manage specific line cards within a rack or chassis.

Opening a card in Cisco Optical Site Manager allows you to:

- View detailed information about the card, including its status, type, alarms, and ports.

- Access various tabs for managing the card such as Alarms, Conditions, History, Circuits, Provisioning, Maintenance, Performance, and Inventory.
- Perform card-specific maintenance and provisioning tasks, including configuring ports, circuits, thresholds, and optical parameters.

Before you begin

Log into Cisco Optical Site Manager

Follow these steps to open a card:

Procedure

Step 1 Click **Topology**.

The **Topology View** page appears.

Step 2 Right-click the card from the rack view and select **Open Card**.

Alternatively, you can double-click the card to open the card view.

The card opens and displays its details in the right panel.

The right panel displays these tabs, which provide access to various management functions.

Tab	Description
Alarms	Lists current alarms (Critical, Major, Minor) for the card or node and updates them in real time.
Conditions	Displays a list of standing conditions on the card or node.
History	Provides a history of alarms including date, type, severity, and object.
Provisioning	Provides configuration options for the card or node, depending on the card type (for example, line thresholds or optics).
Maintenance	Performs maintenance tasks specific to the card or node.

Provision an NCS 1000 or NCS 2000 card

Add a card from the chassis view by using the provisioning option that matches the card configuration.

- Add a card without configuring a card mode.
- Add an NCS 2000 line card and configure the card mode by using the Card Configuration Wizard.

Use **Module Provision** to add an NCS 1000 or NCS 2000 card without assigning a card mode.

Use **Advanced Provision** to add an NCS 2000 line card with a specific operating mode or sub operating mode. The Card Configuration Wizard shows the supported card-mode options based on the primary module that you select.

Before you begin

- Log in to Cisco Optical Site Manager. For more information, see Log in to Cisco Optical Site Manager.
- Open the chassis or card view for the device.

Follow these steps to provision an NCS 1000 or NCS 2000 card.

Procedure

Step 1 Right-click the empty slot where you want to add the card.

Step 2 Choose how to provision the card.

Table 1: Card provisioning options

If...	Then...
You want to add a card without configuring a card mode	**a.** Select **Module Provision**. **b.** Select the required card from the **Select Module** drop-down list. **c.** Click **Provision**.
You want to add an NCS 2000 line card and configure a card mode	**a.** Select **Advanced Provision**. **b.** On the **Add Primary Module** page, select a card from the **Primary Module** drop-down list, and click **Next**. **c.** Complete the card-mode workflow. For details, see Configuring card modes for NCS 2000 line cards, on page 18.

Cisco Optical Site Manager adds the card to the selected chassis slot. If you used **Advanced Provision**, the card uses the card-mode configuration that you completed in the Card Configuration Wizard.

What to do next

Verify that the card appears in the chassis view with the expected inventory and operational state.

NCS 1000 line card modes

Use this information to identify supported Cisco NCS 1000 line card modes and related Cisco Optical Site Manager configuration requirements.

These tables summarize the card mode feature additions for NCS 1000 and related cards across recent releases.

Table 2: Features introduced in R25.4.1

Feature Name	Release Information	Description

Support for NCS1K14-EDFA2 card in Cisco Optical Site Manager	Cisco IOS XR Release 25.4.1	Cisco Optical Site Manager now supports the NCS1K14-EDFA2 card. To use the EDFA2 card, set the optical type to ROADM. The EDFA2 card supports these pluggables and passive modules: • ONS-SC-PTP-1510: Optical Supervisory Channel (OSC) pluggable • ONS-QSFP-OTDR: Optical Time-Domain Reflectometer (OTDR) pluggable • DP01QSDD-ZT5-A1: Coherent probe pluggable • NCS1K-MD-32O-CE: 32-channel Odd Mux/Demux Patch Panel, C-band Enhanced • NCS1K-MD-32E-CE: 32-channel Even Mux/Demux Patch Panel, C-band Enhanced This integration enables comprehensive Operations, Administration, and Maintenance (OAM) capabilities for the card within Cisco Optical Site Manager. The Cisco Optical Site Manager supports only these capabilities: • Inventory • Alarms and alarm history • Provisioning (Amplifier, ZRPlus Interfaces, Interface, Ethernet Interfaces, and Optical Channel) • Performance monitoring and TCA (Threshold crossing alerts) • Maintenance (Live Data, Environmental Monitoring, and Power Monitoring) • Optical Degrees, Internal patchcord (IPCs), Network Function Virtualization (NFV)
Additional Trunk Rates for the NCS1K14-2.4T-X-K9 Card	Cisco IOS XR Release 25.4.1	The **Select Card Mode** page of the **Card Configuration Wizard** has been updated to configure these trunk rates in the muxponder mode for 2x100-GE client traffic: • 400G • 500G • 600G

Table 3: Features introduced in R25.4.1

Feature Name	Release Information	Description

Support for NCS1K14-EDFA2 card in Cisco Optical Site Manager	Cisco IOS XR Release 25.4.1	Cisco Optical Site Manager now supports the NCS1K14-EDFA2 card. To use the EDFA2 card, set the optical type to ROADM. The EDFA2 card supports these pluggables and passive modules: • ONS-SC-PTP-1510: Optical Supervisory Channel (OSC) pluggable • ONS-QSFP-OTDR: Optical Time-Domain Reflectometer (OTDR) pluggable • DP01QSDD-ZT5-A1: Coherent probe pluggable • NCS1K-MD-32O-CE: 32-channel Odd Mux/Demux Patch Panel, C-band Enhanced • NCS1K-MD-32E-CE: 32-channel Even Mux/Demux Patch Panel, C-band Enhanced This integration enables comprehensive Operations, Administration, and Maintenance (OAM) capabilities for the card within Cisco Optical Site Manager. The Cisco Optical Site Manager supports only these capabilities: • Inventory • Alarms and alarm history • Provisioning (Amplifier, ZRPlus Interfaces, Interface, Ethernet Interfaces, and Optical Channel) • Performance monitoring and TCA (Threshold crossing alerts) • Maintenance (Live Data, Environmental Monitoring, and Power Monitoring) • Optical Degrees, Internal patchcord (IPCs), Network Function Virtualization (NFV)
Additional Trunk Rates for the NCS1K14-2.4T-X-K9 Card	Cisco IOS XR Release 25.4.1	The **Select Card Mode** page of the **Card Configuration Wizard** has been updated to configure these trunk rates in the muxponder mode for 2x100-GE client traffic: • 400G • 500G • 600G

Table 4: Features introduced in R25.3.1

Feature Name	Release Information	Description

Additional Card Modes for OTN-XP Card	Cisco IOS XR Release 25.3.1	The **Card Configuration Wizard** now supports configuring these card modes for NCS1K4-OTN-XP card: • 400G-TXP-DD • 4x100GE-MXP-DD • OTU-CN-REGEN

Table 5: Features introduced in R25.1.1

Feature Name	Release Information	Description
Additional Trunk Rates for the NCS1K14-2.4T-X-K9 Card	Cisco IOS XR Release 25.1.1	The **Select Card Mode** page of the **Card Configuration Wizard** has been updated to configure these trunk rates in the muxponder mode for 2x100-GE client traffic: • 800G • 900G • 1000G • 1100G
Additional Card Modes for OTN-XP Card	Cisco IOS XR Release 25.1.1	The **Card Configuration Wizard** now supports configuring these card modes for NCS1K4-OTN-XP card: • FC-MXP • MXP-4x100G-TXP-400G with 400GE and 100GE/OTU4 client rates Additionally, you can configure the OC192 and STM64 client datarates for the MXP-40X10G-4X100G card mode in the 40x10G HM configuration.
Support for 1.2T Cards	Cisco IOS XR Release 25.1.1	The **Card Configuration Wizard** now supports configuration of card mode for these cards: • NCS1K4-1.2T-K9 • NCS1K4-1.2TLCW-K9

Feature Name	Release Information	Description

Support for NCS 2000 Cards	Cisco NCS 2000 Release 25.1.1	The **Card Configuration Wizard** now supports these cards and their operating modes:
		• 10x10G-LC
		  • TXP-10G
		  • RGN-10G
		• 10x10G + 200G-CK-C
		  • MXP-10x10G
		• 200G-CK-C
		  • TXP-100G
		  • RGN-100G
		• 400G-XP-LC
		  • MXP
		  • RGN-100G
		  • RGN-200G
		• NCS2K-1.2T-MXP
		  • TXPMXP

Table 6: Features introduced in R24.3.1

Feature Name	Release Information	Description
Additional Card Mode and Trunk Rates for the NCS1K4-OTN-XP Card	Cisco IOS XR Release 24.3.1	The **Select Card Mode** page of the **Card Configuration Wizard** is updated to include the **1.2T Splitted** configuration on the **Trunk 0** port. You can also use the wizard to configure these trunk rates in the muxponder mode: • 100-GE client traffic for 600-G and 1000-G • 500-G and 900-G

Feature Name	Release Information	Description
Support for NCS 1004 Card and Card Modes	Cisco IOS XR Release 24.3.1	The **Card Configuration Wizard** now supports configuring these card modes for NCS1K4-OTN-XP cards: • 10G-GREY-MXP • 40x10G-4x100G-MXP You can also use the wizard to configure card mode for the NCS1K4-2-QDD-C-K9 card.

Table 7: Features introduced in R24.1.1

Feature Name	Release Information	Description
Card Configuration Wizard Enhancements	Cisco IOS XR Release 24.1.1	The **Card Configuration Wizard** is updated to select the **MXP-1K** muxponder mode supported by the new NCS1K14-2.4T-X-K9 card.

You can use the add card mode feature in Cisco Optical Site Manager to configure NCS 1000 line cards. The configuration performed through the Card Configuration Wizard in Cisco Optical Site Manager allows you to:

- Select the card mode for NCS 1000 line cards
- Set trunk and client data rates tailored to your network requirements.
- Add internal patch cords by specifying ports and chassis details to establish virtual links.
- Configure trunk details including administrative state, frequency, baud rate, bits per symbol, and rate.
- Verify all configuration details in a recap window before applying the settings to ensure accuracy.

Configuring card modes

You can configure NCS 1000 line cards in various operational modes, such as Muxponder and Slice configurations. These modes determine how the line card processes data and manages traffic, enabling efficient client-to-trunk mapping.

Summary

The process is performed using the **Card Configuration Wizard** within Cisco Optical Site Manager. Card Configuration Wizard guides you through selecting the card mode, setting trunk and client data rates, adding internal patch cords, configuring trunk details, and verifying the configuration.

Workflow

Perform these tasks to add a card mode using the **Card Configuration Wizard** in Cisco Optical Site Manager:

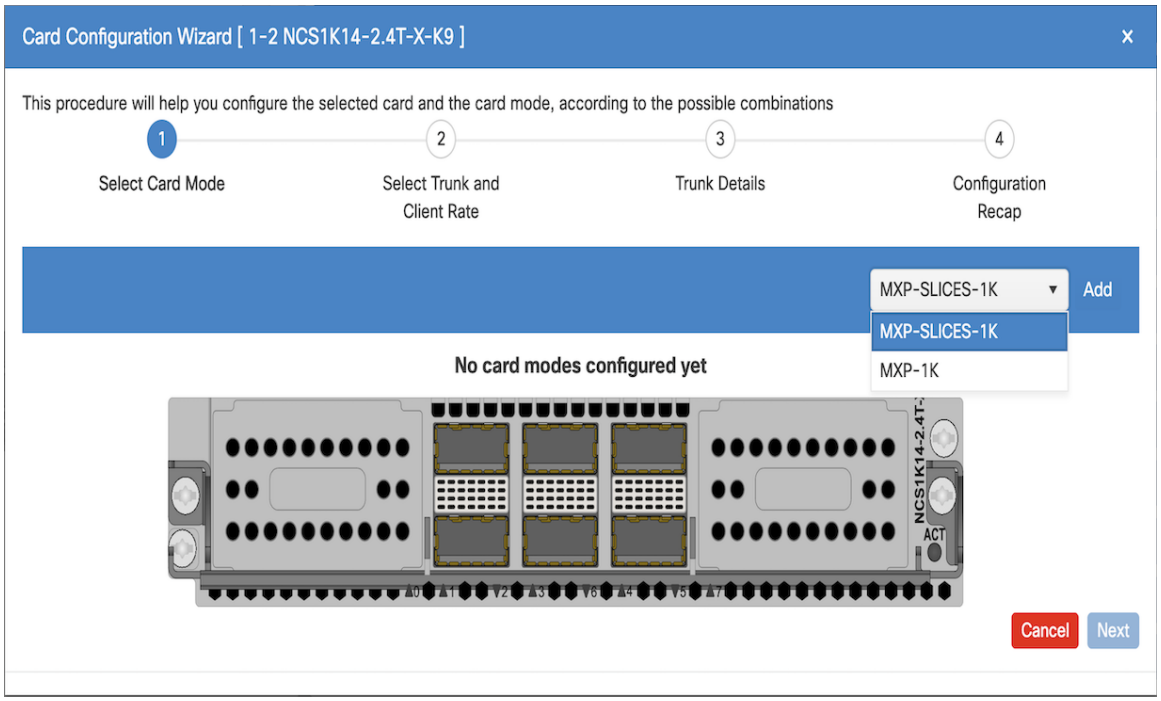
1. Select a card mode, on page 11
2. Select trunk and client data rate, on page 12
3. Add Internal Patch Cords, on page 14

   The Internal PC page is available only when the optical type is configured as ROADM.
4. Add trunk details, on page 15
5. Verify configuration details, on page 17

Select a card mode

The **Select Card Mode** in the Cisco Optical Site Manager **Card Configuration Wizard** allows you to choose from various card modes available for a line card.

Figure 2: Select card mode



Before you begin

Log into Cisco Optical Site Manager

Follow these steps to enter into the **Card Configuration Wizard** and select a card mode.

Procedure

Step 1 Open the **Card Configuration Wizard** in any of these ways.

From rack or card view	From the tabbed view
a. Right-click a line card. **b.** Click **Card Mode**. **c.** Select **Install**.	**a.** Click the **Provisioning** tab. **b.** Click the **Card Modes** section to expand it. **c.** Click the **Add Card mode** button.

Step 2 Select the card mode from the drop-down list and click **Add**.

Table 8: Supported card modes

For details on card modes for	refer to
NCS 1014	Configuring the Card Mode on NCS 1014 Line Cards
NCS 1004	Configuring the Card Mode on NCS 1004 Line Cards

Step 3 Click **Next**.

The card mode is added

What to do next

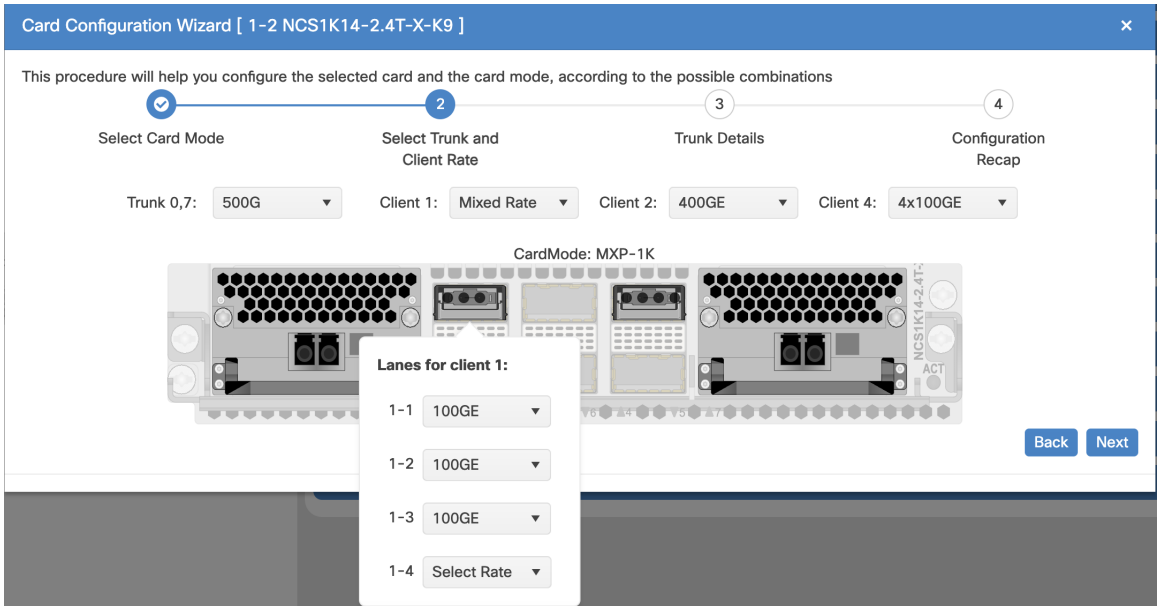
Select the Trunk and Client Data Rates.

Select trunk and client data rate

Use this task to select the trunk and client data rates for a card mode configured on an NCS 1000 line card. This step defines how the line card processes data and manages traffic efficiently.

This configuration helps you map client traffic to trunk ports and supports various card modes, including Muxponder and Slice configurations.

Figure 3: Select Trunk and Client Data Rate



Before you begin

Select a card mode, on page 11

Follow these steps to select the trunk and client port data rates in the **Card Configuration Wizard**.

Procedure

Step 1 Select the trunk data rate from the **Trunk** drop-down list.
The **Client** drop-down lists are displayed.

Step 2 Select the client data rates using one of these ways:

Table 9: Client data rate options

For mixed client data rate for client ports	For same client data rate for all client ports
From the **Client** drop-down lists, select the same data rate for each client port.	**a.** From the **Client** drop-down lists, select **Mixed Rate**. **Mixed rate configuration** information message is displayed. **b.** Close the message box. **c.** Right-click the lane in the line card image and select the data rate from the available drop-down lists.

Step 3 Click **Next**.

The system configures the trunk and client data rates for the selected card mode and maps client traffic as specified.

What to do next

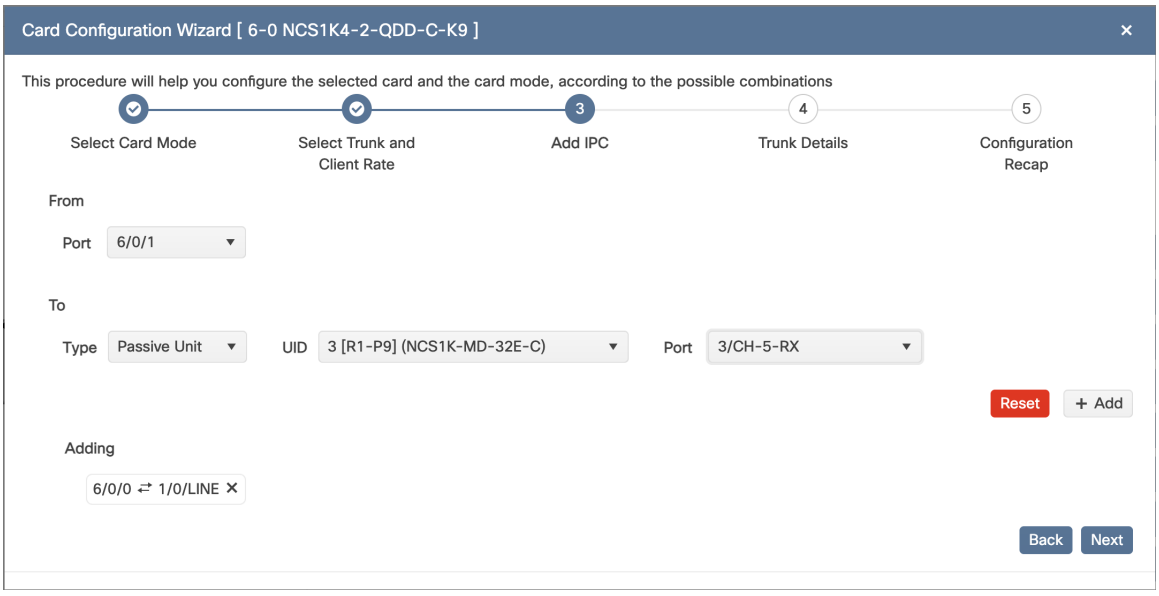
If optical type is	then
txp	Add trunk details, on page 15
roadm	Add Internal Patch Cords, on page 14

Add Internal Patch Cords

You add Internal Patch Cords to establish internal connections that optimize data flow to enable efficient client-to-trunk mapping. IPC links trunk and client ports across line cards. They are necessary when the optical type is set to ROADM.

This task involves creating IPC that are virtual links between network termination points, such as OSC ports, transponder or muxponder trunk ports, line ports, and passive device ports within the node.

Figure 4: Add IPC



Before you begin

Select trunk and client data rate, on page 12

Follow these steps to add IPC in the **Card Configuration Wizard**.

Note **Add IPC** page is only available if optical type is configured as *roadm*.

Procedure

Step 1 Select the port from the **Port** drop-down list in the **From** section.

Step 2 In the **To** section, perform these steps:

Use this table to choose the correct option based on your need:

Table 10: IPC drop-down lists displayed based on device type

To create an IPC for a	Select an option from these drop-down lists
• **Chassis** • **Passive Chassis**	• **UID** • **Slot** • **Port**
Passive Unit	• **UID** • **Port**

Step 3 Click the **Add** button.

Step 4 (Optional) Remove the internal patch cord using one of these methods:

- To remove a single internal patch cord, click the cross (x) icon next to the internal patch cord under the **Adding** section.
- To remove all added internal patch cords, click the **Reset** button.

Step 5 Click **Next**.

