NetStar O&M
21.1.810

Optical Doctor System User Guide

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About This Document

Purpose

This document describes the operations of the Optical Doctor (OD) System.

Related Versions

The following table lists the product versions related to this document:

Product Name	Version
Optical Doctor (OD)	21.1.810

Intended Audience

The intended audiences of this document are technical support engineers.

Symbol Conventions

The symbols that may be found in this document are defined as follows.

Symbol	Description
DANGER	Indicates a hazard with a high level of risk which, if not avoided, will result in death or serious injury.
WARNING	Indicates a hazard with a medium level of risk which, if not avoided, could result in death or serious injury.
CAUTION	Indicates a hazard with a low level of risk which, if not avoided, could result in minor or moderate injury.

Symbol	Description
NOTICE	Indicates a potentially hazardous situation which, if not avoided, could result in equipment damage, data loss, performance deterioration, or unanticipated results. NOTICE is used to address practices not related to personal injury.
NOTE	Supplements the important information in the main text. NOTE is used to address information not related to personal injury, equipment damage, and environment deterioration.

GUI Conventions

The GUI conventions that may be found in this document are defined as follows.

Convention	Description
Boldface	Buttons, menus, parameters, tabs, window, and dialog titles are in **boldface**. For example, click **OK**.
>	Multi-level menus are in **boldface** and separated by the ">" signs. For example, choose **File** > **Create** > **Folder**.

Change History

Changes between document issues are cumulative. The latest document issue contains all the changes in earlier issues.

Updates in Issue 01 (2023-05-19)

This is the first release of 21.1.810. There is no change compared with 21.1.710.

Contents

1 OD System of a WDM/OTN Network

This chapter describes the basic functions, application scenarios, system components, and implementation principles of the Optical Doctor (OD) system.

1.1 Optical Doctor System

Huawei OTN equipment supports the Optical Doctor (OD) system. The OD system provides for intelligent end-to-end, refined, and digital management of the optical layer on a WDM network. Through centralized configuration for optical-layer parameters, the OD system supports automatic monitoring, analysis, commissioning, and optimization of network performance.

Challenges for WDM Network O&M

As WDM networks adopt higher transmission rates and become meshed, reliable network maintenance plays a more important role. An easier-to-use and more professional operation and maintenance (O&M) tool is required.

Currently, WDM networks are facing the following difficulties in the deployment, commissioning, configuration, and network maintenance phases:

- Lack of quick and accurate OSNR monitoring methods:

  After the network rate increases from 10 Gbit/s to 100 Gbit/s or higher, the original spectrum monitoring method cannot quickly and accurately monitor the OSNR of a system. It is a great challenge and a trend to develop an online OSNR monitoring tool for network maintenance.
- Lack of reliable and quick optical-layer O&M methods:

  On meshed networks, WDM services become more flexible, and frequent service creation and deletion make network commissioning and maintenance more complex. Traditional manual OSNR monitoring cannot address WDM network development requirements from the following aspects:

  – Configuration is complex.

When network optical-layer performance needs to be monitored, configuration needs to be performed for each site on the network, which is time-consuming and costly. In addition, some configuration items are widely dispersed and therefore are easily neglected. As a result, commissioning engineers have to perform a network-wide check site by site, leading to low efficiency.

- Network performance deterioration cannot be detected in a timely manner.

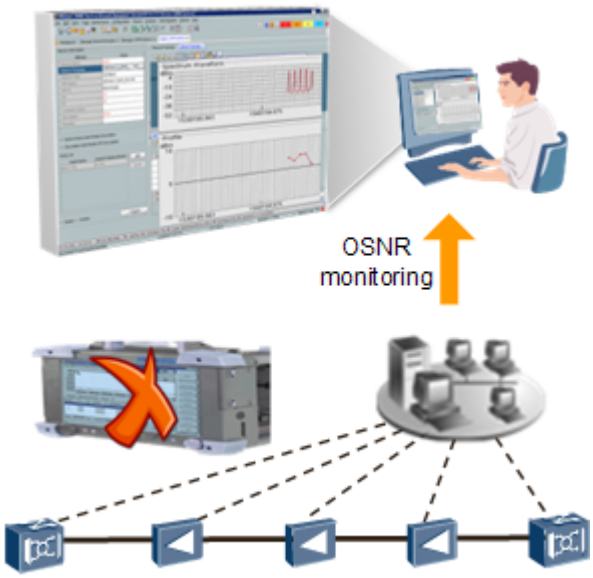
  Optical power fluctuation caused by fiber aging, component aging, wavelength adding or dropping, or external environment cannot be discovered by manual monitoring in a timely manner. Network-wide data collection and analysis require a long time and high costs.

  With the development of WDM technologies and the change of network topology, an effective network O&M tool is required.

Functions of the OD System

The OD system supports online OSNR monitoring for various rate wavelengths, making the OSNR monitoring as convenient as that of 10G wavelengths. This greatly facilitates routine maintenance and makes it easy to upgrade to higher rate networks.

Figure 1-1 Online OSNR monitoring using the OD system



The online OSNR monitoring provided by the OD system has the following features:

- Simple operations

  The OSNR monitoring function is integrated into the Network Management. It can be performed by directly operating the Network Management. The virtual meter provides graphical display of the monitored OSNR information, without using other auxiliary devices or complex operations.

- High detection precision

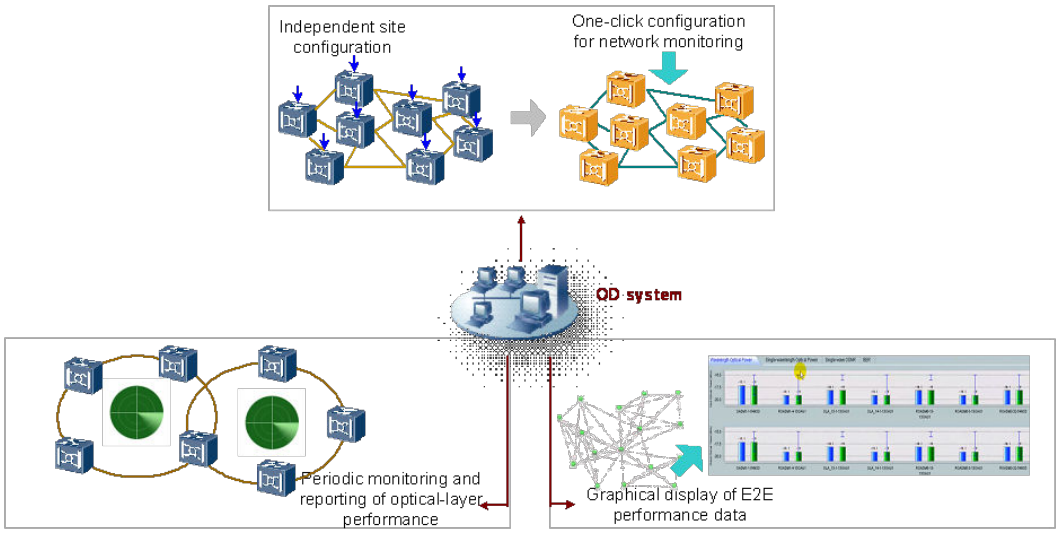
The detection precision is better than that of traditional OSNR detection.

- Wide range of monitored wavelengths

  All site types, all wavelengths, and all spectrum widths can implement online OSNR monitoring.

In addition, the OD system can be used to perform O&M of the optical layer on a WDM network, as described below.

Figure 1-2 O&M of the optical layer on a WDM network



- Centralized configuration for network-wide monitoring

  The OD system supports centralized configuration for optical-layer performance monitoring parameters, greatly saving labor costs.

- Automatic monitoring of optical-layer performance

  The OD system can automatically monitor network-wide optical-layer performance without using any meters. It can automatically detect the channels with abnormal performance.

- End-to-end (E2E) graphical display of optical-layer performance data

  The OD system graphically displays E2E link performance, facilitating status query and fault isolation.

To sum up, the OD system can achieve OSNR monitoring of high-rate WDM networks, quick monitoring deployment, monitoring, and analysis of E2E optical-layer performance. It improves wavelength-level optical-layer O&M capabilities and provides services along the lifecycle of WDM networks, simplifying the network O&M and saving the operating expense (OPEX).

1.2 System Composition

The OD system requires the collaboration between the hardware and software.

The hardware monitors and reports optical-layer performance in real time, performs corresponding adjustments, and is uniformly scheduled by the software. The software provides user-friendly GUIs, supports network-wide configuration,

provides visualized reports, and achieves centralized control and uniform scheduling.

- Hardware

  The hardware required by the OD system includes the following boards installed on the NE:

  – Optical amplifier (OA) boards, spectrum analysis boards, optical wavelength conversion board supporting light sensor (LS OTU boards for short): They are used to obtain optical-layer performance data, monitor all optical signals in a centralized way without interrupting services, and report the monitored optical-layer performance data to the OD system.

  NOTE

  Currently, some OTU boards support LS. When wavelength conversion is performed at the transmit end, the low-frequency pilot-tone LS signals and LS overheads can be loaded, which are used by the receive end to identify and detect optical performance data. Some OA boards can directly report optical performance data (LS OA boards for short) after detecting LS signals. Therefore, optical performance data does not need to be reported by spectrum analysis boards.

Table 1-1 describes the typical deployment rules for each type of boards.

Table 1-1 Typical deployment rules for boards

Typical Deployment	Configuration		MCA Board
-	OTU Board	OA Board	-
Scenario 1: Only non-LS OTU exists.	Non-LS OTU	LS OA	MCA must be deployed on all OA boards (including LS OA boards).
		Non-LS OA	
		LS OA+Non-LS OA	
Scenario 2: Only LS OTU exists.	LS OTU	LS OA	MCA is not mandatory.
	LS OTU	Non-LS OA	MCA is mandatory.
	LS OTU	LS OA+Non-LS OA	MCA must be deployed on all non-LS OA boards.
Scenario 3: Both non-LS OTU and LS OTU exist.	Non-LS OTU+LS OTU	LS OA	MCA must be deployed on all OA boards (including LS OA boards).
		Non-LS OA	
		LS OA+Non-LS OA	

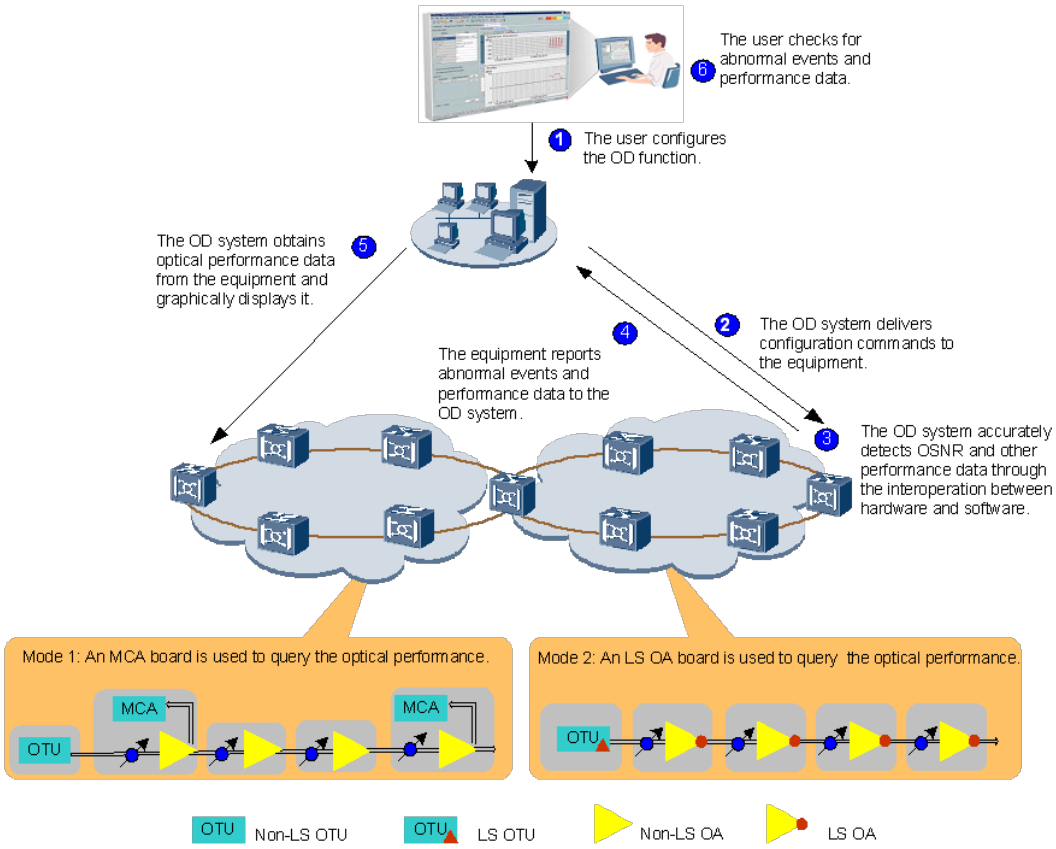
- Electrical variable optical attenuators (EVOAs) and gain-adjustable OA boards: They are used to adjust optical signal performance parameters.
- Optical Supervisory Channel (OSC) boards: They are used for inter-site communication.

- Software

  The OD system is integrated in NCE. Users can deliver network-wide performance monitoring configuration commands using NCE. After obtaining the optical-layer performance data reported by each NE, the OD system analyzes the performance data and graphically displays the analysis result. Based on the configuration policy, the OD system instructs the EVOAs and OA boards to perform adjustments and optimize optical-layer performance.

The following figure shows the collaboration between the hardware and software of the OD system.

Figure 1-3 Collaboration between the hardware and software of the OD system



NOTE

The OD preferentially selects the MCA boards to query the optical performance.

1.3 Principles

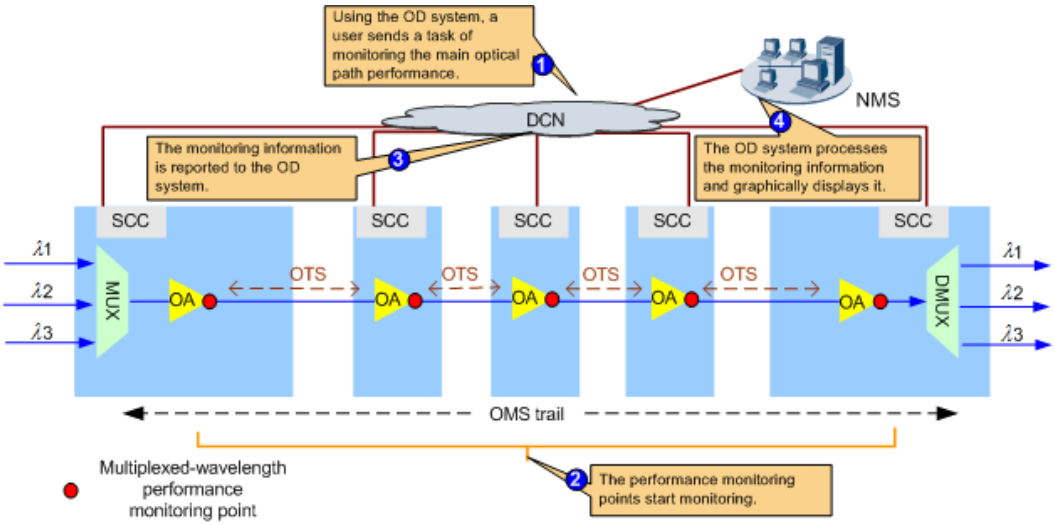
After network-wide monitoring commands are delivered on the NMS in one-click manner, the Optical Doctor (OD) system can monitor and report network optical-layer performance in real time. The OD system can monitor the following performance: main optical path performance, flatness, and input optical power of the receive-end OTU board. This section describes the online performance monitoring principles.

Monitoring Main Optical Path Performance

The OD system monitors the main optical path performance in each optical multiplexing section (OMS). It determines whether the line loss exceeds the design end of life (EOL) value, whether the optical power of the transmit-end OA board or the line loss compensation is out of the permitted range, and whether a fiber cut occurs on the main optical path.

The following describes the process of monitoring main optical path performance online:

Figure 1-4 Process of monitoring main optical path performance online



1. Using the OD system, a user sends a task of monitoring main optical path performance.
2. The performance monitoring points on the functional boards over the main optical path start monitoring the specific performance.
   - Line loss monitoring

     The receive-end OA board detects the line loss and reports an alarm when the line loss exceeds the design EOL value.
   - Monitoring of the optical power of the transmit-end OA board

     The OD system compares the current input optical power of the transmit-end OA board in an OMS with the nominal optical power, and reports an alarm if the difference between the current input optical power and nominal optical power exceeds the threshold.
   - Line loss compensation monitoring

     The receive-end OA board detects the line loss and reports an alarm when the difference between the line loss and the gain value of the OA board exceeds the threshold.

NOTE

The line loss compensation monitoring checks whether the gain of the downstream OA board matches the actual line loss.

Line loss compensation abnormalities include compensation abnormalities in an optical transmission section (OTS) and accumulated compensation abnormalities in an OMS. If the difference between the OTS line loss and OA gain in an OMS exceeds the threshold, alarms are reported on all abnormal OTSs. If no OTS is abnormal in the OMS, OTS line loss is calculated and accumulated from the first OTS and an OMS abnormal alarm is reported on the OTS where the difference between the accumulated OTS loss and OA gain exceeds the threshold.

- Fiber cut on the main optical path

  The OD system checks for the MUT_LOS alarm to determine whether a fiber cut occurs.

3. The monitoring information is reported to the OD system on the NMS.
4. The OD system processes the monitored performance data and displays it on GUIs.

Monitoring Optical Power Flatness

Optical power flatness monitoring is performed based on OMSs.

The following describes the process of monitoring optical power flatness:

Figure 1-5 Process of monitoring optical performance flatness (applicable to OPM8/MCA boards)

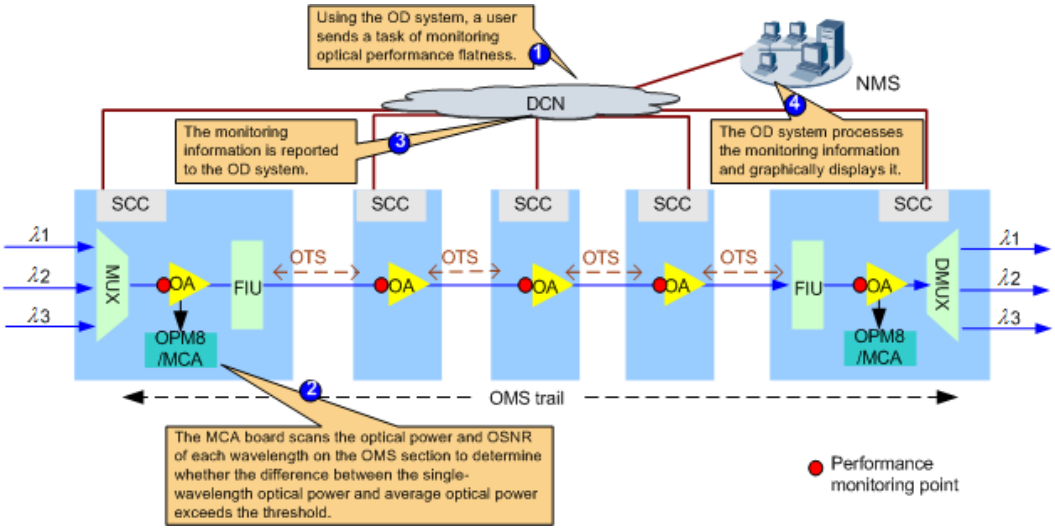
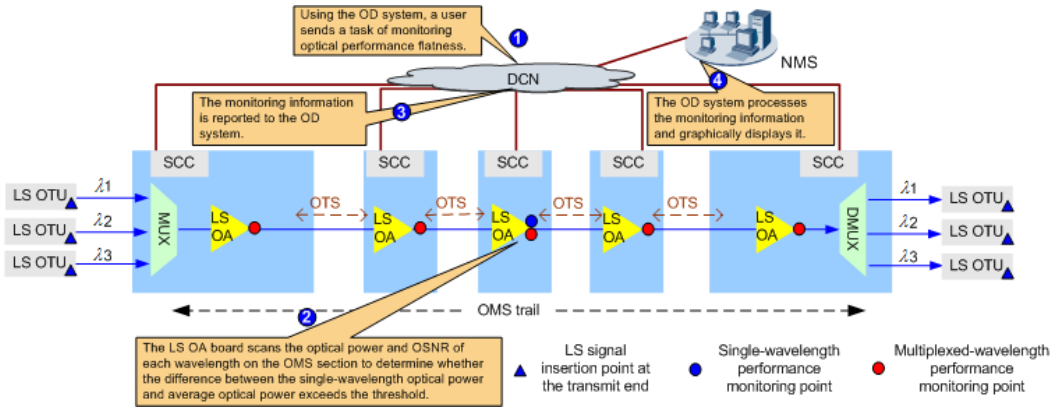


Figure 1-6 Process of monitoring optical performance flatness (applicable to LS OA boards)



NOTE

- If both MCA and LS OA boards are deployed in the same OMS, the OD preferentially selects MCA boards for performance monitoring.
- The OD selects the per-wavelength performance detection point in the following priority order: intermediate detection point > transmit-end detection point > receive-end detection point.

1. Using the OD system, a user sends a task of monitoring optical performance flatness.
2. The functional boards on the main optical path start monitoring the specific performance.

   The MCA/LS OA board is used to scan the optical power of all single wavelengths on the current OMS, calculate the average optical power of all OCh wavelengths in the maintenance state, and determine the difference between the single-wavelength optical power and average optical power. The OD system considers that the optical power is flat when the difference between the single-wavelength optical power and average optical power does not exceed the alarm threshold.
3. The monitoring information is reported to the OD system on the NMS.
4. The OD system processes the monitored performance data and displays it on GUIs.

Monitoring the Input Optical Power of the Receive-End OTU Board

The following describes the process of monitoring the input optical power of the receive-end OTU board:

1. Using the OD system, a user sends a task of monitoring the input optical power of the receive-end OTU board.
2. The OD system determines whether the input optical power is out of the permitted range by checking for the R_LOS, IN_PWR_LOW, or IN_PWR_HIGH alarm on the OTU board.
3. The monitoring information is reported to the OD system on the NMS.

4. The OD system processes the alarm information.

2 Dependencies and Limitations

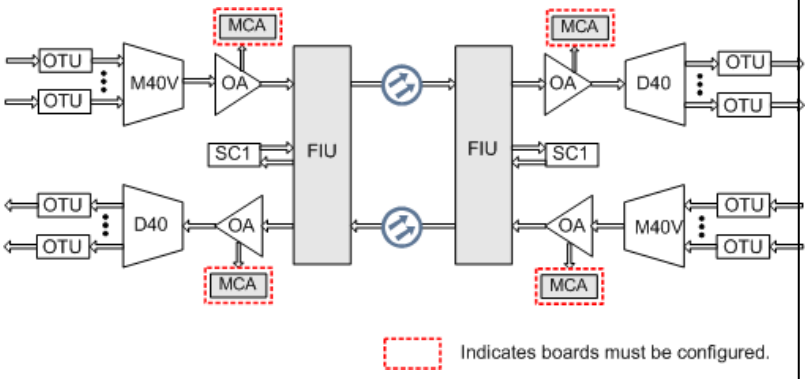
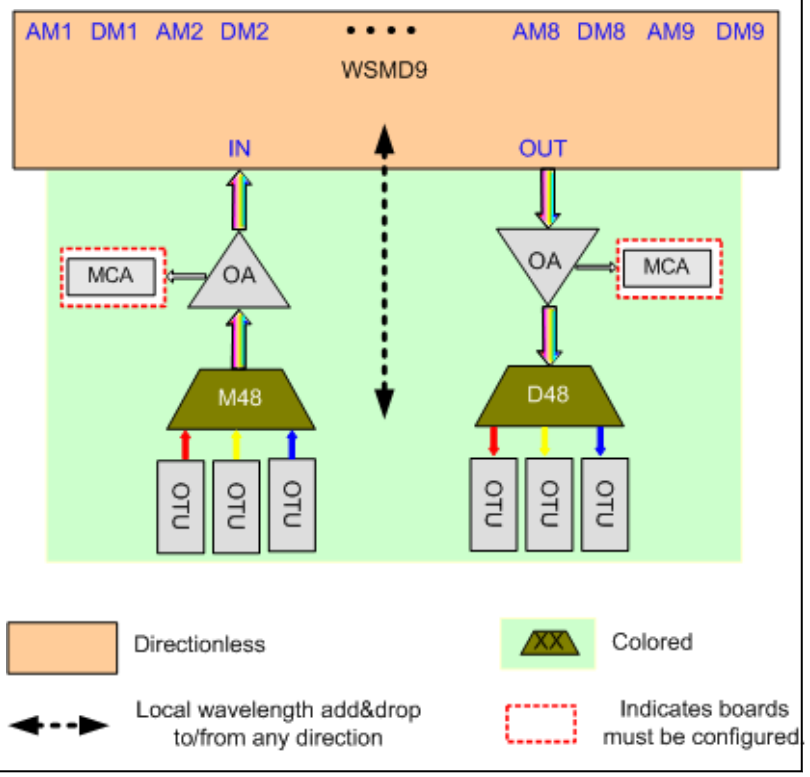
2.1 OSN 9800/8800/6800/3800

This section describes the dependencies and limitations of the OD function in the network planning phase for OSN 9800/8800/6800/3800.

2.1.1 Limitations on the OD Feature

Networking Requirements

Item	Dependencies and Limitations
PID board	The PID board does not support the OD function.
RMU9 board	For the versions earlier than OptiX OSN 8800/6800/3800 V100R010C00 or OptiX OSN 9800 V100R002C10, neither optical power detection nor OSNR detection is supported in the scenario where the local add port of the RMU9 board is directly connected to an OA board.
Optical supervisory channel (OSC) board	OSC boards must be configured on the network.

Item	Dependencies and Limitations
Spectrum analyzer board	• MCA/OPM8 boards must be configured for the OA boards on the wavelength-adding OMS, and the first OA board at the transmit end and the last OA board at the receive end of every inter-site OMS; if the OA board is RAU1/RAU2/SRAU/SRAPXF, the IN port of an MCA/OPM8 must be connected to the MON port of the EDFA module in this board. Otherwise, OSNR detection is not supported. **Figure 2-1** Networking example  • MCA/OPM8 boards must be configured for the OA boards on the wavelength-dropping OMS. Otherwise, OSNR detection is not supported. **Figure 2-2** Networking example 

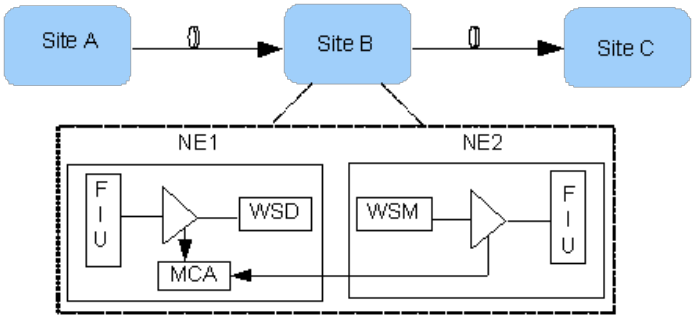
Item	Dependencies and Limitations
	• OptiX OSN 9800 P32 supports OD function only when MON32 board is configured. • Spectrum analyzer boards must be configured for the egress OA board at the transmit end of the OMS, otherwise, transmit-end optical power detection is not supported. • Except spectrum analyzer boards, optical-layer boards in the same dimension must be installed on the same NE.

Interconnection Restrictions

Item	Dependencies and Limitations
MCA board	If an MCA board is used to query and adjust the optical performance, inter-site interconnection or optical-layer and electrical-layer interconnection is supported between the following devices: • OptiX OSN 9800 V100R003C10, OptiX OSN 8800/6800/3800 V100R011C00, OptiX OSN 1800 V/1800 I&II Compact (F3SCC) V100R006C20. • OptiX OSN 9800 V100R005C00, OptiX OSN 8800/6800/3800 V100R011C10, OptiX OSN 1800 V/1800 I&II Compact (F3SCC) V100R007C00. • OptiX OSN 9800 V100R005C10, OptiX OSN 8800/6800/3800 V100R012C00, OptiX OSN 1800 V/1800 I&II Compact (F3SCC) V100R007C10, OptiX OSN 1800 II Enhanced V100R007C10. • OptiX OSN 9800 V100R006C00, OptiX OSN 8800/6800/3800 V100R012C10, OptiX OSN 1800 V/1800 I&II Compact (F3SCC) V100R008C00, OptiX OSN 1800 II Enhanced V100R008C00. • OptiX OSN 9800 V100R006C10, OptiX OSN 8800/6800/3800 V100R013C00, OptiX OSN 1800 V/1800 I&II Compact (F3SCC) V100R008C10, OptiX OSN 1800 II Enhanced V100R008C10. • OptiX OSN 9800 V100R007C00, OptiX OSN 8800/6800/3800 V100R013C10, OptiX OSN 1800 V/1800 I&II Compact (F3SCC) V100R009C00, OptiX OSN 1800 II Enhanced V100R009C00.
LS OA board	If an LS OA board is used to query and adjust the optical performance, inter-site interconnection or optical-layer and electrical-layer interconnection is supported between OptiX OSN 1800 V/1800 I&II Compact (F3SCC) V100R009C00, OptiX OSN 1800 II Enhanced V100R009C00, but not supported between OSN 1800 and OSN 8800/6800/3800/9800.
CWDM	The CWDM system does not support the OD function.

Item	Dependencies and Limitations
Protection	The OLP boards used for intra-board 1+1 protection or client 1+1 protection must be installed on electrical NEs, and the OLP boards used for optical line protection must be installed on optical NEs.

Communication Requirements

Item	Dependencies and Limitations
Inter-NE communication	Ensure normal communication between NEs.
Inter-site communication	OSC boards must be configured to ensure normal communication between sites.
Cross-NE spectrum analyzer board	As shown in the following figure, when two NEs share a spectrum analyzer board, ensure normal communication between NE1 and Site C at the peer end of the OMS to which NE2 belongs. **Figure 2-3** NE example (applicable to OptiX OSN 8800/6800/3800/9800 equipment) 

Precautions

- OD only monitors the OCh trails in the **Maintenance** state.
- Ensure that the physical fiber connections are consistent with the logical fiber connections.
- The **Working Mode** of the RAU1/RAU2/SRAU/SRAPXF must be set to **Gain locking**.
- All the OMSs on a complete OCh trail must be configured with Optical Doctor functions. Otherwise, OSNR detection is not supported.
- You must set the board rate, code type, and system wavelengths.

- If the fiber loss needs to be checked to determine whether the loss value exceeds the designed value, you must set the designed loss(EOL)(dB) value.
- In the scenario that requires high incident optical power, you must set the incident optical power for the egress OA board at the transmit end on NCE.
- To ensure that optimization can be performed in case of abnormal line loss compensation, and that the gain can be accurately adjusted, you must calibrate the ASE value of the RAU1/RAU2/SRAU/SRAPXF board.

2.1.2 Affected Features

None.

2.1.3 Mutually Exclusive Features

Item	Dependencies and Limitations
ALC	If the automatic level control (ALC) function is configured on a network containing WDM equipment, the main optical path monitoring function of the OD cannot be started, and an OMS_LOSS_MON_FAIL alarm will be reported (only on the working trail when protection is configured). The OD-provided power maintenance function is more advanced and delivers better usability than the ALC function. Before enabling the OD function, you must delete the ALC function from a subnet. For details about the method of deleting the ALC function, see **8.4 Deleting an ALC Link**. **NOTE** To use the ALC function on a network where the monitoring or commissioning function of the main optical path on the OD is enabled, you must disable the monitoring or commissioning function first.
APE	During the flatness adjustment on a network containing WDM equipment, the OD will disable the automatic power equilibrium (APE) function. The flatness adjustment results provided by the OD may be inconsistent with the results of flatness adjustment using the APE function. The OD-provided power maintenance function is more advanced and delivers better usability than the APE function. Before enabling the OD function, you are advised to delete the APE function from a subnet. For details about the method of deleting the APE function, see **8.5 Deleting an APE Pair**.

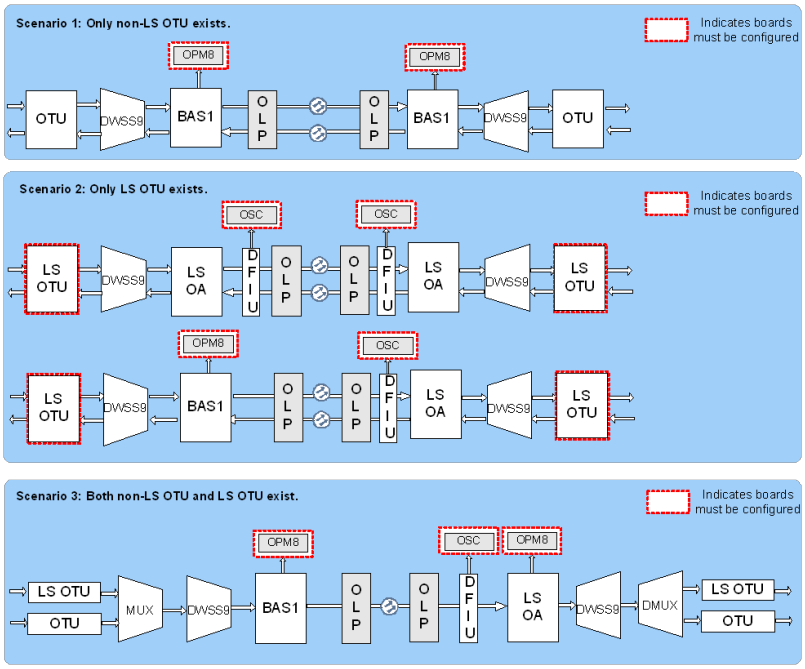
2.2 OSN 1800

This section describes the dependencies and limitations of the OD function in the network planning phase for OSN 1800.

2.2.1 Limitations on the OD Feature

Networking Requirements

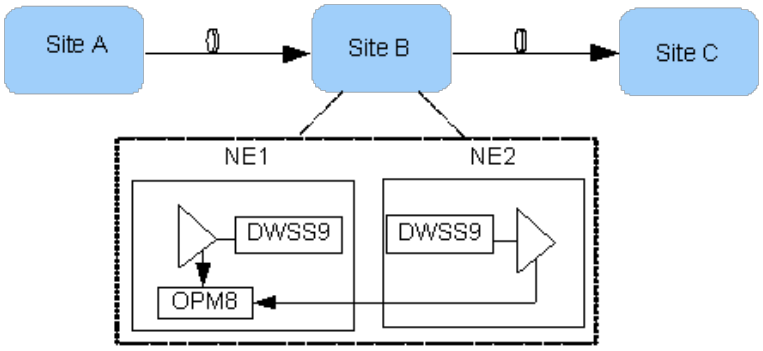
Item	Dependencies and Limitations
DSFIU board	When the DSFIU board is configured with two OSCs in the same direction, the OD function is not supported on the network.
Optical supervisory channel (OSC) board	OSC boards must be configured on the network.

Item	Dependencies and Limitations
Spectrum analyzer board	• If non-LS OTU boards exist on the network, MCA boards must be deployed on all OA boards (including LS OA boards). For details about the deployment principles of MCA boards, see **1.2 System Composition**. • MCA boards or LS OA boards must be configured for the OA boards on the wavelength-adding OMS, and the first OA board at the transmit end and the last OA board at the receive end of every inter-site OMS. Otherwise, OSNR detection is not supported. • MCA boards or LS OA boards are not mandatory for the OA boards on the wavelength-dropping OMS. If no MCA board or LS OA board is configured, however, the OSNR of the wavelength-dropping OA board and receive-end OTU board cannot be viewed. • If an MCA board is used to query the optical performance, spectrum analyzer boards must be configured for the egress OA board at the transmit end of the OMS. Otherwise, transmit-end optical power detection is not supported. • If an LS OA board is used to query the optical performance, the OTU board in the wavelength-adding OMS must be of the LS OTU type. Otherwise, the single-wavelength optical power detection is not supported. • Except spectrum analyzer boards, optical-layer boards in the same dimension must be installed on the same NE. **Figure 2-4** Example of networking with protection 

Interconnection Restrictions

Item	Dependencies and Limitations
MCA board	If an MCA board is used to query and adjust the optical performance, inter-site interconnection or optical-layer and electrical-layer interconnection is supported between the following devices: • OptiX OSN 9800 V100R003C10, OptiX OSN 8800/6800/3800 V100R011C00, OptiX OSN 1800 V/1800 I&II Compact (F3SCC) V100R006C20. • OptiX OSN 9800 V100R005C00, OptiX OSN 8800/6800/3800 V100R011C10, OptiX OSN 1800 V/1800 I&II Compact (F3SCC) V100R007C00. • OptiX OSN 9800 V100R005C10, OptiX OSN 8800/6800/3800 V100R012C00, OptiX OSN 1800 V/1800 I&II Compact (F3SCC) V100R007C10, OptiX OSN 1800 II Enhanced V100R007C10. • OptiX OSN 9800 V100R006C00, OptiX OSN 8800/6800/3800 V100R012C10, OptiX OSN 1800 V/1800 I&II Compact (F3SCC) V100R008C00, OptiX OSN 1800 II Enhanced V100R008C00. • OptiX OSN 9800 V100R006C10, OptiX OSN 8800/6800/3800 V100R013C00, OptiX OSN 1800 V/1800 I&II Compact (F3SCC) V100R008C10, OptiX OSN 1800 II Enhanced V100R008C10. • OptiX OSN 9800 V100R007C00, OptiX OSN 8800/6800/3800 V100R013C10, OptiX OSN 1800 V/1800 I&II Compact (F3SCC) V100R009C00, OptiX OSN 1800 II Enhanced V100R009C00.
LS OA board	If an LS OA board is used to query and adjust the optical performance, inter-site interconnection or optical-layer and electrical-layer interconnection is supported between OptiX OSN 1800 V/1800 I&II Compact (F3SCC) V100R009C00, OptiX OSN 1800 II Enhanced V100R009C00, but not supported between OSN 1800 and OSN 8800/6800/3800/9800.
CWDM	The CWDM system does not support the OD function.
Protection	The OLP boards used for intra-board 1+1 protection or client 1+1 protection must be installed on electrical NEs, and the OLP boards used for optical line protection must be installed on optical NEs.

Communication Requirements

Item	Dependencies and Limitations
Inter-NE communication	Ensure normal communication between NEs.
Inter-site communication	OSC boards must be configured to ensure normal communication between sites.
Cross-NE spectrum analyzer board	As shown in the following figure, when two NEs share a spectrum analyzer board, ensure normal communication between NE1 and Site C at the peer end of the OMS to which NE2 belongs. **Figure 2-5** NE example (applicable to OptiX OSN 1800 equipment) 

Precautions

- OD only monitors the OCh trails in the **Maintenance** state.
- Ensure that the physical fiber connections are consistent with the logical fiber connections.
- All the OMSs on a complete OCh trail must be configured with Optical Doctor functions. Otherwise, OSNR detection is not supported.
- You must set the board rate, code type, and system wavelengths.
- If the fiber loss needs to be checked to determine whether the loss value exceeds the designed value, you must set the designed loss(EOL)(dB) value.

2.2.2 Affected Features

None.

2.2.3 Mutually Exclusive Features

None.

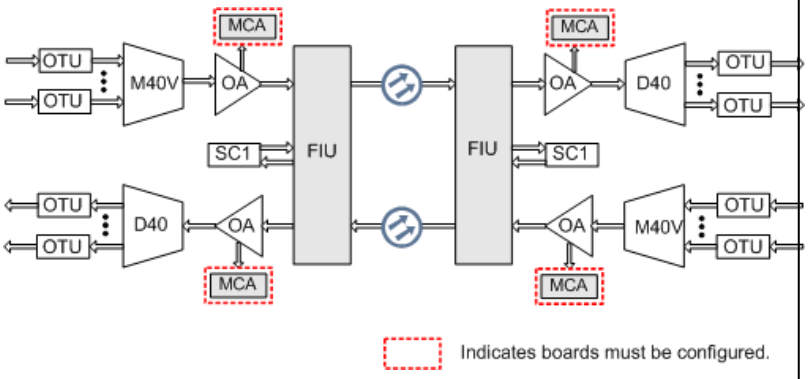
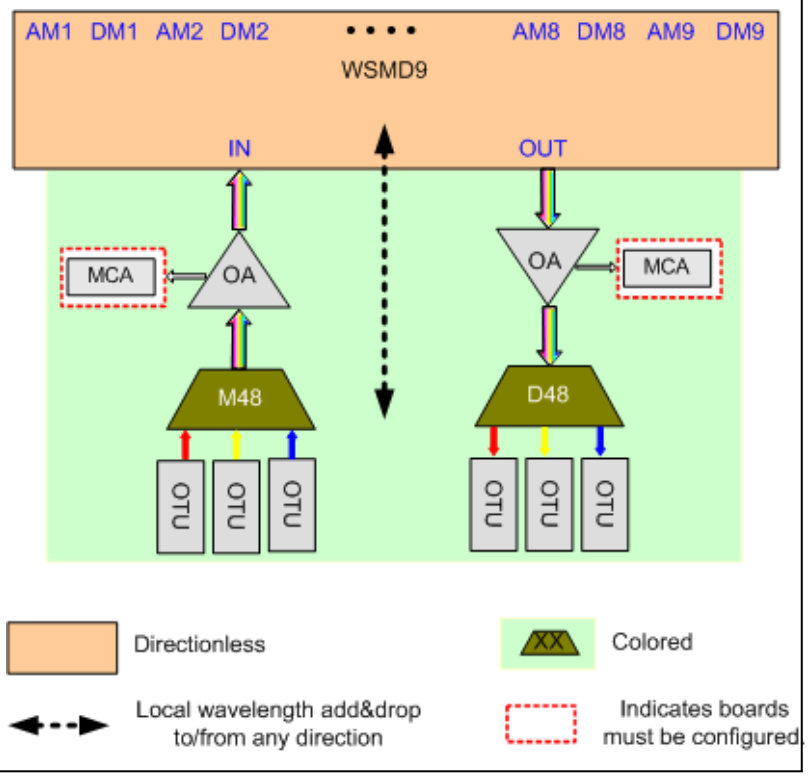
2.3 OptiXtrans E9600

This section describes the dependencies and limitations of the OD function in the network planning phase for OptiXtrans E9600.

2.3.1 Limitations on the OD Feature

Networking Requirements

Item	Dependencies and Limitations
PID board	The PID board does not support the OD function.
Optical supervisory channel (OSC) board	OSC boards must be configured on the network.

Item	Dependencies and Limitations
Spectrum analyzer board	• MCA/OPM8 boards must be configured for the OA boards on the wavelength-adding OMS, and the first OA board at the transmit end and the last OA board at the receive end of every inter-site OMS; if the OA board is SRAPXF, the IN port of an MCA/OPM8 must be connected to the MON port of the EDFA module in this board. Otherwise, OSNR detection is not supported. **Figure 2-6** Networking example  • MCA/OPM8 boards must be configured for the OA boards on the wavelength-dropping OMS. Otherwise, OSNR detection is not supported. **Figure 2-7** Networking example 

Item	Dependencies and Limitations
	• Spectrum analyzer boards must be configured for the egress OA board at the transmit end of the OMS section, otherwise, transmit-end optical power detection is not supported. • Except spectrum analyzer boards, optical-layer boards in the same dimension must be installed on the same NE.

Interconnection Restrictions

Item	Dependencies and Limitations
CWDM	The CWDM system does not support the OD function.
Protection	The OLP boards used for intra-board 1+1 protection or client 1+1 protection must be installed on electrical NEs, and the OLP boards used for optical line protection must be installed on optical NEs.

Communication Requirements

Item	Dependencies and Limitations
Inter-NE communication	Ensure normal communication between NEs.
Inter-site communication	OSC boards must be configured to ensure normal communication between sites.
Cross-NE spectrum analyzer board	As shown in the following figure, when two NEs share a spectrum analyzer board, ensure normal communication between NE1 and Site C at the peer end of the OMS to which NE2 belongs.

Precautions

- OD only monitors the OCh trails in the **Maintenance** state.
- Ensure that the physical fiber connections are consistent with the logical fiber connections.
- The **Working Mode** of the SRAPXF must be set to **Gain locking**.
- All the OMS sections on a complete OCh trail must be configured with Optical Doctor functions. Otherwise, OSNR detection is not supported.
- You must set the board rate, code type, and system wavelengths.
- If the fiber loss needs to be checked to determine whether the loss value exceeds the designed value, you must set the designed loss(EOL)(dB) value.

- In the scenario that requires high incident optical power, you must set the incident optical power for the egress OA board at the transmit end on NCE.
- To ensure that optimization can be performed in case of abnormal line loss compensation, and that the gain can be accurately adjusted, you must calibrate the ASE value of the SRAPXF board.

2.3.2 Affected Features

None.

2.3.3 Mutually Exclusive Features

Item	Dependencies and Limitations
ALC	If the automatic level control (ALC) function is configured on a network containing OptiXtrans E9600 equipment, the main optical path monitoring function of the OD cannot be started, and an OMS-LOSS-MON-FAIL alarm will be reported (only on the working trail when protection is configured). The OD-provided power maintenance function is more advanced and delivers better usability than the ALC function. Before enabling the OD function, you must delete the ALC function from a subnet. For details about the method of deleting the ALC function, see **8.4 Deleting an ALC Link**. **NOTE** To use the ALC function on a network where the monitoring or commissioning function of the main optical path on the OD is enabled, you must disable the monitoring or commissioning function first.
APE	During the flatness adjustment on a network containing OptiXtrans E9600 WDM equipment, the OD will disable the automatic power equilibrium (APE) function. The flatness adjustment results provided by the OD may be inconsistent with the results of flatness adjustment using the APE function. The OD-provided power maintenance function is more advanced and delivers better usability than the APE function. Before enabling the OD function, you are advised to delete the APE function from a subnet. For details about the method of deleting the APE function, see **8.5 Deleting an APE Pair**.

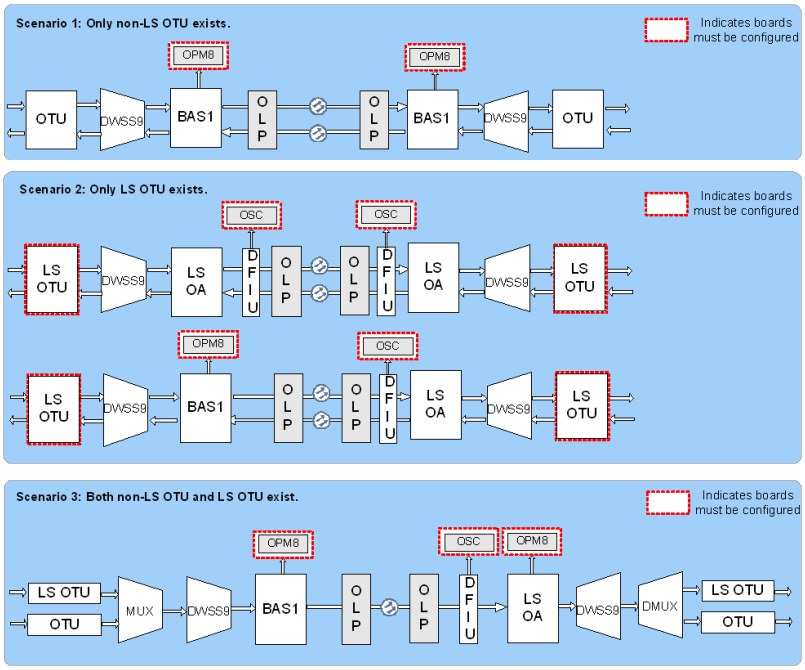
2.4 OptiXtrans E6600

This section describes the dependencies and limitations of the OD function in the network planning phase for OptiXtrans E6600.

2.4.1 Limitations on the OD Feature

Networking Requirements

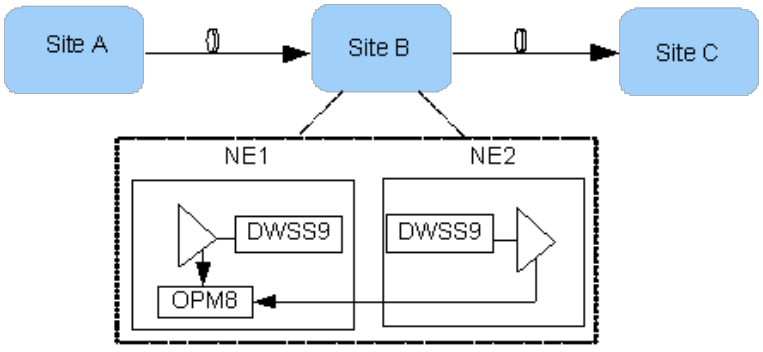
Item	Dependencies and Limitations
Optical supervisory channel (OSC) board	OSC boards must be configured on the network.

Item	Dependencies and Limitations
Spectrum analyzer board	• If non-LS OTU boards exist on the network, MCA boards must be deployed on all OA boards (including LS OA boards). For details about the deployment principles of MCA boards, see **1.2 System Composition**. • MCA boards or LS OA boards must be configured for the OA boards on the wavelength-adding OMS, and the first OA board at the transmit end and the last OA board at the receive end of every inter-site OMS. Otherwise, OSNR detection is not supported. • MCA boards or LS OA boards are not mandatory for the OA boards on the wavelength-dropping OMS. If no MCA board or LS OA board is configured, however, the OSNR of the wavelength-dropping OA board and receive-end OTU board cannot be viewed. • If an MCA board is used to query the optical performance, spectrum analyzer boards must be configured for the egress OA board at the transmit end of the OMS section. Otherwise, transmit-end optical power detection is not supported. • If an LS OA board is used to query the optical performance, the OTU board in the wavelength-adding OMS must be of the LS OTU type. Otherwise, the single-wavelength optical power detection is not supported. • Except spectrum analyzer boards, optical-layer boards in the same dimension must be installed on the same NE. **Figure 2-8** Example of networking with protection 

Interconnection Restrictions

Item	Dependencies and Limitations
CWDM	The CWDM system does not support the OD function.
Protection	The OLP boards used for intra-board 1+1 protection or client 1+1 protection must be installed on electrical NEs, and the OLP boards used for optical line protection must be installed on optical NEs.

Communication Requirements

Item	Dependencies and Limitations
Inter-NE communication	Ensure normal communication between NEs.
Inter-site communication	OSC boards must be configured to ensure normal communication between sites.
Cross-NE spectrum analyzer board	As shown in the following figure, when two NEs share a spectrum analyzer board, ensure normal communication between NE1 and Site C at the peer end of the OMS to which NE2 belongs. **Figure 2-9** NE example (applicable to OptiX OSN 1800 WDM equipment) 

Precautions

- OD only monitors the OCh trails in the **Maintenance** state.
- Ensure that the physical fiber connections are consistent with the logical fiber connections.

- All the OMS sections on a complete OCh trail must be configured with Optical Doctor functions. Otherwise, OSNR detection is not supported.
- You must set the board rate, code type, and system wavelengths.
- If the fiber loss needs to be checked to determine whether the loss value exceeds the designed value, you must set the designed loss(EOL)(dB) value.

2.4.2 Affected Features

None.

2.4.3 Mutually Exclusive Features

None.

2.5 OptiXtrans DC908

This section describes the dependencies and limitations of the OD function in the network planning phase for OptiXtrans DC908.

2.5.1 Limitations on the OD Feature

Interconnection Restrictions

Item	Dependencies and Limitations
CWDM	The CWDM system does not support the OD function.
Protection	The OLP boards used for intra-board 1+1 protection or client 1+1 protection must be installed on electrical NEs, and the OLP boards used for optical line protection must be installed on optical NEs.

Communication Requirements

Item	Dependencies and Limitations
Inter-NE communication	Ensure normal communication between NEs.
Inter-site communication	OSC boards must be configured to ensure normal communication between sites.
Cross-NE spectrum analyzer board	As shown in the following figure, when two NEs share a spectrum analyzer board, ensure normal communication between NE1 and Site C at the peer end of the OMS to which NE2 belongs.

Precautions

- OD only monitors the OCh trails in the **Maintenance** state.
- Ensure that the physical fiber connections are consistent with the logical fiber connections.
- The **Working Mode** must be set to **Gain locking**.
- All the OMSs on a complete OCh trail must be configured with Optical Doctor functions. Otherwise, OSNR detection is not supported.
- You must set the board rate, code type, and system wavelengths.
- If the fiber loss needs to be checked to determine whether the loss value exceeds the designed value, you must set the designed loss(EOL)(dB) value.
- In the scenario that requires high incident optical power, you must set the incident optical power for the egress OA board at the transmit end on NCE.
- To ensure that optimization can be performed in case of abnormal line loss compensation, and that the gain can be accurately adjusted, you must calibrate the ASE value of the board.

2.5.2 Affected Features

None.

2.5.3 Mutually Exclusive Features

Item	Dependencies and Limitations
ALC	If the automatic level control (ALC) function is configured on a network containing OptiXtrans DC908 equipment, the main optical path monitoring function of the OD cannot be started, and an OMS_LOSS_MON_FAIL or OMS-LOSS-MON-FAIL alarm will be reported (only on the working trail when protection is configured). The OD-provided power maintenance function is more advanced and delivers better usability than the ALC function. Before enabling the OD function, you must delete the ALC function from a subnet. For details about the method of deleting the ALC function, see **8.4 Deleting an ALC Link**. **NOTE** To use the ALC function on a network where the monitoring or commissioning function of the main optical path on the OD is enabled, you must disable the monitoring or commissioning function first.
APE	During the flatness adjustment on a network containing OptiXtrans DC908 equipment, the OD will disable the automatic power equilibrium (APE) function. The flatness adjustment results provided by the OD may be inconsistent with the results of flatness adjustment using the APE function. The OD-provided power maintenance function is more advanced and delivers better usability than the APE function. Before enabling the OD function, you are advised to delete the APE function from a subnet. For details about the method of deleting the APE function, see **8.5 Deleting an APE Pair**.

3 Availability

The equipment and NCE of specific versions and licenses are required to enable the Optical Doctor (OD) function.

3.1 Required License

This section describes the licenses required by the OD system.

Table 3-1 lists the OD license requirements.

NOTE

The software used during the manual writing is loaded with full NetStar O&M licenses. The functions in some screenshots can only be displayed when the corresponding licenses are enabled. For example, you can see the function item of optical power optimization in the introduction to SOM functions, but the display on your software is different. This is because the software lacks the corresponding license.

Table 3-1 OD license requirements

ID	License Name	Description
LNSDOPX8807	OptiX OTN Platform,Port OSNR Monitor Function Fee	The license for the OSNR of a port is required only when the TN11MCA402 or TN11MCA802 spectrum analysis board is used. A License is required for each MCA port.
LSDSOM01[a]	Optical Doctor Management System Software Fee Per Port(10G)	The 10G network monitoring network exceptions function, automatically optimizing the main optical path function, and viewing the OSNR function can be used only after the license is obtained.

ID	License Name	Description
LSDSOM02[a]	Optical Doctor Management System Software Fee Per Port(40G)	The 40G network monitoring network exceptions function, automatically optimizing the main optical path function, and viewing the OSNR function can be used only after the license is obtained.
LSDSOM03[a]	Optical Doctor Management System Software Fee Per Port(100G)	The 100G network monitoring network exceptions function, automatically optimizing the main optical path function, and viewing the OSNR function can be used only after the license is obtained.
LNSDODSFP04[a]	Optical Doctor Management System Software Fee Per Port(200G)	The 200G network monitoring network exceptions function, automatically optimizing the main optical path function, and viewing the OSNR function can be used only after the license is obtained.
LNSDODSFP05[a]	Optical Doctor Management System Software Fee Per Port(400G)	The 400G network monitoring network exceptions function, automatically optimizing the main optical path function, and viewing the OSNR function can be used only after the license is obtained.
LNSDRTUC12[a]	Optical Doctor Management System Software Fee Per Port(600G)	The 600G network monitoring network exceptions function, automatically optimizing the main optical path function, and viewing the OSNR function can be used only after the license is obtained.
LNSDRTUC13[a]	Optical Doctor Management System Software Fee Per Port(800G)	The 800G network monitoring network exceptions function, automatically optimizing the main optical path function, and viewing the OSNR function can be used only after the license is obtained.
a: An OD management license is required for each line-side port on an OTU board or each port on a 10G, 40G, 100G, 200G, 400G, 600G or 800G line board. This requirement applies to 40-wavelength, 80-wavelength, 96-wavelength, 120-wavelength, and FlexGrid systems.		

3.2 Supported Hardware and Versions

This section describes the boards supported by the OD system and the mapping between devices, tools, and the NMS.

NOTE

The OD function is integrated in the OptiX NetStar O&M component package that matches the NMS. To obtain the component package, contact the local Huawei engineers. The OptiX NetStar O&M component package is available in the following navigation path:

- Carrier network: **Support** > **Software** > **Optical Business** > **Optical Transmission Network** > **WDM** > **WDM tools** > **Netstar O&M** at **http://support.huawei.com**.
- Enterprise network: **Support** > **Software Download** > **Enterprise Optical Transmission & Access** > **Optical Transmission** > **Netstar O&M** at **http://support.huawei.com/enterprise**.

Version Mapping Between Boards, Products, and WDM Tools (Carrier Services)

Table 3-2 shows the OA boards and spectrum analyzer boards that support the OD function for carrier services.

Table 3-2 OA boards and spectrum analyzer boards that support the OD function

Board Type	WDM Equipment	
-	OSN 9800/8800/6800/3800	OptiX OSN 1800
OA board	TN11OAU1, TN12OAU1, TN13OAU1, TN11OBU1, TN12OBU1, TN13OBU1, TN11OBU2, TN12OBU2, TN15OAU1, TN15OBU1, TN11DAS1, TN11RAU1, TN11RAU2, TN12RAU1, TN12RAU2, HBA, TN11SRAU, TN52DAP, TN52DAPXF, TN53DAPXF, TN52SRAPXF, TNG2DAP, TNG2DAPXF, TNG3DAPXF, TNG2WDAPXF, TNG2SRAPXF, TNG3SRAPXF, TNG2WDAPXFR, TNG2WRPC, TNG2WDAP, TNG3OH20H, TNG3OH20, TNG2OH20H, TNG2OH20 **NOTE** • The TN12OBU1P1 or TN13OBU1P3 board does not support the OD function. • HBA boards do not support the OD function when they are intended for OptiX OSN 8800/6800 in a version earlier than V100R007C02SPC300. The TN51HBA board supports the OD function only in the C band instead of the extended C band. • The TN11SRAU board does not support the OD function when it is intended for OptiX OSN 3800.	TNF1OPU, TNF1OBU, TNF2OBU, TNF1BAS1, TNF1DAP, TMB1DAP, TMB1MD40AFS, TMB1OBU, TMB1MR4AFS, TMB2MR4AFS, TMB1MD48AFS **NOTE** Only the TNF1DAP, TMB2MR4AFS and TMB2MR4AFS boards support detection of single-wavelength optical power and OSNR of LS signals.

Board Type	WDM Equipment	
Optical tributary board	TMP1OT3232, TMP1OT0848C, TMP2OT2020, TMP2OT3232, TMP2OT3232E, TMP3OT3232E, TMP3OT2020, TMP2OT0824C **NOTE** Optical tributary boards support OD function only when MON32 board is configured.	-
Optical line board	TMP1ON32, TMP1ON32P, TMP1DWSS32, TMP2DWSS32, TMP2ON32, TMP2ON32P, TMP2ON20P, TMP2DWSS20, TMP2ON20 **NOTE** Optical line boards support OD function only when MON32 board is configured.	-
Spectrum analyzer board	TN11MCA401, TN11MCA402, TN11MCA801, TN11MCA802, TN11OMCA, TN11OPM8, TN15OPM8, TN97OPM8, TN55OPM8, TNG2OPM8, TNG3OPM8 **NOTE** • A TN11MCA402 or TN11MCA802 board may not support the OD function because its module firmware version is too old. In this case, contact Huawei engineers for problem handling.	TNF1OPM8, TMB1OPM8 **NOTE** • If the LS OTU board TNF1LDCA is deployed at the transmit end and the TNF1DAP board is used to query and adjust the optical performance, no OPM8 board needs to be configured. • The TNF1OPM8 board does not support the detection of 200G ePDM-e16QAM (SDFEC2) signals of LDCA boards.

NOTE

- The OD function is not supported if TN22SCC boards are used in OptiX OSN 3800.
- Upgrading the OD function involves network evaluation and reconstruction. Therefore, if the OD function needs to be upgraded on the live network, contact Huawei technical support engineers.

Version Mapping Between Boards, Products, and WDM Tools (Enterprise Services)

Table 3-3 shows the OA boards and spectrum analyzer boards that support the OD function for enterprise services.

Table 3-3 OA boards and spectrum analyzer boards that support the OD function

Board Type	WDM Equipment		
-	OptiXtrans E9600	OptiXtrans E6600	OptiXtrans DC908
OA board	TNG2DAP, TNG2DAPXF, TNG3DAPXF, TNG3SRAPXF, TNG2WDAPXFR, TNG2WRPC, TNG2WDAP, TNG3OH20H, TNG3OH20, TNG2OH20H, TNG2OH20	TNF1OBU, TNF2OBU, TNF1DAP, TMB1DAP, TMB1MD40AFS, TMB1OBU, TMB1MR4AFS, TMB2MR4AFS, TMB1MD48AFS **NOTE** Only the TNF1DAP, TMB2MR4AFS and TMB2MR4AFS boards support detection of single-wavelength optical power and OSNR of LS signals.	TMN1EMR801, TMN1OLS01/ TMN1OLL01/ TMN1OLS02/ TMN1OLL02, TMN1OLAS01/ TMN1OLAL01, TMN1WOLS01/ TMN1WOLL01, TMN1WOLAS01/ TMN1WOLAL01, TMN1OA
Spectrum analyzer board	TNG2OPM8, TNG3OPM8	TNF1OPM8, TMB1OPM8 **NOTE** • If the LS OTU board TNF1LDCA is deployed at the transmit end and the TNF1DAP board is used to query and adjust the optical performance, no OPM8 board needs to be configured. • The TNF1OPM8 board does not support the detection of 200G ePDM-e16QAM (SDFEC2) signals of LDCA boards.	-

NOTE

- Upgrading the OD function involves network evaluation and reconstruction. Therefore, if the OD function needs to be upgraded on the live network, contact Huawei technical support engineers.

Version Mapping Between WDM Tools and NMSs

The WDM maintenance and running components have a strong mapping relationship with the NMS version.

The following table lists the mapping between **mainstream** tool versions and NMS versions for services.

