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Navis™ Optical Element Management System (EMS)

Release 8.0

Provisioning Guide for *LambdaUnite*™
MultiService Switch (MSS)

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Notice

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Mandatory customer information

Trademarks

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The order number of this document is 365-374-078 (Issue a).

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Contents

5 Traffic provisioning

6 Traffic maintenance

7 Software upgrade

11 Traffic provisioning concepts

12 Traffic maintenance concepts

13 Software upgrade concepts

14 *Navis*™ Optical EMS tutorial

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About this information product

Purpose

This Provisioning Guide provides operations, administration and maintenance information about the *LambdaUnite*™ MSS.

Reason for reissue

The present release (Issue a) is the first version of this manual.

Safety labels

The present manual contains basic safety instructions which have to be strictly observed when handling the equipment and systems described.

Strictly observe the warnings and safety instructions before carrying out work of any kind on the equipment and systems described.

All safety instructions include a signal word that classifies the danger and a text block that contains descriptions of the type and cause of the danger, the consequences of ignoring the safety instruction and the measures that can be taken to minimize the danger. In some safety instructions, a warning symbol is placed underneath the signal word.

Example:

DANGER

Arcing on removing or inserting a live power supply plug.

Arcing can cause burns to the hands and damage to the eyes. Ensure that the line circuit-breaker on the fuse panel is in the ″OFF″ position before removing or inserting the power supply plug.

Classification of hazards

There are three classes of hazards. They are designated using the head words “Danger”, “Warning” and “Caution”. Their meaning is as follows:

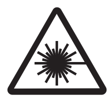
- ***Danger***
  is used to mark safety warnings which, if not followed, will certainly or with a very high degree of probability result in death or extremely serious injury.
- ***Warning***
  is used to mark safety warnings which, if not followed, can lead to serious injury or permanent damage to the health of an individual or to property.
- ***Caution***
  is used to mark safety warnings which, if not followed, can lead to injury or property damage - including financial losses due to extensive operational impairment.

Warning symbols

The examples below show the warning symbols used.

DANGER

Example of a general warning about a danger.



DANGER

Example of a warning about laser radiation.

DANGER

Warning about devices sensitive to electrostatic discharge (ESD)

The safety instructions for the classes “Danger”, “Warning” and “Caution” always have a warning symbol, the “Important” and “Notice” safety instructions can, but do not always have a warning symbol.

Conventions used

These conventions are used in this document:

Numbering

The chapters of this document are numbered consecutively. The page numbering restarts at “1” in each chapter. To facilitate identifying pages in different chapters, the page numbers are prefixed with the chapter number. For example, page 2-3 is the third page in chapter 2.

Cross-references

Cross-reference conventions are identical with those used for numbering, i.e. the first number in a reference to a particular page refers to the corresponding chapter.

Keyword blocks

This document contains so-called keyword blocks to facilitate the location of specific text passages. The keyword blocks are placed to the left of the main text and indicate the contents of a paragraph or group of paragraphs.

Typographical conventions

Special typographical conventions apply to elements of the graphical user interface (GUI), file names and system path information, keyboard entries, alarm messages etc.

- Elements of the graphical user interface (GUI)
  These are examples of text that appears on a graphical user interface (GUI), such as menu options, window titles or push-button:
  - ***Provision…***, ***Delete***, ***Apply***, ***Close***, ***OK*** (push-button)
  - ***Provision Timing/Sync*** (window title)
  - ***View Equipment Details…*** (menu option)
  - ***Administration*** → ***Security*** → ***User Provisioning…*** (path for invoking a window)
- File names and system path information
  These are examples of file names and system path information:
  - *setup.exe*
  - *C:\Program Files\Lucent Technologies*
- Keyboard entries
  These are examples of keyboard entries:
  - **F1**, **Esc X**, **Alt-F**, **Ctrl-D**, **Ctrl-Alt-Del** (simple keyboard entries)
    A hyphen between two keys means that both keys have to be pressed simultaneously. Otherwise, a single key has to be pressed, or several keys have to be pressed in sequence.
  - `copy abc xyz` (command)
    A complete command has to be entered.
- Alarms and error messages
  These are examples of alarms and error messages:
  - `Loss of Signal`
  - `Circuit Pack Failure`
  - `HP-UNEQ`, `MS-AIS`, `LOS`, `LOF`
  - `Not enough disk space available`

Abbreviations

Abbreviations used in this document can be found in the “Glossary” unless it can be assumed that the reader is familiar with the abbreviation.

Related documentation

This section briefly describes the documents that are included in the *LambdaUnite* MSS documentation set.

- Installation Manual
  The *LambdaUnite* MSS Installation Guide is a step-by-step guide to system installation and setup. It also includes information needed for pre-installation site planning and post-installation acceptance testing.
- Applications and Planning Guide
  The *LambdaUnite* MSS Applications and Planning Guide (APG) is for use by network planners, analysts and managers. It is also for use by the Lucent Account Team. It presents a detailed overview of the system, describes its applications, gives planning requirements, engineering rules, ordering information, and technical specifications.
- User Operations Guide
  The *LambdaUnite* MSS User Operations Guide provides step-by-step information for use in daily system operations. The manual demonstrates how to perform system provisioning, operations, and administrative tasks by use of WaveStar® CIT.
- Alarm Messages and Trouble Clearing Guide
  The *LambdaUnite* MSS Alarm Messages and Trouble Clearing Guide gives detailed information on each possible alarm message. Furthermore, it provides procedures for routine maintenance, troubleshooting, diagnostics, and component replacement.
- Operations System Engineering Guide
  The *LambdaUnite* MSS Operations System Engineering Guide serves as a reference for all TL1 commands which can be used to operate the network element. The manual also gives an introduction to the concept of the TL1 commands and instructs how to use them.
- *Navis*™ Optical EMS (Provisioning Guide for *LambdaUnite* MSS)

The *Navis* Optical EMS Provisioning Guide for *LambdaUnite* MSS) gives instructions on how to perform system provisioning, operations, and administrative tasks by use of *Navis* Optical EMS.

The following table lists the documents included in the *LambdaUnite* MSS documentation set.

Document Number (A4)	Document Number (US letter)	Title
109192484 (365-374-067)	109192534 (365-374-068)	*LambdaUnite* MSS Applications and Planning Guide
109192492 (365-374-069)	109192542 (365-374-070)	*LambdaUnite* MSS User Operations Guide
109192468 (365-374-071)	109192476 (365-374-072)	*LambdaUnite* MSS Alarm Messages and Trouble Clearing Guide
109192500 (365-374-073)	109192567 (365-374-074)	*LambdaUnite* MSS Installation Guide
109192518 (365-374-075)	109192583 (365-374-076)	*LambdaUnite* MSS Operations System Engineering Guide
109192443 (365-374-077)	109192450 (365-374-078)	*Navis* Optical EMS Provisioning Guide (Application *LambdaUnite* MSS)
109192526 (365-374-081)		CD-ROM Documentation *LambdaUnite* MSS (all manuals on one CD-ROM)

Related training

For detailed information about the training courses that are related to the *LambdaUnite* MSS please refer to the *LambdaUnite* MSS Applications and Planning Guide, chapter 8 ***Product support - Training courses***.

Documented feature set

This manual describes *LambdaUnite* MSS release 2.1. For technical reasons some features have been documented that will not be available until later software versions. For precise information about the availability of features, please consult the Software Release Description. This provides details of the status at the time of software delivery.

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1 Management communication setup

Overview

Purpose

This chapter describes how network elements (NEs) are added to the management of *Navis*™ Optical EMS and how they are modified or deleted.

Contents

Add an NE - OSI communication

When to use

Use this procedure to add an NE to the *Navis*™ Optical EMS host.

All other NEs in your network which are connected to this NE are automatically added to the *Navis* Optical EMS.

Related information

For related information, see Chapter 8, "Management communication setup concepts".

Instructions

Complete the following steps to add an OSI-connected NE.

1 Select **Administration** → **Network** → **Network Elements...** from the main menu bar on the Map window.

Result:

The **Manage NEs** window is displayed, showing the current list of NEs in your Target Group.

2 Click on the **Add** button. The **Add an NE - General NE Information** panel is displayed.

The **Add an NE** window is divided into four panels:

- **General NE Information**
- **NE Communications Details**
- **FTP/FTAM Gateway Settings**
- **NE Security**.

3 Enter the NE's **Target Identifier** (TID). A TID can be 1-20 alphanumeric characters. Hyphens, slashes ("/"), and periods are allowed. This field is required.

4 Enter the NE's **Alias**. An alias can be 1-20 alphanumeric characters. Uppercase and lowercase letters are allowed. Spaces are allowed. This field is optional.

5 Select **Lambda Unite (TM) MSS** as the **NE Type**.

6 Select the NE's **Time Zone** by clicking the appropriate radio button, e.g. for Germany select **Other** and enter **1.00**. If **Other** is selected, enter the time difference, in hours and minutes, between the NE time and Greenwich Mean Time (GMT). Specify the time difference, "+" (plus) or "-" (minus), up to five characters. Valid values are -11.0 to 13.00 (the plus "+" is implied). Default value: **Same as Host**.

7 Under **Communicate via** click the **OSI** radio button.

8 Click on the **NE Communications Details (OSI)** tab and enter the NE's **Controller #1 NSAP**.

9 Keep the default values for **Controller #2 NSAP**.

10 Click on the **NE Security** tab. The **NE Security** panel is displayed.

11 Enter the **NE Login** and **NE Password** for the NE being added. The login and password can be 1-10 characters.

12 Re-enter the primary NE password, in the **Re-enter Password** field, for checking.

13 Enter the **NE Backup Login** and **NE Backup Password** for the NE. The backup login and password can be 1-10 characters.

14 Click the **Apply** button to activate your choices, or click the **OK** button to activate your choices and close the **NE Security** panel of the **Add/Modify NE** window.

Result:

A message in the status bar is displayed, indicating that the NE is being added to *Navis* Optical EMS .

```
Please note that an OSI-connected NE can be added via
     DSA (Directory Services Agent) if it is available.
```

END OF STEPS

Add an NE - TCP/IP communication

When to use

Use this procedure to add an NE with a direct TCP/IP interface to the *Navis*™ Optical EMS host.

NEs with a “pure” direct TCP/IP interface can be set up to communicate directly via TCP/IP with the *Navis* Optical EMS host or through a TCP/IP-connected NE serving as a Gateway Network Element (GNE) for the other NEs in a ring. To provide support in the event of a communications failure, a backup GNE can be assigned to a subnetwork to allow switchover to another GNE.

Related information

For related information, see Chapter 8, “Management communication setup concepts”.

Before you begin

Before you begin this task, if you are adding a TCP/IP-connected NE as a GNE, the following must be established:

- the GNE’s Target Identifier (TID)
- a valid NE login/password, and a valid backup NE login/password
- the GNE’s IP address
- the number of associations for exchanging messages between the GNE and the other NEs in a ring.

Before adding a TCP/IP GNE, you must first create a compatible subnetwork to which it can be assigned.

Instructions

Complete the following steps to add a TCP/IP-connected NE.

1 Select **Administration** → **Network** → **Network Elements...** from the main menu bar on the Map window.

Result:

The **Manage NEs** window is displayed, showing the current list of NEs in your Target Group.

2 Click on the **Add** button. The **Add an NE - General NE Information** panel is displayed.

The **Add an NE** window is divided into four panels:

- **General NE Information**
- **NE Communications Details (GNE or TCP/IP)**
- **FTP/FTAM Gateway Settings**
- **NE Security**.

3 Enter the NE’s **Target Identifier** (TID). A TID can be 1-20 alphanumeric characters. Hyphens, slashes (“/”), and periods are allowed. This field is required.

