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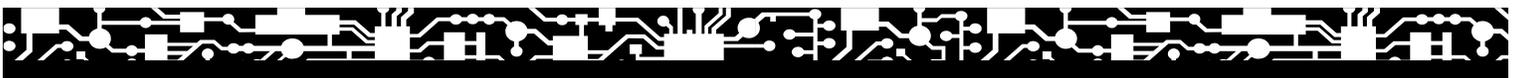


***Navis*[™] Optical Network Management System (NMS)**

Release 6.1 (Pearl)

Provisioning Guide

365-309-278R6.1
Issue 1
April 2002



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About this information product

Purpose This preface provides an overview of this information product, which is the *Navis™ Optical Network Management System (NMS) Release 6.1 Provisioning Guide*.

The purpose of this *Provisioning Guide* is to explain to users how to administer the Navis™ Optical Network Management System (NMS) Release 6.1.

Reason for reissue Issue 1 of *Provisioning Guide* is a new document that supports the Navis™ Optical NMS, Release 6.1.

Safety labels This document does not use safety labels.

Intended audience This guide is written primarily for network planners, engineers, operators, and sales teams. It may be used by anyone desiring specific information about the features, applications, and operations of Navis™ Optical NMS.

How to use this information product

This document contains:

- **task** information, which includes provisioning tasks (that is, step-by-step instructions).
- **conceptual** information, which is specific data related to tasks.

Both types of information is presented within the chapters of this *Provisioning Guide*.

The following table describes the information in each chapter of this Provisioning guide.

Section	Title	Description
Preface	About this information product	Explains this document's purpose, its intended audience, and how to use the document.
Chapter 1	Chapter 1, "The Navis™ Optical NMS Provisioning Process "	Provides an overview of the Navis™ Optical NMS provisioning process and commonly used terminology.
Chapter 2	Chapter 2, "Network Element Configuration Tasks"	Contains tasks associated with controlled and noncontrolled network elements.
Chapter 3	Chapter 3, "Provisioning Tasks"	Contains tasks related to digital link, connection, optical layer, subnet, and preplan restoration provisioning.
Chapter 4	Chapter 4, "Provisioning Concepts"	Explains provisioning concepts associated with network elements, connections, optical layers, subnets, and preplan restoration.
Chapter 5	Chapter 5, "Network Element Port Addresses "	Lists the port addresses of the network elements supported by Navis™ Optical NMS.
Index	Index	Enables the user to quickly find information on specific topics

Conventions used

This Provisioning Guide uses the following typographical conventions to distinguish between computer input and output.

- When describing the Navis™ Optical NMS software, fields in windows and field entries are identified with **this font**.
- When describing the UNIX environment, text and numbers that the user inputs to the computer are identified with **boldface** type.
- In the UNIX environment, text and numbers that the computer outputs to the user are identified with `monospace` type.

Related documentation This Provisioning Guide is part of a set of documents that supports Navis™ Optical NMS.

List of documents

The document set that supports WaveStar NMS comprises:

1. *Navis™ Optical Network Management System Getting Started Guide*, (365-309-276) instructs users how to begin using the product to provision and manage a network. This document includes tasks and conceptual information.
2. *Navis™ Optical Network Management System Applications and Planning Guide*, (365-309-277) describes the WaveStar NMS features and applications, provides a product description and the hardware platforms for the product, and describes system planning and engineering, ordering, and product support. This document contains conceptual information only.
3. *Navis™ Optical Network Management System Provisioning Guide*, (365-309-278) instructs users how to use the product to provision and manage a network. This document includes tasks and conceptual information.
4. *Navis™ Optical Network Management System Maintenance Guide*, (365-309-279) instructs users on how to maintain the product and the network. This document includes tasks and conceptual information.
5. *Navis™ Optical Network Management System Administration Guide*, (365-309-280) instructs users on how to administer the product and the network. This document includes tasks and conceptual information.

Glossary

The *Navis™ Optical NMS Administration Guide* contains a glossary that will be helpful to users of Navis™ Optical NMS.

On-line documentation

On-line documentation for Navis™ Optical NMS is provided in two formats:

1. An on-line version, in HTML format, of this document set is provided as part of the Navis™ Optical NMS software.
2. An on-line version, in HTML format, of this document set is available on CD-ROM.

Navis™ Optical NMS User Documentation CD-ROM,
(365-309-281) - includes the full set of documents listed above.

Screen help

The Navis™ Optical NMS software includes screen help for each form, which describes the purpose of the form, each field, and each button.

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1 The Navis™ Optical NMS Provisioning Process

Overview

Purpose This chapter provides an overview of the Navis™ Optical NMS synchronous digital hierarchy (SDH) provisioning process.

Important note This document instructs users on how to provision with Navis™ Optical NMS.

This document contains two types of chapters:

- **Task** chapters that describe provisioning tasks (that is, step-by-step instructions). The tasks described within this document do not require administrator privileges.
- **Conceptual** chapters that contain detailed information related to the tasks.

Task chapters are located in the front of the document; conceptual chapters follow the task chapters.

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What is provisioning?	1-2
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What is provisioning?

Overview Provisioning, as it pertains to Navis™ Optical NMS, is the process of establishing a connection through a Navis™ Optical NMS managed network and setting appropriate transmission parameters for a digital link, optical link, optical multiplex section, optical channel trails, and SDH/PDH circuit/trails for a specified rate.

This overview assumes that all of the administrative procedures needed to have the system fully operational have been completed by the system administrator or a user with administrator privileges.

Supported actions Navis™ Optical NMS allows users to perform the following actions for provisioning:

- **Add:** users can provision new digital links, circuit/trails and optical layers from Navis™ Optical NMS.
- **Disconnect:** users can delete existing digital links, circuit/trails and optical layers from Navis™ Optical NMS.
- **Modify:** users can modify an existing circuit/trail to create a new route.
- **Merge:** users can merge two or more circuits/trails of the same or equivalent rate to form one new circuit/trail. This activity from Navis™ Optical NMS will not create any implementation commands.
- **Preplan:** users can establish a preplan circuit/trail in Navis™ Optical NMS for use with a service circuit/trail to restore service in case of a service circuit/trail failure.

□

Terminology overview

Overview This section provides an overview of the common terms and concepts necessary to understand the Navis™ Optical NMS product and provisioning process.

For a complete listing of Navis™ Optical NMS-related terms, refer to the glossary section of the *Navis™ Optical NMS Administration Guide*.

Aggregate An aggregate is a collection of one or more network elements and/or aggregates. An aggregate is represented by a single icon on the Navis™ Optical NMS Network Map.

Area Networks managed by Navis™ Optical NMS can be subdivided into smaller, more manageable networks called areas. An area is a collection of nodes and/or aggregates and their associated links. Subdividing a network into areas reduces overcrowding on the user interface and improves system performance because smaller amounts of information are exchanged by the subsystems.

Areas can be defined for any purpose. Examples of areas can include:

- A set of nodes/aggregates dedicated to a subscriber
- A set of nodes/aggregates either connected or not connected
- A set of nodes/aggregates in a geographic location or building

An area is represented by a single icon on the Navis™ Optical NMS Network Map.

Black box A black box is a functional unit in a network that is not displayed on the Navis™ Optical NMS Network Map and which Navis™ Optical NMS cannot monitor or control (also known as noncontrolled network element).

Channels When either a digital link or trail is channelized, it is subdivided into channels. For time division multiplexing (TDM) equipment, channels represent the time slots with which information is carried within a digital link or in a server trail. Channels are created by Navis™ Optical NMS for use during circuit/trail provisioning. When creating channels for digital links, depending on the network element capability, alternate channels, to accommodate the provisioning of different rates of circuits/trails, are created.

Circuits Circuits generally carry customer service. Typically, circuits are plesiochronous digital hierarchy (PDH) and can ride on PDH channels or be mapped to SDH trails. Circuits can ride on trails or digital links.

Circuits ride on:

- Paths (for example, a CEPT-1 circuit riding on a VC-12 path)
- Digital links (a circuit can ride on a digital link directly if the digital link is channelized to one channel, such as a CEPT-1 circuit riding on a CEPT-1 digital link).

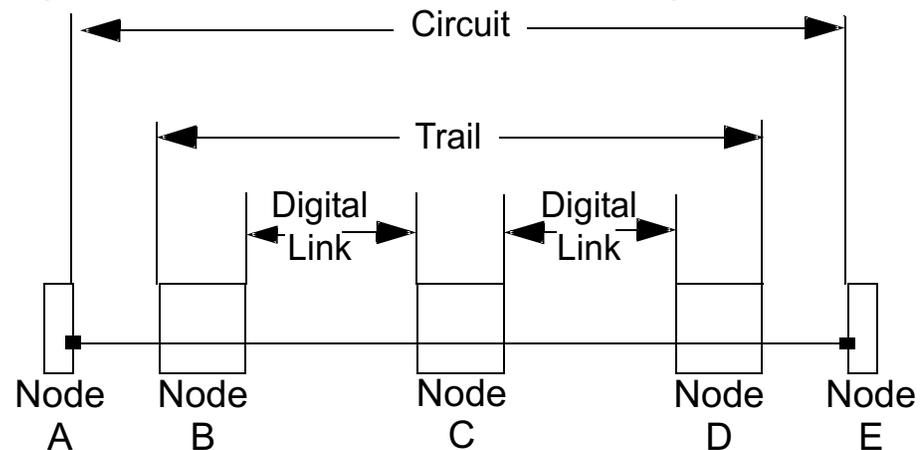
PDH circuits can be provisioned over:

- PDH facilities (for example, a CEPT-1 circuit on a channel of a CEPT- 4 facility)
- SDH paths (for example, a CEPT-1 circuit on a VC-12 path)

SDH circuits cannot be provisioned over a PDH facility.

The following figure shows how a circuit relates to a trail and digital links.

Figure 1-1 A circuit in relation to a trail and digital links



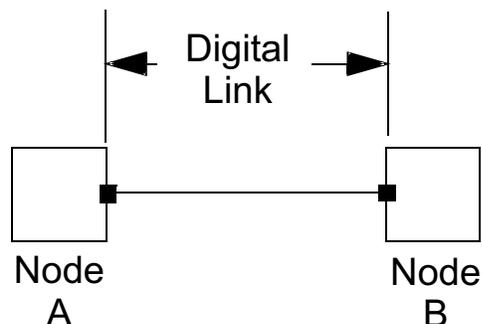
Digital links Digital links are fiber or electrical connections between two points. These transport facilities are assignable to high-order and low-order circuits to carry customer services. Digital links can be of two types: SDH or PDH.

SDH digital links connect two SDH network elements or an SDH network element and a black box or equipment.

PDH digital links are asynchronous connections between two PDH ports of the network elements assignable to the PDH circuits.

The following figure shows a digital link.

Figure 1-2 Sample digital link



Equipment Equipment is a functional unit in a network that is not displayed on the Navis™ Optical NMS Network Map and which Navis™ Optical NMS cannot monitor or control (also known as noncontrolled network element). Some examples of equipment is customer premises equipment.

Gray box A gray box is a network element that is not actively managed by Navis™ Optical NMS, in the sense that no commands, responses or notifications are exchanged. Navis™ Optical NMS will, however, retain enough information about the network element, including logical ports, to allow it to provide channel terminations for the physical ports. Consequently, Navis™ Optical NMS can support gray boxes in all configurations that are supported for managed network elements.

Network A network carries a payload from one point to another. This payload can consist of data, voice, video, or images. Digital links and trails carry the circuits that carry the data.

Network element A network element is a functional unit in a customer's network that displays on the Navis™ Optical NMS Network Map and is controlled by the user. Network elements supply switching, transmission, or multiplexing functionality in a network and are either controlled or noncontrolled.

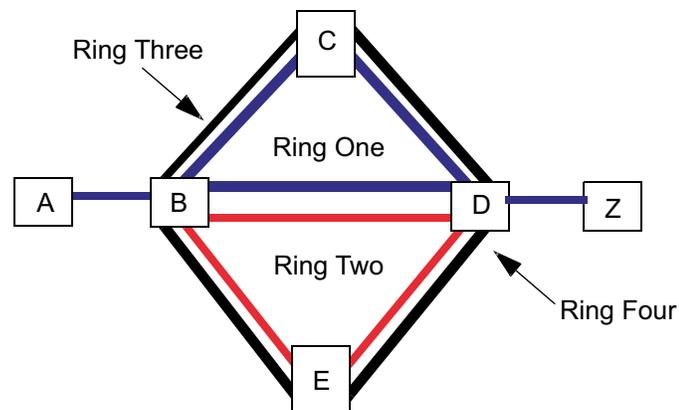
Optical network navigator The Optical Network Navigator (ONN) is the software and hardware present in the Lambda Router network element which performs management functions (e.g., configuration management and fault management) on optical connections across a network of Lambda Routers. The ONN system consists of a number of ONN Modules, each on a different Lambda Router.

PDH Plesiochronous Digital Hierarchy is a transmission hierarchy that involves multiple digital synchronous circuits running at different clock rates.

Preplan restoration Preplan restoration allows for a back-up circuit to be predefined for an existing in service circuit. Navis™ Optical NMS stores the preplan circuit in a database and accesses it when a failure occurs so as to restore the circuit.

Ring A ring is formed when digital links connect all participating network elements to form a closed loop (of course, the network elements have ring forming capabilities).

Figure 1-3 Sample formation of four rings



SDH Synchronous Digital Hierarchy is a transmission hierarchy designed to transport multiple digital signals with different capacities.

Tandem connection A tandem connection is the sublayer between the multiplex section layer and the path layer that allows users to monitor the quality of the signal transport within its managed domain. A tandem connection also provides users with information about the total quality of a signal before the signal travels from the user's managed network to a network managed by a different user. Users can create tandem connections on paths that do not terminate in its managed network but traverse its network from other user managed networks.

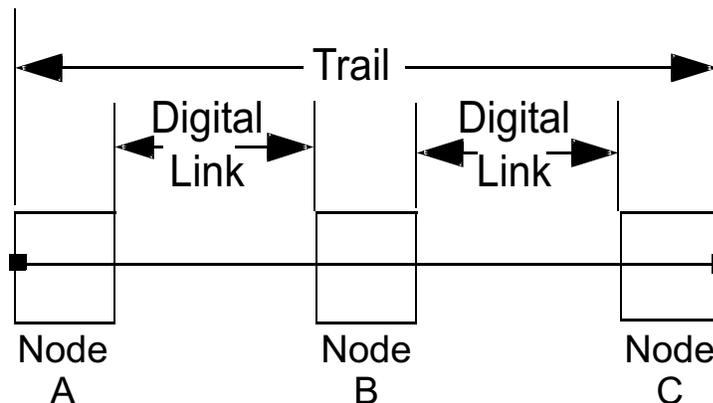
Trails A trail is a logical connection between two adjacent, or nonadjacent network element. It may traverse one or more channels and supports add/drop capability along the path.

Trails simplify provisioning by allowing users to establish routes through digital links and network elements so that circuits can be assigned to the path. This capability allows users to assign a circuit to a path at the path's A and Z ends without spelling out a list of digital links and cross-connections that make up the trail. Two or more trails may be connected as part of a circuit.

Trails ride on one or more digital links and also contain their own payload and overhead sections.

The following figure shows how a trail relates to digital links.

Figure 1-4 Relationship between a trail and digital links



Virtual concatenation Virtual concatenation is a standards compliant inverse multiplexing protocol which creates a virtual concatenated SDH entity (called VCn-Xv) which is transported by X VC-As across the SDH network. The VCn created are standards compliant VCns. Additional VCn's can be added to the VCn-Xv, however it will be service affecting.

□

Task information

Overview Refer to Chapter 2 for task information related to network elements; refer to Chapter 3 for task information regarding digital links, connections, optical layers, optical network navigator, subnets, virtual concatenation groups, shared risk groups, and preplan restoration.

This information is extremely useful when attempting to perform the actual action of provisioning with Navis™ Optical NMS.



Conceptual information

Overview Refer to Chapter 4 for conceptual background information related to network elements, digital links, connections, optical layers, optical network navigator, subnets, virtual concatenation groups, shared risk groups, and preplan restoration.

This information is useful in understanding the 'big picture' of a given feature.





2 Network Element Configuration Tasks

Overview

Purpose After a database synchronization with an element management system (ITM-SC, Lucent EMS or non-Lucent EMS), Navis™ Optical NMS automatically adds all the network elements managed by the EMS to the Navis™ Optical NMS Network Map and stores them in the database. Navis™ Optical NMS allows users to add ITM-SC managed network elements to the Network Map and to discover, through a database synchronization, network elements managed by the Lucent or non-Lucent EMSs.

This chapter contains tasks to add and delete controlled and noncontrolled network elements through Navis™ Optical NMS.

Note: These tasks also apply to non-Lucent EMS controlled network elements that are manageable by Navis™ Optical NMS. Please refer to the appropriate non-Lucent EMS guide for information about the non-Lucent EMS controlled network elements supported by Navis™ Optical NMS.

Before you begin Before you begin using the tasks contained within this chapter, consider the following items:

- The number of allowable network elements on the Network Map varies with the Navis™ Optical NMS configuration. When the limit is reached, an error message will appear.
- When a network element is first added to Navis™ Optical NMS, its corresponding icon is always displayed as green, regardless of whether equipment or environment alarms exist. Users should therefore perform a manual database synchronization in order to display the network element's true state.
- Users must use the correct network element identification number format. The identification number consists of up to 20 alphanumeric characters, including the /, - and _ characters. No leading delimiters are allowed. Navis™ Optical NMS does not, however, support the following characters: space (), quote ("), percent (%), star (*), dot (.), backslash (\), and pipe (|). Currently, only upper case alphabetical characters are supported.
- Not all controlled network elements (e.g., ADM 16/1, TM1, AM1, AM1Plus) can implement a one-way cross-connection.
- A network element may only be deleted if it is not assigned to a digital link or circuit/trail (pending or in-effect). If a network element linked to another network element is deleted, the network element is put in a "pending delete" state and not deleted from the system database or Network Map. Users cannot back out of the pending delete state. However, a database synchronization with the EMS can bring the network element back to a normal state so long as the EMS still reports that network element is still managed by it.
- No commands, such as delete cross-connect or port reprovisioning, will be sent to a network element once it is in a pending delete state.
- If a network element is inadvertently deleted, perform a database synchronization with the corresponding network element to recover it to its original state.
- If a network element is completely deleted, a database synchronization cannot be performed on the network element. To recover the network element in this case, perform a network element database synchronization on the corresponding controller (EMS).

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Section I: Controlled Network Elements

Overview

Purpose This section discusses the provisioning tasks associated with controlled network elements.

Important Controlled network elements (network elements controlled by a Navis™ Optical EMS or by an EMS supported by Navis™ Optical NMS) are not added to Navis™ Optical NMS; they are automatically discovered by Navis™ Optical NMS.

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Update a network element location	2-10
Delete a controlled network element	2-11



Controlled network element support

- Definition** Controlled network elements are network elements that can be controlled by Navis™ Optical NMS.
- Characteristics** Controlled network elements have the following characteristics:
- They are usually displayed on the network maps as nodes (physical locations) interconnected by digital links. A unique icon represents each network element type.
 - They are in constant communication with their EMS.
 - They are controlled by commands sent from the EMS (the EMS receives and processes the responses from the controlled network element).
 - They report and show alarms.
- Controlled Navis™ Optical NMS network elements** For a complete list of controlled network elements supported by Navis™ Optical NMS, refer to Chapter 4.
- Icons for controlled network elements** Controlled network elements managed by Navis™ Optical NMS appear as icons on the Network Map. A legend showing all the icons and their respective models of network elements is available from the Network Map when requested by the user. For additional information regarding what controlled network elements map to which icon, refer to the *Navis™ Optical NMS Getting Started Guide* .
- Additional information** For additional information about controlled network elements, refer to Chapter 4 of this guide or the *Navis™ Optical NMS Applications and Planning Guide* .



Add an ITM-SC controlled network element

Purpose Use this procedure to add an ITM-SC controlled network element to the Navis™ Optical NMS Network Map.

Important! Navis™ Optical EMS controlled network elements are not added to Navis™ Optical NMS; they are automatically discovered by Navis™ Optical NMS during start-up or a database synchronization with an EMS. Examples of network elements automatically discovered by Navis™ Optical NMS include: OLS (400G, 80G, 10G, 1.6T), WaveStar BandWidth Manager, and Lambda Router. Network elements managed by non-Lucent EMSs, such as Alcatel or Nortel Networks, are also discovered by Navis™ Optical NMS.

Task Perform the following task to add an ITM-SC controlled network element to the Navis™ Optical NMS Network Map.

- 1 From the Network Map, select **Configuration > Network Element > Add > (Select any NE Type from the list except for WaveStar DACS or DACS VI)**.

Result:

The NE window appears.

- 2 In the **EMS ID** field, select an EMS ID from the list.
-

- 3 Click **OK**.

Result:

The Connection dialog box appears. If the connection occurs, the **Create MIB Image from NE** window appears.

- 4 Specify the Network Element Name, NSAP Format, Area ID (optional), Network Element SID, and Connection Type.
-

- 5 Click **Apply**.
-

Result:

The network element appears on the Network Map and a success message appears within the window's Message panel.

END OF STEPS



Synchronize a network element

Purpose Use this procedure to synchronize a network element. Synchronizing a network element is a recommended step when performing many provisioning tasks with Navis™ Optical NMS because it will automatically synchronize a network element's alarms, ports, switches, protection group, and cross-connects with the database. This saves the user time because many GUI fields, such as ones for port selection, will automatically present selections for the user if the network elements in the provisioning process are synchronized first.

Important! This procedure synchronizes a single network element with the Navis™ Optical NMS database. To synchronize all network element appearing on the Network Map, managed by a particular EMS, perform a database synchronization from the EMS-level. Refer to the *Navis™ Optical NMS Administration Guide* for details on performing an EMS-level database synchronization for network elements.

Task Complete the following procedure to synchronize a network element with the Navis™ Optical NMS database. This procedure applies to both controlled and noncontrolled network elements.

- 1 On the Network Map, select a network element.

Result:

The icon becomes highlighted.

- 2 Right click on the icon.

Result:

The Node menu appears.

- 3 Select **Session > Start Database Synchronization**.

Result:

A window appears.

- 4 For **NE ID**, verify that the identification listed corresponds to the network element selected earlier.
-

-
- 5** Under **Type**, select the item you wish to synchronize with the database. For example, select **Port** to synchronize the network element's ports. To synchronize all attributes of the selected network element, select **All**.

-
- 6** Press **Apply**.

Result:

A confirmation window appears.

-
- 7** Press **Yes**.

Result:

The Database Synchronization window appears. This window will report the progress of the database synchronization. If the synchronization is successful, a confirmation window appears.

-
- 8** Press **OK**.

Result:

The network element is synchronized.

END OF STEPS



Update a network element location

Purpose Use the following procedure to update the location of a network element on the Navis™ Optical NMS Network Map. This task applies to both controlled and noncontrolled network elements that appear on the Navis™ Optical NMS Network Map.

Important! Any user is able to move a network element on the Network Map, but the network element's location on the Network Map can only be updated within the Navis™ Optical NMS database by a user with appropriate privileges, such as a system administrator.

Task Use the following procedure to update the location of a network element on the Navis™ Optical NMS Network Map.

- 1 On the Network Map, left-click and hold on the network element to be moved.

Result:

The network element becomes highlighted.

- 2 Drag the network element to the desired location on the Network Map.

Result:

The network element is repositioned on the Network Map.

- 3 From the Network Map, select **File > Save Node and Label Map Positions**.

Result:

The network element location is updated on the Network Map.

END OF STEPS



Delete a controlled network element

Purpose Use this procedure to delete a controlled network element from the Navis™ Optical NMS Network Map.

Task Complete the following task to delete a controlled network element from the Network Map. This procedure only deletes the network element from the Navis™ Optical NMS database; it leaves any cross-connect information on the network element. If the database has cross-connect information this procedure will fail. If you want the cross-connect information to remain in the EMS or network element database, you will need to disconnect the cross-connect through a virtual disconnect in Navis™ Optical NMS.

- 1 On the Network Map, right-click the network element to be deleted.

Result:

The Node menu is displayed.

- 2 Select **Node Operation > Delete Node**.

Result:

A confirmation dialog box is displayed.

- 3 Click **Yes**.

Result:

The network element is deleted or put in a “pending delete” state.

END OF STEPS



Section II: Noncontrolled Network Elements

Overview

Purpose This section presents provisioning tasks for noncontrolled network elements, such as black boxes, gray boxes and equipment.

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Noncontrolled network element support

Definition	Noncontrolled network elements are network elements that cannot be controlled by Navis™ Optical NMS.
Characteristics	Noncontrolled network elements: <ul style="list-style-type: none">• Support only manual provisioning• Do not report alarms• Are listed in the database as part of provisioning records
Noncontrolled Navis™ Optical NMS network elements	For a complete list of noncontrolled network elements supported by Navis™ Optical NMS, refer to Chapter 4.
Icons for noncontrolled network elements	Noncontrolled network elements managed by Navis™ Optical NMS appear as icons on the Network Map. A legend showing all the icons and their respective models of network elements is available from the Network Map when requested by the user. For additional information regarding what noncontrolled network elements map to which icon, refer to the <i>Navis™ Optical NMS Getting Started Guide</i> .
Additional information	For additional information about noncontrolled network elements, refer to Chapter 4 of this guide or the <i>Navis™ Optical NMS Applications and Planning Guide</i> .



Add a black box

Purpose Use this procedure to add a black box to the Navis™ Optical NMS Network Map.

Task Complete the following task to add a black box to the Network Map.

- 1 From the Network Map, select **Configuration > Black Box > Add**.

Result:

The Add Black Box form appears.

- 2 In the **BBOX** field, enter a name for the black box. This name will appear on the Network Map.
-

- 3 In the **Acronym** field, specify an acronym.
-

- 4 (*Optional*) In the **Customer Information** field, enter any relevant information about the black box you wish other users to view.
-

- 5 Click **OK**.

Result:

A confirmation window appears and informs you of either the success or failure of the operation.

- 6 Click **OK**.

Result:

The black box is added to the Network Map.

END OF STEPS



Display black box list

Purpose Use this procedure to view all currently existing black boxes known to Navis™ Optical NMS.

Task Perform the following steps to display a complete listing of all existing black boxes.

- 1** From the Network Map, select **Configuration > Black Box > Display List**.

Result:

The Black Box Display List Query window appears.

- 2** Enter * within the **Black Box ID** field.
-

- 3** Press **OK**.

Result:

All the currently existing black boxes appear within the Black Box Display List window.

END OF STEPS



Search for a specific black box

Purpose Use this procedure to search for a specific black box.

Task Perform the following steps to search for a specific black box.

- 1 From the Network Map, select **Configuration > Black Box > Display List**.

Result:

The Black Box Display List Query window appears.

- 2 Enter the black box name within the **Black Box ID** field. Of course, you can search for groupings of black boxes by using a wildcard (*). Simply enter an alphanumeric string followed (or preceded) by the * character.
-

- 3 Press **OK**.

Result:

If you entered a valid name, the specified black box will appear within the Black Box Display List window. If you entered a wildcard, the specified black boxes will appear within the window.

END OF STEPS



Delete a black box

Purpose Use the following procedure to delete a black box from the Network Map.

Before you begin Before you delete a black box from the Network Map, consider the following items:

- Similar to deleting a network element, users must delete any digital links or circuits/trails associated with the black box prior to deleting it.

Task Perform the following procedure to delete a black box from the Network Map.

- 1 From the Network Map, right-click on the black box you wish to delete.

Result:

The Node menu appears.

- 2 From the menu, select **Node Operation > Delete Node**.

Result:

A confirmation window appears asking you to confirm the deletion.

- 3 Select **Yes**.

Result:

A confirmation window appears.

- 4 Press **OK**.

Result:

The black box is deleted from the Network Map.

END OF STEPS



Display gray box list

Purpose Use this procedure to view all currently existing gray boxes known to Navis™ Optical NMS.

Task Perform the following steps to display a complete listing of all existing gray boxes.

- 1 From the Network Map, select **Configuration > Gray Box > Display List**.

Result:

The Gray Box Display List Query window appears.

- 2 Enter * within the **Gray Box ID** field.
-

- 3 Press **OK**.

Result:

All the currently existing gray boxes appear within the Gray Box Display List window.

END OF STEPS



Search for a specific gray box

Purpose Use this procedure to search for a specific gray box.

Task Perform the following steps to search for a specific gray box.

- 1 From the Network Map, select **Configuration > Gray Box > Display List**.

Result:

The Gray Box Display List Query window appears.

- 2 Enter the gray box name within the **Gray Box ID** field. Of course, you can search for groupings of gray boxes by using a wildcard (*). Simply enter an alphanumeric string followed (or preceded) by the * character.
-

- 3 Press **OK**.

Result:

If you entered a valid name, the specified black box will appear within the Gray Box Display List window. If you entered a wildcard, the specified gray boxes will appear within the window.

END OF STEPS



Delete a gray box

Purpose Use the following procedure to delete a gray box from the Network Map.

Before you begin Before you delete a black box from the Network Map, consider the following items:

- Similar to deleting a network element, users must delete any digital links or circuits/trails associated with the gray box prior to deleting it.

Task Perform the following procedure to delete a gray box from the Network Map.

- 1 From the Network Map, right-click on the gray box you wish to delete.

Result:

The Node menu appears.

- 2 From the menu, select **Node Operation > Delete Node**.

Result:

A confirmation window appears asking you to confirm the deletion.

- 3 Select **Yes**.

Result:

A confirmation window appears.

- 4 Press **OK**.

Result:

The gray box is deleted from the Network Map.

END OF STEPS



Add equipment

Purpose Use this procedure to add equipment to the Navis™ Optical NMS Network Map.

Task Complete the following task to add equipment to the Network Map.

- 1 From the Network Map, select **Configuration > Equipment > Add**.

Result:

The Add equipment form is displayed. The **Model** field displays **EQPT**.

- 2 In the **Equipment ID** field, enter the network element identification.
-

- 3 In the **Acronym** field, enter the acronym.
-

- 4 In the **Customer Information** field, enter any information you wish other users to view.
-

- 5 Click **OK**.

Result:

A window informs you of the success or failure of the operation, and the newly added equipment can be viewed on the Equipment Display List.

END OF STEPS



Display equipment list

Purpose Use this task to display a listing of existing equipment.

Task Perform the following steps to display a listing of existing equipment.

- 1 From the Network Map, select **Configuration > Equipment > Display List**.

Result:

The Equipment Display List Query Box form displays.

- 2 In the Equipment ID field, enter the ID of the equipment you wish to display (or enter * to list all existing equipment). Of course, you can search for groupings of equipment by using a wildcard (*). Simply enter an alphanumeric string followed (or preceded) by the * character.
-

- 3 Click **OK**.

Result:

The Equipment Display List appears and displays all the equipment in the network with the specified ID.

END OF STEPS



Delete equipment

Purpose Use this procedure to delete equipment from the Navis™ Optical NMS Network Map.

Task Complete the following task to delete equipment from the Navis™ Optical NMS Network Map.

1 Display the equipment list (see preceding task).

2 Select an entry.

3 Select **Actions > Delete Node**.

Result:

The equipment is deleted from the Network Map.

END OF STEPS



Display ODO List

Purpose The following procedure allows users to display the out-of-domain objects (ODOs) existing for Navis™ Optical NMS and WaveStar TMS.

Task Perform the following steps to display a list of ODOs.

- 1 From the Network Map, select **Configuration > ODO Display List**.

Result:

The ODO Display List Query Box form appears.

- 2 Enter * within the **ODO ID** field to get a complete listing of all ODOs. To locate a specific object, enter its name within this field. Of course, you can search for groupings of ODOs by using a wildcard (*). Simply enter an alphanumeric string followed (or preceded) by the * character.
-

- 3 Press **OK**.

Result:

The specified ODOs appear within the ODO Display List form.

END OF STEPS





3 Provisioning Tasks

Overview

Purpose This chapter presents provisioning tasks usable with Navis™ Optical NMS.

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Section I: Digital Links

Overview

Purpose This section discusses provisioning tasks associated with digital links as they relate to Navis™ Optical NMS.

Definition Digital links are fiber or electrical connections between two points. These transport facilities are assignable to high-order and low-order circuits to carry customer services. Digital links can be of two types: SDH or PDH.

SDH digital links connect two SDH network elements or an SDH network element and a black box or equipment.

PDH digital links are asynchronous connections between two PDH ports of the network elements assignable to the PDH circuits.

Digital links can be unprotected or protected. When protected by another link, it is called Multiplex Section Protection (MSP). The MSP protection can be of two types - 1+1 or 1x1.

Supported digital links Refer to Chapter 4 of this guide for descriptions of the digital links supported by Navis™ Optical NMS.

Before you begin Refer to the individual tasks contained within this section for important 'Before You Begin' information.

Additional information For additional information about digital links as they relate to Navis™ Optical NMS, refer to Chapter 4 of this guide.

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Add a digital link between two network elements

Purpose Use this procedure to add a digital link between two network elements.

Before you begin Before adding a digital link between two network elements, be aware of the network element capabilities with regards to the types of digital links you can use and the protection offered. Although Navis™ Optical NMS will automatically show only the digital links usable with a particular network element couple, Chapter 4 of this guide presents the digital link and protection support per network element so that provisioning can be planned.

Task Complete the following task to add a digital link between two network elements on the Network Map. This task assumes that two network elements already exist on the Network Map.

- 1 From the Network Map, select a network element.

Result:

The selected network element is highlighted.

- 2 Synchronize the network element's ports. Refer to the network element synchronization task in Chapter 2 for details on how to perform this task.

Result:

The network element is synchronized.

- 3 Select a second network element and repeat Step 2.
-

- 4 On the Network Map, select **Configuration > Digital Link > Add > (select an applicable digital link according to the selected network elements)**.

Result:

The Network Map becomes the Provisioning Profile form.

Add a digital link between two network elements

.....
5 Under the **Essentials** tab, enter a circuit ID.

.....
6 Press the **A port** button.

Result:

A window appears.

.....
7 Select a port and press **OK**.

Result:

The selected port appears within the Essentials tab as the **A port**.

.....
8 Repeat Steps 6 and 7 to add the **Z port** (of course, exchange any instances of **A port** with **Z port**).

Result:

The selected port appears within the Essentials tab as the **Z port**.

.....
9 Under the **Parameters** tab, verify that **Order Action** is set to **Add**.

.....
10 Press **OK**.

Result:

The graphical layout form appears.

.....
11 Press **OK**.

Result:

A confirmation window appears.

.....
12 Confirm all confirmation windows that appear.

Result:

The new digital link, linking the specified network elements, appears on the Network Map.

.....
E N D O F S T E P S



Provision a 1+1 MSP digital link

Purpose Use this task to provision a 1+1 multiplex section protected (MSP) digital link.

When MSP is 1+1, the protection link is totally dedicated to the working (service) link and cannot carry preemptible extra traffic.

Task **Important!** This task assumes that the appropriate provisioning was completed on the EMS-level. That is, a protection link was provisioned on the EMS-level prior to this task (this task will create a service link based on the protection link provisioned on the EMS-level).

Complete the following procedure to provision a 1+1 MSP digital link.

- 1 From the Network Map, select a network element.

Result:

The selected network element is highlighted.

- 2 Synchronize the network element's ports. Refer to the network element synchronization task in Chapter 2 for details on how to perform this task.

Result:

The network element is synchronized.

- 3 Select a second network element and repeat Step 2.
-

- 4 On the Network Map, select **Configuration > Digital Link > Add > (select an applicable digital link according to the selected network elements)**.

Result:

The Network Map becomes the Provisioning Profile form.

- 5 Under the **Essentials** tab, enter a circuit ID.
-

.....
6 Press the **A port** button.

Result:

A window appears.

.....
7 Select a port and press **OK**.

Result:

The selected port appears within the Essentials tab as the **A port**.

.....
8 Repeat Steps 6 and 7 to add the **Z port** (of course, exchange any instances of **A port** with **Z port**).

Result:

The selected port appears within the Essentials tab as the **Z port**.

.....
9 Verify that **Auto** is checked for **Path Selection**.

.....
10 Verify that the **MSP Protected?** field, displays **1+1 Protected**. Note that if this field does not show **1+1 Protected**, it means that the selected network elements do not allow for 1+1 MSP.

.....
11 For **MSP Type**, select either **UNI** (unidirectional) or **BI** (bidirectional)

.....
12 For **Protection Path**, specify a port for **A Protect Port** and **Z Protect Port**.

.....
13 Under the **Parameters** tab, verify that **Order Action** is set to **Add**.

.....
14 Verify that **MS Protection Group Name** is the same as the name of the protection link created on the EMS-level.

.....
15 Press **OK**.

Result:

The graphical layout form appears.

- 16** Press **OK**.

Result:

A confirmation window appears.

- 17** Confirm all confirmation windows that appear.

Result:

The new 1+1 digital link, linking the specified network elements, appears on the Network Map.

END OF STEPS



Provision a 1x1 MSP digital link

Purpose Use this task to provision a 1x1 MSP digital link between two network elements that support 1x1 protection (bandwidth manager, black box or Lambda UNITE).

1x1 MSP occurs when a single protection link protects a single service digital link. With a 1x1 MSP digital link, the protection link can carry extra traffic that will be preempted whenever the MSP switching takes place. As a result, both the service and protection links of a 1x1 MSP have separate digital link identifications.

Before you begin Before you provision a 1x1 MSP digital link, consider the following items:

- 1x1 MSP is primarily used as a span protection in a 4-fiber MS-SPRING. Users must first create a protection digital link before any service digital links are created and associated to it.
- Each of the two digital links (service and protection) for a 1x1 MSP must be created or deleted with two separate provisioning orders having separate implementations.
- Users cannot rearrange a 1x1 MSP-protected digital link. They can only delete and add a new digital link with a new layout.
- A protection link cannot be associated to more than one service link.
- Users may specify a switching operation to preempt extra traffic carried on a protection link. Note that Navis™ Optical NMS does not determine if a protection link is carrying extra traffic (users must manually check for extra traffic).

Task **Important!** This task assumes that the appropriate provisioning was completed on the EMS-level. That is, a protection link was provisioned on the EMS-level prior to this task (this task will create a service link based on the protection link provisioned on the EMS-level).

Perform the following procedure to provision a 1x1 MSP-protected digital link.

- 1 From the Network Map, select a network element that allows for 1x1 protection.

Result:

The selected network element is highlighted.

- 2 Synchronize the network element's ports. Refer to the network element synchronization task in Chapter 2 for details on how to perform this task.

Result:

The network element is synchronized.

- 3 Select a second network element and repeat Step 2.
-

- 4 On the Network Map, select **Configuration > Digital Link > Add > (select an applicable digital link according to the selected network elements)**.

Result:

The Network Map becomes the Provisioning Profile form.

- 5 Under the **Essentials** tab, enter a circuit ID.
-

- 6 Press the **A port** button.

Result:

A window appears.

- 7 Select a port and press **OK**.

Result:

The selected port appears within the Essentials tab as the **A port**.

- 8 Repeat Steps 6 and 7 to add the **Z port** (of course, exchange any instances of **A port** with **Z port**).

Result:

The selected port appears within the Essentials tab as the **Z port**.

-
- 9 Verify that **Auto** is checked for **Path Selection**.
-
- 10 Verify that the **MSP Protected?** field, displays **1x1 Protected**. Note that if this field does not show **1x1 Protected**, it means that the selected network elements do not allow for 1x1 MSP.
-
- 11 For **MSP Type**, select either **UNI** (unidirectional) or **BI** (bidirectional)
-
- 12 For **Protection Path**, specify a port for **A Protect Port** and **Z Protect Port**.
-
- 13 Under the **Parameters** tab, verify that **Order Action** is set to **Add**.
-
- 14 Verify that **MS Protection Group Name** is the same as the name of the protection link created on the EMS-level.
-
- 15 Press **OK**.
- Result:**
- The graphical layout form appears.
-
- 16 Press **OK**.
- Result:**
- A confirmation window appears.
-
- 17 Confirm all confirmation windows that appear.
- Result:**
- The new 1x1 digital link, linking the specified network elements, appears on the Network Map.

END OF STEPS



Display protection group names associated with digital links

Purpose Use this task to display a list of protection group names associated with MSP digital links.

In addition to the procedure described below, MSP group names are also displayed in the Graphical Layout, Modify Parameters, and Order Parameters forms. This procedure allows you to view a complete listing of protection group names.

Task Use this task to display a list of protection group names associated MSP digital links.

- 1 From the Network Map, select **Configuration > Connection > Display > MS Protection Group Names**.

Result:

The Protection Group Names list is displayed.

END OF STEPS



Add a regenerator to a digital link

Purpose Use this task to add a regenerator to a digital link.

Task Complete the following task to add a regenerator to a digital link.

1 From the Network Map, select a digital link.

2 Right click on the digital link.

Result:

The Link menu appears.

3 Select **Circuit/Trail List**.

Result:

The Circuit/Trail List form appears.

4 Select the CKT/Trail ID corresponding to the digital link you wish to add the regenerator to.

Result:

The selection becomes highlighted, and the **Actions** menu item becomes enabled.

5 Select **Actions > Graphical Layout**.

Result:

The Graphical Layout form appears.

6 Select **Actions > Modify > Regenerators/Optical Amplifiers**.

Result:

The Regenerator Selection form appears.

7 Select a regenerator from the **Non-Members** sub-window.

Result:

The **Add** and **Remove** buttons become enabled.

8 Press **Add**.

Result:

The regenerator is moved to the **Service** window.

9 Specify the regenerator's left/right ports and service protection.

10 Press **OK**.

Result:

A confirmation window appears.

11 Press **OK**.

Result:

A regenerator is added to the digital link.

END OF STEPS



Delete a regenerator from a digital link

Purpose Use this task to delete a regenerator from a digital link.

Task Perform the following steps to delete a regenerator from a digital link.

1 From the Network Map, select a digital link.

2 Right click on the digital link.

Result:

The Link menu appears.

3 Select **Circuit/Trail List**.

Result:

The Circuit/Trail List form appears.

4 Select the CKT/Trail ID corresponding to the digital link you wish to delete the regenerator from.

Result:

The selection becomes highlighted, and the **Actions** menu item becomes enabled.

5 Select **Actions > Graphical Layout**.

Result:

The Graphical Layout form appears.

6 Select **Actions > Modify > Regenerators/Optical Amplifiers**.

Result:

The Regenerator Selection form appears.

7 Select a regenerator from the **Service** window.

Result:

The **Add** and **Remove** buttons become enabled.

- 8** Press **Remove**.

Result:

The regenerator is moved to the **Non-Members** window.

- 9** Press **OK**.

Result:

A confirmation window appears.

- 10** Press **OK**.

Result:

The regenerator is deleted from the digital link.

END OF STEPS



Disconnect a digital link

Purpose Use this procedure to disconnect a digital link.

Important! Deletion of a digital link is only permitted if there are no in-effect and/or pending circuits or paths riding on it.

Before you begin Before disconnecting a digital link, note the following:

- Users are not required to stop already running performance monitoring data collection prior to disconnecting the digital link.
- Any preplan paths riding on a soon to be disconnected circuit must be disassociated from the service path they are protecting before there is any attempt to disconnect them.
- When deleting 1x1 digital links, the working service link must be deleted before the protection link.

Task Complete the following task to disconnect a digital link from a facility or circuit. Be sure to read the *Before You Begin* information for important considerations to make before attempting to disconnect a digital link.

1 From the Network Map, select a digital link.

2 From the Network Map, select **Configuration > Digital Link > Disconnect**.

Result:

The Ckt/Trail Query Box is displayed.

3 In the **Order Number** field, enter the order number of the digital link to be disconnected.

4 Click **OK**.

Result:

A confirmation window appears.

5 Click **Yes**.

Result:

An action window appears.

- 6** Click **OK**.

Result:

The system disconnects the digital link if all validations are successful. The digital link, linking the specified network elements, disappears from the Network Map.

END OF STEPS



Section II: Connections

Overview

Purpose This section discusses the provisioning tasks associated with connections.

Definition A circuit/trail is a concatenation of link/sub-network connections (cross-connects in Navis™ Optical NMS terminology) to provide end-to-end service to a customer. A circuit/trail is identified by a rate at which the service is provided. The “rate” of a circuit/trail is defined by the ITU and ETSI standards for SDH and PDH circuit/trails.

A circuit (in PDH/asynchronous terminology) provides a service to a customer at a specified rate.

A trail (in SDH terminology) is often referred to as a path. A trail can be assignable or non-assignable depending on the terminating port or based on the sub-structuring of the port to carry lower order traffic. In Navis™ Optical NMS, if one or both end ports of a trail are PDH/Asynchronous, or if one or both end ports are sub-structured to carry lower order traffic, the trail is called an “assignable” entity. If both end ports are SDH and not sub-structured to carry low order traffic, then the trail is called as an “non-assignable” entity. Certain trails, such as VC4-4c, VC4-16c, VC-64c, and VC2, are always non-assignable. Navis™ Optical NMS creates channels for assignable trails in order to carry the low order trails or PDH/asynchronous circuits.

Supported connections Refer to Chapter 4 of this guide for descriptions of the connection types supported by Navis™ Optical NMS.

Before you begin Refer to the individual tasks contained within this section for important ‘Before You Begin’ information.

Additional information For additional information about connections as they relate to Navis™ Optical NMS, refer to Chapter 4 of this guide.

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Add a circuit between two controlled network elements

Purpose Use this procedure to add a circuit between two controlled network elements.

Before you begin Before adding a circuit between two controlled network elements, note the following items:

- Navis™ Optical NMS does not support the provisioning of an unprotected broadcast circuit on an ADM4/1 STM4 network element.
- Not all controlled network elements (e.g., ADM 16/1, TM1, AM1, AM1Plus) can implement a one-way cross-connection.

Task Complete the following task to add a circuit between two controlled network elements.

- 1 On the Network Map, select two network element icons that already have a digital link joining them.

Result:

The icons become highlighted.

- 2 Synchronize the network elements' ports and cross-connects. Refer to the network element synchronization task in Chapter 2 for details on how to perform this task.

Result:

The network elements are synchronized.

- 3 On the Network Map, select **Configuration > Connection > Add > (select an applicable circuit rate according to the selected network elements)**.

Result:

The Provision Profile form is displayed.

- 4 Under the **Essentials** tab, enter a circuit ID next to where the connection type is listed.
-

Add a circuit between two controlled network elements

.....
5 Press the **A port** button.

Result:

A window appears.

.....
6 Select a port and press **OK**.

Result:

The selected port appears within the Essentials tab as the **A port**.

.....
7 Repeat steps 10 and 11 to add the **Z port** (of course, exchange any instances of **A port** with **Z port**).

Result:

The selected port appears within the Essentials tab as the **Z port**.

.....
8 Verify that **Auto** is checked for **Path Selection**.

.....
9 Under the Parameters tab, verify that **Order Action** is set at **Add**.

.....
10 Press **OK**.

Result:

The graphical layout form appears.

.....
11 Press **OK**.

Result:

A confirmation window appears.

.....
12 Press **OK**.

Result:

The circuit is created.

.....
E N D O F S T E P S



Add a circuit between two noncontrolled network elements

Purpose Use this procedure to add a circuit between two noncontrolled network elements.

Before you begin Before you add a circuit between two noncontrolled network elements, note the following items:

- A circuit cannot be created directly between two noncontrolled network elements without at least one intermediate controlled network element.
- Digital links must already be provisioned from the network element to each of the two equipment.

Task Complete the following task to add a circuit between two noncontrolled network elements.

- 1 On the Network Map, select two noncontrolled network element icons that already have a digital link joining them and have at least one intermediate controlled network element.

Result:

The icons become highlighted.

- 2 Synchronize the network elements' ports and cross-connects. Refer to the network element synchronization task in Chapter 2 for details on how to perform this task.

Result:

The network elements are synchronized.

- 3 On the Network Map, select **Configuration > Connection > Add > (select an applicable circuit rate according to the selected network elements)**.

Result:

The Provision Profile form is displayed.

Add a circuit between two noncontrolled network elements

-
- 4 Under the **Essentials** tab, enter a circuit ID next to where the connection type is listed.
-
- 5 Press the **A port** button.
- Result:**
A window appears.
-
- 6 Select a port and press **OK**.
- Result:**
The selected port appears within the Essentials tab as the **A port**.
-
- 7 Repeat steps 10 and 11 to add the **Z port** (of course, exchange any instances of **A port** with **Z port**).
- Result:**
The selected port appears within the Essentials tab as the **Z port**.
-
- 8 Verify that **Auto** is checked for **Path Selection**.
-
- 9 Under the Parameters tab, verify that **Order Action** is set at **Add**.
-
- 10 Press **OK**.
- Result:**
The graphical layout form appears.
-
- 11 Press **OK**.
- Result:**
A confirmation window appears.
-
- 12 Press **OK**.
-

Add a circuit between two noncontrolled network elements

Result:

The circuit is created.

END OF STEPS



Add a circuit between a controlled network element and a noncontrolled network element

Purpose Use this procedure to add a circuit between a controlled network element and a noncontrolled network element.

Before you begin Before you add a circuit between a controlled network element and a noncontrolled network element, note the following items:

- A digital link must exist between the controlled and noncontrolled network elements before attempting to provision a circuit between the two.
- Provisioning of broadcast circuits through WaveStar DACS is supported on all rates (TU3/TU12/AU3/AU4).
- The equipment list menu item is only highlighted on the node menu for those network elements connected to originating or terminating equipment.

Task Perform the following steps to add a circuit between a controlled network element and a noncontrolled network element.

- 1 On the Network Map, select one noncontrolled network element icon and one controlled network element icon that already have a digital link joining them.

Result:

The icons become highlighted.

- 2 Synchronize the network elements' ports and cross-connects. Refer to the network element synchronization task in Chapter 2 for details on how to perform this task.

Result:

The network elements are synchronized.

- 3 On the Network Map, select **Configuration > Connection > Add > (select an applicable circuit rate according to the selected network elements)**.

Add a circuit between a controlled network element and a noncontrolled network element

Result:

The Provision Profile form is displayed.

- 4** Under the **Essentials** tab, enter a circuit ID next to where the connection type is listed.
-

- 5** Press the **A port** button.

Result:

A window appears.

- 6** Select a port and press **OK**.

Result:

The selected port appears within the Essentials tab as the **A port**.

- 7** Repeat steps 10 and 11 to add the **Z port** (of course, exchange any instances of **A port** with **Z port**).

Result:

The selected port appears within the Essentials tab as the **Z port**.

- 8** Verify that **Auto** is checked for **Path Selection**.
-

- 9** Under the Parameters tab, verify that **Order Action** is set at **Add**.
-

- 10** Press **OK**.

Result:

The graphical layout form appears.

- 11** Press **OK**.

Result:

A confirmation window appears.

Add a circuit between a controlled network element and a noncontrolled network element

12 Press **OK**.

Result:

The circuit is created.

END OF STEPS



Provision an AU3-AU4 trail using the BandWidth Manager's adaptation feature

Purpose Use this procedure to provision a trail using the BandWidth Manager's AU3-AU4 adaptation feature.

The AU3-AU4 adaptation feature maps a higher order VC3 payload (AU3) at the interface of a STM1E port to a lower order VC3 payload (TUG structured), which is multiplexed into a VC4 (AU4). A STM1E port can be provisioned to carry one AU4/VC4 or three AU3 (higher order VC3) signals, in which case the AU3-AU4 adaptation is not enabled, or it can be provisioned to enable the adaptation. If the adaptation is enabled, the STM1E signal at the (external) interface will represent 3 AU3 signals, and a single AU4 (VC4) signal structured to contain 3 TU3/VC3 signals will leave the port unit (internally in the BandWidth Manager) to interface with the switching structure of the BandWidth Manager. Although the AU3-AU4 adaptation can be enabled in one direction (ingress or egress), only bidirectional TU3-AU3 type trails are supported.

In the most common application of the feature, a DS3 is mapped into a lower order VC3 at one end of the trail (e.g. in Europe), which in turn is multiplexed into a VC4. The DS3 is extracted from a higher order VC3/AU3 (STS1) at the other end of the trail (e.g. in N. America). If the DS3 within the AU3 needs to be dropped at the same BandWidth Manager, or the AU3 needs to be multiplexed into a higher level optical signal (OC3 or higher) to be transported farther, an external loop-back can be employed at the BandWidth Manager.

The adaptation feature is supported as a provisionable option on STM1E ports only, on the BandWidth Manager's STM1E universal shelf. An STM-1 signal can be looped back at a BandWidth Manager, and the AU3 signals from the STM1E port can be dropped at DS3 ports or consolidated over higher level facilities after being cross-connected through the same BandWidth Manager as AU3 signals. Note that a loop-back is external to BandWidth Manager. It should be configured in advance as a digital link and inventoried in Navis™ Optical NMS.

Provision an AU3-AU4 trail using the BandWidth Manager's adaptation feature

Before you begin Before provisioning a trail using the BandWidth Manager's AU3-AU4 adaptation feature, note the following items:

- Navis™ Optical NMS only supports bi-directional TU3-AU3 trails.
- Navis™ Optical NMS only supports the manual provisioning of TU3-AU3 trails.
- Navis™ Optical NMS supports merge and protection features for TU3-AU3 trails.
- Navis™ Optical NMS does not support preplan restoration for TU3-AU3 trails.

Task Complete the following task to provision a trail using the Navis™ Optical NMS BandWidth Manager's AU3-AU4 adaptation feature. This task assumes that you have already provisioned a VC4 trail that terminates on a Navis™ Optical NMS BandWidth Manager.

- 1 On the Network Map, select a pair of Navis™ Optical NMS BandWidth Manager icons.

Result:

The icons become highlighted.

- 2 Synchronize the network elements' ports and cross-connects. Refer to the network element synchronization task in Chapter 2 for details on how to perform this task.

Result:

The network elements are synchronized.

- 3 On the Network Map, select **Configuration > Connection > Add > (select a VC4 rate)**.

Result:

The Provision Profile form is displayed.

- 4 Under the **Essentials** tab, enter a circuit ID next to where the connection type is listed.
-

Provision an AU3-AU4 trail using the BandWidth Manager's adaptation feature

.....
5 Press the **A port** button.

Result:

A window appears.
.....

6 Select a port and press **OK**.

Result:

The selected port appears within the Essentials tab as the **A port**.
.....

7 Repeat steps 10 and 11 to add the **Z port** (of course, exchange any instances of **A port** with **Z port**).

Result:

The selected port appears within the Essentials tab as the **Z port**.
.....

8 Verify that **Auto** is checked for **Path Selection**.
.....

9 Under the Parameters tab, verify that **Order Action** is set at **Add**.
.....

10 For the **Enable AU4-AU3** option, select **Yes**.
.....

11 Press **OK**.

Result:

The graphical layout form appears.
.....

12 Press **OK**.

Result:

A confirmation window appears.
.....

13 Press **OK**.
.....

Result:

The AU3-AU4 trail is created.

END OF STEPS



Display circuit list

Purpose Use this procedure to display a list of existing circuits.

Task Perform the following procedure to display a complete listing of existing circuits.

- 1 From the Network Map, select **Configuration > Display > Circuit/Trail List**.

Result:

The Circuit/Trail List Query Box form appears.

- 2 Place a check in the **Free Form** box.

Result:

The Free Form field alters.

- 3 Within the **Free Form** field, enter *.
-

- 4 From the field's pull-down menu, select **All**.

Result:

The OK button will become active.

- 5 Click **OK**.

Result:

The Circuit/Trail List form appears listing all existing circuits.

END OF STEPS



Display circuit list by type

Purpose Use this procedure to display a list of particular circuit types.

Task Perform the following procedure to display a list of particular circuit types.

- 1 From the Network Map, select **Configuration > Display > Circuit/Trail List**.

Result:

The Circuit/Trail List Query Box form appears.

- 2 Place a check in the **Free Form** box.

Result:

The Free Form field alters.

- 3 Within the **Free Form** field, enter *.
-

- 4 From the field's drop-down menu, specify a transmission rate.

Result:

The **OK** button becomes active.

- 5 For **Status**, specify an order status. Your query will show all the circuits that abide by this criteria. For example, if you select **Pending**, only pending circuits will be polled for.
-

- 6 For **Order Action**, select an order action if desired.
-

- 7 Press the **More** button if you wish to apply additional search criteria.

Result:

If pressed, the form lengthens to provide additional selections.

-
- 8** Click **OK**.

Result:

The Circuit/Trail List form appears and lists all existing circuits that fit the search criteria.

END OF STEPS



Copy a connection using the Clone feature

Purpose Use this task to use the Clone feature to copy an existing circuit.

Task Perform the following steps to copy a circuit using the Clone feature.

- 1 From the Network Map, select **Configuration > Connection > Clone**.

Result:

A query box form appears.

- 2 Enter a circuit identification so as to filter through all the currently existing circuits.
-

- 3 Press **OK**.

Result:

The Circuit/Trail List form appears.

- 4 Select a circuit to clone.

Result:

A provisioning screen appears pre-populated.

- 5 From the Essentials tab, change the **ID** field to name the clone of the circuit.
-

- 6 Change the port addresses for the circuit clone.
-

- 7 Click **OK**.

Result:

The circuit is cloned.

END OF STEPS



View a work order record document

Purpose Use the following procedure to view a work order record document (WORD).

The WORD feature describes a customer service order or a network infrastructure/engineering order and includes the end-to-end design of the circuit associated with that order. The primary use of the WORD feature is for circuit installation, testing and fault tracing by a technician in the field.

Before you begin Before you view a work order record document, consider the following items:

- The WORD feature must be turned on by an administrator. Administrators may turn on/off the WORD feature using the license tool. Refer to the *Navis™ Optical NMS Administration Guide* for details.
- Prior to using the WORD feature, an administrator must set the IP address of the DNA server.
- The user's system must have a web browser installed in order to view the WORD.

Task Use the following procedure to view a work order record document (WORD).

- 1 From the Network Map, select **Configuration > Connection > Display > Circuit/Trail List**.

Result:

The Circuit/Trail Query box form appears.

- 2 Within the **CKT/Trail ID** field, enter a valid circuit/trail identification.
-

- 3 Select a valid **Order Status** and **Order Action**.

Result:

The OK button becomes active.

-
- 4 Press **OK**.

Result:

The Circuit/Trail List form appears.

-
- 5 With the circuit selected, go to **Actions > Enable WORD Display**.

Result:

The system will launch the resident web browser (in most cases, Microsoft Internet Explorer).

-
- 6 In the web page's entry field, enter a valid IP address.

Result:

The WORD for the entered IP address will appear.

END OF STEPS



Modify circuit order transmission parameters

Purpose Use this procedure to modify circuit order transmission parameters.

Important! Modifying transmissions can only be done for in-effect circuits.

Task Complete the following task to modify a circuit's order transmission parameters.

1 From the Network Map, select a circuit.

2 Right click on the circuit.

Result:

The Node menu appears.

3 Select **Circuit/Trail List**.

Result:

The Circuit/Trail List form appears.

4 Select the CKT/Trail ID corresponding to the circuit you wish to disconnect.

Result:

The selection becomes highlighted, and the **Actions** menu item becomes enabled.

5 Select **Actions > Graphical Layout**.

Result:

The Graphical Layout form appears.

6 Select **Actions > Modify > Transmission Parameters**.

Result:

The Transmission Parameters form appears.

.....
7 Make the modifications to the circuit's order parameters.
.....

8 Select **OK**.

Result:

The circuit's new transmission parameters are saved.

END OF STEPS
.....



Disconnect a circuit

Purpose Use this procedure to disconnect a circuit.

Before you begin When attempting to disconnect a circuit, a backbone circuit cannot be disconnected unless all its tributaries, or other backbones it is feeding, are disconnected first. Users may disconnect backbones and tributaries in the same manner as with any other circuit except for the first circuit that terminates at a customer's location containing the backbone.

Keep the following items in mind:

- You must disconnect all circuits fed by the backbone circuit.
- You may not disconnect the first circuit in Navis™ Optical NMS.
- You must disconnect the circuit that contains the backbone and add a new circuit. This circuit will contain the new backbone.
- You may then add remaining circuits you wish to maintain.
- You are not required to stop data collection prior to disconnecting a circuit.
- Preplan paths, riding on a circuit to be disconnected, must be first disassociated from the service path they are protecting before there is any attempt at canceling them.
- If the circuit to be deleted is part of a broadcast circuit, the circuit that was added last *must* be disconnected first.

Task Complete the following task to disconnect a circuit.

1 From the Network Map, select a circuit.

2 Right click on the circuit.

Result:

The Node menu appears.

3 Select **Circuit/Trail List**.

Result:

The Circuit/Trail List form appears.

-
- 4** Select the CKT/Trail ID corresponding to the circuit you wish to disconnect.

Result:

The selection becomes highlighted, and the **Actions** menu item becomes enabled.

-
- 5** Select **Actions > Graphical Layout**.

Result:

The Graphical Layout form appears.

-
- 6** Select **Actions > Disconnect > Actual**.

Result:

A confirmation window appears.

-
- 7** Select **Yes**.

