Lucent Technologies
Bell Labs Innovations

Navis™ Optical Provisioning Manager (PM) - Network Provisioning (NP)

Release 1.1

Provisioning Guide

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Lucent Technologies at: 800 645-6759 (continental U.S.) or +1 317 322 6847

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Contents

Section III: Optical Layers

Section IV: Lucent Optical Network Navigation System

Section V: Subnets

List of Figures

List of Tables

1 System Overview

5 Provisioning Concepts

About this information product

Purpose

This preface provides an overview of this information product, the Navis™ Optical Provisioning Manager (PM) - Network Provisioning (NP) Provisioning Guide, Release 1.0.

The purpose of this information product is to provide an overview of the Navis™ Optical PM - NP and present step-by-step tasks so as to instruct the reader the recommended way to provision with Navis™ Optical PM - NP.

Reason for reissue

Issue 1 of this Provisioning guide is a new document that supports the Navis™ Optical PM - NP.

Safety labels

This document does not use safety labels.

Intended audience

This document 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 PM - NP.

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 guide's purpose, intended audience, and how to use it.
Chapter 1	Chapter 1, "System Overview"	Explains Navis™ Optical PM - NP features, applications and supported hardware platforms. It also describes system planning and engineering, ordering, and product support.
Chapter 2	Chapter 2, "The Navis™ Optical PM - NP Provisioning Process "	Provides an overview of the Navis™ Optical PM - NP provisioning process and commonly used terminology.
Chapter 3	Chapter 3, "Network Element Configuration Tasks"	Contains tasks associated with controlled and noncontrolled network elements.
Chapter 4	Chapter 4, "Provisioning Tasks"	Contains tasks related to digital link, connection, optical layer, subnet, and preplan restoration provisioning.
Chapter 5	Chapter 5, "Provisioning Concepts"	Explains provisioning concepts associated with network elements, connections, optical layers, subnets, and preplan restoration.
Chapter 6	Chapter 6, "Network Element Port Addresses "	Lists the port addresses of the network elements supported by Navis™ Optical PM - NP.
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 PM - NP 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 PM - NP.

List of documents

The document set that supports Navis™ Optical PM - NP comprises:

1. *Navis™ Optical PM - NP Getting Started Guide*, (365-314-105): provides information useful to first-time users of the Navis™ Optical PM - NP software. It describes how to start and stop Navis™ Optical PM - NP, how to use the software, and how to interpret the graphical user interface.
   This document includes tasks and conceptual information.
2. *Navis™ Optical PM - NP Provisioning Guide*, (365-314-106) instructs users on how to provision and manage a network using Navis™ Optical PM - NP.
   This document includes tasks and conceptual information.
3. *Navis™ Optical PM - NP Maintenance Guide*, (365-314-107) instructs users on how to maintain Navis™ Optical PM - NP and a network.
   This document includes tasks and conceptual information.
4. *Navis™ Optical PM - NP Administration Guide*, (365-314-108) instructs users on how to administer Navis™ Optical PM - NP and a network.
   This document includes tasks and conceptual information.

Glossary

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

On-line documentation

On-line documentation for Navis™ Optical PM - NP 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 PM - NP software.
2. An on-line version, in HTML format, of this document set is available on CD-ROM.
   Navis™ Optical PM - NP User Documentation CD-ROM, (365-314-109) - includes the full set of documents listed above.

Screen help

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

How to comment

To comment on this information product, go to the Online Comment Form (http://www.lucent-info.com/comments) or email your comments to the Comments Hotline (ctiphotline@lucent.com).

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1 System Overview

Overview

Purpose

This chapter provides a system overview of the *Navis*™ Optical Provisioning Manager (PM) - Network Provisioning (NP) application.

Contents

Product Definition

Overview

Purpose

This section provides a product definition for the *Navis*™ Optical Provisioning Manager (PM) - Network Provisioning (NP) software product.

Definition

Navis™ Optical PM - NP provides end-to-end management of service within SONET and optical networks.

Navis™ Optical PM - NP allows service providers to perform provisioning and maintenance for a network that includes the following types of connections:

- Synchronous Optical Network (SONET) links and trails
- Optical layer (optical links, optical channel trails, and optical multiplex sections).

PDH is supported as ports at the edge of the network and as digital links.

Capabilities

From a single operator seat, an entire network can be managed using Navis™ Optical PM - NP. Navis™ Optical PM - NP is designed to manage different network elements and features on a cost-effective combination of hardware platforms.

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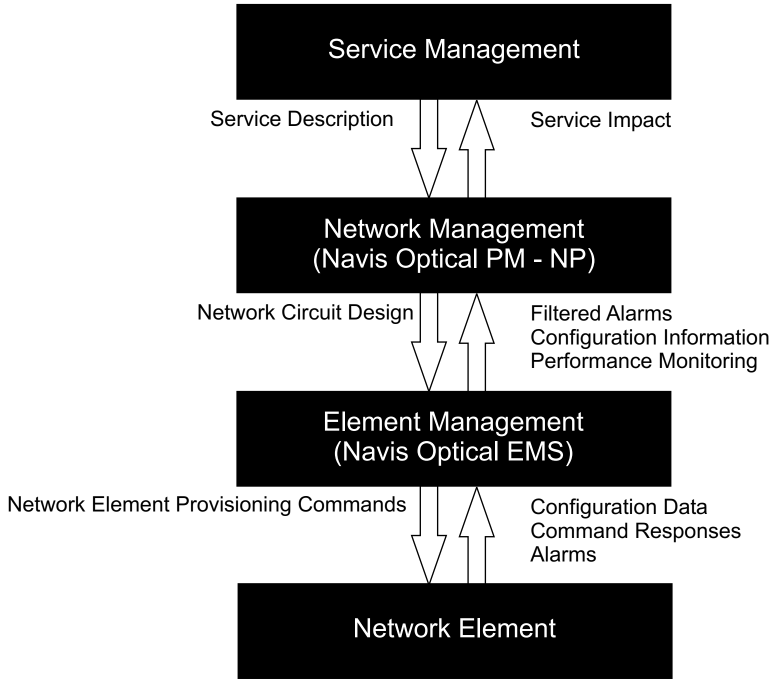
External interfaces

Introduction

The Navis™ Optical PM - NP interfaces are shown in the following figure.

Figure 1-1 Navis™ Optical PM - NP interfaces



Northbound interfaces

The following sections describe the northbound interfaces.

ASCII northbound alarm interface (TIM interface)

The ASCII northbound alarm interface is used to integrate with other-vendor and customer systems. The ASCII northbound alarm interface is also known as the TMN Integration Module (TIM) interface.

Southbound interfaces

Navis™ Optical PM - NP manages network elements through southbound interfaces to EMSs. The following sections describe the southbound interfaces.

G7 2.0 CORBA interface to Navis™ Optical EMS

A G7 2.0 CORBA interface is provided to the following CORBA-based EMSs:

- *Navis*™ Optical Element Management System (EMS) (formerly WaveStar SNMS)

Interfaces to other systems

Navis™ Optical PM - NP interacts with some other systems that supply information used to manage the network. The following sections describe the interfaces to other systems.

Performance Monitoring (PM) Export

Performance monitoring data can be exported in files periodically. The file transfer uses FTP over TCP/IP to copy files from the EMSs to a designated workstation.

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Supported element management systems (EMSs)

Introduction

Navis™ Optical PM - NP manages a network by interworking with an element management system (EMS).

List of supported EMSs

Navis™ Optical PM - NP, Release 1.1 interacts with the following Lucent Technologies element management systems (EMSs):

- Navis™ Optical EMS, Release 8.0

Important! Navis™ Optical EMS is the new name for the product formerly known as WaveStar SNMS.

Navis™ Optical EMS

Navis™ Optical EMS manages the following Lucent Technologies network elements:

- *WaveStar*® BandWidth Manager
- *WaveStar* OLS 1.6T (formerly 400G)
- *LambdaRouter*™ 128/256 All-Optical Switch (AOS)
- *LambdaUnite*™ MultiService Switch (MSS)
- *WaveStar* TDM 2.5/10G
- *Metropolis*® Enhanced Optical Networking (EON)
- *Metropolis* DMX Access Multiplexer
- *Metropolis* DMXpress Access Multiplexer

Important! Navis™ Optical EMS is the new name for the product formerly known as WaveStar SNMS.

About EMS cut-through

A “cut-through” interface to the Navis™ Optical EMS GUI is provided. It is accessed by right-clicking on a node and selecting “Login to EMS” from the resulting menu. The cut-through interface allows a user to invoke the EMS view of the node, access more detailed information about the node, and perform a more detailed analysis of an equipment failure.

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Supported network elements

Introduction

This section describes the network elements that are supported byNavis™ Optical PM - NP.

Releases of network elements

For a complete list of supported network elements, refer to Chapter 5, "Provisioning Concepts".

Supported digital links

Introduction

This section describes the digital links that are supported byNavis™ Optical PM - NP.

Releases of digital links

For a complete list of supported digital links, refer to Chapter 5, "Provisioning Concepts".

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Benefits

Introduction

The benefits delivered by Navis™ Optical PM - NP include fast service activation, state-of-the-art provisioning, reduced operating and equipment costs, accurate record keeping, fault and performance monitoring, and fast problem resolution.

These benefits enable service providers to capture market share and offer an improved level of service to customers, and to efficiently manage their resources.

List of benefits

Navis™ Optical PM - NP provides service providers with the ability to:

- Manage multi-technology SONET equipment
- Perform end-to-end SONET circuit/trail provisioning (using automatic, partial, and manual routing)
- Perform end-to-end DWDM optical channel provisioning (using automatic, partial, and manual routing)
- “Single-seat” control of the network
- Management of all EMSs in the network
- Simplify operational complexity using the user-friendly graphical user interface (GUI)
- Maximize bandwidth utilization with flexible provisioning options and scheduled path provisioning features
- Monitor and maintain service quality using performance monitoring
- Use scalable platforms to cost-effectively support different sizes of networks
- Maintain access security and establish a hierarchy of access levels

Customer support

Navis™ Optical PM - NP customers are provided with responsive field support, effective user documentation, and high-quality product training.

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Features per functional area

Overview

Purpose

The features of Navis™ Optical PM - NP are classified into several functional areas. This chapter gives a description of these features within each functional area.

Contents

User support facilities

Introduction

Navis™ Optical PM - NP provides a number of capabilities to facilitate the task of managing network elements.

Graphical user interface (GUI)

Navis™ Optical PM - NP supports the user in his/her daily operations with an easy-to-use graphical user interface (GUI).

Network Map

The main feature of the GUI is a Network Map on which all the network elements and links within the domain of Navis™ Optical PM - NP are displayed. Network elements and links are colored to show the highest severity alarm occurring. The country map that is the background of the Network Map can be changed by the system administrator.

Other user support facilities

Navis™ Optical PM - NP has the following user support facilities:

- Navis™ Optical PM - NP is capable of handling up to 64 simultaneous user logins.
- Screen help is provided for each form.
- On-line access to the product documentation set is integrated into the Navis™ Optical PM - NP software.
- Help facilities (context-sensitive) are supported. Help texts contain context-sensitive hyperlinks.
- A user log provides a record of all operations made by a user. It can be viewed by that user and by the administrator.

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Security issues

Introduction

Navis™ Optical PM - NP security management allows authorized users to have different levels of access.

For each user, Navis™ Optical PM - NP stores a login ID, password, user type, and user profile.

Controlling access

Only authorized users with correct login ID/password combinations are able to access Navis™ Optical PM - NP.

User type

Every user is assigned a user type.

For Navis™ Optical PM - NP, there is only one user type:

- Regular user: For all users

User profile

The user profile controls which of the task groupings a user is allowed to perform. A user can be assigned more than one user profile.

Task groupings

There are eight task groupings that can be assigned to a user profile.

1. Fault Management
2. Configuration Management
3. Performance Monitoring
4. NE Management
5. Sys Admin
6. Fault Management (View Only)
7. Configuration Management (View Only)
8. Performance Monitoring (View Only)

Predefined user profiles

There are four predefined user profiles:

Table 1-1 Predefined user profiles

User profile	Allowed task groupings
Initial	This profile provides access to the following task groupings: • Fault Management • Configuration Management • Performance Monitoring • NE Management
Alarm Management	This profile provides access to the following task groupings: • Fault Management
Provisioning (View Only)	This profile provides access to the following task groupings: • Configuration Management (View Only)
Combined	This profile provides access to the following task groupings: • All Tasks

Customized user profiles

The system administrator can create and assign additional user profiles that are customized to meet the specific needs of their network.

Default behavior

By default, all new users are assigned to the Initial user profile.

Other security features

Features and tasks that are not available to a user are grayed-out.

If a terminal with an active Navis™ Optical PM - NP session experiences a period of inactivity, the terminal is locked. It can be unlocked by entering the password of the current user.

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Configuration management

Introduction

Navis™ Optical PM - NP provides configuration management capabilities and features that are supported by a user-friendly GUI. From the Network Map, a user can complete all the steps needed for end-to-end provisioning, implementation, and record keeping of optical channels, and SONET digital links, paths, and circuits. In addition, automatic circuit/path provisioning using a powerful auto-router algorithm is provided.

Digital link provisioning

Using Navis™ Optical PM - NP, digital links are provisioned using a form accessed from the Network Map.

Digital link provisioning is accomplished by providing the following information on the form:

1. The desired transmission rate of the digital link
2. The two endpoint nodes of the digital link
3. The two endpoint port address of the digital link (Port address information can either be entered manually or it can be obtained using a context-sensitive cut-through to the appropriate EMS where the user can graphically select the desired ports.)

Path and circuit provisioning

Using Navis™ Optical PM - NP, paths and circuits are provisioned using a form accessed from the Network Map.

Path and circuit provisioning can only be done after digital links are in place.

Path and circuit provisioning is accomplished by providing the following information on the form:

1. The desired path level (for example, STS-1 or STS-12c). Navis™ Optical PM - NP displays only those path levels that can be supported by all the digital links involved.
2. The two endpoint nodes of the path or circuit

Three modes for path and circuit provisioning

Navis™ Optical PM - NP provides three modes for path and circuit provisioning: Automatic, Partial, or Manual. The default is Automatic.

For one-way and broadcast paths, only manual route selection is allowed .

- Automatic: The automatic mode provides the most assistance to the user. The user specifies the A-Port and the Z-Port. The system finds the route automatically, based on the available spare capacity between specified points. For auto-ring-protected paths, it is a requirement that the same channels must be used on all of the segments of the path. For line-switched rings, the system attempts to fill up lower channels around the ring first before attempting to use the next channels within a segment. The user can modify the system's recommendations before the route is committed and implemented. Nothing is changed in the network until the user has provided confirmation.
- Partial: The partial mode allows the user to select the link along the path, and optionally, to additionally specify a channel along the path. At a minimum, each link along the path must be specified. In this case, the system selects the channel on each facility.
- Manual: The manual mode provides the most flexibility and works best for Open_Ended_Z paths that are provisioned using one PDH port and two SONET ports on the same network element. In addition to specifying the A/Z Location and the port, the user specifies each link and channel along the path.

Scheduled Provisioning

The Navis™ Optical PM - NP Scheduled Provisioning feature provides the capability to accept customer requests for services to be turned up at a future date. Order and layout data are entered into Navis™ Optical PM - NP at the time the request is received from the customer. At this time, Navis™ Optical PM - NP validates the order and layout data and stores the information in the database, but it does not "reserve" the requested resources. At the designated date and time, the system automatically implements the circuit/facility (that is, sets up the port parameters and/or cross-connections). After the completion of the implementation, the user is able to perform required testing.

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Network-level facilities

Introduction

The network-level facilities include:

- Network element control and resource management
- Reports management

Network element control and resource management

Support of all Lucent Technologies SONET and optical DWDM network elements is provided through the EMSs.

All network elements are managed with synchronized network element equipage and status information.

Resource management of Navis™ Optical EMS-controlled network elements is provided through a “cut-through” from the Navis™ Optical PM - NP to theNavis™ Optical EMS interface.

Reports management

Navis™ Optical PM - NP can provide on-demand, predefined reports containing summary and analysis data. These reports complement the information that is presented on the Network Map, on the forms, and in the dialog boxes.

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Fault management

Introduction

The status together of all components in the network must be closely monitored to anticipate possible degradation of the services, and to react as quickly and adequately as possible to failures. Fault management encompasses the handling of alarms and events.

Navis™ Optical PM - NP includes powerful alarm handling tools that provide alarm notification, fault isolation, failed-facility and affected circuit identification, and alarm logs.

Two modes

The fault management system may be set to operate in one of two modes: alarm mode and service mode.

- Alarm mode focuses on management from the Alarm List.
- Service mode focuses on management from Traffic Correlated Alarm List.

The mode used is set as an installation option.

Network event summaries

Network event summaries provide:

- A summary of alarms for the network, including counts of events by alarm state and other breakdowns
- Alerts for new alarms
- Display of most recently received alarms at base of window

Different network event summaries are provided for the alarm mode and for the service mode.

The network event summaries offer these features:

- A versatile presentation that can be customized by hiding and expanding counts and alarm displays
- Filtered access to Alarm List and Traffic Correlated Alarm List
- Access to complete Alarm List and Traffic Correlated Alarms List

Alarm List

The Alarm List provides:

- A combined list of all network, EMS, and network element alarms
- The ability to filter the Alarm List manually or automatically

- A record of instantaneous, as well as persistent, alarms
- Details of each alarm

The user may:

- Acknowledge one or more selected alarms
- Create trouble ticket(s) for selected alarm(s)
- Attach an additional alarm to an existing trouble ticket
- Configure on-line suppression of secondary alarms

In the service mode, correlated alarms cannot be acknowledged or assigned to a trouble ticket.

Traffic Correlated Alarms List

The Traffic Correlated Alarms List provides the following information:

- Alarms that affect traffic are correlated to network objects.
- Alarms are classified as internal or external to management domain.
- In addition to trails, alarms may be correlated to:
  - Network element and port (failure on network boundary)
  - Network element and card (equipment failure with traffic impact)
- For each alarm, both Fault State and Service Impact are provided.
- Users may configure on-line suppression of secondary faults.
- Customer priority field shows highest priority of the failed client services, and alarms can be sorted by customer priority.

Fault state determination

If an alarm correlates to a trail, a fault state for that trail and its client trails (trails carried by the alarmed trail) is calculated. Fault state is determined using a real-time calculation.

Fault state has the following characteristics:

- Takes account of protection (Multiplex Section Protection [MSP], Multiplex Section-Shared Protection Ring [MS-SPRING], and Subnetwork Connection Protection [SNCP])
- Assumes protection switching is successful and uses end port alarms to identify unsuccessful attempts

- A failed fault state is propagated to client trails, and a degraded fault state is not. For example, if the fault state of a trail becomes failed, the fault states of all of its client trails also become failed. However, if the fault state of a trail becomes “degraded,” the fault states of its client trails remain working (unless affected by another failure).
- Propagates from optical to SONET layers

Fault state values are: Failed, Degraded, and Working.

Service impact

Service impact is assessed based on the fault state of all client services.

Where there are failed client services, the service impact is the worst-case fault state value.

Service Impact values are: Failed, Degraded, No Services, and Calculating

Calculating value is possible where there are many clients.

Where the failed connection in the Traffic Correlated Alarms List is itself, the fault state and service impact values are the same.

Repeated Alarm List

Repeated alarms are marked on the Alarm List with a repeat alarm flag. The Repeated Alarm List is accessed by clicking on this flag.

The Repeated Alarm List does the following:

- Shows details of previous occurrences with the same probable cause and source
- Allows identification of transient alarms

Trouble ticket

Trouble ticketing is available for alarms (in addition to Traffic Correlated Alarms List records).

Trouble tickets have the following characteristics:

- Multiple alarms can be associated with a single trouble ticket.
- An owner can be assigned to resolve the trouble ticket.
- The trouble ticket exists until the associated alarms or Traffic Correlated Alarms List records are deleted (made historic).
- Users may delete trouble tickets.

Generic filtering and sorting

The following filtering options are provided:

- There is an unlimited number of filter keys.
- Filtering is provided for any value of most displayed fields.
- Filtering is provided on user-entered search string.

The following sorting options are provided:

- There is an unlimited number of sort keys.
- Any field may be selected for sorting.
- Sorting may be in ascending or descending order, as specified by the user.

Alarm log

The Alarm Log displays historic records of alarms.

The Alarm Log includes:

- Two views: service and alarm
- Options to print, export, and archive
- Full filtering and sorting facilities (However, there is a restriction on the number of records that can be displayed.)
- Configurable size for alarm storage

When the number of historic records approaches the limit, an alarm is raised.

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Performance monitoring

Introduction

Performance monitoring specifies continuous monitoring of termination points within SONET equipment. This enables the system administrator to:

- initiate proactive maintenance by spotting performance degradation
- precisely monitor the quality of the end-to-end paths

Monitored events

The different events that can be distinguished are described in the following table.

Table 1-2 Monitored events

Event	Indicates that ...
Errored Seconds (ES)	A one second period with one or more errored blocks
Severely errored seconds (SES)	A one second period with more than 30% errored blocks
Unavailability seconds (UAS)	Seconds of unavailability time (10 or more consecutive SES gives UAS)
Background Block Errors (BBE)	An errored block not occurring as part of an SES

Performing monitoring features

The performance monitoring features include:

- The user can specify which counts (15-minute bins or 24-hour bins) are to be taken from which transport facilities (for example, STS-1 or MS) for which network element.
- In case the association between Navis™ Optical PM - NP and the network element fails, Navis™ Optical PM - NP regains information about the lost time by reading the network element's bins for the relevant interval.
- Navis™ Optical PM - NP supports performance monitoring as provided by the particular SONET network elements. This includes ES, SES, UAS, and BBE parameters for OC-48 and OC-192, section, and line termination points.
- The Navis™ Optical PM - NP performance data log provides a minimum capacity of up to 31 days for the 24-hour bins and 24 hours for the 15-minute bins.

- Performance collecting can be enabled/disabled by the user.
- Inspection of snapshots of counts can be done via current registers.
- The user can print completed performance monitoring reports in tabular and graphical format. In this way, the user may easily spot trends in performance behavior.
- The user may select one or two termination points for viewing or printing. Depending on the termination point type, the user may select up to a maximum of four counters (the counters available depend on the termination point type). The information can be displayed in a tabular form or in a graphical form. The display/print covers 31 days for the 24-hour bins and 24 hours for the 15-minute bins.
- Performance monitoring data can be written to tape in ASCII form.
- Navis™ Optical PM - NP stores historical performance monitoring data only, although it can retrieve and present current bin performance monitoring data in user reports. The historical performance monitoring data is retrieved periodically from the network element.

Performance monitoring measurements

Performance monitoring is based on measurements taken on blocks being transported through the network (where a block is a number of consecutive bits). An error event inside a block can be discovered by applying inherent Error Detection Code (for example, Bit Interleaved Parity [BIP]). If an error event occurs in the block, an errored block will be counted.

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Other features

Introduction

This section describes some of the other features of Navis™ Optical PM - NP.

On-line documentation

This feature provides on-line access to the product document set, integrated into the Navis™ Optical PM - NP software.

The documentation set consists of the following documents:

- *Navis™ Optical PM - NP Administration Guide*
- *Navis™ Optical PM - NP Provisioning Guide*
- *Navis™ Optical PM - NP Maintenance Guide*

The on-line documentation is accessed from the Help menu on the Network Map.

Optional features

Introduction

This section describes the optional features of Navis™ Optical PM - NP.

Performance Monitoring (PM) Data Export

Performance Monitoring (PM) Data Export allows performance monitoring information to be stored in a predefined data file. Users with the appropriate privileges can remotely access this data file and use it for a variety of purposes.

ASCII northbound alarm interface

The ASCII northbound alarm interface is an optional interface.

The ASCII northbound alarm interface is used to integrate with other vendor and customer systems. The ASCII northbound alarm interface is also known as the TMN Integration Module (TIM) interface.

Optical Network Navigator (ONN)

Optical Network Navigator (ONN) is software and hardware present in the LambdaRouter that performs management functions (for example, configuration and fault management) on optical connections across a network of LambdaRouters.

An ONN domain is the area of a network that is under the control of an ONN.

This optional feature allows a user to perform network management (including provisioning and fault management) for connections within an ONN domain, from the Navis™ Optical PM - NP Network Map.

This feature also allows a user to control Shared Risk Groups from Navis™ Optical PM - NP. A Shared Risk Group is an identifier used to indicate risk among fibers that use the same conduit. All entities that share the same risk can be grouped into a Shared Risk Group.

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Strategies for ensuring high-availability

Overview

Purpose

Many customers use Navis™ Optical PM - NP in a network where a high degree of system availability is a necessity. This section describes the high-availability strategies that can be used with Navis™ Optical PM - NP to protect against system downtime.

High-availability strategies

The following high-availability strategies are supported:

- Uninterruptible Power Supply (UPS)
- Mirrored disks

Contents

Uninterruptible Power Supply (UPS)

Description

An Uninterruptible Power Supply (UPS) protects against power failures. It is used to protect the server hardware, client hardware, and their essential peripherals from minutes of power failure. In the case of a longer power loss, the UPS enables the system to shut down gracefully.

When to use

The use of UPS is recommended in all cases. However, due to the site-specific nature of power requirements, it is not a mandatory requirement.

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Mirrored disks

Description

Mirrored disks protect against disk failures. When mirrored disks are used, all data is written to two disk systems. In the event of a disk failure, no data is lost and there is no interruption of system operation at the time of the disk failure. The damaged disk will need to be replaced, which may require a system shutdown, but this can be done as part of scheduled maintenance and will not cause any unexpected downtime.

Applications

Overview

Purpose

This section describes the applications supported by Navis™ Optical PM - NP.

Contents

Supported applications

Introduction

Standard applications have been defined for Navis™ Optical PM - NP.

These applications are used to define the hardware platforms for each application.

The hardware platforms for each application are not described in this document.

List of applications

The standard applications are:

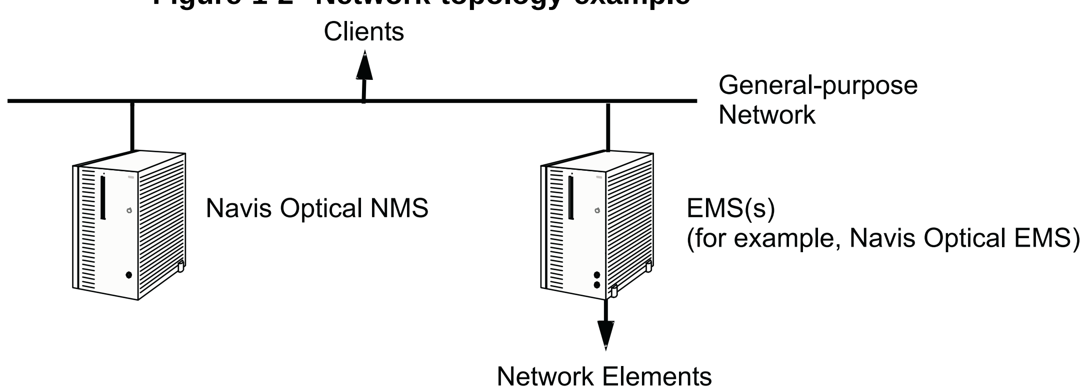
- Small: The small application is a small-scale application.
- Medium: The medium application is a medium-scale application.
- Large: The large application is a large-scale application.

Network topology

In all of the applications, each instance of Navis™ Optical PM - NP and the EMSs is loaded on its own server. Navis™ Optical PM - NP can communicate with all of the EMSs in the network, and with the network elements they manage.

The three applications have the same network topology, but vary in the number of users, EMSs, and network elements that are supported. The following figure illustrates the network topology used by all three applications.

Figure 1-2 Network topology example



Ordering

Overview

Purpose This section describes how to order Navis™ Optical PM - NP.

Contents

How to order Navis™ Optical PM - NP

Overview

This section describes how to order Navis™ Optical PM - NP.

Ordering

Navis™ Optical PM - NP is ordered by calling a Lucent sales representative.

Orderable items

Overview

This section lists the items that are orderable. The lists in this section should be used to help prepare an order before it is actually placed.

Application Software: Core

The following table contains the comcodes for the application software core.

Table 1-3 Comcodes: application software code

Description	Comcode
Navis™ Optical PM - NP Release 1.1 Core KIT: NL R1.0 (includes both DAT and DVD)	109228643
Navis™ Optical PM - NP Release 1.1 Core DAT: NL R1.0	109228627
Navis™ Optical PM - NP Release 1.1 Core DVD: NL R1.0	109228635

Application Software: Optional Features

The following table contains the comcodes for the application software options.

Table 1-4 Comcodes: application software options

Description	Comcode
Navis™ Optical PM - NP Release 1.1 Option: ASCII Northbound Alarm Interface	109228668
Navis™ Optical PM - NP Release 1.1 Option: PM Data Export	109228676

Application Software: Network Element RTU

The following table contains the comcodes for the network element Right to Use (RTUs).

Table 1-5 Comcodes: network element Right to Use

Description	Comcode
Navis™ Optical PM - NP Release 1.1 Network Element RTU: WaveStar TDM 2.5/10G	109228684
Navis™ Optical PM - NP Release 1.1 Network Element RTU: WaveStar BandWidth Manager	109228692
Navis™ Optical PM - NP Release 1.1 Network Element RTU: Metropolis EON	109228700

Table 1-5 Comcodes: network element Right to Use (continued)

Description	Comcode
Navis™ Optical PM - NP Release 1.1 Network Element RTU: Metropolis DMX Access Multiplexer	109228718
Navis™ Optical PM - NP Release 1.1 Network Element RTU: Metropolis DMXpress Access Multiplexer	109228726
Navis™ Optical PM - NP Release 1.1 Network Element RTU: WaveStar OLS 1.6T (formerly 400G)	109229914
Navis™ Optical PM - NP Release 1.1 Network Element RTU: LambdaRouter	109229922
Navis™ Optical PM - NP Release 1.1 Network Element RTU: LambdaRouter with ONN	109229930
Navis™ Optical PM - NP Release 1.1 Network Element RTU: LambdaUnite MSS	109229948
Navis™ Optical PM - NP Release 1.1 Network Element RTU: Black Box (unmanaged object)	109229955

Documentation

The following table contains the comcodes for the Navis™ Optical PM - NP user documentation.

Table 1-6 Comcodes: User documentation

Description	Comcode
Navis™ Optical PM - NP Release 1.1 Getting Started Guide - English (365-314-105R1.1)	109294223
Navis™ Optical PM - NP Release 1.1 Provisioning Guide - English (365-314-106R1.1)	109294231
Navis™ Optical PM - NP Release 1.1 Maintenance Guide - English (365-314-107R1.1)	109294249
Navis™ Optical PM - NP Release 1.1 Administration Guide - English (365-314-108R1.1)	109294629
Navis™ Optical PM - NP Release 1.1 User Documentation CD-ROM - English (365-314-109R1.1)	109294637

Maintenance The following table contains the comcodes for the maintenance packages.

Table 1-7 Comcodes: Maintenance packages

Description	Comcode
Navis™ Optical PM - NP Release 1.1 Maintenance Fee (with one upgrade a year)	109232033
Navis™ Optical PM - NP Release 1.1 Maintenance Fee (without upgrades)	109232041

Product support

Overview

Purpose

This chapter describes product support available for Navis™ Optical PM - NP.

Contents

Technical Assistance

Introduction

Lucent Technologies is committed to providing excellence in technical support for its products.

A support structure is ready and available to resolve any technical issue related to Navis™ Optical PM - NP.

Getting help

In the continental United States, when you need additional technical assistance, the Lucent Technologies Global TSS Contact Center is your first point of contact. Technical assistance is available 24 hours a day, 7 days a week. Contact the Global TSS Contact Center at 866-LUCENT8 (866-582-3688).

Outside the continental United States, contact your Local Customer Support (LCS) or the support organization designated by your Lucent customer team representative. If you are unsure of who to call, contact the Global TSS Contact Center at 630-224-4672.

Local support procedures

Some customers have established their own support procedures that involve escalation within their own companies. In these cases, be sure to follow the procedures established by your company.

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User documentation

Introduction

This information product is part of a set of documents that supports Navis™ Optical PM - NP.

List of documents

The document set that supports Navis™ Optical PM - NP comprises:

1. *Navis™ Optical PM - NP Getting Started Guide,* (365-314-104) provides information needed when you are learning how to use the Navis™ Optical PM - NP software. It describes how to start and stop Navis™ Optical PM - NP, how to use the software, and how to interpret the graphical user interface.
   This document includes tasks and conceptual information.
2. *Navis™ Optical PM - NP Provisioning Guide*, (365-314-100R1.0) instructs users how to use Navis™ Optical PM - NP to provision and manage a network.
   This document includes tasks and conceptual information.
3. *Navis™ Optical PM - NP Maintenance Guide*, (365-314-102R1.0) instructs users on how to maintain Navis™ Optical PM - NP and the network.
   This document includes tasks and conceptual information.
4. *Navis™ Optical PM - NP Administration Guide,* (365-314-102R1.0) instructs users on how to administer Navis™ Optical PM - NP and the network.
   This document includes tasks and conceptual information.

On-line documentation

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

1. An on-line version, in HTML format, of this document set is provided as part of theNavis™ Optical PM - NP software.
2. An on-line version, in HTML format, of this document set is available on CD-ROM.
   Navis™ Optical PM - NP User Documentation CD-ROM, (365-314-103R1.0) includes the full set of documents listed above.

Screen help

The Navis™ Optical PM - NP software includes on-line help for each window, which describes the purpose of the window, each of the fields, and each of the buttons.

How to order

To order Navis™ Optical PM - NP information products, do one of the following:

- Contact your Lucent Technologies customer team representative.
- Contact the Lucent Technologies at:
  - From the United States, call 888-LUCENT8 (888-582-3688), prompt 1.
  - From Canada, call 317-322-6619.
  - From Europe, the Middle East, and Africa, call 317-322-6416.
  - From Asia, the Pacific Region, China, the Caribbean, and Latin America, call 317-322-6411.