4 Enter the **NE Alias**. An alias can be 1-40 alphanumeric characters. Uppercase and lowercase letters are allowed. Spaces are allowed. This field is optional.

5 Select **Lambda Unite (TM) MSS** as the **NE Type**.

6 Select the NE’s **Time Zone** by clicking the appropriate radio button, e.g. for Germany select **Other** and enter **1.00**. If **Other** is selected, enter the time difference, in hours and minutes, between the NE time and Greenwich Mean Time (GMT). Specify the time difference, “+” (plus) or “-” (minus), up to five characters. Valid values are -11.0 to 13.00 (the plus “+” is implied). Default value: **Same as Host**.

7 In the **Communicate via** field:

IF ...	CLICK...
The NE is communicating with the *Navis* Optical EMS host via a GNE	the GNE radio button. Go to Step 8 .
The NE is communicating directly with the *Navis* Optical EMS host via TCP/IP	the TCP/IP radio button. Go to Step 9 .

8 If you selected the Communicate via GNE option in Step 7, click on the **NE Communications Detail (GNE)** tab. Select a GNE from the list on the panel.

Skip to Step 16.

9 If you selected the Communicate via TCP/IP option in Step 7, click on the **NE Communications Detail (TCP/IP)** tab. The NE Communications Details (TCP/IP) panel is displayed. This panel is used to enter information about the interface between this GNE, the *Navis* Optical EMS host and the other NEs in the subnetwork.

> **Important!** You must enter a valid IP address for the NE. *Navis* Optical EMS does not check the validity of the IP address entry.

10 Use the radio buttons to select one of the **No. of Associations**.

11 Click on the down arrow to the right of the **Choose a Subnetwork** field to display a list of subnetworks, and select a compatible subnetwork. This field is required.

> **Important!** More than one GNE can be associated with a subnetwork name/alias. This enables the load to be shared among multiple GNEs. However, it is important that all of the GNEs associated with a subnetwork name/alias truly are in the same physical subnetwork. Incorrect associations of GNEs to subnetworks may result in *Navis* Optical EMS being unable to establish a connection to some remote NEs in the subnetwork.

12 Enter the NE's primary IP address. The **Primary IP Address** field is divided into four 3-character fields separated by periods.

13 Enter the secondary IP address.

14 Click on **FTP/FTAM Gateway Settings** tab. The **FTP/FTAM Gateway Settings** panel is displayed.

15 Define the parameters as desired.

16 Click on the **NE Security** tab. The **NE Security** panel is displayed.

17 Enter the **NE Login** and **NE Primary Password** for the NE being added. The login can be 1-10 characters and the password must be 6-10 alphanumeric characters, with at least two non-alphabetic characters, of which one character must be one of the following special characters (#,%,+). The password must begin with a letter.

18 Re-enter the primary NE password, in the **Re-enter Primary Password** field, for checking.

19 Enter the **NE Backup Login** and **NE Backup Password** for the NE. The login can be 1-10 characters and the password must be 6-10 alphanumeric characters, with at least two non-alphabetic characters, of which one character must be one of the following special characters (#,%,+). The password must begin with a letter.

20 For NEs discovered under the GNE being added (Discovered Remotes), choose one of the following options (by clicking on that option's radio button):

- **This GNE** - the NE login and password entered for this GNE in the NE Security panel will be used to log into the NEs.
- **EMS Default for Remote NEs** - the system-wide *Navis* Optical EMS default NE login and password for the NE type of the Remote Terminal (RT) being discovered will be used to log into the NEs.
- **EMS Default for GNE Type** - the system-wide *Navis* Optical EMS default NE login and password for the NE type of the GNE being added will be used to log into the NEs.

21 Click the **Apply** button to activate your choices, or click the **OK** button to activate your choices and close the **NE Security** panel of the **Add/Modify NE** window.

Result:

A message in the status bar is displayed, indicating that the NE is being added to *Navis* Optical EMS .

22

IF...	THEN...
you are adding a GNE and the system prompts whether DNO should be run at this time to update the *Navis* Optical EMS database with complete information about the newly added NE.	choose **Yes** to run DNO or **No** to not perform DNO at this time. ***Important:*** If you are adding more GNEs to the same subnetwork, choose **No** to not perform DNO at this time. A DNO should not be performed until all GNEs in the same subnetwork have been added so new RNEs discovered automatically by *Navis* Optical EMS via a newly added GNE can be reassigned to another GNE in the same subnetwork, if necessary.
you are not adding a GNE	no DNO prompt is displayed. **Result:** A message in the status bar is displayed, indicating that the NE is being added to *Navis* Optical EMS.

END OF STEPS

Modify an NE

When to use

Use this procedure to modify an NE.

Related information

For related information, see Chapter 8, "Management communication setup concepts".

Before you begin

Before you begin this task, be aware that the **TID** and **Communicate Via** fields cannot be modified. To perform this task, access the Map window.

Instructions

Complete the following steps to modify an NE.

1 Select **Administration** → **Network** → **Network Elements...** from the main menu bar on the Map window.

Result:

The **Manage NEs** window is displayed, showing the current list of NEs in your Target Group.

2 Choose the NE to be modified and click the **Modify** button.

Result:

The **Modify a Network Element - General NE Information** panel is displayed.

3 Click on the tab of the appropriate panel, and change the NE field(s), as needed.

4 Click the **Apply** button to activate your choices, or click the **OK** button to activate your choices and close the **Add/Modify a Network Element** window.

Result:

A message in the status bar is displayed, indicating that the NE is being modified.

END OF STEPS

Delete an NE

When to use

Use this procedure to delete an NE.

Before you begin

Important! If the *Navis*™ Optical EMS is connected to *Navis* Optical NMS, do not delete a NE and try to re-add it back to the *Navis* Optical EMS database without contacting the *Navis* Optical NMS administrator. The *Navis* Optical NMS database maintains records of cross-connections/paths related to the NE being deleted. If an NE is deleted in *Navis* Optical EMS, the related path records are not removed from the *Navis* Optical NMS database. If you are deleting an NE that is also in the *Navis* Optical NMS database, do the following:

1. From *Navis* Optical EMS host command line, run the command NCI_SPDeleteNeDB $TID to clean up the tmf database.
2. From the *Navis* Optical NMS, do a database resync on the NE.
3. From the *Navis* Optical NMS, delete and re-ad the customer paths associated with the deleted NE.

Before you begin this task, make sure that if the NE is assigned to an aggregate, that you remove it from the aggregate before deleting it. When an NE is deleted, all information related to that NE is immediately removed from the *Navis* Optical EMS database. Associated trails may also be deleted. Any trail that is deleted as a result of deleting an NE is also removed from any open window that shows the deleted trail (like the Map window pane and the Trail Manager).

If you are deleting a GNE, you must first reassign all RNEs associated with the GNE or delete the RNEs from the *Navis* Optical EMS database.

To perform this task, access the Map window.

Instructions

Complete the following steps to delete an NE.

1 Select **Administration** → **Network** → **Network Elements...** from the main menu bar on the Map window.

Result:

The **Manage NEs** window is displayed, showing the current list of NEs in your Target Group.

2 Choose the NE to be deleted and click the **Delete** button.

3 Click the **OK** button.

Result:

A pop-up window is displayed, asking if you really want to delete the chosen NE.

4 Choose **Yes**.

Result:

A message in the status bar is displayed, indicating that the NE is being deleted.

END OF STEPS

Add a subnetwork name/alias

When to use

Use this procedure to add a subnetwork name and subnetwork alias. Once a subnetwork name and alias is created, you can associate one or more active Gateway NEs (GNEs) with that subnetwork. The Remote Network Elements (RNEs) associated with a GNE become grouped under that subnetwork name/alias. RNEs in a subnetwork can be manually reassigned to another GNE in the same subnetwork. The subnetwork must exist before one of the X.25-connected or TCP/IP GNEs can be associated with it.

A subnetwork is defined as a set of interconnected network elements using a common data communications protocol, generally OSI over a DCC. More than one GNE can be associated with a subnetwork/alias. This enables the communications load to be shared among multiple GNEs. However, it is important that all the GNEs associated in a subnetwork name/alias are in the same physical subnetwork. Incorrect associations of GNEs to subnetworks may result in *Navis*™ Optical EMS being unable to establish a connection to some remote NEs in the subnetwork.

Before you begin

To perform this task, you must first access the Map window.

Instructions

Complete the following steps to add a subnetwork name and its alias.

---

1 Select **Administration** → **Network** → **Subnetworks...** from the main menu bar on the Map window.

Result:

The **Manage Subnetworks** window is displayed.

---

2 Click the **Add** button to add a new subnetwork name/alias.

Result:

The **Add a Subnetwork** window is displayed.

---

3 Enter the name of the subnetwork in the **Subnetwork Name** field, 1-20 alphanumeric characters (hyphens are allowed).

4 Enter the name of the subnetwork alias in the **Subnetwork Alias** field, 1-20 alphanumeric characters (hyphens are allowed). This field is optional.

5 Click the **Apply** button to add the new information to the *Navis* Optical EMS database, or click the **OK** button to add the new information and close the window.

Result:

The **Status Dialog** window is displayed, indicating that the subnetwork name/alias has been added to the system.

END OF STEPS

Modify a subnetwork alias

When to use

Use this procedure to change a subnetwork's alias once it has been created.

Before you begin

Before you begin this task, the subnetwork name/alias being modified must exist in *Navis*™ Optical EMS.

To perform this task, access the Map window.

Instructions

Complete the following steps to change a subnetwork alias.

1. Select **Administration** → **Network** → **Subnetworks...** from the main menu bar on the Map window.

   Result:

   The **Manage Subnetworks** window is displayed.

2. Select the subnetwork name to be modified from the scroll list and click the **Modify** button.

   Result:

   The **Modify a Subnetwork** window is displayed with the current subnetwork name and alias.

3. Change the subnetwork alias name and click the **OK** button.

   Result:

   A warning dialog window is displayed, indicating that the subnetwork alias change has been made in the system.

END OF STEPS

Delete a subnetwork name/alias

When to use

Use this procedure to delete a subnetwork name and alias from the *Navis*™ Optical EMS database.

Before you begin

Before you begin this task, the subnetwork name/alias must exist in the *Navis* Optical EMS database. The NE(s) assigned to the subnetwork name being deleted must first be reassigned to another subnetwork by modifying the network element, via the **Add/Modify a Network Element** window.

To perform this task, access the Map window.

Instructions

Complete the following steps to delete a subnetwork name and alias from the *Navis* Optical EMS database.

1 Select **Administration** → **Network** → **Subnetworks...** from the main menu bar on the Map window.

Result:

The **Manage Subnetworks** window is displayed.

2 Select the subnetwork name to be deleted and click the **Delete** button.

Result:

A pop-up message window is displayed, asking if you really want to delete the selected subnetwork. Choose **Yes** to delete the subnetwork. The **Status Dialog** window is displayed, indicating that the subnetwork name/alias has been deleted. All references to the deleted subnetwork name/alias and subnetwork/NE relationships are updated in *Navis* Optical EMS .

END OF STEPS

Associate RNEs with GNEs

When to use

Use this procedure to view the GNEs in a subnetwork and associated RNEs and to reassign RNEs to a different GNE in the same subnetwork, as needed.

Before you begin

Before you begin this task, network elements to be reassigned to a different GNE must be initially assigned to a GNE in the subnetwork. The GNEs/RNEs must be given an existing subnetwork name/alias. To perform this task, you must first access the Map window.

Instructions

Complete the following steps to view a GNE and its associated RNEs in a subnetwork and, if needed, to reassign RNEs to a different GNE in the subnetwork.