The IPC are added and displayed.

What to do next

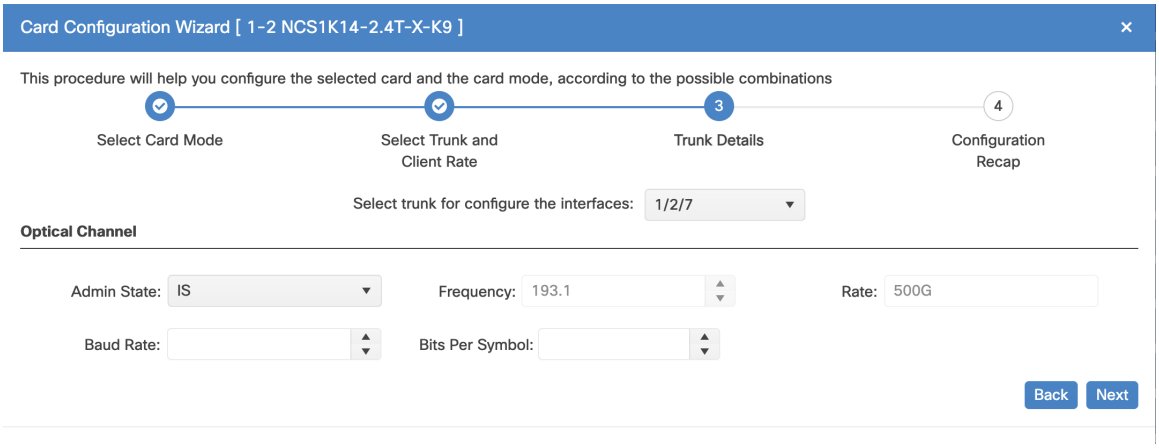
Add the Trunk Details to configure the interfaces.

Add trunk details

Add trunk details to specify trunk interface parameters. These parameters help establish trunk connections, enabling efficient data transport and client-to-trunk mapping.

You can configure trunk port details using the **Card Configuration Wizard** for line cards by selecting parameters such as admin state, frequency, application code, baud rate, bits per symbol, and rate.

Figure 5: Add Trunk Details



Before you begin

If optical type is configured as	then ensure
roadm	Add Internal Patch Cords, on page 14
txp	Select trunk and client data rate, on page 12

Follow these steps to add the trunk details in the **Card Configuration Wizard** to configure the interfaces.

Procedure

Step 1 Select the trunk port from the **Select trunk for configure the interfaces** drop-down list.

Step 2 Select these parameters from their corresponding drop-down lists in the **Optical Channel** section:

- **Admin State**
- **Frequency**
- **Baud Rate**

Note Cisco Optical Site Manager displays the Baud Rate value with seven digits after the decimal point.

- **Bits Per Symbol**
- **Rate**

Step 3 Click **Next**.

The trunk details are configured.

What to do next

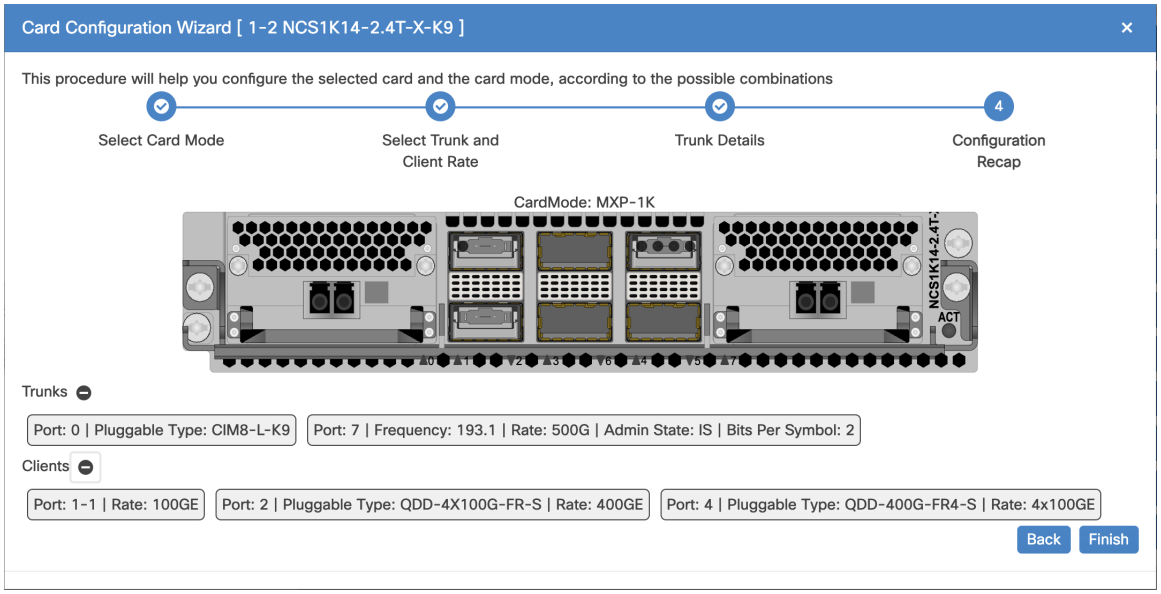
Verify configuration details, on page 17

Verify configuration details

After you add a card mode, verify configuration details to ensure that all selected settings, such as trunk and client configurations, are correct and consistent before adding the card mode.

In the **Card Configuration Wizard**, verify the configuration in the **Configuration Recap** window for the **Trunk** and **Client** sections.

Figure 6: Verify Configuration Details



Before you begin

Add trunk details, on page 15

Follow these steps to verify the card mode configuration details.

Procedure

Step 1 Click to expand the *Trunk* and *Client* sections to verify the configured details.

Step 2 Click **Finish** to add the card mode.

Verifying the configuration details ensures that the card mode is added with the correct parameters.

Edit card mode for NCS 1000 cards

Edit the card mode for NCS 1000 line cards to update the line card configuration to reflect the new trunk and client data rates.

Before you begin

Log into Cisco Optical Site Manager

Follow these steps to edit the trunk and client port data rates for a card mode configured on a for a NCS 1000 line card.

Procedure

Step 1 Open the **Card Configuration Wizard** in any of these ways.

From rack or card view	From the tabbed view
a. Right-click a line card. **b.** Click **Card Mode**. **c.** Select **Install**.	**a.** Click the **Provisioning** tab. **b.** Click the **Card Modes** section to expand it. **c.** Click the **Add Card mode** button.

Step 2 Select the trunk and client data rates.

For more details about selecting trunk and client data rates, see Select trunk and client data rate, on page 12.

The updated trunk and client details are displayed in the **Card Modes** section of the **Provisioning** tab.

Configuring card modes for NCS 2000 line cards

You can configure NCS 2000 line cards in various operational modes, such as Muxponder and Slice configurations. These modes determine how the line card processes data and manages traffic, enabling efficient client-to-trunk mapping.

Summary

Configuring card modes for NCS 2000 line cards enables optimized data processing and traffic management by selecting the operational mode and setting relevant parameters.

- **NCS 2000 line card**: Provides multiple operational modes such as Muxponder and Slice to manage client-to-trunk mapping.
- **Card Configuration Wizard**: A tool within Cisco Optical Site Manager that guides the user through the configuration steps.
- **Cisco Optical Site Manager**: The management interface where the configuration workflow is executed.

For details about the supported card modes for Cisco NCS 2000 cards, including peer-card requirements and client-to-trunk port mappings, see Supported operating modes and port mapping details for NCS 2000 cards, on page 25.

Note When configuring the **MXP-4x100G-TXP-400G** or **10G-Grey-MXP** operation modes on an OTN-XP card via Cisco Optical Site Manager (COSM), consider these synchronization behaviors:

- **Partial configuration (Mode only)**: If you apply the operation mode without defining the associated slice, trunk, or client configurations, the mode will be applied to both COSM and IOS-XR. However, if you later delete this mode from COSM, it will be removed from the COSM interface but will remain in the IOS-XR configuration, resulting in a synchronization discrepancy.
- **Full configuration (Mode + Slice/Trunk/Client)**: If you configure the operation mode alongside its required slice, trunk, and client settings, the deletion process will correctly propagate, removing the configuration from both COSM and IOS-XR.

To maintain configuration integrity and prevent orphaned settings on your device, always include the necessary slice, trunk, and client configurations when setting these operation modes in Cisco Optical Site Manager.

Workflow

The process involves these stages:

1. Select the required card mode for the NCS 2000 line card. For details, see Select a card mode for an NCS 2000 line card, on page 19.
2. Add secondary modules for the selected card mode. For details, see Add secondary modules, on page 21.
3. Add pluggable modules to the required ports. For details, see Add pluggable modules to ports, on page 23.
4. Verify configuration details and complete the wizard. For details, see Verify card configuration details, on page 23.

Result

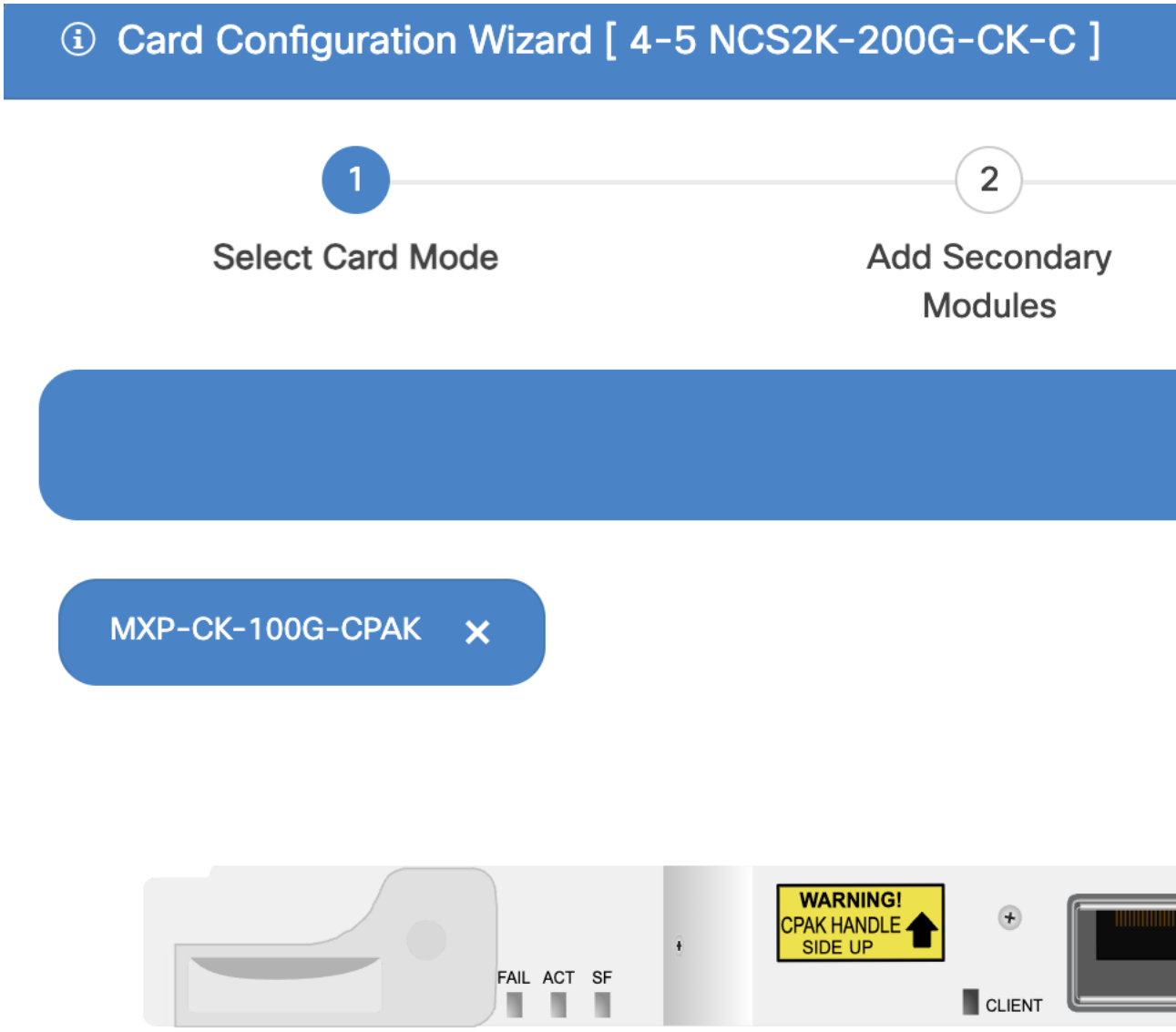
The line card is configured in the selected operational mode.

Select a card mode for an NCS 2000 line card

Set the operational behavior for an NCS 2000 line card. Choose the card mode that matches your deployment requirement.

The **Card Configuration Wizard** in Cisco Optical Site Manager provides an interface for selecting card modes. The selected card mode determines which functions and capabilities are enabled for the line card.

Figure 7: Select card mode



Before you begin

Log into Cisco Optical Site Manager

Follow these steps to open the **Card Configuration Wizard** and select a card mode for an NCS 2000 line card.

Procedure

Step 1 Open the **Card Configuration Wizard** in one of these ways.

From rack or card view	From the tabbed view
a. Right-click a line card. **b.** Click **Card Mode**. **c.** Select **Install**.	**a.** Click the **Provisioning** tab. **b.** Click the **Card Modes** section to expand it. **c.** Click the **Add Card mode** button.

Step 2 From the drop-down list, select the card mode, and then click **Add**.

Step 3 Click **Next**.

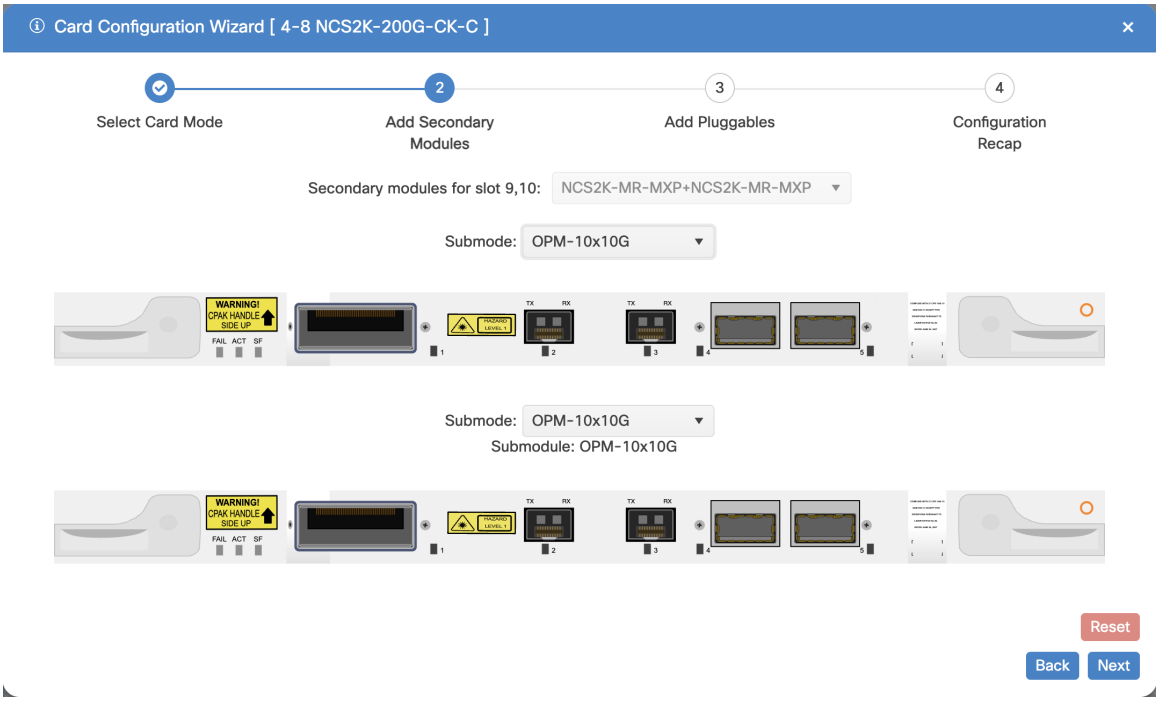
What to do next

Add secondary modules, on page 21

Add secondary modules

Use this task to add a secondary module in the **Card Configuration Wizard** for the selected card mode. A secondary module is an add-on hardware module for the NCS 2000 line card that expands interface capacity based on the selected card mode.

Figure 8: Add secondary modules



Before you begin

Select a card mode for an NCS 2000 line card, on page 19

Follow these steps to add a secondary module for an NCS 2000 line card:

Procedure

Step 1 From the **Secondary modules for slot** drop-down list, select the required secondary module.

This drop-down list is only enabled if the supported secondary modules are available for the card.

Step 2 Select a submode for all slots from the **Submode** drop-down list.

This drop-down list is enabled only when the supported sub modes are available for the card.

Step 3 Click **Next**.

The selected secondary module is added.

What to do next

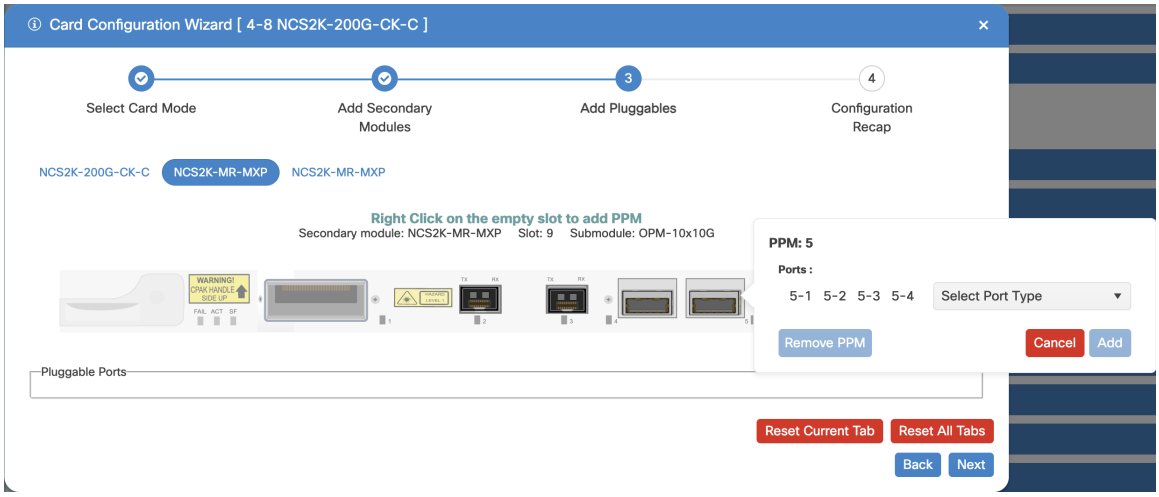
Add pluggable modules to ports, on page 23

Add pluggable modules to ports

Add pluggable modules to the required ports to expand or update the card capabilities.

Use the Card Configuration Wizard to assign or remove pluggable modules (PPMs) on specific ports during the card setup or modification process.

Figure 9: Add pluggable modules



Before you begin

Add secondary modules, on page 21

Procedure

Step 1 Right-click a port and select the PPM from the **Select Port Type** drop-down list.

Step 2 Click **Add** to assign the PPM to the selected port.

Step 3 If you need to remove a module, click **Remove PPM**.

Step 4 Repeat steps 1 through 3 for each port you want to configure.

Step 5 Click **Next**.

The selected pluggable modules are added to the ports.

What to do next

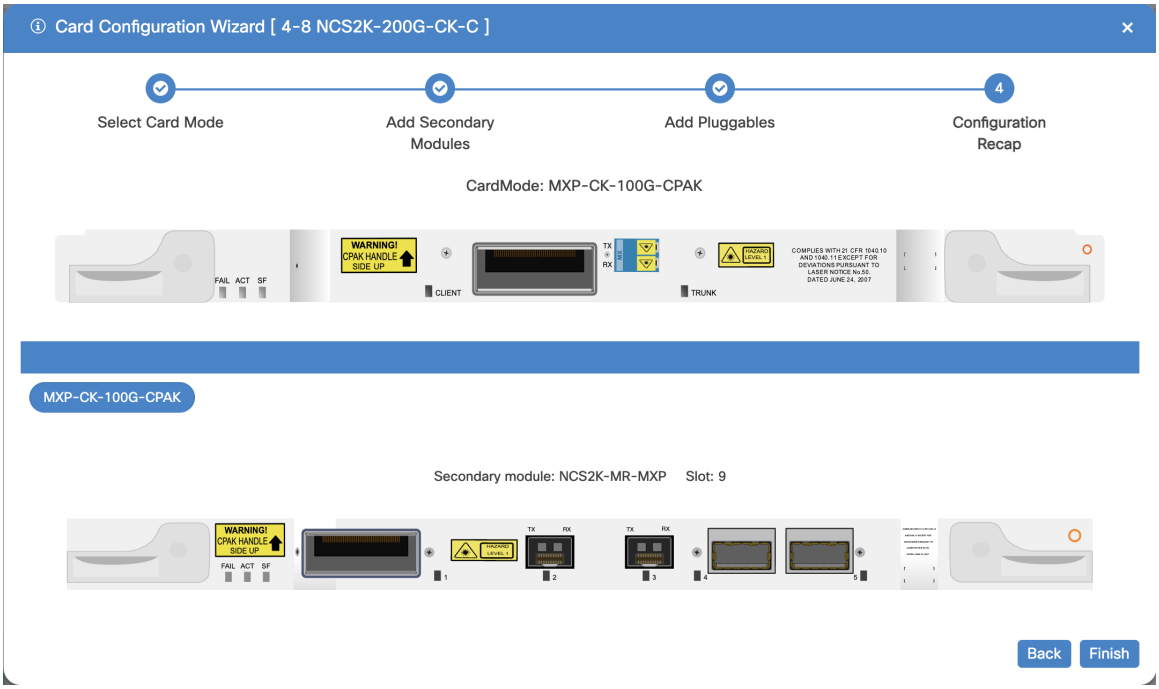
Verify card configuration details, on page 23

Verify card configuration details

Ensure that the card configuration, including card mode, secondary modules, and port module assignments, is correct before completing the wizard.