□

2 The Navis™ Optical PM - NP Provisioning Process

Overview

Purpose

This chapter provides an overview of the Navis™ Optical PM - NP provisioning process.

Important note

This document instructs users on how to provision with Navis™ Optical PM - NP.

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 adminstrator 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.

Contents

What is provisioning?

Overview

Provisioning, as it pertains to Navis™ Optical PM - NP, is the process of establishing a connection through a Navis™ Optical PM - NP managed network and setting appropriate transmission parameters for a digital link, optical link, optical multiplex section, optical channel trails, and circuit/trails for a specified SONET 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 PM - NP allows users to perform the following actions for provisioning:

- **Add**: users can provision new digital links, circuit/trails and optical layers from Navis™ Optical PM - NP.
- **Disconnect**: users can delete existing digital links, circuit/trails and optical layers from Navis™ Optical PM - NP.
- **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 PM - NP will not create any implementation commands.

□

Terminology overview

Overview

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

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

Aggregate

An aggregate is a collection of one or more network elements or aggregates. An aggregate is represented by a single icon on the Navis™ Optical PM - NP Network Map.

Area

Networks managed by Navis™ Optical PM - NP 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 PM - NP Network Map.

Black box

A black box is a functional unit in a network displayed on the Navis™ Optical PM - NP Network Map that Navis™ Optical PM - NP cannot monitor or control (also known as noncontrolled network element).

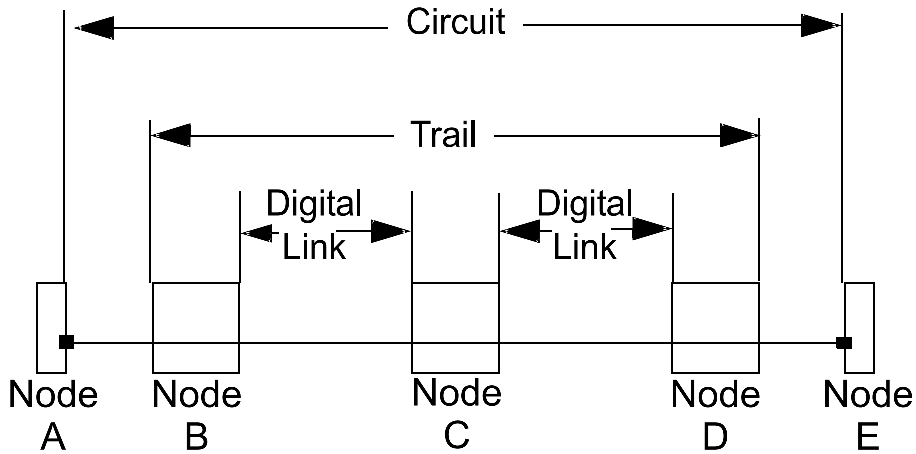
Channel

When either a digital link or trail is channelized, it is subdivided into channels. For time division multiplexing 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 PM - NP 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.

Circuit A circuit is a concatenation of link connections and sub-network connections to provide an end-to-end service to a customer. A circuit is identified by a rate at which the service is provided. The "rate" of a circuit is defined by ITU and ANSI standards for SONET and Asynchronous circuit. An SONET trail is provisioned over SONET link connections and over SONET cross-connects in Navis™ Optical PM - NP managed network elements.

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

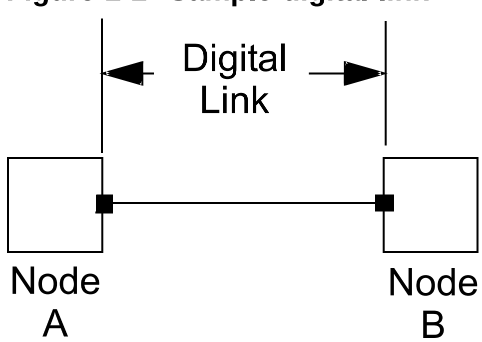
Figure 2-1 A circuit in relation to a trail and digital links



Digital link 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.

The following figure shows a digital link.

Figure 2-2 Sample digital link



Equipment

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

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 PM - NP 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.

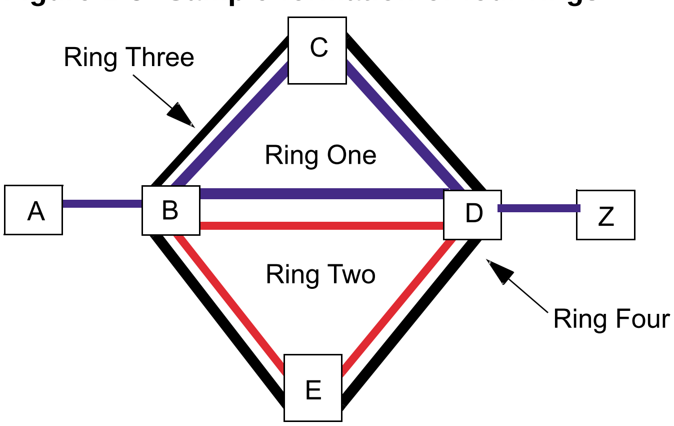
Optical network navigator

The Optical Network Navigator (ONN) is the software and hardware present in the LambdaRouter network element which performs management functions on optical connections across a network of LambdaRouters. The ONN system consists of a number of ONN Modules, each on a different LambdaRouter.

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 2-3 Sample formation of four rings



Shared risk group

A shared risk group is an identifier indicating risk among fibers using the same conduit. All entities that share the same risk can be grouped into a risk group.

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

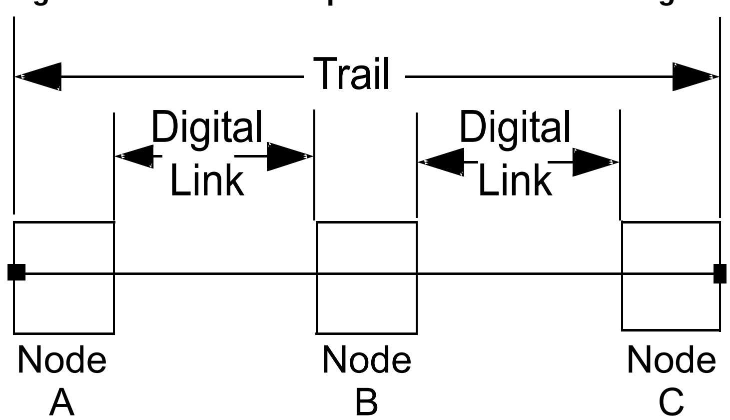
A trail is a logical connection between two adjacent, or nonadjacent network element. It may traverse one or more channels and supports add/drop capability along the path.

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 2-4 Relationship between a trail and digital links



Virtual concatenation

Virtual concatenation is a standards compliant mechanism for efficiently transporting payloads which do not neatly fit into a standard SONET-sized container across a SONET network. It works by distributing the payload across a number of standard SONET containers, transporting the containers independently across the network and then re-assembling the payload a the other side.

□

Task information

Overview

This section describes the task information appearing within this guide. This information is extremely useful when attempting to perform the actual action of provisioning with Navis™ Optical PM - NP.

Location

Refer to Chapter 3: Network Element Configuration Tasks for task information related to network elements; refer to Chapter 4: Provisioning Tasks for task information regarding digital links, connections, optical layers, subnets, virtual concatenation groups, and shared risk groups.

☐

Conceptual information

Overview

This section describes the conceptual information appearing within this guide. This information is useful in understanding the 'big picture' of a given feature as well as its technicalities.

Location

Refer to Chapter 5: Provisioning Concepts for conceptual background information related to network elements, digital links, connections, optical layers, subnets, virtual concatenation groups, and shared risk groups.

□

3 Network Element Configuration Tasks

Overview

Purpose

After a database synchronization with the element management system, Navis™ Optical PM - NP automatically adds all the network elements managed by the EMS to the Navis™ Optical PM - NP Network Map and stores them in the database. Navis™ Optical PM - NP allows users to discover, through a database synchronization, network elements managed by Lucent or non-Lucent EMSs.

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

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 PM - NP configuration. When the limit is reached, an error message will appear.
- When a network element is first added to Navis™ Optical PM - NP, 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 PM - NP does not support the following characters: space ( ), quote (″), percent (%), star (*), dot (.), backslash (\), and pipe (|). Only upper case alphabetical characters are supported.
- 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).

Contents

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 the Navis™ Optical EMS) are not added to Navis™ Optical PM - NP; they are automatically discovered.

Contents

Controlled network element support

Definition

Controlled network elements are network elements that can be controlled by Navis™ Optical PM - NP.

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 PM - NP network elements

For a complete list of controlled network elements supported by Navis™ Optical PM - NP, refer to Chapter 5: Provisioning Concepts.

Icons for controlled network elements

Controlled network elements managed by Navis™ Optical PM - NP 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 Chapter 5: Provisioning Concepts.

Additional information

For additional information about controlled network elements, refer to Chapter 5: Provisioning Concepts of this guide.

□

Add a controlled network element

Purpose Use this task to add a controlled network element to the Navis™ Optical PM - NP Network Map.

Important! Navis™ Optical EMS controlled network elements are not added to Navis™ Optical PM - NP; they are automatically discovered by Navis™ Optical PM - NP during start-up or a database synchronization with an EMS. Examples of network elements automatically discovered by Navis™ Optical PM - NP include: the WaveStar BandWidth Manager and LambdaRouter.

Task Perform the following task to add a controlled network element to the Navis™ Optical PM - NP Network Map.

1 From the Network Map, select **Configuration > Network Element > Add > (Select an NE Type from the list)**.

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 task to synchronize a network element.

Synchronizing a network element is a recommended step when performing many provisioning tasks with Navis™ Optical PM - NP 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 graphical user interface (GUI) fields, such as ones used for port selection, will automatically present up-to-date 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 PM - NP database. To synchronize all network element appearing on the Network Map, perform a database synchronization from the EMS-level. Refer to the ***Navis™ Optical PM - NP Administration Guide*** for details on performing an EMS-level database synchronization for network elements. Note that this procedure does not apply to certain type network elements, such as black boxes.

Task Perform the following task to synchronize a network element with the Navis™ Optical PM - NP 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 selected network element.

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 task to update the location of a network element on the Navis™ Optical PM - NP Network Map. This task applies to both controlled and noncontrolled network elements that appear on the Navis™ Optical PM - NP 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 PM - NP database by a user with appropriate privileges, such as a system administrator. Refer to the ***Navis™ Optical PM - NP Administration Guide*** for details on updating a network element's location in the database.

Task Perform the following task to update the location of a network element on the Navis™ Optical PM - NP 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 task to delete a controlled network element from the Navis™ Optical PM - NP Network Map.

> **Important!** This procedure only deletes a network element from the Navis™ Optical PM - NP 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 PM - NP.

Task Perform the following task to delete a controlled network element from the Network Map.

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 and equipment.

Contents

Noncontrolled network element support

Definition

Noncontrolled network elements are network elements that cannot be controlled by Navis™ Optical PM - NP.

Characteristics

Noncontrolled network elements:

- Support only manual provisioning
- Do not report alarms
- Are listed in the database as part of provisioning records

Noncontrolled Navis™ Optical PM - NP network elements

For a complete list of noncontrolled network elements supported by Navis™ Optical PM - NP, refer to Chapter 5: Provisioning Concepts.

Icons for noncontrolled network elements

Noncontrolled network elements managed by Navis™ Optical PM - NP 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 Chapter 5: Provisioning Concepts.

Additional information

For additional information about noncontrolled network elements, refer to Chapter 5: Provisioning Concepts of this guide.

□

Add a black box

Purpose Use this task to add a black box to the Navis™ Optical PM - NP Network Map.

Task Perform 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 task to view all currently existing black boxes known to Navis™ Optical PM - NP.

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

Task Perform the following task 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. You can search for multiple related black boxes via 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 task 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 task 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

Add equipment

Purpose Use this task to add equipment to the Navis™ Optical PM - NP Network Map.

Important! Locations created as "Equipment" do not appear as icons on the Network Map. They are only listed in the Location Reference Table. When used as the termination of a digital link or connection, they appear on the Graphical Layout to clarify the overall assignment.

Task Perform 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 task 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 task to delete equipment from the Navis™ Optical PM - NP Network Map.

Task Perform the following task to delete equipment from the Navis™ Optical PM - NP 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

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4 Provisioning Tasks

Overview

Purpose

This chapter presents provisioning tasks usable with Navis™ Optical PM - NP.

Contents

Section I: Digital Links

Overview

Purpose

This section discusses provisioning tasks associated with digital links as they relate to Navis™ Optical PM - NP.

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 unprotected or protected. When protected by another link, it is called automatic protection switching (APS).

Supported digital links

Refer to Chapter 5: Provisioning Concepts of this guide for descriptions of the digital links supported by Navis™ Optical PM - NP.

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 PM - NP, refer to Chapter 5: Provisioning Concepts of this guide.

Contents

Add a digital link between two network elements

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

Before you begin Before adding a digital link between two network elements, note the network element capabilities with regards to the types of digital links you can use and the protection offered. Although Navis™ Optical PM - NP will automatically show only the digital links usable with a particular network element pair, Chapter 5 of this guide presents the digital link and protection support per network element so that provisioning can be planned.

Important! For details about provisioning an E_Link and use of Ethernet cards, refer to Section II: Digital Links of Chapter 5: Provisioning Concepts.

Task Perform 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 3: Network Element Configuration Tasks 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.

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5 Under the **Essentials** tab, specify a circuit ID within the last field of the **CKT/Trail ID** field. The previous two fields should be prepopulated with the two previously selected network elements while the third field specifies the selected digital rate.

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6 Press the **A port** button. The **A Location** field should have been prepopulated with one of the selected network elements.

Result:

The Port Selection window appears.

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

Result:

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

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8 Repeat Steps 6 and 7 to add the **Z port** (of course, exchange any instances of **A port** with **Z port**). Note that you have to select a port that is different than the port selected in Step 7.

Result:

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

---

9 Verify that **Order Action** is set to **Add**.

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10 Press **OK**.

Result:

The graphical layout form appears.

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11 Note the information pertaining to the newly created digital link and 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.

END OF STEPS

Add a 1+1 APS protected digital link

Purpose Use this task to provision a 1+1 APS protected digital link.

Task Perform the following task to provision a 1+1 APS protected digital link. This task assumes that two network elements already exist on the Network Map.

1 From the Network Map, select a network element. Be sure to select a network element type that supports 1+1 protection. Refer to Chapter 5: Provisioning Concepts for a list of network elements that support 1+1 protection.

Result:

The selected network element is highlighted.

2 Synchronize the network element’s ports. Refer to the network element synchronization task in Chapter 3: Network Element Configuration Tasks 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, specify a circuit ID within the last field of the **CKT/Trail ID** field. The previous two fields should be prepopulated with the two previously selected network elements while the third field presents the selected digital rate.

6 For **Service Path**, press the **A port** button. The **A Location** field should have been prepopulated with one of the selected network elements.

Result:

The Port Selection window appears.

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

Result:

The selected port appears in the field 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**). Note that you have to select a port that is different than the port selected in Step 7.

Result:

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

9 For **APS Protected?**, select **1+1 Protected**.

Result:

The interface alters to display a new panel (**Protection Path**) and field (**APS Type**).

10 For **Protection Path**, press the **A Protect Port** button.

Result:

The Port Selection window appears.

11 Select a port for the protection path and press **OK**.

Result:

The selected port appears in the field as the **A Protect Port**.

12 Repeat Steps 10 and 11 to add the **Z Protect Port** (of course, exchange any instances of **A Protect Port** with **Z Protect Port**).

Result:

The selected port appears as the **Z Protect Port**.

13 For **APS Type**, select either **UNI** (unidirectional) or **BI** (bidirectional).

14 Verify that **Order Action** is set to **Add**.

15 Press **OK**.

Result:

The graphical layout form appears.

16 Note the information pertaining to the newly created digital link and 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

Display protection group names associated with digital links

Purpose Use this task to display a list of protection group names associated with the APS digital links existing on the Network Map.

In addition to the procedure described below, APS 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 Perform the following task to display a list of protection group names associated APS 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

Display digital link specifications

Purpose Use this task to display the specifications and graphical layout of an existing digital link.

Task Perform the following task to display the specifications and graphical layout of an existing digital link.

1 From the Network Map, select a digital link.

Result:

The digital link becomes highlighted.

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 view the specifications for.

Result:

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

5 Select **Actions > Graphical Layout**.

Result:

The Graphical Layout form appears. This form presents the graphical layout and specifications associated with the digital link.

END OF STEPS

Add a regenerator to a digital link

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

Task Perform the following task to add a regenerator to a digital link. This task assumes that a digital link has already been provisioned and appears on the Network Map.

1 From the Network Map, select a digital link.

Result:

The digital link becomes highlighted.

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 task to delete a regenerator from a digital link. This task assumes that a digital link has already been provisioned and appears on the Network Map.

1 From the Network Map, select a digital link.

Result:

The digital link becomes highlighted.

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 task to disconnect a digital link.

> **Important!** Deletion of a digital link is only permitted if there are no in-effect, 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.

Task

Perform the following task 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, specify 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:

Navis™ Optical PM - NP 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 is a concatenation of link connections and sub-network connections to provide an end-to-end service to a customer. A circuit is identified by a rate at which the service is provided. The "rate" of a circuit is defined by ITU and ANSI standards for SONET and Asynchronous circuit. An SONET trail is provisioned over SONET link connections and over SONET cross-connects in Navis™ Optical PM - NP managed network elements.

Supported connections

Refer to Chapter 5: Provisioning Concepts of this guide for descriptions of the connection types supported by Navis™ Optical PM - NP.

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 PM - NP, refer to Chapter 5: Provisioning Concepts of this guide.

Contents

Add a circuit between two controlled network elements

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

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

- A digital link must exist between the network elements before attempting to provision a circuit between the two.

Task Perform 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 3: Network Element Configuration Tasks 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, specify 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 5 and 6 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 **Order Action** is set at **Add**.

9 Press **OK**.

Result:

The graphical layout form appears.

10 Press **OK**.

Result:

A confirmation window appears.

11 Press **OK**.

Result:

The circuit is created.

END OF STEPS

Add a circuit between two noncontrolled network elements

Purpose Use this task 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 Perform the following task to add a circuit between two noncontrolled network elements.

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

Result:

The selections become highlighted.

2 Synchronize the network elements' ports and cross-connects. Refer to the network element synchronization task in Chapter 3: Network Element Configuration Tasks 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, specify 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 5 and 6 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 Under the Parameters tab, verify that **Order Action** is set at **Add**.

9 Press **OK**.

Result:

The graphical layout form appears.

10 Press **OK**.

Result:

A confirmation window appears.

11 Press **OK**.

Result:

The circuit is created.

END OF STEPS

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

Purpose

Use this task 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.
- 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 task 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 3 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, specify 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 5 and 6 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 Under the Parameters tab, verify that **Order Action** is set at **Add**.

9 Press **OK**.

Result:

The graphical layout form appears.

10 Press **OK**.

Result:

A confirmation window appears.

11 Press **OK**.

Result:

The circuit is created.

END OF STEPS

Display circuit list

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

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

Task Perform the following task 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 to narrow the display criteria.

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 task to copy a circuit using the Clone feature.

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

Result:

A query box form appears.

2 Specify 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

Modify circuit order transmission parameters

Purpose Use this task to modify a circuit's 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 task to disconnect a circuit.

Before you begin When attempting to disconnect a circuit, note the following items:

- 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 customers location containing the backbone.
- You may not disconnect the first circuit in Navis™ Optical PM - NP.
- 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.
- If the circuit to be deleted is part of a broadcast circuit, the circuit that was added last ***must*** be disconnected first.

Task Perform 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.

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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 task to perform a virtual disconnect on a circuit.

Task Perform 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 associated with optical layers as they relate to Navis™ Optical PM - NP.

Definition

An optical layer refers to an existing optical multiplex section, optical link or optical channel trail that connects particular types of network elements on the Navis™ Optical PM - NP Network Map. An optical link can connect a network element with a DWDM network element, a DWDM network element with a LambdaRouter, two LambdaRouters together, or a LambdaRouter with a network element. Unlike an optical multiplex section, however, an optical link can not join two DWDM network elements.

Supported optical layers

Refer to Chapter 5: Provisioning Concepts of this guide for descriptions of the optical layers supported by Navis™ Optical PM - NP.

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 system errors.

Additional information

For additional information about optical layers as they relate to Navis™ Optical PM - NP, refer to Chapter 5: Provisioning Concepts of this guide.

Contents

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 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

Perform the following task 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 3: Network Element Configuration Tasks 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, specify an ID within the last field of the **CKT/Trail ID** field. The previous two fields should be prepopulated with the two previously selected network elements while the third field specifies the OMS name.

5 Press the **A port** button. The **A Location** field should have been prepopulated with one of the selected network elements.

Result:

The Port Selection 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 5 and 6 to add the **Z port** (of course, exchange any instances of **A port** with **Z port**). Note that you have to select a port that is different than the port selected in Step 6.

Result:

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

8 Verify that **Order Action** is set to **Add**.

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 link

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

Task Perform the following task 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 or a LambdaRouter. However, only one network element you select can be a DWDM.

Result:

The two selected network elements become highlighted.

2 Synchronize each network element's ports and cross-connects. Refer to the network element synchronization task in Chapter 3: Network Element Configuration Tasks 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, specify an ID within the last field of the **CKT/Trail ID** field. The previous two fields should be prepopulated with the two previously selected network elements while the third field specifies the OL name.

5 Press the **A port** button. The **A Location** field should have been prepopulated with one of the selected network elements.

Result:

The Port Selection 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 5 and 6 to add the **Z port** (of course, exchange any instances of **A port** with **Z port**). Note that you have to select a port that is different than the port selected in Step 6.

Result:

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

8 Verify that **Order Action** is set to **Add**.

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 task to create an optical channel trail. An optical channel trail transverses the connections established by either an OMS or an OMS and optical link combination. As such, an optical channel trail can span such combinations as two DWDMs (in the case of a single OMS)/network element (optical link)/DWDM (OMS)/DWDM (optical link)/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.
- There must be the desired number of optical links provisioned prior to creating an optical channel trail.
- Optical channel SNCP is supported for LambdaRouter 256/128.
- Cascaded SNCPs are not supported.

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

1 From the Network Map, select an existing OMS.

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, specify an ID within the last field of the **CKT/Trail ID** field. The previous two fields should be prepopulated with the two previously selected network elements while the third field specifies the OCh trail name.

4 Press the **A port** button. The **A Location** field should have been prepopulated with one of the selected network elements.

Result:

The Port Selection 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 4 and 5 to add the **Z port** (of course, exchange any instances of **A port** with **Z port**). Note that you have to select a port that is different than the port selected in Step 5.

Result:

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

7 Verify that **Order Action** is set to **Add**.

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 WaveStar OLS 1.6T

When provisioning an optical channel with a fixed connection span on WaveStar OLS 1.6T, 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 WaveStar OLS 1.6T, you must do the following:

1. Synchronize the ports of the WaveStar OLS 1.6T (database synchronization). Refer to Chapter 3 of this guide for information on how to perform a database synchronization.
2. Synchronize the cross-connects of the WaveStar OLS 1.6T (database synchronization). Refer to Chapter 3 of this guide for information on how to perform a database synchronization.
3. Provision the optical links between the network elements and WaveStar OLS 1.6T. Refer to the task within this section for details.
4. Provision the optical multiplex section between the two WaveStar OLS 1.6Ts. 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 OMS.

Task Perform 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.

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.

END OF STEPS

Delete an optical amplifier from an optical multiplex section

Purpose Use this task to delete an optical amplifier from an OMS.

Task Perform 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.

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.

END OF STEPS

Insert an optical layer into a digital link

Purpose

Use this task 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 APS-protected digital link, it is not necessary to have an optical layer both in the service link and protection link. One of the links does not have to 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 PM - NP 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 task to create a digital link through an optical channel trail.

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

1 From the Network Map, select the terminating 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, specify an ID within the last field of the **CKT/Trail ID** field. The previous two fields should be prepopulated with the two previously selected network elements while the third field specifies the OCh trail name.

4 Press the **A port** button. The **A Location** field should have been prepopulated with one of the selected network elements.

Result:

The Port Selection 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 4 and 5 to add the **Z port** (of course, exchange any instances of **A port** with **Z port**). Note that you have to select a port that is different than the port selected in Step 5.

Result:

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

7 Verify that **Order Action** is set to **Add**.

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.

END OF STEPS

Disconnect an optical channel trail

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

Task Perform the following task 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 task to disconnect an optical link.

Task Perform the following task 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 task to disconnect an OMS.

Task Perform the following task 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: Lucent Optical Network Navigation System

Overview

Purpose

This section discusses the provisioning tasks associated with the Lucent Optical Network Navigation System (ONN) Release 1.0.

Note: The Lucent ONNS is a limited-availability feature of Navis™ Optical PM - NP.

Definition

The Lucent ONNS is the software and hardware present in the LambdaRouter network element which performs management functions, such as configuration management and fault management, on optical connections across a network of LambdaRouters.

The Lucent ONNS system consists of a number of Lucent ONNS modules, each on a different LambdaRouter.

Icons for ONN

Navis™ Optical PM - NP uses a unique icon to identify that a LambdaRouter has been associated to a signalling element. For additional information regarding what icons map to the ONN, refer to Chapter 5: Provisioning Concepts located within this guide.

Before you begin

Refer to the individual tasks contained within this section for important "Before You Begin" information. Review the Lucent ONNS section of Chapter 5: Provisioning Concepts for details about Lucent ONNS provisioning features.

Note: the Lucent ONNS Domain will always be prepopulated (and uneditable) as there is only one Lucent ONNS domain currently supported.

> **Important!** When a LambdaRouter associated with Lucent ONNS is deleted from Navis™ Optical PM - NP, the system will also delete all associations and data shared between Navis™ Optical PM - NP and the Lucent ONNS associated with the LambdaRouter.

Additional information

For additional information about the ONN, refer to Chapter 5: Provisioning Concepts of this guide.

Contents

Establish a connection with the ONN

Purpose Use this task to establish a connection between Navis™ Optical PM - NP and the ONN.

Before you begin Before you perform this task, refer to the Lucent ONNS section of Chapter 5: Provisioning Concepts for important details regarding the features discussed in this task.

Task Perform the following task to establish a connection between Navis™ Optical PM - NP and the ONN.

1 On the Network Map, select **Configuration > Lucent ONNS > Session Parameters > Add**.

Result:

The Add Lucent ONNS 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 PM - NP can use for Lucent ONNS connection requests.

6 In the **Lucent ONNS 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 alphanumeric string up to eight characters) at the **Password** prompt.

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

9 Press **OK**.

Result:

A connection between Navis™ Optical PM - NP and the Lucent ONNS is established.

END OF STEPS

Start communication with the ONN

Purpose Use this task to start communication with the ONN.

Before you begin Before you perform this task, refer to the Lucent ONNS section of Chapter 5: Provisioning Concepts for important details regarding the features discussed in this task.

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

1 From the Network Map, select a LambdaRouter network element icon associated with the Lucent ONNS but not 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 **Session > Manage Lucent ONNS > Start Lucent ONNS Communications**.

Result:

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

END OF STEPS

Stop communication with the ONN

Purpose Use this task to stop communication with the ONN.

Before you begin Before you perform this task, refer to the Lucent ONNS section of Chapter 5: Provisioning Concepts for important details regarding the features discussed in this task.

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

1 From the Network Map, select a LambdaRouter 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 **Session > Manage Lucent ONNS > Stop Lucent ONNS Communications**.

Result:

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

END OF STEPS

Modify Lucent ONNS session parameters

Purpose Use this task to modify the Lucent ONNS session parameters of a network element that is DOWN so as to re-establish communication with the Lucent ONNS using the new Lucent ONNS session parameters.

> **Important!** After performing this task, Navis™ Optical PM - NP will not start communication with the ONN. The user must start communication using the "Start Communication" option from the node menu. Navis™ Optical PM - NP will then use the newly specified session parameters (changed through this task) and establish communication between the Lucent ONNS and Navis™ Optical PM - NP.

Before you begin Before you perform this task, refer to the Lucent ONNS section of Chapter 5: Provisioning Concepts for important details regarding the features discussed in this task.

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

1 From the Network Map, select a LambdaRouter/Lucent ONNS 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 **Session > Manage Lucent ONNS > Display/Modify Session Parameters**.

Result:

The Lucent ONNS Session Parameters form appears.

Note: a user may also reach this form by selecting from the Network Map: Configuration > Lucent ONNS > Session Parameters > Add/Modify. From this alternate approach, the user can modify the Lucent ONNS session parameters for multiple LambdaRouters within the same form.

---

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 Lucent ONNS session parameter is modified.

END OF STEPS

View Lucent ONNS network elements

Purpose Use this task to view only the Lucent ONNS network elements on the Network Map. This task is useful when you wish to quickly view only the Lucent ONNS network elements on a Network Map crowded with many network element types.

Before you begin Before you perform this task, refer to the Lucent ONNS section of Chapter 5: Provisioning Concepts for important details regarding the features discussed in this task.

Task Perform the following task to view only the Lucent ONNS network elements on the Network Map. This task assumes that the Network Map view already has an expanded view of an area.

1. From the Network Map, select **View > Lucent ONNS network elements**.

   Result:

   The Expanded Area window of the Network Map alters so as to show only the ONN-related network elements.

END OF STEPS

Note

The user can return to the Network Map's default view by selecting **View > Network View Reset**.

View Lucent ONNS switch connection spans

Purpose

Use this task to view the Lucent ONNS switch connection spans appearing on the Network Map.

Through this task, Navis™ Optical PM - NP will display all the fixed connection spans and optic links based on whether they are:

- allocated and unallocated to the ONN
- terminating on a LambdaRouter or any SONET network element
- not terminating on DWDMs.

Before you begin

Before you perform this task, refer to the Lucent ONNS section of Chapter 5: Provisioning Concepts for important details regarding the features discussed in this task.

Task

Perform the following task to view the Lucent ONNS switch connections on the Network Map.

1 From the Network Map, select **View > Link View > Lucent ONNS Switch Connection Spans**.

Result:

The Expanded Area window of the Network Map alters so as to show the Lucent ONNS switch connection spans.

END OF STEPS

Note

The user can return to the Network Map’s default view by selecting **View > Network View Reset**.

□

View and modify bandwidth allocation by trail

Purpose Use this task to view and modify the bandwidth allocation parameters by trail.

Before you begin Before you perform this task, refer tothe Lucent ONNS section of Chapter 5: Provisioning Concepts for important details regarding the features discussed in this task.

Task Perform the following task to modify the bandwidth allocation parameters by trail.

1 From the Network Map, select **Configuration > Lucent ONNS > Allocate Bandwidth**.

Result:

The Bandwidth Allocation Query Box appears.

Users may also access this form by right-clicking on an Lucent ONNS network element and selecting Link > Ckt/Trail List.

2 From the **Trails** tab, select a trail type for **Trail**.

Result:

The Trail field contains the selection.

3 Press **CKT/Trail ID**.

Result:

The Selection box appears.

4 Select a trail.

Result:

The trail becomes highlighted.

5 Press **OK**.

Result:

The **CKT/Trail ID** field contains the selected trail.

6 Press **OK**.

Result:

The Bandwidth Allocation window appears listing the bandwidth allocation details for the selected trail.

7 Select and edit a single editable field.

Result:

The edited field remains active.

8 Select **Actions > Allocate**.

Result:

The field is updated to include the edit.

9 Repeat Steps 7 and 8 to edit any additional fields.

10 Press **OK**.

Result:

The bandwidth allocation is modified.

END OF STEPS

View and modify bandwidth allocation by port

Purpose Use this task to view and modify the bandwidth allocation parameters by port.

Before you begin Before you perform this task, refer to the Lucent ONNS section of Chapter 5: Provisioning Concepts for important details regarding the features discussed in this task.

Task Perform the following task to view and modify the bandwidth allocation parameters by port.

1 From the Network Map, select **Configuration > Lucent ONNS > Allocate Bandwidth**.

Result:

The Bandwidth Allocation Query Box appears.

Users may also access this form by right-clicking on an Lucent ONNS network element and selecting “Session.”

2 Select the **Ports** tab.

Result:

The Ports tab appears.

3 Press the **Node** button.

Result:

The Selection Box form appears.

4 Select a network element.

Result:

The network element becomes highlighted.

5 Press **OK**.

Result:

The **Node** field contains the selected network element.

6 Press **OK**.

Result:

The Bandwidth Allocation window appears listing the bandwidth allocation details for the selected network element.

7 Select and edit a single editable field.

Result:

The edited field remains active.

8 Select **Actions > Allocate**.

Result:

The field is updated to include the edit.

9 Repeat Steps 7 and 8 to edit any additional fields.

10 Press **OK**.

Result:

The bandwidth allocation is modified.

END OF STEPS

Provision an Lucent ONNS connection

Overview

For information on provisioning an Lucent ONNS connection, refer to the Lucent ONNS section of Chapter 5: Provisioning Concepts.

□

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 PM - NP subnet support allows users to create rings on the Network Map. In terms of the Navis™ Optical PM - NP, 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 PM - NP allows users to create rings either automatically or manually. Refer to Chapter 5: Provisioning Concepts for details about rings.

Supported subnets

Navis™ Optical PM - NP supports two broad categories of rings:

- bidirectional line switched rings (BLSR).
- unidirectional path switched rings (UPSR).

In addition to the BLSR and UPSR ring types, Navis™ Optical PM - NP also provides support for subtending and virtual rings. These two type rings are dependent on BLSR and UPSR ring types and can not exist independently from one of those types.

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 PM - NP, refer to Chapter 5: Provisioning Concepts of this guide.

For information on how to create subtending and virtual rings, refer to Chapter 5: Provisioning Concepts of this guide.

For information on using Navis™ Optical PM - NP's hairpinning feature, refer to Chapter 5: Provisioning Concepts of this guide.

Contents

Add a BLSR (automatic)

Purpose

Use this task to automatically add a bidirectional line-switched ring (BLSR) to the Navis™ Optical PM - NP Network Map.