1 Select **Administration** → **Network** → **GNE Associations** → **GNE/RNE...** from the main menu bar on the Map window.

Result:

The GNE/RNE Association window is displayed.

This window is divided into two parts. It consists of:

- n explorer tree, which shows the names of all subnetworks in your target group (unexpanded)
- a table which displays the **TID** and **NE Type** of each RNE.

2 To view GNEs in a subnetwork, double-click on a subnetwork name in the explorer tree to select and expand the subnetwork's associations.

3 To view RNEs associated with a GNE, select the GNE.

Result:

The GNE's associated RNEs are displayed in the table.

4 To reassign an RNE from one GNE to another one in the subnetwork, select the RNE by right-clicking on it in the **Remote NEs** part of the window.

Result:

A pop-up window is displayed, with the message "***Associate with...***".

5 Click the select (left) mouse button on the "***Associate with..***" message that is displayed.

Result:

A message is displayed in the status bar: `Select a GNE within the same subnet to associate this RNE with`.

6 Double-click on a GNE under the same subnetwork in the explorer tree to select it for reassignment of the RNE.

Result:

The GNE/RNE reassignment is processed. Messages are displayed in the status bar of the window, indicating the progress of the reassignment and when it is completed.

7 Continue making reassignments as needed.

8 When you are finished, click the **Close** button to close the window.

END OF STEPS

Add a secondary (backup) GNE association

When to use

Use this procedure to add a GNE association. A GNE association is a pair of GNEs in the same subnetwork that serve, respectively, as the primary GNE and secondary (backup) GNE for the other NEs in the subnetwork to communicate with *Navis*™ Optical EMS. The primary GNE initially serves as the point of communications for the other NEs in a subnetwork with *Navis* Optical EMS. The backup (secondary) GNE is the backup GNE should communications with the primary GNE fail.

Before you begin

Before you begin this task, you must configure both NEs to be GNEs in the same subnetwork. You must also verify that the secondary GNE does not have a separate set of RNEs communicating with it.

To perform this task, access the Map window.

Instructions

Complete the following steps to add a GNE association.

1 Select **Administration** → **Network** → **GNE Associations** → **Primary/Secondary...** from the main menu bar on the Map window.

Result:

The **Primary/Secondary GNE Associations** window is displayed.

This window shows the current GNE associations (if any exist). An “X” to the left of a GNE in an association indicates that it is the currently active GNE.

2 Click the **Add New Association...** button.

Result:

The **Add Primary/Secondary GNE Associations** window is displayed.

3 Select the primary GNE from the **Primary GNE** scroll list.

Result:

The GNE(s) available to serve as the secondary GNE in the association is displayed in the **Secondary GNE** scroll list.

4 Select the secondary GNE from the **Secondary GNE** scroll list.

5 Click the **Apply** button to create the association or click the **OK** button to create the association and close the **Add a Primary/Secondary GNE Association** window.

Result:

The GNE association is added to the **GNE Associations** list. The primary GNE in the newly created association becomes the currently active GNE.

6 Close the status window by clicking the **Close** button.

7 Click the **Close** button to close the **Primary/Secondary GNE Association** window.

END OF STEPS

Switch primary/secondary GNEs

When to use

Use this procedure to switch the active and standby status of the GNEs in an association. When a switch is made, the secondary GNE becomes the active GNE.

Before you begin

Before you begin this task, be aware that a manual switch of the active and standby GNEs will cause temporary loss of communications with all of the NEs connected via the GNE pair, resulting in generation of alarms and/or loss of alarms.

To perform this task, access the Map window.

Instructions

Complete the following steps to manually switch the active and standby GNE in a GNE association.

1. Select **Administration** → **Network** → **GNE Associations** → **Primary/Secondary...** from the main menu bar on the Map window.

   Result:

   The **Primary/Secondary GNE Associations** window is displayed.

2. Select the primary/secondary GNE association to be switched and click on **Switch Association**.

   Result:

   The **Status Dialog** window is displayed, indicating that the switch is being made. When the switch is made, the "X" moves to the newly active GNE in the association.

3. Click the **Close** button to close the window.

END OF STEPS

Delete a GNE association

When to use

Use this procedure to delete a GNE association. This procedure is only used to remove the association between two GNEs, not to delete the GNEs from the network. When a GNE association is deleted, NEs in a subnetwork remain connected to the currently active GNE.

Before you begin

Before you begin this task, identify the GNE association to be deleted.

To perform this task, access the Map window.

Instructions

Complete the following steps to manually switch the active and standby GNE in a GNE association.

1. Select **Administration** → **Network** → **GNE Associations** → **Primary/Secondary...** from the main menu bar on the Map window.

   Result:

   The **Primary/Secondary GNE Associations** window is displayed.

2. Select the GNE association to be deleted and click the **Delete Association** button.

   Result:

   The **Status Dialog** window is displayed, indicating that the association has been deleted.

3. Click the **Close** button to close the window.

END OF STEPS

Supporting information for DCC configuration

General

Use this procedure to provision the internal and external LAN port settings and protocol properties for the different management layers of the OSI stack for DCC channels on the selected NE's DCC circuit pack(s). The DCC channels are designated overhead bits on SONET/SDH optical ports. These overhead bits can be used by the customer (or NE) as low bandwidth communication channels to the remote NE that terminates the optical fiber. The DCC circuit pack in a shelf controls all DCC channels for fibers terminated by that shelf.

The various areas of the DCC configuration that can be provisioned are:

- ***LAN Management***: The LAN interface provides a higher bandwidth communications path to the element management system. The LAN capability is contained within the Data Link layer of the OSI model. Functions that can be provisioned include enabling/disabling of the internal and external LAN interfaces of the DCC circuit pack in an I/O shelf. Parameters associated with this panel control the physical level properties of the DCC port.
- ***TCP/IP***: The network layer provided for TCP/IP network is strictly a connectionless service. The IP only transfers datagrams on a best effort basis. The Internet Protocol (IP) provides the functions necessary for delivering datagrams from a source to a destination over an interconnected system of networks.
- ***Network Layer***: The Network Layer provides the means to transmit data across a network regardless of network type, topology, or services offered by the underlying network. The Connectionless Network Service (CLNS) and its corresponding Connectionless Network Protocol (CLNP) provides the following services and functions at the Network Layer: Network Addresses, Quality of Service (QoS) parameters, Error Notification, Segmentation of messages, routing, and relaying of messages through intermediate systems. The Network Service Access Point (NSAP) Address is the access point where the Network Layer services are available to network service users.

- ***TARP Provisioning***: The TID Resolution Protocol (TARP) is used where there is a need to translate the TID of TL1 messages to the CLNP address (NSAP) of the NE. TARP allows NEs to translate between the TID and NSAP by automatically exchanging mapping information with other NEs.
- ***TARP Manual Adjacency***: The TARP Manual Adjacency causes a TARP request to hop through an NE without TARP capability (like a generic router).

□

DCN provisioning (LAN)

Before you begin Before you begin this task, if you are performing a LAN reset using this procedure, the LAN interface on the DCC circuit pack must be enabled. Enabling and disabling of internal and external LAN interfaces can only be done on a DCC circuit pack on the I/O shelf, not the Main shelf or System Controller shelf.

Instructions Complete the following steps to provision LAN port parameters and protocol properties of the DCC channels.

1 Select the desired NE on the Map window.

2 From the main menu bar on the Map Window select **Configuration** → **DCN Management** → **DCN Provisioning... .**

Result:

The **DCN Provisioning** window for the selected NE is displayed.

3 In the **Network Element Explorer** portion of the window, expand the equipment hierarchy by clicking on the plus (+) sign next to each component level until the desired DCC Controller circuit pack is displayed.

4 Select the DCC Controller circuit pack (1-1-LAN1 or 1-1-LAN2 or 1-1-LAN3).

Result:

The **Configure** button at the bottom of the **Network Element Explorer** portion of the window is enabled.

5 Click the **Configure** button.

Result:

The provisioning panels of the **DCC Provisioning** window are displayed:

- **LAN Mgmt**
- **TCP/IP .**

The **LAN Mgmt** panel is active by default.

This panel shows the current LAN management parameters:

- **LAN Router Priority** (1 - 127)
- **OSI Channel Assignment** (osinode1 - osinode8)
- **OSI LAN Status** (Enabled/Disabled)
- **LAN Status** (Enabled/Disabled)
- **LAN TARP Suppression** (Enabled/Disabled)
- **IP LAN Status** (Enable/Disable).

6 Provision the LAN management parameters, as needed.

7 Click on the **TCP/IP** panel tab.

Result:

The **TCP/IP** panel is displayed. The TCP/IP parameters are:

- **IP Address**
- **IP Subnet Mask**
- **IP Default Router**
- **IP Default LAN Port AID**.

8 If you have provisioned all the DCC channel parameters, click the **Apply** button.

Result:

A pop-up dialog window is displayed, informing you that this action may cause loss of communication with the NE(s) and asks if you want to continue. Choose **Yes** to process the request or **No** to cancel the change.

9 Choose **Yes** to process the changes for the NE.

10 Click the **Close** button to close the window.

END OF STEPS

DCN provisioning (osinode1)

Instructions Complete the following steps to provision osinode parameters of the DCC channels.

1 Select the desired NE on the Map window.

2 From the main menu bar on the Map Window select **Configuration** → **DCN Management** → **DCN Provisioning... .**

Result:

The **DCN Provisioning** window for the selected NE is displayed.

3 In the **Network Element Explorer** portion of the window, expand the equipment hierarchy by clicking on the plus (+) sign next to each component level until the desired DCC Controller circuit pack is displayed.

4 Select the DCC Controller circuit pack (osinode1).

Result:

The **Configure** button at the bottom of the **Network Element Explorer** portion of the window is enabled.

5 Click the **Configure** button.

Result:

The provisioning panels of the **DCC Provisioning** window are displayed:

- **Network Layer**
- **TARP Provisioning**
- **TARP MAJ (Manual Adjacency)**.

The **Network Layer** panel is active by default.

This panel shows the current NSAP parameters and the following routing parameters:

- **IS Routing Capability** (Level 1, Level 1&2, Level 1&2 PRC)
- **IS Domain** (1 to 2)
- **Reachable Address Destination Node**.

6 Provision the Network Layer parameters, as needed.

7 Click the **TARP Provisioning** panel tab.

Result:

The **TARP Provisioning** panel is displayed. The TARP parameters are:

- **TARP Propagation**
- **TARP Originator**
- **TARP Responder Function**.

8 Provision the **TARP** parameters, as needed (see also "Configuring the TARP parameters for an NE" (1-38)).

9 Click the **TARP MAJ (Manual Adjacency)** panel tab.

Result:

The **TARP MAJ (Manual Adjacency)** panel is displayed.

10 Provision the **TARP MAJ** parameters, as needed (see also "Assigning TARP manual adjacencies" (1-40)).

11 If you have provisioned all the DCC channel parameters, click the **Apply** button.

Result:

A pop-up dialog window is displayed, informing you that this action may cause loss of communication with the NE(s) and asks if you want to continue. Choose **Yes** to process the request or **No** to cancel the change.

12 Choose **Yes** to process the changes for the NE.

13 Click the **Close** button to close the window.

END OF STEPS

Configuring data communication channels for multiplex section (DCC-M)/Section DCC

When to use

Use this procedure to modify existing DCC terminations for the multiplex section.

Related information

For related information, please refer to “Data communication channels” (8-32).

Instructions

Complete the following steps to modify an existing DCC termination.

1 Select the desired NE in the Map pane and then select **Configuration** → **DCN Management** → **DCC Provisioning...** from the main menu.

Result:

The **DCC Provisioning** window is displayed.

