



Configure the Node

This chapter describes the tasks related to node configuration in Cisco NCS 2000 SVO.

- [Internal Patch Cords, on page 1](#)
- [Connection Verification, on page 2](#)
- [Optical Degrees, on page 6](#)
- [Fiber Attributes, on page 8](#)
- [OSC, on page 9](#)
- [Manage GCC Terminations, on page 10](#)
- [Optical Degree Power Monitoring, on page 11](#)
- [Link Power Control, on page 11](#)
- [Span Loss Measurement, on page 16](#)
- [Optical Cross-connect Management, on page 17](#)
- [Import the Cisco ONP Configuration File into SVO, on page 19](#)
- [OTDR Support, on page 20](#)
- [Expected Input Power, on page 25](#)

Internal Patch Cords

Internal patchcords provide virtual links between two termination points of the network. A termination point may be an OSC port, a transponder or muxponder trunk port, a line port, or a passive device port.

Manage Internal Patch Cords

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

Before you begin

[Log into the SVO Web Interface](#)

Procedure

- Step 1** Click the hamburger icon at the top-left of the page, and select **Node Configuration**.
- Step 2** Click the **Optical Configuration** > **Internal Patch Cords** tabs.

Step 3 Perform these steps, as needed.

a) To add a new internal patch cord, perform these steps:

1. Click the + button.

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

2. Choose the **Type** of the patch cord from the drop-down list. The options are chassis or passive unit.
3. Choose the **UID**, **Slot**, and **Port** types from the drop-down lists.

Note If the selected Type in the previous step is a passive unit, the Slot field is not displayed.

4. Check the **Bi-directional** check box if you want to make the patch cord bidirectional.
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.

b) To delete the internal patch cords, perform these steps:

1. Check the check boxes corresponding to the internal patch cords you want to delete.
2. Click the - button to delete the selected patch cord.
A confirmation message appears.
3. Click **Yes**.

The internal patch cord is deleted from the table.

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

Connection Verification

The connection verification feature measures power levels and verifies the optical cables and patchcords in a node for the following:

- **Connectivity**: Checks whether the cable is connected.
- **Insertion Loss**: Checks whether the cable loss is within expected value.

A 1567-nm connectivity check signal is generated and transmitted into the DMUX input port of the 20-SMRFS-CV card by a dedicated laser source. This signal is detected by an embedded photo diode to complete the connection verification.

Supported Cards and Passive Devices

The cards and passive devices that support connection verification are as follows:

- 16-AD-CCOFS
- 20-SMRFS-CV
- MF-DEG-5 and MF-DEG-5-CV
- MF-MPO-16LC and MF-MPO-16LC-CV
- MF-UPG-4 and MF-UPG-4-CV
- 100GS-CK-LC, 200G-CK-LC, and 400G-XP

The passive devices require loopback caps on unused ports. The CV version of the passive devices is shipped with loopback caps.

Prerequisites

The connection verification feature works only if the following conditions are met:

- Flex nodes must be present.
- Loopback caps must be installed on all the unused ports of the passive devices.
- At least one 20-SMRFS-CV card must be present in the node.
- All sides of the node must have the 20-SMRFS-CV card to test all the cables and patchcords.
- All passive devices must be connected with a USB cable and associated, so that power readings can be calculated.

Running the Connection Verification

The connection verification runs automatically at the following time intervals and events:

- 20 minutes after boot or reboot of the first shelf controller
- One minute after enabling the connection verification
- Ten minutes after creation or deletion of patchcords
- Ten minutes after creation or deletion of circuits
- Every six hours

Benefits

The benefits of connection verification feature are as follows:

- Validates the 20-SMRFS-CV card connectivity with local Add/Drop or other ROADM elements.
- Detects any incorrect cabling in the ROADM network element.
- Collects insertion losses of each optical path inside the network element to detect possible failures.

Verify Connections in Optical Cables

Use this task to verify the optical interconnections between the optical cards inside the flex ROADM node.