In the **Card Configuration Wizard**, verify the configuration in the **Configuration Recap** window.

Figure 10: Verify configuration details



Before you begin

Add pluggable modules to ports, on page 23

Follow these steps to verify card configuration details and complete the Card Configuration Wizard:

Procedure

Step 1 Verify the card mode displayed in the **Configuration Recap** window.

Step 2 Verify secondary modules and slot details.

Step 3 To verify the PPM and pluggable port assignments, expand the **Pluggable Port Modules** and **Pluggable Ports**.

Step 4 Click **Finish**.

The system saves the card configuration with the verified settings.

Configure card mode on a NCS 2000 control card

Add a card mode to an NCS 2000 controller card in Cisco Optical Site Manager to enable switching between supported control card modes.

Control cards support multiple card modes that determine how the card processes payloads.

You can configure the operating mode based on the type of control card installed in the shelf.

- TNC is the default operating mode.

- TNCO mode is required when a TNCS-O card is installed.

Before you begin

- Log into Cisco Optical Site Manager
- Open the card view, on page 3

Follow these steps to provision an operating mode on a control card.

Procedure

Step 1 Click the **Provisioning**, then click **Card Modes** tabs.

Step 2 Select **TNC-MODE** or **TNCO-MODE**, then click **Apply**.

The control card can operate in either TNC or TNCO mode.

- TNC mode is the default operating mode.
- TNCO mode is required when a TNCS-O card is installed.

The operating mode is provisioned on the control card.

Supported operating modes and port mapping details for NCS 2000 cards

Use this reference to identify supported operating modes, valid peer-card combinations, and port mapping details for Cisco NCS 2000 cards before configuring card modes in Cisco Optical Site Manager.

Supported card modes for NCS 2000 cards

This table lists the operating modes that are supported on the NCS 2000 cards.

Table 11: Supported Card modes for NCS 2000 cards

Card	Operating mode	Peer cards	Client-trunk ports
MR-MXP	TXP-100G	200G-CK-LC card or 100GS-CK-C card	Not applicable
	MXP-100G	200G-CK-LC card or 100GS-CK-C card	Not applicable
	100G-B2B-CPAK	MR-MXP	CPAK
	100G-B2B-SFP-QSFP	MR-MXP	2xSFP+2xQSFP
	MXP-2X40G-2X10G	200G-CK-LC	Not applicable

Card	Operating mode	Peer cards	Client-trunk ports	
100G-CK-C	TXP-100G	Not applicable	Not applicable	
	RGN-100G	100G-CK-C, 100G-LC-C	Not applicable	
	MXP-2x40G	Not applicable	Not applicable	
100G-LC-C	TXP-100G	Not applicable	Not applicable	
	RGN-100G	100G-LC-C, 100G-CK-C	Not applicable	
	100GS-CK-C	TXP-100G	Not applicable	Not applicable
RGN-100G		200G-CK-LC or 100GS-CK-C	Not applicable	
MXP-CK-100G-SFP-QSFP		MR-MXP	2xSFP+2xQSFP	
MXP-CK-100G-CPAK		MR-MXP	CPAK	
MXP-200G		MR-MXP. Skip card is MR-MXP.	Not applicable	
MXP-10x10G-100G		10x10G-LC + MR-MXP. Skip card is MR-MXP.	Not applicable	
10x10G-LC	MXP-10x10G	100G-LC-C, 100G-CK-C, 100GS-CK-C, 200G-CK-C	Not applicable	
	RGN-10G	Not applicable	1-2, 3-4, 5-6, 7-8, 9-10	
	TXP-10G	Not applicable	1-2, 3-4, 5-6, 7-8, 9-10	
	Low Latency	Not applicable	1-2, 3-4, 5-6, 7-8, 9-10	
	Fanout-10X10G	Not applicable	Not applicable	
	TXPP-10G	Not applicable	3-4-6, 7-8-10	
	MXP-10x10G	100G-LC-C 400G-XP-LC	Client ports: 1 to 10 Trunk port:	

Card	Operating mode	Peer cards	Client-trunk ports
200G-CK-LC	TXP-100G	Not applicable	Not applicable
	RGN-100G	200G-CK-C or 100GS-CK-C	Not applicable
	MXP-200G	MR-MXP. Skip card is MR-MXP. OPM-10x10G or OPM-2x40G-2x10G sub OpMode is required.	Not applicable
	MXP-CK-100G-CPAK	MR-MXP	CPAK
	MXP-CK-100GSFP-QSFP	MR-MXP	2xSFP+2xQSFP
	MXP-10x10G-100G	10x10G-LC + MR-MXP	Not applicable
CFP-LC	CFP-TXP	One or two 100G-LC-C, 100G-CK-C	Not applicable
	CFP-MXP	Only one 100G-LC-C, 100G-CK-C	Not applicable
	REGEN-200G	Not applicable	No slices
	REGEN-100G	Not applicable	No slices
	MXP-2x150G	Not applicable	Three slices
	MXP	Not applicable	Four slices

Port pair configuration for 10x10G-LC cards

Use the operating mode data to validate card behavior and port mapping before deployment.

Table 12: Port pair configuration for 10x10G-LC cards

Configuration Aspect	Description
Supported Modes	The 10x10G-LC card supports a maximum of five TXP-10G modes, two TXPP-10G modes, five RGN-10G modes, five Low Latency modes, or a combination of five TXP-10G, RGN-10G, and Low Latency modes.
TXPP-10G Client Ports	For TXPP-10G mode, client ports can be port 3, port 7, or both.
TXPP-10G Trunk Ports (Client Port 3)	When port 3 is selected as the client port, ports 4 and 6 can be selected as trunk ports.
TXPP-10G Trunk Ports (Client Port 7)	When port 7 is selected as the client port, ports 8 and 10 can be selected as trunk ports.

NCS 2000 card mode details

This table describes the card mode for the for the 400G-XP-LC, 400G-XP, and 10x10G-LC cards.

Table 13: Card mode details for 400G-XP-LC, 400G-XP, and 10x10G-LC cards

Card	Operating mode or aspect	Description
400G-XP-LC and 400G-XP	REGEN-200G	Both trunk ports use the same 200G rate. The trunk configuration from CFP2-11 is copied to CFP2-12.
400G-XP-LC and 400G-XP	REGEN-100G	Both trunk ports use the same 100G rate. The trunk configuration from CFP2-11 is copied to CFP2-12.
400G-XP-LC and 400G-XP	MXP-2x150G	Both trunk ports are configured for 150G.
400G-XP-LC and 400G-XP	OTNXC	Supported operating mode for these card types.
400G-XP-LC and 400G-XP	MXP	Supported operating mode for these card types.
10x10G-LC	Supported modes	The card supports up to five TXP-10G modes, two TXPP-10G modes, five RGN-10G modes, five Low Latency modes, or a supported combination of TXP-10G, RGN-10G, and Low Latency modes.
10x10G-LC	TXPP-10G client ports	Client ports can be port 3, port 7, or both ports.
10x10G-LC	TXPP-10G trunk ports with client port 3	When port 3 is the client port, trunk ports 4 and 6 are available.
10x10G-LC	TXPP-10G trunk ports with client port 7	When port 7 is the client port, trunk ports 8 and 10 are available.

Reset a line card

Reset a line card to recover from operational issues or to reinitialize the card.

- Choose a soft reset when you need to reboot the line card and reload software without removing power or disrupting traffic on active or standby control cards.
- Choose a hard reset when you need to remove power to clear all memory, equivalent to reseating the card, after placing the card in standby or maintenance mode to avoid traffic disruption.

This task is performed from the NFV view by using the context menu on the line card in the rack.

Before you begin

Log into Cisco Optical Site Manager

Follow these steps to reset a line card.

Procedure

Step 1 In the NFV view, right-click the line card in the rack.

The context menu for the selected line card appears.

Step 2 Select **Soft Reset** or **Hard Reset**.

A confirmation message appears.

Step 3 Click **Yes** to confirm.

The system performs the selected reset operation on the line card.

The line card is reset based on the selected option (soft reset or hard reset).

Provision SONET or SDH trace monitoring

Configure trace monitoring parameters for OC192 (SONET) and STM64 (SDH) payloads. This ensures proper monitoring of the trace strings transmitted and received on the optical network, helping detect discrepancies and maintain network integrity.

SONET and SDH trace monitoring is supported on OTN XP cards.

Before you begin

- Log into Cisco Optical Site Manager
- Open the card view, on page 3

Follow these steps to provision the trace monitoring parameters that are supported for both the OC192 and STM64 payloads.

Procedure

Step 1 Click the **Provisioning** tab.

Step 2 Perform one of the following steps:

Table 14: Provision trace monitoring for SONET/SDH

To...	Click...
provision trace monitoring parameters for SONET	**SONET Trace Monitoring**
provision trace monitoring parameters for SDH	**SDH Trace Monitoring**

Step 3 Click the **Edit** button.
The fields in the table become editable.

Step 4 Modify required settings as described in this table.

Table 15: SONET and SDH Trace Monitoring Parameters

Parameter	Description	Options
Port	Displays the port number.	—
Tx-String	Sets a new transmit string.	0–15 bytes
Expected-String	Sets a new expected string.	0–15 bytes
Rx-String	(Display only) Displays the current received string.	
Detect-Mode	Sets the mode for detecting the discrepancy between the expected and received trace.	• True • False
Trace-Format	Sets the format in which the received string is displayed.	• 1BYTE • 16BYTE • 64BYTE

Step 5 Click **Apply**.

After provisioning the SONET or SDH trace monitoring parameters, the system actively monitors the trace strings on the optical network.

Provision trail trace monitoring

Provision trail trace monitoring to configure parameters that monitor the integrity and connectivity of optical transport paths. This is done by setting and verifying trail trace identifiers (TTI) on OTU and ODU interfaces.

Trail trace monitoring can be configured at different levels, such as Section (OTU interfaces) and Path (ODU interfaces). You can configure parameters such as transmit and expected trace strings, detection modes, and alarm propagation settings.

Before you begin

- Log into Cisco Optical Site Manager
- Open the card view, on page 3

Follow these steps to configure the parameters for trail trace monitoring.

Procedure

Step 1 Click the **Provisioning** tab.

Step 2 Click the **Trail Trace Monitoring** section to expand it.

Step 3 From the **Level** drop-down list, select any of these options:

To	Select
List all the OTU interfaces	**Section**
List all the ODU interfaces	**Path**

Step 4 Modify required settings as listed in this table.

Table 16: Trail Trace Identifier Settings

Parameter	Description	Options
Port	Displays the port number.	This field is not editable.
Legacy Tx-TTI	Set the current transmit string of the TTI. This is the string that network transmits at the beginning of a path. It helps the far-end device verify the source and integrity of the connection.	Valid values: 0-64 bytes
Legacy Expected-TTI	Set the TTI value that the network device expects from the far end of the optical path. The device continuously compares the *Legacy Rx-TTI* with this expected value to verify the integrity and correctness of the connection.	0-64 bytes
Legacy Rx-TTI	Displays the trail trace identifier string that your network device receives from the remote (far-end) device over a monitored path.	This field is not editable.
Alarm Propagation	If a discrepancy is detected between the expected and received trace, it raises an alarm. If set to *true*, the alarm is propagated downstream to the other nodes.	Available options: • true • false
Detect Mode	Enable this mode to allow the system to automatically detect and display the trail trace identifier (TTI) received from the far end of an optical path. • When this mode is enabled, the device does not compare the *Legacy Rx-TTI* to a pre-configured expected value. • Instead, it simply captures and shows the actual TTI being received from the remote end.	Available options: • Disabled • Enabled • SAPI • DAPI • SAPI-and-DAPI

Step 5 Click **Apply**.

After provisioning, the system continuously monitors the trail trace identifiers on the specified interfaces. Any mismatch between the expected and received trace strings triggers alarms.

Provision ODU interfaces

To ensure proper operation and monitoring of the ODU layer in the optical transport network, configure the ODU settings on optical line cards. Adjust these settings to manage signal quality, set error thresholds, and control client interface behavior.

Set parameters for ODU interfaces, such as Signal Fail Bit Error Rate (SF BER), Signal Degrade Bit Error Rate (SD BER), squelch mode (which controls laser behavior on signal loss), and squelch hold-off time.

Before you begin

- Log into Cisco Optical Site Manager
- Open the card view, on page 3

Follow these steps to modify the ODU settings of a card.

Procedure

Step 1 Click the **Provisioning** tab.

Step 2 Click the **ODU Interfaces** section to expand it.

Step 3 Modify required settings as described in the #unique_86 unique_86_Connect_42_ID9913, on page 32table.

Table 17: ODU Interface Settings

Parameter	Description	Options
Port	(Display only) Displays the port name.	—
Description	Displays the description of the port.	—
SF BER	Sets the signal fail (SF) bit error rate (BER).	Only 1E-5 is allowed.
SD BER	Sets the signal degrade (SD) bit error rate (BER).	• 1E-5 • 1E-6 • 1E-7 • 1E-8 • 1E-9

Parameter	Description	Options
Squelch Mode	When a LOS is detected on the near-end client input, the far-end client laser is turned off. It is said to be squelched. Alternatively, an AIS can be invoked. The OTU2-XP card supports Squelch Mode parameter when the card mode is set as Regenerator. The valid values are Squelch and AIS. When the card mode is set to Transponder or Mixed, the Squelch Mode cannot be changed and the parameter defaults to the Squelch value.	• Squelch • AIS
SquelchHold Off Time	Sets the period in milliseconds that the client interface waits for resolution of issues on the trunk side. The client squelching starts after this period.	• Disable • 50 ms • 100 ms • 250 ms • 500 ms
Service State	Displays the service state.	—
Rate	Displays the rate.	—

Step 4 Click **Apply**.

After you provision the ODU interfaces with the desired signal thresholds and squelch behavior, you can monitor and handle signal degradation or failure more effectively.

Provision OTU interfaces

Configure OTU (Optical Transport Unit) interfaces on optical line cards to manage forward error correction, synchronization, and interoperability, as well as related settings.

Use this task to adjust OTU parameters such as HD FEC mode, interoperability with non-native equipment, synchronization support, and administrative synchronization status message settings for optimal network performance and compatibility.

Before you begin

- Log into Cisco Optical Site Manager
- Open the card view, on page 3

Follow these steps to modify the OTU settings of the card.

Procedure

Step 1 Click the **Provisioning** tab.

Step 2 Click the **OTU Interfaces** section to expand it.

Step 3 Modify the required settings described in the #unique_87 unique_87_Connect_42_ID9913, on page 34 table.

Table 18: OTU Interface Settings

Parameter	Description	Options
Port	(Display only) Displays the port name.	—
Description	Displays the description of the port.	—
HD FEC	Sets the OTN lines to forward error correction (FEC).	• DISABLE_FEC • EFEC • EFEC_14 • EFEC_17 • HG_FEC_20 • HG_FEC_7 • STANDARD_FEC
Interop Mode	Enables interoperability between line cards and other vendor interfaces.	• InteropNone • InteropEnable
Supports Sync	(Display only) Displays the SupportsSync card parameter. If the value is true, the card functions as a NE timing reference.	• true • false
Sync Msg In	Sets the EnableSync card parameter. Enables synchronization status messages (S1 byte), which allow the node to choose the best timing source.	• true • false

Parameter	Description	Options
Admin SSM In	Overrides the synchronization status message (SSM) and the synchronization traceability unknown (STU) value. If the node does not receive an SSM signal, the system uses the STU value.	• G811 • STU • G812T • G812L • SETS • DUS • PRS • ST2 • ST3E • ST3 • SMC • ST4 • RES • STU_SDH • DUS_SDH • SSM_FAILED • RES_SDH • TNC
Rate	Displays the rate.	—
Service State	Displays the service state.	—

Step 4 Click **Apply**.

The system saves your changes, and the modified OTU settings are displayed for the selected card.

Provision Ethernet interfaces

Provision Ethernet interfaces by configuring Ethernet port parameters on a network card or device, ensuring proper operation and network integration.

Set operational parameters such as speed, duplex mode, MTU size, Forward Error Correction (FEC), Auto-Negotiation, and service state.

Before you begin

- Log into Cisco Optical Site Manager
- Open the card view, on page 3

Follow these steps to provision the parameters for the Ethernet interfaces of a card.

Procedure

Step 1 Click the **Provisioning** tab.

Step 2 Click the **Ethernet Interfaces** section to expand it.

Step 3 Click the **Edit** button.

Step 4 Modify any of the Ethernet settings as described in the Table 19: Ethernet Settings, on page 36 table.

The available parameters depend on the card mode.

Step 5 Click **Apply**.

The system saves your changes, and the modified ethernet interface settings are displayed for the selected card.

Table 19: Ethernet Settings

Parameter	Description	Options
Port	(Display only) Displays the port number	—
Description	Description of the port.	—
Speed	Sets the expected port speed.	—
MTU	Sets the maximum size of the Ethernet frames that are accepted by the port. The port must be in OOS or locked state.	Numeric. • Default value: 1548 • Valid range: 64 – 9700
FEC	Sets the FEC mode. When set to On, FEC is enabled.	• NA • Auto (default) • On • Off
Duplex	Sets the expected duplex capability of ports.	• Full • Half
Mapping	Sets the mapping mode.	• CBR • GFP

Parameter	Description	Options
Auto Negotiation	Enables or disables auto-negotiation on the port.	• Disabled • Enabled
Squelch Mode	Sets the squelch mode.	• Disable • Squelch • LF
Squelch Hold Off Time	Sets the period in milliseconds that the client interface waits for resolution of issues on the trunk side. The client squelching starts after this period or local fault is sent.	• Disable • 50 ms • 100 ms • 250 ms • 500 ms
Service State	Displays the service status of the port.	

Provision SONET or SDH Interfaces

Provisioning SONET or SDH interfaces involves configuring parameters for synchronous optical network (SONET) or synchronous digital hierarchy (SDH) interfaces on optical line cards. This action enables the transport of SONET or SDH signals over the network and supports payloads such as OC192 for SONET and STM64 for SDH.

Set the operational parameters that control signal quality monitoring, synchronization, and interface behavior. This ensures that the interfaces process and transport SONET/SDH signals correctly, maintain synchronization, handle signal failures, and support trace monitoring and threshold settings for performance management.

Before you begin

- Log into Cisco Optical Site Manager
- Open the card view, on page 3

Follow these steps to provision the parameters for the SONET or SDH interfaces of a card.

Procedure

Step 1 Click the **Provisioning** tab.

Step 2 Perform one of these steps:

- Click the **SONET Trace Monitoring** section to provision interface parameters for SONET.
- Click the **SDH Trace Monitoring** section to provision interface parameters for SDH.

Step 3 Click the **Edit** button.
The fields in the table become editable.

Step 4 Modify required settings as described in the Table 20: SONET or SDH Interface Parameters, on page 38 table.

Step 5 Click **Apply**.

The system saves your changes, and the modified SDH or SONET settings are displayed for the selected card.

Table 20: SONET or SDH Interface Parameters

Field	Description	Valid Values
Port	Displays the port number.	—
Description	Displays the port description. **Note** This parameter is not supproted for the OC192 and STM64 card modes.	—
Type	Displays the current payload for the port. OC192 is displayed for SONET systems and STM64 is displayed for SDH systems.	• OC192 • STM64
SF BER	Sets the signal fail (SF) bit error rate (BER).	• 1E-3 • 1E-4 • 1E-5
SD BER	Sets the signal degrade (SD) bit error rate (BER).	• 1E-5 • 1E-6 • 1E-7 • 1E-8 • 1E-9
Squelch Mode	When a LOS is detected on the near-end client input, the far-end client laser is turned off. It is said to be squelched. Alternatively, an AIS can be invoked. **Note** This parameter is not supported for the OC192 and STM64 card modes.	• Squelch • AIS

Field	Description	Valid Values
Squelch Hold Off Time	Sets the period in milliseconds that the client interface waits for resolution of issues on the trunk side. The client squelching starts after this period. **Note** This parameter is not supported for the OC192 and STM64 card modes.	• Disable • 50 ms • 100 ms • 250 ms • 500 ms
ProvidesSync	(Display only) Displays the ProvidesSync card parameter. **Note** This parameter is not supported for the OC192 and STM64 card modes.	• true • false
Send DoNotUse	When checked, sends a “Do Not Use for Synchronization (DUS)” message on the S1 byte. **Note** This parameter is not supported for the OC192 and STM64 card modes.	• true • false
Sync SyncMsgIn	Sets the ProvidesSync card parameter. Enables synchronization status messages, which allow the node to choose the best timing source. **Note** This parameter is not supported for the OC192 and STM64 card modes.	• true • false
Admin SSM	Overrides the synchronization status message (SSM) and the synchronization traceability unknown (STU) value. If the node does not receive an SSM signal, it defaults to STU. **Note** This parameter is not supported for the OC192 and STM64 card modes.	• DUS • PRS • RES • SMC • ST2 • ST3 • ST3E • ST4 • STU • TNC

Field	Description	Valid Values
Termination Mode	Sets the termination mode. When a session is terminated, the signal is either reinitialized or passed through without any changes. For 400G-XP, 10x10G-LC, and OTU2-XP cards, the default mode is Transparent. For the 40E-MXP card, the default mode is Transparent but can be changed to other values as required. **Note** This parameter is not supported for the OC192 and STM64 card modes.	For SONET: • Transparent • Line • Session For SDH: • Transparent • Multiplex Section • Regeneration Section
Admin State	Sets the administrative state of the port.	—
Service State	(Display only) Identifies the autonomously generated state that gives the overall condition of the port. Service states appear in the format:PrimaryState-PrimaryState Qualifier, Secondary State.	• IS-NR/ Unlocked-enabled • OOS-AU,AINS/ Unlocked-disabled, automaticInService • OOS-MA,DSBLD/ Locked-enabled,disabled • OOS-MA,MT/ Locked-enabled,maintenance

Provision optical channels

Provision Optical Channels involves configuring parameters for optical channels on network cards within DWDM (Dense Wavelength Division Multiplexing) systems. The process sets attributes, including:

- reach
- forward error correction (FEC) standards
- transmit power
- frequency
- wavelength
- chromatic dispersion thresholds
- administrative states

Use this task to establish and optimize the optical signal path for data transmission across the network. This action enables reliable, high-capacity transport of client signals over the optical infrastructure.