Table 3-4 Version mapping between the tool and NCE NMS

Tool Versio	NCE NMS Version[a]
OptiX_NetStar_O&M 7.0.510	**V100R018C10SPC201CP2117**/ V100R018C10SPC201CP2116/ V100R018C10SPC201CP2115
OptiX NetStar O&M 19.0.510	**V100R019C00SPC500CP5101**
OptiX_NetStar_O&M 19.1.310	**V100R019C00SPC600**
OptiX_NetStar_O&M 19.1.510	**V100R019C00CP6111** **V100R019C00CP6112**
OptiX_NetStar_O&M 19.1.610	**V100R019C00SPC602**
OptiX_NetStar_O&M 20.1.310	**V100R020C10SPC200**
OptiX_NetStar_O&M 21.0.210	**V100R021C00SPC101**
OptiX_NetStar_O&M 21.0.310	**V100R021C00SPC200**
OptiX_NetStar_O&M 21.1.310	**V100R021C10SPC100**
OptiX_NetStar_O&M 21.1.510	**V100R021C10SPC200**
OptiX_NetStar_O&M 21.1.610	**V100R021C10SPC202**
OptiX_NetStar_O&M 21.1.710	**V100R021C10SPC203**
OptiX_NetStar_O&M 21.1.810	**V100R021C10SPC205**
a: The NMS versions in bold are recommended.	

NOTE

Huawei OptiXtrans series products adapt to OptiX_NetStar_O&M since **OptiX_NetStar_O&M 19.1.610**.

Table 3-5 Version mapping between the tool and U2000

Tool Version	iManager U2000 Version[a]
OptiX_NetStar_O&M 6.0.210	• **V200R016C60CP2025**/V200R016C60CP2026/V200R016C60CP2027/V200R016C60CP2028/V200R016C60CP2225/V200R016C60CP2322/V200R016C60CP2323/V200R016C60CP2325 • **V200R017C50CP2003**/V200R017C50CP2005 • **V200R017C60SPC201**/V200R017C60CP2012/V200R017C60CP2013 • **V200R018C50SPC200**/V200R018C50CP2002/V200R018C50CP2301
OptiX_NetStar_O&M 7.0.310	• **V200R017C60CP2015**/V200R017C60CP2312 • **V200R018C50CP2003**/V200R018C50CP2102 • **V200R018C60SPC200**
OptiX_NetStar_O&M 19.0.310	V200R018C60SPC500CP5001/V200R018C60SPC200CP2001
OptiX_NetStar_O&M 19.1.110	V200R018C60SPC501CP5011
a: The NMS versions in bold are recommended.	

4 Feature Updates

4.1 Feature Updates of the OD

This section describes the update history of the OD.

Update of NetStar O&M 21.1.610 Compared with 21.1.510

Feature Update	Reason for the Update	Information Update
Null	Null	**5.2.1.2 Synchronizing Data on NCE** Added the description of the scroll bar.

Update of NetStar O&M 21.1.510 Compared with 21.1.310

Feature Update	Reason for the Update	Information Update
Optimized the subnet backup, subnet monitoring configuration, subnet backup export, and automatic backup pages.	To optimize the GUI	**5 Using the OD System for Network O&M (NCE)**: The GUI is changed.

Update of NetStar O&M 21.1.310 Compared with 21.1.210

Feature Update	Reason for the Update	Information Update
EALC automatic adjustment is supported in the OMSP scenario.	To enhance the function	**5.2.5 Configuring Automatic Main Optical Path Adjustment and Automatic Equalization by Trail**: The description of enabling automatic adjustment of the main optical path in the OMSP scenario is added.
Optimizing the WDM trail performance analysis page	To optimize the GUI	**5.3 Using the OD System for Network O&M**: The GUI is changed.

Update of NetStar O&M 21.1.210 Compared with 21.0.310

Feature Update	Reason for the Update	Information Update
Adding **The OMS trail visualization function**	Added function	For details, see **5.3.2.2 Analyzing the Performance Data of E2E Trails**
Adding **Exporting Backup Data Reports**	Added function	For details, see **5.3.4.3 Exporting Backup Data Reports**.
Adding **Exporting Single-Wavelength Performance Reports**	Added function	For details, see **5.3.4.4 Exporting Single-Wavelength Performance Reports**.

Update of NetStar O&M 21.0.310 Compared with 21.0.210

Feature Update	Reason for the Update	Information Update
Updating OMS Configuration Items	Added function	For details, see **5.2.4.2.3 Enabling OD Monitoring by Trail**.
Optical Line Protection Visualization	Added function	For details, see **5.4 Optical Line Protection Visualization**.

Update of NetStar O&M 21.0.210 Compared with 20.1.310

Feature Update	Reason for the Update	Information Update
New boards supporting V100R021C00	Added function	Boards that support V100R021C00 are added to the version mapping table.
Updating OMS Configuration Items	Added function	For details, see **5.2.4.2.3 Enabling OD Monitoring by Trail**.
Updating Planning Parameters Settings	Added function	For details, see **5.2.1.4 Setting Planning Parameters**.

Update of NetStar O&M 20.1.310 Compared with 19.1.610

Feature Update	Reason for the Update	Information Update
New boards supporting V100R020C10	Added function	Boards that support V100R020C10 are added to the version mapping table.

Update of NetStar O&M 19.1.610 Compared with 19.1.510

Feature Update	Reason for the Update	Information Update
New boards supporting V100R019C10	Added function	Boards that support V100R019C10 are added to the version mapping table.

Update of NetStar O&M 19.1.510 Compared with 19.1.310

Feature Update	Reason for the Update	Information Update
The TMP1OT3232/ TMP1OT0848C/ TMP1ON32, TMP1ON32P/ TMP1DWSS32 board is added and it supports the OD.	The board is new to the product and should support the basic board functions.	**Availability**: Added TMP1OT3232/ TMP1OT0848C/TMP1ON32, TMP1ON32P/TMP1DWSS32 in the descriptions of Supported Hardware and Versions.

Update of NetStar O&M 19.1.310 Compared with 19.0.510

Feature Update	Reason for the Update	Information Update
The TNG3SRAPXF board is added and it supports the OD.	The board is new to the product and should support the basic board functions.	**Availability**, **Dependencies and Limitations** and **Calibrating ASE**: Added TNG3SRAPXF in the descriptions of SRAU.
The TNG2OPM8/ TNG3OPM8 board is added and it supports the OD.	The board is new to the product and should support the basic board functions.	**Availability**, **Dependencies and Limitations**, **Analyzing the Performance Data of E2E Trails**, and **Analyzing the Single-Wavelength Optical Power and OSNR of OA Boards**: Added TNG2OPM8/ TNG3OPM8 in the descriptions of MCA.

Update of NetStar O&M 19.0.510 Compared with 7.0.510

Feature Update	Reason for the Update	Information Update
The usability is optimized.	UIs are optimized.	None

7.0.510

Feature Update	Reason for the Update	Information Update
The OD system supports iMaster NCE.	iMaster NCE is supported by the OD system.	The description of NCE is added.

4.2 Feature Updates of OSN 9800

The Optical Doctor (OD) function is available since the OptiX OSN 9800 V100R001C00 version. This topic describes the feature updates in the OptiX OSN 9800 product versions, the reasons for the updates, and the corresponding information updates. Any product versions that are not listed in the document means that they have no feature updates.

Update of V100R021C10 Compared with V100R021C00

Feature Update	Reason for the Update	Information Update
The OD function of the board is added. • TNG2OH20H/ TNG2OH20	The board is new to the product and should support the basic board functions.	Added descriptions of the feature.

Update of V100R021C00 Compared with V100R020C10

Feature Update	Reason for the Update	Information Update
The OD function of the board is added. • TMP2OT2020/ TMP2OT0824C/ TMP2ON20P/ TMP2DWSS20/ TMP2ON20	The board is new to the product and should support the basic board functions.	Added descriptions of the feature.

Update of V100R020C10 Compared with V100R019C10

Feature Update	Reason for the Update	Information Update
The OD function of the board is added. • TNG2WRPC/ TNG2WDAP/ TNG2WDAPXFR/ TNG3OH20H • TMP2DWSS32/ TMP2ON32/ TMP2ON32P/ TMP2OT0824C/ TMP2ON20P/ TMP2DWSS20/ TMP2ON20	The board is new to the product and should support the basic board functions.	Added descriptions of the feature.

Update of V100R019C10 Compared with V100R006C00SPC600

Feature Update	Reason for the Update	Information Update
The TNG2DAP/ TNG2DAPXF/ TNG3DAPXF/ TNG2WDAPXF/ TNG2SRAPXF/ TNG3SRAPXF board is added and it supports the OD function.	The board is new to the product and should support the basic board functions.	Added descriptions of the feature.

Update of V100R006C00SPC600 Compared with V100R006C00SPC500

Feature Update	Reason for the Update	Information Update
The TN52SRAPXF board is added and it supports the OD.	The board is new to the product and should support the basic board functions.	**Availability**, **Dependencies and Limitations** and **Calibrating ASE**: Added TN52SRAPXF or SRAPXF in the descriptions of SRAU.

Update of V100R006C00SPC500 Compared with V100R005C10

Feature Update	Reason for the Update	Information Update
The BER threshold values required by the link optimization commissioning are updated.	The product limitation is updated.	**Dependencies and Limitations**: The link optimization commissioning restrictions are updated.

Update of V100R005C10 Compared with V100R005C00

Feature Update	Reason for the Update	Information Update
The description of the rollback operation upon an abnormality is added for Link Optimization Commissioning (in Manual Optimization Mode).	The main optical path cannot be rolled back. You are advised to compare report data after rollback with report data before commissioning, and modify parameters if required in the NE Explorer.	**Reference Operations**: The requirements before and after the rollback operation are added in Troubleshooting.

Update of V100R003C10SPC200 Compared with V100R003C10SPC100

Feature Update	Reason for the Update	Information Update
The OD supports Inter-site interconnection or optical-layer and electrical-layer interconnection scenario between OptiX OSN 9800 and OptiX OSN 1800 V/1800 I&II Compact (F3SCC).	The product functions are enhanced.	**Dependencies and Limitations**: Interconnection restrictions are added.

Update of V100R003C10SPC100 Compared with V100R003C00

Feature Update	Reason for the Update	Information Update
The function of querying the automatic optimization records of main optical paths is added.	The system can display the main optical path optimization and commissioning records of OMSs. Users can export commissioning comparison reports that contain span performance comparison data before and after adjustment and adjustment volume comparison data of adjusted objects.	• In **Querying Alarms by Fault List**, the function description of the new shortcut menu **View Optimization Record** for some alarm records on the **Alarm Info** tab is added. • **Querying Automatic Optimization Records of Main Optical Paths** is added to reference operations.
The OD newly supports OSNR detection in the FlexGrid system.	The product functions are enhanced.	• **Availability**, **Configuring OD Route for a Trail** and **Configuring OSNR Detection for a Trail**: The FlexGrid system description is added. • **8.2 Setting Incident Optical Power on NCE**: The incident optical power offset description of the FlexGrid system is added.

Update of V100R003C00 Compared with V100R002C10

Feature Update	Reason for the Update	Information Update
The TN51HBA board is added but it not supports the OD function in the extended C band.	The Limitation is new to the product.	**Availability**: The limitation is added in the Supported Hardware and Version.

Feature Update	Reason for the Update	Information Update
The OD supports 400G OSNR detection.	OD function is enhanced.	**Availability**, **Dependencies and Limitations**, **Configuring OD Route for a Trail** and **Configuring OSNR Detection for a Trail**: Added the description of 400G OSNR detection.

Update of V100R002C10 Compared withV100R001C30SPC200

Feature Update	Reason for the Update	Information Update
The TN15OPM8 board is added and it supports the OD.	The board is new to the product and should support 200G OSNR detection.	• **Availability**, **Dependencies and Limitations**, **Analyzing the Performance Data of E2E Trails**, and **Analyzing the Single-Wavelength Optical Power and OSNR of OA Boards**: Added TN15OPM8 or OPM8 in the descriptions of MCA. • **Availability**, **Dependencies and Limitations**, and **Configuring OD Route for a Trail**: Added the description of 200G OSNR detection.
The TN11SRAU board is added and it supports the OD.	The board is new to the product and should support the basic board functions.	**Availability**, **Dependencies and Limitations** and **Calibrating ASE**: Added TN11SRAU or SRAU in the descriptions of RAU.
The TN16FIU board is added and it supports the OD.	The boards is new to the product and should support the basic board functions.	**Calibrating ASE**: Added TN16FIU in the descriptions of TN14FIU.

Update of V100R001C30SPC100 Compared with V100R001C30

Feature Update	Reason for the Update	Information Update
The TN13OBU1 board is added and it supports the OD.	The board is new to the product and should support the basic board functions.	**Availability**: The board is added in the Supported Hardware and Version.

Update of V100R001C30 Compared with V100R001C20SPC300

Feature Update	Reason for the Update	Information Update
The TN12RAU1 and TN12RAU2 boards are added and they support the OD.	The boards are new to the product and should support the basic board functions.	**Availability**: The boards are added in the Supported Hardware and Version.

Update of V100R001C20 Compared with V100R001C01SPC10

Feature Update	Reason for the Update	Information Update
Added the function of setting optical fiber parameters in a centralized way.	On the U2000, you can set the Medium Type, **Length**, and Designed Loss(EOL) for multiple optical fibers at a time.	Descriptions of **Setting Fiber Parameters** are added.

Update of V100R001C01SPC100 Compared with V100R001C01

Feature Update	Reason for the Update
Added the function of querying network performance using the OD view.	The OD view displays network performance through network topology. In this view, you can learn about the network topology, the operating status of objects managed by the OD system, and the possible exceptions in real time.
Added the function of comparing current and historical performance of trails.	You can import the backup historical data and compare it with the current performance data to identify possible network performance deterioration in a timely manner.

Feature Update	Reason for the Update
Added the function of exporting reports.	You can export the networkwide preventive maintenance inspection (PMI) report or trail performance report. These reports can be used for data comparison in future network O&M.

Update in V100R001C01 Compared with V100R001C00

Feature Update	Reason for the Update
Added the centralized monitoring configuration function.	The centralized monitoring configuration function is used to monitor networks in real time, greatly saving labor costs.
Added the function of automatically monitoring network changes.	The function of automatically monitoring network changes is used to automatically deliver configured monitoring policies to new services on a periodic basis, avoiding manual setting of monitoring parameters.
Added the function of detecting optical power or OSNR in E2E mode.	The function of detecting optical power or OSNR in E2E mode enables performance data to be intuitively displayed in E2E mode, facilitating fault diagnosis.
Added the function of automatically optimizing network performance.	The function of automatically optimizing network performance can be used to automatically optimize deteriorated OChs, ensuring normal network operating.

Feature updates in V100R001C00

Feature Update	Reason for the Update
Added the function of detecting single-NE optical parameters.	The function of detecting and reporting single-NE optical parameters is used to accurately detect the OSNR of 10G/40G/100G wavelengths, without using any meter. This greatly facilitates routine maintenance.

4.3 Feature Updates of OSN 8800/6800/3800

The Optical Doctor (OD) function is available since the OptiX OSN 8800 V100R007C00 version. This topic describes the feature updates in the OptiX OSN 8800 product versions, the reasons for the updates, and the corresponding information updates. Any product versions that are not listed in the document means that they have no feature updates.

Update of V100R012C10SPC300 Compared with V100R012C10SPC200

Feature Update	Reason for the Update	Information Update
The TN52SRAPXF board is added and it supports the OD.	The board is new to the product and should support the basic board functions.	**Availability**, **Dependencies and Limitations** and **Calibrating ASE**: Added TN52SRAPXF or SRAPXF in the descriptions of SRAU.

Update of V100R012C10SPC200 Compared with V100R012C00

Feature Update	Reason for the Update	Information Update
The BER threshold values required by the link optimization commissioning are updated.	The product limitation is updated.	**Dependencies and Limitations**: The link optimization commissioning restrictions are updated.

Update of V100R011C00SPC200 Compared with V100R010C10SPC200

Feature Update	Reason for the Update	Information Update
The OD supports Inter-site interconnection or optical-layer and electrical-layer interconnection scenario between OptiX OSN 8800/6800/3800 and OptiX OSN 1800 V/1800 I&II Compact (F3SCC).	The product functions are enhanced.	**Dependencies and Limitations**: Interconnection restrictions are added.

Feature Update	Reason for the Update	Information Update
The function of querying the automatic optimization records of main optical paths is added.	The system can display the main optical path optimization and commissioning records of OMSs. Users can export commissioning comparison reports that contain span performance comparison data before and after adjustment and adjustment volume comparison data of adjusted objects.	• In **Querying Alarms by Fault List**, the function description of the new shortcut menu **View Optimization Record** for some alarm records on the **Alarm Info** tab is added. • **Querying Automatic Optimization Records of Main Optical Paths** is added to reference operations.
The OD newly supports OSNR detection in the FlexGrid system.	The product functions are enhanced.	• **Availability**, **Configuring OD Route for a Trail** and **Configuring OSNR Detection for a Trail**: The FlexGrid system description is added. • **8.2 Setting Incident Optical Power on NCE**: The incident optical power offset description of the FlexGrid system is added.

Update of V100R010C10SPC200 Compared with V100R002C10&V100R002C00SPC810V100R010C00SPC200

Feature Update	Reason for the Update	Information Update
The TN51HBA board is added but it not supports the OD function in the extended C band.	The Limitation is new to the product.	**Availability**: The limitation is added in the Supported Hardware and Version.

Update of V100R010C00SPC200 Compared withV100R009C10SPC100

Feature Update	Reason for the Update	Information Update
The TN15OPM8 board is added and it supports the OD.	The board is new to the product and should support 200G OSNR detection.	• **Availability**, **Dependencies and Limitations**, **Analyzing the Performance Data of E2E Trails**, and **Analyzing the Single-Wavelength Optical Power and OSNR of OA Boards**: Added TN15OPM8 or OPM8 in the descriptions of MCA. • **Availability**, **Dependencies and Limitations** and **Configuring OD Route for a Trail**: Added the description of 200G OSNR detection.
The TN11SRAU board is added and it supports the OD.	The board is new to the product and should support the basic board functions.	**Availability**, **Dependencies and Limitations** and **Calibrating ASE**: Added TN11SRAU or SRAU in the descriptions of RAU.

Update of V100R009C10SPC100 Compared with V100R009C00SPC100

Feature Update	Reason for the Update	Information Update
The TN16FIU board is added and it supports the OD.	The boards is new to the product and should support the basic board functions.	**Calibrating ASE**: Added TN16FIU in the descriptions of TN14FIU.

Update of V100R009C00SPC100 Compared with V100R008C10SPC210/SPC300

Feature Update	Reason for the Update	Information Update
The TN12RAU1, TN12RAU2, and TN13OBU1 boards are added and they support the OD.	The boards are new to the product and should support the basic board functions.	**Availability**: The boards are added in the Supported Hardware and Version.

Update of V100R008C10 Compared with V100R008C00SPC230

Feature Update	Reason for the Update	Information Update
Added the function of setting optical fiber parameters in a centralized way.	On the U2000, you can set the Medium Type, **Length**, and Designed Loss(EOL) for multiple optical fibers at a time.	Descriptions of **Setting Fiber Parameters** are added.

Update of V100R008C00SPC200 Compared with V100R008C00SPC100

Feature Update	Reason for the Update	Information Update
Added the function of querying network performance using the OD view.	The OD view displays network performance through network topology. In this view, you can learn about the network topology, the operating status of objects managed by the OD system, and the possible exceptions in real time.	Descriptions of **querying network performance in the OD view** are added.
Added the function of comparing current and historical performance of trails.	You can import the backup historical data and compare it with the current performance data to identify possible network performance deterioration in a timely manner.	Descriptions of **backing up trail performance data** and **importing the historical performance data of trails** are added.

Feature Update	Reason for the Update	Information Update
Added the function of exporting reports.	You can export the networkwide preventive maintenance inspection (PMI) report or trail performance report. These reports can be used for data comparison in future network O&M.	Descriptions of **exporting reports** are added.

Update in V100R008C00SPC100 Compared with V100R007C00

Feature Update	Reason for the Update
Added the centralized monitoring configuration function.	The centralized monitoring configuration function is used to monitor networks in real time, greatly saving labor costs.
Added the function of automatically monitoring network changes.	The function of automatically monitoring network changes is used to automatically deliver configured monitoring policies to new services on a periodic basis, avoiding manual setting of monitoring parameters.
Added the function of detecting optical power or OSNR in E2E mode.	The function of detecting optical power or OSNR in E2E mode enables performance data to be intuitively displayed in E2E mode, facilitating fault diagnosis.
Added the function of automatically optimizing network performance.	The function of automatically optimizing network performance can be used to automatically optimize deteriorated OChs, ensuring normal network operating.
The HBA board starts to support the feature.	The board function is enhanced.

Feature updates in V100R007C00

Feature Update	Reason for the Update
Added the function of detecting single-NE optical parameters.	The function of detecting and reporting single-NE optical parameters is used to accurately detect the OSNR of 10G/40G/100G wavelengths, without using any meter. This greatly facilitates routine maintenance.

4.4 Feature Updates of OSN 1800

The Optical Doctor (OD) function is available since the 1800 V of V100R6C00 version.The Optical Doctor (OD) function is available since the 1800 I&II Compact of V100R006C00 version.The Optical Doctor (OD) function is available since the 1800 II Enhanced of V100R007C10 version.This topic describes the feature updates in each version and the corresponding documentation updates. The versions that are not listed in the document are those without feature updates.

Updates in V100R021C10 compared with V100R021C00

Feature Update	Reason for the Update	Information Update
The OD function of the board is added. • TMB1MD48AFS/ TMB2MR4AFS	The board is new to the product and should support the basic board functions.	Added descriptions of the feature.

Updates in V100R021C00 compared with V100R020C10

Feature Update	Reason for the Update	Information Update
The OD function of the TMB1OBU board is added.	The board is new to the product and should support the basic board functions.	Added descriptions of the feature.

Updates in V100R020C10 compared with V100R009C00

Feature Update	Reason for the Update	Information Update
The OD function of the TMB1MD40AFS board is added.	The board is new to the product and should support the basic board functions.	Added descriptions of the feature.

Updates in V100R009C00 compared with V100R008C00

Feature Update	Reason for the Update	Information Update
The OD function of the TMB1DAP board is added.	The board is new to the product and should support the basic board functions.	Added descriptions of the feature.

Updates in V100R008C00 compared with V100R007C10

Feature Update	Description
Information optimization	**Dependencies and Limitations**: The BER threshold values required by the link optimization commissioning are updated.

Updates in V100R007C10 compared with V100R007C00

Feature Update	Description
Enhancement	1800 II Enhanced is added to support the OD function.

Updates in V100R006C00 compared with V100R005C20

Update Type	Description
Addition	1800 V: The entire chapter is added. 1800 I&II Compact: The entire chapter is added.

4.5 Feature Updates of OptiXtrans E9600

This topic describes the feature updates in the OptiXtrans E9600 product versions, the reasons for the updates, and the corresponding information updates. Any product versions that are not listed in the document means that they have no feature updates.

Update of V100R021C10 Compared with V100R020C10

Feature Update	Reason for the Update	Information Update
The OD function of the board is added. • TNG2OH20H/ TNG2OH20	The board is new to the product and should support the basic board functions.	Added descriptions of the feature.

Update of V100R020C10 Compared with V100R019C10

Feature Update	Reason for the Update	Information Update
The OD function of the board is added. • TNG2WRPC/ TNG2WDAP/ TNG2WDAPXFR/ TNG3OH20H	The board is new to the product and should support the basic board functions.	Added descriptions of the feature.

4.6 Feature Updates of OptiXtrans E6600

This topic describes the feature updates in each version and the corresponding documentation updates. The versions that are not listed in the document are those without feature updates.

Updates in V100R021C10 compared with V100R021C00

Feature Update	Reason for the Update	Information Update
The OD function of the board is added. • TMB1MD48AFS/ TMB2MR4AFS	The board is new to the product and should support the basic board functions.	Added descriptions of the feature.

Updates in V100R021C00 compared with V100R020C10

Feature Update	Reason for the Update	Information Update
The OD function of the TMB1OBU board is added.	The board is new to the product and should support the basic board functions.	Added descriptions of the feature.

Updates in V100R020C10 compared with V100R019C10

Feature Update	Reason for the Update	Information Update
The OD function of the TMB1MD40AFS board is added.	The board is new to the product and should support the basic board functions.	Added descriptions of the feature.

4.7 Feature Updates of OptiXtrans DC908

This topic describes the feature updates in each version and the corresponding documentation updates. The versions that are not listed in the document are those without feature updates.

Update of V100R021C10 Compared with V100R021C00

Feature Update	Reason for the Update	Information Update
The OD function of the TMN1OA board is added.	The board is new to the product and should support the basic board functions.	Added descriptions of the feature.

Updates in V100R020C10 compared with V100R019C10

Feature Update	Reason for the Update	Information Update
The OD function of the TMN1WOLS01/ TMN1WOLL01, TMN1WOLAS01/ TMN1WOLAL01 board is added.	The board is new to the product and should support the basic board functions.	Added descriptions of the feature.

5 Using the OD System for Network O&M (NCE)

5.1 OD System Configuration and Usage Flowchart

After the monitoring parameters of the Optical Doctor (OD) system are set for a network in centralized mode, the OD system can be used to monitor the network in real time, report abnormalities.

NOTICE

When the OD system is configured or the OD is used for network maintenance:

- If the NCE time is changed, you need to log out of the OD system first. After the NCE services and database are restarted, you can log in to the NCE client again.
- If the time zone of NCE is changed, you need to log out the OD system first. After the OS, NCE services, and database of the NCE server are restarted, you can log in to the NCE client again.

Figure 5-1 OD configuration and usage flowchart

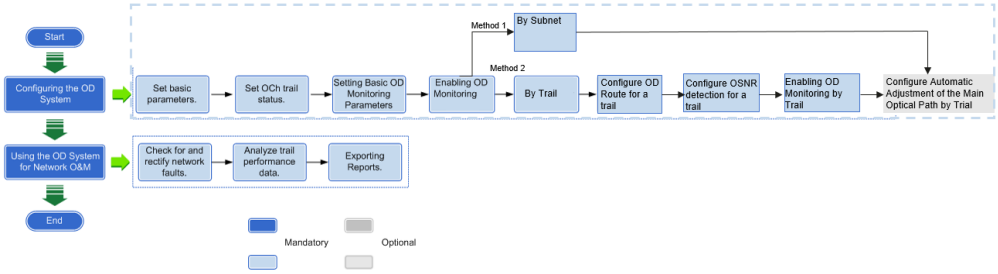


Figure 5-1 the detailed OD configuration process.

Configure OD monitoring:

- For a newly deployed network, you are advised to configure OD monitoring with reference to **5.2.4.1 Method 1: By Subnet**.
- For an existing network, you are advised to configure OD monitoring with reference to **5.2.4.2 Method 2: By Trail**.

Table 5-1 OD system configuration flow

Task	Description
5.2.1 Setting Basic Parameters	The following operations need to be performed: • **5.2.1.1 Synchronizing the NE Time with the NCE Time** • **5.2.1.2 Synchronizing Data on NCE** • **5.2.1.3 Setting Fiber Parameters** • **5.2.1.4 Setting Planning Parameters** • **5.2.1.5 Calibrating ASE**
5.2.2 Setting the Status of OCh Trails	The OD only monitors the trails in the **Maintenance** state. For trails that are successfully commissioned during manual deployment or expansion commissioning, manually set the **Maintenance Status** of the OCh trails to **Maintenance**.
5.2.3 Setting Basic OD Monitoring Parameters	The OD can monitor the main optical path and flatness of a network in real time after OD monitoring parameters and alarm optimization monitoring are configured. This section describes how to set basic OD monitoring parameters.
5.2.4.1 Method 1: By Subnet	After network monitoring parameters are set in a centralized manner, the OD can monitor the main optical path and flatness of the network in real time, reports abnormal information, detects network changes, and delivers configuration parameters to a new network node in a timely manner.
5.2.4.2 Method 2: By Trail	In addition to OD monitoring configuration by subnet, you can also enable OD monitoring by trail. After you enable OD monitoring for an OMS trail, the OD can monitor the main optical path and flatness of the OMS trail in real time and report abnormal information.

Task	Description
5.2.5 Configuring Automatic Main Optical Path Adjustment and Automatic Equalization by Trail	After automatic adjustment of the main optical path is enabled for an OMS, the system can automatically optimize the main optical path of the OMS that generates the OMS_LOSS_ACCUM_ABN, SPAN_LOSS_UPPER_GAIN, or SPAN_LOSS_LOWER_GAIN alarm.

Table 5-2 Network O&M using the OD

Task	Description
5.3.1 Querying Network Performance	The exception list in the OD main window displays all exception information at the optical layer of the current network. The exception information includes the exception type, exception level, and fault point. In the exception list, users can also view the OCh trails where alarms are generated.
Analyze trail performance data.	The OD can intuitively display the monitored performance data, such as the multiplexed-wavelength optical power, single-wavelength optical power, and single-wavelength OSNR. In this way, users can analyze trail performance based on the intuitively displayed data and can import the historical performance data of trails to compare the current data with the historical data. For the procedures, see the following: • 5.3.2 Analyzing Current Trail Performance • 5.3.3 Comparing Historical and Current Performance Data
5.3.4 Exporting Reports	Users can check the commissioning results in the generated report and save the report for data comparison in further network operation and maintenance.

5.2 Configuring the OD System

Before using the OD for network O&M, you must configure basic parameters and the OD monitoring mode.

5.2.1 Setting Basic Parameters

5.2.1.1 Synchronizing the NE Time with the NCE Time

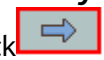
To compare the performance data of trails properly, you need to synchronize the NE time with the NCE time.

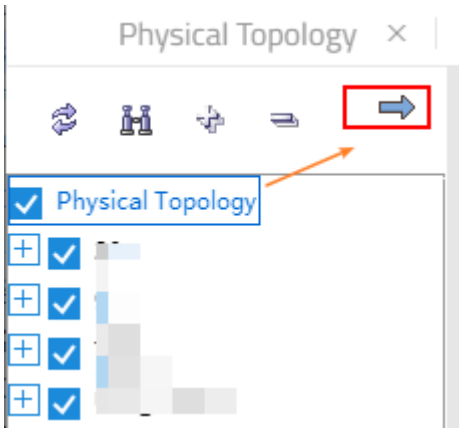
Prerequisites

You are an NMS user with the "Maintainer Group" or higher permission.

Procedure

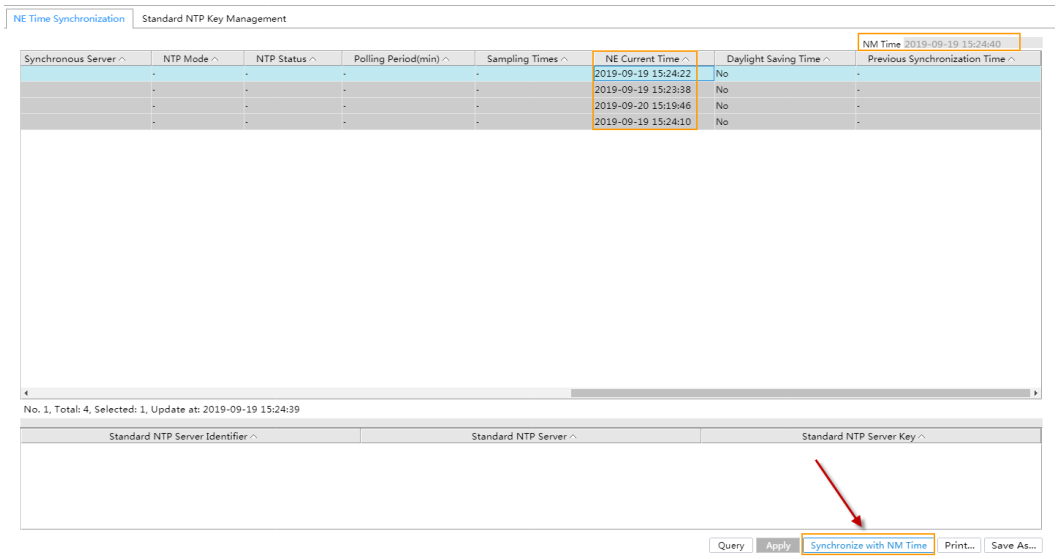
Step 1 On NCE, open the **Network Management** app, and choose **Configuration** > **Common** > **NE Time Sync** from the main menu. The **NE Time Synchronization** page is displayed.

Step 2 In the **Physical Root** navigation tree, select the subnet to be synchronized and click  . The **NE Time Synchronization** progress bar is displayed.



Step 3 After the synchronization is complete, the **Result** dialog box that is displayed. Click **Close**.

Step 4 Check the current NE time. If the NE time is inconsistent with the NCE time, select the NE and click **Synchronize with NM Time**.



NOTE

You can select multiple NEs at a time to synchronize the time of these NEs with the NCE time in batches.

Step 5 In the **Confirm** dialog box that is displayed, click **Yes**.

After the synchronization is complete, the **Result** dialog box that is displayed.

----End

5.2.1.2 Synchronizing Data on NCE

After the WDM commissioning component is installed or re-deployed, you must synchronize data on the entire network. After NE data is uploaded, NE data is synchronized with the NCE data, or NCE data is initialized, you must synchronize the NCE data on the entire network or the corresponding subnets before the commissioning.

Prerequisites

You are an NMS user with the "Maintainer Group" or higher permission.

Background Information

If operations such as the adding, deletion, or modification on subnets, sites, NEs, boards, and fibers are performed during data synchronization, data synchronization will fail.

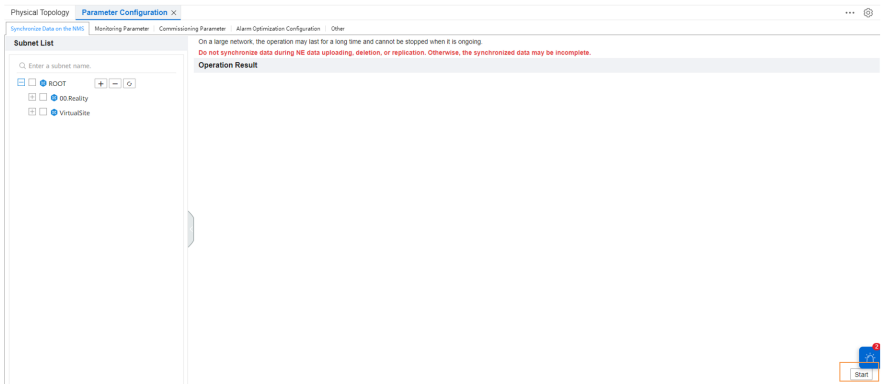
NOTE

When backing up the subnet performance data, do not synchronize data from the NE side to NCE. Otherwise, data synchronization will fail.

Procedure

Step 1 Choose **Configuration** > **WDM Optical Management** > **Parameter Configuration** from the main menu on the NCE Network Management app.

Step 2 Click the **Synchronize Data** on the NCE tab page.



NOTE

In the **Subnet List** area, slide down to load more subnets until the scroll bar reaches the bottom.

Step 3 Choose the subnet to be synchronized from the **Root** navigation tree and click **Start**. A confirmation dialog box is displayed.

NOTE

When synchronizing data for the first time after the NetStar O&M component is installed, you must select **Root** to synchronize the network-wide data. In other scenarios, you can select subnets as required to synchronize data.

Step 4 Click **Yes**. Data synchronization starts.

NOTE

- If a message indicating data sharing conflict is displayed during data synchronization, the possible cause is that a user is deleting, uploading, or copying the NE data, or checking NE data consistency on another set of NCE. In this case, wait until the operations on another set of NCE is complete and then synchronize data again. Do not perform other commissioning operations on the NEs during data synchronization.
- After the synchronization is completed, the refresh icon turns green. Click  to refresh the **Root** navigation tree.

----End

5.2.1.3 Setting Fiber Parameters

Before configuring the centralized monitoring function for the Optical Doctor (OD), you need set an inter-site fiber type and fiber length. If the fiber type is not configured or is incorrectly configured, the incident optical power will be incorrectly calculated. If OD function is enabled but the fiber type is not configured in scenarios where light sensor (LS) is used to detect single-wavelength optical power, FIBERTYPE_NOT_CONFIG alarm will be reported. If the fiber length is not configured, there is no impact because the fiber length will be automatically calculated. If the fiber length is incorrectly configured, the OSNR calculation will be incorrect. The design end of life (EOL)(dB) value of fiber loss must be set to determine whether the fiber loss exceeds the design EOL value. If the EOL is incorrectly configured, the SPAN_LOSS_EXCEED_EOL alarm will be reported, indicating that the fiber loss exceeds the design EOL value. This section describes how to set the fiber parameters in batches.

Prerequisites

- You are an NMS user with "Operator Group" authority or higher.
- The EOL value has been obtained from the network design document.

Tools, Equipment, and Materials

NCE

Configuration Principles

- If the IN port on the receive optical amplifier (OA) board is equipped with a dispersion compensation module (DCM), calculate the EOL value for the fiber

between the local NE and upstream NE using the following formula: EOL = Design fiber loss + Maximum insertion loss of the DCM. If an OLP board is installed in front of the receive OA board, the EOL value for the fiber between the local NE and upstream NE is equal to the fiber loss between the upstream OLP board and the local OLP board.

NOTE

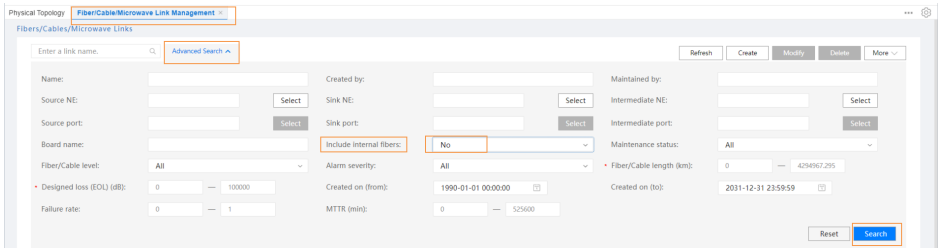
EOL value: historical reference value + 1.5 dB.

- Ensure that the inter-site fiber type and fiber type are the same as those in the practical fiber configurations.

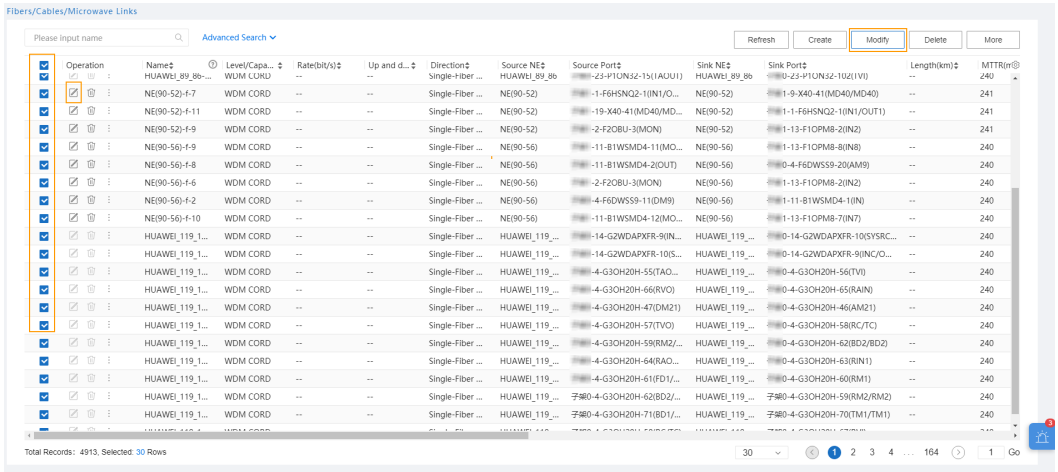
Procedure

Step 1 Choose **Resource > Inventory** > **Fiber/Cable/Microwave Link**s from the main menu on the NCE Network Management app.

Step 2 In the **Fiber/Cable/Microwave Link Management** window, click **Advanced Search**. Select **No** from the drop-down list next to **Include internal fibers**, and click **Search** to filter inter-site fibers.



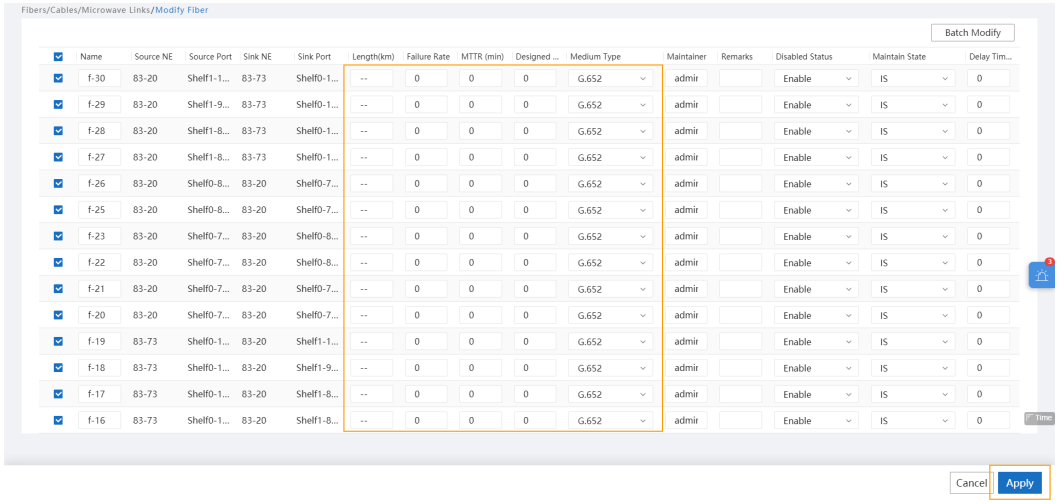
Step 3 Select one or multiple fibers/cables in the list and click to Modify.



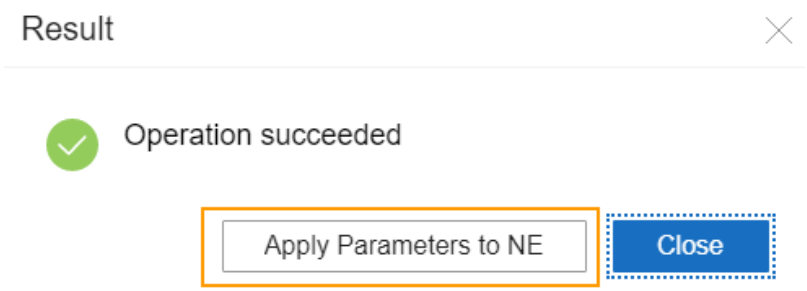
NOTE

To modify a single fiber, click .

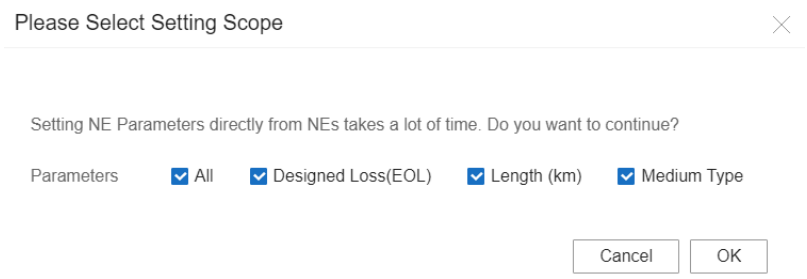
Step 4 In the **Modify Fiber/Cable** window, set **Length (km)**, **Designed Loss(EOL)(dB)**, and **Medium Type** of the fibers/cables as required, and click **Apply**.



Step 5 Click **Apply Parameters to NE** in the **Result** dialog box.



Step 6 In the **Please Select Setting Scope** dialog box, select the desired parameters and click **OK**.



----End

5.2.1.4 Setting Planning Parameters

Prerequisites

The file containing the planned data has been imported to NCE by Huawei engineers in advance.

Configuration Guidelines

- Set **System Wavelengths** based on the maximum number of wavelengths supported by the system. If **System Wavelengths** is not set, the optical power

target value cannot be calculated. If the parameter is incorrectly set, the optical power adjustment will be incorrect.

You can set the value of **System Wavelengths** based on the frequency allocation table in the marketing telecom design documents or based on the actual product configurations. For example:

- If the WDM subnet is configured with the ITL and M40 or D40 boards, the **System Wavelengths** value is **80wave**.
- If the WDM subnet is configured with only the M40 or D40 board, the **System Wavelengths** value is **40wave**.

- You are advised to set **Wavelength Spectral Width** with reference to the principles shown in **5.2.1.4 Setting Planning Parameters**. If **System Wavelengths** is changed, you need to check the setting of **Wavelength Spectral Width** again. If the **Wavelength Spectral Width** configuration is incorrect, the incident optical power adjustment will be affected.

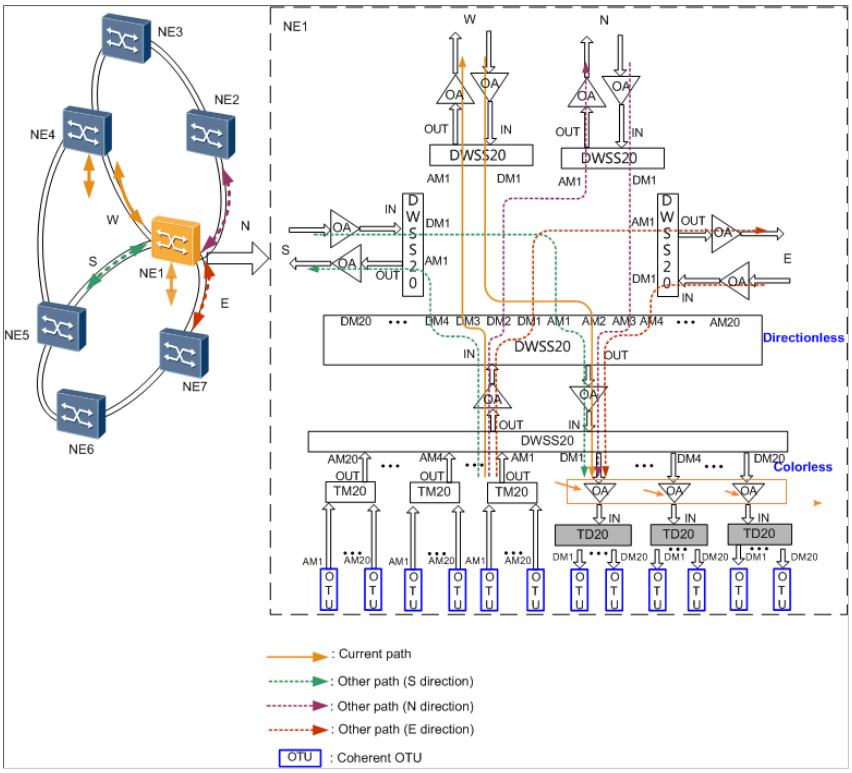
Table 5-3 Suggestions for setting the wavelength spectrum width

Scenario	System Wavelengths	Recommended Wavelength Spectrum Width
Only fixed wavelengths exist in the system.	40, 48, or 60	100 GHz
	80, 96 or 120	50 GHz
Only FlexGrid wavelengths exist in the system.	40, 48, 60, 80, 96, or 120	The minimum spectral width of FlexGrid wavelengths.
Fixed wavelengths and FlexGrid wavelengths exist in the system.	40, 48, 60, 80, 96, or 120	The minimum spectral width of all wavelengths.

- If the TN97TD20 board is used to drop wavelengths, you need to set System Wavelengths to **20wave** for the OA at the input end of the TN97TD20 board.

  NOTE

  System Wavelengths can be set to **20wave** for the OA at the input end of a TN97TD20 board only when the configuration mode is WSS (for example, DWSS20)+OA+TN97TD20, as shown in the following figure. For other wavelength-dropping boards or in other configuration scenarios of TN97TD20 boards, set **System Wavelengths** for the OA at the input end based on the maximum number of system wavelengths.



- The value of **Launch Power** queried on the **Board Parameter** tab is the launch power set on NCE. If the value of **Launch Power** is displayed as **/**, the NMS data may not be synchronized or this parameter is not set for the board on NCE. In this scenario, you are advised to perform the following operations:
  a. Synchronize NMS data.
  b. If the value of **Launch Power** is still displayed as **/**, set **Launch Power** for the board on the **Board Parameter** tab.

NOTE

- To use the OD function, ensure that the **Launch Power** and **System Wavelengths** parameters are set on the **Board Parameter** tab.
- During commissioning, the tool adjusts the rear EVOA of the OA board based on the values of **Wavelength Spectral Width** and **Launch Power**.

Procedure

Step 1 Choose **Configuration** > **WDM Optical Management** > **Planned Data Setting** from the main menu on the NCE Network Management app.

Step 2 Set planning parameters.

For the parameter setting rules, see **Table 5-4**.

- When configuring span loss data, you can select data on the page and click **Update Actual Loss** to query the values of **Current Span Loss** and **Current Fiber Loss**.

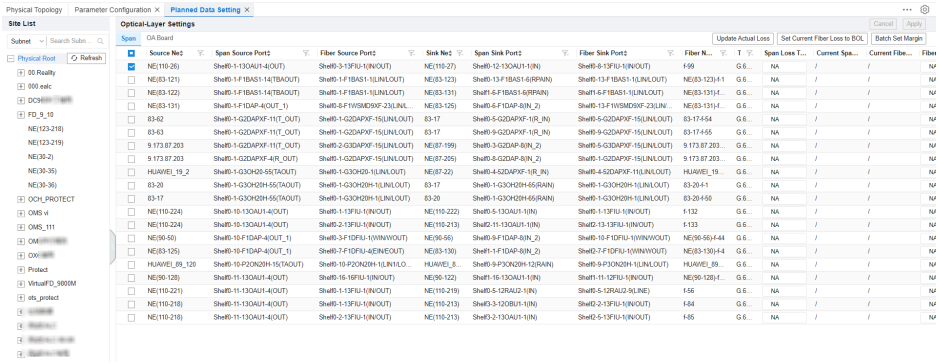


Table 5-4 Parameter description

Parameter		Value Range	Description
Span	Designed Loss Target(dB)	0 to 100	Designed loss of a span.
	Fiber Bol(dB)	0.5 to 85	Initial attenuation of a fiber.
	Fiber Margin(dB)	0 to 10	Attenuation margin of a fiber.

- When configuring OA data, you can select data on the page and click **Querying Module Type** to query the value of **Board Type**.
- When configuring OA data, you can select data on the page, click **Use Recommended Launch Power** to change the value of **Launch Power** to the value of **Recommended Launch Power**.
- When configuring OA data, you can select multiple data on the page and modify the values of **System Wavelengths**, **Wavelength Spectral Width**, **Rate**, and **Code Type** in batches.

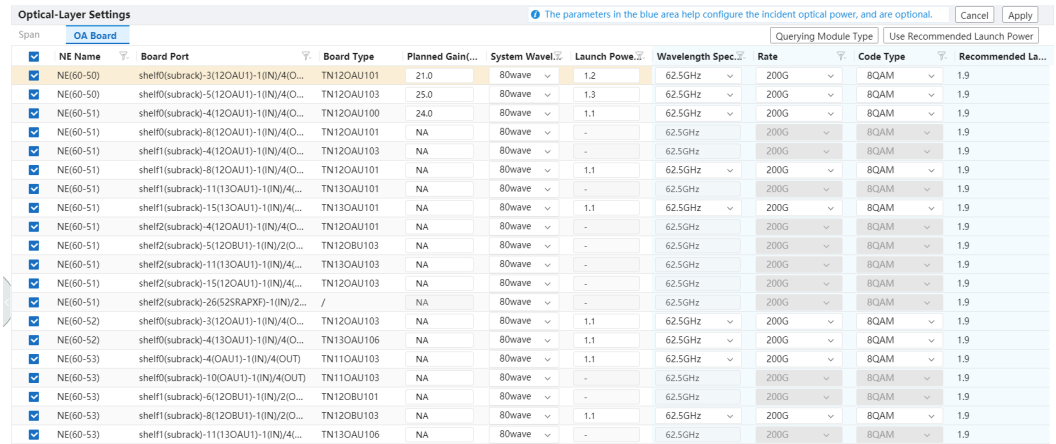


Table 5-5 Parameter description

Parameter		Value Range	Description
OA Board	Planned Gain(dB)	-	Planned gain of an OA board. The value range of this parameter is determined by the gain range of an OA board. The gain range varies depending on the OA board type.
	System Wavelengths	20 to 120	Number of system wavelengths of an OA board.
	Launch Power(dBm)	–10 to +10	Incident optical power of an OA board.

NOTE

Set **Wavelength Spectral Width** according to the planned spectrum width, rate, and code pattern.

- In scenarios involving high incident optical power, **Launch Power** must be manually set.
  - The value of **Launch Power** is a floating-point number ranging from –10.0 to 10.0.
  - If the incident optical power is set on NCE, the incident optical power of the related OA board will be automatically displayed after NMS-side data is synchronized.
- In scenarios involving standard incident optical power, you can use the tool to automatically calculate the value of **Launch Power**. Click **Use Recommended Launch Power**. The value of Launch Power of the board is set to the value of **Recommended Launch Power**, which is the nominal single-wavelength incident optical power.

Step 3 Click **Apply**.

----End

5.2.1.5 Calibrating ASE

Amplified spontaneous emission (ASE) must be calibrated for the RAU1/RAU2/SRAU/SRAPXF board to ensure that the line loss Compensation optimization function is available and can accurately adjust amplifier gains on a long span. If the ASE is not calibrated, the Raman laser on the RAU/SRAU/SRAPXF board will not properly work and the commissioning will fail.

Prerequisites

- You are an NMS user with "Operator Group" authority or higher.
- Logical fiber connections between the RAU1/RAU2/SRAU/SRAPXF and TN14FIU/TN16FIU boards have been established.

Tools, Equipment, and Materials

NCE

Precautions

NOTICE

- The LINE port of the Raman board produces extremely high output optical power. During operations, avoid exposure to laser radiation to prevent bodily injuries, especially to the eyes. In addition, take measures to prevent the fiber connector that connects to the LINE port from being burned out due to high power. A burned out fiber connector may cause fire.
- Calibrating ASE causes service interruption. Therefore, it is recommended that ASE be calibrated at the deployment stage.

ASE Calibration Conditions

Table 5-6, Table 5-7 and Table 5-8 describes the conditions for calibrating ASE according to the upstream OA board type, fiber type, and line loss.

Table 5-6 ASE calibration conditions for RAU1/RAU2

Upstream OA Board of the RAU1/ RAU2 Board	Fiber Type	Line Loss L[a]		
-	-	ASE Calibration Not Required	ASE Calibration Required (Independent of the Wavelength Count)	ASE Calibration Required (Related to the Wavelength Count)[b]
OAU101	G.653, LEAF, TWRS, TWC, TWPLUS, SMFLS, G.656, TERA_LIGHT	L <= 35	35 < L <= 43	L > L0, L0 = 43
	G.652, G.654A	L <= 33	33 < L <= 41	L > L0, L0 = 41
	G.654B	L <= 29	29 < L <= 37	L > L0, L0 = 37

Upstream OA Board of the RAU1/ RAU2 Board	Fiber Type	Line Loss L[a]		
OAU105	G.653, LEAF, TWRS, TWC, TWPLUS, SMFLS, G.656, TERA_LIGHT	L <= 38	38 < L <= 46	L > L0, L0 = 46
	G.652, G.654A	L <= 36	36 < L <= 44	L > L0, L0 = 44
	G.654B	L <= 32	32 < L <= 40	L > L0, L0 = 40
HBA	All types	**NOTICE** When L < 39, the downstream OA board cannot accurately adjust the amplifier gains.	39 < L <= 47	L > L0, L0 = 47
a: L represents the line loss. It includes the FIU board insertion loss and the VOA attenuation on the line. It is the designed end of life (EOL) insertion loss. b: The minimum number of wavelengths is N = 10^c, where c = (L - L0)/10. When the number of wavelengths is less than N, the downstream OA board cannot accurately perform gain adjustments even though the ASE is calibrated.				

Table 5-7 ASE calibration conditions for SRAU

Upstream OA Board of the SRAU Board	Fiber Type	Line Loss L[a]		
-	-	ASE Calibration Not Required	ASE Calibration Required (Independent of the Wavelength Count)	ASE Calibration Required (Related to the Wavelength Count)[b]

Upstream OA Board of the SRAU Board	Fiber Type	Line Loss L[a]		
OAU101	G.653, LEAF, TWRS, TWC, TW+	L <= 34	34 < L <= 40	L > L0, L0 = 40
	G.652, G.654A, LS, G.656, Tera_light	L <= 35	35 < L <= 41	L > L0, L0 = 41
	G.654B	L <= 33	33< L <= 39	L > L0, L0 = 39
OAU105	G.653, LEAF, TWRS, TWC, TW+	L <= 37	37 < L <= 42	L > L0, L0 = 43
	G.652, G.654A, LS, G.656, Tera_light	L <= 38	38 < L <= 44	L > L0, L0 = 44
	G.654B	L <= 36	36 < L <= 43	L > L0, L0 = 42
HBA	All types	**NOTICE** When L < 40, the downstream OA board cannot accurately adjust the amplifier gains.	39 < L <= 47	L > L0, L0 = 50
a: L represents the total line loss. It includes the FIU board insertion loss and the VOA attenuation on the line. It is the designed end of life (EOL) insertion loss. b: The minimum number of wavelengths is N = 10^c, where c = (L - L0)/10. When the number of wavelengths is less than N, the downstream OA board cannot accurately perform gain adjustments even though the ASE is calibrated.				

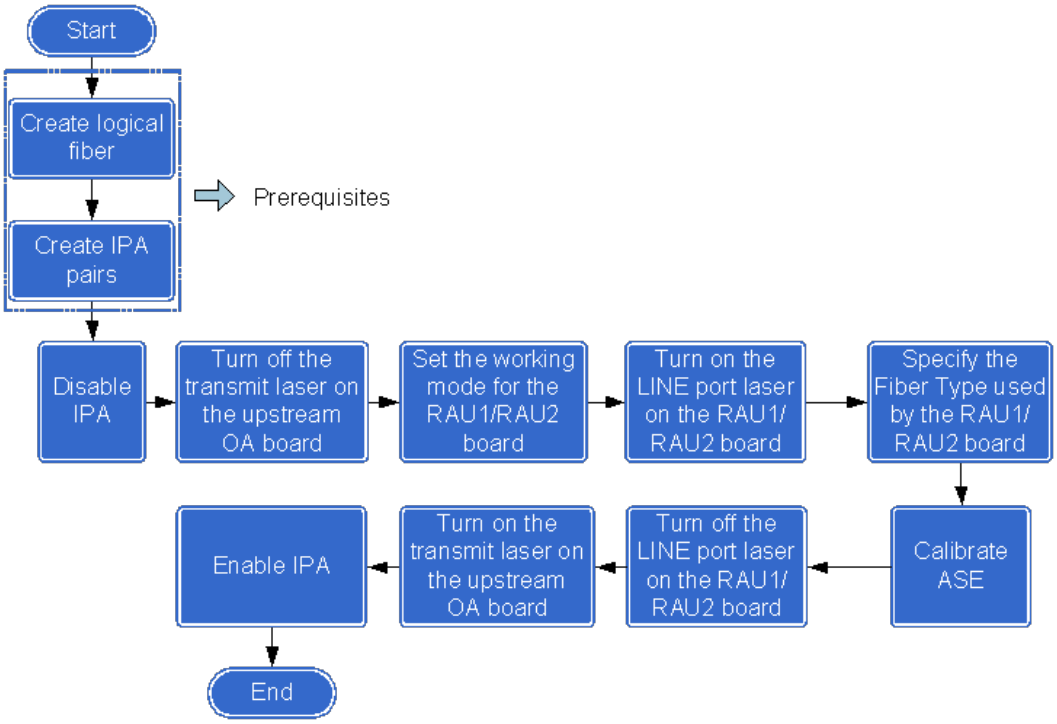
Table 5-8 ASE calibration conditions for SRAPXF

Upstream OA Board of the SRAPXF Board	Fiber Type	Line Loss L[a]		
-	-	ASE Calibration Not Required	ASE Calibration Required (Independent of the Wavelength Count)	ASE Calibration Required (Related to the Wavelength Count)[b]
OAU101/ OAUCE101	G.653, LEAF, TWRS, TWC, TW+	L <= 34	34 < L <= 40	L > L0, L0 = 40
	G.652, G.654A, LS, G.656, Tera_light	L <= 35	35 < L <= 41	L > L0, L0 = 41
	G.654B	L <= 33	33< L <= 39	L > L0, L0 = 39
OAU105/ OAUCE105	G.653, LEAF, TWRS, TWC, TW+	L <= 37	37 < L <= 42	L > L0, L0 = 43
	G.652, G.654A, LS, G.656, Tera_light	L <= 38	38 < L <= 44	L > L0, L0 = 44
	G.654B	L <= 36	36 < L <= 43	L > L0, L0 = 42
HBA	All types	**NOTICE** When L < 40, the downstream OA board cannot accurately adjust the amplifier gains.	39 < L <= 47	L > L0, L0 = 50
a: L represents the total line loss. It includes the FIU board insertion loss and the VOA attenuation on the line. It is the designed end of life (EOL) insertion loss. b: The minimum number of wavelengths is N = 10^c, where c = (L - L0)/10. When the number of wavelengths is less than N, the downstream OA board cannot accurately perform gain adjustments even though the ASE is calibrated.				

Configuration Process

Figure 5-2 shows the ASE calibration flow.

Figure 5-2 ASE calibration flow



Procedure

Step 1 Disable the IPA function.

1. Start the NE Explorer of the associated NE. In the navigation tree, select the NE and choose **Configuration** > **IPA Management**.