Before you begin

Before you attempt to add a BLSR to the Network Map automatically, note the following items:

- A ring is uniquely identified by the digital link rates forming the ring. An OC-48 BLSR and OC-192 BLSR that share the same exact network elements are different from one another due to their rates.
- A maximum of 16 network elements are allowed.
- The ring forming digital links are all of the same level.
- The ring is closed.
- No black boxes are included.
- The ring forming digital links have identical (2-fiber or 4-fiber) protection groups.
- All the network elements in the ring can interwork in a BLSR-forming capacity.
- Within each ring, the same timeslot and channel must be used.

Task

Perform the following task to automatically add a BLSR to the Network Map. This task will show you how to add a BLSR consisting of three network elements. Note that a BLSR can consist of up to 16 network elements.

1 From the Network Map, select a network element. Be sure the selected network element has BLSR forming capabilities.

Result:

The selected network element is highlighted.

2 Synchronize the network element's ports. Refer to the network element synchronization task in Chapter 3: Network Element Configuration Tasks for details on how to perform this task.

Result:

The network element is synchronized.

3 Select a second network element and repeat Step 2. Be sure that the network element can interwork with the first network element in a BLSR-forming capacity.

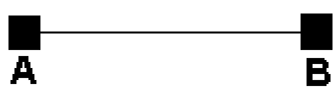
Result:

The network element is synchronized.

4 Provision a digital link between the two network elements. Refer to Section I: Digital Links in this chapter for information on how to provision a digital link between two network elements.

Result:

A digital link joins the two network elements (network element A and network element B).



5 From the Network Map, select a third network element and repeat Step 2.

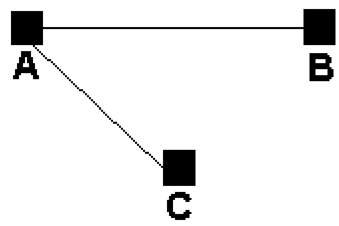
Result:

The network element is synchronized.

6 Provision a digital link between this network element (network element C) and network element A. Note that the digital link you provision in this step must be identical in rate to the digital link you provisioned in Step 4.

Result:

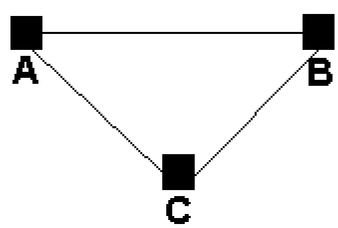
A digital link joins the two network elements (network element A and network element C).



7 Provision a digital link between network element C and network element B being sure to form an enclosed ring. Note that the digital link you provision in this step must be identical in rate to the digital link you provisioned in Steps 4 and 6.

Result:

Assuming the conditions mentioned in the "Before You Begin" section are met, Navis™ Optical PM - NP automatically creates a BLSR and adds its name (automatically generated) to the Subnet List.



END OF STEPS

Add a BLSR (manual)

Purpose Use this task to manually add a bidirectional line-switched ring (BLSR) to the Navis™ Optical PM - NP Network Map.

Before you begin Before you attempt to manually add a BLSR to the Network Map, note the items presented in the “Add a BLSR (automatic)” task.

Task Perform the following task to manually add a BLSR to the Network Map. This task assumes that the appropriate network elements and digital links, for forming a BLSR, have already been provisioned.

1 From the Network Map, select **Configuration > Subnet > Add > LSR > (select a rate)**. The rate you select must be compatible with the network elements and digital links you are planning to use in creating the BLSR.

Result:

The Subnet Manual Creation form appears.

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

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 subwindow'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 BLSR.

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

6 Press **OK**.

Result:

The BLSR is created.

END OF STEPS

Add a UPSR (automatic)

Purpose Use this task to automatically add a unidirectional line-switched ring (UPSR) to the Navis™ Optical PM - NP Network Map.

Before you begin Before you attempt to add a UPSR to the Network Map automatically, note the following items:

- A ring is uniquely identified by the digital link rates forming the ring. An OC-48 UPSR and OC-192 UPSR that share the same exact network elements are different from one another due to their rates.
- A maximum of 65 network elements are allowed.
- The ring forming digital links are all of the same level.
- The ring is closed.
- No black boxes are included.
- The ring forming digital links have identical (2-fiber or 4-fiber) protection groups.
- All the network elements in the ring can interwork in a UPSR-forming capacity.
- Only homogenous network elements are allowed in automatically forming a UPSR. Note, however, that the Metropolis DMX and DMXpress network elements are considered as the same network element type in forming a UPSR.
- Within each ring, the same timeslot and channel must be used.

Task Perform the following task to automatically add a BLSR to the Network Map. This task will show you how to add a UPSR consisting of three network elements. Note, however, that a BLSR can consist of up to 65 network elements.

1 From the Network Map, select a network element. Be sure the selected network element has UPSR forming capability.

Result:

The selected network element is highlighted.

2 Synchronize the network element's ports. Refer to the network element synchronization task in Chapter 3: Network Element Configuration Tasks for details on how to perform this task.

Result:

The network element is synchronized.

3 Select a second network element and repeat Step 2. Be sure that the network element can interwork with the first network element in a UPSR-forming capacity,

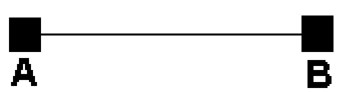
Result:

The network element is synchronized.

4 Provision a digital link between the two network elements. Refer to Section I: Digital Links in this chapter for information on how to provision a digital link between two network elements.

Result:

A digital link joins the two network elements (network element A and network element B).



5 From the Network Map, select a third network element that is compatible with the other two network elements and repeat Step 2.

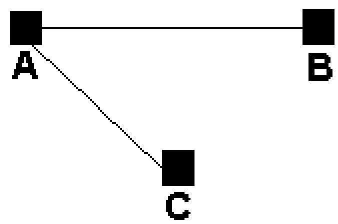
Result:

The network element is synchronized.

6 Provision a digital link between this network element (network element C) and network element A. Note that the digital link you provision in this step must be identical in rate to the digital link you provisioned in Step 4.

Result:

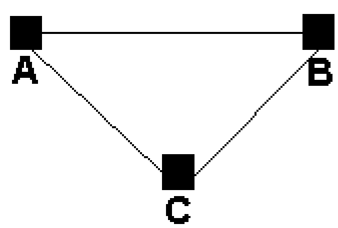
A digital link joins the two network elements (network element A and network element C).



7 Provision a digital link between network element C and network element B being sure to form an enclosed ring. Note that the digital link you provision in this step must be identical in rate to the digital link you provisioned in Steps 4 and 6.

Result:

Assuming the conditions mentioned in the “Before You Begin” section are met, Navis™ Optical PM - NP automatically creates a UPSR and adds its name (automatically generated) to the Subnet List.



END OF STEPS

Add a UPSR (manual)

Purpose Use this task to manually add a unidirectional line-switched ring (UPSR) to the Navis™ Optical PM - NP Network Map.

Before you begin Before you attempt to manually add a UPSR to the Network Map, note the items presented in the "Add a UPSR (automatic)" task.

Task Perform the following task to manually add a UPSR to the Network Map. This task assumes that the appropriate network elements and digital links, for forming a UPSR, have already been provisioned.

1 From the Network Map, select **Configuration > Subnet > Add > PSR > (select a rate)**. The rate you select must be compatible with the network elements and digital links you are planning to use to create the ring.

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 subwindow'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 UPSR.

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

6 Press **OK**.

Result:

The UPSR is created.

END OF STEPS

□

Modify a ring name

Purpose After successful ring creation, Navis™ Optical PM - NP will generate a unique name to identify the ring. Use this task to modify the name of an existing ring.

Task Perform the following task to modify the name of an existing ring. This task assumes that a ring 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 Specify a new subnet ID in the **Subnet ID** field. You must assign a unique ID.

5 Click **OK**.

Result:

The Network Map displays the new ring name.

END OF STEPS

Modify a ring

Purpose Use this task to modify an existing ring.

Task

Important! No modification of a virtual ring is allowed after the ring is created. To make any changes to an already existing virtual ring, the user must delete the ring and create it again.

Perform the following task to modify an existing ring.

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 ring.

5 Click **OK**.

Result:

The Network Map reflect any modifications made to the ring.

END OF STEPS

Delete a ring

Purpose Use this task to delete a ring from the Navis™ Optical PM - NP Network Map.

Before you begin Before you attempt to delete a ring from the Network Map, note the following items:

- Navis™ Optical PM - NP allows for 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.
- If the user disconnects a digital link that is part of a ring forming loop, Navis™ Optical PM - NP will delete the ring and remove the ring name from the list of ring names.
- Navis™ Optical PM - NP allows users to delete a virtual ring without deleting the STS-1 paths as long as there are no VT1.5 circuits riding on the virtual ring. If any of the STS-1 paths that are part of a virtual ring are deleted, the virtual ring is automatically deleted. If any of the rings forming the virtual ring are deleted, the virtual ring is deleted.

Task Perform the following task to delete a ring from the Network Map.

1 Select a digital link that is part of the ring 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, specify 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:

Navis™ Optical PM - NP disconnects the digital link provided that it is not in-effect (IE) or pending.

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 Navis™ Optical PM - NP deletes the ring because there is no longer an enclosed ring.

END OF STEPS

Section VI: Virtual Concatenation Groups

Overview

Purpose

This section describes the provisioning tasks associated with virtual concatenation groups (VCG).

Definition

Virtual concatenation is a standards compliant inverse multiplexing protocol which creates a virtual concatenated entity which is transported by STS-Ns across the network. The created STS-Ns are standards compliant. Additional STSs can be added, 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 PM - NP, refer to Chapter 5: Provisioning Concepts of this guide.

Contents

Add a virtual concatenation group

Purpose Use this task to add a VCG to the Navis™ Optical PM - NP Network Map.

Task Perform the following task to add a VCG to the Navis™ Optical PM - NP Network Map.

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

   Result:

   The Add VCG 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, either the A or Z field 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 will contain 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 port.

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

Result:

The Z Location and Z Port fields specify a network element and port.

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

12 Specify the **Required Capacity**.

13 Select **LCAS Flag** if applicable (this option must be supported by the network elements select for the A and Z Location). Refer to Chapter 5: Provisioning Concepts for details regarding LCAS.

14 Press **OK**.

Result:

The VCG is created.

Note: If **Graphical Layout** is checked, the Graphical Layout screen will appear. Press **Approve** to dismiss the screen.

END OF STEPS

Modify a virtual concatenation group

Purpose Use this task to modify an existing VCG.

Task Perform the following task to modify an existing VCG.

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

Result:

The VCG List form appears.

2 Select a VCG name from the **VCG Name** field.

Result:

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

3 Select **Actions > Graphical Layout**.

Result:

The VCG Graphical Layout form appears.

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

Result:

The Modify VCG form appears.

5 Perform edits on the applicable fields.

6 Press **OK**.

Result:

The VCG is modified.

END OF STEPS

Delete a virtual concatenation group

Purpose Use this task to delete an existing VCG.

Before you begin Before attempting to delete a VCG, verify that the VCG to be deleted does not have any STS-Ns associated with it.

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

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

Result:

The VCG List form appears.

2 Select a VCG name from the **VCG Name** field.

Result:

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

3 Select **Actions > Delete**.

Result:

The VCG 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 PM - NP 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 optical multiplex sections.
- Users are not allowed to modify or delete a shared risk group ID when it is associated with a digital link, optical link, or optical multiplex section.

Contents

☐

Create a shared risk group ID

Purpose Use this task 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 Perform the following task to create a shared risk group ID.

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

Result:

The Add Shared Risk Group form appears.

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

3 In the **SRG ID** field, specify 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 task 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 Perform 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, specify an identification (or specify ***** 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 Perform 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 **Ckt/Trail ID** field, select a rate.

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

4 In the **Order Action** field, select an order action.

5 Press **OK**.

Result:

The Circuit Trail List window appears.

6 From the list, select a circuit/trail identification.

Result:

The selected identification is highlighted.

7 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 Perform 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, specify 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 Use this task 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 Perform 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.

7 Using the window's arrow icons, associate a shared risk group with the digital link by moving the SRG from the **Non-associated SRGs** panel to the **Associated SRG** panel.

Result:

The SRG is moved between panels.

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 Use the following task 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 Perform 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 by moving the SRG from the **Associated SRG** panel to the **Non-associated SRGs** panel.

Result:

The SRG is moved between panels.

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 Perform 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, specify an existing shared risk group identification. If you specify 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, specify 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 task to delete a shared risk group ID.

Task Perform 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, specify an existing shared risk group identification. If you specify 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

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5 Provisioning Concepts

Overview

Purpose

This chapter provides conceptual material related to network elements, digital links, connections, optical layers, the Optical Network Navigator, subnets, virtual concatenation groups, and shared risk groups with Navis™ Optical PM - NP. This information is meant to compliment and provide detail for the task-related provisioning information presented in the previous chapters.

Contents

Section I: Network Elements

Overview

Purpose

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

Contents

Controlled network elements

Definition

Controlled network elements are network elements that can be controlled by Navis™ Optical PM - NP.

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 controllable network element).
- They report and show alarms.

Control techniques

Navis™ Optical PM - NP supported network elements are controlled indirectly through the Navis™ Optical EMS.

Controlled Navis™ Optical PM - NP network elements

The Navis™ Optical PM - NP products listed within the following table are controllable network elements.

Table 5-1 Controlled network elements supported by Navis™ Optical PM - NP

Network Element	Features	Navis™ Optical PM - NP Model
LambdaRouter All Optical Switch (AOS) 128 Release 2.0	* 2.5G, 10G OEO packs. * 1+1 network protection. * No performance monitoring support.	LAMBDA_ROUTER_128
LambdaRouter AOS 256 Release 3.0		LAMBDA_ROUTER_256

Table 5-1 Controlled network elements supported by Navis™ Optical PM - NP (continued)

LambdaUnite MultiService Switch (MSS) Release 2.0	* OC-192, OC-48 ports. * SNC/I and SNC/N protected cross-connects. * Two-fiber BLSR/MSSPRING on OC192 and OC48 interfaces. * 1:2 bridging. * 1 Gb Ethernet interface. * Operate/release protection switching. * Performance monitoring data collection, TCA generation and TCA threshold provisioning for all monitoring points.	LAMBDA_UNITE
LambdaUnite MSS Release 2.1	* OC-12, OC-3 optical interface ports. * 1+1 line protection (APS) on OC12 and C3 (both UNI and BI APS switch types). * Four-fiber BLSR/MSSPRING on OC192 optical interface ports.	
Metropolis EON Dual-Facing Terminal * Release 8.0.2; controlled by Navis™ Optical EMS. Node types include: DUAL	* Three types - end terminal, ring terminal and regenerator. * Sixteen wavelengths. * OUPSR (similar to ORS in 1.6T) protection. * Support all monitoring points (performance monitoring counters and TCAs).	EON_DF
Metropolis EON Single-Ended Terminal * Release 8.0.2; controlled by Navis™ Optical EMS. 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
Metropolis EON Repeater * Release 8.0.2; controlled by Navis™ Optical EMS. Node types include: Repeater		EON_RPTR

Table 5-1 Controlled network elements supported by Navis™ Optical PM - NP (continued)

Metropolis DMXpress Access Multiplexer, Release 1.0	* OC-48, DS3, DS1 ports. * STS-12c, STS-3c, STS-1 and VT1.5 (two way only) XCs. * Gb Ethernet ports. * Support all monitoring points (performance monitoring counters and TCAs).	DMXPRESS
Metropolis DMX Access Multiplexer, Release 2.0, 2.1	* OC-192 (high speed side only), OC-48 (high and low speed sides), OC-12 (low speed side only), OC-3 (low speed side only). * 1+1 line protection. * STS-12c, STS-3c, STS-1 and VT1.5 (two way only). * DS-3/EC-1, DS1 provisioning. * Gb Ethernet ports. * Support all monitoring points (performance monitoring counters and TCAs).	DMX
WaveStar Bandwidth Manager, Release 4.1	* Increased capacity. * New switch fabric shelves. * Supports all SONET performance monitoring points (performance monitoring counters and TCAs).	BWM
WaveStar OLS 1.6T, Release 6.1 Two-Fiber End Terminal	* In-service upgrade from Release 6.0 to 6.1. * Port AID changes for 10GMUX OTU drop side.	WS_OLS1.6T
WaveStar OLS 1.6T, Repeater Release 6.1. Two-Fiber Repeater		WS_OLS1.6T_ REPEATER
WaveStar TDM 2.5G/10G, Release 6.0 (OC-192 two-fiber)	* OC-192, OC-48, DS3/EC-1 ports. * 1+1 line protection, UPSR. * STS-48c, STS-12c, STS-3c and STS-1 (two way only) XCs. * Gb Ethernet ports. * Support all monitoring points (performance monitoring counters and TCAs).	2_5G_10G

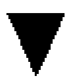
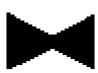
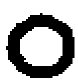
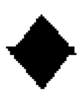
Adding controlled network elements to Navis™ Optical PM - NP

After a database synchronization with the EMS, Navis™ Optical PM - NP automatically adds all the network elements managed by the EMS to the Network Map and stores them in the database. Navis™ Optical PM - NP allows the user, with appropriate privileges, to add a new network element through the Configuration menu item of the Network Map. Refer to Chapter 3: Network Element Configuration Tasks for details on adding network elements to the Navis™ Optical PM - NP Network Map.

Icons for controlled network elements

Controlled network elements managed by Navis™ Optical PM - NP 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. The following table describes the different controlled network element icons used on the Network Map.

Table 5-2 Controlled network element icons

	LAMBDA_ROUTER_256; LAMBDA_UNITE; BWM; 2_5G_10G.
	EON_SF
	(All regenerators, repeaters and optical amplifiers); WS_OLS1.6T_ REPEATER; WS_OLS1.6TL_REPEATER; EON_REPEATER.
	Aggregate.
	WS_OLS1.6T.
	DMXPRESS; DMX; EON_DF.

LambdaUnite MSS support

The LambdaUnite MultiService Switching (MSS) network element is a flexible single product covering 40G and 10G SONET-based network elements. The product supports terminal multiplexers, add-drop-multiplexers, and local cross connect configurations on all line rates within the same common subrack and software load.

LambdaUnite MSS supports unidirectional and bidirectional cross-connections for OC3, OC12, OC48, and OC192. It supports bridging and facility rolling for each of the supported cross-connection rates. It also support broadcast option 1:2 unidirectional cross-connection.

Each physical port can be set in one of three different modes:

- AUTO (automatic): alarms are suppressed until an incoming signal is detected, the mode of the port switches automatically to MON.
- MON (monitored): all alarms that originate in the physical section termination function are reported.
- NMON (non-monitored): all alarms that originate in the physical section termination function are suppressed.

Note: each path termination port can be either MON or NMON.

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 STS-N link.

Metropolis EON support

The Metropolis EON is a modular ring-based system designed for metropolitan and regional applications. Metropolis EON provides efficient support of Metropolis DWDM rings and increased capacity over OLS 40G network elements.

Navis™ Optical PM - NP’s support for Metropolis EON includes:

- dual-facing DWDMs
- single-ended DWDMs
- repeaters.

Additional information

For additional information about controlled network elements, refer to Chapter 3: Network Element Configuration Tasks.

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Noncontrolled network elements

Definition

Noncontrolled network elements are network elements that cannot be controlled by Navis™ Optical PM - NP.

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 PM - NP network elements

The following Navis™ Optical PM - NP products are noncontrollable network elements:

Table 5-3 Noncontrolled network elements supported by Navis™ Optical PM - NP

Network Element	Navis™ Optical PM - NP Model
Black Box	BBOX
Customer Equipment	EQPT

Adding noncontrolled network elements to Navis™ Optical PM - NP

The same information that applies to controlled network element applies to noncontrolled network elements.

Icons for noncontrolled network elements

> **Important!** Locations created as "Equipment" do not appear as icons on the Network Map. They are only listed in the Location Reference Table. When used as the termination of a digital link or connection, they appear on the Graphical Layout to clarify the overall assignment.

Noncontrolled network elements managed by Navis™ Optical PM - NP 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. The following table describes the different noncontrolled network element icons used on the Network Map.

Table 5-4 Noncontrolled network element icons

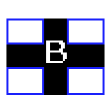
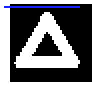
	BBOX

Table 5-4 Noncontrolled network element icons (continued)

	EQPT

Additional information

For additional information about controlled network elements, refer to Chapter 3: Network Element Configuration Tasks found within this guide.

Section II: Digital Links

Overview

Purpose

This section provides conceptual information pertaining to the digital links supported by Navis™ Optical PM - NP.

Contents

Digital link support

Overview This section provides an overview of the digital link support provided by Navis™ Optical PM - NP.

Definition Digital Links are transport facilities that are assignable to high order and low order paths to carry customer services. In Navis™ Optical PM - NP, digital links are always modelled as bidirectional links that carry two-way traffic. The regenerator sections within the multiplexer section layer are not explicitly provisioned; however, Navis™ Optical PM - NP can add regenerators to the digital links and monitor alarms at regenerator sections. All digital links are channelized in Navis™ Optical PM - NP so as to be assignable to carry SONET trails.

Protection Digital links can be unprotected or protected. When protected by another link, it is called automatic protection switching (APS).

When APS is 1+1, the protection link is dedicated to the service link and cannot carry preemptible extra traffic.

Navis™ Optical PM - NP supports two-fiber and four-fiber bidirectional line switched ring (BLSR) and unidirectional path switched ring (UPSR) protection. Refer to Section V: Subnets for information about rings.

Supported digital links The following table presents the digital links supported by each network element supported by Navis™ Optical PM - NP.

Table 5-5 Supported digital links per supported network element

Network Element	OC-192	OC-48	OC-12	OC-3	DS3/EC-1	DS1	E_Link
Black Box	Y	Y	Y	Y	Y	Y	Y
LambdaUnite MSS	Y	Y	Y	Y	—	—	Y
Metropolis DMX	Y	Y	Y	Y	Y	Y	Y
Metropolis DMXpress	—	Y	—	—	Y	Y	Y
WaveStar BandWidth Manager	Y	Y	Y	Y	Y	—	—
WaveStar TDM 2.5G/10G	Y	Y	Y	Y	Y	—	Y

External circuit types

The following table presents the external circuit types associated with each supported digital link.

Table 5-6 Supported digital link external circuit types

Digital Link	External Circuit Type
OC-192	OC192
OC-48	OC48
OC-12	OC12
OC-3	OC3
DS3	T3
EC-1	EC1
DS1	T1

Supported digital transmission rates

This section presents the digital transmission rates of the digital links supported by Navis™ Optical PM - NP. For information about the digital transmission rates of the connections supported Navis™ Optical PM - NP, refer to Section III: Connections.

The following table presents the digital transmission rates supported by Navis™ Optical PM - NP.

Table 5-7 Supported digital transmission rates for digital links

Digital Link	Transmission Rate Mb/s
OC-192	9,953.28
OC-48	2,488.32
OC-12	622.0
OC-3	155.52
EC-1	51.84
DS3	44.736
DS1	1.544

Channel support

Overview

This section provides an overview of the channel support provided by Navis™ Optical PM - NP.

Definition

For time division multiplexing 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 PM - NP for use during circuit/trail provisioning. When channels are created 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 PM - NP creates channel termination records with a fixed number of channels depending on the channel type specified during provisioning.

Supported channels

The following table presents the channels supported by each network element supported by Navis™ Optical PM - NP.

Table 5-8 Supported channel types per supported network elements

Network Element	STS-192c	STS-48c	STS-12c	STS-3c	STS-1	T3	T1
Black Box	Y	Y	Y	Y	Y	Y	Y
LambdaUnite MSS	Y	Y	Y	Y	Y	Y	—
Metropolis DMX	—	—	Y	Y	Y	Y	Y
Metropolis DMXpress	—	—	Y	Y	Y	Y	Y
WaveStar BandWidth Manager	—	Y	Y	Y	Y	Y	—
WaveStar TDM 2.5G/10G	—	Y	Y	Y	Y	Y	—

Creation of channel types

Depending on the capability of the terminating network elements, Navis™ Optical PM - NP creates channel types as specified in the following table.

Table 5-9 Channels created per supported digital links

Digital Link	Channel types created	Number of channels
OC-192	STS-192c	1
	STS-48c	4
	STS-12c	16
	STS-3c	64
	STS-1	192
	VT1.5 (line side only)	28 x 192
OC-48	STS-48c	1
	STS-12c	4
	STS-3c	16
	STS-1	48
	VT1.5 (line side only)	28 x 48
OC-12	STS-12c	1
	STS-3c	4
	STS-1	12
OC-3	STS-3c	1
	STS-1	3
DS3	T3	1
EC-1	STS-1	1
DS1	T1	1

Provisioning concepts

Overview

This section presents information for provisioning digital links with Navis™ Optical PM - NP.

Provisioning support

Navis™ Optical PM - NP supports the following digital link provisioning scenarios:

- an unprotected link that connects two supported network elements.
- an unprotected link that connects one supported network element and one black box.
- an unprotected link that connects two black boxes.

Note: Each end point network element may be part of a ring.

To provision a digital link, a user would first select two network elements from the Network Map and then select **Configuration > Digital Link > Add**. Because physical connectivities have to exist before a digital link is provisioned, four main tasks are performed whenever a user provisions a digital link in Navis™ Optical PM - NP:

1. The digital link is inventoried in Navis™ Optical PM - NP so that the system can create appropriate channels to provision higher order trails or circuits.
2. The corresponding ports at the link's A and Z ends are put in-service (or verified to be in-service) to enable reporting of alarms on them.
3. If the digital link is APS protected, the APS protection is verified by the EMS and the protection switch status data on the appropriate ports are stored in Navis™ Optical PM - NP.

Provisioning order action

The following order actions are applicable for digital link provisioning:

- **Add (A)**: used when a digital link is first added to the network from Navis™ Optical PM - NP. 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 a digital link from the Navis™ Optical PM - NP 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 PM - NP, 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 a digital link is already put in-service through the EMS or from a local craft terminal and needs to be inventoried in Navis™ Optical PM - NP. 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 APS protection (when specified) exists.

E_Link provisioning

Navis™ Optical PM - NP supports the provisioning of E_Links between the LAN port of a Gigabit Ethernet card or Fast Ethernet card of a given network element to a black box or equipment. The E_Link has no specific transport rate value and 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. VCG for Gigabit Ethernet card and Fast Ethernet card is supported.

User can provision an E_Link using the same Network Map menu items as they would use to provision a normal digital link. LAN ports used in E_Link provisioning can either be on a Gigabit Ethernet card or Fast Ethernet card.

Navis™ Optical PM - NP maintains a history of disconnected E_Links for a duration set during Navis™ Optical PM - NP installation. In the absence of an installation set, Navis™ Optical PM - NP will keep the disconnected link for a period of 24 hours.

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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 automatic protection switching (APS). Navis™ Optical PM - NP supports 1+1 APS protection. When APS is 1+1, the protection link is dedicated to the working (service) link and cannot carry preemptible extra traffic.

Automatic protection switching

Navis™ Optical PM - NP allows users to provision 1+1 linear APS protected OC-3, -12, -48, or -192 digital links between two network elements that support the rate or between a network element and a black box/equipment or between two black boxes. 1+1 linear APS is supported on DS3/EC1 digital links. APS types include:

UNI: Navis™ Optical PM - NP supports single ended APS digital links. On the user interface, single ended is called UNI.

BI: Navis™ Optical PM - NP supports dual ended APS digital links. On the user interface, dual ended is called BI.

Supported protection types

The following table presents the protection types supported by each network element supported by Navis™ Optical PM - NP.

Table 5-10 Supported protection types per supported network elements

Network Element	4F BLSROC-192	4F BLSROC-48	2F BLSROC-192	2F BLSROC-48	OC-192	OC-48	OC-12	OC-3
Black Box	Y	Y	Y	Y	1+1	1+1	1+1	1+1
LambdaUnite MSS	Y	—	Y	Y	1+1	1+1	1+1	1+1
Metropolis DMX	—	—	—	—	—	1+1	1+1	1+1
Metropolis DMXpress	—	—	—	—	—	1+1	—	—
WaveStar BandWidth Manager	Y	Y	Y	Y	1+1 (Uni)	1+1 (Uni)	1+1 (Uni)	1+1 (Uni)

Table 5-10 Supported protection types per supported network elements (continued)

WaveStar TDM 2.5G/10G	—	—	Y	Y	—	1+1	1+1	1+1

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Section III: Connections

Overview

Purpose

This section describes the provisioning concepts associated with connections supported by Navis™ Optical PM - NP.

Contents

Connection support

Overview

This section provides an overview of connections and the support provided by Navis™ Optical PM - NP.

Definition

A circuit provides a service to a customer at a specified rate. Specifically, a circuit is a concatenation of link connections and sub-network connections to provide an end-to-end service to a customer. A circuit is identified by a rate at which the service is provided. The “rate” of a circuit is defined by ITU and ANSI standards for SONET and Asynchronous circuit. An SONET trail is provisioned over SONET link connections and over SONET cross-connects in Navis™ Optical PM - NP managed network elements.

A trail, often referred to as a path, 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 PM - NP, if one or both end ports of a trail are 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 SONET and not sub-structured to carry low order traffic, then the trail is called as an “non-assignable” entity. Certain trails, such as STS-192c, STS-48c, STS-12c, STS-3c, T3, and T1 are always non-assignable. Navis™ Optical PM - NP creates channels for assignable trails in order to carry the low order trails or asynchronous circuits.

Supported circuit/trail types

Navis™ Optical PM - NP supports the following circuit/trail types:

- STS-192c
- STS-48c
- STS-12c
- STS-3c
- STS-1
- VT1.5
- T3
- T1
- VCG

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 PM - NP. The network element by itself may support more rates than are supported with Navis™ Optical PM - NP.

The cross-connect types and rates for each network element supported by Navis™ Optical PM - NP are shown in the following table.

Table 5-11 Cross-connect types and rates per supported network element

Network Element	VT1.5	STS-1	STS-3c	STS-12c	STS-48c	STS-192c
Black box	T	T	T	T	T	T
LambdaUnite MSS	-	T	T	T	T	T
Metropolis DMX	T	T	T	T	T	-
Metropolis DMXpress	T	T	T	T	-	-
WaveStar BandWidth Manager	-	T	T	T	T	-
WaveStar TDM 2.5G/10G	-	T	T	T	T	-

Supported UPSR protection

This section presents the rates at which UPSR protection is supported for one-way (O), two-way (T), and broadcast (B) circuits in Navis™ Optical PM - NP.

Note: The network element by itself may support more rates than are supported with Navis™ Optical PM - NP.

The rates at which UPSR cross-connects are supported by Navis™ Optical PM - NP are shown in the following table.

Table 5-12 UPSR protection supported by Navis™ Optical PM - NP

Network Element	VT1.5	STS-1	STS-3c	STS-12c	STS-48c	STS-192c
LambdaUnite MSS	-	T	T	T	T	T
Metropolis DMX	T	T	T	T	T	-
Metropolis DMXpress	T	T	T	T	-	-
WaveStar BandWidth Manager	-	T	T	T	T	-

Table 5-12 UPSR protection supported by Navis™ Optical PM - NP (continued)

Network Element	VT1.5	STS-1	STS-3c	STS-12c	STS-48c	STS-192c
WaveStar TDM 2.5G/10G	-	-	T	T	T	-

Gigabit Ethernet support

Navis™ Optical PM - NP supports the provisioning of an E_Link between a black box and the LAN ports of the network elements that support Gigabit Ethernet cards. The E_Link can be considered as an Ethernet digital link with an unspecified signal rate.

Navis™ Optical PM - NP also support the provisioning of a “virtual concanenation group” (VCG) for the WAN ports of the network elements that support the Gigabit Ethernet card. As with GbE support, the VCG can be considered as a virtual concatenation of STS-N using a grouping concept. The provisioning of STS-Ns used in a VCG is essentially the same as the provisioning of any other STS-N in Navis™ Optical PM - NP with the exception of port specifications, association of the STS-N to a VCG, specifying the capacity of the VCG, and of preserving the port address ordinal symmetry for the “Dual-Ended VCG.” The capacity can be specified either as rate or number of STS-Ns in the VCG.

Performance monitoring support

The Navis™ Optical PM - NP performance monitoring feature is based on trails and transport connections. Trails must be provisioned by configuration management on the network elements before performance monitoring can be started on the Navis™ Optical PM - NP for the trail.

For performance monitoring, the ITU-T definition of trail is used. According to the ITU-T definition, two access points delimit a trail, one at each end of the trail. The trail ends are associated with network connections. Although performance monitoring is based on a trail, the monitored points do not have to necessarily be the trail end points. Supported network elements support performance monitoring on Trail Termination Points (TTP) and Connection Termination Points (CTP).

Supported trail types are supported at the network element level, from where the Navis™ Optical PM - NP can obtain and display performance monitoring data. This assumes that the associated performance monitors on the trail have been started at the network element from the EMS.

Provisioning options

Navis™ Optical PM - NP supports the following features for circuit/trail provisioning:

- **Circuit/trail type**: two way supported (one-way and broadcast circuits are not supported).
- **Order Type**: add, disconnect, rearrange, and virtual disconnect supported.
- **Circuit ID Format**: Free, M1400, and Telecordia formats supported.
- **Path Selection**: Auto, Partial, and Manual supported.
- **Configuration**: Point-to-Point (Linear), APS, 1+1 Protection, bidirectional line switched rings, and unidirectional line switched rings.
- **Routing**: supported with exclusion constraints.
- **Merging**: supported.
- **Fault management**: supported.
- **Performance monitoring**: supported.

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Provisioning controls

Overview

This section presents information for provisioning connections with Navis™ Optical PM - NP. More specialized information pertaining to particular connection types supported by Navis™ Optical PM - NP can be found in subsequent sections.

Circuit/trail provisioning modes

Navis™ Optical PM - NP allows users to provision a circuit/trail in one of the three modes: auto, manual or partial.