Before you begin

- Log into Cisco Optical Site Manager

- Open the card view, on page 3

Follow these steps to configure the parameters for the optical channels on the card.

Procedure

Step 1 Click the **Provisioning** tab.

Step 2 Click the **Optical Channel** section to expand it.

Step 3 Click the **Edit** button.

Step 4 Modify the required parameters in the Table 21: Optical Channel Settings, on page 41 table.

Step 5 Click **Apply**.

The system saves the changes. The modified optical channel parameters are displayed for the selected card.

Table 21: Optical Channel Settings

Parameter	Description	Options
Port	(Display only) Displays the port name.	—
Description	Type the description of the port.	—
Admin State	Sets the port service state unless network conditions prevent the change.	• Unlocked (ETSI)/ IS (ANSI) • Locked, disabled (ETSI)/ OOS, DSBLD (ANSI) • Locked, maintenance (ETSI)/ OOS, MT (ANSI) • Unlocked, automaticInService (ETSI)/ IS, AINS (ANSI)
Service State	Displays the service state.	—
Reach	Indicates the distance from one node to another node.	• Auto Provision • List of reach values

Parameter	Description	Options
SD FEC	Indicates the standard FEC.	• SD_FEC_15_DE_OFF • SD_FEC_15_DE_ON • SD_FEC_20 • SD_FEC_25_DE_OFF • SD_FEC_25_DE_ON • SD_FEC_7
Tx Power (dBm)	Sets the Tx power on the trunk port.	The range is –10.0 to 0.25 dBm.
PSM Info	When enabled on a TXP or MXP trunk port that is connected to a PSM card, it allows fast switching on the cards.	• NA • Enable • Disable
Frequency (THz)	Sets the frequency in THz	-
Wavelength (nm)	Displays the wavelength, which is set based on the **Frequency**.	-
Tx Shutdown	(Display only)	• true • false
Width (GHz)	(Display only)	-
CD (Working Range) High (ps/nm)	Sets the threshold for maximum chromatic dispersion.	-
CD (Working Range) Low (ps/nm)	Sets the threshold for minimum chromatic dispersion.	-
Target Power	Sets the Rx VOA target power. **Note** You cannot configure this parameter if **Fixed Ratio** is already configured.	• Valid range: -19 dBm to +3 dBm • Default value: -2.0 dBm
Fixed Ratio	Sets the Rx VOA fixed ratio. **Note** You cannot configure this parameter if **Target Power** is already configured.	• Valid value: 0.0 dBm
Rate	Displays the rate.	—

Change Trunk Port Parameters

Adjust trunk port parameters to ensure proper configuration. You can enable or disable the port, set the frequency or wavelength, and optimize data transmission rates for network traffic and operational requirements.

Use this task to modify trunk port settings. Typically, you access these settings through management interfaces and adjust parameters such as administrative state, frequency, baud rate, and bits per symbol.

Before you begin

Log into Cisco Optical Site Manager

Follow these steps to configure the trunk port parameters.

Procedure

Step 1 Right-click a trunk port in the Rack, Chassis, or Card view and click **Change Trunk Details**.
The **Change Configuration** dialog box is displayed.

Step 2 Select the **Admin State** to change the admin status of the trunk port to *Out of Service* or *Automatic in Service*.

Step 3 Enter or select the frequency in the **Frequency** field.

The wavelength of the trunk port is automatically selected based on the frequency configured.

Step 4 Enter or select the **Baud Rate** or **Bits Per Symbol**.

For more details about these fields, see Table 21: Optical Channel Settings, on page 41

Step 5 Click **Apply**.

After changing the trunk port parameters and applying the configuration, the updated settings are saved and reflected in the system's provisioning interface.

Provision optical threshold settings

Set the limits for optical performance parameters that trigger alarms or threshold crossing alerts (TCAs). This enables proactive monitoring and management of optical signal quality when parameters exceed or fall below defined thresholds.

Provisioning optical threshold settings involves configuring threshold crossing alert values for optical parameters on network cards such as SVO, OSCM, OSC-CSM, or DWDM cards. These thresholds include these parameters:

- received/transmitted optical power
- laser bias
- chromatic dispersion
- OSNR
- polarization mode dispersion

Note This feature is not supported for the FX-MXP card mode of the OTN-XP card.

Before you begin

- Log into Cisco Optical Site Manager
- Open the card view, on page 3

Follow these steps to set the threshold crossing alert values on the card.

Procedure

Step 1 Click the **Provisioning** tab.

Step 2 Click the **Optics Thresholds** section to expand it.

Step 3 Choose the type of threshold that you want to change, *15 Min* or *24 Hour*.

Step 4 Click **Add Optical Threshold** button.
New Optical Threshold dialog box is displayed.

Step 5 In the **New Optical Threshold** dialog box, add these details:

a) Select the **Interface** from the drop-down list.
b) Select **Granularity** from the drop-down list to set the threshold crossing alert for 15-minute or 24-hour interval.
c) Select **Location** from the drop-down list.
d) Select **Direction** from the drop-down list.
e) Select the performance monitoring type from the **PM Type** from the drop-down.
f) Select the parameter for which you want to set the threshold value from the **PM Type Extension** drop-down list.
For more details about the parameters, see Table 22: Performance Monitoring Parameters, on page 44.
g) Enter the minimum threshold value in the **Low** field and the maximum threshold value in the **High** field.

Step 6 Click **Apply**.

After configuring and applying the optical threshold settings, the system monitors the optical parameters against these thresholds. Alarms are raised when thresholds are crossed.

Table 22: Performance Monitoring Parameters

Use this parameter	to
amplifierTilt	configure the thresholds for ingress or egress amplifier tilt.
amplifierGain	configure the thresholds for ingress or egress amplifier gain.
opticalPower	configure the thresholds for total Rx or Tx power.

Use this parameter	to
opticalPowerOSC	configure the thresholds for total Rx or Tx OSC power.
opticalPowerBackReflection	configure thresholds for optical power back reflection.
opticalPowerBackReflectionRatio	configure threshold to monitor and limit the amount of optical signal reflected back toward the transmitter.
Raman - 1	configure threshold to monitor and control the performance of the first Raman amplifier, ensuring optimal signal amplification in the optical link.

Configure G.709 thresholds

Define limits for key OTN performance parameters that trigger alarms or threshold crossing alerts (TCAs). By establishing these limits, network operators can proactively monitor the health and quality of OTN links, detect degradations or faults early, and maintain network reliability and performance.

Provisioning G.709 thresholds involves setting performance monitoring (PM) threshold values for OTN ports compliant with the ITU-T G.709 standard. These thresholds apply to various PM parameters and can be configured for Near End or Far End monitoring. The monitoring can occur over two time intervals:

- fifteen minutes
- one day

Before you begin

- Log into Cisco Optical Site Manager
- Open the card view, on page 3

Follow these steps to provision the G.709 performance monitoring thresholds for the OTN ports.

Procedure

Step 1 Click the **Provisioning** tab.

Step 2 Click the **G.709 Thresholds** section to expand it.

Step 3 Select the value for the G.709 PM thresholds, and click **Apply**.

For more details about the parameters, refer to the Table 23: G.709 PM Thresholds, on page 46.

After you provision the G.709 thresholds and apply the configuration, the system continuously monitors the OTN ports against these thresholds. If any parameter exceeds its configured limit, the system generates an alert.

Table 23: G.709 PM Thresholds

Parameter	Description
ES (Errored Seconds)	The number of errored seconds recorded during the PM time interval.
SES (Severely Errored Seconds)	The number of severely errored seconds recorded during the PM time interval.
UAS (Unavailable Seconds)	The number of unavailable seconds recorded during the PM time interval.
BBE (Background Block Error)	The number of background block errors recorded during the PM time interval.
FC (Failure Counter)	The number of failure counts recorded during the PM time interval.

Provision FEC thresholds

Define limits for Forward Error Correction (FEC) performance parameters that trigger threshold crossing alerts (TCAs) or alarms. FEC uses Reed-Solomon RS (255,239) encoding to correct and detect errors on optical links, improving signal quality and reducing the need for signal regeneration.

Provisioning FEC thresholds involves setting performance monitoring (PM) threshold values for FEC parameters on optical cards such as transponders or muxponders. These thresholds apply to key FEC metrics, such as BIT-EC and UNC-WORDS. The metrics are measured during these specified monitoring intervals:

- fifteen minutes
- one day

Before you begin

- Log into Cisco Optical Site Manager
- Open the card view, on page 3

Follow these steps to configure the FEC thresholds for the card.

Procedure

Step 1 Click the **Provisioning** tab.

Step 2 Click the **FEC Thresholds** section to expand it.

Step 3 Select the value for the FEC PMs and click **Apply**.

You can set the FEC thresholds for fifteen minutes or one day intervals.

Step 4 Select a performance monitoring type from the options in this table.

PM type	Description
BIT-EC	Sets the value for bit errors corrected.
UNC-WORDS	Sets the value for uncorrectable words.

The system continuously monitors the FEC parameters against these thresholds. When the number of corrected bit errors or uncorrectable words exceeds the configured limits within the selected interval, alerts are generated.

Configure RMON thresholds

RMON thresholds establish monitoring parameters that alert network operators to abnormal conditions. These parameters help detect and resolve network issues early. As a result, network performance and reliability are maintained at optimal levels.

RMON thresholds define specific limits on network performance variables monitored by devices. These thresholds specify conditions that trigger alarms or events when network statistics exceed or fall below set values, enabling continuous observation of Ethernet ports or interfaces.

Before you begin

- Log into Cisco Optical Site Manager
- Open the card view, on page 3

Follow these steps to provision the RMON thresholds on the control card.

Procedure

Step 1 Click **Provisioning**, then click **RMON Thresholds**.

Step 2 Click the + button.

The **Create RMON Threshold** dialog box appears.

Step 3 Specify the parameters in the **Create RMON Threshold** dialog box.

For more details about the parameters, refer to Table 24: RMON threshold parameters, on page 48.

Step 4 Click **Apply**.

Once RMON thresholds are configured, the system tracks the selected variables against the defined rising and falling limits during sampling intervals. Alarms activate when values surpass rising thresholds. They clear when values drop below falling thresholds. This process enables the system to trigger events repeatedly when thresholds are crossed.

Table 24: RMON threshold parameters

Parameter	Description
Port ID	The identifier for the port that you configure the RMON threshold for.
Variable	The specific MIB variable to be sampled. This variable must be any of these ASN.1 primitive type: • INTEGER\ • Counter32 • Counter64 • Gauge • TimeTicks
Alarm Type	Indicates which threshold crossing triggers the alarm: • Rising • Falling • Rising or Falling
Sampling Type	The method used to sample the variable: • **Absolute**: the threshold to use the total number of occurrences, regardless of the time period • **Relative**: restricts the threshold to use the number of occurrences within the user-set sample period.
Sampling Period	The interval in seconds over which the data is sampled and compared against the thresholds.
Rising Threshold	The threshold value that triggers a rising alarm event when the sampled statistic rises to or above it. **Note** For a rising type of alarm, the measured value must move from below the falling threshold to above the rising threshold. For example, if a network is running below a rising threshold of 1,000 collisions every 15 seconds and a problem causes 1,001 collisions in 15 seconds, the excess occurrences trigger an alarm.
Falling Threshold	The threshold value that triggers a falling alarm event when the sampled statistic falls to or below it.

Configure loopback interfaces

A loopback is a logical interface that enables testing of network ports and circuits. This helps to identify and isolate faults before live traffic is transmitted.

Loopbacks facilitate troubleshooting by confirming the operational status of interfaces, cabling, and device components. This improves network reliability and performance.

Note This feature is not supported for the FX-MXP card mode of the OTN-XP card.

Loopbacks test and diagnose network interfaces by routing traffic back to the source. They isolate faults in line cards or optical paths by verifying signal integrity and device programming.

Caution This task is traffic-affecting.

Before you begin

- Log into Cisco Optical Site Manager
- Open the card view, on page 3
- Configure loopback only when the card is in maintenance service state. If you need to place trunk ports in a locked maintenance state, see Provision optical channels, on page 40.

Follow these steps to configure loopback on the card.

Procedure

Step 1 Click the **Maintenance** tab.

Step 2 Click the **Loopback** section to expand it.

Step 3 From the **Loopback Type** drop-down list, select any of these options for each port required:

- Terminal
- Facility
- Terminal-Drop
- Facility-Drop

Step 4 Select the admin state from the **Admin State** drop-down list.

Step 5 Click **Apply**.

The selected port transmits traffic, which is looped back either internally or at the line interface. This setup allows you to verify signal flow and detect errors such as loss of signal or CRC errors. Loopback states are maintained in the maintenance administrative state. You can verify these states using show commands.

Configure optical safety

Configure optical safety parameters to ensure compliance with laser safety standards. The system can automatically shut down or control laser output power during fault conditions such as fiber breaks or signal loss.

Optical safety provisioning protects optical components and personnel from hazardous laser exposure. This process includes configuring parameters for automatic laser shutdown (ALS) modes, optical safety remote interlock (OSRI), and recovery pulse settings on various optical cards, such as line cards, amplifier cards, and service channel cards.

Before you begin

- Log into Cisco Optical Site Manager
- Open the card view, on page 3

Follow these steps to configure the optical safety parameters for cards.

Procedure

Step 1 Click the **Maintenance** tab.

Step 2 Click the **Optical Safety** section to expand it.

Step 3 Modify required settings as described in the Table 25: Optical safety parameters for cards, on page 50 table.

Step 4 Click **Apply** to save the changes.

The system monitors optical signals. When needed, it automatically activates safety mechanisms, such as ALS, to shut down laser output.

Table 25: Optical safety parameters for cards

Parameter	Description	Options
Interface	(Display only) Displays the port name, port type, and direction.	—
Supported Safety	(Display only) Displays the supported safety mechanism.	• ALS for line cards and control cards. • ALS-OSRI for amplifier cards.
ALS Mode	Automatic laser shutdown mode. ALS mode is disabled for RX ALS interfaces.	From the drop-down list, choose one of the following: • ALS-Disabled—Deactivates ALS. • Automatic Restart—(Default) ALS is active. The power is automatically shut down when needed, and it automatically tries to restart using a probe pulse until the cause of the failure is repaired. • Manual Restart

Parameter	Description	Options
OSRI	Optical safety remote interlock. The default value is OSRI-OFF. When set to OSRI-ON, the TX output power is shut down. **Note** OSRI configuration is not supported on the transponder and muxponder cards.	From the drop-down list, choose one of the following: • OSRI-OFF • OSRI-ON
ALS Status	(Display only) ALS status of the device.	• Working • Shutdown
Recovery Pulse Interval (Sec.)	Displays the interval between two optical power pulses.	60 to 300 seconds.
Recovery Pulse Duration (Sec.)	Displays the duration of the optical power pulse that begins when an amplifier restarts.	2 to 100 seconds
Manual Restart	Triggers manual restart for the ALS interface. Manual restart does not occur if Mode is set to Automatic Restart or Disabled.	—

Configure thresholds for SONET or SDH

Configure threshold settings for SONET or SDH payload ports (OC192, STM64) to monitor performance and to maintain network integrity.

Perform this configuration on supported line cards (e.g., OTN XP, ADM-10G, MXP, and transponders) to enable performance monitoring.

This functionality is supported on Slice-0 of the 40x10 HM configuration of the MXP-40X10G-4X100G card mode.

Before you begin

- Log into Cisco Optical Site Manager
- Open the card view, on page 3

Follow these steps to provision SONET or SDH thresholds for OC192 and STM64 payload ports on the OTN XP card.

Procedure

Step 1 Click the **Provisioning** tab.

Step 2 Perform one of the following steps:

- Click the **SONET Trace Monitoring** section to provision thresholds for SONET.
- Click the **SDH Trace Monitoring** section to provision thresholds for SDH.

Step 3 Select the interval of the threshold to *15 Min* or *24 Hour*.

Step 4 Click the plus icon to add a new SONET or SDH threshold.
The **New SONET/SDH Threshold** dialog is displayed.

Step 5 Select the required details in the **New SONET/SDH Threshold** dialog box as described in the Table 26: New SONET/SDH Threshold Dialog, on page 52 table.

Step 6 Click **Apply**.

The system applies the configured thresholds to generate alarms or notifications when performance metrics exceed defined limits, facilitating proactive network management and fault detection.

Table 26: New SONET/SDH Threshold Dialog

Field	Description	Valid Values
TCA Types	Select the interface name.	—
Interface	Select the interface name.	—
Granularity	Sets the threshold for intervals of either 15 minutes or 24 hours.	• 15min • 24Hour
Direction	Sets the direction.	• ES • SES • UAS • EB • SEFS
Location	Sets the low threshold value.	—
PM Type	Sets the PM type.	—
PM Type Extension	Sets the PM type extension.	—
Threshold Value	Sets the threshold value.	—

Enable attention LED

The Attention LED feature helps field engineers identify specific devices—ports, line cards, chassis, or controller cards, within a network installation. Use it during maintenance or troubleshooting.

Table 27: Feature History

Feature Name	Release Information	Description
Enable Attention LED on Demand	Cisco IOS XR Release 24.1.1	You can now turn on the Attention LED by selecting *true* from the **Attention Led for** drop-down list in the **Provisioning** tab. The Attention LED is available for specific ports, chassis, line cards, and controller cards. Once turned on, it will help field engineers quickly identify the relevant device at the installation location for maintenance or troubleshooting.

The attention LED can be enabled on specific ports, chassis, line cards, or controller cards. This feature helps with troubleshooting and maintenance because it allows field engineers to locate the device in its installed location.

Before you begin

- Log into Cisco Optical Site Manager
- Open the card view, on page 3

Follow these steps to enable the attention LED:

Procedure

Step 1 Click the **Provisioning** tab.

Step 2 Click the **Attention Led** section.

Step 3 Perform any one of these steps to turn on the attention LED:

To turn on the attention LED of	perform these steps.
• a chassis provisioned on the rack or • all the ports on a line card	Select *true* from the **Attention Led for** drop-down list, then click **Apply**.
a specific port of a line card	**a.** Click **Edit**. **b.** Select *true* corresponding to the port you want to blink the Attention LED, then click **Apply**.

Step 4 Select *false* from the drop down list and click **Apply** to turn off the Attention LED for a chassis or port.

When enabled, the Attention LED flashes on the selected device or port. This makes it easier for field personnel to physically identify the equipment and reduces the time spent locating devices, improving efficiency in troubleshooting and maintenance.

PSM card protection mechanism

PSM card protection switching is a high-availability mechanism that automatically transfers optical traffic from a primary Protection Switching Module (PSM) card to a redundant standby PSM card in the event of a failure or degradation of the active card.

- It provides automatic failover, ensuring continuous operation and minimizing service interruption.
- It enhances the overall reliability and uptime of the optical transport network.
- It is typically implemented in one-plus-one or one-to-one protection schemes to maintain optical signal integrity.

Types of Protection Switching

The PSM card supports the following types of protection switching:

- Revertive Protection Switching: Traffic automatically returns to the working path from the protection path once the fiber issue is resolved and the Loss of Signal (LOS) alarm is cleared on the working path.
- Non-Revertive Protection Switching: Once traffic is switched to the protection path due to a signal failure, it remains on the protection path even after the failure on the working path is resolved.

Enable the revertive protection switching

Protection switching offers a safeguard against optical fiber faults. When a failure is detected, the system automatically switches live traffic from the working path to the protection path. This process ensures uninterrupted data transmission.

Revertive switching is one of the two protection switching modes. In non-revertive mode, traffic remains on the protection path even after the working path is restored. The revertive mode includes a configurable Wait to Restore (WTR) timer that delays the switch back to the working path to ensure stability.

Before you begin

- Log into Cisco Optical Site Manager
- Open the card view, on page 3

Follow these steps to enable revertive protection switching on the PSM card:

Procedure

Step 1 Click the **Maintenance** tab.

Step 2 Click the **Protection** section to expand it.

Step 3 Click the **Edit** button.
The fields in the table become editable.

Step 4 Select **true** from the drop-down list under the **Revertive** column.