2 Select in the **Network Element Explorer** part of the window the DCC controller of the shelf for which you want to configure the DCC Terminations and press **Configure**.

Result:

The **Section** tab is displayed in the window.

3 Select the **Port AID**.

Result:

The values for this Port AID are displayed in the window.

4 Select the **Port Type** for which you want to modify the DCC terminations.

5 Enable (or disable) the DCC termination in field **Termination Status**.

Important! Disabling a previously enabled DCC at an NE needs to be coordinated with disabling the same DCC at the opposite end of the DCC link (remote NE) to avoid persistent alarms from the remote NE.

6 Next to **LAPD Role** choose **USER-SIDE** or **NETWORK-SIDE**.

Important! The LAPD Role setting must be different at both ends of a DCC link. Otherwise, an alarm (either ***User-Network Side RSect Failure*** or ***User-Network Side MSect Failure***) will be generated.

7 Next to **LAPD Mode** choose **UITS** or **AITS**

8 Press **Apply** to make your changes take effect.

END OF STEPS

Supporting information for "configuring data communication channels for multiplex section (DCC-M)"

Preconditions for enabling a DCC

You are permitted to enable a DCC if all of the following preconditions are fulfilled:

- The corresponding optical interface port is provisioned (configured) or at least pre-provisioned.
- The type of DCC (either DCC-R or DCC-M) is supported on the corresponding optical interface.
- The DCC is not yet enabled.
- There are LAPD channels available. Please refer to the section below.

Max. number of active DCC links

The maximum number of simultaneously supported LAPD channels per DCC controller is 32. Each DCC controller thus can support up to 32 active DCC links. Upon circuit pack insertion, DCCs will automatically be enabled and a LAPD channel assigned as long as LAPD channels are available.

Preconditions for disabling a DCC

You should disable a DCC only if ***all*** of the following preconditions are fulfilled:

- The DCC is currently enabled.
- The DCC is currently not needed for MS-SPRing management.
- The DCC is not the only management connection to remote NEs.

☐

Configuring data communication channels for regenerator section (DCC-R)/Line DCC

When to use Use this procedure to modify existing DCC terminations for the regenerator section.

Related information For related information, please refer to "Data communication channels" (8-32).

Instructions Complete the following steps to modify an existing DCC termination.

1 Select the desired NE in the Map pane and then select **Configuration** → **DCN Management** → **DCC Provisioning...** from the main menu.

Result:

The **DCC Provisioning** window opens.

2 Select in the **Network Element Explorer** part of the window the DCC controller of the shelf for which you want to configure the DCC Terminations and press **Configure**.

Result:

By default the **Section** tab is displayed in the window.

3 Select the **Port AID** for which you want to modify the DCC terminations.

4 Click on the **Line** tab.

Result:

The values for the selected Port AID are displayed in the window.

5 Choose the values for **OSI Channel Assignment** and **Port Type**.

6 Enable (or disable) the DCC termination in field **Termination Status**.

Important! Disabling a previously enabled DCC at an NE needs to be coordinated with disabling the same DCC at the opposite end of the DCC link (remote NE) to avoid persistent alarms from the remote NE.

7 Next to **LAPD Role** choose the **USER-SIDE** or **NETWORK-SIDE**.

Important! The **LAPD Role** setting must be different at both ends of a DCC link. Otherwise, an alarm (either "User-Network Side RSect Failure" or "User-Network Side MSect Failure") will be generated.

8 Next to **LAPD Mode** choose **UITS** or **AITS**.

9 Press **Apply** to make your changes take effect.

END OF STEPS

Supporting information for "configuring data communication channels for regenerator section (DCC-R)"

Preconditions for enabling a DCC

You are permitted to enable a DCC if all of the following preconditions are fulfilled:

- The corresponding optical interface port is provisioned (configured) or at least pre-provisioned.
- The type of DCC (either DCC-R or DCC-M) is supported on the corresponding optical interface.
- The DCC is not yet enabled.
- There are LAPD channels available. Please refer to "Max. number of active DCC links" (1-34) below.

Preconditions for disabling a DCC

You should disable a DCC only if ***all*** of the following preconditions are fulfilled:

- The DCC is currently enabled.
- The DCC is currently not needed for MS-SPRing management.
- The DCC is not the only management connection to remote NEs.

Configuring the TARP parameters for an NE

When to use

Use this procedure to

- enable or disable the TARP propagation functionality,
- enable or disable the TARP responder functionality, or to

for a selected node.

Related information

For related information, please refer to "Name-to-address translation" (8-47).

Instructions

Complete the following steps to configure the TARP parameters for an NE:

1. Select the desired NE in the Map pane and then select **Configuration** → **DCN Management** → **DCN Provisioning...** from the main menu.

   Result:

   The **DCN Provisioning** window opens.

2. Select in the **Network Element Explorer** part of the window the DCC controller (osinode1) of the shelf for which you want to configure the basic DCN parameters and press **Configure**.

   Result:

   The **Network Layer** tab is displayed in the window.

3. Select the **TARP Provisioning** tab.

   Result:

   The **TARP Provisioning** panel is displayed. The TARP parameters are:

   - **TARP Propagation**
   - **TARP Originator**
   - **TARP Responder Function**

4 Provision the **TARP** parameters, as needed.

Important! It is recommended to have the TARP responder functionality and the TARP propagation enabled for the low-speed part of the main shelf.

5 Press **Apply** to make your changes take effect.

END OF STEPS

Assigning TARP manual adjacencies

When to use

Use this procedure to manually assign adjacent nodes that support TARP (“TARP manual adjacencies”) by entering their Network Entity Title (NET).

Two TARP manual adjacencies can be created for one DCC.

The area address together with the system identifier (SYSTEM field) of the NSAP address is also called the Network Entity Title (NET).

Related information

For related information, please refer to “Name-to-address translation” (8-47).

Instructions

Complete the following steps to assign TARP manual adjacencies:

1. Select the desired NE in the Map pane and then select **Configuration** → **DCN Management** → **DCN Provisioning...** from the main menu.

   Result:

   The **DCC Provisioning** window opens.

2. Select in the **Network Element Explorer** part of the window the DCC controller (e. g. osinode1) of the shelf for which you want to configure the basic DCN parameters and press **Configure**.

   Result:

   The **Network Layer** tab is displayed in the window.

3. Select the **TARP MAJ** tab.

4. Depending on whether you want to assign a new, modify or delete an existing TARP manual adjacency:

If you want to ...	then ...
add a manual adjacency, there must be an empty **Current Adjacency1** and *2*.	click on **Enter new manual adjacency** and enter the new NET in this field.

If you want to ...	then ...
modify an existing manual adjacency,	select the adjacency you want to modify via the option menu **Select existing manual adjacency** and press **Modify Adjacency**.
delete an existing manual adjacency,	select the adjacency you want to delete via the option menu **Select existing manual adjacency** and press **Delete Adjacency**.

5 Press **Apply** to make your changes take effect.

END OF STEPS

View DCC terminations

When to use

Use this procedure to view details about the optical ports provisioned as DCC termination points. The result of this procedure is a window panel showing, for each DCC port:

- the port AID
- the port type - working or protection
- the DCC channel type - Multiplex section or regenerator section
- the protection type
- the operational status of the DCC channel
- the LAPD role - Network side or User side.

The NE type determines the columns of data that are displayed. The rows in the table refer to the related DCC optical ports. Some NEs display information on all ports. Other NEs only display information on enabled DCC ports.

Some NEs display information on all ports. Other NEs only display information on enabled DCC ports.

Related information

For related information, please refer to Chapter 8, "Management communication setup concepts".

Instructions

Complete the following steps to view details about the optical ports provisioned as DCC termination points.

1 Select **Configuration** → **DCN Management** → **DCC Provisioning...** from the main menu bar on the Map window.

Result:

The **DCC Terminations** window for the selected NE is displayed.

2 In the **Network Element Explorer** portion of the window, expand the equipment hierarchy by clicking on the plus (+) sign next to each component level until the desired DCC Controller circuit pack is displayed.

3 Select the DCC Controller circuit pack.

Result:

The **View** button at the bottom of the **Network Element Explorer** portion of the window is enabled.

---

4 Click the **View** button.

Result:

The **View DCC Terminations** window panel is displayed. This panel shows in table row format, for each optical port provisioned as a DCC termination point:

- the port AID
- the port type - working or protection
- the DCC channel type - multiplex section (Section) or regenerator section (Line)
- the protection type
- the operational status of the DCC channel
- the LAPD role - Network side or User side
- the LAPD mode

---

5 Click the **Close** button to exit the window.

END OF STEPS

Provision an IP GNE (for IP tunneling)

When to use

Use this procedure to provision an IP Gateway for IP tunneling. The IP Gateway NE (GNE):

- creates and hold entries in the TCP/IP subnetwork application context map. This map lists the IP addresses or host names of operations systems (OSs) and maps them to an OS application service/context (such as TL1 MAINTENANCE, TL1 MEMORY ADMINISTRATION) and allows these OS application services to be forwarded over a TCP/IP LAN connection through the IP GNE to the OSI network of NEs to IP-connected managed devices in an IP subnetwork.
- To support the above function, the IP GNE function is enabled on the selected IP GNE, to allow pure TCP/IP to OSI conversion.

The IP GNE has an IP router entity with an additional port configured on the IP router entity (set up on the DCC controller circuit pack) to add the tunneling capability. In effect, the OSI subnetwork is provisioned with IP routing tables and set up to function as an IP subnetwork.

Related information

For related information, please refer to "DCN protocols and services" (8-20).

Before you begin

Before you begin this task, make sure that the selected NE has a Dual Stack configuration (can handle OSI and TCP/IP traffic) and has the IP Tunneling capability enabled.

This function can be accessed by any user with an administrative or privileged login.

Instructions

Complete the following steps to select and provision the IP GNE.

1. Select **Configuration** → **DCN Management** → **IP Gateway/Tunneling...** from the main menu bar on the Map window.

   Result:

   The **IP Gateway/Tunneling** window for the selected NE is displayed.

2 In the **Network Element Explorer** portion of the window, expand the equipment hierarchy by clicking on the plus (+) sign next to each component level until the desired DCC Controller circuit pack is displayed.

3 Select the DCC Controller circuit pack.

Result:

The **Provision** button at the bottom of the **Network Element Explorer** portion of the window is enabled.

4 Click the **Provision** button.

Result:

The **IP Gateway** panel is displayed.

5 Select the **IP Gateway** panel tab.

The **IP Gateway Provisioning** window panel is divided into two provisioning sections:

- ***IP Gateway Host List***: this consists of a display area showing the current OS IP host addresses (**IP Address**) and **Application Context ID**s in the OS application context map, with two functional buttons which allow you to add and delete entries in the application context map. There are also two radio buttons for enabling or disabling the IP Gateway functionality on the selected NE.
- ***Encoding Mode Port Number***: this is the area for entering the T-TD port numbers for allowing IP tunneling of encapsulated IP packets to IP-connected managed devices via the OSI network. You can enter a separate port number to access by each coding method: **T-TD Length Value Port**, **T-TD Raw Port**, **T-TD Telnet Port**.

6

TO...	DO THIS...
add an entry to the TCP/IP subnetwork application context map	click the **Add...** button next to the application context map display. A secondary **Add an IP** window is displayed. Enter the OS host's IP address and application context ID (examples are TL1 MAINTENANCE and TL1 MEMORY ADMINISTRATION). Click the **Apply** button to apply your entries and leave the window open or click the **OK** button to apply your entries and close the window.
delete an entry in the TCP/IP subnetwork application context map	Select a line entry in the display area showing current **IP Address**/**Application Context ID**s and click the **Delete...** button to the right of the display area. The selected entry is deleted.