- **Auto**: Navis™ Optical PM - NP 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 a trail, Navis™ Optical PM - NP will find the shortest route using the channels from each of the links in the path.
- **Manual**: the user can select each link and a channel in the selected link along the path, and Navis™ Optical PM - NP will build the layout based on the user selection(s). In the case of a trail, the user can select each link from the Network Map that contains one or more 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 channels in the selected digital link. The user can select one of the channels from the list. The selected 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 any one of the contained channels.
- **Partial**: the user picks all the links along the path of the circuit/trail. The channels within the link are picked by Navis™ Optical PM - NP (broadcast and one-way circuits are exceptions). In the case of a trail, the user needs to select only the digital links that are displayed in the Facility Channel List screen. Navis™ Optical PM - NP will automatically pick an appropriate channel in the selected digital link and populate it in the provisioning screen.

Provisioning controls

Navis™ Optical PM - NP provides the following controls, through the various 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). The default value is “two way”.
- **Ignore Alarms**: when this option is set to “Yes in the “auto” provisioning mode, Navis™ Optical PM - NP 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” (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 PM - NP 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. The user may specify - Ring Protected, 1+1 Protected, A End Open, and Z End Open. 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 alphanumeric ’/’, ’-’, ’_’ 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 PM - NP users and will not be used during restoration nor for notifying users on any priority basis. The Customer Priority is a number up to two 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.
- **Implement**: allows users to instruct Navis™ Optical PM - NP 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.
- **Comments**: an optional field that allows users to enter some free formatted text pertaining to the circuit/trail.

Specifying path trace identifiers

Users can specify two path trace identifiers (PTIs) for each trail - one for A-Z direction and the other for Z-A direction. PTIs can be either a specific string of up to 62 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.

The Path Trace ID cannot be left blank when provisioning any type of STS 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).

Specifying mismatch detection mode

The user can specify the Mismatch Detection Mode for each trail provisioned.

The valid values for the Mismatch Detection Mode are: Enable, Disable or Null.

- **Enable**: the EMS will turn on the mismatch detection mode.
- **Disable**: the EMS will turn off the mismatch detection mode.
- **Null**: used for in-effect circuit orders to instruct the EMS to leave the mismatch detection mode in its current setting.

Scheduling circuits and trails for provisioning

Users with administrator privileges can schedule circuits and trails for provisioning from the Navis™ Optical PM - NP Network Map. Refer to the *Navis™ Optical PM - NP Administration Guide* for details.

Y-protected paths

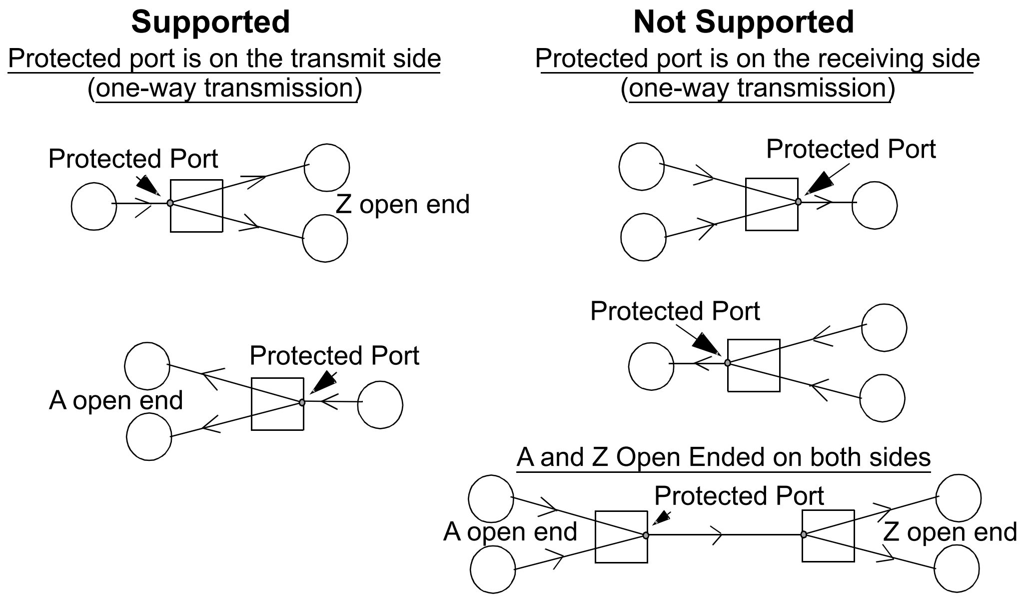
Y-protection paths can be viewed as “one half” of a 1+1 UPSR protected path/circuit. In a 1+1 UPSR protection path, each of the two network elements at the A-end and the Z-end has a “bridge” and “selector” function. At each end, the function of the “bridge” is to split the incoming input signal into 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.

Y-protection has two types:

- **Open-Z Y protection**: 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.
- **Open-A Y protection**: if only the Z end network element incorporates the “bridge and selector” functions.

The following figure shows an example of the supported and non-supported configurations for one-way Y protection.

Figure 5-1 One-way Y-protection configurations



Provisioning circuits

Overview This section presents information for the circuit types supported by Navis™ Optical PM - NP.

STS-1 paths Navis™ Optical PM - NP supports the provisioning of STS-1 paths (STS1 circuit type) using channels contained in OC-3, -12, -48, -192, or EC1 digital links subject to the capabilities of the network element. For the Metropolis DMX and Metropolis DMXpress, STS-1 paths are channelized to carry one T3 path and/or 28 VT1.5s for all STS-1 paths riding on the OC-192/OC-48/OC-12/OC-3, and EC1digital links.

STS-3c paths Navis™ Optical PM - NP supports the provisioning of STS-3c paths (STS3C circuit type) using the channels of OC-3, OC-12, OC-48, or OC-192 links subject to the capabilities of the network element. STS-3c paths are not channelized. Therefore, the channel type is not required for STS-3c path.

STS-12c paths Navis™ Optical PM - NP supports the provisioning of STS-12c paths (STS12C circuit type) using the channels of OC-12, OC-48, or OC-192 links subject to the capabilities of the network element involved. STS-12c paths are not channelized. Therefore, the channel type is not required for STS-12c path.

STS-48c paths Navis™ Optical PM - NP supports the provisioning of STS-48c paths (STS48C circuit type) using the channels of OC-48 or OC-192 links subject to the capabilities of the network element involved. STS-48c paths are not channelized. Therefore, the channel type is not required for a STS-48c path.

STS-192c paths Navis™ Optical PM - NP supports the provisioning of STS-192c paths (STS192C circuit type) using OC-192 subject to the capabilities of the network element involved. STS-192c paths are not channelized. Therefore, a channel type is not required for a STS-192c path.

VT1.5 paths Navis™ Optical PM - NP supports the provisioning of VT1.5 paths (VT1.5 circuit type) using channels contained in OC-3, OC-12, OC-48, OC-192, or EC1 digital links subject to the capabilities of the network element. For the Metropolis DMX and Metropolis DMXpress network elements, a VT1.5 path can carry one T1 circuit.

T3 circuits

Navis™ Optical PM - NP supports the provisioning of T3 circuits using channels contained in OC-3, OC-12, OC-48, OC-192, EC1, or DS3 digital links subject to the capabilities of the network element. A T3 path cannot terminate on OC-3, OC-12, OC-48, OC-192, or EC1 ports (a T3 circuit terminates on at least at one end at the logical port of the DS3 physical port, black box, or equipment).

T1 circuits

Navis™ Optical PM - NP supports the provisioning of T1 circuits using the VT1.5 channels contained in OC-3, OC-12, OC-48, OC-192, EC1, or DS1 digital link subject to the capabilities of the network element. A T1 path cannot terminate on OC-3, OC-12, OC-48, OC-192, or EC1 ports (a T1 circuit terminates on at least at one end at the logical port of the DS1 physical port, black box, and equipment.

Co-existence support

The following list describes the support for co-existence amongst the supported circuit types:

- An STS-192c cannot co-exist with STS-48c, STS-12c, STS-3c, STS-1, VT1.5, or any other path/circuits in the same OC-192.
- An STS-48c can co-exist with STS-12c, STS-3c, STS-1, and VT1.5 circuits in the same OC-192. An STS-48c cannot co-exist with STS-12c, STS-3c, STS-1, VT1.5, or any other path/circuit in the same OC-48.
- An STS-12c can co-exist with STS-3c, STS-1, and VT1.5 circuits in the same OC-48. An STS-12c cannot co-exist with STS-3c, STS-1, VT1.5 or any other path/circuit in the same OC-12c.
- An STS-3c cannot co-exist with STS-1, VT1.5, or any other path circuits in the same OC-3.

Supported circuit identification formats

This section describes the circuit identifications types supported by Navis™ Optical PM - NP. At installation time, the user can select one of three formats for circuit indentification: user-defined free-format, M.1400, or Telecordia.

User-defined free-format

The user-defined free-format circuit identification has the following characteristics:

- Any character string up to 83 characters in length.
- allowable characters include:
  - alphanumeric characters (case-sensitive and both upper- and lower-case characters are allowed).
  - Forward slash /
  - dash -
  - underscore _
  - period
  - blank
- Tabs are not allowed.

An example of a user-defined free-format circuit ID is: NY1 NY2 T3 0001.

M.1400-specification format

The M.1400 specification 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: 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.

Telecordia circuit id format

The ordering of fields with the Telecordia circuit id format is: ID - CircuitType - ALocation - ZLocation. This format is a flexible adaptation for customers with North American and international networks so that the customer can use either a Telcordia or CNC scheme in their world-wide operations while retaining the same field ordering: ID - CircuitType - ALocation - ZLocation or ALocation - ZLocation - CircuitType - ID.

The Telecordia format defines the circuit id field as up to 57 characters long of which:

- 7 to 20 characters are assigned to Equipment ID "A."
- 7 to 20 characters are assigned to Equipment ID "Z."
- 2 to 10 character are assigned to Circuit Type.
- 1 to 4 characters are assigned to the circuit serial number.
- each field is delimited by the "-" character.

For example, 1-STS12-102/2I1-209/6I1 denotes a STS12 between locations 102 and 209, where the network elements are ISM equipment types of 2I1 and 6I1

Circuit ID = Equipment ID "A" + Delimiter + Equipment ID "Z" + Delimiter + Circuit Type + Delimiter + Circuit Serial Number where:

- **Equipment ID "A"**: 7 - 20 alphanumeric characters
- **Delimiter**: 1 character ("-")
- **Equipment ID "Z"**: 7 - 20 alphanumeric characters
- **Delimiter**: 1 character ("-")
- **Circuit Type**: 2 - 10 alphanumeric characters
- **Delimiter**: 1 character ("-")
- **Circuit Serial Number**: 1- 4 digits.

Merging circuits

Navis™ Optical PM - NP supports the following merge capabilities per supported circuit type:

- STS-48c paths can only be merged with STS-48c paths.
- STS-12c paths can only be merged with STS-12c paths.
- STS-3c paths can only be merged with STS-3c paths.
- STS-1 paths can only be merged with STS-1 paths.
- VT1.5 paths can only be merged with VT1.5 paths.
- T3 paths can only be merged with T3 paths.
- T1 paths can only be merged with T1 paths.

Rearranging circuits

Navis™ Optical PM - NP supports the rearranging of the following circuit types: STS-48c, STS-12c, STS-3c, STS-1, VT1.5, T3, and T1.

Time slot assignment

The time slot assignment for SONET trails is similar to that of SDH trails where the concatenation mechanism follows a strict numerical order. For example, the time slot assignment for four STS-48cs in an OC-192 begins in time slot 1, 49, 97, 145, respectively.

Any time slot in an OC-192, OC-48, OC-12, and OC-3 can only occupy one applicable STS-48c, STS-12c, STS-3c, and STS-1 at any moment.

Delete history

Whenever a circuit is rearranged, the data from the previous circuit is retained in the Navis™ Optical PM - NP 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.

□

4-ended protection paths

Overview

The 4-Ended Protection path/circuit is sort of an extension of the 3-ended Y Protection path, that is already supported. The 4-Ended protection maybe used in a configuration with both Open-A and Open-Z simultaneously in the same path/circuit. The service and protection path specifications are similar to the Y-Protection case, except that it necessiates specification of both A-Protection and Z-Protection location and port, respectively. For the current release, there's a restriction for the A-Protection location to be the same as A-Location, and the Z-Protection location to be the same as Z-Location.

Support

Important! 4-ended protection path provisioning is restricted to STS-1 rate only (the protection type selection shall not be available for all rates other than STS-1). Also, Navis™ Optical PM - NP will restrict the A-Location and Z-Location of the 4-ended protection path to be terminated at a Metropolis® DMX or the Metropolis® DMXpress only.

The provisioning of 4-Ended protection paths are supported by Navis™ Optical PM - NP. The "4 Ended" protection type exists on the list of available protection types on the circuit/trail provisioning screen. When "4 Ended" protection type is selected, "A Protect Location", "A Protect Port", "Z Protect Location", and "Z Protect Port," becomes available as input fields.

The parent (OC-n) ports at both A and Z end of the 4-ended protection path must form UPSR rings.

Termination location

Navis™ Optical PM - NP will restrict the protection path to have the same terminations as the service path. This shall be achieved by prepopulating, the value of "A Protect Location" with value of A Location, and the value of "Z Protect Location" with that of "Z Location". Also, the "A Protect Location" and "Z Protect Location" fields shall be uneditable/disabled.

Port restrictions

For the "4 Ended" protection selection, Navis™ Optical PM - NP makes sure that the service and protection path pair at each end terminates either at Main slots, or Function slots in the same function unit. For each end (A and Z), the terminating pair of ports (service and protection) should be belonging either to the Main slots(m-1-1 and m-2-1), or to Function slots in the same function unit (e.g - 'a-1-1 and a-2-1).

Graphical layout

Navis™ Optical PM - NP supports a Graphical layout display of the 4-Ended protection path, consistent with (and similar to) current Graphical layout for 3-ended Y-protected paths.

T1/T3 Circuit Provisioning in Partial/Auto Mode with 4-Ended Protected STS-1

For T1 or T3 circuit provisioning in either "Auto" or "Partial" mode, if there is an underlying 4-Ended protected STS-1 path, Navis™ Optical PM - NP shall pick the 4-ended STS-1 as a preferred path.

Figure 5-2 End-to-end Protected VT1.5 Circuit

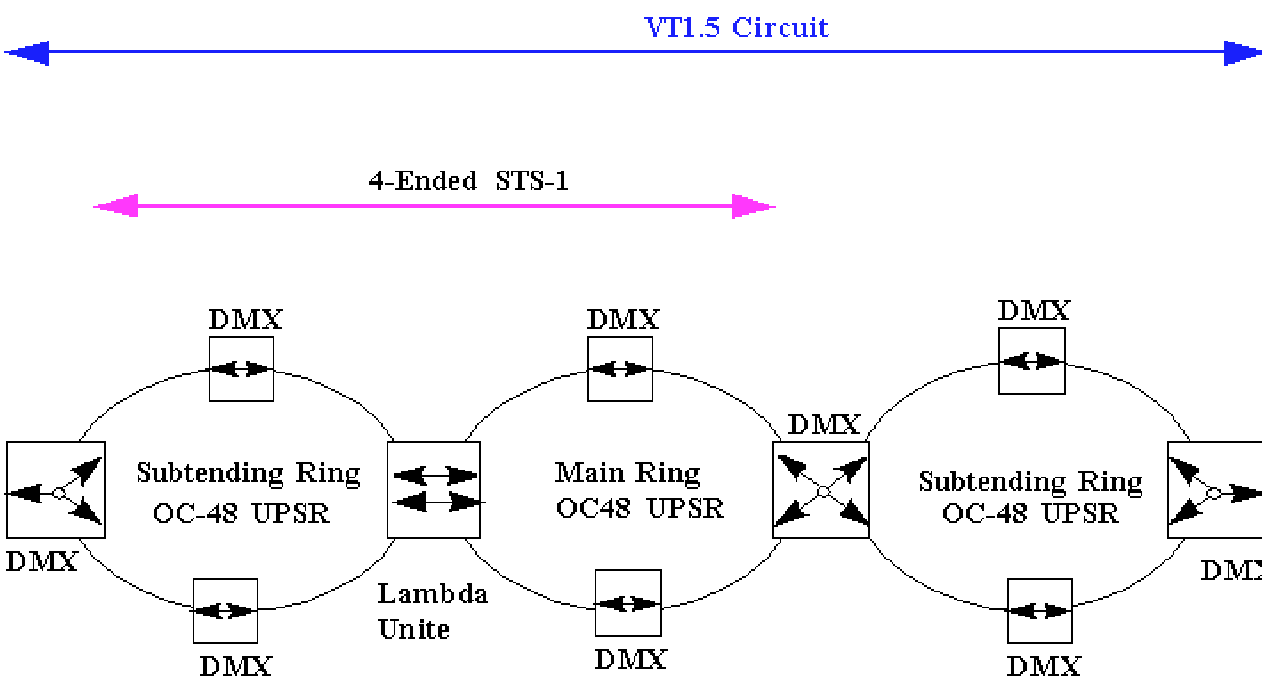
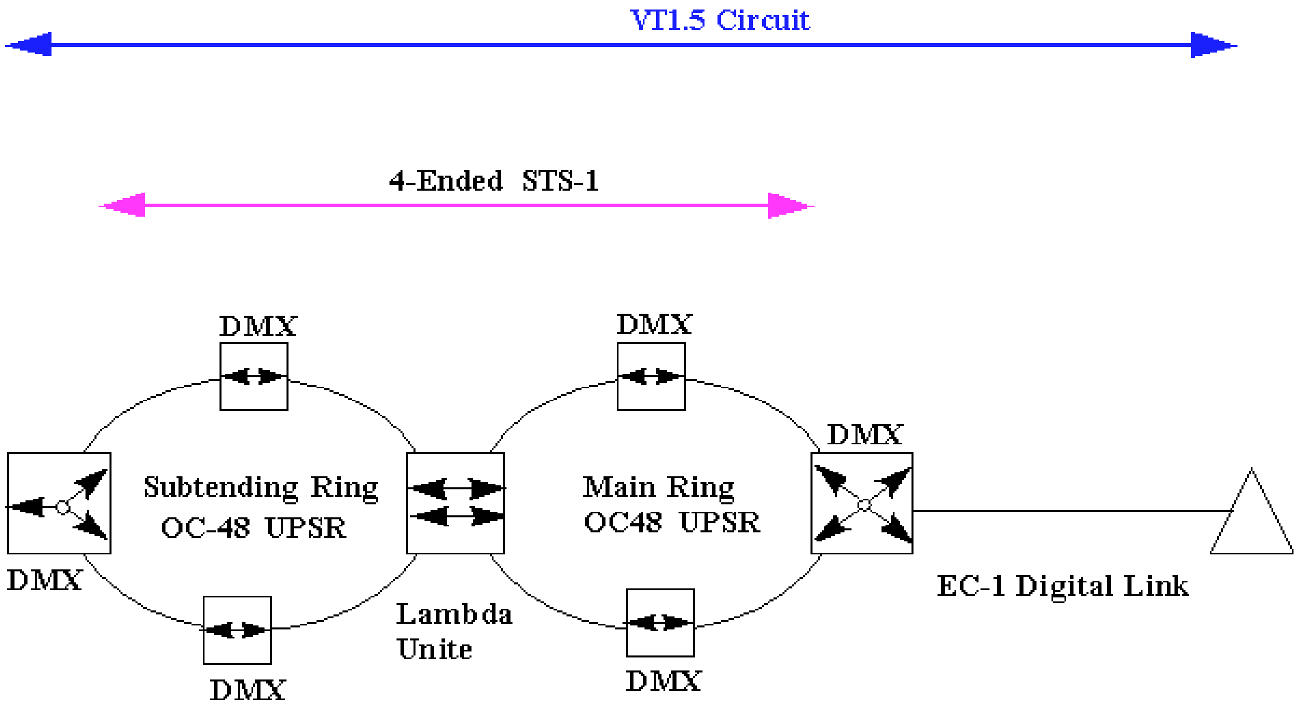


Figure 5-3 Segment Protected VT1.5 Circuit



Section IV: Optical Layers

Overview

Purpose This section provides conceptual information pertaining to provisioning optical layers with Navis™ Optical PM - NP.

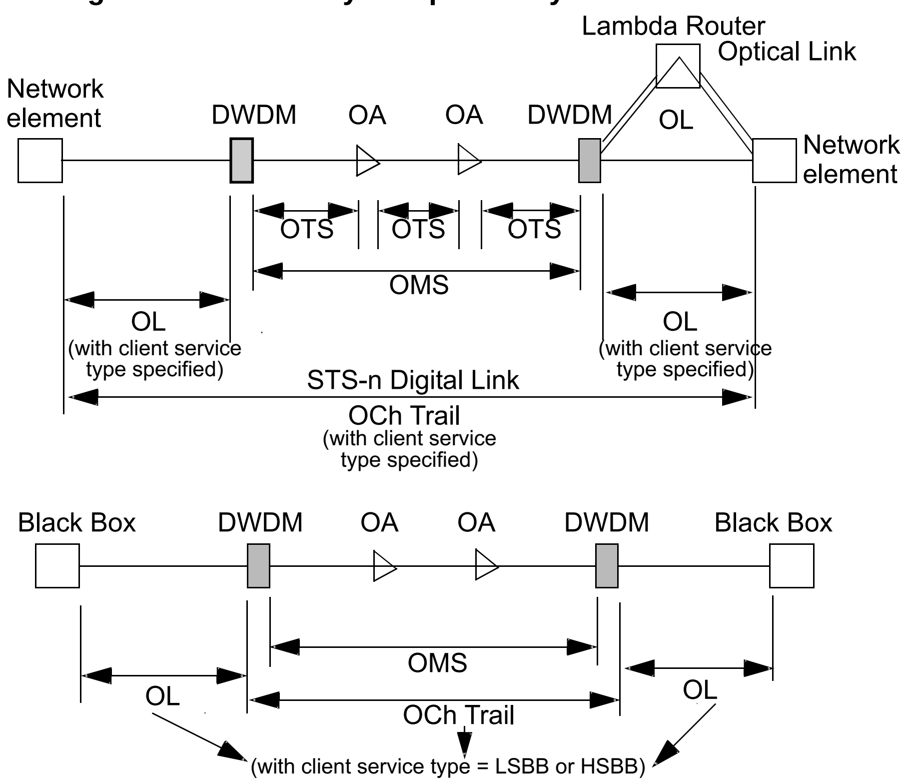
Contents

Optical layer support

Overview This section describes Navis™ Optical PM - NP's support for optical layers.

Optical layer hierarchy The following figure shows the hierarchy of optical layers for provisioning between DWDMs and SONET network elements or black boxes.

Figure 5-4 Hierarchy of Optical Layers



LEGEND:
OTS - Optical Transmission Section
OMS - Optical Multiplex Section
OCh Trail - Optical Channel Trail
OL - Optical Link
OA - Optical Amplifier
DWDM - Dense Wave-Division Multiplexer
Network element - SONET network element

Client Service Types for OCh Trails and Optical Links:
STS-1 STS3c
STS12c STS-48c
STS-192c
T1 T3
Low Speed Broadband (LSBB)
High Speed Broadband (HSBB)

Terminology The following optical layer-related terms appear within this section.

Fixed connection: fixed connections are stored in the Navis™ Optical PM - NP 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 SONET network element or a black box. It can only be discovered. It is only visible in the 'trail/channel selection' screen.

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 SONET 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, such as a digital link.

Optical channel trail: an optical connection that is either assignable to a digital link or non-assignable. OCh trails can be of two types. The first type is an OCh trail (assignable OCh trail) that terminates on an SONET network element or black box at either end in its layout (does not terminate in a LambdaRouter 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 LambdaRouter having a cross-connect in it or may terminate on both ends of DWDM network elements.

Point of flexibility: a port that belongs to a LambdaRouter connected to a DWDM network element via a physical link.

Topological link: in the scope of the optical layer, the topological links are optical multiplex sections and optical links.

□

Provisioning optical layers

Overview

This section describes the provisioning concepts associated with optical layers.

Provisioning order

> **Important!** In order to use the optical layer for provisioning, the physical connectivities between the optical network elements must have been established prior to the provisioning of the optical layers from Navis™ Optical PM - NP.

The following steps are required to provision the different layers in the optical layer. Provisioning in Navis™ Optical PM - NP is mainly to provide the inventory, display and correlation of alarms in the optical layer in addition to some validations by the EMS.

1. The user provisions 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 PM - NP as a bi-directional section.
   Note: The OMS between two Metropolis EON terminals can be unprotected or 1+1 protected. However, the OMS between two WaveStar OLS 1.6T terminals can only be unprotected.
2. If there are connectivities from the DWDM network elements to other SONET network elements or black boxes then the user provisions an optical link between them specifying the “Client Service Type” (CST).
3. The optical channel trail is provisioned. When provisioning an optical channel trail (OCh Trail) the user is required to specify the client service type the OCh trail will carry.
4. If there are connectivities with SONET network elements or black boxes to DWDMs, the user can then provision the conventional SONET digital links between them. If Navis™ Optical PM - NP finds connectivities of the two SONET ports through the optical layer, it will prompt the user to “insert Optical Layer” at the time of the digital link’s order completion.

OMS layer provisioning

Navis™ Optical PM - NP supports the provisioning of OMSs between the optical line sides of two WaveStar OLS 1.6T DWDM network elements. Navis™ Optical PM - NP provides a cut-through to the Navis™ Optical EMS-EMS interface for port selection and automatic population. Navis™ Optical PM - NP checks for the same network element model type for both ends of the OMS section. The selection for "OMS" in the Network Map's Configuration menu is only enabled if both of the selected network elements are DWDM network elements of the same type.

The following table summarizes the interworking of DWDMs and their releases for OMS provisioning. Note: if the user provisions an OMS between two WaveStar OLS 1.6Ts, the user must select the OA ports (OA part of network element) on the WaveStar OLS 1.6T. If the user provisions an OMS between two WaveStar OLS 1.6T or two EON network elements, the user should select the OMU ports.

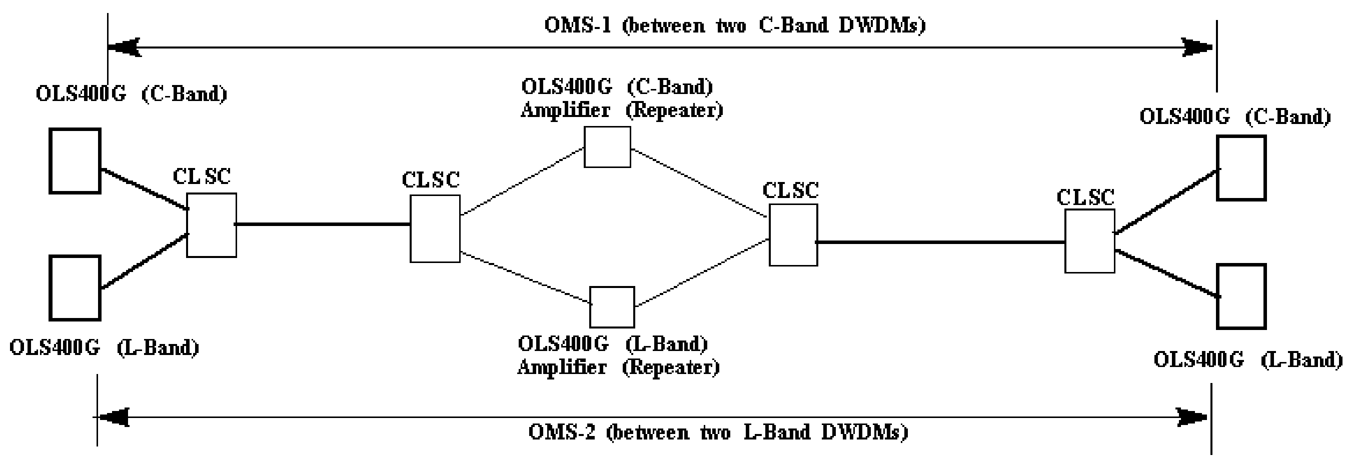
Table 5-13 DWDM network elements for OMS provisioning

A/Z End	Type/Release No.	Z/A End	Type/Release No.
Metropolis EON	End terminal or ring terminal (includes dual-facing)	Metropolis EON	End terminal or ring terminal (includes dual-facing)
WaveStar OLS 1.6T (C-Band)	End terminal, ring or WAD (Type 1 and 2) terminal (R6.0 and 6.1)	WaveStar OLS 1.6T (C-Band)	End terminal, ring or WAD (Type 1 and 2) terminal (R6.0 and 6.1)
WaveStar OLS 1.6T (L-Band)	End or ring terminal (R6.0 and 6.1)	WaveStar OLS 1.6T (L-Band)	End or ring terminal (R6.0 and 6.1)

Optical amplifiers: during provisioning of an OMS, users can add optical amplifiers similar to adding regenerators during digital link provisioning. The list of available optical amplifiers is displayed for the user to choose. The list of optical amplifiers contains only those that support the OMS section with the appropriate number of channels (16 or 40/80). For OMS sections between two WaveStar OLS 1.6T (C-band) DWDMs, only the C-band optical amplifiers are displayed for user selection. For an OMS section between two WaveStar OLS 1.6T (L-band) DWDMs, only the L-band optical amplifiers are displayed for user selection. The order of optical amplifiers determines 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 OLS 1.6T DWDMs provide more bandwidth (up to 160 wavelengths) over a single fiber. The output of the C-Band and L-Band WaveStar OLS 1.6T 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 PM - NP. The following figure illustrates OMS provisioning between pairs of C-Band and L-Band DWDMs. For this figure, OLS400G and OLS 1.6T are interchangeable.

Figure 5-5 OMS provisioning between pairs of C-Band and L-Band DWDMs



From the Navis™ Optical EMS and Navis™ Optical PM - NP 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 PM - NP 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 PM - NP is not in any way affected by this behavior.

Modifying an OMS: users can not modify paths for OMS sections that are already “in-effect.”

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 channel layer provisioning

Discovery of Fixed Connections: The existence of cross-connections (associations) between the tributary ports and the logical port derived from the line port of a DWDM and the client service types of the established cross-connections in the DWDM network can be discovered from the response to the cross-connect synchronization request (for example, “getAllSNCs”) from each DWDM that is managed by the Navis™ Optical EMS.

The following descriptions for the discovery of fixed connections will be useful to understand how Navis™ Optical PM - NP uses those fixed connections during OCh trail provisioning.

1. The discovery process is triggered by Navis™ Optical PM - NP by a background process and is not triggered by the user.
2. All the OMSs and optical links must have been provisioned, inventoried and the channel termination records created in Navis™ Optical PM - NP.
3. Both the cross-connect sync (for Navis™ Optical EMS managed DWDMs only) and the port sync for the selected DWDM network elements are previously performed by the user. The cross-connect synchronization response from Navis™ Optical EMS will provide the connectivity (association between OTU and input to OMU/output of ODU, frequency for both directions of the OCh trail).

4. For the fixed connections that do not terminate in an optical translator unit (those trails that have compatible optics at the SONET network element), it is assumed that the client service types will be derived from the SONET network element port addresses or from the client service types of optical links that terminate on the tributary port of DWDM. In the case of black boxes at the ends, the fixed connections will be discovered/provisioned with alternate channels (client service types). When the user provisions an OCh trail on those terminating ports, the client service types will have to be specified.
5. A fixed connection will not have any order number associated.
6. No alarm correlation to fixed connections.
7. Fixed connections:
   - are created only by the discovery process and cannot be provisioned as an entity by the Navis™ Optical PM - NP user.
   - will be automatically deleted from Navis™ Optical PM - NP if a subsequent discovery does not discover them again or after a virtual disconnect of OMS.
   - will remain in the Navis™ Optical PM - NP when OCh trail use them or even when an OCh trail using them is deleted.
   - are not visible entities for the user but will be indicated in the selectable entities in the OCh Trail provisioning view.

Navis™ Optical PM - NP allows the user to discover fixed connection between the following network elements:

Table 5-14 Fixed connections per network element

A-end	Z-end	Preconditions
SONET network element/black box	SONET network element/black box	At least 2 DWDM network elements between A-end and Z-end. No LambdaRouter between A-end and Z-end.
DWDM network element (tributary side)	DWDM network element (tributary side)	A-end different from Z-end.
LambdaRouter (point of flexibility)	LambdaRouter (point of flexibility)	A-end different from Z-end At least 2 DWDM network elements between A-end and Z-end.

Table 5-14 Fixed connections per network element (continued)

LambdaRouter (point of flexibility)	DWDM network element	At least 1 DWDM network element between A-end and Z-end No LambdaRouter between A-end and Z-end
LambdaRouter (point of flexibility)	SONET network element/black box	At least two DWDM network elements between A-end and Z-end. No LambdaRouter between A-end and Z-end.

Optical link layer provisioning

The following section describes the provisioning of optical links between SONET 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 SONET network element and a DWDM network element
- two LambdaRouters
- a black box and a DWDM network element
- two DWDM network elements (back to back OLS or between ORS and an external DWDM network element)
- a SONET network element and a LambdaRouter
- a black box and a LambdaRouter
- a LambdaRouter and a DWDM network element

The Navis™ Optical PM - NP 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 OLS 1.6T through discovery: When an association exists between the output port of an optical ring switch (ORS) in a OLS 1.6T that association is reported to Navis™ Optical PM - NP as a link. Navis™ Optical PM - NP creates an optical link for this discovered link with a system generated ckt/trail ID and order number.

Behavior of Navis™ Optical PM - NP when an internal optical link is removed: if, after an internal optical link is created in Navis™ Optical PM - NP 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, Navis™ Optical PM - NP does the following:

- If there is no OCh trail provisioned on the internal optical link, the optical link shall be deleted fromNavis™ Optical PM - NP and all the associated records (alarm, PM, if any) are removed per the existing system behavior. In addition, if optical fixed connections are discovered with the internal optical link, the fixed connections are either removed or reconciled by Navis™ Optical PM - NP.
- If an OCh trail is already provisioned on the internal optical link, this should be treated as an 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 LambdaRouter
- 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 LambdaRouter and the other end-node is a DWDM network element without OTU

Validation of client service type for optical link provisioning: When provisioning an optical link, the Navis™ Optical Network Management System performs the following validations:

- If the optical link is provisioned between one SONET network element and one DWDM network element with OTU, the port address rate in the SONET network element is the same than client service type (OTU type) in the DWDM network element.
- If the optical link is provisioned between two DWDM network elements with OTU (dual-facing Metropolis EON or dual-facing WaveStar OLS 1.6T), the OTU type in the two DWDM network elements are the same (same client service type).

