

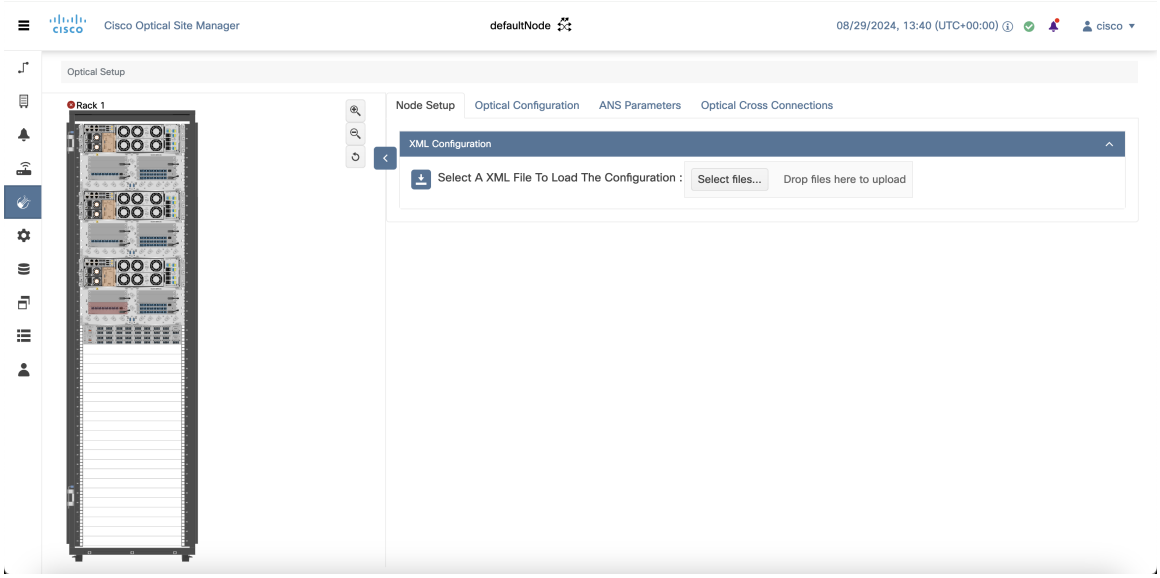
Configure the Node

This chapter describes the tasks related to node configuration in Cisco Optical Site Manager.

If Cisco Optical Site Manager is used to manage an XR device, any configuration changes made to the device using XR (CLI or NETCONF) will trigger a resynchronization of the device in Cisco Optical Site Manager. This means that Cisco Optical Site Manager will temporarily be out of sync with the device while it updates itself with the changes. Any alarms during this period will be reported on Cisco Optical Site Manager after the synchronization process is complete.

Note Removing any line card from the XR device will cause the configuration of the card to revert to the preconfigure state. This will result in the same behavior described above.

Figure 1: Configure the Node



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Import a Cisco Optical Network Planner configuration file

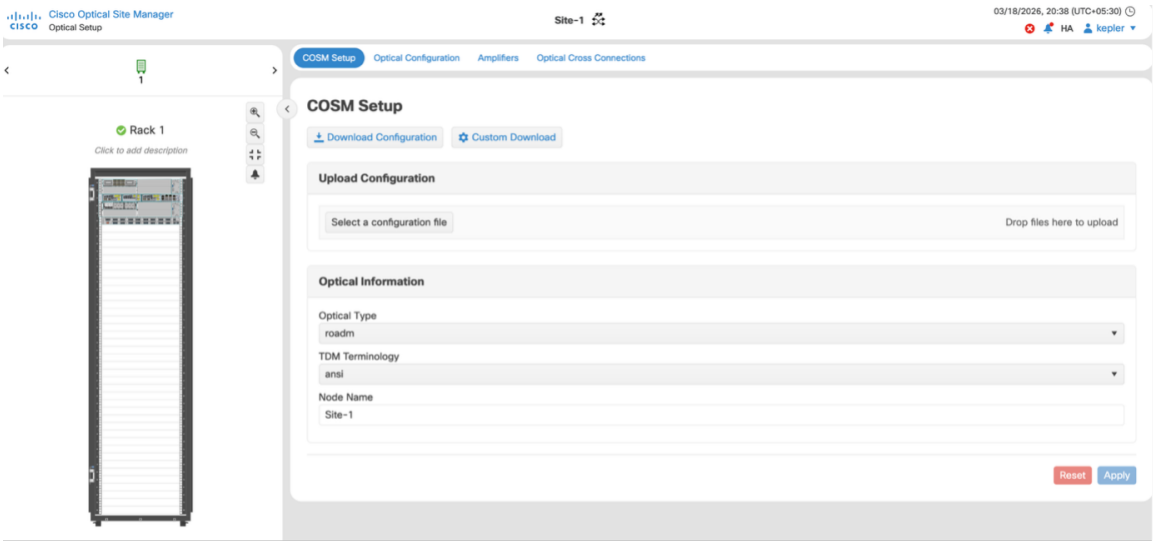
Use this task to import a Cisco Optical Network Planner NETCONF file (.xml) into Cisco Optical Site Manager to configure device parameters automatically.

If you have a NETCONF file (.xml) exported from Cisco Optical Network Planner (Cisco ONP), you can import it to Cisco Optical Site Manager. This file includes:

- Node, shelf, card type, and port information, including wavelength
- Pluggable Port Module (PPM), OTN, and FEC parameters
- Degree, IPC, and link-related information
- Fiber attributes and other network parameters

Note While you will typically upload a Cisco ONP-generated file, there are cases where you must upload the 'golden XML' file provided to you.

Figure 2: Upload Configuration



Before you begin

Ensure that:

- The NETCONF file (.xml) contains these parameters available on Cisco Optical Site Manager:
  - device name
  - uid
  - rack id
  - chassis/passive unit id
- Ensure the Cisco Optical Site Manager site name (in the CONP XML file or any other location) does not contain the string *IP*. If this string appears in the site name, network discovery in Cisco Optical Network Controller does not work correctly.
- Cisco Optical Site Manager is newly activated with no devices added to it.
- The Cisco Optical Network Planner configuration file does not include any Optical Cross-Connects.
- Log into Cisco Optical Site Manager.

Procedure

Step 1 Click **Optical Setup** in the left panel.

Step 2 Click the **Node Setup** tab.

Step 3 In the **Upload Configuration** section, click **Select a configuration file**.

a) Navigate to the location where the NETCONF file (.xml) is present and select it.
b) Click **Yes**.
c) Click **Upload**.
A confirmation message appears after the upload is complete.

Step 4 Verify these configuration before adding a device:

a) Click **Optical Setup**.
b) In the **Optical Configuration** and **ANS Parameters** tabs, verify the successful configuration of CONP XML data onto the device.

Step 5 (Optional) To download the device configuration details in an XML file, follow one of these steps:

- You can download all device configuration details in an XML file by clicking **Download Configuration**.

Note We highly recommend not to directly reuse the downloaded XML file for uploading.

Step 6 Create an authorization group for the device added through the imported XML. For details, see Create or edit an authorization group

Step 7 Edit the device details:

a) Click **Devices** in the left panel.

b) In the **Devices** tab, click the Devices section to expand it.
c) Select the device and update its **IP Address**, **SSH Port**, **Netconf Port**, and **Auth Group**.
d) Click **Apply**.
e) Wait until **Sync Status** shows *sync-completed*, and *alarm-synchronized*.



Note You can edit the details of multiple devices before clicking Apply. However, it may take a few retries for all devices to achieve the *sync-completed*, and *alarm-synchronized* states.

Optical Degrees

From a topological point of view, all the units that are equipped in a node belong to a side. A side can be identified by a letter, or by the ports that are physically connected to the spans. A node can be connected to a maximum of 20 different spans. Each side identifies one of the spans to which the node is connected.

Manage Optical Degrees

Use this task to create, view, modify, or delete optical degrees in the node.

Before you begin

- Log into Cisco Optical Site Manager

Procedure

Step 1 Click **Optical Setup** in the left panel.
Step 2 Click the **Optical Configuration** tab and then click **Optical Degrees** to expand it.
Step 3 Perform these steps, as needed.
a) To create an optical degree, perform these steps:
1. Click the + button.

   The **Create Optical Degree** dialog box appears.
2. Select the **Degree**, **Line In**, and **Line Out**, values from their respective drop-down lists.
3. (Optional) Enter a description in the **Description** field.
4. Click **Apply**.

b) To modify any one of the optical degree parameters described below degree, perform the following step as needed:
- To modify the span validation of an optical degree, select a value from the drop-down list in the **Span Validation** column and click **Apply**.

- Go to the related cell in the **Channel Spacing** column, select 50 or 100 from the drop-down list, and click **Apply**
- Go to the related cell in the **Spectrum Occupancy** column, enter a valid value, and click **Apply**.

c) To delete an optical degree, perform these steps:

1. Check the check box corresponding to the optical degree you want to delete.
2. Click the **-** button to delete the selected optical degree.

   A confirmation message appears.
3. Click **Yes**.

   The optical degree is deleted from the table.

Step 4 (Optional) Click the **Export to Excel** button to export the information to an Excel sheet.

Note You can only create a maximum of 20 optical degrees. The optical degree is created and added to the table that displays the following information.

- **Degree**—Specifies the optical span of the side.
- **Description**—Specifies the description as entered while creating the optical degree.
- **Line In**—Specifies line in settings.
- **Line Out**—Specifies line out settings.
- **Connected-to (IP/Degree)**—Specifies the IP address and the optical degree of the remote Cisco Optical Site Manager instance that is connected on the other side of the span.
- **Span Validation**—Specifies whether the span can be used by the GMPLS algorithm for channel routing and validation. Values are True or False.
- **Channel Grid**—Specifies the type of grid. Values are Flexible-Grid or Fixed-Grid.
- **Channel Spacing**—Specifies the minimum frequency spacing between two adjacent channels in the optical grid. Values are 100 or 50 GHz.
- **Spectrum Occupancy**—Specifies a percentage of the spectral density (the ratio of the C-band used by the carrier versus the total bandwidth). The valid range is 50% to 91%.
- **Domain Type**—Specifies the algorithm that is active on the span. By default, LOGO is displayed.

Internal patch cords

Virtual links can be created between network termination points using Internal Patch Cords (IPC). These termination points include OSC ports, transponder or muxponder trunk ports, line ports, and passive device ports.