Figure 5-3 NE Explorer

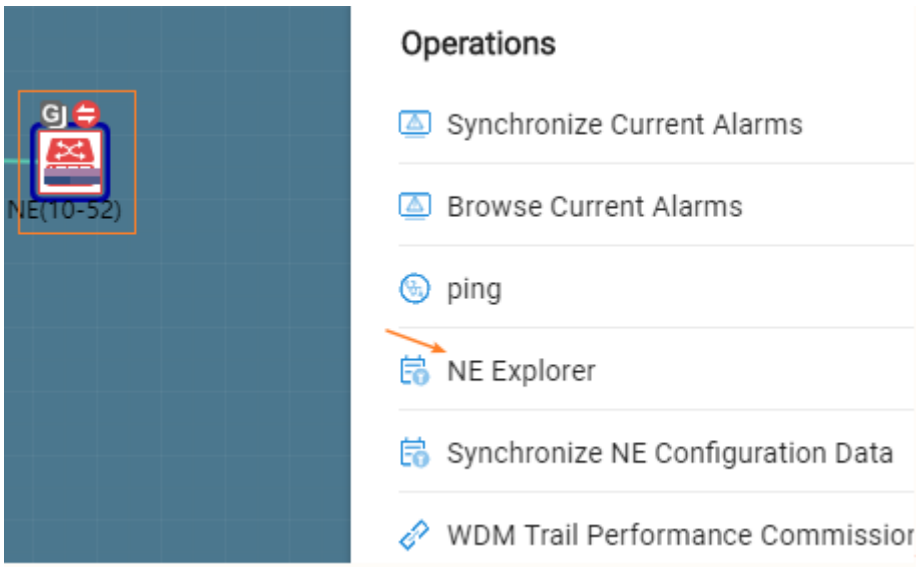
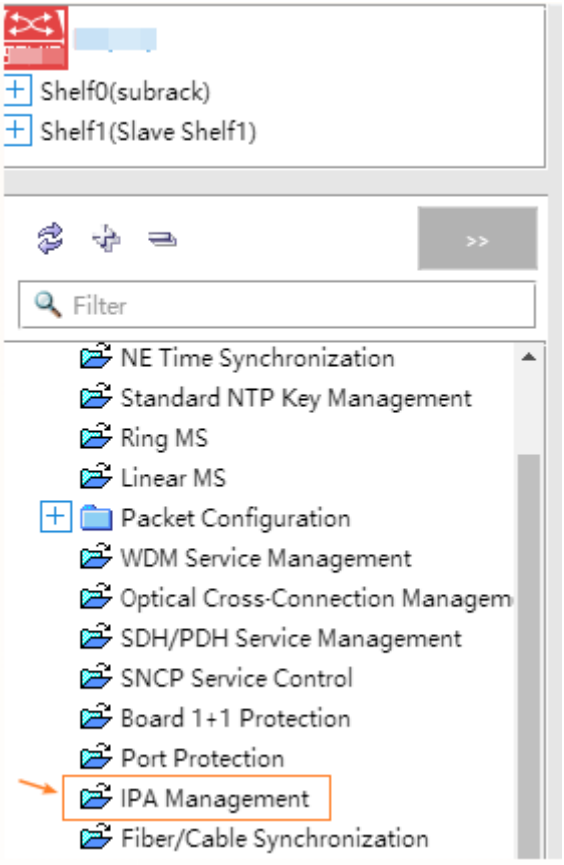
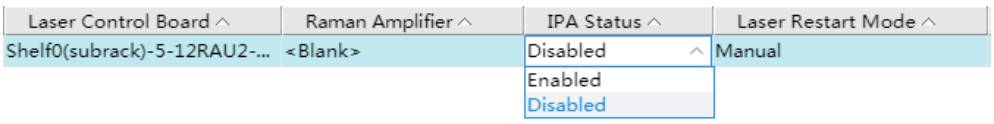


Figure 5-4 IPA Management



2. Select the associated IPA pair and set **IPA Status** to **Disabled**.



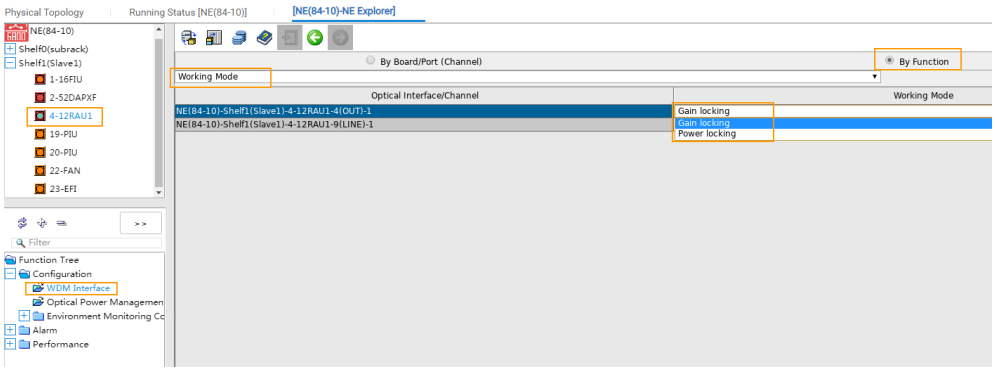
3. Click **Apply**. In the **Warning** dialog box, click **Yes**. Then in the **Result** dialog box, click **Close**.

Step 2 Turn off the transmit laser on the upstream OA board.

1. Start the NE Explorer of the associated NE. In the navigation tree, select the upstream OA board and choose **Configuration** > **WDM Interface**.
2. Click the **By Function** option button and select **Laser Status** from the drop-down list under the option button. Set **Laser Status** to **Off** for the required port on the OA board.
3. Click **Apply**. In the dialog box that is displayed, click **OK**.

Step 3 Set **Working Mode** to **Gain locking** for the LINE port on the RAU1/RAU2/SRAU/SRAPXF board.

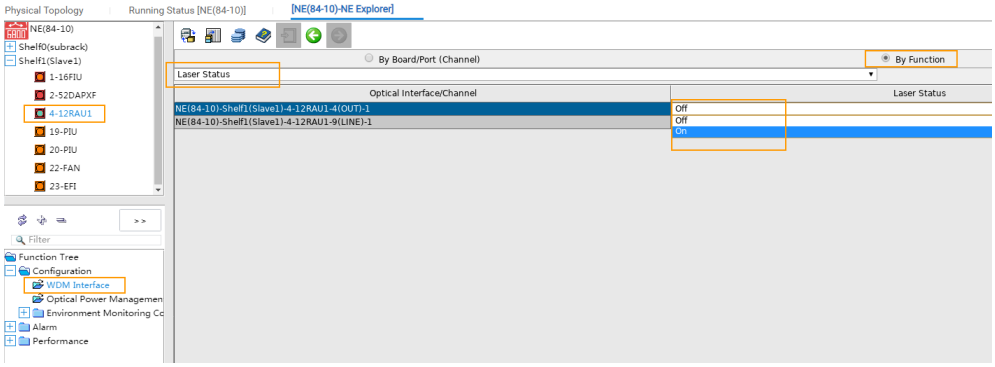
1. Start the NE Explorer of the associated NE. In the navigation tree, select the RAU1/RAU2/SRAU/SRAPXF board and choose **Configuration** > **WDM Interface**. Click the **By Function** option button and select **Working Mode** in the drop-down list under the option button. Then set **Working Mode** to **Gain locking** for the LINE port on the RAU1/RAU2/SRAU/SRAPXF board.



2. Click **Apply**. In the dialog box that is displayed, click **OK**.

Step 4 Turn on the LINE port laser on the RAU1/RAU2/SRAU/SRAPXF board.

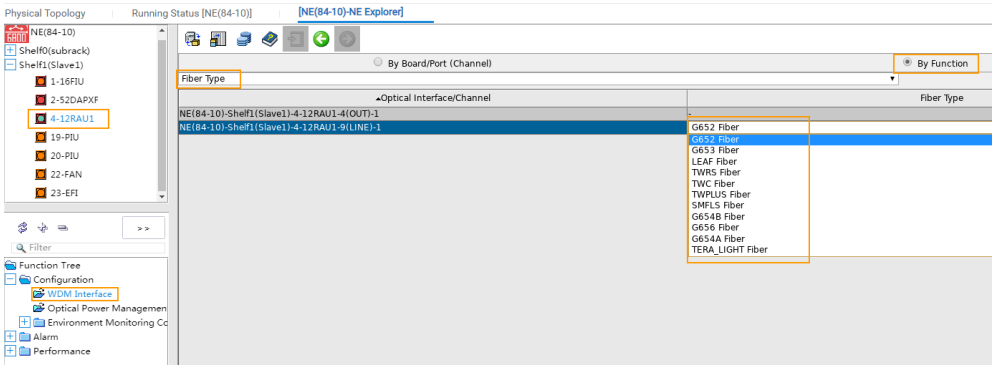
1. Start the NE Explorer of the associated NE. In the navigation tree, select the RAU1/RAU2/SRAU/SRAPXF board and choose **Configuration** > **WDM Interface**.
2. Click the **By Function** option button and select **Laser Status** from the drop-down list under the option button. Set **Laser Status** to **On** for the LINE port.



3. Click **Apply**. In the dialog box that is displayed, click **OK**.

Step 5 Specify the fiber type used by the RAU1/RAU2/SRAU/SRAPXF board. Ensure that the specified fiber type is the same as the actual fiber type.

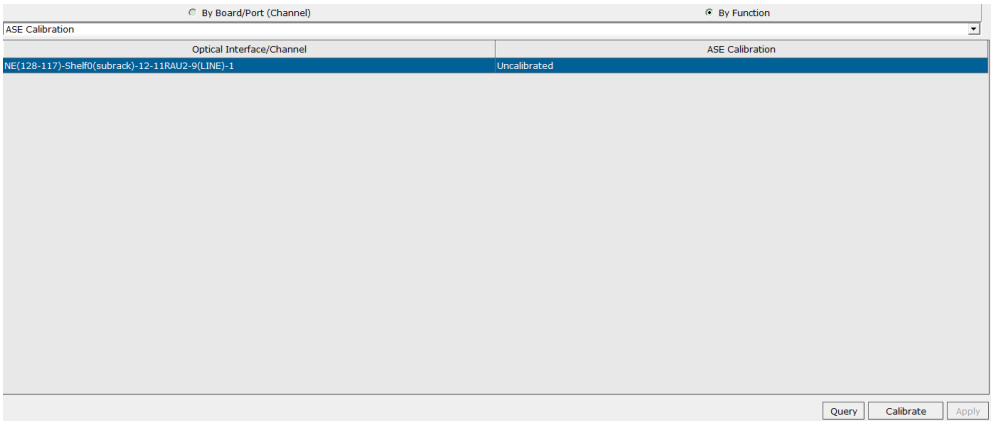
1. In the NE Explorer, select the RAU1/RAU2/SRAU/SRAPXF board and choose **Configuration** > **WDM Interface**. Click the **By Function** option button and select **Fiber Type** from the drop-down list under the option button. Then set **Fiber Type** based on the actual fiber type.



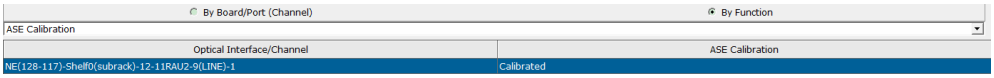
2. Click **Apply**. In the dialog box that is displayed, click **OK**.

Step 6 Calibrate the ASE value of the RAU1/RAU2/SRAU/SRAPXF board.

1. In the NE Explorer, select **ASE Calibration** from the drop-down list under the **By Function** option button. Then click the LINE port on the RAU1/RAU2/SRAU/SRAPXF board.



2. Click **Calibrate**. Three dialog boxes are sequentially displayed. The first dialog box indicates that ASE calibration will cause service interruption. The second dialog box asks you to confirm that all required operations have been completed. The third dialog box is used to confirm the operation. In these dialog boxes, click **OK**.
3. In the **Operation Result** dialog box, confirm that the ASE calibration is successful and click **OK** to complete calibrating the ASE value of the RAU1/RAU2/SRAU/SRAPXF board.



Step 7 Once the ASE calibration is completed, turn off the LINE port laser on the RAU1/RAU2/SRAU/SRAPXF board. For the detailed procedure, see **Step 4**, but set **Laser Status** to **Off**.

Step 8 Turn on the transmit laser on the upstream OA board. For the detailed procedure, see **Step 2**, but set **Laser Status** to **On**.

Step 9 Enable the IPA function. For the detailed procedure, see **Step 1**, but set **IPA Status** to **Enabled**.

----End

Result

If the **Operation Result** dialog box displayed in **Step 6** shows that ASE calibration failed, handle the failure according to the possible causes given in **Table 5-9**.

Table 5-9 Possible causes for an ASE calibration failure

Possible Cause	Solution
The logical fiber connections between the RAU1/RAU2/SRAU/SRAPXF and TN14FIU/TN16FIU boards do not agree with the physical fiber connections.	Ensure that the logical fiber connections agree with the physical fiber connections.
The transmit laser on the upstream OA board is not turned off before the ASE is calibrated.	Go to **Step 2** to turn off the transmit laser on the upstream OA board.
Working Mode is not set to **Gain locking** for the LINE port on the RAU1/RAU2/SRAU/SRAPXF board.	Go to **Step 3** to correct the setting.
The LINE port laser on the RAU1/RAU2/SRAU/SRAPXF board is not turned on.	Go to **Step 4** to correct the setting.
The fiber type specified for the RAU1/RAU2/SRAU/SRAPXF board does not agree with the physical fiber type.	Go to **Step 5** to correct the setting.
The inter-NE fiber has poor quality or the fiber endface has been contaminated. If this is the case, an OA_LOW_GAIN alarm should be reported for the LINE port when the port works in gain locking mode.	Clean the fiber endface or replace the fiber to clear the OA_LOW_GAIN alarm.

Follow-up Procedure

- Repeat **Step 5** to check whether the fiber type specified for the RAU1/RAU2/SRAU/SRAPXF board agrees with the physical fiber type. Note that ASE calibration can be successful but the main channel monitoring function cannot accurately adjust the gain when specified fiber type disagrees with the logical fiber type. If the specified fiber type disagrees with the physical fiber type, correct the setting and calibrate the ASE again.
- If the RAU1/RAU2/SRAU/SRAPXF board is replaced or the LINE port fiber type is changed after a successful ASE calibration, an ASE_NOT_CALIBRATE will be reported. In this situation, calibrate the ASE again.

5.2.2 Setting the Status of OCh Trails

On NCE, an OCh trail can be in the **Unset**, **Commission**, or **Maintenance** state. The OD only monitors the trails in the **Maintenance** state. For an OCh trail whose deployment commissioning is successful, the OCh trail status is automatically set to **Maintenance Status** when the advanced option **Set the trail maintenance state** is selected. If the advanced option is not selected, the OCh trail needs to be manually set to **Maintenance Status**. For the OCh trail whose expansion

commissioning is successful, the OCh trail status is automatically set to **Maintenance Status**.

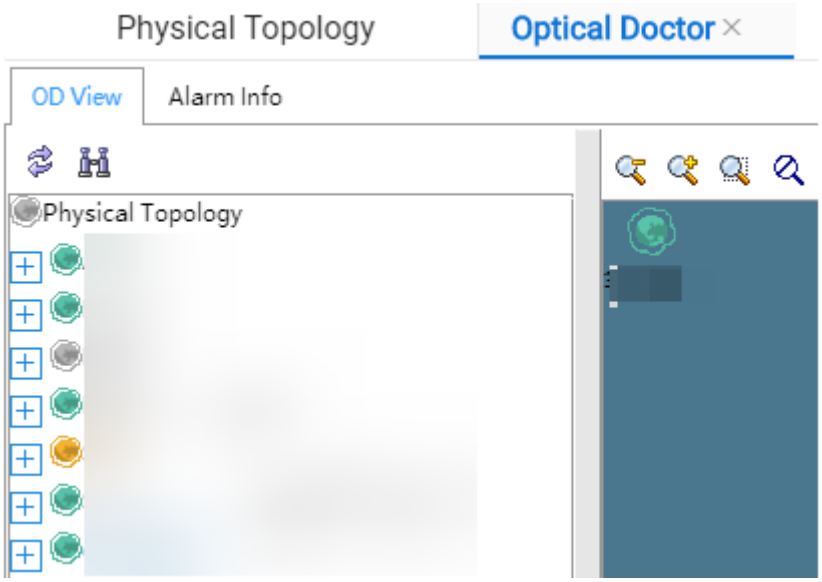
Background Information

For the meanings of the OCh trail status information, see **9.1 Meanings of Commissioning Trail Status Parameters**.

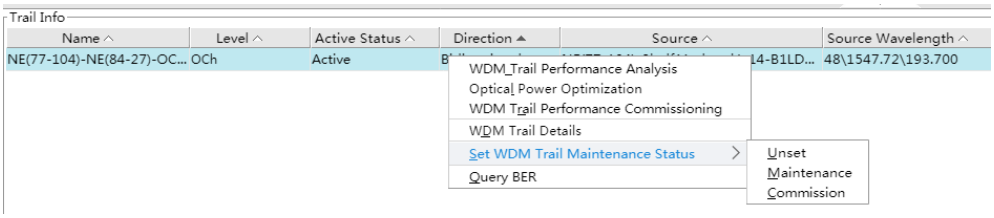
When the status of an OCh trail is changed to **Maintenance Status**, the OD immediately checks whether the trail belongs to the monitored subnet, and automatically monitors the trail if the trail belongs to the monitored subnet.

Method 1: Setting the Status of OCh Trails in the Optical Doctor Window

1. Choose **Configuration** > **WDM Optical Management** > **Optical Doctor** from the main menu on the NCE Network Management app. The **Optical Doctor** window is displayed.

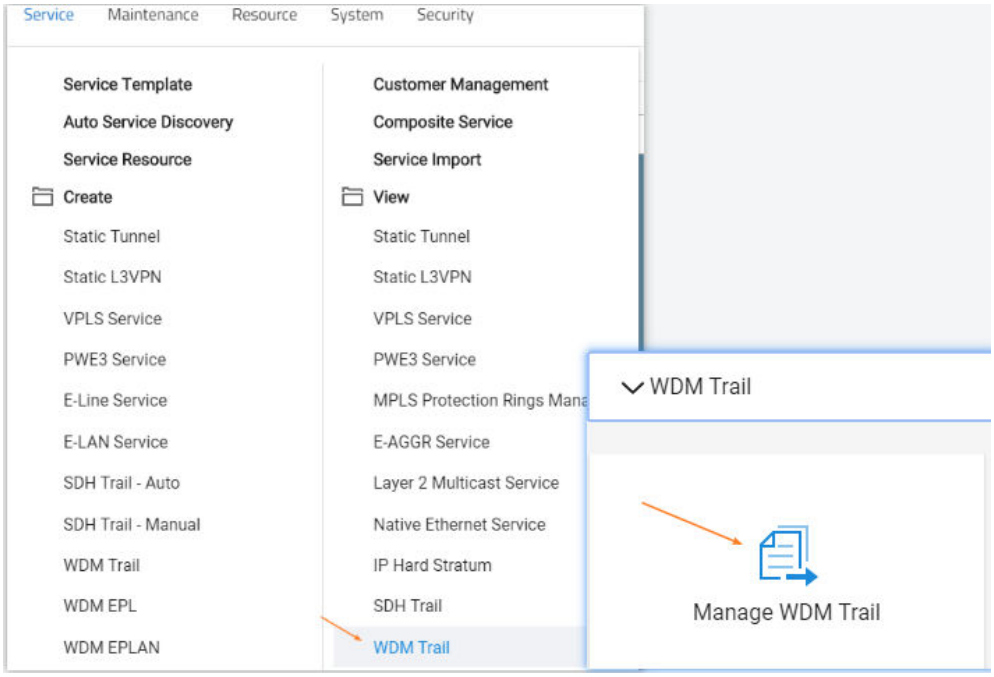


2. On the **OD View** or **Alarm Info** tab, right-click an OCh trail in **Trail Info**, choose **Set Optical Commission Status** from the shortcut menu, and then choose the desired trail state.

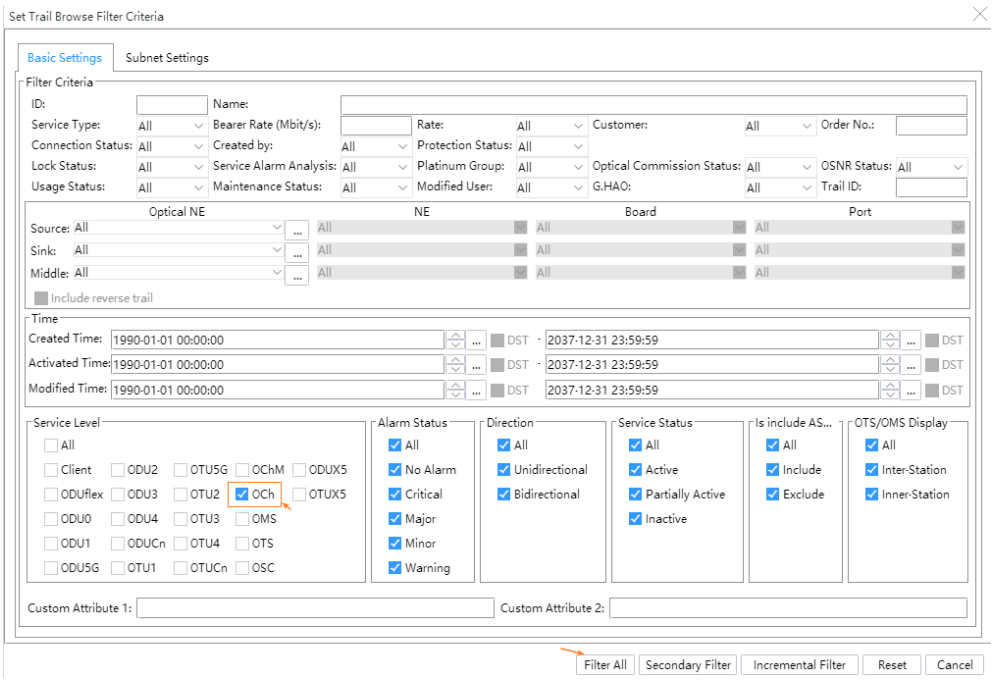


Method 2: Setting the State of OCh Trails on the Manage WDM Trail Page

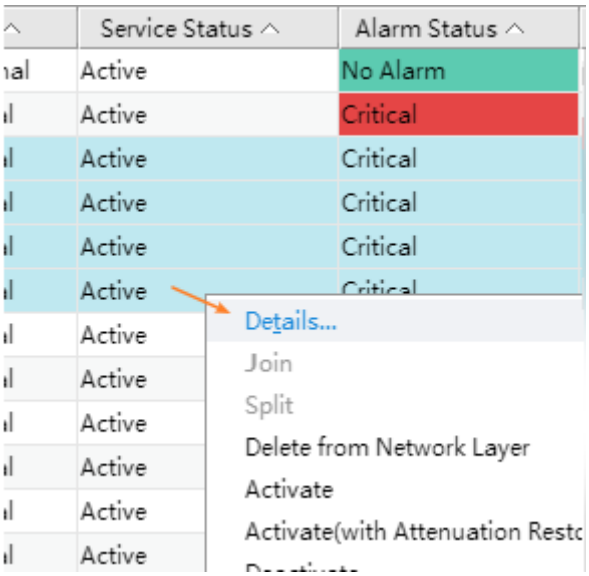
1. Choose **Service** > **View** > **WDM Trail** from the main menu and click **Manage WDM Trail** on the NCE Network Management app.



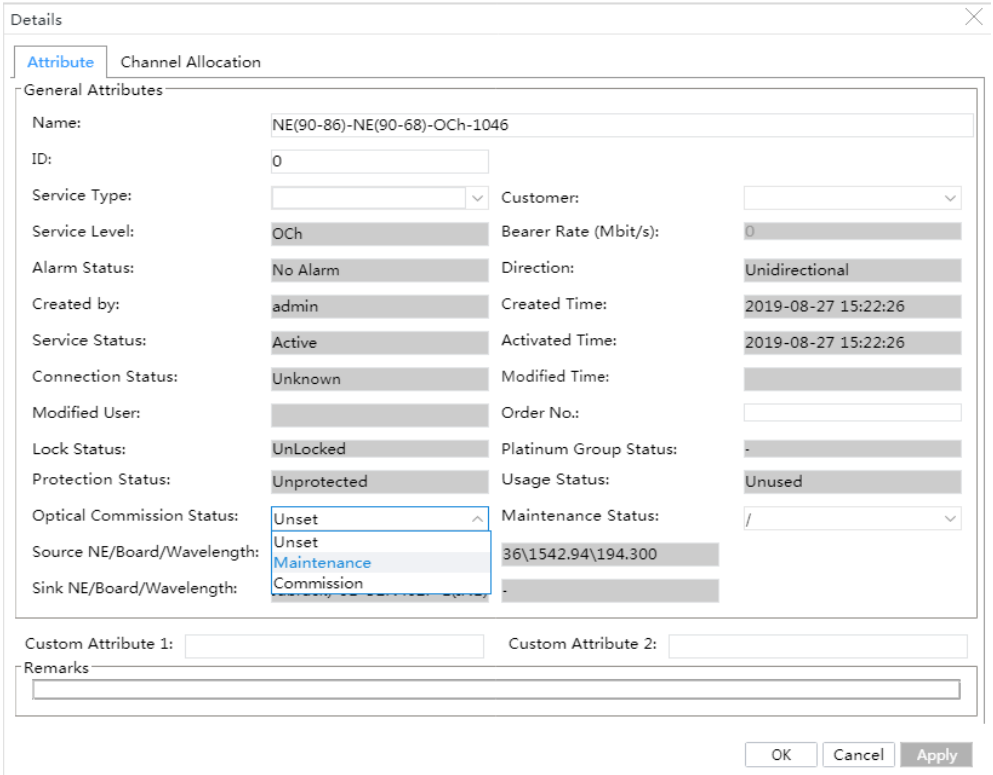
2. In the displayed **Set Trail Browse Filter Criteria** dialog box, select **OCh** in the **Service Level**.



3. Click **Filter All**, and all OCh trails on the live network are displayed.
4. Select and right-click a desired OCh trail. Choose **Details** from the shortcut menu.



5. Set **Optical Commission Status** in the dialog box that is displayed.



5.2.3 Setting Basic OD Monitoring Parameters

The OD can monitor the main optical path and flatness of a network in real time after OD monitoring parameters and alarm optimization monitoring are configured. This section describes how to set basic OD monitoring parameters.

Prerequisites

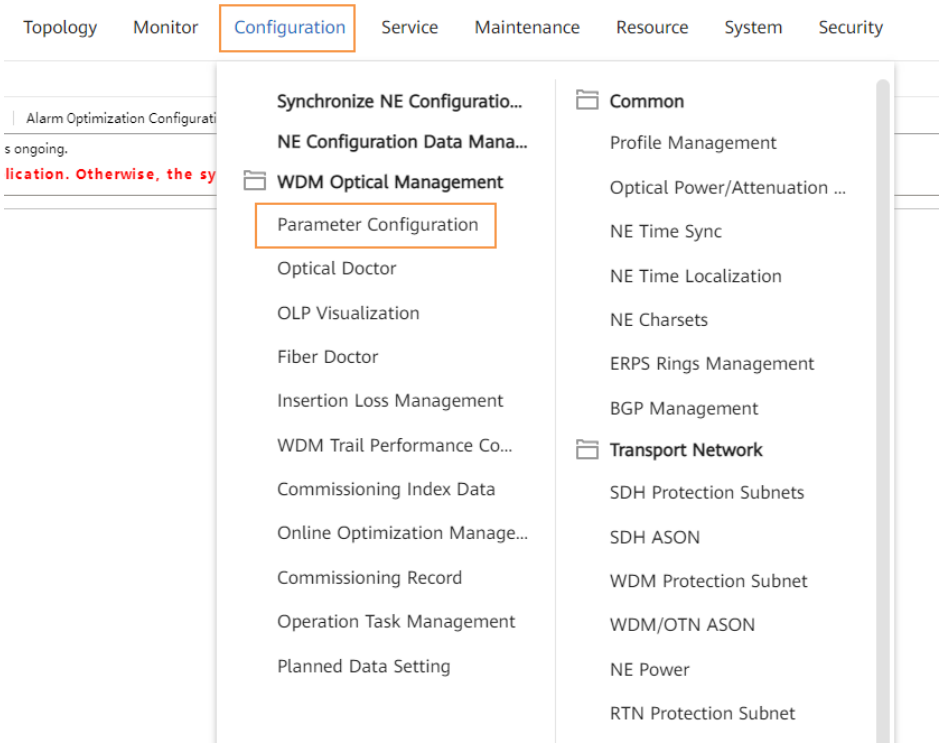
- You are an NMS user with the "Maintainer Group" or higher permission.
- Basic parameters, such as NE time synchronization and NMS-side data synchronization, have been configured.

Background Information

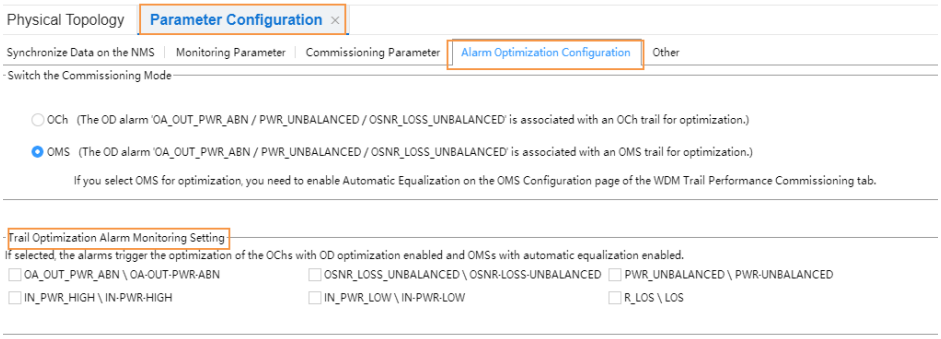
- The optical signal-to-noise ratio (OSNR) is calculated by the OD system based on the OA theories and the receive-end and transmit-end optical power reported by the MCA or LS OA boards in the optical transmission system. This OSNR calculation method can replace the OSNR measurement method using a meter and does not affect services on the live network. In addition, the OSNR obtained using this calculation method is precise and is independent of the signal rate, modulation format, and channel spacing. It can reflect the optical quality of the signals and provides references for checking the system communications quality.
- On all subnets of the entire network, only one configuration policy is supported.

Setting Monitoring Parameters

1. Open the **Network Management** app and choose **Configuration** > **WDM Optical Management** > **Parameter Configuration**.



2. Click **Alarm Optimization Configuration**. In the displayed **Trail Optimization Alarm Monitoring Setting** dialog box, check whether the monitoring parameters are correctly set and click **Apply**. For details about the parameter configuration principles, see the following figure.



NOTE

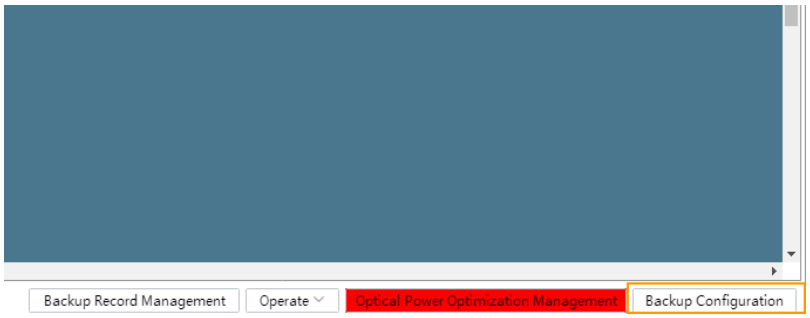
Subnet monitoring is no longer recommended. The configuration here is only compatible with previous versions. OMS configuration is recommended.

Table 5-10 Parameter Description

Field		Value Range	Description
Trail Optimization Alarm Monitoring Setting	SPAN_LOSS_UPPER_GAIN \SPAN-LOSS-UPPER-GAIN SPAN_LOSS_LOWER_GAIN \SPAN-LOSS-LOWER-GAIN OMS_LOSS_ACCUM_ABN \OMS-LOSS-ACCUM-ABN OA_OUT_PWR_ABN \OA-OUT-PWR-ABN PWR_UNBALANCED \PWR-UNBALANCED IN_PWR_HIGH\IN-PWR-HIGH IN_PWR_LOW\IN-PWR-LOW R_LOS OSNR_LOSS_UNBALANCED	• Enable • Disable Default value: **Disable**	• The setting takes effect only after optical power optimization is enabled. • This mode can be used only after an OD optimization license is obtained. When SPAN_LOSS_UPPER_GAIN\SPAN-LOSS-UPPER-GAIN, SPAN_LOSS_LOWER_GAIN\SPAN-LOSS-LOWER-GAIN, OMS_LOSS_ACCUM_ABN\OMS-LOSS-ACCUM-ABR, OA_OUT_PWR_ABN\OA-OUT-PWR-ABR, PWR_UNBALANCED \PWR-UNBALANCED, R_LOS, IN_PWR_HIGH\IN-PWR-HIGH, or IN_PWR_LOW\IN-PWR-LOW occurs, OD automatically starts optimization commissioning for the trails associated with the alarm. The trails must have the OD optimization license. In addition, the system sorts associated trails based on the number of alarms on the trails and preferentially optimizes the trails that have greater number of alarms and are in **Maintenance** state. • If the OD optimization license is not obtained, you cannot configure alarm optimization monitoring. • Only OptiX OSN 98009600/ OptiXtrans E9600 series of V100R019C10SPC500 and later versions support OSNR_LOSS_UNBALANCED alarms.

Configuring the Data Backup Policies

1. In the **Optical Doctor** window, click **Backup Configuration**.



2. On the Manage Backup Configuration dialogue box, select a subnet and configure its backup policies.For details about the parameter setting rules, see **Table 5-11**.

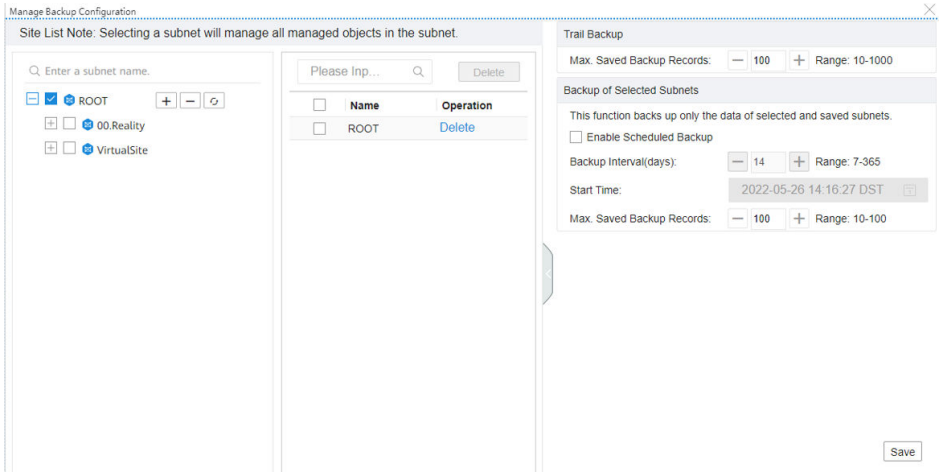


Table 5-11 Parameter Description

Domain		Value	Description
Trail Backup	Max. Saved Backup Records	10-1000 Default: 100	In the **Trail Performance Analysis** window, users can select one or more trails for manual data backup at a time. **Max. Saved Backup Records** indicates the maximum number of times that data can be manually backed up for every trail. When the number of manual backups exceeds the value specified by **Max. Saved Backup Records**, the latest backup data will overwrite the earliest backup data.
Backup of Selected Subnets	Enable Scheduled Backup	Checked, Unchecked Default: Checked	When this check box is selected, the OD will periodically back up the performance data of trails on the selected subnet.

Domain		Value	Description
	Backup Interval (days)	1-365 Default: 14	Indicates the interval for automatic data backup.
	Start Time	-	Indicates the start time for automatic data backup.
	Max. Saved Scheduled Backup Records	10-100 Default: 100	Indicates the maximum number of times that data can be backed up and saved in the storage space. When the number of backups exceeds the value specified by **Number of Retaining Backups**, the latest backup data will overwrite the earliest backup data.

3. Click **Save**.
4. **Optional:** Select **Enable Scheduled Automatic Backup** and click **Save** to back up the data of monitored networks.

NOTE

For a large-scale subnet, the subnet data backup may time out. If the backup fails, contact Huawei engineers.

5.2.4 Enabling OD Monitoring

You can enable OD monitoring in either of the following ways:

- By Subnet

  By subnet, you can apply configurations to all nodes in a subnet. This method is easy to use and efficient and applies to new networks.
- By Trail

  You can select an OMS for OD monitoring. The configuration applies only to this OMS and applies to the capacity expansion of existing networks.

5.2.4.1 Method 1: By Subnet

After network monitoring parameters are set in a centralized manner, the OD can monitor the main optical path and flatness of the network in real time, reports abnormal information, detects network changes, and delivers configuration parameters to a new network node in a timely manner.

Prerequisites

- Set **Subnet Monitoring Configuration** to **Show**.

NOTE

If you want to hide the subnet monitoring configuration function, you can set **Subnet Monitoring Configuration** to **Hide**.

Choose **Configuration** > **WDM Optical Management** > **Parameter Configuration** from the main menu. On the **Monitoring Parameter** tab page, set **Subnet Monitoring Configuration** to **Show** or **Hide**.

- You are an NMS user with the "Maintainer Group" or higher permission.
- The deployment or expansion commissioning has been completed and the network is in the maintenance state.
- OD only monitors the OCh trails in the **Maintenance** state. For details about how to set the status of an OCh trail, see **5.2.2 Setting the Status of OCh Trails**.
- Before enabling OD monitoring, you must set basic OD monitoring parameters. For details, see **5.2.3 Setting Basic OD Monitoring Parameters**.
- If the network is newly deployed, you must **configure monitoring parameters** with reference to this chapter. For an existing network, you are advised to configure OD monitoring with reference to **5.2.4.2 Method 2: By Trail**.
- Trail performance analysis can be performed only 10 minutes after an OD route is configured in the **Network Parameter Settings** window or the network monitoring status is changed.
- If the automatic level control (ALC) function is configured on a network containing OptiX OSN 98009600/8800/6800/3800/OptiXtrans E9600 equipment, the main optical path monitoring function of the OD cannot be started, and an OMS_LOSS_MON_FAIL or OMS-LOSS-MON-FAIL alarm will be reported (only on the working trail when protection is configured). The OD-provided power maintenance function is more advanced and delivers better usability than the ALC function. Before enabling the OD function, you must delete the ALC function from a subnet. For details about the method of deleting the ALC function, see **8.4 Deleting an ALC Link**.

NOTE

To use the ALC function on a network where the monitoring or commissioning function of the main optical path on the OD is enabled, you must disable the monitoring or commissioning function first.

- During the flatness adjustment on a network containing OptiX OSN 98009600/8800/6800/3800/OptiXtrans E9600 equipment, the OD will disable the automatic power equilibrium (APE) function. The flatness adjustment results provided by the OD may be inconsistent with the results of flatness adjustment using the APE function. The OD-provided power maintenance function is more advanced and delivers better usability than the APE function. Before enabling the OD function, you are advised to delete the APE function from a subnet. For details about the method of deleting the APE function, see **8.5 Deleting an APE Pair**.

Background Information

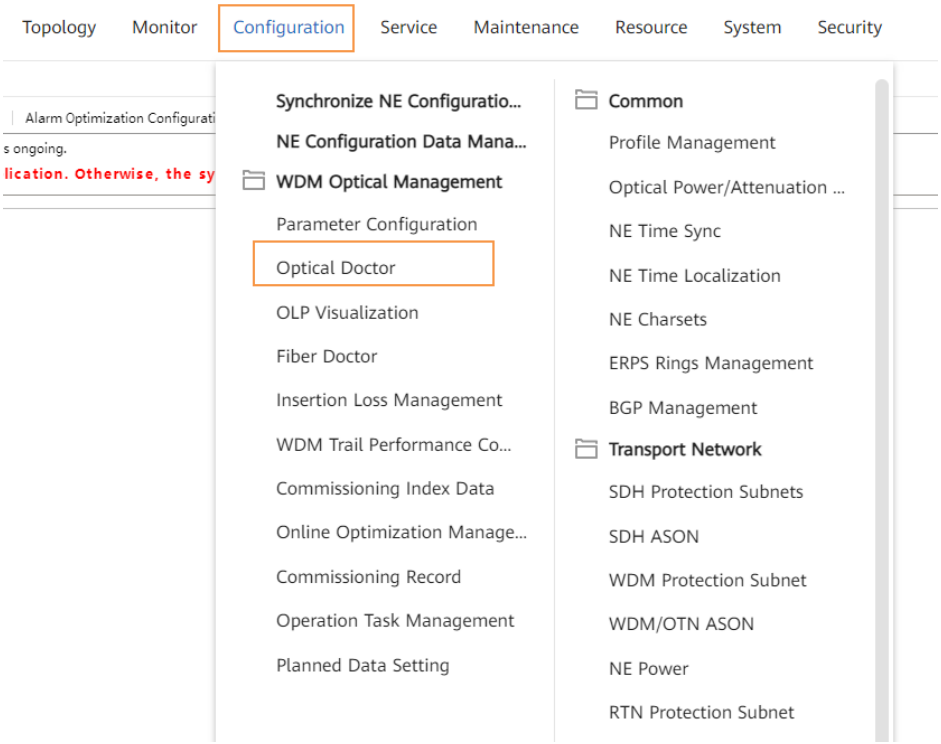
- The optical signal-to-noise ratio (OSNR) is calculated by the OD system based on the OA theories and the receive-end and transmit-end optical power reported by the MCA or LS OA boards in the optical transmission system. This

OSNR calculation method can replace the OSNR measurement method using a meter and does not affect services on the live network. In addition, the OSNR obtained using this calculation method is precise and is independent of the signal rate, modulation format, and channel spacing. It can reflect the optical quality of the signals and provides references for checking the system communications quality.

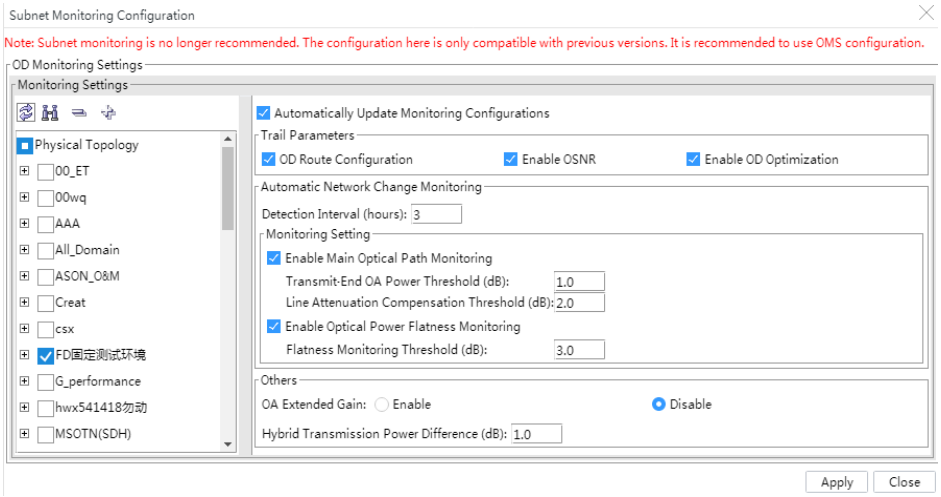
- When a network is managed by multiple NCE servers, the OD function can be enabled on at most one NCE; otherwise, abnormalities may occur. For example, the reported alarms will be inconsistent, or an optimization commissioning conflict will occur.
- On all subnets of the entire network, only one configuration policy is supported.
- Assume that subnet A is composed of subnet A1 and A2. If both subnet A1 and A2 are on an OMS, for ensuring the integrity of the saved historical data and generated report, and entirely monitoring of the OMS, you need to select subnet A when setting the OD monitoring configuration. That is, subnet A1 and A2 must be concurrently selected.
- Because the OD periodically and automatically monitors network changes, when the network topology changes, you can manually click **Apply** to apply the configured parameters.

Setting Monitoring Parameters

1. Choose **Configuration** > **WDM Optical Management** > **Optical Doctor** from the main menu on the NCE Network Management app. The **Optical Doctor** window is displayed.



2. Click **Operate** > **Subnet Monitoring Configuration** to select the desired subnet, set related monitoring parameters based on the network plan. For the parameter setting rules, refer to the following table.



NOTE

- Subnet A containing A1, A2, and A3 is used as an example. Subnet A is automatically monitored only when A1, A2, and A3 are selected.
- If subnet A contains NEs B1 and B2 in addition to subnet A1, A2, and A3, you are advised to create subnet A4, classify NEs B1 and B2 into subnet A4, and then select the desired subnet for monitoring. If subnet A4 is not created, NEs B1 and B2 will be automatically monitored and the monitoring cannot be canceled after subnets A1, A2, and A3 are selected for monitoring.
- If subnet A has a new subnet A4, A4 is monitored only when subnet A is monitored. The monitoring policy of A4 is the same as that of subnet A.

Table 5-12 Parameter Description

Field	Value Range	Description
Automatically Update Monitoring Configurations	• Enable • Disable Default value: **Enable**	If NE changes occur, such as adding or NEs, the OD will automatically deliver the configured monitoring policy to new network nodes at the preset interval. Users do not need to manually set monitoring parameters. Other parameters in the dialog box can be set only after the **Automatically Update Monitoring Configurations** check box is selected. **NOTE** When NE changes occur and monitoring configurations need to be updated immediately, click **Apply**.

Field		Value Range	Description
Trail Parameters	OD Route Configuration	• Enable • Disable Default value: **Enable**	This check box must be selected. When this check box is selected, the OD will enable one-click configuration for OSNR detection for all OMSs that are not configured with OSNR detection and both the source and sink are on the monitored subnet. The following functions are available only after **OD Route Configuration** is selected: • Viewing the OSNR of an OMS • Enabling OSNR equilibrium commissioning • Viewing single-wavelength optical power of the OA board not equipped with MCA/OPM8 during expansion commissioning or optimization commissioning **NOTE** OSNR detection can be enabled for all trails in each OMS one by one. For details about the method, see **5.2.4.2.1 Configuring an OD Route for a Trail**.
	Enable OSNR	• Enable • Disable Default value: **Enable**	You are advised to select the check box. After this check box is selected, OSNR detection and output are enabled, and **OSNR Status** is set to **Enable** for all OCh trails on the monitored subnet. In this scenario, each unidirectional OCh trail will consume an OD wavelength monitoring and management license. The OSNR of the trail whose **OSNR Status** is **Enable** can be viewed only after the **Enable OSNR** check box is selected **NOTE** OSNR detection can be enabled for all trails one by one. For details about the method, see **5.2.4.2.2 Configuring OSNR Detection for a Trail**.

Field		Value Range	Description
	Enable OD Optimization	• Enable • Disable Default value: **Enable**	This check box must be selected for optical power optimization. If **Enable OD Optimization** is selected, **Enable OSNR** must also be selected. After this check box is selected, OD optimization is enabled for all OCh trails on the monitored subnet, and each unidirectional OCh trail will consume an OD wavelength optimization license. After **Enable OD Optimization** is selected, the OD can perform optimization commissioning for the trail whose **OD Optimization Status** is **Enabled**. **NOTE** You can also configure the OD optimization function for all trails one by one. For details about the method, see *Optical Power Optimization User Guide*.
Automatic Network Chane Monitoring	Detection Interval (hours)	1–24 Default value: **3**	Indicates the interval for applying the configured monitoring policies to new services.
Monitoring Setting	Enable Main Optical Path Monitoring	• Enable • Disable Default value: **Enable**	When **Enable Main Optical Path Monitoring** is selected, the OD will monitor the transmit-end OA optical power and fiber loss compensation (determine whether it exceeds the EOL value) on each OMS whose source and sink are on the monitoring subnet. **NOTE** The design fiber loss EOL value must be set to determine whether the fiber loss exceeds the design EOL value. For the configuration method, see **5.2.1.3 Setting Fiber Parameters**.
	Enable Optical Power Flatness Monitoring	• Enable • Disable Default value: **Enable**	When **Enable Optical Power Flatness Monitoring** is selected, the OD will monitor the optical power flatness of each OMS whose source and sink are on the monitoring subnet.

Field		Value Range	Description
Others	OA Extended Gain	• Enable • Disable Default value: **Disable**	Set **OA Extended Gain** to **Enable**. Then, the gains of the following boards can be adjusted: • OBU103 integrated in TNF1BAS • TNF2OBU
	Hybrid Transmission Power Difference (dB)	0–5 Default value: **0**	When 10G and 200G services are transmitted on a non-coherent network, set the nominal optical power that can be reduced for 10G services without affecting the transmission of 10G services.

NOTE

The OD can automatically detect whether the input optical power of the OTU boards at the sink ends of network-wide OCh trails is abnormal.

5.2.4.2 Method 2: By Trail

5.2.4.2.1 Configuring an OD Route for a Trail

In addition to centralized configuration, individual configuration can be used to configure an OD route for each trail to achieve E2E OSNR detection. If no OD route is configured, no OSNR value can be displayed and no OSNR equalization can be performed.

Prerequisites

- You are an NMS user with "Operator Group" rights or higher.
- The logical fiber connection and optical cross-connection must be properly configured.
- The inter-NE OSC communication in the OMS must be normal.
- Only the OSN 8800/6800/3800/9800 TN12OPM8, TN15OPM8, TN97OPM8, TN11MCA402, and TN11MCA802, and OSN 1800 TNF1OPM8 or LS OA boards support OSNR detection.
- Only TN15OPM8 and TN97OPM8 supports OSNR detection in the FlexGrid system.
- The TNG2OPM8/TNG3OPM8 board support OSNR detection for 10 Gbit/s, 40 Gbit/s, 100 Gbit/s, 200 Gbit/s, and 400 Gbit/s signals and support OSNR detection for wavelengths at a fixed channel spacing, flexible grid wavelengths, and super C band.
- If MCA or OPM8 boards are used to detect OSNR, MCA or OPM8 boards must be configured for the first and last OA boards in an OMS. If the OMS contains

only one OA board, an MCA or OPM8 board must be configured for the OA board; otherwise, OSNR cannot be detected for the OMS.

- If LS OA boards are used to detect OSNR, LS OTU boards must be configured, and LS OA boards must be configured for the first and last OA boards in an OMS. If the OMS contains only one OA board, an LS OA board must be configured for the OA board; otherwise, OSNR cannot be detected for the OMS.

Precautions

- For Raman boards, the OD route configuration does not support the CRPC or ROP board. However, it supports the RAU/ SRAU/SRAPXF board in gain locking mode.
- All the OMSs on a complete OCh trail must be configured with OD route configuration function; otherwise, OSNR detection is not supported.
- When a fiber cut occurs on the downstream links, the OPM8 or LS OA or MCA board at the receive end of an OMS cannot detect the optical power. In addition, the OPM8/MCA4/MCA8 or LS OA board at the transmit end cannot calculate and display OSNR values of all detected wavelengths.
- If the OPM8 or LS OA or MCA board at an ROADM or OTM site is faulty, the OSNR of wavelengths that traverse this site cannot be detected at the local site or any of the downstream sites.
- The TNF1OPM8 board does not support the detection of 200G ePDM-e16QAM (SDFEC2) signals of LDCA boards.

Tools, Equipment, and Materials

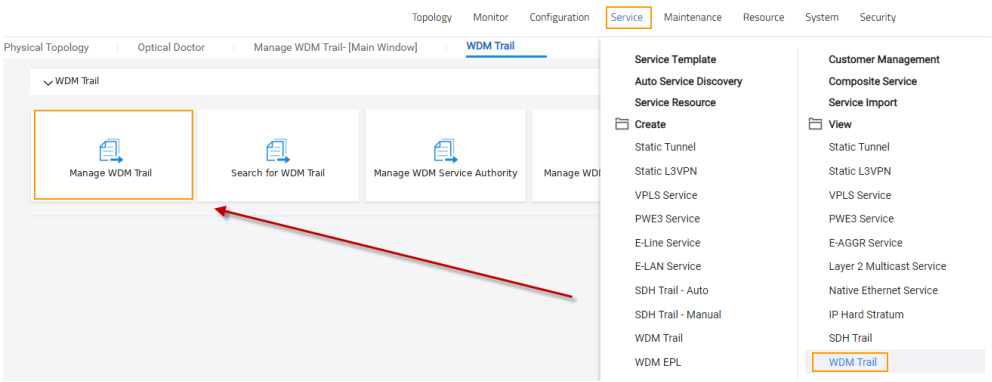
NCE

Procedure

Step 1 Specify the type and length for fibers between sites. For details, see **5.2.1.3 Setting Fiber Parameters**.

Step 2 Filtering the OMS trail.

1. Choose **Service > View > WDM Trail** > **Manage WDM Trail** from the main menu on the NCE Network Management app.

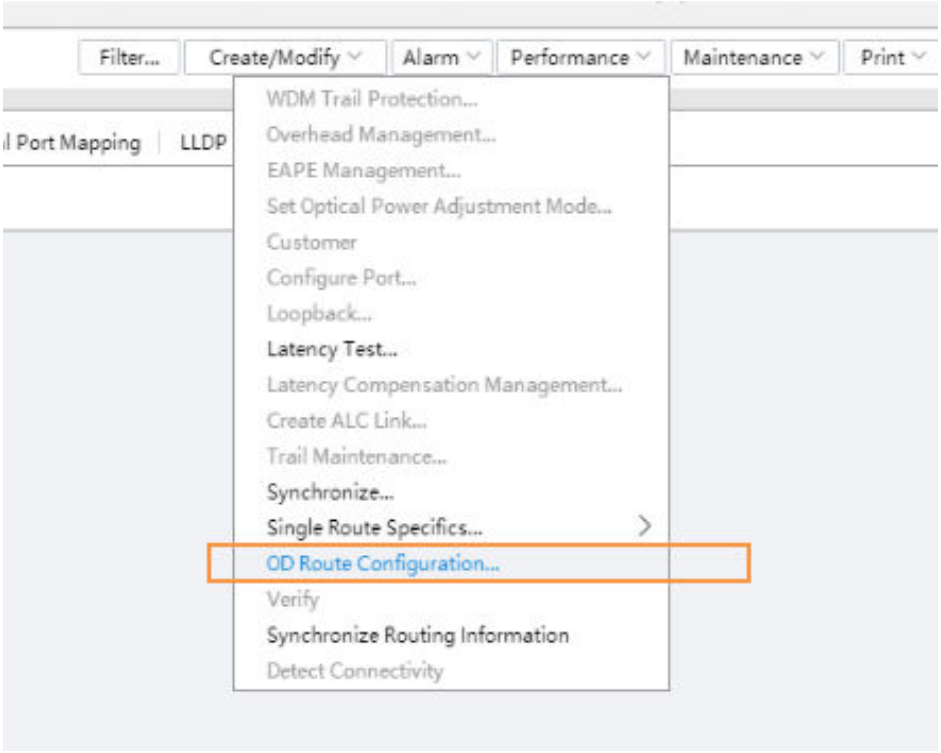


2. In the displayed **Set Trail Browse Filter Criteria** dialog box, select **OMS** in the **Service Level**.

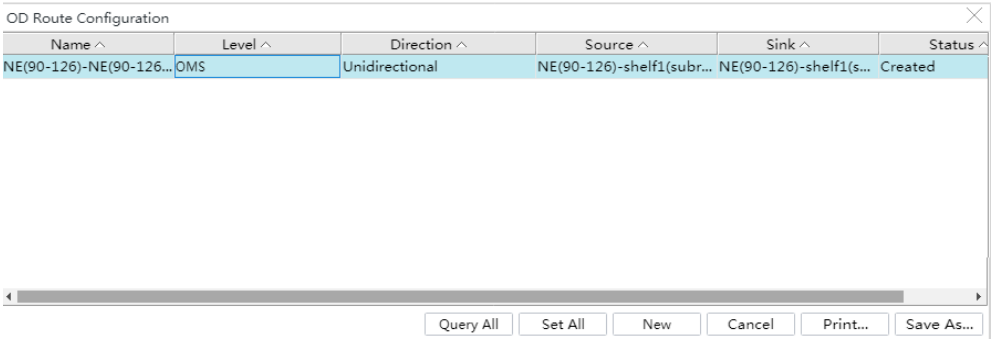
3. Click **Filter All**, and all OMS trails on the live network are displayed.

Step 3 Configure the OD route configuration function for an OMS.

1. Click **Maintenance**, and choose **OD Route Configuration**.



2. The scanning progress window is displayed. After the scanning completes, the **Result** dialog box is displayed, click **Close**.
3. **Optional:** Click **Query All**. The status of all OMSs is refreshed.
4. In the **OD Route Configuration** window, select an OMS to be created. Click **New**.



5. In the displayed **Result** dialog box, click **Close**.
6. Check whether **Status** of a set OMS is **Created**.

NOTE

When the network topology changes or the boards/fiber connections change, the OD route configuration function of the OMSs must be reconfigured.

- Click **Query All**. The status of all OMSs is refreshed.
- In the **OD Route Configuration** window, select the OMSs affected by the network topology changes or the boards/fiber connections change. Click **New**.

----End

Follow-up Procedure

After the OD route configuration function is configured on the OPM8/MCA4/MCA8 or LS OA board, you can use the following methods to locate the causes of an abnormal OSNR.

- In the query of the optical spectrum analysis data, only the optical power can be obtained. For the OSNR, **---** is displayed and OSNR calculation is abnormal. The possible causes are as follows:
  - The OMS is configured incorrectly or offline boards exist in this section. Check the function configurations of this OMS on the NMS and the actual networking configurations.
  - The scanned spectrums at the transmit and receive ends of the OPM8/MCA4/MCA8 or LS OA board are inconsistent. Check the scanned wavelength in the OMS.
  - The inter-NE communication is abnormal. Check whether you can log in to NEs and whether NEs are reachable.
  - The upstream OMS is abnormal. Check the optical spectrum information of the OPM8/MCA4/MCA8 or LS OA board in the upstream OMS along the signal flow direction. If the same fault exists, use the same methods to locate the causes.
  - If the fiber type of the OMS is modified, the OSNR detection of the OMS must be reconfigured refer to **Step 3**.
- In the query of wavelength information of a specific wavelength in the optical spectrum analysis data, no information is reported. The possible causes are as follows:
  - The physical fiber connection of the OPM8/MCA4/MCA8 or LS OA board is incorrect. Check the physical fiber connection.
  - The optical path on the link is abnormal. Check whether the optical path is set up, for example, whether the optical cross-connection is created, whether the physical fiber connection is correct, and whether the OA laser is enabled.

5.2.4.2.2 Configuring OSNR Detection for a Trail

In addition to centralized configuration, individual configuration can be used to enable OSNR detection for each trail to achieve OCh trail OSNR detection. If the OSNR detection function is not enabled for an OCh trail, the OSNR value of the OCh trail cannot be displayed.

Prerequisites

- You are an NMS user with the "Maintainer Group" or higher permission.
- The logical fiber connection and optical cross-connection must be properly configured.
- Only the OSN 8800/6800/3800/9800 TN12OPM8, TN15OPM8, TN97OPM8, TN11MCA402, and TN11MCA802, and OSN 1800 TNF1OPM8 or LS OA boards support OSNR detection.
- Only TN15OPM8 and TN97OPM8 supports OSNR detection in the FlexGrid system.
- The TNG2OPM8/TNG3OPM8 board support OSNR detection for 10 Gbit/s, 40 Gbit/s, 100 Gbit/s, 200 Gbit/s, and 400 Gbit/s signals and support OSNR detection for wavelengths at a fixed channel spacing, flexible grid wavelengths, and super C band.

Precautions

The TNF1OPM8 board does not support the detection of 200G ePDM-e16QAM (SDFEC2) signals of LDCA boards.

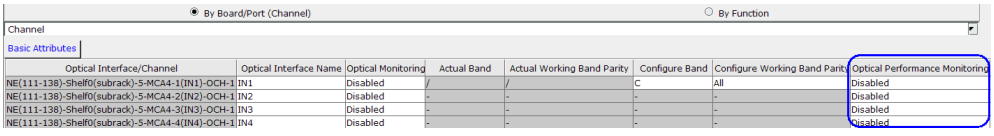
Tools, Equipment, and Materials

NCE

Procedure

Step 1 **Optional:** If you need to query single-wavelength optical power and OSNR by station, the optical performance monitoring for the TN11MCA402, and TN11MCA802 boards should be enabled. The optical performance monitoring for other boards need not be enabled.

1. Search for the NE where the TN11MCA402 or TN11MCA802 boards reside and double-click the NE to open the NE Panel.
2. In **NE Panel**, select and right-click the board. Choose **WDM Configuration** from the shortcut menu to start the NE Explorer.
3. In the NE Explorer, select a board to be set and choose **Configuration** > **WDM Interface**.
4. Click the **Basic Attributes** tab. Set **Optical Performance Monitoring** to **Enable**.



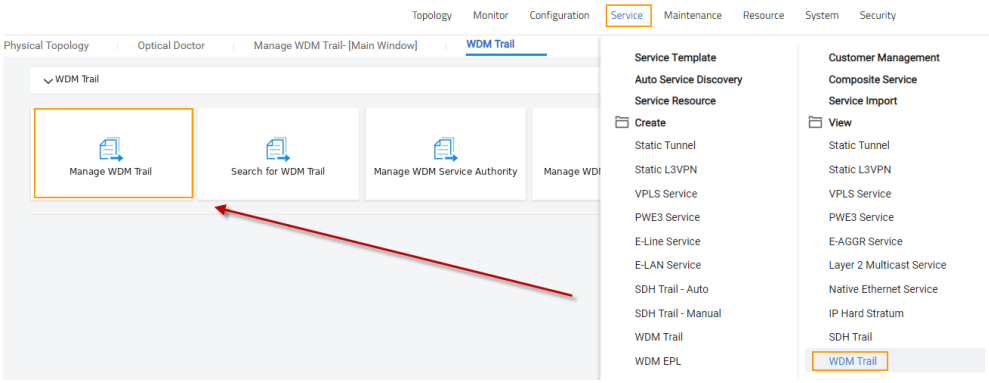
5. Click **Apply**.

NOTE

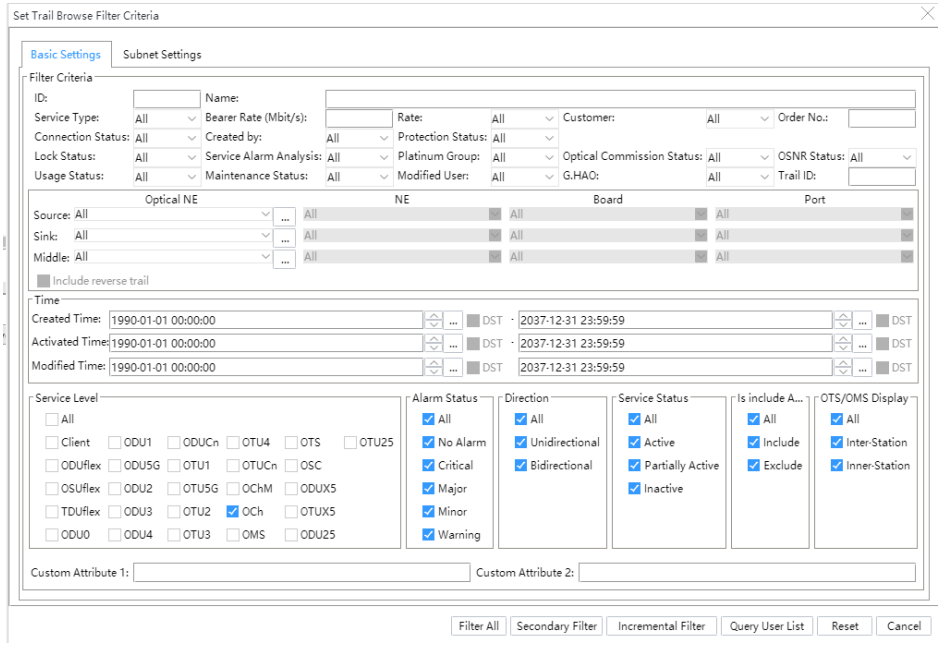
When the optical performance monitoring for the TN11MCA402, or TN11MCA802 board is enabled, each MCA port automatically consumes an OSNR port license. When the optical performance monitoring for the TN11MCA402, or TN11MCA802 board is disabled, the used licenses are released.

Step 2 Enable OSNR detection function for each trail.

1. Choose **Service** > **View** > **WDM Trail** > **Manage WDM Trail** from the main menu on the NCE Network Management app.