Rearrange for Optical Links : the user is not allowed to a rearrange optical links that are already ‘in-effect’ or ‘pending’ (in IMP step).

However, the user can modify an optical link in “pending” (in LAY step).

Optical channel connection (trail) provisioning for clients and servers

This section covers the handling and provisioning of OCh connections with Navis™ Optical PM - NP for both clients and servers.

Navis™ Optical PM - NP supports the following features for optical channel connection provisioning:

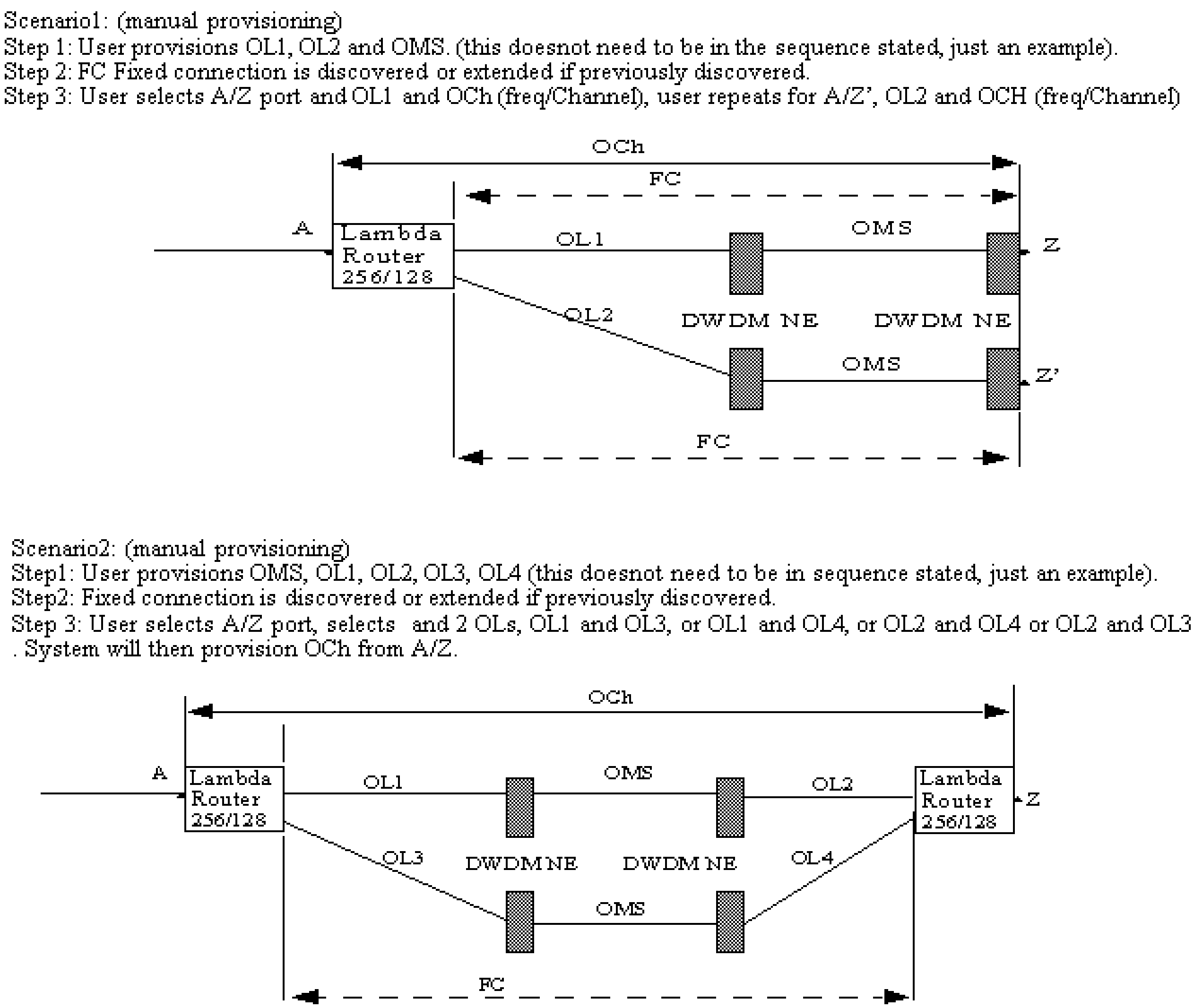
- protected OCH connection (using ORS in WaveStar OLS 1.6T) and protection switching.
- OCH over OCH (using 10G mux in WaveStar OLS 1.6T).
- OCH provisioning using fixed connections.
- Routing in Auto mode (including exclude node and exclude link).
- re-arrange for OCH.
- Y-protected OCH connection is supported.
- SNCP on the LambdaRouter is not supported (as it is not supported by the network element).

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 protection scenarios for the LambdaRouter 256 and 128 Release 2.0: the following figure provides a sample OCh protection scenarios for the LambdaRouter 256 and 128.

Figure 5-6 OCh protection scenarios for the LambdaRouter



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 PM - NP 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 PM - NP 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.

When the ports of an OCH server are selected using the Navis™ Optical PM - NP 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 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.

OCh trail provisioning involving OLS 1.6T wavelength add/drop terminals: Navis™ Optical PM - NP allows users to provision an OCh trail between two WaveStar OLS 1.6T Add/Drop terminals or between an WaveStar OLS 1.6T Add/Drop terminal and a WaveStar OLS 1.6T end terminal. In the case of through connections in the wavelength add/drop terminal or WaveStar OLS 1.6T, the OCh trail will terminate only at the two end terminals.

The following configurations are possible for OCh trail passing through or terminating on the WaveStar OLS 1.6T. In the case of an OCh trail passing through the WaveStar OLS 1.6T WAD terminal, the through association between the two line ports of the WAD terminal will be represented as a cross-connect in Navis™ Optical PM - NP and verified by Navis™ Optical EMS. There is no validation in Navis™

Optical PM - NP as to which frequencies are added/dropped and which are pass-through. It is expected that such validations will be done by Navis™ Optical EMS.

OCh trail provisioning involving WaveStar OLS 1.6T 2 fiber Full Add/Drop (Ring) Terminals Navis™ Optical PM - NP allows users to provision an OCh trail through a WaveStar OLS 1.6T 2 Fiber Add/Drop (Ring) Terminal. In the case of Full Add/Drop terminal, an OCh trail can either terminate on the drop side OTU port or can pass through from one line port to the other line port. The following figures show different configurations of OCh trail that either pass through the WaveStar OLS 1.6T 2 fiber Full Add/Drop (Ring) terminal or terminate on the drop side OTU.

In the case of pass through from one line to the other, the cross-connect from one OMU/ODU pair to the other OMU/ODU pair is reported to Navis™ Optical PM - NP as a through cross-connect. The presence of one “through OTU” or two “through OTUs” is transparent toNavis™ Optical PM - NP. It is also assumed that there is no frequency interchange in the “through OTUs”. Though the Full

Add/Drop Terminals are shown in a ring configuration, there is no protection provided for the OCh trails.

Figure 5-7 OCh trail terminating on the full add/drop (ring) terminal

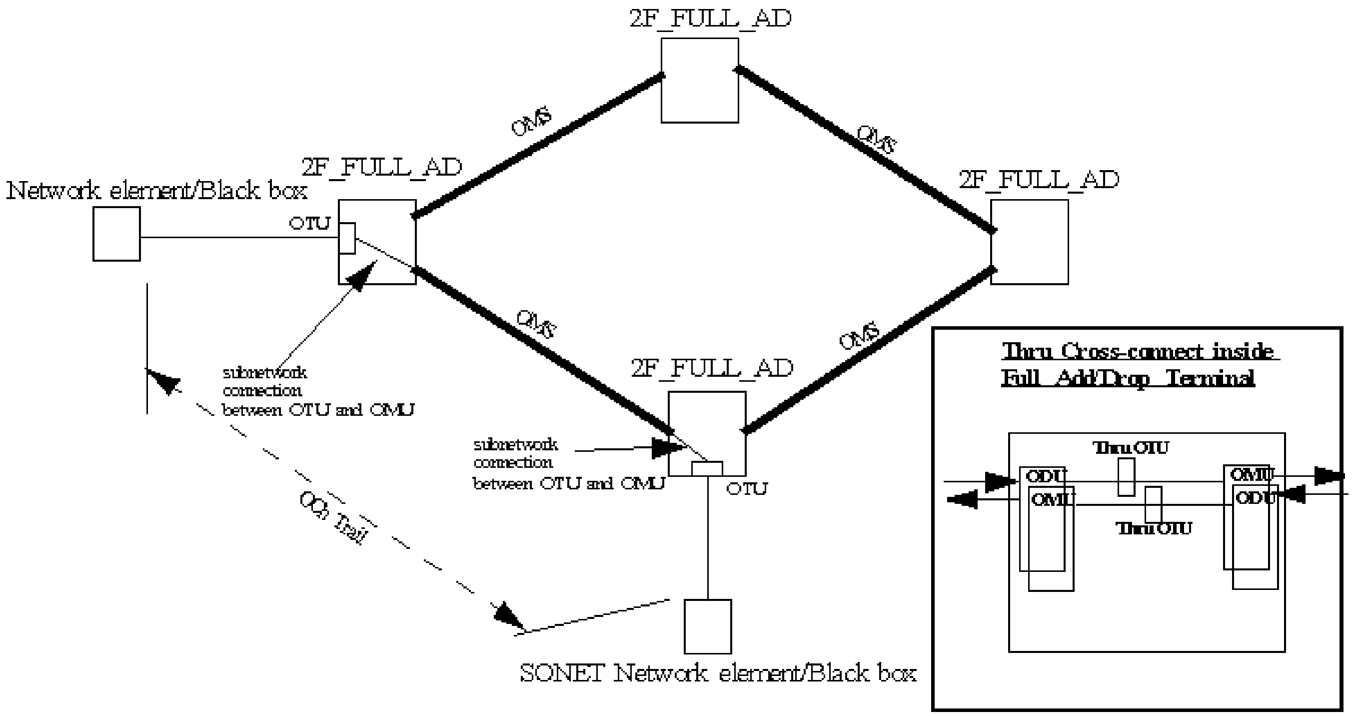
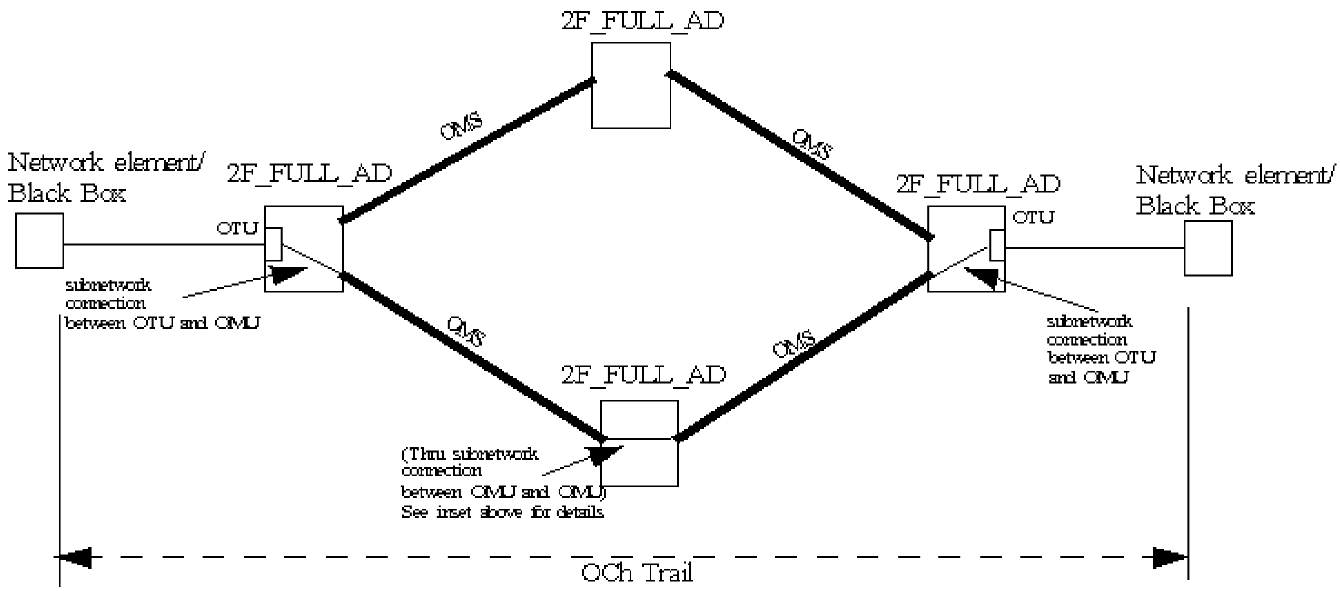


Figure 5-8 OCh trail passing the intermediate full add/drop (ring) terminal



OCh trail provisioning in manual mode: When the user provisions an OCh trail in the Manual mode, any time the user selects one of the links corresponding to either Optical Links or OMS, the related Fixed connections shall be available for selection. Alternately, if the user selects an Optical Link that is part of a discovered Fixed Connection, the other links such as OMS channel and the other Optical Link that are part of the same Fixed Connection shall be automatically chosen in the Network Map during provisioning (i.e. shown with dashed lines). The Facility Channel List screen where the link IDs of the selected link are shown shall also indicate the presence of Fixed Connections with the A end and Z end and their Client Service Type.

Selection of three ports ended fixed connections: When the user selects a channel from an OL or an OMS, that is common of two fixed connections, Navis™ Optical PM - NP displays two fixed connections to choose from. When the user selects a channel from an OL or an OMS that is part of only one fixed connection, Navis™ Optical PM - NP will only display that fixed connection for selection. Alternately, if the user selects a channel that is part of a Fixed Connection, the other links such as OMS channel and the other Optical Link that are part of the same Fixed Connection shall be automatically chosen in the Network Map during provisioning (i.e. shown with dashed lines).

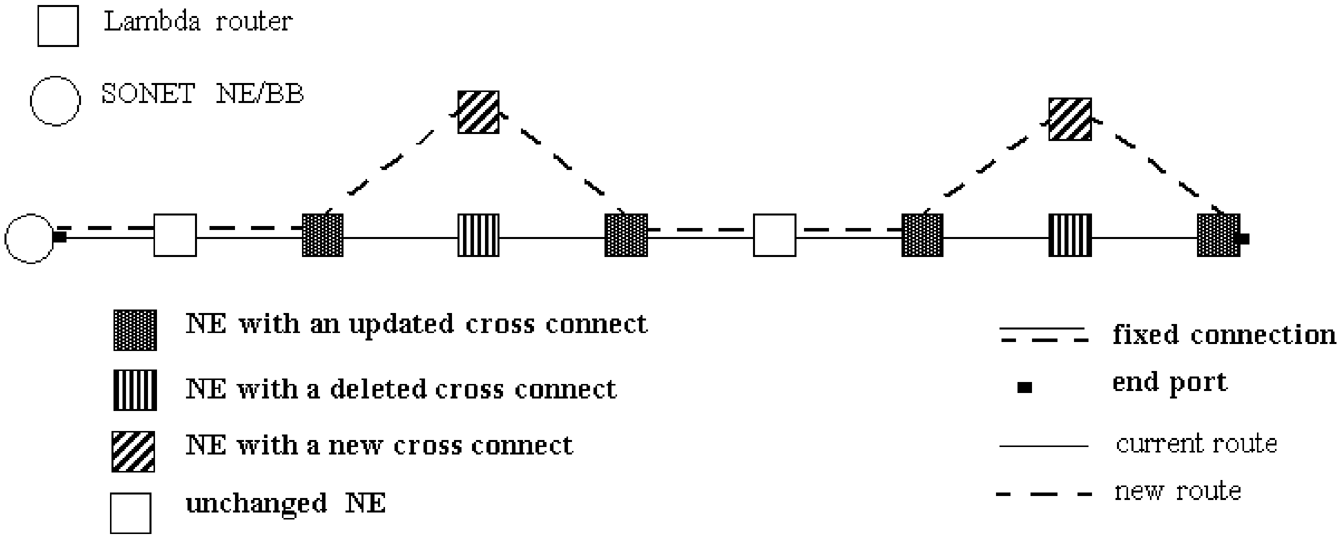
Display the list of selected channels: When a channel that is part of a fixed connection is selected, then all the channels of this fixed connections shall be displayed in the link list of the connection. When a channel that is part of a fixed connection is removed from the link list of the connection profile form, then all the channels of the fixed connection shall be removed as well.

OCH channels for an OCH connections: When the OCH connection is assignable, Navis™ Optical PM - NP will create channels depending on the OCH type and the client service type:

- for an OCH-S, Navis™ Optical PM - NP will create four OCH channels should be created. Each channel shall be marked with a OC-48 client service type.
- In the other cases, Navis™ Optical PM - NP will create one channel. The client service type of the connection should be used to mark the OCH channel.

Rearrange an OCH with fixed connections: Navis™ Optical PM - NP supports rearrange for IE OCH connections. The workflow for OCH rearrange shall be the same as for other connection types. The only difference is the channel selection for the new route shall be as for OCH provisioning, i.e. selection of fixed connection instead of individual channels. Navis™ Optical PM - NP prevents changing the A or Z port of the connection. For a route only formed with fixed connection before and after the re-arrange, Navis™ Optical PM - NP determines the lists of LambdaRouters where the cross connect has to be created, deleted, updated or left unchanged. Navis™ Optical PM - NP creates and deletes the cross connect as determined. For network elements where the cross connect has to be updated, Navis™ Optical PM - NP will delete the current cross connect and create a new one (no bridge and roll). In case of re-arrange of an OCH connection that is not entirely formed by fixed connection, the re-arrange shall not attempt to compute the difference between the two routes. All the cross connects of the old route shall be deleted and all the cross connects of the new route shall be created.

Figure 5-9 Example of an OCH re-arrange



Delete an OCH trail: When the user requests to delete an OCH connection, Navis™ Optical PM - NP will follow the following steps in the given order. If any step fails, an error will occur and the order status of this connection shall be updated consequently.

- Check there is no connection client of this OCH.
- Delete the cross connect on each LambdaRouter
- Mark the OCH order as history

Client layer support

Provisioning of OC-n digital links if connectivity through the optical layer is found: when provisioning OC-n (n=3, 12, 48, 192) digital links, if the selected port on A and/or Z end terminates an OCh trail, Navis™ Optical PM - NP will verify if there is an end-to-end connectivity between the A and Z ports of the digital links through the optical layer. If there is, the layout generation of the OC-n digital link shall automatically include the optical channel trails. The OCh trail for the service and protection of 1+1 APS digital link will be included. If there is no end-to-end connectivity through the optical layer, the digital link provisioning shall continue without the optical layer.

In the case of provisioning 1+1 APS digital links that span through optical layer(s), it is possible that the service link and the protection link can take diverse paths through the optical layer(s). In such cases, the layout of the 1+1 APS digital link shall include the layouts of both service link and the protection link. It is also possible that only service link or protection link can go through optical layer.

Capability to insert an optical layer into a digital link: in certain customer applications, an optical layer might be already exist in a OC-n digital link with complete connectivities but not inventoried in Navis™ Optical PM - NP. In such cases, the user can provision "In-Effect" optical links, optical channel trails and OMS sections in the optical layer. After all the optical layer components are provisioned in Navis™ Optical PM - NP, a new option in the Graphical Layout for digital links is provided so as to insert the optical layer to the digital link.

The "Insert Optical Layer" option is available from the "Action" menu of the Graphical Layout screen. To insert the optical layer, the following steps are performed:

1. Navis™ Optical PM - NP will check if the digital link has any SONET regenerators. If there are, an error message will appear. If there are no SONET regenerators in the digital link layout, proceed to step 2.
2. Navis™ Optical PM - NP will then find the connectivity between the two SONET network elements through the OCh trail. If it fails to find the connectivity, an error message will appear. If the connectivity through the optical layer is found, proceed to step 3.
3. If the connectivity through optical layer is found, Navis™ Optical PM - NP will modify the layout of the digital link inserting the optical layer and notify the user stating that "the insertion of the optical layer is successfully completed."

4. A pop-up message will appear asking if the user wants to see the modified Graphical Layout of the digital link after the insertion of the optical layer.
   - If the user chooses “Yes,” the graphical layout of the digital link showing the optical layer all appear.
   - If the user chooses “No,” no action is required and the pop-up window will close.
   - If there is an existing display of the digital link, the “Query Again” operation after the optical layer is successfully inserted will display the graphical layout of the digital link with the optical layer.
5. The Network Map shall be dynamically updated with the successful completion of the optical layer. The digital link connectivity shall be appropriately displayed.

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

No provisioning commands shall be generated during “Insert Optical Layer” operation. It is the user’s responsibility to set the “Expected Trace Identifiers” at the appropriate DWDMs from the EMS screens.

Provisioning HSBB and LSBB circuits: Navis™ Optical PM - NP supports the provisioning of unprotected HSBB and LSBB circuits (no 1+1 or Ring protection). Provisioning is only allowed in “Manual” mode. Both LSBB and HSBB circuits are allowed to be created only when both the A and Z ends are black boxes and an OCh trail terminates on the A and Z end ports. If the connectivity check through the OCh trail fails, the provisioning of LSBB or HSBB circuit shall fail with an appropriate error message. No transmission parameters are required for LSBB or HSBB circuits. However, the order parameters, such as customer name, priority, Quality of Service will be applicable to both LSBB and HSBB circuits. Merging of two or more LSBB or HSBB circuits is not supported.

Optical ring switch support

An optical ring switch (ORS) circuit pack supports optical channel protection. An ORS can be added to any WaveStar OLS 1.6T DWDM network element as an add-on including the existing configuration and includes a splitter in the transmit direction to bridge the incoming signal to two output ports and a selector in the receive direction that selects the better of the two incoming signals from the other direction from the ODU.

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Section V: Optical Network Navigator

Overview

Purpose

This section provides conceptual information associated with the Optical Network Navigator (ONN). Note that ONN is a limited availability feature with Navis™ Optical PM - NP Release 1.0.

Contents

ONN support

Overview

This section describes the Navis™ Optical PM - NP's support of the Optical Network Navigator (ONN).

Definition

The ONN is the software and hardware present in the LambdaRouter network element that performs management functions, such as configuration management and fault management, on optical connections across a network of LambdaRouters.

An ONN system consists of a number of ONN modules, each on a different LambdaRouter.

Terminology

The following ONN-related terms appear within this section.

Connection: in the context of the ONN, a signal carried between two edge ports. Depending on the type of connection (unprotected, 1+1), the two edgeports may be connected by different ONN paths during the connection's lifetime.

1+1 ONN connection: a connection routed by the ONN which has two paths through the network. If the first path fails, the second path automatically takes over.

Client service type (CST): the input provided by Navis™ Optical PM - NP to indicate the bandwidth when provisioning optical links.

Discover route: the process undertaken in configuration management to determine the route of ONN-created connections in the network from the cross connections present in the LambdaRouter.

Fixed connection span (FCS): denotes a fixed connection span established internally by Navis™ Optical PM - NP 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, the connection will automatically be rerouted on to another path. This new path will be computed at the time the failure occurs.

ONN domain: The area of the network that is under the control of the ONN. Specifically, an ONN domain is a collection of LambdaRouters and ONNs that are capable of signalling amongst themselves and maintain neighbor topology data to provide routing and restoration within that domain. This is helpful for customer wishing to partition the ONN network. In this release, only a single ONN domain is supported by Navis™ Optical PM - NP. Therefore, the system will not provide a mechanism for the user to specify the ONN domain. Instead, Navis™ Optical PM - NP prepopulates the ONN domain name either based on the user's input during installation or predefines the ONN domain name as "ONN_DOMAIN."

Network to network interface (NNI): a network signalling interface value set against the networkInterfacetype ONN parameter. This port is 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): an OCH connection that 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 LambdaRouter and will not automatically reroute after a failure.

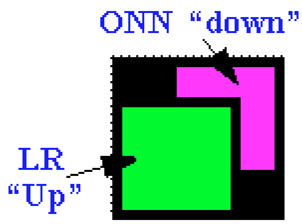
Icon for ONN

Navis™ Optical PM - NP uses a unique icon to identify that a LambdaRouter has been associated to an ONN signalling element. Navis™ Optical PM - NP depicts the ONN on the Network Map as a square-shaped icon and specifies whether the ONN is active or inactive. When the ONN icon contains a green square, the ONN is active. When the icon contains an L-shaped pink shape, the ONN is inactive.

Navis™ Optical PM - NP enables users to view the icons representing LambdaRouters associated with the ONN from the legend menu accessible through the Network Map.

The following table presents the icon for the ONN as it appears on the Navis™ Optical PM - NP Network Map.

Table 5-15 Icon for the ONN

	The ONN in active (Up) and inactive (Down) mode. "LR" denotes the LambdaRouter.

Feature description

LambdaRouters managed by the Navis™ Optical EMS possess a signalling element that facilitates automatic routing between similarly equipped LambdaRouters. The auto-routing between the routers with a signalling element is managed by the ONN. Navis™ Optical PM - NP has to interface with the ONN for connection (routing and implementation) between LambdaRouters and will interface with the routers through the Navis™ Optical EMS for data synchronization, alarms and notifications of port parameters, and cross-connects.

Navis™ Optical PM - NP has a direct LAN (TCP/IP) interface to the ONN located within the network element. Navis™ Optical PM - NP provides a mechanism to set up this communication via the Network Map.

Not all LambdaRouters in the network are equipped with the signalling element. This forces Navis™ Optical PM - NP to manage a mixture of LambdaRouters with ONN and some without it. The routing between LambdaRouters is made feasible because of the capability of LambdaRouters to identify its neighbor by signaling. Once a LambdaRouter is set up with the signaling capability, the ports are identified to the ONN 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 PM - NP has to inventory these navigable ports based on the allocation from the user. If user requests a connection involving a LambdaRouter with navigable port, the source (ingress LambdaRouter) and the sink (egress LambdaRouter) has to be determined by Navis™ Optical PM - NP and a connection request has to be made to the ONN. If a connection request from the user does not involve a LambdaRouter with navigable ports, the implementation is the same as what exists currently.

The connections passing through ONN domains are called soft permanent connections (SPC). The route through the LambdaRouters associated with the ONN are determined by the ONN. Navis™ Optical PM - NP needs to request connections from the ONN or EMS depending on the category (S/PC) of connection. In addition, Navis™ Optical PM - NP must also maintain the states of the routes of these SPCs and provide the same to the user accordingly.

Establishing an ONN communication connection

Navis™ Optical PM - NP interfaces directly with the ONN through TCP/IP. Navis™ Optical PM - NP will establish a corresponding number of TCP/IP connections with the corresponding ONN. During a network element synchronization with the EMS, Navis™ Optical PM - NP automatically uploads all LambdaRouters. At this time, Navis™ Optical PM - NP is unaware whether the LambdaRouter has a signalling element (ONN) associated with it. As a result, the association between Navis™ Optical PM - NP and the ONN is not done automatically. Instead, the user has to manually add this association using the ONN configuration management features available through the Navis™ Optical PM - NP Network Map. Navis™ Optical PM - NP will use the specified session parameters to establish communication with the ONN. Once communication is established, the LambdaRouters associated with the ONN are represented on the Network Map with a icon different from the LambdaRouters with no ONN association. Refer to the “Icon for ONN” section located at the beginning of this section for more information.

In addition to the communication IP address, the ONN uses a signalling IP address as an identifier to establishing connections during routing. As a result, the session parameters includes a “Signalling IP Address” parameter that is provided by the user during ONN session setup. ONN session parameters can be modified from the Network Map when the session between Navis™ Optical PM - NP and the ONN is down. The ONN session parameters, along with the time when the last synchronization was performed, the time when communication between Navis™ Optical PM - NP and the ONN was lost, and the time when communication between Navis™ Optical PM - NP and the ONN was reestablished will be displayed via the ONN Session Parameters form.

Users can start or stop communication with the ONN by right-clicking on an ONN icon and selecting “ Start/Stop ONN communication.” The ONN icon will reflect the color associated with the session status of “Up” or “Down.” Refer to the “Icon for ONN” section for more information about the ONN icon.

Starting an ONN session

When the user selects **Configuration > ONN Network Elements > Add** from the Navis™ Optical PM - NP Network Map, the ONN Session Setup form appears. This form enables the user to start a session with the ONN. After the user provides the session parameters and clicks **OK**, Navis™ Optical PM - NP applies the provided session parameters when establishing a session with the ONN.

Navis™ Optical PM - NP allows the following attributes for ONN session parameters:

- **IP address**: how Navis™ Optical PM - NP communicates with the ONN. Navis™ Optical PM - NP allows for the standard IP address specifications (nnn.nnn.nnn.nnn n).
- **Login**: used to establish communication from Navis™ Optical PM - NP to the ONN. Navis™ Optical PM - NP allows for an alphanumeric string of up to eight characters.
- **Passwd**: the password for ONN login. Navis™ Optical PM - NP allows for an alphanumeric string of up to eight characters.
- **Signalling IP address**: used by Navis™ Optical PM - NP in all connection requests to the ONN. Navis™ Optical PM - NP allows for the standard IP address specifications (nnn.nnn.nnn.nnn n).

Database synchronization

ONN port parameters are the port parameters set on the LambdaRouter ports and utilized by the ONN during the ONN connection requests from Navis™ Optical PM - NP. Navis™ Optical PM - NP has to synchronize all ONN port parameters and the route states of all the ONN SPC connections.

The ONN port parameters are synchronized through a port synchronization between Navis™ Optical PM - NP and the EMS via the TMF interface. The only synchronization between Navis™ Optical PM - NP and the ONN associated with the LambdaRouter is the route states and the new connections created or deleted from the ONN.

If communication between Navis™ Optical PM - NP and the ONN is down , and in that time if the ONN has rerouted the traffic on mesh protected paths or if failures has occurred causing change in route states, these need to be synchronized with the states of the connections in the system. Incremental synchronizations to retrieve only the changes during the loss of communication is not available.

Navis™ Optical PM - NP provides the user the mechanism to manually trigger synchronizations with the ONN at which time Navis™ Optical PM - NP will send a request to the ONN to obtain route states. In addition, Navis™ Optical PM - NP will sift through the data retrieved to identify the changes and reflect them in its system.

Modify session parameters

When a user selects **Configuration > ONN Network Element > Display/Modify** from the Network Map, the ONN Session Parameters form is displayed. This form allows users to modify the ONN session parameters.

The ONN Session Parameters form contains the following fields for filtering

- **Node name**: the name of the ONN network element.
- **ONN domain name**: the ONN domain the ONN network element belongs to. This field is prepopulated for this release as only one ONN domain is supported.
- **IP address**: how Navis™ Optical PM - NP communicates with the ONN. Navis™ Optical PM - NP allows for the standard IP address specifications (nnn.nnn.nnn.nnn n).
- **Signalling IP address**: used by Navis™ Optical PM - NP in all connection requests to the ONN. Navis™ Optical PM - NP allows for the standard IP address specifications (nnn.nnn.nnn.nnn n).
- **Session status**: indicates whether the session between Navis™ Optical PM - NP and the ONN is "Up" or "Down."
- **Login**: used to establish communication from Navis™ Optical PM - NP to the ONN. Navis™ Optical PM - NP allows for an alphanumeric string of up to eight characters.
- **Passwd**: the password for ONN login. Navis™ Optical PM - NP allows for an alphanumeric string of up to eight characters.
- **Sync time**: a time stamp indicating the last time when user successfully completed an ONN Connection sync.
- **Outage time**: a time stamp indicating when the communication between Navis™ Optical PM - NP and the ONN was last lost.
- **Session start time**: indicates when communication between Navis™ Optical PM - NP and the ONN was last established.

Route discovery and management

Route management for OCH-SPC connections is shared between Navis™ Optical PM - NP and the ONN associated with the ingress ONN in the path. Navis™ Optical PM - NP identifies only the routes outside of the ONN domain and the ingress/egress to the ONN domain. During execution, Navis™ Optical PM - NP sends connection requests to the ONN associated with the ingress ONN. The ONN associated with the ingress ONN determines the route within the ONN domain based on the protection type and constraint criteria specified by the user and executes the cross connects for the LambdaRouters in the path.

Automatic re-routing

The ONN has the capability of auto re-routing the ONN managed section of an OCH-SPC connection depending on the protection type.

- If the protection type is set to "revertive auto re-route," the ONN re-routes the path in case of fault and would re-route back to the original path once the fault has been cleared.
- If the protection type is set to "non-revertive," the ONN re-routes the path in case of faults to a different route and the original path details are deleted.
- If the protection type is set to pre-emptible, the connection has the lowest priority in the ONN. If a higher priority connection, such as revertive or non-revertive auto reroute paths, could not find available resources, a lower priority path can be pre-empted.

Route discovery

Users can build end-to-end routes for OCH-SPC connections through the Graphical Layout screen: Action > Discover ONN Route. This selection is disabled for Disconnect Orders.

When user selects Discover ONN Route, Navis™ Optical PM - NP builds an end-end path using the cross connects received for the LambdaRouters in the path together with the trails terminating on those cross connects. The entire route of the OCH-SPC Connection, with the details of the associated ONN domain, is displayed to the user.

Route states

Navis™ Optical PM - NP supports the following route states for OCH-SPC connections:

- **Initial**: the route state for an OCH-SPC connection when the details within the ONN domain are not discovered.
- **Actual**: the route state for OCH-SPC connection when Navis™ Optical PM - NP successfully builds the end-to-end route.
- **Notfound**: the route state for OCH-SPC connection when Navis™ Optical PM - NP is unable to build the end-to-end path.
- **Stale**: the route state applicable for a revertive/nonrevertive auto-rerouted OCH-SPC connection when the ONN successfully restores/reroutes the connection.
- **ReRouteFailed**: the route state applicable for a revertive/nonrevertive auto-rerouted OCH-SPC connection when the ONN fails to re-route the connection.
- **Preempted**: the route state applicable for a pre-emptible OCH-SPC connection when auto re-routing in the ONN pre-empts a low priority connection.