7 Use the radio buttons to enable/disable the TCP/IP Gateway function and the FTAM/FTP Gateway function for the selected NE.

8

TO...	DO THIS...
define the T-TD length value port	enter the port number in the **T-TD Length Value Port** field.
define the T-TD raw port	enter the port number in the **T-TD Raw Port** field.
define the T-TD telnet port	enter the port number in the **T-TD Telnet Port** field. **Important!** Click the **Retrieve** button to retrieve previously stored values for each field.

9 Click the **Apply** button to apply your selections.

Result:

The IP GNE is provisioned for IP tunneling.

END OF STEPS

2 Equipment provisioning

Overview

Purpose This chapter contains procedures for provisioning the equipment.

Contents

Establish *LambdaUnite*™ MSS equipment

When to use

Use this procedure to establish the *LambdaUnite* MSSequipment. In the *LambdaUnite* MSS, circuit packs can be added and removed.

Related information

For related information, see Chapter 9, "Equipment provisioning concepts".

Instructions

Complete the following steps to establish *Navis*™ Optical EMS equipment.

1 From the main menu bar on the Map window, select **Configuration** → **Establish...**.

Result:

This displays the **Choose an NE** window.

2 Select an NE from the list by double-clicking on it.

3 Click on **OK** button.

Result:

The **Create/Provision Equipment** window for the selected NE is displayed.

4 Select the **Establish this Pack** radio button

Result:

The **NE UnEstablished Equipment** Explorer section (just below the radio buttons) contains the AID of existing shelves. Under the shelves are displayed only those slots for which no circuit pack has been established. Within the slot is displayed the type of circuit packs that are legal types for that slot AID. You can choose a circuit pack type within the slot.

5 Use the mouse to select an AID to establish from the displayed information in the Explorer section. Selecting the AID or circuit pack enables the **Get Parameters** button.

6 Click on the **Get Parameters** button.

Result:

The right hand portion of the panel is populated with the current values for provisionable parameters. Additional parameter information may have to be entered before the equipment is established. The correct parameter labels are displayed and are populated with their default values, which are updatable.

7 Click the **Apply** button.

Result:

The equipment is established. If there is a problem with the request to establish equipment, a pop-up error message is displayed, indicating the nature of the problem.

END OF STEPS

Remove *LambdaUnite*™ MSS equipment

When to use

Use this procedure to remove *LambdaUnite* MSS NE equipment. In the *LambdaUnite* MSS shelves circuit packs can be added and removed.

Related information

For related information, see Chapter 9, "Equipment provisioning concepts".

Instructions

Complete the following steps to remove *Navis*™ Optical EMS equipment.

1. From the main menu bar on the Map window, select **Configuration** → **Remove...**.

   Result:

   The **Choose an NE** window is displayed.

2. Double-click on the NE in the list to select it and click the **OK** button.

   Result:

   The **Remove Equipment** window is displayed. This window allows you to choose existing equipment from the explorer tree and to remove that equipment from the NE.

3. To remove the undesired equipment (circuit pack), first select it with the mouse.

4. After selecting the undesired equipment with the mouse, click the **Remove** button.

   Result:

   If the removal is allowed, the system displays a confirmation window to which you should reply **Yes**.

END OF STEPS

View NE equipment

When to use

Use this procedure to display and view NE equipment on the **Equipment Configuration** window.

Related information

For related information, see Chapter 9, "Equipment provisioning concepts".

Instructions

Complete the following steps to display and view various NE equipment components on the **Equipment Configuration** window.

1 Select the NE in the Map pane portion of the Map window.

2 Select **Configuration** → **Equipment...** from the main menu bar on the Map window.

Result:

This displays the **Equipment View** window, containing equipment information for the selected NE.

3 The Equipment View window allows you to view and/or "drill down" through a NE to view its various constituent parts via the graphical representation (the NE view panel), or to select a component (shelf, slot) for viewing via the hierarchical representation (the network explorer panel). In addition, you can access certain features via a pop-up menu that is available in both panels.

END OF STEPS

Navigational conventions

View Panel

- ***Single Left Click***s - elects the component both here and in the explorer.
- ***Double Left Click***- shows the contents of the component in the view panel, and indicates that it is selected. Shows the component as selected in the explorer and its subtending components (if there are any).
- ***Single Right Click*** - indicates that the component is selected, and shows the pop-up menu.

Explorer List Item

- ***Single Left Click*** - selects the explorer component and the view component. If the component selected has contents, it shows the content in the view panel. Does not show/hide subtending explorer components.
- ***Double Left Click*** - same as single left click on explorer list item, but does show/hide subtending components in the explorer.
- ***Single Right Click*** - indicates that the component is selected, and shows the pop-up menu.

Explorer plus or minus sign

- ***Single Left Click*** - shows/hides subtending components.

□

View NE equipment details

When to use Use this procedure to view details of a single component inside a NE.

Related information For related information, see Chapter 9, "Equipment provisioning concepts".

Instructions Complete the following steps to display NE equipment details.

1 Select the NE in the Map pane portion of the Map window.

2 Select **Configuration** → **Equipment...** from the main menu bar on the Map window.

Result:

This displays the **Equipment View** window, containing equipment information for the selected NE.

3 In the NE Explorer part of the **Equipment View** window, right click on the component for which you want to display equipment details.

4 On the sub-menu displayed when you right clicked, select **Equipment Details**.

Result:

This displays the **Equipment Details** window, containing the requested information.

Right clicking on the desired component in the Equipment View window also displays a sub-menu from which Equipment Details can be selected. If the component selected for details is a populated slot (with a circuit pack installed) then details for both the slot and circuit pack are displayed in Equipment Details.

END OF STEPS

View NE equipment lists

When to use

Use this procedure to access the list of a given component's subtending equipment. When you request an equipment item from either the drop-down or pop-up menu, *Navis*™ Optical EMS provides a list of equipment for the selected item and its subtending equipment. The lists can be saved and printed.

Related information

For related information, see Chapter 9, "Equipment provisioning concepts".

Instructions

Complete the following steps to view NE equipment lists.

1. Select the NE in the Map pane portion of the Map window.

2. Select **Configuration** → **Equipment...** from the main menu bar on the Map window.

   Result:

   This displays the **Equipment View** window, containing equipment information for the selected NE.

3. Select **View** → **Equipment List** from the menu bar.

   Result:

   This displays the equipment list for the selected component. The list contains information about the NE equipment, at the level you requested. The information is textual and listed in name/value pairs.

   Right clicking on the desired component in the **Equipment View** window also displays a sub-menu from which Equipment List can be selected. If the component selected for listing is a populated slot (with a circuit pack installed) then information for both the slot and circuit pack are displayed in the Equipment List.

END OF STEPS

Provision NE system parameters

When to use Use this procedure to display the windows used system parameters.

Related information For related information, see Chapter 9, "Equipment provisioning concepts".

Instructions Complete the following steps to display the windows used to provision system parameters.

1 From the main menu bar on the Map window, select **Configuration** → **Provision...**.

Result:

The **Choose an NE** window is displayed.

2 Use the mouse to select an NE on the **Choose an NE** window. (Double click on the desired NE and then click the **OK** button.)

Result:

The **Provisioning** window is displayed.

The **Provisioning** window can be displayed in similar fashion from the **Alarm Summary**, **Equipment View**, and **Cross-Connection** windows.

3 Use the mouse to select the TID from the **Network Element Explorer** portion of the window.

4 Click the **Provision** button.

Result:

The system parameters for your selection are displayed in the **Provisioning** area of the window.

5 Make your provisioning changes in the **Provisioning** section of the window using the available fields and your selected values.

6 Click **Apply** to enter your changes.

Result:

The system displays a confirmation window.

7 Click on **Yes** to confirm the changes.

END OF STEPS

Perform cut-through commands

When to use Use this procedure to initiate a TL1 cut-through session from the Map window and perform enhanced cut-through commands via the Cut-Through window.

Related information For related information, see "Cut-Through commands" (9-18).

Before you begin Before you begin this task, you must have already displayed the Map window and determined the NE for which you want to initiate a cut-through session.

Instructions Complete the following steps to initiate and perform cut-through.

1. Position the mouse pointer over the NE to which a cut-through is required, press the menu mouse button and select **Cut-Through** from the pop-up menu or select **Configuration** → **Cut-Through...** in the main menu of the **Map** window.

   Result:

   The **Cut-Through** window and the **Cut-Through Output** window are displayed. (If the NE is unavailable for any reason, a message identifying the cause of the error is displayed in a pop-up window.)

2. At the **Cut-Through** window, type the appropriate TL1 command into the **Cut-Through Command** field. If desired, select the displayed Command by double-clicking on the command and the desired AID from the list by single-clicking on it to save typing time. See your NE documentation for detailed command information. (You can select the **Clear Command Area** button any time to clear the **Cut-Through Command** field and start over.)

   The AID list for an NE displayed in the AID scroll list may not be complete. You may have to select a similar AID from the list to populate the **Cut-Through Command** field and then manually edit the AID to make it the correct one.

3. After completing your entry in the **Cut-Through Command** field, select the **Send Command Now** button.

Result:

The command is echoed to the **Cut-Through Output** window and the command output appears there.

END OF STEPS

Build TL1 commands

When to use

Use this procedure to create a TL1 command file to assist in performing maintenance and provisioning activities on one or more NEs (such as download of standard configuration), without having to manually enter a set of TL1 command strings. This feature both reduces the amount of manual entry needed to create TL1 command strings and allows for the reuse, at a later time, of the commands built on the same NE or other NEs of the same type.

Related information

For related information, see "Building TL1 commands" (9-18).

Before you begin

Before you begin this task, you must have already determined the TL1 commands you wish to build.

Instructions

Complete the following steps to build TL1 commands.

1 On the Map window, select **File**→ **TL1 Macro Scripts** → **TL1 Macro Builder** from the main menu bar.

Result:

This displays the **Macro Builder/Broadcaster** window.

2 Select the **Macro Builder** tab if it is not already selected. TL1 command files can only be built for one NE type at a time, so first specify the NE type by clicking the down arrow adjacent to the **NE Type** field (directly below the **Manage TL1 Macro Files** heading) and select an NE.

3 Next type the appropriate TL1 command(s) into the **Macro File Commands** area at the lower left of the window. Press the **Return** key between commands, typing each new command on the next available line in the **Macro File Commands** area. If desired, select from the displayed **Command List** by double-clicking on the command and from the **AID List** by single-clicking on the AID to save typing time. To enter multiple commands from the **Command List**, click on the end of a command string and press the **Return** key before entering the next command. This will access the next available command line. See your NE documentation for detailed TL1 command information.

4 When you have completed your macro file commands, select **Save/Save As**.

Result:

This displays the **Save As** window.

5 In the **Save As** window, save the contents of the **Macro File Command** lines as a new macro file (by typing the new macro file name into the **Save As** field) or to an existing macro file name, overwriting the contents of the file (by selecting one from the displayed list). Don’t forget to use the radio buttons to indicate whether the file should be **Accessible by all** or **Accessible by owner** only.

6 The following list shows how to use remaining items on the **TL1 Macro Builder** window:

- ***Clear Command(s)*** - click this button to clear the current entries in the Macro File Command area.
- ***Owner*** - displays the macro file owner’s login ID.
- ***File Properties*** - indicates whether the displayed macro file is ***Accessible By All***or ***Accessible by Owner Only***. This value can be changed (by owners) via the ***Save As***screen, which is displayed by clicking the ***Save/Save As***button.
- ***Put Into Command Area*** - select this button to put the contents of the selected macro file into the command line text area.
- ***View Macro*** - use this button to view the contents of the selected macro file.
- ***Delete Macro*** - click this button to delete the selected macro file (for owners only).