Before you begin

- [Log into the SVO Web Interface](#)

Procedure

- Step 1** Click the hamburger icon at the top-left of the page, and select **Node Configuration**.
- Step 2** Click the **Optical Configuration > Connection Verification** tabs.
- Step 3** Check the **Enable Verification** check box to enable connection verification at the node level.
- Step 4** View the following information displayed in the **Connection Verification** pane:
- From—Displays the source slot for connection verification.
 - To—Displays the destination slot for connection verification.
 - Connectivity Verification—Displays connectivity status. This information is summarized and displayed for any patchcord in the MPO cable. The different status includes:
 - Connected—Cable or patchcord is connected.
 - Not Connected—Cable or patchcord is disconnected.
 - Disabled—Cable or patchcord is excluded from connection verification.
 - Not Measurable—Power source is not detected; cable or patchcord cannot be tested for connection verification.
 - Not Verified—Cable or patchcord is not tested for connection verification. This is the default status upon first boot.
 - Connectivity Last Change—Displays the date and time when the connectivity information was previously changed.
 - Loss Verification—Displays insertion loss verification status that is one of the following:
 - Not Verified—Cable or patchcord is not tested for insertion loss verification. This is the default status upon first boot.
 - Not Measurable—Power source is not detected; cable or patchcord cannot be tested for insertion loss verification.
 - OK—Cable or patchcord insertion loss is within expected value.
 - Degrade—Cable or patchcord insertion loss is degrading.
When the insertion loss is greater than the Insertion Loss Degrade threshold and less than the Insertion Loss Fail threshold, the status of insertion loss verification is Degrade. The Insertion Loss Degrade threshold is available at the bottom of the **Connection Verification** pane.
 - Fail—Cable or patchcord insertion loss crossed the fail threshold.

When the insertion loss is greater than the Insertion Loss Fail threshold, the status of insertion loss verification is Fail. The Insertion Loss Fail threshold is available at the bottom of the **Connection Verification** pane.

- Disabled—Cable or patchcord is excluded from insertion loss verification.
- Loss Last Changed—Displays the date and time when the insertion loss verification information was previously changed.
- Excess Loss [dB]—Displays the excess loss versus the maximum specified loss for the cable under test. When the shelf controller reboots, the information in the Excess Loss column is lost.
- Last Run—Displays the date and time when the connection verification and insertion loss verification were previously run. When the shelf controller reboots, the information in the Last Run column is lost.
- Ack—Displays the alarm acknowledgment information for a specific fiber. The possible values are true or false.
- Is Reachable—Indicates whether the connectivity is available to the patchcords and MPO cables. The possible values are true or false.
- Combined Loss—Indicates whether two or more patch cords are considered as a chain from the connection verification point of view. The possible values are true or false.

Step 5 Perform these steps, as needed.

- a) Click **Abort CV** to stop the connection or insertion loss verification at any point.
- b) Click **Verify Connectivity** to perform connection verification on all the patchcords and MPO cables (default behavior) or choose the required patchcords and MPO cables and click **Verify Connectivity** to perform connection verification on the selected patchcords and MPO cables.

The confirmation message appears that lists all the links or the selected links accordingly.

- c) Click **Verify Loss** to perform insertion loss verification on all the patchcords and MPO cables (default behavior) or choose the required patchcords and MPO cables and click **Verify Loss** to perform insertion loss verification on the selected patchcords and MPO cables.

The confirmation message appears that lists all the links or the selected links accordingly.

- d) Click **Ack** to acknowledge the insertion loss verification result related to the selected MPO cables or patchcords. This button allows MPO cable or patch cord to operate beyond the insertion loss thresholds without raising an alarm. If all the insertion loss verification problems on the current node are acknowledged, the consequent alarm on the node is cleared.
- e) Click **Clear Ack** to clear the acknowledgment on the selected MPO cable or patchcord. The insertion loss verification result becomes Fail or Degrade. This operation can raise the IPC-VERIFICATION-FAIL or IPC-VERIFICATION-DEGRADE alarm on the node.
- f) Enter the Insertion Loss Fail threshold in the Fail field and the Insertion Loss Degrade threshold in the Degrade field.

The IPC-Verification-Running condition is raised when connection or insertion loss verification is started. The default values of Insertion Loss Fail threshold and Insertion Loss Degrade threshold parameters are 4 and 1.5 dB respectively. These two default thresholds are used to generate the alarms.

- g) Click **Refresh** to refresh the connection verification information.

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

Step 7 After connection verification, perform these steps, as needed:

If the insertion loss verification results for a patchcord are Fail or Degrade, perform these steps:

- a. Remove the patchcord.
- b. Clean the patch cord.
- c. Install the patchcord.
- d. Perform the insertion loss verification step again.

If the patchcord status is Not Connected, it raises the IPC-VERIFICATION-FAIL alarm on the node. To clear this condition, perform these steps:

- a. Ensure that the patchcords are installed correctly on both the ends.
- b. Perform the insertion loss verification step again.
- c. Replace the patchcords if the alarm still exists.