Network map views

This section discusses network map views for ONN support.

ONN layer view

When the user selects the View > Link View > Optical Layer > ONN Switch Connection Spans menu item, Navis™ Optical PM - NP displays on the Network Map all the fixed Connection spans and optic links based on whether they are:

- allocated and unallocated to the ONN
- terminating on a LambdaRouter or any SONET network element
- not terminating on DWDMs.

Span information

A fixed connection span is an entity created in Navis™ Optical PM - NP to represent fixed cross connects and does not contain data such as channels or circuit trail lists. When a link icon is selected and the right mouse is clicked, a link menu appears and the user can select View > Optic Layer > Switch Spans NE ID--NE ID _ Span Information Form to view the Span Information form. Through this form, Navis™ Optical PM - NP displays the allocation data for all the optical links and fixed connections spans represented by that link.

When the user selects the Allocation Information form, from the link menu of the Switch Span view, Navis™ Optical PM - NP will bring up the Span Information Form, which contains the following fields:

- **A-Port**: network level port address for A End
- **Z-Port**: network level port address for Z End
- **ONN Allocated (Y/N)**: indicates whether the underlying FCS/OL has been allocated for an ONN
- **Spare (Y/N)**: indicates whether the FCS/OL is available or has service.

Behavior when a LambdaRouter is out of service

When a LambdaRouter associated with an ONN is put in an out of service state, Navis™ Optical PM - NP sets the session state between Navis™ Optical PM - NP and the ONN. The color of the ONN icon on the Network Map reflects the session state. Refer to the "Icon for ONN" section located at the beginning of this section for more information.

Behavior when a LambdaRouter is deleted

When a LambdaRouter associated with an ONN is deleted, Navis™ Optical PM - NP also deletes all associations and data shared between Navis™ Optical PM - NP and the ONN associated with the LambdaRouter.

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Bandwidth allocation feature

Overview

This section describes the provisioning concepts associated with the bandwidth allocation feature supported by Navis™ Optical PM - NP.

Definition

The mechanism involving the creation of ONN parameters that effectively allocates ports for the ONN from Navis™ Optical PM - NP is termed bandwidth allocation.

Provisioning connections from Navis™ Optical PM - NP involving the LambdaRouter can be done via the ONN for SPC connections and via an EMS otherwise. The provisioning of ONN-SPC connections through the ONN is only possible with ports under ONN control. The control of ports in the LambdaRouter 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 the LambdaRouter are under the control of the EMS. A port can be assigned to the ONN by setting the NetworkInterfaceType ONN port parameter on the LambdaRouter or ONN. Client service type refers to the type of client rate that can be carried on the ONN port.

Shared risk group

A shared risk group indicates the risk for existing traffic and is created from Navis™ Optical PM - NP using a mechanism independent from the allocation process. During the ONN port parameter setup, Navis™ Optical PM - NP assigns the ONN port to a shared risk group from the existing shared risk group list.

Setting parameters

Navis™ Optical PM - NP currently sets the LambdaRouter's port parameters only during provisioning through connection requests to the EMS. In order to provision ONN (SPC) connections, the ONN parameter NetworkInterfaceType must have been set prior to provisioning. Navis™ Optical PM - NP provides a mechanism independent of provisioning that allows the user to allocate ports for ONN control from the Network Map during which Navis™ Optical PM - NP sends TP set up request to LambdaRouter via the EMS for setting the ONN port parameters. Navis™ Optical PM - NP uses the same mechanism to enable the user to set the other optional ONN parameters, namely the client service type and shared risk group.

Operational methods

From Navis™ Optical PM - NP, users can allocate bandwidth for the ONN using the following two operational methods:

1. Users can allocate ONN client ports. Using this mechanism, the ONN parameters network interface port type (UNI) and client service type can be allocated for these ports. Ports that meet the following criteria are eligible to be allocated using this method:
   - Ports in a LambdaRouter/ONN that are completely free with no associated connections.
   - Optical link ports on a LambdaRouter/ONN that are not a termination port for any fixed connection span between two LambdaRouters/ONNs.
   - Optical link ports on a LambdaRouter/ONN that are a termination point of optic link between either a LambdaRouter/ONN and a SONET network element or between a LambdaRouter/ONN and a black box.
2. Users can allocate ports on the network side. These ports can only be assigned for the NNI network interface port type. Users can also assign the shared risk group and client service type ONN port parameters. Based on the allocation from the user, Navis™ Optical PM - NP will send port set up requests (setTPData) to Navis™ Optical EMS for ports at either ends (A and Z) of the connection. The connections, fixed connection span and optical link, terminating on ports assigned to the ONN are reserved for OCH-SPC connections through the ONN domain and will not be available for other regular connections. Ports meeting the following criteria come under this method of allocation:
   - Optical link ports on the LambdaRouter/ONN that are termination ports for any unprotected fixed connection span between two LambdaRouters or ONNs.
   - Optical link ports on the LambdaRouter/ONN that are termination points of an optical link between two LambdaRouters or ONNs.

Note: The ports on a LambdaRouter or ONN that are a termination point of fixed connection spanning between a LambdaRouter/ONN and a network element are not eligible to be allocated for ONN as they cannot be utilized for SPC connections.

Allocating bandwidth by trails

Whenever a user selects **Configuration > ONN Bandwidth Allocation** from the Network Map, Navis™ Optical PM - NP provides a query box that has two options for allocating bandwidth to the ONN, **Ports** and **Trails**. The Trails option presents all the fixed connection spans using OMS trails as a carrier terminating on the ONN and optical links between the ONN from which (de)allocation can be made.

The following options become available if Trails is selected:

- **ONN Domain Name**: prepopulated with the ONN domain name.
- **Trail type**: allows the user to select a trail type. Selections include: OL, OMS, and All (default).
    - **OL**: when the user selects OL trail type and then clicks on a CircuitId field name, Navis™ Optical PM - NP will provide a list of the OLs in the system associated between two LR/ONN.
    - **OMS**: when the user selects OMS trail type and then clicks on a CircuitId field name, Navis™ Optical PM - NP will present a selection box with the circuit IDs of all the OMS trails in Navis™ Optical PM - NP that are a carrier for a fixed connection span terminating at both ends on LR's associated with ONN.
    - **All**: Navis™ Optical PM - NP provides a list of OMS and OL trails satisfying the criterias mentioned above. Selection of a CircuitID in the selection box shall automatically populate the CircuitID field value in the query box.

Allocating bandwidth by ports

Whenever a user selects **Configuration > ONN Bandwidth Allocation** from the Network Map, Navis™ Optical PM - NP provides a query box that has two options for allocating bandwidth to the ONN: **Ports** and **Trails**. The Ports option presents a list of all allocated ports as well as unallocated ports eligible for ONN allocation from which (de)allocation can be made.

When the user clicks on **Node** in the Ports tab, Navis™ Optical PM - NP presents a selection box containing names of all LambdaRouters currently in the system. When a user selects a network element and clicks **OK**, the Bandwidth Allocation form appears, listing the following types of ONN allocated and unallocated ports:

- Optical link ports within the specified ONN that are completely free with no associated connections.
- Optical link ports between the ONN that are not termination ports for any fixed connection span between two ONNs.
- Optical link ports on the ONN that are termination points of an optic link between an ONN and a network element between an ONN and black box.

Setting bandwidth for client ports

From the Bandwidth Allocation form, accessible through the Network Map, users can view and update previously set ONN paramters for bandwidth allocation.

The bandwidth allocation form possesses the following fields:

- **Network:ClientServiceType**: indicates the actual bandwidth (payload) for the port in the network.
- **Network:NetworkInterfaceType**: indicates the client/network interface attribute of the port in the network.
- **Allocation Status**: specifies the status of the allocation requests made for the associated ports by the user.
- **Manager:ClientServiceType**: corresponds the bandwidth set from the network manager.
- **Manager:NetworkInterfaceType**: represents the client/network interface for the port on the network manager.
- **Error Description**: indicates the cause of failure.

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Provisioning support

Overview

This section discusses the provisioning support provided by the ONN.

Connection types

Navis™ Optical PM - NP supports three connection types: Unprotected, OnePlusOne protection, and Ring protection. These three protection types are supported in three provisioning modes: Auto, Manual, and Partial. The user specifies the category of the required connection, whether the category is a Permanent Connection (PC), which is not across the NN domain, or a Soft PC (SPC), which traverses through the NN domain.

> **Important!** These SPC network connections can be made only after successful completion of direct communication to the ONN from Navis™ Optical PM - NP and bandwidth allocation of ports to the ONN. If the user requests a SPC connection, and if Navis™ Optical PM - NP is unable to identify the ingress/egress LambdaRouters due to the absence of navigable ports, provisioning will fail. Navis™ Optical PM - NP will not attempt a SPC connection using available unallocated ports.

Permanent connections

If the category of connection is permanent (PC), the provisioning flow is same as what exists currently. Manual, Auto and Partial modes will be supported with ring, OnePlusOne and unprotected connection types. The bandwidth in LambdaRouters allocated for navigation will neither be eligible for manual provisioning nor for automatic route selections by Navis™ Optical PM - NP.

Soft permanent connections

If user specifies a SPC, automatic provisioning with the following protection types will be available:

- **None**: unprotected connection where a simple unprotected network connection is made
- **1+1**: where the network connection is protected by dedicated path capable of switching in case of failure
- **Reroute**: auto rerouted connections where the ONN autonomously restores the path on best-effort basis;

Unprotected connections

Unprotected connections can be set to pre-emptible or non-pre-emptible from Navis™ Optical PM - NP. A unprotected pre-emptible path can be pre-empted during revertive/non revertive auto rerouting when resources are not available.

Auto rerouted protection connections

If the user specifies an auto rerouted protection connection, it can be further classified based on reroute types as:

- Revertive: where a auto rerouted path can be re instated to the original path
- Nonrevertive: where a auto rerouted path cannot be re-instated to its original path

Provisioning an ONN connection

This section discusses the provisioning of an ONN connection.

Preconditions

The following pre-conditions apply to provisioning an ONN connection:

- Prior to the ONN connection set up, the user must have provisioned LambdaRouters associated with the ONN.
- Bandwidth Allocation involving the networkInterfaceType port parameter must have been completed.
- The session between Navis™ Optical PM - NP and the ONN and Navis™ Optical PM - NP and Navis™ Optical EMS must be UP. Server trails OL, OMS, FCS conforming with Navis™ Optical PM - NP guidelines must have been provisioned.

Provisioning input

When the user selects Configuration > ONN Connections > Add > OCH from the Network Map, the Circuit Profile Form will appear. This form allows users to specify input for OCH connection request through the NN domain.

The following ONN-specific options appear with the Circuit Profile form:

- **Connection Category**: preset to SPC (Soft Permanent Connection). For all other provisioning through Navis™ Optical PM - NP, this option is set to PC (Permanent Connection).
- **Provisioning mode**: only auto mode is available.
- **Protection types**: default is unprotected (None); 1+1 Protection; Auto Reroute Protection. For 1+1 protection type, the user is not be prompted for a_protect_location and z_protect_location.

- **Preemptible**: if unprotected is selected, the user is provided with an option to select whether the connection is preemptible. The allowed values are Y/N. The default value for preemptible is "N."
- **Reroute type**: when an auto reroute protection connection is selected by the user, the "Reroute Type" option will become active. This option allows the user to indicate whether the re-routed connection is revertive or non-revertive. This selection is available for auto re routed protection type OCH-SPC connections only.
- **Priority**: valid values ranges from 0 to 5.
- **Routing tab**: Navis™ Optical PM - NP provides users a mechanism to specify one of the following routing constraints :
  Explicit Node List: A specific list of all intermediate nodes (LR/ONN) in the path ordered from source to destination
  Exclude Node List: A list of nodes (LR/ONN) that shall be excluded from the path created.
  For a 1+1 OCH SPC connection, Navis™ Optical PM - NP provides users a mechanism to specify routing constraints:
  - Explicit Node List (Service): A specific list of all intermediate network elements in the service path specified in order from source to destination.
  - Explicit Node List (Protection): A specific list of all intermediate network elements in the protection path specified in order from source to destination.
  - Exclude Node List: A list of network elements that must be excluded from the path created. This applies for both service and protection paths.

Constrained routing

When the user selects Explicit or Exclude Node List constraint for OCH SPC connection, Navis™ Optical PM - NP provides only the LambdaRouters associated with the ONN in the included or excluded list selection box.

For unprotected and auto-rerouted paths, Navis™ Optical PM - NP supports a maximum of five intermediate network elements in the explicit node list and a maximum of 15 intermediate network elements in the exclusive node list.

For 1+1 connections, Navis™ Optical PM - NP supports a maximum of five intermediate network elements in the service explicit node list, a maximum of five intermediate network elements in the protection explicit node list, and a maximum of 15 intermediate network elements in the exclusive node list.

Cancel an ONN connection

Navis™ Optical PM - NP allows users to cancel an ONN connections at LAY, IMP, TST and COI steps. A message indicating the success or failure status is provided to the user.

Disconnect an ONN connection

Navis™ Optical PM - NP allows the disconnection of InEffect ONN connections from the Navis™ Optical PM - NP database. A message indicating the success or failure is provided to the user.

□

Network discrepancy

Overview This section describes the provisioning concepts associated with the network discrepancy feature supported by the ONN.

Definition Network discrepancy occurs when the network is changed externally to Navis™ Optical PM - NP.

The route involving ONN connections is shared between Navis™ Optical PM - NP and the ONN. When the ONN-owned section of a connection is modified or deleted, this results in discrepancies between Navis™ Optical PM - NP and the ONN.

Causes The following scenarios will cause discrepancies in Navis™ Optical PM - NP:

- When Navis™ Optical PM - NP establishes SPC paths, by sending connection requests to the ONN, a route is determined and cross connects are made on a LambdaRouter by the ONN. Navis™ Optical PM - NP receives the completion response from the ONN. Cross connect events on the LambdaRouter are sent by Navis™ Optical EMS. . These discrepancies gets cleared when user triggers route discovery for the OCH-SPC connection and system builds it using these un-correlated cross connects.
- In the case of an auto reroute SPC connection, any failures in the path manged by an ONN domain triggers a automatic rerouting in the ONN. Navis™ Optical PM - NP receives cross connects events from Navis™ Optical EMS, which indicate the disconnects inventoried as improper disconnects. According to Navis™ Optical PM - NP, they belong to the SPC connection.
- Communication between Navis™ Optical PM - NP and the ONN is down and when link comes up, the user performs an ONN Connection synchronization to synchronize all connections between Navis™ Optical PM - NP and the ONN. Any new connections created by the ONN during this time will have no SPC connection request associated with it in Navis™ Optical PM - NP.
- From Navis™ Optical PM - NP, OCH-SPC connections can be pre-emptible. This allows the auto rerouted connections to steal the resources of pre-emptible connections.

Access When a user selects **Configuration > Network Discrepancy > ONN Connections** from the Network Map, the ONN Discrepancy form, consisting of discrepancies relating to ONN connections, is displayed.

Process When ONN connections are created or disconnected external to Navis™ Optical PM - NP, ONN connection discrepancies are reported to the user. This discrepancy is identified in Navis™ Optical PM - NP either via notifications from the ONN or during an ONN connection synchronization from Navis™ Optical PM - NP. These are connections/paths in ONN consisting of cross connects on multiple LambdaRouters and is different from the existing discrepancies. These are reported as a independent ONN discrepancy reports to the user.

□

Section VI: Subnets

Overview

Purpose

This section provides conceptual information pertaining to the subnets (rings) supported by Navis™ Optical PM - NP.

Contents

Subnet support

Overview This section presents an overview of Navis™ Optical PM - NP's support for subnets (rings).

Definition A ring is a collection of network elements that form a closed loop where each network element is connected to the adjacent network element. Supported bidirectional line switched rings (BLSR) and unidirectional path switched rings (UPSR) provide redundant bandwidth or equipment to ensure system integrity in the event of any transmission failure, such as a fiber cut or network element failure.

Support Navis™ Optical PM - NP supports two broad categories of rings:

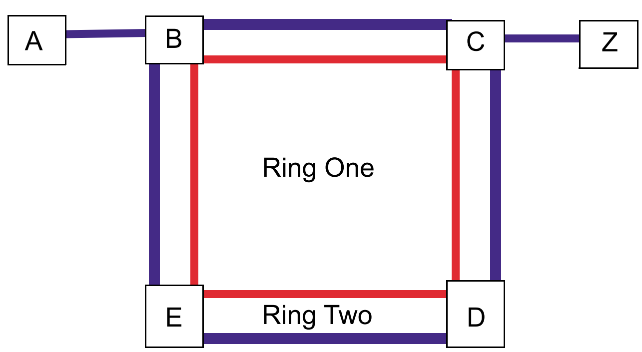
- bidirectional line switched rings (BLSR).
- unidirectional path switched rings (UPSR).

In addition to the BLSR and UPSR ring types, Navis™ Optical PM - NP also provides support for virtual rings and subtending rings.

Ring examples The following are examples of ways in which users can create rings.

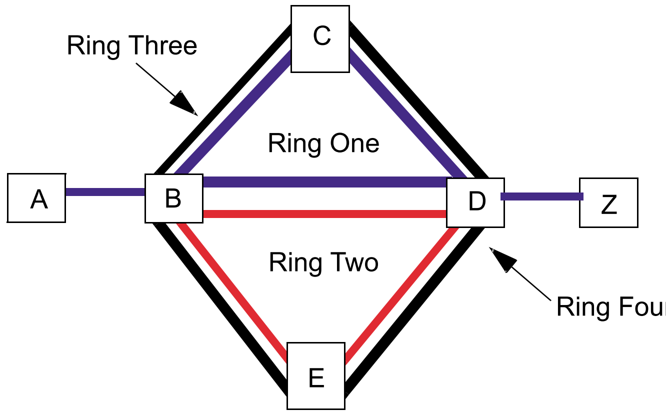
Two rings sharing all nodes

The below figure illustrates two rings sharing all nodes.



Four rings formed by four nodes

The below figure shows four rings formed using the same four network elements.



Ring names

Users can display the names of all link IDs that belong to a specified ring name through the Network Map.

If a ring is deleted, Navis™ Optical PM - NP will remove the ring name from the list of ring names. This applies to all ring types.

Protection protocol

Navis™ Optical PM - NP will display the ring protection protocol as reported to it by the EMS.

Timeslots and channels

Within each ring, the same timeslot/channel must be used. The same timeslot/channel rule is applicable to all rings.

Effect of a digital link disconnection

If the user disconnects a digital link that is part of a ring forming loop, Navis™ Optical PM - NP will delete the ring and remove the ring name from the list of ring names. This applies to all ring types.

Deletion criteria

Navis™ Optical PM - NP allows for 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.

□

Bidirectional line switched rings

Overview

This section dicusses Navis™ Optical PM - NP's support for bidirectional line switched rings (BLSR).

Size limits

Navis™ Optical PM - NP supports up to 16 network elements (including black boxes) to partake in a BLSR.

Note: For Navis™ Optical PM - NP, all the network elements in the ring will use the same channel/timeslot. This applies to both manual and automatic path provisioning.

Automatic formation criteria

Navis™ Optical PM - NP uses the following criteria to automatically form a BLSR:

- The loop forming OC-N digital links (N = 48, 192) are identical.
- The OC-N loop is closed.
- The loop closing OC-N's have identical (2-fiber or 4-fiber) protection group.
- No black boxes are included.
- The connected network elements have BLSR capability at the OC-N level closing the loop (already enforced by Navis™ Optical EMS in order to provide the protection group).
- All the network elements in the loop can interwork in a BLSR forming capacity (already enforced by the Navis™ Optical EMS in order to provide the protection group). That is, a BLSR can be automatically formed even if the network elements in the loop are not homogenous (a mix of network elements are permitted).

Two-fiber rings

When OC-N (N = 48 or 192) connectivity is established between two or more network elements, the protection group of the OC-N's is 2-fiber, and automatic ring forming pre-requisites are met, Navis™ Optical PM - NP will form a two-fiber BLSR.

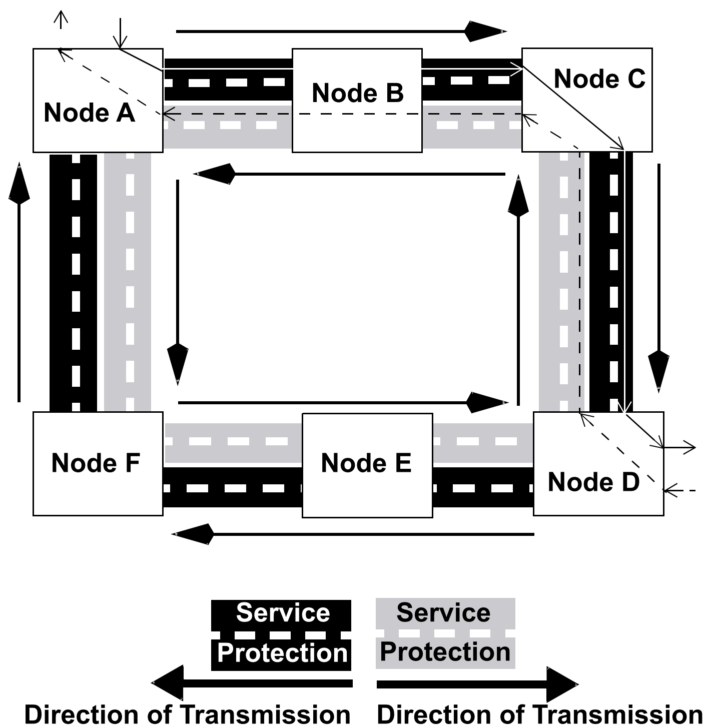
With a two-fiber BLSR, one fiber transmits and the other receives. Both transmission directions of the bidirectional connection travel through the ring in opposite directions. If the working transmit path at a given network element is clockwise, then the working receive path is ***counterclockwise*** 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. The protection channels and service channels are not on the same fiber.

Traffic Flow

The following figure shows the traffic flow on a two-fiber ring. 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.

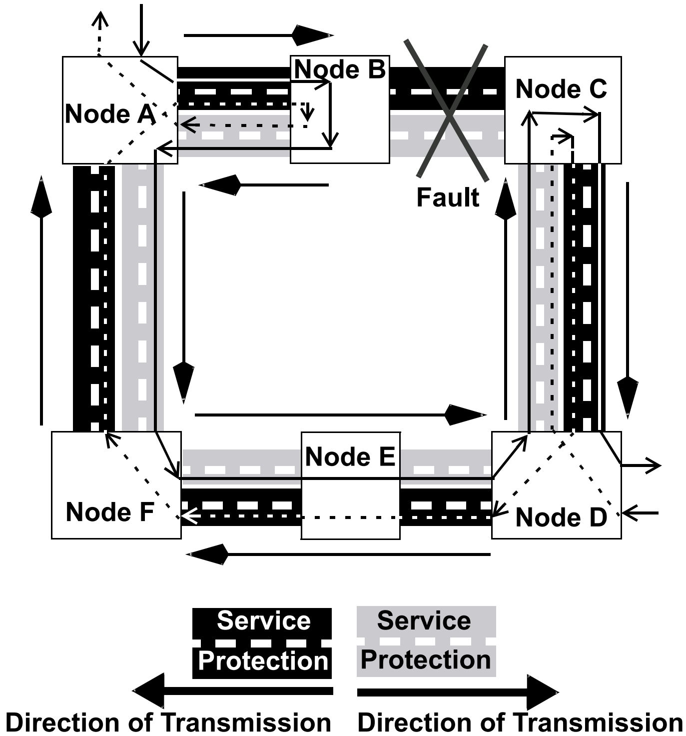
Figure 5-10 Two-Fiber BLSR



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 5-11 Two-Fiber BLSR with Fault



Four-fiber rings

When OC-N (N=48 or 192) connectivity is established between two or more network elements, the protection group of the OC-N's is 4-fiber, and automatic ring pre-requisites are met, Navis™ Optical PM - NP will create a 4-fiber BLSR.

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.

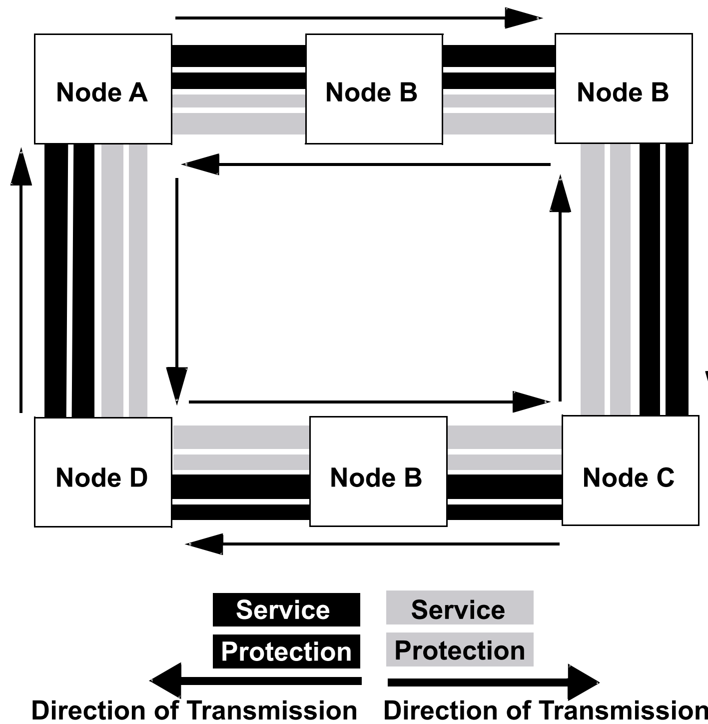
Also, the creation of a four-fiber ring is slightly different from that of a two-fiber ring in that the protection for the digital links have to be individually provisioned. It is required that the protection digital links be provisioned between the BandWidth Manager prior to the provisioning of the working (protected) digital links in creating a four-fiber ring.

Protection on a four-fiber rings consists of dedicated fibers for protection and service so that 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 5-12 Four-Fiber BLSR



Automatic BLSR-forming network elements

Navis™ Optical PM - NP will automatically form a BLSR using the following SONET network elements at the OC-N level specified when the BLSR prerequisites are met.

Table 5-16 Automatic BLSR-forming network elements

Network element	Rate	BLSR Type
DMX Release 2.0 and 2.1	OC-48/OC-192	Not supported.
DMXpress Release 1.0	OC-48	
LambdaUnite MSS	OC-48	2 Fiber
	OC-192	2 Fiber

Table 5-16 Automatic BLSR-forming network elements (continued)

WaveStar BandWidth Manager	OC-48	2 Fiber and 4 Fiber
	OC-192	2 Fiber and 4 Fiber
WaveStar TDM 2.5/10G	OC-48	2 Fiber
	OC-192	2 Fiber

Manual formation criteria

The following conditions must be met in order to manually form a BLSR with Navis™ Optical PM - NP:

- All network elements selected to participate in the 2- or 4-fiber BLSR must have 2- or 4-fiber BLSR forming capability respectively.
- At least two network elements have been identified/selected for creating the ring.
- The digital links connecting the participating network elements form a closed loop.
- The protection group (if applicable) must be identical on all network elements.
- The digital links forming the closed loop are of the same level (they are either all OC-3, OC-12, OC-48 or OC-192).
- The ring to be created does not already exist.
- The network elements selected to participate in the desired ring are not all black boxes.

Timeslot and channel use

In the case of provisioning ring protected paths going through BLSRs:

- **Auto path selection**: Navis™ Optical PM - NP will automatically pick the same timeslot/channel of all the service link segments in the BLSR.
- **Manual path selection** : once a user selects the timeslot/channel of the first service link segment in the BLSR, Navis™ Optical PM - NP will reserve/mark the same timeslot/channel for the rest service link segments. Navis™ Optical PM - NP will discard any protection link segment selected by the user.

□

Unidirectional line switched rings

Overview

This section dicusses Navis™ Optical PM - NP's support for unidirectional line switched rings (UPSR).

Definition

A UPSR provides path-level protection for VT1.5 (DMX and DMXpress) circuits within a physical ring network. The ring is usually comprised of unprotected lines at the same OC-N rate.

Size limits

Navis™ Optical PM - NP supports up to 65 network elements to participate in a UPSR.

Note: All network elements in the ring use the same channel and timeslot. This applies to both manual and automatic path provisioning.

Automatic formation criteria

Navis™ Optical PM - NP uses the following criteria to automatically form a UPSR:

- An OC-N (N = 3, 12, 48, 192) loop is closed.
- The loop forming digital links are identical in value.
- None of the end loop forming OC-N digital links are in a 1+1 APS, 2-Fiber, or 4-Fiber protection group.
- No black boxes are included.
- The connected network elements have UPSR capability using the loop closing OC-N links.
- All the network elements in the loop can interwork in a UPSR capacity within the context of Navis™ Optical PM - NP.
- Only homogenous network elements are allowed in the automatically forming of an UPSR. Note that Metropolis DMX and Metropolis DMXpress network elements are considered as the same network element type when forming a UPSR.

Automatic UPSR-forming network elements

Navis™ Optical PM - NP can automatically form a UPSR using the following SONET network elements at the OC-N level specified when the UPSR prerequisites are met.

Table 5-17 Automatic UPSR-forming network elements

Network element	Rate
Metropolis DMX	OC-3, OC-12, OC-48, OC-192

Table 5-17 Automatic UPSR-forming network elements (continued)

Metropolis DMXpress	OC-48

Manual UPSR-forming network elements

Navis™ Optical PM - NP supports the forming of a UPSR for the following SONET network element at the specified OC-N rate when the manual ring forming criteria are met.

Table 5-18 Automatic UPSR-forming network elements

Network element	Rate
Metropolis DMX	OC-3, OC-12, OC-48, OC-192
Metropolis DMXpress	OC-48
LambdaUnite MSS	OC-12, OC-48
WaveStar BandWidth Manager	OC-12, OC-48
WaveStar TDM 2.5G/10G	OC-12, OC-48, OC-192

Manual formation criteria

The following conditions must be met in order to manually form a UPSR with Navis™ Optical PM - NP:

- All network elements selected to participate in a UPSR have UPSR forming capabilities respectively.
- A minimum of two network elements have been selected for creating the ring.
- The digital links connecting the participating network elements form a closed loop.
- The digital links forming the closed loop are all of the same level (all OC-3, OC-12, OC-48, or OC-192).
- The digital links forming the loop are not be members of a 1+1 linear APS, 2-fiber or 4-fiber group.
- The ring to be created does not already exist.
- The network elements selected to participate in the desired ring are not all black boxes.

Timeslot and channel use

When provisioning a 1+1 protected path that goes through a UPSR, the following items apply:

- **Auto path selection**: Navis™ Optical PM - NP will automatically pick the same timeslot/channel of all the link segments in the UPSR.
- **Manual path selection**: the user needs to specify each link segment in the UPSR as either service or protection. Once the user selects the timeslot/channel of the first link segment in the UPSR, Navis™ Optical PM - NP will reserve/mark the same timeslot/channel for the rest service/protection link segments.

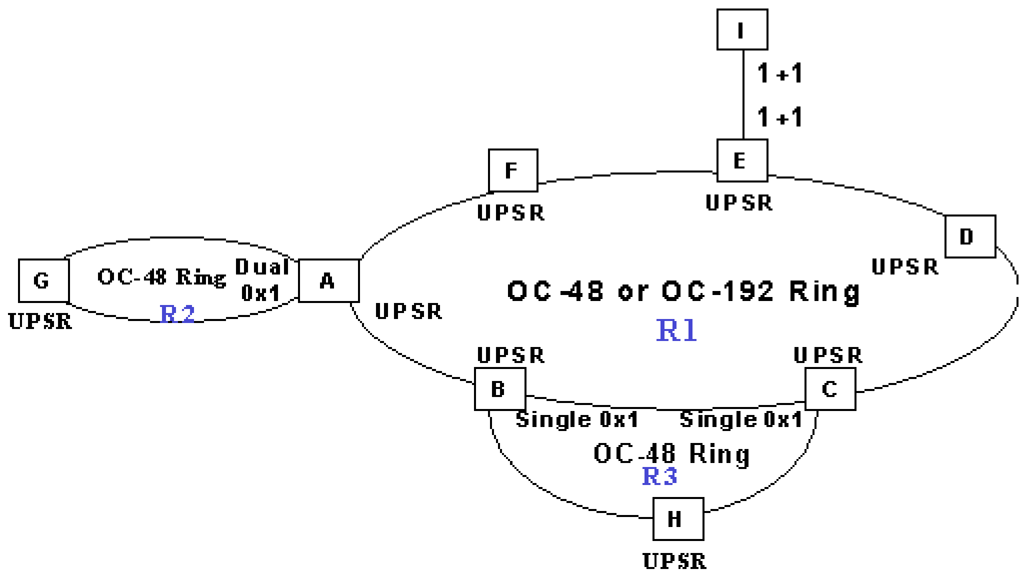
□

Subtending rings

Overview This section describes Navis™ Optical PM - NP's support for subtending rings.

Definition A subtending ring is assumed to be associated with a UPSR. In the following figure, both the single homed subtending ring (R2) and dual homed subtending ring (R3) is associated with the main UPSR (R1).