You can also create IPC between trunk ports of one line card and the client ports of another line card, optimizing data flow across various line cards. These IPC can be viewed in the NFV, where optical types are selected as **txp** and **roadm**.

Additional information

Table 1: Feature History

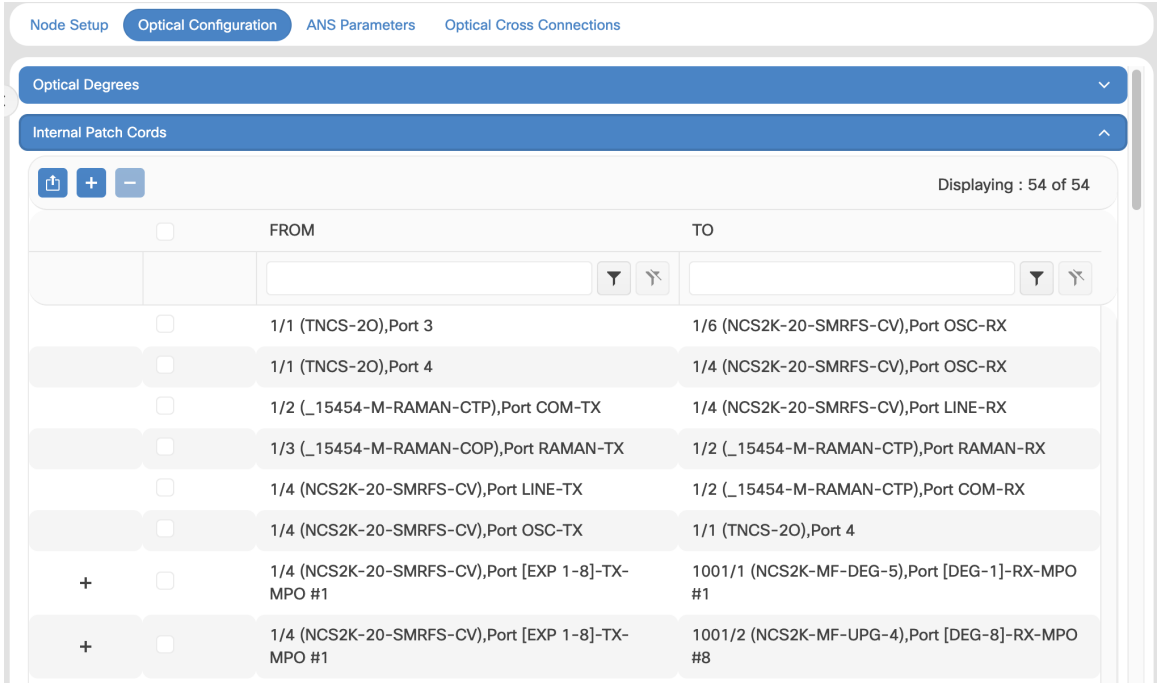
Feature Name	Release Information	Description
Support for Trunk and Client Port Connections	Cisco IOS XR Release 25.1.1	Cisco Optical Site Manager now allows one or more trunk ports on line cards to feed multiple line cards via client ports. This feature supports real and pre-provisioned line cards and is visible in NFV view with optical types **txp** and **roadm**. It enables IPC connections between trunk ports and client ports, allowing for efficient data flow across various line cards.

Create internal patch cords

Use this task to create internal patch cords.

Use this task to create, modify, view, or delete internal patch cords in the node.

Figure 3: Internal Patch Cords



Before you begin

Log into Cisco Optical Site Manager

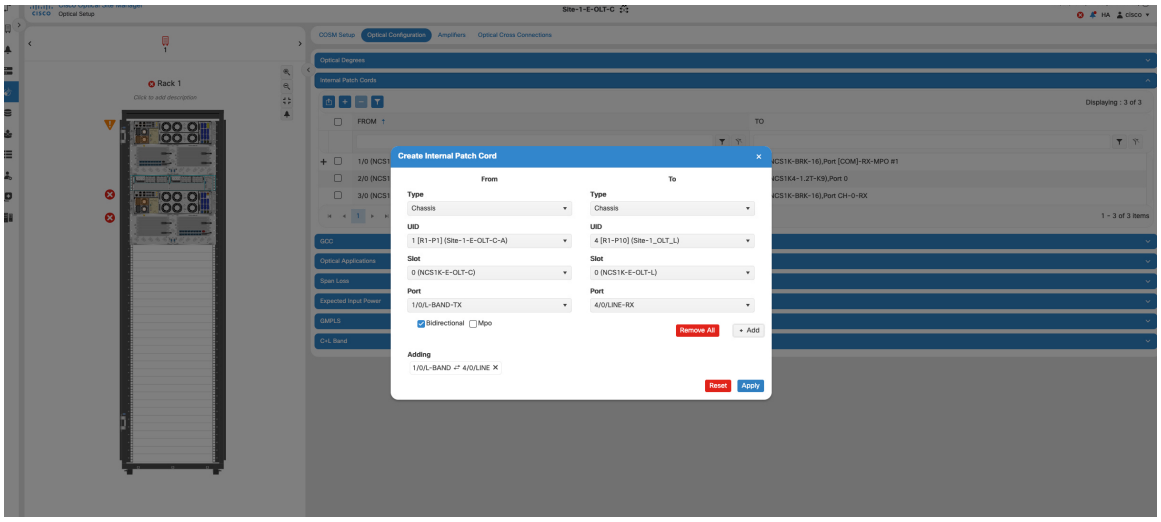
Follow these steps to create internal patch cords.

Procedure

Step 1 Click **Optical Setup** in the left panel.

Step 2 Click the **Optical Configuration** tab and then click **Internal Patch Cords** to expand it.

Step 3 Click the + button.
The **Create Internal Patch Cord** dialog box appears. It displays the **From** and **To** columns indicating the two termination points.



Step 4 Perform the following steps for the **From** and **To** columns:

a) Select the patch cord type from the **Type** drop-down lists in the **From** and **To** columns.

Available options are *Chassis*, *Passive Chassis*, and *Passive Unit*.

The **UID** drop-down is displayed.

b) Select the unique ID of the device from the **UID** drop-down list
The **Port** drop-down is displayed.

c) Select the **Bidirectional** or **MPO** check box for the **From** column.

If you want to make the patch cord bidirectional, select the **Bi-directional** check box.

d) Select the slot from the **Slot** type drop-down list for the **To** column.

If the selected UID in the previous step is a *Passive Unit*, the **Slot** field is not displayed.

e) Click the **Add** button to add the selected Internal Patch Cord options to the **Adding** list.

f) (Optional) Click **Reset** to remove all added internal patch cords from the **Adding** list.

Step 5 Click **Apply**.
The internal patch cord is created and added to the table that displays the following information:

- **From**-Specifies the location from where the connection originates.

- **To**-Specifies the location where the connection terminates.
- **Type**-Specifies the type of internal patch cord. Possible values are Transport and Add-Drop.

Step 6 (Optional) Select the check boxes corresponding to the internal patch cords you want to delete and click the - button.

Step 7 (Optional) Click the **Export to Excel** button to export the information to an Excel sheet.

Note You can view the internal patch cords and detailed information about cards and ports from the Map and Detailed views.

Automatic Power Control

The Automatic Power Control (APC) feature performs the following functions:

- Maintains constant per-channel power increases optical network resilience, even when changes to the number of channels occur.
- Compensates for the degradation of optical networks caused by aging effects.
- Simplifies installation and upgrades of DWDM optical networks by automatically calculating amplifier setpoints.

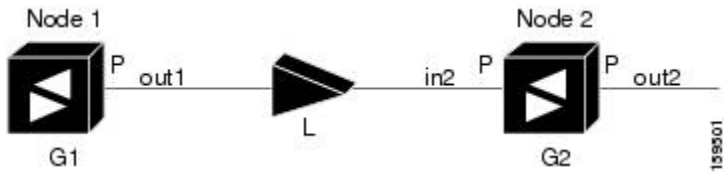
The amplifier software uses a control gain loop to keep channel power constant regardless of the number of channels. It monitors input power changes and adjusts output power proportionately. The shelf controller software emulates the control output power loop to compensate for fiber degradation.

For proper functioning, the control card needs to know the channel distribution via a signaling protocol, and the expected per-channel power which you can set. It compares actual amplifier output power with expected power and adjusts setpoints if needed.

APC at the Shelf Controller Layer

Amplifiers are managed through software to monitor changes in the input power. Changes in the network characteristics have an impact on the amplifier input power. Changes in the input power are compensated for by only modifying the original calculated gain, because input power changes imply changes in the span loss. As a consequence, the gain to span loss established at the amplifier start-up is no longer satisfied, as shown in the following figure.

Figure 4: Using Amplifier Gain Adjustment to Compensate for System Degradation



In the preceding figure, Node 1 and Node 2 are equipped with booster amplifiers and preamplifiers. The input power received at the preamplifier on Node 2 (Pin2) depends on the total power launched by the booster amplifier on Node1, Pout1(n) (where n is the number of channels), and the effect of the span attenuation (L) between the two nodes. Span loss changes due to aging fiber and components or changes in operating conditions. The power into Node 2 is given by the following formula:

Pin2 = LPout1(n)

The phase gain of the preamplifier on Node 2 (GPre-2) is set during provisioning to compensate for the span loss so that the Node 2 preamplifier output power (Pout-Pre-2) is equal to the original transmitted power, as represented in the following formula:

Pout-Pre-2 = L x GPre-2 x Pout1(n)

In cases of system degradation, the power received at Node 2 decreases due to the change of span insertion loss (from L to L'). As a consequence of the preamplifier gain control working mode, the Node 2 preamplifier output power (Pout-Pre-2) also decreases. The goal of APC at the shelf controller layer is simply to detect if an amplifier output change is needed because of changes in the number of channels or to other factors. If factors other than the "changes in the number of channels" factor occur, APC provisions a new gain at the Node 2 preamplifier (GPre-2') to compensate for the new span loss, as shown in the formula:

GPre-2' = GPre-2 (L/ L') = GPre-2 + [Pout-Pre-2 –Exp(Pout-Pre-2)]

Generalizing on the preceding relationship, APC is able to compensate for system degradation by adjusting working amplifier gain or variable optical attenuation (VOA) and to eliminate the difference between the power value read by the photodiodes and the expected power value. The expected power values are calculated using:

- Provisioned per channel power value
- Channel distribution (the number of express, add, and drop channels in the node)
- ASE estimation

Channel distribution is determined by the sum of the provisioned and failed channels. Information about provisioned wavelengths is sent to APC on the applicable nodes during the circuit creation. Information about failed channels is collected through a signaling protocol that monitors alarms on ports in the applicable nodes and distributes that information to all the other nodes in the network.