END OF STEPS

Broadcast TL1 commands

When to use

The broadcast TL1 commands feature allows you to perform maintenance and provisioning activities (such as download of standard configuration) on one or more NEs, utilizing the TL1 command files created by the TL1 macro builder feature, and broadcasting those files to multiple NEs of the same type. This feature saves you time by performing similar tasks on multiple NEs in one step, and by reducing the manual entry required in the creation of TL1 command strings.

Related information

For related information, see "Broadcasting TL1 commands to NEs" (9-18).

Before you begin

Before you begin this task, you must have already determined the TL1 commands you wish to broadcast, or know the name of the TL1 macro file you are going to use.

Instructions

Complete the following steps to broadcast TL1 commands.

1. On the Map window, select **File** → **TL1 Macro Scripts** → **TL1 Macro Broadcaster** from the main menu bar.

   Result:

   This displays the **Macro Builder/Broadcaster** window.

2. Specify the NE type for the broadcast; select **All NEs**, **NEs by Type**, or **NEs by TID** from the **Where to Broadcast** block at the top middle of the **Broadcaster** window. Specify the parameters of the broadcast further by highlighting NEs in the **Available Network Elements** list (on the left side of the window) and clicking the single right arrow (>) to move them to the **Chosen Network Elements** list (on the right side). The NEs placed in the **Chosen Network Elements** list on the right will be the ones to receive the broadcast. You can use the double arrows (>>, <<) to move all current choices between the two lists.)

3. Next type the name of the macro file (to be broadcast to the NEs selected in the **Chosen Network Element** list) into the field in the **Macro File to Broadcast** block (or simply select a macro file from the displayed list by double clicking on it).

4 Select the **Broadcast Macro** button to ask the system to perform the broadcast. The following list shows how to use the remaining buttons on the Broadcaster window:

- **View Macro** - use this button to view the macro file, which you may want to do before executing it.
- **Abort Broadcast** - use this button to stop the execution of the TL1 commands at any time while the broadcast window is active. When this button is chosen, the system stops sending out the next command in the macro file to the NE(s) currently being broadcast to. Once the abort is completed, the system displays a message.
- **Close** - click this button any time before clicking the Broadcast Macro button to remove the Broadcast window from your screen.

END OF STEPS

Set NE Date/Time synchronization

When to use Use this procedure to manually initiate date/time synchronization for a single NE, a group of NEs, an aggregate, or all NEs under *Navis*™ Optical EMS control.

Related information For related information, see "Ways to perform date/time synchronization" (9-21).

Before you begin Before you begin this task, you must take into account whether the NE(s) being set with the date/time synchronization feature are located in the same or a different time zone as the *Navis* Optical EMS host. You can also select to have *Navis* Optical EMS automatically make adjustments for Daylight Savings Time (Spring Forward) and standard time (Fall Back) before doing date/time synchronization for the selected NE(s).

Instructions Complete the following steps to manually perform date/time synchronization.

1 Select **Configuration** → **Date/Time Synchronization** → **Manual** from the main menu bar on the Map window.

Result:

The **Choose an NE/Aggregate** window is displayed.

2 Click the **NEs** radio button to display a list of NEs or click the **Aggregates** radio button to display a list of aggregates.

Result:

A list of NEs or aggregates is displayed.

3 Double-click on the NE or aggregate to select it for date/time synchronization. To perform date/time synchronization on all NEs, scroll to the top of the **Choose an NE/ Aggregate** window and double-click on the word **ALL** in the list. Click the **OK** button.

Result:

The **Date and Time Synchronization** window is displayed.

4 Click the **OK** button to initiate date/time synchronization for the NE(s) or aggregate.

Result:

Date/Time synchronization is initiated. A pop-up window is displayed, showing the status of the date/time synchronization.

The status is as follows:

- **Completed** – date/time synchronization is completed for the selected NE(s) or aggregate.
- **Incompleted** – The command to perform date/time synchronization may be completed but the time difference between the host and NE is greater than the drift threshold set.

END OF STEPS

Enable/disable Fall Back and Spring Forward

When to use Use this procedure to enable or disable the Spring Forward (Daylight Savings Time) and Fall Back (standard time) feature to make automatic time adjustments in date/time synchronization for the selected NE(s)/aggregate(s).

Related information For related information, see "Standard time and daylight savings time" (9-20).

Instructions Complete the following steps to enable or disable the Spring Forward/Fall Back time adjustment feature.

1 Select one or more NEs/aggregates from the Map window or select no NEs/aggregates to use this feature for all NEs in your Target group.

2 Select **Configuration** → **Date/Time Synchronization** → **Spring/Fall Change** from the main menu bar on the Map window. If you have not yet selected the NE(s)/aggregate(s), the **Choose an NE/Aggregate** window is displayed. Select the NE(s)/aggregate(s) on which to use the Spring Forward/ Fall Back feature and click the **OK** button.

Result:

The **Fall Back and Spring Forward Active Status of NEs** window is displayed.

3 If you want to enable the Spring Forward/Fall Back feature for the selected NE(s) click the **Enable FB/SF for above NEs** button. If you want to disable the Spring Forward/Fall Back feature for the selected NE(s) click the **Disable FB/SF for above NEs** button.

4 Click the **OK** button to activate your choices.

Result:

If Daylight Savings Time is already in effect for an NE, and you disable Spring Forward/Fall Back for an NE, requiring a date/time synchronization, a pop-up window is displayed, asking if you want to automatically initiate date/time synchronization for the NE(s). Choose **Yes** to initiate automatic date/time synchronization for the NE or **No** to skip date/time synchronization for the NE.

END OF STEPS

Schedule NE Date/Time synchronization

When to use

Use this procedure to schedule date/time synchronization for an NE.

Before you begin

Before you begin this task, be aware that if you are scheduling a job to be performed monthly, regardless of the frequency (every x months) that a job is scheduled, the first time the job will be performed will be at the time and day you selected, which can occur in the current month or the following month. For example, if you have scheduled a job to be performed once every two months, at 1:00 AM, on the 21st day of the month, the first time that the job will be performed could be on the 21st day of this month, if that date has not yet passed.

Be aware that if the *Navis*™ Optical EMS interfaces with the *Navis* Optical NMS, and if the time zone of the *Navis* Optical NMS server is set to GMT, the time zone of the *Navis* Optical EMS server should also be set to GMT, and the date/time synchronization feature in the *Navis* Optical EMS should be enabled to ensure date/time synchronization between the *Navis* Optical EMS host and its managed NEs. The time zone of the managed NEs should be set to Same As Host (which is the default), which would be GMT. The time zone of an NE can be changed through the Add/Modify an NE window.

Instructions

Complete the following steps to schedule date/time synchronization for an NE.

---

1 Select **Administration** → **Schedule** → **Date/Time Sync...** from the main menu bar on the Map window.

Result:

The **Schedule Manager for Date/Time** window is displayed, showing a list of currently scheduled date/time synchronizations.

---

2 Click the **Add** button.

Result:

The **Add a Scheduled Date/Time Sync** window is displayed.

3 Choose an NE (by TID) from the **Choose an NE** scroll bar list by double-clicking on the item. Use the type ahead field and/or filter/sort functions to narrow the list, if necessary.

4 Choose the following scheduling options, as needed:

- **Daily**: click on this radio button if you want the task to be done on a daily basis. If you schedule the task to be done daily, use the **Schedule Time** spinner field to select the time of day for the scheduled task.
- **Weekly on...**: click on this radio button if you want to task to be done on a weekly basis. If you schedule the task to be done weekly, choose the day of the week by using the spinner field list next to this option.
- **Once every...**: click on this radio button if you want the task to be done periodically. If you schedule the task to be done periodically, choose the frequency (every x month(s)) and the day of the month it will be done using the spinner field lists next to this option or click the **Last Day of the Month** checkbox.
- **Schedule Time**: click the up and down arrows on this spinner field to select the time of day for the scheduled task. The schedule time is in 24-hour format, in hours:minutes. You can also type the time into this field. The time must be input in 24-hour format as hh:mm in 15 minute increments (for example, 11:15 P.M. is entered as 23:15). If the time entry is invalid, the color of the field changes to yellow, and you must re-enter a valid time in the proper format.

5 Click the **Apply** button to activate your choices, or click the **OK** button to activate your choices and close the window.

END OF STEPS

☐

Modify a scheduled task

When to use

Use this procedure to change the parameters of a task for any function that can be scheduled.

Before you begin

Before you begin this task, be aware that you cannot modify a scheduled task that is already in progress. You cannot modify another user's scheduled tasks unless you are the system administrator or have a privileged login.

To perform this task, access the Map window.

Instructions

Complete the following steps to modify a scheduled task.

1 Select **Administration** → **Schedule** → **DNO...** (or **Date/Time Sync...** or **Software Mgmt**) from the main menu bar on the Map window.

Result:

The **Scheduler Manager** window for the selected function is displayed, showing a list of currently scheduled tasks.

2 Select a task from the list to be modified.

3 Click the **Modify** button.

Result:

The appropriate **Modify a Scheduled Item** window is displayed.

4 Make modifications to the information.

5 Click the **Apply** button to apply the changes or click the **OK** button to apply the changes and close the window.

END OF STEPS

Delete a scheduled task

When to use

Use this procedure to delete a scheduled task for any function that can be scheduled.

Before you begin

Before you begin this task, be aware that you cannot delete any scheduled task that is already in progress. You cannot delete another user's scheduled tasks unless you are the system administrator or have a privileged login.

To perform this task, access the Map window.

Instructions

Complete the following steps to delete a scheduled task.

1. Select **Administration** → **Schedule** → **DNO...** (or **Date/Time Sync...** or **Software Mgmt**) from the main menu bar on the Map window.

   Result:

   The **Scheduler Manager** window for the selected function is displayed, showing a list of currently scheduled tasks.

2. Choose the item to be deleted, which is identified by TID, from the list.

3. Click the **Delete** button.

   Result:

   A pop-up question dialog window is displayed, asking if you want to delete the selected scheduled task.

4. Choose **Yes** to delete the selected scheduled task or **No** to cancel the deletion.

END OF STEPS

3 Topology management

Overview

Purpose This chapter contains procedures for adding, modifying and deleting trails and aggregates.

Contents

Add an aggregate

When to use

Use this procedure to add an aggregate. An aggregate is a collection of related NEs/aggregates that are grouped and named for purposes of streamlining network monitoring and resynchronization. A new aggregate is created by providing a unique aggregate name and alias and adding NEs or other aggregates to it.

Related information

For related information, see "Aggregates" (14-33).

Before you begin

Before you begin this task, identify which NEs and/or aggregates you want associate with the aggregate being created.

Instructions

Complete the following steps to create a new aggregate.

1 Select **Administration** → **Network** → **Aggregates** → **Add...** from the main menu bar on the Map window.

Result:

The **Add an Aggregate** window is displayed.

2 Fill in the following fields, as needed:

- **Aggregate Name** – This is the aggregate name. The Aggregate name can be 1-20 alphanumeric characters. Dashes are allowed. This field is required. The Aggregate name must be unique.
- **Aggregate Alias** – This is the aggregate alias (alternate label). The Aggregate alias can be 1-20 alphanumeric characters. Dashes are allowed. This field is optional.

3 Click the **OK** button.

Result:

The **Status Dialog** box is displayed and indicates that a new aggregate has been created. When a new aggregate is created, it is automatically placed into the TOP layer of the Map view. Any NE or aggregate that is placed into the aggregate is removed from the TOP layer.

The icon for the new aggregate is displayed in the current Map view and the subnetwork explorer, and is automatically selected.