If the IPC-LOOPBACK-MISS alarm is raised on any port, perform these steps:

- a. Identify the port with IPC-LOOPBACK-MISS alarm.
 - b. Check whether the loopback is installed on the port.
 - c. If the loopback is correctly installed, perform the insertion loss verification step again.
 - d. Replace the loopback if the alarm still exists.
-

Optical Degrees

From a topological point of view, all the DWDM 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 the SVO Web Interface](#)

Procedure

- Step 1** Click the hamburger icon at the top-left of the page, and select **Node Configuration**.
- Step 2** Click the **Optical Configuration > Optical Degree** tabs.
- 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**.

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 SVO 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. Values are LOGO or LEGACY.

b) To modify any one of the optical degree parameters described below degree, perform the required 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**.
- To enable Fixed-Grid with LOGO on an optical degree, go to the related cell in the **Channel Spacing** column, select 50 or 100 from the drop-down list, and click **Apply**.

The **Channel Grid** value changes to Fixed-Grid and the **Domain Type** value changes to LOGO.

- To enable Flexible-Grid with LOGO on an optical degree, go to the related cell in the **Spectrum Occupancy** column, enter a valid value, and click **Apply**.

The **Channel Grid** value changes to Flexible-Grid and the **Domain Type** value changes to LOGO.

- To change the **Domain Type** from LOGO to LEGACY, you must delete the optical degree and create it again.

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.

Fiber Attributes

The Fiber Attributes tab lists the attributes of the fibers that are connected to the optical side.

Manage Fiber Attributes

Use this task to create, view, modify, or delete fiber attributes of a span.

Before you begin

[Log into the SVO Web Interface](#)

Procedure

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

Step 2 Click the **Optical Configuration > Fiber Attributes** tabs.

Step 3 Perform these steps, as needed.

a) To create a fiber attribute, perform these steps:

1. Click the + button.
The **Create Fiber Attributes** dialog box appears.
2. Enter the fiber ID in the **Fiber ID** field.
3. Select the **Fiber ID**, **Degree**, **Fiber Type**, **Length**, **PMD**, **Attenuator In**, and **Attenuator Out** from their respective scroll-lists.
4. Click **Apply**.

The fiber attribute is created and added to the table that displays the following information.

- **Degree**—Specifies the optical side.
- **Fiber ID**—Specifies the fiber number in the duct.
- **Fiber Type**—Specifies the type of fiber deployed.
- **Length**—Specifies the length of the optical span in kms or miles.

- **PMD**—Specifies the polarization mode dispersion (PMD) fiber coefficient in ps/sqrt (km).
- **Attenuator In**—Specifies the input attenuation in dB between the node output port (typically LINE-TX port) and the input of the fiber span. The span may include patchcords, attenuators, and patch panels.
- **Attenuator Out**—Specifies the output attenuation in dB between the node input port (typically LINE-RX port) and the output of the fiber span. The span may include patchcords, attenuators, and patch panels.

b) To modify the fiber attributes, perform these steps:

1. To modify the Fiber Type, Length, PMD, Attenuator In, Attenuator Out, or PMD values on an optical degree, go to the related cell in the related column, select a value from the drop-down list, and click **Apply**.

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

c) To delete a fiber attribute, perform these steps:

1. Check the check box corresponding to the fiber attribute you want to delete.
2. Click the - button to delete the selected fiber attribute.

A confirmation message appears.

3. Click **Yes**.

The fiber attribute is deleted from the table.

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

OSC

OSC is a point-to-point communication channel that connects two consecutive nodes. The OSC carries a supervisory data channel and synchronizes clocking at network nodes. The OSC also carries a user data channel. Before provisioning OSC terminations on TNC ports carrying Fast Ethernet (FE) payloads, ensure that you set the ALS mode on these ports to Disabled.

Manage OSC

Use this task to provision OSC terminations.

Before you begin

[Log into the SVO Web Interface](#)

Procedure

- Step 1** Click the hamburger icon at the top-left of the page, and select **Node Configuration**.
- Step 2** Click the **Optical Configuration > OSC** tabs.
- Step 3** Perform these steps, as needed.
- a) To create a OSC termination, perform these steps:
1. Click the + button.
The **Create OSC Terminations** dialog box appears.
 2. Choose the port from the **Port** drop-down list.
 3. Click **Apply**.
The OSC termination is created and added to the table that displays the following information.
 - **Port**—Specifies the control card OSC port.
 - **Service State**—Specifies the OSC service state.
- b) To delete an OSC termination, perform these steps:
1. Check the check box corresponding to the OSC termination you want to delete.
 2. Click the - button to delete the selected OSC termination.
A confirmation message appears.
 3. Click **Yes**.
The OSC termination is deleted from the table.
- Step 4** (Optional) Click the **Export to Excel** button to export the information to an Excel sheet.
-

Manage GCC Terminations

Use this task to create or delete the GCC terminations required for the network.