ASE calculations purify the noise from the power level that is reported from the photodiode. Each amplifier can compensate for its own noise, but cascaded amplifiers cannot compensate for ASE generated by preceding nodes. The ASE effect increases when the number of channels decreases; therefore, a correction factor must be calculated in each amplifier of the ring to compensate for ASE build-up.

APC is a network-level feature that is distributed among different nodes. An APC domain is a set of nodes that are regulated by the same instance of APC at the network level. An APC domain optically identifies a network portion that can be independently regulated. Every domain is terminated by two node sides residing on a terminal node, ROADM node, hub node, line termination meshed node, or an XC termination meshed node. An optical network can be divided into several different domains, with the following characteristics:

- Every domain is terminated by two node sides. The node sides terminating domains are:
  - Terminal node (any type)
  - ROADM node
  - Hub node
  - Cross-connect (XC) termination mesh node

    - Line termination mesh node

- APC domains are shown in the GUI.

Inside a domain, the APC algorithm designates a primary node that is responsible for starting APC hourly or every time a new circuit is provisioned or removed. Every time the primary node signals APC to start, gain and VOA setpoints are evaluated on all nodes in the network. If corrections are needed in different nodes, they are always performed sequentially following the optical paths starting from the primary node.

APC corrects the power level only if the variation exceeds the hysteresis thresholds of +/– 0.5 dB. Any power level fluctuation within the threshold range is skipped because it is considered negligible. Because APC is designed to follow slow time events, it skips corrections greater than 3 dB. This is the typical total aging margin that is provisioned during the network design phase. After you provision the first channel or the amplifiers are turned up for the first time, APC does not apply the 3-dB rule. In this case, APC corrects all the power differences to turn up the node.

To avoid large power fluctuations, APC adjusts power levels incrementally. The maximum power correction is +/– 0.5 dB. This is applied to each iteration until the optimal power level is reached. For example, a gain deviation of 2 dB is corrected in four steps. Each of the four steps requires a complete APC check on every node in the APC domain. APC can correct up to a maximum of 3 dB on an hourly basis. If degradation occurs over a longer time period, APC compensates for it by using all margins that you provision during installation.

APC can be manually disabled. In addition, APC automatically disables itself when:

- A Hardware Fail (HF) alarm is raised by any card in any of the domain nodes.
- A Mismatch Equipment Alarm (MEA) is raised by any card in any of the domain nodes.
- An Improper Removal (IMPROPRMVL) alarm is raised by any card in any of the domain nodes.
- Gain Degrade (GAIN-HDEG), Power Degrade (OPWR-HDEG), and Power Fail (PWR-FAIL) alarms are raised by the output port of any amplifier card in any of the domain nodes.
- A VOA degrade or fail alarm is raised by any of the cards in any of the domain nodes.
- The signaling protocol detects that one of the APC instances in any of the domain nodes is no longer reachable.

APC raises the following minor, non-service-affecting alarms:

- APC Out of Range—APC cannot assign a new setpoint for a parameter that is allocated to a port because the new setpoint exceeds the parameter range.
- APC Correction Skipped—APC skipped a correction to one parameter allocated to a port because the difference between the expected and current values exceeds the +/– 3-dB security range.

APC at the Amplifier Card Level

In constant gain mode, the amplifier power out control loop performs the following input and output power calculations, where G represents the gain and t represents time.

- Pout (t) = G * Pin (t) (mW)
- Pout (t) = G + Pin (t) (dB)

In a power-equalized optical system, the input power scales with the number of channels, and the amplifier software adjusts for power fluctuations caused by changes in the incoming signal's channel count.

The amplifier software detects input power changes at two instances, t1 and t2, as traffic fluctuations occur. In the formula, 'm' and 'n' denote distinct channel numbers, and Pin/ch signifies the input power per channel.

- Pin (t1)= nPin/ch
- Pin (t2) = mPin/ch

The output power is quickly adjusted in response to input power changes, maintaining constant power for each channel, even during upgrades or fiber cuts, with a reaction time in milliseconds.

The power and mode for each channel are determined by Automatic Node Setup (ANS) on a per-degree basis during provisioning.

Forcing Power Correction

A wrong use of maintenance procedures can lead the system to raise the APC Correction Skipped alarm. The APC Correction Skipped alarm strongly limits network management (for example, a new circuit cannot be converted into In-Service (IS) state).

The **Force Power Correction** button in the **APC** section helps the user to restore normal conditions by clearing the APC Correction Skipped alarm. The use of the **Force Power Correction** button must be supervised by Cisco TAC to prevent any traffic loss.

Enable APC

Use this task to enable APC.

Before you begin

Log into Cisco Optical Site Manager

Procedure

Step 1 Click **Optical Setup** in the left panel.

Step 2 Click the **Optical Configuration** tab and then click **APC** to expand it.
A list of degrees is displayed.

Step 3 Select the check box corresponding to the degree you want to enable APC and click the **Edit** button.

Step 4 Select **automatic-enabled** from the **Admin Status** drop-down list.

Only degrees with Admin Status as force-disabled can be enabled.

Step 5 Click **Apply**.

Step 6 Verify that the **Service Status** field changes to enabled.

Disable APC

Use this task to disable APC.

Caution When APC is disabled, aging compensation is not applied and circuits cannot be activated. Disable APC only to perform specific troubleshooting or node provisioning tasks. When the tasks are completed, enable and run APC. Leaving APC disabled can cause traffic loss.

Before you begin

Log into Cisco Optical Site Manager

Procedure

Step 1 Click **Optical Setup** in the left panel.

Step 2 Click the **Optical Configuration** tab and then click **APC** to expand it.
A list of degrees is displayed.

Step 3 Select the check box corresponding to the degree you want to enable APC and click the **Edit** button.

Step 4 Select **force-disabled** from the **Admin Status** drop-down list.

Only degrees with Admin Status as automatic-enabled can be disabled.

Step 5 Click **Apply**.

Step 6 Verify that the **Service Status** field changes to force-disabled.

Span Loss Measurement

Span loss measurements (in dB) check the span loss and are useful whenever changes to the network occur.

The span loss operational parameters are:

- **Measured By**—Displays whether the span loss is measured by the channel or Optical Service Channel (OSC). If a channel is not configured, the span loss is measured by the OSC. An EDFA measures the span loss based on circuits.
- **Measured Span Loss**—Displays the measured span loss.
- **Measured Span Loss Accuracy**—Displays the accuracy of the span loss measurement. For example, if the measured span loss is 20 dB and the displayed accuracy value is 2.5, the actual span loss could either be 19 or 21 dB.
- **Measured Time**—Displays the time and date when the last span loss measured value is changed.

If there is a new network with Cisco Optical Site Manager, the operational parameters list of span loss has two rows. The first row displays the OSC-measured span loss details. After the channel is configured, the

second row is added, which displays the channel-measured span loss details. After the channel is configured, only the channel-measured span loss details are updated.

View or modify span loss parameters

Use this task to measure span loss and update the minimum and maximum expected span loss values for an optical span.

Span loss parameters help monitor optical span performance and detect conditions where measured loss exceeds expected thresholds.

If a channel or OSC is not configured, span loss measurement is not reported and the operational parameters list is empty.

Before you begin

Log into Cisco Optical Site Manager

Follow these steps to view or modify span loss parameters.

Procedure

Step 1 Click **Optical Setup** in the left panel.

Step 2 Click the **Optical Configuration** tab, and then click **Span Loss** to expand it.

Step 3 Click the + icon next to a degree to expand it.

Step 4 Select a row and click **Measure Span Loss**.

A message appears.

Click **OK**.

Step 5 Click **Retrieve** to view updated values.

The measured span loss, accuracy, and measurement time are updated.

Step 6 Enter values for **Min. Exp. Span Loss** or **Max. Exp. Span Loss** in dB.

The valid range is from 0 to 99 dB.

Step 7 Click **Apply**.

A confirmation message appears.

Step 8 Click **Yes**.

The span loss range is extended to include the accuracy value.

A *Span Loss Out of Range* condition is raised when the measured span loss exceeds the extended range.

Step 9 (Optional) Click **Export to Excel** to export the data.

The **Span Loss Measured Data** section displays the following information:

Field	Description
Degree	Displays the side for which span loss information is shown.
Measured By	Indicates whether the measurement was executed using OSC or channels.
Min. Exp. Span Loss (dB)	Displays the minimum expected span loss value.
Max. Exp. Span Loss (dB)	Displays the maximum expected span loss value.
Measured Span Loss (dB)	Displays the measured span loss value.
Measured Accuracy (dB)	Displays the accuracy of the span loss measurement. For example, if the measured span loss is 20 dB and the accuracy value shown is 2.5, the actual span loss may range approximately from 19 dB to 21 dB.
Measured Time	Displays the date and time of the last span loss measurement.

Configure amplifier parameters

Set the optical amplifier settings for cards. This includes selecting the amplifier working mode (such as Channel Power or Fixed Gain), setting gain values, tilt, power setpoints, and other parameters to optimize the amplifier's performance and maintain signal quality across the optical network.

Table 2: Feature History

Feature Name	Release Information	Description
Amplifier Working Mode Support for NCS 1001	Cisco IOS XR Release 25.4.1	You can now choose between **Channel Power** and **Fixed Gain** modes when configuring the working mode for Cisco NCS 1001 cards in the **Amplifier** section of the **Provisioning** tab. In **Channel Power** mode, the amplifier keeps each channel at a set power.

Before you begin

- Log into Cisco Optical Site Manager
- Open the card view

Follow these steps to configure the optical amplifier parameters.

Procedure

Step 1 Click **Optical Setup** in the left panel.

Step 2 Click the **Provisioning** tab and then click **Amplifier** to expand it.

Step 3 Click the **Edit** button to enable editing of the parameters.

Step 4 Modify any of these settings.

For more details about the parameters, see the Parameters for amplifier cards table.

Step 5 Click **Apply** to save the changes.