Step 5 Specify the time in seconds under the **Wait to Restore** column.

Wait to Restore (WTR) is the time delay (in seconds) applied after a Loss of Signal (LOS) alarm on the working path is cleared. Once the WTR timer expires, traffic is switched back to the working path.

Step 6 Click **Apply**.
Revertive protection switching is enabled on the card.

Revertive protection switching automatically switches traffic back to the working path after the fault is cleared and the WTR timer expires. This process minimizes service disruption and optimizes network performance.

What to do next

•

Configure the non-revertive protection switching

Non-revertive protection switching ensures that, once traffic is switched to the protection path due to a signal failure, it remains there even after the failure on the working path is cleared.

Non-revertive switching contrasts with revertive switching, where traffic automatically returns to the working path after fault resolution. Non-revertive mode is often used to maintain traffic on the protection path until a manual switch is performed or other conditions are met. It is also applicable in MPLS-TE path protection and EVPN configurations to control failover behavior.

Before you begin

- Log into Cisco Optical Site Manager
- Open the card view, on page 3

Follow these steps to enable or disable non-revertive protection switching on a PSM card interface:

Procedure

Step 1 Click the **Maintenance** tab.

Step 2 Click the **Protection** section to expand it.

Step 3 Select the check-box corresponding to the PSM switch and then click **Protection Switch** button.
The **New Switch Command** dialog box is displayed.

Step 4 Complete these steps to enable non-revertive switching in the **New Switch Command** dialog box:

a) Select the interface you want to lockout from the **Target Interface** drop-down list.
b) Select **Lock-Out** from the **Switch Command** drop-down list.
c) Click **Apply**.

Step 5 Complete these steps to disable non-revertive switching:

a) Select **Release** from the **Switch Command** drop-down list.
b) Click **Apply**.

Traffic remains on the protection path after a failure is cleared. This behavior avoids potential disruptions that can result from switching paths repeatedly. When non-revertive mode is disabled, traffic reverts automatically to the original working path once it is restored.

Perform a manual switch

A manual switch lets you transfer traffic between the working and protection paths. Typically, this switch is used during scheduled maintenance or when manual intervention is necessary.

Before you begin

- Log into Cisco Optical Site Manager
- Open the card view, on page 3

Follow these steps to perform a manual switch:

Procedure

Step 1 Click the **Maintenance** tab.

Step 2 Click the **Protection** section to expand it.

Step 3 Select the check-box corresponding to the PSM switch and then click **Protection Switch** button. The **New Switch Command** dialog box is displayed.

Step 4 Select the interface you want to manually switch to from the **Target Interface** drop-down list.

Step 5 Select **Manual-Switch** from the **Switch Command** drop-down list.

Step 6 Click **Apply**.

The system status shows the manual switch state and confirms that the traffic is switched.

View performance monitoring parameters

Performance monitoring (PM) parameters are used by service providers to gather, store, set thresholds, and report performance data for early problem detection. Users can retrieve current and historical PM counters for various controllers at several intervals.

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

Before you begin

- Log into Cisco Optical Site Manager
- Open the card view, on page 3

Follow these steps to view the current and historical PM parameters of a card.

Procedure

Step 1 Click the **Performance** tab.

Step 2 Select the **Interface Type** and **Interface** for which you want to retreive the PM data.

Step 3 Select the **Granularity** to *15 Min* or *24 Hour*.

Step 4 Click **Get PM**.
The PM parameters are displayed on the table.

Step 5 (Optional) Click the **Excel Export** button to export the parameters to an Excel sheet.

Step 6 Perform one of the following from the **Clear PM** drop-down list to clear the current PM parameters on the table:

- Select **Clear Current** to clear the current PM parameters collected on the card.
- Select **Clear All** to clear the current PM parameters collected on the card.

Caution Cleared event logs on a card are not recoverable.

The current and historical PM parameters of the selected card are displayed.

Table 28: Performance monitoring parameter fields

Use this drop-down	To	Valid values
Interface Type	Select the interface type of the card.	The options available are based on the selected card.
Interface	Select the interface of the card.	The options available are based on the selected interface type.
Granularity	Select the threshold value to retrieve performance monitoring parameters for the chosen time interval.	• 1 Min • 15 Mins • 1 Hour • 24 Hours
Location	Select the location.	• nearEnd • farEnd

SVO Card

In this chapter, "SVO" refers to the NCS2K-SVO-K9 card.

The Shelf Virtualization Orchestrator (SVO) card is a two-slot card, which allows better management and control of multichassis solutions for the Cisco NCS 2000.

Cisco Optical Site Manager extends the Network Services Orchestrator (NSO) application by network topology-aware virtualization, thereby improving the management of Cisco NCS 2000 through alarms, status and connection verifications, and so on.

SVO Card enables High Availability functionality by connecting the two SFP+ 10GE optics back-to-back with another SVO Card. You can also configure the card in Geo HA mode where two SVO-LCs are installed in separate NCS2000 nodes to ensure that redundancy is maintained if one of the NCS2000 nodes fails.

SVO Card has a powerful 12 core 2GHz Intel Xeon processor with 64GB DDR4 RAM, 240GB SSD, 4x SFP+ ports, 5x 1GE copper for External Switch, 2x USB 3.0 along with Ethernet management and Console port.

On the Cisco NCS 2015 shelf, the cards can be installed in slots 2 to 15.

The following pluggables on the four front panel ports.

SFP+ (10G)	SFP (1G)
ONS-SC+-10G-SR=	ONS-SI-GE-SX=
ONS-SC+-10G-LR=	ONS-SI-GE-LX=
SFP-10G-SR=	ONS-SE-ZE-EL=
SFP-10G-LR=	

The card has the features:

- Runs in complete redundancy mode with another standby SVO Card.
- Provides selfmonitored hardware status with on board logging.
- Provides virtualization of nodes in a network.

Installing the SVO Card

Note Install and configure the SVO card before installing any other line cards into the shelf assemblies.

When you install the SVO card on the chassis, the PWR-CON-LMT alarm is raised when the power consumption limit is exceeded. We recommend that you remove the SVO card and place it in another chassis that supports the required power.

Procedure

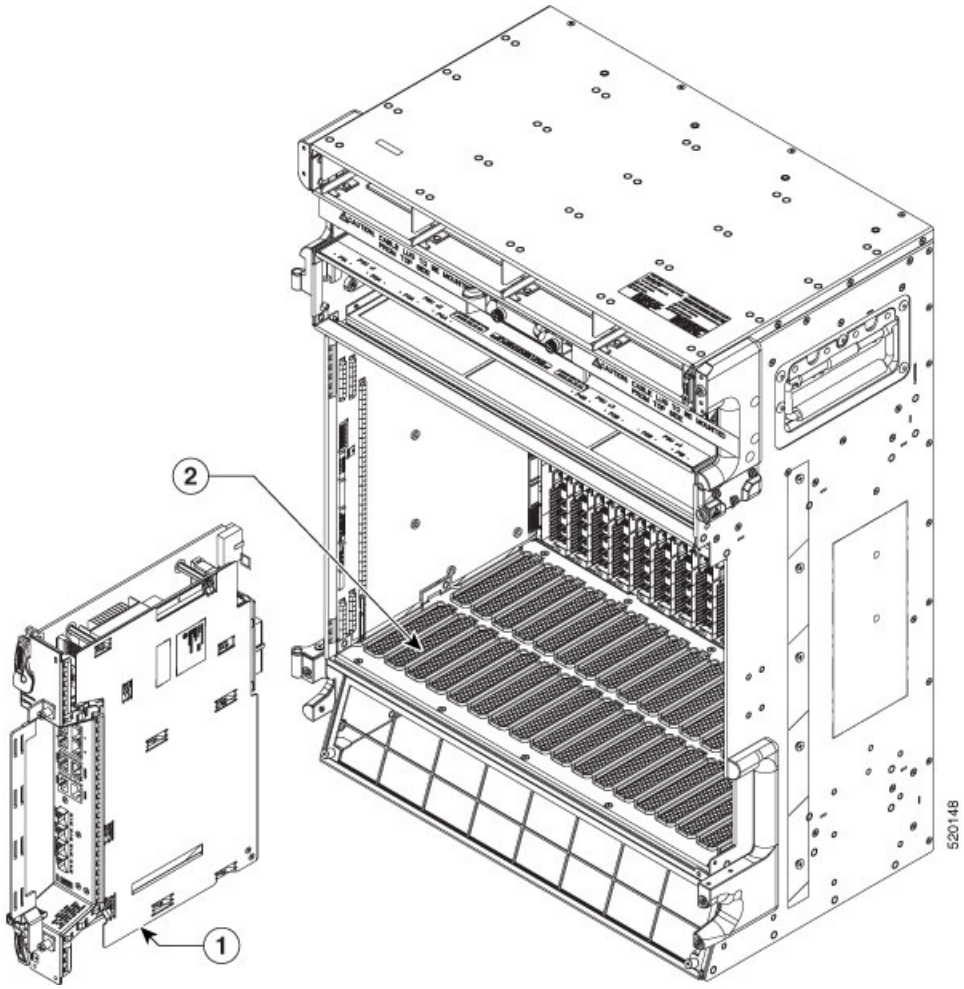
Step 1 Align the SVO card so the markings on the card and the chassis are on the same side.

Step 2 Open the latches or ejectors of the first SVO card that you will install.

Step 3 Use the latches or ejectors to firmly slide the card horizontally along the guide rails until the card plugs into the receptacle at the back of the slot (any slot from slot 2 to 6 in the shelf or slot 2 to 15 in the NCS 2015 shelf).

Step 4 Verify that the card is inserted correctly, and close the latches or ejectors on the card.

Figure 11: Installing SVO card on the NCS 2015 Shelf



1	SVO card	2	Guide Rail

Figure 12: Installed SVO Card on the NCS 2015 Shelf

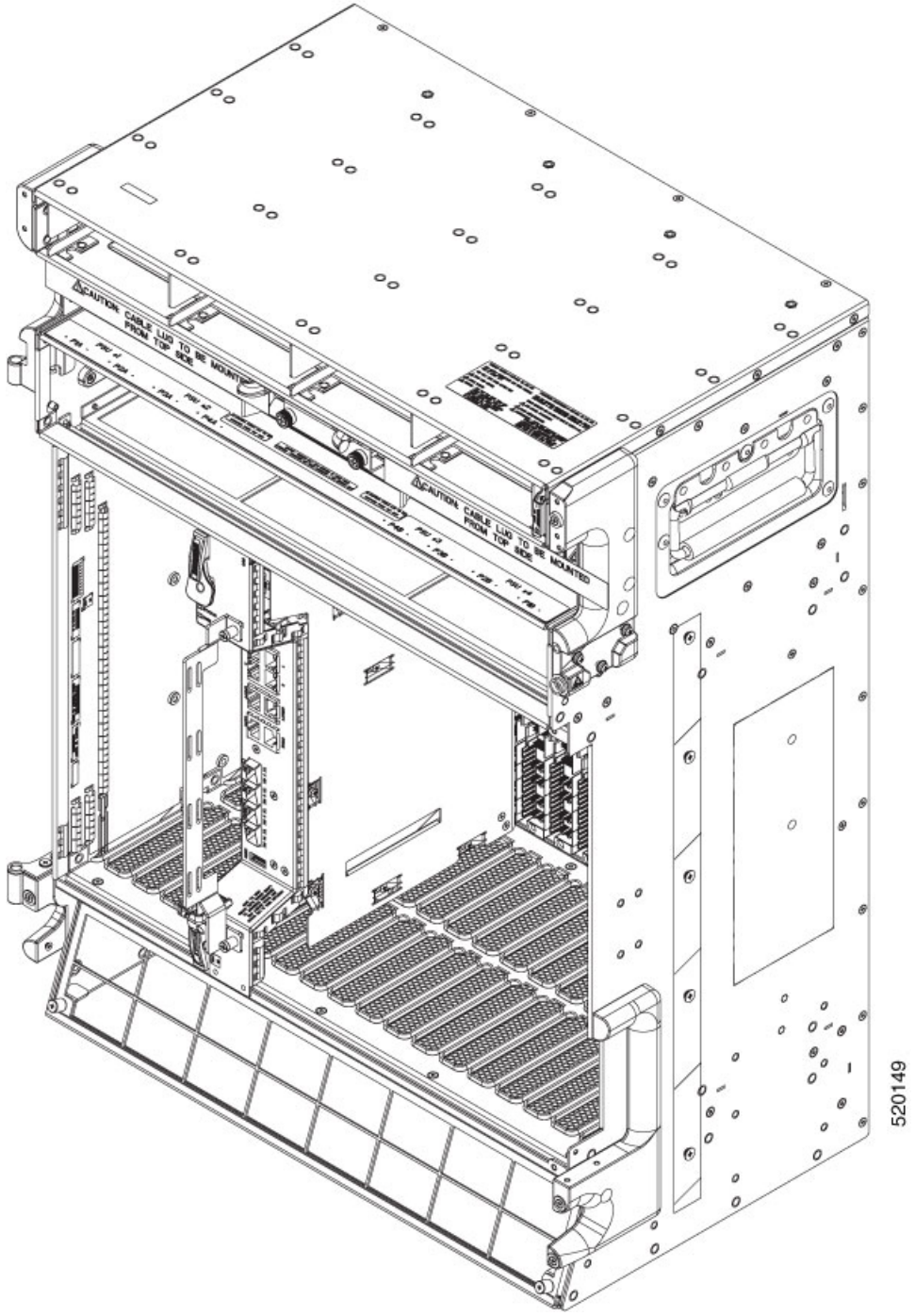
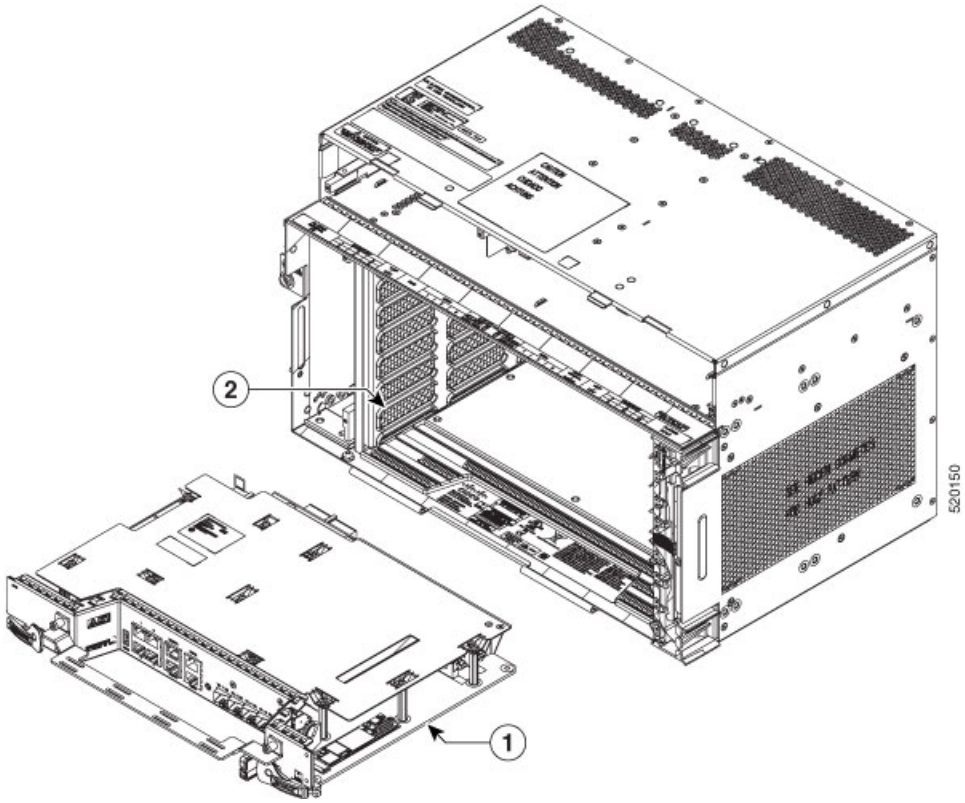
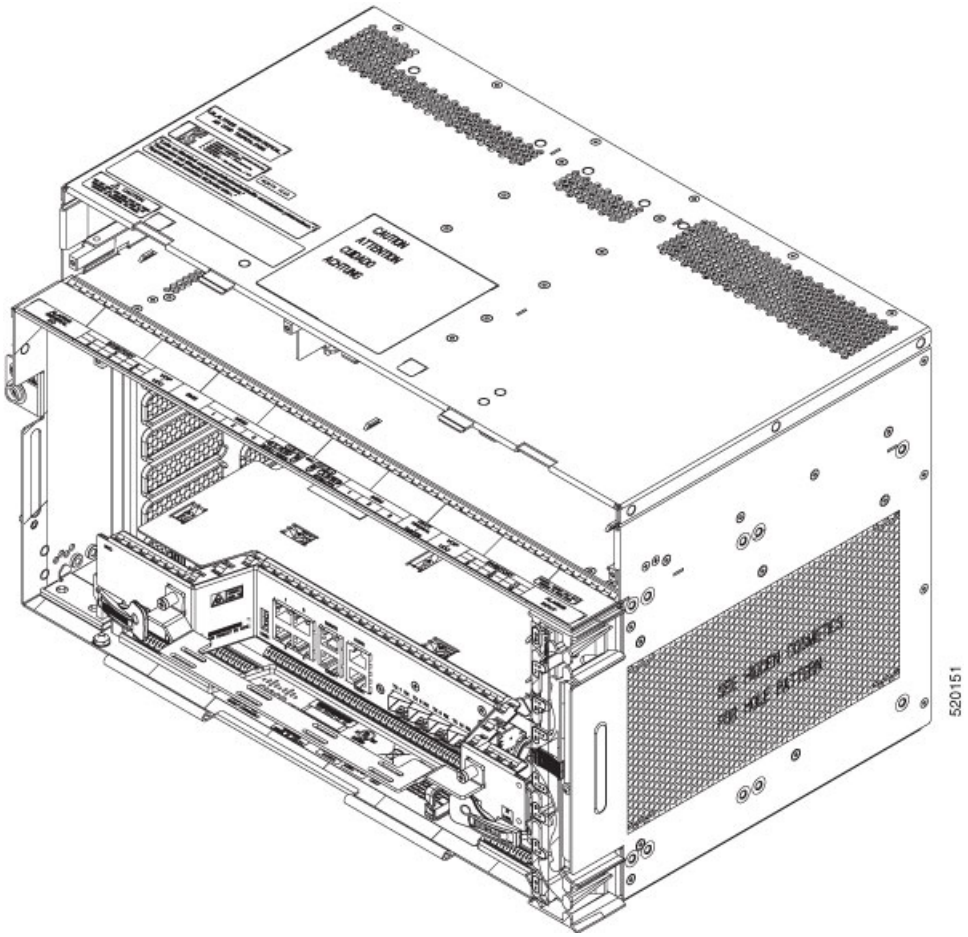


Figure 13: Installing SVO Card on the Shelf



1	SVO Card	2	Guide Rail

Figure 14: Installed SVO Card on the Shelf



View UDC details

The User Data Channel (UDC) is a 100 Mbps Ethernet-type interface available on certain cards, providing a dedicated path for management or user-defined data. Cisco Optical Site Manager allows you to view the details of a UDC channel configured through the CTC.

Use this task to view the UDC channel details of a control card.

Before you begin

- Log into Cisco Optical Site Manager
- Open the card view, on page 3

Procedure

Step 1 Click the **Provisioning** tab.

Step 2 Click the **UDC** section to expand it.

The UDC section displays the port and its service type.

View Insertion Loss Parameters

Use this task to view the insertion loss parameters of the 16-AD-CCOFS and 6AD-DD-CFS cards.

Before you begin

- Log into Cisco Optical Site Manager
- Open the card view, on page 3

Procedure

Click the **Maintenance** > **Insertion Loss** tabs to view the insertion loss parameters.

The Insertion Loss tab displays the following information:

- **Insertion Loss Path**—Displays the insertion loss path.
- **IL Value (dB)**—Displays the insertion loss value.

Note When the card is removed, the last retrieved Insertion Loss values are displayed in the Cisco Optical Site Manager web UI. When the card is replaced, the Insertion Loss values are updated in the Cisco Optical Site Manager web UI.

Manage the Protection Group

Use this task to view the protection group that is automatically created when a new PSM card is provisioned. You can also perform a switch operation on the interfaces.

Before you begin

- Log into Cisco Optical Site Manager

- Open the card view, on page 3

Procedure

Step 1 Click the **Maintenance** > **Protection** tabs to view the parameters of the PSM protection group.

The Protection tab displays the following information:

- **Name**—Name of the protection group
- **Protection Type**—The protection type is splitter
- **Active Interfaces**—The interfaces on which the traffic is present
- **Working Interfaces**—The working interfaces are the active interfaces when the protection group is created.
- **Protection Interfaces**—The protection interfaces when the protection group is created.
- **Switch Type**—The switch type is bidirectional-switching.
- **Revertive**—If set to true, the traffic reverts to the working port after failure conditions remain corrected for the amount of time entered in the Reversion Time field.
- **Reversion Time (min)**—Reversion time is the amount of time that will elapse before the traffic reverts to the working card. The reversion timer starts after conditions causing the switch are cleared. The range is from one to 12 minutes.
- **Reversion Pulse Width (sec)**—Reversion Pulse Width is between 10 to 200 seconds and is configurable only if the protection is revertive. By default, the duration is set to 60 seconds.