Result:

The circuit is disconnected.

END OF STEPS



Perform a virtual disconnect

Purpose Use this procedure to perform a virtual disconnect on a circuit.

Task Complete the following task to perform a virtual disconnect on a circuit.

1 From the Network Map, select a circuit.

2 Right click on the circuit.

Result:

The Node menu appears.

3 Select **Circuit/Trail List**.

Result:

The Circuit/Trail List form appears.

4 Select the CKT/Trail ID corresponding to the circuit you wish to disconnect.

Result:

The selection becomes highlighted, and the **Actions** menu item becomes enabled.

5 Select **Actions > Graphical Layout**.

Result:

The Graphical Layout form appears.

6 Select **Actions > Disconnect > Virtual (DB only)**.

Result:

A confirmation window appears.

7 Select **Yes**.

Result:

A virtual disconnect is performed on the circuit.

END OF STEPS



Section III: Optical Layers

Overview

Purpose This section contains tasks to add and delete optical layers through Navis™ Optical NMS.

Definition An optical layer refers to an existing optical multiplex section (OMS), optical link or optical channel trail that connects particular types of network elements on the Navis™ Optical NMS Network Map. For example, an optical link can connect a SDH network element with a DWDM network element, a DWDM network element with a Lambda Router, two Lambda Routers together, or a Lambda Router with an SDH network element. Unlike an optical multiplex section (OMS), however, an optical link can not join two DWDM network elements.

Supported optical layers Refer to Chapter 4 of this guide for descriptions of the optical layers supported by Navis™ Optical NMS.

Before you begin Refer to the individual tasks contained within this section for important 'Before You Begin' information. Note that this tasks themselves are presented in the order in which they should occur. Failure to follow the order presented here could result in provisioning problems.

Additional information For additional information about optical layers as they relate to Navis™ Optical NMS, refer to Chapter 4 of this guide.

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Create an optical multiplex section

Purpose Use this procedure to create an optical multiplex section (OMS). An OMS is used to connect two DWDM network elements.

Before you begin Before you create an OMS, note the following:

- The OMS between two OLS80G DWDMs can be unprotected or 1+1 protected.
- The optical amplifier list contains only the amplifiers that support the OMS section with the appropriate number of channels (16 or 40/80). It is assumed that the optical amplifiers are all bi-directional.

Task Use the following procedure to create an OMS. This procedure assumes that the appropriate network elements already exist.

- 1 From the Network Map, select two DWDM network element icons.

Result:

The two selected network elements become highlighted.

- 2 Synchronize the network elements' ports and cross-connects. Refer to the network element synchronization task in Chapter 2 for details on how to perform this task.

Result:

The network elements are synchronized.

- 3 From the Network Map, select **Configuration > Optical Layer > Add > OMS**.

Result:

The Network Map becomes the Provisioning Profile form.

- 4 Under the **Essentials** tab, enter a circuit ID next to where **OMS** is listed.

-
- 5 Press the **A port** button.

Result:

A window appears.

- 6 Select a port and press **OK**.

Result:

The selected port appears within the Essentials tab as the **A port**.

- 7 Repeat steps 10 and 11 to add the **Z port** (of course, exchange any instances of **A port** with **Z port**).

Result:

The selected port appears within the Essentials tab as the **Z port**.

- 8 Verify that **Auto** is checked for **Path Selection**.
-

- 9 Press **OK**.

Result:

The graphical layout form appears.

- 10 Press **OK**.

Result:

A confirmation window appears.

- 11 Confirm all confirmation windows that appear.

Result:

The newly created OMS appears on the Network Map.

END OF STEPS



Create an optical multiplex section with 1+1 protection

Purpose Use this procedure to create an optical multiplex section (OMS) with 1+1 protection.

Before you begin Before you create an OMS with 1+1 protection, note the following:

- The OMS must be between two OLS80G DWDMs.
- The optical amplifier list contains only the amplifiers that support the OMS section with the appropriate number of channels (16 or 40/80). It is assumed that the optical amplifiers are all bi-directional.

Task Use the following procedure to create an OMS with 1+1 protection. This procedure assumes that the appropriate network elements already exist.

- 1 From the Network Map, select two OLS80G DWDM network element icons.

Result:

The two selected network elements become highlighted.

- 2 Synchronize the network elements' ports and cross-connects. Refer to the network element synchronization task in Chapter 2 for details on how to perform this task.

Result:

The network elements are synchronized.

- 3 From the Network Map, select **Configuration > Optical Layer > Add > OMS**.

Result:

The Network Map becomes the Provisioning Profile form.

- 4 Under the **Essentials** tab, enter a circuit ID next to where **OMS** is listed.

-
- 5 Press the **A port** button.

Result:

A window appears.

- 6 Select a port and press **OK**.

Result:

The selected port appears within the Essentials tab as the **A port**.

- 7 Repeat steps 10 and 11 to add the **Z port** (of course, exchange any instances of **A port** with **Z port**).

Result:

The selected port appears within the Essentials tab as the **Z port**.

- 8 Verify that **Auto** is checked for **Path Selection**.
-

- 9 Set **MSP** (for multiplex section protection) to **Y**.
-

- 10 Press **OK**.

Result:

The graphical layout form appears.

- 11 Press **OK**.

Result:

A confirmation window appears.

- 12 Confirm all confirmation windows that appear.

Result:

The newly created OMS with 1+1 protection appears on the Network Map.

END OF STEPS



Create an optical link

Purpose Use this procedure to create an optical link. An optical link can connect a SDH network element with a DWDM network element, a DWDM network element with a LambdaRouter, two LambdaRouters together, or a LambdaRouter with an SDH network element. Unlike an OMS, an optical link can not join two DWDM network elements.

Task Use the following procedure to create an optical link. This procedure assumes that the appropriate network elements already exist.

- 1 From the Network Map, select two network element icons. As stated previously, the network elements can be DWDM, SDH or a Lambda Router. However, only one network element you select can be a DWDM.

Result:

The two selected network elements become highlighted.

- 2 Synchronize the network elements' ports and cross-connects. Refer to the network element synchronization task in Chapter 2 for details on how to perform this task.

Result:

The network elements are synchronized.

- 3 From the Network Map, select **Configuration > Optical Layer > Add > OL**.

Result:

The Network Map becomes the Provisioning Profile form.

- 4 Under the **Essentials** tab, enter a circuit ID next to where **OL** is listed.
-

- 5 Press the **A port** button.
-

Result:

A window appears.

- 6** Select a port and press **OK**.

Result:

The selected port appears within the Essentials tab as the **A port**.

- 7** Repeat steps 10 and 11 to add the **Z port** (of course, exchange any instances of **A port** with **Z port**).

Result:

The selected port appears within the Essentials tab as the **Z port**.

- 8** Ensure that **Auto** is checked for **Path Selection**.
-

- 9** Press **OK**.

Result:

The graphical layout form appears.

- 10** Press **OK**.

Result:

A confirmation window appears.

- 11** Confirm all confirmation windows that appear.

Result:

The newly created optical link appears on the Network Map.

END OF STEPS



Create an optical channel trail

Purpose Use this procedure to create an optical channel trail. An optical channel trail transverses the connections established by either an OMS or and OMS/optical link combination. As such, an optical channel trail can span such combinations as two DWDMs (in the case of a single OMS)/SDH network element (optical link)/DWDM (OMS)/DWDM (optical link)/SDH network element scheme.

Before you begin Before you create an optical channel trail, note the following:

- There must be at least one OMS provisioned. There also must be the desired number of optical links provisioned prior to creating an optical channel trail.
- Optical channel SNCP is supported for Lambda Router 256/128.
- Cascaded SNCPs are not supported.

Task Use the following procedure to create an optical channel trail. This procedure assumes that the appropriate network elements already exist.

- 1 From the Network Map, select an existing OMS. For sake of clarity, this procedure will discuss the provisioning of an optical channel trail for a single OMS. Note that an optical channel trail can be provisioned so as to include several optical links and OMSs.

Result:

The selected OMS becomes highlighted.

- 2 From the Network Map, select **Configuration > Optical Layer > Add > OChTrail**.

Result:

The Network Map becomes the Provisioning Profile form.

- 3 Under the **Essentials** tab, enter a circuit ID next to where **OChTrail** is listed.
-

- 4 Press the **A port** button.
-

Result:

A window appears.

- 5** Select a port and press **OK**.

Result:

The selected port appears within the Essentials tab as the **A port**.

- 6** Repeat steps 10 and 11 to add the **Z port** (of course, exchange any instances of **A port** with **Z port**).

Result:

The selected port appears within the Essentials tab as the **Z port**.

- 7** Verify that **Auto** is checked for **Path Selection**.
-

- 8** Press **OK**.

Result:

The graphical layout form appears.

- 9** Press **OK**.

Result:

A confirmation window appears.

- 10** Confirm all confirmation windows that appear.

Result:

The newly created optical channel trail appears on the Network Map.

END OF STEPS

Important Note for OLS400G

When provisioning an optical channel with a fixed connection span on OLS400G, the sequence of provisioning matters. In short, a cross-connect database synchronization must be performed before an optical link or optical multiplex section is provisioned. To successfully provision an optical channel with OLS400G, you must do the following:

1. Synchronize the ports of the OLS400G (database synchronization). Refer to Chapter 2 of this guide for information on how to perform a database synchronization.
2. Synchronize the cross-connects of the OLS400G (database synchronization). Refer to Chapter 2 of this guide for information on how to perform a database synchronization.
3. Provision the optical links between the SDH network elements and the OLS400G. Refer to the task within this section for details.
4. Provision the optical multiplex section between the two OLS400Gs. Refer to the task within this section for details.
5. Provision the optical channel. Refer to the task within this section for details.



Add an optical amplifier to an optical multiplex section

Purpose Use this task to add an optical amplifier to an optical multiplex section (OMS).

Task Complete the following task to add an optical amplifier to an OMS.

1 From the Network Map, select an OMS.

2 Right click on the OMS.

Result:

The Node menu appears.

3 Select **Circuit/Trail List**.

Result:

The Circuit/Trail List form appears.

4 Select the CKT/Trail ID corresponding to the OMS you wish to add the optical amplifier to.

Result:

The selection becomes highlighted, and the **Actions** menu item becomes enabled.

5 Select **Actions > Graphical Layout**.

Result:

The Graphical Layout form appears.

6 Select **Actions > Modify > Regenerators/Optical Amplifiers**.

Result:

The Optical Amplifier Selection form appears.

Add an optical amplifier to an optical multiplex section

.....
7 Select an optical amplifier from the **Non-Members** sub-window.

Result:

The **Add** and **Remove** buttons become enabled.

.....
8 Press **Add**.

Result:

The optical amplifier is moved to the **Service** window.

.....
9 Specify the optical amplifier's left/right ports and the service protection.

.....
10 Press **OK**.

Result:

A confirmation window appears.

.....
11 Press **OK**.

.....
12 From the Network Map, select **File > Query Again**.

Result:

An optical amplifier is added to the OMS.

.....
E N D O F S T E P S



Delete an optical amplifier from an optical multiplex section

Purpose Use this task to delete an optical amplifier from an optical multiplex section (OMS).

Task Complete the following task to delete an optical amplifier from an OMS.

1 From the Network Map, select an OMS.

2 Right click on the OMS.

Result:

The Node menu appears.

3 Select **Circuit/Trail List**.

Result:

The Circuit/Trail List form appears.

4 Select the CKT/Trail ID corresponding to the OMS you wish to add the optical amplifier to.

Result:

The selection becomes highlighted, and the **Actions** menu item becomes enabled.

5 Select **Actions > Graphical Layout**.

Result:

The Graphical Layout form appears.

6 Select **Actions > Modify > Regenerators/Optical Amplifiers**.

Result:

The Optical Amplifier Selection form appears.

Delete an optical amplifier from an optical multiplex section

.....
7 Select an optical amplifier from the **Service** window.

Result:

The **Add** and **Remove** buttons become enabled.

.....
8 Press **Remove**.

Result:

The amplifier is moved to the **Non-Members** window.

.....
9 Press **OK**.

Result:

A confirmation window appears.

.....
10 Press **OK**.

.....
11 From the Network Map, select **File > Query Again**.

Result:

The optical amplifier is deleted from the OMS.

.....
E N D O F S T E P S



Create a preplan for an optical channel trail

Purpose Use this procedure to create assign preplan restoration to an optical channel trail. Preplan restoration allows a user to re-route traffic temporarily so as to restore service in the event of a failure with the optical channel trail.

Before you begin Before you create a preplan for an optical channel trail, note the following:

- Navis™ Optical NMS will not perform validation to insure compliance with the following assumptions: the service path includes the Lambda Router; the service and preplan paths use the same Lambda Router where the restoration cross connect occurred.
- Navis™ Optical NMS can provide the capability to restore an optical channel trail if the following items occur: the service and preplan paths have the same channel/client service type; the service and preplan paths have different optical channel trails; the service path optical channel and the preplan path optical channel trail have the same end port.
- Navis™ Optical NMS supports preplan for OCh trail for OLS80G and all models of OLS400G.
- Lambda Router 256 and 128 are supported.

Task Use the following procedure to create a preplan for an optical channel trail. This procedure assumes that the appropriate network elements, OMSs and optical links already exist.

- 1 From the Network Map, select an existing OMS that supports preplan (see above caveats). For sake of clarity, this procedure will discuss creating a preplan for an optical channel trail. Note: an optical channel trail can be provisioned so as to include several optical links and OMSs.

Result:

The selected OMS becomes highlighted.

- 2 From the Network Map, select **Configuration > Optical Layer > Add > OChTrail**.
-

Create a preplan for an optical channel trail

Result:

The Network Map becomes the Provisioning Profile form.

- 3** Under the **Essentials** tab, enter a circuit ID next to where **OChTrail** is listed.
-

- 4** Press the **A port** button.

Result:

A window appears.

- 5** Select a port and press **OK**.

Result:

The selected port appears within the Essentials tab as the **A port**.

- 6** Repeat steps 10 and 11 to add the **Z port** (of course, exchange any instances of **A port** with **Z port**).

Result:

The selected port appears within the Essentials tab as the **Z port**.

- 7** Verify that **Auto** is checked for **Path Selection**.
-

- 8** Under the Parameters tab, specify **Order Action** as **Pre-plan**.
-

- 9** Press **OK**.

Result:

The graphical layout form appears.

- 10** Press **OK**.

Result:

A confirmation window appears.

Create a preplan for an optical channel trail

-
- 11** Confirm all confirmation windows that appear.

Result:

The newly created optical channel trail with preplan restoration appears on the Network Map.

END OF STEPS



Insert an optical layer into a digital link

Purpose Use this procedure to insert an optical layer into an existing digital link. An optical layer, in this case, refers to an existing OMS, optical link or optical channel trail.

Before you begin Before attempting to insert an optical layer into a digital link, consider the following items:

- In the case of an MSP-protected digital link, it is not necessary to have an optical layer both in the service link and protection link. One of the links need not go through the optical layer.

Task Perform the following steps to insert an optical layer into a digital link. This task assumes that all necessary optical layer components are provisioned in Navis™ Optical NMS before attempting to insert the optical layer.

- 1 From the Network Map, right click on a terminating network element icon of a digital link.

Result:

The Node menu appears.

- 2 Select **Assigned Ports List**.

Result:

The Assigned Ports List window appears.

- 3 From the list, select a digital link.

Result:

The digital link becomes highlighted.

- 4 Select **Actions > Graphical Layout**.

Result:

The Graphical Layout form appears.

-
- 5** Select **Actions > Insert Optical Layer**.

Result:

A confirmation window appears.

-
- 6** Press **Yes**.

Result:

The optical layer is inserted into the digital link.

END OF STEPS



Create a digital link through an optical channel trail

Purpose Use this procedure to create a digital link through an optical channel trail.

Task Perform the following steps to create a digital link through an optical channel trail. This task assumes that all necessary optical layer components are provisioned in Navis™ Optical NMS before attempting to create the digital link.

1 From the Network Map, select the terminating SDH network element icons of an optical trail.

2 From the Network Map, select **Configurations > Digital Link > Add > (select an applicable rate according to the selected network elements)**.

Result:

The Network Map becomes the Provisioning Profile form.

3 Under the **Essentials** tab, enter a circuit ID.

4 Press the **A port** button.

Result:

A window appears.

5 Select a port and press **OK**.

Result:

The selected port appears within the Essentials tab as the **A port**.

6 Repeat steps 10 and 11 to add the **Z port** (of course, exchange any instances of **A port** with **Z port**).

Result:

The selected port appears within the Essentials tab as the **Z port**.

.....
7 Verify that **Auto** is checked for **Path Selection**.

.....
8 Press **OK**.

Result:

The graphical layout form appears.

.....
9 Press **OK**.

Result:

A confirmation window appears.

.....
10 Confirm all confirmation windows that appear.

Result:

The newly created digital link follows the optical channel trail.

.....
E N D O F S T E P S



Disconnect an optical channel trail

Purpose Use the following procedure to disconnect an optical channel trail.

Task Complete the following steps to disconnect an optical channel trail.

1 From the Network Map, select an optical channel trail (by selecting one of its end points).

2 Right click on the end point (a network element icon).

Result:

The Node menu appears.

3 Select **Assigned Ports List**.

Result:

The Assigned Ports List window appears.

4 From the listing, select an optical channel trail. Make sure it is **In-Effect (IE)**.

Result:

The selection becomes highlighted.

5 Select **Actions > Graphical Layout**.

Result:

The Graphical Layout form appears.

6 Select **Actions > Disconnect > Actual**.

Result:

A confirmation window appears.

7 Press **OK**.

Result:

The optical channel trail is disconnected.

END OF STEPS



Disconnect an optical link

Purpose Use the following procedure to disconnect an optical link.

Task Complete the following steps to disconnect an optical link.

1 From the Network Map, select an optical link (by selecting one of its end points).

2 Right click on the end point (a network element icon).

Result:

The Node menu appears.

3 Select **Assigned Ports List**.

Result:

The Assigned Ports List window appears.

4 From the listing, select the optical link. Make sure it is **In-Effect (IE)**.

Result:

The selection becomes highlighted.

5 Select **Actions > Graphical Layout**.

Result:

The Graphical Layout form appears.

6 Select **Actions > Disconnect > Actual**.

Result:

A confirmation window appears.

7 Press **OK**.

Result:

The optical link is disconnected.

END OF STEPS

Disconnect an optical multiplex section

Purpose Use the following procedure to disconnect an optical multiplex section (OMS).

Task Complete the following steps to disconnect an OMS.

1 From the Network Map, select an OMS (by selecting one of its end points).

2 Right click on the end point (a network element icon).

Result:

The Node menu appears.

3 Select **Assigned Ports List**.

Result:

The Assigned Ports List window appears.

4 From the listing, select the OMS. Make sure it is **In-Effect (IE)**.

Result:

The selection becomes highlighted.

5 Select **Actions > Graphical Layout**.

Result:

The Graphical Layout form appears.

6 Select **Actions > Disconnect > Actual**.

Result:

A confirmation window appears.

7 Press **OK**.

Result:

The OMS is disconnected.

END OF STEPS



Section IV: Optical Network Navigator

Overview

Purpose This section discusses the provisioning tasks associated with the Optical Network Navigator (ONN) Release 1.0. Note that ONN is a limited-availability feature with Navis™ Optical NMS Release 6.0.

Definition The ONN is the software and hardware present in the Lambda Router network element which performs management functions (e.g., configuration management and fault management) on optical connections across a network of Lambda Routers. The ONN system consists of a number of ONN Modules, each on a different Lambda Router.

Icons for ONN Navis™ Optical NMS uses a unique icon to identify that a Lambda Router has been associated to a signalling element. For additional information regarding what icons map to ONN, refer to the *Navis™ Optical NMS Getting Started Guide*.

Before you begin Refer to the individual tasks contained within this section for important 'Before You Begin' information. Note, however, that the ONN Domain will always be prepopulated (and uneditable) as there is only one ONN domain currently supported.

Important! When a Lambda Router associated with ONN is deleted from Navis™ Optical NMS, the system will also delete all associations and data shared between Navis™ Optical NMS and the ONN associated with the Lambda Router.

Additional information For additional information about ONN as they relate to Navis™ Optical NMS, refer to Chapter 4 of this guide.

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Establish a connection with ONN

Purpose Use this procedure to establish a connection between Navis™ Optical NMS and the ONN.

Before you begin Before following this procedure, refer to “Before You Begin” located at the beginning of this section for important information.

Task Complete the following task to establish a connection between Navis™ Optical NMS and the ONN.

- 1 On the Network Map, select **Configuration > ONN > Session Parameters > Add**.

Result:

The Add ONN Session Parameters form appears.

- 2 In the **NE ID** field, press the **Location** button.

Result:

The Selection box appears.

- 3 In the **Location** field, select a network element that is not yet associated with ONN.

Result:

The network element is highlighted.

- 4 Press **OK**.

Result:

The selected network element populates that NE ID field.

- 5 In the **Signalling ID** field, enter the IP address Navis™ Optical NMS can use with all connection requests associated with the ONN.

-
- 6 In the **ONN Session Parameters** field, enter a valid login (an alpha-numeric string up to eight characters) at the **Login** prompt.

.....

 - 7 Enter a valid password (an alpha-numeric string up to eight characters) at the **Password** prompt.

.....

 - 8 In the **IP Address** field, enter the IP address Navis™ Optical NMS can use to communicate with the ONN.

.....

 - 9 Press **OK**.

Result:

A connection between Navis™ Optical NMS and the ONN is established.

END OF STEPS



Start communication with ONN

Purpose Use this procedure to start communication with the ONN.

Before you begin Before following this procedure, refer to “Before You Begin” located at the beginning of this section for important information.

Task Complete the following task to start communication with the ONN.

- 1 From the Network Map, select a Lambda Router/ONN network element icon that is not communication with the ONN.

Result:

The selected network element becomes highlighted.

- 2 Right-click the network element.

Result:

The Node menu appears.

- 3 Select **Start/Stop ONN Communications**.

Result:

Communication is started, and the icon will specify the session status (UP).

END OF STEPS



Stop communication with ONN

Purpose Use this procedure to stop communication with the ONN.

Before you begin Before following this procedure, refer to “Before You Begin” located at the beginning of this section for important information.

Task Complete the following task to stop communication with the ONN.

- 1 From the Network Map, select a Lambda Router/ONN network element icon that is in communication with the ONN.

Result:

The selected network element becomes highlighted.

- 2 Right-click the network element.

Result:

The Node menu appears.

- 3 Select **Start/Stop ONN Communications**.

Result:

Communication is stopped, and the icon will specify the session status (DOWN).

END OF STEPS



Modify ONN session parameters

Purpose Use this procedure to modify the ONN session parameters of a network element that is DOWN so as to re-establish communication with the ONN.

Before you begin Before following this procedure, refer to “Before You Begin” located at the beginning of this section for important information.

Task Complete the following task to modify ONN session parameters so as to re-establish communication between a network element and the ONN.

- 1 From the Network Map, select a Lambda Router/ONN network element icon that is DOWN (out of communication).

Result:

The selected network element becomes highlighted.

- 2 Right-click the network element.

Result:

The Node menu appears.

- 3 Select **ONN Session > Display/Modify Session Parameters**.

Result:

The ONN Session Parameters form appears.

- 4 Select and edit a single editable field. Editable fields include: **IP Address, Signalling IP Address, Login, and Password**.

Result:

The edited field remains active.

- 5 Select **Actions > Update**.

Result:

The field is updated to include the edit.

-
- 6** Repeat Steps 4 and 5 to edit any additional fields.
-

- 7** Press **OK**.

Result:

The ONN session parameter is modified and communication is re-established.

END OF STEPS



View bandwidth allocation

Purpose Use this procedure to view the parameters and ports allocated for ONN from Navis™ Optical NMS (bandwidth allocation).

Before you begin Before following this procedure, refer to “Before You Begin” located at the beginning of this section for important information.

Task Complete the following task to view the bandwidth allocation associated with a circuit/trail or port. This procedure will focus on bandwidth allocation as it relates to ports.

- 1 From the Network Map, select **Configuration > ONN > Allocate Bandwidth**.

Result:

The Bandwidth Allocation Query Box appears.

- 2 From the **Ports** tab, press the **Node** button.

Result:

The Selection Box form appears.

- 3 Select a port.

Result:

The port becomes highlighted.

- 4 Press **OK**.

Result:

The **Node** field contains the selected port.

- 5 Press **OK**.

Result:

The Bandwidth Allocation window appears listing the ONN parameters previously set.

END OF STEPS



Edit bandwidth allocation

Purpose Use this procedure to edit the Bandwidth Allocation window.

Before you begin Before following this procedure, refer to “Before You Begin” located at the beginning of this section for important information.

Task Complete the following task to modify the Bandwidth Allocation window. This procedure will focus on the Bandwidth Allocation window as it relates to ports.

- 1 From the Network Map, select **Configuration > ONN > Allocate Bandwidth**.

Result:

The Bandwidth Allocation Query Box appears.

- 2 From the **Ports** tab, press the **Node** button.

Result:

The Selection Box form appears.

- 3 Select a port.

Result:

The port becomes highlighted.

- 4 Press **OK**.

Result:

The **Node** field contains the selected port.

- 5 Press **OK**.

Result:

The Bandwidth Allocation window appears listing the ONN parameters previously set.

-
- 6** Select and edit a single editable field.

Result:

The edited field remains active.

- 7** Select **Actions > Update**.

Result:

The field is updated to include the edit.

- 8** Repeat Steps 6 and 7 to edit any additional fields.
-

- 9** Press **OK**.

Result:

The Bandwidth Allocation window is modified.

END OF STEPS



Section V: Subnets

Overview

- Purpose** This section describes the provisioning tasks associated with subnets.
- Definition** Subnets are defined as devices on a network that shares a common address component. For example, all devices with IP addresses that start with 100.100.100. could be part of the same subnet. Dividing a network into subnets is useful for both security and performance reasons.
- Navis™ Optical NMS subnet support allows users to create rings on the Network Map. In terms of the Navis™ Optical NMS, a ring is defined as when three or more network elements are connected to form a closed loop. Messages travel around the ring, with each network element reading those messages addressed to it.
- An advantage of ring networks is that they can span larger distances than other types of networks, such as bus networks, because each network element regenerates messages as they pass through it. Another advantage is that one half of the ring's channels can be defined as working (carrying data) while the other half can be defined as protection.
- Creating subnets** Navis™ Optical NMS allows users to create subnets either automatically or manually. The Navis™ Optical NMS Network Map provides features so that users can automatically create subnets (the tasks contained within this section describe this). Users can, however, manually create subnets on the Network Map by forming enclosed 'rings' using connected network elements and digital links. Refer to Chapter 4 for details about subnets and rings.
- Supported subnets** Refer to Chapter 4 of this guide for descriptions of the subnets supported by Navis™ Optical NMS.
- Before you begin** Refer to the individual tasks contained within this section for important 'Before You Begin' information.

Additional information For additional information about subnets as they relate to Navis™ Optical NMS, refer to Chapter 4 of this guide.

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Add a subnet

Purpose Use this task to add a subnet to Navis™ Optical NMS.

Manual task Perform the following steps to manually create a subnet. This task assumes that the desired number of network elements and digital links already exist.

- 1 From the Network Map, select **Configuration > Subnet > Add > (select either PSR or LSR depending upon the desired rate) > (select a rate)**. The rate you select must be compatible with the network elements and digital links you are planning to create the subnet with.

Result:

The Subnet Manual Creation form appears.

- 2 From the Network Map, select a digital link you wish to add to the subnet.

Result:

The **A** and **Z** fields within the Subnet Manual Creation form become populated with the digital link information.

- 3 From the Subnet Manual Creation form, select the digital link.

Result:

Selection becomes highlighted and the arrow icon becomes enabled.

- 4 Press the arrow icon to move the digital link to the Subnet Designation sub-window.

Result:

The sub-window's fields become populated with the digital link information. The digital link on the Network Map becomes thicker to signify the creation of a piece of the subnet.

-
- 5** Repeat Steps 2 through 4 until you form an enclosure using digital links and network elements.
-

- 6** Press **OK**.

Result:

The subnet is created.

END OF STEPS



Name a subnet

Purpose Use this procedure to name an existing subnet.

Task Complete the following task to name a subnet. This task assumes that a subnet has already been created.

- 1 From the Network Map, select **Configuration > Subnet > Display/Modify**.

Result:

The Subnet Display List form appears.

- 2 In the **Subnet IDs** column, select a subnet.

Result:

The selection is highlighted, and the **Actions** menu item becomes enabled.

- 3 Select **Actions > Modify Parameters**.

Result:

The Subnet window appears.

- 4 Enter a new subnet ID in the **Subnet ID** field. You must assign a unique ID.
-

- 5 Click **OK**.

Result:

A confirmation window is displayed informing you of the operation's success.

- 6 Select **File > Query Again**.

Result:

The Network Map displays the new subnet name.

END OF STEPS



Modify a subnet

Purpose Use this task to modify an existing subnet.

Task Perform the following steps to modify an existing subnet.

- 1 From the Network Map, select **Configuration > Subnet > Display/Modify**.

Result:

The Subnet Display List form appears.

- 2 In the **Subnet IDs** column, select a subnet.

Result:

The selection is highlighted, and the **Actions** menu item becomes enabled.

- 3 Select **Actions > Modify Parameters**.

Result:

The Subnet window appears.

- 4 Make the desired modifications to the subnet.
-

- 5 Click **OK**.

Result:

A confirmation window is displayed informing you of the operation's success.

- 6 Select **File > Query Again**.

Result:

The Network Map reflect any modifications made to the subnet.

END OF STEPS



Delete a subnet

Purpose Use this task to delete a subnet.

Task Perform the following steps to delete a subnet.

1 Select a digital link that is part of the subnet you wish to delete.

2 From the Network Map, select **Configuration > Digital Link > Disconnect**.

Result:

The Ckt/Trail Query Box is displayed.

3 In the **Order Number** field, enter the order number of the digital link.

4 Click **OK**.

Result:

A confirmation window appears.

5 Click **Yes**.

Result:

An action window appears.

6 Click **OK**.

Result:

The system disconnects the digital link if all validations are successful.

7 From the Network Map, select **File > Query Again**.

Result:

The digital link, that was part of the subnet, disappears from the Network Map and thus deletes the subnet because there is no longer an enclosed ring.

.....
E N D O F S T E P S



Section VI: Virtual Concatenation Groups

Overview

Purpose This section describes the provisioning tasks associated with virtual concatenation groups.

Definition Virtual concatenation is a standards compliant inverse multiplexing protocol which creates a virtual concatenated SDH entity (called VCn-Xv) which is transported by X VC-As across the SDH network. The VCn created are standards compliant VCns. Additional VCn's can be added to the VCn-Xv, however it will be service affecting.

Before you begin Refer to the individual tasks contained within this section for important 'Before You Begin' information.

Additional information For additional information about virtual concatenation groups as they relate to Navis™ Optical NMS, refer to Chapter 4 of this guide.

Contents

Add a virtual concatenation group	3-95
Modify a virtual concatenation group	3-97
Delete a virtual concatenation group	3-98



Add a virtual concatenation group

Purpose Use this task to add a virtual concatenation group (VCG) to Navis™ Optical NMS.

Task Perform the following steps to add a VCG to Navis™ Optical NMS.

- 1 From the Network Map, select **Configuration > Virtual Concatenation Group > Add**.

Result:

The Add VCgroup form appears.

- 2 in the **VCG Name** field, specify a VCG name (maximum of 83 alphanumeric characters).
-

- 3 Specify either **Single-Ended** or **Dual-Ended**.

Result:

If **Single-Ended** is selected, one set of the either A or Z fields will disappear.

- 4 Press the **A Location** button.

Result:

The Selection box appears.

- 5 Select a network element.
-

- 6 Press **OK**.

Result:

The A Location field contains the specified network element and the A Port button becomes active.

.....
7 Press the **A Port** button.

Result:

The Selection box appears.

.....
8 Select a port.

.....
9 Press **OK**.

Result:

The A Port field contains the specified network element.

.....
10 Repeat Steps 4 through 9 to specify the **Z location** and **Z Port**.

.....
11 Specify the options within the **VCG Capacity** panel.

.....
12 Specify the **Required Capacity**.

.....
13 Press **OK**.

Result:

The VCG is created.

END OF STEPS



Modify a virtual concatenation group

Purpose Use this task to modify an existing virtual concatenation group.

Task Perform the following steps to modify an existing virtual concatenation group.

- 1 From the Network Map, select **Configuration > Virtual Concatenation Group > Display/Modify**.

Result:

The VCgroup List form appears.

- 2 Select a VC group anme from the **VCG Name** field.

Result:

The selection is highlighted, and the **Actions** menu item becomes enabled.

- 3 Select **Actions > Graphical Layout**.

Result:

The VCgroup Graphical Layout form appears.

- 4 Select **Actions > Modify > Order Parameters**.

Result:

The Modify VCgroup form appears.

- 5 Perform edits on the applicable fields.
-

- 6 Press **OK**.

Result:

The VC group is modified.

END OF STEPS



Delete a virtual concatenation group

Purpose Use this task to delete an existing virtual concatenation group.

Task Perform the following steps to delete an existing virtual concatenation group.

- 1 From the Network Map, select **Configuration > Virtual Concatenation Group > Display/Modify**.

Result:

The VCgroup List form appears.

- 2 Select a VC group anme from the **VCG Name** field.

Result:

The selection is highlighted, and the **Actions** menu item becomes enabled.

- 3 Select **Actions > Delete**.

Result:

The VCgroup is deleted.

END OF STEPS



Section VII: Shared Risk Groups

Overview

Purpose This section discusses the provisioning tasks associated with shared risk groups.

Definition In order to provide physical separacy between a protected route and service route, Navis™ Optical NMS supports the association of shared risk groups to digital links. One or more shared risk groups can be associated with one digital link, or a number of digital links can be associated with one shared risk group.

All fibers, cables and conduits in a given shared risk group may not survive physical disaster. In order to design a network for maximum survivability, shared risk groups, which are used for working paths/circuits, must not be used for protection paths/circuits. In case of rings or linear protection, network designers must take care of physical separacy, because links and path are well defined.

Before you begin Before you attempt to create a shared risk group, consider the following items:

- A maximum of five shared risk groups can be associated with a single digital link.
- One shared risk group can be used by multiple digital links.
- A shared risk group identification can not exceed 83 alphanumeric characters.
- A shared risk group description can not exceed 32 alphanumeric characters.
- Shared risk groups are only applicable to digital links, optical links and OMSs.
- Users are not allowed to modify or delete a shared risk group ID when it is associated with a digital link, optical link, or OMS.

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Create a shared risk group ID

Purpose Use this procedure to create a shared risk group ID.

Before you begin Before following this procedure, refer to “Before You Begin” located at the beginning of this section for important information.

Task Complete the following task to create a shared risk group ID.

- 1 On the Network Map, select **Configuration > Shared Risk Group > Add**.

Result:

A window containing three fields appears.

- 2 In the **SRG Name** field, enter a unique name for the shared risk group.
-

- 3 In the **SRG ID** field, enter a unique identification for the shared risk group.
-

- 4 In the **Description** field, provide a description of the shared risk group so as to distinguish it from other existing shared risk groups.
-

- 5 Click **OK**.

Result:

The shared risk group ID is created.

END OF STEPS



Display a list of shared risk groups

Purpose Use this procedure to display a list of existing shared risk groups.

Before you begin Before following this procedure, refer to “Before You Begin” located at the beginning of this section for important information.

Task Complete the following task to display a list of existing shared risk groups.

- 1 From the Network Map, select **Configuration > Shared Risk Group > Display/Modify**.

Result:

The Shared Risk Group Display List Query Box appears.

- 2 In the **SRG ID** field, enter a trench identification (or enter * to list all shared risk groups).
-

- 3 Press **OK**.

Result:

The Shared Risk Group Display List form appears and displays a list of all the existing shared risk groups.

END OF STEPS



Display the shared risk groups associated with a digital link

Purpose Use this task to display the shared risk groups associated with a digital link.

Before you begin Before following this procedure, refer to “Before You Begin” located at the beginning of this section for important information.

Task Complete the following task to display the shared risk groups associated with a digital link.

- 1 From the Network Map, select **Configuration > Connection > Display > Circuit/Trail List**.

Result:

The Circuit/Trail Query Box window appears.

- 2 In the **Order Status** field, specify an order status.
-

- 3 In the **Ckt/Trail ID** field, select a rate.
-

- 4 Press **OK**.

Result:

The Circuit Trail List window appears.

- 5 From the list, select a circuit/trail identification.

Result:

The selected identification is highlighted.

- 6 Select **Actions > Shared Risk Group Associations/Display**.

Result:

A window appears showing all the shared risk groups associated with the digital link.

END OF STEPS



Display the digital links associated with a shared risk group

Purpose Use this task to display the digital links associated with a shared risk group.

Before you begin Before following this procedure, refer to “Before You Begin” located at the beginning of this section for important information.

Task Complete the following task to display the digital links associated with a shared risk group.

- 1 From the Network Map, select **Configuration > Shared Risk Group > Display/Modify**.

Result:

The Shared Risk Group Display Query Box appears.

- 2 In the **SRG ID** field, enter a shared risk group ID.
-

- 3 Press **OK**.

Result:

The Share Risk Group Display List form appears and lists the shared risk groups according to the query information that was specified.

- 4 From the list, select a shared risk group.

Result:

The selection is highlighted.

- 5 Select **Actions > Shared Risk Group-Links Associations List**.

Result:

The Shared Risk Group-Links Associations List form appears and displays all the digital links associated with the specified shared risk group.

END OF STEPS



Associate a shared risk group with a digital link

Purpose Perform the following procedure to associate a shared risk group with a digital link.

Before you begin Before following this procedure, refer to “Before You Begin” located at the beginning of this section for important information.

Task Complete the following task to associate a shared risk group with a digital link.

- 1 From the Network Map, select **Configuration > Connection > Display > Circuit/Trail List**.

Result:

The Circuit/Trail Query Box form appears.

- 2 In the **Order Status** field, specify an order status.
-

- 3 In the **Ckt/Trail ID** field, select a rate.
-

- 4 Press **OK**.

Result:

The Circuit/Trail List form appears.

- 5 From the list, select a circuit/trail identification.

Result:

The selected identification is highlighted.

- 6 Select **Actions > Shared Risk Group Associations/Display**.

Result:

A form appears displaying all the shared risk groups associated with the digital link.

Associate a shared risk group with a digital link

-
- 7 Using the window's arrow icons, associate a shared risk group with the digital link.
-

- 8 Select **Apply**.

Result:

The shared risk group is associated with the digital link.

END OF STEPS



Disassociate a shared risk group with a digital link

Purpose Perform the following procedure to disassociate a shared risk group with a digital link.

Before you begin Before following this procedure, refer to “Before You Begin” located at the beginning of this section for important information.

Task Complete the following task to disassociate a shared risk group with a digital link.

- 1 From the Network Map, select **Configuration > Connection > Display > Circuit/Trail List**.

Result:

The Circuit/Trail Query Box form appears.

- 2 In the **Order Status** field, specify an order status.
-

- 3 In the **Ckt/Trail ID** field, select a rate.
-

- 4 Press **OK**.

Result:

The Circuit/Trail List form appears.

- 5 From the list, select a circuit/trail identification.

Result:

The selected identification is highlighted.

- 6 Select **Actions > Shared Risk Group Associations/Display**.

Result:

A form appears displaying all the shared risk groups associated with the digital link.

-
- 7 Using the window's arrow icons, disassociate a shared risk group with the digital link.
-

- 8 Select **Apply**.

Result:

The digital link is disassociated with the shared risk group.

END OF STEPS

.....



Modify a shared risk group ID

Purpose Use this task to modify a shared risk group ID.

Task Complete the following task to modify a shared risk group ID.

- 1 From the Network Map, select **Configuration > Shared Risk Group > Display/Modify**.

Result:

The Shared Risk Group Display List Query Box form appears.

- 2 In the **SRG ID** field, enter an existing shared risk group identification. If you enter nothing, you will get a complete list of existing shared risk groups.
-

- 3 Press **OK**.

Result:

The Shared Risk Group Display List form appears and lists the shared risk groups according to the query information specified within the previous window.

- 4 In the **SRG ID** field, select a shared risk group.
-

- 5 Select **Actions > Update**.

Result:

A form appears.

- 6 In the **New SRG ID** and **New Description** fields, enter new information for the shared risk group.
-

- 7 Click **OK**.

Result:

The shared risk group ID is modified.

END OF STEPS

Delete a shared risk group ID

Purpose Use this procedure to delete a shared risk group ID.

Task Complete the following task to delete a shared risk group ID.

- 1 From the Network Map, select **Configuration > Shared Risk Group > Display/Modify**.

Result:

The Shared Risk Group Display List Query Box form appears.

- 2 In the **SRG ID** field, enter an existing shared risk group identification. If you enter nothing, you will get a complete list of existing shared risk groups.
-

- 3 Press **OK**.

Result:

The Shared Risk Group Display List form appears and lists the shared risk groups according to the query information specified within the previous window.

- 4 From the list, select a shared risk group.

Result:

The selection is highlighted.

- 5 Select **Actions > Delete**.
-

- 6 From the Network Map, select **File > Query Again**.

Result:

The shared risk group ID is deleted.

END OF STEPS



Section VIII: Preplan Restoration

Overview

Purpose This section describes the Navis™ Optical NMS provisioning tasks associated with preplan restoration.

Definition Restoration allows users to temporarily re-route traffic so as to restore service in the event of a network failure. Preplan restoration is one type of restoration provided by Navis™ Optical NMS that allows for a back-up circuit to be predefined for an existing in-service circuit. Navis™ Optical NMS stores a preplan in a database and accesses it whenever a failure occurs so as to restore the circuit.

Preplan restoration works best where:

- one portion of the service circuit is controlled by Navis™ Optical NMS while the other end is outside Navis™ Optical NMS control and on the end customer's premise;
- customers have mixed network elements in their network;
- restoration paths are “off-network” and must be defined by the customer;
- ring protection is not provided by the network element;
- there is a fiber cut between rings;
- more efficient usage of spare capacity is desired.

Before you begin Refer to the individual tasks contained within this section for important 'Before You Begin' information. Note that this tasks themselves are presented in the order in which they should occur. Failure to follow the order presented here could result in provisioning problems.

Additional information For additional information about preplan restoration as it relates to Navis™ Optical NMS, refer to Chapter 4 of this guide.

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Add a preplan circuit

Purpose Use this procedure to add a preplan circuit. If the service circuit fails, the associated preplan circuit can be invoked manually or automatically.

For a more detailed description of circuit provisioning, refer to Section II: Connections found within this chapter.

Task Complete the following task to create a preplan circuit that is reserved for one specific service circuit.

- 1 On the Network Map, select two network element icons.

Result:

The icons become highlighted.

- 2 On the Network Map, select **Configuration > Connection > (Desired Circuit Rate)**.

Result:

The Provision Profile form is displayed.

- 3 Under the Essentials tab, enter a circuit ID next to where the circuit rate is displayed.
-

- 4 Specify an **A port** and a **Z port**. Refer to Section II: Connections within this chapter for details on specifying a circuit's A port and Z port.
-

- 5 Under the Parameters tab, specify **Order Action** as **Pre-plan**.
-

- 6 Click **OK**.

Result:

A preplan circuit is created.

END OF STEPS



Assign a preplan circuit to a service circuit

Purpose Use this procedure to associate a preplan circuit with a service circuit. By assigning a preplan circuit to a service circuit, you create a preplan pair.

Before you begin Before you associate a preplan circuit with a service circuit, consider the following items:

- The service circuit being protected must be in-effect (IE).
- The preplan circuit must be in the pending state (CPL).

Task Complete the following task to associate a preplan circuit with a service circuit.

- 1 From the Network Map, select **Configuration > Preplan Restore Management > Preplan Pairs > Add**.

Result:

The Preplan Pairs Add form appears.

- 2 In the **Service Circuit ID** field, enter the service circuit ID.

- 3 In the **Preplan Circuit ID** field, enter the preplan circuit ID.

- 4 In the **Preference** field, enter a preference (from 1-99 with 99 as the highest preference).

- 5 In the **Priority** field, enter a priority (from 1-10 with a default value of 5).

- 6 Press **Apply**.

Result:

An association between the service circuit and the preplan circuit is created. The preplan circuit now protects the service circuit.

END OF STEPS



Create a preplan plan

Purpose Use this procedure to create a preplan plan. A preplan plan must be created before you can assign preplan pairs to it.

Task Complete the following task to create a preplan plan.

- 1 From the Network Map, select **Configuration > Preplan Restore Management > Preplan Plan > Add**.

Result:

A window appears.

- 2 In the **Preplan ID** field, enter a preplan ID.
-

- 3 Press **OK**.

Result:

The preplan plan is created. A message appears indicating the success or failure of the task.

END OF STEPS



Assign a preplan pair to a preplan plan

Purpose Use this procedure to assign a preplan pair to a preplan plan. A preplan circuit can not be assigned to a preplan plan by itself. It has to be associated with a service circuit first (becoming a preplan pair), before it can be assigned to a preplan plan.

Before you begin Before you assign a preplan pair to a preplan plan, the following conditions must be met:

- The service circuit being protected must be in-effect (IE).
- The preplan circuit must be in a pending state (CPL).
- The preplan pairs must already exist.
- A preplan plan can contain a maximum of 500 service/preplan circuit pairs.

Task Complete the following task to assign a preplan pair to a preplan plan. Note: you can also assign a preplan pair to a preplan plan through the Preplan Pairs form.

1 Create a preplan plan.

2 Create a preplan pair by assigning a preplan circuit to a service circuit.

3 Select **Configuration > Preplan Restore Management > Preplan Pairs > Add**.

Result:

The Preplan Plan Pairs Add form appears.

4 Select a preplan pair.

Result:

The selection becomes highlighted.

5 Select **Link to Plan**.

Result:

The **Plan ID** field becomes active.

-
- 6** Within the **Plan ID** field, enter a plan ID.
-

- 7** Press **Apply**.

Result:

The preplan pair is assigned to the preplan plan. A message appears indicating the success or failure of the task.

END OF STEPS



Create a preplan group

Purpose Use this procedure to add a preplan group. A preplan group must be created before you can assign preplan plans to it.

Task Complete the following task to add a preplan group.

- 1 From the Network Map, select **Configuration > Preplan Restore Management > Preplan Group > Add**.

Result:

A window appears.

- 2 In the **Preplan ID** field, enter an ID for the preplan group.
-

- 3 Press **OK**.

Result:

The preplan group is created. A message appears indicating the success or failure of the task.

END OF STEPS



Assign a preplan plan to a preplan group

Purpose Use this procedure to assign a preplan plan to a preplan group.

Before you begin Before you assign a preplan plan to a preplan group, the following conditions must be met:

- The service circuit being protected must be in-effect (IE) state.
- The preplan facility must be in a pending state (CPL).
- The preplan plan must already exist.
- A preplan group can contain a maximum of 500 preplan plan identifications.

Task Complete the following task to assign a preplan plan to a preplan group.

1 Create a preplan plan.

2 From the Network Map, select **Configuration > Preplan Restore Management > Preplan Plan > Display/Modify**.

Result:

The Preplan Query Box form appears.

3 Press **OK**.

Result:

The Preplan Plan form appears.

4 Select a preplan plan.

5 Select **Actions > Link Plan to Group**.

Result:

The Link Plan to Group form appears.

6 For **Group ID**, enter a valid preplan group ID.

7 Press **OK**.

Result:

The preplan plan is assigned to the preplan group.

END OF STEPS



Restore a service circuit with a preplan circuit

Purpose Use this procedure to restore service with a preplan circuit.

Task Complete the following task to restore service with a preplan circuit.

- 1 From the Network Map, select **Configuration > Preplan Restore Management > (select any one of the three preplan types) > Display/Modify**.

Result:

A preplan form appears.

- 2 Select a preplan.
-

- 3 Select **Actions > Reinstate**.

Result:

A query window appears.

- 4 Select **Yes**.

Result:

The Preplan Parameters form appears.

- 5 If desired, specify a value for **Reinstatement** and **Preemption**.
-

- 6 Press **OK**.

Result:

The preplan circuit restores the service circuit it is associated with.

END OF STEPS



Reinstate a preplan pair

Purpose Use this procedure to reinstate a preplan pair.

Task Complete the following task to reinstate a preplan pair.

- 1 From the Network Map, select **Configuration > Preplan Restore Management > Preplan Pairs > Display/Modify**.

Result:

A preplan form appears.

- 2 Select a preplan pair.
-

- 3 Select **Actions > Reinstate**.

Result:

A query window appears.

- 4 Select **Yes**.

Result:

The Preplan Parameters form appears.

- 5 If desired, specify a value for **Reinstatement** and **Preemption**.
-

- 6 Press **OK**.

Result:

The preplan pair is reinstated.

END OF STEPS



Disassociate a preplan circuit from a service circuit

Purpose Use this procedure to disassociate a preplan circuit from a service circuit. You must perform this procedure before you can delete a preplan pair, preplan plan, or preplan group.

Before you begin Before you disassociate a preplan circuit from a service circuit, the following conditions must be met:

- The service circuit being protected must be in-effect (IE).
- The preplan circuit must be in the pending state (CPL).
- The preplan circuit is associated with a service circuit.

Task Complete this task to disassociate a preplan circuit from a service circuit.

- 1 Select **Configuration > Preplan Restore Management > Preplan Pairs > Display/Modify**.

Result:

The Preplan Pairs query box is displayed.

- 2 Select a preplan pair.
-

- 3 Select **Actions > Delete**.

Result:

A confirmation window appears.

- 4 Confirm the confirmation window.

Result:

The preplan pair is dissociated from the service circuit.

END OF STEPS



Cancel a preplan circuit order

Purpose Use this procedure to cancel a preplan circuit order.

Before you begin Before you cancel a preplan circuit order, consider the following item:

- The preplan cannot be associated with any service paths.

Task Complete the following task to cancel a preplan circuit order.

1 From the Network Map, select a service circuit with a preplan associated with it.

2 Right click on either network element icon associated with the circuit.

Result:

The node menu appears.

3 Select **Assigned Port List**.

Result:

The Assigned Port List window appears.

4 Press **OK**.

Result:

A window appears.

5 Select a preplan.

6 Select **Actions > Cancel Order**.

Result:

The preplan circuit order is cancelled.

END OF STEPS



Unlink a preplan pair from a preplan plan

Purpose Use this procedure to unlink a preplan pair from a preplan plan.

Task Perform the following steps to unlink a preplan pair from a preplan plan.

- 1 From the Network Map, select **Configuration > Preplan Restore Management > Preplan Pair > Display/Modify**.

Result:

The Preplan Pairs form appears.

- 2 Select a preplan pair.
-

- 3 Select **Actions > Unlink Pair from Plan**.

Result:

A window appears.

- 4 For **Plan ID**, enter the preplan plan ID.
-

- 5 Press **OK**.

Result:

A confirmation window appears.

- 6 Confirm the confirmation.

Result:

The preplan pair is unlinked from the preplan plan.

END OF STEPS



Unlink a preplan plan from a preplan group

Purpose Use this procedure to unlink a preplan plan from a preplan group.

Task Perform the following steps to unlink a preplan plan from a preplan group.

1 Ensure that there are no preplan pairs linked to the preplan plan.

2 From the Network Map, select **Configuration > Preplan Restore Management > Preplan Plan > Display/Modify**.

Result:

The Preplan Plan form appears.

3 Select a preplan plan.

4 Select **Actions > Unlink Plan from Group**.

Result:

A window appears.

5 For **Group ID**, enter the preplan group ID.

6 Press **OK**.

Result:

A confirmation window appears.

7 Confirm the confirmation.

Result:

The preplan plan is unlinked from the preplan group.

END OF STEPS



Delete a preplan plan

Purpose Use this procedure to delete a preplan plan.

Before you begin Before you delete a preplan plan, consider the following item:

- The preplan circuits included in the preplan plan cannot be associated with any service paths.

Task Complete the following task to delete a preplan plan.

1 Ensure that any preplan pairs are unlinked from the preplan plan.

2 Select **Configuration > Preplan Restore Management > Preplan Plan > Display/Modify**

Result:

The Preplan Plan query box is displayed.

3 Select a preplan plan.

4 Select **Actions > Delete**.

5 Click **OK**.

Result:

The preplan plan is deleted.

END OF STEPS



Delete a preplan group

Purpose Use this procedure to delete a preplan group.

Before you begin Before you delete a preplan group, consider the following item:

- The preplan circuit included in the preplan group cannot be associated with any service paths.

Task Complete the following task to delete a preplan group.

1 Ensure that there are no preplan plans associated with the preplan group.

2 Select **Configuration > Preplan Restore Management > Preplan Plan Group > Display/Modify**.

Result:

The Preplan Group query box is displayed.

3 Select a preplan group.

4 Select **Actions > Delete**.

5 Click **OK**.

Result:

The preplan group is deleted.

END OF STEPS





4 Provisioning Concepts

Overview

Purpose This chapter provides conceptual material related to network elements, digital links, connections, optical layers, subnets, and preplan restoration with Navis™ Optical NMS. This information is meant to compliment and provide detail for the task-related provisioning information presented in the previous chapters.

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Section I: Network Elements

Overview

Purpose This section provides conceptual information regarding the network elements supported by Navis™ Optical NMS. Navis™ Optical NMS supports two types of network elements: controlled and noncontrolled.

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Controlled network elements

Definition Controlled network elements are network elements that can be controlled by Navis™ Optical NMS.

Characteristics Controlled network elements have the following characteristics:

- They are displayed on the Network Maps as nodes (physical locations) interconnected by digital links. A unique icon represents each network element type.
- They are in constant communication with their EMS.
- They are controlled by commands sent from the EMS. (The EMS receives and processes the responses from the controllable network element.)
- They report and show alarms.

Control techniques Controlled network elements may be controlled:

- Directly, by ITM-XM
- Indirectly, through the ITM-SC or Navis™ Optical EMS.

Controlled Navis™ Optical NMS network elements The Navis™ Optical NMS products listed within the following table are controllable network elements.

Table 4-1 Controlled network elements supported by Navis™ Optical NMS

Network Element	Navis™ Optical NMS Model
ISM-1 Terminal Multiplexer	ISM1TERM
ISM-1 Add-Drop Multiplexer	ISM1RDI
ISM-1 Regenerator	ISM1REGEN
ISM-4 Terminal Multiplexer	ISM4TERM
ISM-4 Add-Drop Multiplexer	ISM4RDI
ISM-4 Regenerators	ISM4REGEN
ISM-5E Terminal Multiplexer	ISM5ETERM
SLM-4 (0:1) Terminal Multiplexer	SLM40xN
SLM-4 (1+1) Multiplexer	SLM41+1
SLM-4 Multiplexer	SLM4RDI
SLM4 Regenerator	SLM4REGEN

Table 4-1 Controlled network elements supported by Navis™ Optical NMS (continued)

SLM-4 Terminal Multiplexer	SLM4TERM
SLM-16 (0:N) Terminal Multiplexer	SLM160xN
SLM-16 (1+1) Terminal Multiplexer	SLM161+1
SLM-16 Add-Drop Multiplexer	SLM16RDI
SLM-16 Regenerator	SLM16REGEN
NERA Radio Terminal	NERATERM
NERA Regenerator	NERAREGEN
NERA CityLink Radio	CITY_LINK1_REGEN
ADM-155c Add-Drop Multiplexer	155C4 (4 slot model) 155C6 (6 slot model)
ADM-155E Add-Drop Multiplexer	155E
ADM 4/1 (with STM-1 line card)	WS4/1STM1
ADM 4/1 (with STM-4 line card)	WS4/1STM4
ADM 4/1 Regenerator (STM-4 line card)	WS4/1STM4R
PHASE TM4/4 Terminal	TM4/4
PHASE TM 16/4 Terminal	TM16/4
PHASE ADM 4/4 Add-Drop Multiplexer	ADM4/4
PHASE ADM 16/4 Add-Drop Multiplexer	ADM16/4
PHASE LXC 4/1	LXC4/1
PHASE LXC-16/1	LXC16/1
PHASE STM-4 REGENERATOR	LR4REGEN
PHASE STM-16 REGENERATOR	LR16REGEN
Physical Link Details from Xpercom, with models:	ODF, LGX, DDF, DSX, and NIE
WaveStar ADM 16/1 (non MSSPRING)	WS16/1
WaveStar ADM 16/1c (non MSSPRING)	WS16/1c
WaveStar ADM 16/1 (MSSPRING)	WS16/1MSSP
WaveStar ADM 16/1c (MSSPRING)	WS16/1cMSSP
DACS VI	DACSVI
WaveStar DACS R2.0	WAVESTARDACS
WaveStar DACS R2.1 & R3.0	WSDACS
WaveStar TM-1	WS_TM1

Table 4-1 Controlled network elements supported by Navis™ Optical NMS (continued)

WaveStar AM-1 (with STM-1 line card)	WS_AM1STM1
WaveStar AM1Plus (with 2 STM-1 line ports) R1.0,1.1,& 2.0	WS_AM1PLUS_STM1
WaveStar AM1Plus (with 2 STM-4 line ports) R1.0,1.1,& 2.0	WS_AM1PLUS_STM4
WaveStar AM1Plus (with 1 STM-1 line port) R1.0,1.1,& 2.0	WS_AM1PLUS_STM1_T
EON Single Ended DWDM EON Dual Facing DWDM * up to and including Release 6.0; controlled by SC.	WS_OLS80G_SE WS_OLS80G_DF
EON Repeater * up to and including Release 6.0; controlled by SC.	WS_OLS80G_REPEATER
EON Single Ended DWDM * Release 8.0; controlled by SNMS. Node types include: 1A-TX, 1A-TX-THRU, 1A-RCV, 1A-RCV-THRU, 1A-TX-32, 1A-TX-THRU-32, 1A-RCV-32, 1A-RCV-THRU-32.	EON_SE
EON Dual Facing DWDM * Release 8.0; controlled by SNMS. Node types include: DUAL	EON_DF
EON Repeater * Release 8.0; controlled by SNMS. Node types include: Repeater	EON_RPTR
WaveStar OLS80G Single Ended DWDM WaveStar OLS80G Dual Facing DWDM (up to and incl Rls 6.0, controlled via SC.)	WS_OLS80G_SE WS_OLS80G_DF
WaveStar OLS80G Repeater (up to and incl Rls 6.0, controlled via SC.)	WS_OLS80GREPEATER
WaveStar TDM 10G	WS_TDM10G
Lambda Router All Optical Switch (AOS) 256 Release 1.0	LAMBDA_ROUTER
Lambda Router AOS 256 Release 2.0	LAMBDA_ROUTER_256
Lambda Router AOS 128 Release 2.0	LAMBDA_ROUTER_128
WaveStar Bandwidth Manager	BWM
LambdaUnite™ MultiService Switch (MSS) R2.1	LAMBDA_UNITE

Adding controlled network elements to Navis™ Optical NMS

After a database synchronization with the EMS (ITM-SC, SNMS or non-Lucent EMS), Navis™ Optical NMS will automatically add all the network elements managed by the EMS to the Network Map and store them in the database. Navis™ Optical NMS allows the user, with appropriate privileges, to add a new network element from the Configuration menu item of the Network Map. Refer to Chapter 2 for details on adding network elements to the Navis™ Optical NMS Network Map.

Icons for controlled network elements

Controlled network elements managed by Navis™ Optical NMS appear as icons on the Network Map. A legend showing all the icons and their respective models of network elements is available from the Network Map when requested by the user. For additional information regarding what controlled network elements map to which icon, refer to the *Navis™ Optical NMS Getting Started Guide*.

LambdaUNITE™ MSS support

The LambdaUnite MultiService Switching (MSS) network element is a flexible single product covering 40G (from R1.1) and 10G SDH/SONET-based network elements. The product supports terminal multiplexers (TM), add-drop-multiplexer (ADM) and local cross connect (LXC) configurations on all line rates within the same common subrack and software load.

Each physical port can be set in one of three different modes: AUTO (automatic), MON (monitored) or NMON (non-monitored). In NMON mode, all alarms that originate in the physical section termination function are suppressed while in the MON mode they are reported. In the AUTO mode, alarms are suppressed until an incoming signal is detected, the mode of the port switches automatically to MON. Each path termination port can be either MON or NMON.

For Navis™ Optical NMS, the supported LambdaUnite MSS features include: STM-16, STM-64, STM-4, and STM-1 in various type of transmission protection 2F-MSSPRING, 4F-MSSPRING (including span protection), SNC/I, SNC/N, and 1+1 MSP.

Navis™ Optical NMS supports 1Gb Ethernet interface units (point to point LAN bridge) with direct SDH packet mapping (carried over a SDH WAN port) using VC4 unidirectional or bidirectional virtual concatenation: VC4-Kv where K=1 up to 7 in steps of 1 are supported.

LambdaUnite MSS supports the technique of Link Capacity Adjustment System (LCAS), previously known as Variable Bandwidth

Allocation (VBA), for GigaBit Ethernet transport. The LCAS is supported which allows manual in-service dynamic sizing of bandwidth in a VC4-Xv link.