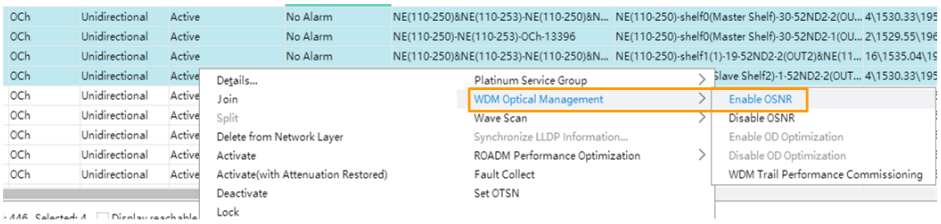
2. In the **Set Trail Browse Filter Criteria** dialog box, select the desired OCh trail. The trail is displayed in the trail list.



NOTE

- If you need to filter all the trails, click **Filter All**.
- If you need to add to the list more trails that match the requirement, click **Incremental Filter**.
- To search the existing trails using new filter criteria, click **Secondary Filter**.

3. Select and right-click one or more OCh trails, and choose **WDM Optical Management** > **Enable OSNR** from the shortcut menu. **OSNR Status** of the selected trail(s) becomes **Enabled**.



NOTE

When the OSNR detection function is enabled for trails, each unidirectional trail automatically consumes an OD management system license. When the OSNR detection function is disabled for trails, the used licenses are released.

----End

5.2.4.2.3 Enabling OD Monitoring by Trail

In addition to OD monitoring configuration by subnet, you can also enable OD monitoring by trail. After you enable OD monitoring for an OMS trail, the OD can monitor the main optical path and flatness of the OMS trail in real time and report abnormal information.

Prerequisites

- You are an NMS user with the "Maintainer Group" or higher permission.
- The deployment or expansion commissioning has been completed and the network is in the maintenance state.
- OD only monitors the OCh trails in the **Maintenance** state. For details about how to set the status of an OCh trail, see **5.2.2 Setting the Status of OCh Trails**.
- Before enabling OD monitoring, you must set basic OD monitoring parameters. For details, see **5.2.3 Setting Basic OD Monitoring Parameters**.
- For an existing network, you are advised to **configure monitoring parameters** by referring to this chapter. The network is an existing network. If the network is newly deployed, you must enable OD monitoring by referring to **5.2.4.1 Method 1: By Subnet**.
- Trail performance analysis can be performed only 10 minutes after an OD route is configured in the **Network Parameter Settings** window or the network monitoring status is changed.
- If the automatic level control (ALC) function is configured on a network containing OptiX OSN 98009600/8800/6800/3800/OptiXtrans E9600 equipment, the main optical path monitoring function of the OD cannot be started, and an OMS_LOSS_MON_FAIL or OMS-LOSS-MON-FAIL alarm will be reported (only on the working trail when protection is configured). The OD-provided power maintenance function is more advanced and delivers better usability than the ALC function. Before enabling the OD function, you must delete the ALC function from a subnet. For details about the method of deleting the ALC function, see **8.4 Deleting an ALC Link**.

NOTE

To use the ALC function on a network where the monitoring or commissioning function of the main optical path on the OD is enabled, you must disable the monitoring or commissioning function first.

- During the flatness adjustment on a network containing OptiX OSN 98009600/8800/6800/3800/OptiXtrans E9600 equipment, the OD will disable the automatic power equilibrium (APE) function. The flatness adjustment results provided by the OD may be inconsistent with the results of flatness adjustment using the APE function. The OD-provided power maintenance function is more advanced and delivers better usability than the APE function.

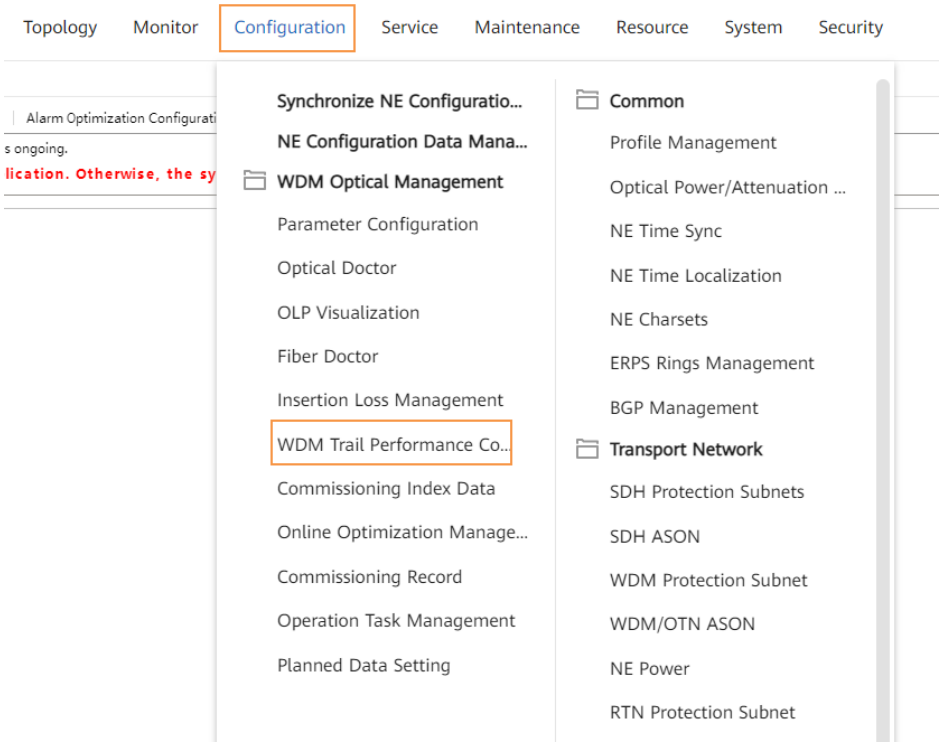
Before enabling the OD function, you are advised to delete the APE function from a subnet. For details about the method of deleting the APE function, see **8.5 Deleting an APE Pair**.

- In the local dimension, monitoring is enabled when adding wavelengths and disabled when dropping wavelengths.

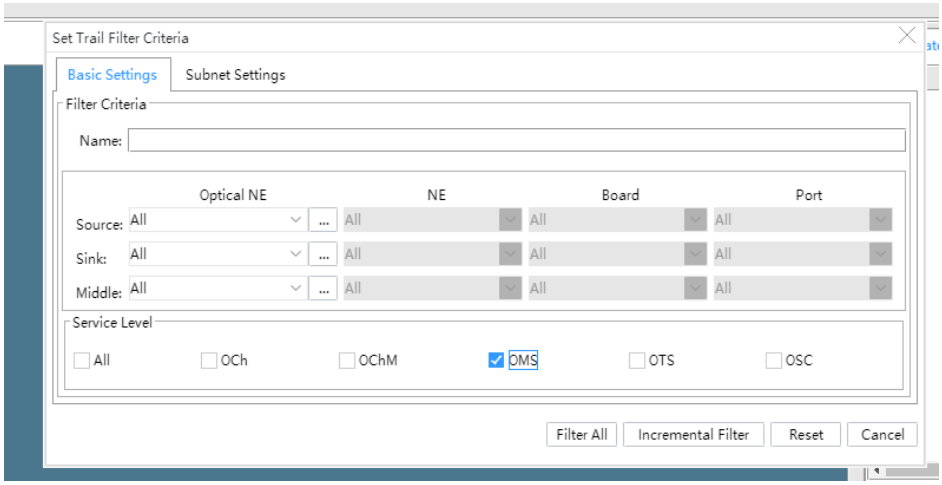
Procedure

- Method 1

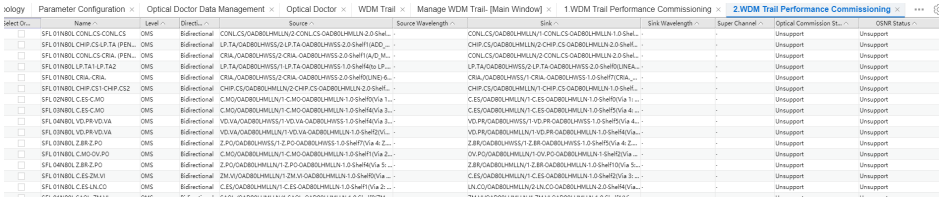
  a. Choose **Configuration** > **WDM Optical Management** > **WDM Trail Performance Commissioning** from the main menu.



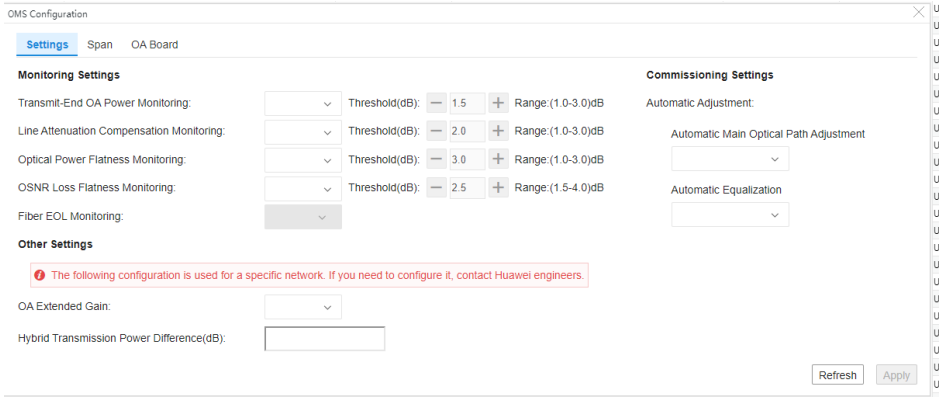
  b. In the **Set Trail Filter Criteria** dialog box, select **OMS** and click **All Filter**.



  c. The filtered trails are displayed in the **WDM Trail Performance Commissioning** window.



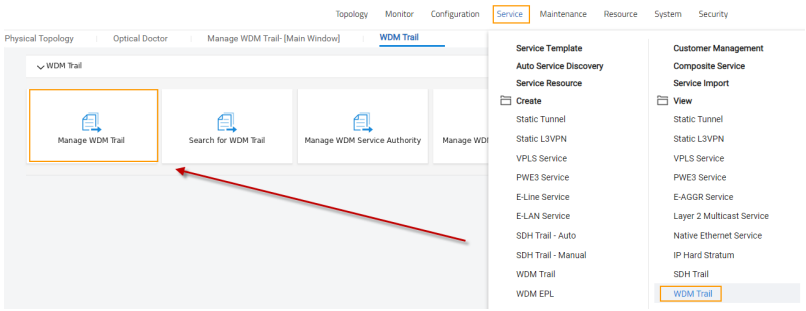
d. Click **Configure** in the lower right corner and choose **OMS Configuration**. In the displayed **OMS Configuration** dialog box, set OMS parameters. For details about the parameters, see **Table 5-13**.



- Method 2

  a. Filter OMS trails.

  i. Choose **Service** > **View** > **WDM Trail** > **Manage WDM Trail** from the main menu.

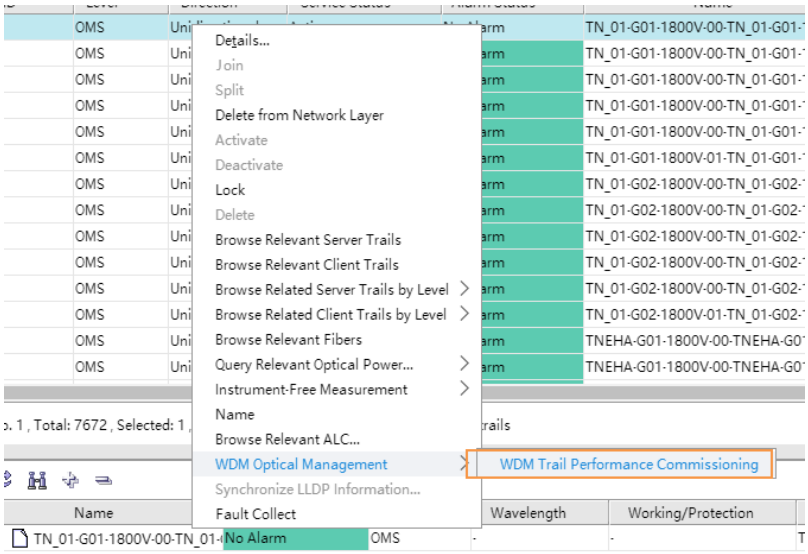


  ii. In the **Set Trail Browse Filter Criteria** dialog box, set **Service Level** to **OMS**.

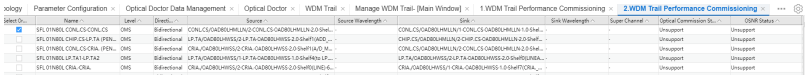
  iii. Click **Filter All**. All OMS trails on the live network are displayed.

  b. Enable OD monitoring for OMS trails.

  i. Choose the desired OMS and right-click to choose **WDM Optical Management** > **WDM Trail Performance Commissioning**.



ii. View trails in the **WDM Trail Performance Commissioning** window.



iii. Click **Configure** in the lower right corner and choose **OMS Configuration**. In the displayed **OMS Configuration** dialog box, set OMS parameters. For details about the parameters, see **Table 5-13**.

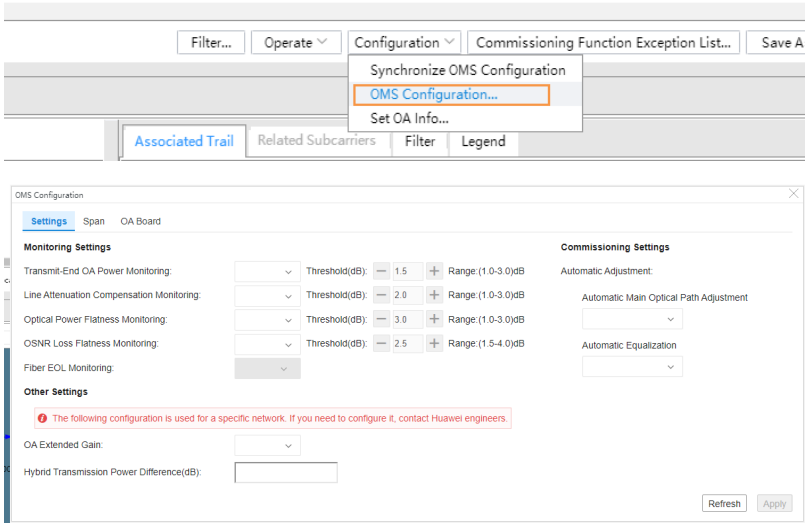


Table 5-13 Parameter description

Parameter	Value	Description
Transmit-End OA Power Monitoring	• Enable • Disable	When **Transmit-End OA Power Monitoring** is enabled, the OD monitors the transmit-end OA optical power of the selected OMS.

Parameter	Value	Description
	Threshold	Indicates the threshold for the difference between the current output optical power of the transmit-end OA board in an OMS and the target value. An OA_OUT_PWR_ABN \ OA-OUT-PWR-ABN alarm is reported when the difference exceeds the threshold. For example, if the threshold is 1.5 dB, an OA_OUT_PWR_ABN \ OA-OUT-PWR-ABN alarm will be reported if the difference between the current output optical power of the transmit-end OA board and the target value is greater than or equal to 1.5 dB. **NOTE** The OA_OUT_PWR_ABN alarm disappears during the next scanning performed by the MCA board when the following condition is met: Current output optical power of the OA – Target value < Optical power threshold of the transmit-end OA
Line Attenuation Compensation Monitoring	• Enable • Disable	When **Line Attenuation Compensation Monitoring** is enabled, the OD monitors whether the line attenuation compensation of the selected OMS exceeds the EOL value. **NOTE** The design fiber loss EOL value must be set to determine whether the fiber loss exceeds the design EOL value. For the configuration method, see **5.2.1.3 Setting Fiber Parameters**.

Parameter	Value	Description
	Threshold	Indicates the threshold for the difference between the loss of optical transmission section (OTS) and OA gain. ● A SPAN_LOSS_UPPER_GAIN \ SPAN-LOSS-UPPER-GAIN alarm is reported when the OTS loss is greater than the OA gain and the difference between the OTS loss and OA gain exceeds the threshold. ● A SPAN_LOSS_LOWER_GAIN \ SPAN-LOSS-LOWER-GAIN alarm is reported when the OTS loss is lower than the OA gain and the difference between the OTS loss and OA gain exceeds the threshold. ● An OMS_LOSS_ACCUM_ABN \ OMS-LOSS-ACCUM-ABN alarm is reported when the accumulated difference between the OTS loss and OA gain exceeds the threshold. **NOTE** OTS loss = Output optical power of the upstream OA board – Input optical power of the downstream OA board. An OTS loss can be caused by many factors such as the fiber loss, EVOA attenuation, and insertion loss of fiber connectors or boards. **NOTE** For the SPAN_LOSS_UPPER_GAIN \ SPAN-LOSS-UPPER-GAIN or SPAN_LOSS_LOWER_GAIN \ SPAN-LOSS-LOWER-GAIN alarm: ● In the **Alarm Info** window, the alarm is cleared if the offset between the span loss and the gain compensation value is within half of the alarm threshold. For example, if the alarm threshold is 2, the alarm is cleared when the offset between the span loss and gain compensation value is -1 to 1. ● In the **Trail Performance Analysis** window, the alarm is cleared if the offset between the span loss and the gain compensation value is within the alarm threshold.
Optical Power Flatness	● Enable ● Disable	When **Optical Power Flatness Monitoring** is enabled, the OD monitors the optical power flatness of the selected OMS.

Parameter	Value	Description
Monitoring	Threshold	When multiple wavelengths are present in an OMS, the difference between the optical power of each OCh wavelength and the average optical power cannot exceed the optical power flatness threshold. The configuration is effective only when **Enable Optical Power Flatness Monitoring** is selected. **NOTE** The PWR_UNBALANCED alarm disappears during the next scanning performed by the MCA board when the following condition is met: Optical power of the monitoring wavelength – Average optical power of the monitored wavelength < Optical power flatness threshold **NOTE** For equipment versions earlier than V100R019C10SPC500, the threshold ranges from 1 dB to 3 dB.
OSNR Loss Flatness Monitoring	• Enable • Disable	When **OSNR Loss Flatness Monitoring** is enabled, the OD monitors the OSNR loss flatness of the selected OMS.
	Threshold	Set **Threshold (dB)** to a value within the value range. **NOTE** Only OSN 9800 M series and OSN 9800 P series of V100R019C10SPC500 and later versions support OSNR Loss flatness monitoring.
Fiber EOL Monitoring	• Enable • Disable	Whether to enable fiber attenuation monitoring. If the fiber attenuation exceeds the designed value, the SPAN_LOSS_EXCEED_EOL alarm is reported.
Automatic Main Optical Path Adjustment	• Enable • Disable	This parameter is optional. For details, see **5.2.5 Configuring Automatic Main Optical Path Adjustment and Automatic Equalization by Trail**.

Parameter	Value	Description
Automatic Equalization	Enable, Disable	This parameter is optional. For details, see **5.2.5 Configuring Automatic Main Optical Path Adjustment and Automatic Equalization by Trail**. **NOTE** **Auto Equalization** is displayed only in OMS mode when the optical optimization system license has been acquired.
OA Extended Gain	• Enable • Disable Default value: **Disable**	Set **OA Extended Gain** to **Enable**. Then, the gains of the following boards can be adjusted: • TNF1BAS1 • TNF2OBU • TNG2DAP, TNG2DAPXF, and TNG3DAPXF boards: supported only when the TNG3OACE106 optical module is used
Hybrid Transmission Power Difference (dB)	0–5 Default value: **0**	When 10G and 200G services are transmitted on a non-coherent network, set the nominal optical power that can be reduced for 10G services without affecting the transmission of 10G services.

Table 5-14 Parameter description

Parameter		Value Range	Description
Span	Designed Loss Target(dB)	0 to 100	Designed loss of a span.
	Fiber Bol(dB)	0.5 to 85	Initial attenuation of a fiber.
	Fiber Margin(dB)	0 to 10	Attenuation margin of a fiber.

Parameter		Value Range	Description
	Span Loss Offset(dB)	–10 to +10	Set the span loss offset of the downstream OA board in a fiber. If the value is a positive number, the optical power of the downstream OA board will decrease accordingly after the main optical path is optimized.
OA Board	Planned Gain(dB)	-	Planned gain of an OA board. The value range of this parameter is determined by the gain range of an OA board. The gain range varies depending on the OA board type.
	Launch Power(dBm)	–10 to +10	Incident optical power of an OA board.
	Upper Limit of Automatically Adjustable Gain(dB)	-	Incident optical power of an OA board.

Follow-up Procedure

To disable the monitoring of the main optical path or optical power flatness, perform the following steps:

Step 1 In the **WDM Trail Performance Commissioning** dialog box, select the desired trails.

Step 2 Click **Configure** and select **OMS Configuration**,choose **Disable** from the **Transmit-End OA Power Monitoring** drop-down menu, and click **Apply**.

Step 3 Click **Configure** and select **OMS Configuration**,choose **Disable** from the **Line Attenuation Compensation Monitoring** drop-down menu, and click **Apply**.

Step 4 Click **Configure** and select **OMS Configuration**,choose **Disable** from the **Optical Power Flatness Monitor** drop-down menu, and click **Apply**.

----End

5.2.5 Configuring Automatic Main Optical Path Adjustment and Automatic Equalization by Trail

After automatic adjustment of the main optical path is enabled for an OMS, the system can automatically optimize the main optical path of the OMS that generates the OMS_LOSS_ACCUM_ABN, SPAN_LOSS_UPPER_GAIN, or SPAN_LOSS_LOWER_GAIN alarm.

You can configure automatic equalization by trail to enable automatic equalization for each OMS so that the system can automatically optimize the OMSs for which the OA_OUT_PWR_ABN, PWR_UNBALANCED, or OSNR_LOSS_UNBALANCED alarm is reported.

Prerequisites

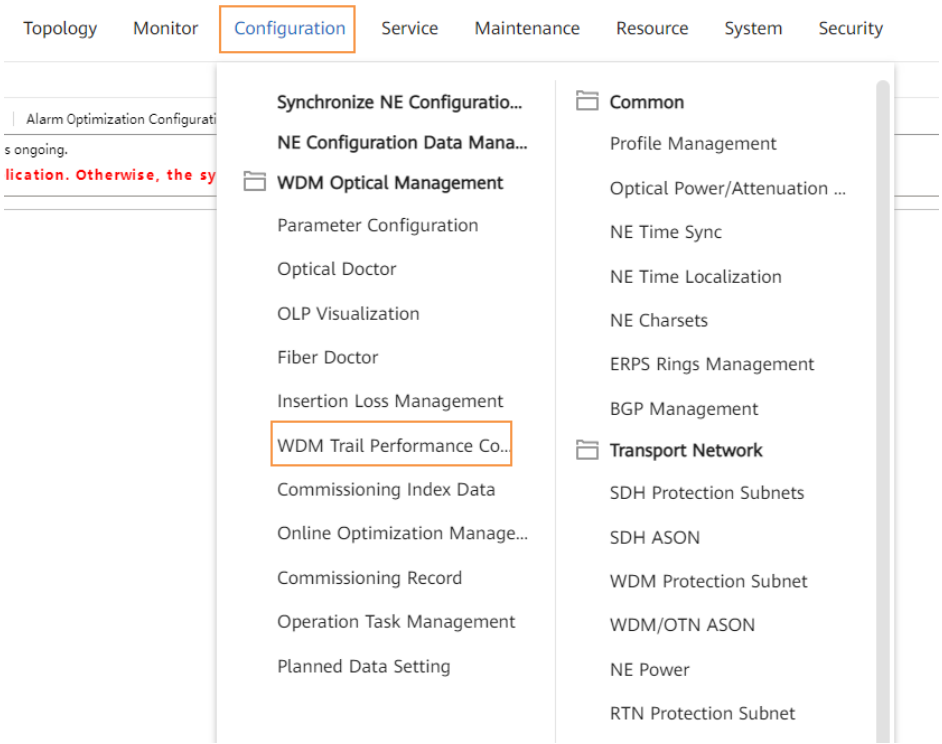
- You are an NMS user with the "Maintainer Group" or higher permission.
- You have obtained an OD optimization license.
- You can enable automatic main optical path adjustment only after **Enable Main Optical Path Monitoring** is selected for trails.
- **Auto Equalization** is displayed only in OMS mode when the optical optimization system license has been acquired.

Tools, Equipment, and Materials

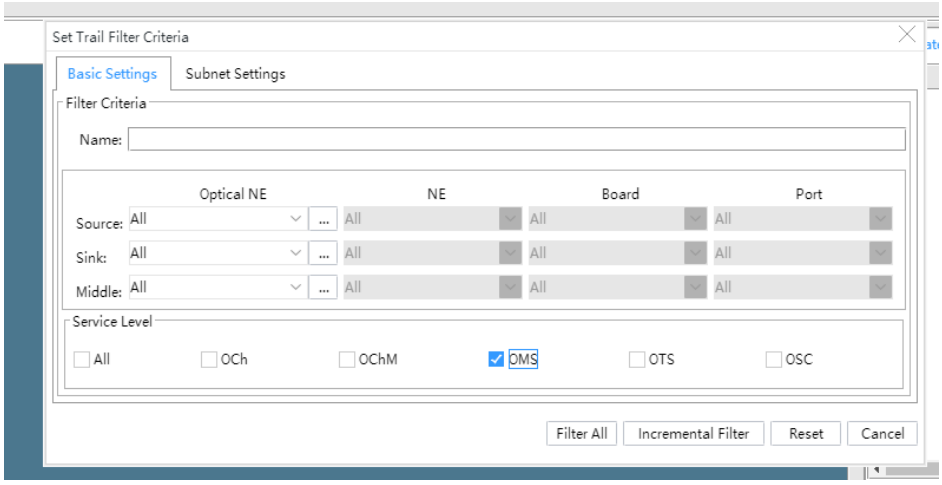
NCE

Procedure

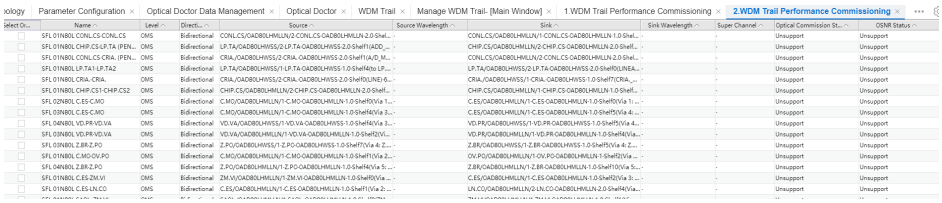
- Method 1
  a. Choose **Configuration** > **WDM Optical Management** > **WDM Trail Performance Commissioning** from the main menu.



b. In the **Set Trail Filter Criteria** dialog box, select **OMS** and click **All Filter**.



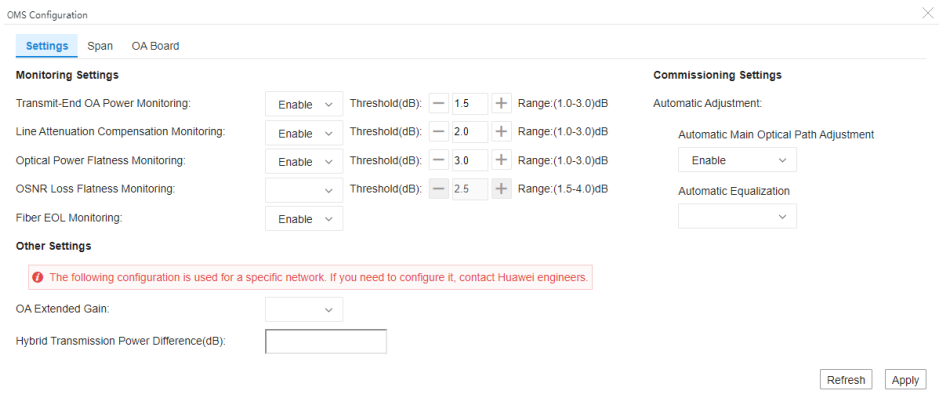
c. The filtered trails are displayed in the **WDM Trail Performance Commissioning** window.



d. Select one or more trails to be configured,click **Configure** and select **OMS Configuration**. In the displayed **OMS Configuration** dialog box, set **Automatic Main Optical Path Adjustment** and **Automatic Equalization** to **Enable** and click **Apply**.

NOTE

Auto Equalization is displayed only in OMS mode when the optical optimization system license has been acquired.



e. In the displayed **Risk Check** dialog box, read risk notes and determine whether to continue to enable automatic main optical path adjustment.

i. If an OMS is abnormal and you still want to enable automatic main optical path adjustment, select the **I know all the risks and choose to forcibly enable automatic adjustment** check box, and click **Continue**.

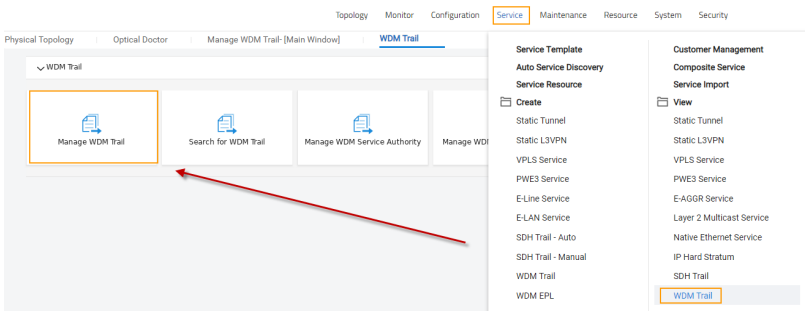
ii. If you want to enable automatic main optical path adjustment only for normal OMSs, select the **Enable only normal OMSs** check box and click **Continue**.

f. Click **OK** in the **Prompt** dialog box.

- Method 2

a. Filter OMS trails.

i. Choose **Service** > **View** > **WDM Trail** > **Manage WDM Trail** from the main menu.

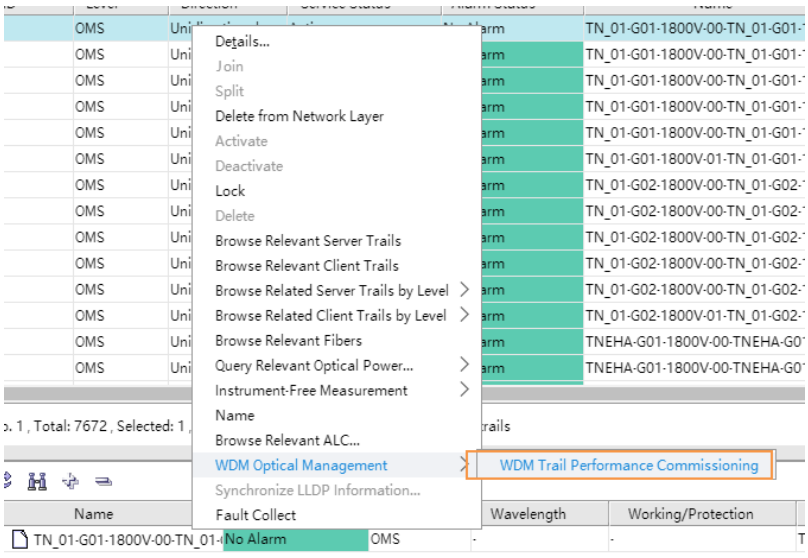


ii. In the **Set Trail Browse Filter Criteria** dialog box, set **Service Level** to **OMS**.

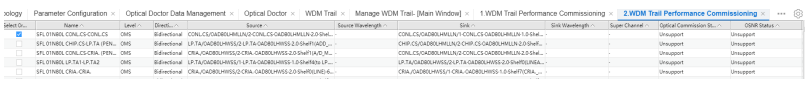
iii. Click **Filter All**. All OMS trails on the live network are displayed.

b. Enable automatic adjustment of the main optical path for the OMS trail.

i. Choose the desired OMS and right-click to choose **WDM Optical Management** > **WDM Trail Performance Commissioning**.



ii. View trails in the **WDM Trail Performance Commissioning** window.



iii. Refer to **Step 4** and **Step 5**.

c. Click **OK** in the **Prompt** dialog box.

5.3 Using the OD System for Network O&M

Using the Optical Doctor (OD) system, you can visually query the alarm and performance data on abnormal trails.

5.3.1 Querying Network Performance

5.3.1.1 Querying Network Performance in the OD View

The OD view displays network performance through network topology. In this view, you can understand the network topology, the operating status of objects managed by the OD system, and the possible exceptions in real time. With the information, you can handle the exceptions in a timely manner.

Background Information

The OD view consists of a navigation tree on the left and a view on the right. The navigation tree displays the hierarchical network structure. The view on the right displays NE objects and fiber connections, making it easier to understand object locations and network performance.

Entry of the Window

1. Choose **Configuration** > **WDM Optical Management** > **Optical Doctor** from the main menu on the NCE Network Management app. The **Optical Doctor** window is displayed.
2. Click the **OD View** tab. Double-click the subnet in the view on the right or right-click the subnet and choose **Enter** from the shortcut menu to open the subnet topology view.

Functions of the OD View

- Querying alarms

  The colors of subnets, NEs, and fiber connections indicate the alarm severity. If multiple alarms are generated in a subnet, NE, or fiber connection, the color indicates the highest alarm severity. Users can obtain the alarm details in the OD view. For details, see **Querying Alarms in a Subnet, NE, or Fiber Connection**.
- Viewing to-be-optimized trails

  You can switch from the OD view to the **Online Optimization Management** window to query the to-be-optimized trials of the network, an NE, or a fiber connection, obtain the reasons of the trail degradation, and optimize the trails accordingly. For details, see **Viewing To-Be-Optimized Trails**.
- Querying the trails associated with objects

  The OD view displays the activated OCh trails associated with an NE or fiber connection. You can query the details about the OCh trails, set the state of OCh trails, analyze the end-to-end power and OSNR performance of the OCh trails. For details, see **Querying the OCh Trails Associated with an NE or Fiber Connection**.

- Querying fiber loss

  In the OD view, you can query the current fiber loss and import the historical fiber loss data. Then you can compare the current value with the historical value and the design value to find the possible exceptions. For details, see **Querying Fiber Loss**.

- Exporting the preventive maintenance inspection report of the entire network

  You can export a preventive maintenance inspection report from the OD view for data comparison during future network maintenance. For details, see **5.3.4.1 Exporting the Networkwide Preventive Maintenance Report**.

- Set the design fiber loss EOL value and fiber type.

  On the OD view, you can set the design fiber loss EOL and fiber type for one or more inter-site fiber connections. For details, see **8.1 Setting the Fiber Type and Design Fiber Loss (EOL) (dB)**.

NOTE

If the icon  is red, a change has occurred in the network topology. You must click the icon to display the latest network status in the OD view.

Querying Alarms in a Subnet, NE, or Fiber Connection

Right-click a subnet, NE or fiber connections in abnormal state in the OD view and choose **Browse Current Alarms** from the shortcut menu. Then the alarms generated in the subnet, NE or fiber connection are displayed in **Alarm Info**.

For details about how to query and handle the alarms in **Alarm Info**, see **5.3.1.2 Querying Alarms by Fault List**.

Viewing To-Be-Optimized Trails

You can query the to-be-optimized trails of an NE, a fiber connection, or the entire network in the **OD View**.

- Querying the to-be-optimized trails of an NE or a fiber connection

  Right-click an NE or fiber connection in abnormal state in the OD view and choose **View to-Be-Optimized Trail** from the shortcut menu. The to-be-optimized trails of the selected NE or fiber connection are displayed in the **Optical Power Optimization Management** window.

NOTE

View Paths to be Optimized is not supported when there are SPAN_LOSS_EXCEED_EOL and MUT_LOS alarms. Besides, optimization and commissioning cannot clear the above alarms and you need to handle them manually.

- Querying the to-be-optimized trails of the entire network

  If the **Optical Power Optimization Management** button is marked red, trails to be optimized are present. Click **Optical Power Optimization Management**. In the **Optical Power Optimization Management** window that is displayed, you can view networkwide trails to be optimized, including the trails to be optimized after an abnormality, trails being optimized, and trails failing to be optimized.

Figure 5-5 Optical power optimization management

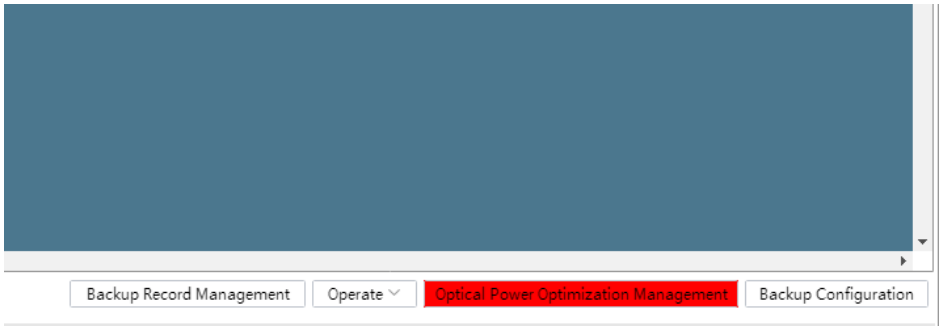
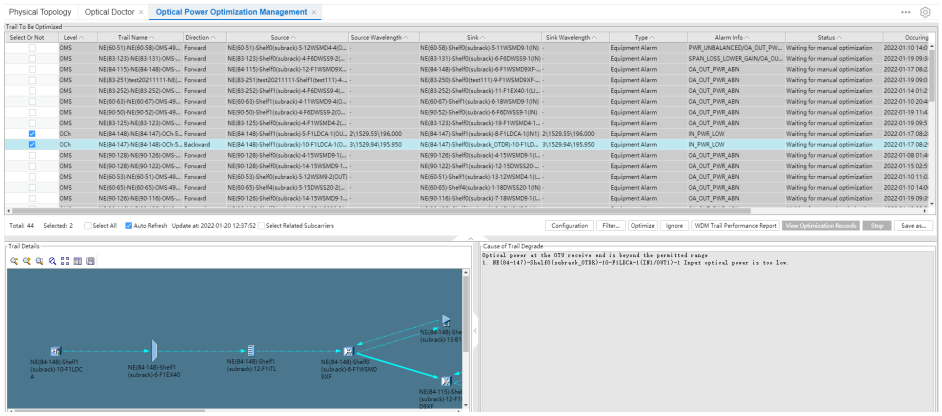


Figure 5-6 Trail to be optimized

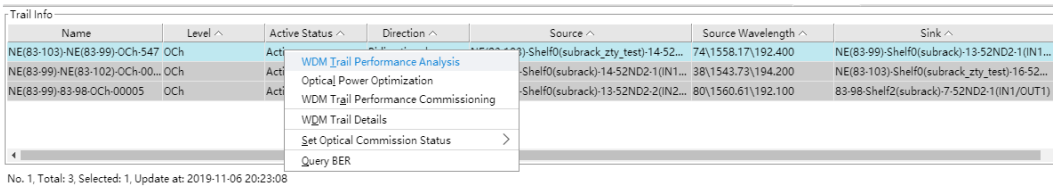


Querying the OCh Trails Associated with an NE or Fiber Connection

1. In the OD view, select an NE or fiber connection. The activated OCh trails associated with the NE or fiber connection are displayed in the **Trail Info**.

NOTE

When associated OCh trails of an NE or fiber connection change, right-click the NE or fiber connection and choose **Browse Relevant Trials** from the shortcut menu to refresh the **Trail Info**.



NOTE

With the trail information, you can analyze the performance of the associated trails. In addition, you can switch to the **WDM Trail Management** window of NCE to query the trail details.

Right-click a trail in the **Trail Info** and a shortcut menu is displayed:

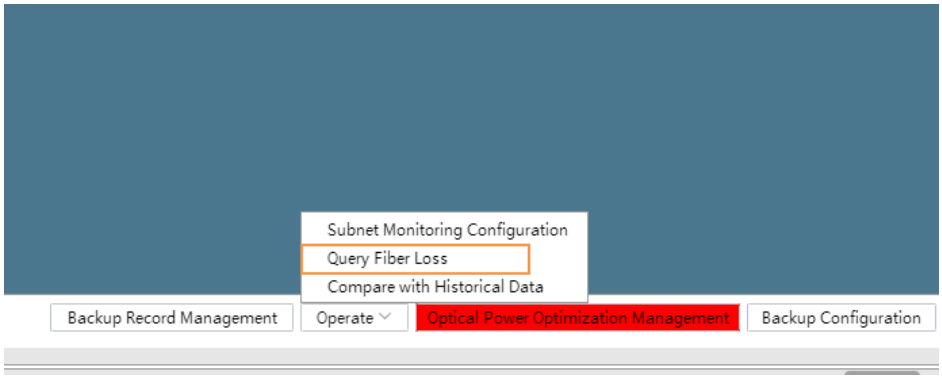
- Choose **WDM Trail Performance Analysis**. The **WDM Trail Performance Analysis** window is displayed. You can compare the current optical power and OSNR data of the selected end-to-end trails with the historical data.

  For details, see **5.3.2 Analyzing Current Trail Performance**.
- Choose **Optical Power Optimization**. The **Optical Power Optimization** window is displayed. You can optimize the optical power of the selected trails. For details, see *Optical Power Optimization User Guide*.
- Choose **WDM Trail Performance Commissioning**. The **WDM Trail Performance Commissioning** window is displayed. You can implement optical power commissioning (Visualization) of the selected trails. For details, see *Optical Power Commission User Guide*.
- Choose **WDM Trail Details** to switch to the **WDM Trail Management** window of NCE, and query the trail details in the window.
- Choose **Set WDM Trail Maintenance Status** to manually change the status of an OCh trail.
- Choose **Query BER** to query the BER, BER alarm threshold, and FEC type of a trail. The symbol / is displayed when the query fails and - is displayed when the query is not supported. If the queried BER is worse than the alarm threshold, the BER is marked in a color corresponding to a critical alarm. If the message "The essential data of trails are incomplete." are displayed during a BER query, the trail is an incomplete trail and does not support a BER query.

Querying Fiber Loss

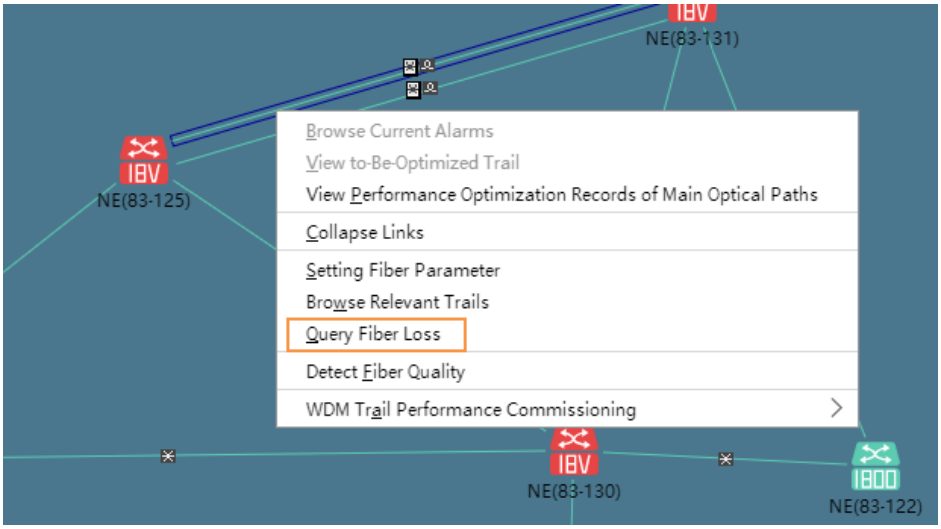
1. Click **Operate** and choose **Query Fiber Loss**.

   The design loss and actual loss of all fiber connections are displayed in the OD view. If the current attenuation of a fiber connection exceeds the design attenuation, the fiber connection is marked in a color corresponding to a major alarm.



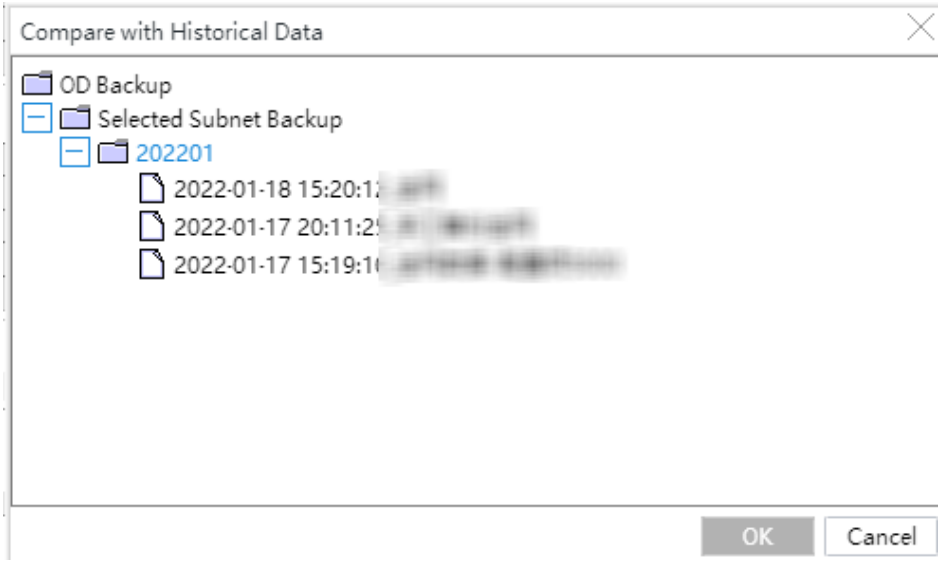
NOTE

You can also select one or more fibers, right-click and choose **Query Fiber Loss** to display the design loss and actual loss of the selected fiber connections. Because of slight deviations in power detection, if the optical fiber is not long enough, the actual loss value displayed on the OD view is 0.



Fiber loss cannot be queried if one of the NEs at two ends of a fiber is in version V100R008C00 or earlier and the other is in version V100R009C00 or later.

2. **Optional:** Click **Operate** and choose **Compare With History Data**. Choose the historical data to be imported in the **Compare With History Data** dialog box that is displayed. Then the historical fiber loss of the entire network is displayed in the window.



NOTE

- If the CRPC board is used at the transmit or receive end or no OA board is used at the receive end, the actual fiber loss cannot be queried.
- The fiber loss values are displayed in the format of *designed value*/*current value*/*historical value*.
- Historical data is marked "-" in the table before it is imported. If a fiber connection does not have historical data, the historical fiber loss value is marked "-" in the table after historical data is imported.
- After historical data is imported, it does not need to be imported again during subnet changing.

NOTE

You can select or deselect **Display Fiber Loss** from the shortcut menu of the OD view to display or hide the fiber loss data in the OD view.

5.3.1.2 Querying Alarms by Fault List

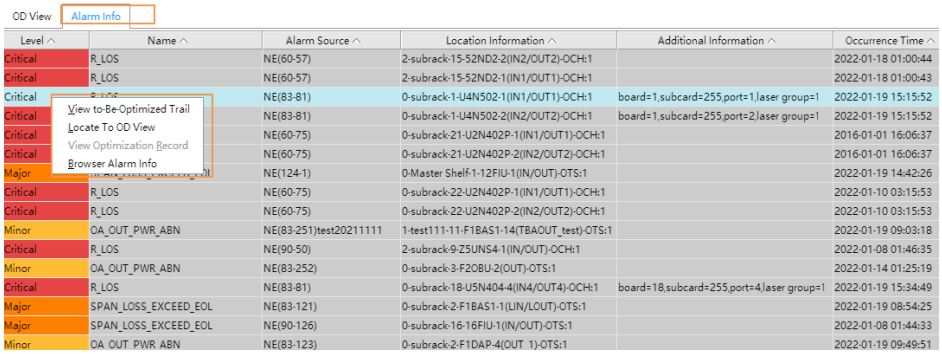
The **Alarm Info** tab page in the Optical Doctor (OD) main window displays all fault information at the optical layer of the current network. The fault information includes the fault type, fault severity, and fault point. On the **Alarm Info** tab page, users can also view the OCh trails where alarms are generated.

Background Information

- On the **Alarm Info** tab page, **Occurrence Time** indicates the NE time when a fault occurs. Therefore, **Occurrence Time** is accurate only after synchronizing the NE time with the standard NTP server time is complete.

Querying Abnormal Alarms and Corresponding Trails

1. Choose **Configuration** > **WDM Optical Management** > **Optical Doctor** from the main menu on the NCE Network Management app. The **Optical Doctor** window is displayed.
2. On the **Alarm Info** tab page, view all fault information at the optical layer of the monitored network.



NOTE

- For details about the alarm information and handling method, see **6 Alarm Description**.
- Right-click an alarm and choose **Locate To OD View** from the shortcut menu. The **OD View** window is displayed and the NEs or fiber connections related to the alarm are circled by blue boxes in the topology view. For the MUT_LOS \ LOS-MUT, OMS_LOSS_ACCUM_ABN \ OMS-LOSS-ACCUM-ABN, SPAN_LOSS_EXCEED_EOL \ SPAN-LOSS-EXCEED-EOL, SPAN_LOSS_UPPER_GAIN \ SPAN-LOSS-UPPER-GAIN, and SPAN_LOSS_LOWER_GAIN \ SPAN-LOSS-LOWER-GAIN alarms, if the fiber connections related to the alarms on NCE are deleted, the related NEs will be circled by blue boxes in the topology view.
- Right-click the SPAN_LOSS_UPPER_GAIN \ SPAN-LOSS-UPPER-GAIN, SPAN_LOSS_LOWER_GAIN \ SPAN-LOSS-LOWER-GAIN, or OMS_LOSS_ACCUM_ABN \ OMS-LOSS-ACCUM-ABN alarm and choose **View Optimization Record** from the shortcut menu to go to the **Commissioning Record** window, where you can query the automatic optimization records of main optical paths. For details, see **8.6 Querying Automatic Optimization Records of Main Optical Paths**.
- If you choose **Configuration** > **WDM Optical Management** > **Parameter Configuration** from the main menu, click the **Monitoring Parameter** tab on the displayed **Parameter Configuration** page, and disable R_LOS alarm monitoring, the system will not associate to-be-optimized trails with new R_LOS alarms on the **Alarm Info** tab page.
- Right-click the OSNR_LOSS_UNBALANCED alarm and choose **View OSNR Loss Alarm Details** from the shortcut menu. In the displayed **Alarm Details** dialog box, the OSNR loss performance data of each wavelength of the OMS trail where the alarm port is located is displayed.

3. (Optional) Click **Filter** to filter and display the alarm information on the **Alarm Info** tab page by alarm severity and alarm name.
4. On the **Alarm Info** tab page, select an abnormal message. In the trail list, all associated OCh trails are displayed.

NOTE

- The displayed OCh trails are activated trails.
- In the trail list, right-click one or more OCh trails and choose **WDM Trail Performance Analysis** from the shortcut menu. The **WDM Trail Performance Analysis** window is displayed. For the method of querying trail performance data, see **5.3.2 Analyzing Current Trail Performance**.

Querying Abnormal Trails

On the **Alarm Info** tab page, right-click an alarm record and choose **View To-Be-Optimized Trail** from the shortcut menu. The Optical Power Optimization Management window is displayed and the trails related to the alarm are displayed.

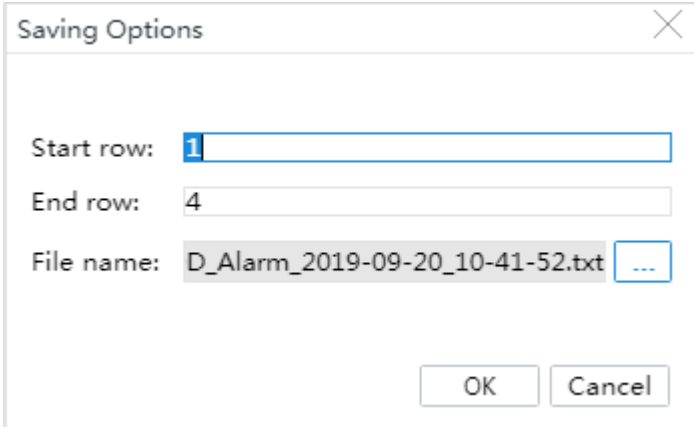
NOTE

View Paths to be Optimized is not supported when there are SPAN_LOSS_EXCEED_EOL and MUT_LOS alarms. Besides, optimization and commissioning cannot clear the above alarms and you need to handle them manually.

Saving the Fault List

1. Click **Save As...**. The **Saving Options** dialog box is displayed.

2. Set **Start Row**, **End Row**, and **File Name**.



3. Click **OK**.

5.3.2 Analyzing Current Trail Performance

The Optical Doctor (OD) system can intuitively display the multiplexed-wavelength optical power, single-wavelength optical power, single-wavelength optical signal-to-noise ratio (OSNR), bit error rate (BER) of monitored trails, and OSNR Loss and the single-wavelength optical power and OSNR of the OA boards that the trails traverse. Users can analyze trail performance data in a timely manner by comparing historical and current performance data.

5.3.2.1 Displaying the Trail Performance Analysis Window

In the **Trail Performance Analysis** window, users can view the performance data of trails in maintenance state as well as the single-wavelength optical power and optical signal-to-noise (OSNR) of the OA boards that the E2E trails traverse.

Prerequisites

- OD routes must be configured and optical signal-to-noise ratio (OSNR) detection must be enabled; otherwise, single-wavelength OSNR data cannot be queried.
- When the optical line protection is nested, the trail performance analysis function is not supported.

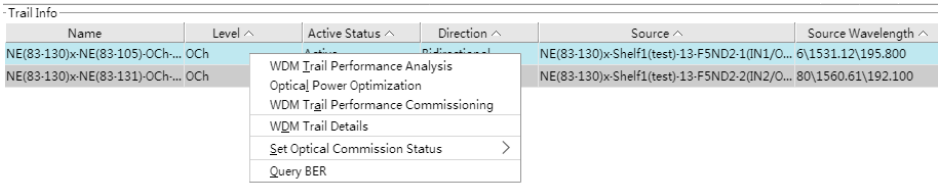
Operation Procedure

Step 1 Choose **Configuration** > **WDM Optical Management** > **Optical Doctor** on the NCE Network Management app. The **Optical Doctor** window is displayed.

Step 2 Enter the **WDM Trail Performance Analysis** window.

- Method 1: Select a site or fiber in **OD VIEW**. All activated OCh trails related to the site or fiber are displayed in the **Trail Info** window.
- Method 2: On the **Alarm Info** tab, right-click one or more alarm records and choose **View Associated Trail** from the shortcut menu. In the trail list, all associated OCh trails are displayed.

In the trail list, right-click one or more OCh trails and choose **WDM Trail Performance Analysis** from the shortcut menu. The **WDM Trail Performance Analysis** window is displayed.



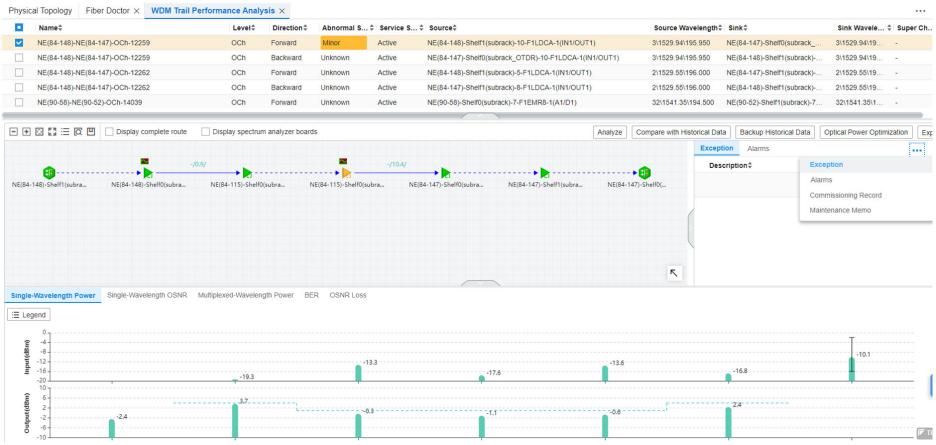
NOTE

You can also choose **Trail Performance Analysis** from the main menu.

Choose **Configuration** > **WDM Optical Management** > **WDM Trail Performance Commissioning** from the main menu on the NCE Network Management app.

1. In the **Set Trail Browse Filter Criteria** dialog box, set filter criteria. The required trails are displayed in the trail list.
2. Select an OCh trail whose performance needs to be analyzed, click **Operation**, and select **WDM Trail Performance Analysis**.

Step 3 Select the desired OCh trail and click **Analysis**. The current performance data of the trail is displayed.



NOTE

If the selected trail is not an OCh trail in the **Maintenance** state, the trail is automatically filtered out.

NOTE

- The signal flow diagram of the trail is displayed in the upper part of the interface. The current and historical single-wavelength/multiplexed-wavelength power, single-wavelength OSNR, BER, and OSNR loss of the selected trail are displayed in a bar chart in the lower part of the window. Click a bar chart and the corresponding node in the signal flow diagram is highlighted. Click a node in the signal flow diagram and the corresponding node in the bar chart is highlighted.
- Move the pointer to the bar chart of a node. The detailed parameter information of the node is displayed in the lower right corner of the cursor.
- In the signal flow diagram, click a node marked abnormal. All the exception information of the node is displayed.
- The current attenuation value, historical attenuation value, and the design EOL value of the long fiber are displayed on the signal flow diagram.
- Move your cursor onto the optical amplifier. The current and historical values of the attenuator and the OA gain are displayed on the window.
- The icon  on the OA node in the signal flow diagram indicates that the node is used to monitor optical power flatness.
- In the signal flow diagram, right-click a board and choose **WDM Configuration** to locate the WDM interface of the board on NCE. In this way, users can query the related parameters of the board.
- Select and right-click the required board in the signal flow diagram, and choose **Edit Maintenance Memo** from the shortcut menu. On the displayed **Maintenance Memo** dialog box, you can edit the board maintenance information. After you close the dialog box, the maintenance memo information is automatically saved. Only one memo can be configured for each board and each memo contains a maximum of 170 bytes. If the  icon is displayed on a board in the signal flow diagram, a memo is configured for the board.
- Click the **Historical Alarms** tab in the right pane to view historical alarm information.
- Click the **Commissioning Record** tab in the right pane and click a commissioning record to view the **Details**.

Step 4 **Optional:** 5.3.3.2 Importing the Historical Performance Data of Trails. The historical performance data of the trail is displayed in the window.

NOTE

You can right-click the route chart to display the historical data status, and click **Historical Data Legend** on the bar chart to display or hide the historical data.

----End

5.3.2.2 Analyzing the Performance Data of E2E Trails

In the **WDM Trail Performance Analysis** window, the Optical Doctor (OD) system intuitively displays the multiplexed-wavelength optical power, single-wavelength optical power, single-wavelength optical signal-to-noise ratio (OSNR), bit error rate (BER), and OSNR Loss of the monitored end-to-end (E2E) OCh trails, and the multiplexed-wavelength optical power and OSNR Loss of the monitored E2E OMS trails.

NOTE

In the **WDM Trail Performance Analysis** window, performance visualization is not supported when there is no OMS in a site without OAs.

Prerequisites

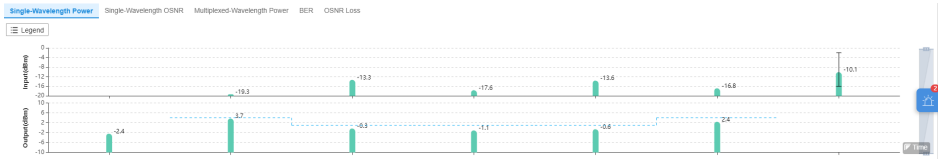
- OD routes must be configured and optical signal-to-noise ratio (OSNR) detection must be enabled; otherwise, single-wavelength OSNR data cannot be queried.
- Historical single-wavelength OSNR data can be viewed only after OD routes are configured and OSNR detection must be enabled.
- For the OSN 9800 NE, the NE data must be uploaded.

Background Information

- On a trail for which the OD route is not configured, the **WDM Trail Performance Analysis** window will display the single-wavelength optical power and OSNR of OA boards according to the values scanned by the MCA or LS OA board. If no MCA or LS OA board is configured for the OA boards, no single-wavelength optical power or OSNR will be displayed for the OA boards.
- The historical performance data of the trail is displayed in the window only after **5.3.3.2 Importing the Historical Performance Data of Trails** for the selected trail.
- Trail performance analysis can be performed only 10 minutes after an OD route is configured in the **Network Parameter Settings** window.
- The OD obtains device data at an interval of 10 minutes. Therefore, the performance data is not real-time data.
- The following uses OCh trails as an example to analyze E2E performance data. The operations for OMS trails are the same as those for OCh trails. (The analysis on OMS trials intuitively displays only the multiplexed-wavelength optical power and OSNR Loss.)

Single-Wavelength Optical Power Analysis

Click the **Single-Wavelength Power** tab. On the displayed tab page, query the single-wavelength optical power of all nodes on the trail.



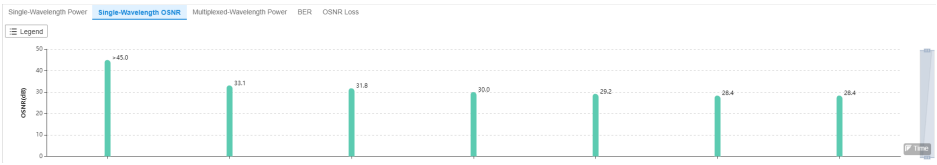
NOTE

The following describes the histograms on the **Single-Wavelength Power** tab page:

- The current and historical single-wavelength input and output power of the OTU boards and OA boards on the trail are displayed in histograms. The sequence for optical power bars of all boards must be the same as that for the boards in the signal flow diagram.
- The horizontal dashed lines indicate the single-wavelength nominal input and output optical power of OA boards.
- The input optical power threshold of the receive-end OTU board is represented as ⊥. When the current single-wavelength input optical power of a receive-end OTU board is beyond the permitted threshold range, a fatal error is displayed on the bar for the board. In addition, the OTU board is marked abnormal in the signal flow diagram.
- If no optical power is obtained for a board, the corresponding bar for the board is not displayed and the board is marked abnormal in the signal flow diagram.

Analyze the Single-Wavelength OSNR of the Trail

Click the **Single-Wavelength OSNR** tab. On the displayed tab page, query the single-wavelength OSNR of all nodes on the trail.



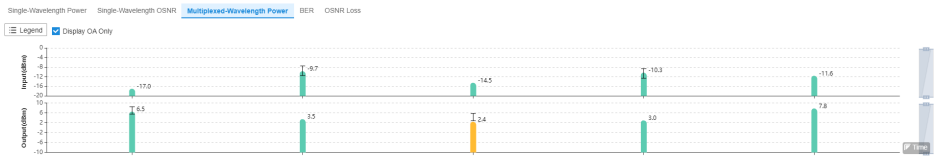
NOTE

The following describes the histograms on the **Single-Wavelength OSNR** tab page:

- The current and historical single-wavelength OSNRs of the OA boards on the trail are displayed in histograms. The sequence for OSNR bars of all boards must be the same as that for the boards in the signal flow diagram.