Before you begin

[Log into the SVO Web Interface](#)

Procedure

- Step 1** Click the hamburger icon at the top-left of the page, and select **Node Configuration**.
- Step 2** Click the **Optical Configuration > GCC** tabs.
- Step 3** Perform these steps, as needed.
- a) To create a GCC termination, perform these steps:

1. Click the + button.
The **Create GCC Terminations** dialog box appears.
2. Choose the **Port**, **Channel**, and **Speed (K)** from their respective drop-down lists.
3. (Optional) Enter the foreign IP in the **Foreign IP** field.
4. Choose an option from the **Enable Ospf** drop-down list.
5. Click **Apply**.
The GCC termination is created and added to the table.

- b) To delete a GCC termination, perform these steps:
1. Check the check box corresponding to the GCC termination you want to delete.
 2. Click the - button to delete the selected GCC termination.
A confirmation message appears.
 3. Click **Yes**.
The GCC termination is deleted from the table.

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

Optical Degree Power Monitoring

Use this task to view bar graphs of the input and output spectrum on each optical side of the node.

Before you begin

[Log into the SVO Web Interface](#)

Procedure

- Step 1** Click the hamburger icon at the top-left of the page, and select **Node Configuration**.
 - Step 2** Click the **Optical Configuration > Optical Degree Power Monitoring** tabs.
 - Step 3** Choose the **Optical Degree** from the drop-down list.
 - Step 4** Click **Refresh**.
-

Link Power Control

The Link Power Control (LPC) feature performs the following functions:

- Maintains constant per channel power when desired or accidental changes to the number of channels occur. Constant per channel power increases optical network resilience.
- Compensates for optical network degradation (aging effects).
- Simplifies the installation and upgrade of DWDM optical networks by automatically calculating the amplifier setpoints.



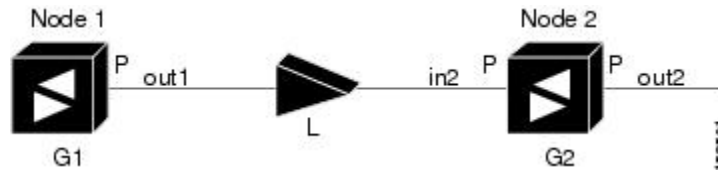
Note LPC algorithms manage the optical parameters of the line cards.

Amplifier software uses a control gain loop with fast transient suppression to keep the channel power constant regardless of any changes in the number of channels. Amplifiers monitor the changes to the input power and change the output power proportionately according to the calculated gain setpoint. The shelf controller software emulates the control output power loop to adjust for fiber degradation. To perform this function, the control card must know the channel distribution, which is provided by a signaling protocol, and the expected per channel power, which you can provision. The control card compares the actual amplifier output power with the expected amplifier output power and modifies the setpoints if any discrepancies occur.

LPC 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 1: 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 (P_{in2}) depends on the total power launched by the booster amplifier on Node 1, $P_{out1}(n)$ (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:

$$P_{in2} = L P_{out1}(n)$$

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

$$P_{out-Pre-2} = L \times G_{Pre-2} \times P_{out1}(n)$$

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 ($P_{out-Pre-2}$) also decreases. The goal of LPC 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, LPC provisions a new gain at the Node 2 preamplifier (GPre-2') to compensate for the new span loss, as shown in the formula:

$$G_{Pre-2'} = G_{Pre-2} (L / L') = G_{Pre-2} + [P_{out-Pre-2} - \text{Exp}(P_{out-Pre-2})]$$

Generalizing on the preceding relationship, LPC 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 LPC 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.

LPC is a network-level feature that is distributed among different nodes. An LPC domain is a set of nodes that are regulated by the same instance of LPC at the network level. An LPC 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
 - Cross-connect (XC) termination mesh node
 - Line termination mesh node
- LPC domains are shown in the GUI.

Inside a domain, the LPC algorithm designates a primary node that is responsible for starting LPC hourly or every time a new circuit is provisioned or removed. Every time the primary node signals LPC 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.

LPC 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 LPC 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, LPC does not apply the 3-dB rule. In this case, LPC corrects all the power differences to turn up the node.

To avoid large power fluctuations, LPC 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 LPC check on every node in the LPC domain. LPC can correct up to a maximum of 3 dB on an hourly basis. If degradation occurs over a longer time period, LPC compensates for it by using all margins that you provision during installation.

LPC can be manually disabled. In addition, LPC 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 LPC instances in any of the domain nodes is no longer reachable.

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

- APC Out of Range—LPC 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—LPC 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.