LambdaUnite MSS supports unidirectional and bidirectional cross-connections for HO (high order) VC-3 (AU3), VC-4, VC4-4c, VC4-16c and VC4-64c. It supports bridging and facility rolling for each of the supported cross-connection rates. It also support broadcast option 1:2 unidirectional cross-connection.

LambdaUnite MSS will support 2F-MSSPRING (STM-64 and STM-16), 4F-MSSPRING (STM-64 and STM-16), 4F-MSSPRING Transoceanic Protocols (STM-64 only) and MSSPRING Preemptible Protection Access (STM-n where n=1,4,16,or 64). Non Preemptible Unprotected Traffic (NUT) is not supported by NMS.

Navis™ Optical NMS supports LambdaUnite MSS with 1+1 MSP for STM-n (n=1, 4, 16, or 64) rates but will not support 1:1 MSP Preemptible Protection Access. Two types of SNCP (SNC/I and SNC/N) on all supported cross-connect will be supported. It will also support following combination of protection scheme: MSSPRING with MSSPRING, MSSPRING with 1+1 MSP, 1+1 MSP with 1+1 MSP, SNCP with 1+1 MSP and SNCP with SNCP.

Additional information

For additional information about controlled network elements, refer to the *Navis™ Optical NMS Applications and Planning Guide* .



Noncontrolled network elements

Definition Noncontrolled network elements are network elements that cannot be controlled by Navis™ Optical NMS.

Characteristics Noncontrolled network elements share the following characteristics:

- They support only manual provisioning
- They do not report alarms
- They are listed in the database as part of provisioning records

Noncontrolled Navis™ Optical NMS network elements The following Navis™ Optical NMS products are noncontrollable network elements:

Table 4-2 Noncontrolled network elements supported by Navis™ Optical NMS

Network Element	Navis™ Optical NMS Model
Black Box	BBOX
Customer Equipment	EQPT
Gray Box	LCT-GB TN-1C-GB TN-4XE-GB TN-16X-GB TDAX-GB

Adding noncontrolled network elements to Navis™ Optical NMS The same information that applies to controlled network element applies to noncontrolled network elements.

Icons for noncontrolled network elements Noncontrolled network elements managed by Navis™ Optical NMS appear as icons on the Network Map. A legend showing all the icons and their respective models of network elements is available from the Network Map when requested by the user. For additional information regarding what noncontrolled network elements map to which icon, refer to the *Navis™ Optical NMS Getting Started Guide* .

Gray box support A Gray Box, similar to a Black Box, is a network element not actively managed by Navis™ Optical NMS, in the sense that no commands/responses/notifications are exchanged between the two. In the case of a Gray Box, however, Navis™ Optical NMS will retain enough information about the network element, including logical ports, to allow it to provide channel terminations for the physical ports. Consequently, Navis™ Optical NMS can support Gray Boxes in all configurations that are supported for managed network elements.

Navis™ Optical NMS supports the following Gray Box models:

- LCT-GB
- TN-1C-GB
- TN-4XE-GB
- TN-16X-GB
- TDAX-GB

The model types: TN-1C-GB, TN-4XE-GB and TN-16X-GB are the same network element types as the Nortel TN-1C, TN-4XE and TN-16X, respectively, except that the latter are managed by Navis™ Optical NMS, whereas Navis™ Optical NMS does not send commands to or receive notifications from the Gray Boxes. In addition to the above network element types, Navis™ Optical NMS will support as a Gray Box the following two Nortel network elements, if the interface to the Nortel EMS is not ready: TN-64X-GB (TN-64X will be the corresponding managed network element model) and OTP_DX-GB (OTP_DX will be the corresponding managed network element model)

The following table contains the physical port rates supported per gray box.

Table 4-3 Physical port rates supported per gray box

Gray Box	E1	E3	E4	DS1	DS3	STM-1	STM-4	STM-16	STM-64
LCT-GB	—	—	—	—	—	Y	Y	Y	—
TN-1C-GB	Y	Y	—	—	Y	Y	—	—	—
TN-4XE-GB	Y	Y	Y	—	Y	Y	Y	—	—
TN-16X-GB	—	—	Y	—	—	Y	Y	Y	—
TN-64X-GB	—	—	—	—	—	Y	Y	Y	Y
OTP_ DX-GB	—	—	—	—	—	Y	Y	Y	Y

Table 4-3 Physical port rates supported per gray box (continued)

TDAX-GB	Y	Y	—	Y	Y	Y	Y	—	—
---------	---	---	---	---	---	---	---	---	---

Additional information For additional information about noncontrolled network elements, refer to the *Navis™ Optical NMS Applications and Planning Guide* .



Section II: Digital Links

Overview

Purpose This section provides conceptual information pertaining to the digital links supported by Navis™ Optical NMS.

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Digital link support

Overview This section provides an overview of digital links and the support provided by Navis™ Optical NMS.

Definition Digital Links are transport facilities that are assignable to high order and low order digital links to carry customer services. In Navis™ Optical NMS, digital links are always modelled as bidirectional links that carry two way traffic.

Types of digital links Digital Links are of two types - SDH and PDH. SDH digital links are synonymous with multiplexer sections that connect two SDH network elements or black boxes/equipment. In Navis™ Optical NMS, the regenerator sections within the multiplexer section layer are not explicitly provisioned; however, Navis™ Optical NMS can add regenerators to the digital links and monitor alarms at regenerator sections.

PDH digital links are physical links that connect two PDH ports of SDH network elements or black boxes/equipment. Except for ethernet interface (e.g. LAN8/TransLAN), all digital links are channelized in Navis™ Optical NMS so as to be assigned to carry SDH trails or PDH circuits.

Protection Digital links can be unprotected or protected. When protected by another link, it is called multiplex section protection (MSP). The MSP protection can be of two types - 1+1 or 1x1.

When MSP is 1+1, the protection link is totally dedicated to the working (service) link and cannot carry preemptible extra traffic.

When MSP is 1x1, the protection link serves as a protection to the working (service) link but can be configured to carry extra traffic that is preemptible when the traffic in the working link gets switched.

Supported digital links

The following table presents the digital links supported by each network element supported by Navis™ Optical NMS.

NE	STM64	STM16	STM4	STM1	STM0	2.5GB	E4	E3	E1	DS3	DS1	LAN [®] (a.k.a. TransLAN)	E_LINK ^d	X21	PCT
ADM155E	-	-	-	Y	-	-	-	Y	Y	Y	-	-	-	-	-
WS ADM4/1STM-1	-	-	-	Y	-	-	-	Y	Y	Y	-	-	-	-	-
WS ADM4/1STM4	-	-	Y	Y	-	-	-	Y	Y	Y	-	-	-	-	-
WS ADM16/1	-	Y	Y	Y	-	-	Y	Y	Y	Y	Y	Y	Y	-	-
WS ADM 16/1 Compact	-	Y	Y	Y	-	-	-	Y	Y	Y	-	-	-	Y	-
WS AM1	-	-	-	Y	-	-	-	Y	Y	Y	-	Y	Y	Y [†]	-
WS AM1 PLUS - STM1	-	-	-	Y	-	-	-	Y	Y	Y	Y	Y	-	Y	Y ^c
WS AM1 PLUS - STM4	-	-	Y	Y	-	-	-	Y	Y	Y	Y	-	-	Y	Y ^c
WS TM1	-	-	-	Y	-	-	-	-	Y	-	-	-	-	-	-
WS BWM	Y	Y	Y	Y	-	-	-	-	-	-	Y	-	-	Y	-
WS TDM10G	Y	Y	Y	Y	-	-	-	-	-	-	-	-	-	Y	-
WSDACS (via SC)	-	Y	Y	Y	-	-	-	-	-	-	-	-	-	-	-
WaveStarDACS (via XM)	-	-	-	Y	Y	-	-	-	-	-	-	-	-	-	-
DACS VI (R2.1)	-	-	-	Y	Y	-	Y	Y	Y	-	-	-	-	-	-
Black Box/EQPT	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
LCT	-	Y	Y	Y	-	-	-	-	-	-	-	-	-	-	-
ISM-1	-	-	-	Y	-	-	-	Y	Y	-	-	-	-	-	-
ISM-4	-	-	Y	Y	-	-	Y	Y	Y	-	-	-	-	-	-
ISM-5E	-	-	-	Y	-	-	-	-	-	-	-	-	-	-	Y
SLM-16	-	Y	-	Y	-	-	Y	-	-	-	-	-	-	-	-
SLM-4	-	-	Y	Y	-	-	Y	-	-	-	-	-	-	-	-
PHASE ADM-16/4	-	Y	Y	Y	-	-	Y	Y	Y	Y	-	-	-	-	-
PHASE ADM-4/4	-	-	Y	Y	-	-	Y	Y	Y	Y	-	-	-	-	-
PHASE LXC-16/1	-	Y	Y	Y	-	-	Y	Y	Y	Y	-	-	-	-	-
PHASE LXC-4/1	-	-	Y	Y	-	-	Y	Y	Y	Y	-	-	-	-	-
PHASE TM-16/4	-	Y	Y	Y	-	-	Y	Y	Y	Y	-	-	-	-	-
PHASE TM-4/4	-	-	Y	Y	-	-	Y	Y	Y	Y	-	-	-	-	-
NERA Term.	-	-	-	Y	-	-	-	-	-	-	-	-	-	-	-
BOSCH	-	-	-	Y	-	-	Y	Y	Y	-	-	-	-	-	-
NEC ADM16	-	-	-	-	-	Y	-	-	-	-	-	-	-	-	-
Nortel NEs	-	Y	Y	Y	-	-	Y	Y	Y	Y	-	-	-	-	-
CityLink (a.k.a. NERA Radio)	-	-	-	Y	-	-	-	-	-	-	-	-	-	-	-
FLAG NEs via UNME	-	-	-	Y	-	-	Y	-	-	Y	-	-	-	-	-
LambdaUnit ^e MSS ^{***}	Y	Y	Y [*]	Y [*]	-	-	-	-	-	-	-	-	Y	-	-

With this table, note the following items:

- A LAN8 digital link between an ADM16/1 or AM1 network element with a LAN card is not allowed. The only LAN8 digital link supported is between a controlled network element and a black box.
- Back-to-back X.21 digital links are not supported. The only X.21 digital link supported is between a AM1 and a Black Box.
- Back-to-back X.21 digital links are not supported. The only X.21 digital link supported is between a AM1 plus and a Black Box.
- E_LINK includes Gb Ethernet and TransLAN+ [14]. Back-to-back E_LINK digital links are not supported. The only E_LINK digital link supported is between a supported NE and a Black Box .

Supported digital transmission rates

This section presents the digital transmission rates of the digital links supported by Navis™ Optical NMS. For information about the digital transmission rates of the connections supported Navis™ Optical NMS, refer to Section III: Connections.

The following table presents the digital transmission rates supported by Navis™ Optical NMS.

Table 4-4 Supported digital transmission rates for digital links

Designation	Description	Facility Type	Transmission Rate Mb/s	Notes
STM-64	Digital Link	64S(10,000LN)	9,953.28	
STM-16	Digital Link	16S (2500LN)	2,488.32	
STM-4	Digital Link	4S (620LN)	622.0	
STM-1	Digital Link	1S (155LN)	155.52	
STM-0	Digital Link	0S (52LN)	51.84	
CEPT-4	Digital Link	E4 (140LN)	139.264	
CEPT-3	Digital Link	E3 (34LN)	34.368	
CEPT-1	Digital Link	E1 (2LN)	2.048	
DS3	Digital Link	45LN	44.736	
DS1	Digital Link	1.6LN	1.544	
LAN8	Digital Link		up to 4 VC-12s	AM 1, ADM 16/1 only

Table 4-4 Supported digital transmission rates for digital links (continued)

Designation	Description	Facility Type	Transmission Rate Mb/s	Notes
LSBB			45 Mb/s to 750 Mb/s	OLS
HSBB			100 Mb/s to 2.5 Gb/s	OLS
X.21	Digital Link		2 Mb/s	AM 1, Black Boxes only



Channel support

Overview This section provides an overview of the support provided by Navis™ Optical NMS for channels.

Definition For time division multiplexing (TDM) equipment, channels represent the time slots with which information is carried within a digital link or in a server trail. Channels are created by Navis™ Optical NMS for use during circuit/trail provisioning. When creating channels for digital links, depending on the network element capability, alternate channels, to accommodate the provisioning of different rates of circuits/trails, are created.

Channel termination records Depending on the type of digital link and the terminating network element type, Navis™ Optical NMS creates channel termination records with a fixed number of channels depending on the channel type specified by Navis™ Optical NMS during provisioning.

In the case of SDH digital links, the channel types can be either VC4-64c, VC4-16c, VC4-4c, VC4 or AU3. When a network element supports multiple higher order cross-connect rates, complimentary channels are created to give the flexibility to the user to provision any of those higher order trails without having the need to re-provision the digital link with other channel types. The creation of complimentary channels is determined by the capability of the network element(s) that terminate the digital link. Such network element-specific capability data is stored in NMS. In general, an STM-n digital link (where n=0,1,4,16 or 64) will have 3*n AU3 channels (except for n=0 where it will have one AU3 channel) or n VC4 channels.

For PDH links, the channel type depends on the rate and the terminating port characteristics. For example, a CEPT-1 digital link will have one C1 channel to carry a CEPT-1 circuit. A CEPT-3 digital link can have either one C3 channel or 16 C1 channels depending on the network element type.

Supported channels The following table presents the channels supported by each network element supported by Navis™ Optical NMS.

Table 4-5 Supported channel types per supported network elements

Network Element	VC4-64c	VC4-16c	VC4-4c	VC-4	VC-3	VC-2	VC-12	AU3
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Table 4-5 Supported channel types per supported network elements (continued)

ADM155E	—	—	—	Y	Y	—	Y	—
WaveStar ADM4/1STM1	—	—	—	Y	Y	—	Y	—
WaveStar ADM4/1STM4	—	—	—	Y	Y	—	Y	—
WaveStar ADM16/1	—	—	Y	Y	Y	—	Y	—
WaveStar ADM16/1 Compact	—	—	Y	Y	Y	—	Y	—
WaveStar AM1	—	—	—	—	Y	—	Y	—
WaveStar AM1 Plus	—	—	—	Y	Y	—	Y	—
WaveStar TM1	—	—	—	—	—	—	Y	—
WaveStar BandWidth Manager	—	Y	Y	Y	—	—	—	Y
WaveStar TDM10G	—	Y	Y	Y	—	—	—	Y
WaveStar DACS (via SC)	—	—	Y	Y	Y	—	Y	Y
WaveStar DACS (via XM)	—	—	—	Y	Y	—	Y	Y
DACS VI (R2.1)	—	—	—	Y	Y	—	Y	Y
Black Box	Y	Y	Y	Y	Y	Y	Y	Y
Equipment	Y	Y	Y	Y	Y	Y	Y	Y
ISM-1	—	—	—	Y	Y	—	Y	—
ISM-4	—	—	—	Y	Y	—	Y	—
ISM-5E	—	—	Y	—	—	—	Y	—
SLM-16	—	—	—	Y	—	—	—	—
SLM-4	—	—	—	Y	—	—	—	—
PHASE ADM-16/4	—	—	Y	Y	Y	—	Y	—
PHASE ADM-4/4	—	—	—	Y	Y	—	Y	—
PHASE LXC-16/1	—	—	—	Y	Y	Y	Y	—
PHASE LXC-4/1	—	—	—	Y	Y	Y	Y	—
PHASE TM-16/4	—	—	Y	Y	Y	—	Y	—
PHASE TM-4/4	—	—	—	Y	Y	—	Y	—
NERA CityLink	—	—	—	Y	—	—	—	—

Table 4-5 Supported channel types per supported network elements (continued)

DACS V-2000 (APCN)	—	—	—	Y	—	—	—	—
LambdaUnite MSS	Y	Y	Y	Y	—	—	—	Y

□

Provisioning concepts

Overview This section presents information pertinent to provisioning digital links with Navis™ Optical NMS. More specialized information pertaining to particular digital link types supported by Navis™ Optical NMS can be found in subsequent sections.

Purpose Because physical connectivities have to exist before a digital link is provisioned in Navis™ Optical NMS, four main tasks are performed whenever a user provisions a digital link in Navis™ Optical NMS.

1. The digital link is inventoried in NMS so that the system can create appropriate channels to provision higher order SDH trails or PDH circuits.
2. The corresponding ports at the A and Z ends of the digital link are put in-service or verified to be in-service to enable reporting of alarms on them.
3. The ports are structured to carry any of the following higher order paths - VC4-64c, VC4-16c, VC4-4c, VC4, AU3 or whichever is applicable.
4. If the digital link is MSP protected, the MSP protection is verified by the EMS and the protection switch status data on the appropriate ports are stored in NMS.

Provisioning order action There are several order actions for any digital link during provisioning:

- **Add (A):** used when a digital link is first added to the network from Navis™ Optical NMS. Port provisioning commands will be generated and sent to the EMS for putting the ports in-service, if they are not already in-service.
- **Disconnect (D):** used to delete the digital link from the Navis™ Optical NMS database although the link can still physically exist with the terminations. During the “Disconnect” order, commands are generated and sent to the EMS to put the ports “out-of-service”. In Navis™ Optical NMS, the “Disconnect” order will not be processed if there are any “in-effect” or “pending” higher order trails or PDH circuits that are provisioned on any of the digital link’s channels.

- **In-Effect (IE):** used when the digital link is already put in-service through the EMS or from a local craft terminal and needs to be inventoried in Navis™ Optical NMS. Since the digital link is already provisioned, the appropriate provisioning commands are used by the EMS to verify that the ports are put “in-service” and the MSP protection (when specified) exists. The “In-Effect” digital link may or may not be carrying any higher order trails.
- **Rearrange (R):** used when changing any components (e.g. facilities/channel, A port, A location, Z port, Z location) on the layout of an In-Effect facility/circuit. The “Restoration” order is used when rerouting an IE facility/circuit onto an alternate path.
- **Reinstatement (RI):** used when reinstating a facility/circuit that was previously restored back to its original service path.
- **Preplan (PP):** used when restoring the failed facility including each of the affected circuits over to the pre-planned route.



Provisioning STM digital links

Overview This section presents conceptual information related to provisioning STM digital links with Navis™ Optical NMS.

Note: Throughout this section, the "n" within the term "STM-n" can equal 0, 1, 4, 16, 64, or 2.5 Gb/s.

Selecting network elements Navis™ Optical NMS allows the user to provision a STM-n digital link between:

1. two network elements that support the desired STM ports
2. a network element that support the port and a black box/equipment
3. between two black boxes.

The network elements that support the ports for the provisioning of STM-n and 2.5 GB digital links are listed earlier in this section.

From the Navis™ Optical NMS Network Map, users can select (left-click) two network elements and create a digital link between the two via the Configuration menu item. If more than two network elements are selected, an error message appears. Clicking on the selected network element will undo the selection and toggle between the two for subsequent clicks on the network element. If the selected network elements already have OCh trails provisioned, the STM-n digital link provisioning shall automatically include the optical layer layout.

Circuit types The following table specifies the internal and external circuit types for STM-n digital links.

Table 4-6 Internal and external circuit types for STM-n digital links

Digital Link	Internal Circuit Type	External Circuit Type
STM-0	S0DL	0S
STM-1	V4DL	1S
STM-4	S4DL	4S
STM-16	S16DL	16S
STM-64	S64DL	64S
2.5GB	2.5GBDL	2.5GB

Adding regenerators Navis™ Optical NMS allows the user to add regenerators of appropriate type to STM-1 (only for NERA Regenerators), STM-4, STM-16, and STM-64 digital links during provisioning. No regenerators can be added for STM-0 or STM-1 or 2.5GB digital links except for STM-1 digital links terminating on NERA Radio terminals.

When adding regenerators to digital links, users are required to enter the port addresses for the east and west sides. No validation is made in NMS whether the east and west sides are correctly chosen by the user. However, the rate should be compatible as the rate of the digital link terminating on regenerators. No provisioning commands are generated for the regenerators when they are either added or removed from a digital link. However, the layout of the digital link is updated to reflect the addition or deletion of regenerators.

Deleting regenerators Users can delete regenerators from an “in-effect” digital link. Deleting a regenerator from a digital link only removes the regenerator from the digital link layout and does delete it from NMS (e.g. from Location Reference Table).

Creating alternate channel types Depending on the capabilities of the terminating network elements, based on their cross-connect rates, the channel types of AU3, VC4, VC4-4c, VC4-16c and VC4-64c will be created for STM-n digital links as specified in the table below. When more than one channel type is created based on network element support, the channels created are considered alternate channels.

The following table presents the alternate channels for STM-n digital links.

Table 4-7 Alternate channels for STM-n digital links

Digital Link	Alternate channel types to be created	Number of Channels
STM-0	AU3	1
STM-1	AU3	3
	VC4	1
STM-4	AU3	12
	VC4	4
	VC4-4c	1

Table 4-7 Alternate channels for STM-n digital links (continued)

STM-16	AU3	48
	VC4	16
	VC4-4c	4
	VC4-16c	1
STM-64	AU3	192
	VC4	64
	VC4-4c	16
	VC4-16c	4
	VC4-64c	1
2.5GB	VC4	16

Provisioning of unprotected digital links

Users can provision a regular unprotected STM-n digital link between any pair of homogeneous or non-homogeneous network elements, BandWidth Manager, TDM 10G, LambdaUnite MSS, or a black box. The provisioning of unprotected STM-n digital link will be denied if Navis™ Optical NMS discovers that a protection group already exists on either of the two (A or Z) ports.



Provisioning PDH digital links

Overview This section presents conceptual information related to provisioning PDH digital links with Navis™ Optical NMS.

Selecting network elements With PDH digital links, Navis™ Optical NMS allows the user to provision an:

- Unprotected E4 (CEPT-4) digital link between two 140 Mb/s ports of two network elements or between a 140 Mb/s port of a network element and a black box or equipment.
- Unprotected E3 (CEPT-3) digital link between two 34 Mb/s ports of two network elements or between a 34 Mb/s port of a network element and a black box or equipment.
- Unprotected E1 (CEPT-1) digital link between two 2 Mb/s ports of two network elements or between a 2 Mb/s port of a network element and a black box or equipment.
- Unprotected DS-3 digital link between two 45 Mb/s ports of two network elements or between a 45 Mb/s port of a network element and a black box or equipment.
- Unprotected DS-1 digital link between two 1.5 Mb/s ports of two network elements or between a 1.5 Mb/s port of a network element and a black box or equipment.
- PCT digital link between a PCT port of an ISM-5E network element and a black box (which is used to represent a 5ESS switching system). The PCT digital link is inherently always protected and therefore the ‘MSP Protected?’ field in the provisioning screen will always be set to “1+1 Protected” and the MSP Type shall be set to “BI” (bidirectional).

LAN card support

The ADM16/1 LAN card consists of 8 ports whereas the AM1 LAN card consists of two ports. Each port maps up to four TU12s (VC-12). The mapping of the four TU12's to single signal can be considered as a "pseudo concatenation" of four TU12's. The mapped four TU12s provide a point-to-point protocol (PPP) output of up to 8 Mb/s. The four VC-12s to be used for LAN connection can be provisioned individually using the proper ports. The VC-12s used for LAN connection are like any other VC-12 with the exception of their port addresses that tie them to the LAN card and the fact that they can only be two-way VC-12s. (It is the user's responsibility to ensure that all VC-12s used for LAN connection are provisioned as two-way.) Therefore, other than the exceptions stated, the VC-12 used for LAN connection shall enjoy/suffer the privileges/limitations of typical VC-12 in NMS. To summarize, 10/100 Base T PPP provisioning boils down to VC-12 provisioning with ports derived from the LAN Card ports. All the VC-12s making up the LAN connection can take diverse path. It is to be noted that all the VC-12's that make up a single LAN connection have to originate from the same port of a LAN card and terminate on a single port of another LAN card. In other words, different VC-12 of the same LAN connection cannot originate from different LAN card or ports or end up either on different LAN card or different LAN card ports of the same LAN card. However, if the VC-12 used for LAN connection terminate on a port other than LAN card port, it does not have to terminate on the same network element.

A digital link called LAN8 is introduced but is not be able to carry any circuit or path. Navis™ Optical NMS supports the provisioning of LAN8 digital link from/to a LAN port of a controlled network element equipped with LAN8 (a.k.a. TransLAN) cards and a black box. Back-to-back provision is not be allowed. For display purposes, LAN8 digital link is referred to as LAN8DL.

Channel termination record

A channel termination record is created for every provisioning of a PDH link. There are no alternate channels that are required for PDH digital links. The following table summarizes the type and number of channels that shall be created.

Table 4-8 Channel types for PDH links

Digital Link	Channel Type	Number of Channels
CEPT-4	C4	1
CEPT-3	C3	1

Table 4-8 Channel types for PDH links (continued)

CEPT-1	C1	1
DS-3	D3	1
DS-1	D1	1
PCT	C1	21
LAN8	None	NA
X21	None	NA

E_Link provisioning

Navis™ Optical NMS supports the provisioning of E_Links between a “LAN” port of an VCG capable card of a given network element to a black box or equipment. The E_Link between the LAN port of a network element and black box or equipment has no specific NMS transport rate value. An E_link can not be used as a server to any clients. Performance monitoring and alarm analysis can potentially be done using this link. LAN port to LAN port connections using E_Link is not supported.

User can add an E_Link via Configuration > Digital Link > Add menu option and can delete an E_Link via Configuration > Digital Link > Disconnect menu option as well as other ways of digital link disconnection that is currently supported by NMS .

Navis™ Optical NMS maintains a history of disconnected E_Links for a duration set during NMS installation. In the absence of an installation set, Navis™ Optical NMS will keep the disconnected link for a period of 24 hours.



Protection concepts

Overview This section discusses protection concepts related to digital links. As noted earlier in this section, digital links can be unprotected or protected. When protected by another link, it is called Multiplex Section Protection (MSP). The MSP protection can be of two types - 1+1 or 1x1.

When MSP is 1+1, the protection link is totally dedicated to the working (service) link and cannot carry preemptible extra traffic.

When MSP is 1x1, the protection link serves as a protection to the working (service) link but can be configured to carry extra traffic that is preemptible when the traffic in the working link gets switched.

Multiplexer section protection

Multiplexer Section Protection provides protection of service for STM-n (N=0, 1, 4, 16 or 64), digital links in case of a fiber cut or a failure. The protection is provided by grouping two physical fibers (both bidirectional) into a MSP group. The MSP grouping of the two ports is performed at each network element where the two fibers terminate. There are two types of MSP protection - 1+1 MSP and 1x1 MSP. Each type is described in the following two sections.

1+1 MSP protection for STM-n digital links: 1+1 MSP protection is supported by most of the network elements that support provisioning of unprotected STM-n digital links (except for 2.5 GB digital link). In the case of 1+1 MSP protection, one working digital link is protected by a protection digital link and they are both grouped with one trail ID. In some network elements, the MSP protection group has to be previously formed from the EMS before it can be provisioned from Navis™ Optical NMS. Also, in some network elements the port address for a MSP protected digital link takes the form a “group address” that always represents the ports in adjacent physical slots. Where “group address” is not supported by some network elements, any two physical port with the same rate can be combined to form a MSP protection, in which case, the Navis™ Optical NMS allows the user to enter the working and protection port addresses separately.

Depending on the network element support, there are three types of MSP switch types that can be provisioned on a 1+1 MSP protected digital link. The three switch types are - UNI (unidirectional), BI (bidirectional) or NTT (a variation of bi-directional switching for Japanese customers).

The following table presents the network elements supported by Navis™ Optical NMS with MSP capabilities.

Table 4-9 MSP protection capabilities per supported network elements

Network Element	STM-0	STM-1	STM-4	STM-16	STM-64
ADM 155E		1+1			
WaveStar ADM 4/1 STM-1		1+1			
WaveStar ADM 4/1 STM-4		1+1			
WaveStar ADM 16/1		1+1		1+1	
WaveStar ADM 16/1 Compact		1+1			
WaveStar AM 1		1+1			
WaveStar AM 1 PLUS STM1		1+1			
WaveStar AM 1 PLUS STM4					
WaveStar TM 1		1+1			
WaveStar BandWidth Manager		1+1	1+1	1+1, 1x1	1x1
WaveStar TDM 10G		1+1	1+1	1+1	1+1, 1x1
WaveStar DACS (Rel. 2.1 and 3.0)		1+1	1+1	1+1	
WaveStar DACS (Rel. 2.0)	1+1	1+1			
DACS VI (Rel. 2.1)	1+1	1+1			
Black Box	1+1	1+1	1+1	1+1	1+1
Equipment	1+1	1+1	1+1	1+1	1+1
ISM-1		1+1			
ISM-4			1+1		
ISM-5E		1+1			
SLM-16 Terminal				1+1	
SLM-16 RDI		1+1			
SLM-4			1+1		

Table 4-9 MSP protection capabilities per supported network elements (continued)

PHASE ADM 16/4		1+1	1+1	1+1	
PHASE ADM 4/4		1+1	1+1		
PHASE LXC 16/1		1+1	1+1	1+1	
PHASE LXC 4/1		1+1	1+1		
PHASE TM 16/4		1+1	1+1	1+1	
PHASE TM 4/4		1+1	1+1		
DACS V-2000		1+1			
LambdaUnite MSS		1+1	1+1	1+1	1+1, 1x1

Users can add regenerators of appropriate type to the 1+1 MSP protected STM-4 or STM-16 digital link during provisioning. The user can add regenerators for working and protection links separately. Certain regenerators can accept up to two inputs and two outputs in which case, the same regenerator could be used in both the working and protection links. The user shall be able to delete the regenerators from an “in-effect” digital link. No provisioning commands are generated for the regenerators when they are either added or removed from a digital link. However, the layout of the digital link shall be updated to reflect the addition or deletion of regenerators.

1x1 MSP Protection on STM-n (n=16 or 64) digital links: the BandWidth Manager supports 1x1 MSP protection for STM-n (n=16 or 64) digital links. LambdaUnite MSS R2.1 and up will support 1x1 MSP on STM-64 digital links. LCT supports 1x1 MSP protection for STM-16 digital links. The 1x1 MSP protection is different from 1+1 MSP protection that is well known to the NMS user in the previous releases. In 1x1 MSP protection scheme, one digital link will protect one service digital link. In the future releases, 1x1 MSP protection will be required to be supported, where one service digital link will be protected by one protection link. In the case of 1x1 MSP protected digital link, the protection link can carry extra traffic that will be preemptible when the MSP switching takes place. Because of this, both the service and protection links of the 1x1 MSP have to be separately identified with Digital Link IDs. 1x1 MSP is primarily used for span protection in a 4-fiber MSSRING. The Protection Digital Link must be created first and associated with a unique Protection Group Name before any of the service digital links are created and associated.

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Section III: Connections

Overview

Purpose This section describes the provisioning concepts associated with connections supported by Navis™ Optical NMS.

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Connection support

- Overview** This section provides an overview of connections and the support provided by Navis™ Optical NMS.
- Definition** A circuit/trail is a concatenation of digital links and cross-connects used to provide an end-to-end service to a customer. A circuit/trail is identified by a rate at which the service is provided. The “rate” of a circuit/trail is defined by the ITU and ETSI standards for SDH and PDH circuit/trails. An SDH trail is provisioned over the SDH link connections and over SDH cross-connects in Navis™ Optical NMS managed network elements. It is possible that the link connections (SDH) may go through an optical layer. In general, a PDH/Asynchronous circuit is provisioned on SDH trails. With the “One-Step (Combo) Provisioning” feature in Navis™ Optical NMS, it is possible to provision both SDH trails and PDH circuits or trails and Asynchronous circuits in a single provisioning step.
- A trail is often referred as a path. A trail can be assignable or non-assignable depending on the terminating port or based on the sub-structuring of the port to carry lower order traffic. In Navis™ Optical NMS, if one or both end ports of a trail are PDH/Asynchronous, or if one or both end ports are sub-structured to carry lower order traffic, the trail is called an “assignable” entity. If both end ports are SDH and not sub-structured to carry low order traffic, then the trail is called as an “non-assignable” entity. Certain trails, such as VC4-4c, VC4-16c and VC2, are always non-assignable. Navis™ Optical NMS creates channels for assignable trails in order to carry the low order trails or PDH/asynchronous circuits.
- A circuit provides a service to a customer at a specified rate.
- Supported cross-connect types and rates** This section presents the rates at which cross-connect types are supported for one-way (O), two-way (T), and broadcast (B) circuits by Navis™ Optical NMS. The network element by itself may support more rates than are supported with Navis™ Optical NMS.
- The cross-connect types and rates for each network element supported by Navis™ Optical NMS are shown in the following table.

Table 4-10 Cross-connect types and rates per supported network element

Network Element	VC4-64c	VC4-16c	VC4-4c	VC-4	VC-3	VC-2	VC-12	AU-3
ADM 155E				T	O, T, B		T	
WaveStar ADM 4/1 STM-1				T	O, T, B		T	
WaveStar ADM 4/1 STM-4				T	O, T, B		T	
WaveStar ADM 16/1			T	T	T		T	
WaveStar ADM 16/1 Compact			T	T	T		T	
WaveStar AM 1					T		T	
WaveStar AM 1 PLUS				T	T		T	
WaveStar TM 1							T (fixed)	
WaveStar BandWidth Manager		O, T, B	O, T, B	O, T, B				O, T, B
WaveStar TDM 10G		O, T, B	O, T, B	O, T, B				O, T, B
LambdaUnite R2.1	O,T,B	O,T,B	O,T,B	O,T,B				O,T,B
WaveStar DACS			O, T, B	O, T, B	O, T, B		O, T, B	O, T, B
WaveStar DACS VI R2.1				T	O, T, B		O, T, B	O, T, B
DACS VI				O, T, B	O, T, B		O, T, B	O, T, B
Black Box	O, T, B	T	O, T, B	O, T, B				

Table 4-10 Cross-connect types and rates per supported network element (continued)

Network Element	VC4-64c	VC4-16c	VC4-4c	VC-4	VC-3	VC-2	VC-12	AU-3
ISM-1				T	O, T, B		T	
ISM-4				T	O, T, B		T	
ISM-5E							T	
SLM-16				T				
SLM-4				T (fixed)				
PHASE ADM 16/4			O, T, B	O, T, B				
PHASE ADM 4/4				O, T, B				
PHASE LXC 16/1				O, T, B	O, T, B	T	O, T, B	
PHASE LXC 4/1				O, T, B	O, T, B	T	O, T, B	
PHASE TM 16/4			O, T, B	O, T, B				
PHASE TM 4/4				O, T, B				
DACS V-2000 (APCN)				O, T, B (R3.0)				

Supported SNCP protection

This section presents the rates at which SNCP protection is supported for one-way (O), two-way (T), and broadcast (B) circuits in Navis™ Optical NMS.

Note: The network element by itself may support more rates than are supported with Navis™ Optical NMS.

The rates at which SNCP cross-connects are supported by Navis™ Optical NMS are shown in the following table.

Table 4-11 SNCP protection supported by Navis™ Optical NMS

Network Element	VC4-64c	VC4-16c	VC4-4c	VC-4	VC-3	VC-2	VC-12	AU-3
ADM 155E				T	O, T, B		T	

Table 4-11 SNCP protection supported by Navis™ Optical NMS (continued)

Network Element	VC4-64c	VC4-16c	VC4-4c	VC-4	VC-3	VC-2	VC-12	AU-3
WaveStar ADM 4/1 STM-1				T	O, T, B		T	
WaveStar ADM 4/1 STM-4				T	O, T, B		T	
WaveStar ADM 16/1			T	T	T		T	
WaveStar ADM 16/1 Compact			T	T	T		T	
WaveStar AM 1					T		T	
WaveStar AM 1 PLUS				T	T		T	
WaveStar TM 1							T (fixed)	
WaveStar BandWidth Manager		O, T, B	O, T, B	O, T, B				O, T, B
WaveStar TDM 10G		O, T, B	O, T, B	O, T, B				O, T, B
LambdaUnite R2.1	O, T, B	O, T, B	O, T, B	O, T, B				O, T, B
WaveStar DACS (managed by ITM-SC)			O, T, B (R3.0)	O, T, B (R3.0)	O, T, B (R3.0)		O, T, B (R3.0)	O, T, B (R3.0)
WaveStar DACS (managed by ITM-XM)								
DACS VI (R2.1)				T	O, T, B		O, T, B	O, T, B

Table 4-11 SNCP protection supported by Navis™ Optical NMS (continued)

Network Element	VC4-64c	VC4-16c	VC4-4c	VC-4	VC-3	VC-2	VC-12	AU-3
Black Box	O, T, B	O, T, B	O, T, B	O, T, B	O, T, B	T	O, T, B	O, T, B
ISM-1				T	O, T, B		T	
ISM-4				T	O, T, B		T	
ISM-5E							T	
SLM-16				T				
SLM-4				T (fixed)				
PHASE ADM 16/4			O, T, B	O, T, B				
PHASE ADM 4/4				O, T, B				
PHASE LXC 16/1				O, T, B	O, T, B	T	O, T, B	
PHASE LXC 4/1				O, T, B	O, T, B	T	O, T, B	

Supported digital transmission rates

This section presents the digital transmission rates of the connections supported by Navis™ Optical NMS. For information about the digital transmission rates of the digital links supported Navis™ Optical NMS, refer to Section II: Digital Links.

The following table presents the digital transmission rates supported by Navis™ Optical NMS.

Table 4-12 Supported digital transmission rates for connections

Designation	Description	Facility Type	Transmission Rate Mb/s	Notes
VC-4	Path	VC4S	150.336	
VC-3	Path	VC3S	48.960	
VC-12	Path	VC12S	2.240	
CEPT-4	Facility	1920N	139.264	Similar to CEPT-4 Circuit
CEPT-3	Facility	480N	34.368	Similar to CEPT-3 Circuit
CEPT-4	Circuit	1920N	139.264	

Table 4-12 Supported digital transmission rates for connections (continued)

Designation	Description	Facility Type	Transmission Rate Mb/s	Notes
CEPT-3	Circuit	480N	34.368	
CEPT-1	Circuit	30N	2.048	
DS3	Circuit	672N	44.736	
DS1	Circuit	24N	1.544	

Ethernet TransLAN+ support

Navis™ Optical NMS supports the provisioning of an Ethernet TransLAN+ (E_Link) between a black box and the LAN ports of the network elements that support the TransLAN+. The E-Link can be considered as an ethernet digital link with an unspecified signal rate. The ITM-SC managed network elements (ADM16/1, ADM16/1c, AM1, and AM1PLUS) support Ethernet TransLAN+.

Navis™ Optical NMS also support the provisioning of the “VCgroup” for the WAN ports of the network elements that support the TransLAN+. As with GbE support, the VCgroup can be considered as a virtual concatenation of VC-n using a grouping concept. For the TransLAN+, the VCgroup consists of VC3-Xv (where X is from 1 to 2) and VC12-Xv (where X is from 1 to 5). The provisioning of VC-n’s used in a VCgroup is essentially the same as the provisioning of any other VC-n in Navis™ Optical NMS with the exception of port specifications, association of the VC-n to a VCgroup, specifying the capacity of the VCgroup, and of preserving the port address ‘ordinal symmetry’ for the ‘Dual-Ended VCG’. The capacity can be specified either as rate or number of VC-n’s in the VCgroup.



Provisioning concepts

Overview This section presents information pertinent to provisioning connections with Navis™ Optical NMS. More specialized information pertaining to particular connection types supported by Navis™ Optical NMS can be found in subsequent sections.

Circuit/trail provisioning modes Navis™ Optical NMS allows users to provision a circuit/trail in one of the three modes - auto, manual or partial.

- **Auto:** Navis™ Optical NMS will find a route from the user specified end ports for the trail and present it to the user for approval, if requested. In the case of an AU3 trail, Navis™ Optical NMS shall find a shortest route using the V4 channels from each of the links in the path.
- **Manual:** the user will be able to select each link and a channel in the selected link along the path and Navis™ Optical NMS will build the layout based on the user selection(s). In the case of an AU3 trail, the user can select each link from the Network Map that contains one or more AU3 channels from the Network Map and can bring up a display of the Facility Channel List screen showing only the all the digital links between the two end nodes that terminate the selected link. Selecting one of the digital links shall list all the AU3 channels in the selected digital link. The user shall be able to select one of the channels from the list. The selected AU3 channel shall automatically get populated in the provisioning screen. In the case of span of control, the user can select a bridge and intern select a link which allows user to select AU3 and any on of the contained channels.
- **Partial:** the user will pick all the links along the path of the circuit/trail. The channels within the link shall be picked by Navis™ Optical NMS (broadcast and one-way circuits are exceptions). In the case of AU3 trails, the user needs to select only the digital links that are displayed in the Facility Channel List screen. Navis™ Optical NMS will automatically pick an appropriate V4 channel in the selected digital link and populate it in the provisioning screen.

Provisioning controls

Navis™ Optical NMS provides the following controls, through GUI provisioning screens, to provision connections. A description of each control is listed.

- **Circuit Type:** used to specify the circuit type. Valid values are: Two Way (T), One Way (O), or Broadcast (B). The default value is “two way”.
- **Ignore Alarms:** when this option is set to “Yes in the “auto” provisioning mode, Navis™ Optical NMS can pick the channels that are in alarm and put the circuit “in effect” even if the alarms are present in the circuit path. The default is “No” (i.e. do not ignore alarms for finding the channels and putting the circuit/trail “in effect”).
- **Graphical Layout:** when this option is chosen (Yes), Navis™ Optical NMS will display the graphical layout for the created route for approval by the user. The graphical layout shall also be displayed again when the implementation commands are successfully sent and the circuit/trail is put “in effect”. The default is “Yes”.
- **Stop at Test Step:** allows the user to perform manual testing after the implementation of the circuit/trail is completed and before the circuit is put in service (“in effect”). After performing manual testing, the user can move the provisioning order to the next step for completion of the provisioning process. The default is “No.”
- **Protection:** allows the user to specify if the circuit/trail shall be protected. These are the types of protection available for the user to choose - Ring Protected, 1+1 Protected, A End Open, or Z End Open, and DNI/DRI. The user specified selection is taken in to consideration when finding the path in the “auto” mode or when validating the layout at the end of provisioning in the “manual” or “partial” mode. The default is “Unprotected.”
- **Quality of Service:** an optional field in the provisioning screen applicable for all circuits/trails including combo rates. The field is 10 characters long and allows for case-sensitive alpha-numeric ‘/’, ‘-’, ‘_’ and blank (single white space) in the middle of a character string, or all blanks. Users can modify the Quality of Service field from the “Modify Order Parameters” menu selection under the “Action” menu in Graphical Layout. The default value is blank.

- **Customer Priority:** an optional field in the provisioning screen that allows users to set the priority for a service. The value in this field is only for Navis™ Optical NMS users and will not be used during restoration nor for notifying users on any priority basis. The Customer Priority is a number up to 2 digits (0 to 99). Users can modify the Customer Priority field from the “Modify Order Parameters” menu selection under the “Action” menu in Graphical Layout. The default value is blank.
- **Service Domain:** an optional field in the provisioning screen used to specify the service domain name to which a provisioned trail is assigned. The Service Domain name should already exist in the Navis™ Optical NMS database, otherwise the validation will fail. This field is enabled only when the “Service Domain Partitioning” feature is turned on for the customer application. The default value is blank.
- **Implement:** allows users to instruct Navis™ Optical NMS to implement the circuit/trail immediately when approved or schedule the provisioning for a later date and time. The allowed values are “Start Now” or “Schedule”. If “Start Now” is selected, the implementation commands will be sent once the layout is approved by the user. If “Schedule” is selected, another dialog box will be displayed for the user to enter the date and time when the implementation commands should be sent to the EMS. The default value is “Start Now.”
- **Comments:** an optional field that allows users to enter some free formatted text pertaining to the circuit/trail. There is a maximum number of lines and characters per line for this field.

Specifying trace identifiers and mismatch detection mode

Users can specify two path trace identifiers (PTIs) for each trail - one for A-Z direction and the other for Z-A direction. The PTIs can be either a specific string of upto 15 alphanumeric characters (case sensitive) or non-specific (system generated 0s or 1s). In order to specify non-specific byte for the PTIs, the user shall enter the word “NONE” in the appropriate PTI field(s).

When sending implementation or verification commands, the “pti_t” (transmitted) and “pti_e” (expected) fields in the data structure shall be populated as follows:

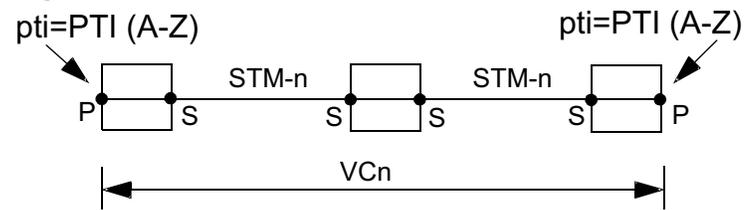
- For the A end network element, the “pti_t” shall be the value entered in the PTI for A-Z direction and the “pti_e” shall be the value entered in the PTI for Z-A direction.
- For the Z end network element, the “pti_t” shall be the value entered in the PTI for Z-A direction and the “pti_e” shall be the value entered in the PTI for A-Z direction.

With routing, the user must enter the PTI for all circuit types. The user can enable or disable the PTI mismatch detection mode independently from setting the PTI to specific string or to a non-specific mode.

Path Trace ID cannot be left blank when provisioning any type of VC circuit. If the user intends to leave the Path Trace ID blank, the user must enter the word NONE (in capitals). Additionally, if the user wants to send a string of zeros as the Path Trace ID, the user must enter NULL (in capitals).

The following figure shows an example of how PTIs are applied.

Figure 4-1 Example of a PTI



The user can specify the Mismatch Detection Mode for each trail provisioning. The valid values for the Mismatch Detection Mode are “Enable”, “Disable” or “null” (\0). If the user specifies “Enable”, the EMS will turn on the mismatch detection mode and if the user specifies “Disable”, the EMS will turn off the mismatch detection mode. The value of “null” (\0) is used for in-effect circuit orders to instruct the EMS to leave the mismatch detection mode in its current setting.

One-step provisioning

Navis™ Optical NMS supports the provisioning of the following one-step or simple combo circuits:

- VC3S-672N
- VC4S-1920N
- VC3S-480N
- VC12S-30N
- TU12-VC11S-24N
- AU3S-672N

Note

Please note the following items with regards to one-step provisioning:

- One-step provisioning is an option that is selected at installation time.
- The selection of either VC12S-30N, VC3S-480N, VC3S-672N or VC4S-1920N for provisioning is a selection for 30N, 480N, 672N, or 1920N provisioning. However, one-step provisioned paths/circuits have the characteristic of the SDH (Skipped SDH) circuits/paths. As such, they possess performance monitoring, path trace identifier, fault management, and pre-plan characteristics.
- 30N, 480N, 672N, and 1920N are no longer available for provisioning to ensure the mutual exclusivity of one-step and traditional provisioning.
- If a free-format circuit ID is used, the circuit type for one-step provisioned circuits can be: VC12S-30N, VC3S-480N, VC3S-672N, VC4S-1920N, TU12-VC11S-24N, or AU3S-672N.
- A one-step provisioned path/circuit can terminate on either an SDH or PDH port. However, both ends of the path/circuit cannot be SDH.
 - In the case of an SDH termination, the ports will be derived from the STM-N link on which the circuit is riding.
 - In the case of a PDH termination, the port is the appropriate PDH port.
- A one-step provisioned circuit can cross or ride SDH links only and cannot cross or ride on PDH links.
- No PDH bridges are allowed when merging one-step provisioned paths/circuits.

Scheduling circuits/trails for provisioning

Users with administrator privileges can schedule circuits and trails for provisioning from the Navis™ Optical NMS Network Map. Refer to the *Navis™ Optical NMS Administration Guide* for details.

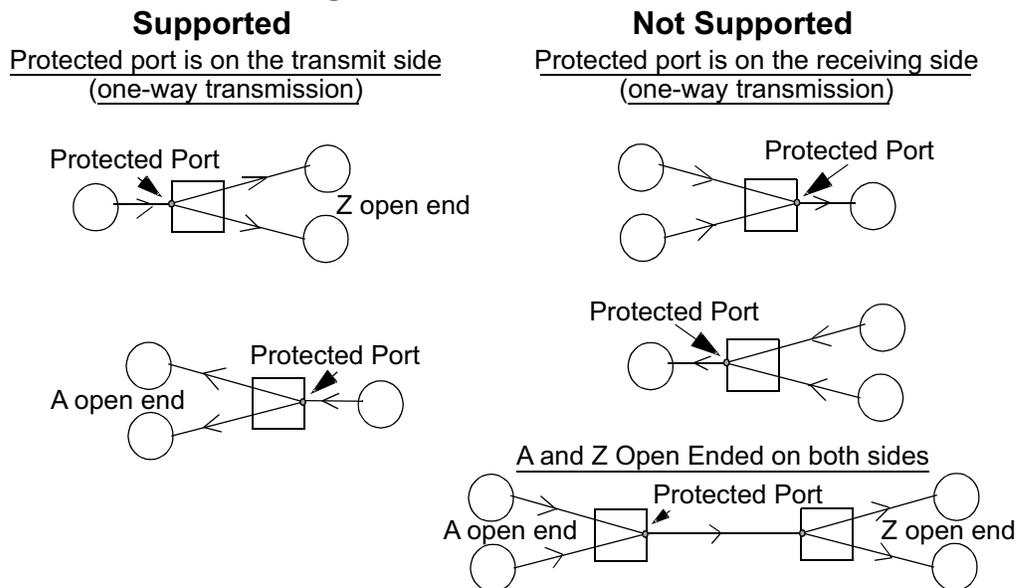
Y-protected paths

Y Protection path/circuit can be viewed as “one half” of a 1+1 SNCP protected path/circuit. In a 1+1 SNCP protection path, each of the two network elements at the A-end and the Z-end has a “bridge” and “selector” function. At each end, the function of the “bridge” is to split the incoming input signal into two and send them via separate paths to the other end and the function of the “selector” is to select one of the two incoming signals from the other end (via the two separate paths) as its “received” signal.

The Y Protection has two flavors. If only one of the two end network elements, say A, incorporates the “bridge and selector” functions and its two outgoing paths terminates at two different network elements without the “bridge and selector” functions, then the configuration is referred to as Open-Z Y protection. Conversely, if only the Z end network elements incorporates the “bridge and selector” functions, then it is referred to as the Open-A Y protection.

The following figure shows an example of the supported and non-supported configurations for one-way Y protection.

Figure 4-2 Supported/Not Supported One-way Y-protection Configurations



Work order record document

The Work Order Record Document (WORD) describes a customer service order or an network infrastructure/engineering order and includes the end-to-end design of the circuit associated with that order. The primary use of the WORD is for circuit installation, testing, and fault tracing by technicians in the field.

The WORD document will contain order-related data and circuit layout details. The WORD can be populated for any circuit ('circuit' here is used in a generic sense as a 'link' in PRM) including topological links (digital links and optical layer links), facilities, and customer circuits.

Enabling low order alarms

Refer to the *Navis™ Optical NMS Maintenance Guide* for details.



Provisioning trails

Overview This section presents technical informations associated with the different trails supported by Navis™ Optical NMS.

VC4-64c (AU4-64c) trails Navis™ Optical NMS supports the provisioning of VC4-64c trails using STM-64 subject to the capabilities of the network element involved (at present only LambdaUnite supports VC4-64c). All the network elements in a VC4-64c are “non-assignable.” The VC4-64c trail can be one way, two way or broadcast type.

A VC4-64c can not co-exist with a VC4-16c, VC4-4c, VC4, AU3 or any other path/circuits within the same STM-64.

Navis™ Optical NMS supports the merging of VC4-64c circuits/paths. VC4-64c circuits/paths can only be merged with VC4-64c circuits/paths.

Rearrange is supported for VC4-64c. Because VC4-64c is only supported for LambdaUnite STM-64, any rearrange has to be done between LambdaUnites. Although these path/circuit may have already protected, LambdaUnite has bridge and roll capability (SNMS-EML Tier 2 capability release plan) and this feature shall be utilized for rearrange.

VC4-16c (AU4-16c) trails

With a VC4-16c, sixteen VC4s are combined to form a single VC4-16c (or AU4-16c). VC4-16c (AU4-16c) can be provisioned on STM-N (N \geq 16) only. Concatenation of VC4s to form a single VC4-16c follows strict numerical order. That is, in an STM-N, the VC4-16cs start at specified time slots. For example, in an STM-64 the VC4-16c can start at time slot 1, 17, 33 or 49 of the STM-64. VC4-16c is supported without termination. For network elements that strictly use AU3s the numbering scheme used is based on the fact that three AU3s form one AU4. Therefore, in the previous example of an STM-64 with several VC4-16c, the VC4-16c can start at AU3 time slots 1, 49, 97 or 145. The VC4-16c starting time slot number (n4 or n3) can be abstracted as $\text{Mode}16(n4-1)$ and $\text{Mode}48(n3-1)$ in terms of AU4 and AU3 respectively. Two-way, one-way and broadcast VC4-16cs are supported. LambdaUnite, BandWidth Manager and TDM10G can be used to provision VC4-16c. Other than these three network elements, no other network elements have VC4-16c capability. Unless otherwise specified general Navis™ Optical NMS features such as merge, etc. are applicable to VC4-16c.

Navis™ Optical NMS supports the provisioning of VC4-16c trail using STM-N (N = 16 or 64) subject to the capabilities of the network element involved. All the network elements in the VC4-16c are “non-assignable.” The VC4-16c trail can be one way, two way or broadcast type.

Navis™ Optical NMS supports the merging and rearranging of VC4-16c circuits/paths. VC4-16c circuits/paths can only be merged with VC4-16c circuit/path.

Mutual Exclusion: if a VC4-16c occupies part of (group of time slots) on an STM-N, the time slots occupied by the VC4-16c shall not be available for other AU3s, VC4s, VC4-4cs or VC4-16cs. For “auto or partial” provisioning, which VC4-16c to select becomes an issue only in the case of STM-N (N >16). For example there are four VC4-16cs in an STM-64. As stated in the introduction, each VC4-16c starts specific time AU4 (AU3) time slots. Therefore, in provisioning VC4-16c, the system is expected to select the first available (see reference [1]) VC4-16c. The order of selection preference is based on an ascending order of the VC4-16c starting time slots.

Transmission Direction: VC4-16c supports one-way, broadcast and two-way transmission direction, subject to and consistent with EMS/network element support. 1809: VC4-16c Protection (two-way)
The provisioning of a VC4-16c shall support two-way protected or

unprotected VC4-16c. 1810: VC4-16c Protection (one-way) The provisioning of a VC4-4c shall support one-way protected or unprotected VC4-4c. Merging of VC4-16c 1811: Merging VC4-16c Navis™ Optical NMS supports the merging VC4-16c circuits/paths. VC4-16c circuits/paths can only be merged with VC4-16c circuit/path. Rearranging VC4-16c 1811: Rearranging VC4-16c Navis™ Optical NMS supports rearranging VC4-16c.

VC4-4c trails

Four virtual container level 4's (VC-4) can be combined to form a single VC4-4c known as concatenated VC-4. Of course, the VC4-4c can be provisioned on STM-N (N ≤ 4) only. Concatenation is supported on STM-4 optical tributary units and STM-16 or STM-64 line units. There are two kinds of concatenation—fixed and virtual. In a fixed concatenation all the AU-4s within the AU4-4c have their concatenation pointer set in the pointer bit. Navis™ Optical NMS supports only fixed concatenation. VC4-4c is not terminated and is non-assignable. Unless otherwise stated, concatenation follows strict order. That is in an STM-N, the VC4-4s can start only at specified time slots. For example, in an STM-16 the VC4-4c can start at time slot 1, 5, 9 or 13 of the STM-16. The provisioning of a VC4-4c supports one-way, broadcast and two-way transmission direction, subject to and consistent with EMS/network element support.

Navis™ Optical NMS supports the merging and rearranging of VC4-4c circuits/paths. VC4-4c circuits/paths can only be merged with VC4-4c circuit/path.

AU3 trails

From the network map, the user can provision a two way unprotected VC-4 trail either in the “auto”, “manual” or “partial” mode. An AU-3 path can be assignable or non-assignable based on the following criteria:

- If one or both end ports of the AU3 is a DS3 port, then the AU3 is channel assignable (for a non-combo trail provisioning). In this case, the AU3 shall be created with one DS3 channel.
- If both end ports of the AU3 are STM-n (n=1,4,16) ports with a cross-connect at the end network elements, then the AU3 is not assignable.

The provisioning of a AU3 shall support one-way, broadcast and two-way transmission direction, subject to and consistent with EMS/NE support.

- VC-4 trails** From the network map, the user can provision a two way unprotected VC-4 trail either in the “auto”, “manual” or “partial” mode.
- When a VC-4 is determined to be assignable, based on its termination port type (140 Mb/s or STM-n), a channel termination record shall be created for the VC-4. If the VC-4 terminates on a 140 Mb/s port (CEPT-4), one C4 channel shall be created. If the VC-4 terminates on an STM-n ($n = 1, 4, 16$ or 64), based on the union of the cross-connect capabilities of both end nodes, it shall create ($n \times 63$) V12, ($n \times 3$) V3 and ($n \times 21$) V2 channels. If one or both the end nodes of the assignable VC4 terminates on a fixed multiplexed 2 Mb/s port of PHASE ADM16/4, PHASE ADM 4/4, PHASE TM 4/4 or a PHASE TM 16/4 network element, then only the first 21 channels shall be available for use. The rest 42 channels shall be blocked. No alternate channels shall be created. If one or both the end nodes of the assignable VC4 terminates on a fixed multiplexed 34 or 45 Mb/s port of PHASE ADM16/4, PHASE ADM 4/4, PHASE TM 4/4 or a PHASE TM 16/4 network element, then only three V3 channels shall be created (no alternate channels).
- VC-3 trails** From the network map, the user can provision a two way unprotected VC-3 trail either in the “auto”, “manual” or “partial” mode.
- In the “auto” mode, Navis™ Optical NMS finds the shortest route using the V3 channels from each of the links in the path.
- In the “manual” mode, Navis™ Optical NMS selects each link from the VC-3 provisioning view of the Network Map that shows all VC-4 trail connectivities. Selecting any VC-4 trail connectivity link that contains one or more V3 channels, the user shall be able to bring up a display of the Facility Channel List screen showing only the V3 channels in the selected VC-4 trail connectivity link. The user shall be able to select one of the channels from the list. The selected V3 channel shall automatically get populated in the provisioning screen.
- In the “partial” mode, the user needs to select only the VC-4 trails that are displayed in the Facility Channel List screen. Navis™ Optical NMS shall automatically pick an appropriate V3 channel in the selected VC-4 and populate it in the provisioning screen.

The transmission type for a VC-3 path terminating on a 45-Mb/s port can be:

- One-way
- Two-way
- Broadcast
- Only two-way transmission is supported by the ADM16/1.
- The specific network element known capabilities, PHASE network elements that are ADM-16/4, ADM-4/4, TM-16/4, TM-4/4 do not support the one-way and broadcast VC-3 path.

A VC-3 path terminating on a 45-Mb/s port can be protected or unprotected. If the VC-3 path is protected, then all existing protection types are supported. This is limited only by the specific network element capabilities (in addition to the transmission type limitations). WaveStar DACS and DACS VI -2000 do not support protected path. Also, a switch status and switch requests are possible and are available on all ports where a 1+1 protected cross-connect exists.

VC-2 trails From the network map, the user can provision a two way unprotected VC-2 trail either in the “auto”, “manual” or “partial” mode.

In the “auto” mode, Navis™ Optical NMS will find the shortest route using the V2 channels from each of the links in the path. A VC-2 trail is always non-assignable since it does not have trail termination point on a SDH port nor has a PDH port corresponding to its rate.

In the “manual” mode, the user can select each link from the VC-2 provisioning view of the Network Map that shows all VC-4 trail connectivities. Selecting any VC-4 trail connectivity link that contains one or more V2 channels, the user shall be able to bring up a display of the Facility Channel List screen showing only the V2 channels in the selected VC-4 trail connectivity link. The user can select one of the channels from the list. The selected V2 channel shall automatically get populated in the provisioning screen.

In the “partial” mode, the user needs only to select the VC-4 trails that are displayed in the Facility Channel List screen. Navis™ Optical NMS will automatically pick an appropriate V2 channel in the selected VC-4 and populate it in the provisioning screen.