Analyze the Multiplexed-Wavelength Optical Power of the Trail

Click the **Multiplexed-Wavelength Power** tab. On the displayed tab page, query the multiplexed-wavelength optical power of all nodes on the trail.



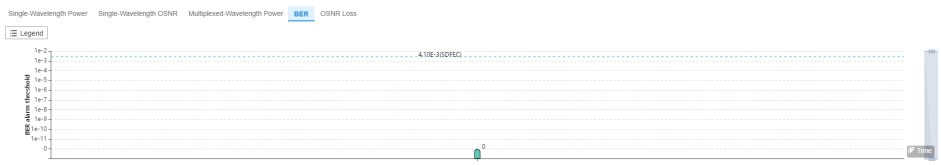
NOTE

The following describes the histograms on the **Multiplexed-Wavelength Power** tab page:

- The current and historical multiplexed-wavelength input and output power of the OA boards and multiplexer/demultiplexer boards on the trail are displayed in histograms. The sequence for optical power bars of all boards must be the same as that for the boards in the signal flow diagram.
- Move the cursor to the bar chart. You can see a message indicating the number of wavelengths that traverse the board in the maintenance state.
- ⊥ indicates the current upper and lower limits for the multiplexed-wavelength optical power of all OA boards except the local wavelength dropping OA board. When the current multiplexed-wavelength optical power of an OA board is not within the permitted range, a minor alarm is displayed in the bar for the OA board. In addition, a minor alarm is displayed for the OA board in the signal flow diagram.
- If no optical power is obtained for a board, the corresponding bar for the board is not displayed and the board is marked abnormal in the signal flow diagram.
- For the boards that do not support the query of input or output optical power, no input or output optical power will be displayed for the boards in the histograms.
- The multiplexed power cannot be queried on the TN11WSD9 and TN11WSM9 boards.
- Select **Display OA Only** in the upper left corner. The histograms only for OA boards are displayed on the tab.

BER Analysis

Click the **BER** tab. On the displayed tab page, query the BER of the OTU boards on the trail.



NOTE

The following describes the histograms on the **BER** tab:

- The current and historical pre-FEC BERs of the OTU boards on the trail are displayed in histograms.
- The FEC type of the trail is displayed on the bars.
- The horizontal dashed lines indicate the BER alarm threshold. When the current BER of an OTU board exceeds the threshold, a critical alarm is indicated on the bar for the OTU board.
- For the OTU boards that do not support the query of pre-FEC BERs, no pre-FEC BER will be displayed for the boards in the histograms.

OSNR Loss Analysis

Click the **OSNR Loss** tab to query the OSNR loss performance data of the selected OCh trail and its associated trails in the maintenance state.

NOTE

Description of the **OSNR Loss** tab page:

- The NEs in the upper part of the page (for example, **NE(84-86)** and **NE(84-81)** as shown in the figure above) indicate the sink and source NEs of an OMS respectively. The OMSs on the selected OCh trail are displayed from left to right based on the service direction. The left part displays the wavelength information.
- The OSNR loss values of each wavelength are displayed above the OMSs. The OSNR loss value that is not queried is displayed as -- and the corresponding OMS is marked in red.
- For an OMS whose OSNR loss is not within the value range, the corresponding NE and the OMS are marked in orange (indicating an alarm).

5.3.2.3 Analyzing the Single-Wavelength Optical Power and OSNR of OA Boards

In the **WDM Trail Performance Analysis** window, the Optical Doctor (OD) system intuitively displays the multiplexed-wavelength optical power, single-wavelength optical power, single-wavelength optical signal-to-noise ratio (OSNR), bit error rate (BER), and OSNR Loss of the monitored end-to-end (E2E) OCh trails, and the multiplexed-wavelength optical power and OSNR Loss of the monitored E2E OMS trails.The analysis on the single-wavelength optical power and OSNR of OA boards helps you identify network exceptions.

Prerequisites

- OD routes must be configured and optical signal-to-noise ratio (OSNR) detection must be enabled; otherwise, single-wavelength OSNR data cannot be queried.
- Historical single-wavelength OSNR data can be viewed only after OD routes are configured and OSNR detection must be enabled.
- For the OSN 9800 NE, the NE data must be uploaded.

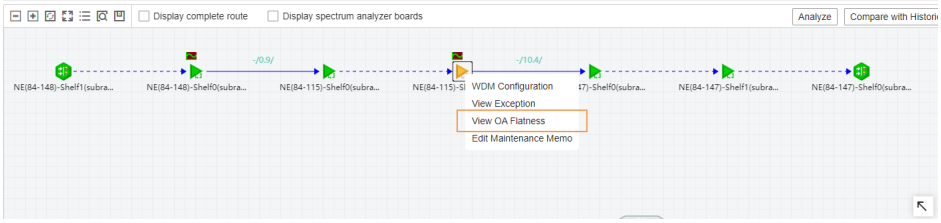
Background Information

- On a trail for which the OD route is not configured, the **WDM Trail Performance Analysis** window will display the single-wavelength optical power and OSNR of OA boards according to the values scanned by the MCA or LS OA board. If no MCA or LS OA board is configured for the OA boards, no single-wavelength optical power or OSNR will be displayed for the OA boards.
- The historical performance data of the trail is displayed in the window only after **5.3.3.2 Importing the Historical Performance Data of Trails** for the selected trail.
- Trail performance analysis can be performed only 10 minutes after an OD route is configured in the **Network Parameter Settings** window.
- The OD obtains device data at an interval of 10 minutes. Therefore, the performance data is not real-time data.

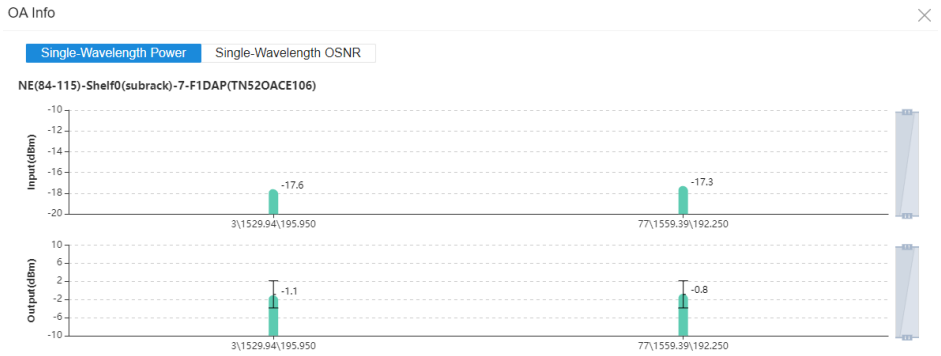
Operation Procedure

1. In the **WDM Trail Performance Analysis** window, select the desired OCh trail and click **Analysis**. The current performance data of the trail is displayed.

2. **Optional:** The **5.3.3.2 Importing the Historical Performance Data of Trails** window displays the historical performance of the trail.
3. In the signal flow diagram, double-click the desired OA board. Alternatively, double-click the desired OA board. The **OA Info** dialog box is displayed.



4. Click the **Single-Wavelength Power** tab to view the optical power of all wavelengths on the OA board.

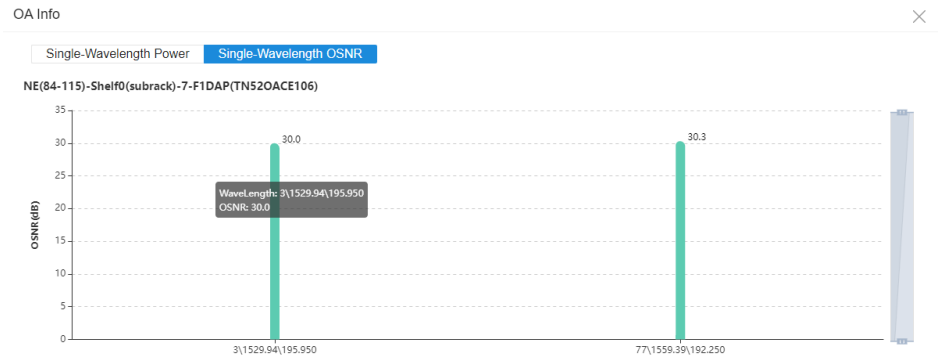


NOTE

The following describes the line charts on the **Single-Wavelength Power** tab page:

- The current and historical input and output optical power of a single wavelength in the maintenance state that passes through an OA board is displayed in a bar chart.
- If **Flatness Monitoring** is set to **Enable**, the OA for monitoring optical power equilibrium is represented as ⊥ to indicate the reference range of the single-wavelength input power. The central position of ⊥ indicates the average single-wavelength optical power. Wavelengths having no optical power are not involved in the calculation of average single-wavelength optical power.
- The **Single-Wavelength Power** in the **Flatness Monitoring** window displays the wavelength in the current maintenance state.

5. Click the **Single-Wavelength OSNR** tab to view the OSNR of each wavelength on the OA board.



NOTE

The following describes the histogram on the **Single-Wavelength OSNR** tab page:

- The current and historical single-wavelength OSNR of all wavelengths on an OA board is displayed in terms of column graph.
- The **Single-Wavelength OSNR** in the **Flatness Monitoring** window displays the OSNR in the current maintenance state.

5.3.3 Comparing Historical and Current Performance Data

5.3.3.1 Backing Up Trail Performance Data

You can back up the performance data of all or selected trails in the **Maintenance** state in the **WDM Trail Performance Analysis** window. The performance data can be imported later as historical data for performance data comparison.

Prerequisites

- You are an NMS user with the "Maintainer Group" or higher permission.
- OD routes must be configured and optical signal-to-noise ratio (OSNR) detection must be enabled; otherwise, single-wavelength OSNR data cannot be queried.
- Historical single-wavelength OSNR data can be backed up and viewed only after OD routes must be configured and optical signal-to-noise ratio (OSNR) detection must be enabled.
- For the OSN 9800 NE, the NE data must be uploaded.

Background Information

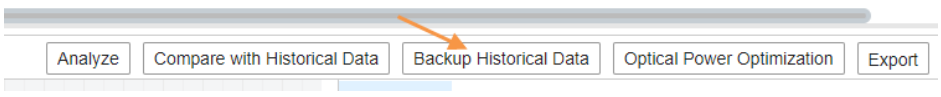
- One terminal can perform only one performance data backup task at a time. The performance data of a maximum of 200 trails can be backed up in one task.
- For details about how to set the maximum number of backups that can be stored in the storage space, see **Strategy of Setting the Backup Data**.
- **Back Up Historical Data** does not support backup of real-time data. Performance analysis results cannot be directly saved as historical data.

NOTE

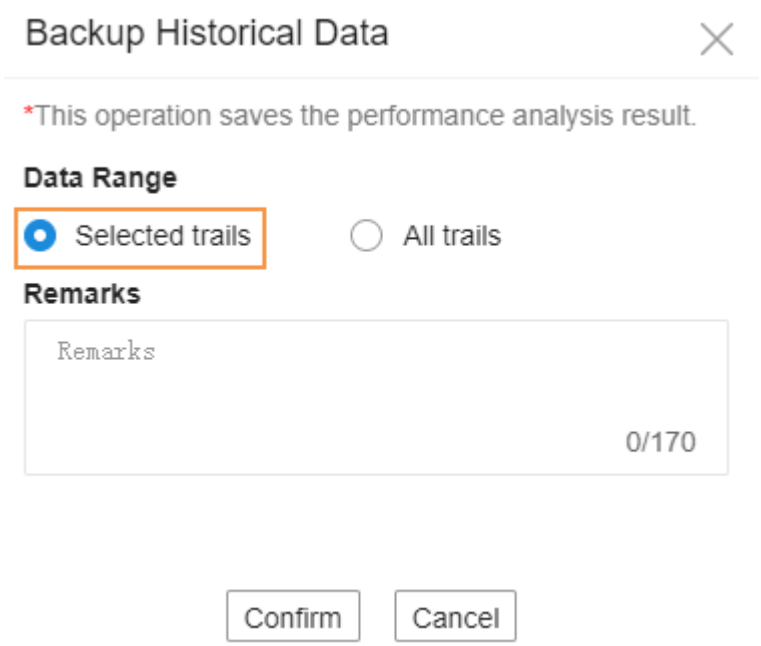
When the data of a subnet is synchronized, do not back up the performance data. Otherwise, the backup operation fails.

Procedure

Step 1 In the **WDM Trail Performance Analysis** window, select one or more trails and click **Back Up Historical Data**.



Step 2 Set **Data Range** in the **Back Up Historical Data** dialog box.



Step 3 Add remarks for this backup in **Remarks**.

NOTE

If you add remarks in **Remarks**, the name of the backup data will be in the format of **Date_No._Remarks**.

Step 4 Click **OK**.

----End

5.3.3.2 Importing the Historical Performance Data of Trails

You can import the backup historical data and compare it with the current performance data to identify possible network performance deterioration in a timely manner.

Prerequisites

- You are an NMS user with "Operator Group" authority or higher.
- OD routes must be configured and optical signal-to-noise ratio (OSNR) detection must be enabled; otherwise, single-wavelength OSNR data cannot be queried.
- Historical single-wavelength OSNR data can be viewed only after OD routes are configured and OSNR detection must be enabled.
- For the OSN 9800 NE, the NE data must be uploaded.

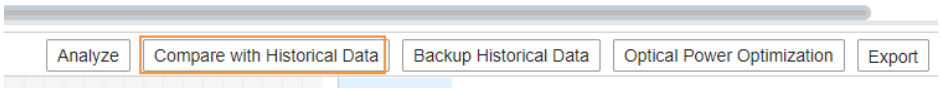
Background Information

- The historical data of only the selected trail in the current window can be imported. If the physical ID of an NE is changed, the historical NE data backed up by using the tool earlier than OptiX NetStar O&M 7.0.310 cannot be used for historical data comparison.

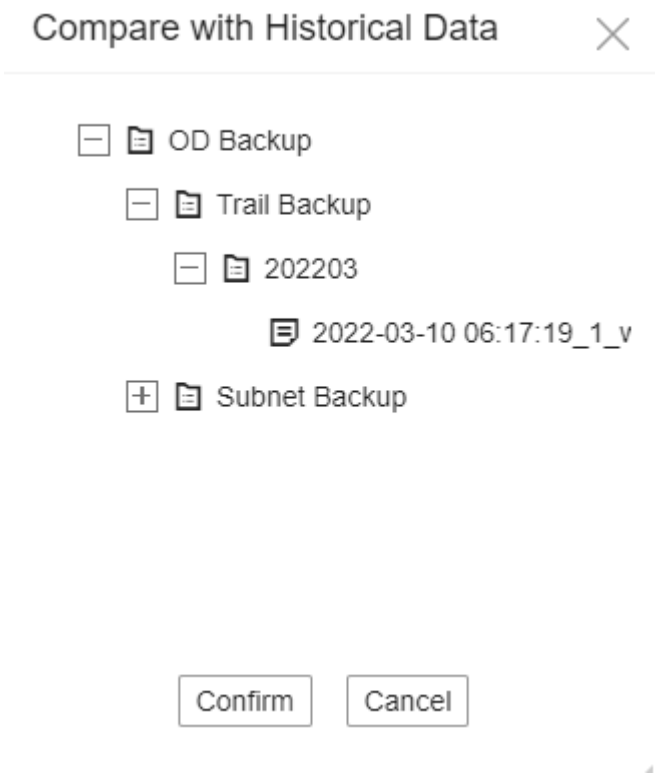
- After an ASON trail is manually rerouted, the rerouting time of the trail is not refreshed. When you compare the historical data before and after rerouting, the system display a message indicating that the trail has been rerouted.
- Different clients can choose different historical data records.

Procedure

Step 1 In the **WDM Trail Performance Analysis** window, select one or more trails and choose **Compare With Historical Data**.



Step 2 Select the desired historical data in the **Compare With Historical Data** dialog box.



NOTE

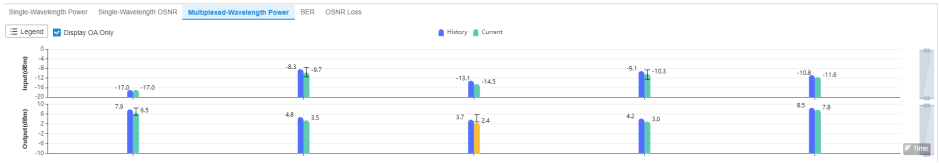
The subnet backup data or trail backup data can be imported. For details about how to configure automatic backup policies for subnet data, see **Configuring the Data Backup Policies**. For details about how to back up trail data, see **5.3.3.1 Backing Up Trail Performance Data**.

Step 3 Click **OK**.

----End

Result

After the operation is completed, the historical data of the trail is displayed.



NOTE

The historical data of trail performance analysis and imported trail backup shows the number of maintenance wavelengths. The imported historical subnet backup data shows the number of wavelengths that pass through the OA during backup.

5.3.4 Exporting Reports

5.3.4.1 Exporting the Networkwide Preventive Maintenance Report

You can export the networkwide preventive maintenance report in the OD view. This report can be used for data comparison in future network O&M.

Prerequisites

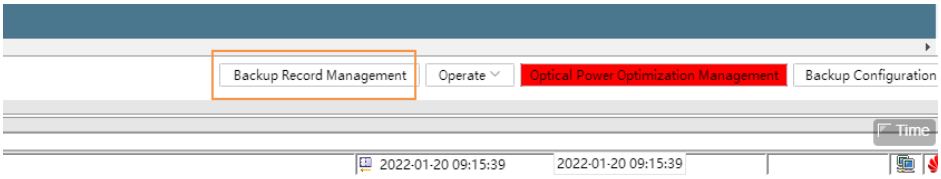
OD routes must be configured and optical signal-to-noise ratio (OSNR) detection must be enabled; otherwise, single-wavelength OSNR data cannot be queried.

Background Information

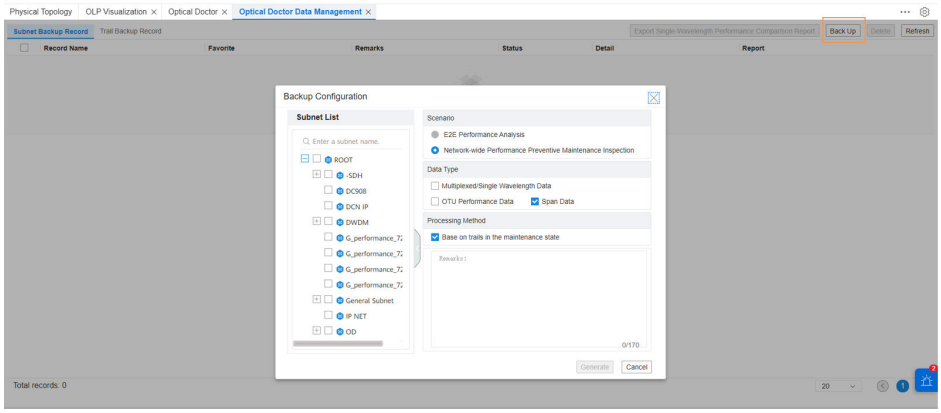
- The networkwide preventive maintenance report supports only Microsoft Excel 2007 or later.
- When querying the report, if **Security Warning** is displayed and prompt **Macros have been disabled** on the main menu of the file in the format of excel, you should click **Options** and choose **Enable this content**. Otherwise, the diagram in the report may be abnormally displayed.
- The OD obtains device data at an interval of 10 minutes. Therefore, the report data is not real-time data.

Operation Process

1. On the **OD View** tab page, click **Backup Record Management**.



2. Click **Back Up**. On the page that is displayed, set **Data Type** and **Data Range**.

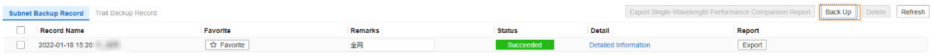


NOTE

Assume that subnet A is composed of subnet A1 and A2. If both subnet A1 and A2 are on an OMS, when you select **Data Range**, you must select subnet A for ensuring the data integrity of the exported report. That is, subnet A1 and A2 must be concurrently selected.

The **Based on trails in the maintenance state** check box is selected by default, indicating that the generated report collects statistics on wavelengths only in the **Maintenance** state.

3. Click **Generate**.
4. After the task is complete, return to the **Optical Doctor Data Management** page and click **Export** in the **Report** column corresponding to the record.



NOTE

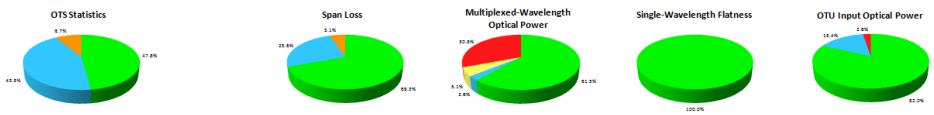
You can add backup records to favorites and make remarks for the records. Backup records added to favorites are not limited by the maximum number of backup records allowed and will not be automatically deleted.A maximum of two immediate backup tasks can be generated at the same time, but automatic backup tasks are not included.

5. (Optional) Set **Power Deviation Excessive Threshold** and **Automatically Query After Apply,Delay Time**.

Result

The exported report contains the following sheets: **Statistics Info**, **OMS List**, **OMS Data**, **Single-Wavelength Data**, **Span Data**, **Trail Power Diagram**, and **OA Power Flatness Diagram**.

- **Statistics Info** lists the collected alarm of span loss, single wavelength data, and multiplexed wavelength data in the form of table and proportion of these alarms in the form of pie diagram.



- The **OMS List** lists all OMS information in the entire network.
- **OMS Data** lists the collected power and OSNR data related to OCh trails on all OMSs in the network.

In the **Status** column of **OMS Data**, click **Trail Power Diagram** of an OMS to switch to the **Trail Power Diagram** sheet, which graphically displays the multiplexed-wavelength optical power of each node on OCh trails.

- The **Single-Wavelength Data** lists the single-wavelength performance of OA boards in the entire network.

  On the **Single-Wavelength Data** worksheet, click any link in the **Board Port** column. In the displayed **OA Power Flatness Diagram** window, you can query the input and output single-wavelength optical power and OSNR of selected OA in the form of diagram.

- The **Span Data** lists parameters of OTS in the entire network.

Parameters in the Networkwide PMI Report

A hyphen (-) indicates that the corresponding parameter is not supported or configured. A slash (/) indicates that no data is obtained. Abnormal data is marked with a color based on its abnormality level. The **Status** column shows the color of the abnormality with the highest level in the row.

Table 5-15 OMS List

Parameter	Description
Source Optical NE	Indicates the source optical NE of an OMS.
Source NE	Indicates the source NE of an OMS.
Source Board	Indicates the source board of an OMS.
Sink Optical NE	Indicates the sink optical NE of an OMS.
Sink NE	Indicates the sink NE of an OMS.
Sink Board	Indicates the sink board of an OMS.
Span Loss	Indicates whether a span loss alarm is reported on an OMS.
Multiplexed-Wavelength Optical Power	Indicates whether an alarm related to multiplexed-wavelength optical power is reported on an OMS.
Single-Wavelength Flatness	Indicates whether an alarm related to single-wavelength power flatness is reported on an OMS.

Parameter	Description
OTU Input Optical Power	Indicates whether an alarm related to OTU input optical power is reported on an OMS.
Hyperlink	Provides a link for an OMS. By clicking the link, you can navigate to the **OMS Data** sheet to query the data of the OMS.

Table 5-16 OMS Data

Parameter		Description
Object	Optical NE	Indicates the optical NEs on an OMS.
	NE	Indicates the NEs on an OMS.
	Board	Indicates the boards on an OMS.
	Port	Indicates the board ports on an OMS.
	Port Type	Indicates the types of the board ports on an OMS.
Number of Wavelengths		Indicates the number of wavelengths in the Maintenance state on an OA board that the OMS traverses.
Wavelength		Indicates a single wavelength in maintenance state on the line board or OTU board that an OMS traverses. **NOTE** • In a non-FlexGrid system, the value of **Wavelength** is displayed in the format of *Wavelength number*|*Wavelength*|*Frequency*, for example, **6\1531.12\195.800**. • In a FlexGrid system, the value of **Wavelength** is displayed in the format of *Center wavelength+Frequency width*, for example, **195.95000THz +-18.75GHz**.

Parameter		Description
Single-Wavelength Optical Power (dBm)	Current Value	Indicates the current value of the single-wavelength power of the board that an OMS passes through. **NOTE** Click the link to switch to the **Single-Wavelength Data** tab page, where you can query the current value of the single-wavelength power of all single wavelengths on an OA board.
	Threshold	Indicates the input power alarm threshold of an OTU board that an OMS traverses.
Single-Wavelength OSNR (dB)	Current Value	Indicates the current single-wavelength OSNR of each OTU board on an OMS.
	Min. Value/ Max. Value	Indicates the minimum/ maximum single-wavelength OSNR of each board on an OMS.
Multiplexed-Wavelength Optical Power (dBm)	Current Value	Indicates the multiplexed-wavelength optical power of boards on an OMS. **NOTE** The multiplexed power cannot be queried on the TN11WSD9 board.
	Threshold	Indicates the multiplexed-wavelength optical power threshold of boards on an OMS.
Nominal Gain (dB)	Current Value	Indicates the current nominal gain of boards on an OMS.
	Range	Indicates the nominal gain threshold of boards on an OMS.
Attenuation (dB)	Current Value	Indicates the current optical power attenuation of boards on an OMS.
	Range	Indicates the optical port attenuation threshold of boards on an OMS.
Span Data		Provides a link to the **Span Data** sheet, where you can query the span data of the OMS.

Parameter		Description
Pre-FEC BER	Current Value	Indicates the current pre-FEC BER of each drop OTU board on an OMS.
	Threshold	Indicates the pre-FEC BER threshold of each drop OTU board on an OMS.
	FEC Type	Indicates the FEC type of each drop OTU board on an OMS.
	Q Value	Indicates the Q value of each drop OTU board on an OMS. The Q value directly shows the network performance and each Q value matches a BER value. A greater Q value indicates better network performance.
CD Compensation	Current Value	Indicates the current Chromatic Dispersion (CD) offset value of each drop OTU board on an OMS. CD indicates spreading of a pulse in an optical fiber caused by differences in wave velocity in the medium.
DGD	Current Value	Indicates the polarization mode dispersion of each drop OTU board on an OMS. The polarization mode dispersion is caused by imperfect symmetry of cross-sectional area of a fiber.
In-band noise (dB)	Current Value	Indicates the in-band noise of Raman boards on an OMS.
Maintenance Memo		Indicates the memo for the boards on an OMS.

Table 5-17 Single-Wavelength Data

Parameter		Description
OA Board	Optical NE	Indicates the optical NE on the OCh trail where an OA board resides.

Parameter		Description
	NE	Indicates the NE on the OCh trail where a board resides.
	Board Port	Indicates an OA board and board port that the OCh trail traverses. **NOTE** Clicking the link navigates you to the **OA Power Flatness Diagram** sheet, which graphically displays the single-wavelength optical power.
OSA Board	Optical NE	Indicates the optical NE where an optical spectrum analyzer (OSA) board resides.
	NE	Indicates the NE where an OSA board resides.
	Board Port	Indicates an OSA board and the board port. This port is used to analyze the spectrum of an OA board.
Wavelength		Indicates a single wavelength on the OA board. **NOTE** • In a non-FlexGrid system, the value of **Wavelength** is displayed in the format of *Wavelength number*|*Wavelength*|*Frequency*, for example, **6\1531.12\195.800**. • In a FlexGrid system, the value of **Wavelength** is displayed in the format of *Center wavelength*+*Frequency width*, for example, **195.95000THz+-18.75GHz**.

Parameter		Description
Single-Wavelength Input Optical Power (dBm)	Current Value	Indicates the current input optical power of a single wavelength on the OA board. **NOTE** • If querying the single-wavelength power of the OA board fails, **/** is displayed in **Current Value**, and the data identifier displayed in the **Current Value** column is **Suggestion**. • If the single wavelength on the OA board has no light, **-60** is displayed in **Current Value**, and the data identifier displayed in the **Current Value** column is **Minor**.
	Nominal Value	Indicates the single-wavelength nominal input optical power of the OA board that an OCh trail traverses when the gain of the OA board reaches the minimum.
Single-Wavelength Output Optical Power (dBm)	Current Value	Indicates the current output optical power of a single wavelength on the OA board. **NOTE** • If querying the single-wavelength power of the OA board fails, **/** is displayed in **Current Value**, and the data identifier displayed in the **Current Value** column is **Suggestion**. • If the single wavelength on the OA board has no light, **-60** is displayed in **Current Value**, and the data identifier displayed in the **Current Value** column is **Minor**.

Parameter		Description
	Nominal Value	Indicates the single-wavelength nominal output optical power of the OA board that an OCh trail traverses when the gain of the OA board reaches the minimum.
	Threshold	Indicates the current flatness monitoring threshold of a single wavelength on the OA board.
	Deviation Value	Indicates the deviation output power of a single wavelength on an OA board.
	Result	Indicates the monitoring result of a single wavelength on the OA board.
Single-Wavelength OSNR (dB)	Current Value	Indicates the current OSNR value of a single wavelength on an OA board.

Table 5-18 Span Data

Parameter		Description
Inter-Site Object	Source Optical NE	Indicates the source optical NE of an optical transmission section (OTS).
	Source NE	Indicates the source NE of an OTS.
	Span Source Port	Indicates the source OA board of an OTS.
	OTS Source	Indicates the source port of an OTS.
	Sink Optical NE	Indicates the sink optical NE of an OTS.
	Sink NE	Indicates the sink NE of an OTS.

Parameter		Description
	Span Sink Port	Indicates the sink OA board of an OTS.
	OTS Sink	Indicates the sink port of an OTS.
Fiber Loss	Current Value (dB)	Indicates the current fiber loss. **NOTE** If the current fiber loss is greater than the specified EOL value, the current fiber loss is identified as a major abnormality.
	Design Value(EOL)(dB)	Indicates the design fiber loss.
	Margin (dB)	Margin between the designed attenuation and current attenuation of a fiber. If the current attenuation exceeds the designed attenuation, 0 is displayed.
	Result	Indicates the monitoring result of fiber loss.
Span Loss	Current Value (dB)	Indicates the current loss of an OTS. **NOTE** • The span loss is not calculated if there is no source or sink OA board. • The current span attenuation is the output optical power of the source OA board minus the input optical power of the sink OA board. When the current span loss is not within the permitted range, the current span loss is identified as a minor abnormality.
	Reference Value Range (dB)	Indicates the nominal loss of an OTS.
Output power of Source OA	Current Value(dBm)	Indicates the output optical power of the source OA board on an OTS.
EVOA before Sink OA	Current Value(dB)	Indicates the attenuation of the electrical variable optical attenuator (EVOA) before the sink OA board on an OTS.

Parameter		Description
Input power of Sink OA	Current Value(dBm)	Indicates the input optical power of the sink OA board on an OTS.
Launch Power	Launch Power(dBm)	Indicates the single-wavelength incident optical power of a fiber.
	Target Attenuation of EVOA After Source Port (dB)	Indicates the target attenuation of the EVOA after the source OA board on an OTS.
	Attenuation of EVOA After Source Port(dB)	Indicates the attenuation of the EVOA after the source OA board on an OTS. **NOTE** **Attenuation of EVOA After Source Port (dB)** in the **Launch Power** column indicates the attenuation of the EVOA that is installed in the downstream direction of the egress OA board and is used to control the incident optical power. When the **Launch Power** less than the value calculated from the output optical power of the OA board (the nominal output optical power just at the board is transmit-end OA) minus the EVOA attenuation, the **Attenuation of EVOA After Source Port (dB)** column is marked as minor abnormality.

5.3.4.2 Exporting Trail Performance Report

In the **WDM Trail Performance Analysis** window, you can export the trail performance report for data comparison in further network O&M.

Prerequisites

OD routes must be configured and optical signal-to-noise ratio (OSNR) detection must be enabled; otherwise, single-wavelength OSNR data cannot be queried.

CAUTION

- During optimization commissioning, you are not advised to export reports.
- If a report fails to be exported, export the report again after the commissioning is complete.

Background Information

- When querying the report, if **Security Warning** is displayed and prompt **Macros have been disabled** on the main menu of the file in the format of excel, you should click **Options** and choose **Enable this content**. Otherwise, the diagram in the report may be abnormally displayed.
- The OD obtains device data at an interval of 10 minutes. Therefore, the report data is not real-time data.

Operation Procedure

Step 1 In the **WDM Trail Performance Analysis** window, select one or more trails and click **export>WDM Trail Performance Report**.

Step 2 In the **Export Report** dialog box, set **Data type** and **Data range** for the report.

Figure 5-7 OCh trails

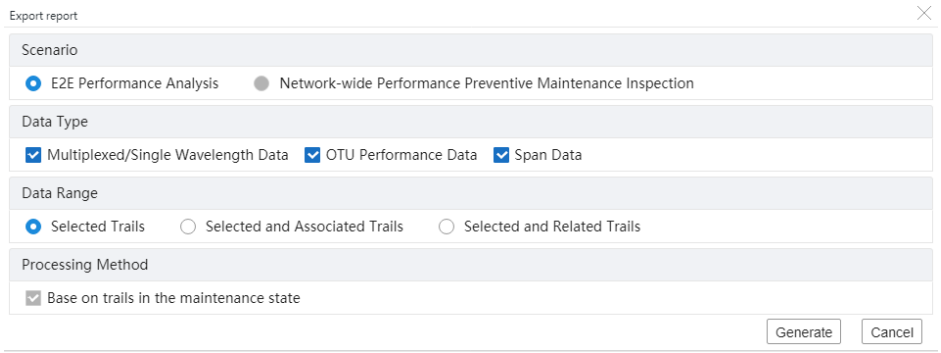
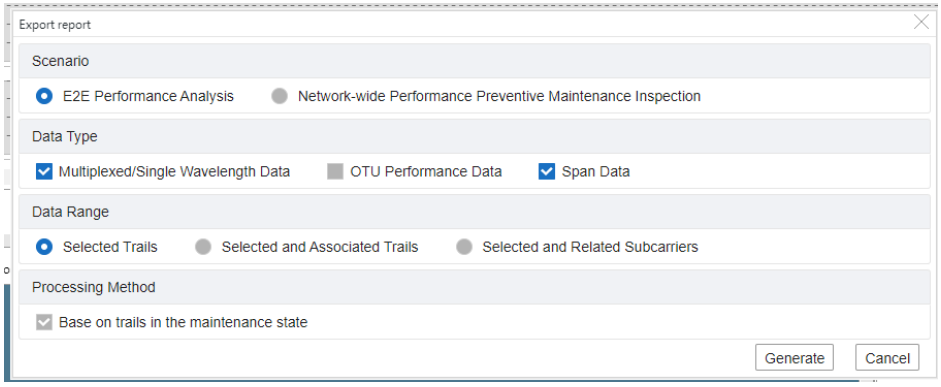


Figure 5-8 OMS trails



NOTE

The **Based on trails in the maintenance state** check box is selected by default, indicating that the generated report collects statistics on wavelengths only in the **Maintenance** state.

Step 3 Click **Generate**.

NOTE

When you export the report for the first time, the browser blocks the report pop-up and the address bar is marked Pop-up blocked  . You can perform the following operations:

1. Click Pop-up blocked  . In the dialog box that is displayed, click the link for the pop-up you want to see. The report is automatically downloaded.
2. To always see pop-ups for the report, select **Always allow pop-ups and redirects from [site]** and click **Done**.

----End

Result

The exported report contains the following worksheets: **Trail Data**, **Single-Wavelength Data**, **Span Data**, **Trail Power Diagram**, and **OA Power Flatness Diagram**.

- **Trail Data** displays the power of the selected trail in the **Maintenance** state and the OSNR data.

  In the **Status** column of **Trail Data**, click **Trail Power Diagram** to switch to the **Trail Power Diagram** sheet, which graphically displays the power or OSNR of each node on trails.
- **Single-Wavelength Data** displays the power and OSNR of single wavelengths of an OA on an trail.

  On the **Single-Wavelength Data** worksheet, click any link in the **Board Port** column. On the displayed **OA Power Flatness Diagram** tab, you can directly query the single-wavelength power and OSNR in the form of diagram.
- **Span Data** displays the information about the optical fiber loss and optical power of an OTS on an trail.

NOTE

For an 80-channel system with no OA board configured at the transmit end, no data is displayed in **Span Data** in the report.

Parameters in the Trail Performance Report

A hyphen (-) indicates that the corresponding parameter is not supported or configured. A slash (/) indicates that no data is obtained. Abnormal data is marked with a color based on its abnormality level. The **Status** column shows the color of the abnormality with the highest level in the row.

NOTE

For details about how to handle abnormal issues displayed in the report, see **9.2 Solutions to Abnormal Optical Power in the WDM Trail Performance Report**.

Table 5-19 Trail Data

Parameter		Description
Object	Optical NE	Indicates the optical NEs on an trail.
	NE	Indicates the NEs on an trail.
	Board	Indicates the boards on an trail.
	Port	Indicates the board ports on an trail.
	Port Type	Indicates the types of board ports on an trail.
Number of Wavelengths		Indicates the number of wavelengths on an board port that the trail traverses.
Wavelength		Indicates the wavelength of an trail. **NOTE** • In a non-FlexGrid system, the value of **Wavelength** is displayed in the format of *Wavelength number*|*Wavelength*|*Frequency*, for example, **6\1531.12\195.800**. • In a FlexGrid system, the value of **Wavelength** is displayed in the format of *Center wavelength* +*Frequency width*, for example, **195.95000THz +-18.75GHz**.
Single-Wavelength Optical Power (dBm)	Current Value	Indicates the current value of the single-wavelength power of the nodes that an trail traverses. **NOTE** Click the link to switch to the **Single-Wavelength Data** tab page, where you can query the current value of the single-wavelength power of all single wavelengths on an OA board.

Parameter		Description
	Nominal Value/Threshold	Indicates the single-wavelength nominal input or output power of the OA board that an trail traverses when the gain of the OA board is the minimum value, and the input power alarm threshold of an OTU board.
Single-Wavelength OSNR (dB)	Current Value	Indicates the current single-wavelength OSNR of a node that the trail traverses.
	Min. Value/ Max. Value	Indicates the minimum/ maximum single-wavelength OSNR of a node that the trail traverses. **NOTE** Click the link to display the **Single-Wavelength Data** tab page, where the current OSNR value of every single wavelength on the OA is displayed.
Multiplexed-Wavelength Optical Power (dBm)	Current Value	Indicates the multiplexed-wavelength optical power of a node that the trail traverses. **NOTE** The multiplexed power cannot be queried on the TN11WSD9 board.
	Threshold	Indicates the multiplexed-wavelength optical power threshold of a node that the trail traverses.
Nominal Gain (dB)	Current Value	Indicates the current nominal gain of a node that the trail traverses.
	Range	Indicates the nominal gain threshold of a node that the trail traverses.
	Actual Range	Indicates the actual nominal gain threshold of a node that the trail traverses.
Attenuation (dB)	Current Value	Indicates the current optical power attenuation of a node that the trail traverses.

Parameter		Description
	Range	Indicates the optical port attenuation range of a node that the trail traverses.
Span Data		Provides a link to the **Span Data** sheet, where you can query the span data of the trail.
Pre-FEC BER	Current Value	Indicates the current pre-FEC BER of a node that the trail traverses.
	Threshold	Indicates the pre-FEC BER threshold of a node that the trail traverses.
	FEC Type	Indicates the FEC type of a node that the trail traverses.
	Q Value	Indicates the Q value of a node that the trail traverses. The Q value directly shows the network performance and each Q value matches a BER value. A greater Q value indicates better network performance.
CD Compensation	Current Value	Indicates the current chromatic dispersion (CD) offset value of a node that the trail traverses. CD indicates spreading of a pulse in an optical fiber caused by differences in wave velocity in the medium.
DGD	Current Value	Indicates the current polarization mode dispersion value of a node that the trail traverses. The polarization mode dispersion is caused by imperfect symmetry of cross-sectional area of a fiber.
In-band noise (dB)	Current Value	Indicates the current in-band noise of a node that the trail traverses.

Table 5-20 Single-Wavelength Data

Parameter		Description
OA Board	Optical NE	Indicates the optical NE on the trail where an OA board resides.
	NE	Indicates the NE on the trail where a board resides.
	Board Port	Indicates an OA board and board port that the trail traverses.
OSA Board	Optical NE	Indicates the optical NE where an optical spectrum analyzer (OSA) board resides.
	NE	Indicates the NE where an OSA board resides.
	Board Port	Indicates an OSA board and the board port. This port is used to analyze the spectrum of an OA board.
Wavelength		Indicates a single wavelength on the OA board. **NOTE** • In a non-FlexGrid system, the value of **Wavelength** is displayed in the format of *Wavelength number*|*Wavelength*|*Frequency*, for example, **6\1531.12\195.800**. • In a FlexGrid system, the value of **Wavelength** is displayed in the format of *Center wavelength*+*Frequency width*, for example, **195.95000THz+-18.75GHz**.

Parameter		Description
Single-Wavelength Input Optical Power (dBm)	Current Value	Indicates the current input optical power of a single wavelength on the OA board. **NOTE** • If querying the single-wavelength power of the OA board fails, **/** is displayed in **Current Value**, and the data identifier displayed in the **Current Value** column is **Suggestion**. • If the single wavelength on the OA board has no light, **-60** is displayed in **Current Value**, and the data identifier displayed in the **Current Value** column is **Minor**.
	Nominal Value	Indicates the single-wavelength nominal input optical power of the OA board that an trail traverses when the gain of the OA board reaches the minimum.
Single-Wavelength Output Optical Power (dBm)	Current Value	Indicates the current output optical power of a single wavelength on the OA board. **NOTE** • If querying the single-wavelength power of the OA board fails, **/** is displayed in **Current Value**, and the data identifier displayed in the **Current Value** column is **Suggestion**. • If the single wavelength on the OA board has no light, **-60** is displayed in **Current Value**, and the data identifier displayed in the **Current Value** column is **Minor**.

Parameter		Description
	Nominal Value	Indicates the single-wavelength nominal output optical power of the OA board that an trail traverses when the gain of the OA board reaches the minimum.
	Threshold	Indicates the current flatness monitoring threshold of a single wavelength on the OA board.
	Deviation Value	Indicates the deviation output power of a single wavelength on an OA board.
	Result	Indicates the monitoring result of a single wavelength on the OA board.
Single-Wavelength OSNR (dB)	Current Value	Indicates the current OSNR value of a single wavelength on an OA board.

Table 5-21 Span Data

Parameter		Description
Inter-Site Object	Source Optical NE	Indicates the source optical NE of an optical transmission section (OTS).
	Source NE	Indicates the source NE of an OTS.
	Span Source Port	Indicates the source OA board of an OTS.
	OTS Source	Indicates the source port of an OTS.
	Sink Optical NE	Indicates the sink optical NE of an OTS.
	Sink NE	Indicates the sink NE of an OTS.

Parameter		Description
	Span Sink Port	Indicates the sink OA board of an OTS.
	OTS Sink	Indicates the sink port of an OTS.
Fiber Loss	Current Value (dB)	Indicates the current fiber loss. **NOTE** If the current fiber loss is greater than the specified EOL value, the current fiber loss is identified as a major abnormality.
	Design Value(EOL)(dB)	Indicates the design fiber loss.
	Margin (dB)	Margin between the designed attenuation and current attenuation of a fiber. If the current attenuation exceeds the designed attenuation, 0 is displayed.
	Result	Indicates the monitoring result of fiber loss.
Span Loss	Current Value (dB)	Indicates the current loss of an OTS. **NOTE** • The span loss is not calculated if there is no source or sink OA board. • The current span attenuation is the output optical power of the source OA board minus the input optical power of the sink OA board. When the current span loss is not within the permitted range, the current span loss is identified as a minor abnormality.
	Reference Value Range (dB)	Indicates the nominal loss of an OTS.
Output power of Source OA	Current Value(dBm)	Indicates the output optical power of the source OA board on an OTS.
EVOA before Sink OA	Current Value(dB)	Indicates the attenuation of the electrical variable optical attenuator (EVOA) before the sink OA board on an OTS.

Parameter		Description
Input power of Sink OA	Current Value(dBm)	Indicates the input optical power of the sink OA board on an OTS.
Launch Power	Launch Power(dBm)	Indicates the single-wavelength incident optical power of a fiber.
	Nominal Single-Wavelength Output Power of Source Port(dBm)	Indicates the single-wavelength nominal output optical power of the source OA board on an OTS.
	Attenuation of EVOA After Source Port(dB)	Indicates the attenuation of the EVOA after the source OA board on an OTS. **NOTE** **Attenuation of EVOA After Source Port (dB)** in the **Launch Power** column indicates the attenuation of the EVOA that is installed in the downstream direction of the egress OA board and is used to control the incident optical power. When the **Launch Power** less than the value calculated from the output optical power of the OA board (the nominal output optical power just at the board is transmit-end OA) minus the EVOA attenuation, the **Attenuation of EVOA After Source Port (dB)** column is marked as minor abnormality.

5.3.4.3 Exporting Backup Data Reports

Prerequisites

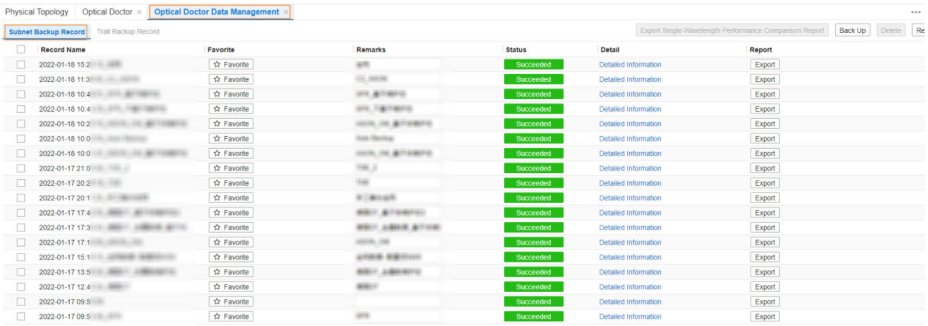
The records must be normal. For the data that is manually backed up on a subnet, the single-wavelength data must be included in the backup records for analysis, and two records must be selected.

Context

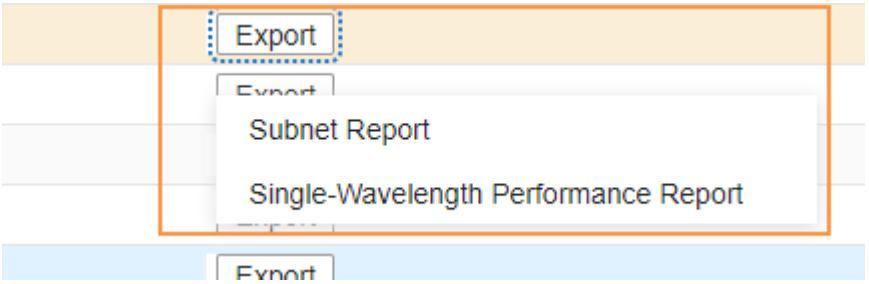
If the message "**SECURITY WARNING Macros have been disabled.**" is displayed on the Excel menu bar, click **Options** and select **Enable Content**. Otherwise, the graphics in the report may be displayed abnormally.

Procedure

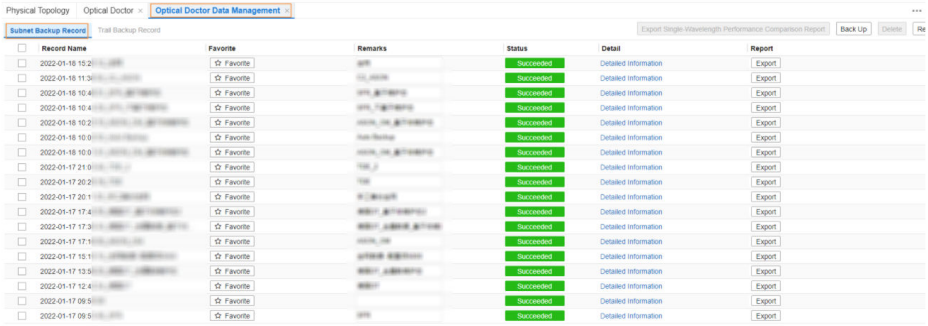
- Export the subnet backup record report.
  a. On the **Optical Doctor Data Management** page, click **Subnet Backup Record**.



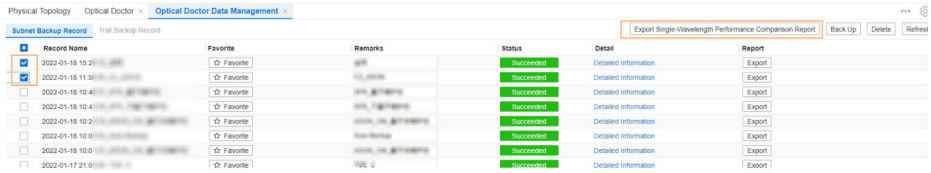
  b. Select the report to be exported and click **Export**.



- Export the Subnet Single-Wavelength Performance Comparison Report.
  a. On the **Optical Doctor Data Management** page, click **Subnet Backup Record**.

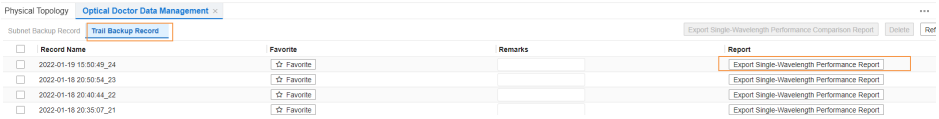


  b. Select two records of the same subnet or trail, click **Export Single-Wavelength Performance Comparison Report** in the upper right corner.



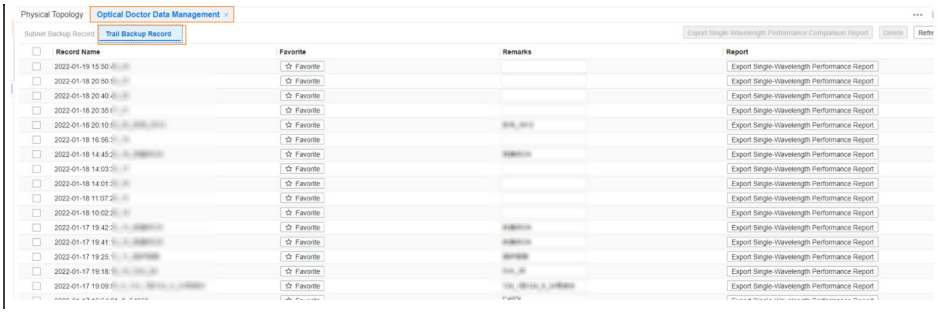
- Export the trail backup record report.
  a. On the **Optical Doctor Data Management** page, click **Trail Backup Record**.

b. Select the report to be exported and click **Export Single-Wavelength Performance Report**.



- Export the trail Single-Wavelength Performance Comparison Report.

  a. On the **Optical Doctor Data Management** page, click **Trail Backup Record**.



  b. Select two records of the same subnet or trail, click **Export Single-Wavelength Performance Comparison Report** in the upper right corner.

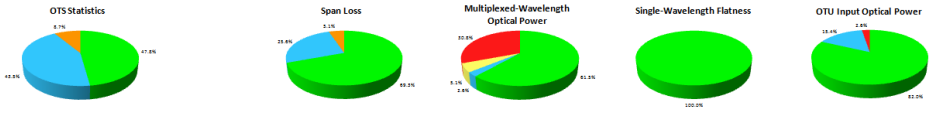
Operation Result

The exported subnet report contains the following items: **Statistics, OMS List, OMS Data, Single-Wavelength Data, Span Data, Trail Power Diagram, OSNR Loss Flatness Diagram,** and **OA Data Flatness Diagram.**

The exported single-wavelength performance report includes **Single-Wavelength Data, OSNR Loss Flatness Diagram, and OA Data Flatness Diagram.**

The report data is exported, including **OMS Name**, **OMS Source Board**, **OMS Sink Board**, **Number of Wavelengths**, **Wavelength**, **Current Single-Wavelength Value**, **Average Single-Wavelength Value**, and **Single-Wavelength Deviation Value**.

- **Statistics Info** lists the collected alarm of span loss, single wavelength data, and multiplexed wavelength data in the form of table and proportion of these alarms in the form of pie diagram.



- The **OMS List** lists all OMS information in the entire network.
- **OMS Data** lists the collected power and OSNR data related to OCh trails on all OMSs in the network.

  In the **Status** column of **OMS Data**, click **Trail Power Diagram** of an OMS to switch to the **Trail Power Diagram** sheet, which graphically displays the multiplexed-wavelength optical power of each node on OCh trails.
- The **Single-Wavelength Data** lists the single-wavelength performance of OA boards in the entire network.

  On the **Single-Wavelength Data** worksheet, click any link in the **Board Port** column. In the displayed **OA Power Flatness Diagram** window, you can query the input and output single-wavelength optical power and OSNR of selected OA in the form of diagram.
- The **Span Data** lists parameters of OTS in the entire network.

Parameters in Backup Data Report

A hyphen (-) indicates that the corresponding parameter is not supported or configured. A slash (/) indicates that no data is obtained. Abnormal data is marked with a color based on its abnormality level. The **Status** column shows the color of the abnormality with the highest level in the row.

Table 5-22 OMS List

Parameter	Description
Source Optical NE	Indicates the source optical NE of an OMS.
Source NE	Indicates the source NE of an OMS.
Source Board	Indicates the source board of an OMS.
Sink Optical NE	Indicates the sink optical NE of an OMS.
Sink NE	Indicates the sink NE of an OMS.
Sink Board	Indicates the sink board of an OMS.
Span Loss	Indicates whether a span loss alarm is reported on an OMS.

Parameter	Description
Multiplexed-Wavelength Optical Power	Indicates whether an alarm related to multiplexed-wavelength optical power is reported on an OMS.
Single-Wavelength Flatness	Indicates whether an alarm related to single-wavelength power flatness is reported on an OMS.
OTU Input Optical Power	Indicates whether an alarm related to OTU input optical power is reported on an OMS.
Hyperlink	Provides a link for an OMS. By clicking the link, you can navigate to the **OMS Data** sheet to query the data of the OMS.

Table 5-23 OMS Data

Parameter		Description
Object	Optical NE	Indicates the optical NEs on an OMS.
	NE	Indicates the NEs on an OMS.
	Board	Indicates the boards on an OMS.
	Port	Indicates the board ports on an OMS.
	Port Type	Indicates the types of the board ports on an OMS.
Number of Wavelengths		Indicates the number of wavelengths in the Maintenance state on an OA board that the OMS traverses.

Parameter		Description
Wavelength		Indicates a single wavelength in maintenance state on the line board or OTU board that an OMS traverses. **NOTE** • In a non-FlexGrid system, the value of **Wavelength** is displayed in the format of *Wavelength number*|*Wavelength*|*Frequency*, for example, **6\1531.12\195.800**. • In a FlexGrid system, the value of **Wavelength** is displayed in the format of *Center wavelength+Frequency width*, for example, **195.95000THz +-18.75GHz**.
Single-Wavelength Optical Power (dBm)	Current Value	Indicates the current value of the single-wavelength power of the board that an OMS passes through. **NOTE** Click the link to switch to the **Single-Wavelength Data** tab page, where you can query the current value of the single-wavelength power of all single wavelengths on an OA board.
	Threshold	Indicates the input power alarm threshold of an OTU board that an OMS traverses.
Single-Wavelength OSNR (dB)	Current Value	Indicates the current single-wavelength OSNR of each OTU board on an OMS.
	Min. Value/ Max. Value	Indicates the minimum/ maximum single-wavelength OSNR of each board on an OMS.
Multiplexed-Wavelength Optical Power (dBm)	Current Value	Indicates the multiplexed-wavelength optical power of boards on an OMS. **NOTE** The multiplexed power cannot be queried on the TN11WSD9 board.
	Threshold	Indicates the multiplexed-wavelength optical power threshold of boards on an OMS.

Parameter		Description
Nominal Gain (dB)	Current Value	Indicates the current nominal gain of boards on an OMS.
	Range	Indicates the nominal gain threshold of boards on an OMS.
Attenuation (dB)	Current Value	Indicates the current optical power attenuation of boards on an OMS.
	Range	Indicates the optical port attenuation threshold of boards on an OMS.
Span Data		Provides a link to the **Span Data** sheet, where you can query the span data of the OMS.
Pre-FEC BER	Current Value	Indicates the current pre-FEC BER of each drop OTU board on an OMS.
	Threshold	Indicates the pre-FEC BER threshold of each drop OTU board on an OMS.
	FEC Type	Indicates the FEC type of each drop OTU board on an OMS.
	Q Value	Indicates the Q value of each drop OTU board on an OMS. The Q value directly shows the network performance and each Q value matches a BER value. A greater Q value indicates better network performance.
CD Compensation	Current Value	Indicates the current Chromatic Dispersion (CD) offset value of each drop OTU board on an OMS. CD indicates spreading of a pulse in an optical fiber caused by differences in wave velocity in the medium.

Parameter		Description
DGD	Current Value	Indicates the polarization mode dispersion of each drop OTU board on an OMS. The polarization mode dispersion is caused by imperfect symmetry of cross-sectional area of a fiber.
In-band noise (dB)	Current Value	Indicates the in-band noise of Raman boards on an OMS.
Maintenance Memo		Indicates the memo for the boards on an OMS.

Table 5-24 Single-Wavelength Data

Parameter		Description
OA Board	Optical NE	Indicates the optical NE on the OMS trail where an OA board resides.
	NE	Indicates the NE on the OMS trail where a board resides.
	Board Port	Indicates an OA board and board port that the OMS trail traverses. **NOTE** Clicking the link navigates you to the **OA Power Flatness Diagram** sheet, which graphically displays the single-wavelength optical power.
OSA Board	Optical NE	Indicates the optical NE where an optical spectrum analyzer (OSA) board resides.
	NE	Indicates the NE where an OSA board resides.
	Board Port	Indicates an OSA board and the board port. This port is used to analyze the spectrum of an OA board.

Parameter		Description
Wavelength		Indicates a single wavelength on the OA board. **NOTE** • In a non-FlexGrid system, the value of **Wavelength** is displayed in the format of *Wavelength number*|*Wavelength*|*Frequency*, for example, **6\1531.12\195.800**. • In a FlexGrid system, the value of **Wavelength** is displayed in the format of *Center wavelength*+*Frequency width*, for example, **195.95000THz+-18.75GHz**.
Single-Wavelength Input Optical Power (dBm)	Current Value	Indicates the current input optical power of a single wavelength on the OA board. **NOTE** • If querying the single-wavelength power of the OA board fails, **/** is displayed in **Current Value**, and the data identifier displayed in the **Current Value** column is **Suggestion**. • If the single wavelength on the OA board has no light, **-60** is displayed in **Current Value**, and the data identifier displayed in the **Current Value** column is **Minor**.
	Nominal Value	Indicates the single-wavelength nominal input optical power of the OA board that an OMS trail traverses when the gain of the OA board reaches the minimum.

Parameter		Description
Single-Wavelength Output Optical Power (dBm)	Current Value	Indicates the current output optical power of a single wavelength on the OA board. **NOTE** • If querying the single-wavelength power of the OA board fails, **/** is displayed in **Current Value**, and the data identifier displayed in the **Current Value** column is **Suggestion**. • If the single wavelength on the OA board has no light, **-60** is displayed in **Current Value**, and the data identifier displayed in the **Current Value** column is **Minor**.
	Nominal Value	Indicates the single-wavelength nominal output optical power of the OA board that an OMS trail traverses when the gain of the OA board reaches the minimum.
	Threshold	Indicates the current flatness monitoring threshold of a single wavelength on the OA board.
	Deviation Value	Indicates the deviation output power of a single wavelength on an OA board.
	Result	Indicates the monitoring result of a single wavelength on the OA board.
Single-Wavelength OSNR (dB)	Current Value	Indicates the current OSNR value of a single wavelength on an OA board.

Table 5-25 Span Data

Parameter		Description
Inter-Site Object	Source Optical NE	Indicates the source optical NE of an optical transmission section (OTS).
	Source NE	Indicates the source NE of an OTS.
	Span Source Port	Indicates the source OA board of an OTS.
	OTS Source	Indicates the source port of an OTS.
	Sink Optical NE	Indicates the sink optical NE of an OTS.
	Sink NE	Indicates the sink NE of an OTS.
	Span Sink Port	Indicates the sink OA board of an OTS.
	OTS Sink	Indicates the sink port of an OTS.
Fiber Loss	Current Value (dB)	Indicates the current fiber loss. **NOTE** If the current fiber loss is greater than the specified EOL value, the current fiber loss is identified as a major abnormality.
	Design Value(EOL)(dB)	Indicates the design fiber loss.
	Margin (dB)	Margin between the designed attenuation and current attenuation of a fiber. If the current attenuation exceeds the designed attenuation, 0 is displayed.
	Result	Indicates the monitoring result of fiber loss.

Parameter		Description
Span Loss	Current Value (dB)	Indicates the current loss of an OTS. **NOTE** • The span loss is not calculated if there is no source or sink OA board. • The current span attenuation is the output optical power of the source OA board minus the input optical power of the sink OA board. When the current span loss is not within the permitted range, the current span loss is identified as a minor abnormality.
	Reference Value Range (dB)	Indicates the nominal loss of an OTS.
Output power of Source OA	Current Value(dBm)	Indicates the output optical power of the source OA board on an OTS.
EVOA before Sink OA	Current Value(dB)	Indicates the attenuation of the electrical variable optical attenuator (EVOA) before the sink OA board on an OTS.
Input power of Sink OA	Current Value(dBm)	Indicates the input optical power of the sink OA board on an OTS.
Launch Power	Launch Power(dBm)	Indicates the single-wavelength incident optical power of a fiber.
	Target Attenuation of EVOA After Source Port (dB)	Indicates the target attenuation of the EVOA after the source OA board on an OTS.

Parameter		Description
	Attenuation of EVOA After Source Port(dB)	Indicates the attenuation of the EVOA after the source OA board on an OTS. **NOTE** **Attenuation of EVOA After Source Port (dB)** in the **Launch Power** column indicates the attenuation of the EVOA that is installed in the downstream direction of the egress OA board and is used to control the incident optical power. When the **Launch Power** less than the value calculated from the output optical power of the OA board (the nominal output optical power just at the board is transmit-end OA) minus the EVOA attenuation, the **Attenuation of EVOA After Source Port (dB)** column is marked as minor abnormality.

5.3.4.4 Exporting Single-Wavelength Performance Reports

Prerequisites

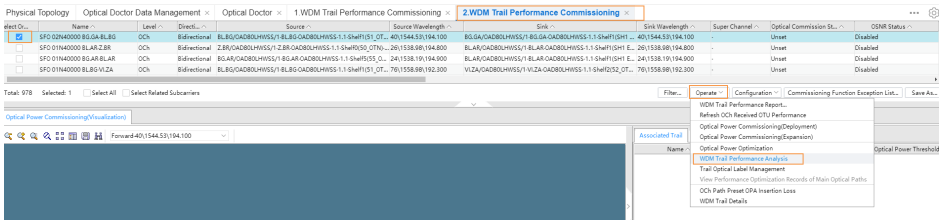
You need to analyze the performance and compare it with the historical data.