Note The following fields in the protection group are editable in the Chassis view > Provisioning tab:

- Name
- Revertive
- Reversion Time
- Reversion Pulse Width

Step 2 Click + to view the protection group data.

The interfaces of the protection group are displayed.

- **Interface**—displays the name of the interface
- **Entity**—Displays the entity of the interface, whether it is working or protect
- **Entity Status**—Displays the status of the entity, whether it is active or Standby
- **Switch Status**—Displays the switch status when a switch operation is performed.

Step 3 To perform a switch operation between the interfaces of a protection group, perform these steps:

Note A switch operation can only be performed if revertive is set to false.

a. Check the check box corresponding to the interface you want to perform a switch operation.

b. Click **Edit**.

The Switch Command dialog box appears.

c. Select an option from the **Action** drop-down list.

The options available are—Lock-Out, Force-Switch, Manual-Switch, and Release.

d. Click **Apply**.

Provisioning Optical Amplifier Cards

This chapter describes the optical amplifier cards used in Cisco NCS 2000 and its related tasks.

RAMAN-CTP and RAMAN-COP Cards

In this chapter, "RAMAN-CTP" refers to the 15454-M-RAMAN-CTP card and "RAMAN-COP" refers to the 15454-M-RAMAN-COP card.

The single-slot RAMAN-CTP and RAMAN-COP cards support counter and co-propagating Raman amplification on long unregenerated spans.

The cards manage up to 96 ITU-T 50 GHz spaced channels over the C-band of the optical spectrum (wavelengths from 1528.77 to 1566.72 nm). The counter-propagating RAMAN-CTP card is the primary unit. The co-propagating RAMAN-COP card is the secondary unit and can be used only when the counter-propagating unit is present. The OSC pluggable used with the cards is ONS-SC-OSC-18.0=.

The RAMAN-CTP card can be calibrated either manually or automatically from the **Maintenance** tab in the Cisco Optical Site Manager web interface. When the RAMAN-COP card is used, the RAMAN-CTP card can be calibrated only using the manual option.

The features of the RAMAN-CTP and RAMAN-COP cards include:

- Raman section: 1000-mW total pump power for four pumps and two wavelengths.
- Embedded distributed feedback (DFB) laser at 1568.77 nm to be used for optical safety and link continuity (in RAMAN-CTP card only).
- Photodiodes to enable monitoring of Raman pump power.
- Photodiodes to enable monitoring of the DFB laser and signal power (in RAMAN-CTP card only).
- Automatic laser shutdown (ALS) for optical laser safety.
- Hardware output signals for loss of signal (LOS) monitoring at input photodiodes.

- Raman pump back reflection detector to check for excessive back reflection.

When the node has either RAMAN-CTP or RAMAN-COP card, you can install the card in the following slots.

- Slots 2–7 in NCS 2006
- Slots 2–16 in NCS 2015

When the node has both RAMAN-CTP or RAMAN-COP cards, you can install the cards in the following slots.

- If the RAMAN-CTP card is installed in an even slot, the RAMAN-COP card must be installed in the next odd slot.
- If the RAMAN-COP is installed in an even slot, the RAMAN-CTP card must be installed in the next odd slot.

RAMAN-CTP and RAMAN-COP Cards Power Monitoring

Physical photodiodes P1 through P10 monitor the power for the RAMAN-CTP card.

Table 29: RAMAN-CTP Port Calibration

Photodiode	Type Name	Calibrated to Port
P1	DFB in-fiber Output Power	LINE-TX
P2	DWDM RX Input Power	LINE-RX
P3	Pump 1 in-fiber Output Power	LINE-RX
P4	Pump 2 in-fiber Output Power	LINE-RX
P5	Total Pump in-fiber Output Power	LINE-RX
P6	Back-Reflected Pump Power	LINE-RX
P7	DWDM TX Input Power	COM-RX
P8	Total Co-Pump in-fiber Output Power	LINE-TX
P9	DFB Input Power	LINE-RX
P10	ASE Input Power	LINE-RX

Physical photodiodes P3 through P6 monitor the power for the RAMAN-COP card.

Table 30: RAMAN-CTP Port Calibration

Photodiode	Type Name	Calibrated to Port
P3	Pump 1 in-fiber Output Power	RAMAN-TX
P4	Pump 2 in-fiber Output Power	RAMAN-TX

Photodiode	Type Name	Calibrated to Port
P5	Total Pump in-fiber Output Power	RAMAN-TX
P6	Back-Reflected Pump Power	RAMAN-TX

For more information about the RAMAN-CTP and RAMAN-COP cards, see the data sheet.

Clear the Raman Laser Shutdown Condition

The Raman Laser Shutdown (RLS) condition is raised during the Raman link turn-up phase on the RAMAN-TX port of the RAMAN-CTP and RAMAN-COP cards when excessive back reflection is detected. When the RLS condition is raised, the Raman pump laser inside the card is automatically shut down and the optical link turn-up procedure is terminated. The RLS condition must be cleared before proceeding with further provisioning.

Use this task to clear the RLS condition for RAMAN-CTP and RAMAN-COP cards.

Before you begin

- Log into Cisco Optical Site Manager
- Open the card view, on page 3

Procedure

Step 1 Click the **Maintenance** > **Safety** tabs.

Step 2 Click **Manual Safety Restart** to clear the RLS condition.

A confirmation dialog box appears and is service-affecting.

Step 3 Click **Yes** to proceed.

Collect Failure Logs

Use this task to collect the failure log information for the cards. This task can be used to debug the cards before RMA.

Before you begin

- Log into Cisco Optical Site Manager
- Open the card view, on page 3

Procedure

Right-click the card and choose **OBFL** to collect the On Board Failure Logs (OBFL).

The failure log information is displayed in the **Maintenance** > **OBFL Status** tabs.

Perform Automatic Calibration

Use this task to perform automatic calibration for the RAMAN-CTP, EDRA1-xx, and EDRA2-xx cards.

The automatic calibration automatically runs on the cards upon fiber restoration, power cycle, and so on.

Before you begin

- Log into Cisco Optical Site Manager
- Open the card view, on page 3

Procedure

Step 1 Click the **Maintenance** > **Automatic Calibration** tabs.

All the values in this pane are read-only and reflects the status of last automatic calibration.

Table 31: Parameters of Automatic Calibration

Parameter	Description
Port	Displays the port number, port type, and direction (TX or RX).
Timestamp	Displays the date and time of calibration.
Calibration Gain (dB)	Displays the Raman gain that is obtained with calibration of total pump power.
Calibration Total Pumps (mW)	Displays the reference power level used throughout calibration. The default value is 700 mW. If Raman gain is too low, the power value is automatically increased to 850 mW.
Target Gain (dB)	Displays the target spectrum gain.
Obtained Gain (dB)	Displays the obtained spectrum gain.
Target Tilt (dB)	Displays the target spectrum tilt.
Obtained Tilt (dB)	Displays the obtained spectrum tilt.
Raman Noise Floor (dBm)	Displays the optical power measured at the LINE-RX port when Raman pumps are at calibration total pumps power level and incoming signal is not received from the neighboring node. It is noise generated by the Raman amplification process.

Parameter	Description
Incoming Power Pumps Off (dBm)	Displays the power level of probe signal with Raman pumps off.
Incoming Power Pumps On (dBm)	Displays the power level of probe signal with Raman pumps on (combined with Raman noise floor).
Power Source	Displays the type of power source that is used for calibration. The possible values of Power Source are as follows: • Broadband Optical Power—Raman automatic calibration used broadband optical power, typically, Amplified Spontaneous Emission (ASE) generated by an optical amplifier. • Active Optical Services—Raman automatic calibration used active services. • Active Optical Services (Unbalanced)—Raman automatic calibration used active services;however, they do not properly cover the whole C-Band spectrum.
Result	Displays the result of automatic Raman calibration. The possible values of Result are as follows: • No Target Gain—Raman target gain is not configured. • Not Enough Gain—Raman gain obtained from calibration is too low. • Lower Than Target Gain (Need Accept)—Raman gain obtained from calibration is below the target but might be acceptable. The user must accept the Raman gain. • Lower Than Target Gain (Accepted)—Raman gain obtained from calibration is below the target and the user has accepted the Raman gain. • Target Gain Reached—Raman target gain is reached. • User Override—User has overridden the calibration result and uses configured setpoint of Raman pumps manually.

Parameter	Description
Status	Displays the status of automatic Raman calibration. The possible values of Status are as follows: • Not Scheduled—Raman automatic calibration is not scheduled. • Invalid—Raman automatic calibration reports invalid data. • Pending—Raman automatic calibration is scheduled and pending. • Running On User Request—Raman automatic calibration is running on user request. • Running—Raman automatic calibration is automatically running. • Failed—Raman automatic calibration has failed. • Aborted—Raman automatic calibration has been terminated and will be re-scheduled soon. • Completed—Raman automatic calibration is completed.

Step 2 Click **Run Calibration** to start the automatic calibration.

A confirmation message appears.

Step 3 Click **Yes**.

When you start the automatic calibration, the Status column in the Automatic Calibration tab changes to "Running on User Request."

The calibration result can be success, failure, or lower than target gain.

- If the calibration result is success, the obtained target gain value is applied to the node.
- If the calibration result is failure, the old target gain value is restored.
- If the calibration result is lower than target gain, it implies that the obtained gain is + or –2 dB from the target gain. The gain is degraded. The RAMAN-GAIN-NOT-REACHED alarm is raised on the node to inform the user of a lower target gain. The user can accept this lower target gain by clicking the **Accept Degraded Gain** button. This clears the RAMAN-GAIN-NOT-REACHED alarm and the lower target gain value is applied to the node.

Step 4 (Optional) (Not applicable for RMN-CTP-CL card) Click **Get All Calibration Reports** to display the last 10 calibration reports with the timestamp and result in a table.

Step 5 (Optional) Click **Get Last Calibration Error** to identify the reason for the last calibration failure.

The automatic calibration typically completes without user intervention. However, the automatic calibration fails upon certain conditions such as loss of communication between two nodes and OSC failure. You can

identify the reason for the last calibration failure by clicking the **Get Last Calibration Error** button. The reason is displayed only when the Status column in the Automatic Calibration tab is Failure.

Perform Manual Calibration

Use this task to perform manual calibration for the RAMAN-CTP and RAMAN-COP cards.

The RAMAN-COP card supports only manual calibration. The RAMAN-CTP card supports both automatic and manual calibration. However, if a node has both RAMAN-CTP and RAMAN-COP cards, the RAMAN-CTP card supports only manual calibration.

For complete information on the specific setup that is required for manual calibration, see DLP-G690 Configure the Raman Pump Using Manual Day-0 Installation.

Before you begin

- Log into Cisco Optical Site Manager
- Open the card view, on page 3

Procedure

Step 1 Click the **Maintenance** > **Manual Calibration** tabs.

All the values in this pane are read-only and reflects the status of last manual calibration.

Table 32: Parameters of Manual Calibration

Parameter	Description
Port	Displays the port number, port type, and direction (TX or RX).
Time Stamp	Displays the date and time of calibration.
Pump 1 Low Power (dBm)	Displays the measured incoming power with only pump 1 on at low power level.
Pump 2 Low Power (dBm)	Displays the measured incoming power with only pump 2 on at low power level.
Pump 1 High Power (dBm)	Displays the measured incoming power with only pump 1 on at high power level.
Pump 2 High Power (dBm)	Displays the measured incoming power with only pump 2 on at high power level.
Target Gain (dB)	Displays the target spectrum gain.
Obtained Gain (dB)	Displays the obtained spectrum gain.

Parameter	Description
Target Tilt (dB)	Displays the target spectrum tilt.
Obtained Tilt (dB)	Displays the obtained spectrum tilt.
Result	Displays the result of manual Raman calibration. The possible values of Result are as follows: • No Target Gain—Raman target gain is not configured. • Not Enough Gain—Raman gain obtained from calibration is too low. • Lower Than Target Gain—Raman gain obtained from calibration is below the target but is acceptable. • Target Gain Reached—Raman target gain is reached. • User Override—User has overridden the calibration result and uses the configured setpoint of Raman pumps manually.
Status	Displays the status of manual Raman calibration. The possible values of Status are as follows: • Not Calibrated—Raman calibration was not run. • In Progress—Raman calibration is being run by the user. • Completed—Raman calibration is completed. • Using pumps-power-setpoint—Raman pumps are regulated according to the user configuration.

Step 2 Click **Run Calibration**.

A confirmation message appears.

Step 3 Click **Yes**.

Step 4 Click **Run Pump Test** for each individual pump.

The pump test cannot be run if active circuits are present in the node. When you run the pump test, the Status column in the Manual Calibration tab changes to "In Progress."

Step 5 Enter the optimum power value of individual pump in the Power Value (dBm) field.

Step 6 Click **Calibrate Pump** to start the manual calibration.

The calibration progress appears in the **Calibration Result** area. The calibration result can be a success, failure, or lower than target gain.

- If the calibration result is success, the obtained target gain value is applied to the node.

- If the calibration result is a failure, the old target gain value is restored.
- If the calibration result is lower than the target gain, it implies that the obtained gain is + or –2 dB from the target gain. The gain is degraded. However, the calibration is still accepted and the obtained target gain value is applied to the node.

Provision FPD Upgrade

Whenever the firmware version on the card is earlier than the FPGA firmware version, an alarm "FPD-UPG-REQUIRED" is raised on the card in the **Alarms** tab.

You can view the running firmware version and the NCS 2000 FPGA firmware version under the **Maintenance** > **FPD upgrade** tabs.

Use this task to upgrade the RMN-CTP-CL card with the latest firmware released as part of the NCS 2000 software release.

Before you begin

- Log into Cisco Optical Site Manager
- Open the card view, on page 3

Procedure

Step 1 Click the **Maintenance** > **FPD Upgrade** tabs.

Step 2 Click **FPD upgrade** to perform firmware upgrade for the card.

After the firmware upgrade is completed successfully, the "FPD-UPG-REQUIRED" alarm gets cleared in **Alarms** tab and you can view the updated running firmware version in the **FPD Upgrade** table.

Retrieve MAC Addresses through LLDP

Use this task to retrieve the source MAC address of the host connected to the 100GE or 400GE ports of 1.2T-MXP card, after a Link Layer Discovery Protocol (LLDP) packet is received on the client port.

Before you begin

- Log into Cisco Optical Site Manager
- Open the card view, on page 3

Procedure

Step 1 Click the **Maintenance** tabs.

Step 2 Click the **LLDP** section to expand it.

Step 3 Click **Refresh**.

The table displays the following fields:

- Port—Displays the port number.
- Source MAC Address—Displays the MAC address of the node to which the port is connected.

Limitations of LLDP Support on the 1.2T-MXP Card

The LLDP support on the 1.2T-MXP card has the following limitations:

- The 1.2T-MXP card can handle only one LLDP packet of 2000byte size per client every four seconds.
- LLDP packet is not detected when the client ports if moved to from IS to OOS.
- After the trunk port transits from OOS to IS, there is a delay of 12 to15 seconds to detect the LLDP packet and display it on the GUI.
- LLDP capture does not happen when CFP2 DCO associated with the client port is not plugged in.
- The 1.2T-MXP card captures the LLDP packets only when:
  1. The value of ETH TYPE header is 0x88CC.
  2. The destination Multicast addresses are:
     - 01:80:C2:00:00:00
     - 01:80:C2:00:00:0e
     - 01:80:C2:00:00:03

Provision FPD Upgrade for the Ports

When the firmware version on the DCO trunk port is earlier than the NCS 2000 package firmware version, an alarm "FPD-UPG-REQUIRED" is raised on that trunk port in the **Alarms** tab. Each trunk port has separate upgrade alarm.

You can view the DCO running firmware version and the NCS 2000 package firmware version under the **FPD upgrade** section of the **Maintenance** tab.

Use this task to upgrade DCO (trunk ports) on the 1.2T-MXP card with the latest firmware released as part of the NCS 2000 software release.

Before you begin

- Log into Cisco Optical Site Manager
- Open the card view, on page 3

Procedure

Step 1 Click the **Maintenance** tabs.

Step 2 Click the **FPD Upgrade** section to expand it.

Step 3 Choose the DCO ports that you want to upgrade.

You can consider the following use cases to choose the DCO ports for upgrade:

- When the DCO ports have both traffic-affecting and non-traffic affecting upgrade alarms, you can select only the DCO ports with non-traffic affecting upgrade alarms and proceed with the firmware upgrade without affecting traffic on the node.
- If the upgrade is required only for a DCO on a specific circuit, you can select that particular DCO and perform the upgrade without disturbing any other DCO ports.

Step 4 Click **FPD upgrade** to perform firmware upgrade for the chosen ports.

After the firmware upgrade is completed successfully, the "FPD-UPG-REQUIRED" alarm gets cleared in the **Alarms** tab and you can view the updated running firmware version in the **FPD Upgrade** table.

Provision FPD Upgrade for MR-MXP Card

When the firmware version on the MR-MXP card is earlier than the NCS 2000 package firmware version, an alarm "TRAF-AFFECT-RESET-REQUIRED" is raised on that card in the **Alarms** tab.

You can view the running firmware version and the NCS 2000 package firmware version under the **FPD upgrade** section of the **Maintenance** tab.

Use this task to upgrade the MR-MXP card with the latest firmware released as part of the NCS 2000 software release.

Before you begin

- Log into Cisco Optical Site Manager
- Open the card view, on page 3

Procedure

Step 1 Click the **Maintenance** tabs.

Step 2 Click the **FPD Upgrade** section to expand it.

Step 3 Click **FPD upgrade** to perform firmware upgrade for the card.

After the firmware upgrade is completed successfully, the "TRAF-AFFECT-RESET-REQUIRED" alarm gets cleared in the **Alarms** tab and you can view the updated running firmware version in the **FPD Upgrade** table.

Enable Proactive Protection

Use this task to modify the proactive protection settings of the card.

Before you begin

- Log into Cisco Optical Site Manager
- Open the card view, on page 3

Procedure

Step 1 Click the **Provisioning** tab.

Step 2 Click the **Proactive Protection** section to expand it.

Step 3 Modify required settings described in the following table.

Table 33: Proactive Protection Regen Settings

Parameter	Description	Options
Port	(Display only) Displays the port name.	—
Trigger Threshold	Sets the maximum BER threshold to trigger proactive protection.	• 1E-3 • 9E-2 to 1E-2 • 9E-3 to 1E-3 • 9E-4 to 1E-4 • 9E-5 to 1E-5 • 9E-6 to 1E-6 • 9E-7 to 1E-7

Parameter	Description	Options
Trigger Window (ms)	Sets the duration when BER is monitored before triggering the proactive protection. The trigger window value must be a multiple of: • 10 ms for trigger thresholds between 1E-3 and 6E-6 • 100 ms for a trigger threshold between 5E-6 to 1E-7 Trigger window must be less than or equal to 500 ms for trigger thresholds between 1E-3 and 6E-6. The trigger window must be less than or equal to 3900 ms for trigger thresholds between 5E-6 to 1E-7.	Time in milliseconds.
Revert Threshold	Sets the revert threshold value of BER. **Note** The revert threshold settings must be less than the trigger threshold values.	• 1E-4 • 9E-3 to 1E-3 • 9E-4 to 1E-4 • 9E-5 to 1E-5 • 9E-6 to 1E-6 • 9E-7 to 1E-7 • 9E-8 to 5E-8
Revert Window (ms)	Sets the duration when BER is monitored for settings that are less than the revert threshold value before which, proactive protection that is provided to the router is removed. The revert window value must be at least 2000 ms and a multiple of: • 10 ms for a revert threshold of 1E-4 to 6E-7. • 100 ms for a revert threshold of 5E-7 to 5E-8. The revert window must be less than or equal to 3900 ms.	Time in milliseconds.
Enable Proactive Protection	Enables proactive protection.	• Disabled • FRR Proactive Protection • Pre-FEC PSM Proactive Protection

Step 4 Click **Apply**.

Provision ODU Circuit

Use this task to provision ODU circuit created through NETCONF client, in the OTNXC mode of the 400G-XP card.

Both unprotected and protected ODU connections or OTNXC circuits that are created in CTC will be available in the Cisco Optical Site Manager. The user interface after the NCS2000 device is upgraded from CTC to Cisco Optical Site Manager and the device sync is completed. The ODU connection data that is displayed in the Cisco Optical Site Manager user interface has the following discrepancies:

- When ODU connections are discovered, Cisco Optical Site Manager autogenerates the connection name as "device-name/object index" (an integer number) and displays the connection name as Circuit ID.
- CTC allows creating a protected ODU connection with two trunk ODU sources and one client ODU destination. But Cisco Optical Site Manager considers this protected ODU connection as invalid. Hence as part of discovery, Cisco Optical Site Manager recreates the protected ODU connection with one source client and two destination trunk ODUs, by swapping.

Use this task to provision ODU circuit created in the OTNXC mode of the 400G-XP card.

Before you begin

- Log into Cisco Optical Site Manager
- Open the card view, on page 3

Procedure

Step 1 Click the **Maintenance** tabs.

Step 2 Click the **OTN Circuit** section to expand it.

The **OTN Circuit** tab displays the following information:

- Circuit ID—Unique identifier for the end-to-end circuit
- Connection label—Unique identifier for ODU connections
- Bandwidth—Bandwidth of the circuit. Supported values are ODU4, ODU2, ODU2e
- Direction—Only bidirectional is supported
- Source—Source ODU port
- Destination—Destination ODU port
- Protection Reference—Displays the Protection port
- Admin State—Displays the admin state
- Service State—Displays the service state

- ILK Usage—Displays interlink port usage

Step 3 Click the plus icon to view the **Protection Attributes** of the circuit.