- VC-12 trails** VC-12 trails ride on channels of structured VC-4 Paths and can, for example, be provisioned on VC-4 Paths between:
- SLM-4 Tributary Port and SLM-4 Tributary Port (can be used to interconnect two SLM-4 digital rings)
 - SLM-4 Tributary Port and SLM-16 Tributary Port (can be used to interconnect an SLM-4 digital ring and an SLM-16 digital ring)
 - SLM-16 Tributary Port and SLM-16 Tributary Port (can be used to interconnect an SLM-16 digital ring and an SLM-16 digital ring)
 - ADM4/1 or ADM-155E Tributary Port and ADM4/1 or ADM-155E Tributary Port
 - ADM4/1 or ADM-155E Tributary Port and SLM-4 Tributary Port
 - ADM4/1 or ADM-155E Tributary Port and SLM-16 Tributary Port
 - ADM4/1 or ADM-155E Tributary Port and DSX, EQPT or Black Box.
 - VC-4 Paths can traverse any of the following:
 - SLMs
 - ADM4/1
 - ADM-155E
- VC-12 paths can be ring protected through the following:
- Transmission Restriction: for VC-4 Paths terminating on ADM4/1 or ADM-155E multiplexers, one-way transmission will not be allowed.
 - Line Switched Ring (LSR): when a failure occurs, an LSR loops back switched lines to restore service. As an example, SLMs employ LSRs.
 - Path Switched Ring (PSR): when a failure occurs, a new path around the ring is taken. As an example, ADM4/1 network elements employ PSRs.
 - Fixed Cross-connect: cross-connections are pre-determined by vendor; no commands are sent from Navis™ Optical NMS.
 - Digital Cross-Connect System (DXC): a generic term for electronic cross-connect systems.

TU12-VC11S trails In some network elements, such as ADM 16/1, a DS-1 (1.5 Mb/s) port can also terminate an SDH trail that can get cross-connected at the VC-12 rate. The DS-1 signal first gets adapted to a VC-11 SDH signal and then mapped to a TU-12 tributary pay load. Those trails that terminate on the DS-1 port are specially designated as VC11-TU12 trails. The circuit type for these trails is VC11-TU12. The requirements for VC11-TU12 trails will be same as for VC-12 trails except the termination ports. For VC11-TU12 trails, the end ports can only be a DS1 (1.5 Mb/s) port.

Navis™ Optical NMS will create client channels if at least one end port is a assignable port.

□

Provisioning circuits

Overview This section presents technical informations associated with the different circuits supported by Navis™ Optical NMS.

CEPT-4 (140 Mb/s) Users can provision an unprotected two way or one way CEPT-4 (E4) circuit that rides on a two way or a one way VC-4 trail. Since the CEPT-4 circuit rides on a VC-4 trail, the end nodes and the originating and terminating port addresses of the CEPT-4 circuit shall be the same as VC-4 trail. In the “auto” mode, if the two ends of the CEPT-4 circuit do not coincide with the VC-4 trail terminations, then Navis™ Optical NMS finds a route using the C4 channels of CEPT-4 digital links or C4 channels of a VC-4 trail. No broadcast CEPT-4 circuit provisioning is allowed from Navis™ Optical NMS. Currently, there are no parameters that are required to be set at the 140 Mb/s port(s) for the CEPT-4 circuits.

CEPT-3 (34 Mb/s) Users can provision an unprotected two way or one way CEPT-3 (E3) circuit that rides on a two way or a one way VC-3 trail. Since the CEPT-3 circuit rides on a VC-3 trail, the end nodes and the originating and terminating port addresses of the CEPT-3 circuit shall be the same as VC-3 trail. In the “auto” mode, if the two ends of the CEPT-3 circuit do not coincide with the VC-3 trail terminations, then Navis™ Optical NMS finds a route using the C3 channels of CEPT-3 digital links or C3 channels of a VC-3 trail. Currently, there are no parameters that are required to be set at the 34 Mb/s port(s) for the CEPT-3 circuits.

DS-3 (45 Mb/s) Users can provision an unprotected two way or one way DS3 (D3) circuit that rides on a two way or a one way VC-3 trail. Since the DS-3 circuit rides on a VC-3 trail, the end nodes and the originating and terminating port addresses of the DS-3 circuit shall be the same as VC-3 trail. In the “auto” mode, if the two ends of the DS-3 circuit do not coincide with the VC-3 trail terminations, then Navis™ Optical NMS finds a route using the D3 channels of DS-3 digital links or D3 channels of a VC-3 trail. For DS-3 circuit provisioning, the Navis™ Optical NMS user can specify a new parameter “Frame Format” in the provisioning screen. The valid values for the Frame Format field are “cbit” and “unframed”.

CEPT-1 (2 Mb/s) Users can provision an unprotected two way or one way CEPT-1 (E1) circuit that rides on a two way or a one way VC-4 trail. Since the CEPT-1 circuit rides on a VC-12 trail, the end nodes and the originating and terminating port addresses of the CEPT-1 circuit shall be the same as VC-12 trail. In the “auto” mode, if the two ends of the CEPT-1 circuit do not coincide with the VC-12 trail terminations, then Navis™ Optical NMS finds a route using the C1 channels of CEPT-1 digital links or C1 channels of a VC-12 trail. The existing CEPT-1 (E1) circuit (30N) provisioning capabilities shall be extended to support AM1PLUS.

T1-E1 The switch (TDAX-GB) at which the T1 to/from E1 mapping is executed will be managed as a gray box and will terminate the circuit. In the long term, the T1-E1 circuit is planned to manage the TDAX-GB through the multi-vendor CORBA interface, and the T1-E1 may extend beyond the TDAX-GB (not just terminate).

A T1-E1 circuit is treated as a combo circuit that rides on a VC12 trail and terminates at an E1 or VC12 port at one end (consistent with current E1 circuit designs) and a T1 port at the other end of the connection. The T1 port can be a logical port within a T3 physical port in a TDAX-GB. No new channel type shall be created to support T1-E1. Navis™ Optical NMS will verify that a T1-E1 circuit terminates at a TDAX-GB DCS T1 port, which could be contained within a T1 or T3 physical port. The T1 logical port shall be connected (virtual VC12 cross-connect) to a VC12 logical port within a STM-1 or STM-4 physical port. The end-to-end T1-E1 circuit, except for the segment in the terminating TDAX-GB, shall be managed (configuration management, fault management, monitoring, etc.) similar to a VC12S-30N circuit.

Broadcast circuits Broadcast circuits are provisioned in a network where one source signal needs to be sent to multiple end users, as in video broadcast. To support this capability, many network elements provide broadcast type cross-connects where one source port can be cross-connected to more than one destination port in the same network element. In Navis™ Optical NMS, broadcast circuit provisioning is supported by provisioning first a back bone circuit from which each of the broadcast legs can be provisioned. The back bone circuit and each broadcast leg will have its own circuit ID. However, they are all linked together by a “broadcast family” name. This “broadcast family” name is used in Navis™ Optical NMS to identify a set of circuits that derive the same source signal from a back bone. It also enables the Navis™ Optical NMS user to be able to display the complete broadcast circuit along with the broadcast legs. A broadcast leg can be provisioned from a back bone circuit or from another broadcast leg. All broadcast circuits are non-assignable.

Before attempting to disconnect a broadcast circuit, note the following:

- A backbone circuit cannot be disconnected unless all it’s tributaries or other backbones it is feeding are disconnected first.
- Backbones circuits and tributaries can be disconnected in the normal manner as any other circuit.

One-way circuits With regards to provisioning, one-way circuits can be provisioned only in the manual mode through the network elements listed in Table 6-1.

Note that one-way circuits cannot be provisioned:

- Through the SLM and ADM16/1 network elements
- In a manner in which the circuit starts and stops in the same port of the same network element (loopback configuration).

Protection: With regards to protection, one-way circuits can be protected or unprotected with ring protection or 1+1 protection. One-way circuits cannot be modified from protected to unprotected, or from unprotected to protected.

Merging: With regards to merging, one-way and broadcast circuits cannot be merged.

Support circuit ID formats

This section describes the circuit ID, which is a unique identifier of a circuit. At installation time, the user can select one of two formats for circuit ID: user-defined free-format or M.1400.

User-defined free-format

The user-defined free-format circuit ID has the following characteristics:

- 83 characters in length
- allowable characters include:
 - alphanumeric characters (The character string is case-sensitive and both upper- and lower-case characters are allowed.)
 - Forward slash /
 - dash -
 - underscore _
 - period
 - blank
- Tabs are not allowed.
- The syntax of the format is: <A Location> <Z Location> <Type> <ID Number>

An example of a user-defined free-format circuit ID is: NY1 NY2 VC4S 0001.

M.1400-specification format

The M.1400 specification. The format consists of four sub-fields:

- The A Location of the path or circuit
- The Z Location of the path or circuit
- The Type of the path or circuit
- The Identification Number of the path or circuit.

Note that the A Location value will alphabetically precede the Z Location value by default only if the variable to swap network elements are set up at installation.

Delete history Whenever a circuit is rearranged, the data from the previous circuit is retained in the Navis™ Optical NMS database. A circuit that has been rearranged several times accumulates a large amount of history information. The Delete History script retains only the necessary history data associated with each circuit, and deletes all unnecessary history data from the database.

The Delete History script consists of two parts:

- A script that automatically runs once, when upgrading the database. If you need to refer to any circuits listed in the history that are not the most recent non-RS, non-RI circuits, you should print out these circuits before upgrading the database. The Delete History script will delete these circuits from the history during the upgrade.
- A daily script execution that runs immediately following each successful daily backup.



AU3-AU4 adaptation feature

- Overview** This section describes the provisioning concepts associated with the AU3-AU4 adaptation feature for the BandWidth Manager.
- Purpose** The AU3-AU4 adaptation feature maps a higher order VC3 payload (AU3) at the interface of a STM1E port to a lower order VC3 payload (TUG structured), which is multiplexed into a VC4 (AU4). A STM1E port can be provisioned to carry one AU4/VC4 or three AU3 (higher order VC3) signals, in which case the AU3-AU4 adaptation is not enabled, or it can be provisioned to enable the adaptation. If the adaptation is enabled, the STM1E signal at the (external) interface will represent three AU3 signals, and a single AU4 (VC4) signal structured to contain three TU3/VC3 signals will leave the port unit (internally in the BandWidth Manager) to interface with the switching structure of the BandWidth Manager. Although the AU3-AU4 adaptation can be enabled in one direction (ingress or egress), only bidirectional TU3-AU3 type trails are supported.

In the most common application of the feature, a DS3 is mapped into a lower order VC3 at one end of the trail (e.g. in Europe), which in turn is multiplexed into a VC4. The DS3 is extracted from a higher order VC3/AU3 (STS1) at the other end of the trail (e.g. in N. America). If the DS3 within the AU3 needs to be dropped at the same BandWidth Manager, or the AU3 needs to be multiplexed into a higher level optical signal (OC3 or higher) to be transported farther, an external loop-back can be employed at the BandWidth Manager.

The adaptation feature is supported as a provisionable option on STM1E ports only, on the BandWidth Manager's STM1E universal shelf. An STM-1 signal can be looped back at a BandWidth Manager, and the AU3 signals from the STM1E port can be dropped at DS3 ports or consolidated over higher level facilities after being cross-connected through the same BandWidth Manager as AU3 signals. Note that a loop-back is external to BandWidth Manager. It should be configured in advance as a digital link and inventoried in Navis[™] Optical NMS.

- Caveats** The following caveats apply to the provisioning of TU3-AU3 trails with Navis™ Optical NMS:
- Navis™ Optical NMS only supports bi-directional TU3-AU3 trails.
 - Navis™ Optical NMS only supports the manual provisioning of TU3-AU3 trails.
 - Navis™ Optical NMS supports a digital link at STM1 rate that terminates at STM1E ports on the same BandWidth Manager at both ends. This is referred to as an external loop-back (see Figure 2). The external loop-back type STM1 digital link shall be channelized for AU3 only (no VC4), and will be used to carry 3 TU3-AU3 type trails.
 - Navis™ Optical NMS supports asymmetric VC4 trails, where at one end the VC4 trail terminates at a network element before being cross-connected (a VC3/TU3 is cross-connected and mapped/multiplexed into the VC4), and at the other end the VC4 trail terminates after being cross-connected (e.g., at the BandWidth Manager AU4-AU3 adaptation point).
 - Navis™ Optical NMS supports merge and protection features for TU3-AU3 trails. Only a TU3 (VC3) or an AU3 can be merged at one end of a TU3-AU3. The resulting trail will be a TU3-AU3. The merge of a TU3 and an AU3 to get a TU3-AU3 is not supported. Also, the merge of two TU3-AU3 trails is not supported.
 - Navis™ Optical NMS does not support preplan restoration for TU3-AU3 trails.

- Protection schemes** The following protection schemes associated with a TU3-AU3 are supported:
- Ring protection on a segment of a TU3-AU3 trail. For example, in Figure 3 the STM16 and/or OC12/STM4 can be ring configurations. (The STM16 ring actually would be associated with the VC4 trail.)
 - SNCP protection associated with the VC4 trail (if supported by STM1E). (Again, this would be a characteristics of the VC4 trail and not the TU3-AU3 trail.)
 - End-to-end protection (similar to SNCP at the ends). For example, Figure 3 can represent the “working” path, and a similar segment (e.g., between the TU3 X-conn and right-most AU3 X-conn) that contains another AU4-AU3 adaptation point - in another BWM - can represent the protection path.

- Verifications** When the user provisions a TU3-AU3 trail, Navis™ Optical NMS verifies the following conditions and generates the appropriate error messages if the conditions are not met:
- A TU3-AU3 trail rides on a VC4/AU4 trail for part of the connection. If no such trail exists in the TU3-AU3 path selected (designed) by the user, Navis™ Optical NMS will generate an error message.
 - Only one of the VC4 paths on which a TU3-AU3 trail rides must terminate at one end only at a STM1E port of a BandWidth Manager and be cross-connected at the VC4/AU4 level in the same BandWidth Manager. If the selected TU3-AU3 trail rides on one or more VC4 paths but none satisfies this condition, Navis™ Optical NMS will generate an error message.
 - The BandWidth Manager at which a VC4 path terminates and gets converted into three AU3s, must be of release 4.0 or beyond. Otherwise, an error message will appear.

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Section IV: Optical Layers

Overview

Purpose This section provides conceptual information pertaining to provisioning optical layers with Navis™ Optical NMS.

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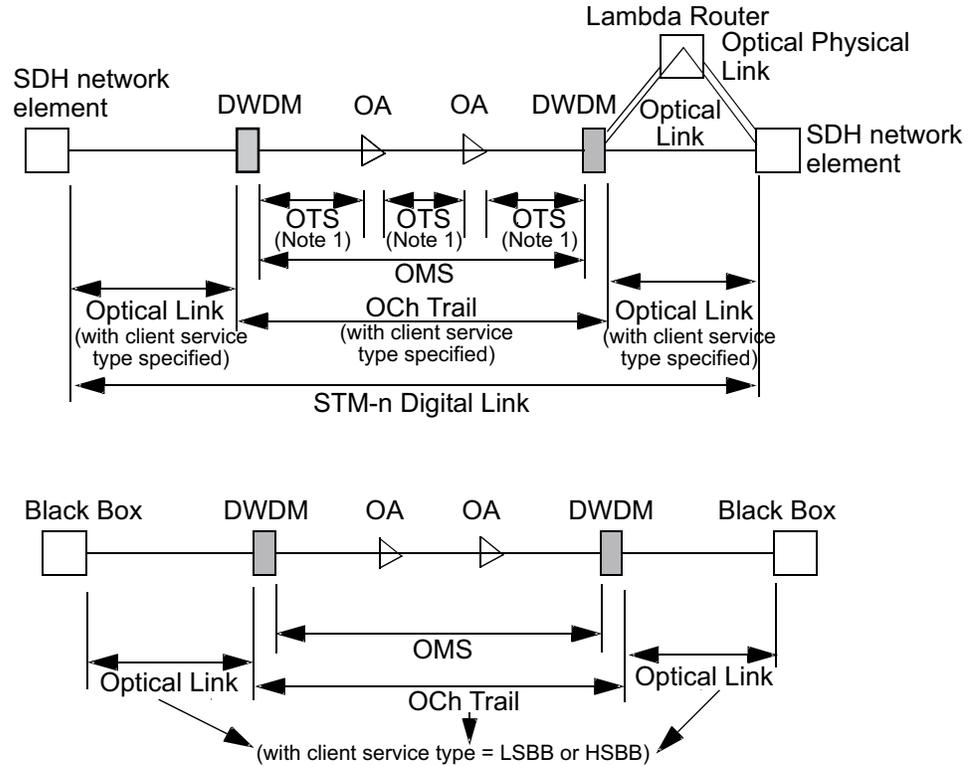


Optical layer support

Overview This section describes the Navis™ Optical NMS's support for optical layers.

Optical layer hierarchy The following figure shows the different hierarchy of optical layers for provisioning between DWDMs and SDH network elements or black boxes.

Figure 4-3 Hierarchy of Optical Layers



LEGEND:

- OTS - Optical Transmission Section (Note 1)
- OMS - Optical Multiplex Section
- OCh Trail - Optical Channel Trail
- Optical Link
- OA - Optical Amplifier
- DWDM - Dense Wave-Division Multiplexer
- SDH network element - SDH Network Element

Client Service Types for OCh Trails and Optical Links:

- STM-1
- STM-4
- STM-16
- STM-64
- Low Speed Broadband (LSBB)
- High Speed Broadband (HSBB)

Terminology The following terms appear within this section.

Fixed connection: fixed connections are stored in the Navis™ Optical NMS and used for provisioning. A fixed connection can be terminated by one or two point(s) of flexibility, the tributary side of a DWDM network element, a SDH network element or a black box. It can only be discovered. It is only visible in the ‘trail/channel selection’ screen. In this document, the fixed connection belongs to the OCh layer. However, it can be used at any level (VC-4, VC-12, ...) to help the provisioning process.

Paired Fixed Connection: a pair of two fixed connection that share some common channels.

OCH assignable port: an OCH assignable port terminates an OCH trail. OCH assignable ports are located either on the SDH network element, a non managed network element (Black Box/Equipment), or on the muxed port of a 10G mux card. The OCH assignable port can also be referred as a OCH TTP.

OCH non assignable port: any intermediate port of an OCH connection.

OCH connection: an OCH connection is a end to end optical path.

OCH server: is an OCH that is used to carry other OCH connections instead of regular client types (DL, HSBB, etc.)

Point of flexibility: a port that belongs to a Lambda Router connected to a DWDM network element via a physical link.

Topological link: in the scope of the optical layer, the topological links are OMS and OL.

□

Provisioning optical layers

Overview This section describes the provisioning concepts associated with optical layers.

Provisioning order The following steps are required to provision the different layers in the Optical Layer. It is important to remember that to be able to use the Optical Layer for SDH layer provisioning, the physical connectivities between the Optical Network Elements must have been established prior to the provisioning of the optical layers from Navis™ Optical NMS. Provisioning in Navis™ Optical NMS is mainly to provide the inventory, display and correlation of alarms in the optical layer in addition to some validations by the EMS. The user provisions the Optical Multiplex Section (OMS) between two similar types of DWDM network elements specifying any Optical Amplifiers (OA) between them. The OMS provisioning is always treated in Navis™ Optical NMS as a bidirectional section. If there are connectivities from the DWDM network elements to other SDH network elements or Black Boxes then the user provisions an Optical Link between them specifying “Client Service Type” (CST). Then the Optical Channel Trail is provisioned. When provisioning an Optical Channel Trail (OChTrail) the user is required to specify the client service type that the OCh trail will carry. The client service types are : V4DL, S4DL, S16DL, S64DL, OC-48, OC-192, LSBB (Low Speed Broadband) or HSBB (High Speed Broadband). If there are connectivities with SDH network elements or Black Boxes to DWDMs, the user can then provision the conventional SDH Digital Links between them. If Navis™ Optical NMS finds connectivities of the two SDH ports through the optical layer, it will prompt the user to “insert Optical Layer” at the time of order completion of digital link.

OMS layer provisioning

Navis™ Optical NMS supports the provisioning of Optical Multiplex Section (OMS) between the optical line sides of two OLS400G or OLS80G DWDM network elements. The cut-through to SNMS-EMS Graphical User Interface for OLS400G and to ITM-SC for OLS80G for port selection and automatic population is provided. Navis™ Optical NMS checks for the same network element model type for both ends of the OMS section. For the point and click provisioning, the selection for “OMS” in the selection menu under “Configuration --> Optical Layer --> Add --> OMS” shall be enabled only if both the network elements selected are DWDM network elements of the same type (i.e. both OLS400G or both OLS80G).

The following table summarizes the interworking of DWDMs and their types/ releases for OMS provisioning.

Table 4-13 DWDMs for OMS provisioning

A/Z End	Type/Rel. No.	Z/A End	Type/Rel. No.
OLS80G	End terminal or dual facing (Any release)	OLS80G	End terminal or dual facing (any release)
OLS400G (C-Band)	End terminal or ring or WAD terminal (Rel. 3.0/3.1)	OLS400G (C-Band)	End terminal or ring or WAD terminal (Rel. 3.0/3.1).
OLS400G (L-Band)	End terminal (R4.0)	OLS400G (L-Band)	End terminal (R4.0)
OLS400G (C-Band)	End terminal or ring or WAD (Type 1 and 2) terminal (Rel. 5.0 or 6.0)	OLS400G (C-Band)	End terminal or Ring or WAD (Type 1 and 2) Terminal (Rel. 5.0 or R6.0)
OLS400G (L-Band)	End terminal or ring terminal (R6.0)	OLS400G (L-Band)	End terminal or Ring terminal (R6.0)

Optical amplifiers: during provisioning of an OMS, users can add Optical Amplifiers similar to adding regenerators during digital link provisioning. The list of Optical Amplifiers that are available shall be displayed for the user to choose. The list of optical amplifiers shall contain only those that support the OMS section with the appropriate number of channels (16 or 40/80). For OMS Section between two OLS400G (C-band) DWDMs, only the C-band optical amplifiers shall be displayed for user selection. For OMS section between two OLS400G (L-band) DWDMs, only the L-band optical amplifiers shall be displayed for user selection. The order of Optical Amplifiers shall determine their sequence from left to right in the layout in the Optical

Multiplex Section. It is assumed that the Optical Amplifiers are all bi-directional providing amplification of the optical signals in both directions of the fiber. As with regenerators in Digital Links, the user shall be allowed to add or delete Optical Amplifiers to the Optical Multiplex Section.

C+L band: the C+L Band OLS400G DWDMs provide more bandwidth (upto 160 wavelengths) over a single fiber. The output of C-Band and the L-Band OLS400G R6.0 DWDMs are fed in to a CLSC (C and L band Separator and Combiner) unit that combines all the 160 wavelengths (80 from C-Band and 80 from L-Band) on a single fiber. This maximizes the output of each fiber in backbone and longhaul networks. When Repeater stations are needed in long haul applications, before each Repeater Station, the wavelengths have to be separated in to the C-band and L-band frequencies and fed in to their respective Optical Amplifiers and then re-combined for transmission again. The CLSC unit is a passive device that does not need any provisioning commands nor does it generate any alarm. However, when combining a L-band with a C-band system, a parameter has to be set in the C-band system that tells the C band system that it is working in conjunction with a L band system. This is required to adjust some power gain in the C band system. It is not expected that this parameter is set from Navis™ Optical NMS. From SNMS and Navis™ Optical NMS perspective, the C-band and L-band DWDMs are treated as two separate network elements. Therefore the OMS provisioning between C+L band DWDMs are treated as two separate OMS sections, one between two C-band DWDMs and the other between two L-band DWDMs with their own set of Optical Amplifiers (Regenerators). It is understood that in case of a fiber break between two C+L Band systems, Navis™ Optical NMS will receive alarms from both C and L band DWDMs resulting in showing two OMS section failures even though in reality there is only one fiber break. The functionality of Navis™ Optical NMS is not in any way affected by this behavior. It is the responsibility of the user to recognize this as a single failure for dispatching craft people to fix the problem.

Deleting an OMS: when the user tries to delete an OMS Section through a Delete Order, the request for deletion shall be denied if there is at least one OCh Trail (in-effect or pending) that is assigned to one of the OMS channels.

Optical link layer provisioning

The following section describes the provisioning of optical links between SDH network element or Black Box and DWDM network elements or between two DWDM network elements.

End nodes for optical link provisioning : a user can provision an optical link between: a SDH network element and a DWDM network element, a black box and a DWDM network element, two DWDM network elements (back to back OLS or in the case of OLS80G dual facing terminals or between ORS and an external DWDM network element) a SDH network element and a Lambda Router, a black box and a Lambda Router, a Lambda Router and a DWDM network element, The Navis™ Optical NMS checks the model of the nodes that terminate the optical link. If the models are not correct, the provisioning request shall be rejected. The cut-through to the selected EMS graphical user interface for port selection and automatic population shall be provided.

Automatic creation of internal optical link in OLS400G through discovery: When an association exists between the output port of a n ORS (Optical Ring Switch) in a OLS400G (R6.0 onwards), that association is reported to Navis™ Optical NMS as a link. Navis™ Optical NMS creates an optical link for this discovered link with a system generated ckt/trail ID and order number.

Behavior of NMS when an internal optical link is removed: if, after an internal optical link is created in Navis™ Optical NMS with a ckt/trail ID and order number after a database synchronization, the optical link is detected to be absent from a subsequent dbsync procedure, the Navis™ Optical NMS shall do the following: If there is no OCh trail provisioned on the internal optical link, the optical link shall be deleted from the system and all the associated records (alarm, PM, if any) shall be removed as per the existing system behavior. In addition, if the optical Fixed Connections are discovered with the internal optical link, those Fixed Connections shall be either removed or reconciled by the system. If an OCh trail is already provisioned on the internal optical link, this should be treated as improper disconnect and reported to the user. The improper disconnect notification shall be on the internal optical link.

'Client service type' in the Optical Link provisioning screen: when provisioning an optical link, depending of the end-node types, a user will have to populate a 'client service type' field in the provisioning screen. The 'client service type' will have to be populated only in the following cases: one end-node of the optical link is a black box and

the other end-node is a lambda router one end-node of the optical link is a black box and the other end-node is a DWDM network element without OTU one end-node of the optical link is a lambda router and the other end-node is a DWDM network element without OTU In other words, the “Client Service Type” field shall be enabled only when both end nodes of the Optical Link are not SDH network elements. In the other cases, the ‘client service type’ in the optical link provisioning screen shall be disabled and automatically populated by the system internally without explicit user input.

Optical channel connection (trail) provisioning for clients and servers

This section covers the handling and provisioning of OCh connections with Navis™ Optical NMS for both clients and servers.

An OCh trail is defined as an optical connection that is either assignable to a digital link or non-assignable. The OCh trail are of two types. The first type is an OCh trail (assignable OCh trail) that terminates on an SDH network element or a Black Box at either end in its layout (i.e. does not terminate in a Lambda Router with a cross-connect or in a DWDM network element). The second type of OCh trail (non-assignable) does not fall in to the above category of assignable OCh trail but may have a termination in a Lambda Router having a cross-connect in it.

Provisioning optical channel connections: The user may have to provide the following information to provision a new OCH connection:

- whether it is an OCH server or a regular OCH (client)
- Two end ports
- the client service type: this is the type of client connection that will ride on this OCH connection.
- protection type: path protected or not.
- routing mode: manual or auto
- in manual mode: selection of OCH channels and fixed connections from the network map as for other connection type
- in auto mode: selection of a list of node and link to be excluded (optional)

OCH connection type: The connection type for OCH connections is “OCH” for a regular OCH and “OCH-S” for an OCH server. This is also the value in the “type” field of a Circuit ID in the M.1400 circuit ID format. The “channel type” is “OCH” both connection type.

Supported operations: Navis™ Optical NMS supports the following operations for the OCH connection type: Add; Disconnect (include both regular and paper disconnect); Modify (re-arrange).

Map filtering: When an OCH-S is being provisioned, the map should be filtered to represent OL and OMS. When an OCH is being provisioned, the map shall be filtered to represent OL, OMS and OCH-S.

Mandatory fields: Navis™ Optical NMS does not allow the user to validate the order (“Apply”) unless the following parameters are filled: connection ID (A and Z location and port ID).

Optional parameters: The following optional parameters exist for optical channel connection provisioning:

- client service type: mandatory if auto-routing is selected.
- selection of channels: greyed out for auto-routing mode, optional for manual mode.
- exclude node and links: greyed out for manual mode, optional for auto-routing mode.
- exclude node and links: greyed out for manual mode, optional for auto-routing mode.

Port selection: When ports are selected using the NMS port table, those ports shall be filtered depending on the network element, as follows:

- SDH: STMn port related to an OL.
- Lambda Router: logical port with no optical link terminating on the related physical port.
- DWDM: OCH port on the low speed side (not derived from an OMS but including ORS and input ports of a 10G muxed card) with no optical link terminating on the related physical port.

When the ports of an OCH server are selected using the NMS port table, those ports shall be filtered to display only the 10G muxed ports.

Protection types: The protection type for OCH provisioning shall be 1+1. By default, the connection shall be left to unprotected.

For an OCH server connection, the client service type shall be greyed out, and the protection type is set to unprotected and greyed out.

Preplan for optical trails: Navis™ Optical NMS provides the capability to restore/reinstate an OCh channel trail if the following conditions are met: the service path and the preplan path have the same channel type/client service type, the service path and the preplan path have different OCh trail and ride on different OMS. the service path OCh channel trail and the preplan path OCh channel trail have the same end port. The user shall be able to choose provisioning the protection OCh channel trail (i.e. the preplan path) using either through another DWDM or the same DWDM but with different OMS (only if the DWDM supports more than one set with the same wavelength). If the protection OCh channel trail runs across another DWDM, it is client of on another OMS. Note: 1) For protected service path (e.g. involving DWDM equipped with ORS), both the working and protection segments of the service OCh channel trail are using the same OMS (i.e. one fixed OCh). The preplan path can not use the same OCh trail with the service path regardless it is protected or unprotected path. 2) The cross connect between the service and preplan path for optical trail must be done via the same LambdaRouter.

Navis™ Optical NMS allows the user to discover fixed connection between the following network elements:

Table 4-14 Fixed connections per network element

A-end	Z-end	Preconditions
SDH network element/black box	SDH network element/black box	At least 2 DWDM network elements between A-end and Z-end. No Lambda router between A-end and Z-end.
DWDM network element (tributary side)	DWDM network element (tributary side)	A-end different from Z-end.
Lambda router (point of flexibility)	Lambda router (point of flexibility)	A-end different from Z-end At least 2 DWDM network elements between A-end and Z-end.
Lambda router (point of flexibility)	DWDM network element	At least 1 DWDM network element between A-end and Z-end No Lambda router between A-end and Z-end
Lambda router (point of flexibility)	SDH network element/black box	At least two DWDM network elements between A-end and Z-end. No Lambda router between A-end and Z-end.



Section V: Optical Network Navigator

Overview

Purpose This section provides conceptual information associated with the Optical Network Navigator (ONN) Release 1.0. Note that ONN is a limited-availability feature with Navis™ Optical NMS Release 6.0.

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ONN support

- Overview** This section describes the Navis™ Optical NMS's support of the Optical Network Navigator (ONN).
- Definition** The ONN is the software and hardware present in the Lambda Router network element which performs management functions (e.g., configuration management and fault management) on optical connections across a network of Lambda Routers. The ONN system consists of a number of ONN Modules, each on a different Lambda Router.
- Terminology** The following ONN-related terms appear within this section.
- Connection:** in the context of ONN, the signal is carried between two edge ports. Depending on the type of connection (Unprotected, 1+1), the 2 edgeports may be connected by different ONN paths during the life time of the connection.
- 1+1 ONN connection:** a connection routed by an ONN which has two paths through the network - if the first path fails, the second path will automatically take over
- Client service type (CST):** Client service type is the input provided by Navis™ Optical NMS to indicate the bandwidth when provisioning optic links
- Discover route:** the process undertaken in CM to determine the route of ONN created connections in the network from the cross connections present in the Lambda Routers.
- Fixed connection span (FCS):** denotes fixed connection span established internally by Navis™ Optical NMS traversing DWDM's with fixed cross connects.
- Auto reroute ONN connection:** a connection routed by an ONN. If a failure occurs along the length of the ONN managed part will be automatically re-routed on to another path. This new path will be computed at the time the failure occurs.
- ONN domain:** The area of the network which is under the control of an NN.
- Network to network interface (NNI):** the network signalling interface value set against the networkInterfacetype ONN parameter. This port

is then available for signaling within the service provider's transport network

Permanent connection (PC): a connection which is routed entirely over a traditional network. In this mode, the request for service provisioning is received by the management system which handles each network element individually.

Soft permanent connection (SPC): a connection (OCH) which is (partially) routed over an ONN network. In this mode, the request for service provisioning is received by the management system and then transferred to the signaling control plane to route and establish the end-to-end service (within the domain).

User network interface (UNI): the client signalling interface value set against the networkInterfacetype ONN parameter. This port is then able to receive requests for connection creation.

Unprotected ONN connection: a connection routed by an ONN which has only a single path through the Lambda Router and will not automatically re-route after a failure.

Features description

The Lambda Routers (LRs) currently managed by the Navis™ Optical EMS have in addition a signalling element which facilitates automatic routing between similarly equipped LRs. This auto-routing between these LRs (with signalling element) is managed by the NN. Navis™ Optical NMS has to interface with the NN for connection (routing and implementation) between LRs and will interface with LRs through the Navis™ Optical EMS for data synchronization, alarms and notifications of port parameters, cross-connects etc.

Navis™ Optical NMS will have a direct LAN(TCP/IP) interface to the S/ONN located within the network element. Navis™ Optical NMS provides a mechanism to set up this communication via the Network Map.

Not all LRs in the network are equipped with the signalling element. This forces Navis™ Optical NMS to manage a mixture of LRs with ONN and some without NN. The routing between LRs is made feasible because of the capability of LRs to identify its neighbour by signaling. Once a LR is set up with the signaling capability, the ports are identified to the NN that are within its control. The ports have to be set with network interface type as NNI for network signaling and UNI to accept connection requests. Navis™ Optical NMS has to inventory these navigable ports based on the allocation from the user.

If user requests a connection involving a LR with navigable port, the source (ingress LR) and the sink (egress LR) has to be determined by Navis™ Optical NMS and a connection request has to be made to ONN. If connection request from user does not involve a LR with navigable ports, the implementation is same as what exists currently.

The connections passing thru NN domains are called SPC connections. The route thru the LRs associated with ONN are determined by the ONN. Navis™ Optical NMS needs to request connections from ONN or EMS depending on the category (S/PC) of connection. In addition, Navis™ Optical NMS must also maintain the states of the routes of these SPC connections and provide the same to the user accordingly.

Establishing an ONN connection

Navis™ Optical NMS interfaces directly with ONN R1.0, a signaling element coexisting on LR network element. via TCP/IP. (Effectively, if there are 'n' LR's associated with ONN, Navis™ Optical NMS will establish 'n' TCP/IP connections with the corresponding ONN) During a network element synchronization with the EMS, NMS automatically uploads all LRs. At this time NMS is unaware whether the LR has signalling element (ONN) associated with it. As a result, the association between NMS and LR/ONN will not be done automatically. Instead, the user has to manually add this association between NMS and the ONN using the mechanism provided from NMS GUI where the user can enter the IP address, login and password. The system will use the specified session parameters to establish communication with LR/ONN via TL1 commands. Once this communication is established, the LRs associated with ONN should be represented on network map with a icon different from the LRs with no ONN association. Also, in addition to this communication IP address, ONN uses a signalling IP address as identifier to establish connections during routing. So, the session parameters also includes another new parameter "Signalling IP Address" which shall be provided by the user during ONN session setup. These session parameters associated with ONN can be modified from NMS GUI when the session between NMS and ONN is down. Also, the above mentioned ONN session parameters along with the time when last sync was performed, the time when communication between NMS and LR/ONN was lost, the time when communication between NMS and LR/ONN was reestablished will always be displayed to the user using the ONN session parameter form. The user would also be able to start session to ONN from node menu of LR/ONN. As ONN coexists with LR, when LR is deleted, the ONN will no longer exist. When LR is deleted, NMS must remove all associations to the corresponding ONN. All data related to this ONN must be deleted from Navis™ Optical NMS.

ONN domains An ONN domain is a collection of Lambda Routers and ONNs that are capable of signalling amongst themselves and maintain the neighbor topology data to provide routing and restoration within that domain. This is helpful for customer to partition the ONN network. In this release, only single ONN domain is supported from Navis™ Optical NMS. Therefore, the system will not provide a mechanism for the user to define/modify the ONN domain. Instead, Navis™ Optical NMS prepopulates the ONN domain name either based on user's input during installation or predefine ONNDomain name as "ONN_DOMAIN."

Icons for ONN Navis™ Optical NMS uses a unique icon to identify that a Lambda Router has been associated to a signalling element. For additional information regarding what icons map to ONN, refer to the *Navis™ Optical NMS Getting Started Guide*.

Database synchronization ONN port parameters are the port parameters set on ports of the LR and utilized by ONN during the ONN connection requests from Navis™ Optical NMS. In relation with ONN, Navis™ Optical NMS has to synchronise all ONN port parameters and the route states of all the ONN SPC connections. The ONN port parameters are synchronised using the existing "Port" sync between NMS and the EMS via the TMF interface. The only sync between the NMS and ONN associated with LR is the route states and the new connections created/deleted from ONN. If communication between NMS and ONN is down, and in that time if ONN has rerouted the traffic on mesh protected paths or if failures has occurred causing change in route states, these need to be synchronised with the states of the connections in NMS. Incremental syncs to retrieve only the changes during the loss of communication is not available. Navis™ Optical NMS provides the user the mechanism to manually trigger syncs with NN at which time NMS will send a request to NN to obtain route states. In addition, Navis™ Optical NMS will sift thru the data retrieved to identify the changes and reflect them in its system.

□

Bandwidth allocation feature

- Overview** This section describes the provisioning concepts associated with the bandwidth allocation feature Navis™ Optical NMS supports.
- Definition** The provisioning of connections from Navis™ Optical NMS involving the Lambda Router (LR) can be done via ONN for SPC connections and via an EMS otherwise. The provisioning of ONN-SPC connections thru ONN is possible only with the ports under ONN control. This in turn implies that the the control of ports in the LR must be shared between the EMS and ONN and the ports must be assigned to belong to the EMS or ONN. By default, the ports in LR are under the control of the EMS. A port can be assigned to ONN by setting NetworkInterfaceType ONN port parameter on LR/ONN. Client service type refers to the type of client rate (S16,S4...) that can be carried on this ONN port. The shared risk group is the identifier indicating the risk for the existing traffic and is created from Navis™ Optical NMS using mechanism independent from this process of allocation. During this ONN port parameter setup, NMS assigns the ONN port to SRG from the existing SRG list. The mechanism involving the settingup of the above mentioned ONN parameters that effectively allocates ports for ONN from Navis™ Optical NMS is termed Bandwidth Allocation.
- Navis™ Optical NMS currently sets port parameters on LR only during provisioning as part of connection requests to the EMS. But in order to provision ONN (SPC) connections, the ONN parameter NetworkInterfaceType must have been set prior to provisioning. Navis™ Optical NMS provides a mechanism independent of provisioning that allows user to allocate ports for ONN control from the GUI during which the system shall send TP set up request to LR via the EMS for setting the ONN port parameters. Furthermore, Navis™ Optical NMS will use the same mechanism to enable the user in setting the other optional ONN parameters namely the CST (Client Service type) and shared risk group (SRG).

Operational methods From Navis™ Optical NMS, users can allocate bandwidth for ONN using the following two operational methods.

1. Method 1 is targetted towards allocating ONN Client ports. Using this mechanism, ONN parameters network interface port type (UNI) and CST can be allocated for these ports. Ports that meet the following criteria are eligible to be allocated using this method.

- Ports in LR/ONN that are completely free with no connections associated with it
- OL ports on LR/ONN that is not a termination port for any fixed connection span between two LR/ONN
- OL ports on LR/ONN that is a termination point of optic link (OL) : between LR/ONN and an SDH network element or between LR/ONN and a black box.

2. Method 2 is targetted towards allocating ports on the network side. These ports can only be assigned for NNI network interface port type. The user will also be able to assign the SRG and the CST ONN port parameters. Based on the allocation from the user, Navis™ Optical NMS will send port set up requests (setTPData) to SNMS for ports at either ends (A and Z) of the connection. The connections (FCS, OL) terminating on ports assigned to ONN are reserved for OCH-SPC connections thru ONN domain and will not be available for other regular connections (PC). Ports meeting the following criteria come under this method of allocation.

- OL ports on LR/ONN that are termination ports for any unprotected fixed connection span between two LRs or ONNs
- OL ports on LR/ONN that is a termination point of optic link (OL) between two LRs or ONNs.

Note: The OL ports on a LR or ONN that is a termination point of fixed connection span between LR/ONN and a SDH network element is not eligible to be allocated for ONN as they cannot be utilized for SPC connections.

□

Section VI: Subnets

Overview

Purpose This section provides conceptual information pertaining to the subnets supported by Navis™ Optical NMS.

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Subnet support

Overview This section presents an overview of Navis™ Optical NMS's support for subnets.

Definition Subnets are groups of interconnected facilities or network elements forming a closed ring that provide service protection for Navis™ Optical NMS if one of the facilities or network elements fail. With ring protection, there is a loss of efficiency in the utilization of facilities because bandwidth must be reserved in the protection facility to provide service restoration.

Support Navis™ Optical NMS supports two broad categories of rings:

- path-switched rings (PSRs)
- line-switched rings (LSRs)

Navis™ Optical NMS supports the following ring and ring protection features:

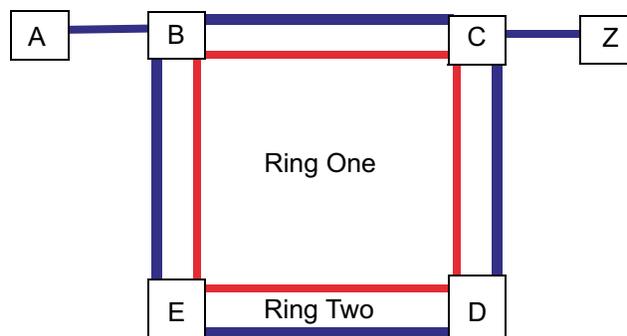
- 2- and 4-fiber PSRs and LSRs.
- The creation of line-switched rings containing two different network elements, specifically ADM16/1 and TDM10G (ADM64/4) network elements
- Allowing a single network element to belong to multiple rings. A network element that belongs to more than one ring is referred to as a multi-homed node or shared node
 - ADM16/1, ADM16/4, ADM4/1, AM 1, LXC16/1, and LXC4/1 can be part of multiple path-switched rings.
 - BandWidth Manager can be part of multiple line-switched rings.
- Manual ring creation of path-switched rings
- BandWidth Manager four-fiber line switched rings (MS-SPRING)

Note: An aggregate is not automatically created when Navis™ Optical NMS creates or discovers a ring.

Ring examples The following are examples of ways in which users can create rings.

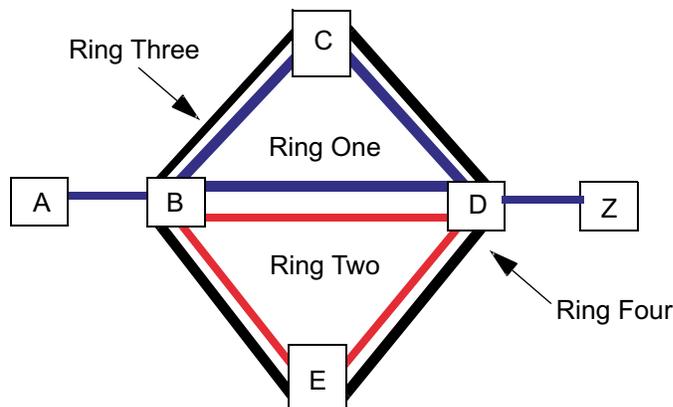
Two path switched rings sharing all nodes

The below figure illustrates two path-switched rings sharing all nodes.



Four rings formed by four nodes

The below figure shows four rings formed using the same four network elements.



Two-fiber rings

With a two-fiber line-switched ring (MS-SPRING), one fiber transmits and the other receives. Both transmission directions of the bidirectional connection travel through the ring in opposite directions. If the working transmit path at a given network element is clockwise, then the working receive path is *counterclockwise* and vice versa.

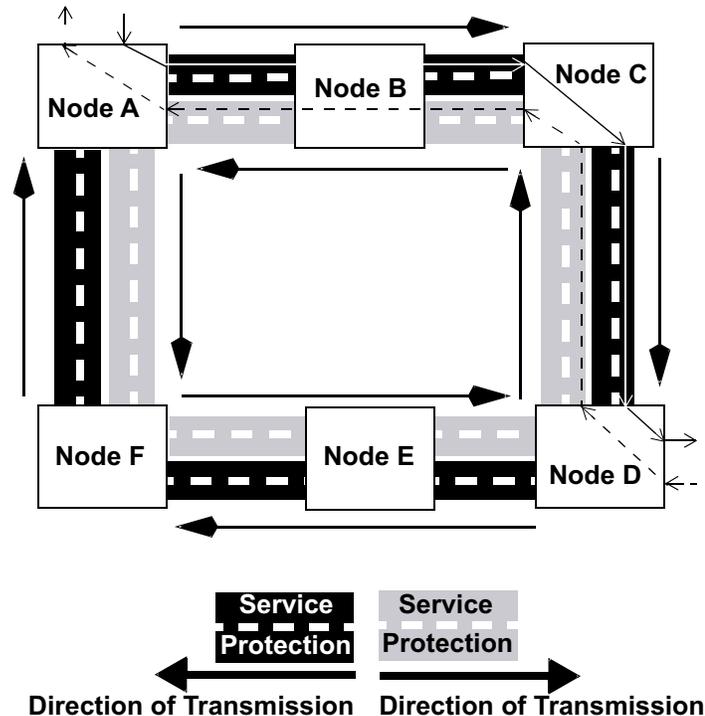
For protection against faults, each fiber's channels are split. The first, or top half, fibers are assigned as service paths while the second, or lower half, fibers are assigned as protection paths. Thus, the protection channels and service channels are not on the same fiber.

In a two-fiber ring consisting of STM-16 digital links, for example, the first fiber has channels 1-8 assigned as the service path; the second digital link meanwhile has channels 9-16 assigned as the protection path for the first fiber's 8 channels (channels 1-8).

Traffic Flow

The following figure shows the traffic flow on a two-fiber ring with MS-SPRING protection. With this figure, note that the path of working traffic transmitting from Node A to Node D traverses both fibers on the service path, and the path of protection traffic transmitting from Node D to Node A traverses both fibers on the protection path.

Figure 4-4 Two-Fiber Line Switched Ring

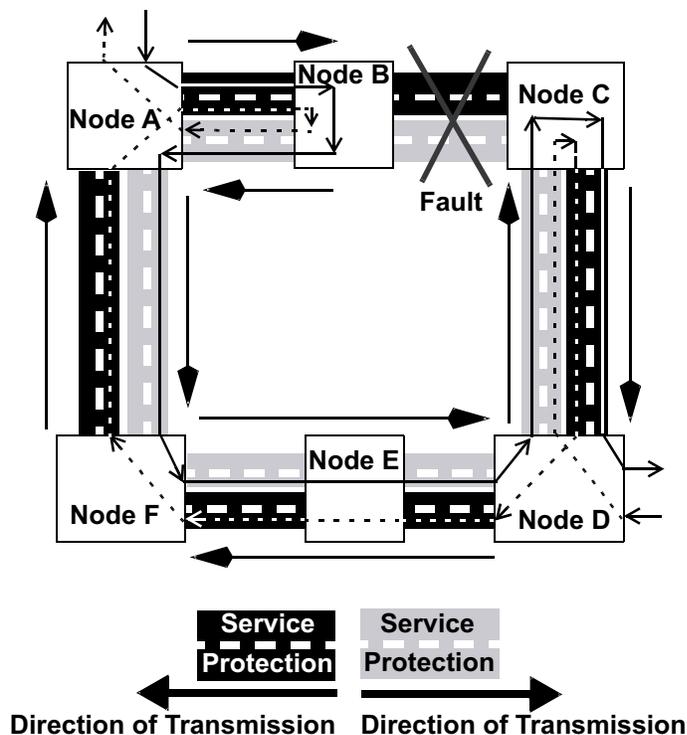


Example of a fault

The following figure shows that a fault has occurred in the paths from Node B to Node C. Note how the traffic is re-routed to bypass the

fault so that the traffic still emerges from the destination node from the expected port.

Figure 4-5 Two-Fiber Line Switched Ring with Fault



Four-fiber rings

Four-fiber rings are similar to two-fiber rings in function in that they possess transmit and receive lines. With a four-fiber ring, however, there are two pairs of transmit and receive lines on each node rather than a single pair.

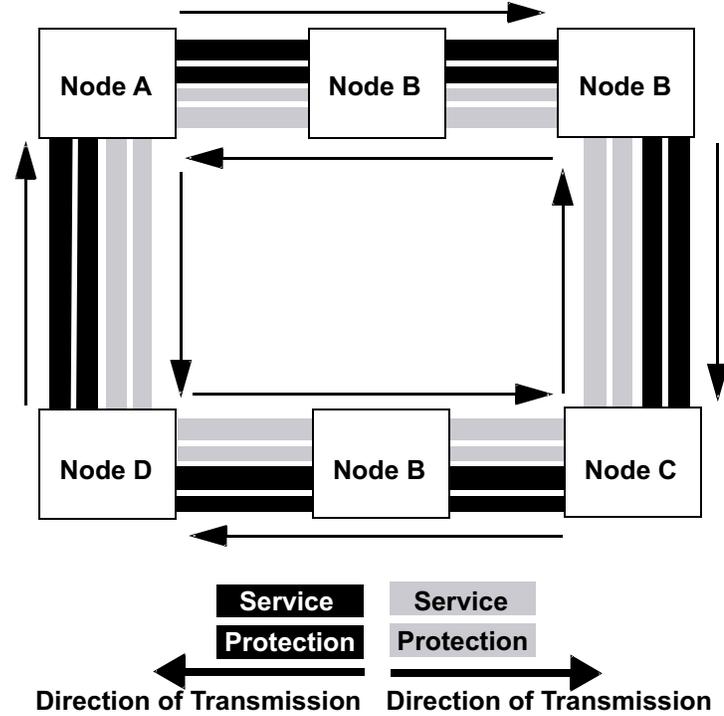
Also, the creation of a four-fiber ring is slightly different from that of a two-fiber ring in that the protection for the digital links have to be individually provisioned. It is required that the protection digital links (STM-16 or STM-64) be provisioned between the BandWidth Manager prior to the provisioning of the working (protected) digital links (STM-16 or STM-64) in creating a four-fiber ring.

MS-SPRING protection on a four-fiber rings consists of dedicated fibers for protection and service. In a four fiber MS-SPRING ring, two fibers are dedicated for service and two digital links are dedicated for protection.

Traffic Flow

The following figure shows the traffic flow on a four-fiber ring.

Figure 4-6 Four-Fiber Ring Line Switched Ring



□

Subnet creation

Overview This section discusses Navis™ Optical NMS support for subnet creation. Navis™ Optical NMS supports two methods of subnet creation: automatic and manual.

Automatic creation Navis™ Optical NMS can automatically create two-fiber or four-fiber rings if the following conditions are met:

1. Connectivity is established between two or more network elements.
2. The protection group of all the network elements in the group is MSSPRING.
3. Rings must consist of the same network element type. Exceptions are:
 - TDM10G
 - ADM4/1
 - ADM155E

Manual creation Manual ring creation is supported for line switched rings, path-switched rings, and homogenous black box rings (rings comprising of all black boxes).

For manual ring creation and deletion, Navis™ Optical NMS provides the following features:

- Support of heterogeneous, homogenous and multi-homed (shared) network elements
- Selection of multiple STM-N links
- Exclusion and deselecting of STM-N links
- Automatic ring name creation
- Creation and deletion notification
- Ring manipulation

Prerequisites for Manual Creation

Before attempting to manually create a ring, be sure the following prerequisites are met:

- All nodes participating in a path switched ring have SNC/N or SNC/I capability.
- With a line switched ring, at least one black box is present and the all other network elements selected to participate in the line switched ring have line switched ring capability and would automatically create such a ring in the absence of the participating black boxes.
- A minimum of two network element or black boxes are selected for creating the ring. Note that a selection can be either explicit or implicit. For example, the selection of an STM-N link implicitly selects two network elements.
- The STM-N links connecting the participating nodes form a closed loop. If the ring to be created is an line switched ring, the protection group (if applicable) shall be identical on all nodes.
- The STM-N links forming the closed loop are of the same level (they are either all STM-1, STM-4, STM-16 or STM-64).
- The ring to be created does not already exist.
- The maximum number of nodes that can be part of a manually created path switched ring is limited only by system resources.
- You can manually delete a created path-switched ring only if there are no protected paths through it (that is, the path-switched ring does not provide protection to any path).

Navis™ Optical NMS supports the forming of path switched rings for the following SDH network element at the specified STM-N rate when the manual ring forming criteria are met:

Table 4-15 Path switched ring-forming network elements

Network Element	Rate
ISM-1	STM-1
ISM-4	STM-4
PHASE ADM-16/4	STM-16
PHASE ADM-4/4	STM-4
ADM155E	STM-1

Table 4-15 Path switched ring-forming network elements (continued)

WaveStar ADM4/1STM1	STM-1
WaveStar ADM4/1STM4	STM-4
WaveStar AM1	STM-1
WaveStar AM1 + STM1	STM-1
WaveStar AM1 + STM4	STM-4
ADM 16/1 (SNCP model)	STM-1, STM-4, STM-16
ADM16/1 Compact (SNCP model)	STM-1, STM-16
TDM10G	STM-1, STM-4, STM-16, STM-64
BWM	STM-1, STM-4, STM-16, STM-64

Size limits

There is no requirement imposing a limit on the maximum number of nodes that can be part of a manually created PSR as long as the system resources permit. However, the system shall be able to support the participation of up to sixty-five (65) nodes within a manually created PSR ring. See subsequent requirements. In the case of LSR, however, the maximum number of nodes can not exceed sixteen.

More information Refer to Chapter 3 for more information about subnet creation.



Line-switched rings

Overview This section discusses Navis™ Optical NMS support for line-switched rings (LSR).

Definition With line switched rings, each network element recognizes all of the other network elements in the ring. Line-switched rings use one of two protocols, the standard protocol (G841) or the transoceanic protocol (TOP). Line-switched rings can be either two-fiber or four-fiber.

Advantages Line-switched rings offer users a few advantages in relation to protection and traffic management.

- Extra, unprotected traffic can be provisioned on the protection path. However, in the event of a failure, the unprotected traffic is preempted to make the channels available for line-switched protected channels.
- MS-SPRING (multiplexed-shared protocol ring) protection provides protection for two-fiber or four-fiber line-switched rings. While MS-SPRING protection is available for both two-fiber and four-fiber rings, it is assigned in a different method for these two ring types.
- Extra, unprotected traffic can be provisioned on the protection path. However, in the event of a failure in the ring, the unprotected traffic is preempted to make the channels available for line-switched protected channels.
- Automatic ring protection. When assigning channels in the ring for a path that is to be protected, you must assign the same channel all around the ring for the service traffic. If you use point and click provisioning and select ring protection, the processor will do this automatically.

LSR forming network elements The system forms line switched rings using the following SDH network elements at the STM-N level specified when the LSR pre-requisites are met.

Table 4-16 LSR-forming network elements

Network Elements	Rate	Fiber
ADM16/1 (MSSPring Model)	STM-16	2 fiber

Table 4-16 LSR-forming network elements (continued)

ADM16/1 Compact (MSSPring Model)	STM-16	2 fiber
SLM16	STM-16	2 fiber
BWM	STM-16, STM-64	2 and 4 fiber
TDM10G	STM-16, STM-64	2 fiber

Scenarios The following figures illustrate the conditions of a line switched ring before and after a line failure.

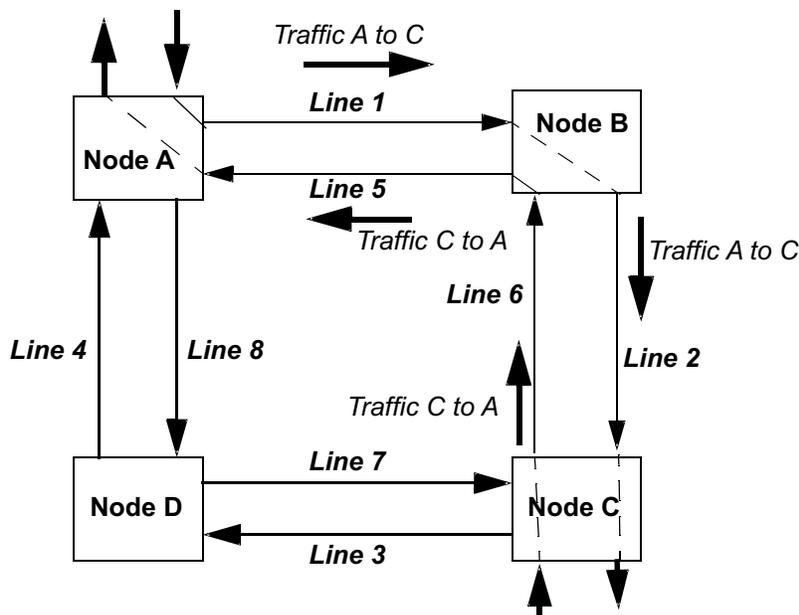
Before a Failure

The first figure displays a two fiber line switched ring consisting of network elements and STM-16 digital links before the failure.

The current condition of this ring is

- The path of working traffic, transmitting from Node A to Node C, traverses lines 1 and 2.
- The path of working traffic, transmitting from Node C to Node A, traverses lines 6 and 5.

Figure 4-7 A Line Switched Ring Before Failure

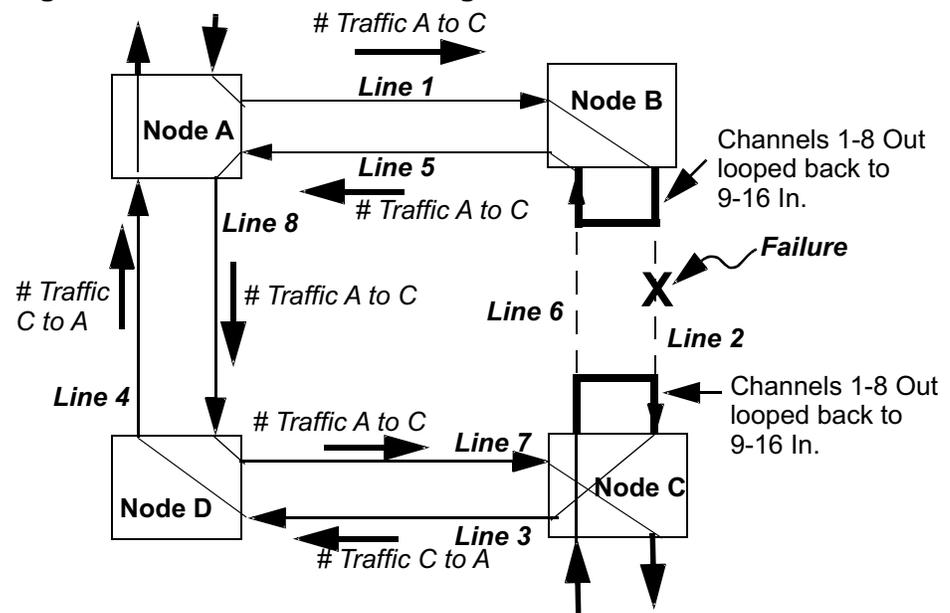


After a Failure

This figure displays the same two-fiber, STM-16 line switched ring *after* line 2 has failed. The current conditions of this ring, as a result of the line 2 failure, are

- Node B loops back channels 1-8 out towards Node C back to 9-16.
- Node C loops back channels 1-8 out towards Node B back to 9-16.
- The path of working traffic from Node A to Node C:
 - Traverses line 1 using channels 1-8
 - Loops back at the output of Node B to Node C 1-8 out to 9-16 In.
 - Traverses lines 5, 8 and 7 using channels 9-16 to reach Node C
- The path of working traffic transmitting from Node C to Node A:
 - Loops back at the output of Node C to Node B 1-8 out to 9-16 In
 - Traverses lines 3 and 4 using channels 9-16 to reach Node A.
- If line 6 also fails, nothing changes.

Figure 4-8 A Line Switched Ring After a Failure



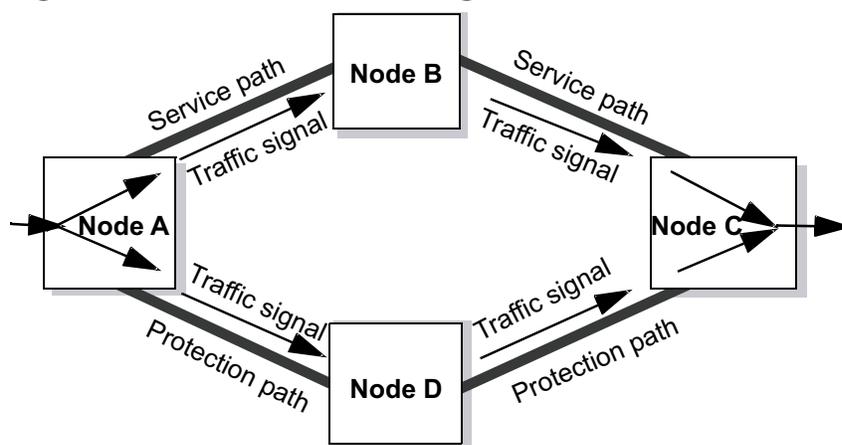
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Path-switched rings

Overview This section discusses path-switched rings.