Context

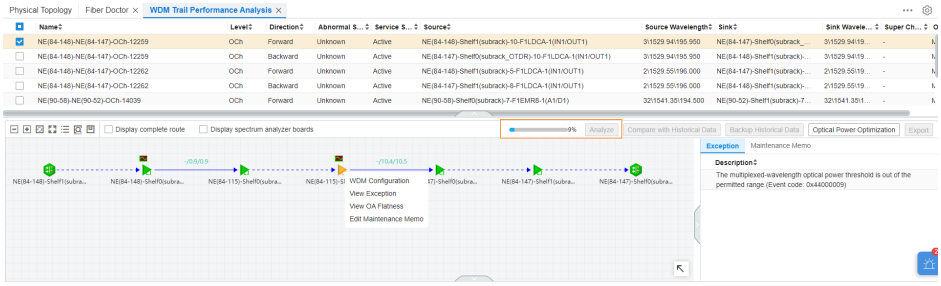
If the message "**SECURITY WARNING Macros have been disabled.**" is displayed on the Excel menu bar, click **Options** and select **Enable Content**. Otherwise, the graphics in the report may be displayed abnormally.

Procedure

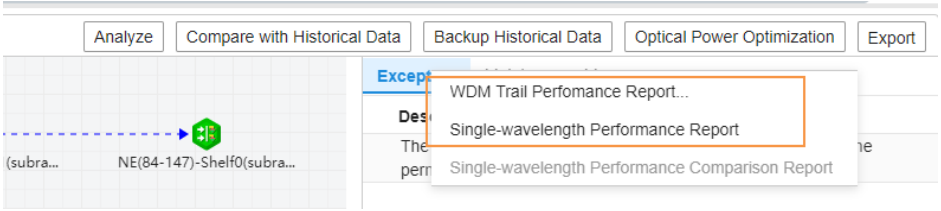
1. On the **WDM Trail Performance Commissioning** page, select data. Click **Operation** in the lower right corner and select **WDM Trail Performance Analysis** from the drop-down list.



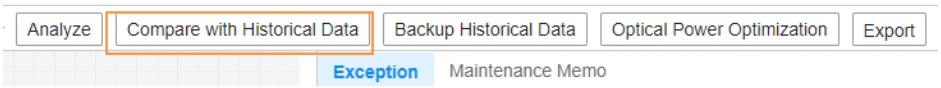
2. On the **WDM Trail Performance Analysis page**, click **Analyze** in the lower right corner and wait until the progress reaches 100%.



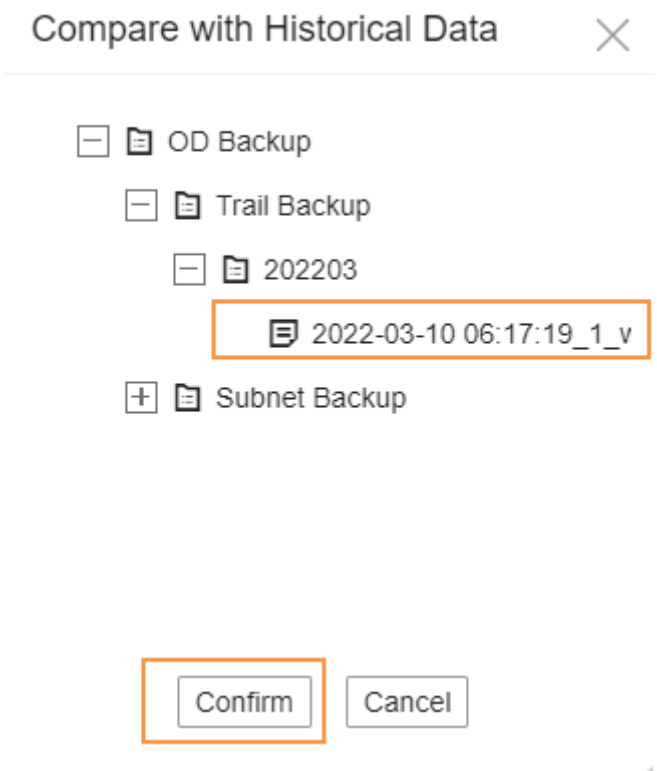
3. In the lower right corner of the **WDM Trail Performance Analysis** page, click **Export** and select the report to be exported.



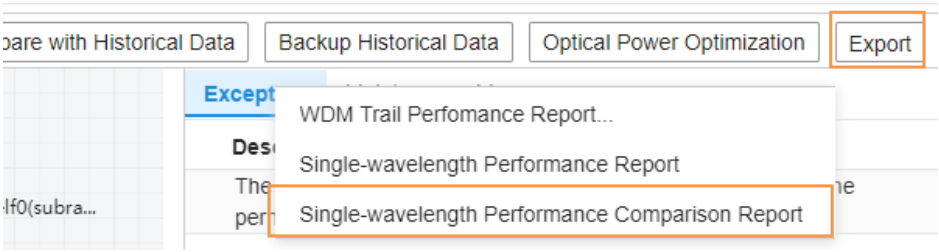
4. Click **Compare with Historical Data**.



5. In the dialog box that is displayed, select the data to be compared and click **Confirm**.



6. Click **Export** again and select the comparison reports to be exported.



Operation Result

1. The exported WDM trail performance report includes **Single-Wavelength Data, OMS Trail Data, Span Data, Trail Power Diagram,** and **OA Data Flatness** Diagram.
   - **Single-Wavelength Data(WDM trail performance report)** displays the power and OSNR of single wavelengths of an OA on an trail.

     On the **Single-Wavelength Data(WDM trail performance report)** worksheet, click any link in the **Board Port** column. On the displayed **OA Power Flatness Diagram** tab, you can directly query the single-wavelength power and OSNR in the form of diagram.
   - **Span Data** displays the information about the optical fiber loss and optical power of an OTS on an trail.
   - **OMS Data** lists the collected power and OSNR data related to trails on all OMSs in the network.
2. The exported single-wavelength performance report includes **Single-Wavelength Data, OA Data Flatness Diagram,** and **OSNR Loss Flatness Diagram.**
   - **Single-Wavelength Data(single-wavelength performance report)** displays the power and OSNR Loss of single wavelengths of an OA on an trail.

Parameters in Single-Wavelength Performance Reports

Table 5-26 Single-Wavelength Data(WDM trail performance report)

Parameter		Description
OA Board	Optical NE	Indicates the optical NE on the trail where an OA board resides.
	NE	Indicates the NE on the trail where a board resides.
	Board Port	Indicates an OA board and board port that the trail traverses.

Parameter		Description
OSA Board	Optical NE	Indicates the optical NE where an optical spectrum analyzer (OSA) board resides.
	NE	Indicates the NE where an OSA board resides.
	Board Port	Indicates an OSA board and the board port. This port is used to analyze the spectrum of an OA board.
Wavelength		Indicates a single wavelength on the OA board. **NOTE** • In a non-FlexGrid system, the value of **Wavelength** is displayed in the format of *Wavelength number*|*Wavelength*|*Frequency*, for example, **6\1531.12\195.800**. • In a FlexGrid system, the value of **Wavelength** is displayed in the format of *Center wavelength*+*Frequency width*, for example, **195.95000THz+-18.75GHz**.
Single-Wavelength Input Optical Power (dBm)	Current Value	Indicates the current input optical power of a single wavelength on the OA board. **NOTE** • If querying the single-wavelength power of the OA board fails, **/** is displayed in **Current Value**, and the data identifier displayed in the **Current Value** column is **Suggestion**. • If the single wavelength on the OA board has no light, **-60** is displayed in **Current Value**, and the data identifier displayed in the **Current Value** column is **Minor**.

Parameter		Description
	Nominal Value	Indicates the single-wavelength nominal input optical power of the OA board that an trail traverses when the gain of the OA board reaches the minimum.
Single-Wavelength Output Optical Power (dBm)	Current Value	Indicates the current output optical power of a single wavelength on the OA board. **NOTE** • If querying the single-wavelength power of the OA board fails, **/** is displayed in **Current Value**, and the data identifier displayed in the **Current Value** column is **Suggestion**. • If the single wavelength on the OA board has no light, **-60** is displayed in **Current Value**, and the data identifier displayed in the **Current Value** column is **Minor**.
	Nominal Value	Indicates the single-wavelength nominal output optical power of the OA board that an trail traverses when the gain of the OA board reaches the minimum.
	Threshold	Indicates the current flatness monitoring threshold of a single wavelength on the OA board.
	Deviation Value	Indicates the deviation output power of a single wavelength on an OA board.
	Result	Indicates the monitoring result of a single wavelength on the OA board.

Parameter		Description
Single-Wavelength OSNR (dB)	Current Value	Indicates the current OSNR value of a single wavelength on an OA board.

Table 5-27 Single-wavelength data (single-wavelength performance report)

Parameter	Description
OMS Name	Displays the name of the OMS segment.
Subnet	Displays the public parent subnet of the subnet where the source and sink boards of the current OMS section are located.
Oms Type	OMSs are classified into Intra-Station and Inter-Station.
Source Board	Indicates the source board of an OMS.
Sink Board	Indicates the sink board of an OMS.
Number of Wavelengths	Displays the number of analyzed wavelengths of the OA boards that the current OMS section traverses.
Wavelength	Indicates the wavelength of an trail. **NOTE** • In a non-FlexGrid system, the value of **Wavelength** is displayed in the format of *Wavelength number*|*Wavelength*|*Frequency*, for example, **6\1531.12\195.800**. • In a FlexGrid system, the value of **Wavelength** is displayed in the format of *Center wavelength+Frequency width*, for example, **195.95000THz+-18.75GHz**.
Single-Wavelength Output Optical Power (dBm)	Current Value:Indicates the current output optical power of a single wavelength on the OA board. **NOTE** • If querying the single-wavelength power of the OA board fails, **/** is displayed in **Current Value**, and the data identifier displayed in the **Current Value** column is **Suggestion**. • If the single wavelength on the OA board has no light, **-60** is displayed in **Current Value**, and the data identifier displayed in the **Current Value** column is **Minor**. Single-Wavelength Output Average Optical Power(dBm):Displays the average output power of each wavelength on an OA board. Deviation Value(dBm):Indicates the monitoring result of a single wavelength on the OA board.
Transmit-End OA	The last transmit-end OA board of the OMS.

Parameter	Description
OSNR Loss(dB)	Current Value: Displays the current OSNR Loss value of each wavelength on the OMS. Average: Displays the current average OSNR Loss of each wavelength on the OMS. Deviation: Displays the current OSNR loss deviation of each wavelength on the OMS.
Receive-End OA	The last receive-end OA board of the OMS.

Table 5-28 OMS Data

Parameter		Description
Object	Optical NE	Indicates the optical NEs on an OMS.
	NE	Indicates the NEs on an OMS.
	Board	Indicates the boards on an OMS.
	Port	Indicates the board ports on an OMS.
	Port Type	Indicates the types of the board ports on an OMS.
Number of Wavelengths		Indicates the number of wavelengths in the Maintenance state on an OA board that the OMS traverses.
Wavelength		Indicates a single wavelength in maintenance state on the line board or OTU board that an OMS traverses. **NOTE** • In a non-FlexGrid system, the value of **Wavelength** is displayed in the format of *Wavelength number*|*Wavelength*|*Frequency*, for example, **6\1531.12\195.800**. • In a FlexGrid system, the value of **Wavelength** is displayed in the format of *Center wavelength+Frequency width*, for example, **195.95000THz +-18.75GHz**.

Parameter		Description
Single-Wavelength Optical Power (dBm)	Current Value	Indicates the current value of the single-wavelength power of the board that an OMS passes through. **NOTE** Click the link to switch to the **Single-Wavelength Data** tab page, where you can query the current value of the single-wavelength power of all single wavelengths on an OA board.
	Threshold	Indicates the input power alarm threshold of an OTU board that an OMS traverses.
Single-Wavelength OSNR (dB)	Current Value	Indicates the current single-wavelength OSNR of each OTU board on an OMS.
	Min. Value/ Max. Value	Indicates the minimum/ maximum single-wavelength OSNR of each board on an OMS.
Multiplexed-Wavelength Optical Power (dBm)	Current Value	Indicates the multiplexed-wavelength optical power of boards on an OMS. **NOTE** The multiplexed power cannot be queried on the TN11WSD9 board.
	Threshold	Indicates the multiplexed-wavelength optical power threshold of boards on an OMS.
Nominal Gain (dB)	Current Value	Indicates the current nominal gain of boards on an OMS.
	Range	Indicates the nominal gain threshold of boards on an OMS.
Attenuation (dB)	Current Value	Indicates the current optical power attenuation of boards on an OMS.
	Range	Indicates the optical port attenuation threshold of boards on an OMS.
Span Data		Provides a link to the **Span Data** sheet, where you can query the span data of the OMS.

Parameter		Description
Pre-FEC BER	Current Value	Indicates the current pre-FEC BER of each drop OTU board on an OMS.
	Threshold	Indicates the pre-FEC BER threshold of each drop OTU board on an OMS.
	FEC Type	Indicates the FEC type of each drop OTU board on an OMS.
	Q Value	Indicates the Q value of each drop OTU board on an OMS. The Q value directly shows the network performance and each Q value matches a BER value. A greater Q value indicates better network performance.
CD Compensation	Current Value	Indicates the current Chromatic Dispersion (CD) offset value of each drop OTU board on an OMS. CD indicates spreading of a pulse in an optical fiber caused by differences in wave velocity in the medium.
DGD	Current Value	Indicates the polarization mode dispersion of each drop OTU board on an OMS. The polarization mode dispersion is caused by imperfect symmetry of cross-sectional area of a fiber.
In-band noise (dB)	Current Value	Indicates the in-band noise of Raman boards on an OMS.
Maintenance Memo		Indicates the memo for the boards on an OMS.

Table 5-29 Span Data

Parameter		Description
Inter-Site Object	Source Optical NE	Indicates the source optical NE of an optical transmission section (OTS).

Parameter		Description
	Source NE	Indicates the source NE of an OTS.
	Span Source Port	Indicates the source OA board of an OTS.
	OTS Source	Indicates the source port of an OTS.
	Sink Optical NE	Indicates the sink optical NE of an OTS.
	Sink NE	Indicates the sink NE of an OTS.
	Span Sink Port	Indicates the sink OA board of an OTS.
	OTS Sink	Indicates the sink port of an OTS.
Fiber Loss	Current Value (dB)	Indicates the current fiber loss. **NOTE** If the current fiber loss is greater than the specified EOL value, the current fiber loss is identified as a major abnormality.
	Design Value(EOL)(dB)	Indicates the design fiber loss.
	Margin (dB)	Margin between the designed attenuation and current attenuation of a fiber. If the current attenuation exceeds the designed attenuation, 0 is displayed.
	Result	Indicates the monitoring result of fiber loss.
Span Loss	Current Value (dB)	Indicates the current loss of an OTS. **NOTE** • The span loss is not calculated if there is no source or sink OA board. • The current span attenuation is the output optical power of the source OA board minus the input optical power of the sink OA board. When the current span loss is not within the permitted range, the current span loss is identified as a minor abnormality.

Parameter		Description
	Reference Value Range (dB)	Indicates the nominal loss of an OTS.
Output power of Source OA	Current Value(dBm)	Indicates the output optical power of the source OA board on an OTS.
EVOA before Sink OA	Current Value(dB)	Indicates the attenuation of the electrical variable optical attenuator (EVOA) before the sink OA board on an OTS.
Input power of Sink OA	Current Value(dBm)	Indicates the input optical power of the sink OA board on an OTS.
Launch Power	Launch Power(dBm)	Indicates the single-wavelength incident optical power of a fiber.
	Nominal Single-Wavelength Output Power of Source Port(dBm)	Indicates the single-wavelength nominal output optical power of the source OA board on an OTS.
	Attenuation of EVOA After Source Port(dB)	Indicates the attenuation of the EVOA after the source OA board on an OTS. **NOTE** **Attenuation of EVOA After Source Port (dB)** in the **Launch Power** column indicates the attenuation of the EVOA that is installed in the downstream direction of the egress OA board and is used to control the incident optical power. When the **Launch Power** less than the value calculated from the output optical power of the OA board (the nominal output optical power just at the board is transmit-end OA) minus the EVOA attenuation, the **Attenuation of EVOA After Source Port (dB)** column is marked as minor abnormality.

5.3.5 Verifying Trail Board Consistency

You can verify the consistency of OCh trails in the **Trail Optical Label Management** window. That is, you can verify the consistency between the

wavelengths (logical wavelengths) that traverse the board ports and the actual wavelengths (physical wavelengths).

Prerequisites

- You need to apply for and install the OD system software license. For details, see **3.1 Required License**. The 10/40G system is not supported.
- The optical path can be detected only when services are available on the optical path.
- This function strongly depends on logical fiber connections. If logical fiber connections are missing, this function is unavailable.
- Only the OptiX OSN 98009600/OptiXtrans E9600 (excluding OSN 9800 P32 series subracks) is supported.
- Only new pure coherent networks are supported, which are mainly used in 96-wavelength systems.
- Only boards that support the LS function are supported.
- Third-party wavelengths are not supported.

Tools, Equipment, and Materials

NCE

Background Information

- Detection principle: The source physical information is loaded on the source OTU board of the signal flow, parsed on a downstream board, and compared with the logical information.
- Detection range: board ports that support LS overhead detection
- Detection item: consistency between the wavelengths (logical wavelengths) that traverse the board ports and the actual wavelengths (physical wavelengths)

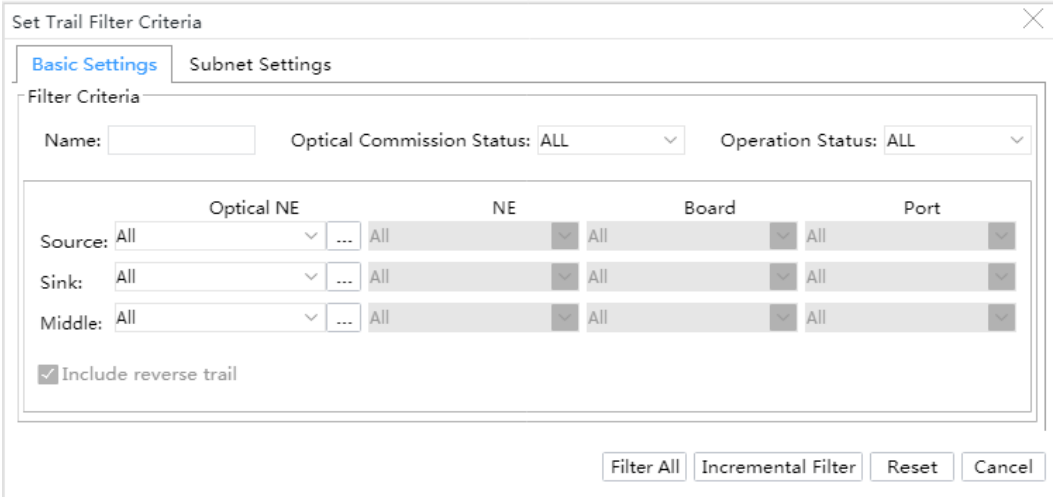
Procedure

Step 1 Choose **Configuration** > **WDM Optical Management** > **WDM Trail Performance Commissioning** from the main menu on the NCE Network Management app.

Step 2 In **Set Trail Filter Criteria** window, select the desired filter criteria and click **Filter All** or **Incremental Filter**.

NOTE

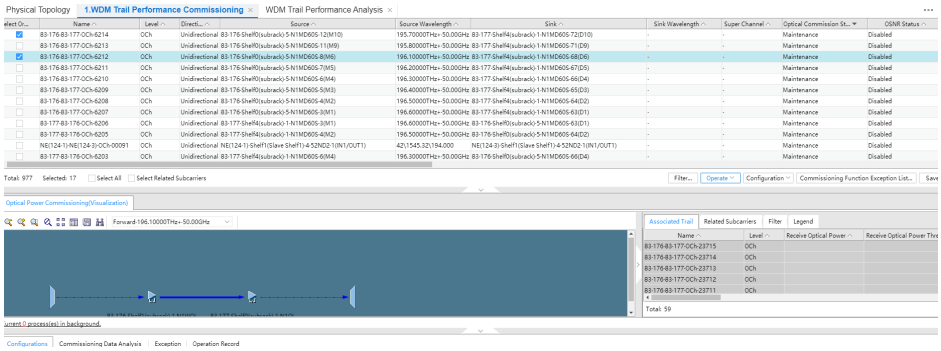
- If you need to filter all the trails, click **Filter All**.
- If you need to add to the list more trails that match the requirement, click **Incremental Filter**.



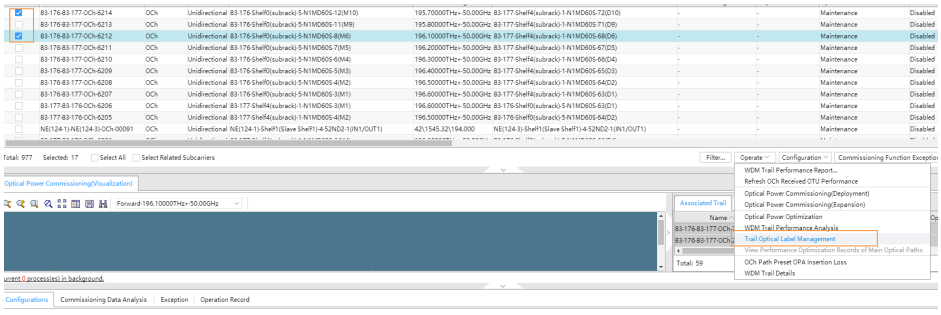
NOTE

You can also click **Subnet Settings** tab to filter the subnets.

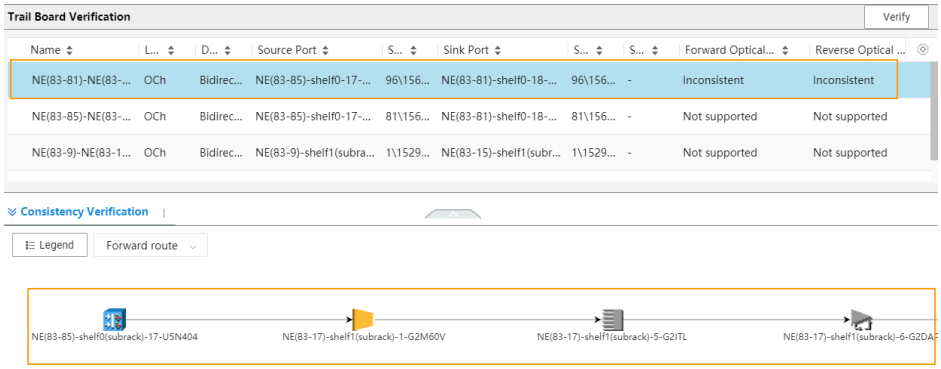
Step 3 The desired filtering OCh trails are displayed in the **WDM Trail Performance Commissioning**



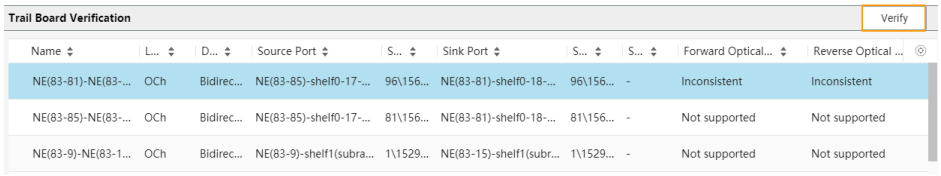
Step 4 In the **WDM Trail Performance Commissioning** window, select the OCh trails to be verified, click **Operate**, and select **Trail Optical Label Management** from the drop-down menu.



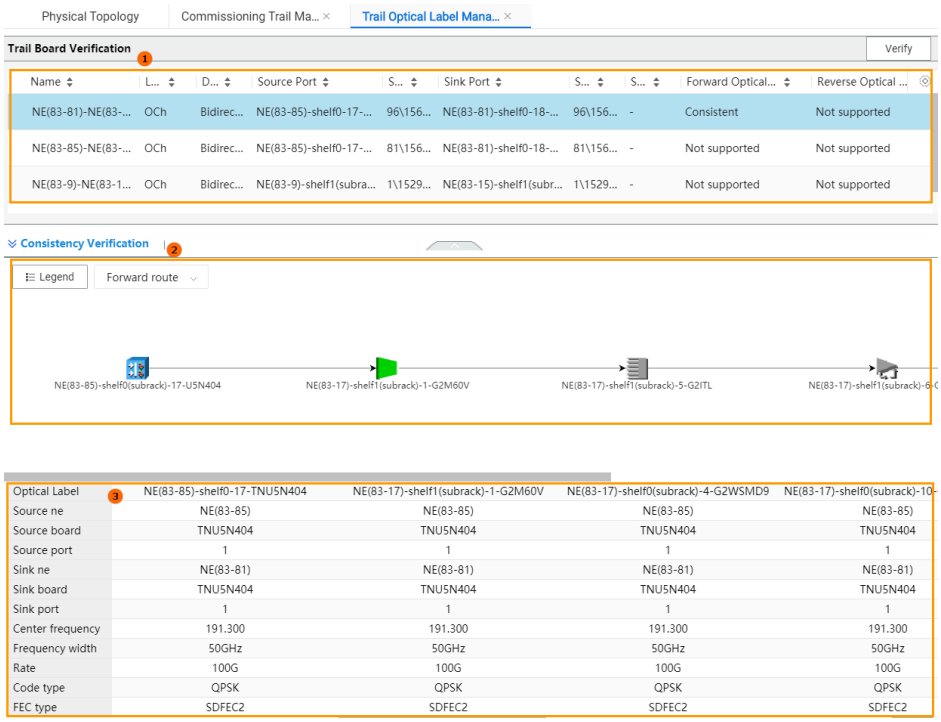
Step 5 In the **Trail Optical Label Management** window, click an OCh trail. The selected OCh trail is highlighted in the list and its routing diagram is displayed in the lower part of the window.



Step 6 Click **Verify** to check the consistency of all trails in the list.



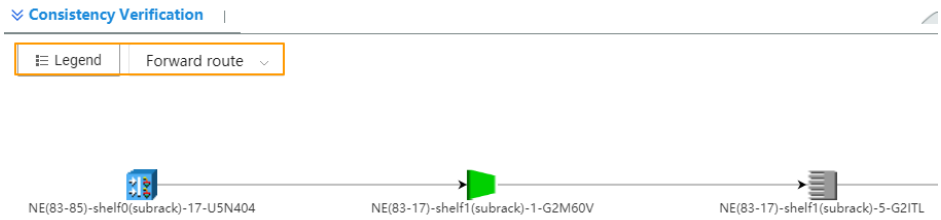
Step 7 Select an OCh trail and view the verification result.



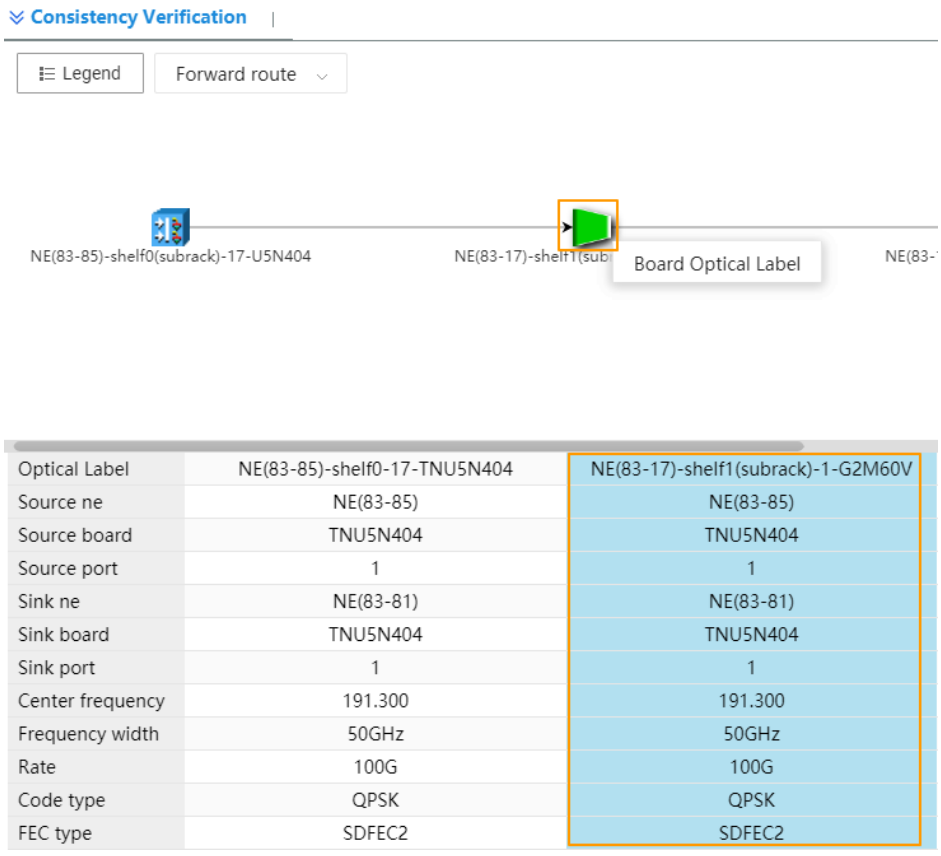
NOTE

- 1: Displays the basic information as well as forward and reverse optical label verification results of a trail.
- 2: Displays the routing diagram of a trail.
- 3: Displays the optical label information of boards that support LS overhead detection of a trail.

Step 8 In the **Consistency Verification** area, select **Forward route** or **Reverse route** to view the routing diagram of the analyzed OCh trail. The routing diagram of a trail is colored based on the legend. You can view the analysis result by referring to the legend.



Step 9 Click a board. The optical label information of the board on the current route is highlighted in the lower part.



Optical Label	NE(83-85)-shelf0-17-TNU5N404	NE(83-17)-shelf1(subrack)-1-G2M60V
Source ne	NE(83-85)	NE(83-85)
Source board	TNU5N404	TNU5N404
Source port	1	1
Sink ne	NE(83-81)	NE(83-81)
Sink board	TNU5N404	TNU5N404
Sink port	1	1
Center frequency	191.300	191.300
Frequency width	50GHz	50GHz
Rate	100G	100G
Code type	QPSK	QPSK
FEC type	SDFEC2	SDFEC2

Table 5-30 describes the optical label parameters.

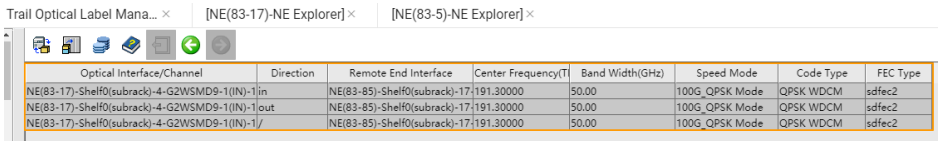
Table 5-30 Optical label parameters

Parameter	Description
Optical Label	Indicates the board information of the site that an OCh route traverses.
Source ne	Indicates the name of the NE to which the source board belongs.

Parameter	Description
Source board	Indicates the source board name of an OCh route.
Source port	Indicates the source port name of an OCh route.
Sink ne	Indicates the name of the NE to which the sink board belongs.
Sink board	Indicates the sink board name of an OCh route.
Sink port	Indicates the sink port name of an OCh route.
Center frequency	Indicates the center frequency of a wavelength.
Frequency width	Indicates the frequency bandwidth of a board.
Rate	Indicates the transmission rate of a route.
Code type	Indicates the modulation format of a board.
FEC type	Indicates the FEC type of a board.

Step 10 Click **Board Optical Label** to view the single-NE optical label information of the board.

Optical Label	NE(83-85)-shelf0-17-TNU5N404	NE(83-17)-shelf1(subrack)-1-G2M60V
Source ne	NE(83-85)	NE(83-85)
Source board	TNU5N404	TNU5N404
Source port	1	1
Sink ne	NE(83-81)	NE(83-81)
Sink board	TNU5N404	TNU5N404
Sink port	1	1
Center frequency	191.300	191.300
Frequency width	50GHz	50GHz
Rate	100G	100G
Code type	QPSK	QPSK
FEC type	SDFEC2	SDFEC2



----End

5.4 Optical Line Protection Visualization

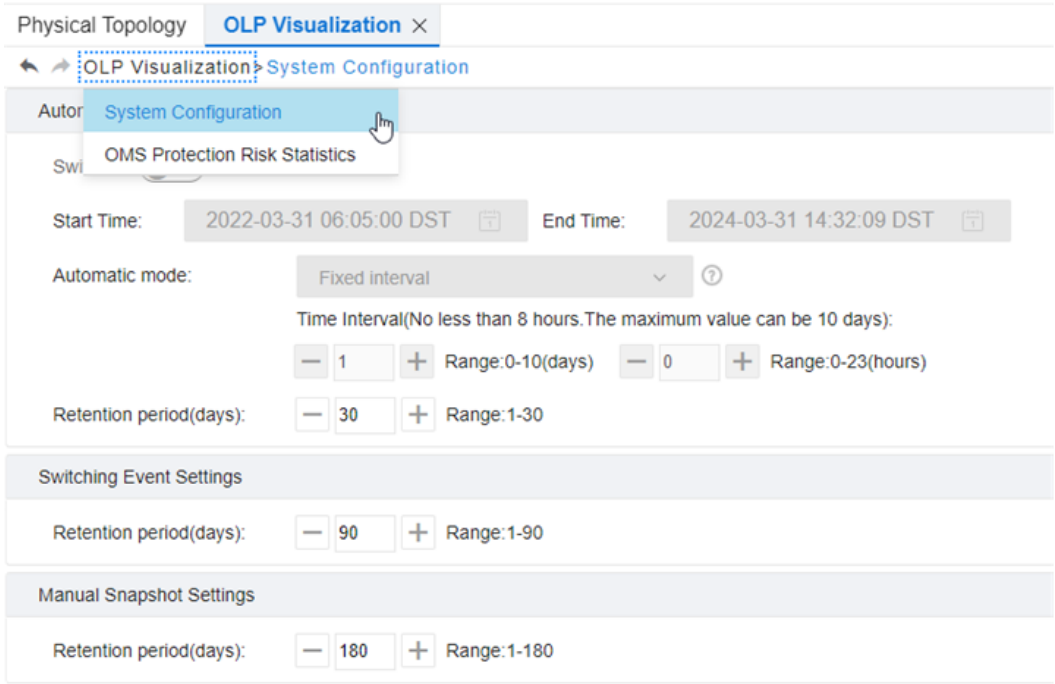
Optical line protection (OLP) visualization can implement OLP switching history query and visualized OLP protection group performance. Users can discover the OLP abnormal status on the GUI in time, and query and analyze the OLP switching history and historical performance data.

5.4.1 (Optional) Configuring the Parameters of Visualized Optical Line Protection

Procedure

Step 1 On NCE, open the **Network Management** app, and choose **Configuration** > **WDM Optical Management** > **OLP Visualization** from the main menu.

Step 2 Choose **OLP Visualization** > **System Configuration** to configure the storage duration of automatic periodic tasks and various analysis data..



Domain	Value Range	Description
Switch	Enable, Disable	Enable or disable automatic analysis tasks.

Domain	Value Range	Description
Start time, End time	-	Set the start time and end time of an automatic analysis task.
Automatic mode	Fixed interval, Specified time point	• Fixed interval: Executing tasks every several hours. • Specified time point: Execute tasks at specified time points everyday. The interval between two executions cannot be less than 8 hours.
Retention period(days)	1-30	Set the retention days of automatic analysis task records. After the retention days, the records will be deleted.

NOTE

You can also set **Retention period(days)** for **Switch Event Settings** and **Manual Snapshot Settings**.

----End

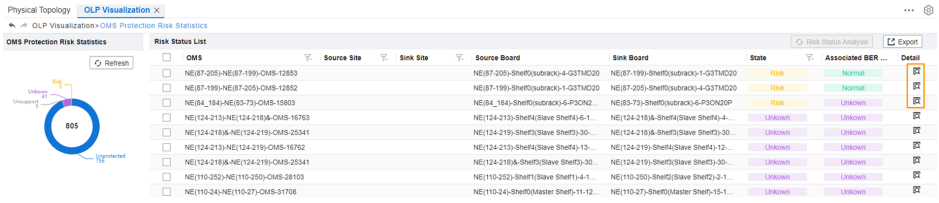
5.4.2 Querying the OLP Status

Procedure

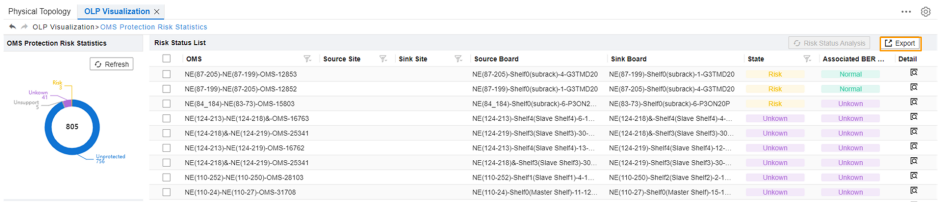
Step 1 On NCE, open the **Network Management** app, and choose **Configuration** > **WDM Optical Management** > **OLP Visualization** from the main menu.

Step 2 On the **OLP Visualization** page, choose **OMS Protection Risk Statistics**, and view the required protection data by using the filtering function.

1. Click and the **Protection Group Performance Details** page is displayed.

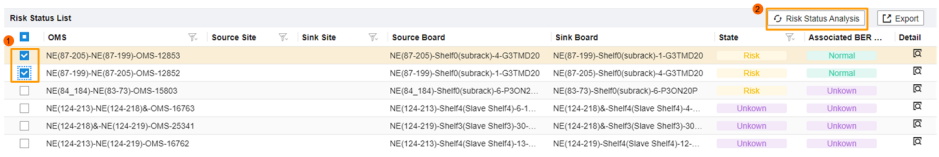


2. Click **Export** to view the OLP risk report.



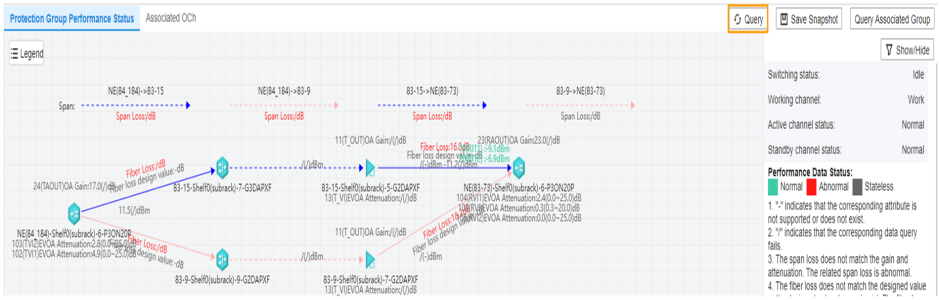
3. Select one or more OMSs, and click **Risk Status Analysis** to manually refresh the risk status of the selected data.

- If the query is successful, the status is updated.
- If the query fails, the **Operation Result** dialog box is displayed, indicating the failure cause.

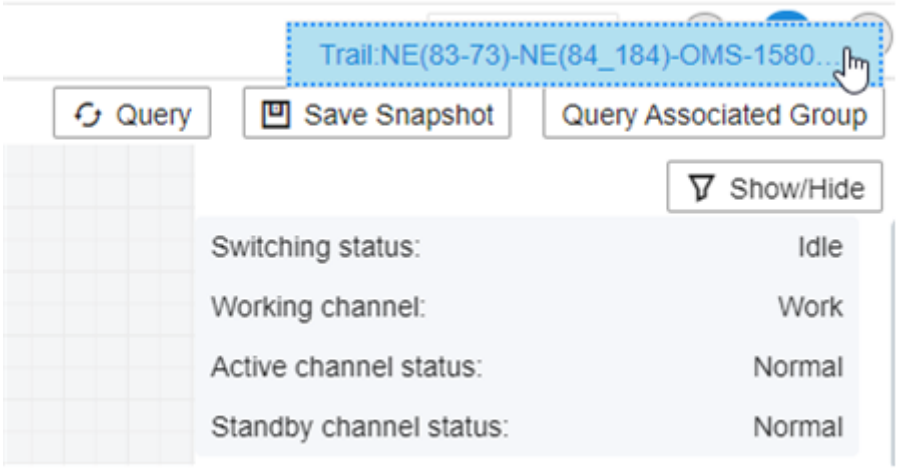


Step 3 On the **Protection Group Performance Details** page, click the **Protection Group Performance Status** tab to view the performance status.

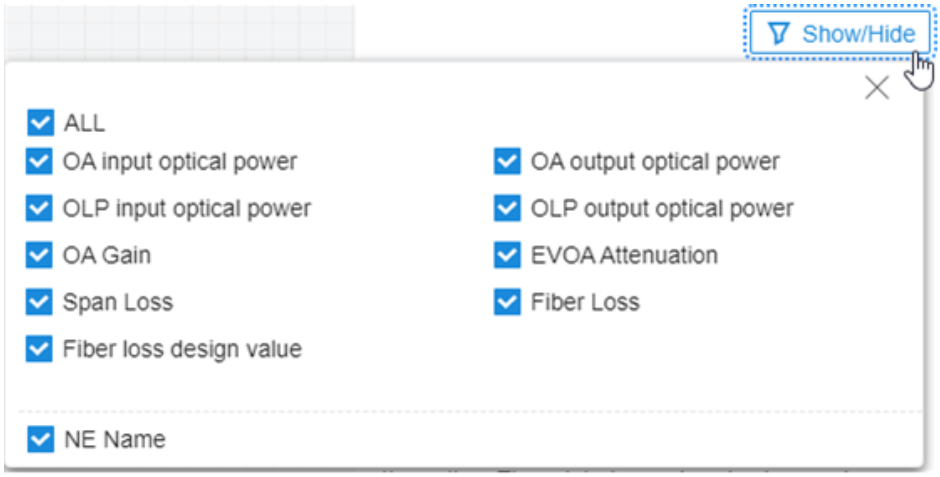
1. Click **Query** to query the performance status of the current protection group.



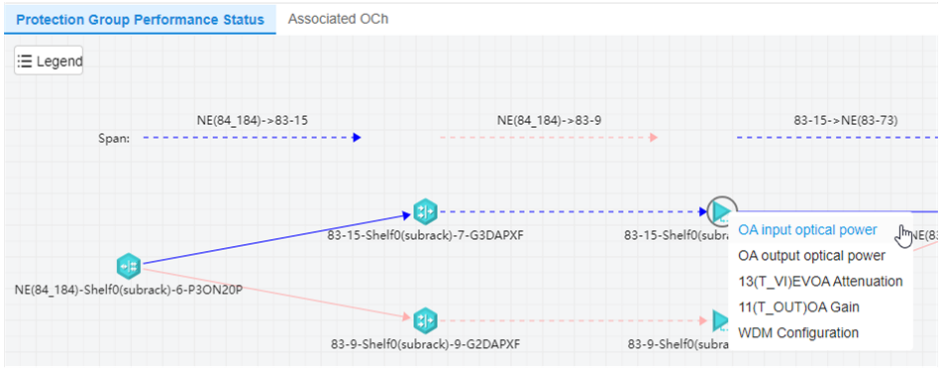
2. After the query, click **Save Snapshot** to save the queried status information to historical data.
3. Click **Query Associated Group** to query the risk status details of the reverse protection group associated with the current protection group.



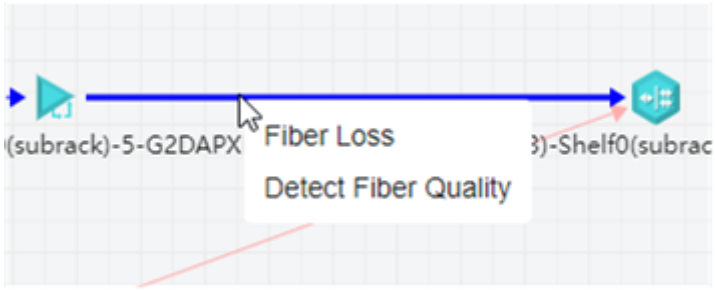
4. Click **Show/Hide** to select the items to be displayed or hidden.



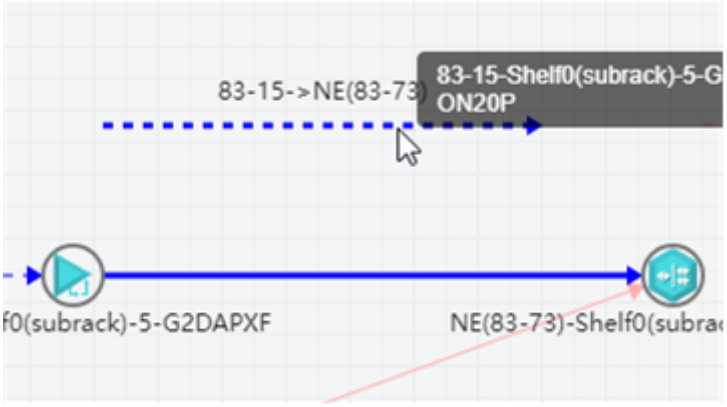
5. Right-click a board to view the historical trend.



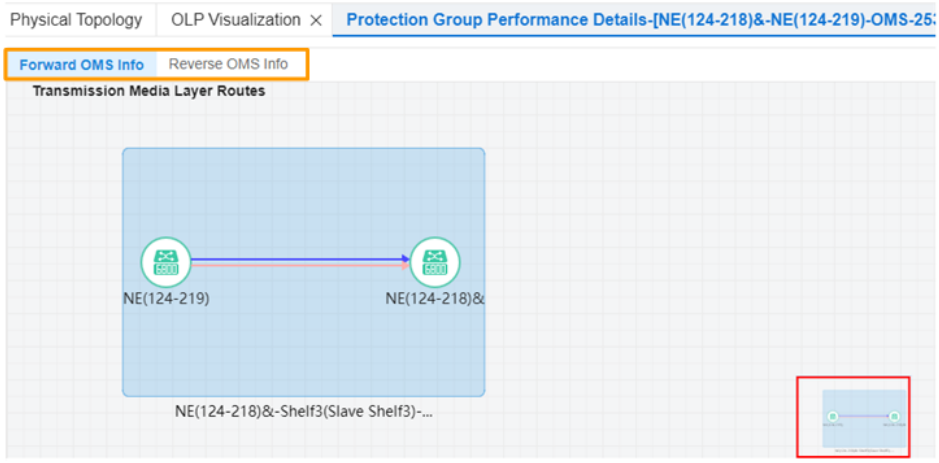
6. Click **WDM Configuration** to redirect to the corresponding NE Explorer and perform WDM interface configurations.
7. Right-click an active or standby fiber to view **Fiber Loss** and start **Detect Fiber Quality**.



8. Click an active or standby span fiber to highlight it.

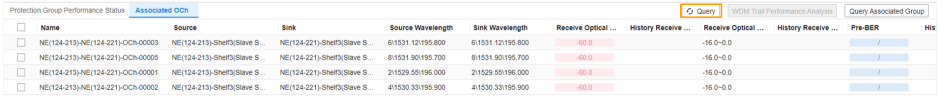


9. If both forward OMSs and reverse OMSs exist, click the **Forward OMS Info** or **Reverse OMS Info** tab to switch between the performance status of different protection groups.



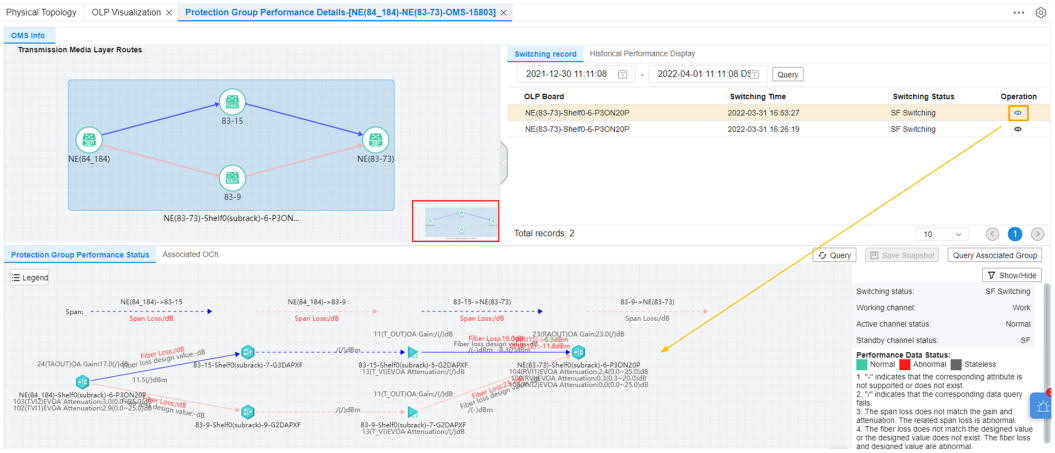
Step 4 On the **Protection Group Performance Details** page, click the **Associated OCh** tab to view associated OChs.

1. Click **Query** to query the performance status of the current protection group.



2. After the query, select OChs as required and click **WDM Trail Performance Analysis**. The **WDM Trail Performance Analysis** page is displayed.

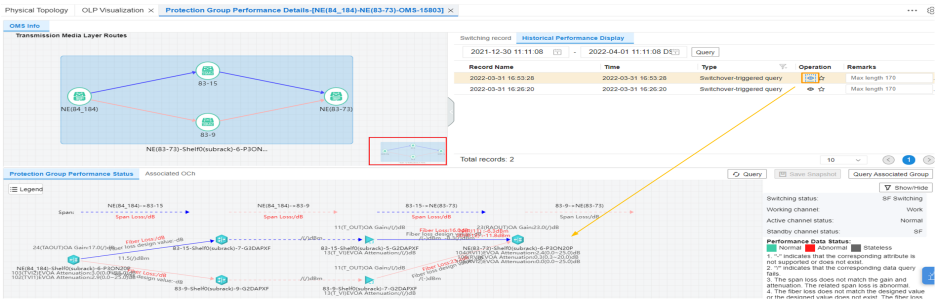
Step 5 On the **Protection Group Performance Details** page, click the **Switching record** page, and click the icon on the right of a record. The performance status of the switching protection group will be displayed in the **Protection Group Performance Status** view.



NOTE

The current and historical performance which is separated by a slash (/) can be displayed in the **Protection Group Performance Status** view at the same time. On the left of the slash is the current performance and on the right of the slash is historical performance.

Step 6 On the **Protection Group Performance Details** page, click the **Historical Performance Display** page, and click the icon on the right of a record. The performance status of the switching protection group will be displayed in the **Protection Group Performance Status** view.



NOTE

You can click ☆ to favorite a historical record or enter remarks in the text box. Favorite records will not be deleted after the retention period.

----End

6 Alarm Description

This section describes information of common alarm handling, including descriptions, parameters, impacts on the system, and possible causes of alarms.

NOTE

For the handling of the MUT_LOS and SPAN_LOSS_EXCEED_EOL alarms, see the Alarm and Event Handling manual for auxiliary devices.

6.1 IN_PWR_HIGH\IN-PWR-HIGH

Description

Input optical power being too high. This alarm is generated on the IN port of the receive-end line board or OTU board when the input optical power is higher than the upper threshold of the input optical power.

Attribute

Alarm Severity	Alarm Type
Critical	Equipment alarm

Parameters

None

Impact on the System

When the input optical power is excessively high, bit errors and LOF alarms may be generated in the received signals, and the optical module on the board can be damaged. As a result, the services are affected.

Fault Symptom

None

Possible Causes

- Cause 1 (reported from the WDM side): The output optical power of the board in the upstream station is excessively high.
- Cause 2 (reported from the WDM side): The board that reports this alarm is faulty.

Procedure

- Cause 1 (reported from the WDM side): The output optical power of the board in the upstream station is excessively high.
  a. If the alarm is generated on the WDM side, query the input optical power of the board that reports the alarm on NCE to check whether the input optical power is within the permitted range. If the input optical power is abnormal, query the input and output optical power of the board in the upstream direction of the OTU along the reverse signal flow on NCE. If the input and output optical power of the upstream board exceeds the permitted range, adjust the input optical power of the board to a proper value.
  b. If the input optical power of the upstream boards is within the permitted range, whereas the output optical power is abnormal, the upstream board may be faulty. Replace the board.

If...	Then...
The board supports pluggable optical modules	Replace the specific pluggable optical module.
The board does not support pluggable optical modules	Replace the board.

c. Check whether the alarm is cleared. If the alarm persists, see the alarm handling procedure for cause 2 (reported from the WDM side).

- Cause 2 (reported from the WDM side): The board that reports this alarm is faulty.

  a. If the input optical power of the board that reports this alarm is normal, the board may be faulty. In this case, replace the board.

If...	Then...
The board supports pluggable optical modules	Replace the specific pluggable optical module.
The board does not support pluggable optical modules	Replace the board.

  b. Check whether the alarm is cleared. If the alarm persists, contact Huawei for assistance.

- If the alarm is generated in multiple wavelengths, the alarm handling method is similar to the handling method for the alarm generated on the WDM side.

Related Information

The optical attenuator is marked with attenuation values expressed in dB.

6.2 IN_PWR_LOW\IN-PWR-LOW

Description

Input optical power being too low. This alarm is generated on the IN port of the receive-end line board or OTU board when the input optical power is lower than the lower threshold of the input optical power.

Attribute

Alarm Severity	Alarm Type
Critical	Equipment alarm

Parameters

None

Impact on the System

If the input optical power is excessively low, bit errors may be generated in the received signals, which affect the normal receiving of the services.

Fault Symptom

None

Possible Causes

The possible causes of the IN_PWR_LOW\IN-PWR-LOW alarm are as follows:

- Cause 1 (reported from the WDM side): The fiber connector is dirty, and the fiber jumper is over-bent, damaged or aged.
- Cause 2 (reported from the WDM side): The attenuation of the attenuator attached to the optical port on the board that reports this alarm is excessively high.
- Cause 3 (reported from the WDM side): The attenuation attached to the transmit optical port on the board at the opposite station is excessively high, or the transmit optical module is faulty.
- Cause 4 (reported from the WDM side): The attenuation in the transmission of the optical signals is excessively high and the compensation is insufficient.
- Cause 5 (reported from the WDM side): The board that reports this alarm is faulty.

Procedure

- Cause 1 (reported from the WDM side): The fiber connector is dirty, and the fiber jumper is over-bent, damaged or aged.
  a. Use an optical power meter to measure the input optical power of the local board to determine whether the input optical power is within the permitted range.
  b. If the detected power is excessively low, check the fiber connection. If the fiber connector is dirty, clean or replace the fiber connector.
  c. If the alarm persists, check the fiber jumper. If the fiber jumper is over-bent, damaged or aged, adjust the fiber jumper or replacing fiber jumpers.
  d. Check whether the alarm is cleared. If the alarm persists, see the alarm handling procedure for cause 2 (reported from the WDM side).
- Cause 2 (reported from the WDM side): The attenuation of the attenuator attached to the optical port on the board that reports this alarm is excessively high.
  a. Check whether the attenuation of the attenuator attached to the receive optical port is excessively high. If the attenuation is excessively high, decrease the attenuation value of the attenuator to a proper value or replace the attenuator with a suitable attenuator.
  b. Check whether the alarm is cleared. If the alarm persists, see the alarm handling procedure for cause 3 (reported from the WDM side).
- Cause 3 (reported from the WDM side): The attenuation attached to the transmit optical port on the board at the opposite station is excessively high, or the transmit optical module is faulty.
  a. Check the board at the opposite station. If the laser on the board is turned off, turn on it on NCE.

b. Check whether the alarm is cleared. If the alarm persists, check whether an optical attenuator with excessively high attenuation is attached to the transmit optical port on the board at the opposite station. If it is, decrease the attenuation to a proper value or replace the optical attenuator so that the output optical power of the opposite board is normal.

c. Check whether the alarm is cleared. If the alarm persists, check the output optical power performance values and alarms of the board. If the reported alarms or performance values are different from the specification values, see the corresponding handling procedure for the alarms or performance events to rectify the fault.

d. Check whether the alarm is cleared. If the alarm persists, see the alarm handling procedure for cause 4 (reported from the WDM side).

- Cause 4 (reported from the WDM side): The attenuation in the transmission of the optical signals is excessively high and the compensation is insufficient.

  a. Query the input and output optical power of the boards in the upstream direction of the OTU at the local station along the reverse signal flow on NCE. Locate the board with the excessively low optical power and adjust the input optical power of the board to a proper value.

  b. Check the input and output optical power of the upstream stations one by one along the reverse signal flow on NCE and locate the faulty section where the optical power is excessively low.

  c. If the output optical power of the upstream station is normal, check the cables, fiber jumpers, fiber connectors, and attenuators. If the attenuation of the cables is higher than the attenuation in the engineering design, adjust the attenuator, or rectify or change the cables. If the fiber jumper, fiber connector or the attenuator is dirty, clean or replace the fiber jumper, fiber connector or attenuator.

  d. If the output optical power of the upstream station is abnormal, troubleshoot the faults at the upstream station so that the output optical power is normal.

  e. Check whether the alarm is cleared. If the alarm persists, see the alarm handling procedure for cause 5 (reported from the WDM side).

- Cause 5 (reported from the WDM side): The board that reports this alarm is faulty.

  a. If the alarm persists, the board that reports this alarm may be faulty. Replace the board.

     i. If the board supports pluggable optical modules, replace the specific pluggable optical module.

     ii. If the board does not support pluggable optical modules, replace the board.

  b. If the alarm persists, contact Huawei for assistance.

- If the alarm is generated in multiple wavelengths, the alarm handling method is similar to the handling method for the alarm generated on the WDM side.

Related Information

The optical attenuator is marked with attenuation values expressed in dB.

6.3 MUT_LOS\LOS-MUT

Description

Loss of multiplexed signals. This alarm is generated when the input multiplexed signals of the board are lost.

Attribute

Alarm Severity	Alarm Type
Critical	Communication alarm

Parameters

None

Impact on the System

The services carried at the optical port where this alarm is generated are interrupted.

Fault Symptom

Table 6-1 lists the fault symptom for the MUT_LOS\LOS-MUT alarm.

Table 6-1 Fault symptom for the MUT_LOS\LOS-MUT alarm

Fault Symptom	Cause
There is no input optical power on the optical port where the MUT_LOS\LOS-MUT alarm is reported.	Cause 1: The fiber connected to an optical port at the receive end of the board that reports the alarm is not connected, incorrectly connected, or damaged.

Possible Causes

- Cause 1: The fiber connected to an optical port at the receive end of the board that reports the alarm is not connected, incorrectly connected, or damaged.
- Cause 2: The attenuation of the signals during line transmission is excessively high.

NOTE

The OD function reports the MUT_LOS\LOS-MUT alarm only for an inter-site fiber connection fault.

6.4 OA_OUT_PWR_ABN\OA-OUT-PWR-ABN

Description

Transmit-end OA power abnormal alarm. This alarm is generated when the difference between the output optical power computed using the output optical power of the multiplexed wavelengths on the transmit-end OA board and the standard optical power exceeds the specified threshold. It is reported on the OUT port of the transmit-end egress OA board that is connected to the spectrum analyzer board on an OMS.

Attribute

Alarm Severity	Alarm Type
Minor	Equipment alarm

Parameters

None

Impact on the System

If the output optical power of the multiplexed wavelengths on the transmit-end OA board is abnormal, service signals may be unstable and BER may increase. Then an alarm indicating excessively low or high path optical power may occur and the performance may be abnormal.

Possible Causes

The input optical power of the monitored wavelengths is abnormal. As a result, the difference between the computed output optical power of the multiplexed wavelengths on the transmit-end OA board and the standard power exceeds the threshold.

Procedure

Step 1 Check whether the line fiber connections are normal and whether the fibers are aged.

Step 2 Check whether any VOA is not configured on the line. If yes, manually adjust the VOA attenuation to the normal value.

Step 3 Check whether the alarm threshold is excessively low. If the alarm threshold is excessively low, set the alarm threshold according to the plan of the live network.

Step 4 Check whether the insertion loss of the board is normal.

----End

Related Information

None

6.5 OMS_LOSS_ACCUM_ABN\OMS-LOSS-ACCUM-ABN

Description

Abnormal accumulated span loss. This alarm is generated when the actual span loss is different from the gain compensation value and the accumulated difference of all spans exceeds the threshold. It is reported on the sink port of an inter-site OTS section where the accumulated difference exceeds the threshold.

Attribute

Alarm Severity	Alarm Type
Minor	Equipment alarm

Parameters

None

Impact on the System

If the line loss is excessively large, service signals may be unstable and BER may increase. Then an alarm indicating excessively low path optical power may occur and the performance may be abnormal.

Possible Causes

Because of line fiber aging and environment temperature changes, the accumulated difference between span loss and the gain compensation value exceeds the threshold.

Procedure

Step 1 Check whether the line fiber connections are normal, whether the fibers are aged, and whether the fiber connectors are clean.

Step 2 Check whether any VOA is not configured on the line. If yes, manually adjust the VOA attenuation to the normal value.

Step 3 Check whether the alarm threshold is excessively low. If the alarm threshold is excessively low, set the alarm threshold according to the plan of the live network. For details about the method of setting the alarm thresholds, see **5.2.3 Setting Basic OD Monitoring Parameters**. Among the threshold parameters, **Line Attenuation Compensation Threshold(dB)** indicates the threshold for the difference between the loss of optical transmission section (OTS) and OA gain.

Step 4 Check whether the insertion loss of the board is normal.

----End

Related Information

Table 6-2 Formulas for calculating the span line loss and gain compensation value

Scenario	Span Line Loss	Gain Compensation Value
Only EDFA boards are used at the two ends of a span line.	Output optical power of the upstream OA board – Input optical power of the downstream OA board	Gain value of the downstream OA board
RAU boards are used in the downstream of a span line.	Output optical power of the upstream OA board – Input optical power of the EDFA part of the downstream RAU board + Actual gain of the Raman part of the downstream RAU board + Optical power of the inband noise introduced by the Raman part of the downstream RAU board	Gain of the Raman part of the downstream RAU board + Gain of the EDFA part of the downstream RAU board

6.6 PWR_UNBALANCED\PWR-UNBALANCED

Description

Unbalanced optical power flatness alarm. This alarm is generated when the optical power flatness of monitored wavelengths at the optical power monitoring point exceeds the threshold. It is reported on the OUT port of the OA board connecting to the spectrum analyzer board that is used for optical power equilibrium.

Attribute

Alarm Severity	Alarm Type
Minor	Equipment alarm

Parameters

When you view an alarm on the network management system, select the alarm. In the Alarm Details field display the related parameters of the alarm. The alarm

parameters are in the following format: Alarm Parameters (hex): parameter1 parameter2...parameterN. For details about each parameter, refer to the following table.

Name	Meaning
Parameters 1 to 4	Indicates that the center frequency of a service wavelength.

Impact on the System

If the wave power is abnormal, service signals may be unstable and BER may increase. Then an alarm indicating excessively low or high path optical power may occur and the performance may be abnormal.

Possible Causes

Because of abnormal wavelength attenuation adjustment and line condition changes, the optical power flatness of monitored wavelengths at the optical power monitoring point is abnormal.

Procedure

Step 1 Check whether the boards and fiber connections are normal.