Step 4 (Optional) Edit the **Connection label** and the **Admin State**.

Step 5 (Optional) Click **ODU Utilization** to view ODU Utilization information.

An ODU utilization window for the 400G-XP-LC card is displayed where you can get information about the availability of each port for ODU circuit creation. All ODU ports are displayed according to the slice configuration that was configured. Each row represents 100G or ODU4 bandwidth. The client ports are listed first followed by the trunk ports. The ports that are already used by the ODU circuit are displayed in green, the ports that are available for circuit creation are displayed in orange and the ports that are not applicable nor configured are displayed in gray.

To view Bandwidth Utilization using the NETCONF client, use the following RPCs:

- To show the utilization under odu-interface which is part of otn-xc connection:

```
<action xmlns="urn:ietf:params:xml:ns:yang:1">
    <svo xmlns="http://cisco.com/yang/svo">
      <odu-connection-commands>
        <interface-otnxc-utilization>
          <interface-name>1/3/11/1-1</interface-name>
        </interface-otnxc-utilization>
      </odu-connection-commands>
    </svo>
  </action>
```

- To show card level utilization (You enter the shelf and slot info.):

```
<action xmlns="urn:ietf:params:xml:ns:yang:1">
    <svo xmlns="http://cisco.com/yang/svo">
      <odu-connection-commands>
        <module-otnxc-utilization>
          <uid>1</uid>
          <module-id>3</module-id>
        </module-otnxc-utilization>
      </odu-connection-commands>
    </svo>
  </action>
```

Step 6 Click **Apply**.

You can edit only the Admin State and the Connection label in the Cisco Optical Site Manager user interface. For protected ODU connection, Protection group Name, Revertive mode, and Revertive time can be edited from NETCONF, and web user interface (under the **Protection** section of the **Provisioning** tab in the shelf view). The other parameters such as Holdoff Timer can be edited only through the NETCONF client.

Functional Module Group

Functional Module Group (FMG) stepper simplifies the process of configuring the operating modes for transponder and muxponder cards. In the previous releases, you must navigate through multiple tabs in the Cisco Optical Site Manager application to make the appropriate selections. With the FMG stepper, you can

configure the operating modes and sub operating modes of different cards with specific client payloads in simple steps.

Configure Card Mode using Functional Module Group

Use this task to configure the operating mode and sub operating modes of a card while adding it to the NCS 2006 or NCS 2015 chassis.

Before you begin

- Log into Cisco Optical Site Manager
- Open the card view, on page 3

Procedure

Step 1 Click **COSM Topology** in the left panel.

The Topology view is displayed.

Step 2 Click the rack title to zoom into the required rack in the left panel.

The enlarged view of the rack appears.

Step 3 Left-click the empty slot in the chassis where you want to add the card.

The dialog box for the selected slot appears.

Note Configuration of card mode cannot start from slot 16 in NCS 2015 chassis.

Step 4 Click **FMG Provision** to add a card to the chassis and configure its card mode.

The **Functional Module Group** wizard appears.

Step 5 In **Add primary module**, perform the steps to choose a primary card.

a) Choose a primary card from the **Select primary module** drop-down list.

Note When adding the NCS2K-400G-XP or NCS2K-100GS-CK-C card, ensure to follow the correct slot combinations in NCS 2006 and NCS 2015 chassis. If correct slot combinations are not available, the **Select primary module** drop-down list does not display the NCS2K-400G-XP or NCS2K-100GS-CK-C card.

A preview of the selected card appears below the drop-down list.

b) Click **Next**.

Step 6 In **Select card mode**, perform the steps to configure a card mode.

a) Choose the required card mode configuration from the drop-down list.

Note The number of available card mode configurations differ based on the primary card selected. For more information on the card mode configurations, see Configuring card modes for NCS 2000 line cards, on page 18.

b) Click **Add**.

When adding the 15454-M-10x10G-LC card, you can choose multiple card mode configurations. You must choose trunk ports for the RGN-10G, TXP-10G, Low Latency and TXPP-10G card modes, and client port for TXP-10G card mode.

When adding the NCS2K-400G-XP card, you must choose slice configurations for the card mode selected.

c) Click **Next**.

Step 7 In **Add secondary modules**, perform the steps to configure the required peer card.

a) Choose the peer card from the **Select secondary modules** drop-down list.

Note The **Functional Module Group** wizard lists the compatible peer cards for the selected primary card and its card mode configuration. For NCS2K-100GS-CK-C and NCS2K-200G-CK-C cards, you must choose sub operating modes for MXP-200G card mode from the **Submode** drop-down list.

A preview of the selected peer card appears below the drop-down list.

b) Click **Next**.

Note For standalone card modes, the **Functional Module Group** wizard skips the **Add secondary modules** step.

Step 8 In **Add pluggables**, perform the following steps to configure the pluggable parameters.

Note You need to configure the pluggable port modules and pluggables ports for the primary card followed by the secondary cards.

a) In the **Pluggable Port Modules** pane, choose from the **PPM** drop-down list and click **Add**.

The added port modules appear below the drop-down list.

b) In the **Pluggable Ports** pane, choose from the **Port ID** and **Port Type** drop-down lists and click **Add**.

The added Port ID and Port Type appear below the drop-down list.

c) Click **Next**.

A preview of the configured cards, pluggable port modules and pluggable ports appear in **Configuration recap**. If sub modes and slices are configured, then a preview of the sub modes and slices are also displayed.

Step 9 Click **Finish**.

Note Errors are displayed if the configuration is inaccurate.

Provision ZR Plus Interfaces

Use this task to provision the parameters for the ZR Plus interfaces of the 1.2T-MXP card.

Before you begin

- Log into Cisco Optical Site Manager
- Open the card view, on page 3

Procedure

Step 1 Click the **Maintenance** tabs.

Step 2 Click the **ZR Plus Interfaces** section to expand it.

Step 3 Modify any of the ZR Plus settings as described in the following table. These parameters depend on the card mode.

Table 34: Card ZR Plus Settings

Parameter	Description	Options
Port	(Display only) Displays the port number	—
Squelch Mode	(Display only) Displays the squelch mode	• LF
Squelch Hold Off Time	Sets the period in milliseconds that the client interface waits for resolution of issues on the trunk side. The client squelching starts after this period	• Disable
FEC	Sets the FEC mode	OFEC_15_DE_ON
GroupId	Sets the GroupId that uniquely identifies a group of physical ports in a ZR frame. This makes sure that noncompliant groups do not interoperate. When a mismatch in the group is identified, GIDM alarm is raised.	1–255

Step 4 Click **Apply**.

Provision ZR Plus Interfaces

Use this task to provision the parameters for the ZR Plus interfaces of the 1.2T-MXP card.

Before you begin

- Log into Cisco Optical Site Manager
- Open the card view, on page 3

Procedure

Step 1 Click the **Maintenance** tabs.

Step 2 Click the **ZR Plus Interfaces** section to expand it.

Step 3 Modify any of the ZR Plus settings as described in the following table. These parameters depend on the card mode.

Table 35: Card ZR Plus Settings

Parameter	Description	Options
Port	(Display only) Displays the port number	—
Squelch Mode	(Display only) Displays the squelch mode	• LF
Squelch Hold Off Time	Sets the period in milliseconds that the client interface waits for resolution of issues on the trunk side. The client squelching starts after this period	• Disable
FEC	Sets the FEC mode	OFEC_15_DE_ON
GroupId	Sets the GroupId that uniquely identifies a group of physical ports in a ZR frame. This makes sure that noncompliant groups do not interoperate. When a mismatch in the group is identified, GIDM alarm is raised.	1–255

Step 4 Click **Apply**.

Provision ZR Plus Trail Trace Monitoring

This task provisions the trail trace monitoring parameters that are supported for the ZR plus payloads on the 1.2T-MXP card.

Before you begin

- Log into Cisco Optical Site Manager
- Open the card view, on page 3

Procedure

Step 1 Click the **Maintenance** tabs.

Step 2 Click the **ZR Plus Trail Trace Monitoring** section to expand it.

Step 3 Modify any of the ZR Plus settings as described in the following table.

Table 36: ZR plus Trail Tracing Settings

Parameter	Description	Options
Port	(Display only) Displays the port number.	—
Send-Tti	Sets the transmit TTI String.	0–32 Bytes
Expected-Tti	Sets the expected TTI String.	0–32 Bytes
Received-Tti	(Display only) Displays the received TTI String.	0–32 Bytes

Note
- When the trunk port is in OOS-DSBL state, its received TTI is not displayed in the GUI.
- Sometimes, the received TTI value takes up to ten seconds to get displayed in the GUI.

Step 4 Click **Apply**.

Provision ZR Plus Trail Trace Monitoring

This task provisions the trail trace monitoring parameters that are supported for the ZR plus payloads on the 1.2T-MXP card.

Before you begin

- Log into Cisco Optical Site Manager
- Open the card view, on page 3

Procedure

Step 1 Click the **Maintenance** tabs.

Step 2 Click the **ZR Plus Trail Trace Monitoring** section to expand it.

Step 3 Modify any of the ZR Plus settings as described in the following table.

Table 37: ZR plus Trail Tracing Settings

Parameter	Description	Options
Port	(Display only) Displays the port number.	—
Send-Tti	Sets the transmit TTI String.	0–32 Bytes
Expected-Tti	Sets the expected TTI String.	0–32 Bytes
Received-Tti	(Display only) Displays the received TTI String.	0–32 Bytes

Note
- When the trunk port is in OOS-DSBL state, its received TTI is not displayed in the GUI.
- Sometimes, the received TTI value takes up to ten seconds to get displayed in the GUI.

Step 4 Click **Apply**.

Provision Pluggable Ports

Use this task to provision the payloads supported on the card.

Before you begin

- Log into Cisco Optical Site Manager
- Open the card view, on page 3
- Configuring card modes for NCS 2000 line cards, on page 18

Procedure

Step 1 Click the **Provisioning** tab.

Step 2 Click the **Pluggable Ports** section to expand it.

Step 3 In the Pluggable Ports area, click the + button.

The Create Port dialog box appears.

Step 4 Choose the port number from the **Port ID** drop-down list.

Step 5 Choose the supported payload from the **Port Type** drop-down list.

Note For 1.2T-MXP card, if you try to choose a payload which is not supported by the sub operating mode of the pluggable, you will see an error message.

Step 6 Choose the number of lanes from the drop-down list.

This field is visible only in specific configurations.

Step 7 Click **Apply**.

Step 8 Repeat Step 1 through Step 6 to configure the rest of the port rates as needed.

View Circuit Protection Parameters

Use this task to display the protection parameters of ODU circuit created in the OTNXC mode of the 400G-XP card. The protection parameters are defined when a protected ODU circuit is created through NETCONF client.

Before you begin

Log into Cisco Optical Site Manager

Procedure

Step 1 Click **COSM Topology** in the left panel.

The Topology view is displayed.

Step 2 Click the rack in the left panel.

The rack view appears.

Step 3 Left-click the chassis and select **Open**.

The chassis view appears.

Step 4 Click the **Maintenance Protection** tabs to view the following protection parameters:

- **Name**—Name of the protection group.
- **Protection Type**—Type of the protection.
- **Active Interfaces**—The interfaces on which the traffic is present.
- **Working Interfaces**—The working interfaces are the active interfaces when the protection group is created.
- **Protection Interfaces**—The protection interfaces when the protection group is created.
- **Switch Type**—The switch type is bidirectional-switching.
- **Revertive**—Choose True or False. If set to true, the traffic reverts to the working port after failure conditions remain corrected for the amount of time that is entered in the Reversion Time field.
- **Reversion Time (min)**—Reversion time is the amount of time that will elapse before the traffic reverts to the working port. The reversion timer starts after conditions causing the switch are cleared. The range is from one to 12 minutes.
- **Reversion Pulse Width (sec)**—Reversion Pulse Width is not applicable for the ODU circuit.



Note The following fields in the protection group are editable in the **Chassis view Provisioning** tab:

- Name
- Revertive
- Reversion Time
- Reversion Pulse Width

Step 5 Click + to view the protection group data.

The interfaces of the protection group are displayed.

- **Interface**—Displays the name of the interface
- **Entity**—Displays the entity of the interface, whether it is working or protect
- **Entity Status**—Displays the status of the entity, whether it is active or Standby
- **Switch Status**—Displays the switch status when a switch operation is performed.

Step 6 To perform a switch operation between the interfaces of a protection group, perform these steps:

a. Check the check box of the interface that has **Entity Status** as active.

b. Click **Edit**.

The **Switch Command** dialog box appears.

c. Select an option from the **Action** drop-down list.

The options available are—Lock-Out, Force-Switch, Manual-Switch, and Release.

d. Click **Apply**.

Note Cisco Optical Site Manager does not support the Y-cable protection type. If a Y-cable protected circuit is available in the system, Cisco Optical Site Manager cannot fetch the data when you expand the protection data.

NCS 2000 Cards

Table 38: Feature History

Feature Name	Release Information	Description
Flexible Migration Options for NCS 2000 Management	Cisco NCS 2000 Release 25.1.1	This release improves flexibility and migration options for NCS 2000 management. Network-level and node-level functionalities can now be managed through Cisco Optical Network Controller or Cisco Optical Site Manager using SVO-LC. Transition to Cisco Optical Network Controller or Cisco Optical Site Manager at your own pace while continuing to use TL1, EPNM 8.1.1, and CTC. When ready, you can disable these legacy tools and adopt Cisco Optical Network Controller or Cisco Optical Site Manager as the primary management platform.

This section describes the NCS 2000 cards that can be configured using Cisco Optical Site Manager.

In release 25.1.1, CTC card-level and node-level functionalities are limited due to the availability of the Cisco Optical Site Manager web UI. The TL1 interface remains fully supported.

Note Before making any configuration changes to the NCS 2000 cards using CTC or TL1, ensure that the Cisco Optical Site Manager interface is disabled through the device lock/unlock feature. This step is essential to avoid potential conflicts during the configuration process.

10x10G-LC Card

In this section, "10x10G-LC" refers to the 15454-M-10x10G-LC card.

The 10x10G-LC card is a DWDM client card, which simplifies the integration and transport of 10 Gigabit Ethernet interfaces and services to enterprises or service provider optical networks. The 10x10G-LC card is supported on ONS 15454 M2, ONS 15454 M6, and Cisco NCS 2000 Series platforms.

The 10x10G-LC card is a single-slot card and can be installed in any service slot of the chassis. The 10x10G-LC card consists of a 10-port SFP+ based (with gray-colored, coarse wavelength division multiplexing ([CWDM] and DWDM optics available) and one 100 G CXP-based port.

The 10x10G-LC card interoperates with 200G-CK-C card through a chassis backplane.

The 10x10G-LC card supports the following signal types:

- 10 Gigabit Ethernet LAN PHY (10.3125 Gbps)
- OC-192/STM-64 (9.95328 Gbps)
- OTU-2
- G.709 overclocked to transport 10 Gigabit Ethernet as defined by ITU-T G. Sup43 Clause 7.1 (11.0957 Gbps)

Operating Modes for 10x10G-LC Card

The 10x10G-LC card supports RGN-10G (5x10G Regenerator)/TXP-10G (5x10G Transponder) operating mode:

Each operating mode can be configured using specific set of cards and client payloads.

RGN-10G (5x10G Regenerator)/TXP-10G (5x10G Transponder)

The 10x10G-LC card works as a standalone card, supporting the multitransponder functionality. The 10 Gbps SFP+ ports should be paired to provide the 10 G transponder functionality for each port of the port pair. By using the grey optics SFP+ to provide the client equipment connectivity and DWDM SFP+ on the WDM side, up to five 10 G transponders are supported by a single 10x10G-LC card. Up to six 10x10G-LC cards are supported on the chassis allowing for 30 10 Gbps transponders in a single shelf.

All ports can be equipped with or without the G.709 Digital Wrapper function that provides wide flexibility in terms of the supported services.

As the client and trunk ports are completely independent, it is also possible to equip both SFP+ of the same pair of ports with the DWDM SFP+. The CXP pluggable is unused in this configuration.

Each of the SFP+ ports can be provisioned as a client or trunk. When one port is selected as a trunk, the other port of the pair is automatically selected as the client port. The allowed port pairs are 1-2, 3-4, 5-6, 7-8, or 9-10.

For RGN-10G mode, both ports are trunk ports.

It is not a constraint to provision five pairs of TXP-10G mode or five pairs of RGN-10G mode. A mix of TXP-10G and RGN-10G modes can be configured. For example, pairs 1-2 and 5-6 can be configured as TXP-10G mode and the remaining pairs as RGN-10G mode.

Table 39: Supported Payload Mapping Between Two SFP+ Ports

SFP+ Payload (Peer-1)	SFP+ Payload (Peer -2)
10GE-LAN (CBR Mapped)	OTU2e or 10GE-LAN (CBR Mapped)
OTU2	OC192 or OTU2

200G-CK-C Card

In this section, "200G-CK-C" refers to the NCS2K-200G-CK-C card.

The 200G-CK-C cards simplify the integration and transport of 200-Gigabit Ethernet interfaces and services to enterprises or service provider optical networks. This card is supported on Cisco NCS 2006 and Cisco NCS 2015 platforms.

The cards interoperate with 10x10G-LC card through a chassis backplane.

Note The 200G-CK-LC cards do not operate with the CFP-LC card.

The cards provide the following benefits:

- Provide 100-Gbps wavelengths transport over fully uncompensated networks, with more than 2,500 km of unregenerated optical links
- Enable 100-Gbps transport over very high Polarization Mode Dispersion (PMD)
- Improve overall system density of up to 100-Gbps per slot, which is five times greater than what can be achieved with 40-Gbps units

You can install up to six cards per Cisco NCS 2006 shelf, supporting up to 42 100-Gbps interfaces per 42-rack units (RU) bay frame. It is possible to place up to two 100G TXPs, one 100 G Regen, or one 100 G MXP on a Cisco NCS 2006 shelf.

The 200G-CK-C cards are tunable DWDM trunk cards, which simplify the integration and transport of 100 and 200- Gigabit Ethernet interfaces and services to enterprises or service provider optical networks. The 200G-CK-C card is an enhancement of the 100GS-CK-C card.

The 200G-CK-C cards provide the following benefits:

- Allow choosing 16 QAM and QPSK as the modulation formats at the line side
- Provide Standard G-FEC (Reed-Solomon), Soft Decision FEC (SD-FEC) encoding with 20% overhead, and Hard Decision FEC (HD-FEC) encoding with 7% overhead
- Provide Nyquist filtering for best performance and optimal band usage
- Support gridless tunability
- Allow client access either through the local 100G CPAK interface or through backplane lines
- In MXP-10X10G operating mode, allow 10GE clients (multiplexed on 100G trunk)

Key Features of 200G-CK-C and 10x10G-LC Cards

The 200G-CK-C and10x10G-LC cards support the following key feature:

- Operating Modes—You can configure the cards into multiple operating modes. The cards can be equipped with pluggables for client and trunk options, and offer large variety of configurations. When you configure the card into multiple operational modes, make sure that you complete the following tasks:
  - The card must be preprovisioned and the modes must be configured. None of the modes are provisioned on the card by default. All operating modes are created on the card level. These are card-specific provisioning, which decides the behavior of a particular card.
  - Depending on the card mode selected, the supported payload for that particular card mode must be provisioned on the PPMs. The payloads can be provisioned after configuring the operational mode on the card.

- Protocol Transparency—The 200G-CK-C cards deliver any 100-Gbps services for cost-effective, point-to-point networking. The 10x10G-LC card delivers any 10-Gbps services for cost-effective, point-to-point networking. In case of 100 G muxponder clients that are mapped into OTU4 DWDM wavelength.

Table 40: Transponder Client Configurations and Mapping for a 10x10G-LC Card

Client		Mapping
Format	**Rate (Gbps)**	
10GE LAN-PHY (MXP-10x10G mode)	10.3125	CBR-BMP clause 17.2.4 (ex G sup43 7.1) + GMP ODU2e to OPU3e4
10GE LAN-PHY (MXP-10x10G mode)	10.3125	GFP-F clause 17.4.1 (ex G sup43 7.3) + GMP ODU2 to OPU3e4
10GE LAN-PHY (TXP-10G mode)	10.3125	CBR-BMP clause 17.2.4 (ex G sup43 7.1)
10GE LAN-PHY (TXP-10G mode)	10.3125	GFP-F clause 17.4.1 (ex G sup43 7.3)
OTU2	10.709	ODU transparent + GMP ODU2 to OPU3e4
OTU2e	11.095	ODU transparent + GMP ODU2e to OPU3e4

- Flow-Through Timing—The cards allow the timing to flow through from the client to line optical interface. The received timing from the client interface is used to time the line transmitter interface. This flow-through timing allows multiple cards to be placed in the same shelf but be independently timed fully, independent of the NE timing.
- Far-End Laser Control (FELC)—FELC is supported on the cards.
- Performance Monitoring—The 100-Gbps DWDM trunk provides support for both transparent and non-transparent signal transport performance monitoring. The Digital Wrapper channel is monitored according to G.709 (OTN) and G.8021 standards. Performance Monitoring of optical parameters on the client and DWDM line interface include loss of signal (LOS), Laser Bias Current, Transmit Optical

Power, and Receive Optical Power. Calculation and accumulation of the performance monitoring data is supported in 15-minute and 24-hour intervals as per G.7710. Physical system parameters measured at the wavelength level, like Mean PMD, accumulated Chromatic Dispersion, or Received OSNR, are also included in the set of performance monitoring parameters. These measurements can greatly simplify troubleshooting operations and enhance the set of data which can be collected directly from the equipment.