Definition The following figure depicts a path-switched ring. In it, the traffic signal is duplicated as it enters the ring (node A) and is sent out over both the service and protection paths. Both signals are analyzed and compared at the end ring destination (Node C). The stronger traffic signal is sent on to the next destination (out of the ring).

Figure 4-9 A Path-Switched Ring



Prerequisites for automatically forming a PSR

Navis™ Optical NMS uses the following criteria to automatically form a path switched ring (PSR):

- An STM-N loop is closed.
- The loop forming STM-N digital links are of the same level. That is, the value of N (N = 1, 4, 16) in the STM-N's are identical.
- None of the loop forming STM-N are in 1+1 MSP, 1X1 MSP, 2-F, 4-F protection group.
- The connected network elements have Sub-network Connection Protection (SNCP) capability using the loop closing STM-N links.
- All the network elements in the loop can inter-work in an SNCP capacity within the context of Navis™ Optical NMS.

Automatic PSR forming network elements

Navis™ Optical NMS automatically forms a path switched ring for the following network element at the specified STM-N rate when the PRS forming criteria are met. Only the add/drop multiplexer model of a given network element can form a PSR ring.

This table lists the automatic PSR-forming network elements.

Table 4-17 PSR-forming network elements

Network Element	Rate
ISM-1	STM-1
ISM-4	STM-4
PHASE ADM-16/4	STM-16
PHASE ADM-4/4	STM-4
ADM155E	STM-1
WaveStar ADM4/1STM1	STM-1
ADM155E and WaveStar ADM4/1STM1	STM-1
WaveStar ADM4/1STM4	STM-4
WaveStar AM1	STM-1
WaveStar AM1+STM1	STM-1
WaveStar AM1+STM4	STM-4

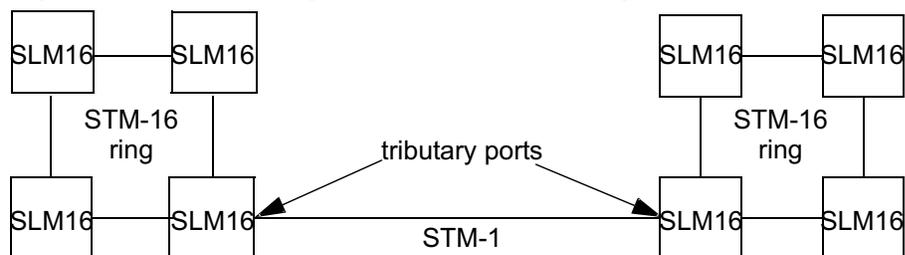


Synchronous line multiplexer rings

Overview This section describes Synchronous Line Multiplexer (SLM) rings.

Definition SLM rings can be interconnected by using tributary ports. The following figure shows two SLM rings at the STM16 rate interconnected at the STM-1 rate by interconnecting their tributary ports.

Figure 4-10 SLM Rings with Interconnecting Tributary Ports



Line switching support For line switching, SLM-2000 rings support the following features:

- Only channels 1-8 (VC-4 Paths) of the STM-16 lines will be assigned working traffic.
- Channels 9-16 (VC-4 Paths) are reserved for protection traffic.
- Channels 9 through 16 (VC-4 Paths), the reserved channels, are not assigned to protect any particular working channels. Thus, there is only one layout, the working circuit, and no protection layout used in line switched protection.
- Each line contains half working traffic and the other half is reserved for protection channels.
- Navis™ Optical NMS establishes, deletes, or views SLM-2000 rings.

□

Protection protocol

Overview This section describes the protection protocols for rings. LSR ring protection protocol be either standard or Transoceanic Protocol (TOP).

Ring protection protocol can not be set from Navis™ Optical NMS. It can, however, be retrieved from the EMS. Upon request, the system shall display the ring protection protocol as reported to it by the EMS.

TOP protection The transoceanic protection protocol is used for very long path (when the distances between network elements are greater than 1500 km.) in which a purely multiplex section shared protection scheme results in signal delay and degradation. The delay and degradation are results of the added path owing to the fact that the switching in MSSPRING is not done right at either the source or the destination of the working traffic.

In a transoceanic application, the ring switching at a network element is augmented such that the bridging from the working channels to the protections channels is performed at the source network element in the event of a failure.

In current release, line switched rings formed by some network elements supports transoceanic protocol. Since rings formed by these network elements are self-discovering, other than provisioning the links between the network elements, the network manager (Navis™ Optical NMS) need not explicitly configure the protection protocol. Therefore, no protection protocol setting by is necessary. The only requirement on Navis™ Optical NMS is that it recognizes the protocol as reported to it by the EMS.

□

Subnet deletion

Overview This section describes subnet deletion. A subnet is deleted whenever a user deletes a subnet-forming digital link. That is, whenever a user deletes a single digital link forming a subnet, the subnet is deleted.

Considerations The following items should be considered before a user attempts to delete a subnet:

- Navis™ Optical NMS allows the disconnection of a digital link even if the digital link is part of a ring loop as long as the ring is not providing any protection.
- Navis™ Optical NMS deletes a ring if the disconnection results in the disconnection of a digital link that is part of a ring-forming loop.
- If a ring is deleted, the system shall remove the ring name from the list of ring names.

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Section VII: Virtual Concatenation Groups

Overview

Purpose This section provides conceptual information pertaining to virtual concatenation as supported by Navis™ Optical NMS.

Contents

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Virtual concatenation without link capacity adjustment scheme	4-102



Virtual concatenation support

Definition Virtual concatenation is a standards compliant inverse multiplexing protocol which creates a virtual concatenated SDH entity (called VCn-Xv) which is transported by X VC-As across the SDH network. The VCn created are standards compliant VCns. Additional VCn's can be added to the VCn-Xv, however it will be service affecting.

In the network model, virtual concatenation is supported by allowing a virtually concatenated link connection to be derived from multiple VC-N connections. Additionally, a new attribute is added to the link connection to represent the transport mechanism for that link connection over the server(s) which carry it. This can take the values of:

- DirectClient - the link connection is carried over a single connection (all previous link connections have this value).
- InverseMuxScalable - the link connection is carried by an inverse multiplexing scheme which allows dynamic scaling as the server connections fail (e.g. virtual concatenation with LCAS).
- InverseMuxFixed - the link connection is carried by an inverse multiplexing scheme which does not allow dynamic scaling as the server connections fail (e.g. virtual concatenation without LCAS).

Principles The principles of virtual concatenation are:

- the VCn-Xv is one signal at the VCn-XvTTP's (i.e. end points) which is transported as X individual (VCn) entities between these VCn-XvTTP's, creating a virtual path.
- the VCn's within the VCn-Xv are not locked together by means of their pointers. All VCn's in the VCn-Xv have a valid AU/TU pointer and a sequence number is added to their overhead.
- the AU's [TU's] in the AU-n-Xv [TU-m-Xv] can be freely distributed over the available timeslots in an STM-N. For the case of interconnecting two pieces of equipment by means of a number of electrical STM-1 signals, the AU's in the AU-n-Xv can be transported over the available STM-1s.
- overhead of all VC's in the VCn-Xv is used for integrity checking of the concatenated structure.

- the payload capacity of the VCn-Xv is X times the payload capacity of the VCn.

Figure 4-11 A virtual concatenated AU-n-Xv or STS3-Xv

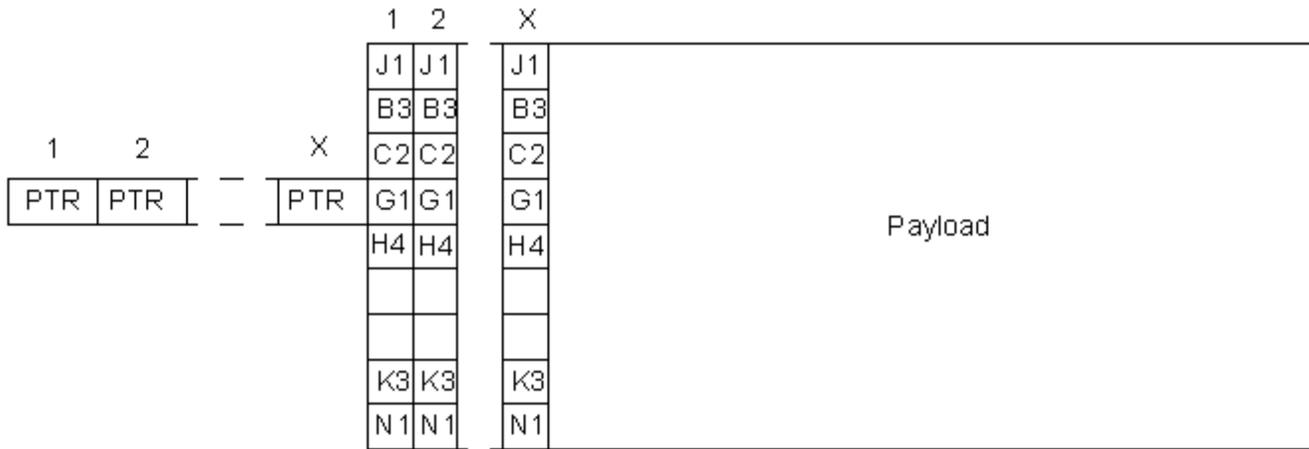
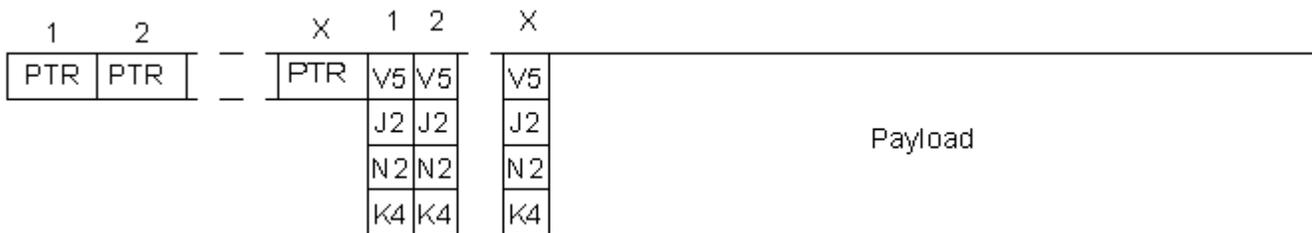


Figure 4-12 A virtual concatenated TU-12-Xv or VT1.5-Xv



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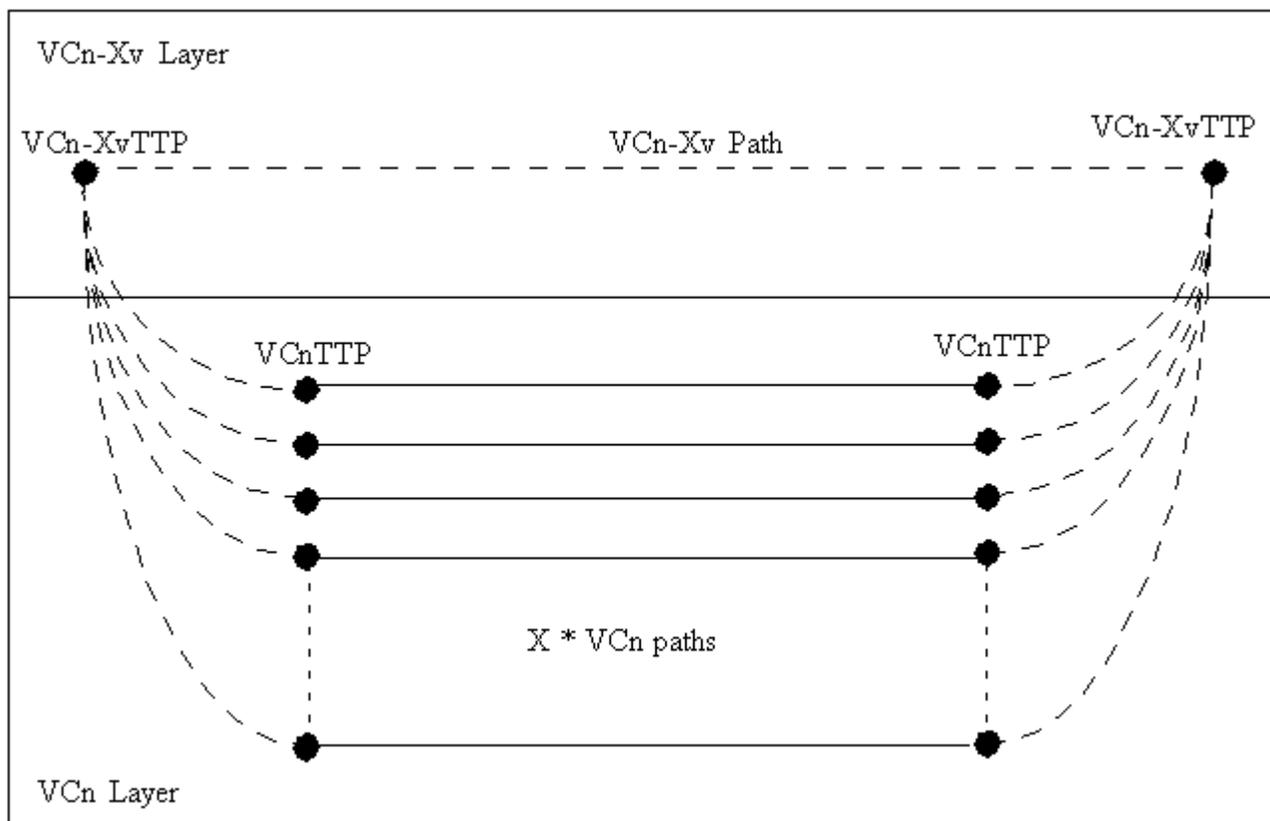
Virtual concatenation with link capacity adjustment scheme

Overview This section describes Navis™ Optical NMS's support for virtual concatenation with a link capacity adjustment scheme (LCAS).

Background LCAS provides a control mechanism to hitlessly increase or decrease the capacity of a virtually concatenated link to meet the bandwidth needs of the application. It also provides a means of removing member links that have experienced failure.

Model The following model is a high level diagram of virtual concatenation.

Figure 4-13 High level diagram of virtual concatenation



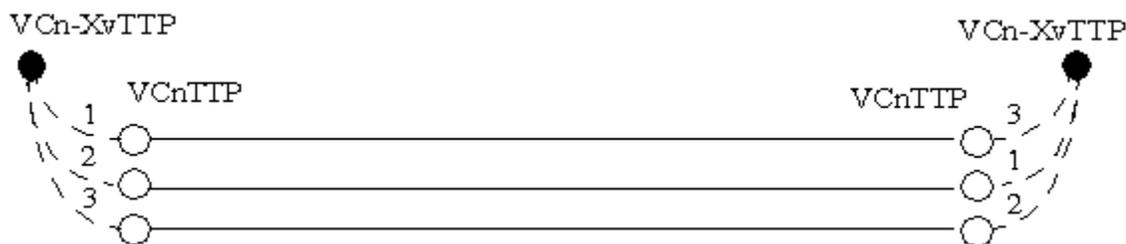
- Bandwidth adjustment** Once provisioned, bandwidth adjustment is hitless.
- Bandwidth can be modified under management control whilst keeping the virtually concatenated path in service. This will not be service affecting, and can be done by:
 - provisioning additional VCn's to be part of the virtually concatenated path.
 - reducing the number of VCn's that are part of the virtually concatenated path.
 - Bandwidth can be modified automatically due to failure of the VCn's whilst keeping the virtually concatenated path in service.
 - On failure, the affected VCn is disabled until the VCn path has been restored, at which point it will be re-incorporated into the VCn-Xv.
 - If failure of all but one of the VCn paths that support the VCn-Xv occur, then the VCn-Xv will be degraded and will be operating at a reduced bandwidth. If the final VCn fails then the VCn-Xv also fails.
 - Bandwidth can be protected whilst keeping the virtually concatenated path in service by provisioning the capacity VCn-Xv to be greater than the intended maximum capacity needed by the client service.
 - On failure of one or more of the VCn's in the VCn-Xv, reducing the capacity of the VCn-Xv down to the intended maximum capacity needed by the client service, the VCn-Xv itself is degraded, however the service itself is still working.
 - On failure of one or more VCn's in the VCn-Xv, reducing the capacity of the VCn-Xv to below that required for the intended maximum capacity needed by the client service, both the VCn-Xv is degraded and the service itself is degraded.

Ordinal symmetry Unlike for virtual concatenation without the LCAS, the VCn paths that support the VCn-Xv path do not have to have the same ordinal symmetry at both ends of the connection. Ordinal symmetry will be enforced by Navis™ Optical NMS.

All STS trails belonging to a VCG have to maintain ordinal symmetry when both ends of the trail terminate on VCG capable cards. Ordinal symmetry should not be confused with time slot. Herein, by ordinal

symmetry it is meant the rank order (that is first, second, third, etc.) of the STS at the VCG port. For example, say the user wants to provision up to 150Mb/s capacity between network element “A” and “Z”. To achieve the 150Mb/s capacity, three STS-1s have to be provisioned between “A” and “Z”. Consider the first, second and third STS-1 terminate on “A” at ports “1”, “2” and “3” respectively. To maintain ordinal symmetry the second STS-1 can only terminate at “Z” on ports that have higher sequential order than the “Z” termination port for first STS-1. Similarly, the third STS-1 can only terminate at “Z” on ports that have higher sequential order than the “Z” termination ports for first and second STS-1. On the other hand, if only 50Mb/s capacity is provisioned from “A” to “Z” any combination is acceptable since only one STS-1 is provisioned.

Figure 4-14 Ordinal symmetry requirements for virtual concatenation with LCAS



The LCAS has the ability to reconstitute the VcN-Xv based on the sequence number of each of the VcN's, ensuring that the payload of VcN-Xv is reconstituted in the right order. If a VcN has a sequence number that is completely out of the scope of the VcN-Xv, e.g. for Ordinal Symmetry Requirements for Virtual Concatenation with LCAS.

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Virtual concatenation without link capacity adjustment scheme

Overview This section describes Navis™ Optical NMS's support for virtual concatenation without a link capacity adjustment scheme (LCAS).

Background Basic virtual concatenation without LCAS, enables pipes to be created in granularities outside of that for standard SDH. Thus increasing flexibility in the use of the available bandwidth in the network. the availability of these pipes is based on that of the SDH connections that support it. Any adjustments in size made to the pipes, either automatically due to failures or manually due to provisioned changes are service affecting.

Bandwidth adjustment Once provisioned, bandwidth adjustment is *not* hitless.

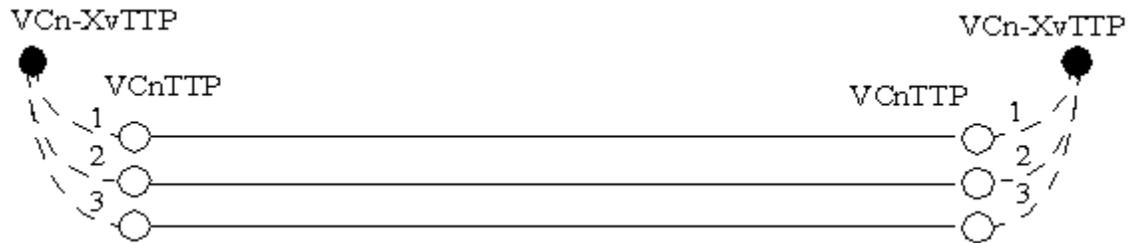
- To increase the bandwidth, additional VCn's can be added, however, this will be service affecting.
- If a failure of one on the VCn's that makes up the VCn-Xv occurs, then the VCn-Xv Path itself fails. This will also be service affecting.

Ordinal symmetry For the VCn-Xv path to operate successfully, the VCnTTP's over which it is transmitted must have the same ordinal symmetry at both ends of the connection.

All STS trails belonging to a VCG have to maintain ordinal symmetry when both ends of the trail terminate on VCG capable cards. Ordinal symmetry should not be confused with time slot. Herein, by ordinal symmetry it is meant the rank order (that is first, second, third, etc.) of the STS at the VCG port. For example, say the user wants to provision up to 150Mb/s capacity between network element "A" and "Z". To achieve the 150Mb/s capacity, three STS-1s have to be provisioned between "A" and "Z". Consider the first, second and third STS-1 terminate on "A" at ports "1", "2" and "3" respectively. To maintain ordinal symmetry the second STS-1 can only terminate at "Z" on ports that have higher sequential order than the "Z" termination port for first STS-1. Similarly, the third STS-1 can only terminate at "Z" on ports that have higher sequential order than the "Z" termination ports for first and second STS-1. On the other hand,

if only 50Mb/s capacity is provisioned from “A” to “Z” any combination is acceptable since only one STS-1 is provisioned.

Figure 4-15 Ordinal symmetry requirements for virtual concatenation without LCAS



A sequence number is added to the overhead of each of the VCn's to ensure that the payload of the VCn-Xv is reconstituted in the right order. If the order of the VCn paths that support the VCn-Xv path is not maintained, then the VCn-Xv path will fail. If a VCn has a sequence number that is completely out of the scope of the VCn-Xv will be treated the same as if the order has been mixed up and the VCn-Xv will fail.

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Section VIII: Preplan Restoration

Overview

Purpose Restoration is the process for Navis™ Optical NMS users to reroute traffic temporarily in order to restore service in case of a network failure. Navis™ Optical NMS manages restoration through two features: automatic protection switching and preplan restoration. This section focuses on preplan restoration as it relates to Navis™ Optical NMS.

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How Navis™ Optical NMS manages restoration

Overview This section describes how Navis™ Optical NMS manages restoration. In the event of a network failure, Navis™ Optical NMS can restore service to an alternative link or path that has been reserved for restoration purposes. Navis™ Optical NMS manages service recovery with two features:

- Automatic protection switching
- Preplan restoration

Automatic protection switching

Automatic protection switching restores service to a disrupted circuit by switching the traffic to a dedicated protection route. It is triggered by an alarm and allows for only one-stage restoration. This restoration feature does not require user intervention.

Automatic protection switching requires dedicated spare capacity to be set up when service is provisioned. Mechanisms for automatic protection switching include: MSP, MS-SPRing, PSR, 1+1 SNC/P, and Y-protection. The mechanism is selected during service provisioning, depending upon the capability of a network element. In the case of failure, detected by the network element supporting the mechanism, a protection path will be selected and routed by the network element automatically.

Preplan restoration

Preplan restoration allows users to create dedicated backups for service paths and circuits. Disrupted circuit can then be temporarily rerouted on an alternate route to restore service. The restoration process can be triggered manually or automatically by an alarm. Once the alarm situation is resolved, the restored circuit is reinstated to its original route.

Preplan restoration works best where:

1. One portion of the service circuit is within control of Navis™ Optical NMS while the other end is outside the Navis™ Optical NMS control and on the end customers premise
2. Customers have mixed network elements in their network
3. Restoration paths are “off-network” and must be defined by the customer.
4. Ring protection not provided in the network element.

5. Fiber cut between rings
6. More efficient usage of spare capacity is desired

Customers can use preplan restoration to establish specific predefined path(s) according to their network preference. In the event of a failure, the service will be restored to one of the predefined paths. The spare capacity is only used at the time of restoration and can be shared among different preplans for different failure scenarios.

Navis™ Optical NMS supports preplan restoration of all the circuit rates that are allowed under normal service provisioning below the digital link level. However, only two-way circuit types can be protected by preplan restoration. One-way and broadcast circuits cannot have preplan.

Normally, a preplan path protects a service path with identical circuit type, including “One Step” provisioned circuits, except for FLAG application. The service facility/circuit to be protected must be in the “In-Effect” (IE) state in the network before preplan association can be invoked. One stage or three stages restoration/reinstatement process can be allowed if appropriately supported by the network element or EMS.

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Aspects of preplan restoration

Overview This section discusses the three aspects of preplan restoration:

- **Restoration:** a disrupted circuit is temporarily rerouted to an alternate route to restore service.
- **Reinstatement:** a restored circuit is returned to its original route.
- **Preemption:** a higher priority circuit is restored even if there is a lower or equal priority circuit already using the channel. In such a case, the lower priority circuit is disconnected and the higher priority circuit is restored. The system administrator has the option of turning preemption on or off for restoration.

Basic features The following items are basic features supported by preplan restoration:

- creation of preplan restoration and preplan assignments
- association of a preplan to a service circuit
- preplan plan and preplan group
- execution of a preplan
- preemption and affected circuits
- reinstatement
- restoration status
- reports
- preplan for optical trails

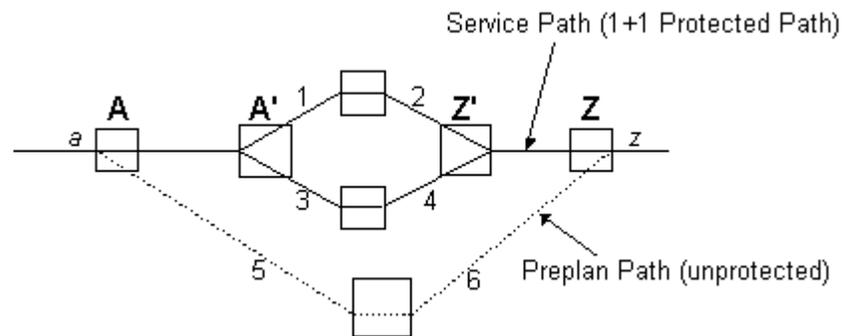
Restoration Restoration is when a disrupted circuit is temporarily rerouted to an alternate route in order to restore service. The process of restoring the failed facility involves moving each affected circuit over to the preplanned route. The graphical layout for each moved circuit is updated with the new port address information.

Soft Restoration

With soft restoration, also referred to as *bridge and roll*, a *bridge* is first established and then traffic is rerouted from service to the preplan. Once the traffic is rerouted, the bridge is disconnected. Although traffic is uninterrupted, soft restoration is much slower as compared to hard restoration.

Normally, Navis™ Optical NMS supports soft restoration/reinstatement for a protected path. The exception is when cross connection performed between the protection segment of a protected path and another path (either from service to preplan path or from preplan to service path) within the same network element node, where the involving network elements support bridge and roll capabilities, Navis™ Optical NMS does not allow preplan soft restoration/reinstatement (bridge and roll) for protected path.

Figure 1: With the A node and Z node supporting bridge and roll capabilities, soft restoration/reinstatement can be applied in this scenario because either the A node or the Z node does not cross connect traffic from the protection segment of a protected path to the preplan path (5-6). Hard restoration/reinstatement can also be used.



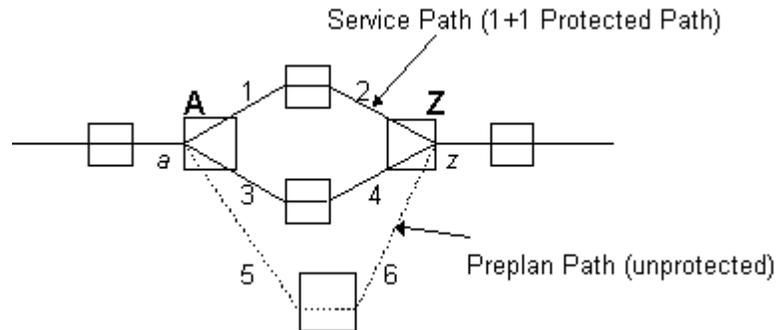
Hard restoration

With hard restoration, a network service is first disconnected on the service path, a switch is made to the preplan and then the service is connected on the preplan path. Traffic is temporarily interrupted in a hard restoration.

Hard restoration/reinstatement (default) is available for restoration/reinstatement of all unprotected and protected paths.

Figure 2: With the A node and Z node supporting bridge and roll capabilities, soft restoration/reinstatement can not be applied in this scenario because either the A node or the Z node has protection segment of a protected service path and unprotected preplan path. No soft restoration/reinstatement shall be allowed for cross connection between the protection segment of a protected service path and preplan (either protected or unprotected) path from the same network

element node. Hard restoration to preplan or reinstatement to service path must be used.



Hard and soft restoration for the Lambda Router: users can choose to use either hard (default) or soft restoration for Lambda Router models 256/128 that support 1+1 SNCP protection. Navis™ Optical NMS can support both hard and soft restoration using modify SNC operation for Lambda Routers (in lieu of bridge and roll).

Hard and soft restoration for the BandWidth Manager: users can choose to use either Hard (default) or Soft restoration for the BandWidth Manager.

Hard and soft restoration for LambdaUnite: Navis™ Optical NMS supports bridge and roll capabilities between service and preplan routes for LambdaUnite. Users can use either Hard (default) or Soft restoration for LambdaUnite.

Hard and soft restoration for WaveStar TDM 10G: Navis™ Optical NMS supports bridge and roll capabilities between service and preplan routes for WaveStar TDM 10G. Users can use either Hard (default) or Soft restoration this network element type.

Triggers

A preplan form's preference and priority fields determine whether restoration is triggered.

- **Automatic** - if a service circuit is protected by multiple preplans, the preplan selection criteria is based on the highest preference level as well as the alarm status of the preplan. If the selected preplans based on the preference level have alarms or in-effect circuits on their channels, the preplan shall not be used for restoration and the next highest preference level available preplan will be tried.
- **Manual** - if a restoration fails, the user will go to the Preplan Pairs, PrePlan Plan, or Preplan Group form to execute restoration for the selected facility/circuit.

Tracking status of restoration orders

Users can track the status of restoration orders by using the Preplan Pairs form.

Reinstatement

Reinstatement is the process whereby a restored circuit is returned to its original route. Once a failure has been repaired, a reinstatement may be initiated which would move circuits from the restoration path back to the original service path.

Enabling reinstatement

Users can activate the reinstatement process from the Preplan Pairs form. From that form, users need to specify the facility to be reinstated and then select the reinstate action from the Actions pull-down menu.

Preemption

Preemption is used to restore a higher-priority circuit to a circuit that is being currently used by lower or equal priority traffic.

How it works

If preemption is turned on and a facility/circuit is needed for restoration, a dialogue box appears, during restoration indicating the preemption target (CKT/Trail ID), and requests user confirmation. After user confirmation, the lower-priority circuit on the channel is disconnected and the higher priority circuit is restored. To maximize restoration speed, Navis™ Optical NMS does not check whether the preemption target has another preplan.

After preemption is completed, the preplan that caused the preemption must be manually re-triggered to complete the restoration process. A preemption report is available to keep track of all the preempted circuits.

Constraints

The following constraints apply to preemption:

- Preemption is not allowed on circuits carrying lower order in-effect traffic (such as a VC-4 carrying a VC-12).
- If any preplan circuit in a preplan plan (or preplan group) requires preemption, the system displays a message for that particular preplan and awaits confirmation. Preemption must be confirmed before the system can continue to process other preplans in that preplan plan (or preplan group). After the preplan plan or preplan group execution is completed, there are two options to re-trigger those circuits that have gone through preemption:
 - A preplan plan (or preplan group) can be triggered for a second restoration because the preplan, marked for restoration order, is skipped. Only the circuits with confirmed preemption are restored.
 - Individual circuits can be triggered for restoration through the preplan pairs form after preemption acknowledgement.

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Preplan creation

Overview The preplan restoration creation process begins when the user selects a service paths/circuits to be protected and creates preplans via provisioning. The process is done off of the Service Network Map using the point and click provisioning capabilities. The user shall be able to provision a preplan path/circuit using the automatic, semi-automatic or manual route selection, similar to the process used for adding a service path/circuit except using the value 'Preplan' of Order Action for preplan. Each preplan is reserved for one specific service path/circuit of its failure condition.

Implementation Preplan restoration is implemented in three phases:

1. The user creates and implements a service circuit.
2. The user creates a preplan circuit to backup the service circuit.
3. The preplan circuit is assigned to the service circuit through the preplan pairs add form.
4. Once the process is completed, the service facility is automatically protected in the event of failure.

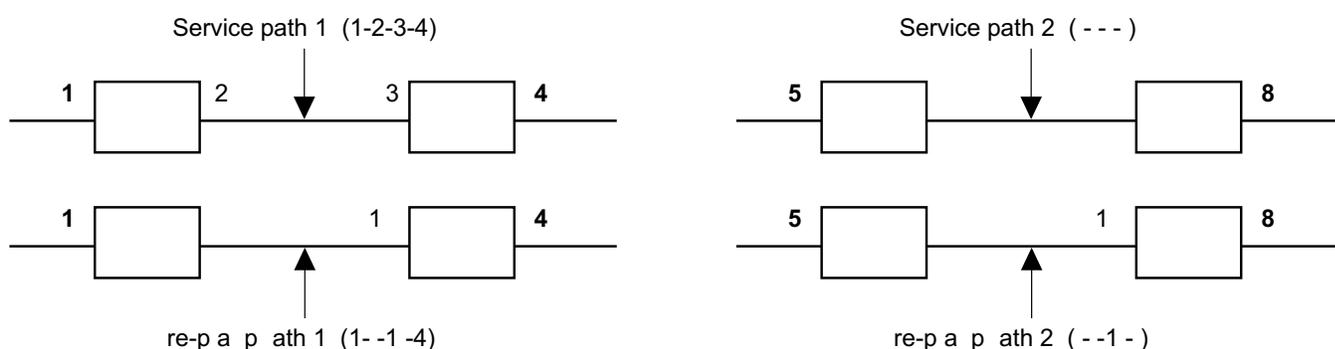
Selection The user can select a two-way service facility/circuit to be protected via the Service Network Map and create preplans at that rate (a list of available circuit types will be displayed for user to select from). The user can access the Preplan Assignment form to display the preplan circuit assignment information including corresponding channel status and preplan circuit execution mode and status for a specified circuit.

The user has the option of picking the exact channels for the preplan (manually) or allowing the system to pick the channels (automatic). If the automatic method is selected, then Navis™ Optical NMS shall select and assign spare channels along the selected path to the preplan restoration order. If the manual method is selected, the user shall select the channels on each of the links in the preplan path. A preplan circuit shall be able to be viewed from the graphical layout similar to a regular provisioned circuit.

Using common resources

Navis™ Optical NMS supports multiple service paths, which can be associated with their individual preplan paths using the same common channel resources. To be able to use a common channel resource, the user has to manually provision separate preplans (with different circuit ID for each preplan) for each service path with the common channel resource. Also the same digital link/channel shall be able to be used for multiple preplan paths.

Example 1: Service path 1 (1-2-3-4) associated with preplan path 1 (1-9-10-4) and service path 2 (5-6-7-8) associated with preplan path 2 (5-9-10-8). Preplan path 1 and 2 can use a common channel resource (9-10).



Possible circuit types

Navis™ Optical NMS allows users to create preplan restorations for individual working circuits in a network. The creation of preplans are implemented using map-driven point-and-click operations off the Network Map. A preplan circuit creation is provisioned similar to adding a service circuit. To distinguish the preplan circuit from a service circuit, the value ‘Preplan’ of Order Action shall be used for preplan circuit/path instead of the value ‘Add’. The preplan circuit can be viewed from the Graphical Layout. A preplan path and the service path that it protects, including “One Step” provisioned circuits, have identical circuit types except for the FLAG application.

The following table listed all possible circuit types can be provisioned as service circuit if “One Step” provisioning is selected at installation and the corresponding preplan circuits that shall be allowed for each service circuit.

Possible circuit types of service circuit in “One Step”	Allowed circuit types of preplan in “One Step”
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TU12-VC11S	TU12-VC11S
VC12S	VC12S
VC2S	VC2S
VC3S	VC3S
AU3S	AU3S
VC4S	VC4S
TU12-VC11S-24N	TU12-VC11S-24N
VC12S-30N	VC12S-30N
VC3S-480N	VC3S-480N
VC3S-672N	VC3S-672N
AU3S-672N	AU3S-672N
VC4S-1920N	VC4S-1920N

Protected path support A protected path can be protected by preplan path(s). The protected paths in Navis™ Optical NMS include 1+1 protected, ring-protected and Y-protected (non-assignable only). The ring-protected paths/preplan paths involved in preplan pairs can be either SNCP (PSR) or MSSPRING (LSR). A preplan path in Navis™ Optical NMS can be provisioned as either a protected or unprotected path. Protected service path can be protected by either unprotected or protected preplan path(s).

The same rules of association for unprotected paths will be applied to the protected paths (e.g. a preplan path shall protect a service path with identical circuit type).

- **Unprotected Service Paths:** A service path provisioned as unprotected path can have either protected path (1+1, ring protected, or Y-protected) or unprotected path as the preplan path. In other word, all the existing preplan capabilities for unprotected service path shall be expanded to allow having either protected path or unprotected path as preplan path.
- **Non-Assignable Y-Protected Paths:** Navis™ Optical NMS can support preplan association for only non-assignable Y-protected paths at any rate that the path can support.
- **Protected Service Paths:** The Navis™ Optical NMS can support preplan provisioning, association and restoration for a service path provisioned as protected path. A service path provisioned as protected path can have either unprotected or protected path as the preplan path. All the existing preplan capabilities for unprotected preplan path shall be applied to protected preplan path (e.g. preplan creation, association, preplan plan, preplan group, alarm-triggered restoration, preemption, reports). A protected path involves both working and protection segments. When a failure (e.g. alarm on paths with Disabled fault status) occurred on the working path, the traffic will be switched automatically by the network elements to the protection path first. If the protection switching can not take place, then the traffic shall be routed to the associated preplan path manually or automatically. The manual preplan restoration for protected path remains the same as for the unprotected path.

The following four figures depict some possible situations for service path provisioned as protected/unprotected having preplan path(s).

Figure 1: A service path, provisioned as an unprotected path, is protected by a preplan path provisioned as an unprotected path.

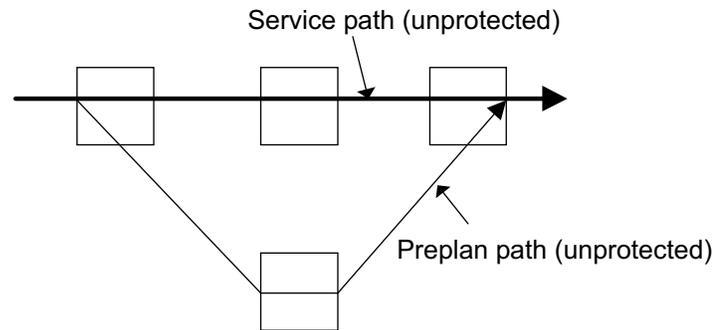


Figure 2: A service path provisioned as a Y-protected path can be protected by a preplan path provisioned as Y-protected and/or an unprotected and/or a ring-protected path.

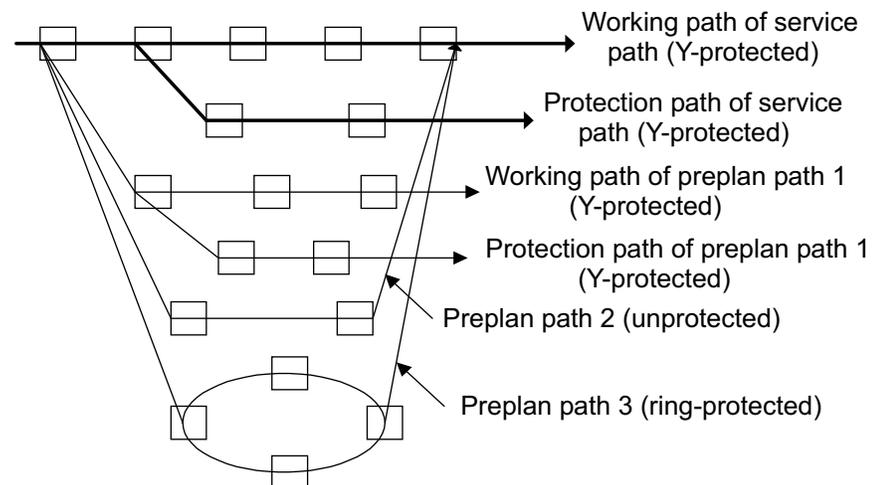
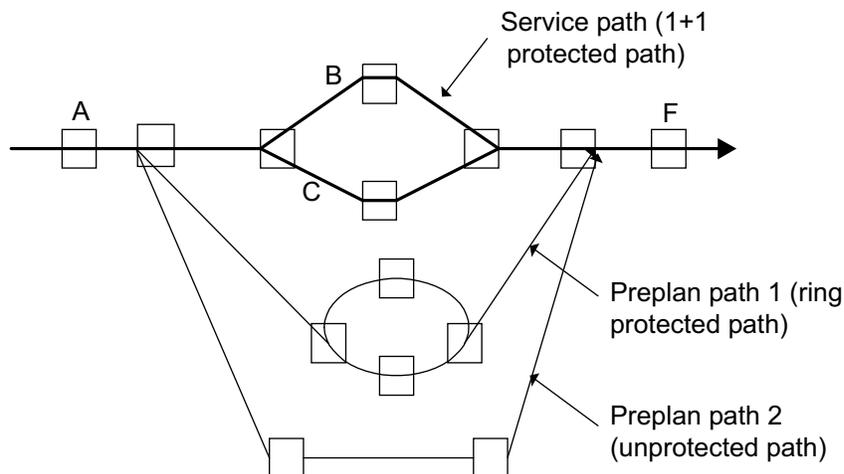


Figure 3: Service paths provisioned as 1+1 protected can be protected by a preplan path provisioned as a ring protected and/or an unprotected path.



Graphical layout The graphical layout supports the same display capabilities of unprotected path for the protected path when the implementation of restoration/reinstatement process is failed.

Only the segment(s) which belong to the old order path and are not common with the new order path shall be shown in color gray. The rest segments (if any) of the old order path and the new order path shall be shown with the color indicating the current status (e.g. blue, magenta, green depending on the status).

Figure 1: When restore/reinstatement implementation from path 1-2-3-4 (old order) to path 1-5-6-4 (new order) failed, the segments C-2-D and E-3-F of the old order path will be in gray because they are not common segments with the new order path. The rest segments of the

new and old order paths are in the color(s) indicating the current status.

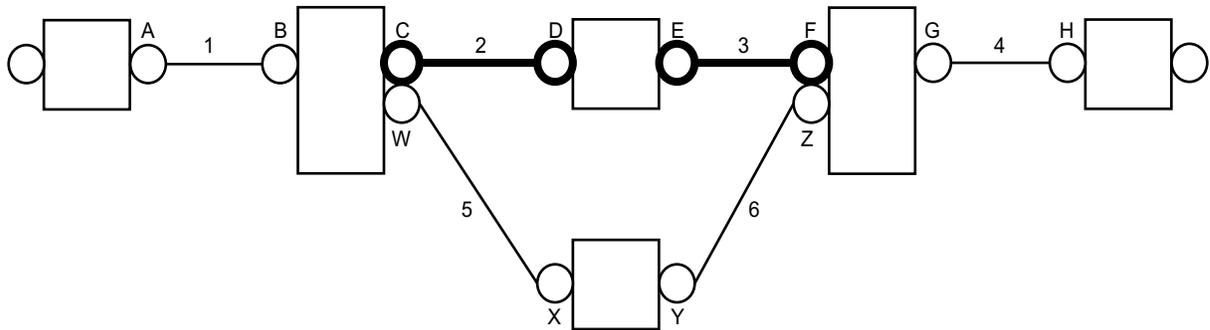
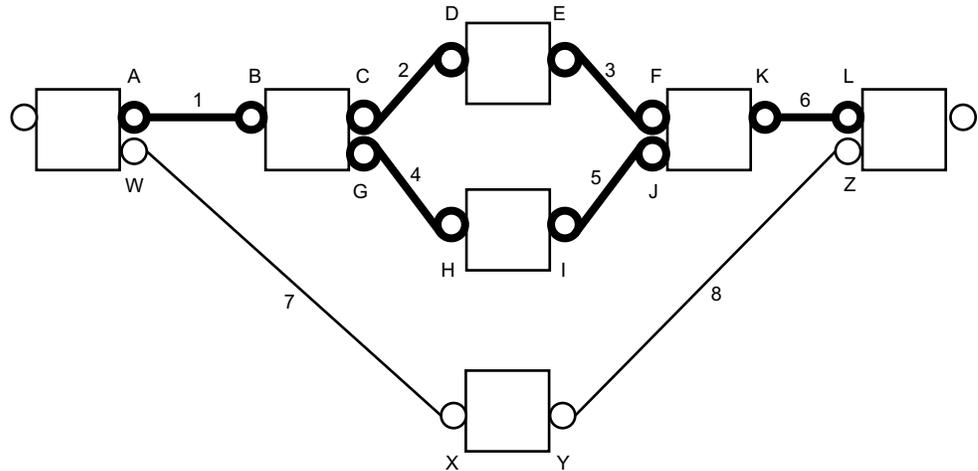


Figure 2: When restore/reinstate implementation from path 1 - 2/4 - 3/5 - 6 (old order) to path 7 - 8 (new order) failed, the whole segments of the old order path (A-1-B, C/G - 2/4 - D/H, E/I - 3/5 - F/J, K-6-L) will be in gray because no common segment with the new order path. The segments of the new order path (W-7-X, Y-8-Z) are in the color(s) indicating the current status.



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Associating a preplan to a service circuit

Introduction To protect an in-effect service circuit, a preplan circuit needs to be associated with the service circuit to be protected after it is successfully created.

The service circuit being protected must be in the in-effect state and the preplan circuit must be in the pending step (CPL) before an association can be made. The association shall be made utilizing the Preplan Pairs Add form, from which the user shall be able to enter both the service and the preplan circuits IDs to establish the association or link preplan pairs to a preplan plan. A preplan path shall protect a service path with identical circuit type, including "One Step" provisioned circuits, except for FLAG application.

1 x N preplans Navis™ Optical NMS has "1 x N" preplan restoration capability which can be set up through the environmental variable during system installation process. The "1 x N" preplan restoration means that an IE service circuit can be protected by "N" (99 less than or equal to N greater than or equal to 1) preplan circuits.

M x 1 preplans Navis™ Optical NMS provides "M x 1" preplan restoration capability which can be set up through an environmental variable during system installation process. "M x 1" preplan restoration implies M (10 ≤ M ≤ 1) service paths maybe protected by 1 preplan path.

This option is not supported if "1 x N" preplan restoration is chosen (i.e the "M x 1" and "1 x N" preplan options are mutually exclusive).

Preplans with different end nodes

Navis™ Optical NMS can handle preplan restoration/reinstatement path with one or both end nodes that are not identical to the end nodes of the associated service path. It means the preplan path and its corresponding service path may have two common end nodes, one common end node, or two different end nodes. However, Navis™ Optical NMS shall block the implementation of preplans with different end nodes if the end node of the service circuit contains groomed low-level paths/circuits. A non-channel assignable entity (e.g. VC-4, VC-12, VC-3, or VC-2) shall allow preplan with different end nodes (one or both). An assignable entity but no lower order paths/circuits provisioned shall allow preplan with different end nodes (one or both) at the SDH level. TUG structure VC-4 path can be preplan protected as long as the TUG structure termination points are not changed.

Preplan path with different end ports on the same end node

For non-infrastructure paths that do not terminate at WaveStar DACS or DACS VI, Navis™ Optical NMS shall allow preplan restoration/reinstatement circuit within the same network element node with the service circuit but sharing one common end port. The preplan path and the associated service path can be either unprotected or protected. If either preplan path or service path is provisioned as protected path, only hard restoration/reinstatement shall be applied regardless the involving network element has bridge and roll capabilities. Soft restoration/reinstatement shall be available only when both preplan and service paths are provisioned as unprotected and the network element, where the cross connect will be performed, supporting the bridge and roll capabilities. Restoration/reinstatement shall not be allowed for the service and preplan paths have no common terminating port within the same end node.

Preplan path with one different end port on the same end node

For non-infra-structure paths that do not terminate at WaveStar DACS or DACS 6, Navis™ Optical NMS allows for a preplan restoration/reinstatement circuit within the same network element with the service circuit but sharing one common end port. The preplan path and the associated service path can be either unprotected or protected. If either preplan path or service path is provisioned as protected path, only hard restoration/reinstatement shall be applied regardless the involving network element has bridge and roll capabilities. Soft restoration/reinstatement shall be available only when both preplan and service paths are provisioned as unprotected and the network element, where the cross connect will be performed, supporting the bridge and roll capabilities.

Restoration/reinstatement shall not be allowed for the service and preplan paths have no common terminating port within the same end node.

Preplan preference level

Users can specify the preference level 1-99 (99 is the highest preference) for each preplan circuit via the Preplan Pairs form and Preplan Pairs Add form. Preference level of each service/preplan circuit pair for the same service circuit must be unique and can be set at the same time the preplan path is established. This will allow the user to establish multiple preplans to protect similar type failures.

In the automatic (alarm-triggered) restoration, the preference level shall be used as the order of selection preference. For example, the preplan with the highest preference will be implemented when a service circuit is protected by multiple preplans. If the preplan with the highest preference is not available (i.e. it has a primary alarm on its route or on its carriers) at the time of restoration, the preplan with the next highest preference when available will be selected. For automatic restoration, if no preplan available at the time of restoration for a service circuit, no restoration action will be taken and the service circuit shall be left in the failed state until manual resolution by the user. Preplan preference level is mainly for alarm-triggered restoration and for 1 x N application.

- Preplan priority level** Users have the option of setting the priority (1-10, default value is set to 5 if not entered by user) of the service/preplan circuits pair via the Preplan Pairs form and Preplan Pairs Add form. The user can use priority level to determine which service circuit has higher priority when multiple service circuits share the same preplan. If all service circuits have same priority level then the preference level will be used. The service circuit with the highest preference level will use the preplan. The priority level can be used for preemption.
- Automatic triggering of next available preference level preplan restoration** If turned on, Navis™ Optical NMS shall automatically trigger the next highest available preference level preplan if the failed service circuit can not be restored with the highest available preplan because the highest preference level preplan is already used by other circuits or is in alarmed state. The process of finding the next preference level preplan shall be continued until an associated preplan with no alarm or not in use by other service circuits is found. If no available preplan is found at the time of restoration for a service circuit, no restoration action will be taken and the service circuit shall be left in the failed state until manual resolution by the user.
- Disassociation of preplans from service circuits** Users can use the Preplan Pairs Form to disassociate the service circuits from its associated preplan circuit. Each disassociation action shall disassociate one service/preplan pair at a time. For the service/preplan pair linked to a Preplan Plan and/or Group, the user needs to unlink the preplan circuits from the Preplan Plan and/or Group before disassociate preplans from service circuits. If user tries to disassociate a preplan of a Preplan Plan and/or Group without unlinking it first, an error message shall be displayed.

Modifying preplans Users can modify preplans from the Graphical Layout only if it is in the LAY state and not associated with any service circuit. After association, the preplan can not be modified because it must be in the pending CPL step. If the preplan not associated with any service circuit but in the CPL state needs to be modified, the user shall be able to select Actions Æ Move Order Step Back from the preplan's Graphical Layout to bring the preplan's Order Step from CPL to LAY. Once the preplan is in the LAY state, the user shall be able to modify the preplan circuit via the Digital Link/Facility/Circuit Profile form by selecting Actions Æ Modify Æ Path from the preplan's Graphical Layout. The user shall also be able to bring the preplan's Order Step from LAY to CPL by selecting Actions Æ Move Order Step Forward from the preplan's Graphical Layout.

Cancelling preplans Users can cancel a preplan circuit via the Graphical Layout if the preplan circuit is not associated with a service circuit and the preplan circuit must be in LAY state. For the preplan circuits linked to Preplan Plan and/or Group, the user needs to unlink the preplan circuits from the Preplan Plan and/or Group before cancelling preplans. If user tries to cancel a preplan of a Preplan Plan and/or Group without unlinking it first, an error message shall be displayed.

Preplan restoration on top of preplan If turned on, the Navis™ Optical NMS shall allow next available unalarmed preplan circuit (one of the 1 x N preplans associated with the same service circuit) for the restoration of the original service circuit if the previous preplan restoration path is alarmed after the restoration has been complete. This feature shall be for 1 x N application only and applicable for manual and automatic restorations. For example, preplan P1 (preference level 90) & P2 (preference level 80) protect a service circuit (S1). First restoration used preplan P1 and completed. Alarmed on the in effect preplan P1, restoration will execute preplan P2 if available. When a service circuit protected by only one preplan, if the preplan restored and then has alarm, the service circuit remains in alarm/failure status.

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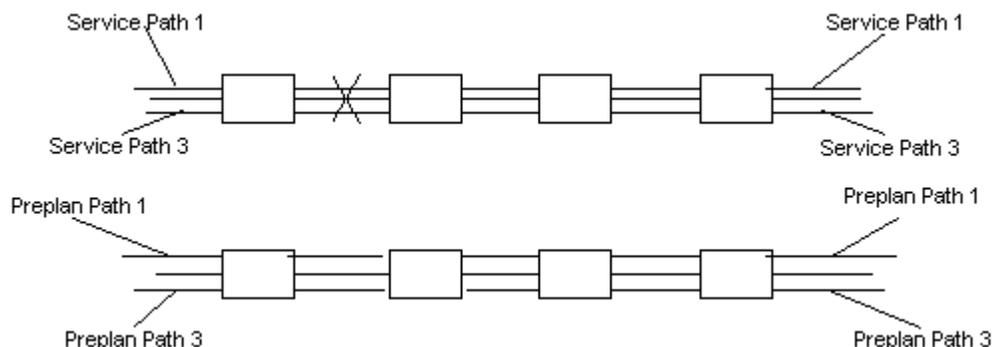
Preplan plans and preplan groups

Introduction For a single service circuit, Navis™ Optical NMS supports multiple preplans to be provisioned for different failure scenario in the network. For a single failure scenario, there can be many service circuits involved. For these scenarios, the user can utilize Preplan Plan or/and Preplan Group features. Preplan Plan/Group allows the user to create multiple preplans against each failure condition providing alternate route option at the time of restoration. This feature is applicable for manual restoration/reinstatement process only. Each service circuit can appear only once in each Preplan Plan/Group. For example, service circuit 1 associated with preplan circuit 1 (pair 1) and preplan circuit 2 (pair 2). The pair 1 and pair 2 can not co-exist in the same Preplan Plan/Group. Pair 1 can be in Preplan Plan/Group 1 while pair 2 is in Preplan Plan/Group 2.

Preplan plan Users can group more than one service/preplan circuit pairs into a Preplan Plan (Plan ID). Since a Preplan Plan is intended for a particular restoration route or a specific failure scenario, a service circuit shall appear only once in a Preplan Plan. A Preplan Plan can contain a grouping of maximum 500 service/preplan circuit pairs.

Figure 1: For example, service path 1 associated with preplan path 1, service path 2 associated with preplan path 2, and service path 3 associate with preplan path 3. If a failure occurred on the common carrier of all the three service paths, the entire service paths shall be routed to the associated preplan paths. The user has two ways to restore traffic for this failure scenario. One way is to restore the traffic from service path 1 to preplan path 1, service path 2 to preplan path 2, and service path 3 to preplan path 3 individually. The other way is to put the three service/preplan pairs in a preplan plan during preplan creation. The user only needs to execute a single trigger, the Preplan

Plan will restore the three service paths traffic to their associated preplan paths.



Preplan group

Users can group multiple preplan plans into a preplan group (Group ID), so the preplan restorations/reinstatements can be easily tracked and implemented as a group. Since a preplan group is intended for a particular restoration route or a specific failure scenario, a service circuit shall appear only once in a preplan group. The preplan circuits in the same preplan group shall not have common channels. A preplan group can contain a grouping of maximum 500 Plan IDs.

Restoration and restatement

Navis™ Optical NMS allows the execution of the Preplan Plan or Preplan Group with some circuits that have been restored or reinstated. In this scenario, Preplan Plan or Preplan Group restoration/reinstatement shall proceed with restoration or reinstatement for the remaining circuits. Upon completion of the restoration/reinstatement, the total count of already restored or reinstated circuits included in each Preplan Plan/Group shall be indicated in the "No Action" column in the table of the Preplan Plan or Preplan Group form. For example, Preplan Plan 1 includes service/preplan circuit pairs 1, 2, 3, 4, 5 while pair #2 has been restored for an alarm situation. When executing restoration from the Preplan Plan 1, pairs 1, 3, 4, 5 will be restored and pair 2 will be skipped (because already in REST status). After the restoration is completed, the number of pairs that have no action taken because the pair was already in the requested state shall be indicated in the No Action column in the Preplan Plan form. In this example, 1 (for pair #2) will be shown in the No Action column.

Preplan for optical trails

Navis™ Optical NMS provides the capability to restore/reinstate an OCh channel trail if the following conditions are met:

- the service path and the preplan path have the same channel type/client service type
- the service path and the preplan path have different OCh trail

Users can choose to provision the protection OCh channel trail (i.e. the preplan path) either through another DWDM or the same DWDM but with different OMS (only if the DWDM supports more than one set with the same wavelength). If the protection OCh channel trail runs across another DWDM, it is client of on another OMS.

The preplan shall support the hierarchy of optical layers for provisioning between DWDMs and SDH network elements/black boxes via LamdaRouter for different applications. All SDH network elements can have compatible or non-compatible optics.

For protected service path (e.g. involving DWDM equipped with ORS), both the working and protection segments of the service OCh channel trail are using the same OMS (i.e. one fixed OCh). The preplan path can not use the same OCh trail with the service path regardless it is protected or unprotected path.

The cross connect between the service and preplan path for optical trail must be done via the same LamdaRouter.

Figure 1: If the failure is between the LamdaRouter and the DWDM (e.g. DWDM 1), one OCh trail is affected. Navis™ Optical NMS can

redirect the traffic through another DWDM (e.g. DWDM A) using one protection OCh trail client of another OMS (e.g. OMS A).

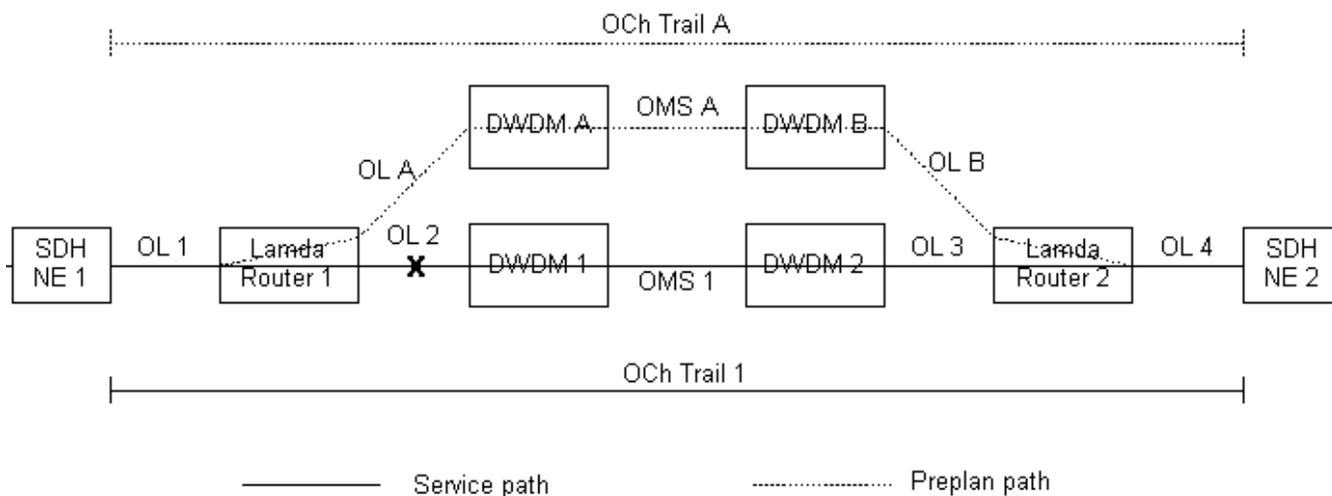


Figure 2: If the failure is between the two DWDMs, all OCh trails on the OMS (e.g. OMS 1) are affected. Navis™ Optical NMS redirects the traffic through another DWDM (e.g. DWDM A) using all protection OCh trails client of another OMS (e.g. OMS A).