4 To add NEs and/or aggregates to the newly created aggregate drag the NE or aggregate icon into the parent (owner) aggregate.

END OF STEPS

Moving an NE or aggregate out of an aggregate

An NE or aggregate can be moved out of the current parent aggregate into the top Map view by choosing **Return to Top** in the NE/aggregate's pop-up menu.

☐

Modify an aggregate

When to use

Use this procedure to change an aggregate's alias.

Related information

For related information, see "Aggregates" (14-33).

Before you begin

Before you begin this task, identify the aggregate to be modified. Be aware that the aggregate name for the Top Level Aggregate (TOP), which is the default parent of all member NEs in the network, cannot be changed.

Instructions

Complete the following steps to change the aggregate alias.

1 Select the aggregate to be modified from the Map window or subnetwork explorer and choose **Administration** → **Network** → **Aggregates** → **Modify Alias...** from the main menu bar on the Map window.

Result:

The **Modify an Aggregate** window is displayed with the current aggregate name and/or alias.

2 Change the aggregate alias, as desired and click the **OK** button.

Result:

The **Status Dialog** box is displayed, indicating that the changes to the aggregate are being made by *Navis*™ Optical EMS.

END OF STEPS

Selecting the aggregate from a list

If no aggregates were chosen from the Map window or Subnetwork Explorer in Step 1, the **Choose an NE/Aggregate** window is displayed for selection of the aggregate to be modified. Select the aggregate to be modified and click the **OK** button.

□

Delete an aggregate

When to use Use this procedure to delete an aggregate from *Navis*™ Optical EMS.

Related information For related information, see "Aggregates" (14-33).

Before you begin Before you begin this task, be aware that NEs/aggregates that are members of the aggregate being deleted must be reassigned to another aggregate or to the TOP aggregate level by choosing **Return to Top** in the NE/aggregate's pop-up menu.

Instructions Complete the following steps to delete an aggregate.

1 Select **Administration** → **Network** → **Aggregates** → **Delete...** from the main menu bar on the Map window.

Result:

The **Choose an Aggregate Aggregate/Delete** window is displayed.

2 Select the aggregate to be deleted and click the **OK** button.

Result:

The **Re-Assign an Aggregate** window is displayed.

3 Choose an aggregate from the list to which you want to reassign any member NEs/aggregates. You may also choose **Return to TOP** to return the NE(s) to the TOP Level Aggregate, which includes all NEs.

4 Click the **OK** button.

Result:

The **Status Dialog** window is displayed, indicating that the aggregate is being deleted.

END OF STEPS

Distributing aggregates to other aggregates

If you are not moving the majority of NEs to a single aggregate, it is recommended that you select the TOP Level Aggregate and modify those aggregates that take the NEs from the deleted aggregate.

□

Add a trail

When to use Use this procedure to manually add a trail between two NEs. Trails between identical Lucent Technologies NEs may be autodiscovered by the DNO (Dynamic Network Operation) feature and do not have to be manually added. Manually added trails may also be manually deleted.

DCN connection Trails have to be added manually only if the DCC is not working on the respective connection.

Related information For related information, see "Trails" (14-35).

Before you begin Before you begin this task, verify that the NEs at either end of the trail are compatible for the connection and that the AIDs at both ends of the trail are using compatible software releases. DNO has to be performed on the NEs at either end of the trail before manually adding a trail.

When you are adding a trail between an NE managed by *Navis*™ Optical EMS and a non-managed device (such as a DDM-2000), the AID(s) may not be available for the non-managed device, and, subsequently, will not be displayed in the AID list on the ***Add a Trail*** window. The trail can still be added between the managed and non-managed NE.

To perform this task, access the Map window.

Instructions Complete the following steps to manually add a trail.

1 Select **Administration** → **Network** → **Trails** from the main menu bar on the Map window.

Result:

The **Trail Manager** window is displayed, showing the current list of user-defined trails between NEs.

2 Click the **Add** button.

Result:

The **Add a Trail** window is displayed.

This window consists of:

- **Alias** field
- **From TID** and **To TID** scroll lists for both NEs
- **From AID** and **To AID** explorers for both NEs

The Trail Termination Point (TTP) for either end of the trail consists of the NE's TID and AID.

3 Select the first NE's TID from the **From TID** list.

Result:

The corresponding AIDs for the first NE's TID are displayed in the **From AID** explorer.

4 Select the second NE's TID from the **To TID** list.

Result:

The corresponding AIDs for the second NE's TID are displayed in the **To AID** explorer.

If the TID chosen is for a non-managed device, the associated AID list is empty and disabled. The trail can still be added between the managed NE and non-managed device.

5 Select a valid AID for the first NE's TID from the **From AID** explorer.

6 Select a valid AID for the second NE's TID from the **To AID** explorer.

7 Click the **Apply** button to create the trail, or click the **OK** button to create the trail and close the window.

END OF STEPS

Delete a trail

When to use

Use this procedure to manually delete a trail between two NEs. Automatically discovered trails are deleted automatically if one of the NEs at either end is deleted.

Related information

For related information, see "Trails" (14-35).

Before you begin

Before you begin this task, be aware that if you delete a trail, it is removed from the trail list in any open windows, including the Trail Manager window. The deleted trail is also removed from all open Map windows. Be aware that autodiscovered trails cannot be deleted. To perform this task, access the Map window.

Instructions

Complete the following steps to manually delete a trail.

1 Select **Administration** → **Network** → **Trails** from the main menu bar on the Map window.

Result:

The **Trail Manager** window is displayed, showing the current list of user-defined trails between NEs.

2 Select a trail to be deleted.

3 Click the **Delete** button.

Result:

A pop-up window is displayed, asking if you really want to delete the trail.

4 Choose **Yes** to delete the trail.

Result:

The **Status Dialog** window is displayed, indicating that the trail is being deleted.

END OF STEPS

4 Timing provisioning

Overview

Purpose

This chapter describes the procedures which have to be performed for the configuration of the system timing of the *LambdaUnite*™ MSS

Contents

Viewing the timing configuration

Overview Use this procedure to view the configuration of the external timing input and output ports, the timing reference and the system timing.

Related information For related information, see Chapter 10, "Timing provisioning concepts" and "Parameters of the View Timing/Sync window" (10-11) .

Instructions Complete the following steps to query the data of the timing configuration:

1 Select the NE in the Map pane portion of the Map window.

2 Select **Configuration** → **Synchronization** → **View...** from the main menu bar on the Map window.

Result:

This displays the **Ext Timing I/P Ports** tab of the **ViewSync** window, containing synchronization information for the selected NE. The corresponding parameters are described in "The External Timing Input Ports tab" (10-12).

3 Click on the tab **Ext Timing O/P Ports** to query the data on the timing output port. The corresponding parameters are described in "The External Timing Output Ports tab" (10-13).

4 Click on the **Timing Reference** tab to query the data on the configured timing reference source. The corresponding parameters are described in "The Timing Reference tab" (10-18).

5 Click on the **System Timing** tab to query the data on the internal SDH Equipment Clock (SEC). The corresponding parameters are described in "The System Timing tab" (10-21).

6 Click on **Close** to quit the window.

END OF STEPS

Refresh of values

The displayed parameters can be newly retrieved from the NE by pressing the **Refresh** button in the **View** screen.

Configuring the external timing input ports

Overview

Use this procedure to configure the external timing input ports.

Related information

For related information, see Chapter 10, "Timing provisioning concepts", "The External Timing Input Ports tab" (10-12).

Before you begin

Prior to performing this task, you must connect the external timing input ports to an external timing source.

Instructions

Complete the following steps to configure the external timing input ports:

1 Select the desired NE in the Map pane portion of the Map window.

2 Select **Configuration** → **Synchronization** → **Configure...** from the main menu bar on the Map window.

Result:

This displays the **Ext Timing I/P Ports** tab of the **ConfigSync** window, containing synchronization information for the selected NE. The corresponding parameters are described in "The External Timing Input Ports tab" (10-12).

3 Select the **AID** from the option menu. The following values are possible:

- **EXTTMG0**
- **EXTTMG1**

4 Select the **Timing Input Format** from the option menu. Select the format according to the format of the external clock source. The following values are possible for **SDH** mode:

- **2 MHz** (initial value)
- **2 Mbit – framed**
- **2 Mbit – unframed**
- **64 kHz**

For **SONET** mode

- **ESF** (extended superframed)
- **SF** (superframed)
- **64 kHz**

5 Select the **Input Sa Bit Location**. This parameter is only supported for framed 2 Mbit/s **SDH** signals.

Possible values are:

- **SA4**
- **SA5**
- **SA6**
- **SA7**
- **SA8**

6 Select **SUPPORTED** respectively **NOT-SUPPORTED** in the **Input SSM Support** information field. This parameter is only valid for framed **2 Mbit/s** or **DS1 ESF** signals.

7 Apply the changes by clicking on **Apply**. If you wish to discard the changes click on **Close**.

Result:

If you have clicked on **Close**, the **ConfigSync** window closes. If you have clicked on **Apply,** the window remains open and you can select another tab.

END OF STEPS

Configuring the external timing output ports

Overview

Use this procedure to configure the external timing output ports.

Before you begin

Prior to performing this task, you must connect the external timing output ports to an external timing network.

Related information

For related information, see Chapter 10, "Timing provisioning concepts", "The External Timing Output Ports tab" (10-13).

Instructions

Complete the following steps to configure the external timing output ports:

1 Select the desired NE in the Map pane portion of the Map window.

2 Select **Configuration** → **Synchronization** → **Configure...** from the main menu bar on the Map window.

Result:

This displays the **Ext Timing I/P Ports** tab of the **ConfigSync** window, containing synchronization information for the selected NE.

3 Select the **Ext Timing O/P Ports** tab of the **ConfigSync** window.

4 Select the **AID** (**EXTTMG0_OUT**, **EXTTMG1_OUT** or **EXTTMGALL_OUT**) from the option menu.

5 Select the **Derived Output Timing Source** from which the external timing signal is derived. The possible values are:

For **SDH** mode

- **TLS** (Timing Link Switch)
  The external timing signal is derived from one of the timing references. The currently active timing reference is selected in this case.
- **SETG**
  The external timing signal is derived from the system clock.

For **SONET** mode

- **LINE1**
- **LINE2**

---

6 Select the **Timing Output Equalization**. This parameter is only valid for **DS1 SONET** signals. The possible values are **20, 40, 60, 80 or 100**.

---

7 Select the **Timing Output Format** from the option menu. Select the format according to the format which is required for the external network. The following values are possible for **SDH** mode:

- **2 MHz** (initial value)
- **2 Mbit - framed**
  For framed 2 Mbit/s signals, the generation and evaluation of timing marker information on the timing quality is supported as per ITU-T Rec. G.703. If you want to use the timing marker, select **2 Mbit - framed**.
- **2 Mbit - unframed**
- **6.312 MHz**

For **SONET** mode

- **ESF** (extended superframed)
- **SF** (superframed)
- **6.312 MHz**

---

8 Select the **Output Sa Bit Location**. This parameter is only supported for framed 2 Mbit/s **SDH** signals.

Possible values are:

- **SA4**
- **SA5**
- **SA6**
- **SA7**
- **SA8**

9 Select the **Output Signal Status** from the main menu. The possible values are **DISABLED**, **NORMAL** or **UNACCEPTABLE.**

10 Enable or disable the use of the external outputs in the option menu **Timing Output Enable/Disable** by clicking on **ENABLE** respectively **DISABLE**.

Please note that there is only one timing output signal derived from the system clock or line signals which is forwarded in parallel to the two output ports which are physically available.

11 Set the parameter **Timing Output AIS Mode** to **AISMODE** or **QLMODE**.

This parameter is only valid for **2Mbit/s framed** and **DS1 ESF** signals.