- Loopback—The terminal, facility, or backplane loopback can be provisioned on all the ports of the 10x10G-LC and 200G-CK-C cards, configured in any operating mode except for the low latency mode. The backplane facility loopback cannot be configured on the 10x10G -LC card that is configured in the MXP-10x10G mode. The loopback can be provisioned only when the port is in OOS-MT state. A new port cannot be provisioned when the backplane loopback is configured on the 10x10G-LC card.
- Fault propagation on 10GE, 40GE, and 100GE clients—A new squelch option that is named LF is supported for GigE payloads. A local fault (LF) indication is fowarded to the client port in the downstream direction when a failure on the trunk port occurs. The LF option is supported for:
  - 10GE payloads on 10x10G-LC cards configured in the:
    - RGN-10G or TXP-10G mode
    - MXP-10x10G mode
  - 100GE payloads on:
    - 200G-CK-C cards configured in the TXP-100G mode
- Trail Trace Identifier—The Trail Trace Identifier (TTI) in the path monitoring overhead is supported in OTU, and ODU OTN frames.
  - 10x10G-LC—OTU4 and ODU4 payloads
  - 200G-CK-C—OTU4 and ODU4 payloads

  The Trail Trace Identifier Mismatch (TTIM) alarm is raised after checking only the SAPI bytes.
- Automatic Laser Shutdown (ALS) can be configured on all ports. ALS is supported only on the ports that are configured with OTU2 and OTU4 payloads.
- GCC channels—can be provisioned on the OTU2 client and trunk ports of the 10 x10G-LC card.
- Pseudo Random Binary Sequence (PRBS)—PRBS allows you to perform data integrity checks on their encapsulated packet data payloads using a pseudo-random bit stream pattern. PRBS generates a bit pattern and sends it to the peer router that uses this feature to detect whether the sent bit pattern is intact or not. The supported PRBS patterns are PRBS_NONE and PRBS_PN31.
- Multivendor Interoperability - The 200G-CK line card can be configured to interoperate with other vendor interfaces. A new option called, Interop Mode is available to disable or enable interoperability. This option is available when the:
  - Modulation format is 100G-QPSK.
  - FEC is set to 7% High Gain FEC.
  - Admin state of the trunk port is set to OOS-DSBLD (Out of service and disabled).

  The behavior and performance of the card that is configured with HG-FEC Multivendor FEC is the same as the old HG-FEC mode. There is no optical performance variation.

Operating Mode for 200G-CK-C Card

Each operating mode can be configured using the specific set of cards and client payloads.

200G Operating Modes

The 200G-CK-LC cards support these 100G operating modes. You can perform the operating mode configuration for the 100G operating modes on the client card.

- TXP-100G (Standalone 100GE Transponder)
- RGN-100G (100G Regenerator)

TXP-100G (Standalone 100GE Transponder)

You can configure the cards as a standalone 100-Gigabit Ethernet transponder. CXP or CPAK and coherent optical trunk supports the 100-Gigabit Ethernet traffic. The 100-Gigabit Ethernet or OTU4 payload traffic is routed from the CXP or CPAK to the optical trunk, passing through the T100 framer and the opposite way. The supported client signals in this mode are 100-Gigabit Ethernet LAN-PHY or OTU4 data rates.

RGN-100G (100G Regenerator)

You can configure the cards as a regenerator. You can connect the two cards to work in back-to-back mode connecting through the chassis backplane in the same shelf. The allowed slot pairs are 2–3, 4–5, 6–7, 8–9, 10–11, 12–13, or 14–15.

The card supports 100-Gigabit Ethernet or OTU4 client signals. Regeneration is performed leveraging on the OTU4 backplane interconnection. OTU4 overhead is terminated, allowing ODU4 to transparently pass through. GCC0 is terminated, while GCC1 and GCC2 are allowed to pass through.

The CXP client is not required because communication between the two cards acting as a regeneration group is supported through the chassis backplane.

400G-XP Card

In this section, "400G-XP" refers to the NCS2K-400G-XP card.

The 400G-XP card is a tunable DWDM trunk card that simplifies the integration and transport of 10 Gigabit and 100 Gigabit Ethernet interfaces and services to enterprises and service provider optical networks. The card is a double-slot unit that provides 400 Gbps of client and 400 Gbps of trunk capacity. The card supports six QSFP+ based client ports that can be equipped with 4x 10 Gbps optics and four QSFP28 or QSFP+ based client ports that can be equipped with 100 Gbps QSFP28 and 4x 10 Gbps QSFP+ optics. The card is capable of aggregating client traffic to either of the two 200 Gbps coherent CFP2 trunk ports.

Note For any card mode except REGEN with slide mode as OPM-10x10G, you can configure a mix of 10G payloads (OTU2, 10GE) on the same slice or client port with the exception of CDR ports (7, 8, 9, and 10). On CDR ports, the first configured 10G lane would determine the configurable payloads for the other three port lanes.

Note If a slice is configured using the OPM_10x10G slice mode, it can be used only for 10G circuit creation whereas if a slice is configured using the OPM_100G slice mode, it can be used only for 100G circuit creation.

Note GCC Rate in the Edit GCC Termination Window is shown as 192K instead of the supported 1200K. This is a known behavior.

Note The maximum short term operating temperature of the shelf must not exceed 50 degrees when the card is installed.

Key Features

The card supports the following key feature:

- • Operating Modes—The card can be configured in various operating modes. The cards can be equipped with pluggables for client and trunk ports, and offer a large variety of configurations. When you configure the card, make sure that the following tasks are completed:
    - The trunk port PPMs must be preprovisioned before configuring the card operating mode. When the card is paired with the 10x10G-LC card, all the operating mode provisioning must performed on the card. The client payloads can be provisioned after configuring the operational mode on the card.

  The table below details the configurations supported on the card for the supported card modes.

  Table 41: Configuration Options for the Card Modes

Configuration	Options		
Card configuration	MXP	REGEN	
Trunk configuration (per trunk)	M_100G	M_100G	
	M_200G	M_200G	
Slice configuration	None	Slice configuration is not supported	None
	OPM_2x40G_2x10G		OPM_100G
	OPM_100G		OPM_10x10G

- Each trunk port functions as a muxponder instance has the following features:
    - The trunk port supports Analog Coherent Optical (ACO) CFP2 coherent pluggable.

Note Before removing the CFP2 pluggable from any of two trunk ports, ensure that the relevant trunk port is set to the OOS (Out-of-service) state. Wait until the trunk port LED turns off. Wait for a further 120 seconds before extracting the CFP2 pluggable.

- Configurable trunk capacity:
  - 100 Gbps coherent DWDM transmission with quadrature phase shift keying (QPSK)modulation.
  - 200 Gbps coherent DWDM transmission with 16-state quadrature amplitude modulation (16-QAM) modulation.
- Configurable trunk FEC: SD-FEC with 15% or 25% overhead.
- Configurable differential/non-differential line encoding.
- Nyquist shaping if channels at trunk TX.
- Flex spectrum tunability over the full extended C-Band.
- 100 Gbps through 100 Gbps QSFP28 client ports.
- 10 Gbps through 4x 10 Gbps QSFP+ client ports.
- 16 Gbps through 4 x 16 Gbps QSFP+ client ports.

- The supported CD ranges are detailed in the table below:

Table 42: CD Range for Card

	200G 16-QAM		100G QPSK	
	Low	High	Low	High
Default Working CD Range	-10000	50000	-20000	90000
Default CD Thresholds	-9000	45000	-18000	72000
Allowed CD Range (Working and Thresholds)	-60000	60000	-280000	280000

- Loopback—The following loopback types are supported:
  - Client ports - Terminal (Inward), Facility (Line)
  - Trunk ports - Terminal (Inward)
- Automatic Laser Shutdown (ALS) can be configured on all the ports.
- 100GE ethernet client ports can be provisioned with or without IEEE 802.3 bj FEC. The options are Auto, Force-Fec-On, Force-Fec-Off.
- Trail Trace Identifier (TTI)—TTI in the section monitoring overhead is supported . Source Access Point Identifer (SAPI), Destination Access Point Identifer (DAPI), and User Operator Data fields are supported in Release 10.6.2 and later releases.
- Trunk Port Interworking—The two CFP2 trunk ports can interoperate with each other when the source and destination cards have the same trunk mode and slice mode configuration.

- GCC0 Support—The card supports provision of GCC0 channel on the trunk port.
- Interoperability—The card is interoperable with the NC55-6X200-DWDM-S card supported on NCS 5500 and the NCS4K-4H-OPW-QC2 Card supported on NCS 4000.

  The following table describes the configurations, payload types, and pluggables supported for interoperability between the card and the NCS4K-4H-OPW-QC2 card.

Table 43: Interoperability with the NCS4K-4H-OPW-QC2 card.

Payload type	Trunk configuration	Pluggables for trunk ports on	Pluggables for client ports on	Pluggables for trunk ports on 4H-OPW-QC2	Pluggables for client ports on 4H-OPW-QC2
100GE	OTU4	CFP2	QSFP-100G-SR4-S	CFP2	QSFP-100G-SR4-S
100GE	OTU4C2	CFP2	QSFP-100G-SR4-S	CFP2	QSFP-100G-SR4-S
OTU2	OTU4	CFP2	ONS-QSFP-4X10 MLR	CFP2	ONS-QSFP28-LR4
OTU2	OTU4C2	CFP2	ONS-QSFP-4X10 MLR	CFP2	ONS-QSFP28-LR4
10GE	OTU4	CFP2	ONS-QSFP-4X10 MLR	CFP2	ONS-QSFP-4X10 MLR
10GE	OTU4C2	CFP2	ONS-QSFP-4X10 MLR	CFP2	ONS-QSFP-4X10 MLR

The following table describes the configurations, payload types, and pluggables supported for interoperability between the card and the NC55-6X200-DWDM-S card.

Table 44: Interoperability with the NC55-6X200-DWDM-S card.

Payload type	Trunk configuration	Pluggables for trunk ports on	Pluggables for client ports on	Pluggables for trunk ports on 6X200-DWDM-S	Pluggables for client ports on 6X200-DWDM-S
100GE	OTU4	CFP2	QSFP-100G-SR4-S	CFP2	QSFP-100G-SR4-S
100GE	OTU4C2	CFP2	QSFP-100G-SR4-S	CFP2	QSFP-100G-SR4-S

For a detailed list of the supported pluggables, see .

Interoperability

The card has two trunk ports, each supporting up to 20 ODU2es. These ODU2es are numbered from 1 through 20. ODU2es from 1 through 10 belong to the first ODU4 slice and ODU2es from 11 through 20 belong to the second ODU4 slice. Each ODU number has a pre-defined group of timeslots as seen in the following table.

Trunk Port	ODU4 Slice	ODU Trunk Number	ODU Trunk FAC	Tributary Port Number	Timeslots
Trunk 1 (FAC 10)	Slice 1	1	96	1	1 11 21 31 41 51 61 71
		2	97	2	2 12 22 32 42 52 62 72
		3	98	3	3 13 23 33 43 53 63 73
		4	99	4	4 14 24 34 44 54 64 74
		5	100	5	5 15 25 35 45 55 65 75
		6	101	6	6 16 26 36 46 56 66 76
		7	102	7	7 17 27 37 47 57 67 77
		8	103	8	8 18 28 38 48 58 68 78
		9	104	9	9 19 29 39 49 59 69 79
		10	105	10	10 20 30 40 50 60 70 80
	Slice 2	11	106	1	1 11 21 31 41 51 61 71
		12	107	2	2 12 22 32 42 52 62 72
		13	108	3	3 13 23 33 43 53 63 73
		14	109	4	4 14 24 34 44 54 64 74
		15	110	5	5 15 25 35 45 55 65 75
		16	111	6	6 16 26 36 46 56 66 76
		17	112	7	7 17 27 37 47 57 67 77

Trunk Port	ODU4 Slice	ODU Trunk Number	ODU Trunk FAC	Tributary Port Number	Timeslots
		18	113	8	8 18 28 38 48 58 68 78
		19	114	9	9 19 29 39 49 59 69 79
		20	115	10	10 20 30 40 50 60 70 80
Trunk 2 (FAC 11)	Slice 1	1	116	1	1 11 21 31 41 51 61 71
		2	117	2	2 12 22 32 42 52 62 72
		3	118	3	3 13 23 33 43 53 63 73
		4	119	4	4 14 24 34 44 54 64 74
		5	120	5	5 15 25 35 45 55 65 75
		6	121	6	6 16 26 36 46 56 66 76
		7	122	7	7 17 27 37 47 57 67 77
		8	123	8	8 18 28 38 48 58 68 78
		9	124	9	9 19 29 39 49 59 69 79
		10	125	10	10 20 30 40 50 60 70 80
	Slice 2	11	126	1	1 11 21 31 41 51 61 71
		12	127	2	2 12 22 32 42 52 62 72
		13	128	3	3 13 23 33 43 53 63 73
		14	129	4	4 14 24 34 44 54 64 74

Trunk Port	ODU4 Slice	ODU Trunk Number	ODU Trunk FAC	Tributary Port Number	Timeslots
		15	130	5	5 15 25 35 45 55 65 75
		16	131	6	6 16 26 36 46 56 66 76
		17	132	7	7 17 27 37 47 57 67 77
		18	133	8	8 18 28 38 48 58 68 78
		19	134	9	9 19 29 39 49 59 69 79
		20	135	10	10 20 30 40 50 60 70 80

When the card interoperates with NCS4K-4H-OPW-QC2 card, the first ODU4 slice of the trunk is connected to the second ODU4 slice of the same NCS4K-4H-OPW-QC2 trunk.

Note The ODU circuit between the and NCS4K-4H-OPW-QC2 cards is created even when the ODU number is incorrect. Please ensure that the correct source and destination ODU numbers are selected.

Regeneration Mode for 400G-XP-LC

From Release 10.8.0, the 400G-XP-LC can be configured as a regenerator. The regeneration functionality is available only on the trunk ports. A new card operating mode, REGEN, is available. No client ports are involved. The two trunk ports must have the same rate to achieve regeneration (wavelengths and FEC of the trunks can vary).

Note For traffic to flow in the REGEN mode, it is mandatory that the 400G-XP-LC should be running on firmware (SCP) version 5.24 or later.

We recommend that you use the REGEN mode only with the MXP operating mode (the output from the MXP trunk of a can be connected to trunk ports in REGEN mode).

1.2T-MXP Card

Table 45: Feature History

Feature	Release Information	Description
1.2T-MXP Card		This card triples the per slot throughput of the NCS 2000 system from 200 Gbps to 600 Gbps. The DCO trunk ports of the card can support up to 400-Gbps data-rate with multiple modulation formats, encoding types, and FEC options. This card can be installed in the NCS 2006 and NCS 2015 chassis.

In this section, "1.2T-MXP" refers to the NCS2K-1.2T-MXP card.

The 1.2Tbps Transponder or Muxponder line card (1.2T-MXP) is the first line card to have a 400G trunk and 400GE client interface in the NCS 2000 platform. It is a two-slot card that triples the per slot throughput of the NCS 2000 system from 200 Gbps to 600 Gbps.

The 1.2T-MXP card has three QSFPDD56 or QSFP28 client ports, five QSFP28 client ports, and three CFP2 DWDM Digital Coherent Optics (DCO) trunk ports. The QSFPDD56 client ports can also be used alternately as QSFP28 ports on an individual port. The DCO ports can support up to 400-Gbps data-rate with multiple modulation formats, encoding types, and FEC options. You can configure the 1.2T-MXP card in different ways with a maximum of 1.2Tbps total traffic on the client side (QSFP-DD/28) and the 1.2Tbps total traffic on the trunk side.

The 1.2T-MXP card can be installed in:

- NCS 2006 chassis that can accommodate a maximum of three 1.2T-MXP cards.
- NCS 2015 chassis that can accommodate a maximum of seven 1.2T-MXP cards.

The 1.2T-MXP card coexists with other NCS 2000 line cards without restricting their functionalities. However, it does not interoperate with any other line cards.

Key Features of 1.2T-MXP

The key features are:

- Enhanced muxponder or transponder capabilities while enabling double-slot card with 100GE or 400GE client type.
- O-FEC encoding on the trunk interface.
- Nyquist filtering for OSNR.
- Supports configurable modulation format such as 300 8QAM, 400 16QAM, PAM4, and 16QAM in both Open ROADM and 400ZR+ framing mode.
- Flex spectrum support with Nyquist filtering.
- ZR+ based framing on trunk.

- 3x400GE client bandwidth using QSFP-DD or 12x100GE client bandwidth using QSFP-DD (break-out mode)
- LLDP support on 100GE or 400GE clients.
- Supports secure boot.
- Alarms for ZR interface and, Alarms, Performance, and Statistics for GE interface as well as Optical Pluggable.
- Diagnostics and maintenance support.
- Supports GroupId that uniquely identifies a group of physical ports in a ZR frame.

Supported Pluggables

The supported pluggables are:

- Three CFP2 400G DCO trunk pluggables
- Eight QSFP28 or three QSFP-DD pluggables
- Five QSFP28 client pluggables

Limitations of 1.2T-MXP Card

The following are the limitations of the 1.2T-MXP card:

- Optics PMs are not supported by Active Optical Cable (AOC) PPM.
- GroupID feature is not supported for 400GE transponder configuration.
- I-port management is not supported.
- OTN is not supported on trunk.
- Traffic does not go down when FlexO-SR Interface Trail Trace Identifier Mismatch (FOIC-TIM) alarm is raised.
- There might be traffic fluctuations affecting some switches and routers due to the following scenario:

  When there is a 400GE or 4x100GE traffic congestion on the pluggables, an electrical squelch or unsquelch is performed for one second on the transmit side of the pluggables. This operation relocks the transmit Clock and Data Recovery (CDR) of the pluggables. This results in an out-of-range frequency on the client for four to six seconds before the traffic clears.

  This issue occurs in pluggables such as QSFP-DD DR4, QDD-400G-FR4, QDD-400G-LR8, QDD-400-AOC1M, QDD-400-AOC2M, QDD-400-AOC3M, QDD-400-AOC5M, QDD-400-AOC7M, QDD-400-AOC10M, and QDD-400-AOC15M.

Operating Modes and Slice Definition in the 1.2T-MXP Card

Operating Modes

You can configure the 1.2T-MXP card in the TXPMXP mode. The following are the suboperating modes:

- OPM-400G—Enables 400GE client on the QSFP DD port, when the trunk is at 400G rate.

- OPM-4x100G-DD—Enables four 100GE clients that use four-level Pulse Amplitude Modulation (PAM4), on one QSFP DD port, when the trunk is at 400G rate.
- OPM-3x100G-DD—Enables three 100GE clients that use PAM4, on one QSFP DD port, when the trunk is at 300G rate.
- OPM-4x100G—Enables 100GE clients over four QSFP28 ports, when the trunk is at 400G rate.
- OPM-3x100G—Enables 100GE clients over three QSFP28 ports, when the trunk is at 300G rate.

The slices are configured based on the required data path configuration. The following table explains the suboperating modes that are enabled on trunk ports for each slice:

Table 46: Sub-Operating Modes

Slice	Trunk Port	Supported Sub-Operating Modes
Slice 1	9	• OPM-400G • OPM-4x100G-DD • OPM-3x100G-DD
Slice 2	10	• OPM-400G • OPM-4x100G • OPM-4x100G-DD • OPM-3x100G
Slice 3	11	• OPM-400G • OPM-4x100G • OPM-3x100G

You can use the 1.2T-MXP card in different configurations. The following table describes the combinations of suboperating modes, the trunk ports, and client ports for each slice:

Note In the combinations described, you can also choose to configure only one of the slices 1–3.

Table 47: Different Combinations of Sub-Operating Modes

Configuration	Sub-Operating Modes	Trunk Ports	Client Ports
400GE Transponder—Includes 3x400G trunk, 3x400GE client with 3xQSFP-DD pluggables	Slice 1: OPM-400G	9	6
	Slice 2: OPM-400G	10	7
	Slice 3: OPM-400G	11	8

Configuration	Sub-Operating Modes	Trunk Ports	Client Ports
12x100GE Muxponder—Includes 3x400G trunk, 12x100GE client with 2xQSFP-DD breakout + 4xQSFP28 pluggables	Slice 1: OPM-4x100G-DD	9	Port-6 lanes (6.1, 6.2, 6.3, 6.4)
	Slice 2: OPM-4x100G-DD	10	Port-7 lanes (7.1, 7.2, 7.3, 7.4)
	Slice 3: OPM-4x100G	11	2, 3, 4, 8
9x100GE Muxponder—Includes 3x300G trunk, 9x100GE client with 1xQSFP-DD breakout + 6xQSFP28 pluggables	Slice 1: OPM-3x100G-DD	9	Port-6 lanes (6.1, 6.2, 6.3) 6.4 is unused.
	Slice 2: OPM-3x100G	10	1, 5, 7
	Slice 3: OPM-3x100G	11	3, 4, 8
Mixed Configuration 1	Slice 1: OPM-400G	9	6
	Slice 2: OPM-4x100G-DD	10	Port-7 lanes (7.1, 7.2, 7.3, 7.4)
	Slice 3: OPM-3x100G	11	3, 4, 8