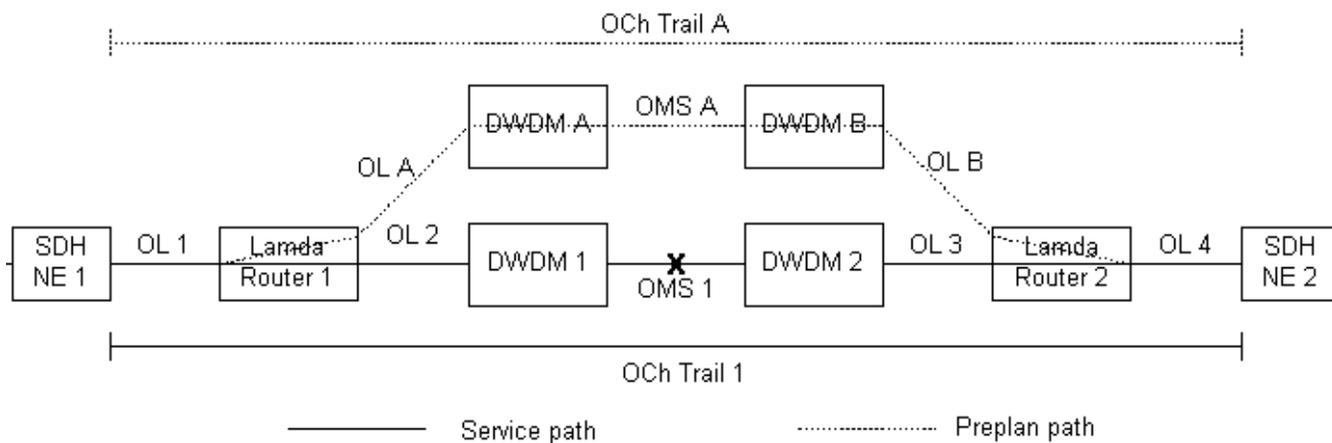
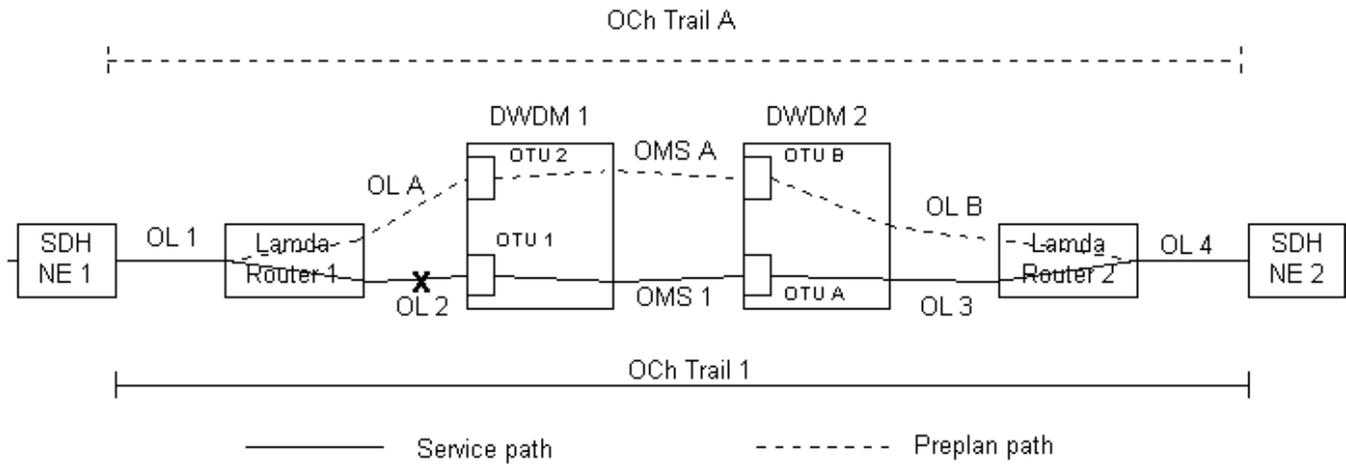


Figure 3: If the failure is between the LambdaRouter and the DWDM (e.g. DWDM 1), one OCh trail is affected. If the involving DWDM supports more than one set with the same wavelength, Navis™ Optical NMS can redirect the traffic through different OMS (e.g. OMS A in

the following figure) within the same DWDM with the same wavelength.



□

Provisioning controls

Overview This section presents an in-depth look at the GUI controls and features usable by the user to provision preplans with Navis™ Optical NMS.

Forms Preplan restoration managements contains the following forms:

- Preplan Pairs Query Box
- Preplan Pairs
- Preplan Pairs Add
- Preplan Plan Query Box
- Preplan Plan
- Preplan Plan Add
- Preplan Group Query Box
- Preplan Group
- Preplan Group Add
- Affected Circuits for Preplan Execution Query Box
- Affected Circuits for Preplan Execution
- Preplan Assignment Query Box
- Preplan Assignment
- Preplan Parameters

Preplan pairs query box The Preplan Pairs Query Box form allows users to specify query parameters to display only the selected preplan pairs records on the Preplan Pairs form or to have the all preplan pairs listed. The Preplan Pairs Query Box form has the following fields and buttons.

Editable Fields

- **CKT/Trail ID** - Enter unique circuit fields as query parameters to search matching records. Enter nothing to list all the preplan pairs. If the Free Form box is checked, only one field displayed allowing maximum 83 ASCII alphanumeric number. If the Free Form box is not checked, this field shall be in M.1400 format containing four sub-fields:
- **Plan ID** - Enter preplan plan ID to search preplan pairs in the specified preplan plan. Enter nothing to list all the preplan pairs without filtering preplan plan ID.

Definable Fields

- Mode - Select preplan pairs is undergoing the REST (restoration) mode, REIN (reinstatement) mode, or None. Default value is 'None' to list preplan pairs in all available modes.
- Show Alarms on the Forms - List all the preplan pairs with available alarm information if any. Default value is pre-defined by the value of 'Show Alarms on the Form' in the Administration -> Preferences form. If 'Show Alarms on the Form' is not checked, the preplan query shall not perform filtering on alarms. If all other fields are either blank or using default value plus with 'Show Alarms on the Form' unchecked, the preplan query shall display all preplan pairs (with or without alarm) currently stored in the WS-NMS database. If 'Show Alarms on the Form' is checked, the preplan query shall display only preplan has alarms. The following two sub-fields shall be available only when 'Show Alarms on the Forms' field is checked:
 - Alarm - Display preplan pairs with the specified alarm type. Default value is 'All' to list all preplan pairs have alarm. If 'Equipment' is selected, only the preplan has equipment alarm shall be retrieved and displayed if any. If 'Performance' is selected, only the preplan has performance alarm shall be shown if any. If 'Signal' is selected, only the preplan has signal alarm shall be displayed if any.
 - Number of Records Requested - Enter the numeric number (maximum of 5 digits) of retrieved records to be displayed on the form. Default value is '100'.

Button Selection

- OK - Search the matching records with the data entered in the form and close the window form.
- Apply - Search the matching records with the data entered in the form and leave the window form opened with user entered data displayed.
- Reset - Clear and unchecked all data fields.
- Close - Close the window form without searching. All entered data fields are eliminated.
- Help - Display help message on the Netscape form.

Preplan plan query box The Preplan Plan Query Box form allows user to specify query parameters to display only the selected preplan plan records on the Preplan Plan form or to have the all preplan plans listed. If the Circuit ID tab selected and data entered, the query shall be using the data entered in the Circuit ID tab. If the Group ID tab selected and data entered, the query shall be based on the Group ID entered. The Group ID tab shall become un-accessible once a data entered in any field of the Circuit ID tab. When group ID entered in the Group ID tab, the Circuit ID tab shall become un-accessible. The Preplan Plan Query Box form shall have the following two tabs and buttons.

Circuit ID Tab Editable Fields

- Service Circuit ID - Enter unique service circuit fields as query parameters to search matching records. Enter nothing applying to all service circuits. If the Free Form box is checked, only one field displayed allowing maximum 83 ASCII alphanumeric number. If the Free Form box is not checked, this field shall be in M.1400 format containing four sub-fields:
- Preplan Circuit ID - Enter unique preplan circuit fields as query parameters to search matching records. Enter nothing applying to all preplan circuits. If the Free Form box is checked, only one field displayed allowing maximum 83 ASCII alphanumeric number. If the Free Form box is not checked, this field shall be in M.1400 format containing four sub-fields:

Group ID Tab Editable Fields

- Group ID - Enter unique group ID.

Button Selection

- OK - Search the matching records with the data entered in the form and close the window form.
- Apply - Search the matching records with the data entered in the form and leave the window form opened with user entered data displayed.
- Reset - Clear and unchecked all data fields.
- Close - Close the window form without searching. All entered data fields are eliminated.
- Help - Display help message on the Netscape form.

Preplan parameters form The Preplan Parameters form allows user to specify parameters for restoration or reinstatement. Basic preplan shall not include preemption parameter. Preemption parameter shall be available only when the feature is licensed and set to be 'ON' during installation. This form can have the following fields:

Definable Fields

- Stages - The restoration/reinstatement action is performed in One Stage or Three Stage. Default value is 'One Stage'.
- Restoration (for restoration action) - If reinstatement action is entered, this field shall be labelled as Reinstatement instead. Either for restoration or reinstatement, the default value is 'Hard'. If the associated network elements do not support the bridge and roll features, selecting value 'Soft' shall cause an error message displayed to user.
- Ignore Alarm - If this field is checked, the restoration/reinstatement action shall be performed ignoring any alarms on the preplan path. The default is not to have this field checked.
- Preemption - Only appeared when featured and turned on. If reinstatement action is selected, this field shall not be available. If this field is checked, preemption shall be available for restoration action.

Button Selection

- OK - Search the matching records with the data entered in the form and close the window form.
- Close - Close the window form without searching. All entered data fields are eliminated.
- Help - Display help message on the Netscape form.



Triggering a preplan

Overview Preplan restoration can be triggered manually by the user or automatically by a service affecting alarm. This section discusses both manual and automatic preplan restoration.

Manual preplan restoration The user can go to the Preplan Pairs, Preplan Plan, or Preplan Group form to execute the restoration for the selected facility/circuit or reinstate to service circuit after repair. The user shall be required to set the “Ignore Alarm” (Yes or No), “Stage” (One Stage or Three Stages) and “Restoration/Reinstatement” (Soft or Hard) parameters whenever applicable.

Ignore Alarm option: The user can specify the “Ignore Alarm” option via the PrePlan Parameters form. “Ignore Alarm” option allows the user to specify if the alarm status on the preplan circuit should be ignored and has two choices: ‘Yes’ and ‘No’ (default). If the selection is ‘No’ and the selected preplan based on the preference level has alarm then the preplan restoration shall fail. The only exception is when the user sets “Ignore Alarms” to ‘Yes’, then an alarmed preplan shall be used and restoration order shall be created.

Stage option: The user can specify the “Stage” option via the PrePlan Parameters form. The “Stage” option allows the user to specify whether the ‘one stage’ or ‘three stages’ restoration/reinstatement process should be executed. If value “One Stage” is selected, then all commands will be executed automatically. If value “Three Stages” is selected, then the system stops after each step (IMP – bridge operation, IMR – roll operation) for user to send commands manually. The default setting for the “Stage” option is “One Stage” which can be set for Soft or Hard preplan restoration/reinstatement. Value “Three Stages” shall be applicable only for Soft preplan restoration/reinstatement.

Restoration/Reinstatement option: Users can specify the Hard or Soft restoration/reinstatement via the PrePlan Parameters form at the group level, plan level or preplan circuit at the time of restoration/reinstatement. For network elements which support bridge and roll capabilities, the user shall be able to choose to use either Hard (default) or Soft restoration/reinstatement. Network elements that do not support bridge and roll capabilities shall only be able to use Hard restoration/reinstatement. If value “hard” is selected, then disconnect (for restoration)/connect (for reinstatement) commands are

used for the alarmed service circuit and the cross-connect operation shall be implemented for preplan circuit. If “soft” is selected, then bridge, roll, and disconnect commands are issued for those network elements that support this type of activity. Hard option can not be used together with “Stages” option which has value “Three Stages.”

Preemption option: The user can set the “preemption” option via the Preplan Parameters form only when the preemption feature is licensed. This option has two values, Yes and No (default), to turn preemption feature on or off. If ‘Yes’ is selected then the preemption feature is turned on; otherwise, the preemption is off. Preemption feature is only for manual restoration and used to restore a higher priority circuit even when there is a lower or equal priority circuit already using the channel.

Automatic preplan restoration

Automatic (alarm-triggered) preplan restoration is triggered by service affecting (SA) alarms for hard restoration only. When detecting an SA alarm, the user will be notified by a Maintenance Event icon. Upon receiving a SA alarm against a specific service circuit, the fault analysis will identify the failure at the highest level of the transmission hierarchy. If an alarm comes in against a digital link, then all service circuits with preplans on the digital link will be triggered for restoration. Once selected, a restoration order shall be created for the service path. If the restoration order fails, it needs to be manually resolved by the user.

If a service circuit is protected by multiple preplans, the preplan selection criteria shall be based on the highest preference level as well as the alarm status of the preplan. If the selected preplans based on the preference level have alarms or have in-effect circuits on their channels, then the preplan shall not be used for restoration and the next highest preference level available preplan shall be tried. Alarmed triggered restoration shall not allow user to set values and configure the following defaults for restoration parameters: Ignore Alarm – No, Stages – One Stage, Restoration – Hard, Preemption - No, during Navis™ Optical NMS installation.

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Generating reports

Overview Navis™ Optical NMS allows users to generate reports for both preplan restoration and preemption activities. This section describes these two types of reports.

For preplan restoration Navis™ Optical NMS allows users to generate reports for the preplan restoration activities for up to a period of 31 days on a designated printer. When a service circuit is restored using a preplan circuit before or after it is reinstated, user shall have the ability to print a Preplan Restoration Report. The report shall include information about the service circuit ID(s), the faulted digital link ID/channel number, restoration date and time, reinstatement date and time. The user can set From Date and End Date in the report query form for selecting the restoration circuits. If the dates are not specified, all the data within 31 days shall be printed.

For preemption Preemption reports are only available when the preemption feature is licensed to the user. This report allows a user to obtain paper print out of the preempted circuits, and the correlation between the preempted circuit and the service circuit which caused the preemption. The user shall be able to obtain information up to a period of 31 days from the current date on a designated printer. The information shall include the preempted circuit ID, the service circuit ID that causes preemption, the preemption date/time, the reinstatement date/time, and the restoration order number (i.e. RS Clo) of the preempted circuit.

This report supports up to 400 records of preempted circuits. The user shall be able to set From Date and End Date in the report query form for searching the preempted-and-reinstated circuits. If the dates are not specified, all the data within 31 days shall be printed. If preempted, the “REIN date/time” field shall be blank. If reinstated, all the fields shall be populated.



Preemption concepts

Overview When other in-effect service circuit uses the channel of a preplan circuit, this preplan can not be used for restoration until the in-use channel is released/disconnected from the active traffic. The user will have the option of preemption feature on Navis™ Optical NMS if licensed. Preemption is an optional feature which shall be provided as an additional option only if the preplan restoration feature is installed.

The preemption feature can be used to restore a higher priority circuit even where there is a lower or equal priority circuit already using the channel. After preemption is completed, the user needs to manually re-trigger the preplan that caused the preemption.

If preemption is manually activated, then preemption may be used in the restoration process to restore a higher priority circuit even when there is a lower or equal priority circuit already using the channel.

Access Users can operate the preemption feature through the preemption button. The preemption button in the Pre-plan Parameters form is accessible to the user only if the preemption feature is licensed to the user.

Detection The user can turn preemption on or off when initiating the restoration. If preemption is turned on, the user shall be notified at association if any other in-effect circuits use the selected channel. User confirmation is required before the system can continue with the preemption.

At the time of restoration, Navis™ Optical NMS will notify the user if the preplan contains a channel used by other in-effect circuit. The user shall have the ability to either terminate the restoration process or disconnect (preempt) the lower/equal priority circuit on the channel and then implement a preplan restoration with higher priority circuit. If preemption is not turned on and the channel of the selected preplan can not be used at the time of restoration, the system will terminate the restoration process.

The user can use the Affected Circuits for Preplan Execution form to find out what circuit affected by the preplan. This form lists the affected service circuits or circuits have pending circuits where the pending circuits have commands been sent during the IMP state. The user can manually disconnect or rearrange those affected circuits before the preplan can be executed.

For manual restoration The preemption feature is applicable for manual restoration only. If preemption is needed at restoration, a dialogue box shall appear indicating the preemption target circuit and requesting user confirmation to continue. After user confirmation, the preemption process shall create a “dummy” restoration order for the preempted circuit to keep the original circuit layout for reinstatement purpose and disconnect the target circuit. The user shall not be notified when the preemption is completed. After preemption is completed, the original preplan that causes the preemption shall be manually triggered again.

For a preplan plan or group If preemption is turned on and if any circuit in a Preplan Plan (or Group) requires preemption, the Navis™ Optical NMS will display a message for that specific preplan and wait for user confirmation. Once the user confirms the preemption, the system shall continue or process other preplans in the Plan (or Group). After the Plan or Group implementation is completed, the user may trigger the Plan (or Group) operation for a second time for restoration. Only the circuits of which preemption has been confirmed (not in RS state) will be restored. The user can also trigger individual circuits for restoration via the Preplan Pairs Form after the preemption is completed.

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Reinstatement concepts

Overview The reinstatement of a service circuit is a manual process. This is to ensure that the reinstatement is carried out in a way most appropriate to the customer's network operation since the reinstatement process could introduce service interruption if hard reinstatement is required. The user will be notified at the time of preplan creation that service will be disrupted on reinstatement if only hard reinstatement is supported because the restoration facility needs to be disconnected before the original service path can be re-established. The user can select hard or soft reinstatement (default is soft).

The preempted circuit can not be reinstated unless the service circuit, which causes the preemption, has been reinstated.

The reinstatement process shall always bring the current restoration circuit back to the original service circuit without reverting to any of the intermediate preplan restoration circuits if any.

Of circuits If a service circuit is protected by a preplan, after the faulted service facility has been repaired, Navis™ Optical NMS will receive an alarm clear message and update the alarm status of the affected service facility. The user then shall be able to move the circuits from the restoration path back to the original service path. The user shall be able to initiate reinstatement using the Preplan Pairs form or Graphical Layout of the preplan circuit. Reinstatement process shall be also applicable for Preplan Plan and Preplan Group reinstatement.

For the reinstatement process, the user shall specify the parameter values in Preplan Parameters form in the same way as they work for the manual restoration process. The Ignore Alarm, Stages, and Hard/Soft Reinstatement options shall also work in a similar fashion as for the manual restoration process.

Modification or deletion The user can modify the "Start Date" and/or "Start Time" for any scheduled reinstatement or delete a scheduled reinstatement through the "Scheduled List" screen. Modifying or deleting scheduled reinstatement shall not be allowed if the circuit is already undergoing or completing manually initiated reinstatement. This capability shall be supported at the preplan circuit level only and shall not include Preplan Plan and Preplan Group levels.

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5 Network Element Port Addresses

Overview

Purpose This chapter presents the port addresses for the network elements supported by Navis™ Optical NMS.

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Section I: Introduction

Overview

Purpose This section presents an overview of the chapter including a definition of terms used throughout the chapter and also a description of port address structure.

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Terminology

Overview Generic port addressing allows for a single address structure across all network elements. This applies to Lucent network elements and other vendor equipment. With Navis™ Optical NMS, the generic port address is commonly referred to as the *external address* or *network level address*.

- Terminology** The following terminology applies to the material discussed within this chapter:
- **Entity identifier (EID):** the name of a logical or physical port or a non-port resource in a network element. The EID is the primary means by which resources within the network elements are identified in the host-to-host interactions between the network management system and the element management system. The EID is often referred to as the internal address.
 - **External address:** the network level address used in Navis™ Optical NMS. The external address is sometimes referred to as the network level address.
 - **Internal Address:** the element level address, which is generally the 'native' port address used in the EMS. The internal address is sometimes referred to as the entity identifier.
 - **Logical port address:** address of a logical channel riding on a higher-order system; the higher-order system is terminated on a physical port. A logical port address can also be a lower-order logical channel, riding on a higher-order logical channel, riding on a facility that terminates on a physical port.
 - **Network level address:** this format is used for port identification at the NMS user-interface and, also, in the ITM-SC Port Selection screens. The Network Level Address selected by the user from the ITM-SC Port Selection screen is passed to NMS via the F-Interface. NLAs also appear in some of the host-to-host interface messages. The network level address is sometimes referred to as the external address.
 - **Physical port address:** address of the port that physically terminates a facility.
 - **Protection Group:** not visible in Navis™ Optical NMS.

- **Tributary port:** generally refers to the add/drop side of a network element.
- **Virtual port:** terminates the two line ports in a protection scheme.
- **Virtual port address:** allows users to control two line ports; one line port is the service port while the other is the protection port. Virtual port addressing is a protection scheme.



Port address structure and components

- Overview** This section describes the components of a port address.
- Generic structure** The generic structure of a port address is as follows:
Physical Port Type / Physical Port Location / Logical Address(es)
 For a lower-order logical channel riding on a higher-order logical channel, the generic port address structure is as follows:
Physical Port Type / Physical Port Location / Higher Order Logical Address - Lower Order Logical Address
 Note that *[]* (brackets) indicates that the selection is contained within brackets. , (comma) denotes 'or.' - (hyphen) signifies a range of numbers. Users may select only one number in the range.
- Physical port types** The physical port types associated with the generic port addresses are as follows:
- STM-x = Sx. For example, STM-4 is S4.
 - CEPT-x = Px. For example, CEPT-3 is P3.
- Physical port location** The physical port location consists of: ***Shelf / Slot / Port***
 If *Slot* contains only one port, the number one is entered for the port number.
- Logical port location** The logical port location consists of:
- ***Shelf / Slot / Port /higher logical port*** - lower logical port
 - ***Shelf / Slot / Port /single logical port.***
- External addresses** The external addresses associated with generic port addressing may be represented through the following form: **Sx/m/n/p/h - 1**
- *x* can equal 0, 1, 4, 16, or 64.
 - *m= mm*: physical shelf number
 - *n=nn*: physical slot number
 - *p*: physical port number
 - *h*: high order logical port number
 - *l*: lower order logical port number

□

KLM (G707) notation

Introduction The KLM (G707) notation feature causes a different notation to be used for external port addressing.

Navis™ Optical NMS uses a sequential port addressing scheme to represent the lower order logical port number. The KLM (or G707) notation for external port addressing uses a tributary numbering notation to represent the “channel number” or the “lower order logical port number” of the VC-3, VC-12, and VC-2 paths.

Examples The following table provides examples of the two external port addressing schemes:

Table 5-1 External port addressing scheme example with KLM notation

Path Type	Logical Port Type	External Port Address	K, L, M External Port Address Notation
VC-12	TU12	S1/PA5/1/2/1-31	S1/PA5/1/2/1-2.4.1
VC-12	TU12	S1/1/12/4-63	S1/1/12/4-3.7.3
VC-2	TU2	S1/1/2/4/1-20	S1/1/2/3/1-3.6.0
VC-3	TU3	S1/PA5/1/3/1-2	S1/PA5/1/3/1-2.0.0



Section II: ADM Port Addresses

Overview

Purpose This section provides information regarding the Navis™ Optical NMS port addresses for the both the physical and logical ports of the supported ADM network elements.

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Port identifiers for ADM 16/1 network elements

Overview This section describes the port identifiers for ADM 16/1 network elements.

Table The following table lists the port identifiers for ADM 16/1 network elements.

Table 5-2 Port Identifiers for ADM 16/1 network elements

Description	Network Element	Entity Identifier	Network Level Address
STM-16 Physical Port (Line)	WS16/1, WS16/1MSSP	LP[1,2]	S16/1/[4,16]/1 ¹
STM-16 MSP (Line)	WS16/1	LP1	S16/1/GRP1/1 ¹
STM-4 Physical Port (Trib)	WS16/1, WS16/1MSSP	TP[1-9]	S4/1/[5-13]/1a
STM-4 MSP (Trib)	WS16/1, WS16/1MSSP	TP[1,3,5,7]	S4/1/GRP1/1 ^{1 2} S4/1/GRP2/1 ^{1 2} S4/1/GRP3/1 ^{1 2} S4/1/GRP4/1 ¹²
STM-1 Physical Port (Trib-optical or electrical)	WS16/1, WS16/1MSSP	TP[1-9].[1-4]	S1/1/[5-13]/[1-4] ¹
STM-1 MSP (Trib-optical only)	WS16/1, WS16/1MSSP	TP1.[1-4] TP3.[1-4] TP5.[1-4] TP7.[1-4]	S1/1/GRP1/[1-4] ^{1 2} S1/1/GRP2/[1-4] ^{1 2} S1/1/GRP3/[1-4] ^{1 2} S1/1/GRP4/[1-4] ¹²
STM-0 Physical Port (Trib)	WS16/1, WS16/1MSSP	TP[1-9].[1-12]	S0/1/[5-13]/[1-12] ^{1 2}
STM-0 MSP (Trib)	WS16/1, WS16/1MSSP	TP1.[1-12] TP3.[1-12] TP5.[1-12] TP7.[1-12]	S0/1/GRP1/[1-12] ^{1 2} S0/1/GRP2/[1-12] ^{1 2} S0/1/GRP3/[1-12] ^{1 2} S0/1/GRP4/[1-12] ^{1 2}

Table 5-2 Port Identifiers for ADM 16/1 network elements (continued)

Description	Network Element	Entity Identifier	Network Level Address
E4(140 Mb/s) Physical Port (Trib)	WS16/1, WS16/1MSSP	TP[2-9].[1-4]	P4/1/[6-13]/[1-4]
E3(34 Mb/s) Physical Port (Trib)	WS16/1, WS16/1MSSP	TP[1-8].[1-12]	P3/1/[5-12]/[1-4]-[1-3] ^{1 2}
DS3 (45 Mb/s) Physical Port (Trib)	WS16/1, WS16/1MSSP	TP[1-8].[1-12]	D3/1/[5-12]/[1-4]-[1-3] ^{3 4}
E1(2 Mb/s) Physical Port (Trib)	WS16/1, WS16/1MSSP	TP[1-8].[1-63]	P1/1/[5-12]/1-[1-63] ³
D1 (1.5Mb/s) Physical Port (Trib)	WS16/1, WS16/1MSSP	TP[1-8].[1-63]	D1/1/[5-12]/1-[1-63]
LAN8 Physical Port (Trib)	WS16/1, WS16/1MSSP	TP[1-8].[1-8]	LAN8/1/[5-12]/[1-8]
LAN Physical/Logical Port (TransLAN + / MLAN)	WS16/1, WS16/1MSSP	LAN[1-8].[1-8]	[[LAN/1/[5-12]/[1-8]]]
LAN Logical Port - VLAN context (TransLAN + / MLAN)	WS16/1, WS16/1MSSP	LAN[1-8].[1-8].[1- 4093]	N/A
LANGRP (TransLAN + / MLAN)	WS16/1, WS16/1MSSP	[[LANGRP[1-8].[1- 65535]]]	N/A
WAN Logical Port (TransLAN + / MLAN)	WS16/1, WS16/1MSSP	WAN[1-8].[1-8]	N/A
WAN Logical Port - VLAN context (TransLAN + / MLAN)	WS16/1, WS16/1MSSP	WAN[1-8].[1-8].[1- 4093]	N/A

Table 5-2 Port Identifiers for ADM 16/1 network elements (continued)

Description	Network Element	Entity Identifier	Network Level Address
SDH Channel Logical Port (TransLAN+ / MLAN)	WS16/1, WS16/1MSSP	SDHChan[1-8].[1-8]	[[LANBR/1/[5-12]/[1-8]]]
VC4-4c Logical Port on STM-16 Line Port	WS16/1, WS16/1MSSP	LP[1-2].1-4 LP[1-2].5-8 LP[1-2].9-12 LP[1-2].13-16	S16/1/[4,16]/1/4c.1 S16/1/[4,16]/1/4c.2 S16/1/[4,16]/1/4c.3 S16/1/[4,16]/1/4c.4
VC4-4c Logical Port on STM-16 MSP Line Port	WS16/1	LP1.1-4 LP1.5-8 LP1.9-12 LP1.13-16	S16/1/GRP1/1/4c.1 S16/1/GRP1/1/4c.2 S16/1/GRP1/1/4c.3 S16/1/GRP1/1/4c.4
VC4-4c Logical Port on STM-4 Tributary Port	WS16/1, WS16/1MSSP	TP[1-9].1-4	S4/1/[5-13]/1/4c.1
VC4-4c Logical Port on STM-4 MSP Tributary Port	WS16/1, WS16/1MSSP	TP[1,3,5,7].1-4	S4/1/GRP[1-4]/1/4c.1
VC-4 Logical Port on STM-16 (Line)	WS16/1, WS16/1MSSP	LP[1,2].[1-16]	S16/1/[4,16]/1/[1-16]
VC-4 Logical Port on STM-16 MSP (Line)	WS16/1	LP1.[1-16]	S16/1/GRP1/1/[1-16] ¹
VC4 Logical Port on STM-4 Tributary Port	WS16/1, WS16/1MSSP	TP[1-9].[1-4]	S4/1/[5-13]/1/[1-4]
VC4 Logical Port on STM-4 MSP Tributary Port	WS16/1, WS16/1MSSP	TP[1,3,5,7].[1-4]	S4/1/GRP[1-4]/1/[1-4]
VC-4 Logical Port on STM-1 (Trib)	WS16/1, WS16/1MSSP	TP[1-9].[1-4].1	S1/1/[5-13]/[1-4]/1 ¹

Table 5-2 Port Identifiers for ADM 16/1 network elements (continued)

Description	Network Element	Entity Identifier	Network Level Address
VC-4 Logical Port on STM-1 MSP(Trib)	WS16/1, WS16/1MSSP	TP[1,3,5,7].[1-4].1	S1/1/GRP[1-4]/[1-4]/1 5 6
[[VC-4 Logical Port on STM-0 (Trib)]]	WS16/1, WS16/1MSSP	[[TP[1-9].[1-4]]]	[[S0/1/[5-13]/[1-4]]]
[[VC-4 Logical Port on STM-0 MSP(Trib)]]	WS16/1, WS16/1MSSP	[[TP[1,3,5,7].[1-4]]]	[[S0/1/GRP[1-4]/[1-4]/1 5 6]]
VC-4 Logical Port on PI/E12 card (Trib)	WS16/1, WS16/1MSSP	TP[1-8]	P1/1/[5-12]/1
VC-4 Logical port on PI-DS1/63 card (Trib)	WS16/1, WS16/1MSSP	TP[1-8]	D1/1/[5-12]/1
VC-4 Logical Port on PI-E3DS3/12 card (Trib)	WS16/1, WS16/1MSSP	TP[1-8].[1-2] TP[1-8].[3-4]	P3/1/[5-12]/[1-2] D3/1/[5-12]/[3-4]
VC-4 Logical Port on PI-DS3/12 card (Trib)	WS16/1, WS16/1MSSP	TP[1-8].[1-4]	D3/1/[5-12]/[1-4]
VC-4 Logical Port on P4-E4/4 card (Trib)	WS16/1, WS16/1MSSP	TP[2-9].[1-4]	P4/1/[6-13]/[1-4]
VC4 on LAN8 Tributary Port	WS16/1, WS16/1MSSP	TP[1-8]	LAN8/1/[5-12]/1
VC-4 Logical Port on LAN (TransLAN + / MLAN)	WS16/1, WS16/1MSSP	TP[1-8].[1-2]	[[LANBR/1/[5-12]/[1-2]]]
VC-4 Logical Port on LAN (TransLAN + / MLAN)	WS16/1, WS16/1MSSP	TP[1-8].[1-2]	[[LANBR/1/[5-12]/[1-2]]]

Table 5-2 Port Identifiers for ADM 16/1 network elements (continued)

Description	Network Element	Entity Identifier	Network Level Address
VC-4 Logical Port in CC-64/n (Flexible Cross Connect - n=16 or 32)	WS16/1, WS16/1MSSP	CC1.[1-32]	N/A
VC-3 Logical Port on STM-16 (Line)	WS16/1, WS16/1MSSP	LP[1,2].[1-16].[1-3].0.0	S16/1/[4,16]/1/[1-16]-[1-3]
VC-3 Logical Port on STM-16 MSP (Line)	WS16/1	LP1.[1-16].[1-3].0.0	S16/1/GRP1/1/[1-16]-[1-3] ⁵
VC3 on STM-4 Tributary Port	WS16/1, WS16/1MSSP	TP[1-9].[1-4].[1-3].0.0	S4/1/[5-13]/1/[1-4]-[1-3]
VC3 on STM-4 MSP Tributary Port	WS16/1, WS16/1MSSP	TP[1,3,5,7].[1-4].[1-3].0.0	S4/1/GRP[1-4]/1/[1-4]-[1-3]
VC-3 Logical Port on STM-1 (Trib)	WS16/1, WS16/1MSSP	TP[1-9].[1-4].1.[1-3].0.0	S1/1/[5-13]/[1-4]/1-[1-3]
VC-3 Logical port on STM-1 MSP (Trib)	WS16/1, WS16/1MSSP	TP[1,3,5,7].[1-4].1.[1-3].0.0	S1/1/GRP[1-4]/[1-4]/1-[1-3] ⁵
VC-3 Logical Port on E3 port (Trib)	WS16/1, WS16/1MSSP	TP[1-8].[1-12]	P3/1/[5-12]/[1-4]-[1-3] ⁴
VC-3 Logical Port on DS3 port (Trib)	WS16/1, WS16/1MSSP	TP[1-8].[1-12]	D3/1/[5-12]/[1-4]-[1-3] ³
VC-3 Logical Port on SDH Channel (TransLAN+ / MLAN)	WS16/1, WS16/1MSSP	TP[1-8].wxyz	[[LANBR1/[5-12]/[1-2]-[1-2]]] ³

Table 5-2 Port Identifiers for ADM 16/1 network elements (continued)

Description	Network Element	Entity Identifier	Network Level Address
VC-3 Logical Port in CC-64/n (Flexible Cross Connect - n=16 or 32)	WS16/1, WS16/1MSSP	CC1.[1-32].[1-3].0.0	N/A
VC-12 Logical Port on STM-16 (Line)	WS16/1, WS16/1MSSP	LP[1,2].[1-16].[1-3].[1-7].[1-3]	S16/1/[4,16]/1/[1-16]-[1-63]
VC-12 Logical Port on STM-16 MSP (Line)	WS16/1,	LP1.[1-16].[1-3].[1-7].[1-3]	S16/1/GRP1/1/[1-16]-[1-63]
VC12 on STM-4 Tributary Port	WS16/1, WS16/1MSSP	TP[1-9].[1-4].[1-3].[1-7].[1-3]	S4/1/[5-13]/1/[1-4]-[1-63]
VC12 on STM-4 MSP Tributary Port	WS16/1, WS16/1MSSP	TP[1,3,5,7].[1-4].[1-3].[1-7].[1-3]	S4/1/GRP[1-4]/1/[1-4]-[1-63]
VC12 on STM-4 MSP Tributary Port	WS16/1, WS16/1MSSP	TP[1,3,5,7].[1-4].[1-3].[1-7].[1-3]	S4/1/GRP[1-4]/1/[1-4]-[1-63]
VC-12 Logical port on STM-1 (Trib)	WS16/1, WS16/1MSSP	TP[1-9].[1-4].1.[1-3].[1-7].[1-3]	S1/1/[5-13]/[1-4]/1-[1-63]
VC-12 Logical port on STM-1 MSP (Trib)	WS16/1, WS16/1MSSP	TP[1,3,5,7].[1-4].1.[1-3].[1-7].[1-3]	S1/1/GRP[1-4]/[1-4]/1-[1-63] ⁵
VC-12 Logical port on E1 Port (Trib)	WS16/1, WS16/1MSSP	TP[1-8].[1-63]	P1/1/[5-12]/1-[1-63]
VC12 on LAN8 Tributary Port	WS16/1, WS16/1MSSP	TP[1-8].[1-8].[1-4]	LAN8/1/[5-12]/1-[1-8]-[1-4]
VC12 Logical Port on SDH Channel(Trans-LAN+ / MLAN)	WS16/1, WS16/1MSSP	TP[1-8].wxyz	[[LANBR/1/[5-12]/[1-2]-[43-62]

Table 5-2 Port Identifiers for ADM 16/1 network elements (continued)

Description	Network Element	Entity Identifier	Network Level Address
VC12 Logical Port in CC-64/n (Flexible Cross Connect - n=16 or 32)	WS16/1, WS16/1MSSP	CC1.[1-32].[1-3].[1-7].[1-3]	N/A
VC-11 Logical port on D1 Port (Trib)	WS16/1, WS16/1MSSP	TP[1-8].[1-63]	D1/1/[5-12]/1-[1-63]

Notes:

1. In general, the ITM-SC Port Selection screen should display both the physical port and GRP addresses when the parameter from ITM-NM across the F-interface is UI_PORT_LEVEL. There are, however, two exceptions which are as follows: 1) If the equipment necessary for MSP is known to be not present in the network element, then the display of the MSP Group address should be suppressed. 2) If MSP is already provisioned, then the standard port addresses (non-GRP) should be suppressed from the Port Selection screen.
2. With STM-n tributary units, the ITM-SC Port Selection screen should display the Network Level Address for each physical port, without regard to the AU3 / AU4 type configured for the port (subject to footnote 'a' above).
3. For setting of "In-use" flag for the ports in the ITM-SC Port Selection screens please refer to Port Status of Immediately Multiplexed Ports in Port Selection Screen, 8-54.
4. The definitions for EIDs and network level addresses allow for port addresses that may not be valid. A E3 (34 Mb/s) port, for example, may have port numbers ranging 1 through 6 only; a D3 port (45 Mb/s) in a mixed card may have port numbers ranging 7 to 12 only.
5. The ITM-SC Port Selection screen should display the logical GRP addresses when the corresponding STM-n digital link is provisioned with MSP. If the logical port is not derived from an MSP STM-n port, the standard port addresses (without GRP in the Network Level Address) will be displayed within the ITM-SC Port Selection screens.
6. In the case of the SA-1/4B or SI-L4.1/1 unit, the ITM-SC Port Selection screen should not display any VC-4 address for a physical port which has been configured in AU3 mode. It follows that no low-order port addresses will be displayed for a physical port which has been configured in AU3 mode.



Non-port identifiers for ADM 16/1 network elements

Overview This section describes the non-port identifiers for ADM 16/1 network elements.

Table The following table lists the non-port identifiers for ADM 16/1 network elements.

Table 5-3 Non-port identifiers for ADM 16/1 network elements

Slot Number	Description	Entity Identifiers
1	System Controller Unit	SC
2	Cross-connect Unit	CC1
3	Line Port Unit	LS3
4	Line Port Unit	LS1
5-13	Tributary Port Unit	TS(n-4)
14	Cross-connect Unit	CC2
15	Line Port Unit	LS4
16	Line Port Unit	LS2
17-18	Power and Timing Unit	PT(n-16)
19-36	Paddle Board	PB(n-18)
37-38	Timing Interface	TI(n-36)
39-40	Paddle Board	PB(n-20)



Port identifiers for ADM 16/1 compact network elements

Overview This section describes the port identifiers for ADM 16/1 compact network elements.

Table The following table lists the port identifiers for ADM 16/1 compact network elements.

Table 5-4 Port Identifiers for ADM 16/1 compact network elements

Description	Entity Identifier	Network Level Address
STM-16 Physical Port (Line)	LP[1,2]	S16/1/[1,4]/1 <u>1</u>
STM-16 MSP (Line)	LP1	S16/1/GRP1/1 <u>1</u>
STM-4 Physical Port (Trib)	TP[1-5]	S4/1/[7-11]/1a
STM-4 MSP (Trib)	TP[1,3]	S4/1/GRP1/1 <u>1</u> <u>2</u> S4/1/GRP2/1 <u>1</u> <u>2</u>
STM-1 Physical Port (Trib-optical or electrical)	TP[1-5].[1-4]	S1/1/[7-11]/[1-4] <u>1</u>
STM-1 MSP (Trib-optical only)	TP1.[1-4] TP3.[1-4]	S1/1/GRP1/[1-4] <u>1</u> <u>2</u> S1/1/GRP2/[1-4] <u>1</u> <u>2</u>
E3/DS3 switchable (34/45 Mb/s) Physical Port (Trib)	TP[1-4].[1-12]	P3-D3/1/[7-10]/[1-4]-[1-3] <u>1</u> <u>2</u>
E1(2 Mb/s) Physical Port (Trib)	TP[1-4].[1-63]	P1/1/[7-10]/1-[1-63] <u>3</u>
LAN Physical/Logical Port (TransLAN + / MLAN)	LAN[1-4].[1-8]	[[LAN/1/[7-10]/[1-8]]]
LAN Logical Port - VLAN context (TransLAN + / MLAN)	LAN[1-4].[1-8].[1-4093]	N/A
LANGRP (TransLAN + / MLAN)	[[LANGRP[1-4].[1-65535]]]	N/A
WAN Logical Port (TransLAN + / MLAN)	WAN[1-4].[1-8]	N/A
WAN Logical Port - VLAN context (TransLAN + / MLAN)	WAN[1-4].[1-8].[1-4093]	N/A
SDH Channel Logical Port (TransLAN+ / MLAN)	SDHChan[1-4].[1-8]	[[LANBR/1/[7-10]/[1-8]]]

Table 5-4 Port Identifiers for ADM 16/1 compact network elements (continued)

Description	Entity Identifier	Network Level Address
VC4-4c Logical Port on STM-16 Line Port	LP[1-2].1-4	S16/1/[1,4]/1/4c.1
	LP[1-2].5-8	S16/1/[1,4]/1/4c.2
	LP[1-2].9-12	S16/1/[1,4]/1/4c.3
	LP[1-2].13-16	S16/1/[1,4]/1/4c.4
VC4-4c Logical Port on STM-16 MSP Line Port	LP1.1-4	S16/1/GRP1/1/4c.1
	LP1.5-8	S16/1/GRP1/1/4c.2
	LP1.9-12	S16/1/GRP1/1/4c.3
	LP1.13-16	S16/1/GRP1/1/4c.4
VC4-4c Logical Port on STM-4 Tributary Port	TP[1-5].1-4	S4/1/[7-11]/1/4c.1
VC4-4c Logical Port on STM-4 MSP Tributary Port	TP[1,3].1-4	S4/1/GRP[1,2]/1/4c.1
VC-4 Logical Port on STM-16 (Line)	LP[1,2].[1-16]	S16/1/[1,4]/1/[1-16]
VC-4 Logical Port on STM-16 MSP (Line)	LP1.[1-16]	S16/1/GRP1/1/[1-16] 1
VC4 Logical Port on STM-4 Tributary Port	TP[1-5].[1-4]	S4/1/[7-11]/1/[1-4]
VC4 Logical Port on STM-4 MSP Tributary Port	TP[1,3].[1-4]	S4/1/GRP[1,2]/1/[1-4]
VC-4 Logical Port on STM-1 (Trib)	TP[1-5].[1-4].1	S1/1/[7-11]/[1-4]/ 1
VC-4 Logical Port on STM-1 MSP(Trib)	TP[1,3].[1-4].1	S1/1/GRP[1,2]/[1-4]/1 5 6
VC-4 Logical Port on PI-E3DS3/12 card (Trib)	TP[1-4].[1-4]	P3-D3/1/[7-10]/[1-4]
VC-4 Logical Port on P1/E1 card (Trib)	TP[1-4]	P1/1/[7-10]/1
VC4 Logical Port on LAN (TransLAN + / MLAN)	TP[1-4].[1-2]	[[LANBR/1/[7-10]/[1-2]]]
VC-4 Logical Port in CC-64/32 (Flexible Cross Connect)	CC1.[1-32]	N/A
VC-3 Logical Port on STM-16 (Line)	LP[1,2].[1-16].[1-3].0.0	S16/1/[4,16]/1/[1-16]-[1-3]

Table 5-4 Port Identifiers for ADM 16/1 compact network elements (continued)

Description	Entity Identifier	Network Level Address
VC-3 Logical Port on STM-16 MSP (Line)	LP1.[1-16].[1-3].0.0	S16/1/GRP1/1/[1-16]-[1-3] 5
VC3 on STM-4 Tributary Port	TP[1-5].[1-4].[1-3].0.0	S4/1/[7-11]/1/[1-4]-[1-3]
VC3 on STM-4 MSP Tributary Port	TP[1-4].[1-3].0.0	S4/1/GRP[1,2]/1/[1-4]-[1-3]
VC-3 Logical Port on STM-1 (Trib)	TP[1-5].[1-4].1.[1-3].0.0	S1/1/[7-11]/[1-4]/1-[1-3]
VC-3 Logical port on STM-1 MSP (Trib)	TP[1-4].1.[1-3].0.0	S1/1/GRP[1,2]/[1-4]/1-[1-3] 5
VC-3 Logical Port on E3/DS3 switchable port (Trib)	TP[1-4].[1-12]	P3-D3/1/[7-10]/[1-4]-[1-3] 4
VC-3 Logical Port on SDH Channel (TransLAN+ / MLAN)	TP[1-4].wxyz	[[LANBR1/[7-10]/[1-2]-[1-2]]] 3
VC-3 Logical Port in CC-64/32 (Flexible Cross Connect)	CC1.[1-32].[1-3].0.0	N/A
VC-12 Logical Port on STM-16 (Line)	LP[1,2].[1-16].[1-3].[1-7].[1-3]	S16/1/[1,4]/1/[1-16]-[1-63]
VC-12 Logical Port on STM-16 MSP (Line)	LP1.[1-16].[1-3].[1-7].[1-3]	S16/1/GRP1/1/[1-16]-[1-63]
VC12 on STM-4 Tributary Port	TP[1-5].[1-4].[1-3].[1-7].[1-3]	S4/1/[7-11]/1/[1-4]-[1-63]
VC12 on STM-4 MSP Tributary Port	TP[1,3].[1-4].[1-3].[1-7].[1-3]	S4/1/GRP[1,2]/1/[1-4]-[1-63]
VC-12 Logical port on STM-1 (Trib)	TP[1-5].[1-4].1.[1-3].[1-7].[1-3]	S1/1/[7-11]/[1-4]/1-[1-63]
VC-12 Logical port on STM-1 MSP (Trib)	TP[1,3].[1-4].1.[1-3].[1-7].[1-3]	S1/1/GRP[1,2]/[1-4]/1-[1-63] 5
VC-12 Logical port on E1 Port (Trib)	TP[1-4].[1-63]	P1/1/[7-10]/1-[1-63]
VC-12 Logical Port on SDH Channel(TransLAN+ / MLAN)	TP[1-4].wxyz	[[LANBR/1/[7-10]/[1-2]-[43-62]
VC-12 Logical Port in CC-64/32 (Flexible Cross Connect)	CC1.[1-32].[1-3].[1-7].[1-3]	N/A



Non-port identifiers for ADM 16/1 compact network elements

Overview This section describes the non-port identifiers for ADM 16/1 compact network elements.

Table The following table lists the non-port identifiers for ADM 16/1 compact network elements.

Table 5-5 Non-port identifiers for ADM 16/1 compact network elements

Slot Number	Description	Entity Identifiers
1	Line Port Unit	LS1
2	Cross-connect Unit	CC1
3/6	Power and Timing Unit	PT(n/3)
4	Line Port Unit	LS2
5	Cross-connect Unit	CC2
7-11	Tributary Port Unit	TS(n-6)
12	System Controller Unit	SC
13-16	Paddle Board	PB(n-12)



Port identifiers for ADM 4/1 network elements

Overview This section describes the port identifiers for ADM 4/1 network elements.

Table The following table lists the port identifiers for ADM 4/1 network elements.

Table 5-6 Port identifiers for ADM 4/1 network elements

Description	Network Element	Entity Identifier	Network Level Address
[[MSP Group for STM-4]]	WS4/1STM4	[[LP[20,60]]]	[[S4/1/GRP[1,2]/1]]
MSP Group for STM-1	WS4/1STM1	LP[20,60]	S1/1/GRP[1,2]/1
STM-4 Physical Port (Line)	WS4/1STM4 WS4/1STM4R	LP[20,30, 50,60] LP[20,60]	S4/1/[20,30,50,60]/1 S4/1/[20,60]/1
STM-1 Physical Port (Line)	WS4/1STM1	LP[20,30, 50,60]	S1/1/[20,30,50,60]/1
STM-1 Physical Port (Trib)	WS4/1STM4 WS4/1STM1	TP[21,31,41,51,61] TP[21,31,41,51,61]	S1/1/[21,31,41,51,61]/1 S1/1/[21,31,41,51,61]/1
CEPT-3 Physical Port (Trib)	WS4/1STM4 WS4/1STM1	TP[21,31,41,51,61].1 TP[21,31,41,51,61].1	P3/1/[21,31,41,51,61]/1 P3/1/[21,31,41,51,61]/1
DS3 Physical Port (Trib)	WS4/1STM4 WS4/1STM1	TP[21,31,41,51,61].1 TP[21,31,41,51,61].1	D3/1/[21,31,41,51,61]/1 D3/1/[21,31,41,51,61]/1
CEPT-1 Physical Port (Trib)	WS4/1STM4 WS4/1STM1	TP[21,22,31,32,41,51,52,61,62].[1-16] TP[21,22,31,32,41,51,52,61,62].[1-16]	P1/1/[21,22,31,32,41,51,52,61,62]/[1-16] P1/1/[21,22,31,32,41,51,52,61,62]/[1-16]
[[VC-4 Logical Port on STM-4 (Line MSP)]]	WS4/1STM4	[[LP[20,60].[1-4]]]	[[S4/1/GRP[1,2]/1/[1-4]]]
VC-4 Logical Port on STM-4 (Line)	WS4/1STM4	LP[20,30, 50,60].[1-4]	S4/1/[20,30, 50,60]/1/[1-4] ³
VC-4 Logical Port on STM-4 (Virtual)	WS4/1STM4	VP[11,22].[1-4]	S4/1/[11,22]/1/[1-4] ³
VC-4 Logical Port on STM-1 (Line MSP)	WS4/1STM1	LP[20,60].1	S1/1/GRP[1,2]/1/1 ²
VC-4 Logical Port on STM-1 (Line)	WS4/1STM1	LP[20,30, 50,60].1	S1/1/[20,30, 50,60]/1/1

Table 5-6 Port identifiers for ADM 4/1 network elements (continued)

Description	Network Element	Entity Identifier	Network Level Address
VC-4 Logical Port on STM-1 (Virtual)	WS4/1STM1	VP[11,22].1	S1/1/[11,22]/1/1
VC-4 Logical Port on STM-1 (Trib)	WS4/1STM4 WS4/1STM1	TP[21,31,41,51,61].1 TP[21,31,41,51,61].1	S1/1/[21,31,41,51,61]/1/1 S1/1/[21,31,41,51,61]/1/1
[[VC-3 Logical Port on STM-4 (Line MSP)]]	WS4/1STM4	[[LP[20,60].[1-4].[1-3].0.0]]	[[S4/1/GRP[1,2]/1/[1-4]-[1-3] ²]]
VC-3 Logical Port on STM-4 (Line)	WS4/1STM4	LP[20,60].[1-4].[1-3].0.0	S4/1/[20,60]/1/[1-4]-[1-3]
VC-3 Logical Port on STM-4 (Virtual)	WS4/1STM4	VP[11,22].[1-4].[1-3].0.0	S4/1/[11,22]/1/[1-4]-[1-3]
VC-3 Logical Port on STM-1 (Line MSP)	WS4/1STM1	LP[20,60].1.[1-3].0.0	S1/1/GRP[1,2]/1/1-[1-3] ²
VC-3 Logical Port on STM-1 (Line)	WS4/1STM1	LP[20,60].1.[1-3].0.0	S1/1/[20,60]/1/1-[1-3]
VC-3 Logical Port on STM-1 (Virtual)	WS4/1STM1	VP[11,22].1.[1-3].0.0	S1/1/[11,22]/1/1-[1-3]
VC-3 Logical Port on STM-1 (Trib)	WS4/1STM4 WS4/1STM1	TP[21,31,41,51,61].1.[1-3].0.0 TP[21,31,41,51,61].1.[1-3].0.0	S1/1/[21,31,41,51,61]/1/1-[1-3] S1/1/[21,31,41,51,61]/1/1-[1-3]
VC-3 Logical Port on CEPT-3 Physical port (Trib)	WS4/1STM4 WS4/1STM1	TP[21,31,41,51,61].1 TP[21,31,41,51,61].1	P3/1/[21,31,41,51,61]/1 P3/1/[21,31,41,51,61]/1
VC-3 Logical Port on DS-3 Physical port (Trib)	WS4/1STM4 WS4/1STM1	TP[21,31,41,51,61].1 TP[21,31,41,51,61].1	D3/1/[21,31,41,51,61]/1 D3/1/[21,31,41,51,61]/1
[[VC-12 Logical Port on STM-4 (Line MSP)]]	WS4/1STM4	[[LP[20,60].[1-4].[1-3].[1-7].[1-3]]]	[[S4/1/GRP[1,2]/1/[1-4]-[1-63] ²]]
VC-12 Logical Port on STM-4 (Line)	WS4/1STM4	LP[20,60].[1-4].[1-3].[1-7].[1-3]	S4/1/[20,60]/1/[1-4]-[1-63]
VC-12 Logical Port on STM-4 (Virtual)	WS4/1STM4	VP[11,22].[1-4].[1-3].[1-7].[1-3]	S4/1/[11,22]/1/[1-4]-[1-63]
VC-12 Logical Port on STM-1 MSP (Line)	WS4/1STM1	LP[20,60].1.[1-3].[1-7].[1-3]	S1/1/GRP[1,2]/1/1-[1-63] ²

Table 5-6 Port identifiers for ADM 4/1 network elements (continued)

Description	Network Element	Entity Identifier	Network Level Address
VC-12 Logical Port on STM-1 (Line)	WS4/1STM1	LP[20,60].1.[1-3].[1-7].[1-3]	S1/1/[20,60]/1/1-[1-63]
VC-12 Logical Port on STM-1 (Virtual)	WS4/1STM1	VP[11,22].1.[1-3].[1-7].[1-3]	S1/1/[11,22]/1/1-[1-63]
VC-12 Logical Port on STM-1 (Trib)	WS4/1STM4 WS4/1STM1	TP[21,31,41,51,61].1.[1-3].[1-7].[1-3] TP[21,31,41,51,61].1.[1-3].[1-7].[1-3]	S1/1/[21,31,41,51,61]/1/1-[1-63] S1/1/[21,31,41,51,61]/1/1-[1-63]
VC-12 Logical Port on CEPT-1 (2 Mb/s) Physical port	WS4/1STM4 WS4/1STM1	TP[21,22,31,32,41,51,52,61,62].[1-16] TP[21,22,31,32,41,51,52,61,62].[1-16]	P1/1/[21,22,31,32,41,51,52,61,62]/[1-16] P1/1/[21,22,31,32,41,51,52,61,62]/[1-16]

Notes:

1. For a STM-n physical port which is involved in MSP protection (as either the worker or protecting port), the ITM-SC Port Selection screen should display the appropriate GRP address only. For a STM-n physical port which is not involved in MSP protection, the ITM-SC Port Selection screen should display the standard port address only (non-GRP).
2. For a logical port which is derived from a STM-n MSP protection group, the ITM-SC Port Selection screen should display the logical GRP address only. For a logical port derived from a STM-n port which is not involved in MSP protection, the ITM-SC Port Selection screen should display the standard logical port address only (non-GRP).
3. The ITM-SC Port Selection screen should always display all the existing AU4 ports, not only the AU4 port available for add/drop use. The 3 AU4 which are fixed cross connected (line to line transferred) will be always tagged as in-use. The 4th AU4 (the flexible one) will be displayed with the in-use tag set depending on its in-use status.

□

Port identifiers for ADM-155E network elements

Overview This section describes the port identifiers for ADM-155E network elements.

Table The following table lists the port identifiers for ADM 4/1 network elements.

Table 5-7 Port identifiers for ADM-155E network elements

Description	Entity Identifier	Network Level Address
MSP Group for STM-1	LP[6,16]	S1/1/GRP[1,2]/1
STM-1 Physical Port (Line)	LP[6,7,16,17]	S1/1/[6,7,16,17]/1
STM-1 Physical Port (Trib)	TP[8-15]	S1/1/[8-15]/1
CEPT-3 Physical Port (Trib)	TP[8-15].1	P3/1/[8-15]/1
DS3 Physical Port (Trib)	TP[8-15].1	D3/1/[8-15]/1
CEPT-1 Physical Port (Trib)	TP[8-15].[1-16]	P1/1/[8-15]/[1-16]
VC-4 Logical Port (Line MSP)	LP[6,16].1	S1/1/GRP[1,2]/1/1
VC-4 Logical Port (Line)	LP[6,16].1	S1/1/[6,16]/1/1
VC-4 Logical Port (Virtual)	VP[21,22].1	S1/1/[21,22]/1/1
VC-4 Logical Port on STM-1 (Trib)	TP[8-15].1	S1/1/[8-15]/1/1
VC-3 Logical Port (Line MSP)	LP[6,16].1.[1-3].0.0	S1/1/GRP[1,2]/1/1-[1-3]
VC-3 Logical Port (Line)	LP[6,16].1.[1-3].0.0	S1/1/[6,16]/1/1-[1-3]
VC-3 Logical Port (Virtual)	VP[21,22].1.[1-3].0.0	S1/1/[21,22]/1/1-[1-3]
VC-3 Logical Port on STM-1 (Trib)	TP[8-15].1.[1-3].0.0	S1/1/[8-15]/1/1-[1-3]
VC-3 Logical Port on CEPT-3 Physical port (Trib)	TP[8-15].1	P3/1/[8-15]/1
VC-3 Logical Port on DS-3 Physical port (Trib)	TP[8-15].1	D3/1/[8-15]/1
VC-12 Logical Port (Line MSP)	LP[6,16].1.[1-3].[1-7].[1-3]	S1/1/GRP[1,2]/1/1-[1-63]
VC-12 Logical Port (Line)	LP[6,16].1.[1-3].[1-7].[1-3]	S1/1/[6,16]/1/1-[1-63]
VC-12 Logical Port (Virtual)	VP[21,22].1.[1-3].[1-7].[1-3]	S1/1/[21,22]/1/1-[1-63]
VC-12 Logical Port on STM-1 (Trib)	TP[8-15].1.[1-3].[1-7].[1-3]	S1/1/[8-15]/1/1-[1-63]

Table 5-7 Port identifiers for ADM-155E network elements (continued)

Description	Entity Identifier	Network Level Address
VC-12 Logical Port on CEPT-1 (2 Mb/s) Physical port	TP[8-15].[1-16]	P1/1/[8-15]/[1-16]

□

Section III: AM 1 Port Addresses

Overview

Purpose This section provides the external and internal port addresses for both the physical and logical ports of AM 1 network elements. It also discusses the correlation between the external and internal port addresses.

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Port identifiers for AM 1 network elements

Overview This section contains port address information for the physical and logical ports usable with AM 1 network elements.

Port identifiers The following table shows the port identifier address information for AM 1 network elements.

Table 5-8 Port identifiers for AM 1 network elements

Description		Entity Identifier	Network Level Address
STM-1 Line Port	Physical Port (optical)	LP[1-2]	S1/1/[2-3]/1
	Logical Port (AU4 and VC4 combined)	LP[1-2].1	S1/1/[2-3]/1/1
	Logical Port TU3	LP[1-2].1[1-3].0.0	S1/1/[2-3]/1/1-[1-3]
	Logical Port TU12	LP[1-2].1[1-3].[1-7].[1-3]	S1/1/[2-3]/1/1-[1-63]
STM-1 Line MSP Group	Physical Port (optical)	LP1	S1/1/GRP1/1
	Logical Port (AU4 and VC4 combined)	LP1.1	S1/1/GRP1/1/1
	Logical Port TU3	LP1.1.[1-3].0.0	S1/1/GRP1/1/1-[1-3]
	Logical Port TU12	LP1.1.[1-3].[1-7].[1-3]	S1/1/GRP1/1/1-[1-63]
DS3 (45Mb/s) Tributary	Physical Ports	TP2.[1-2]	D3/1/5/[1-2]
	Logical Port VC3	TP2.[1-2]	D3/1/5/[1-2]
E3 (CEPT-3) (34Mb/s) Tributary	Physical Ports	TP2.[1-2]	P3/1/5/[1-2]
	Logical Port VC3	TP2.[1-2]	P3/1/5/[1-2]
CMB E1 (CEPT-1) (2Mb/s) Tributary (on-board)	Physical Ports	TP1.[1-16]	P1/1/4/[1-16]
	Logical Port VC12	TP1.[1-16]	P1/1/4/[1-16]

Table 5-8 Port identifiers for AM 1 network elements (continued)

CMC E1 (CEPT-1) (2Mb/s) Tributary (additional)	Physical Ports	TP2.[1-16]	P1/1/5/[1-16]
	Logical Port VC12	TP2.[1-16]	P1/1/5/[1-16]
X.21 Tributary (TransLAN/X.21 card)	Physical X.21 Ports (X21DL)	TP2.[1-4]	X21/1/5/[1-4]
	Logical X.21 Ports VC12	TP2.[1-4]	X21/1/5/[1-4]
TransLAN Tributary (TransLAN/X.21 card)	Physical LAN 10/100baseT Ports (LAN8DL)	LAN2.[1-2]	LAN8/1/5/[1-2]
	Logical LAN 10/100baseT ports VC12	LAN2.[1-2].[1-4]	LAN8/1/5/[1-2]/[1-4]
TransLAN+ Tributary	Physical LAN 10/100baseT Ports	LAN2.[1-4]	[[LAN/1/5/[1-4]]]
	[[Logical LAN 10/100baseT LAN Groups]]	[[LANGRP2.n]]	[[NA]]
	Logical LAN 10/100baseT LAN Ports	LAN2.[1-4]	N/A
	Logical LAN 10/100baseT WAN Ports	WAN2.[1-4]	N/A
	Logical SDH Channel Ports	SDHChan2.[1-4]	[[LANBR/1/5/[1-4]]]
	Logical Ports VC3	TP2.abcd	[[LANBR/1/5/abcd]]
	Logical Ports VC12	TP2.abcd	[[LANBR/1/5/abcd]]



Non-port identifiers for AM 1 network elements

Overview This section describes the non-port identifiers for AM 1 network elements.