LPC 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.

$$P_{out}(t) = G * P_{in}(t) \text{ (mW)}$$

$$P_{out}(t) = G + P_{in}(t) \text{ (dB)}$$

In a power-equalized optical system, the total input power is proportional to the number of channels. The amplifier software compensates for any variation of the input power due to changes in the number of channels carried by the incoming signal.

Amplifier software identifies changes in the read input power in two different instances, t_1 and t_2 , as change in the traffic is being carried. The letters m and n in the following formula represent two different channel numbers. P_{in}/ch represents the input power per channel.

$$P_{in}(t_1) = nP_{in}/ch$$

$$P_{in}(t_2) = mP_{in}/ch$$

Amplifier software applies the variation in the input power to the output power with reaction time that is a fraction of a millisecond. This keeps the power constant on each channel at the output amplifier, even during a channel upgrade or a fiber cut.

The per channel power and working mode (gain or power) are set by automatic node setup (ANS). The provisioning is conducted on a per-degree basis.

Starting from the expected per channel power, the amplifiers automatically calculate the gain setpoint after the first channel is provisioned. An amplifier gain setpoint is calculated in order to make it equal to the loss

of the span preceding the amplifier itself. After the gain is calculated, the setpoint is no longer changed by the amplifier. Amplifier gain is recalculated every time the number of provisioned channels returns to zero. If you must force a recalculation of the gain, move the number of channels back to zero.

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 available in the **Node Configuration** > **APC** tab helps the user to restore normal conditions by clearing the APC Correction Skipped alarm. The **Force Power Correction** button must be used under the Cisco TAC surveillance because its misuse can lead to traffic loss.

Disable Link Power Control

Use this task to disable Link Power Control.



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

Before you begin

[Log into the SVO Web Interface](#)

Procedure

- Step 1** Click the hamburger icon at the top-left of the page, and select and select **Node Configuration**.
- Step 2** Click the **APC** tab.
- Step 3** Choose a degree and choose **force-disabled** from the **Admin Status** drop-down list.
Only degrees with Admin Status as automatic-enabled can be disabled.
- Step 4** Click **Apply**.
- Step 5** Verify that the **Service Status** field changes to force-disabled.

Enable Link Power Control

Use this task to enable Link Power Control.

Before you begin

[Log into the SVO Web Interface](#)

Procedure

- Step 1** Click the hamburger icon at the top-left of the page, and select **Node Configuration**.
- Step 2** Click the **APC** tab.
- Step 3** Choose a degree and choose **automatic-enabled** from the **Admin Status** drop-down list.
Only degrees with Admin Status as force-disabled can be enabled.
- Step 4** Click **Apply**.
- Step 5** Verify that the **Service Status** field changes to enabled.
-

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. After a SMR-20 or SMR-9 channel is configured, the span loss is measured by the channel. 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 SVO, 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 view or modify span loss parameters.



Note 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 the SVO Web Interface](#)

Procedure

- Step 1** Click the hamburger icon at the top-left of the page, and select **Node Configuration**.
- Step 2** Click the **Optical Configuration > Span Loss** tabs.
- A table is displayed with the following information:
- **Degree**—Displays the side for which span loss information appears.
 - **Measured By**—Displays whether the measurement was executed with or without channels. Values are OSC or CHANNEL.
 - **Min Exp. Span Loss (dB)**—Displays the minimum expected span loss (in dB) for the incoming span.
 - **Max Exp. Span Loss (dB)**—Displays the maximum executed span loss (in dB) for the incoming span.
 - **Measured Span Loss (dB)**—Displays the measured span loss value.
 - **Measured Accuracy (dB)**—Displays the resolution or accuracy of the span loss measurement. The resolution is +/-1.5 dB if the measured span loss is 0–25 dB. The resolution is +/-2.5 dB if the measured span loss is 25–38 dB.
 - **Measured Time**—Displays the time and date when the last span loss measured value is changed.
- Step 3** Select a row and click **Measure Span Loss**.
- A message appears. Click **OK**.
- Step 4** Refresh the table to view the updated **Measured Span Loss**, **Measured Accuracy**, and **Measured time**.
- Step 5** Modify the values for **Min. Exp. Span Loss** or **Max. Exp. Span Loss** in dB. The range is from 0 to 99.
- Step 6** Click **Apply**.
- A confirmation message appears.
- Step 7** Click **Yes**.
- The span loss range is extended including the Accuracy value. A Span Loss Out of Range condition is raised when the measured span loss is higher than the extended range.
- Step 8** (Optional) Click the **Export to Excel** button to export the information to an Excel sheet.
-

Optical Cross-connect Management

Optical cross-connect (OXC) circuits establish connectivity between two optical nodes on a specified C-band wavelength. The connection is made through the ports present on the wavelength selective switches, multiplexers, demultiplexer, and add/drop cards. In an OXC circuit, the wavelength from a source interface port ingresses to a DWDM system and then egresses from the DWDM system to the destination interface port. The OXC circuits are bidirectional in nature and are created using data models. The administrative states are:

- IS/Unlocked
- IS,AINS/Unlocked,AutomaticInService

- OOS,DSBLD/Locked,disabled

View Optical Cross-connect Circuits

Use this task to view the details of the optical cross-connects that are created for a node using data models.