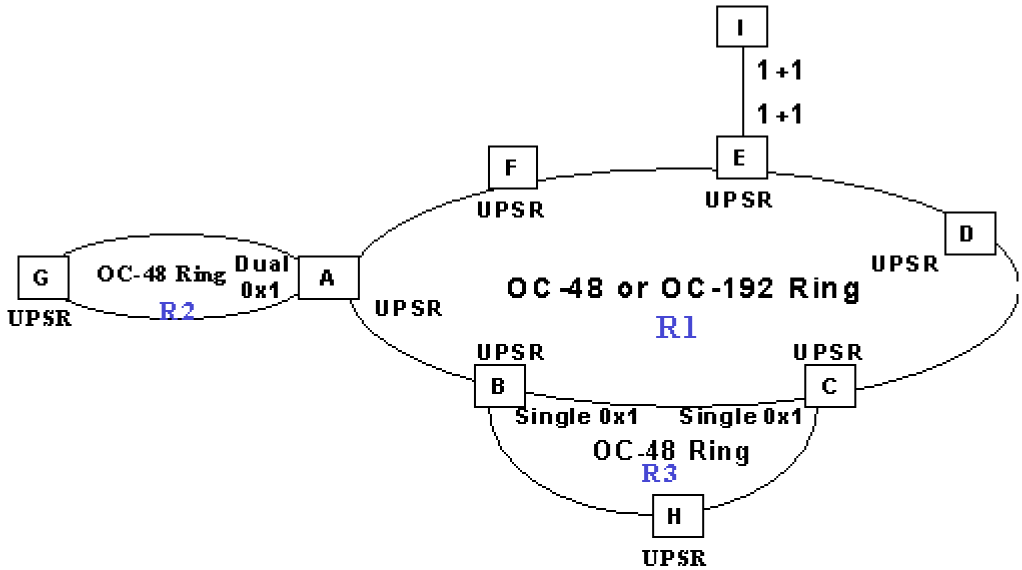
Figure 5-13 A typical Metropolis DMX and Metropolis DMXpress ring topology



Single homed rings

A single homed subtending ring (R2) consisting of Nodes G and A forms a 'closed' loop with the two digital links terminating at Node A's function unit with or without the consideration of the main UPSR (R1). The single homed subtending ring can be formed with the existing manual (physical) ring forming.

Figure 5-14 Single homed subtending ring example

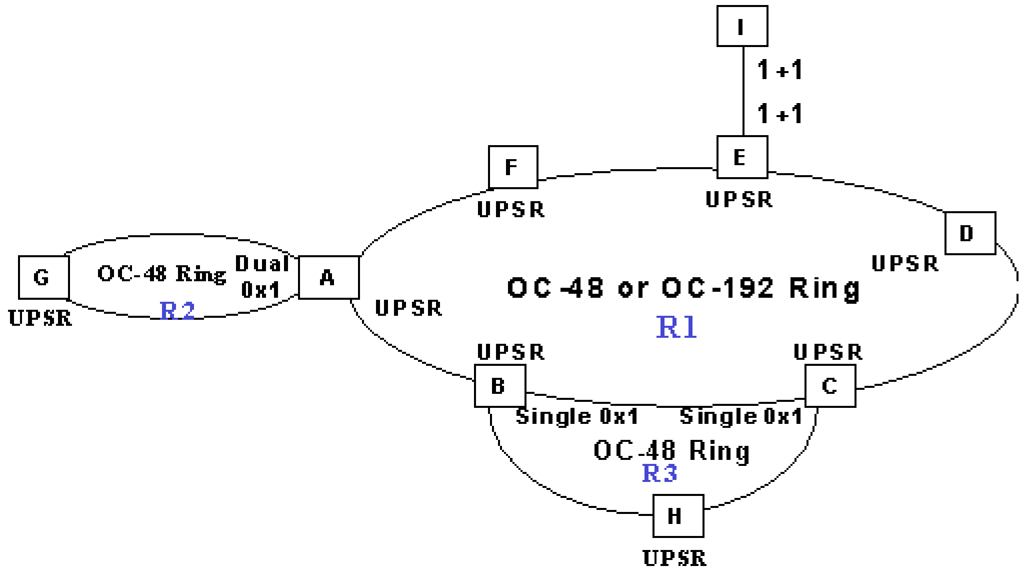


Dual homed rings

A dual homed subtending ring is an open ring which allows only a pair of adjacent nodes in a ring that do not have a link connected. The two end nodes of a dual homed subtending ring do have a link or links connected between them. However, any links are assigned to a main UPSR. There can be additional node(s) in the main UPSR between the two end nodes of the dual homed subtending ring.

In the figure below, the dual homed subtending ring (R3) consisting of Nodes H, B, and C forms a closed loop only with the consideration of the main UPSR (R1).

Figure 5-15 Dual homed subtending ring example



Size limits

Navis™ Optical PM - NP supports up to 65 network elements to participate in a subtending ring.

Note: For Navis™ Optical PM - NP, all the network elements in the ring will use the same channel/timeslot. This functions is applied to both manual and automatic path provisioning.

Automatic formation criteria

Navis™ Optical PM - NP does not support the automatic formation of subtending rings.

Manual creation

Navis™ Optical PM - NP supports manual subtending ring formation when each network elements is a Metropolis DMX or Metropolis DMXpress. With the exception of the host network elements, the loop forming OC-n digital links in each of the Metropolis DMXs or Metropolis DMXpresses can terminate at the two main slots with the same level of OC-3/OC-12/OC-48 optical interfaces. In addition, each port in these slots must configure in the “UPSR port ProtectionAssociation”.

For the host nodes, the one (the single homed subtending ring) or two (the dual-homed subtending ring) host nodes must use the function unit slots with the same OC-n rate and the port in these slots must configure in the “0x1 port ProtectionAssociation”.

Manual formation criteria

The following conditions must be met in order to manually form a ring with Navis™ Optical PM - NP:

- A minimum of two network elements have been selected for creating the ring.
- The digital links connecting the participating network elements form a closed loop.
- The digital links forming the closed loop are all of the same level (all OC-3, OC-12, OC-48, or OC-192).
- The digital links forming the loop are not be members of a 1+1 linear APS, 2-Fiber or 4-Fiber group.
- The ring to be created does not already exist.
- The network elements selected to participate in the desired ring are not all black boxes.

□

Virtual rings

Overview

This section describes Navis™ Optical PM - NP's support for virtual rings.

Definition

A virtual ring is usually a main UPSR ring plus at least one adjacent subtending ring. A network element can belong to more than one virtual ring. When multiple rings are required to form a virtual ring, the adjacent rings must share at least one common network element.

Size limits

Navis™ Optical PM - NP supports a virtual ring consisting of one UPSR and up to 15 subtending rings.

Creation criteria

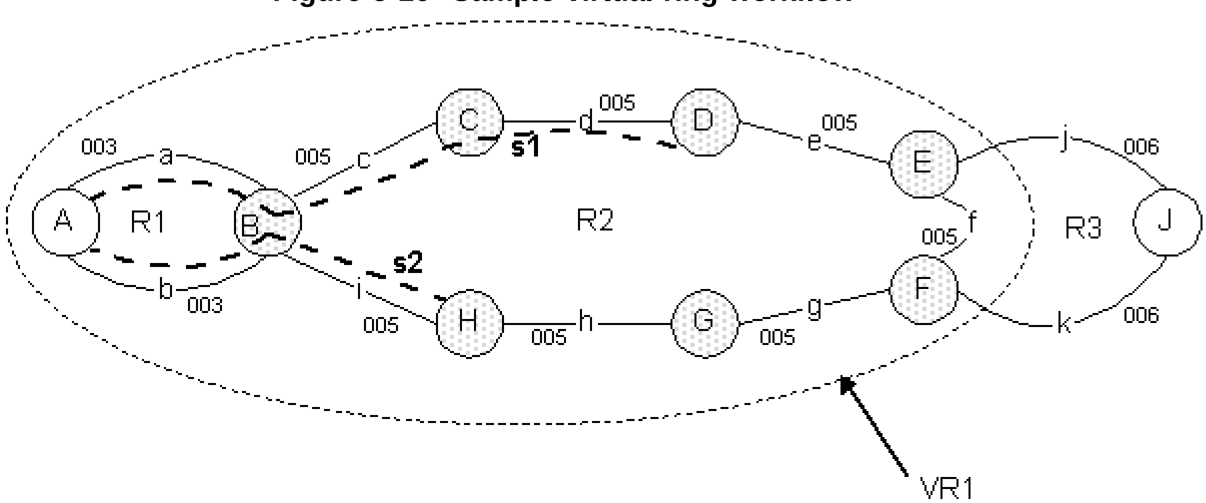
The following criteria applies to creating virtual rings:

- Must be manually created.
- For use with UPSR and subtending rings only.
- Within each ring, the same timeslot/channel must be used. The same timeslot/channel rule is applicable to all rings.
- VT1.5 can ride on STS-1 paths or OC-N (N = 3, 12, 48, 192) links.

Workflow

This section describes a sample workflow of a virtual ring. This virtual ring is assumed to transverse only rings (R1) and (R2).

Figure 5-16 Sample virtual ring workflow



1. The user provisions OC-N links and forms a ring. In the figure, links (a) and (b) with nodes (A) and (B) form ring (R1).
2. Links (c), (d), (e), (f), (g), (h), and (i) with nodes (B), (C), (D), (E), (F), (G), and (H) form ring (R2) and links (j) and (k) with network elements (E), (F), and (J) to form ring (R3). It is assumed that the virtual ring only transverses (R1) and (R2).
3. The user provisions a pair of STS-1s to traverse the main ring (R2) and at least one subtending ring (s1 from Node A to D) and (s2 from node A to H). The two STS-1 paths should be provisioned in opposite directions of the ring (i.e. clockwise and counter-clockwise) and cannot have any overlapping segments or links. It is the user’s responsibility to make sure each STS-1 path of the pair has the same timeslot within the same ring. For example, if timeslot/channel ″005″ is picked for link (c) and (d) of (s1) then the user should also pick ″005″ for link (i) of (s2). In (R1), if timeslot/channel ″003″ is picked for link (a) of (s1) then the user should also pick ″003″ for link (b) of (s2). Different rings can have different timeslot/channels.
4. The user forms virtual rings for the STS-1 timeslots only. Navis™ Optical PM - NP will provide a means for allowing the user to form a virtual ring and select the supported circuit/path rate for the virtual ring. In the current release, only the STS-1 is supported. Also,Navis™ Optical PM - NP provide the available/unmarked timeslots/channels of the specified circuit/path rate (only STS-1 for the current release) for all links within each ring. For each ring, the user needs to select one from the available/unmarked timeslots to be used to carry the STS-1 path in the ring. For example, the virtual ring (VR1) can consist of nodes (A), (D), (E), (F), (G), and (H) with timeslot 003 in (R1) and 005 in (R2) respectively. Note that network elements (B) and (C) are not part of the virtual ring due to the fact that the STS-1 timeslot is riding on the STS-1 infrastructure paths.
5. For the remaining links in the ring that do not have the STS-1 paths on the selected timeslot, Navis™ Optical PM - NP will reserve the same timeslot/channel (as user specified) for those segments of each ring (as user entered) respectively.

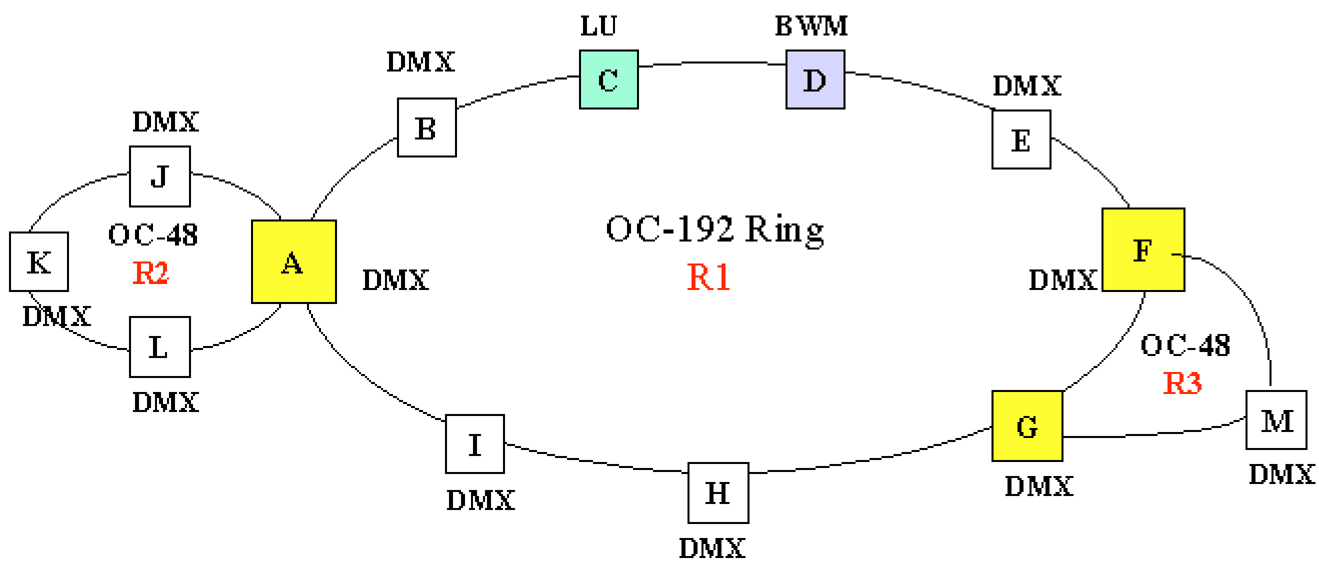
Virtual ring creation examples

This section illustrates the creation of a virtual rings by only one STS-1 pair and possibly with one additional “express” STS-1 path.

With the network configuration as shown in the following figure, it is assumed that Node C is a LambdaUnite, Node D is a WaveStar BandWidth Manager, and all of the remaining nodes are Metropolis DMXs. There are three rings in this figure:

- **R1**: an OC-192 Main UPSR formed by the nine nodes, A through I.
- **R2**: an OC-48 "single homed" subtending ring formed by the four nodes, J, K, L, and host node A.
- **R3**: an OC-48 "dual homed" subtending ring formed by the three nodes, M and two host nodes F and G.

Figure 5-17 Metropolis DMX configuration with a mixed main UPSR



The following table summarizes the STS-1 paths (and their associated time slots) that may have been provisioned for Figure 5-15. These paths are intended for virtual ring creation and carrying T1/T3 traffic.

Table 5-19 Example STS-1 paths provisioned for the creation of virtual rings

STS-1 Scenario	1st STS-1 (Rings transversed	2nd STS-1 (Rings transversed	STS-1 Time Slot in:		
			Ring 1 (R1)	Ring 2 (R2)	Ring 3 (R3)
VR1	K-J-A-B-C-D-E (R2, R1)	K-L-A-I (R2, R1)	1	1	-
VR2	K-J-A-B (R2, R1)	K-L-A-I (R2, R1)	2	2	-

Table 5-19 Example STS-1 paths provisioned for the creation of virtual rings (continued)

VR3	K-J-A-B (R2, R1)	K-L-A-I (R2, R1)	3	3	-
VR4 (express)	B-C-D-E (R1)	None	3	-	-
VR5	M-G-H (R3, R1)	M-F-E-D-C-B (R3, R1)	192	-	1
VR6	M-G-H (R3, R1)	M-F-E (R3, R1)	191	-	2
VR7	K-J-A-B-C-D-E-F-M (R2, R1, R3)	K-L-A-I-H-G-M (R2, R1, R3)	4	4	4
VR8	K-J-A-B-C-D-E (R2, R1)	K-L-A-I-H-G-M-F-E (R2, R1, R3)	5	5	5

In the following table, which supplements Table 5-19 and Figure 5-15, columns two to four show the user selection of rings and their STS-1 time slots for virtual ring creation. Column six shows the nodes that belonged to the successfully created virtual ring. The nodes in column six enclosed in parenthesis are bypassed by STS-1 paths in the created virtual ring.

Table 5-20 Example of virtual ring creation

STS-1 Scenario	STS-1 Time Slot Picked			Virtual Ring Creation	
	R1	R2	R3	Y/N	Virtual Ring Nodes
VR1	1	1	-	Y	K-(J-A-B-C-D)-E-F-G-H-I-(A-L)-K
VR2	2	2	-	Y	K-(J-A)-B-C-D-E-F-G-H-I-(A-L)-K
VR3 and VR4	3	3	-	Y	K-(J-A)-B-(C-D)-E-F-G-H-I-(A-L)-K
VR5	192	-	1	Y	M-(G)-H-I-A-B-(C-D-E-F)-M
VR6	191	-	2	Y	M-(G)-H-I-A-B-C-D-E-(F)-M
VR7	4	4	4	Y	K-(J-A-B-C-D-E-F)-(M-G-H-I-A-L)-K
VR8	5	5	5	Y	K-(J-A-B-C-D)-E-(F-M-G-H-I-A-L)-K

Selecting ring IDs

To form a virtual ring, Navis™ Optical PM - NP allows users to select rings from a list of ring IDs (PSR and subtending rings that already exist) to form a virtual ring. Each virtual ring consists of at least two rings which consists of one main UPSR and one or more subtending rings. Multiple selections of all the required ring IDs for creating a virtual ring are provided. For virtual ring creation, every listed ring ID can be selected only once (if selected). In other words, multiple selections of the same ring ID for the same virtual ring creation is denied.

Time slot and channel use

Once the virtual ring is created, Navis™ Optical PM - NP reserves the same timeslot and channel, as the two STS-1 infrastructure paths used, of the rest of the link segments around the ring (for main and subtending rings). In other words, Navis™ Optical PM - NP will enforce the use of the same timeslot/channel in each rings forming the virtual ring, and the user can not manually select different timeslots/channel for the paths. Upon a successful creation of a virtual ring, Navis™ Optical PM - NP will generate a unique name/ID for the virtual ring.

Deleting a virtual ring

Navis™ Optical PM - NP allows users to delete a virtual ring without deleting the STS-1 paths as long as there are no VT1.5 circuits riding on the virtual ring. If any of the STS-1 paths that are part of a virtual ring are deleted, the virtual ring shall be automatically deleted. If any of the rings forming the virtual ring are deleted, the virtual ring shall be deleted.

Navis™ Optical PM - NP allows for the disconnection of a STS-1 path that was used in forming a virtual ring as long as the ring is not providing any protection to an in-effect or pending path/trail.

□

Hairpinning

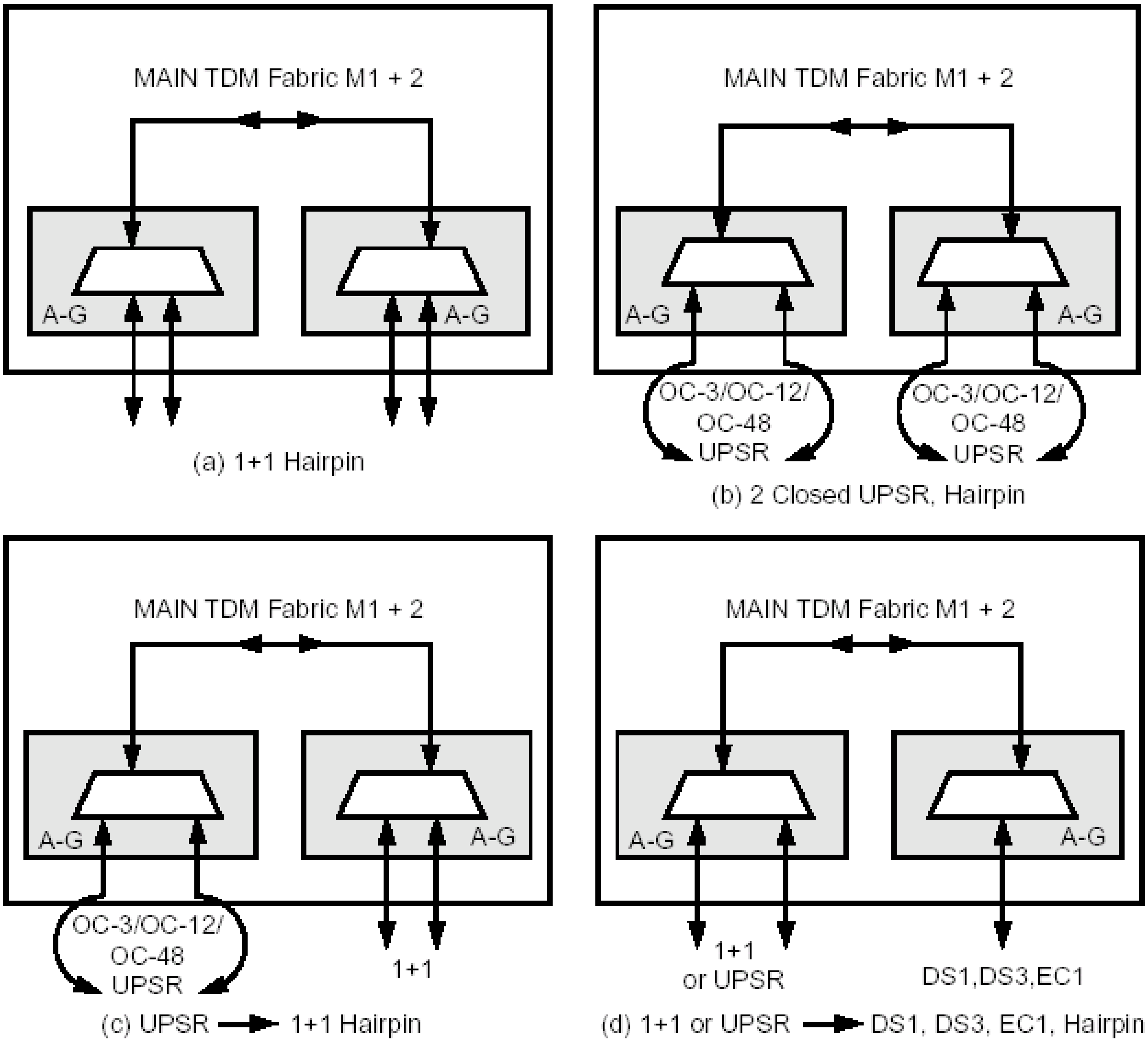
Overview In a “hairpinning” topology, low-speed tributary traffic is routed into Navis™ Optical PM - NP and back out of the system without ever being placed on the high-speed (OC48 or OC-192) UPSR interfaces. Hairpinning can be either inter-function group or intra-function group hairpinning cross-connections.

Hairpinning connections

Important! Hairpinning is only applicable with Metropolis® DMX network elements.

The following figure illustrates hairpinning connections.

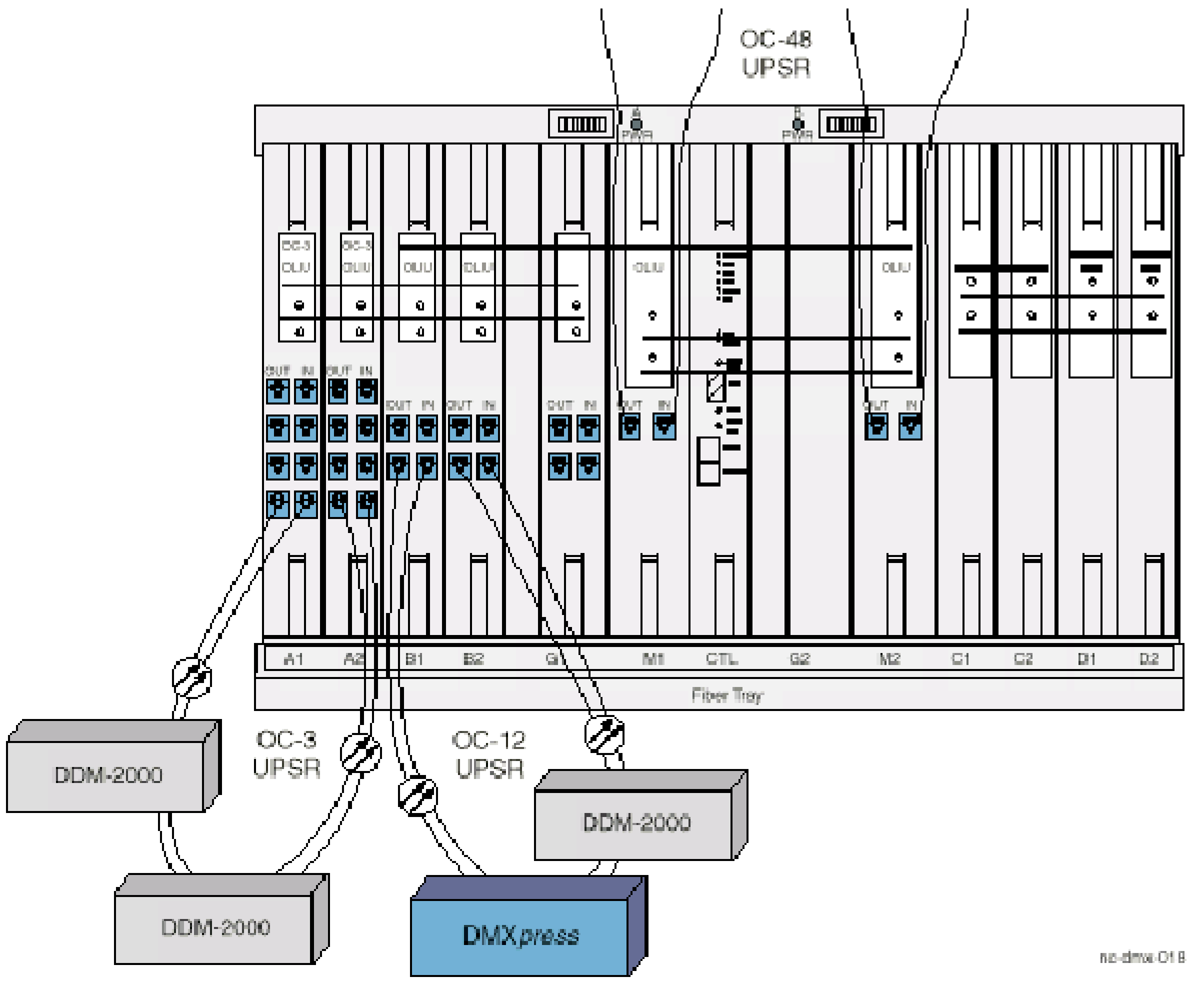
Figure 5-18 Hairpin connections



Inter-function group hairpin

Navis™ Optical PM - NP supports two way "inter-function group hairpin" cross connections between channels on two different ring interfaces on different function units. In following Figure, for example, traffic from OC-3 UPSR ring coming into function unit A is hairpinned to OC-12 UPSR ring in function unit B.

Figure 5-19 Inter-function group hairpin



Intra-function group hairpins

Navis™ Optical PM - NP supports two way "intra-function group hairpin" cross connection between channels on two different ring interfaces on the same function unit.

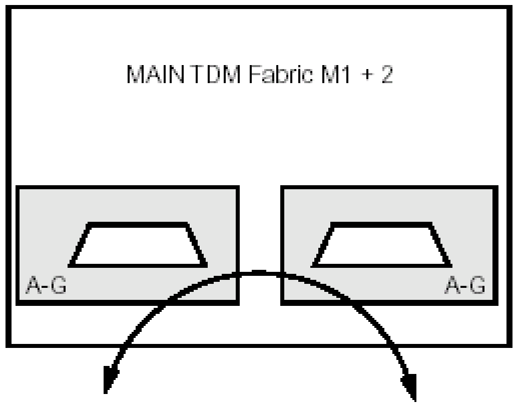
Protection association in inter/intra function group hairpins

In Navis™ Optical PM - NP, for inter/intra function group hairpin crossconects between two different ring interfaces, both pair of ports at either end must have either '0x1' Protection association or 'UPSR' Protection Association (i.e 'UPSR' to '0x1' is currently not supported).

Pass-through hairpin cross connect

Navis™ Optical PM - NP supports two way intra-function group "pass-through hairpin" cross connections between a receive port and a transmit port on a ring interface channels on same or different ring interfaces, on the same function unit.

Figure 5-20 Pass-through hairpin



□

Section VII: Virtual Concatenation Groups

Overview

Purpose

This section provides conceptual information for virtual concatenation groups (VCG) as supported by Navis™ Optical PM - NP.

Contents

Virtual concatenation support

Definition

Virtual concatenation is a standards compliant mechanism for efficiently transporting payloads which do not neatly fit into a standard SONET-sized container across a SONET network. It works by distributing the payload across a number of standard SONET containers, transporting the containers independently across the network and then reassembling the payload a the other side.

In the network model, virtual concatenation is supported by allowing a virtually concatenated link connection to be derived from multiple STS-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).

Feature support

The following items apply to virtual concatenation groups as they relate to Navis™ Optical PM - NP:

- Application of virtual concatenation groups is for Ethernet transport only.
- An Ethernet card can interwork with another Ethernet card of a different network element type (example Metropolis DMX and Metropolis DMXpress).
- Gigabit Ethernet (1GbE) and Fast Ethernet cards are supported.
- Neither a LAN nor WAN port enabling/disabling is performed at Navis™ Optical PM - NP-level.
- No Ethernet parameter setting for a LAN or WAN port is performed from the Navis™ Optical PM - NP-level.

- LAN to WAN associations are unknown and not accounted by Navis™ Optical PM - NP.
- Navis™ Optical PM - NP does not support the merging of STS-1 circuit/path if any one of the circuits/path to be merged terminates on a port derived from a VCG port.
- The identification of the link capacity adjustment system (LCAS) to Navis™ Optical PM - NP is the user's responsibility.
- Enabling/disabling LCAS across the Navis™ Optical EMS interface is not supported.
- Its the user's responsibility to enter the correct required capacity.
- Only two-way STS-1's can be members of a VCG.
- Any rearrange that results in a change of a VCG end port(s) or a VCG member's (STS-1) port contained by a VCG port is not supported.
- The VCG has to be provisioned before the individual STS member trails can be provisioned. The variable rate is changed via the capacity parameter and subsequent adding/removing STS trail(s).
- Support for single ended VCGs (a VCG in which only one end, either the "A" or "Z" end, is provided) and dual ended VCGs (a VCG in which both ends, the "A" and "Z" ends, are specified).
- Ethernet support for LambdaUnite MSS R2.1 (no support for release 2.0)
- Enabling or disabling LCAS across the southbound interface is not supported.

Naming conventions

Navis™ Optical PM - NP allows up to 83 alphanumeric characters for a VCG name. The valid characters are alphanumeric characters (A-Z, a-z and 0-9) plus "/", ".", "_", "-", and ″ ″ (forward slash, period, underscore, dash and blank) and is case sensitive. Navis™ Optical PM - NP will remove all leading and trailing blanks.

Navis™ Optical PM - NP will ensure that the user specified VCG name is unique within Navis™ Optical PM - NP.

Adding a VCG

The provisioning of a VCG is slightly different from the provision of other circuits/paths in Navis™ Optical PM - NP in that the specification of the two end network elements or ports are not always necessary. That is, a VCG can be provisioned using a single network element and port since no explicit and direct physical connection is implied by a VCG. The port(s) specified during VCG provisioning are WAN ports and have a one-to-one correspondence to a VCG port.

Users must specify the VCG name, capacity, required capacity, and whether LCAS is applicable. Enabling or disabling can be performed at either the EMS or network element level since LCAS information is not currently passed across the Navis™ Optical EMS interface.

Once a VCG has been provisioned and given a VCG name, STS trails can be provisioned as members of the VCG. During STS trail provisioning, Navis™ Optical PM - NP is expected to provide the user with an option to identify the VCG that the STS trail will belong to. Navis™ Optical PM - NP allows only STS-1 trails to belong to a VCG

Modify a VCG

Users can display and modify a VCG from the list of VCGs existing in Navis™ Optical PM - NP through the Network Map (**Configuration > Virtual Concatenation Group > Display/Modify**). Navis™ Optical PM - NP will present a VCG Query Box which allows filtering of the list of VCGs based on either the VCG Name, Order Status with/without Order Action, or A and/or Z Location.

Provisioning with one end port

Navis™ Optical PM - NP supports the provisioning of a STS trail in which one or both ends terminate at a VCG capable card. In case of a single-ended VCG, the other end of the STS trail (not the end that is derived from the VCG port) should have a STS-1 cross-connect and should not terminate on a non-SONET (asynchronous) port (e.g. DS3).

VCG selection

During STS trail provisioning, once user has selected A and/or Z node, Navis™ Optical PM - NP will present the user with a list of VCG names and capacity, associated with the nodes. The VCG field on the STS trail provisioning screen is only available for the STS-1 rate. The user is able to select only one of the VCGs from the list.

A STS trail in a VCG can have one or both ends terminated on a VCG capable card. Allowing one end of the STS trail to terminate on a “plain” SONET port is required to cover the case of an VCG in which both ends may not be within Navis™ Optical PM - NP domain.

The following figure shows a single-ended VCG. The second figure shows the VCG having three STS trail members.