Table The following table lists the non-port identifiers for AM 1 network elements.

Table 5-9 Non-port identifiers for AM 1 network elements

Slot Number	Description	Entity Identifiers	AM 1, AM 1+ Add/Drop	AM 1+ Terminal (STM-1)
1	Motherboard (System control, timing and cross-connect)	SC	Y	Y
2	Line Slot 1	LS1		
3	Line Slot 2	LS2		N
4	Tributary Slot 1 (Motherboard)	TS1		Y
5	Tributary Slot 1 (Motherboard)	TS2		



Port identifiers for AM 1+ network elements

Overview This section contains port address information for the physical and logical ports usable with AM 1+ network elements.

Port identifiers The following table shows the port identifier address information for AM 1+ network elements.

Table 5-10 Port identifiers for AM 1+ network elements

Network Elements	Description		Entity Identifier	Network Level Address
WS_AM1PLUS_ STM4	STM-4 Line Port	Physical Ports	LP [1-2]	S4/1/[2-3]/1
		Logical Port (AU4 or AU4/VC4 combined)	LP[1-2].[1-4]	S4/1/[2-3]/1/[1-4]
		Logical Port TU3	LP[1-2].[1-4].[1-3].0.0	S4/1/[2-3]/1/[1-4]-[1-3]
		Logical Port TU12	LP[1-2].[1-4].[1-3].[1-7].[1-3]	S4/1/[2-3]/1/[1-4]-[1-63]
	[[STM-4 Line MSP Group]]	[[Physical Ports]]	[[LP1]]	[[S4/1/GRP1/1]]
		[[Logical Port (AU4 or AU4/VC4 combined)]]	[[LP1.[1-4]]]	[[S4/1/GRP1/1[1-4]]]
		[[Logical Port TU3]]	[[LP1.[1-4].[1-3].0.0]]	[[S4/1/GRP1/1[1-4]-[1-3]]]
		[[Logical Port TU12]]	[[LP1.[1-4].[1-3].[1-7].[1-3]]]	[[S4/1/GRP1/1[1-4]-[1-63]]]
	STM-1 Tributary	Physical Port (optical or electrical)	TP2.[1-2]	S1/1/5/[1-2]
		Logical Port (AU4)	TP2.[1-2].1	S1/1/5/[1-2]/1

Port identifiers for AM 1+ network elements

Table 5-10 Port identifiers for AM 1+ network elements (continued)

WS_AM1PLUS_STM1, WS_AM1PLUS_STM1_ T	STM-1 Line Port (Line Slot 1)	Physical Ports (optical)	LP1	S1/1/2/1
		Logical Port (AU4 and VC4 combined)	LP1.1	S1/1/2/1/1
		Logical Port TU3	LP1.1.[1-3].0.0	S1/1/2/1/1-[1-3]
		Logical Port TU12	LP1.1.[1-3].[1- 7].[1-3]	S1/1/2/1/1-[1-63]
WS_AM1PLUS_ STM1	STM-1 Line Port (Line Slot 2)	Physical Ports (optical)	LP2	S1/1/3/1
		Logical Port (AU4 and VC4 combined)	LP2.1	S1/1/3/1/1
		Logical Port TU3	LP2.1.[1-3].0.0	S1/1/3/1/1-[1-3]
		Logical Port TU12	LP2.1.[1-3].[1- 7].[1-3]	S1/1/3/1/1-[1-63]
WS_AM1PLUS_ STM1	STM-1 Line MSP Group	Physical Ports (optical)	LP1	S1/1/GRP1/1
		Logical Port (AU4 and VC4 combined)	LP1.1	S1/1/GRP1/1/1
		Logical Port TU3	LP1.1.[1-3].0.0	S1/1/GRP1/1/1-[1-3]
		Logical Port TU12	LP1.1.[1-3].[1- 7].[1-3]	S1/1/GRP1/1/1-[1- 63]

Table 5-10 Port identifiers for AM 1+ network elements (continued)

WS_AM1PLUS_STM4, WS_AM1PLUS_STM1, WS_AM1PLUS_STM1_ T	DS3 (45Mb/s) Tributary	Physical Ports	TP2.[1-2]	D3/1/5/[1-2]
		Logical Port VC3	TP2.[1-2]	D3/1/5/[1-2]
	E3 (CEPT-3) (34Mb/s) Tributary	Physical Ports	TP2.[1-2]	P3/1/5/[1-2]
		Logical Port VC3	TP2.[1-2]	P3/1/5/[1-2]
	CMB E1 (CEPT-1) (2Mb/s) Tributary (on-board)	Physical Ports	TP1.[1-16]	P1/1/4/[1-16]
		Logical Port VC12	TP1.[1-16]	P1/1/4/[1-16]
	CMC E1 (CEPT-1) (2Mb/s) Tributary (additional)	Physical Ports	TP2.[1-16]	P1/1/5/[1-16]
		Logical Port VC12	TP2.[1-16]	P1/1/5/[1-16]
	ISDN PRI (2Mb/s) Tributary (on-board)	Physical Ports	TP1.[1-16]	P1/1/4/[1-16]
		Logical Port VC12	TP1.[1-16]	P1/1/4/[1-16]
	ISDN PRI (2Mb/s) Tributary (additional)	Physical Ports	TP2.[1-16]	P1/1/5/[1-16]
		Logical Port VC12	TP2.[1-16]	P1/1/5/[1-16]
	DS1 Tributary	Physical Ports	TP2.[1-16]	P1/1/5/[1-16]
		Logical Port VC12	TP2.[1-16]	P1/1/5/[1-16]
	X.21 Tributary	Physical X.21 Ports (X21DL)	TP2.[1-4]	X21/1/5/[1-4]
		Logical X.21 Ports VC12	TP2.[1-4]	X21/1/5/[1-4]

Port identifiers for AM 1+ network elements

Table 5-10 Port identifiers for AM 1+ network elements (continued)

WS_AM1PLUS_STM4, WS_AM1PLUS_STM1, WS_AM1PLUS_STM1_ T	TransLAN+ Tributary	Physical LAN 10/100baseT Ports	LAN2.[1-4]	[[LANACC/1/5/[1-4]]]
		[[Logical LAN 10/100baseT LAN Groups]]	[[LANGRP2.n]]	[[NA]]
		Logical LAN Ports	LAN2.[1-4]	N/A
		Logical LAN Ports - VLAN context	WAN2.[1-4]	N/A
		Logical WAN Ports	WAN2.[1-4]	N/A
		Logical WAN Ports - VLAN context	WAN2.[1-4].[1-4093]	N/A
		Logical SDH Channel Ports	SDHChan2.[1-4]	[[LANBR/1/5/[1-4]]]
		Logical Ports VC3	TP2.abcd	[[LANBR/1/5/abcd]]
		Logical Ports VC12	TP2.abcd	[[LANBR/1/5/abcd]]

□

Non-port identifiers for AM 1+ network elements

Overview This section describes the non-port identifiers for AM 1+ network elements.

Table The following table lists the non-port identifiers for AM 1+ network elements.

Table 5-11 Non-port identifiers for AM 1+ network elements

Slot Number	Description	Entity Identifiers	AM 1, AM 1+ Add/Drop	AM 1+ Terminal (STM-1)
1	Motherboard (System control, timing and cross-connect)	SC	Y	Y
2	Line Slot 1	LS1		N
3	Line Slot 2	LS2		Y
4	Tributary Slot 1 (Motherboard)	TS1		
5	Tributary Slot 1 (Motherboard)	TS2		



Section IV: WaveStar DACS Port Addresses

Overview

Purpose This section provides the external and internal port addresses for both the physical and logical ports of WaveStar DACS network elements.

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Port identifiers

Overview This section discusses the port identifiers for WaveStar DACS network elements.

Entity identifier and network-level address syntax The following tables provides the port identifiers for WaveStar DACS network elements.

Table 5-12 Port identifiers for WaveStar DACS network elements

Port Derivation	Description	Entity Identifier	Network Level Address
STM-1, non-MSP	STM-1 Physical Port	PSA-[4-19]-STM1-[1-8, 11-18]-[1-4]	S1/PA[4-19]/[1-8, 11-18]/[1-4]
	VC4 Logical Port on STM1	PSA-[4-19]-STM1-[1-8, 11-18]-[1-4]-AUG1#1-AU4	S1/PA[4-19]/[1-8, 11-18]/[1-4]/1
	VC3 Logical Port on STM1	PSA-[4-19]-STM1-[1-8, 11-18]-[1-4]-AUG1#1-AU4-TUG3#[1-3]-TU3	S1/PA[4-19]/[1-8, 11-18]/[1-4]/1-[1-3]
	VC12 Logical Port on STM1	PSA-[4-19]-STM1-[1-8, 11-18]-[1-4]-AUG1#1-AU4-TUG3#[1-3]-TUG2#[1-7]-TU12#[1-3]	S1/PA[4-19]/[1-8, 11-18]/[1-4]/1-[1-63]
	AU3 logical port on STM1	PSA-[4-19]-STM1-[1-8, 11-18]-[1-4]-AUG1#1-AU3#[1-3]	S1/PA[4-19]/[1-8, 11-18]/[1-4]/[1-3]

Table 5-12 Port identifiers for WaveStar DACS network elements (continued)

STM-1, MSP	STM-1 (MSP) Physical Port	PSA-[4-19]-STM1-[1, 3, 5, 7, 11, 13, 15, 17]-[1-4]	S1/PA[4-19]/GRP[1-8]/[1-4]
	VC4 Logical Port on STM1 (MSP)	PSA-[4-19]-STM1-[1, 3, 5, 7, 11, 13, 15, 17]-[1-4]-AUG1#1-AU4	S1/PA[4-19]/GRP[1-8]/[1-4]/1
	VC3 Logical Port on STM1 (MSP)	PSA-[4-19]-STM1-[1, 3, 5, 7, 11, 13, 15, 17]-[1-4]-AUG1#1-AU4-TUG3#[1-3]-TU3	S1/PA[4-19]/GRP[1-8]/[1-4]/1-[1-3]
	VC12 Logical Port on STM1 (MSP)	PSA-[4-19]-STM1-[1, 3, 5, 7, 11, 13, 15, 17]-[1-4]-AUG1#1-AU4-TUG3#[1-3]-TUG2#[1-7]-TU12#[1-3]	S1/PA[4-19]/GRP[1-8]/[1-4]/1-[1-63]
	AU3 logical port on STM1 (MSP)	PSA-[4-19]-STM1-[1, 3, 5, 7, 11, 13, 15, 17]-[1-4]-AUG1#1-AU3#[1-3]	S1/PA[4-19]/GRP[1-8]/[1-4]/1-[1-3]
STM-4, non-MSP	STM-4 Physical Port	PSC-[4-19]-STM4-[1-8]-[1-4]	S4/PC[4-19]/[1-8]/[1-4]
	VC4-4c Logical Port on STM4	PSC-[4-19]-STM4-[1-8]-[1-4]-AUG4#1-AU4_4C	S4/PC[4-19]/[1-8]/[1-4]/4c.1
	VC4 Logical Port on STM4	PSC-[4-19]-STM4-[1-8]-[1-4]-AUG1#[1-4]-AU4	S4/PC[4-19]/[1-8]/[1-4]/[1-4]
	VC3 Logical Port on STM4	PSC-[4-19]-STM4-[1-8]-[1-4]-AUG1#[1-4]-AU4-TUG3#[1-3]-TU3	S4/PC[4-19]/[1-8]/[1-4]/[1-4]-[1-3]
	VC12 Logical Port on STM4	PSC-[4-19]-STM4-[1-8]-[1-4]-AUG1#[1-4]-AU4-TUG3#[1-3]-TU2#[1-7]-TU12#[1-3]	S4/PC[4-19]/[1-8]/[1-4]/[1-4]-[1-63]
	AU3 Logical Port on STM4	PSC-[4-19]-STM4-[1-8]-[1-4]-AUG1#[1-4]-AU3#[1-3]	S4/PC[4-19]/[1-8]/[1-4]/[1-12]

Table 5-12 Port identifiers for WaveStar DACS network elements (continued)

STM-4, MSP	STM-4 (MSP) Physical Port	PSC-[4-19]-STM4-[1, 3, 5, 7]-[1-4]	S4/PC[4-19]/GRP[1-4]/[1-4]
	VC4-4c Logical Port on STM4 (MSP)	PSC-[4-19]-STM4-[1, 3, 5, 7]-[1-4]-AUG4#1-AU4_4C	S4/PC[4-19]/GRP[1-4]/[1-4]/4c.1
	VC4 Logical Port on STM4 (MSP)	PSC-[4-19]-STM4-[1, 3, 5, 7]-[1-4]-AUG1#[1-4]-AU4	S4/PC[4-19]/GRP[1-4]/[1-4]/[1-4]
	VC3 Logical Port on STM4 (MSP)	PSC-[4-19]-STM4-[1, 3, 5, 7]-[1-4]-AUG1#[1-4]-AU4-TUG3#[1-3]-TU3	S4/PC[4-19]/GRP[1-4]/[1-4]/[1-4]-[1-3]
	VC12 Logical Port on STM4 (MSP)	PSC-[4-19]-STM4-[1, 3, 5, 7]-[1-4]-AUG1#[1-4]-AU4-TUG3#[1-3]-TU2#[1-7]-TU12#[1-3]	S4/PC[4-19]/GRP[1-4]/[1-4]/[1-4]-[1-63]
	AU3 Logical Port on STM4 (MSP)	PSC-[4-19]-STM4-[1, 3, 5, 7]-[1-4]-AUG1#[1-4]-AU3#[1-3]	S4/PC[4-19]/GRP[1-4]/[1-4]/[1-12]
STM-16, non-MSP	STM-16 Physical Port	PSC-[4-19]-STM16-[1-8]-1	S16/PC[4-19]/[1-8]/1
	VC4-4c Logical Port on STM16	PSC-[4-19]-STM16-[1-8]-1-AUG4#[1-4]-AU4_4c	S16/PC[4-19]/[1-8]/1/4c.[1-4]
	VC4 Logical Port on STM16	PSC-[4-19]-STM16-[1-8]-1-AUG1#[1-4][1-4]-AU4	S16/PC[4-19]/[1-8]/1/[1-16]
	VC3 Logical Port on STM16	PSC-[4-19]-STM16-[1-8]-1-AUG1#[1-4][1-4]-AU4-TUG3#[1-3]-TU3	S16/PC[4-19]/[1-8]/1/[1-16]/[1-3]
	VC12 Logical Port on STM16	PSC-[4-19]-STM16-[1-8]-1-AUG1#[1-4][1-4]-AU4-TUG3#[1-3]-TUG2#[1-7]-TU12#[1-3]	S4/PC[4-19]/GRP[1-4]/[1-4]/[1-4]-[1-63]
	AU3 Logical Port on STM16	PSC-[4-19]-STM16-[1-8]-1-AUG1#[1-4][1-4]-AU3#[1-3]	S16/PC[4-19]/[1-8]/1/[1-48]

Table 5-12 Port identifiers for WaveStar DACS network elements (continued)

STM-16, MSP	STM-16 Physical Port (MSP)	PSC-[4-19]-STM16-[1, 3, 5, 7]-1	S16/PC[4-19]/GRP[1-4]/1
	VC4-4c Logical Port on STM16 (MSP)	PSC-[4-19]-STM16-[1, 3, 5, 7]-1-AUG4#[1-4]-AU4_4c	S16/PC[4-19]/GRP[1-4]/1/4c.[1-4]
	VC4 Logical Port on STM16 (MSP)	PSC-[4-19]-STM16-[1, 3, 5, 7]-1-AUG1#[1-4][1-4]-AU4	S16/PC[4-19]/GRP[1-4]/1/[1-16]
	VC3 Logical Port on STM16 (MSP)	PSC-[4-19]-STM16-[1, 3, 5, 7]-1-AUG1#[1-4][1-4]-AU4-TUG3#[1-3]-TU3	S16/PC[4-19]/GRP[1-4]/1/[1-16]/[1-3]
	VC12 Logical Port on STM16 (MSP)	PSC-[4-19]-STM16-[1, 3, 5, 7]-1-AUG1#[1-4][1-4]-AU4-TUG3#[1-3]-TUG2#[1-7]-TU12#[1-3]	S16/PC[4-19]/GRP[1-4]/1/[1-16]-[1-63]
	AU3 Logical Port on STM16 (MSP)	PSC-[4-19]-STM16-[1, 3, 5, 7]-1-AUG1#[1-4][1-4]-AU3#[1-3]	S16/PC[4-19]/GRP[1-4]/1/[1-48]

Table 5-13 WaveStar DACS port addresses for AU3 and VC4 logical ports

Logical Port	Port Card Type	Entity Identifier	Network Level Address
AU3	STM0	S0/PB[4-19]/[1-8,11-18]/[[1-12]/1	PSB-[4-19]-STM0-[1-8,11-18]-[1-12]-AUG1#1-AU3#1
AU3	STM1	S1/PA[4-19]/[1-8,11-18]/[[1-4]/[1-3]	PSA-[4-19]-STM1-[1-8,11-18]-[1-4]-AUG1#1-AU3#[1-3]
AU3	STM0 (MSP)	S0/PB[4-19]/GRP[1-8]/[1-12]/1	PSB-[4-19]-STM0-MSP[1,3,5,7,11,13,15,17]-[1-12]-AUG1#1-AU3#1
AU3	STM1 (MSP)	S1/PA[4-19]/GRP[1-8]/[1-4]/[1-3]	PSA-[4-19]-STM1-MSP[1,3,5,7,11,13,15,17]-[1-4]-AUG1#1-AU3#[1-3]
VC4	STM1	S1/PA[4-19]/[1-8,11-18]/[[1-4]/1	PSA-[4-19]-STM1-[1-8,11-18]-[1-4]-AUG1#1-AU4
VC4	STM1 (MSP)	S1/PA[4-19]/GRP[1-8]/[1-4]/1	PSA-[4-19]-STM1-MSP[1,3,5,7,11,13,15,17]-[1-4]-AUG1#1-AU4

Table 5-14 WaveStar DACS network level port addresses for VC3 and VC12

Logical Port	Port Card Type	Entity Identifier	Network Level Address
VC3	STM1	S1/PA[4-19]/[1-8,11-18]/[[1-4]/1-[1-3]	PSA-[4-19]-STM1-[1-8,11-18]-[1-4]-AUG1#1-AU4-TUG3#[1-3]-TU3
VC3	STM1 (MSP)	S1/PA[4-19]/GRP[1-8]/[1-4]/1-[1-3]	PSA-[4-19]-STM1-MSP[1,3,5,7,11,13,15,17]-[1-4]-AUG1#1-AU4-TUG3#[1-3]-TU3
VC12	STM1	S1/PA[4-19]/[1-8,11-18]/[[1-4]/1-[1-63]	PSA-[4-19]-STM1-[1-8,11-18]-[1-4]-AUG1#1-AU4-TUG3#[1-3]-TUG2#[1-7]-TU12#[1-3]
VC12	STM1 (MSP)	S1/PA[4-19]/GRP[1-8]/[1-4]/1-[1-63]	PSA-[4-19]-STM1-MSP[1,3,5,7,11,13,15,17]-[1-4]-AUG1#1-AU4-TUG3#[1-3]-TUG2#[1-7]-TU12#[1-3]

Entity identifier and network-level address syntax

The following tables provides the port identifiers for WaveStar DACS network elements.

Table 5-15 Port identifiers for WaveStar DACS network elements

Port Derivation	Description	Entity Identifier	Network Level Address
STM-1, non-MSP	STM-1 Physical Port	PSA-[4-19]-STM1-[1-8,11-18]-[1-4]	S1/PA[4-19]/[1-8,11-18]/[1-4]
	VC4 Logical Port on STM1	PSA-[4-19]-STM1-[1-8,11-18]-[1-4]-AUG1#1-AU4	S1/PA[4-19]/[1-8,11-18]/[1-4]/1
	VC3 Logical Port on STM1	PSA-[4-19]-STM1-[1-8,11-18]-[1-4]-AUG1#1-AU4-TUG3#[1-3]-TU3	S1/PA[4-19]/[1-8,11-18]/[1-4]/1-[1-3]
	VC12 Logical Port on STM1	PSA-[4-19]-STM1-[1-8,11-18]-[1-4]-AUG1#1-AU4-TUG3#[1-3]-TUG2#[1-7]-TU12#[1-3]	S1/PA[4-19]/[1-8,11-18]/[1-4]/1-[1-63]
	AU3 logical port on STM1	PSA-[4-19]-STM1-[1-8,11-18]-[1-4]-AUG1#1-AU3#[1-3]	S1/PA[4-19]/[1-8,11-18]/[1-4]/[1-3]

Table 5-15 Port identifiers for WaveStar DACS network elements (continued)

STM-1, MSP	STM-1 (MSP) Physical Port	PSA-[4-19]-STM1-[1, 3, 5, 7, 11, 13, 15, 17]-[1-4]	S1/PA[4-19]/GRP[1-8]/[1-4]
	VC4 Logical Port on STM1 (MSP)	PSA-[4-19]-STM1-[1, 3, 5, 7, 11, 13, 15, 17]-[1-4]-AUG1#1-AU4	S1/PA[4-19]/GRP[1-8]/[1-4]/1
	VC3 Logical Port on STM1 (MSP)	PSA-[4-19]-STM1-[1, 3, 5, 7, 11, 13, 15, 17]-[1-4]-AUG1#1-AU4-TUG3#[1-3]-TU3	S1/PA[4-19]/GRP[1-8]/[1-4]/1-[1-3]
	VC12 Logical Port on STM1 (MSP)	PSA-[4-19]-STM1-[1, 3, 5, 7, 11, 13, 15, 17]-[1-4]-AUG1#1-AU4-TUG3#[1-3]-TUG2#[1-7]-TU12#[1-3]	S1/PA[4-19]/GRP[1-8]/[1-4]/1-[1-63]
	AU3 logical port on STM1 (MSP)	PSA-[4-19]-STM1-[1, 3, 5, 7, 11, 13, 15, 17]-[1-4]-AUG1#1-AU3#[1-3]	S1/PA[4-19]/GRP[1-8]/[1-4]/1-[1-3]
STM-4, non-MSP	STM-4 Physical Port	PSC-[4-19]-STM4-[1-8]-[1-4]	S4/PC[4-19]/[1-8]/[1-4]
	VC4-4c Logical Port on STM4	PSC-[4-19]-STM4-[1-8]-[1-4]-AUG4#1-AU4_4C	S4/PC[4-19]/[1-8]/[1-4]/4c.1
	VC4 Logical Port on STM4	PSC-[4-19]-STM4-[1-8]-[1-4]-AUG1#[1-4]-AU4	S4/PC[4-19]/[1-8]/[1-4]/[1-4]
	VC3 Logical Port on STM4	PSC-[4-19]-STM4-[1-8]-[1-4]-AUG1#[1-4]-AU4-TUG3#[1-3]-TU3	S4/PC[4-19]/[1-8]/[1-4]/[1-4]-[1-3]
	VC12 Logical Port on STM4	PSC-[4-19]-STM4-[1-8]-[1-4]-AUG1#[1-4]-AU4-TUG3#[1-3]-TU2#[1-7]-TU12#[1-3]	S4/PC[4-19]/[1-8]/[1-4]/[1-4]-[1-63]
	AU3 Logical Port on STM4	PSC-[4-19]-STM4-[1-8]-[1-4]-AUG1#[1-4]-AU3#[1-3]	S4/PC[4-19]/[1-8]/[1-4]/[1-12]

Table 5-15 Port identifiers for WaveStar DACS network elements (continued)

STM-4, MSP	STM-4 (MSP) Physical Port	PSC-[4-19]-STM4-[1, 3, 5, 7]-[1-4]	S4/PC[4-19]/GRP[1-4]/[1-4]
	VC4-4c Logical Port on STM4 (MSP)	PSC-[4-19]-STM4-[1, 3, 5, 7]-[1-4]-AUG4#1-AU4_4C	S4/PC[4-19]/GRP[1-4]/[1-4]/4c.1
	VC4 Logical Port on STM4 (MSP)	PSC-[4-19]-STM4-[1, 3, 5, 7]-[1-4]-AUG1#[1-4]-AU4	S4/PC[4-19]/GRP[1-4]/[1-4]/[1-4]
	VC3 Logical Port on STM4 (MSP)	PSC-[4-19]-STM4-[1, 3, 5, 7]-[1-4]-AUG1#[1-4]-AU4-TUG3#[1-3]-TU3	S4/PC[4-19]/GRP[1-4]/[1-4]/[1-4]-[1-3]
	VC12 Logical Port on STM4 (MSP)	PSC-[4-19]-STM4-[1, 3, 5, 7]-[1-4]-AUG1#[1-4]-AU4-TUG3#[1-3]-TU2#[1-7]-TU12#[1-3]	S4/PC[4-19]/GRP[1-4]/[1-4]/[1-4]-[1-63]
	AU3 Logical Port on STM4 (MSP)	PSC-[4-19]-STM4-[1, 3, 5, 7]-[1-4]-AUG1#[1-4]-AU3#[1-3]	S4/PC[4-19]/GRP[1-4]/[1-4]/[1-12]
STM-16, non-MSP	STM-16 Physical Port	PSC-[4-19]-STM16-[1-8]-1	S16/PC[4-19]/[1-8]/1
	VC4-4c Logical Port on STM16	PSC-[4-19]-STM16-[1-8]-1-AUG4#[1-4]-AU4_4c	S16/PC[4-19]/[1-8]/1/4c.[1-4]
	VC4 Logical Port on STM16	PSC-[4-19]-STM16-[1-8]-1-AUG1#[1-4][1-4]-AU4	S16/PC[4-19]/[1-8]/1/[1-16]
	VC3 Logical Port on STM16	PSC-[4-19]-STM16-[1-8]-1-AUG1#[1-4][1-4]-AU4-TUG3#[1-3]-TU3	S16/PC[4-19]/[1-8]/1/[1-16]/[1-3]
	VC12 Logical Port on STM16	PSC-[4-19]-STM16-[1-8]-1-AUG1#[1-4][1-4]-AU4-TUG3#[1-3]-TUG2#[1-7]-TU12#[1-3]	S4/PC[4-19]/GRP[1-4]/[1-4]/[1-4]-[1-63]
	AU3 Logical Port on STM16	PSC-[4-19]-STM16-[1-8]-1-AUG1#[1-4][1-4]-AU3#[1-3]	S16/PC[4-19]/[1-8]/1/[1-48]

Table 5-15 Port identifiers for WaveStar DACS network elements (continued)

STM-16, MSP	STM-16 Physical Port (MSP)	PSC-[4-19]-STM16-[1, 3, 5, 7]-1	S16/PC[4-19]/GRP[1-4]/1
	VC4-4c Logical Port on STM16 (MSP)	PSC-[4-19]-STM16-[1, 3, 5, 7]-1-AUG4#[1-4]-AU4_4c	S16/PC[4-19]/GRP[1-4]/1/4c.[1-4]
	VC4 Logical Port on STM16 (MSP)	PSC-[4-19]-STM16-[1, 3, 5, 7]-1-AUG1#[1-4][1-4]-AU4	S16/PC[4-19]/GRP[1-4]/1/[1-16]
	VC3 Logical Port on STM16 (MSP)	PSC-[4-19]-STM16-[1, 3, 5, 7]-1-AUG1#[1-4][1-4]-AU4-TUG3#[1-3]-TU3	S16/PC[4-19]/GRP[1-4]/1/[1-16]/[1-3]
	VC12 Logical Port on STM16 (MSP)	PSC-[4-19]-STM16-[1, 3, 5, 7]-1-AUG1#[1-4][1-4]-AU4-TUG3#[1-3]-TUG2#[1-7]-TU12#[1-3]	S16/PC[4-19]/GRP[1-4]/1/[1-16]-[1-63]
	AU3 Logical Port on STM16 (MSP)	PSC-[4-19]-STM16-[1, 3, 5, 7]-1-AUG1#[1-4][1-4]-AU3#[1-3]	S16/PC[4-19]/GRP[1-4]/1/[1-48]

Table 5-16 WaveStar DACS port addresses for AU3 and VC4 logical ports

Logical Port	Port Card Type	Entity Identifier	Network Level Address
AU3	STM0	S0/PB[4-19]/[1-8,11-18]/[[1-12]/1	PSB-[4-19]-STM0-[1-8,11-18]-[1-12]-AUG1#1-AU3#1
AU3	STM1	S1/PA[4-19]/[1-8,11-18]/[[1-4]/[1-3]	PSA-[4-19]-STM1-[1-8,11-18]-[1-4]-AUG1#1-AU3#[1-3]
AU3	STM0 (MSP)	S0/PB[4-19]/GRP[1-8]/[1-12]/1	PSB-[4-19]-STM0-MSP[1,3,5,7,11,13,15,17]-[1-12]-AUG1#1-AU3#1
AU3	STM1 (MSP)	S1/PA[4-19]/GRP[1-8]/[1-4]/[1-3]	PSA-[4-19]-STM1-MSP[1,3,5,7,11,13,15,17]-[1-4]-AUG1#1-AU3#[1-3]
VC4	STM1	S1/PA[4-19]/[1-8,11-18]/[[1-4]/1	PSA-[4-19]-STM1-[1-8,11-18]-[1-4]-AUG1#1-AU4
VC4	STM1 (MSP)	S1/PA[4-19]/GRP[1-8]/[1-4]/1	PSA-[4-19]-STM1-MSP[1,3,5,7,11,13,15,17]-[1-4]-AUG1#1-AU4

Table 5-17 WaveStar DACS Network Level Port Address for VC3 and VC12

Logical Port	Port Card Type	External Address	Internal Address
VC3	STM1	S1/PA[4-19]/[1-8,11-18]/[[1-4]/1-[1-3]	PSA-[4-19]-STM1-[1-8,11-18]-[1-4]-AUG1#1-AU4-TUG3#[1-3]-TU3
VC3	STM1 (MSP)	S1/PA[4-19]/GRP[1-8]/[1-4]/1-[1-3]	PSA-[4-19]-STM1-MSP[1,3,5,7,11,13,15,17]-[1-4]-AUG1#1-AU4-TUG3#[1-3]-TU3
VC12	STM1	S1/PA[4-19]/[1-8,11-18]/[[1-4]/1-[1-63]	PSA-[4-19]-STM1-[1-8,11-18]-[1-4]-AUG1#1-AU4-TUG3#[1-3]-TUG2#[1-7]-TU12#[1-3]
VC12	STM1 (MSP)	S1/PA[4-19]/GRP[1-8]/[1-4]/1-[1-63]	PSA-[4-19]-STM1-MSP[1,3,5,7,11,13,15,17]-[1-4]-AUG1#1-AU4-TUG3#[1-3]-TUG2#[1-7]-TU12#[1-3]



Non-port identifiers

Overview This section discusses the non-port identifiers for WaveStar DACS network elements.

Entity identifier and network-level address syntax The following tables provides the non-port identifiers for WaveStar DACS network elements.

Table 5-18 Non-port identifiers for PSA subrack in WaveStar DACS network elements

Description	Entity Identifier
STM-1 Port Unit	PSA[4-19]-STM1[1-9, 11-19]
Digital Timing Unit	PSA[4-19]-DTU[1-2]
Subrack Controller	PSA[4-19]-SRC1
Interface Unit	PSA[4-19]-IU[1-8, 11-18]
Bit Sliced Interface Unit	PSA[4-19]-BSIU[1-10]
Power Terminal Module	PSA[4-19]-SRC1-PWR[1, 2]

Table 5-19 Non-port identifiers for MC subrack in WaveStar DACS network elements

Description	Entity Identifier
Main Process Unit	MC[1-2]-MPU[1-2]
Mass Storage Unit	MC[1-2]-MSU[1-2]
Memory and Interface Unit	MC[1-2]-MIU[1-2]
LAN Hub Unit	MC[1-2]-LHU[1-2]
Alarm Relay Unit	MC[1-2]-ARU1
Power Supply Filter	MC[1-2]-PSP1
Fan	MC[1-2]-FAN1

Table 5-20 Non-port identifiers for MS subrack in WaveStar DACS network elements

Description	Entity Identifier
Bit Switch Controller	MS3-BSC[1-2]
System Timing Unit	MS3-STU[1-2]
Subrack Controller	MS3-SRC[1-2]
Power Terminal Module	MS3-SRC[1-2]-PWR[1-2]
Optical Link Unit	MS3-OLU[1-4]

**Table 5-20 Non-port identifiers for MS subrack in WaveStar DACS network elements
(continued)**

Bit Sliced Switching Unit	MS3-BSSU[1-10]
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Section V: ISM Port Addresses

Overview

Purpose This section discusses the external and internal port addresses for both the physical logical and virtual ports of the ISM (Release 2.3 or later). This section also describes the correlation between external and internal port addresses.

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Port identifiers for ISM-1 network elements

Overview This section provides the port identifiers for ISM-1 network elements.

Table The following table contains the port identifiers for the ISM-1 network elements.

Table 5-21 Port identifiers for ISM-1 network elements

Description	Network Element	Entity Identifier	Network Level Address
STM-1 Physical Port (Line)	ISM-1 TERM	LP[1-2]	S1/1/[12-13]/1
	ISM-1 ADM	LP[1-2]	S1/1/[12-13]/1
	ISM5ETERM	LP[1-2]	S1/1/[7-8]/1
STM-1 MSP Physical Port (Line)	ISM-1 TERM	LP1	S1/1/GRP1/1
	ISM5ETERM	LP1	S1/1/GRP1/1
E4 (140 Mb/s) Physical Port (Trib)	ISM-1 TERM	TP[7-8].1	P4/1/[7-8]/1
	ISM-1 ADM	TP[7-8].1	P4/1/[7-8]/1
E3 (34 Mb/s) Physical Port (Trib)	ISM-1 TERM	TP[1-8].[1-3]	P3/1/[1-8]/[1-3]
	ISM-1 ADM	TP[1-8].[1-3]	P3/1/[1-8]/[1-3]
E1 (2 Mb/s) Physical Port (Trib)	ISM-1 TERM	TP[1-8].[1-16]	P3/1/[1-8]/[1-16]
	ISM-1 ADM	TP[1-8].[1-16]	P3/1/[1-8]/[1-16]
PCTDL Physical Port (MSP) (Trib)	ISM5ETERM	TP1.[1-3]	PCT/1/1/GRP[1-3]
VC-4 Logical Port on STM-1 (Line)	ISM-1 TERM	LP1.1	S1/1/12/1/1
	ISM-1 ADM	LP[1-2].1	S1/1/[12-13]/1/1
	ISM5ETERM	LP1.1	S1/1/7/1/1
VC-4 Logical Port on STM-1 MSP (Line)	ISM-1 TERM	LP1.1	S1/1/GRP1/1/1
	ISM5ETERM	LP1.1	S1/1/GRP1/1/1
VC-4 Logical Port on E4 (140 Mb/s) port (Trib)	ISM-1 TERM	TP[7-8].1	P4/1/[7-8]/1
	ISM-1 ADM	TP[7-8].1	P4/1/[7-8]/1
VC-3 Logical Port on STM-1 (Line)	ISM-1 TERM	LP1.1.[1-3].0.0	S1/1/12/1/1-[1-3]
	ISM-1 ADM	LP[1-2].1.[1-3].0.0	S1/1/[12-13]/1/1-[1-3]
VC-3 Logical Port on STM-1 MSP (Line)	ISM-1 TERM	LP1.1.[1-3].0.0	S1/1/GRP1/1/1-[1-3]

Port identifiers for ISM-1 network elements

Table 5-21 Port identifiers for ISM-1 network elements (continued)

VC-3 Logical Port on E3 (34 Mb/s) port (Trib)	ISM-1 TERM	TP[1-8].[1-3]	P3/1/[1-8]/[1-3]
	ISM-1 ADM	TP[1-8].[1-3]	P3/1/[1-8]/[1-3]
VC-12 Logical Port on STM-1 (Line)	ISM-1 TERM	LP1.[1-3].[1-7].[1-3]	S1/1/12/1/1-[1-63]
	ISM-1 ADM	LP[1-2].1.[1-3].[1-7].[1-3]	S1/1/[12-13]/1/1-[1-63]
	ISM5ETERM	LP1.1.[1-3].[1-7].[1-3]	S1/1/7/1/1-[1-63]
VC-12 Logical Port on STM-1 MSP (Line)	ISM-1 TERM	LP1.[1-3].[1-7].[1-3]	S1/1/GRP1/1/1-[1-63]
	ISM5ETERM	LP1.1.[1-3].[1-7].[1-3]	S1/1/GRP1/1/1-[1-63]
VC-12 Logical Port on E1 (2 Mb/s) port (Trib)	ISM-1 TERM	TP[1-8].[1-16]	P1/1/[1-8]/[1-16]
	ISM-1 ADM	TP[1-8].[1-16]	P1/1/[1-8]/[1-16]
	ISM5ETERM	TP1.[1-3].[1-21]	PCT/1/1/GRP[1-3]/[1-21]
E1 (2 Mb/s) Logical Port on PCT Physical Port	ISM5ETERM	TP1.[1-3].[1-21]	PCT/1/1/GRP[1-3]/[1-21]

□

Non-port identifiers for ISM-1 network elements

Overview This section provides the non-port identifiers for ISM-1 network elements.

Table The following table contains the non-port identifiers for the ISM-1 network elements.

Table 5-22 Non-port identifiers for ISM-1 network elements

Description	Entity Identifier
Pointer Processing and Cross-connect Unit	PPC[1-2]
Timing Generator Unit	TGU[1-2]
Data Packet Switch	DPS
System Controller	CTL
Power Supply Filter	PSF[1-2]
User Panel	UPL
Line Port Card	LPU[1-2]
Tributary Port Card	TP[1-9]



Port identifiers for ISM-4 network elements

Overview This section provides the port identifiers for ISM-4 network elements.

Table The following table contains the port identifiers for the ISM-4 network elements.

Table 5-23 Port identifiers for ISM-4 network elements

Description	Network Element	Entity Identifier	Network Level Address
STM-4 Physical Port (Line)	ISM-4 TERM	LP[1-2]	S4/1/[12-13]/1
	ISM-4 ADM	LP[1-2]	S4/1/[12-13]/1
	ISM-4 REGEN	LP[1-2]	S4/1/[12-13]/1
STM-4 MSP Physical Port (Line)	ISM-4 TERM	LP1	S4/1/GRP1/1
STM-4 Physical Port (Trib)	ISM-4 TERM	TP[1-8]	S1/1/[1-8]/1
	ISM-4 ADM	TP[1-8]	S1/1/[1-8]/1
E4 (140 Mb/s) Physical Port (Trib)	ISM-4 TERM	TP[7-8].1	P4/1/[7-8]/1
	ISM-4 ADM	TP[7-8].1	P4/1/[7-8]/1
E3 (34 Mb/s) Physical Port (Trib)	ISM-4 TERM	TP[1-8].[1-3]	P3/1/[1-8]/[1-3]
	ISM-4 ADM	TP[1-8].[1-3]	P3/1/[1-8]/[1-3]
E1 (2 Mb/s) Physical Port (Trib)	ISM-4 TERM	TP[1-8].[1-16]	P1/1/[1-8]/[1-16]
	ISM-4 ADM	TP[1-8].[1-16]	P1/1/[1-8]/[1-16]
VC-4 Logical Port on STM-4 (Line)	ISM-4 TERM	LP1.[1-4]	S4/1/12/1/[1-4]
	ISM-4 ADM	LP[1-2].[1-4]	S4/1/[12-13]/1/[1-4]
VC-4 Virtual Port on STM-4 (Line)	ISM-4 ADM	VP[1-4][1-4]	S4/1/10-[1-4]-[1-4]/1
VC-4 Logical Port on STM-4 MSP (Line)	ISM-4 TERM	LP1.[1-4]	S4/1/GRP1/1/[1-4]
VC-4 Logical Port on STM-1	ISM-4 TERM	TP[1-8].1	S1/1/[1-8]/1/1
	ISM-4 ADM	TP[1-8].1	S1/1/[1-8]/1/1
VC-4 Logical Port on E4 (140 Mb/s) port (Trib)	ISM-4 TERM	TP[7-8].1	P4/1/[7-8]/1
	ISM-4 ADM	TP[7-8].1	P4/1/[7-8]/1

Table 5-23 Port identifiers for ISM-4 network elements (continued)

VC-3 Logical Port on STM-4 (Line)	ISM-4 TERM	LP1.[1-4].[1-3].0.0	S4/1/12/1/[1-4]-[1-3]
	ISM-4 ADM	LP[1-2].[1-4].[1-3].0.0	S4/1/[12-13]/1/[1-4]-[1-3]
VC-3 Logical Port on STM-4 MSP (Line)	ISM-4 TERM	LP1.[1-4].[1-3].0.0	S4/1/GRP1/1/[1-4]-[1-3]
VC-3 Logical Port on STM-1 (Trib)	ISM-4 TERM	TP1.[1-8].1.[1-3].0.0	S1/1/[1-8]/1/1-[1-3]
	ISM-4 ADM	TP1.[1-8].1.[1-3].0.0	S1/1/[1-8]/1/1-[1-3]
VC-3 Logical Port on E3 (34 Mb/s) port (Trib)	ISM-4 TERM	TP[1-8].[1-3]	P3/1/[1-8]/[1-3]
	ISM-4 ADM	TP[1-8].[1-3]	P3/1/[1-8]/[1-3]
VC-12 Logical Port on STM-4 (Line)	ISM-4 TERM	LP1.[1-4].[1-3].[1-7].[1-3]	S4/1/12/1/[1-4]-[1-63]
	ISM-4 ADM	LP[1-2].[1-4].[1-3].[1-7].[1-3]	S4/1/[12-13]/1/[1-4]-[1-63]
VC-12 Logical Port on VC-4 Virtual (Line)	ISM-4 ADM	VP[1-4][1-4].[1-3].[1-7].[1-3]	S4/1/10-[1-4]-[1-4]/1-[1-63]
VC-12 Logical Port on STM-4 MSP (Line)	ISM-4 TERM	LP1.[1-4].[1-3].[1-7].[1-3]	S4/1/GRP1/1/[1-4]-[1-63]
VC-12 Logical Port on STM-1 (Trib)	ISM-4 TERM	TP[1-8].1.[1-3].[1-7].[1-3]	S1/1/[1-8]/1/1-[1-63]
	ISM-4 ADM	TP[1-8].1.[1-3].[1-7].[1-3]	S1/1/[1-8]/1/1-[1-63]
VC-12 Logical Port on E1 (2 Mb/s) port (Trib)	ISM-1 TERM	TP[1-8].[1-16]	P1/1/[1-8]/[1-16]
	ISM-4 ADM	TP[1-8].[1-16]	P1/1/[1-8]/[1-16]



Non-port identifiers for ISM-4 network elements

Overview This section provides the non-port identifiers for ISM-4 network elements.

Table The following table contains the non-port identifiers for the ISM-4 network elements.

Table 5-24 Non-port identifiers for ISM-4 network elements

Description	Entity Identifier
Pointer Processing and Cross-connect Unit	PPC[1-2]
Timing Generator Unit	TGU[1-2]
Data Packet Switch	DPS
System Controller	CTL
Power Supply Filter	PSF[1-2]
User Panel	UPL
Line Port Card	LPU[1-2]
Tributary Port Card	TP[1-9]



Section VI: NERA CityLink Port Addresses

Overview

Purpose This section describes the external port addresses for the NERA CityLink network elements.

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Port identifiers

Overview This section provides the port identifiers for NERA CityLink network elements.

Table The following table contains the port identifiers for the NERA CityLink network elements.

Table 5-25 Port identifiers for NERA CityLink network elements

Description	Entity Identifier	Network Level Address
SDH side: for both electrical and optical (port type STM1)	Line	S1 / Line
Radio side (port type STM1)	Radio	S1 / Radio



Section VII: OLS80G Port Addresses

Overview

Purpose This section describes the external port addresses for the OLS80G network elements.

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Port identifiers

Overview This section provides the port identifiers for the OLS80G network elements.

Port identifiers for OLS80G This table presents the port identifiers for the OLS80G network elements.

Table 5-26 Port identifiers for OLS80G network elements

Description	Entity Identifier	Network Level Address
OCH Trail or Optical Link (with no OMSP on line port)	TP[1-4].[1-16]	OT/ TP[1-4]/[1-16]
OCH Trail or Optical Link (with OMSP on line port)	TP 1&2. [1-16]	OT/ TP 1&2/[1-16]
Optical Physical Port	TP[1-4].[1-16]	OT/ TP[1-4]/[1-16]
OMS Line Port	LP[1-4]	OL16c/ LP[1-4]
OMSP Line Port	LP[1, 2]	OL16c/ LP[1, 2]
OCH Trail logical port on OMS line	LP[1-4].[1-16]	OL16c/ LP[1-4]/[1-16]
OCH Trail logical port on OMSP line	LP[1,2].[1-16]	OL16c/ LP[1,2]/[1-16]
Repeater Port	LP[1A,2A,3A,4A,1B,2B,3B,4B]]	OL16c/ LP[1A,2A,3A,4A,1B,2B,3B,4B]



Section VIII: OLS400G Port Addresses

Overview

Purpose This section describes the external port addresses for the OLS400G network elements..

Contents

Port identifiers for WaveStar OLS400G	5-60
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Port identifiers for WaveStar OLS400G

Overview This section provides the port identifiers for the OLS400G network elements.

Port identifiers for OLS400G This section provides the port identifiers for the OLS400G network elements (Release 3.0, 3.1, 4.0, and 5.0 C-Band; Release 4.0 L-Band).

Table 5-27 Port identifiers for an OCH trail or optical link

OCH Trail or Optical Link (up to OLS400G R5.0)			
Description	Port Type	Entity Identifier	Network Level Address
No compatible Optics	OTU	[linenum]/[BAY]-[SHELF]-[SLOT]-freq (port-num)	OT / [linenum]/[BAY]-[SHELF]-[SLOT]-freq (port-num)
		[1E, 2E, 1W, 2W]/[1-12]-[1-3]-[1-12]-zzzz ([1, 2])	OT / [1E, 2E, 1W, 2W]/[1-12]-[1-3]-[1-12] /zzzz ([1, 2])
Compatible Optics	OMU	EXT_[linenum]/[BAY]-[SHELF]-[SLOT]-freq	OT/EXT_[linenum]/[BAY]-[SHELF]-[SLOT]-freq
		EXT_[1E, 2E, 1W, 2W]/[1-12]-[1-3]-[1-12]-zzzz	OT/EXT_[1E, 2E, 1W, 2W]/[1-12]-[1-3]-[1-12]/zzzz

Table 5-28 Port identifiers for an OMS line port

OMS Line Port (up to OLS400G R5.0)			
Description	Port Type	Entity Identifier	Network Level Address
All OLS400G models except WADs	OA	[linenum]/[BAY]-[SHELF]-[SLOT] (for Add)	OL[40, 80]c/[linenum]/[BAY]-[SHELF]-[SLOT] (for Add)
		/[BAY]-[SHELF]-[SLOT] (for Drop)	[BAY]-[SHELF]-[SLOT] (for Drop)
		[1E, 2E, 1W, 2W] (see lookup table for Bay-Shelf-Slot values)	OL [40, 80]c/[1E, 2E 1W, 2W]/[see lookup table for Bay-Shelf-Slot values]

Table 5-28 Port identifiers for an OMS line port (continued)

For WAD model, 2F_4CH_AD	OA	[linenum]/[BAY]-[SHELF]-[SLOT] (for Add) /[BAY]-[SHELF]-[SLOT] (for Drop)	OL[40, 80]c/[linenum]/[BAY]-[SHELF]-[SLOT] (for Add) [BAY]-[SHELF]-[SLOT] (for Drop)
		[1E, 2E, 1W, 2W] (see lookup table for Bay-Shelf-Slot values)	OL [40, 80]c/[1E, 2E 1W, 2W]/[see lookup table for Bay-Shelf-Slot values]
For WAD model, 2F_4CH_AD2	OA	[linenum]/[BAY]-[SHELF]-[SLOT] (for Add) /[BAY]-[SHELF]-[SLOT] (for Drop)	OL[40, 80]c/[linenum]/[BAY]-[SHELF]-[SLOT] (for Add) [BAY]-[SHELF]-[SLOT] (for Drop)
		[1E, 2E, 1W, 2W] (see lookup table for Bay-Shelf-Slot values)	OL [40, 80]c/[1E, 2E 1W, 2W]/[see lookup table for Bay-Shelf-Slot values]
For WAD model, 4F_4CH_AD	OA	[linenum]/[BAY]-[SHELF]-[SLOT] (for Add) /[BAY]-[SHELF]-[SLOT] (for Drop)	OL[40, 80]c/[linenum]/[BAY]-[SHELF]-[SLOT] (for Add) [BAY]-[SHELF]-[SLOT] (for Drop)
		[1E, 2E, 1W, 2W] (see lookup table for Bay-Shelf-Slot values)	OL [40, 80]c/[1E, 2E 1W, 2W]/[see lookup table for Bay-Shelf-Slot values]
Repeater port	OA	[linenum]/[BAY]-[SHELF]-[SLOT] (for Add) /[BAY]-[SHELF]-[SLOT] (for Drop)	OL[40, 80]c/[linenum]/[BAY]-[SHELF]-[SLOT] (for Add) [BAY]-[SHELF]-[SLOT] (for Drop)
		[1E, 2E, 1W, 2W] / [1-12] - [1-3] - [1-12] / [1-12] - [1-3] - [1-12]	OL [40, 80]c/[1E, 2E 1W, 2W]/[1-12] - [1-3] - [1-12] / [1-12] - [1-3] - [1-12]

Table 5-29 Port identifiers for an OCH trail logical port on OMS line

OCH Trail Logical Port on OMS Line (up to OLS400G R5.0)			
Description	Port Type	Entity Identifier	Network Level Address

Table 5-29 Port identifiers for an OCH trail logical port on OMS line (continued)

All OLS400G models except WADs	OA	[linenum]/[BAY]-[SHELF]-[SLOT] (for Add) /[BAY]-[SHELF]-[SLOT] (for Drop) - zzzz	OL[40, 80]c/[linenum]/[BAY]-[SHELF]-[SLOT] (for Add) [BAY]-[SHELF]-[SLOT] (for Drop) zzzz
		[1E, 2E, 1W, 2W] (see lookup table for Bay-Shelf-Slot values) - zzzz	OL [40, 80]c/[1E, 2E 1W, 2W]/[see lookup table for Bay-Shelf-Slot values] zzzz
For WAD model, 2F_4CH_AD	OA	[linenum]/[BAY]-[SHELF]-[SLOT] (for Add) /[BAY]-[SHELF]-[SLOT] (for Drop) zzzz	OL[40, 80]c/[linenum]/[BAY]-[SHELF]-[SLOT] (for Add) [BAY]-[SHELF]-[SLOT] (for Drop) zzzz
		[1E, 2E, 1W, 2W] (see lookup table for Bay-Shelf-Slot values) zzzz	OL [40, 80]c/[1E, 2E 1W, 2W]/[see lookup table for Bay-Shelf-Slot values] zzzz
For WAD model, 2F_4CH_AD2	OA	[linenum]/[BAY]-[SHELF]-[SLOT] (for Add) /[BAY]-[SHELF]-[SLOT] (for Drop) zzzz	OL[40, 80]c/[linenum]/[BAY]-[SHELF]-[SLOT] (for Add) [BAY]-[SHELF]-[SLOT] (for Drop) zzzz
		[1E, 2E, 1W, 2W] (see lookup table for Bay-Shelf-Slot values) zzzz	OL [40, 80]c/[1E, 2E 1W, 2W]/[see lookup table for Bay-Shelf-Slot values] zzzz
For WAD model, 4F_4CH_AD	OA	[linenum]/[BAY]-[SHELF]-[SLOT] (for Add) /[BAY]-[SHELF]-[SLOT] (for Drop) zzzz	OL[40, 80]c/[linenum]/[BAY]-[SHELF]-[SLOT] (for Add) [BAY]-[SHELF]-[SLOT] (for Drop) zzzz
		[1E, 2E, 1W, 2W] (see lookup table for Bay-Shelf-Slot values) zzzz	OL [40, 80]c/[1E, 2E 1W, 2W]/[see lookup table for Bay-Shelf-Slot values] zzzz



Port identifiers for WaveStar OLS 1.6T

Overview This section provides the port identifiers for the OLS 1.6T network elements.

Port identifiers for OLS 1.6T (R6.1/R6.0) The following table provides the port identifiers for the OLS 1.6T network elements.

Table 5-30 Port identifiers for OLS 1.6T

OMS Line Port (OLS 1.6T R6.1/R6.0 all node-types)			
Description	Port Type	Entity Identifier	Network Level Address
(All OLS 1.6T models including WADs)	OA	PORT-[BAY]-[SHELF]-[OAaddSLOT]-OUT/ PORT-[BAY]-[SHELF]-[OAdropSLOT]-OUT	OL [80,16]c/PORT-[BAY]-[SHELF]-[OAaddSLOT]-OUT/[PORT]-[BAY]-[SHELF]-[OAdropSLOT]-OUT
		PORT-[1-2]-[1-3]-[1-12]-OUT/PORT-[1-2]-[1-3]-[1-12]-OUT	OL [80,16]c/PORT-[1-2]-[1-3]-[1-12]-OUT/[PORT]-[1-2]-[1-3]-[1-12]-OUT
OTS Repeater Port	OA	PORT-[BAY]-[SHELF]-[OAaddSLOT]-OUT/ PORT-[BAY]-[SHELF]-[OAdropSLOT]-OUT	OL [80,16]c/PORT-[BAY]-[SHELF]-[OAaddSLOT]-OUT/[PORT]-[BAY]-[SHELF]-[OAdropSLOT]-OUT
		PORT-[1]-[1]-[1,4]-OUT/PORT-[1]-[1]-[1,4]-OUT	OL [80,16]c/PORT-[1]-[1]-[1,4]-OUT/[PORT]-[1]-[1]-[1,4]-OUT
OCH Trail Logical Port on OMS Line (OLS 1.6T R6.1/R6.0 all node types)			
(All OLS 1.6T models including WADs)	OA	PORT-[BAY]-[SHELF]-[OAaddSLOT]-OUT/ PORT-[BAY]-[SHELF]-[OAdropSLOT]-OUT-zzzz	OL [80,16]c/PORT-[BAY]-[SHELF]-[OAaddSLOT]-OUT/PORT-[BAY]-[SHELF]-[OAdropSLOT]-OUT-zzzz
		PORT-[1-2]-[1-3]-[1-12]-OUT/PORT-[1-2]-[1-3]-[1-12]-OUT-zzzz	OL [80,16]c/PORT-[1-2]-[1-3]-[1-12]-OUT/ PORT-[1-2]-[1-3]-[1-12]-OUT-zzzz
Optical Link and OCH Trail (OLS 1.6T R6.1 all node types)			

Table 5-30 Port identifiers for OLS 1.6T (continued)

No compatible optics (i.e., OTU) required	OTU (PTP)	[PORT]-[BAY]-[SHELF]-[SLOT]-[PORT] [PORT]-[1-12]-[1-3]-[1-12]-[IN1, IN2]	OT/PORT-[BAY]-[SHELF]-[SLOT]-[PORT] OT/PORT-[1-12]-[1-3]-[1-12]-[IN1, IN2]
	OTU (CTP)	PORT-[1-12]-[1-3]-[1-12]-[IN1, IN2]-zzzz PORT-[1-12]-[1-3]-[1-12]-[IN1, IN2]-zzzz	OT/PORT-[1-12]-[1-3]-[1-12]-[IN1, IN2]-zzzz OT/PORT-[1-12]-[1-3]-[1-12]-[IN1, IN2]-zzzz
	10G MUX-OTU 2.5G (PTP)	[PORT]-[BAY]-[SHELF]-[SLOT]-[PORT] [PORT]-[1-12]-[1-3]-[1-12]-[IN1, IN2, IN3, IN4]	OT/PORT-[BAY]-[SHELF]-[SLOT]-[PORT] OT/PORT-[1-12]-[1-3]-[1-12]-[IN1, IN2, IN3, IN4]
	10G MUX-OTU 2.5G (CTP)	[PORT]-[BAY]-[SHELF]-[SLOT]-[PORT]-1 [PORT]-[1-12]-[1-3]-[1-12]-[IN1, IN2, IN3, IN4]-1	OT/PORT-[BAY]-[SHELF]-[SLOT]-[PORT]-1 OT/PORT-[1-12]-[1-3]-[1-12]-[IN1, IN2, IN3, IN4]-1
	10G MUX-OTU (GTP)	[PORT]-[BAY]-[SHELF]-[SLOT]-[PORT]-zzzz [PORT]-[1-12]-[1-3]-[1-12]-IN-zzzz	OT/PORT-[BAY]-[SHELF]-[SLOT]-[PORT]-zzzz OT/PORT-[1-12]-[1-3]-[1-12]-IN-zzzz
	ORS End/Ring Terminal (PTP)	PORT-[BAY]-[SHELF]-[SLOT]-[PORT] PORT-[1-12]-[1-3]-[1-12]-[C1IN, C2IN, 1AIN, 2AIN, 1BIN, 2BIN]	OT/PORT-[BAY]-[SHELF]-[SLOT]-[PORT] OT/PORT-[1-12]-[1-3]-[1-12]-[C1IN, C2IN, 1AIN, 2AIN, 1BIN, 2BIN]
	ORS End/Ring Terminal (CTP)	PORT-[BAY]-[SHELF]-[SLOT]-[PORT]-1 PORT-[1-12]-[1-3]-[1-12]-[C1IN, C2IN, 1AIN, 2AIN, 1BIN, 2BIN]-1	OT/PORT-[BAY]-[SHELF]-[SLOT]-[PORT]-1 OT/PORT-[1-12]-[1-3]-[1-12]-[C1IN, C2IN, 1AIN, 2AIN, 1BIN, 2BIN]-1
	Compatible optics (i.e., virtual OTU)	OMU (PTP/CTP) EXT_PORT-[BAY]-[SHELF]-[omuSLOT]-zzzz EXT_PORT-[1-12]-[1-3]-[1-12]-zzzz	OT/EXT_PORT-[BAY]-[SHELF]-[omuSLOT]-zzzz OT/EXT_PORT-[1-12]-[1-3]-[1-12]-zzzz



Section IX: PHASE Port Addresses

Overview

Purpose This section describes the external and internal port addresses for both the physical and logical ports of the PHASE network elements. This section also discusses the correlation between the external and internal port addresses.

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Non-port identifiers	5-74



Port identifiers

Overview This section lists the port addresses for the supported PHASE network elements.

Port addresses The following lists the port addresses for the supported PHASE network elements.