Note The optical cross-connects are read-only and cannot be modified.

Before you begin

[Log into the SVO Web Interface](#)

Procedure

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

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

The following details are displayed for each cross-connect.

- **Connection Label**—Displays the name of the cross-connect.
- **Type**—Displays the type of cross-connect. It is bidirectional.
- **Admin Status**—Displays the admin state on the circuit.
- **Central Frequency (THz)**—Displays the spectral position of the circuit.
- **Allocation Width (GHz)**—Displays the bandwidth occupied by the service. The range is 25 to 300GHz.
- **Signal Width (GHz)**—Displays the carrier bandwidth.

Note The payload bandwidth is lesser than the allocation bandwidth.

- **Path 1 End-points**—Displays the source and destination interfaces of the path.
- **Path 2 End-points**—Displays the source and destination interfaces of the path.

To view Path 1 or Path 2, click the + icon to expand the cross-connect. Click the down arrow on the right to view the internal details of Path 1 or Path 2. The details are:

- **Interface Name**—Displays the interface name.
- **Optical Power**—Displays the value of the optical power.
- **Power Degrad High**—Displays the threshold for a maximum power degrade.
- **Power Degrad Low**—Displays the threshold for a minimum power degrade.
- **Power Failure Low**—Displays the threshold for power failure.
- **Optical Psd Setpoint (dBm/GHz)**—Displays the optical power spectral density setpoint. This setpoint is independent of the width of the circuit.

- **Optical Power Setpoint**—Displays optical power setpoint. This setpoint is scaled to the width of the circuit and matches the value of the optical power parameter.

Step 3 (Optional) Click the **Export to Excel** button to export the information to an Excel sheet.

Import the Cisco ONP Configuration File into SVO

You can import the configuration file (NETCONF file) exported from Cisco ONP. The file contains parameters for the node, shelf, card type, port (including wavelength of the card), pluggable port module (PPM), and OTN and FEC parameters.



Caution Verify that you have the correct Cisco ONP network file before you begin this procedure. The file has an XML extension and a name that is assigned by your network planner. Check with your network planner or administrator if you have any questions.

Only the values present in XML format appear in the configuration file parameters. If the values are not in XML format, a column appears blank. The XML file values are independently reported and do not affect any configuration changes that you apply. Finally, the NETCONF file installs the ANS parameters that are calculated by Cisco ONP.

Use this task to import the Cisco ONP NETCONF file into SVO.

Before you begin

[Log into the SVO Web Interface.](#)

Procedure

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

Step 2 Click **Node Setup** tab.

Step 3 Click **Select Files**, browse and select the NETCONF file exported from Cisco ONP.

Note • If you see an error in a pop-up window, validate the XML file and re import.

Step 4 If you want to export the XML file, click the **Download Node Configuration as XML** icon.

OTDR Support

Table 1: Feature History

Feature	Release Information	Description
OTDR Enhancements	Cisco NCS 2000 Release 12.2	<p>The following OTDR enhancements are introduced to improve the user experience:</p> <ul style="list-style-type: none"> • Choose either Hybrid or Fast mode for OTDR scan • Download OTDR scan configurations in .xls format • Print and download OTDR graph in JPEG or PNG formats • View the Event table below the graph with Event ID, Location (km), Magnitude (dB), and Type parameters

From R12.01 onwards, SVO supports TNCS-O and TNCS-2O cards for Optical Time Domain Reflectometer (OTDR) specific operations. OTDR is used to detect faults in an optical fiber link of a communication network.

The OTDR feature on the TNCS-O and TNCS-2O cards lets you do the following:

- Inspect the transmission fiber.
- Identify discontinuities or defect on the fiber.
- Measure the distance and magnitude of defects like insertion loss, reflection loss, and so on.
- Monitor variations in scan values and configured threshold values periodically.



Note OTDR does not support the placement of a bulk attenuator in its path. OTDR sends pulses of light and measures the reflected light. Bulk attenuator hinders this mechanism. The attenuator reduces the dynamic range of OTDR, limiting its capability. Another issue with bulk attenuator is that it has two reflective surfaces very close to each other which corrupts the OTDR pulses.