The **Amplifier** section displays the following details:

Table 3: Parameters for amplifier cards

Parameter	Description	Displayed Values
Port	(Display only) Displays the port number, port type, and direction (TX or RX).	—
Total Output Power (dBm)	(Display only) Shows the current power level for each port.	—
Output Power Setpoint (dBm)	Shows the output power setpoint.	—
Working Mode	Select the working mode.	• Channel Power: Available for NCS 1001 crads • Total Power • Optimized • Fixed Gain: Available for NCS 1001 crads • Start and Hold
Role	Role of the amplifier.	• Preamplifier • Booster
Actual Gain (dB)	Actual gain setpoint.	—
Target Gain (dB)	Target gain setpoint.	—
Tilt Setpoint (dB)	Target output tilt requested by the user.	—

Parameter	Description	Displayed Values
PSD Setpoint (dBm/12.5 GHz)	Set this when **Working Mode** is selected as **Channel Power**. Target output power requested by the user for each circuit. **Note** • This option is only available for NCS 1001 cards. • If **Channel Power Setpoint (dBm)** is set, do not set **PSD Setpoint (dBm/12.5 GHz)**.	Valid range: Upto *+10dBm*
Channel Power Setpoint (dBm)	Set this when **Working Mode** is selected as **Channel Power**. Channel Power Setpoint defines the target transmit power level for an individual optical channel (wavelength). It's essential for optimizing signal strength, preventing overload, and maintaining overall signal quality across the optical network. **Note** • If **PSD Setpoint (dBm/12.5 GHz)** is set, do not set **Channel Power Setpoint (dBm)**. • This option is only available for NCS 1001 cards.	Valid range: - *40dBm* to *+30dBm*
PSD Optimized (dBm/GHz)	Optimized PSD	—
Gain Setpoint (dB)	Set this when **Working Mode** is selected as **Fixed Gain**. Target amplifier gain requested by the user.	—
Gain Range	Sets the gain range of the amplifier.	• Gain Range 1 • Gain Range 2 • No Gain Range
Power Degrade Threshold (High) (dBm/GHz)	Shows the current value of the optical power degrade high threshold.	—

Parameter	Description	Displayed Values
Power Degrade Threshold (Low) (dBm/GHz)	Shows the current value of the optical power degrade low threshold.	—
Status	Shows the current status of the amplifier.	—
Gain Degrade High (dB)	(Display only) Shows the current value of the gain degrade high threshold configured in the card. This threshold applies only when the amplifier is active and in constant gain mode. Gain Degrade High refers to the Gain value of the port and is automatically calculated by the control card when the amplifier is turned up.	—
Gain Degrade Low (dB)	(Display only) Shows the current value of the gain degrade low threshold configured in the card. This threshold applies only when the amplifier is active and in constant gain mode. Gain Degrade Low refers to the Gain value of the port and is automatically calculated by the control card when the amplifier is turned up.	—
Max OSC Power Delta	The maximum allowable deviation or change in the optical power level of the OSC before an alarm or warning is triggered.	—

Provision interface parameters

Use this task to provision or modify interface parameters. This supports operational requirements for enabling, disabling, or tuning optical interfaces as needed.

- Change administrative state, set optical thresholds, and adjust interface-related parameters for RX or TX ports.

Before you begin

- Log into Cisco Optical Site Manager

- Open the card view

Follow these steps to provision interface parameters:

Procedure

Step 1 Click **Optical Setup** in the left panel.

Step 2 Click the **ANS Parameters** tab and then click **Interface** to expand it.

Step 3 Modify the required settings in the interface table. This table describes each parameter and its options.

Table 4: Interface Options

Parameter	Description	Options
Port	Displays the port number, port type, and direction (RX or TX).	All RX and TX ports (Display only)
Admin State	Sets the administrative state of the port.	• Unlocked / IS • Locked, disabled / OOS, DSBLD • Locked, maintenance / OOS, MT • Unlocked, automaticInService / IS, AINS
Service State	Displays the autonomously generated state that gives the port's overall condition (display only). States appear as: Primary State-Primary State 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
Optical Power (dBm)	Displays the optical power for each port (display only).	—
OSC Power (dBm)	Displays the service-channel power level for each port (display only).	—
Optical PSD Setpoint (dBm/GHz)	Target output Power Spectral Density requested by the user.	-50 to 10
Attenuator Value (dB)	Sets the attenuator value.	—

Parameter	Description	Options
Optical Power Threshold Low (dBm)	Fail low threshold used to detect the LOS alarm on the port.	—
OSC Power Threshold Low (dBm)	Displays the OSC power level for each port (display only).	—
Current Power Degrade High (dBm)	Shows the current value of the optical power degrade high threshold configured in the card (display only). Power Degrade High refers to the Signal Output Power value and is automatically calculated.	—
Current Power Degrade Low (dBm)	Shows the current value of the optical power degrade low threshold configured in the card (display only). Power Degrade Low refers to the Signal Output Power value and is automatically calculated.	—
Current Power Failure Low (dBm)	Shows the optical power failure low threshold for the port (display only).	—

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

Note For passive modules, the **Service State** is displayed as **IS-NR** by default.

The specified ANS interface parameters are provisioned as required.

What to do next

Verify the state and alarms of the affected ports after making changes. Adjust further as required to ensure stable operation.

Provision Raman Amplifier Parameters

Use this task to provision the optical Raman amplifier parameters.

Before you begin

- Log into Cisco Optical Site Manager

- Open the card view

Procedure

Step 1 Click **Optical Setup** in the left panel.

Step 2 Click the **ANS Parameters** tab and then click **Raman Amplifier** to expand it.

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

Table 5: Raman Amplifier Parameters for Amplifier Cards

Parameter	Description	Options
Port	(Display only) Displays the port number, port type, and direction (TX or RX).	—
Status	Displays the Status of the port.	
Gain Setpoint (dB)	Target amplifier gain requested by the user.	—
Actual Gain (dB)	(Display only) Displays the actual amplifier gain.	—
Pumping Scheme	(Display only) Displays the pumping scheme that the card uses.	• Counter-Propagating for the RAMAN-CTP, RMN-CTP-CL, EDRA-1-xx, and EDRA-2-xx cards. • Co-Propagating for the RAMAN-COP card.
Calibration Type	Calibration type that the card uses. The RAMAN-COP card supports only manual calibration. The RAMAN-CTP card supports both automatic and manual calibration. The RMN-CTP-CL card supports only automatic calibration. If a node has both RAMAN-CTP and RAMAN-COP cards, the RAMAN-CTP card supports only manual calibration.	• Automatic • Manual • No-Calibration
Unsaturated Gain Setpoint (dBm)	Unsaturated target amplifier gain. This field is editable only for the RAMAN-COP card.	0–50

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

The RAMAN port section is displayed.

Step 5 Expand the RAMAN port to view the pump power details.

Table 6: RAMAN Pump Power Parameters

Parameter	Description
Pump ID	(Display only) Identifier of the Raman Pump (2 pumps with RAMAN-CTP and 4 pumps with EDRA).
Pump Power Setpoint (mW)	(Only for RAMAN-CTP and RAMAN-COP cards) Provisioned value of pump power setpoint. This value is effective only for manual calibration of RAMAN-CTP and RAMAN-COP cards and if the calibration is not performed. The value of this parameter must also be provided for automatic calibration of the RAMAN-CTP card even if the value is not effective.
Pump Power Target (mW)	(Display only) Target power set by the internal control algorithm. The result of calibration can be both automatic and manual.
Pump Power (mW)	(Display only) Actual power value of the individual pump.

Step 6 Click **Apply** to save the changes.

Manage Raman Interface Parameters

Use this task to manage the Raman interface parameters.

Before you begin

- Log into Cisco Optical Site Manager
- Open the card view

Procedure

Step 1 Click **Optical Setup** in the left panel.

Step 2 Click the **ANS Parameters** tab and then click **Raman Interface** to expand it.

Step 3 View the settings described in the following table. Only the Admin State parameter can be modified.

Table 7: Interface Options

Parameter	Description	Options
Port	(Display only) Displays the port number, port type, and direction (RX or TX)	All the RX and TX ports
Admin State	Sets the administrative state of the port.	From the drop-down list, choose one of the following: • Unlocked (ETSI)/ IS (ANSI) • Locked, disabled (ETSI)/OOS, DSBLD (ANSI) • Locked, maintenance (ETSI)/OOS, MT (ANSI) • Unlocked, automaticInService (ETSI)/ IS, AINS (ANSI)
Service State	(Display only) Identifies the autonomously generated state that gives the overall condition of the port. Service states appear in the format: Primary State-Primary State 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
Optical Power (mW)	(Display only) Displays the optical power for each port.	—
Current Optical Power Setpoint (mW)	(Display only) Shows the current value of the optical power setpoint that must be reached.	—
Current Power Degrade High (mW)	(Display only) Shows that the current value of the optical power degrade high threshold. Power Degrade High refers to the Signal Output Power value of the port and is automatically calculated by the control card.	—

Parameter	Description	Options
Current Power Degrade Low (mW)	(Display only) Shows that the current value of the optical power degrade high threshold configured in the card. Power Degrade Low refers to the Signal Output Power value of the port and is automatically calculated by the control card.	—
Current Power Failure Low (mW)	(Display only) Shows the optical power failure low threshold for the port.	—

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

Optical cross-connect circuits

An Optical Cross-Connect (OXC) circuit is a bidirectional optical connection that links two optical nodes over a specified C-band wavelength within a DWDM system.

- Defined and instantiated using data models.
- Operates on C-band wavelengths.
- Provides bidirectional connectivity between optical nodes through DWDM elements.

OXC Circuit and administrative states

An OXC circuit establishes an optical path through DWDM network elements and provides a wavelength-based bidirectional connection between two interface ports.

The connection is formed through these optical components:

- Wavelength selective switches (WSS)
- Multiplexers and demultiplexers
- Add/drop cards

Typical signal flow for an OXC circuit:

1. Enters the DWDM system from the source interface port.
2. Traverses DWDM network elements (WSS, mux/demux, add/drop).
3. Exits the DWDM system toward the destination interface port.

This table describes the administrative states of an OXC circuit.

Table 8: OXC Administrative States

State	Operational Status	Description
IS/Unlocked	In Service	The circuit is active and unlocked.
IS, AINS/Unlocked	Automatic In Service	The circuit automatically transitions to an in-service state.
OOS, DSBLD/Locked	Out of Service	The circuit is disabled and locked.

Important Cisco Optical Site Manager operates with native IOS XR NETCONF (CLI) data models. Configurations performed using OpenConfig (OC) models are incompatible with IOS XR native models. Do not use OpenConfig models to configure devices that are intended to be managed by Cisco Optical Site Manager.

Note Administrative state changes affect circuit availability but do not change the physical optical path.