Table 5-31 PHASE network element port addresses

Description	Network Element	Entity Identifier	Network Level Addresses
STM-16 Physical Port (Line)	TM16/4	LP[301,302,318]	S16/1/[1,2,18]/1
	(CS-17 or CS-19)	LP[302-305]	S16/1/[2-5]/1
	ADM16/4	LP[301,302,318]	S16/1/[1,2,18]/1
	LR 16		
STM-16 Physical Port (Trib)	TM16/4	TP[303-317]	S16/1/[3-17]/1
	(CS-17 or CS-19)	TP[306-318]	S16/1/[6-18]/1
	ADM16/4	GP[301-306]	S16/1/1-[1-6]/1
	LXC16/1	GP[314-318]	S16/1/2-[14-18]/1
	LR 16	GP[401-406]	S16/1/3-[1-6]/1
		GP[414-418]	S16/1/4-[14-18]/1
STM-4 Physical Port (Line)	TM4/4	LP[301-302,318-319]	S4/1/[1-2,18-19]/1
	(CS-17 or CS-19)	LP[302-305]	S4/1/[2-5]/1
	ADM4/4	LP[301-302,318-319]	S4/1/[1-2,18-19]/1
	LR 4		

Table 5-31 PHASE network element port addresses (continued)

Description	Network Element	Entity Identifier	Network Level Addresses
STM-4 Physical Port (Trib)	TM4/4	TP[303-317]	S4/1/[3-17]/1
	(CS-17 & CS-19)	TP[303-317]	S4/1/[3-17]/1
	TM16/4	TP[306-319]	S4/1/[6-19]/1
	ADM4/4	TP[306-319]	S4/1/[6-19]/1
	ADM16/4	TP[303-317]	S4/1/[3-17]/1
	LXC4/1	GP[301-306]	S4/1/1-[1-6]/1
	LXC16/1	GP[314-319]	S4/1/2-[14-19]/1
	LR 4	GP[401-406]	S4/1/3-[1-6]/1
		GP[414-419]	S4/1/4-[14-19]/1
STM-1 Physical Port on TIU-4 or SIU-1 card (Trib)	TM4/4	TP[303-317].[1-4]	S1/1/[3-17]/[1-4]
	(CS-17 & CS-19)	TP[303-317].[1-4]	S1/1/[3-17]/[1-4]
	TM16/4	TP[306-319].[1-4]	S1/1/[6-19]/[1-4]
	ADM4/4	TP[306-319].[1-4]	S1/1/[6-19]/[1-4]
	ADM16/4	TP[303-317].[1-4]	S1/1/[3-17]/[1-4]
	LXC4/1	GP[301-306].[1-4]	S1/1/1-[1-6]/[1-4]
	LXC16/1	GP[314-319].[1-4]	S1/1/2-[14-19]/[1-4]
		GP[401-406].1	S1/1/3-[1-6]/1
		GP[414-419].1	S1/1/4-[14-19]/1
CEPT-4 Physical Port (Trib)	TM4/4	TP[303-317].[1-4]	P4/1/[3-17]/[1-4]
	(CS-17 & CS-19)	TP[303-317].[1-4]	P4/1/[3-17]/[1-4]
	TM16/4	TP[306-319].[1-4]	P4/1/[6-19]/[1-4]
	ADM4/4	TP[306-319].[1-4]	P4/1/[6-19]/[1-4]
	ADM16/4	TP[303-317].[1-4]	P4/1/[3-17]/[1-4]
	LXC4/1	GP[301-304].[1-4]	P4/1/1-[1-4]/[1-4]
	LXC16/1	GP[314, 316-319].[1-4]	P4/1/2-[14, 16-19]/[1-4]

Table 5-31 PHASE network element port addresses (continued)

Description	Network Element	Entity Identifier	Network Level Addresses
CEPT-3 Physical Port (Trib)	TM4/4	TP[303-317].[1-2].[1-3]	P3/1/[3-17]/[1-2]-[1-3]
	(CS-17 & CS-19)	TP[303-317].[1-2].[1-3]	P3/1/[3-17]/[1-2]-[1-3]
	TM16/4	TP[306-319].[1-2].[1-3]	P3/1/[6-19]/[1-2]-[1-3]
	ADM4/4	TP[306-319].[1-2].[1-3]	P3/1/[6-19]/[1-2]-[1-3]
	ADM16/4	TP[303-317].[1-6]	P3/1/[3-17]/[1-6]
	LXC4/1	GP[301-304].[1-6]	P3/1/1-[1-4]/[1-6]
	LXC16/1	GP[314, 316-319].[1-6]	P3/1/2-[14, 16-19]/[1-6]
45 Mb/s Physical Port (Trib)	TM4/4	TP[303-317].[1-2].[1-3]	D3/1/[3-17]/[1-2]-[1-3]
	(CS-17 & CS-19)	TP[303-317].[1-2].[1-3]	D3/1/[3-17]/[1-2]-[1-3]
	TM16/4	TP[306-319].[1-2].[1-3]	D3/1/[6-19]/[1-2]-[1-3]
	ADM4/4	TP[306-319].[1-2].[1-6]	D3/1/[6-19]/[1-2]-[1-3]
	ADM16/4	TP[303-317].[1-6]	D3/1/[3-17]/[1-6]
	LXC4/1	GP[301-304].[1-6]	D3/1/1-[1-4]/[1-6]
	LXC16/1	GP[314, 316-319].[1-6]	D3/1/2-[14, 16-19]/[1-6]
CEPT-1 Physical/Logical Port (Trib)	TM4/4	TP[303-317].1.[1-21]	P1/1/[3-17]/1-[1-21]
	(CS-17 & CS-19)	TP[303-317].1.[1-21]	P1/1/[3-17]/1-[1-21]
	TM16/4	TP[306-319].1.[1-21]	P1/1/[6-19]/1-[1-21]
	ADM4/4	TP[306-319].1.[1-21]	P1/1/[6-19]/1-[1-21]
	ADM16/4	TP[303-317].[1-21]	P1/1/[3-17]/[1-21]
	LXC4/1	GP[301-304].[1-21]	P1/1/1-[1-4]/[1-21]
	LXC16/1	GP[314, 316-319].[1-21]	P1/1/2-[14, 16-19]/[1-21]
VC-4 Logical Port on STM-16 (Line)	TM16/4	LP[301-302,318].[1-16]	S16/1/[1-2,18]/1/[1-16]
	(CS-17 or CS-19)	LP[302-305].[1-16]	S16/1/[2-5]/1/[1-16]
	ADM16/4		
VC-4 Logical Port on STM-16 (Trib)	TM16/4	TP[303-317].[1-16]	S16/1/[3-17]/1/[1-16]
	(CS-17 & CS-19)	TP[306-318].[1-16]	S16/1/[6-18]/1/[1-16]
	ADM16/4	GP[301-306].[1-16]	S16/1/1-[1-6]/1/[1-16]
	LXC16/1	GP[314-318].[1-16]	S16/1/2-[14-18]/1/[1-16]
		GP[401-406].[1-16]	S16/1/3-[1-6]/1/[1-16]
		GP[414-418].[1-16]	S16/1/4-[14-18]/1/[1-16]

Table 5-31 PHASE network element port addresses (continued)

Description	Network Element	Entity Identifier	Network Level Addresses
VC-4 Logical Port on STM-4 (Line)	TM4/4 (CS-17 or CS-19) ADM4/4	LP[301-302,318-319].[1-4] LP[302-305].[1-4]	S4/1/[1-2,18-19]/1/[1-4] S4/1/[2-5]/1/[1-4]
VC-4 Logical Port on STM-4 (Trib)	TM4/4 (CS-17 & CS-19) TM16/4 ADM4/4 ADM16/4 LXC4/1 LXC16/1	TP[303-317].[1-4] TP[303-317].[1-4] TP[306-319].[1-4] TP[306-319].[1-4] TP[303-317].[1-4] GP[301-306].[1-4] GP[314-319].[1-4] GP[401-406].[1-4] GP[414-419].[1-4]	S4/1/[3-17]/1/[1-4] S4/1/[3-17]/1/[1-4] S4/1/[6-19]/1/[1-4] S4/1/[6-19]/1/[1-4] S4/1/[3-17]/1/[1-4] S4/1/1-[1-6]/1/[1-4] S4/1/2-[14-19]/1/[1-4] S4/1/3-[1-6]/1/[1-4] S4/1/4-[14-19]/1/[1-4]
VC-4 Logical Port on 140 Mb/s port on TIU-4 card (Trib)	TM4/4 (CS-17 & CS-19) TM16/4 ADM4/4 ADM16/4 LXC4/1 LXC16/1	TP[303-317].[1-4] TP[303-317].[1-4] TP[306-319].[1-4] TP[306-319].[1-4] TP[303-317].[1-4] GP[301-304].[1-4] GP[314, 316-319].[1-4]	P4/1/[3-17]/[1-4] P4/1/[3-17]/[1-4] P4/1/[6-19]/[1-4] P4/1/[6-19]/[1-4] P4/1/[3-17]/[1-4] P4/1/1-[1-4]/[1-4] P4/1/2-[14, 16-19]/[1-4]
VC-4 Logical Port on STM-1 (Trib)	TM4/4 (CS-17 & CS-19) TM16/4 ADM4/4 ADM16/4 LXC4/1 LXC16/1	TP[303-317].[1-4].1 TP[303-317].[1-4].1 TP[306-319].[1-4].1 TP[306-319].[1-4].1 TP[303-317].[1-4].1 GP[301-306].[1-4].1 GP[314-319].[1-4].1 GP[401-406].1.1 GP[414-419].1.1	S1/1/[3-17]/[1-4]/1 S1/1/[3-17]/[1-4]/1 S1/1/[6-19]/[1-4]/1 S1/1/[6-19]/[1-4]/1 S1/1/[3-17]/[1-4]/1 S1/1/1-[1-6]/[1-4]/1 S1/1/2-[14-19]/[1-4]/1 S1/1/3-[1-6]/1/1 S1/1/4-[14-19]/1/1

Table 5-31 PHASE network element port addresses (continued)

Description	Network Element	Entity Identifier	Network Level Addresses
VC-4 Logical Port on TIU-1 card (Trib)	TM4/4 (CS-17 & CS-19)	TP[303-317].1	P1/1/[3-17]/1
		TP[303-317].1	P1/1/[3-17]/1
	TM16/4	TP[306-319].1	P1/1/[6-19]/1
	ADM4/4	TP[306-319].1	P1/1/[6-19]/1
	ADM16/4		
VC-4 Logical Port on TIU-3 card (Trib)	TM4/4	TP[303-317].[1-2]	[P,D]3/1/[3-17]/[1-2]
	(CS-17 & CS-19)	TP[303-317].[1-2]	[P,D]3/1/[3-17]/[1-2]
	TM16/4	TP[306-319].[1-2]	[P,D]3/1/[6-19]/[1-2]
	ADM4/4	TP[306-319].[1-2]	[P,D]3/1/[6-19]/[1-2]
	ADM16/4		
VC-3 Logical Port on STM-16 (Trib)	LXC16/1	GP[301-306].[1-16].[1-3].0.0	S16/1/1-[1-6]/1/[1-16]-[1-3]
		GP[314-318].[1-16].[1-3].0.0	S16/1/2-[14-18]/1/[1-16]-[1-3]
		GP[401-406].[1-16].[1-3].0.0	S16/1/3-[1-6]/1/[1-16]-[1-3]
		GP[414-418][1-16].[1-3].0.0	S16/1/4-[14-18]/1/[1-16]-[1-3]
VC-3 Logical Port on STM-4 (Trib)	LXC4/1 LXC16/1	TP[303-317].[1-4].[1-3].0.0	S4/1/[3-17]/1/[1-4]-[1-3]
		GP[301-306].[1-4].[1-3].0.0	S4/1/1-[1-6]/1/[1-4]-[1-3]
		GP[314-319].[1-4].[1-3].0.0	S4/1/2-[14-19]/1/[1-4]-[1-3]
		GP[401-406].[1-4].[1-3].0.0	S4/1/3-[1-6]/1/[1-4]-[1-3]
		GP[414-419].[1-4].[1-3].0.0	S4/1/4-[14-19]/1/[1-4]-[1-3]

Table 5-31 PHASE network element port addresses (continued)

Description	Network Element	Entity Identifier	Network Level Addresses
VC-3 Logical Port on STM-1 (Trib)	LXC4/1 LXC16/1	TP[303-317].[1-4].1.[1-3].0.0 GP[301-306].[1-4].1.[1-3].0.0 GP[314-319].[1-4].1.[1-3].0.0 GP[401-406].[1-4].1.1.[1-3].0.0 GP[414-419].[1-4].1.1.[1-3].0.0	S1/1/[3-17]/[1-4]/1- [1-3] S1/1/1-[1-6]/[1-4]/1- [1-3] S1/1/2-[14-19]/[1-4/1-[1-3] S1/1/3-[1-6]/1/1-[1-3] S1/1/4-[14-19]/1-[1-3]
VC-3 Logical/Physical Port on TIU-3 (Trib)	TM4/4 (CS-17 & CS-19) TM16/4 ADM4/4 ADM16/4 LXC4/1 LXC16/1	TP[303-317].[1-2].[1-3] TP[303-317].[1-2].[1-3] TP[306-319].[1-2].[1-3] TP[306-319].[1-2].[1-3] TP[303-317].[1-6] GP[301-304].[1-6] GP[314, 316-319].[1-6]	[P,D]3/1/[3-17]/[1-2]-[1-3] [P,D]3/1/[3-17]/[1-2]-[1-3] [P,D]3/1/[6-19]/[1-2]-[1-3] [P,D]3/1/[6-19]/[1-2]-[1-3] [P,D]3/1/[3-17]/[1-6] [P,D]3/1/1-[1-4]/[1-6] [P,D]3/1/2-[14, 16-19]/[1-6]
TU2 Logical port on STM-16 (Trib)	LXC16/1	GP[301-306].[1-16].[1-3].[1-7].0 GP[314-318].[1-16].[1-3].[1-7].0 GP[401-406].[1-16].[1-3].[1-7].0 GP[414-418].[1-16].[1-3].[1-7].0	S16/1/1-[1-6]/1/[1-16]- [1-21] S16/1/2-[14-18]/1/[1-16]-[1-21] S16/1/3-[1-6]/1/[1-16]-[1-21] S16/1/4-[14-18]/1/[1-16]-[1-21]
TU2 Logical port on STM-4 (Trib)	LXC4/1 LXC16/1	TP[303-317].[1-4].[1-3].[1-7].0 GP[301-306].[1-4].[1-3].[1-7].0 GP[314-319].[1-4].[1-3].[1-7].0 GP[401-406].[1-4].[1-3].[1-7].0 GP[414-419].[1-4].[1-3].[1-7].0	S4/1/[3-17]/1/[1-4]- [1-21] S4/1/1-[1-6]/1/[1-4]- [1-21] S4/1/2-[14-19]/1/[1-4]-[1-21] S4/1/3-[1-6]/1/[1-4]-[1-21] S4/1/4-[14-19]/1/[1-4]-[1-21]

Table 5-31 PHASE network element port addresses (continued)

Description	Network Element	Entity Identifier	Network Level Addresses
TU2 Logical port on STM-1 (Trib)	LXC4/1 LXC16/1	TP[303-317].[1-4].1.[1-3].[1-7].0 GP[301-306].[1-4].1.[1-3].[1-7].0 GP[314-319].[1-4].1.[1-3].[1-7].0 GP[401-406].1.1.[1-3].[1-7].0 GP[414-419].1.1.[1-3].[1-7].0	S1/1/[3-17]/[1-4]/1-[1-21] S1/1/1-[1-6]/[1-4]/1-[1-21] S1/1/2-[14-19]/[1-4]/1-[1-21] S1/1/3-[1-6]/1/1-[1-21] S1/1/4-[14-19]/1/1-[1-21]
VC-12 Logical port on STM-16 (Trib)	LXC16/1	GP[301-306].[1-16].[1-3].[1-7].[1-3] GP[314-318].[1-16].[1-3].[1-7].[1-3] GP[401-406].[1-16].[1-3].[1-7].[1-3] GP[414-418].[1-16].[1-3].[1-7].[1-3]	S16/1/1-[1-6]/1/[1-16]-[1-63] S16/1/2-[14-18]/1/[1-16]-[1-63] S16/1/3-[1-6]/1/[1-16]-[1-63] S16/1/4-[14-18]/1/[1-16]-[1-63]
VC-12 Logical port on STM-4 (Trib)	LXC4/1 LXC16/1	TP[303-317].[1-4].[1-3].[1-7].[1-3] GP[301-306].[1-4].[1-3].[1-7].[1-3] GP[314-319].[1-4].[1-3].[1-7].[1-3] GP[401-406].[1-4].[1-3].[1-7].[1-3] GP[414-419].[1-4].[1-3].[1-7].[1-3]	S4/1/[3-17]/1/[1-4]-[1-63] S4/1/1-[1-6]/1/[1-4]-[1-63] S4/1/2-[14-19]/1/[1-4]-[1-63] S4/1/3-[1-6]/1/[1-4]-[1-63] S4/1/4-[14-19]/1/[1-4]-[1-63]

Table 5-31 PHASE network element port addresses (continued)

Description	Network Element	Entity Identifier	Network Level Addresses
VC-12 Logical port on STM-1 (Trib)	LXC4/1 LXC16/1	TP[303-317].[1-4].1.[1-3].[1-7].[1-3] GP[301-306].[1-4].1.[1-3].[1-7].[1-3] GP[314-319].[1-4].1.[1-3].[1-7].[1-3] GP[401-406].1.[1-3].[1-7].[1-3] GP[414-419].1.[1-3].[1-7].[1-3]	S1/1/[3-17]/[1-4]/1-[1-63] S1/1/1-[1-6]/[1-4]/1-[1-63] S1/1/2-[14-19]/[1-4]/1-[1-63] S1/1/3-[1-6]/1/1-[1-63] S1/1/4-[14-19]/1/1-[1-63]
VC-12 Logical/Physical port on TIU-1 (Trib)	TM4/4 (CS-17 & CS-19) TM16/4 ADM4/4 ADM16/4 LXC4/1 LXC16/1	TP[303-317].1.[1-21] TP[303-317].1.[1-21] TP[306-319].1.[1-21] TP[306-319].1.[1-21] TP[303-317].[1-21] GP[301-304].[1-21] GP[314, 316-319].[1-21]	P1/1/[3-17]/1-[1-21] P1/1/[3-17]/1-[1-21] P1/1/[6-19]/1-[1-21] P1/1/[6-19]/1-[1-21] P1/1/[3-17]/[1-21] P1/1/1-[1-4]/[1-21] P1/1/2-[14, 16-19]/[1-21]
VC4-4c Logical Port on STM-16 (Line)	TM16/4 ADM16/4	LP[301-302,318].1-4 LP[301-302,318].5-8 LP[301-302,318].9-12 LP[301-302,318].13-16 LP[302-305].1-4 LP[302-305].5-8 LP[302-305].9-12 LP[302-305].13-16	S16/1/[1-2,18]/1/4c.1 S16/1/[1-2,18]/1/4c.2 S16/1/[1-2,18]/1/4c.3 S16/1/[1-2,18]/1/4c.4 S16/1/[2-5]/1/4c.1 S16/1/[2-5]/1/4c.2 S16/1/[2-5]/1/4c.3 S16/1/[2-5]/1/4c.4
VC4-4c Logical Port on STM-16 (Trib)	TM16/4 (CS-17 & CS-19) ADM16/4	TP[303-317].1-4 TP[303-317].5-8 TP[303-317].9-12 TP[303-317].13-16 TP[306-318].1-4 TP[306-318].5-8 TP[306-318].9-12 TP[306-318].13-16	S16/1/[3-17]/1/4c.1 S16/1/[3-17]/1/4c.2 S16/1/[3-17]/1/4c.3 S16/1/[3-17]/1/4c.4 S16/1/[6-18]/1/4c.1 S16/1/[6-18]/1/4c.2 S16/1/[6-18]/1/4c.3 S16/1/[6-18]/1/4c.4



Non-port identifiers

Overview This section lists the non-port identifiers for the PHASE network elements.

Non-port identifiers The following table lists the non-port identifiers for the supported PHASE network elements.

Table 5-32 Non-port identifiers for PHASE network elements

Description	Entity Identifier
Management and Communication Unit	MCU_nnn
STM-1 Optical Interface	SIU-1OP_nnn
STM-4 Optical Interface	SIU-4OP_nnn
STM-16 Optical Interface	SIU-16OP_nnn
STM-1 Electrical Interface	SIU-1EL_nnn
STM-4 Optical Interface with OH Bus access and CCU-X3 integrated	SIU-4B_nnn
STM-1 Optical Interface without central clock unit	SIU-1OPWITHOUTCCU_nnn
STM-4 Optical Interface without central clock unit	SIU-4OPWITHOUTCCU_nnn
STM-1 Electrical Interface without central clock unit	SIU-1ELWITHOUTCCU_nnn
CEPT-1 Electrical Interface (21 channels)	TIU-1El_nnn
CEPT-3 Electrical Interface (6 channels)	TIU3WITH34M_nnn
DS-3 Electrical Interface (6 channels)	TIU3WITH45M_nnn
CEPT-4 Electrical Interface (CEPT-4 or STM-1, 4 channels)	TIU4EL_nnn
Bus Bridge Unit	BBU_nnn
Pointer Processing Unit (processes 4 STM-1s)	PPU4_nnn
Pointer Processing Unit (processes 8 STM-1s)	PPU8_nnn
Pointer Processing Unit (processes 16 STM-1s)	PPU16_nnn
Connection Matrix Unit (for LXC4/1)	CMU_nnn
Connection Matrix Unit (for LXC16/1)	CMU16_nnn
Overhead Access Unit	OAU_nnn
Optical Booster Amplifier 1	OBA1_nnn
Optical Booster Amplifier 2	OBA2_nnn
Optical Pre-Amplifier	OPA_nnn

Table 5-32 Non-port identifiers for PHASE network elements (continued)

Description	Entity Identifier
Synchronous Connection Interface	SCIX1_nnn
Synchronous Connection Interface (SISA)	SCIX2_nnn
Synchronous Connection Interface (Adder)	SCIA_nnn
Tributary Connection Interface (2Mbs Unprotected 120 Ohm)	TCI1U120_nnn
Tributary Protection Interface (2Mbs Protected 120 Ohm)	TPI1T120_nnn
Tributary Protection Interface (2Mbs Protecting 120 Ohm)	TPI1P120_nnn
Tributary Connection Interface (2Mbs Unprotected 75 Ohm)	TCI1U75_nnn
Tributary Protection Interface (2Mbs Protected 75 Ohm)	TPI1T75_nnn
Tributary Protection Interface (2Mbs Protecting 75 Ohm)	TPI1P75_nnn
Tributary Connection Interface (34Mbs)	TCI3WITH34M_nnn
Tributary Protection Interface (34Mbs)	TPI3WITH34M_nnn
Tributary Connection Interface (45Mbs)	TCI3WITH45M_nnn
Tributary Protection Interface (45Mbs)	TPI3WITH45M_nnn
Tributary Connection Interface (140Mbs or STM-1)	TCI4_nnn
Tributary Protection Interface (140Mbs or STM-1)	TPI4_nnn
Overhead Access Interface	OAI_nnn
Order Wire Interface	OWI_nnn
Overhead Access and Order Wire Interface	OAIANDOWI_nnn
MCU Connection Interface (with AIP)	MCI0_nnn
MCU Connection Interface (with AIM)	MCI1_nnn
Unassigned slot, nnn	SLOT_nnn



Section X: SLM Port Addresses

Overview

Purpose This section describes the external and internal port addresses for both the physical and logical ports of SLM network elements. This section also discusses the correlation between the external and internal port addresses.

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Port identifiers for SLM-4 network elements

Overview This section provides the port identifiers for SLM-4 network elements.

Table The following table contains the port identifiers for the SLM-4 network elements.

Table 5-33 Port identifiers for SLM-4 network elements

Description	Network Element	Entity Identifier	Network Level Address
STM-4 Physical Port (Line)	SLM40xNTERM	LP[1-2]	S4/1/[2, 11]/1
	SLM41+1TERM	LP[1-2]	S4/1/[2, 11]/1
	SLM4REGEN	LP[1,2,3,4]	S4/1/[1, 2, 3, 4]/1
STM-4 MSP Physical Port (Line)	SLM41+1TERM	LP1	S4/1/GRP1/1
STM-1 Physical Port (Trib)	SLM40xNTERM	TP[1-4].[1-2]	S1/1/[4,5,8,9]/[1-2]
	SLM41+1TERM	TP[1-2].[1-2]	S1/1/[4,5]/[1-2]
E4 (140 Mb/s) Physical Port (Trib)	SLM40xNTERM	TP[1-4].[1-2]	P4/1/[4,5,8,9]/[1-2]
	SLM41+1TERM	TP[1-2].[1-2]	P4/1/[4,5]/[1-2]
VC-4 Logical Port on STM-4 (Line)	SLM40xNTERM	TP[1-2].[1-4]	S4/1/[2,11]/1/[1-4]
VC-4 Logical Port on STM-4 MSP (Line)	SLM41+1TERM	LP1.[1-4]	S4/1/GRP1/1/[1-4]
VC-4 Logical Port on STM-1 (Trib)	SLM40xNTERM	TP[1-4].[1-2].1	S1/1/[4,5,8,9]/[1-2]/1
	SLM41+1TERM	TP[1-2].[1-2].1	S1/1/[4,5]/[1-2]/1
VC-4 Logical Port on E4 (140 Mb/s) port (Trib)	SLM40xNTERM	TP[1-4].[1-2]	P4/1/[4,5,8,9]/[1-2]
	SLM41+1TERM	TP[1-2].[1-2]	P4/1/[4,5]/[1-2]



Non-port identifiers for SLM-4 network elements

Overview This section presents the non-port identifiers for the SLM-4 network elements.

Non-port identifiers The following table presents the non-port identifiers for the supported SLM-4 network elements.

Table 5-34 Non-port identifiers for SLM-4 network elements

Description	Entity Identifier
For SLM40xNTERM and SLM41+1TERM network elements	
Timing Generator Unit	TGU[1-2]
System Controller	SCT
Power Supply Filter	PSF[1-2]
Line Port Card	LPRX[1-2] LPTX[1-2]
Tributary Port Card	TP[1-4]
Tributary Overhead Controller	TOC
Line Overhead Controller	LOC
Interconnect pack with fixed straps	RCU4
For SLM4REGEN network elements	
System Controller	SCT
Power Supply Filter	PSF[1-2]
User Panel	UPL
Regenerator Line Card	RGU[1-4]
Regenerator Overhead Controller	ROC



Port identifiers for SLM-16 network elements

Overview This section provides the port identifiers for SLM-16 network elements.

Table The following table contains the port identifiers for the SLM-16 network elements.

Table 5-35 Port identifiers for SLM-16 network elements

Description	Network Element	Entity Identifier	Network Level Address
STM-16 Physical Port (Line)	SLM160x1TERM	LP1	S16/1/13/1
	SLM161+1TERM	LP[1-2]	S16/1/[13, 29]/1
	SLM16ADM	LP[1-2]	S16/1/[4, 9]/1
	SLM16REGEN	LP[1,2,3,4]	S16/1/[1, 2, 3, 4]/1
STM-16 MSP Physical Port (Line)	SLM161+1TERM	LP1	S16/1/GRP1/1
STM-1 Physical Port (Trib)	SLM160xNTERM	TP[1-8].[1-2]	S1/1/[1-4, 7-10]/[1-2]
	SLM161+1TERM	TP[1-8].[1-2]	S1/1/[1-4, 7-10]/[1-2]
	SLM16ADM	TP[1-8].[1-2]	S1/1/[15-18, 20-23]/[1-2]
STM-1 MSP Physical Port (Trib)	SLM16ADM	TP[1, 3, 5, 7].[1-2]	S1/1/GRP[1-4]/[1-2]
E4 (140 Mb/s) Physical Port (Trib)	SLM160x1TERM	TP[1-8].[1-2]	P4/1/[1-4, 7-10]/[1-2]
	SLM161+1TERM	TP[1-8].[1-2]	P4/1/[1-4, 7-10]/[1-2]
	SLM16ADM	TP[1-8].[1-2]	P4/1/[15-18, 20-23]/[1-2]
VC-4 Logical Port on STM16 (Line)	SLM160x1TERM	LP1.[1-16]	S16/1/13/1/[1-16]
	SLM16ADM	LP1.[1-2].[1-16]	S16/1/[4,9]/1/[1-16]
VC-4 Logical Port on STM-16 MSP (Line)	SLM161+1TERM	LP1.[1-16]	S16/1/GRP1/1/[1-16]
VC-4 Logical Port on STM-1 (Trib)	SLM160x1TERM	TP[1-8].[1-2].1	S1/1/[1-4, 7-10]/[1-2]/1
	SLM161+1TERM	TP[1-8].[1-2].1	S1/1/[1-4, 7-10]/[1-2]/1
	SLM16ADM	TP[1-8].[1-2].1	S1/1/[15-18, 20-23]/[1-2]/1
VC-4 Logical Port on STM-1 MSP	SLM16ADM	TP[1, 3, 5, 7].[1-2].1	S1/1/GRP[1-4]/[1-2]/1

Table 5-35 Port identifiers for SLM-16 network elements (continued)

VC-4 Logical port on E4 (140 Mb/s) Port (Trib)	SLM160x1TERM	TP[1-8].[1-2]	P4/1/[1-4, 7-10]/[1-2]
	SLM161+1TERM	TP[1-8].[1-2]	P4/1/[1-4, 7-10]/[1-2]
	SLM16ADM	TP[1-8].[1-2]	P4/1/[15-18, 20-23]/[1-2]

□

Non-port identifiers for SLM-16 network elements

Overview This section presents the non-port identifiers for the SLM-16 network elements.

Non-port identifiers The following table presents the non-port identifiers for the supported SLM-16 network elements.

Table 5-36 Non-port identifiers for SLM-16 network elements

Description	Entity Identifier
For SLM160xNTERM and SLM161+1TERM, and SLM16ADM network elements	
Timing Generator Unit	TGU[1-2]
System Controller	SCT
Power Supply Filter	PSF[1-4]
Line Port Card	LPRX[1-2] LPTX[1-2]
Tributary Port Card	TP[1-8]
Tributary Overhead Controller	TOC
Line Overhead Controller	LOC
Transmitter Switch Unit	SWTX[1-2]
Receiver Switch Unit	SWRX[1-2]
Line Controller Unit	LNCTL
System Control Unit	SYSCTL
System Memory Unit	SYSTEM
User Panel	UPL
For SLM16REGEN network elements	
System Controller	SCT
Power Supply Filter	PSF[1-2]
User Panel	UPL
Regenerator Line Card	RGU[1-4]
Regenerator Overhead Controller	ROC



Section XI: TDM 10G Port Addresses

Overview

Purpose This section provides conceptual information regarding the external and internal port addresses for both the physical and logical ports of the TDM 10G. It also discusses the correlation between the external and internal port addresses.

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□

Port identifiers

Overview This section presents the port identifiers for the TDM 10G network element.

Table The following table contains the port identifiers for the TDM 10G network elements.

Table 5-37 Port identifiers for TDM 10G network elements

Description	Entity Identifiers	Network Level Address
STM-64 Physical Port	1-2-#-#-[tre, trw]-1	S64/ 1-2 - #-# - [tre, trw] - 1
VC4-16c logical port on STM-64 physical port	1-2-#-#-[tre, trw]-1-[1, 49, 97, 145]	S64/ 1-2 - #-# - [tre, trw] - 1 / 16c.[1-4]
VC4-4c logical port on STM-64 physical port	1-2-#-#-[tre, trw]-1-[1, 13, 25, 37, 49, 61, 73, 85, 97, 109, 121, 133, 145, 157, 169, 181]	S64/ 1-2 - #-# - [tre, trw] - 1/4c.[1-16]
VC4 logical port on STM-64 physical port	1-2-#-#-[tre, trw]-1-[1, 4, 7, 10, 13, 16, 19, 22, 25, 28, 31, 34, 37, 40, 43, 46, 49, 52, 55, 58, 61, 64, 67, 70, 73, 76, 79, 82, 85, 88, 91, 94, 97, 100, 103, 106, 109, 112, 115, 118, 121, 124, 127, 130, 133, 136, 139, 142, 145, 148, 151, 154, 157, 160, 163, 166, 169, 172, 175, 178, 181, 184, 187, 190]	S64/ 1-2 - #-# - [tre, trw] - 1 / AU.[1-64].0
AU3 logical port on STM-64 physical port	1-2-#-#-[tre, trw]-1-[1-192]	S64/ 1-2 - #-# - [tre, trw] - 1 / AU.[1-64].[1-3]
STM-16 Physical Port	[1-4]-[1-3]-#-#-[02, 04, 06...16]-1	S16/[1-4]-[1-3]-#-#- [02, 04,06.....16]/ 1
VC4-16c logical port on STM-16 physical port	[1-4]-[1-3]-#-#-[02, 04, 06...16]-1-[1]	S16/[1-4]-[1-3]-#-#- [02, 04,06.....16] -1/ 16c.[1]
VC-4c logical port on STM-16 physical port	[1-4]-[1-3]-#-#-[02, 04, 06...16]-1-[1, 13, 25, 37]	S16/[1-4]-[1-3]-#-#- [02, 04,06.....16] -1/ 4c.[1-4]

Table 5-37 Port identifiers for TDM 10G network elements (continued)

VC4 logical port on STM-16 physical port	[1-4]-[1-3]-#-#[02, 04, 06...16]-1-[1, 4, 7, 10, 13, 16, 19, 22, 25, 28, 31, 34, 37, 40, 43, 46]	S16/[1-4]-[1-3]-#-#- [02, 04,06.....16] -1/ AU.[1-16].0
AU3 logical port on STM-16 physical port	[1-4]-[1-3]-#-#[02, 04, 06...16]-1-[1-48]	S16/[1-4]-[1-3]-#-#- [02, 04,06.....16] -1/ AU.[1-16].[1-3]
STM-4 Physical Port	[1-4]-[1-3]-#-#[01-16]-[1-2]	S4/[1-4]-[1-3]-#-#- [01-16]-[1-2]
VC4-4c logical port on STM-4 physical port	[1-4]-[1-3]-#-#[01-16]-[1-2]-[1]	S4/[1-4]-[1-3]-#-#- [01-16]-[1-2] / 4c.[1]
VC4 logical port on STM-4 physical port	[1-4]-[1-3]-#-#[01-16]-[1-2]-[1, 4, 7, 10]	S4/[1-4]-[1-3]-#-#- [01-16]-[1-2] AU.[1-4].0
AU3 logical port on STM-4 physical port	[1-4]-[1-3]-#-#[01-16]-[1-2]-[1-12]	S4/[1-4]-[1-3]-#-#- [01-16]-[1-2] / AU.[1-4].[1-3]
STM-1 Physical Port	[1-4]-[1-3]-#-#[01-16]-[1-8]	S1/[1-4]-[1-3]-#-#- [01-16]-[1-8]
VC4 logical port on STM-1 physical port	[1-4]-[1-3]-#-#[01-16]-[1-8]-1	S1/[1-4]-[1-3]-#-#- [01-16]-[1-2] / AU. 1.0
AU3 logical port on STM-1 physical port	[1-4]-[1-3]-#-#[01-16]-[1-8]-[1-3]	S1/[1-4]-[1-3]-#-#- [01-16]-[1-8] / AU.1[1-3]
GbE Physical Port (LAN) - ptp	{1-4}-{1-3}-#-#[02, 04, 06, 08, 10, 12, 14, 16]-[1-4]	LAN/{1-4}-{1-3}-#-#- [02, 04, 06, 08, 10, 12, 14, 16]-[1-4]
GbE Physical Port (WAN) - ptp	{1-4}-{1-3}-#-#[02, 04, 06, 08, 10, 12, 14, 16]-v[1-2]	WAN/{1-4}-{1-3}-#-#- [02, 04, 06, 08, 10, 12, 14, 16]-v[1-2]
VC4 Logical Port on GbE Physical Port - ctp	{1-4}-{1-3}-#-#[02, 04, 06, 08, 10, 12, 14, 16]-v[1-2]-[1, 4, 7, 10, 13, 16, 19, 22]	WAN/{1-4}-{1-3}-#-#- [02, 04, 06, 08, 10, 12, 14, 16]-v[1-2]-[1, 4, 7, 10, 13, 16, 19, 22]]



Section XII: TM 1 Port Addresses

Overview

Purpose This section provides the port identifiers for TM 1 network elements.

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Port identifiers

Overview This section presents the port identifiers for TM 1 network elements.

Table The following table contains the port identifiers for the TM 1 network elements.

Table 5-38 Port identifiers for TM 1 network elements

Description		Entity Identifier	Network Level Address
STM-1 Line Port 1	Physical Port	LP1	S1/1/2/1
	Logical Port (AU4 and VC4 combined)	LP1.1	S1/1/2/1/1
	Logical Port TU12	LP1.1.1.[1-6].[1-3]	S1/1/2/1/1-[1-16]
E1 (CEPT-1) (2Mb/s) Tributary (on-board)	Physical Ports	TP1.[1-16]	P1/1/3/[1-16]
		TP1.[1-16]	P1/1/3/[1-16]



Non-port identifiers

Overview This section presents the non-port identifiers for the supported TM 1 network elements.

Table The following table contains the non-port identifiers for the supported TM 1 network elements.

Table 5-39 Non-port identifiers for TM 1 network elements

Slot	Description	Entity Identifier
1	Motherboard (System control and timing)	SC
2	Line port	LS1
3	Tributary Slot 1	TS1



Section XIII: LambdaRouter Port Addresses

Overview

Purpose This section provides conceptual information regarding the external and internal port addresses for both the physical and logical ports of the WaveStar LambdaRouter. It also discusses the correlation between the external and internal port addresses.

Note: Navis Optical NMS Release 6.0 does not support the Lambda Router Release 1.0. Navis Optical NMS Release 6.0 supports Lambda Router 256 Release 2.0 and Lambda Router 128 Release 2.0.

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Port identifiers

Overview This section provides the port identifiers for the LambdaRouter 256 R2.0, and 128 Release 2.0.

Table The following port identifiers are applicable to the LambdaRouter 256 R2.0, and 128 Release 2.0. Entries enclosed in { } are variables. Fields enclosed in [] are optional fields.

Table 5-40 Port identifiers for the WaveStar LambdaRouter

Description	Entity Identifier	Network Level Address
Optical Channel Port (Transparent Ports)	och-[1-32]-[1-32]-[1-4]	OT/och-[1-32]-[1-32]-[1-4]
Optical Link Logical Port (Transparent Ports)	och-[1-32]-[1-32]-[1-4]	OT/och-[1-32]-[1-32]-[1-4]
10G Optical Channel Port (Opaque Ports)	och-[1-32]-[1-32]-1	OT/och-[1-32]-[1-32]-1
10G Optical Link Logical Port (Opaque Ports)	och-[1-32]-[1-32]-1	OT/och-[1-32]-[1-32]-1
2.5G Optical Channel Port (Opaque Ports)	och-[1-32]-[1-32]-[1-2]	OT/och-[1-32]-[1-32]-[1-2]
2.5G Optical Link Logical Port (Opaque Ports)	och-[1-32]-[1-32]-[1-2]	OT/och-[1-32]-[1-32]-[1-2]

Note: “Opaque Ports” refer to the case where the Lambda Router is used in conjunction with the “OEO 10G/2.5G Optical Interface CP (OXI10GC or OX12.5GC).

□

Section XIV: WaveStar BandWidth Manager Port Addresses

Overview

Purpose This section contains WaveStar BandWidth Manager port addresses specific to Navis™ Optical NMS.

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Port identifiers

Overview This section presents the port identifiers for the WaveStar BandWidth Manager.

Address format The format for the WaveStar BandWidth Manager addresses are as follows:

<bay>-<Shelf>-<Protection group#>-<w/p>-<slot>-<port>

Important! The Protection group# and the w/p are not used. Enter the # character for both of these.

Table This table contains the port addresses (internal and external) for the BandWidth Manager (BWM).

Table 5-41 Port identifiers for WaveStar BandWidth Manager

Description	Entity Identifier	Network Level Address
STM-64 Physical Port	[1-99]-[1-2]-#-#-tr[1-4]-1	S64/[1-99]-[1-2]-#-#-tr[1-4]-1
VC4-16c logical port on STM-64 physical port	[1-99]-[1-2]-#-#-tr[1-4]-1-[1, 49, 97, 145]	S64/[1-99]-[1-2]-#-#-tr[1-4]-1/16c.[1-4]
VC4-4c logical port on STM-64 physical port	[1-99]-[1-2]-#-#-tr[1-4]-1-[1, 13, 25, 37, 49, 61, 73, 85, 97, 109, 121, 133, 145, 157, 169, 181]	S64/[1-99]-[1-2]-#-#-tr[1-4]-1/4c.[1-16]
VC4 logical port on STM-64 physical port	[1-99]-[1-2]-#-#-tr[1-4]-1-[1, 4, 7, 10, 13, 16, 19, 22, 25, 28, 31, 34, 37, 40, 43, 46, 49, 52, 55, 58, 61, 64, 67, 70, 73, 76, 79, 82, 85, 88, 91, 94, 97, 100, 103, 106, 109, 112, 115, 118, 121, 124, 127, 130, 133, 136, 139, 142, 145, 148, 151, 154, 157, 160, 163, 166, 169, 172, 175, 178, 181, 184, 187, 190]	S64/[1-99]-[1-2]-#-#-tr[1-4]-1/AU.[1-64].0
AU3 logical port on STM-64 physical port	[1-99]-[1-2]-#-#-tr[1-4]-1-[1-192]	S64/[1-99]-[1-2]-#-#-tr[1-4]-1/AU.[1-64].[1-3]
OC-192 physical port (for SONET gateway)	[1-99]-[1-2]-#-#-tr[1-4]-1	OC192/[1-99]-[1-2]-#-#-tr[1-4]-1
VC4-16c logical port on OC-192 physical port	[1-99]-[1-2]-#-#-tr[1-4]-1-[1, 49, 97, 145]	OC192/[1-99]-[1-2]-#-#-tr[1-4]-1/48c.[1-4]

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Port identifiers

Table 5-41 Port identifiers for WaveStar BandWidth Manager (continued)

VC4-4c logical port on OC-192 physical port	[1-99]-[1-2]-#-#-tr[1-4]-1-[1, 13, 25, 37, 49, 61, 73, 85, 97, 109, 121, 133, 145, 157, 169, 181]	OC192/[1-99]-[1-2]-#-#-tr[1-4]-1/12c.[1-16]
VC4 logical port on OC-192 physical port	[1-99]-[1-2]-#-#-tr[1-4]-1-[1, 4, 7, 10, 13, 16, 19, 22, 25, 28, 31, 34, 37, 40, 43, 46, 49, 52, 55, 58, 61, 64, 67, 70, 73, 76, 79, 82, 85, 88, 91, 94, 97, 100, 103, 106, 109, 112, 115, 118, 121, 124, 127, 130, 133, 136, 139, 142, 145, 148, 151, 154, 157, 160, 163, 166, 169, 172, 175, 178, 181, 184, 187, 190]	OC192/[1-99]-[1-2]-#-#-tr[1-4]-1/3c.[1-64]
AU3 logical port on OC-192 physical port	[1-99]-[1-2]-#-#-tr[1-4]-1-[1-192]	OC192/[1-99]-[1-2]-#-#-tr[1-4]-1/STS1.[1-192]
STM-16 physical port	[1-99]-[1-2]-#-#-[02, 04, 06.....16]-1	S16/[1-99]-[1-2]-#-#-[02, 04, 06.....16]-1
VC4-16c logical port on STM-16 physical port	[1-99]-[1-2]-#-#-[02, 04, 06.....16]-1-[1]	S16/[1-99]-[1-2]-#-#-[02, 04, 06.....16]-1/16c.[1]
VC4-4c logical port on STM-16 physical port	[1-99]-[1-2]-#-#-[02, 04, 06.....16]-1-[1, 13, 25, 37]	S16/[1-99]-[1-2]-#-#-[02, 04, 06.....16]-1/4c.[1-4]
VC4 logical port on STM-16 physical port	[1-99]-[1-2]-#-#-[02, 04, 06.....16]-1-[1, 4, 7, 10, 13, 16, 19, 22, 25, 28, 31, 34, 37, 40, 43, 46]	S16/[1-99]-[1-2]-#-#-[02, 04, 06.....16]-1/AU.[1-16].0
AU3 logical port on STM-16 physical port	[1-99]-[1-2]-#-#-[02, 04, 06.....16]-1-[1-48]	S16/[1-99]-[1-2]-#-#-[02, 04, 06.....16]-1/AU.[1-16].[1-3]
OC-48 physical port (for SONET gateway)	[1-99]-[1-2]-#-#-[02, 04, 06.....16]-1	OC48/[1-99]-[1-2]-#-#-[02, 04, 06.....16]-1
VC4-16c logical port on OC-48 physical port	[1-99]-[1-2]-#-#-[02, 04, 06.....16]-1-[1]	OC48/[1-99]-[1-2]-#-#-[02, 04, 06.....16]-1/48c.1
VC4-4c logical port on OC-48 physical port	[1-99]-[1-2]-#-#-[02, 04, 06.....16]-1-[1, 13, 25, 37]	OC48/[1-99]-[1-2]-#-#-[02, 04, 06.....16]-1/412c.[1-4]
VC4 logical port on OC-48 physical port	[1-99]-[1-2]-#-#-[02, 04, 06.....16]-1-[1, 4, 7, 10, 13, 16, 19, 22, 25, 28, 31, 34, 37, 40, 43, 46]	OC48/[1-99]-[1-2]-#-#-[02, 04, 06.....16]-1/3c.[1-16]
AU3 logical port on OC-48 physical port	[1-99]-[1-2]-#-#-[02, 04, 06.....16]-1-[1-48]	OC48/[1-99]-[1-2]-#-#-[02, 04, 06.....16]-1/STS1.[1-48]
STM-4 physical port	[1-99]-[1-2]-#-#-[01-16]-[1-2]	S4/[1-99]-[1-2]-#-#-[01-16]-[1-2]

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Port identifiers

Table 5-41 Port identifiers for WaveStar BandWidth Manager (continued)

VC4-4c logical port on STM-4 physical port	[1-99]-[1-2]-#-#[01-16]-[1-2]-[1]	S4/[1-99]-[1-2]-#-#[01-16]-[1-2]/4c.[1]
VC4 logical port on STM-4 physical port	[1-99]-[1-2]-#-#[01-16]-[1-2]-[1, 4, 7, 10]	S4/[1-99]-[1-2]-#-#[01-16]-[1-2]/AU.[1-4].0
AU3 logical port on STM-4 physical port	[1-99]-[1-2]-#-#[01-16]-[1-2]-[1-12]	S4/[1-99]-[1-2]-#-#[01-16]-[1-2]/AU.[1-4].[1-3]
OC-12 Physical Port (for SONET Gateway)	[1-99]-[1-2]-#-#[01-16]-[1-2]	OC12/[1-99]-[1-2]-#-#[01-16]-[1-2]
VC4-4c logical port on OC-12 physical port	[1-99]-[1-2]-#-#[01-16]-[1-2]-[1]	OC12/[1-99]-[1-2]-#-#[01-16]-[1-2]/12c.1
VC4 logical port on OC-12 physical port	[1-99]-[1-2]-#-#[01-16]-[1-2]-[1, 4, 7, 10]	OC12/[1-99]-[1-2]-#-#[01-16]-[1-2]3c.[1-4]
AU3 logical port on OC-12 physical port	[1-99]-[1-2]-#-#[01-16]-[1-2]-[1-12]	OC12/[1-99]-[1-2]-#-#[01-16]-[1-2]/STS1.[1-12]
STM-1 and STM1E Physical Port	[1-99]-[1-2]-#-#[01-16]-[1-4]	S1/[1-99]-[1-2]-#-#[01-16]-[1-4]
VC4 logical port on STM-1 physical port	[1-99]-[1-2]-#-#[01-16]-[1-4]-[1]	S1/[1-99]-[1-2]-#-#[01-16]-[1-4]/AU.1.0
AU3 logical port on STM-1 physical port	[1-99]-[1-2]-#-#[01-16]-[1-4]-[1-3]	S1/[1-99]-[1-2]-#-#[01-16]-[1-4]/AU.1.[1-3]
OC-3 Physical Port (for SONET Gateway)	[1-99]-[1-2]-#-#[01-16]-[1-4]	OC3/[1-99]-[1-2]-#-#[01-16]-[1-4]
VC4 logical port on OC-3 physical port	[1-99]-[1-2]-#-#[01-16]-[1-4]-[1]	OC3/[1-99]-[1-2]-#-#[01-16]-[1-4]/3c.1
AU3 logical port on OC-3 physical port	[1-99]-[1-2]-#-#[01-16]-[1-4]-[1-3]	OC3/[1-99]-[1-2]-#-#[01-16]-[1-4]/STS1.[1-3]
EC1 and STS1E Physical Port	[1-99]-[1-2]-#-#[01-16]-[1-8]	EC1/[1-99]-[1-2]-#-#[01-16]-[1-8]
DS3 Physical Port	[1-99]-[1-2]-#-#[01-16]-[1-8]	D3/[1-99]-[1-2]-#-#[01-16]-[1-8]
AU3 logical port on DS3 physical port	[1-99]-[1-2]-#-#[01-16]-[1-8]-1	D3/[1-99]-[1-2]-#-#[01-16]-[1-8]/1
AU3 logical port on EC1 physical port	[1-99]-[1-2]-#-#[01-16]-[1-8]-1	EC1/[1-99]-[1-2]-#-#[01-16]-[1-8]/AU.1.1
T3 logical port on DS3 physical port	[1-99]-[1-2]-#-#[01-16]-[1-8]	D3/[1-99]-[1-2]-#-#[01-16]-[1-8]



Section XV: LambdaUnite Port Addresses

Overview

Purpose This section provides the port identifiers for LambdaUnite Release 2.0 and 1.0.

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Port identifiers

Overview This section presents the port identifiers for Lambda Unite Release 2.0 and 1.0.

Table The following table displays the SDH port addresses for Lambda Unite Release 2.0 and 1.0.

Table 5-42 Port identifiers for LambdaUnite Release 2.0 and 1.0

Description	Entity Identifier	Network Level Address
STM-64 Physical Port	1-1-#-#[1-8, 12-19, 21-28, 32-39]-1	S64/1-1-#-#[1-8, 12-19, 21-28, 32-39]-1
VC4-64c logical port on STM-64 physical port	1-1-#-#[1-8, 12-19, 21-28, 32-39]-1-1	S64/1-1-#-#[1-8, 12-19, 21-28, 32-39]-1/64c.1
VC4-16c logical port on STM-64 physical port	1-1-#-#[1-8, 12-19, 21-28, 32-39]-1-[1, 49, 97, 145]	S64/1-1-#-#[1-8, 12-19, 21-28, 32-39]-1/64c.[1-4]
VC4-4c logical port on STM-64 physical port	1-1-#-#[1-8, 12-19, 21-28, 32-39]-1-[12n+1 where n=0 to 15]	S64/1-1-#-#[1-8, 12-19, 21-28, 32-39]-1/4c.[1-16]
VC4 logical port on STM-64 physical port	1-1-#-#[1-8, 12-19, 21-28, 32-39]-1-[3n+1 where n=0 to 63]	S64/1-1-#-#[1-8, 12-19, 21-28, 32-39]-1/AU.[1-64].0
AU3 logical port on STM-64 physical port	1-1-#-#[1-8, 12-19, 21-28, 32-39]-1-[1-192]	S64/1-1-#-#[1-8, 12-19, 21-28, 32-39]-1/AU.[1-64].[1-3]
OC-192 Physical Port (for SONET gateway)	1-1-#-#[1-8, 12-19, 21-28, 32-39]-1	OC192/1-1-#-#[1-8, 12-19, 21-28, 32-39]-1
VC-64c logical port on OC-192 physical port	1-1-#-#[1-8, 12-19, 21-28, 32-39]-1-1	OC192/1-1-#-#[1-8, 12-19, 21-28, 32-39]-1/192c.1
VC4-16c logical port on OC-192 physical port	1-1-#-#[1-8, 12-19, 21-28, 32-39]-1-[1, 49, 97, 145]	OC192/1-1-#-#[1-8, 12-19, 21-28, 32-39]-1/48c.[1-4]
VC4-4c logical port on OC-192 physical port	1-1-#-#[1-8, 12-19, 21-28, 32-39]-1-[12n+1 where n=0 to 15]	OC192/1-1-#-#[1-8, 12-19, 21-28, 32-39]-1/12c.[1-16]

Table 5-42 Port identifiers for LambdaUnite Release 2.0 and 1.0 (continued)

VC4 logical port on OC-192 physical port	1-1-#-#[1-8, 12-19, 21-28, 32-39]-1-[3n+1 where n=0 to 63]	OC192/1-1-#-#[1-8, 12-19, 21-28, 32-39]-1/3c.[1-64]
AU3 logical port on OC-192 physical port	1-1-#-#[1-8, 12-19, 21-28, 32-39]-1-[1-192]	OC192/1-1-#-#[1-8, 12-19, 21-28, 32-39]-1/STS1.[1-192]
STM-16 Physical Port	1-1-#-#[1-8, 12-19, 21-28, 32-39]-[1-4]	S16/1-1-#-#[1-8, 12-19, 21-28, 32-39]-[1-4]
VC4-16c logical port on STM-16 physical port	1-1-#-#[1-8, 12-19, 21-28, 32-39]-[1-4]-[1]	S16/1-1-#-#[1-8, 12-19, 21-28, 32-39]-[1-4]/16c.[1]
VC4-4c logical port on STM-16 physical port	1-1-#-#[1-8, 12-19, 21-28, 32-39]-[1-4]-[1, 13, 25, 37]	S16/1-1-#-#[1-8, 12-19, 21-28, 32-39]-[1-4]/4c.[1-4]
VC4 logical port on STM-16 physical port	1-1-#-#[1-8, 12-19, 21-28, 32-39]-[1-4]-[3n+1 where n=0 to 15]	S16/1-1-#-#[1-8, 12-19, 21-28, 32-39]-[1-4]/AU.[1-16].0
AU3 logical port on STM-16 physical port	1-1-#-#[1-8, 12-19, 21-28, 32-39]-[1-4]-[1-48]	S16/1-1-#-#[1-8, 12-19, 21-28, 32-39]-[1-4]/AU.[1-16].[1-3]
OC-48 Physical Port (for SONET gateway)	1-1-#-#[1-8, 12-19, 21-28, 32-39]-[1-4]	OC48/1-1-#-#[1-8, 12-19, 21-28, 32-39]-[1-4]
VC4-16c logical port on OC-48 physical port	1-1-#-#[1-8, 12-19, 21-28, 32-39]-[1-4]-[1]	OC48/1-1-#-#[1-8, 12-19, 21-28, 32-39]-[1-4]/48c.1
VC4-4c logical port on OC-48 physical port	1-1-#-#[1-8, 12-19, 21-28, 32-39]-[1-4]-[1, 13, 25, 37]	OC48/1-1-#-#[1-8, 12-19, 21-28, 32-39]-[1-4]/12c.[1-4]
VC4 logical port on OC-48 physical port	1-1-#-#[1-8, 12-19, 21-28, 32-39]-[1-4]-[3n+1 where n=0 to 15]	OC48/1-1-#-#[1-8, 12-19, 21-28, 32-39]-[1-4]/3c.[1-16]
AU3 logical port on OC-48 physical port	1-1-#-#[1-8, 12-19, 21-28, 32-39]-[1-4]-[1-48]	OC48/1-1-#-#[1-8, 12-19, 21-28, 32-39]-[1-4]/STS1[1-48]
STM-4 Physical Port	1-1-#-#[1-8, 12-19, 21-28, 32-39]-[1-8]	S4/1-1-#-#[1-8, 12-19, 21-28, 32-39]-[1-8]
VC4-4c logical port on STM-4 physical port	1-1-#-#[1-8, 12-19, 21-28, 32-39]-[1-8]-1	S4/1-1-#-#[1-8, 12-19, 21-28, 32-39]-[1-8]/4c.1

Table 5-42 Port identifiers for LambdaUnite Release 2.0 and 1.0 (continued)

VC4 logical port on STM-4 physical port	1-1-#-#[1-8, 12-19, 21-28, 32-39]-[1-8]-[1, 4, 7, 10]	S4/1-1-#-#[1-8, 12-19, 21-28, 32-39]-[1-8]/AU.[1-4].0
AU3 logical port on STM-4 physical port	1-1-#-#[1-8, 12-19, 21-28, 32-39]-[1-8]-[1-12]	S4/1-1-#-#[1-8, 12-19, 21-28, 32-39]-[1-8]/AU.[1-4].[1-3]
OC-12 Physical Port (for SONET gateway)	1-1-#-#[1-8, 12-19, 21-28, 32-39]-[1-8]	OC12/1-1-#-#[1-8, 12-19, 21-28, 32-39]-[1-8]
VC4-4c logical port on OC-12 physical port	1-1-#-#[1-8, 12-19, 21-28, 32-39]-[1-8]-1	OC12/1-1-#-#[1-8, 12-19, 21-28, 32-39]-[1-8]/12c.1
VC4 logical port on OC-12 physical port	1-1-#-#[1-8, 12-19, 21-28, 32-39]-[1-8]-[1, 4, 7, 10]	OC12/1-1-#-#[1-8, 12-19, 21-28, 32-39]-[1-8]/3c.[1-4]
AU3 logical port on OC-12 physical port	1-1-#-#[1-8, 12-19, 21-28, 32-39]-[1-8]-[1-12]	OC12/1-1-#-#[1-8, 12-19, 21-28, 32-39]-[1-8]/STS1.[1-12]
STM-1 Physical Port	1-1-#-#[1-8, 12-19, 21-28, 32-39]-[1-8]	S1/1-1-#-#[1-8, 12-19, 21-28, 32-39]-[1-8]
VC4 logical port on STM-1 physical port	1-1-#-#[1-8, 12-19, 21-28, 32-39]-[1-8]-1	S1/1-1-#-#[1-8, 12-19, 21-28, 32-39]-[1-8]/AU.1.0
AU3 logical port on STM-1 physical port	1-1-#-#[1-8, 12-19, 21-28, 32-39]-[1-8]-[1-3]	S1/1-1-#-#[1-8, 12-19, 21-28, 32-39]-[1-8]/AU.1.[1-3]
OC-3 Physical Port (for SONET gateway)	1-1-#-#[1-8, 12-19, 21-28, 32-39]-[1-8]	OC3/1-1-#-#[1-8, 12-19, 21-28, 32-39]-[1-8]
VC4 logical port on OC-3 physical port	1-1-#-#[1-8, 12-19, 21-28, 32-39]-[1-8]-1	OC3/1-1-#-#[1-8, 12-19, 21-28, 32-39]-[1-8]/3c.1
AU3 logical port on OC-3 physical port	1-1-#-#[1-8, 12-19, 21-28, 32-39]-[1-8]-[1-3]	OC3/1-1-#-#[1-8, 12-19, 21-28, 32-39]-[1-8]/STS1.[1-3]
GbE Physical Port (LAN) - ptp	1-1-#-#[1-8, 12-19, 21-28, 32-39]-[1-4]	LAN/1-1-#-#[1-8, 12-19, 21-28, 32-39]-[1-4]
GbE Physical Port (WAN) - ptp	1-1-#-#[1-8, 12-19, 21-28, 32-39]-v[1-4]	WAN/1-1-#-#[1-8, 12-19, 21-28, 32-39]-v[1-4]
VC4 logical port on GbE Physical Port - ctp	1-1-#-#[1-8, 12-19, 21-28, 32-39]-v[1-4] - [1, 4, 7, 10, 13, 16, 19]	WAN/1-1-#-#[1-8, 12-19, 21-28, 32-39]-v[1-4]-[1, 4, 7, 10, 13, 16, 19]



Section XVI: MetroEON Port Addresses

Overview

Purpose This section provides the port identifiers for MetroEON Release 8.0 network elements.

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Port identifiers

Overview This section presents the port identifiers for MetroEON Release 8.0 network elements.

Table The following table displays the port identifiers for MetroEON Release 8.0 network elements.

Description	Port Type	Entity Identifier	Network Level Address
OMS Line Port (ptp)	OA (20A, 10A, 00A)	where the first OU represents the OUadd and the second the OUDrop; together they form a bidirectional port	OL16c
Repeater Port (ptp)	OA	where the first OA represents the OAadd and the second the OADrop; together they form a bidirectional port	OL16c
OCH Trail Logical Port on OMS Line (ctp)	OA	OCHAN-[1-16]	OL16c/OCHAN-[1-16]
OTPM (Quad OTUs)	OTPM (ptp)	OTPM-[1, 2]-[1, 3, 5, 7, 9, 11, 13, 15, 17, 19, 21, 23, 25, 27, 29, 31]-[1-4]-1	OT/OTPM-[1, 2]-[1, 3, 5, 7, 9, 11, 13, 15, 17, 19, 21, 23, 25, 27, 29, 31]-[1-4]-1
	OTPM (ctp)	OTPM-[1, 2]-[1, 3, 5, 7, 9, 11, 13, 15, 17, 19, 21, 23, 25, 27, 29, 31]-[1-4]-1-zzzz	OT/OTPM-[1, 2]-[1, 3, 5, 7, 9, 11, 13, 15, 17, 19, 21, 23, 25, 27, 29, 31]-[1-4]-1-zzzz
OTU (for GbE)	OTU (ptp)	OTU-[1, 2]-[1-32]-1	OT/OTU-[1, 2]-[1-32]-1
	OTU (ctp)	OTU-[1, 2]-[1-32]-1-zzzz	OT/OTU-[1, 2]-[1-32]-1-zzzz

Port identifiers

OUPSR (Ring and End Terminal)	OUPSR (ptp)	OUPSR-[shelf]-[slot]-[port] OUPSR-[1,2]-[1-32]-[CIN, AIN, BIN] Note 1: The three bidirectional ports of the OUPSR may be interpreted as: C is the 'reliable' port and A/B are the 'working' and 'protecting' ports. Note 2: CIN represents bidirectional port CIN/COU. Similarly, AIN and BIN are bidirectional ports.	OT/OUPSR-[shelf]-[slot]-[port] OT/OUPSR-[1,2]-[1-32]-[CIN, AIN, BIN]
	OUPSR (ctp)	OUPSR-[shelf]-[slot]-[port]-1 OUPSR-[1,2]-[1-32]-[CIN, AIN, BIN]-1	OT/OUPSR-[shelf]-[slot]-[port]-1 OT/OUPSR-[1,2]-[1-32]-[CIN, AIN, BIN]-1
Compatible Optics	OMU (ptp/ctp)	EXT_OMU-zzzz	OT/EXT_OMU-zzzz





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