If a bulk attenuator is placed near the OTDR faceplate, the OTDR may not measure beyond the attenuator. If lumped attenuation is present beyond the attenuator, OTDR may erroneously declare that the fiber ends at that point. As per design, OTDR may exhibit this behavior with 5 dB or more, of lumped attenuation.



Note Once the OTDR port is initialized, it needs calibration every 24 hours for ORL measurement in Tx Direction. For this calibration, ORL training is triggered automatically by the OTDR module. ORL training is performed in hybrid mode and it lasts for just a few minutes. You cannot stop the trigger of this automatic ORL training.

OTDR Training

OTDR scan performances are improved using specific parameters of fiber such as span length, span loss, equipment insertion loss, reflection contributions, and major events on the fiber. This calibration operation is called OTDR training.

OTDR training is executed with the following rules.

- OTDR training is executed on both the Tx fiber and Rx fiber.
- OTDR training results are used to execute the composite scan.
- OTDR training is embedded in the scan operation.
- OTDR training takes up to 2 minutes in fast mode and up to 10 minutes in hybrid mode.
- OTDR training results in calibration file, fast span trace, and identification of the fiber end.



Note High reflection location is not available if detected during Optical Return Loss (ORL) training.

Provision OTDR Ports

Use this task to provision OTDR ports on the TNCS-O and TNCS-2O control cards.

Before you begin

[Log into the SVO Web Interface](#)

Procedure

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

Step 2 Click the **OTDR > Provisioning** tabs.

Step 3 Perform these steps as needed.

- a) To add an OTDR port, click **+Add**.
 1. In the Create OTDR dialog box, choose the **Port**.
 2. Click **Apply**.

The OTDR port is created and added to the table that displays the following information:

Note When you create an OTDR port, there are two entries with the status for direction Tx and the direction Rx.

- Port—Displays the OTDR port name.
 - Direction—Displays the direction of the port (Rx or Tx).
 - Scan Status—Displays the status of the OTDR scan; for example, status-progress, status-failure, or status-idle.
 - Scan Progress—Displays the progress of the OTDR scan, in percentage.
 - OTDR Training Status—Displays the status of the OTDR training; for example, status-trained, and status-not-executed. The status is unique for each direction.
 - ORL Training Status—Displays the status of the ORL training. The status is unique for each direction.
 - Scan Failure Message—Displays the reason for the scan failure.
 - High Reflection Location—Displays the location of high reflection that is detected when the scan fails.
 - ORL Threshold— Displays the threshold of the ORL measure. There is an alarm (Excessive ORL Measure) associated with this field.
 - Refractive Index—Displays the fiber refractive index, which depends on the installed fiber.
 - Backscatter—Displays the reflective light on the fiber, which is also dependent on the installed fiber.
 - Loss Sensitivity—Displays the limit under which the loss is not considered as real loss, in dB.
 - Reflection Sensitivity—Displays the limit under which the reflection is not considered as a real reflection, in dB.
- b) (Optional) If you want to delete a port, select one of the entries (Tx or Rx), and click **Delete**.
Both entries (Tx and Rx) of the port are deleted.

Step 4

To run the OTDR scan, perform these steps:

- a) (Optional) Set the following values, if required.
 - **Absolute Alarm Thresholds** for loss and reflection
 - **Loss Sensitivity** and **Reflection Sensitivity** of the fiber
- b) Choose the OTDR port on which OTDR scan has to be performed.
- c) Click **Start**.
"OTDR scan started" message appears.

- Note**
- You can run only one scan at a time either in TX or RX direction, for each port. When you start a scan on direction TX, the column that is related to TX direction is updated, and when you start the scan on RX, the other column is updated.
 - You can run scan on both ports (for example: ports 1 and 2 on TNCS-O, and ports 3 and 4 on TNCS-2O) at the same time.
 - You can perform as many scans as you want, but SVO database can retain only up to two Tx scans and two Rx scans for each port. If you perform subsequent scans, the existing scan file is overwritten by the latest scan file. Hence, for each port, the web user interface displays only up to two TX scans and two RX scans.

You can view the status of the scan under the **Scan Status** column.

Step 5

To view the OTDR scan traces, perform these steps:

- a) Click the **Traces** tab.
- b) To set a baseline, perform these steps:
 - From the **Port** drop-down list, choose one of the ports you have configured, to analyze.
 - From the **Last Scan Traces** drop-down list, choose the scan file that you want to analyze.
 - If the selected scan had desired results and you want to set the selected scan file as a baseline, click **Baseline**.
 - Click **Yes** to confirm.
 - Click **Ok** in the **Action** dialog box.