Optical cross-connections management in Cisco Optical Site Manager

- If a device already has optical cross-connections configured, they are imported into Cisco Optical Site Manager (COSM) the first time the device is synchronized or when a degree is created on the device, whichever occurs later.
- After a device is managed by Cisco Optical Site Manager, you must create, edit, or delete OXCs only through Cisco Optical Network Controller or Cisco Optical Site Manager using NETCONF.
- Do not perform any cross-connection-related changes through the IOS XR CLI once the device is managed by Cisco Optical Site Manager.

View Optical Cross-Connect Circuits

Use this task to view the configuration and operational details of Optical Cross-Connect (OXC) circuits that are modeled on a node. The task explains how to access OXC information, export OXC data, and synchronize OXC information with the managed device.

- Inspect OXC parameters such as central frequency, allocation width, and path endpoints.
- Export OXC details for reporting or offline review.
- Synchronize OXC data with the associated NCS device to refresh the displayed information.

OXC circuits are created using data models and provide bidirectional wavelength-based connectivity between two optical nodes in a DWDM network. This task describes how to view those OXC records in the Web UI.

The information shown on the **Optical Cross Connections** tab is primarily read-only. Some actions (for example, deletion or device synchronization) depend on your deployment and device capabilities.

- OXC entries represent modeled, bidirectional circuits mapped to C-band wavelengths.

- To refresh OXC data from the device, use the **Sync from device** action (if available for your device model).

Before you begin

- Log into Cisco Optical Site Manager
- Ensure network connectivity to the associated NCS device if you plan to use the **Sync from device** action.

Follow these steps to view the configuration and operational details of Optical Cross-Connect circuits that are modeled on a node.

Procedure

Step 1 Click **Optical Setup** in the left panel.

Step 2 Click the **Optical Cross Connections** tab.

Step 3 Expand the cross-connect entry to view Path 1 and Path 2 details by clicking the + icon.

Click the down arrow on the right of a path to show internal path parameters.

Step 4 Review the cross-connect summary fields displayed in the table.

The table includes the following fields for each cross-connect:

- **Connection Label**—Name of the cross-connect.
- **Type**—Type of cross-connect (bidirectional).
- **Admin Status**—Administrative state of the circuit.
- **Service Status**—Operational status of the service.
- **Central Frequency (THz)**—Spectral position of the circuit.
- **Allocation Width (GHz)**—Bandwidth occupied by the service (range: 25–300 GHz).
- **Signal Width (GHz)**—Carrier bandwidth.
- **Path 1 End-points**—Source and destination interfaces for Path 1.
- **Path 2 End-points**—Source and destination interfaces for Path 2.

To view per-path internal details, expand Path 1 or Path 2 and review these items:

- **Interface Name**—Interface identifier.
- **Optical Power**—Measured optical power.
- **Power Failure Low**—Threshold for power-failure detection.
- **Optical PSD Setpoint (dBm/GHz)**—Configured optical power spectral density setpoint (independent of circuit width).
- **Current PSD Setpoint**—Current PSD setpoint.
- **Optical Power Setpoint**—Power setpoint scaled to the circuit width.

Step 5 (Optional) Click the **Export to Excel** button to export the displayed OXC information to an Excel file.

Step 6 (Optional) Click the **Download OXC as XML** button to download the cross-connect details as an XML file.

Step 7 (Optional) Click the **Sync from device** button to synchronize the OXC information with the associated device.

Step 8 (Conditional) To remove a cross-connect, select the check box for the cross-connect and click the - button.

Note: The **Optical Cross Connections** entries are typically read-only in many deployments. Deletion is only possible when your COSM deployment and device model allow direct modification of modeled OXC records. If deletion is not available, use device-side management or a supported provisioning workflow.

The **Optical Cross Connections** tab displays a list of OXC circuits with the fields described above. Expanding an entry reveals per-path details and measured values.

What to do next

After viewing or exporting OXC information, confirm any required follow-up actions such as device-side configuration or synchronization.

- If you synchronized from the device, verify that the displayed **Service Status** reflects the expected operational state.
- If you exported data, store the export in your documentation system as required.

Troubleshooting incorrect OXC path endpoints

Identify when OXC discovery can map a circuit to incorrect path endpoints and select the correction method.

OXC discovery can map a circuit to incorrect path endpoints when a cross-connect is already present in IOS XR before the device is onboarded in Cisco Optical Site Manager. These colorless devices do not provide a deterministic 1:1 port mapping between the COM port and the channel ports. As a result, the discovered OXC can be associated with an incorrect channel port. This behavior applies when the OXC is extended to a colorless device such as:

- **NCS1K-BRK-24** or
- **NCS1K14-CCMD-16-C**

After onboarding the device, verify the discovered circuit endpoints against the physical topology. If the discovered endpoints are incorrect, update the endpoints by using one of these tasks:

- Update OXC endpoints by importing a configuration XML file
- Edit OXC endpoints from the COSM CLI

Note After correcting the endpoints, do not click the **Sync** button in the **Optical Cross Connections** tab.

Update OXC endpoints by importing a configuration XML file

Update OXC endpoints when Cisco Optical Site Manager discovers an OXC through a colorless passive device and maps the endpoint to an incorrect passive port.

OXC discovery can map a circuit to an incorrect endpoint when the OXC is connected through a colorless passive device, such as BRK-24 or CCMD. This can occur when the passive device does not provide a 1:1 mapping between the COM port and channel ports.

After device onboarding, verify the discovered OXC endpoints against the physical topology. If the discovered endpoints are incorrect, update the endpoints in a configuration XML file and import the corrected file into Cisco Optical Site Manager.

Before you begin

- You are logged in to Cisco Optical Site Manager.
- You have verified the physical topology and identified the correct channel endpoints for the OXC.
- You have the **Connection Label** of the OXC that must be corrected.

Follow these steps to update OXC endpoints by importing a configuration XML file.

Procedure

Step 1 Click **Optical Setup** in the left panel, and then click the **Optical Cross Connections** tab.

Step 2 Identify the OXC with the incorrect endpoint and note the value in the **Connection Label** column.

Use the physical topology to identify the correct channel endpoint that must replace the discovered COM endpoint.

Step 3 Click the **Node Setup** tab, and then click **Download Node Configuration as XML**.

The current node configuration XML file is downloaded.

Step 4 Open the downloaded XML file in an XML editor and search for the OXC by using the connection label.

For example, search for a connection label such as **`1001_Ch1`**.

Step 5 Update the OXC endpoint values to match the correct channel ports for your topology.

Replace	with
5/2/COM-TX	*6/CH-1-TX*
5/2/COM-RX	*6/CH-1-RX*
5/2/COM-TX	*6/CH-3-TX*
5/2/COM-RX	*6/CH-3-RX*

Example:

```
<config xmlns="http://tail-f.com/ns/config/1.0">
  <nodes xmlns="http://cisco.com/yang/opt-node">
  <node>
    <id>0</id>
    <oxc xmlns="http://cisco.com/yang/optical/xconnect">
      <connection-name>1001_Ch1</connection-name>
      <oxc-type>bidirectional</oxc-type>
      <central-frequency>195.95</central-frequency>
      <allocation-width>150.0</allocation-width>
      <signal-width>150.0</signal-width>
      <path1>
```

```
        <endpoints>
          <src-if>5/3/LINE-RX</src-if>
          <dst-if>6/CH-1-TX</dst-if>
        </endpoints>
      </path1>
      <path2>
        <endpoints>
          <src-if>6/CH-1-RX</src-if>
          <dst-if>5/3/LINE-TX</dst-if>
        </endpoints>
      </path2>
    </oxc>
    <oxc xmlns="http://cisco.com/yang/optical/xconnect">
      <connection-name>1001_Ch3</connection-name>
      <oxc-type>bidirectional</oxc-type>
      <admin-state>In-Service</admin-state>
      <central-frequency>195.65</central-frequency>
      <allocation-width>150.0</allocation-width>
      <signal-width>150.0</signal-width>
      <path1>
        <endpoints>
          <src-if>5/3/LINE-RX</src-if>
          <dst-if>6/CH-3-TX</dst-if>
        </endpoints>
      </path1>
      <path2>
        <endpoints>
          <src-if>6/CH-3-RX</src-if>
          <dst-if>5/3/LINE-TX</dst-if>
        </endpoints>
      </path2>
    </oxc>
  </node>
  </nodes>
</config>
```

Step 6 In the configuration XML file, keep only the updated OXC entries under the `<nodes>` element.

Remove unrelated OXC entries and other node configuration content before saving the file.

Step 7 Click **Optical Setup** in the left panel, then click the **Node Setup** tab.

Step 8 Click **Select Files**, select the corrected configuration XML file, and click **Yes** when the confirmation message appears.

Step 9 Click **Upload**.

The upload completes with a **Done** status and the **XML file upload completed** message.

Step 10 Click the **Optical Cross Connections** tab and verify that the corrected OXC endpoints are displayed.

Expand the OXC and review the **Path 1 End-points** and **Path 2 End-points** values.

The selected OXC entries use the corrected channel endpoints in Cisco Optical Site Manager.

Edit OXC endpoints from the COSM CLI

Edit the OXC endpoint configuration directly from the Cisco Optical Site Manager CLI when a discovered OXC is associated with an incorrect passive endpoint.

OXC discovery can map a circuit to an incorrect endpoint when a colorless passive device does not provide a 1:1 mapping between the COM port and channel ports. Before you edit the OXC configuration, verify the discovered endpoints against the physical topology.

Before you begin

- You have identified the OXC **Connection Label** and the correct channel endpoints.
- You can lock and unlock the device from Cisco Optical Site Manager.
- You have IOS XR CLI access to the Cisco Optical Site Manager host device. If the Cisco Optical Site Manager host device uses different credentials than Cisco Optical Site Manager, you also have the Cisco Optical Site Manager username.

Follow these steps to edit OXC endpoints from the COSM CLI.

Procedure

Step 1 Lock the device in Cisco Optical Site Manager web-UI:

a) Click **Devices** in the left panel.
b) Select the device and click **Edit**
c) Set **Admin state** to **Locked**
d) Click **Apply**.

Step 2 Log in to the Cisco Optical Site Manager host device using one of these steps.