Figure 5-21 A single-ended VCG

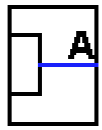


Figure 5-22 Members of a single-ended VCG

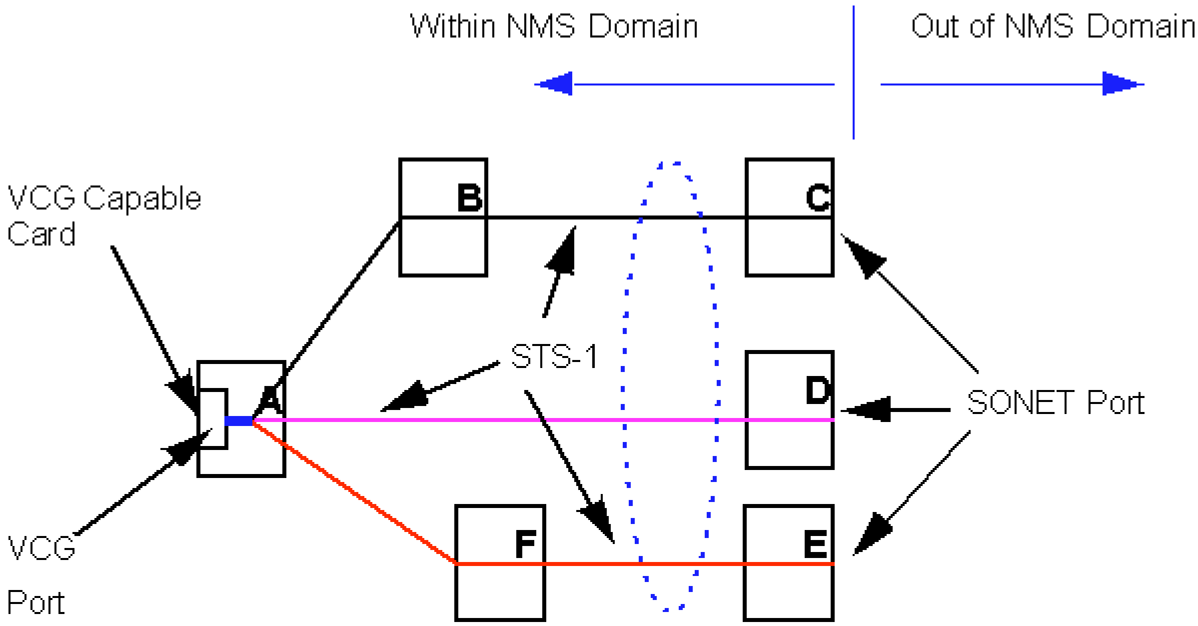


Figure 5-23 A dual-ended VCG

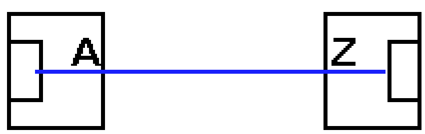
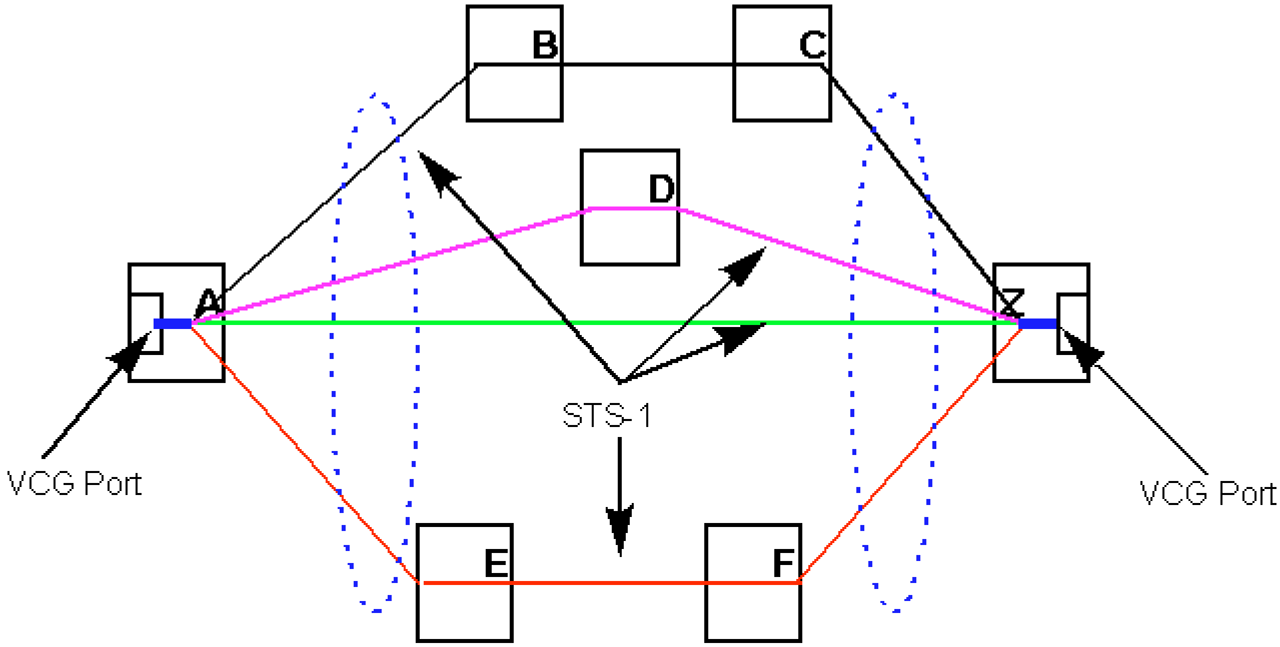


Figure 5-24 Members of a dual-ended VCG



STS port constraints

Navis™ Optical PM - NP does not allow the provisioning of a STS trail with one end terminating on an SONET port if the STS trail is to belong to a dual-ended VCG. In other words, both ends of the STS trail have to terminate on a VCG port for the STS trail to belong to a dual-ended VCG. Navis™ Optical PM - NP does not allow the provisioning of a STS trail with either end terminating on a VCG port, if the VCG name was not specified.

Deleting a VCG

Navis™ Optical PM - NP will deny the deletion of a VCG if the VCG has member STS trails, be it in-effect or pending. Upon successful deletion of a VCG, Navis™ Optical PM - NP will remove the VCG name (no history maintenance is required for a VCG name; the VCG name can be reused immediately after deletion).

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Virtual concatenation with link capacity adjustment scheme

Overview

This section describes Navis™ Optical PM - NP's support for virtual concatenation with a link capacity adjustment scheme (LCAS).

Background

LCAS provides a control mechanism to 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.

Bandwidth adjustment

Once provisioned, bandwidth adjustment is hitless.

- Bandwidth can be modified under management control while keeping the virtually concatenated path in service. This will not be service affecting, and can done by:
  - Provisioning additional STS-Ns to be part of the virtually concatenated path.
  - Reducing the number of STS-Ns that are part of the virtually concatenated path.
- Bandwidth can be modified automatically due to failure of the STS-Ns whilst keeping the virtually concatenated path in service.
  - On failure, the affected STS is disabled until the path has been restored, at which point it will be re-incorporated into the STS-N.
  - If failure of all but one of the STS paths, the STS path will be degraded and will be operating at a reduced bandwidth. If the final STS-N fails then the STS also fails.
- Bandwidth can be protected whilst keeping the virtually concatenated path in service by provisioning the capacity STS-N to be greater than the intended maximum capacity needed by the client service.
  - On failure of one or more of the STS-Ns in the VCG, reducing the capacity of the VCG down to the intended maximum capacity needed by the client service, the VCG itself is degraded, however the service itself is still working.
  - On failure of one or more STS-Ns in the VCG, reducing the capacity of the VCG to below that required for the intended maximum capacity needed by the client service, both the VCG is degraded and the service itself is degraded.

Ordinal symmetry

For the STS-1-Xv path to operate successfully, the STS-n TTPs 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, a 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 terminates 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 terminates 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.

The LCAS has the ability to reconstitute the STS-1-Xv based on the sequence number of each of the STS-Ns, ensuring that the payload of STS-1-Xv is reconstituted in the right order.

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Virtual concatenation without link capacity adjustment scheme

Overview

This section describes Navis™ Optical PM - NP'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 SONET so as to increase flexibility in the use of the available bandwidth in the network. The availability of the pipes is based on the 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 STS-Ns can be added, however, this will be service affecting.
- If a failure of one on the STS-Ns that makes up the STS-1-Xv occurs, then the STS-1-Xv Path itself fails. This will also be service affecting.

Ordinal symmetry

For the STS-1-Xv path to operate successfully, the STS-n TTP'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, 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 terminates 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 terminates 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.

A sequence number is added to the overhead of each of the STS-Ns to ensure that the payload of the STS-1-Xv is reconstituted in the right order. If the order of the STS-Ns paths that support the STS-1-Xv path is not maintained, then the STS-1-Xv path will fail. If a STS-N has a sequence number that is completely out of the scope of the STS-1-Xv will be treated the same as if the order has been mixed up and the STS-1-Xv will fail.

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Section VIII: Shared Risk Groups

Overview

Purpose This section provides conceptual information pertaining to shared risk groups as supported by Navis™ Optical PM - NP.

Contents

Shared risk group support

Definition

A shared risk group is an identifier used to indicate risk among fibers that use the same conduit. All entities that share the same risk can be grouped into a risk group.

Functionality

A shared risk group possesses the following functionality:

- Can be associated with digital links, optical multiplex sections, and optical links.
- Users are not allowed to modify or delete a shared risk group identification when it is associated with a digital link, optical multiplex section, or optical link.
- Cable and conduits are not supported.
- Able to be associated to digital links with IE status.
- Maximum of five shared risk groups can be associated with each digital link.

Creating shared risk groups

Navis™ Optical PM - NP allows users to create shared risk groups through the Network Map (**Configuration > Shared Risk Group > Add**). If duplicate risk groups are created, Navis™ Optical PM - NP rejects the duplication. The Risk Group Add form contains the following fields:

- **Shared Risk Group Name**: this alphanumeric string specifies the shared risk group's name. A maximum of 83 characters is allowed.
- **Shared Risk Group Id**: the number associated with the shared risk group. Each shared risk group ID contains a two-byte (unassigned) value = [1...65535].
- **Description**: used to add comments. The description format is limited to 32 characters.

Display or modify shared risk groups

Users can display and modify shared risk groups from the Network Map (**Configuration > Shared Risk Group > Display/Modify**). Users can modify a shared risk group name by simply overwriting it. However, modifying a shared risk group identification is not allowed if the shared risk group is already allocated to a digital link or optical link connection.

Update shared risk groups

Users can update shared risk group IDs by overwriting them and can also add or modify any comments from the shared risk group list form. After modifying the IDs, the user can update them through **Action > Update**. Updating is not allowed if the shared risk group is already allocated to a digital link, ONN ports of a FCS, or to an optical link connection.

Display associated links

Users can display the digital links associated with a shared risk group through the Network Map (from the Shared Risk Group List form, select **Actions > Shared Risk Group > Links Association list**).

Deleting shared risk groups

Users can select a row in the Shared Group List form and then delete the selected group through the **Action > Delete** menu item. Users can not delete a shared risk group if it is already associated with any digital or optical links.

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6 Network Element Port Addresses

Overview

Purpose

This chapter presents the port addresses for the network elements supported by Navis™ Optical PM - NP.

Contents

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.

Contents

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 PM - NP, 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 PM - NP. 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 Navis™ Optical PM - NP GUI and also on the Port Selection screens. The Network Level Address selected by the user from the Port Selection screen is passed to the NMS-level 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 PM - NP.
- **Tributary port**: generally refers to the add/drop side of a network element.

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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:

- STS-x = OCx. For example, STS-48c is OC48.

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: **OCx/m/n/p/h - 1**

- ***x*** can equal 3, 12, 48, or 192.
- ***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

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Section II: 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 LambdaRouter 256 (2.0) and 128 (2.0). It also discusses the correlation between the external and internal port addresses.

Contents

Port identifiers

Overview This section provides the port identifiers for the LambdaRouter 256 (2.0) and 128 (2.0).

Table The following port identifiers are applicable to the LambdaRouter 256 (2.0) and 128 (2.0). Entries enclosed in { } are variables. Fields enclosed in [] are optional fields.

Table 6-1 Port identifiers for the LambdaRouter 256 (2.0) and 128 (2.0)

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 LambdaRouter is used in conjunction with the “OEO 10G/2.5G Optical Interface CP (OXI10GC or OX12.5GC).

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Section III: LambdaUnite Port Addresses

Overview

Purpose

This section provides the port identifiers for LambdaUnite releases 2.0 and 1.0.

Contents

Port identifiers

Overview This section presents the port identifiers for LambdaUnite releases 2.0 and 1.0.

Table The following table displays the port addresses for LambdaUnite releases 2.0 and 1.0.

Table 6-2 Port identifiers for LambdaUnite Release 2.0 and 1.0

Description	Entity Identifier	Network Level Address
OC-192 Physical Port	**1-1-#-#-[1-8, 12-19, 21-28, 32-39]-1**	**OC192/1-1-#-#-[1-8, 12-19, 21-28, 32-39]-1**
STS-192c 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
STS-48c 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]
STS-12c 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]
STS-3c 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]
STS-1 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]
OC-48 Physical Port	**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]**
STS-48c 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
STS-12c 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]
STS-3c 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]

Table 6-2 Port identifiers for LambdaUnite Release 2.0 and 1.0 (continued)

STS-1 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]
OC-12 Physical Port	**1-1-#-#-[1-8, 12-19, 21-28, 32-39]-[1-16]**	**OC12/1-1-#-#-[1-8, 12-19, 21-28, 32-39]-[1-16]**
STS-12c logical port on OC-12 physical port	1-1-#-#-[1-8, 12-19, 21-28, 32-39]-[1-16]-1	OC12/1-1-#-#-[1-8, 12-19, 21-28, 32-39]-[1-16]/12c.1
STS-3c logical port on OC-12 physical port	1-1-#-#-[1-8, 12-19, 21-28, 32-39]-[1-16]-[1, 4, 7, 10]	OC12/1-1-#-#-[1-8, 12-19, 21-28, 32-39]-[1-16]/3c.[1-4]
STS-1 logical port on OC-12 physical port	1-1-#-#-[1-8, 12-19, 21-28, 32-39]-[1-16]-[1-12]	OC12/1-1-#-#-[1-8, 12-19, 21-28, 32-39]-[1-16]/STS1.[1-12]
OC-3 Physical Port	**1-1-#-#-[1-8, 12-19, 21-28, 32-39]-[1-16]**	**OC3/1-1-#-#-[1-8, 12-19, 21-28, 32-39]-[1-16]**
STS-3c logical port on OC-3 physical port	1-1-#-#-[1-8, 12-19, 21-28, 32-39]-[1-16]-1	OC3/1-1-#-#-[1-8, 12-19, 21-28, 32-39]-[1-16]/3c.1
STS-1 logical port on OC-3 physical port	1-1-#-#-[1-8, 12-19, 21-28, 32-39]-[1-16]-[1-3]	OC3/1-1-#-#-[1-8, 12-19, 21-28, 32-39]-[1-16]/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]**
STS-1 logical port on GbE Physical Port - ctp	1-1-#-#-[1-8, 12-19, 21-28, 32-39]-v[1-4] - [1-21]	WAN/1-1-#-#-[1-8, 12-19, 21-28, 32-39]-v[1-4]-[1-21]

Section IV: Metropolis DMX Port Addresses

Overview

Purpose This section contains port addresses specific to the Metropolis DMX network elements.

Contents

Port identifiers

Overview This section presents the port identifiers for the Metropolis DMX (2.0/2.1) network elements.

Table This table contains the port addresses for the Metropolis DMX (2.0/2.1) network elements.

Table 6-3 Port identifiers for Metropolis DMX (2.0/2.1)

Description	Entity Identifier	Network Level Address
OC-192 (Main) physical port	**main-[1, 2]-1**	**OC192/m-[1, 2]-1**
STS-48c logical port on OC-192 physical port	m[1, 2]-1-[1, 49, 97, 145]	OC192/m-[1, 2]-1/48c.[1-4]
STS-12c logical port on OC-192 physical port	m[1, 2]-1-[12n+1 for n=0 to 15]	OC192/m-[1, 2]-1/12c.[1-16]
STS-3c logical port on OC-192 physical port	m[1, 2]-1-[3n+1 for n=0 to 63]	OC192/m-[1, 2]-1/3c.[1-64]
STS-1 logical port on OC-192 physical port	m[1, 2]-1-[1-192]	OC192/m-[1, 2]-1/STS1.[1-192]
VT1.5 logical port on OC-192 physical port	m[1, 2]-1-[1-192]-[1-7]-[1-4]	OC192/m-[1, 2]-1/STS1.[1-192]/VT.[1-7].[1-4]
OC-48 (Main) physical port	**main-[1, 2]-1**	**OC48/m-[1, 2]-1**
STS-48c logical port on OC-48 physical port	m[1, 2]-1-1	OC48/m-[1, 2]-1/48c.1
STS-12c logical port on OC-48 physical port	m[1, 2]-1-[1, 13, 25, 37]	OC48/m-[1, 2]-1/12c.[1-4]
STS-3c logical port on OC-48 physical port	m[1, 2]-1-[3n+1 for n=0 to 15]	OC48/m-[1, 2]-1/3c.[1-16]
STS-1 logical port on OC-48 physical port	m[1, 2]-1-[1-48]	OC48/m-[1, 2]-1/STS1.[1-48]
VT1.5 logical port on OC-48 physical port	m[1, 2]-1-[1-48]-[1-7]-[1-4]	OC48/m-[1, 2]-1/STS1.[1-48]/VT.[1-7].[1-4]
OC-48 physical port (function unit)	**fn-[a, b, c, d]-[1, 2]-1 growth-[1, 2]-1**	**OC48/[a, b, c, d]-[1, 2] -1OC48/g-[1, 2]-1**

Table 6-3 Port identifiers for Metropolis DMX (2.0/2.1) (continued)

STS-48c logical port on OC-48 physical port	[a, b, c, d, g][1, 2]-1-1	OC48/[a, b, c, d, g]-[1, 2]-1/48c.1
STS-12c logical port on OC-48 physical port	[a, b, c, d, g][1, 2]-1-[1, 13, 25, 37]	OC48/[a, b, c, d, g]-[1, 2]-1/12c.[1-4]
STS-3c logical port on OC-48 physical port	[a, b, c, d, g][1, 2]-1-[3n+1 for n=0 to 15]	OC48/[a, b, c, d, g]-[1, 2]-1/3c.[1-16]
STS-1 logical port on OC-48 physical port	[a, b, c, d, g][1, 2]-1-[1-48]	OC48/[a, b, c, d, g]-[1, 2]-1/STS1.[1-48]
VT1.5 logical port on OC-48 physical port	group-port-STS1-VTG-VT1.5 [a, b, c, d, g][1, 2]-1-[1-48]-[1-7]-[1-4]	OC48/m-[a, b, c, d, g]-[1, 2]-1/AU.[1-16].[1-3]/TU.[1-7].[1-4]
OC-12 Physical Port (Function Unit)	**fn-[a, b, c, d]-[1, 2]-[1, 2] growth-[1, 2]-[1, 2]**	**OC12/[a, b, c, d]-[1, 2] -[1, 2]OC12/g-[1, 2]-[1, 2]**
STS-12c logical port on OC-12 physical port	[a, b, c, d, g][1, 2]-[1, 2]-1	OC12/[a, b, c, d, g]-[1, 2]-[1, 2]1/12c.1
STS-3c logical port on OC-12 physical port	[a, b, c, d, g][1, 2]-[1, 2]-[1, 4, 7, 10]	OC12/[a, b, c, d, g]-[1, 2]-[1, 2]/3c.[1-4]
STS-1 logical port on OC-12 physical port	[a, b, c, d, g][1, 2]-[1, 2]-[1-12]	OC12/[a, b, c, d, g]-[1, 2]-[1, 2]/STS1.[1-12]
VT1.5 logical port on OC-12 physical port	[a, b, c, d, g][1, 2]-[1, 2]-[1-12]-[1-7]-[1-4]	OC12/m-[a, b, c, d, g]-[1, 2]-[1, 2]/STS1.[1-12]/VT.[1-7].[1-4]
OC-3 Physical Port (Function Unit)	**fn-[a, b, c, d]-[1, 2]-[1-4] growth-[1, 2]-[1-4]**	**OC3/[a, b, c, d]-[1, 2] -[1-4]OC3/g-[1, 2]-[1-4]**
STS-3c logical port on OC-3 physical port	[a, b, c, d, g][1, 2]-[1-4]-1	OC3/[a, b, c, d, g]-[1, 2]-[1-4]/3c.1
STS-1 logical port on OC-3 physical port	[a, b, c, d, g][1, 2]-[1-4]-[1-3]	OC3/[a, b, c, d, g]-[1, 2]-[1-4]/STS1.[1-3]
VT1.5 logical port on OC-3 physical port	[a, b, c, d, g][1, 2]-[1-4]-[1-3]-[1-7]-[1-4]	OC3/[a, b, c, d, g]-[1, 2]-[1-4]/STS1.[1-3]/VT.[1-7].[1-4]
EC1 (or STS1E) Physical Port (Function Unit)	**[a, b, c, d, g]-[1-12]**	**EC1/[a, b, c, d, g]-[1-12]**
STS-1 logical port on EC1 physical port	[a, b, c, d, g]-[1-12]-1	EC1/[a, b, c, d, g]-[1-12]/STS1.1
VT1.5 logical port on EC1 physical port	[a, b, c, d, g]-[1-12]-1-[1-7]-[1-4]	EC1/[a, b, c, d, g]-[1-12]/STS1.1/VT.[1-7].[1-4]

Table 6-3 Port identifiers for Metropolis DMX (2.0/2.1) (continued)

DS3 Physical Port (Function Unit)	**[a, b, c, d]-[1-12]**	**D3/[a, b, c, d]-[1-12]**
T3 logical port on DS3 physical port	[a, b, c, d, g]-[1-12]	D3/[a, b, c, d, g]-[1-12]
DS1 Physical Port (Function Unit)	**[a, b, c, d, g]-[1-7]-[1-4]**	**D1/[a, b, c, d, g]-1/[1-7].[1-4]**
T1 logical port on DS1 physical port	[a, b, c, d, g]-1-[1-7]-[1-4]	D1/[a, b, c, d, g]-1/[1-7].[1-4]
GbE Physical Port (LAN) - ptp	**[a, b, c, d, g]-[1-2]**	**LAN/[a, b, c, d, g]-[1-2]**
GbE Physical Port (WAN) - ptp	**[a, b, c, d, g]-v[1-4]**	**WAN/[a, b, c, d, g]-v[1-4]**
STS-1 logical port on GbE Physical Port (WAN) - ctp	[a, b, c, d, g]-v[1-4]-[1-21]	WAN/[a, b, c, d, g]-v[1-4]-[1-21]

Section V: Metropolis DMXpress Port Addresses

Overview

Purpose This section contains port addresses specific to the Metropolis DMXpress network elements.

Contents

Port identifiers

Overview This section presents the port identifiers for the Metropolis DMXpress (1.0) network elements.

Table This table contains the port addresses for the Metropolis DMXpress (1.0) network elements.

Table 6-4 Port identifiers for Metropolis DMXpress (1.0)

Description	Entity Identifier	Network Level Address
OC-48 (Main) physical port	**main-[1, 2]-1**	**OC48/m-[1, 2]-1**
STS-12c logical port on OC-48 physical port	m[1, 2]-1-[1, 13, 25, 37]	OC48/m-[1, 2]-1/12c.[1-4]
STS-3c logical port on OC-48 physical port	m[1, 2]-1-[3n+1 for n=0 to 15]	OC48/m-[1, 2]-1/3c.[1-16]
STS-1 logical port on OC-48 physical port	m[1, 2]-1-[1-48]	OC48/m-[1, 2]-1/STS1.[1-48]
VT1.5 logical port on OC-48 (Main) physical port	m[1, 2]-1-[1-48]-[1-7]-[1-4]	OC48/m-[1, 2]-1/STS1.[1-48]/VT.[1-7].[1-4]
DS3 Physical Port (Function Unit)	**b-1 or g-[1-12]**	**D3b-1 or D3/g-[1-12]**
T3 logical port on DS3 physical port	b-1 or g-[1-12]	D3b-1 or D3/g-[1-12]
DS1 Physical Port (Function Unit)	**a-[1-4]-[1-4]**	**D1/a-1/[1-4].[1-4]**
T1 logical port on DS1 physical port	a-1-[1-4]-[1-4]	D1/a-1/[1-4].[1-4]
GbE Physical Port (LAN) - ptp	**d-[1-2]**	**LAN/d-[1-2]**
GbE Physical Port (WAN) - ptp	**SlotType-Group-Port d-v[1-4]**	**WAN/d-v[1-4]**
STS-1 logical port on GbE physical port (WAN) - ctp	group-port-trib (odd port addresses odd and even port pair) d-v[1-4]-[1-21]	WAN/d-v[1-4]-[1-21]

Section VI: Metropolis EON Port Addresses

Overview

Purpose This section provides the port identifiers for the Metropolis EON Release 8.1 network elements.

Contents

Port identifiers

Overview This section presents the port identifiers for the Metropolis EON Release 8.1 network elements.

Note: Optical links terminate at ptp and OCH trails terminate at ctp.

Table The following table displays the port identifiers for the Metropolis EON Release 8.1 network elements.

Description	Port Type	Entity Identifier	Network Level Address
OMS Line Port (ptp)	OA (20A, 10A, 0OA)	oline-[1a, 1b, 2a, 2b]/oline-[1a, 1b, 2a, 2b]	OL16c/oline-[1a, 1b, 2a, 2b]/oline-[1a, 1b, 2a, 2b]
Repeater Port (ptp)	OA	oline-[1a, 1b, 2a, 2b]/oline-[1a, 1b, 2a, 2b]	OL16c/oline-[1a, 1b, 2a, 2b]/oline-[1a, 1b, 2a, 2b]
OCH Trail Logical Port on OMS Line (ctp)	OA	oline-[1a, 1b, 2a, 2b]/oline-[1a, 1b, 2a, 2b]-zzzz	OL16c/[1a, 1b, 2a, 2b]/oline-[1a, 1b, 2a, 2b]-zzzz
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)	optm-[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	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

OUPSR (Ring and End Terminal)	OUPSR (ptp)	oupsr-[shelf]-[slot]-[port] oupsr-[1,2]-[1-32] 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/COUT. Similarly, AIN and BIN are bidirectional ports.	OT/oupsr-[shelf]-[slot]-[port] OT/oupsr-[1,2]-[1-32]
	OUPSR (ctp)	oupsr-[shelf]-[slot]-[port]-1 oupsr-[1,2]-[1-32]-1	OT/oupsr-[shelf]-[slot]-[port]-1 OT/oupsr-[1,2]-[1-32]-1

Section VII: WaveStar BandWidth Manager Port Addresses

Overview

Purpose

This section contains WaveStar BandWidth Manager port addresses specific to Navis™ Optical PM - NP.

Contents

Port identifiers

Overview This section presents the port identifiers for the WaveStar BandWidth Manager (BWM).

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 for the WaveStar BandWidth Manager.

Table 6-5 Port identifiers for the WaveStar BandWidth Manager

Description	Entity Identifier	Network Level Address
OC-192 physical port	**[1-99]-[1-2]-#-#-tr[1-4]-1**	**OC192/[1-99]-[1-2]-#-#-tr[1-4]-1**
STS-48c 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]
STS-12c logical port on OC-192 physical port	[1-99]-[1-2]-#-#-tr[1-4]-1-[12n+1 where n=0 to 15]	OC192/[1-99]-[1-2]-#-#-tr[1-4]-1/12c.[1-16]
STS-3c logical port on OC-192 physical port	[1-99]-[1-2]-#-#-tr[1-4]-1-[3n+1 where n=0 to 63]	OC192/[1-99]-[1-2]-#-#-tr[1-4]-1/3c.[1-64]
STS-1 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]
OC-48 physical port	**[1-99]-[1-2]-#-#-[02, 04, 06.....16]-1**	**OC48/[1-99]-[1-2]-#-#-[02, 04, 06.....16]-1**
STS-48c 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
STS-12c 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]-1/12c.[1-4]
STS-3c logical port on OC-48 physical port	[1-99]-[1-2]-#-#-[02, 04, 06.....16]-1-[3n+1 where n=0 to 15]	OC48/[1-99]-[1-2]-#-#-[02, 04, 06.....16]-1/3c.[1-16]
STS-1 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]
OC-12 Physical Port	**[1-99]-[1-2]-#-#-[01-16]-[1-2]**	**OC12/[1-99]-[1-2]-#-#-[01-16]-[1-2]**

Table 6-5 Port identifiers for the WaveStar BandWidth Manager (continued)

STS-12c 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]
STS-3c 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]
STS-1 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]
OC-3 Physical Port (for SONET Gateway)	**[1-99]-[1-2]-#-#-[01-16]-[1-4]**	**OC3/[1-99]-[1-2]-#-#-[01-16]-[1-4]**
STS-3c 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
STS-1 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]**
STS-1 logical port on EC1 physical port	[1-99]-[1-2]-#-#-[01-16]-[1-8]-1	EC1/[1-99]-[1-2]-#-#-[01-16]-[1-8]/STS1.1
DS3 Physical Port	**[1-99]-[1-2]-#-#-[01-16]-[1-8]**	**D3/[1-99]-[1-2]-#-#-[01-16]-[1-8]**
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 VIII: WaveStar TDM 2.5G/10G Port Addresses

Overview

Purpose This section provides the port identifiers for the WaveStar TDM 2.5G/10G (6.0) network elements.

Contents

Port identifiers

Overview This section presents the port identifiers for the WaveStar TDM 2.5G/10G (6.0) network elements.

Table The following table displays the port addresses for the WaveStar TDM 2.5G/10G (6.0) network elements.

Table 6-6 Port identifiers for WaveStar TDM 2.5G/10G (6.0)

Description	Entity Identifier	Network Level Address
OC-192 Physical Port	**1-2-#-#-[tre, trw]-1**	**OC192/1-2-#-#-[tre, trw]-1**
STS-48c logical port on OC-192 physical port	1-2-#-#-[tre, trw]-1-[1, 49, 97, 145]	OC192/1-2-#-#-[tre, trw]-1/48c.[1-4]
STS-12c logical port on OC-192 physical port	1-2-#-#-[tre, trw]-1-[12n+1 where n=0 to 15]	OC192/1-2-#-#-[tre, trw]-1/12c.[1-16]
STS-3c logical port on OC-192 physical port	1-2-#-#-[tre, trw]-1-[3n+1 where n=0 to 63]	OC192/1-2-#-#-[tre, trw]-1/3c.[1-64]
STS-1 logical port on OC-192 physical port	1-2-#-#-[tre, trw]-1-[1-192]	OC192/1-2-#-#-[tre, trw]-1/STS1.[1-192]
OC-48 Physical Port	**[1-4]-[1-3]-#-#-[02, 04, 06....16]-1**	**OC48/[1-4]-[1-3]-#-#-[02, 04, 06....16]-1**
STS-48c logical port on OC-48 physical port	[1-4]-[1-3]-#-#-[02, 04, 06....16]-1-1	OC48/[1-4]-[1-3]-#-#-[02, 04, 06....16]-1/48c.1
STS-12c logical port on OC-48 physical port	[1-4]-[1-3]-#-#-[02, 04, 06....16]-1-[1, 13, 25, 37]	OC48/[1-4]-[1-3]-#-#-[02, 04, 06....16]-1/12c.[1-4]
STS-3c logical port on OC-48 physical port	[1-4]-[1-3]-#-#-[02, 04, 06....16]-1-[3n+1 where n=0 to 15]	OC48/[1-4]-[1-3]-#-#-[02, 04, 06....16]-1/3c.[1-16]
STS-1 logical port on OC-48 physical port	[1-4]-[1-3]-#-#-[02, 04, 06....16]-1-[1-48]	OC48/[1-4]-[1-3]-#-#-[02, 04, 06....16]-1/STS1.[1-48]
OC-12 Physical Port	**[1-4]-[1-3]-#-#-[01-16]-[1-2]**	**OC-12/[1-4]-[1-3]-#-#-[01-16]-[1-2]**

Table 6-6 Port identifiers for WaveStar TDM 2.5G/10G (6.0) (continued)

STS-12c logical port on OC-12 physical port	[1-4]-[1-3]-#-#-[01-16]-[1-2]-1	OC12/[1-4]-[1-3]-#-#-[01-16]-[1-2]/12c.1
STS-3c logical port on OC-12 physical port	[1-4]-[1-3]-#-#-[01-16]-[1-2]-[1, 4, 7, 10]	OC12/[1-4]-[1-3]-#-#-[01-16]-[1-2]/3c.[1-4]
STS-1 logical port on OC-12 physical port	[1-4]-[1-3]-#-#-[01-16]-[1-2]-[1-12]	OC12/[1-4]-[1-3]-#-#-[01-16]-[1-2]/STS1.[1-12]
OC-3 Physical Port	**[1-4]-[1-3]-#-#-[01-16]-[1-4]**	**OC3/[1-4]-[1-3]-#-#-[01-16]-[1-4]**
STS-3c logical port on OC-3 physical port	[1-4]-[1-3]-#-#-[01-16]-[1-4]-1	OC3/[1-4]-[1-3]-#-#-[01-16]-[1-4]/3c.1
STS-1 logical port on OC-3 physical port	[1-4]-[1-3]-#-#-[01-16]-[1-4]-[1-3]	OC3/[1-4]-[1-3]-#-#-[01-16]-[1-4]/STS1.[1-3]
EC1 Physical Port	**[1-5]-[1-3]-#-#-[01-16]-[1-8]**	**EC1/[1-5]-[1-3]-#-#-[01-16]-[1-8]**
STS-1 logical port on EC1 physical port	[1-5]-[1-3]-#-#-[01-16]-[1-8]-1	EC1/[1-5]-[1-3]-#-#-[01-16]-[1-8]/STS1.1
DS3 Physical Port	**[1-5]-[1-3]-#-#-[01-16]-[1-8]**	**D3/[1-5]-[1-3]-#-#-[01-16]-[1-8]**
T3 Logical Port on DS3 Physical Port	[1-5]-[1-3]-#-#-[01-16]-[1-8]	D3/[1-5]-[1-3]-#-#-[01-16]-[1-8]
GbE Physical Port (LAN) - ptp	**[1-4]-[1-3]-#-#-[02, 04, 06, 08, 10, 12, 14, 16]-[1-2]**	**LAN/[1-4]-[1-3]-#-#-[02, 04, 06, 08, 10, 12, 14, 16]-[1-2]**
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]**
STS-1 logical port on GbE Physical Port (WAN) - ctp	[1-4]-[1-3]-#-#-[02, 04, 06, 08, 10, 12, 14, 16]-v[1-2]-[1-24]	WAN/[1-4]-[1-3]-#-#-[02, 04, 06, 08, 10, 12, 14, 16]-v[1-2]-[1-24]

Section IX: WaveStar OLS 1.6T Port Addresses

Overview

Purpose

This section describes the external port addresses for the WaveStar OLS 1.6T network elements.

Contents

Port identifiers

Overview This section provides the port identifiers for the WaveStar OLS 1.6T network elements.

Port identifiers for WaveStar OLS 1.6T (6.1) The following table provides the port identifiers for the WaveStar OLS 1.6T network elements.

Table 6-7 Port address table for WaveStar OLS 1.6T (6.1)

OMS Line Port (WaveStar OLS 1.6T R6.1 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 (PTP)	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 (WaveStar OLS 1.6T R6.1 all node types)			
(All OLS 1.6T models including WADs)	OA (CTP)	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 (WaveStar OLS 1.6T R6.1 all node types)			

Table 6-7 Port address table for WaveStar OLS 1.6T (6.1) (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

Index

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