The baseline is saved. You can have one baseline for each direction. You can use this baseline to compare with other OTDR scan results.

- c) Choose the scan file and baseline file, and click the **Refresh** icon next to the **Port** drop-down list.

You can view the traces chart having Loss (dB) plotted against Distance (Km). The baseline chart is plotted in blue color, and the selected otdr scan chart is plotted in green color.

To zoom into the graph, press **Shift** key and drag the mouse pointer to select the portion of the graph.
- d) Click **Download** to download the data file saved in the Standard OTDR Record (SOR) format.

The SOR file contains fiber trace data that are recorded by the OTDR instrument when testing an optical fiber.
- e) Click the **Export as SVG** icon to download the traces file in SVG format.

Perform OTDR Scan

Use this task to perform the OTDR scan on a specific port.

Before you begin

[Log into the SVO Web Interface](#)

Procedure

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

Step 2 Click the **OTDR** tab.

Step 3 Click the **Provisioning** tab.

Step 4 Choose either **Hybrid** or **Fast** mode using the toggle button.

Step 5 Choose the port, you want to scan.

Step 6 Click **Start** to start scanning.

OTDR scan started message appears.

Step 7 Click **Ok**.

Step 8 Click **Stop**, when you want to stop scanning.

Step 9 Click **Yes** to confirm.

OTDR scan terminated message appears.

Step 10 Click **Ok**.

Note In the fast mode, an alarm (OTDR-FAST-SCAN-IN-PROGRESS-TX or OTDR-FAST-SCAN-IN-PROGRESS-RX) gets triggered informing that the scan is running in fast mode.

Automatic OTDR Scan

Automatic OTDR scan is started by checking the check box of the following parameters:

- **System Start-up, Fiber cut & Repair**-When there is a fiber cut or after fiber repair, automatic OTDR scan is started. You can set a time delay for the OTDR scan by choosing the **Start Delay (Min)** value.
- **Span Loss Increase**-When the span loss increases above the threshold value, automatic OTDR scan is started. You can choose the **Span Loss Increase Threshold (dB)** value.
- **Excessive ORL from Span**-When the ORL information is excessive, automatic OTDR scan is started.

OTDR Graph and Event Table

You can view the OTDR configurations in the graph. The Events in the graph are represented as following:

- O - OPEN CONNECTOR
- P - PASS THROUGH
- F - FACE PLATE

You can also print and download the graph in JPEG and PNG formats. You can view the Event table below the graph with the following parameters:

- Event ID

- Location (km)
- Magnitude (dB)
- Type

Expected Input Power

You can manage optical power on external devices while performing cross connection at the node level using expected input power. You can configure the expected input power on the OTS interface of the add port of the passive device.

You can set the expected input power on the following passive units:

- 15216-MD-48-ODD
- 15216-MD-48-EVEN
- 15216-MD-40-ODD
- 15216-MD-40-EVEN
- 15216-EF-40-ODD
- 15216-EF-40-EVEN
- NCS1K-MD-64-C
- NCS2K-MF-M16LC-CV
- NCS2K-MF-4X4-COFS
- NCS2K-MF-MPO-8LC
- NCS2K-MF-6AD-CFS
- NCS2K-MF-10AD-CFS

Manage Expected Input Power

Use this task to add, modify, view, or delete expected input power on the node.

Before you begin

[Log into the SVO Web Interface](#)

Procedure

- Step 1** Click the hamburger icon at the top-left of the page, and select **Node Configuration**.
- Step 2** Click the **Optical Configuration** > **Expected Input Power** tabs.
- Step 3** Perform these steps, as needed.
- a) To add a new expected input power, perform these steps:

1. Click the + button.

The **Configure Expected Input Power** dialog box appears.

2. From the **Type** drop-down list, choose **chassis** or **passive** unit.
3. Choose the **UID** and **Input Port** types from the drop-down lists.
4. Enter label to assign for the expected input power in the **Label** field.
5. Enter a value (dBm) in the **Expected Input Power** field.
6. Click **Apply**.

The expected input power is added to the table that displays the following information:

- **Input Port**—Specifies the port on which the expected input power is configured.
- **Label**—Specifies the label information.
- **Expected Input Power**—Specifies the expected input power that is configured in the port.

- b) To delete the expected input power, perform these steps:

1. Check the check boxes corresponding to the expected input power you want to delete.
2. Click the - button to delete the selected input power.
A confirmation message appears.
3. Click **Yes**.

The expected input power is deleted from the table.