If	Then

the Cisco Optical Site Manager host device uses the same credentials that you use for Cisco Optical Site Manager.	**a.** Log in to the COSM host device using the same credentials that you use for Cisco Optical Site Manager.
	b. Run the **cosm** command from the IOS XR prompt.
	`RP/0/RP0/CPU0:ios#cosm`
	`NODE01:cosm#`

If	Then

the Cisco Optical Site Manager host device uses different credentials than Cisco Optical Site Manager.	**a.** Use the **bash** command from the IOS XR prompt to reach the Linux prompt.
	`RP/0/RP0/CPU0:ios#bash`
	`[node0_RP0_CPU0:~]$`
	b. Access the **COSM** container.
	`[node0_RP0_CPU0:~]$ docker exec -it COSM bash`
	`[COSM:/]$`
	c. Log in to the Cisco Optical Site Manager CLI by using the **ncs_cli -C -u** command and the Cisco Optical Site Manager username.
	`[COSM:/]$ ncs_cli -C -u cisco1`
	`User cisco1 last logged in 2026-05-13T07:36:57.343064+00:00, to COSM, from 127.0.0.1 using cli-console`
	`cisco1 connected from 127.0.0.1 using console on COSM`
	`NODE01:cosm#`
	If your deployment uses a different Cisco Optical Site Manager username, replace **`cisco1`** with that username.

Step 3 Run the **show running-config nodes node** command to retrieve the OXC details from the running configuration with the OXC connection label.

Example:

```
NODE01:cosm# show running-config nodes node 0 oxc 1001_Ch1
nodes node 0
 oxc 1001_Ch1
  oxc-type          bidirectional
  central-frequency 195.95
  allocation-width  150.0
  signal-width      150.0
  path1 endpoints src-if 5/3/LINE-RX
  path1 endpoints dst-if 5/2/COM-TX
  path2 endpoints src-if 5/2/COM-RX
  path2 endpoints dst-if 5/3/LINE-TX
 !
!
NODE01:cosm# show running-config nodes node 0 oxc 1001_Ch2
nodes node 0
 oxc 1001_Ch2
  oxc-type          bidirectional
  central-frequency 195.95
  allocation-width  150.0
  signal-width      150.0
  path1 endpoints src-if 5/1/LINE-RX
  path1 endpoints dst-if 6/CH-1-TX
  path2 endpoints src-if 6/CH-1-RX
  path2 endpoints dst-if 5/1/LINE-TX
 !
!
```

To identify the OXC label from the Cisco Optical Site Manager GUI, click **Optical Setup**, click the **Optical Cross Connections** tab, and export the OXC list to Excel.

Step 4 Enter the configuration terminal and select the OXC that must be corrected.

Example:

```
NODE01:cosm# conf
Entering configuration mode terminal
NODE01:cosm(config)# nodes node 0 oxc 1001_Ch1
NODE01:cosm(config-oxc-1001_Ch1)#
```

Step 5 Update the path endpoints to use the correct MD-32 channel ports and commit the change.

Example:

```
NODE01:cosm(config-oxc-1001_Ch1)# path1 endpoints dst-if 6/CH-1-TX
NODE01:cosm(config-oxc-1001_Ch1)# path2 endpoints src-if 6/CH-1-RX
NODE01:cosm(config-oxc-1001_Ch1)# commit
```

Repeat this step for each OXC that has incorrect endpoints.

Step 6 Verify that the OXC endpoints are updated in the running configuration.

Example:

```
NODE01:cosm# show running-config nodes node 0 oxc 1001_Ch1
nodes node 0
 oxc 1001_Ch1
  oxc-type          bidirectional
  central-frequency 195.95
  allocation-width  150.0
  signal-width      150.0
  path1 endpoints src-if 5/3/LINE-RX
  path1 endpoints dst-if 6/CH-1-TX
  path2 endpoints src-if 6/CH-1-RX
  path2 endpoints dst-if 5/3/LINE-TX
 !
!
NODE01:cosm# show running-config nodes node 0 oxc 1001_Ch2
nodes node 0
 oxc 1001_Ch2
  oxc-type          bidirectional
  central-frequency 195.95
  allocation-width  150.0
  signal-width      150.0
  path1 endpoints src-if 5/1/LINE-RX
  path1 endpoints dst-if 6/CH-1-TX
  path2 endpoints src-if 6/CH-1-RX
  path2 endpoints dst-if 5/1/LINE-TX
 !
!
```

Step 7 Unlock the device in Cisco Optical Site Manager and wait until synchronization is complete.

Step 8 Verify the OXC endpoints again after the device is unlocked.

Example:

```
NODE01:cosm# show running-config nodes node 0 oxc 1001_Ch1
NODE01:cosm# show running-config nodes node 0 oxc 1001_Ch2
```

The selected OXC entries use the corrected channel endpoints in Cisco Optical Site Manager.

Submarine Line Terminating Equipment mode

The NCS 1010 optical line system supports SLTE mode configuration through Cisco Optical Site Manager, enhancing compatibility and control for subsea deployments.

SLTE configuration in Cisco Optical Site Manager

Cisco Optical Site Manager allows you to configure these parameters for SLTE mode, streamlining subsea system management and optimization.

- Manual ASE loading: Controls ASE source injection for channels.
- ASE attenuation setpoint: Sets attenuation level for ASE channels.
- OXC restoration soak time: Defines restoration timing after failures.
- ASE guard band: Configures protection bandwidth for ASE.

Enable or disable submarine mode

The Submarine Mode toggle button, located in the Optical Degrees panel, allows you to enable or disable Submarine Line Terminal Equipment (SLTE) parameters.

- Enabling Submarine Mode disables Link Power Control, Gain Estimator, and Link Tuner, sets static-ASE-disable, and shuts down OSC ports.
- Disabling Submarine Mode enables Link Power Control, Gain Estimator, and Link Tuner, activates OSC ports, and removes static-ASE-disable from XR.

The Manual Ase loading parameter in the interface panel (under OLT-C > Amplifier) is directly linked to the Submarine Mode toggle. If Manual Ase loading is enabled from the interface panel, the Submarine Mode button will show as enabled, and vice versa.

Activating Submarine Mode can disrupt network traffic if it is not performed by an optical expert. When you activate Submarine Mode, the system displays a confirmation message that lists the functionalities disabled by this change.

Before you begin

- Log into Cisco Optical Site Manager
- Provision these interface parameters:
  - Manual Ase loading
  - Ase Attenuation Setpoint
  - OSC Restoration Soak Time, and
  - Ase Guard Band

Procedure

Step 1 Click **Optical Setup** in the left panel, then click the **Optical Configuration** tab.

Step 2 Expand **Optical Degrees** section, then click the **Edit** button.

Step 3 Locate the desired optical degree in the table.

Step 4 Under the **Submarine Mode** column, toggle the button to either enable or disable the mode.

A confirmation dialog box appears, warning that activating submarine mode will disable functionalities such as Link Power Control, Gain Estimator, and Link Tuner.

Step 5 Click **Yes** to enable submarine mode, or **No** to cancel the operation.

Step 6 Under the **Optical Cross Connections** tab, select **signal** from the **Power Source** column for the optical degree.

Step 7 (Optional) Follow these steps to initiate manual ASE loading:

a) Open the OLT-C card from the topology view.
b) Expand the **Alarms** tab at the bottom of the screen. Next, select the **OCM** tab.
c) Click the **Manual Attenuation Tuning** button.
The **Attenuation Tuning** window appears.
d) Click a channel in the graph and set the values for **Optical Attenuation** and **Ase Attenuation**.
e) Click **Continue**.
The system processes and applies the configuration. This may take a few minutes.

The system applies the selected Submarine Mode setting and automatically adjusts the associated network parameters.

GMPLS UNI

Table 9: Feature History

Feature Name	Release Information	Description
GMPLS UNI Circuit Connection	Cisco IOS XR Release 25.1.1	You can now establish circuit connections between two clients within an optical network using the Generalized Multiprotocol Label Switching (GMPLS) User Network Interface (UNI). This connection is facilitated through signaling exchanges between UNI Client (UNI-C) nodes, which are router nodes, and UNI Network (UNI-N) nodes, which are optical nodes. This integration enables effective usage of the DWDM grid with minimal wastage of spectral bandwidth and allows the transmission of mixed bit-rate or mixed modulation data in a grid with different channel widths.

The Generalized Multiprotocol Label Switching (GMPLS) User Network Interface (UNI) creates a circuit connection between two clients (UNI-C) of an optical network.

GMPLS UNI Advantages

GMPLS UNI plays a crucial role in connecting and optimizing network functionalities:

- GMPLS UNI allows packet networks to directly access the optical transport control plane, enabling coordination of resource requirements with the optical transport network.
- By leveraging open standards, GMPLS UNI optimizes network resources and enhances utilization across both packet and optical networks.

Channel Spacing Types in GMPLS

GMPLS supports two types of channel spacing, each affecting the capacity and flexibility of traffic management:

- **Fixed Grid Channel Spacing:** This spacing is fixed at 50 GHz, supporting traffic rates of 100 and 200 Gbps.
- **Flexible Grid Channel Spacing:** This spacing is set at 6.25 GHz, accommodating all data rates.

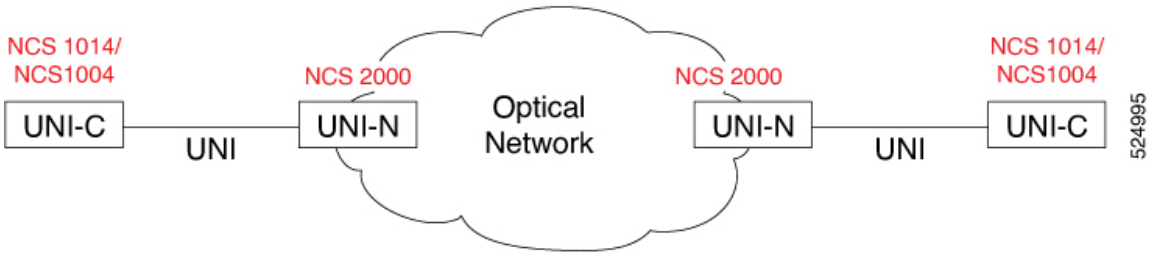
How to Create a GMPLS UNI Tunnel

Before you begin

- The NCS 2000 node must possess a valid license for ROADM and WSON support.
- Management IP addresses for both NCS 1014/NCS 1004 and NCS 2000 nodes must be accessible.
- The administrative state of the trunk port of the optics controller on the NCS 1014 or NCS 1004 node must not be in the shutdown state.