Step 2 Check whether the fiber loss has changed.

Step 3 Check whether there is a margin for single-wavelength attenuation adjustment.

----End

Related Information

None

6.7 R_LOS\LOS

Description

Loss of signals at the receive end. This alarm is generated when the receive end receives no signal. It is reported on the IN port of the receive-end OTU board.

Attribute

Alarm Severity	Alarm Type
Critical	Communication alarm

Parameters

None

Impact on the System

The services carried at the optical port where this alarm is generated are interrupted.

Possible Causes

- Cause 1 (reported from the WDM side): No fiber jumper is connected to the optical port on the board of the local station, the fiber jumper connected to the optical port is loose, or the fiber jumper is connected incorrectly.
- Cause 2 (reported from the WDM side): The line attenuation is excessively high or a fiber cut occurs.
- Cause 3 (reported from the WDM side): The laser of the board at the opposite station is shut down.
- Cause 4 (reported from the WDM side): The transmit module of the opposite station or receive module of the local station is faulty.
- Cause 5 (reported from the WDM side): For the coherent board, the actually received wavelength is inconsistent with the configured received wavelength on the board.

Procedure

Step 1 Check the fiber jumper connection on the board that reports this alarm at the local station.

Step 2 Check whether the fiber jumper is connected properly. Reconnect fiber jumpers between boards according to the actual networking environment.

Step 3 On NCE, check whether the receive optical power at the optical port is within the permitted range.

Step 4 On NCE, check whether the laser on the board at the opposite station is on. If not, open the laser.

Step 5 Check whether the board at the opposite station or the board at the local station supports pluggable optical modules.

Step 6 Verify consistency between the actually received wavelength and configured received wavelength on the board.

Step 7 Check whether the alarm is cleared. If the alarm persists, contact Huawei engineers.

----End

6.8 SPAN_LOSS_EXCEED_EOL\SPAN-LOSS-EXCEED-EOL

Description

Span fiber loss exceeding EOL. This alarm is generated when the actual fiber loss is larger than the EOL value. It is reported on the sink port of an inter-site OTS section.

Attribute

Alarm Severity	Alarm Type
Major	Equipment alarm

Parameters

None

Impact on the System

If the line loss is excessively large, service signals may be unstable and BER may increase. Then an alarm indicating excessively low path optical power may occur and the performance may be abnormal.

Possible Causes

The line fiber ages or the ambient temperature changes, which causes excessively large line loss.

Procedure

Step 1 Check whether the line fiber connections are normal, whether the fibers are aged, and whether the fiber connectors are clean.

Step 2 Check whether the insertion loss of the board is normal.

----End

Related Information

None

6.9 SPAN_LOSS_UPPER_GAIN\SPAN-LOSS-UPPER-GAIN

Description

The span loss is higher than the gain compensation value. This alarm is generated when the actual span loss is larger than the power compensation value and the

difference between the two exceeds the specified threshold. It is reported on the sink port of an inter-site OTS section.

Attribute

Alarm Severity	Alarm Type
Minor	Equipment alarm

Parameters

None

Impact on the System

Service signals may be unstable, bit errors may increase, and even abnormal performance may result.

Possible Causes

Because of incorrect adjustment, board faults, span fiber aged, and environment temperature changes, the actual span loss becomes larger than the gain compensation value and the difference between them exceeds the threshold.

Procedure

Step 1 Check whether the line fiber connections are normal, whether the fibers are aged, and whether the fiber connectors are clean.

Step 2 Check whether any VOA is not configured on the line. If yes, manually adjust the VOA attenuation to the normal value.

Step 3 Check whether the alarm threshold is excessively low. If required, change the threshold to an appropriated value according to the network plan and actual network requirements. For details about the method of setting the alarm thresholds, see **5.2.3 Setting Basic OD Monitoring Parameters**. Among the threshold parameters, **Line Attenuation Compensation Threshold(dB)** indicates the threshold for the difference between the loss of optical transmission section (OTS) and OA gain.

Step 4 Check whether the insertion loss of the board is normal.

----End

Related Information

Table 6-3 Formulas for calculating the span line loss and gain compensation value

Scenario	Span Line Loss	Gain Compensation Value
Only EDFA boards are used at the two ends of a span line.	Output optical power of the upstream OA board – Input optical power of the downstream OA board	Gain value of the downstream OA board
RAU boards are used in the downstream of a span line.	Output optical power of the upstream OA board – Input optical power of the EDFA part of the downstream RAU board + Actual gain of the Raman part of the downstream RAU board + Optical power of the inband noise introduced by the Raman part of the downstream RAU board	Gain of the Raman part of the downstream RAU board + Gain of the EDFA part of the downstream RAU board

6.10 SPAN_LOSS_LOWER_GAIN\SPAN-LOSS-LOWER-GAIN

Description

The span loss is lower than the gain compensation value. This alarm is generated when the actual span loss is smaller than the power compensation value and the difference between the two exceeds the specified threshold. It is reported on the source port of the inter-site fiber connection on an OMS.

Attribute

Alarm Severity	Alarm Type
Minor	Equipment alarm

Parameters

None

Impact on the System

Service signals may be unstable, bit errors may increase, and even abnormal performance may result.

Possible Causes

Because of incorrect adjustment, board faults, span fiber aged, and environment temperature changes, the actual span loss becomes smaller than the gain compensation value and the difference between them exceeds the threshold.

Procedure

Step 1 Verify that the line fiber connections are normal.

Step 2 Check whether any VOA is not configured on the line. If yes, manually adjust the VOA attenuation to the normal value.

Step 3 Check whether the alarm threshold is excessively low. If required, change the threshold to an appropriated value according to the network plan and actual network requirements. For details about the method of setting the alarm thresholds, see **5.2.3 Setting Basic OD Monitoring Parameters**. Among the threshold parameters, **Line Attenuation Compensation Threshold(dB)** indicates the threshold for the difference between the loss of optical transmission section (OTS) and OA gain.

Step 4 Verify that the insertion loss of the board is normal.

----End

Related Information

Table 6-4 Formulas for calculating the span line loss and gain compensation value

Scenario	Span Line Loss	Gain Compensation Value
Only EDFA boards are used at the two ends of a span line.	Output optical power of the upstream OA board – Input optical power of the downstream OA board	Gain value of the downstream OA board

Scenario	Span Line Loss	Gain Compensation Value
RAU boards are used in the downstream of a span line.	Output optical power of the upstream OA board – Input optical power of the EDFA part of the downstream RAU board + Actual gain of the Raman part of the downstream RAU board + Optical power of the inband noise introduced by the Raman part of the downstream RAU board	Gain of the Raman part of the downstream RAU board + Gain of the EDFA part of the downstream RAU board

6.11 OSNR_LOSS_UNBALANCED

Description

Unbalanced OSNR loss flatness alarm. This alarm is generated when the difference between the OSNR loss of monitored wavelengths and the average loss exceeds the threshold.

Attribute

Alarm Severity	Alarm Type
Minor	Equipment alarm

Parameters

None

Impact on the System

If the single-wavelength OSNR loss is abnormal, service signals may be unstable and the BER may increase. Then an alarm indicating excessively low or high path optical power may occur and the performance may be abnormal.

Possible Causes

Because of abnormal wavelength attenuation adjustment and line condition changes, the OSNR loss flatness of monitored wavelengths on an OMS is abnormal.

Procedure

Step 1 Check whether the boards and fiber connections are normal.

Step 2 Check whether the fiber loss has changed.

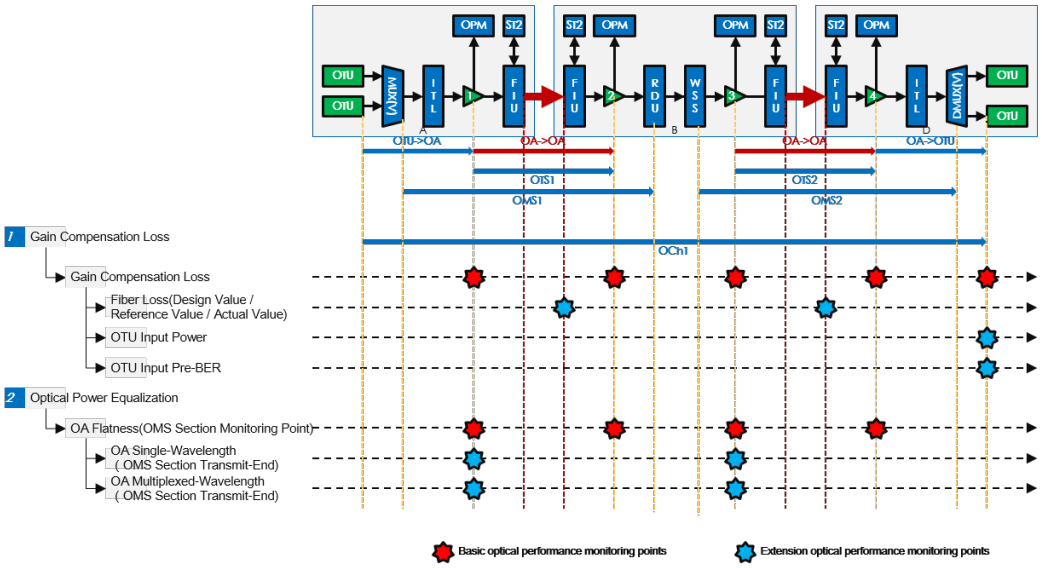
Step 3 Check whether there is a margin for single-wavelength attenuation adjustment.

----End

7 Optical Power Indicators Analysis

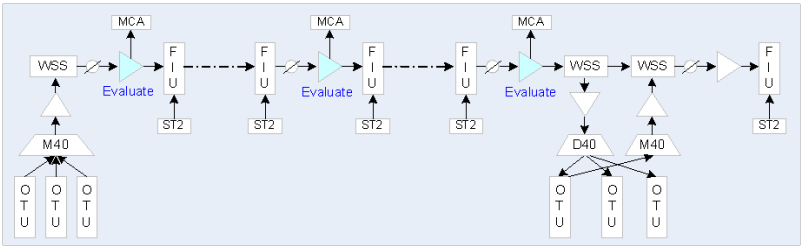
Figure 7-1 shows the performance monitoring points corresponding to each indicator.

Figure 7-1 WDM trail and optical performance monitoring point



7.1 OA Flatness

Table 7-1 OA flatness indicators

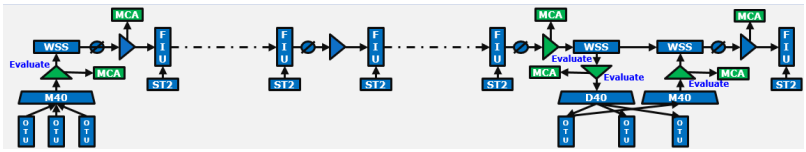
Item	Description
Indicator	OA flatness
Definition	Difference between the single-wavelength output optical power of each wavelength and the average value of each wavelength. The maximum value is used.
Schematic diagram	
Indicator calculation method	Use the MCA to scan the single-wavelength output optical power of each wavelength. The calculation method is as follows: • The power of all wavelengths scanned by the MCA = Σ (P1+P2+... +Pn). In the formula, Pi indicates the power of a single channel (unit: mW). • The modified single-wavelength optical power of the MCA board Pi = Pi+ (total output power of the OA board – power of all wavelengths scanned by the MCA). In the formula, Pi indicates the power of a single channel (unit: dBm), The unit of total OA output optical power and power of all wavelengths scanned by the MCA is dBm. • Average power = (P1/W1+P2/W2+ ... +Pn/Wn) x 50/N. In the formula, Pi indicates the power of a single channel (unit: mW), Wi indicates the channel spectrum width (unit: GHz). N indicates the number of monitoring signal wavelengths (excluding the monitored noise channel and non-monitoring channel). • Flatness of each channel = (Pi/(Wi/50)) (mW to dBm) – Average power (mW to dBm). In the formula, Pi/(Wi/50) indicates the actual single-wavelength power of each channel, and Pi indicates the power of a single channel (unit: mW). The unit of average power is mW. • Flatness = Maximum value of absolute values of each channel flatness **NOTE** The flatness is calculated based on formula after the power of all channels must be converted to the same spectral width. That is, the actual single-wavelength optical power is normalized. The calculation formula is as follows: If the channel spectral widths are different, assume that the channel spectral widths before and after conversion are A and B respectively, and the channel power before and after conversion is Pa and Pb respectively, Pb = 10 x log10 (10^(Pa/10)/A x B).

Item	Description
Indicator criteria	• Qualified: Flatness ≤ 3 dB • Unqualified: Flatness > 3 dB **NOTE** For sub-carriers in the same super channel, the optical power flatness must be less than or equal to 1 dB.
Evaluation range	Only the OA boards that are connected to the MCA board in each OMS span are evaluated. (This indicator can be used to evaluate the single-wavelength optical power of an OA board.)
Related alarms	PWR_UNBALANCED
Possible fault cause	The line attenuation of different wavelengths is different. As a result, the single-wavelength optical power of the monitored wavelength at the optical power flatness monitoring point is not flat, and the difference between the single-wavelength optical power and the nominal single-wavelength optical power exceeds the threshold.
Handling suggestion	• Commission links. • Manually check whether the board or fiber connection is normal, whether the fiber attenuation is normal, and whether the attenuation margin of the attenuator is sufficient.
Commissioning requirements	Balance the flatness of the monitoring point to be less than 0.5 dB. The evaluation range is as follows: Balance the OA at the monitoring point. The monitoring point is preferentially selected based on the OPM. 1. Check whether there is OPM in the middle, transmit end, and receive end. If yes, the indicator is used. 2. If there is no OPM, check whether there is LS in the middle, transmit end, and receive end. If yes, the indicator is used.

7.2 OSNR Loss Flatness

Table 7-2 OSNR loss flatness indicators

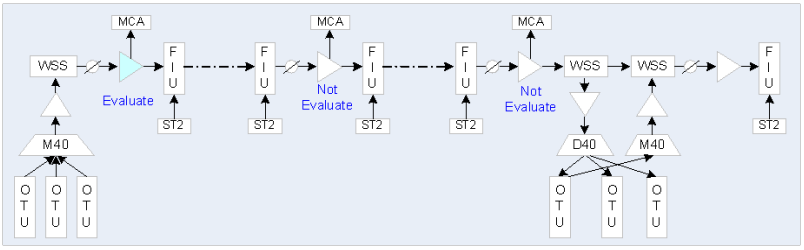
Item	Description
Indicator	OSNR loss flatness
Definition	Difference between the actual single-wavelength OSNR deterioration and the average OSNR deterioration of each wavelength in an OMS.

Item	Description
Schematic diagram	
Indicator calculation method	• Calculate the OSNR deterioration of each channel based on the eMCA, and convert the OSNR deterioration of each channel to the same spectral width to obtain the single-wavelength OSNR deterioration. • Average OSNR loss (dB) = (OSNR_Loss1 + OSNR_Loss2 + ... + OSNR_LossN)/N (OSNR_LossN needs to be calculated after being converted to the same spectral width.) • OSNR loss flatness (dB) = Max(|Single-wavelength OSNR deterioration – Average OSNR deterioration|) **NOTE** • The flatness can be calculated using the preceding formula only after the OSNR loss of all channels are converted to the same spectral width. • If the spectral widths are inconsistent, calculate the desired OSNR loss OSNR_Loss_b' according to the following formula: OSNR_Loss_b' = 10 x log10(10^(OSNR_Loss_b/10)/A x B). A and B indicate the spectral widths before and after conversion respectively. OSNR_Loss_b and OSNR_Loss_b' indicate the OSNR loss before and after conversion respectively.
Alarm indicator	C80/96/C120 band Qualified: flatness ≤ 2.5 dB Unqualified: flatness > 2.5 dB
Evaluation range	During optical power equalization commissioning, OSNR loss is used neither as a commissioning method nor an evaluation indicator. During OSNR loss commissioning, OSNR loss flatness is used as an evaluation indicator. Evaluation scope: OMS (receive-end), the output end of the last OA board that adds wavelengths locally, and the output end of the last OA board that drops wavelengths locally.
Related alarms	OSNR_LOSS_UNBALANCED
Possible fault cause	The line attenuation of different wavelengths is different. As a result, the single-wavelength OSNR deterioration of the monitored wavelengths at the OSNR flatness monitoring points is not flat, and the difference between the single-wavelength OSNR deterioration and the average OSNR deterioration exceeds the threshold.
Handling suggestion	• Enable the link optimization commissioning function of the OD. • Manually check whether the board or fiber connection is normal, whether the fiber attenuation is normal, and whether the attenuation margin of the attenuator is sufficient.

Item	Description
Commissioning requirements	Flatness of equalization monitoring points < 0.5 dB

7.3 Single-Wavelength Output Power of OA Boards

Table 7-3 Single-wavelength output indicators of OA boards

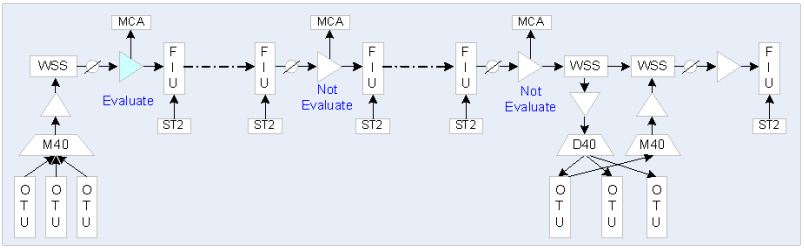
Item	Description
Indicator	Single-wavelength output of OA boards
Definition	Single-wavelength output optical power of the output port on an OA, which is used to evaluate whether the single-wavelength output optical power meets the requirement.
Schematic diagram	
Indicator calculation method	The nominal single-wavelength output optical power is determined by the maximum output optical power of the OA and the channel spectrum width. The calculation formula is as follows: • Nominal single-wavelength output optical power = Maximum output optical power of the OA – 10 x log10 (floor (Total spectrum width of the band/Channel spectrum width) x Number of subcarriers) Band total spectrum width: C-band = 4000 GHz, C+ band = 4800 GHz The calculation method in the Fix/Flex Grid system is the same. The number of subcarriers of the Fix system is 1, and that of the Flex Grid subcarrier ≥ 1. The spectral width of SuperChannel is the total spectral width of multiple subcarriers, for example, 200 GHz. • Current single-wavelength output optical power = MCA scanned single-wavelength optical power + OA MON split ratio + Fiber loss between OA and MCA

Item	Description
Indicator criteria	Deviation = |Current single-wavelength output power – Target single-wavelength output power| • Qualified: Deviation ≤ 3 dB • Unqualified: Deviation > 3 dB
Evaluation range	All transmit-end OAs connected to the MCA
Related alarms	-
Possible fault cause	• Cause 1: The fiber attenuation increases due to fiber aging, ambient temperature changes, or board faults. As a result, the attenuation of the fiber jumper between the OA and the MCA is large. • Cause 2: The adjustment is incorrect.
Handling suggestion	• Commission links. • Manually check whether the board or fiber connection is normal, whether the fiber attenuation is normal, and whether the attenuation margin of the attenuator is sufficient.
Commissioning requirements	Requirements for balancing all OAs at monitoring points: ≤ 0.5 dB

7.4 Multiplexed Wavelength Output Power of OA Boards

Table 7-4 Multiplexed wavelength output power of OA boards

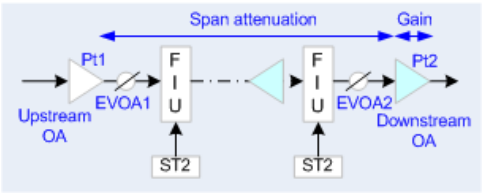
Item	Description
Indicator	Multiplexed wavelength output power of OA boards
Definition	Total output optical power of the OA board, which is used to evaluate whether the multiplexed wavelength output optical power meets the requirement.

Item	Description
Schematic diagram	
Indicator calculation method	The formulas for calculating the multiplexed output optical power of the OA board are as follows: ● Actual value of the multiplexed output optical power of the OA board = 10*log10 (Sum of the corrected linear values of the actual optical power of each channel scanned by the MCA) (unit: dBm) ● Nominal multiplexed-wavelength output optical power of the OA board = 10*log10 (Sum of the nominal single-wavelength output optical power of each channel) (Unit: dBm) **NOTE** If the Fix system or all channels have the same spectral width, the calculation method can be simplified as follows: Nominal multiplexed-wavelength output optical power of the OA board = Nominal single-wavelength output optical power + 10*log10 (N). N indicates the number of wavelengths on the current OA board. ● The formula for converting the channel power linear value and the dB value is as follows: P (mW) = 10^(P(dBm)/10)
Indicator criteria	Deviation = |Current multiplexed wavelength output power – Target multiplexed wavelength output power| ● Qualified: Deviation ≤ 1.5 dB ● Unqualified: Deviation > 1.5 dB
Evaluation range	The egress OA board at the transmit end of each OMS span is connected to the MCA board.
Related alarms	OA_OUT_PWR_ABN
Possible fault cause	● Cause 1: The fiber attenuation increases due to fiber aging, ambient temperature changes, or board faults. ● Cause 2: The adjustment is incorrect.
Handling suggestion	● Commission links. ● Manually check whether the board or fiber connection is normal, whether the fiber attenuation is normal, and whether the attenuation margin of the attenuator is sufficient.

Item	Description
Commissioning requirements	OA board at the transmit end of the OMS: Deviation ≤ 0.5 dB

7.5 OTS Gain Compensation Span Loss

Table 7-5 OTS gain compensation span loss

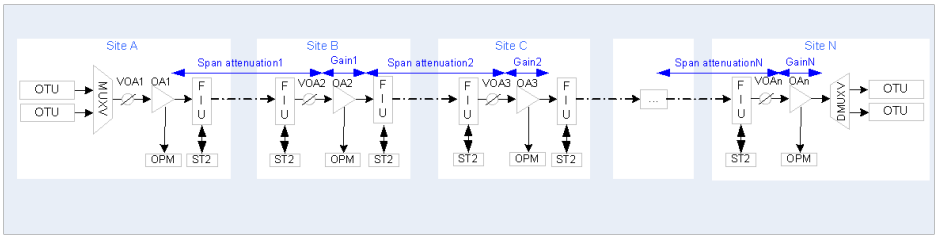
Item	Description
Indicator	OTS gain compensation span loss
Definition	The span loss compensation indicates the compensation for the inherent insertion loss of line fibers and line-side optical components using the gain of an OA board. According to the commissioning principle, the gain of the OA board should compensate for the span attenuation. If the nominal single-wavelength output optical power of the downstream OA board is different from that of the upstream OA board, consider the nominal power difference (or the maximum output engineering difference of the OA board).
Schematic diagram	
Indicator calculation method	Actual OA gain: Query the STD gain of the downstream OA board and Raman amplifier board. • (OA gain + Raman gain) target value = Span attenuation – Single-wavelength nominal difference between upstream and downstream OA boards • Span attenuation = Actual output optical power of the upstream OA board – (Actual input power of downstream OA – Raman in-band noise) + Current Raman gain • Single-wavelength nominal output optical power difference = Nominal single-wavelength output optical power of the upstream OA board – Nominal single-wavelength output optical power of the downstream OA board

Item	Description
Indicator criteria	Deviation = |Actual OA gain – Target OA gain| • Qualified: Deviation ≤ 2 • Unqualified: Deviation > 2 Set the default indicator threshold to 2 dB. The threshold ranges from 1 dB to 3 dB.
Evaluation range	Each OTS span Forward and reverse optical fibers
Related alarms	• SPAN_LOSS_UPPER_GAIN • SPAN_LOSS_LOWER_GAIN • MUT_LOS
Possible fault cause	• Cause 1: The fiber attenuation increases because the line fiber is aged, the ambient temperature changes, or the board is faulty. • Cause 2: The adjustment is incorrect.
Handling suggestion	• Commission links. • Manually check whether the board or fiber connection is normal, whether the fiber attenuation is normal, and whether the attenuation margin of the attenuator is sufficient.
Commissioning requirements	Deviation of each OTS section ≤ 0.5 dB

7.6 OMS Gain Compensation Span Loss

Table 7-6 OMS gain compensation span loss

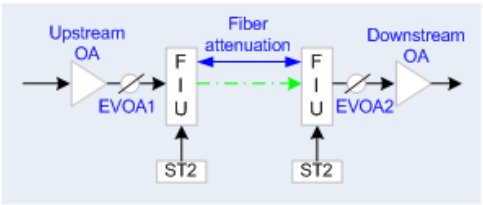
Item	Description
Indicator	OMS gain compensation span loss
Definition	The compensation of gains of all OA boards in the OMS for the inherent attenuation of the long fibers and line optical components of all lines in the OMS.

Item	Description
Schematic diagram	
Indicator calculation method	Actual OA gain = stdGain1 + ... + stdGainN (stdGain indicates the gain of OUT port on each OA board) Target OA gain = Span attenuation 1+ ... + Span attenuation N – Single-wavelength nominal difference of OA boards at the transmit and receive ends • Span loss = Output optical power of the upstream OA board – Input optical power of the downstream OA board • Single-wavelength nominal difference of the OA board at the transmit and receive ends = Single-wavelength nominal output optical power of the transmit-end OA board – Single-wavelength nominal output optical power of the receive-end OA board
Indicator criteria	Deviation = |Actual OA gain – Target OA gain| • Qualified: Deviation ≤ 2 • Unqualified: Deviation > 2 Set the default indicator threshold to 2 dB. The threshold ranges from 1 dB to 3 dB.
Evaluation range	Each OMS span Forward and reverse optical fibers
Related alarms	• OMS_LOSS_ACCUM_ABN • MUT_LOS
Possible fault cause	• Cause 1: The fiber attenuation increases because the line fiber is aged, the ambient temperature changes, or the board is faulty. • Cause 2: The adjustment is incorrect.
Handling suggestion	• Commission links. • Manually check whether the board or fiber connection is normal, whether the fiber attenuation is normal, and whether the attenuation margin of the attenuator is sufficient.

Item	Description
Commissioning requirements	Deviation of each OMS ≤ 0.5 dB

7.7 Fiber Attenuation

Table 7-7 Fiber attenuation indicators

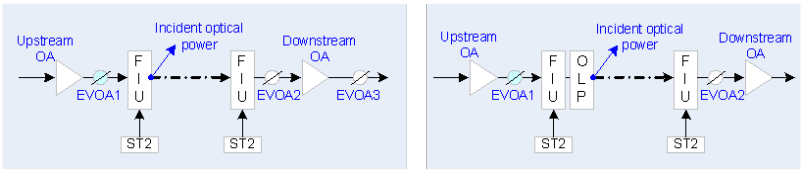
Item	Description
Indicator	Fiber attenuation
Definition	Fiber attenuation between two sites
Schematic diagram	
Indicator calculation method	Fiber attenuation EOL value: EOL value of the fiber attenuation on the NMS. Actual fiber attenuation = Actual output optical power of the upstream multiplexed wavelength – (Actual input optical power of the downstream multiplexed wavelength – Noise power of the Raman board) – EVOA attenuation – Inherent attenuation of the board + Current gain of the Raman board • If there are multiple EVOAs between the upstream OA and the downstream OA, the EVOA attenuation must contain all EVOAs. • The inherent attenuation must include the inherent attenuation on FIU and OLP boards between two power detection points. • If there is no OA board in the upstream or downstream direction, the optical power of the multiplexing port on the multiplexer/demultiplexer board can be used for calculation. Fiber attenuation reference value = Fiber length x Fiber attenuation coefficient + Number of hop nodes x Attenuation coefficient of the hop nodes. The fiber length, fiber attenuation coefficient, number of hop nodes, and hop node attenuation coefficient are imported by users through the template.

Item	Description
Indicator criteria	Deviation = Actual fiber attenuation – EOL • Qualified: Deviation ≤ 0 • Unqualified: Deviation > 0 Set the indicator default threshold to 0 dB.
Evaluation range	Each OTS span Forward and reverse optical fibers
Related alarms	SPAN_LOSS_EXCEED_EOL
Possible fault cause	The line fiber is aged, the ambient temperature changes, and the line attenuation is too large. As a result, the difference between the line attenuation and the reference value is greater than the EOL value.
Handling suggestion	1. Check whether the fiber connection of the line is normal, whether the fiber is aged, and whether the fiber connector is dirty. 2. Check whether the board insertion loss is normal.
Commissioning requirements	Deviation ≤ 0

7.8 Attenuation of EVOA Configured Behind an OA Board

Table 7-8 Attenuation of EVOA configured behind an OA board

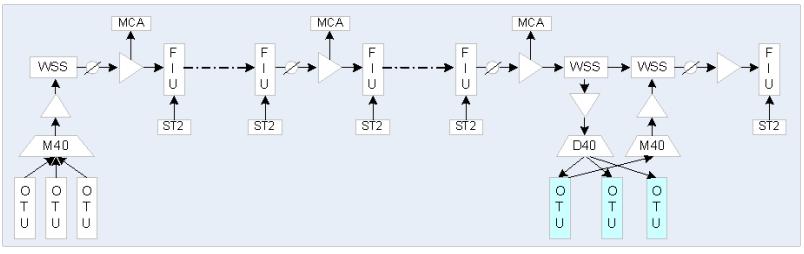
Item	Description
Indicator	EVOA configured behind an OA board
Definition	Attenuation value of EVOA configured behind an OA board at the site. It is used to evaluate whether the EVOA setting meets the incident optical power requirement.

Item	Description
Schematic diagram	
Indicator calculation method	Target incident optical power: Obtain the value based on the fiber type, OCh rate modulation format, and channel spectrum width. ● Target value of the EVOA configured behind an OA board = Nominal single-wavelength output optical power of the upstream OA – Target value of the incident optical power – Fixed attenuation of the FIU/OLP board The inherent attenuation includes the inherent attenuation of all wavelengths, such as FIU/OLP, between the OA and the long fiber ingress. ● Actual value of the EVOA configured behind an OA board: Query the attenuation of the EVOA configured behind the device.
Indicator criteria	The incident optical power is not used as an indicator for evaluation. It is only used for commissioning calculation. The following formula is used to calculate the incident optical power: Deviation = Actual value of the EVOA configured behind an OA board – Target value of the EVOA configured behind an OA board ● Qualified: Deviation ≥ 0 ● Unqualified: Deviation < 0 The permitted range of the incident optical power is as follows: | Incident optical power| ≤ 10 dBm. (The absolute value is less than or equal to 10 dBm.)
Evaluation range	Each OTS span and forward and reverse optical fibers are separately evaluated.
Related alarms	-
Possible fault cause	● Cause 1: The adjustment of EVOA configured behind an OA board is incorrect. ● Cause 2: The OA configuration is incorrect.

Item	Description
Handling suggestion	Check whether the setting of the EVOA configured behind an OA board is normal. (The incident optical power does not have an independent monitoring point. Only the EVOA configured behind the OA board is monitored.) Check whether the OA configuration is correct. If the configuration is abnormal (such as EVOA3), perform the following operations: 1. Adjust the output optical power of the OA board according to the target power. Adjust the EVOA1 configured behind the upstream OA board and the EVOA2 configured before the current OA board. If the adjustment fails, adjust the gain of the current OA board. 2. Check whether the EVOA3 configured behind the current OA is proper. 3. If the attenuation value of the EVOA3 cannot be adjusted to the target value, an alarm is reported.
Commissioning requirements	Deviation ≥ 0

7.9 OTU Pre-FEC BER

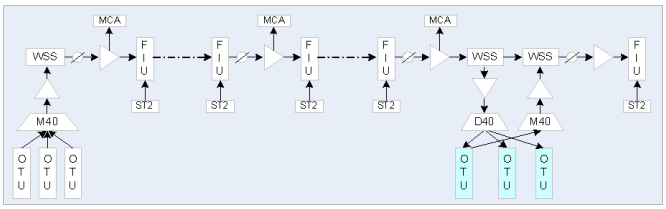
Table 7-9 OTU Pre-FEC BER indicator

Item	Description
Indicator	OTU Pre-FEC BER
Definition	Pre-FEC BER of the receive signals of an OTU board.
Schematic diagram	

Item	Description
Indicator calculation method	The current value of the pre-FEC BER is obtained through performance. The pre-FEC BER threshold is automatically calculated based on the FEC type.
Indicator criteria	● Qualified: Current pre-FEC BER value ≤ Threshold ● Unqualified: Current pre-FEC BER value > Threshold
Evaluation range	The WDM-side ports on each OTU board are evaluated.
Related alarms	BEFFEC_EXC
Possible fault cause	● Cause 1: The receive optical power of the OTU board is too low. ● Cause 2: The adjustment of the upstream OA board is abnormal.
Handling suggestion	For cause 1 and cause 2, perform the following steps: 1. Check whether the FOA configuration or EVOA setting before the OTU is proper. 2. Check whether the output optical power of the upstream OA board meets the requirement. 3. If the total output of the optical amplifier meets the requirements, check whether the single-wavelength equalization is abnormal through the MCA.
Commissioning requirements	-

7.10 OTU Input Optical Power

Table 7-10 Input optical power of the OTU board

Item	Description
Indicator	OTU input optical power
Definition	Input optical power of the WDM-side port on the OTU board. It is used to evaluate whether the input optical power is within the threshold range.
Schematic diagram	
Indicator calculation method	The input optical power and threshold of the OTU board are obtained from the NE.
Indicator criteria	• Qualified: The input optical power of the OTU board is within the range of [Low input optical power alarm threshold + 3 dB, High input optical power alarm threshold – 3 dB]. • Unqualified: The input optical power of the OTU board is not within the range of [Low input optical power alarm threshold + 3 dB, High input optical power alarm threshold – 3 dB].
Evaluation range	The WDM-side ports on each OTU board are evaluated.
Related alarms	• IN_PWR_HIGH • IN_PWR_LOW • R_LOS

Item	Description
Possible fault cause	Excessively high optical power: ● Cause 1: The output power of the upstream board is too high. ● Cause 2: The upstream board that reports this alarm is faulty. Low optical power: ● Cause 1: Fiber connectors are contaminated, pigtail bend radius is too large, the pigtails are loose, incorrectly connected, damaged or aged. ● Cause 2: An excessive optical attenuator is added to the receive optical port of the board that reports the alarm. ● Cause 3: Optical signals are excessively attenuated during transmission without enough optical amplification compensation. Or fiber cut occurs. ● Cause 4: An excessively large attenuator is added to the transmit optical port of the board at the opposite site or the laser is shut down. ● Cause 5: The transmit module of the board at the opposite station or the receive module of the board at the local station is faulty.
Handling suggestion	● Commission links or manually check. ● Check whether indicators on each power point meet the requirements from downstream to upstream. Check whether the fixed attenuator configuration, EVOA configuration, OA configuration, and optical power equalization meet the specifications. If not, adjust the indicators. ● If the fiber connector is contaminated, the pigtail is abnormal, or the board is faulty, replace the faulty component.
Commissioning requirements	● Qualified: The input optical power of the OTU board is within the range of [Low input optical power alarm threshold + 3 dB, High input optical power alarm threshold – 3 dB]. ● Unqualified: The input optical power of the OTU board is not within the range of [Low input optical power alarm threshold + 3 dB, High input optical power alarm threshold – 3 dB].

8 Reference Operations

This section provides reference operations for optical doctor system.

8.1 Setting the Fiber Type and Design Fiber Loss (EOL) (dB)

On the OD view, you can set the design fiber loss EOL and fiber type for one or more inter-site fiber connections.

Prerequisites

You are an NMS user with **Maintainer Group** authority or higher.

Procedure

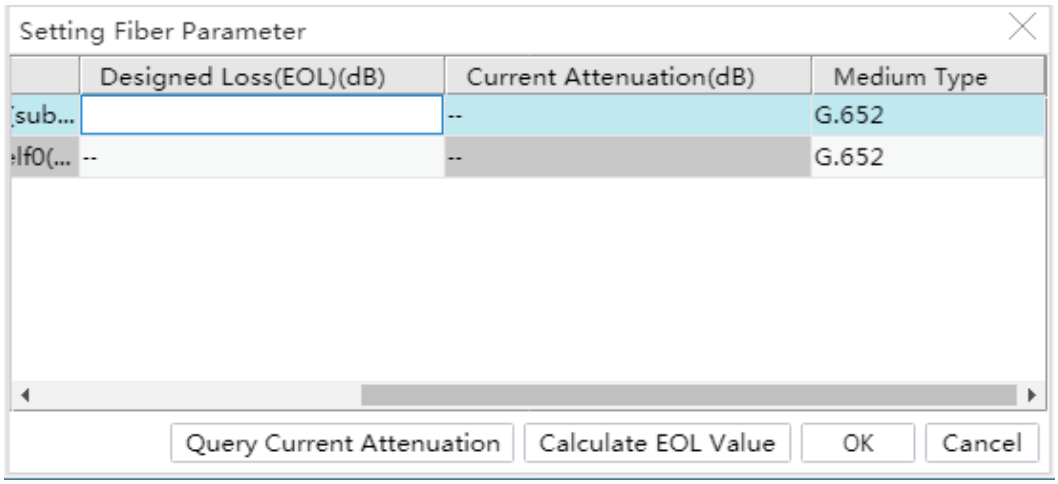
Step 1 Choose **Configuration** > **WDM Optical Management** > **Optical Doctor** from the main menu on the NCE Network Management app. The **Optical Doctor** window is displayed.

Step 2 Select one or more desired fibers between sites, right-click, and choose **Setting Fiber Parameter**.

Step 3 Set the design EOL value.

Two setting modes are available: manual and automatic.

- Manual mode: In the **Setting Fiber Parameter** window that is displayed, double-click **EOL(dB)** of the required fiber to set the EOL value and click **OK**.

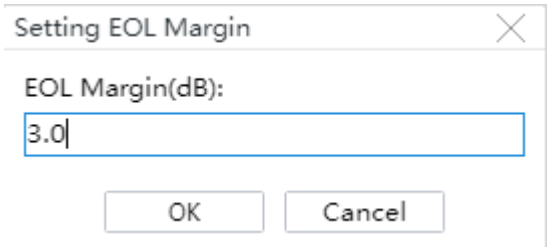


- Automatic mode:
  a. Select the required fiber for which the EOL value needs to be set.
  b. Click **Query Current Attenuation** to query the current attenuation of the fiber.

     NOTE

     If attenuation is not queried before or the attenuation query fails, **Current Attenuation(dB)** is displayed as **-**.

  c. Click **Calculate EOL Value** to set **EOL Margin(dB)**.



  d. Click **OK**. The OD automatically calculates the EOL value and updates the value in **EOL(dB)**.

NOTE

The following formula is used to automatically calculate the attenuation EOL: Attenuation EOL = Current attenuation + EOL margin

- If the calculated EOL value is out of permitted range, the maximum value 85.0 is used as the EOL value.
- If the current attenuation of a fiber is **-**, the EOL value is not updated.

Step 4 **Optional:** Double-click **Medium Type** of a fiber to change the fiber type, and click **OK**.

NOTE

The following fiber types can be set: G.651, G.652, G.652A, G.652B, G.652C, G.652D, G.653, G.654A, G.654B, G.655-LEAF, G.655-TWRS, G.655-TWC, G.655-TW+, G.655-LS, G.656, G.657, TERA_LIGHT.

----End

8.2 Setting Incident Optical Power on NCE

In a coherent system, when the single-wavelength incident optical power of the transmission fiber is less than the nominal single-wavelength output power of the egress OA board at the transmit end, set **Launch Power** for the egress OA board at the transmit end.

Prerequisites

- You are an NMS user with the "Maintainer Group" or higher permission.
- Commissioning inter-NE optical paths has been completed.
- An EVOA is deployed in the transmit direction of the egress OA board at the transmit end.

Tools, Equipment, and Materials

NCE

Background Information

For the value of **Launch Power** supported by each fiber type, see the following tables.

When **Launch Power** is less than **Nominal single-wavelength output optical power**, set **Launch Power** for the egress OA board at the transmit end according to the following procedure.

NOTICE

The incident optical power described in the following tables is the power at point C. The commissioning tool uses point B as the reference point. Power at point B = Power at power C + 0.5 dB. 0.5 dB indicates the FIU insertion loss.

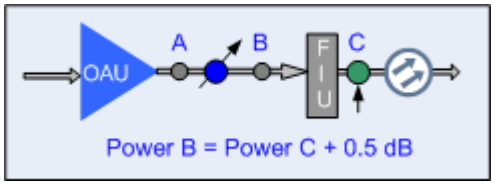


Table 8-1 Incident optical power specifications of OSN 8800/6800/3800/9800 in the C band

Channel Spectrum Width of Each Modulation Format		G.652			LEAF			G.653			TWRS			TWC		
Modulation Format	Channel Spectrum Width (GHz)	Mainstream Incident Optical Power (dBm)	(High) Special Incident Optical Power (dBm)	(Low) Special Incident Optical Power (dBm)	Mainstream Incident Optical Power (dBm)	(High) Special Incident Optical Power (dBm)	(Low) Special Incident Optical Power (dBm)	Mainstream Incident Optical Power (dBm)	(High) Special Incident Optical Power (dBm)	(Low) Special Incident Optical Power (dBm)	Mainstream Incident Optical Power (dBm)	(High) Special Incident Optical Power (dBm)	(Low) Special Incident Optical Power (dBm)	Mainstream Incident Optical Power (dBm)	(High) Special Incident Optical Power (dBm)	(Low) Special Incident Optical Power (dBm)
40GePDM-	50	0.5	3.5	-	-1.0	-	-3.0	-7.0	-5.0	-	-2.0	-	-4.0	-2.0	-	-4.0

Channel Spectrum Width of Each Modulation Format		G.652			LEAF			G.653			TWRS			TWC		
BPSK	100	3.5	-	0.5	2.0	3.5	0.0	-7.0	-5.0	-	-2.0	-	-4.0	-2.0	-	-4.0
100GePDM-QPSK	50	0.5	3.5	-	-1.0	0.5	-3.0	-7.0	-5.0	-10	-2.0	0.5	-4.0	-2.0	0.5	-4.0
	100	3.5	6.5	0.5	2.0	3.5	0.0	-7.0	-5.0	-10	1.0	3.5	-1.0	1.0	3.5	-1.0
	200 (5 x 37.5 sub-wavelength)	-0.5	2.5	-	-2.0	-0.5	-4.0	-	-	-	-	-	-	-	-	-
200G16QAM	200 (5 x 37.5 sub-wavelength)	-0.5	2.5	-	-2.0	-0.5	-4.0	-	-	-	-	-	-	-	-	-
	50	0.5	3.5	-	-1.0	0.5	-3.0	-	-	-	-	-	-	-	-	-
	100	3.5	6.5	0.5	2.0	3.5	0.0	-	-	-	-	-	-	-	-	-
200GQPSK	75	2.3	5.3	-	0.8	2.3	-1.2	-	-	-	-	-	-	-	-	-
	100	3.5	6.5	-	2.0	3.5	0.0	-	-	-	-	-	-	-	-	-

Channel Spectrum Width of Each Modulation Format		G.652			LEAF			G.653			TWRS			TWC		
200G8QAM	50	0.5	3.5	-	-1.0	0.5	-3.0	-	-	-	-	-	-	-	-	-
	62.5	1.4	4.4	-	-0.1	1.4	-2.1	-	-	-	-	-	-	-	-	-
200Ge16QAM	50	0.5	3.5	-	-1.0	0.5	-3.0	-	-	-	-	-	-	-	-	-
	75	2.3	5.3	-	0.8	2.3	-1.2	-	-	-	-	-	-	-	-	-
	100	3.5	6.5	-	2.0	3.5	0.0	-	-	-	-	-	-	-	-	-
200G16QAM-H	200 (5 x 37.5 sub-wavelength)	-0.5	2.5	-	-2.0	-0.5	-4.0	-	-	-	-	-	-	-	-	-
	50	0.5	3.5	-	-1.0	0.5	-3.0	-	-	-	-	-	-	-	-	-
	100	3.5	6.5	0.5	2.0	3.5	0.0	-	-	-	-	-	-	-	-	-
200GDQPSK	100	3.5	6.5	-	2.0	3.5	0.0	-	-	-	-	-	-	-	-	-

Channel Spectrum Width of Each Modulation Format		G.652			LEAF			G.653			TWRS			TWC		
400G16QAM	75	2.3	5.3	-	0.8	2.3	-1.2	-	-	-	-	-	-	-	-	-
	100	3.5	6.5	-	2.0	3.5	0.0	-	-	-	-	-	-	-	-	-
400Gs16QAM	100	3.5	6.5	-	2.0	3.5	0.0	-	-	-	-	-	-	-	-	-
600G16QAM	100	3.5	6.5	-	2.0	3.5	0.0	-	-	-	-	-	-	-	-	-
800Ge64QAM	100	3.5	6.5	-	2.0	3.5	0.0	-	-	-	-	-	-	-	-	-
800	100	3.5	6.5	-	2.0	3.5	0.0	-	-	-	-	-	-	-	-	-

Channel Spectrum Width of Each Modulation Format		G.652			LEAF			G.653			TWRS			TWC		
G64QA	112.5	4.1	7.1	-	2.6	4.1	0.6	-	-	-	-	-	-	-	-	-

Table 8-2 Incident optical power specifications of OSN 8800/6800/3800/9800 in the extended C band

Channel Spectrum Width of Each Modulation Format		**G.652**			**LEAF**			**G.653**			**TWRS**		
Modulation Format	Channel Spectrum Width (GHz)	Mainstream Incident Optical Power (dBm)	(High) Special Incident Optical Power (dBm)	(Low) Special Incident Optical Power (dBm)	Mainstream Incident Optical Power (dBm)	(High) Special Incident Optical Power (dBm)	(Low) Special Incident Optical Power (dBm)	Mainstream Incident Optical Power (dBm)	(High) Special Incident Optical Power (dBm)	(Low) Special Incident Optical Power (dBm)	Mainstream Incident Optical Power (dBm)	(High) Special Incident Optical Power (dBm)	(Low) Special Incident Optical Power (dBm)
40GePDM-	50	1.2	3.5	-	-1.0	1.2	-3.0	-7.0	-5.0	-	-2.0	1.2	-4.0

Channel Spectrum Width of Each Modulation Format		G.652			LEAF			G.653			TWRS		
BPSK	100	4.2	6.5	1.2	2.0	4.2	0.0	-7.0	-5.0	-	-2.0	1.2	-4.0
100GePDM-QPSK	50	1.2	3.5	-	-1.0	1.2	-3.0	-7.0	-5.0	-10	-2.0	1.2	-4.0
	100	4.2	6.5	1.2	2.0	4.2	0.0	-7.0	-5.0	-10	1.0	4.2	-1.0
	200 (5 x 37.5 sub-wavelength)	0.2	2.5	-	-2.0	0.2	-4.0	-	-	-	-	-	-
200G 16QAM	200 (5 x 37.5 sub-wavelength)	0.2	2.5	-	-2.0	-0.2	-4.0	-	-	-	-	-	-
	50	1.2	3.5	-	-1.0	1.2	-3.0	-	-	-	-	-	-
	100	4.2	6.5	1.2	2.0	4.2	0.0	-	-	-	-	-	-
200G QPSK	75	2.9	5.2	-	0.8	2.9	-1.2	-	-	-	-	-	-
	100	4.2	6.5	-	2.0	4.2	0.0	-	-	-	-	-	-
200G 8QAM	50	1.2	3.5	-	-1.0	1.2	-3.0	-	-	-	-	-	-
	62.5	2.2	4.5	-	-0.1	2.2	-2.1	-	-	-	-	-	-

Channel Spectrum Width of Each Modulation Format		G.652			LEAF			G.653			TWRS		
200Ge16QAM	50	1.2	3.5	-	-1.0	1.2	-3.0	-	-	-	-	-	-
	75	2.9	5.2	-	0.8	2.9	-1.2	-	-	-	-	-	-
	100	4.2	6.5	-	2.0	4.2	0.0	-	-	-	-	-	-
200G16QAM-H	200 (5 x 37.5 sub-wavelength)	0.2	2.5	-	-2.0	0.2	-4.0	-	-	-	-	-	-
	50	1.2	3.5	-	-1.0	1.2	-3.0	-	-	-	-	-	-
	100	4.2	6.5	1.2	2.0	4.2	0.0	-	-	-	-	-	-
400G16QAM	75	2.9	5.2	-	0.8	2.9	-1.2	-	-	-	-	-	-
	100	4.2	6.5	-	2.0	4.2	0.0	-	-	-	-	-	-
400Gs16QAM	100	4.2	6.5	-	2.0	4.2	0.0	-	-	-	-	-	-
600G16QAM	100	4.2	6.5	-	2.0	4.2	0.0	-	-	-	-	-	-

Channel Spectrum Width of Each Modulation Format		G.652			LEAF			G.653			TWRS		
800Ge64QAM	100	4.2	6.5	-	2.0	4.2	0.0	-	-	-	-	-	-
800G64QAM	100	4.2	6.5	-	2.0	4.2	0.0	-	-	-	-	-	-
	112.5	4.8	7.1	-	2.6	4.8	0.6	-	-	-	-	-	-

NOTE

The special incident optical power (Low) is the incident optical power lower than the mainstream incident optical power. The purpose is to reduce the non-linear effect.

The special incident optical power (High) is higher than the incident optical power of the mainstream optical power. The purpose is to improve the OSNR. For example: In the case of G.652 fibers, set this parameter to OAU105 or OAU107.

Table 8-3 Incident optical power specifications of OSN 1800 in the C band (only for DAP)

Channel Spectrum Width of Each Modulation Format		**G.652**			**LEAF**			**G.653**			**TWRS**		
Modulation Format	Channel Spectrum Width (GHz)	Mainstream Incident Optical Power (dBm)	(High) Special Incident Optical Power (dBm)	(Low) Special Incident Optical Power (dBm)	Mainstream Incident Optical Power (dBm)	(High) Special Incident Optical Power (dBm)	(Low) Special Incident Optical Power (dBm)	Mainstream Incident Optical Power (dBm)	(High) Special Incident Optical Power (dBm)	(Low) Special Incident Optical Power (dBm)	Mainstream Incident Optical Power (dBm)	(High) Special Incident Optical Power (dBm)	(Low) Special Incident Optical Power (dBm)
100G ePDM-QPSK	50	0.5	3.5	-	-1.0	0.5	-3.0	-7.0	-5.0	-10	-2.0	0.5	-4.0
	100	3.5	6.5	0.5	2.0	3.5	0.0	-7.0	-5.0	-10	1.0	3.5	-1.0
	200 (5 x 37.5 sub-wavelength)	-0.5	2.5	-	-2.0	-0.5	-4.0	-	-	-	-	-	-
200G 16QAM	50	0.5	3.5	-	-1.0	0.5	-3.0	-	-	-	-	-	-
	100	3.5	6.5	0.5	2.0	3.5	0.0	-	-	-	-	-	-

Channel Spectrum Width of Each Modulation Format		G.652			LEAF			G.653			TWRS		
	200 (5 x 37.5 sub-wavelength)	-0.5	2.5	-	-2.0	-0.5	-4.0	-	-	-	-	-	-

Table 8-4 Incident optical power specifications of OSN 1800 in the C band (for OBU and OPU)

Channel Spectrum Width of Each Modulation Format		G.652			LEAF			G.653			TWRS		
Modulation Format	Number of Wavelengths	Mainstream Incident Optical Power (dBm)	(High) Special Incident Optical Power (dBm)	(Low) Special Incident Optical Power (dBm)	Mainstream Incident Optical Power (dBm)	(High) Special Incident Optical Power (dBm)	(Low) Special Incident Optical Power (dBm)	Mainstream Incident Optical Power (dBm)	(High) Special Incident Optical Power (dBm)	(Low) Special Incident Optical Power (dBm)	Mainstream Incident Optical Power (dBm)	(High) Special Incident Optical Power (dBm)	(Low) Special Incident Optical Power (dBm)

Channel Spectrum Width of Each Modulation Format		G.652			LEAF			G.653			TWRS		
2.5G SFP	40-wavelength OBU	3.5	-	-	-	-	-	-	-	-	-	-	-
	40-wavelength OPU	0.5	-	-	0.5	-	-	-5.0	-	-	-	-	-
	16-wavelength OPU	4.5	-	-	4.5	-	-	-4.0	-	-	-	-	-
	8-wavelength OPU	7.5	-	-	-	-	-	-	-	-	-	-	-
10G NRZ	80-wavelength OBU	0.5	-	-	-	-	-	-7.0	-	-	-	-	-
	40-wavelength OBU	3.5	-	-	-	-	-	-5.0	-	-	-	-	-
	40-wavelength OPU	0.5	-	-	0.5	-	-	-5.0	-	-	-	-	-
	16-wavelength OPU	4.5	-	-	4.5	-	-	-4.0	-	-	-	-	-
100G ePDM-QPSK (hy	80-wavelength OBU	0.5	-	-	0.5	-	-1.0	-	-	-	-	-	-

Channel Spectrum Width of Each Modulation Format		G.652			LEAF			G.653			TWRS		
brid transmission)	40-wavelength OBU	3.5	-	-	3.5	-	2.0	-	-	-	-	-	-
100G ePDM-QPSK (Coherent)	80-wavelength OBU	0.5	-	-	-1.0	0.5	-	-	-	-	-	-	-
	40-wavelength OBU	3.5	-	-	2.0	-	-	-	-	-	-	-	-
200G 16QAM	80-wavelength OBU	0.5	-	-	-1.0	0.5	-	-	-	-	-	-	-
	40-wavelength OBU	3.5	-	-	2.0	-	-	-	-	-	-	-	-

Table 8-5 Requirements on Incident Optical Power of the 10 Gbit/s and 2.5 Gbit/s single-wavelength system

Module Type	Number of Wavelengths	G.652	LEAF	TWRS	G.653	TW-C	TW+	SMF-LS
N/A	40	+4/+7	+4/+7	N/A	N/A	N/A	N/A	N/A
	80	+4/+7	+4/+7	N/A	N/A	N/A	N/A	N/A
NRZ	40	+4/+7	+4/+7	+2/+4	-5/-4	+2/+4	-1/+1	-3/-3
	80	+1/+4	+1/+4	-1/+1	-7/-6	-1/+1	-1/+1	-3/-3

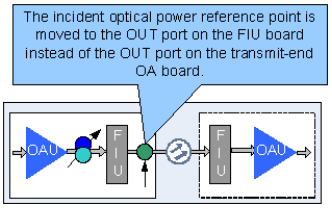
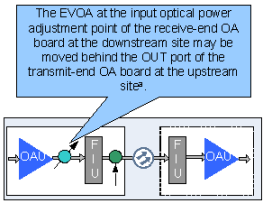
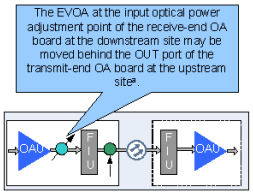
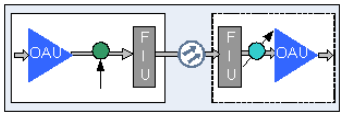
Module Type	Number of Wavelengths	G.652	LEAF	TWRS	G.653	TW-C	TW+	SMF-LS
(D)RZ	40	+4/+7	+4/+7	+2/+4	-5/-4	+2/+4	+1/+1	-3/-3
	80	+1/+4	+1/+4	-1/+1	-7/-6	-1/+1	-1/+1	-3/-3
The optical power listed in the table is expressed in dBm.								

Table 8-6 Requirements on Incident Optical Power of the 40 Gbit/s non-coherent transmission system

Module Type	Number of Wavelengths	G.652	LEAF	TWRS	G.653	TW-C	TW+	SMF-LS
40G ODB	40	+4/+7	+4/+7	N/A	N/A	+4/+7	N/A	N/A
	80	+1/+4	+1/+4	N/A	N/A	+1/+4	N/A	N/A
40G DQPSK	40	+4/+7	+2/+4	+2/+4	-5/-5	+2/+4	+1/+1	-1/-1
	80	+1/+4	+1/+4	+1/+4	-5/-5	+1/+4	-1/+1	-2/-2
The optical power listed in the table is expressed in dBm, and is applicable to optical amplifiers with total output optical power of 20 dBm.								

Commissioning Difference Between the Coherent and Non-coherent Transmission Systems

Table 8-7 Commissioning difference between the coherent and non-coherent transmission systems

Transmission System	Non-standard Fiber Access	Standard Fiber Access
Coherent system		
Non-coherent system		

 : Incident optical power reference point

 : Incident optical power adjustment point

 : Input optical power adjustment point of the receive-end OA board at the downstream site

NOTE

a: On a practical coherent network, the position where the EVOA at the input optical power adjustment point of the receive-end OA board at a site is located is determined by the actual network design. If the EVOA is located at the receive end of the downstream site, the commissioning method is the same as that in a non-coherent transmission system.

NOTE

The figures describe the commissioning difference between the coherent and non-coherent transmission systems in a signal flow, and in the opposite direction they are the same way.

Procedure

Step 1 Select the NE housing the egress OA board at the transmit end and start the NE Explorer. Select the OA board and, in the navigation tree, choose **Configuration** > **WDM Interface**.

Step 2 Click the **By Board/Port(Channel)** option button and then the **Advanced Attributes** tab. Select the associated port on the OA board and correctly set **Launch Power**.

Step 3 Click **Apply** to apply the setting to the OA board.

----End

8.3 Setting Optical Amplifier Information

To ensure that the optical power is more accurately commissioned, you can set the attributes of specific OA boards such as the rate, code type, and system wavelengths based on the practical networking scenario.

Prerequisites

- You are an NMS user with the "Maintainer Group" or higher permission.
- The Plan Data Setting is set.
- Commissioning trails are filtered.
- The designed rate, modulation format, and maximum number of system wavelengths for specific OAs have been obtained from the network design document before the configuration.

Context

Set commissioning information for specific OAs based on actual network parameters as follows:

- When both 40-wavelength and 80-wavelength systems are configured in a subnet to be commissioned, set the maximum number of system wavelengths for OAs based on the type of the system.
- When NEs on different subnets are interconnected and the values of **System Wavelengths**, **Rate**, and **Code Type** for the subnets are inconsistent, the three parameters need to be set in the **Set OA Info** window for boards on the NE of a subnet so that the parameter values are consistent with the parameter values on the interconnected subnet.
- The value of **Launch Power** queried in the **Set OA Info** window is the launch power set on NCE. If the value of **Launch Power** is displayed as **/**, the NMS data may not be synchronized or this parameter is not set for the board on NCE. In this scenario, you are advised to perform the following operations:
  a. Synchronize NMS data.
  b. If the value of **Launch Power** is still displayed as **/**, set **Launch Power** for the board in the **Set OA Info** window.

NOTE

- To use the OD function, ensure that the **Launch Power** parameter is set.
- During launch power commissioning, the **Launch Power** value set for the board will be preferentially used. If **Launch Power** is not set for the board, ensure that other OA parameters including **System Wavelengths**, **Rate**, **Code Type**, and **Fiber Type** are correct. If other parameters are properly set, the system can automatically calculate the launch power based on the settings of other OA parameters to ensure accurate launch power commissioning.

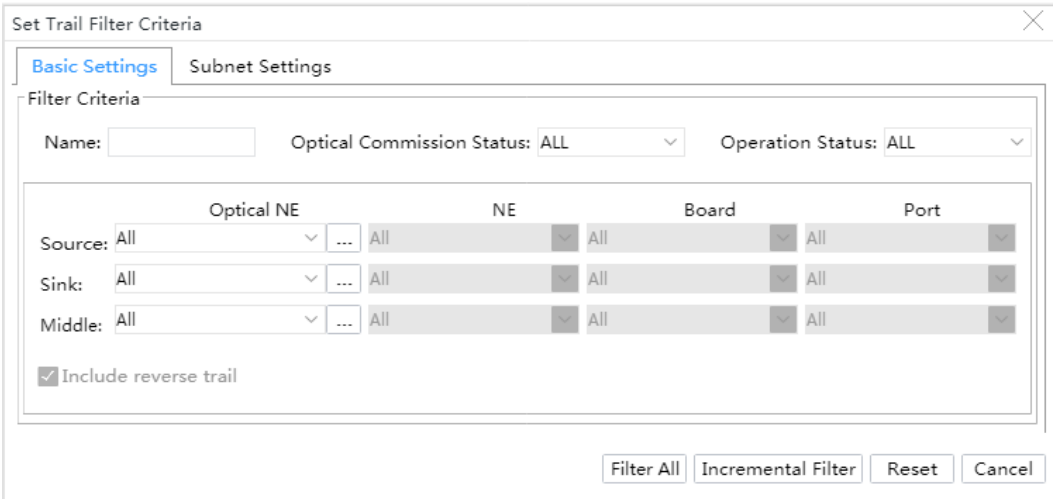
Procedure

Step 1 Choose **Configuration** > **WDM Optical Management** > **WDM Trail Performance Commissioning** from the main menu on the NCE Network Management app.

Step 2 In **Set Trail Filter Criteria** window, select the desired filter criteria and click **Filter All** or **Incremental Filter**.

NOTE

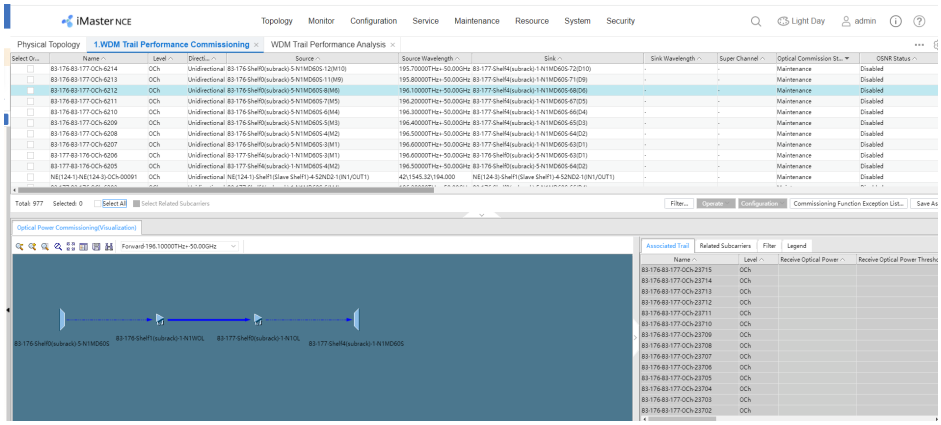
- If you need to filter all the trails, click **Filter All**.
- If you need to add to the list more trails that match the requirement, click **Incremental Filter**.



NOTE

You can also click **Subnet Settings** tab to filter the subnets.

Step 3 The desired filtering OCh trails are displayed in the **WDM Trail Performance Commissioning**.