Workflow

Figure 5: GMPLS UNI Tunnel Between two NCS 1014/NCS 1004 Nodes



Creating a tunnel between two NCS 1014 or NCS 1004 nodes on a network involves establishing a connection from the headend to the tailend. The tunnel can be created between the source and destination NCS 1014 or NCS 1004 nodes without involving NCS 2000 nodes in the middle. The NCS 2000 provides GMPLS control plane support and enables dynamic provisioning and rerouting of lightpaths.

These stages describe how to create a connection between the NCS 1014 and NCS 2000 at the headend of the network.

1. Add a card mode on the NCS 1014 or NCS 1004 card. For more details, see NCS 1000 line card modes.
2. Create internal patch cords, on page 6 between the NCS 1014 or NCS 1004 and NCS 2000 ports.
3. Create static Link Management Protocol link for GMPLS, on page 36 to establish connectivity between a NCS 2000 node and a NCS 1014 or NCS 1004 node.
4. Create Optical Cross Connections using Cisco Optical Network Controller.

Repeat the same steps at the tailend of the network to ensure complete connectivity.

Create static Link Management Protocol link for GMPLS

Table 10: Feature History

Feature Name	Release Information	Description
Static Link Management Protocol configuration for GMPLS	Cisco IOS XR Release 25.1.1	You can now configure static Link Management Protocol (LMP) using the Cisco Optical Site Manager web UI to establish connectivity between an NCS 2000 node and NCS 1004 and NCS 1014 nodes for GMPLS UNI. This protocol efficiently manages the control channel across GMPLS UNIs, ensuring smooth Traffic Engineering (TE) link connectivity between interfaces. Furthermore, it performs fault management functions, helping in fault isolation, link property correlation, and verifying link connectivity.

Link Management Protocol (LMP) manages and maintains the control and data links between nodes while overseeing the channels and links necessary for routing, signaling, and comprehensive link management. The LMP link is created to establish connectivity between an NCS 2000 node and an NCS 1004 node.

LMP effectively manages the control channel across the GMPLS UNIs, ensuring seamless Traffic Engineering (TE) link connectivity between these interfaces. Also, it performs fault management, aiding in fault isolation, link property correlation, and verifying link connectivity.

To to create LMP to establish connectivity between an NCS 2000 node and an NCS 1004 node, using the **LMP Configuration Wizard** in Cisco Optical Site Manager, perform these tasks:

- Select the LMP type, on page 36
- Select the optical parameters for LMP, on page 37
- Select the End Points for LMP, on page 38
- Verify the LMP configurations, on page 39
- Create LMP regeneration pair, on page 39

Select the LMP type

The **LMP Type** area in the Cisco Optical Site Manager **LMP Configuration Wizard** allows users to choose from various LMP Types.

Use this task to enter the **LMP Configuration Wizard** and select a card mode.

Before you begin

Log into Cisco Optical Site Manager

Procedure

Step 1 Click **Optical Setup** in the left panel.

Step 2 Click the **Optical Configuration** tab and then click **GMPLS** > **LMP** to expand it.

Step 3 Click the + button to open LMP Configuration Wizard.

a) From the **LMP Type** drop-down list, choose the type of LMP.

If the LMP link is going to be established with	Select...
NCS 1004 or 1014 device	LOCAL TXP/OCHNC
NCS 1004 or NCS 4000 routers	Signaled
a TXP in a remote NCS 2000 ROADM node	Remote TXP

Note The LOCAL TXP/OCHNC and Remote TXP systems support a multi-carrier configuration, which involves bundling two Add & Drop ports to enable inverse multiplexing of traffic across trunks. This approach optimizes bandwidth distribution. However, the Signaled LMP does not support multi-carrier configuration.

Step 4 Click **Next**.

Select the optical parameters for LMP

Use this task to configure various optical parameters for different LMP types:

Before you begin

Select the LMP type, on page 36

Procedure

Step 1 Enter a name for the LMP in the Description field.

NCS 1014 does not support GMPLS-UNI.

Step 2 Choose the **TXP Controller Mode**.

This field is available only for **Local TXP/ OCHNC** LMP type. The available options are:

TXP mode	Applicable for
RSVP (GMPLS)	NCS 1004
Local	NCS 1004

TXP mode	Applicable for
Controller	NCS 1014

Step 3 Choose the **Alien ID**, **Trunk Mode**, and **FEC Mode**. See FEC modes and Trunk modes supported for Alien IDs, on page 40 for the list of aline ids and its corresponding trunk modes and FEC modes.

This field is available only for **Local TXP/ OCHNC** LMP type, and **Signaled** LMP type with Add/Drop End-Point Type.

Step 4 Choose the UNI Control Mode as UNI-Clinet or UNI-Netwrok.

This field is available only for **Signaled** LMP type.

Step 5 Select the **Channel Mode** as **Flex** or **DWDM**.

Step 6 If required, enter the **Remote Node Address** and **Remote IF Index**.

Step 7 Check the **Is Local** checkbox, to configure the UNI parameters on the client port of the TXP card

This check-box is available only for **Signaled** LMP type.

Step 8 Click **Next**.

Select the End Points for LMP

Use this task to select the end points for the LMP:

Before you begin

Select the optical parameters for LMP, on page 37

Procedure

Step 1 In the Ingress Port Selection and Egress Port Selection areas:

a) From the **Type** drop-down list, select **Chassis**, **Passive Unit**, or **Passive Chassis**.
b) From the **UID** drop-down list, select the UID.
c) From the **Slot** drop-down list, select the slot.
d) From the **Port** drop-down list, select the port.
e) Enter a name in the **Remote Description** field.

Step 2 Click **Next**.

What to do next

Verify the LMP configurations, on page 39.

Verify the LMP configurations

In the **Configuration Recap** window, verify the selected configurations across the various windows of the **LMP Configuration Wizard**.

Before you begin

Select the End Points for LMP, on page 38

Procedure

Step 1 Click to expand the **Type**, **Optical Parameters**, and **End Points** sections to verify the configured details.

Step 2 Click **Finish** to complete the LMP configuration.

What to do next

Create LMP regeneration pair, on page 39.

Create LMP regeneration pair

You can create regeneration pair to create a regeneration path for longer link. Use this task to create a regeneration pair.

Before you begin

Create the required number of LMP links using these tasks:

- Select the LMP type, on page 36
- Select the optical parameters for LMP, on page 37
- Select the End Points for LMP, on page 38
- Verify the LMP configurations, on page 39

Procedure

Step 1 Select the LMPs to be added to the regeneration path.

Note You can add only the RSVP type of LMPs into the pair.

Step 2 Click **Regen Pair**.

The regen pair gets created and you can view the same under the **LMP Regen** tab.

FEC modes and Trunk modes supported for Alien IDs

This table lists the optical interfaces (Alien IDs) supported for all LMP types, along with their corresponding trunk modes and FEC modes.

Table 11: Alien IDs supported for LMP

Alien ID	Trunk Mode	FEC Modes
100G-LC-C	Default-Mode	STANDARD_FEC, HG_FEC_7, SD_FEC_20
100G-CK-C	Default-Mode	STANDARD_FEC, HG_FEC_7, SD_FEC_20
200G-CK-LC	100G-Mode	STANDARD_FEC, HG_FEC_7, SD_FEC_20
	200G-Mode	SD_FEC_20
100GS-CK-LC	100G-Mode	STANDARD_FEC, HG_FEC_7, SD_FEC_20
	200G-Mode	SD_FEC_20
400G-XP-LC-CFP2	100G-Mode	SD_FEC_15_DE_ON, SD_FEC_15_DE_OFF, SD_FEC_25_DE_ON, SD_FEC_25_DE_OFF
	150G-Mode	SD_FEC_15_DE_ON, SD_FEC_15_DE_OFF, SD_FEC_25_DE_ON, SD_FEC_25_DE_OFF
	200G-Mode	SD_FEC_15_DE_ON, SD_FEC_15_DE_OFF, SD_FEC_25_DE_ON, SD_FEC_25_DE_OFF
NCS10x4 (NCS1K4-1.2T-K9, NCS1K4-2-QDD-C-K9)	200G-Mode	SD_FEC_27
	200G-2dot3125-BPS-Mode	SD_FEC_27
	300G-3-BPS-Mode	SD_FEC_27
	300G-3dot4375-BPS-Mode	SD_FEC_27
	400G-Mode	SD_FEC_27
	400G-4dot4375-BPS-Mode	SD_FEC_27
	500G-Mode	SD_FEC_27
	600G-Mode	SD_FEC_27

Alien ID	Trunk Mode	FEC Modes
ONS-CFP2D-400G-C-FOIC(NCS1K4-OTN-XP)	400G-Mode	OFEC
	300G-Mode	OFEC
	200G-4-BPS-Mode	OFEC
	200G-2-BPS-Mode	OFEC
	200G-3-BPS-1-E-Mode	OFEC
	200G-4-BPS-1-E-Mode	OFEC
	100G-1-S-Mode	OFEC
DP04QSDD	100G-Mode	OFEC
	200G-Mode	OFEC
	200G-4-BPS-Mode	OFEC
	200G-6-BPS-Mode	OFEC
	200G-8-BPS-Mode	OFEC
	200G-0-S-Mode	OFEC
	300G-0-S-Mode	OFEC
	400G-0-S-Mode	OFEC
NCS1K(NCS1002-K9)	100G-Mode	STANDARD_FEC, HG_FEC_7, SD_FEC_20
DCO-CFP2-8QAM-200G	200G-Mode	SD_FEC_15_DE_ON
QSFP-DD-ZR	400G-Mode	CFEC
QSFP-DD-ZR+	100G-Mode	OFEC
	300G-Mode	OFEC
	200G-4-BPS-Mode	OFEC
	200G-6-BPS-Mode	OFEC
	200G-8-BPS-Mode	OFEC
	200G-0-S-Mode	OFEC
	300G-0-S-Mode	OFEC
	400G-Mode	CFEC, OFEC
	400G-0-S-Mode	OFEC

Alien ID	Trunk Mode	FEC Modes
ONS-CFP2D-400G-C (NCS1K4-1.2T-MXP)	100G-Mode	OFEC
	300G-Mode	OFEC
	200G-4-BPS-Mode	OFEC
	200G-6-BPS-Mode	OFEC
	200G-8-BPS-Mode	OFEC
	200G-0-S-Mode	OFEC
	300G-0-S-Mode	OFEC
	400G-Mode	OFEC
	400G-0-S-Mode	OFEC
• CIM8-C-K9 • CIM8-CE-K9 • CIM8-LE-K9	• 400G-Mode • 500G-Mode • 600G-Mode • 700G-Mode • 800G-Mode • 900G-Mode • 1000G-Mode • 1100G-Mode • 1200G-Mode	SD_FEC_15

DCN Extension

External links are the logical links between two optical degrees that belong to two adjacent nodes. From this release, you can add one or more external links on a node using different optical degrees configured on that node. The creation of an external link allows the management of a remote node and these external links are used when it is not possible to create an optical-service-channel (OSC) communication.

Cisco Optical Site Manager enables you to create and provision external logical links between a source local node and a destination remote node. These nodes use local and remote degrees and require IP addresses of the NCS 2000 devices.

Limitations for DCN Extension

- If any external link is already configured for a degree on a device, then you cannot use that degree for another external link on the same node or device. To achieve this, you should delete the existing external link and create a new external link on the same degree of the device.

- You cannot delete the degree if that degree is already used by an external link.

Manage DCN Extension

Use this task to add, view, or delete external links on the node.

Before you begin

Log into Cisco Optical Site Manager

Ensure that the degrees are existing in the node before configuring external links.

Procedure

Step 1 Click the hamburger icon at the top-left of the page, and select **Node Configuration**.

Step 2 Click the **Optical Configuration** > **External Links** tabs.

Step 3 Perform these steps, as needed.

a) To add a new external link, perform these steps:

1. Click the + button.

   The **New External Link** dialog box appears.

2. In the **Local IP** field, the Local IP address of Cisco Optical Site Manager instance that you are connected gets displays.
3. Enter username of the remote user who is allowed to perform configuration on the remote Cisco Optical Site Manager instance in the **Remote Username** field.
4. Enter password of the remote user who is allowed to perform configuration on the remote Cisco Optical Site Manager instance in the **Remote Password** field.
5. Enter the IP address of an Cisco Optical Site Manager instance that you want to get connected in the **Remote IP** field.
6. Click the refresh (image) button at the end of the **Remote IP** field. The details from the remote node are fetched to allow the configuration.
7. From the **Local Degrees** drop-down list, select the available local degrees to create a starting point for the external link connection.
8. From the **Remote Degrees** drop-down list, select the available remote degrees to create an ending point for the external link connection.

Note If no degree is displayed, check the remote Cisco Optical Site Manager instance to configure the degrees.

9. Click **Add**.

The external link is added to the table of the local and remote Cisco Optical Site Manager **Node Configuration** pages. The table displays the following information under the **External Links** section of the **Node Configuration** page:

- **Local Degrees**—Specifies the local degree on which the external link is created.
- **Interfaces**—Specifies the interfaces on which the external link is created.
- **Connected To**—Specifies the remote node instance to which it is connected. You can click the remote node instance link that is connected and it opens the remote node Cisco Optical Site Manager instance. If nothing is displayed, then the local endpoint is not connected.
- **Local IP**—Specifies the IP address of the NCS 2000 device on which the external link is created.
- **Remote IP**—Specifies the NCS 2000 remote device IP address which is the end of the external link connection.

b) To delete the external link, perform these steps:

1. Check the check boxes corresponding to the external link that you want to delete.
2. Click the - button to delete the selected external link.

   A confirmation message appears. You must authenticate with the username and password for the remote Cisco Optical Site Manager instance to which the external links are connected.
3. Click **Yes**.

   The external link is deleted from both the local and remote Cisco Optical Site Manager instances.

Remote Node Management Using GCC

The remote node management feature allows you to remotely manage NCS 2000 devices with transponder cards using the in-band General Communication Channel (GCC) channels with fiber optics from OTN clients. You can only use the Cisco Light Web UI on the NCS 2000 node to create and manage the GCC channel to the remote NCS 2000 node.

The transponder cards that are supported for remote node management using GCC on Cisco web UI are 200G-CK-LC, and 400G-XP and 10x10-LC cards.

Limitations

For remote node using a GCC0 channel, the Cisco Optical Site Manager and NCS 2000 router should be in different subnets.

Manage Remote Node Using GCC

To manage a remote node, perform the following steps:

1. Bring up the remote node using the Light web UI. For more information, see Cisco Light Web User Interface.

2. Insert the transponder cards and pluggables in the NCS 2000 device at the remote site.
3. Provision a Node in GCC Using Light Web UI for Remote Node, on page 45.
4. Add a NCS 2000 Node

Provision a Node in GCC Using Light Web UI for Remote Node

Use this task to provision a node in GCC using the Cisco Light web UI.

Procedure

From the Cisco light web UI, click **Provisioning** > **GCC Configurations**.

a) In the **GCC Configuration** section, enter the following details:

- Shelf Number—Choose the shelf number.
- Slot Number—Choose the slot number.
- Port Number—Choose the port number. The options are:
  - **200G**—Port 2
  - **400G**—Port 11 or 12 pluggable
- Port Mode—Choose the transponder card port mode.
  - **200G**—The option is MXP 10x10G.
  - **400G**—The options are M100 or M200.
    - **M100**
      - First Slice—First slice should be configured when you are using M_200G as the port mode.
      - Second Slice—Choose the slice on which the card is configured. The options are OPM 100G or OPM 10 X 10G.
    - **M200**
      - First Slice—Choose the slice on which the card is configured. The options are OPM 100G or OPM 10 X 10G.
      - Second Slice—Choose the slice on which the card is configured. The options are OPM 100G or OPM 10 X 10G.
- GCC Rate—Choose the GCC rate for the channel.
  - **200G**—192K and 1200K
  - **400G**—1200K
- FEC—Choose the FEC rate.

- **200G**—Standard, HG_FEC_7, or SD_FEC_20.
- **400G**—SD_FEC_15_DE_OFF, SD_FEC_15_DE_ON, SD_FEC_25_DE_OFF, or SD_FEC_25_DE_ON.

- Wavelength—Choose the wavelength for the GCC channel.

View the GCC channel added under the GCC once the status of the GCC channel changes to Sync Completed. You can view the status of the GCC channel from both the Cisco Optical Site Manager web UI and light web UI.

- For Cisco Optical Site Manager web UI, see Add a NCS 2000 Node.
- For the light web UI, you can check if the node is provisioned properly under the **Summary** table.

Now the GCC channel is created from remote to local node and the GCC channel is up.

Add a device

Onboard a NCS 1000 or NCS 2000 device so it can be tracked, monitored, and managed within Cisco Optical Site Manager.

Note Wait for the current device to complete synchronization before you add the next device to Cisco Optical Site Manager.

Figure 6: Add a Device

Follow these steps to add an NCS 1000 or NCS 2000 device to Cisco Optical Site Manager.

Before you begin

- Log into Cisco Optical Site Manager
- Use an authorization group with an IOS XR administrative account that has write-capable NETCONF access, such as a `root-lr` user or equivalent, for device onboarding. Cisco Optical Site Manager requires these privileges because it performs configuration changes on the XR device after onboarding.
- Before onboarding an NCS 1001 device, verify that the device has a COSM-supported ECDSA crypto key. Cisco Optical Site Manager uses SSH/SFTP/SCP for device operations such as database backup, SOR file download, device diagnostics, and device software download or activation.

  On the IOS XR device, run:

```
RP/0/RP0/CPU0:ios# show crypto key mypubkey ecdsa

Key label: the_default
Type     : ECDSA General Curve Nistp256
Degree   : 256
Created  : <timestamp>
Data     :
 <key-data>
```

  The output must include one of these supported key types:

```
Type     : ECDSA General Curve Nistp256
Type     : ECDSA General Curve Nistp384
Type     : ECDSA General Curve Nistp521
```

  If no supported ECDSA key is displayed, configure one of the following on the IOS XR device:

```
RP/0/RP0/CPU0:ios# configure
RP/0/RP0/CPU0:ios(config)# crypto key generate ecdsa nistp256
RP/0/RP0/CPU0:ios(config)# commit
```

  You can configure one of these keys on the IOS XR device:

```
crypto key generate ecdsa nistp256
crypto key generate ecdsa nistp384
crypto key generate ecdsa nistp521
```



Note In Cisco Optical Site Manager R25.1.1 and R26.1.1, ED25519 keys are not supported for these COSM device operations. For NCS 1001 devices, ED25519 is the default key type, but a supported ECDSA key is required.

- For Cisco Optical Site Manager device management, we strongly recommend to configure the authorization group with credentials for a local IOS XR user account on the managed device. The account must have write-capable NETCONF access, such as a `root-lr` user or equivalent.

  Use IOS XR credentials in this order of preference:

  1. A local IOS XR user account.
  2. If a TACACS+ account is required, configure a local user account with the same username, password, and privileges to ensure seamless management of the device even if TACACS server is not available.

3. If TACACS+ authentication fails, Cisco Optical Site Manager can manage the device only when the TACACS+ and local user credentials match.

Procedure

Step 1 Click **Devices** in the left panel.
The *Device Configuration* page appears.

Step 2 In the **Devices** tab, click the **Devices** section to expand it.

A table appears that lists all the devices that are configured.

Step 3 Click the **Add Device** icon.
The **Add Device** dialog box appears.

Step 4 Select the **Device Type** from the drop-down list.

Select	to
ncs1000	add a NCS 1000 device.
ncs2000	add a NCS 2000 device.
unmanaged-network-element	add a device that is not actively managed by NCS 1000 or NCS 2000.

Step 5 Enter the **Netconf Port**.

Note This field is displayed only if *ncs1000* is selected in the **Device Type** drop-down list.

Step 6 Enter the **Device Name** and **IP Address**.

Use this table to identify the recommended IP address for onboarding NCS 1000 host devices.

Table 12: Recommended IP address for onboarding NCS 1000 host devices

Deployment mode	NCS 1000 device onboarding IP address
HA	Use the IP address of the interface configured as **cosm redundancy interface-name** to onboard each host device.
Standalone	Use the IP address of the interface configured as the **cosm mgmt-interface-name**.

Step 7 Enter the **UID**.

Note This field is displayed only if *ncs1000* or *ncs2000* is selected in the **Device Type** drop-down list.

Step 8 Select an authorization group from the **Auth Group** drop-down list.

Step 9 Click **Add**.

The device is added to Cisco Optical Site Manager and displayed in the **Devices** section.

In an NCS 1000 HA deployment, the Name column displays an A icon for the active node and an S icon for the standby node.

What to do next

Warning Do not perform any cross-connection-related changes through the IOS XR CLI once the device is managed by Cisco Optical Site Manager.