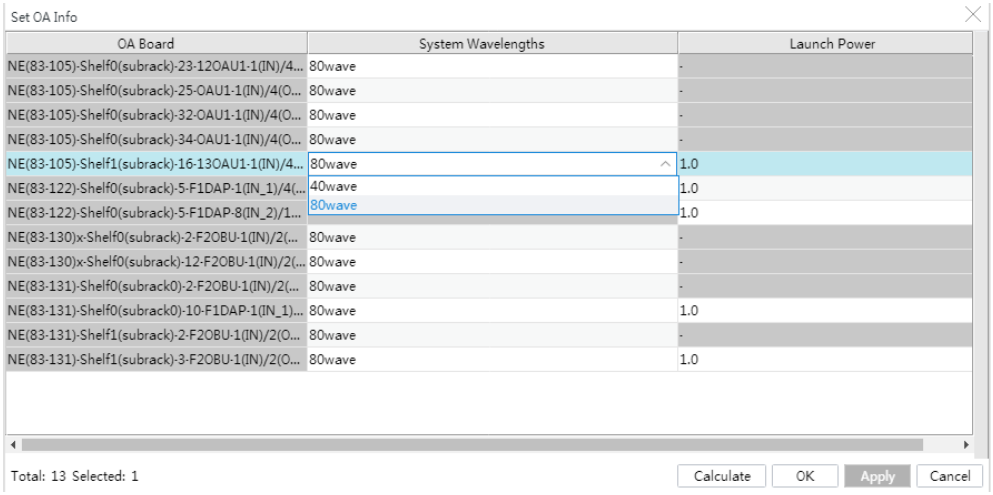
Step 4 In the **WDM Trail Performance Commissioning** window, select the desired trails, and click **Set OA Info**.

NOTE

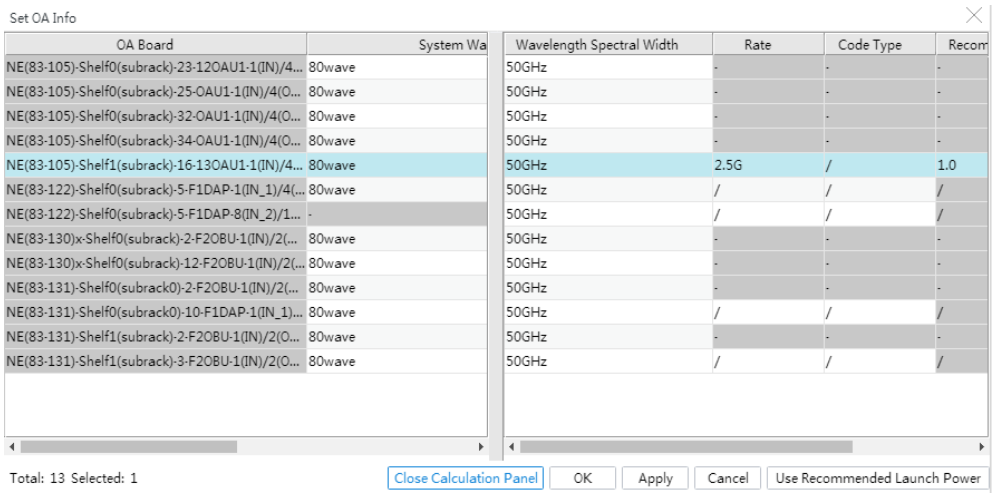
You can also select and right-click an OA board in the signal flow in **Trail Details**, and choose **Set OA Info** from the shortcut menu.

Step 5 In the **Set OA Info** window, set the system wavelengths, rate, code type, and launch power for specific OAs based on actual networking requirements.

1. Set **System Wavelengths** of each OA board.



2. Select one or more boards and click **Calculate**. The **Wavelength Spectral Width**, **Rate**, **Code Type**, and **Recommended Launch Power** columns are displayed.



NOTE

Set **Wavelength Spectral Width** according to the planned spectrum width, rate, and code pattern. For details about the incident optical power specifications in different configurations, see **8.2 Setting Incident Optical Power on NCE**.

To perform batch setting, select multiple boards, right-click a parameter column, and choose the desired value.

3. Set **Rate** and **Code Type** of the egress OA board at the transmit end.

NOTE

- In the high-power fiber access scenario, **Launch Power** must be set.
- The value of **Launch Power** is a floating-point number ranging from –10.0 to 10.0.
- In case of **8.2 Setting Incident Optical Power on NCE**, the launch power of the related OA board will be automatically displayed after NMS data synchronization.

4. **Optional:** Click **Use Recommended Launch Power**. The value of **Recommended Launch Power** in the selected record will be used as the value of **Launch Power**.

Step 6 Click **Apply**.

Step 7 Click **OK** to close the **Set OA Info** window.

----End

8.4 Deleting an ALC Link

This section describes how to delete an ALC link from a network containing WDM equipment.

Prerequisites

You are an NMS user with "Operator Group" authority or higher.

Tools, Equipment, and Materials

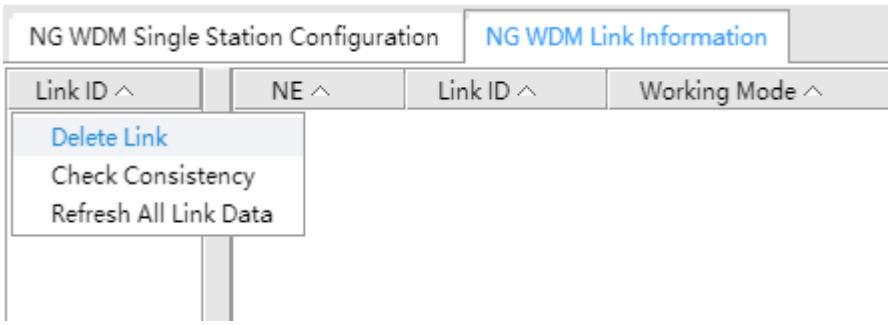
NCE

Procedure

Step 1 Choose **Configuration** > **Transport Network** > **WDM Configuration** > **WDM ALC Management** from the main menu on the NCE Network Management app. The **WDM ALC Management** window is displayed.

Step 2 In the **WDM ALC Management** window, click the **NG WDM** and **NG WDM Link Information** tabs.

Step 3 On the left of the **NG WDM Link Information** tab page, right-click the desired link ID and choose **Delete Link** from the shortcut menu.



Step 4 In the **Confirm** dialog box, click **Yes**.

----End

8.5 Deleting an APE Pair

This section describes how to delete an APE pair from a network containing WDM equipment.

Prerequisites

You are an NMS user with "Operator Group" authority or higher.

Tools, Equipment, and Materials

NCE

Procedure

Step 1 In the NE Explorer, select the NE. In the navigation tree, choose **Configuration** > **Optical Power Equilibrium**.

Step 2 Click **Query**.

Step 3 Select an APE pair that has been created and click **Delete**. In the dialog box that is displayed, click **Confirm**.

----End

8.6 Querying Automatic Optimization Records of Main Optical Paths

After the main optical paths of OMSs are completed on a device, you can query the adjustment status of each adjusted object in all optimization processes, and also export a report to view the span performance comparison data before and after adjustment and adjustment volume comparison data of the adjusted objects.

Prerequisites

- You are an NMS user with the **Maintainer Group** or higher permission.
- The main optical paths of OMSs on the equipment have been optimized.

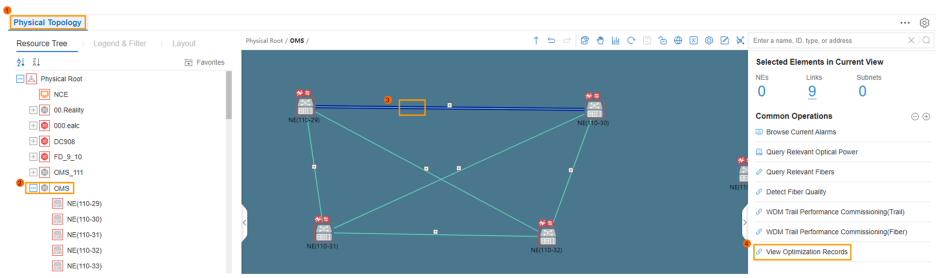
Tools, Equipment, and Materials

NCE

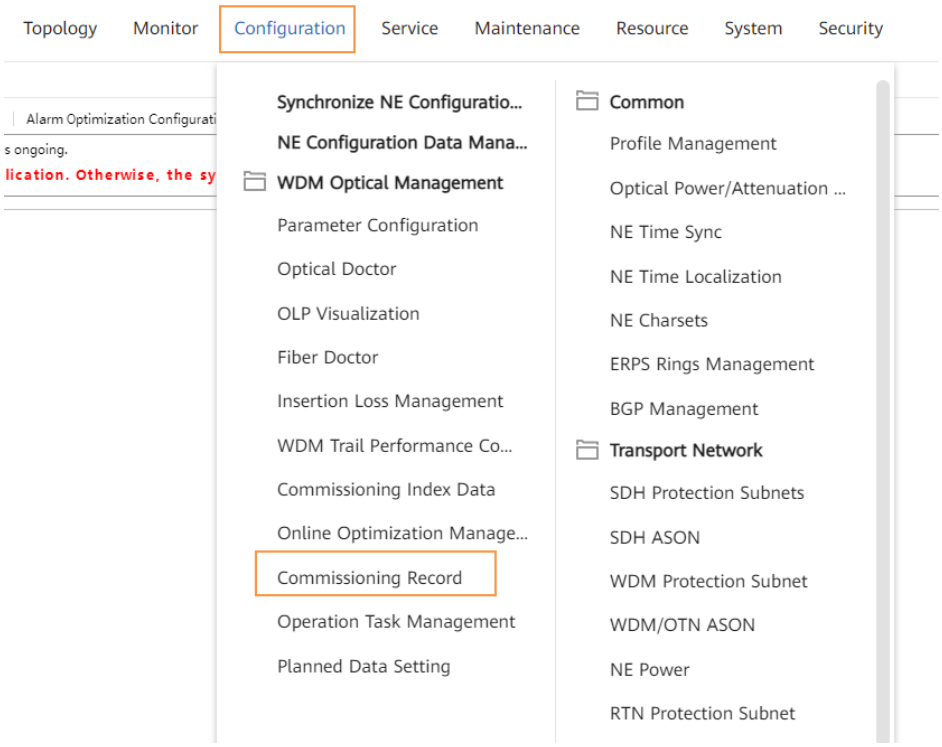
Procedure

Step 1 Enter the **Network Management** app. Enter the commissioning record window.

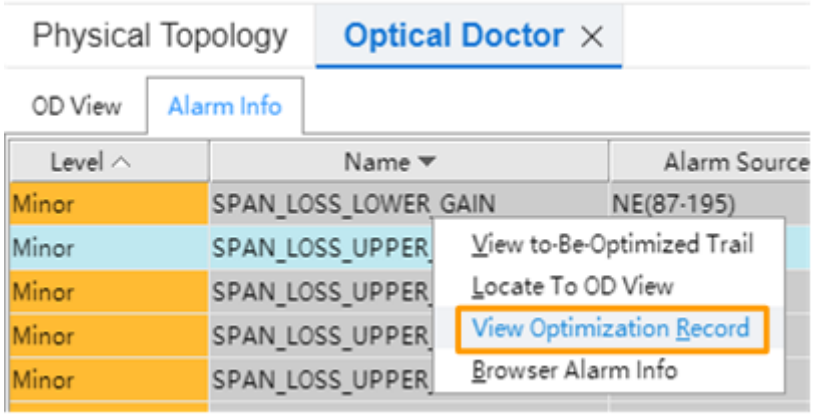
- Method 1: In the physical topology, select an inter-site fiber and choose **View Optimization Records** in the right pane.



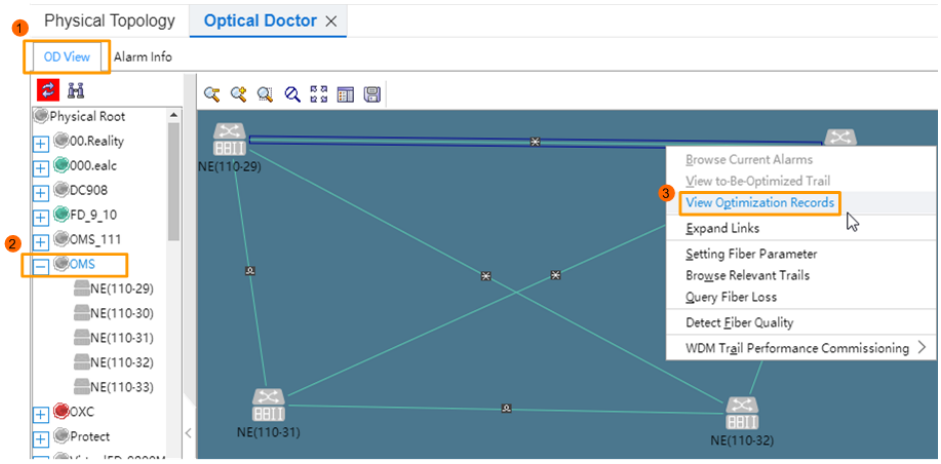
- Method 2: Choose **Configuration** > **WDM Optical Management** > **Commissioning Record** from the main menu on the NCE Network Management app, In the **Filter Criteria** window, click **Filter All**.



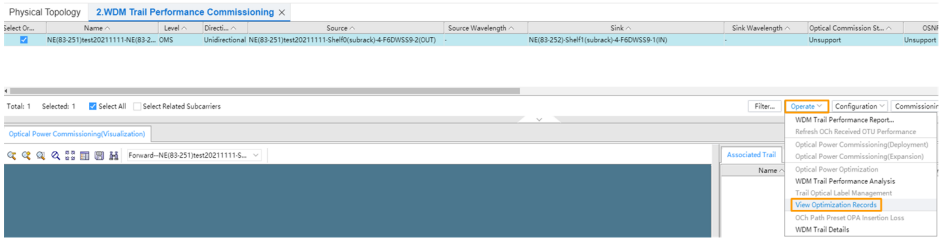
- Method 3: Choose **Configuration** > **WDM Optical Management** > **Optical Doctor** from the main menu. On the **Alarm Info** tab page, select and right-click SPAN_LOSS_UPPER_GAIN \ SPAN-LOSS-UPPER-GAIN, SPAN_LOSS_LOWER_GAIN \ SPAN-LOSS-LOWER-GAIN, or OMS_LOSS_ACCUM_ABN \ OMS-LOSS-ACCUM-ABN, and choose **View Optimization Record** from the shortcut menu.



- Method 4: Choose **Configuration** > **WDM Optical Management** > **Optical Doctor** from the main menu. On the **OD View** tab page, right-click an inter-site fiber and choose **View Optimization Records** from the shortcut menu.



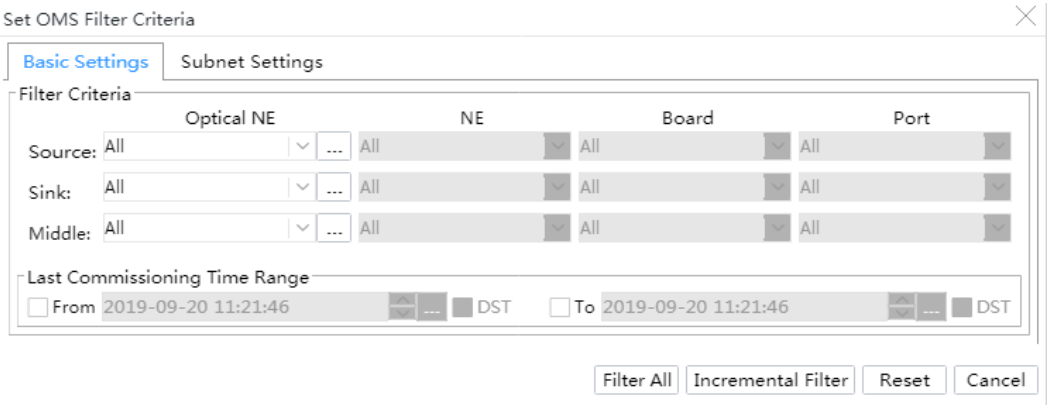
- Method 5: Open the **WDM Trail Performance Commissioning** page and the **Set Trail Filter Criteria** dialog box is displayed. Set **Service Level** to **OMS** and click **Filter All**. Select an OMS trail and choose **Operate > View Optimization Records**.



Step 2 Click **Main Optical Path View** tab. In the **Set OMS Filter Criteria** window, select search criteria and click **Filter ALL** or **Incremental Filter**.

NOTE

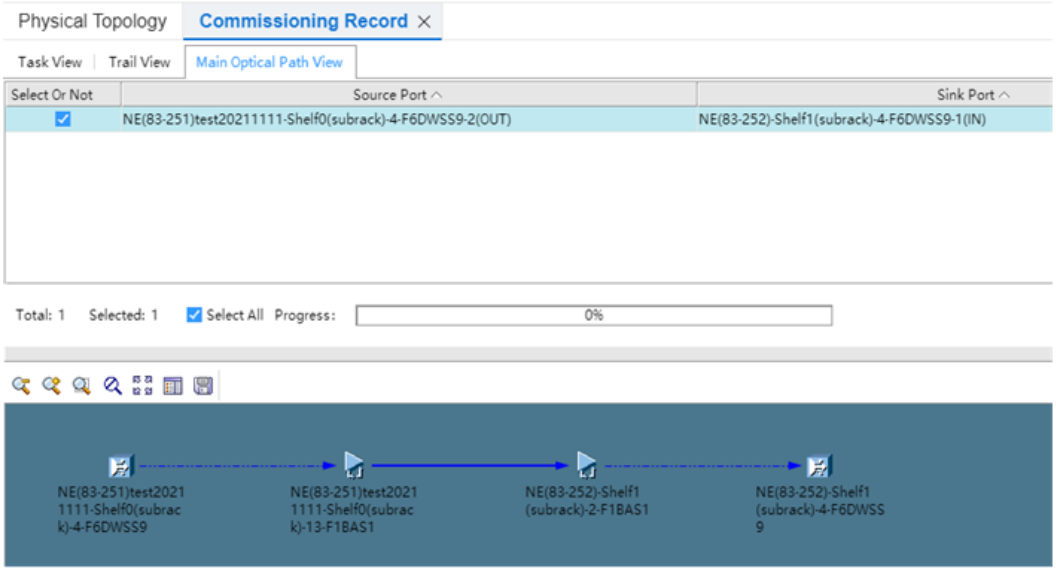
- If you click **Filter ALL**, all the trails meeting the conditions will be displayed.
- If you click **Incremental Filter**, the filters that are newly filtered out will be added after the displayed trails.



NOTE

You can also click **Subnet Settings** tab to filter the subnets.

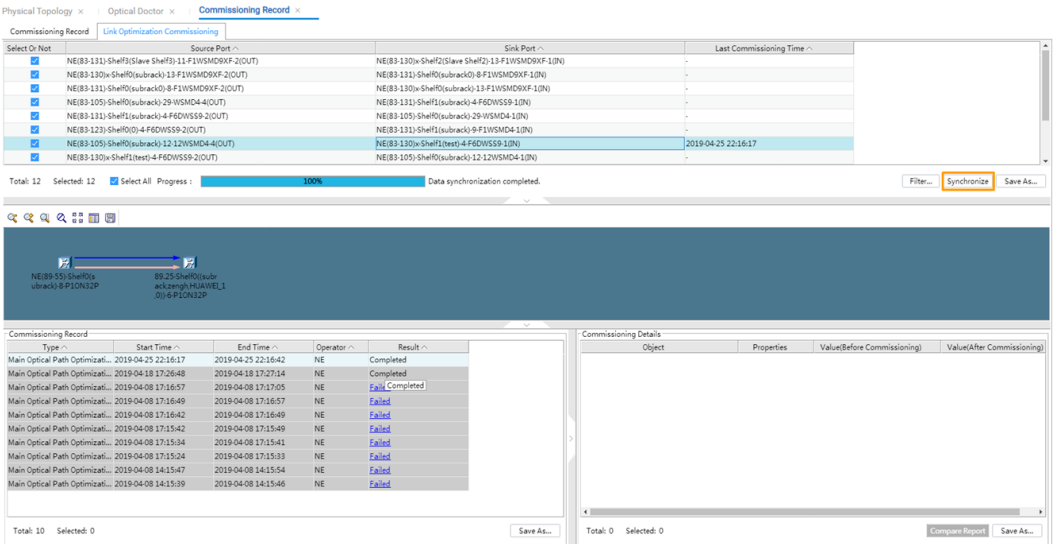
Step 3 In the **Main Optical Path View** area, select a desired OMS. You can view its routes at the bottom of the OMS list.



NOTE

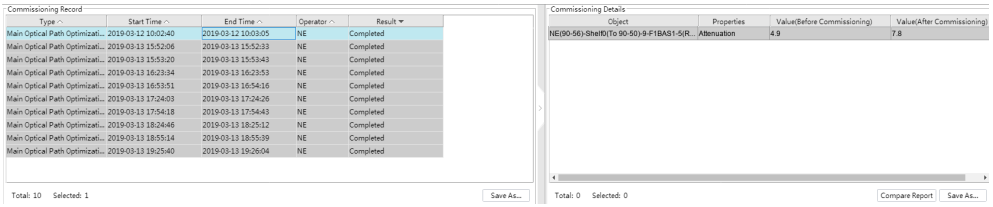
- To zoom out on a routing diagram, click  .
- To zoom in on a routing diagram, click  .
- To zoom in on the routing diagram within a specific scope, click  , hold the left-mouse button on the routing diagram, and drag the mouse to select a routing area.
- To display a routing diagram by the default percentage, click  .
- To automatically display a routing diagram by an appropriate percentage based on the window size, click  .
- To unfold or fold the legend panel on the right of a routing diagram, click  . The legend panel is folded by default. You can view legend descriptions after unfolding the legend panel.
- To save the current routing diagram, click  .

Step 4 Click **Synchronize** to synchronize the main optical path optimization commissioning records from the equipment side. The synchronized records are displayed in the **Commissioning Record** area.



Step 5 In the **Commissioning Record** area, select a commissioning record to view details.

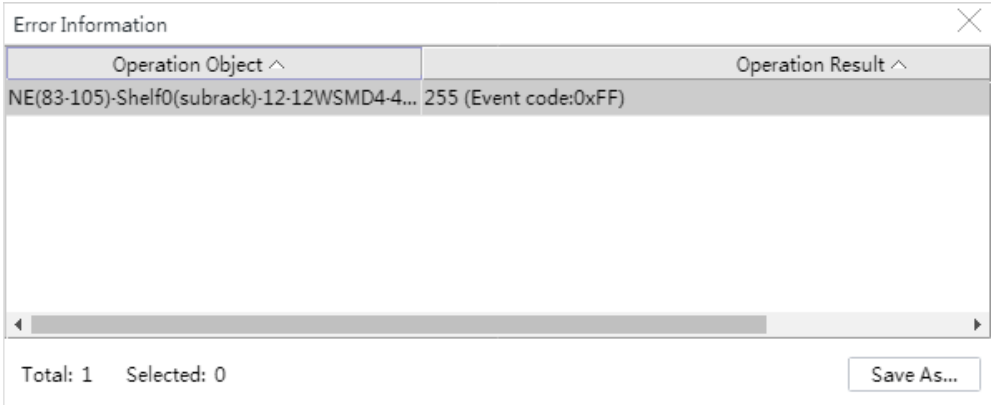
- If **Result** of a commissioning record is **Completed**, the optimization commissioning is successful. In the **Commissioning Details** area on the right side, you can view the adjusted object of the main optical path optimization commissioning, and the details about the adjustment of the attenuation, gain (including the nominal Raman gain), and optical power.



NOTE

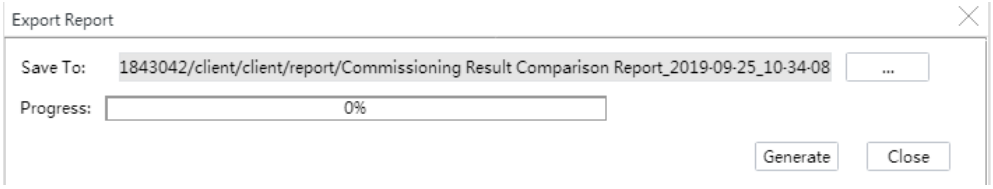
If the value of **Value(After Commissioning)** is **/**, data is lost.

- If **Result** of a commissioning record is **Failed**, the optimization commissioning fails. You can click the **Failed** link to view details about the error.

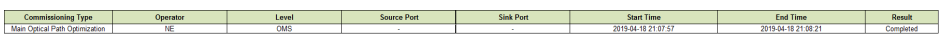


Step 6 Export a comparison report to view the span performance comparison data before and after adjustment and adjustment volume comparison data of the adjusted object.

1. In the **Commissioning Details** area, click **Compare Report**.
2. Set a path for saving the report, and click **Generate**.

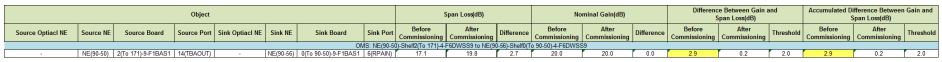


3. Check the generated comparison report in the specified path.
   - **Commissioning Information** lists the basic information about the optimization commissioning.



Commissioning Type	Operator	Level	Source Port	Sink Port	Start Time	End Time	Result
Main Optical Path Optimization	NE	OMS	-	-	2019-04-18 21:07:57	2019-04-18 21:08:21	Completed

   - **Span Loss Comparison** lists the performance comparison data of each OTS in the OMS involved in the optimization commissioning.



Object								Span Loss(dB)			Nominal Gain(dB)			Difference Between Gain and Span Loss(dB)			Accumulated Difference Between Gain and Span Loss(dB)		
Source Optiacl NE	Source NE	Source Board	Source Port	Sink Optiacl NE	Sink NE	Sink Board	Sink Port	Before Commissioning	After Commissioning	Difference	Before Commissioning	After Commissioning	Difference	Before Commissioning	After Commissioning	Threshold	Before Commissioning	After Commissioning	Threshold
OMS: NE(90-56)-Shelf0(To 171)-4-FDWSS9 to NE(90-56)-Shelf0(To 90-50)-4-FDWSS9																			
-	NE(90-56)	2(To 171)-9-F1BAS1	14(TBAOUT)	-	NE(90-56)	3(To 90-50)-9-F1BAS1	6(RPAIN)	17.1	19.8	2.7	20.0	20.0	0.0	2.9	0.2	2.0	2.9	0.2	2.0

NOTE

The light blue row in the preceding figure provides information about the OMS involved in the optimization commissioning, including the source and sink boards of the OMS.

- **Adjustment Value Comparison** lists the adjusted volume comparison data of each adjustment point in the OMS.

Object				Adjustment Info (dB)			
Optical NE	NE	Board	Port	Type	Before Commissioning	After Commissioning	Difference
-	NE(90-56)	0(To 90-50)-9-F1BAS1	5(RVI)	Attenuation	4.9	7.8	2.9

----End

Parameters in the Comparison Report

- indicates that the corresponding attribute is not supported or does not exist. **/** indicates that the corresponding data query or computing fails.

Table 8-8 Commissioning information

Parameter	Description
Commissioning Type	The value can only be **Main Optical Path Optimization**, indicating the main optical path optimization of OMSs on the equipment side.
Operator	The value can only be **NE**.
Level	The value can only be **OMS**, indicating that the optimization commissioning records of OMSs will be displayed.
Source Port	Indicates the source port on an OMS.
Sink Port	Indicates the sink port on an OMS.
Start Time	Indicates the commissioning start time.
End Time	Indicates the commissioning end time.
Result	Indicates commissioning results.

Table 8-9 Span Loss Comparison

Parameter		Description
Object	Source Optical NE	Indicates the source optical NE on an OTS of the OMS.
	Source NE	Indicates the source NE on an OTS of the OMS.
	Source Board	Indicates the source OA board on an OTS of the OMS.

Parameter		Description
	Source Port	Indicates the output port of the source OA board on an OTS of the OMS.
	Sink Optical NE	Indicates the sink optical NE on an OTS of the OMS.
	Sink NE	Indicates the sink NE on an OTS of the OMS.
	Sink Board	Indicates the sink OA board on an OTS of the OMS.
	Sink Port	Indicates the input port of the sink OA board on an OTS of the OMS.
Span Loss(dB)	Before Commissioning	Indicates the span loss on an OTS of the OMS before commissioning. The value is the offset between the output optical power of the source OA board and the input optical power of the sink OA board on an OTS before commissioning.
	After Commissioning	Indicates the span loss on an OTS of the OMS after commissioning. The value is the offset between the output optical power of the source OA board and the input optical power of the sink OA board on an OTS after commissioning.
	Difference	Indicates the offset between **After Commissioning** and **Before Commissioning** of the span loss.
Gain(dB)	Before Commissioning	Indicates the nominal gain of the sink OA board on an OTS of the OMS before commissioning.
	After Commissioning	Indicates the nominal gain of the sink OA board on an OTS of the OMS after commissioning.

Parameter		Description
	Difference	Indicates the offset between **After Commissioning** and **Before Commissioning** of the gain.
Difference Between Gain and Span Loss(dB)	Before Commissioning	Indicates the offset between **Gain** and **Span Loss** on an OTS of the OMS before commissioning. If the value exceeds that of **Threshold**, the column will be marked yellow.
	After Commissioning	Indicates the offset between **Gain** and **Span Loss** on an OTS of the OMS after commissioning. If the value exceeds that of **Threshold**, the column will be marked yellow.
	Threshold	The value is the same as that of **Line Attenuation Compensation Threshold(dB)** in **5.2.3 Setting Basic OD Monitoring Parameters** configured during commissioning.
Accumulated Difference Between Gain and Span Loss(dB)	Before Commissioning	Indicates the sum of **Difference Between Gain and Span Loss** on all OTSs of the OMS before commissioning. If the value exceeds that of **Threshold**, the column will be marked yellow.
	After Commissioning	Indicates the sum of **Difference Between Gain and Span Loss** on all OTSs of the OMS after commissioning. If the value exceeds that of **Threshold**, the column will be marked yellow.

Parameter		Description
	Threshold	The value is the same as that of **Line Attenuation Compensation Threshold(dB)** in **5.2.3 Setting Basic OD Monitoring Parameters** configured during commissioning.

Table 8-10 Adjustment Value Comparison

Parameter		Description
Object	Optical NE	Indicates the optical NE that houses an adjustment point.
	NE	Indicates the NE that houses an adjustment point.
	Board	Indicates the board that houses an adjustment point.
	Port	Indicates the adjustment port.
Adjustment Info(dB)	Type	Only the attenuation and gain can be displayed.
	Before Commissioning	Indicates the value before commissioning.
	After Commissioning	Indicates the value after commissioning.
	Difference	Indicates the offset between **After Commissioning** and **Before Commissioning** of the attenuation or gain of an adjustment point.

9 FAQs

This section describes methods of handling common problems when using the OD system for Network O&M.

9.1 Meanings of Commissioning Trail Status Parameters

This section describes the meanings of the commissioning trail status parameters **Optical Commission Status**, **OSNR Status**.

Table 9-1 Meanings of commissioning trail status parameters

Status	Meaning
Optical Commission Status	On NCE, an OCh trail can be in the **Unset**, **Commission**, or **Maintenance** state. • The **Unset** state indicates that an OCh trail is initially created. • The **Commission** state indicates that an OCh trail has been created but the optical path has not been commissioned, and therefore the OCh trail cannot be used to carry services. • The **Maintenance** state indicates that the optical path of an OCh trail has been commissioned and the OCh trail can be used to carry services. Indicates the commissioning status of a trail. • If **Optical Commission Status** of a trail is **Maintenance**, deployment commissioning and expansion commissioning cannot be performed. • If **Optical Commission Status** of a trail is **Commission**, this trail cannot be optimized. Besides, deployment commissioning and expansion commissioning cannot be performed.
OSNR Status	Indicates whether an OCh trail supports OSNR detection. You can view the OSNR of a trail only when **OSNR Status** of the trail is set to **Enable**. For the method of setting **OSNR Status** to **Enable**, see **5.2.4.2.2 Configuring OSNR Detection for a Trail**. **NOTE** When the OSNR detection function is enabled for trails, each unidirectional trail automatically consumes an OD management system license. When the OSNR detection function is disabled for trails, the used licenses are released.

9.2 Solutions to Abnormal Optical Power in the WDM Trail Performance Report

This section describes how to handle abnormal optical power displayed in the WDM trail performance report.

Abnormal Optical Power of Optical Amplifiers

In the WDM trail performance report, if input optical power at the transmit end of the OA deviates from the nominal value by >= 1.5 dB, the OA board is yellow.

[Solution]:

- Check whether there are wavelengths that are not commissioned. If yes, commission them, regenerate a commissioning report, and check the optical power again.
- Check whether some channels are added or lost, the MCA or LS OA board will detect the added or lost channels, and CHAN_ADD or CHAN_LOS will be reported on the MCA or LS OA board. At that case, repair the channels and regenerate a commissioning report.
- Check whether the link fiber attenuation exceeds the engineering design value, or the inter-station fiber attenuation exceeds 0.5 dB. If yes, repair the fibers and regenerate a WDM trail performance report.
- Re-adjust the deviation in a proper maintenance time period.

Abnormal Optical Power Flatness

Ensure that the optical power flatness of all the wavelengths is within the range of ±3 dB of the average single-wavelength optical power. Check for MCA or LS OA boards on the link from source to sink for abnormal optical power flatness. The WDM trail performance report automatically discovers flatness problems on the MCA or LS OA board on the link and marks the MCA or LS OA board in yellow if a problem is discovered. Check whether there are wavelengths that are not commissioned. If yes, commission them, regenerate a commissioning report, and check the optical power again.

NOTE

The optical power displayed on the MCA board is 20 dB less than actual power. Therefore we need to compensate the value obtained by 20 dB to get the actual single-channel power value. For example in the 40-channel WDM configuration, if each channel output power should be + 4 dBm, it will be displayed as -16 dBm in the MCA board.

[Solution]: In the event, the wavelengths are not flat, that means the flatness is more than the recommended margin, each wavelength should be adjusted to fulfill the recommended single-channel power value. This can be done by adjusting the VOA on the WSS boards (WSMD4, WSM9 or WSD9) for each channel (as needed) with each step by incrementing or decrementing 0.5 dB.

In more severe cases, it is advised to consult Huawei to provide assistance in fixing the issue.

9.3 If an OCh Trail Traverses the CRPC, ROP, or HBA Board That the OD Does not Support, Can the OSNR of the OCh Trail Be Accurately Detected?

The OD does not support the CRPC or ROP board and the OD intended for OptiX NG WDM in version earlier than V100R007C02SPC300 does not support the HBA board. The OSNR of the OCh trails traversing these boards cannot be accurately detected.

9.4 Why the Fiber Type and Length Must Be Specified During the Configuration of OSNR Detection?

The Raman effects of fibers are related to the fiber type and length, especially the fiber type. The fiber length is accurate to km.

9.5 What Do I Do If No Wavelength Information Is Displayed in the Queried Spectrum Analysis Data?

[Problem Description]: No wavelength information is displayed in the queried spectrum analysis data.

[Problem Analysis]:

The possible causes are as follows:

- The physical fiber connections of the OPM8 or LS OA, MCA4, or MCA8 board are incorrect.
- The optical path is abnormal.

[Solution]:

1. Check the physical fiber connections of the OPM8 or LS OA, MCA4, or MCA8 board.
2. Check whether the optical path is set up. For example, check whether optical cross-connections are created, physical fiber connections are correct, or the laser on the OA board is properly turned on.

9.6 Why a Fiber Cut in the Downstream Will Make the OPM8 or LS OA, MCA4, or MCA8 Board at the Upstream Transmit-End Site Fail to Calculate the OSNR of All Monitored Wavelengths?

[Problem Description]: On an OMS, a fiber cut in the downstream will make the OPM8 or LS OA or MCA board at the downstream receive-end site fail to detect optical power. In addition, the OPM8 or LS OA, MCA4, or MCA8 board at the

upstream transmit-end site will not calculate the OSNR of all monitored wavelengths.

[Problem Analysis]: Theoretically, a fiber cut in the downstream of an OMS will not affect the OSNR results in the upstream of the OMS. However, according to the OD algorithm, the OSNR of wavelengths is calculated based on the OMS where the wavelengths are located. The OPM8 or LS OA or MCA board in the downstream needs to be used to rectify the OSNR detection results of each detection point in the OMS. If a fiber cut occurs in the downstream, the upstream of the OMS does not have the rectification data of the downstream, and therefore does not have the OSNR results. The upstream and downstream mentioned in the description refer to the upstream and downstream in the OMS instead of the upstream and downstream of a service or the OMS.

[Solution]: Use the OD to measure the optical power 10 minutes after the fiber is repaired.

9.7 Why the traditional OSNR detection method has a lower detection precision than the OD when they are used to detect the OSNR of a 40G or 100G system?

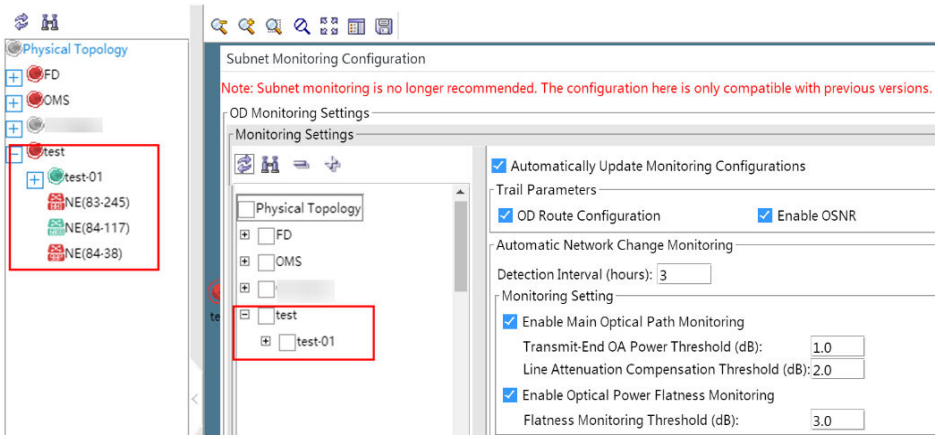
The optical spectrum of 40G or 100G signals is wider than that of 10G signals. As a result, the signal spectra of adjacent channels overlap each other. Inter-channel noise power contains not only the amplified spontaneous emission (ASE) noise power but also the signal crosstalk power. The traditional OSA method is implemented based on the interpolation of inter-channel noise that is equivalent to in-band noise. In this way, the OSNR obtained by using the traditional OSA method is less than the actual OSNR. Therefore, the traditional OSNR detection method has a low detection precision.

The traditional OSNR detection method and integral method have the following disadvantages:

- Scanning method: applicable only to a system with a 100G channel spacing and without traversing an OEQ node. The detection results have low precision.
- Integral method: When there are a few wavelengths, turning on or off the lasers will cause noise power fluctuation and therefore affect the detection accuracy. In addition, the noise power cannot be measured by turning on or off the laser when there is only one wavelength.

9.8 Failure to Monitor Standalone NEs Because the OD Monitoring Unit Is Subnet

[Problem Description]: As shown in the following figure, 83-245, 84-38 and 84-117 are standalone NEs on the test subnet. They cannot be selected during the configuration of the OD monitoring scope. Therefore, the OD cannot monitor only 83-245, 84-38 and 84-117.



[Problem Analysis]: The OD monitoring unit is subnet and therefore cannot monitor standalone NEs.

[Solution]:

- Solution 1: Select the test subnet when configuring the monitoring scope. Then the OD will monitor all NEs including 83-245, 84-38 and 84-117 on the test subnet.
- Solution 2: Include NEs 83-245, 84-38 and 84-117 into a new-created subnet. Select the subnet where NEs 83-245, 84-38 and 84-117 are located so that the OD can monitor the NEs.

9.9 What Do I DO If OD Configuration Data Is Inconsistent Between the NE and NMS?

[Problem Description]: During the trail performance analysis, the error message **The OD configuration data is inconsistent between NetStar O&M and the NE. (Event code:0x42042303)** is displayed.

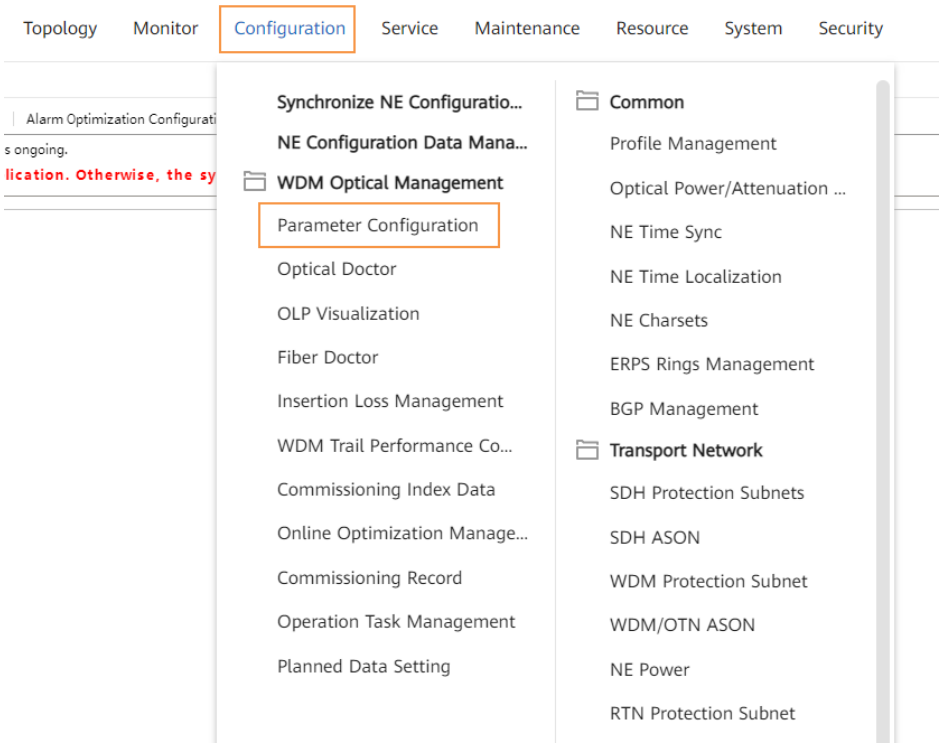
In addition, the error message **Failed to obtain the optical power of wavelength XX. (Event code:0x44000000)** may be displayed.

[Problem Analysis]: The possible causes are as follows:

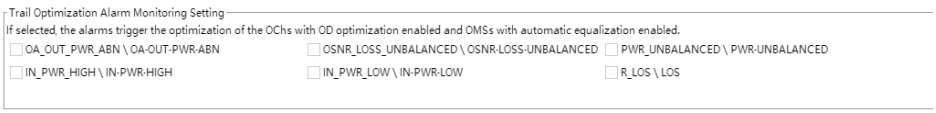
- No OD route is configured in the OMS where the OA board reporting the error message is located.
- The physical fiber connections of the OA board reporting the error message and the connected MCA board change, causing the OD route configuration inconsistency between the NE and NMS. As a result, the OD cannot properly monitor the configuration data.

[Solution]:

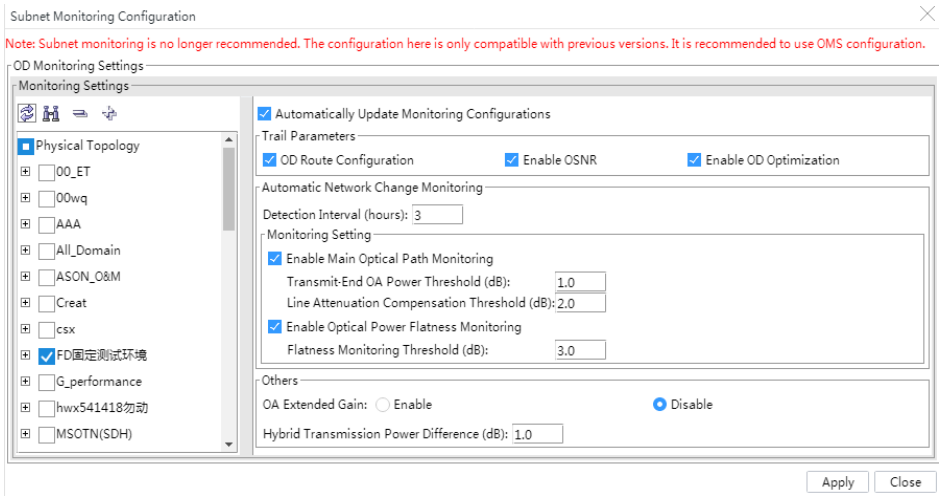
1. Open the **Network Management** app and choose **Configuration** > **WDM Optical Management** > **Parameter Configuration** from the main menu.



2. Click **Alarm Optimization Configuration**. In the displayed **Alarm Optimization Monitoring Configuration** dialog box, check whether the monitoring parameters are correctly set and click **Apply**.



3. Choose **Configuration** > **WDM Optical Management** > **Optical Doctor** from the main menu. The **Optical Doctor** page is displayed.



NOTE

Subnet monitoring is no longer recommended. The configuration here is only compatible with previous versions. You are advised to use OMS configuration.

9.10 What Do I Do If an Error Message Without Specifying the Board Where a Fault Occurs Is Displayed During the Export of a Subnet Performance Report?

[Problem Description]: An error message is displayed during the export of a subnet performance report, but the error message does not specify the board where a fault occurs. The following figures show examples of the error message.

NE(71-19)	Operation Failed	Failed to query the single-waveleng th OSNR of the OA board. NE Error: Query result is null. (Event code: 0x9706)

[Problem Analysis]: Failed to query the single-wavelength OSNR of the OA board indicates a failure to calculate the single-wavelength OSNR values of all OA boards in an OMS.

In the exported report, critical alarms are present on some OMSs in the **OMS Data** sheet.

In the detailed OMS information, the values in the **Single-Wavelength OSNR** column of the OMSs where alarms are present are empty.

The possible cause of this problem is that an OMS contains multiple OA boards. When the OSNR calculation fails in the OMS, an error message is reported only on the receive-end NE of the OMS. According to the report, the OMS has no input multiplexed-wavelength optical power. Therefore, you are advised to check the physical environment.

[Solution]: Check the physical environment based on the data in the exported report and the alarm information.

9.11 What Do I Do If an Error Message Indicating that the NE Is Absent Is Displayed During Report Exporting or Performance Analysis?

[Problem Description]: Error Message Indicating that the NE Is Absent During Report Exporting or Performance Analysis.

[Problem Analysis]: The possible cause is that the NE name or ID has been changed. After the NE name or ID is changed, the OD route configurations are not automatically updated. As a result, the OD cannot obtain the latest NE information and therefore a message indicating that the NE is absent is displayed.

[Solution]: Configure the OD route again for the OMS trail whose NE name or ID is changed.

1. Choose **Service** > **View** > **WDM Trail** > **Manage WDM Trail** from the main menu on the NCE Network Management app.
2. Filter the OMS trail.
   a. In the displayed **Set Trail Browse Filter Criteria** dialog box, select **OMS** in the **Service Level**.
   b. Click **Filter All**, and all OMS trails on the live network are displayed.
3. Configure the OD route configuration function for an OMS trail.
   a. Click **Maintenance**, and choose **OD Route Configuration**. The scanning progress window is displayed.
   b. After the scanning completes, the **Result** dialog box is displayed, click **Close**.
   c. Click **Query All**. The status of all OMS trails is refreshed.
   d. In the **OD Route Configuration** window, select the OMS trail that is affected by the change of the NE name or ID, and click **New**.

9.12 OSNR Value of a Downstream OA Board Is Greater Than That of an Upstream OA Board on an OCh Trail During the Trail Performance Analysis

[Problem Description]: During the trail performance analysis, the OSNR value of a downstream OA board is greater than that of an upstream OA board on an OCh trail.

[Problem Analysis]:

NOTE

OSNR calculation is started 10 minutes after the delivery of the OD route configuration is started. OSNR values are calculated by OMS, and the prerequisite to OSNR calculation is that OD routes have been configured on OMSs. The OSNR calculation in each OMS depends on the calculated OSNR value of the previous OMS. After the OSNR calculation of the first OMS on an OCh trail is triggered, the OSNR calculation of subsequent OMSs will be triggered in sequence.

The possible causes are as follows:

1. A performance analysis is started immediately after the initially configured OD routes are delivered.

   On the NMS, the OD route configurations of OMSs on an OCh trail are not delivered in sequence. As a result, the OSNR calculation of an OMS on the OCh trail will be started if its OD route configuration delivery is completed even though the OD route configuration delivery of the previous OMS is not completed. Since no OSNR calculation values of the previous OMSs are used for reference, the OSNR value of a downstream OA board may be greater than that of an upstream OA board on the OCh trail.
2. A performance analysis is started when the OSNR calculation of an OMS is completed and the OSNR calculation of the subsequent OMSs is not started yet.

It takes several seconds to complete the OSNR calculation of an OMS. If a performance analysis is started when the OSNR calculation of some previous OMSs on an OCh trail is completed but the OSNR calculation of the subsequent OMSs is not yet started a second time, the newly calculated OSNR values of the previous OMSs will be smaller than the previously calculated OSNR values in case of a network environment change during the performance analysis. As a result, the OSNR values of the previous OMSs are the newly calculated OSNR values, and those of the subsequent OMSs are the previously calculated OSNR values, causing the problem described in the preceding.

There is a small probability that the network environment changes within 10 minutes during OSNR calculation. Therefore, the first cause is the probable cause.

[Solution]: In the **Trail Performance Analysis** window, click **Analysis** to start a performance analysis again.

9.13 Some Historical Data Is Not Found During the Comparison Between Current Data and Historical Data in the Trail Performance Analysis Window

[Problem Description]: A user performs the following steps:

1. Selects an OCh trail for a performance analysis.
2. Backs up the data of the OCh trail.
3. Imports the backup performance data and compares it with the current data.

During the data comparison, the error message No port information exist in the historical data file is displayed. Some historical data is not displayed.

[Problem Analysis]: The cause of the error is that historical data fails to be backed up. The possible causes for the data backup failure are as follows:

1. The NE is offline.

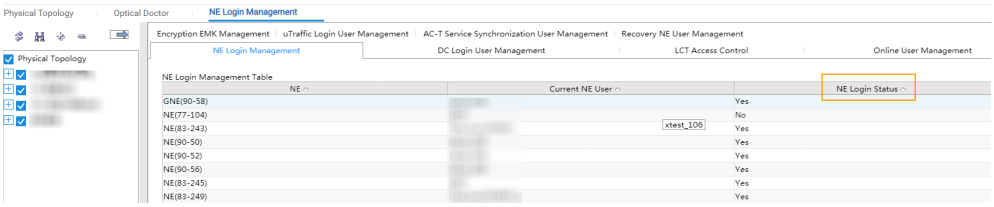
   If the NE is offline, NCE cannot interact with the devices on the NE and therefore fails to query performance data, causing a data backup failure.
2. The performance monitoring function is not enabled for the NE.

   The NE can periodically detect network performance and report the performance data to NCE, and the NetStar O&M component can back up the desired data only after the performance monitoring function is enabled for the NE.
3. The NE time is not synchronized with the NCE time.

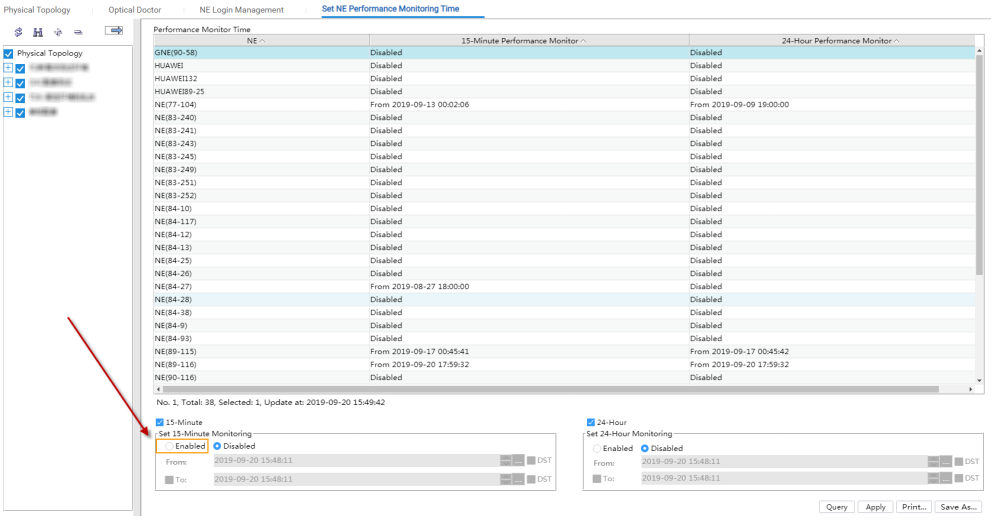
   For example, if the NCE time is ahead of the NE time, the NE performance data to be queried in a backup period may not be uploaded to NCE during the NCE data backup. As a result, the backup data may be lost.

[Solution]:

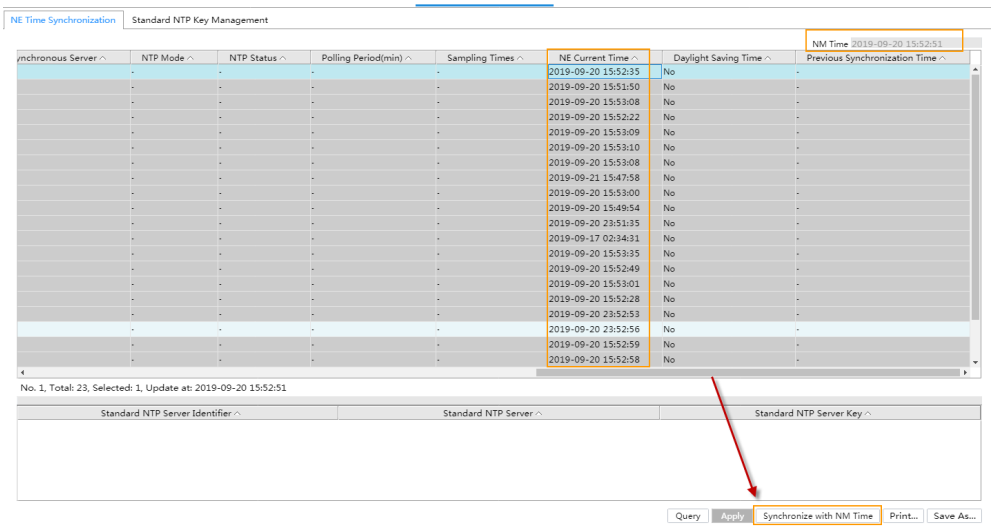
1. In the **NE login Management** window, check whether the login status of all NEs on the trail is normal.



2. Choose **Monitor > Performance** > **Monitoring Time Settings** from the main menu on the NCE Network Management app. In the NE monitoring time configuration window, check whether the 15-minute performance monitoring function is enabled. If the function is not enabled, set it to **Enable**.



3. Choose **Configuration** > **Common** > **NE Time Sync** from the main menu on the NCE Network Management app. In the window for synchronizing NE time and NCE time, synchronize the NE time and NCE time if they are inconsistent.



9.14 NE Is Displayed as Logoff in the Main Topology of the OD After Import of NMS Scripts

[Problem Description]: Choose **Administration** > **Back up/Restore NMS Data** > **Import/Export Script File** from the main menu on the NCE Network

Management app and import backup NMS scripts. After the scripts are imported, the NE status is displayed as login in the **NE Login Management** window, as shown in **Figure 9-1**. In the main topology of the OD, the NE is dimmed (as shown in **Figure 9-2**), indicating that the NE status is logoff.

Figure 9-1 NE status in the NE Login Management window

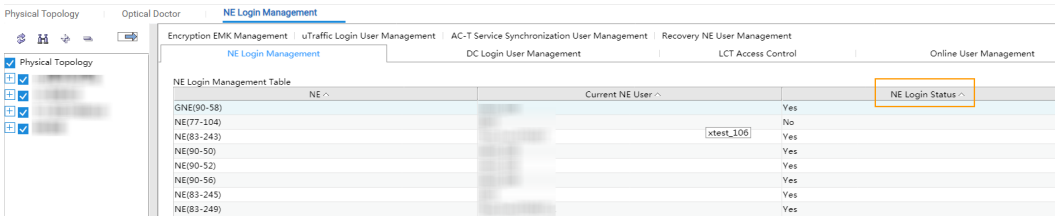
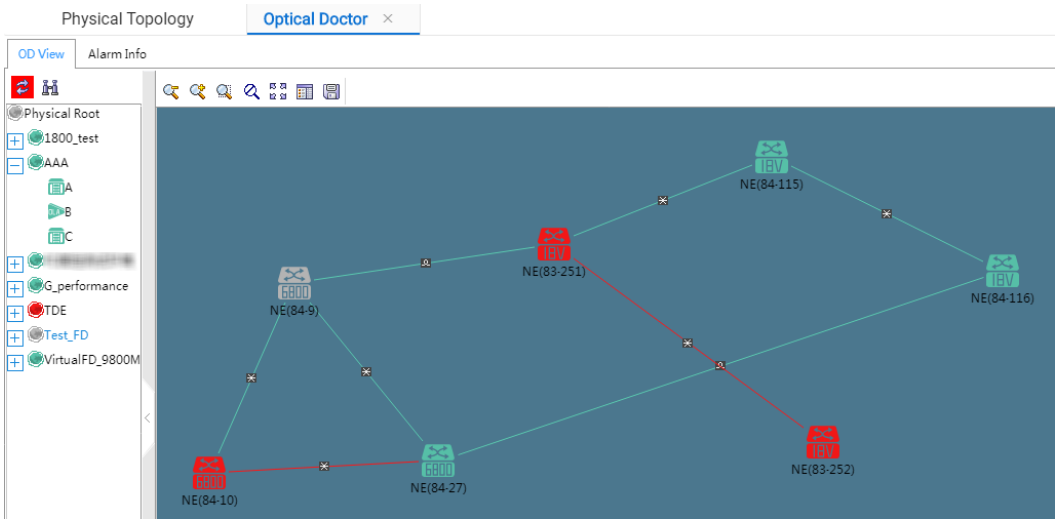


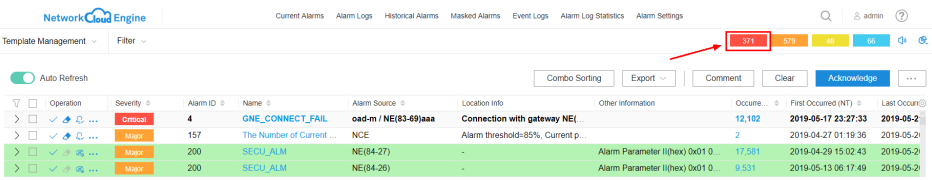
Figure 9-2 NE status in the main topology of the OD



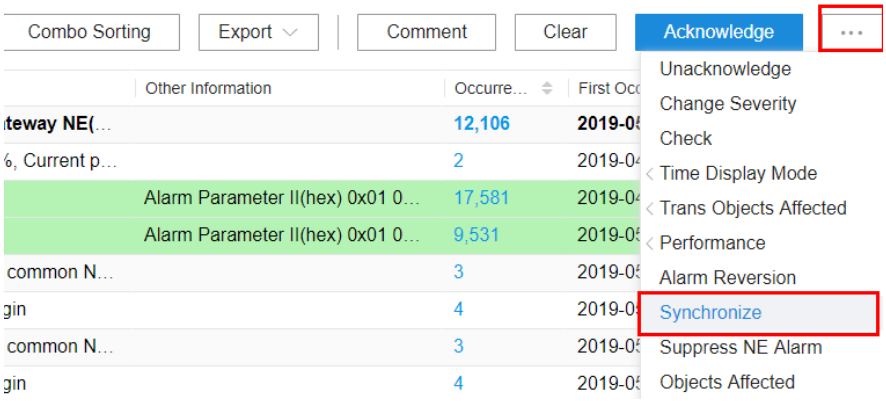
[Problem Analysis]: During the import of NMS scripts, the NE communication becomes abnormal due to a login conflict. As a result, the NE_NOT_LOGIN alarm on the NMS cannot be cleared. When this occurs, the NE status is still displayed as logoff in the main topology of the OD even though the login to the NE is successful.

[Solution]: Synchronize the alarm data as follows:

1. Choose **Monitor** > **Current Alarms** from the main menu on the NCE Network Management app.
2. In the **Current Alarms** window, click the red icon for critical alarms in the upper right corner.

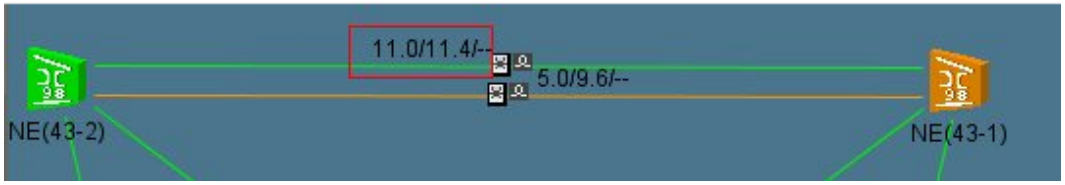


3. Click ... and choose **Synchronize**.



9.15 Fiber Loss Queried Through the OD Has Exceeded the Designed Attenuation (EOL) (dB) but No Alarm Is Reported

[Problem Description]: In the OD view, click **Operate** and choose **Query Fiber Loss**. The current attenuation value (11.4 in the following figure) of the fiber connection displayed in the OD view exceeds the designed attenuation value (11.0 in the following figure), but the fiber connection is not marked in a color corresponding to a critical alarm.



[Problem Analysis]: When the value of **Designed Loss(EOL)(dB)** is set in the OD, the data on NCE is updated but the data on the device side may not be updated due to device communication problems or other unknown reasons. As a result, the data on NCE is inconsistent with that on the device side. The value of **Designed Loss(EOL)(dB)** displayed in the OD view is subject to the data queried on the NCE. The alarm reporting threshold is subject to the data on the device side. When the value of **Designed Loss(EOL)(dB)** on NCE side is inconsistent with that on the device side, the fiber connection may not be marked in a color corresponding to a critical alarm because the value of **Current Loss** queried from NCE by the OD may exceed the value of **Designed Loss(EOL)(dB)** displayed in the OD view, however, the attenuation does not exceed the **Designed Loss(EOL)(dB)** on the device side.

[Solution]: In the OD view, right-click the inter-site fiber connection to be modified and choose **Setting Fiber Parameter** from the shortcut menu to reset **EOL(dB)** and synchronize the value of **Designed Loss(EOL)(dB)** between NCE and the device.

9.16 What Do I Do If an OA_OUT_PWR_ABN Alarm Is Reported and Cannot Be Cleared Through Optical Power Optimization Commissioning in the Intra-Site OA-RDU-OA2 Scenario?

[Problem Description]: The transmit-end OA board alarm monitoring function is enabled for intra-site OMSs. In the intra-site OA-RDU-OA2 scenario, an OA_OUT_PWR_ABN alarm is reported by the OA2 board and cannot be cleared through optical power optimization commissioning.

[Problem Analysis]: After the transmit-end OA board alarm monitoring function is enabled for intra-site OMSs, the optical power of the OA2 board is adjusted based on the principle of gain compensation for span loss, or the optical power of the OTU board at the receive end needs to be adjusted to the target average value. In this case, the single-wavelength optical power of the OA2 board may not be close to the nominal value. As a result, an OA_OUT_PWR_ABN alarm may be reported by the OA2 board, and cannot be cleared through optical power optimization commissioning.

[Solution]: When enabling OD alarm monitoring by OMS, you are advised to deliver the configuration to only inter-site (cross-site) OMSs.