12 Set the parameter **Forced DNU/DUS**. Via this parameter you can define whether DNU is consistently transmitted from the timing output ports.

The following values are possible:

- **ENABLE**
- **DISABLE**

13 Set the parameter **Timing Regenerator Loop Delay (1-60)**. This parameter defines the delay during which DNU/DUS is transmitted from the timing outputs after the Regenerator Loop conditions are no longer present. You can select a value between **0** and **60** seconds.

14 Select the quality of the outgoing timing signal in the **Timing Output Port QL** main menu.

The following values are possible for **SDH** mode

- **PRC, SSUL, SSUT, SEC, DNU**

The following values are possible for **SONET** mode

- **PRS, STU, ST2, ST3, DUS**

15 Select the provisioned quality acceptance level in **Acceptance QL for Output Threshold AIS**.

The following values are possible for **SDH** mode

- **PRC, SSUL, SSUT, SEC**

The following values are possible for **SONET** mode

- **PRS, STU, ST2, ST3**

16 Set the parameter **Timing Regenerator Loop** in order to avoid timing loops between the timing output ports and one or both of the timing inputs through a Stand-Alone Synchronization Equipment (SASE/BITS) Office Clock. This might happen, if the NE forwards timing to the SASE/BITS and at the same time receives a timing signal via one or both of the external timing input ports. If additionally the system clock is in the Locked Mode and derived from an external timing signal, DNU/DUS is forwarded to the timing outputs.

The following values are possible (**SDH**):

- **DISABLE**
  The Regenerator Loop functionality is disabled. Timing loops are not considered.
- **EXTREF1**
  If the quality level of the incoming framed 2 Mbit/s timing signal at the exttmg0 input is equal to the quality level of the timing signal that is transmitted to the external timing output ports, DNU is inserted for the outgoing timing signal as the NE assumes that a timing loop is present.
- **EXTREF2**
  If the quality level of the incoming framed 2 Mbit/s timing signal at the exttmg1 input is equal to the quality level of the timing signal that is transmitted to the external timing output ports, DNU is inserted for the outgoing timing signal as the NE assumes that a timing loop is present.
- **BOTH**
  The Regenerator Loop functionality is applied to both external timing inputs.

The following values are possible (**SONET**):

- **DISABLE**
- **ENABLE**

---

17 Type an up to 24 characters alphanumeric string in the field **ASAP Name**. The default value is **PFNAME**.

---

18 Apply the changes by clicking on **Apply**. If you wish to discard the changes click on **Close**.

Result:

If you have clicked on **Close** the **ConfigSync** window closes. If you have clicked on **Apply,** the window remains open and you can select another tab.

END OF STEPS

Configuring the timing references

Overview Use this procedure to configure the timing references.

Related information For related information, see Chapter 10, "Timing provisioning concepts", "The Timing Reference tab" (10-18).

Instructions Complete the following steps to configure the timing references:

1 Select the desired NE in the Map pane portion of the Map window.

2 Select **Configuration** → **Synchronization** → **Configure...** from the main menu bar on the Map window.

Result:

This displays the **Ext Timing I/P Ports** tab of the **ConfigSync** window, containing synchronization information for the selected NE.

3 Select the **Timing Reference** tab of the **ConfigSync** window.

4 Select the timing reference which you wish to configure in the drop-down list box **AID.**You can select the external timing signals **EXTREF1**, **EXTREF2** or **EXTREFALL** or a signal via **LINE1**,..., **LINE6** or **LINEALL**.

5 Select the port AID in the drop-down menu **Port AID**.

IF	THEN
the selected timing reference shall not be used,	select **NOT-CONNECTED**
both timing references shall be used	select **EXTTMGALL**
the selected timing reference is **EXTREF1**	select **EXTTMG0**

IF	THEN
the selected timing reference is **EXTREF2**	select **EXTTMG1**
the selected timing reference is from **LINE1** to **LINE6** or **LINEALL** and you want to assign a new SDH signal as timing reference,	select **NOT-CONNECTED** first in order to disable the currently assigned SDH port, and then select the new SDH port.
you want to use a value which depends on the port rate	select **SPortAID** The following table shows the values and their corresponding values
Value	Rate
STM-64/OC-192	1-1-#-#-[1-8, 12-19, 21-28, 32-39]-1
STM-16/OC-48	1-1-#-#-[1-8, 12-19, 21-28, 32-39]-[1-4]

6 Select in the drop-down menu **Timing Output Reference Priority** the priority of the selected timing reference. This parameter is available for **SDH** mode only. The values can be

- **0** DISABLE (initial value)
- **1**, ..., **6**

Make sure that all configured timing references have different priorities assigned.

Result:

A priority list is created for the configured timing reference signals. Initially the signal with the highest quality level is used as timing reference signal. If it fails, the system switches to the signal with the next lower quality level. If there are several timing references with the same quality level, they are used according to the priority list. If all possible timing reference signals fail, the timing generator enters the holdover mode.

7 Select the timing quality belonging to the timing reference in the drop-down menu **QL Provisioned**. For **LINE1** to **LINE6** or **LINEALL** select **AUTO** for SDH mode. This means that the timing marker is evaluated. For **EXTREF1** and **EXTREF2** and **EXTREFALL** select

SSUT. Other possible values for SDH mode are **PRC**, **SSUL** and **SEC**.

For SONET mode the values **AUTO**, **PRS**, **STU**, **ST2**, **ST3** are possible. Select **AUTO** for **LINE1** to **LINE6** or **LINEALL** and for **EXTREF1** and **EXTREF2** and **EXTREFALL**.

Result:

The timing references are now used in the order of their quality level.

---

8 Select the priority for the timing references in **System Timing Reference Priority**. The possible values are **0** (default) to **8**.

---

9 Type a name for the system timing ASAP (up to 24 characters alphanumeric string) in the field **ASAP Name**.

---

10 Enable timing port mode monitoring by selecting **MONITORED** in the **Timing Port Mode Monitoring** tab.

---

11 Select the value for the wait the system makes before it switches back to a timing reference in the **Wait To Restore** tab.

The possible values are

- For SONET mode
  - **0sec**
  - **20sec** (default)
  - **1** up to **60min** in 1 minute steps
  - **99** (infinite value)
- For SDH mode
  - **0** up to **60min** in 1 minute steps
  - default value is **5min**

---

12 Apply the changes by clicking on **Apply**. If you wish to discard the changes click on **Close**.

13 Repeat Step 4 to Step 12 until all timing references are configured. Click on **OK** to close the window.

END OF STEPS

Configuring the system timing

Overview

Use this procedure to configure the system timing.

Related information

For related information, see Chapter 10, “Timing provisioning concepts”, “The System Timing tab” (10-21).

Instructions

Complete the following steps to configure the system timing:

1 Select the desired NE in the Map pane portion of the Map window.

2 Select **Configuration** → **Synchronization** → **Configure...** from the main menu bar on the Map window.

Result:

This displays the **ConfigSync** window, containing synchronization information for the selected NE.

3 Select the **System Timing** tab of the **ConfigSync** window.

4 For SONET mode select **System** in the **AID** list box.

5 Select the clock mode in the option menu **Clock Mode.** You can select the following values:

- **FREE RUNNING** (The system is synchronized to the internal oscillator.)
- **LOCKED** (The system is synchronized to a timing reference signal.)

During normal operation in a network, the timing generator should be locked to a timing reference signal as far as available. Normally the free-running mode is used directly after the system start.

6 Enable or disable the use of the timing marker for the system timing option menu **System SSM Mode**. This means that the selection of timing reference for the system timing is either determined only by the provisioned priority list or by the quality level given by the timing marker (SSM, Synchronization Status Message) and secondly by the priority list.

The values can be

- **ENABLE**
- **DISABLE**

7 Select the ASAP for the system timing with the option menu **ASAP Name**.

8 Apply the changes by clicking on **Apply**. If you wish to discard the changes click on **Close**.

Result:

If you have clicked on **OK** or **Cancel,** the window **ConfigSync** closes. If you have clicked on **Apply,** the window remains open and you can select another tab.

END OF STEPS

Forced switching of the timing generator to the holdover mode

Overview

Use this procedure to switch the timing generator to the holdover mode.

Related information

For related information, see Chapter 10, "Timing provisioning concepts".

Instructions

Complete the following steps to change the clock mode:

1. Select the NE in the Map pane portion of the Map window.

2. Select **Fault** → **Synchronization** → **Operate...** from the main menu bar on the Map window.

   Result:

   This displays the **OperateSync** window.

3. Set the option menu **Sync Switch Modifier** to **System Clock Mode Switch**.

4. Select the switch command via the option menu **Switch Type**. You can select the following value via an option menu:

   - **Forced Switch**
     The **Forced Switch** command causes the system clock to be switched to the holdover mode regardless of the state of the timing references.
     The mode switch is not carried out when the clock is provisioned for the free running mode.

5. Apply the changes by clicking on **Operate**. If you wish to discard the changes, click on **Cancel**.

   Important! After a switch to holdover or a clear mode switch, it takes the system about 7 minutes to stabilize the holdover filter. So don't do any further timing action during these 7 minutes.

END OF STEPS

Switching of the timing reference

Overview

Use this procedure to switch between different timing reference signals and to apply certain switch requests to a selected reference:

- Forced Switch
- Manual Switch
- Lockout Switch
- Clear Wait to Restore

Related information

For related information see Chapter 10, "Timing provisioning concepts", "Configuring the timing references" (4-11).

Before you begin

Prior to performing this task,

- Configure the timing references sources for the system via **Configuration** → **Synchronization** → **Configure...** (cf. "Configuring the timing references" (4-11)).
- verify that the timing generator is in the locked mode via **Configuration** → **Synchronization** → **View...** (cf. "Viewing the timing configuration" (4-2))

Please note that the switch requests are only applicable if the timing generator is locked to a timing reference source. When the system is provisioned to the free running mode, all present requests are cleared.

Instructions

Complete the following steps to switch to another timing reference:

1 Select the NE in the Map pane portion of the Map window.

2 Select **Fault** → **Synchronization** → **Operate...** from the main menu bar on the Map window.

Result:

This displays the **OperateSync** window.

3 Set the option menu **Sync Switch Modifier** to **System Assigned Timing Reference Switch**.

4 Select the switch request you want to perform in the option menu **Switch Type**. The following switch requests are possible:

- **Forced Switch**
  causes the system to be switched to the selected timing references regardless of the state of the timing reference. Only if a release synchronization switch or a Lockout command is present the Forced Switch is denied. A Forced Switch remains active until it is removed by a release synchronization switch or a Lockout command.
- **Clear Wait to Restore**
  the wait to restore period will be terminated. The signal status will return to normal.
- **Manual Switch**
  causes the system to be switched to the selected timing reference only if that timing reference is working fault free and no other external request is present.
- **Lockout Switch**
  allows manual selection of individual references, or manual disabling of individual references.

5 Select the timing reference source to which you want to perform a switch request in the option menu **Destination**. This can be:

- **EXTREF1, EXTREF2**
- **LINE1** to **LINE6**

6 Apply the changes by clicking on **Operate**. If you wish to discard the changes, click on **Cancel**.

> **Important!** After a timing reference switch, it takes the system about 2 minutes to stabilize the holdover filter. So don't do any further timing action during these 2 minutes.IF *LambdaUnite*™ MSS is in warm-up state, which takes about 6 minutes, you should wait these 6 minutes.

END OF STEPS

Switching of the system clock

Overview Use this procedure to switch the system clock.

Related information For related information see Chapter 10, "Timing provisioning concepts".

Instructions Complete the following steps to switch the system clock:

1 Select the NE in the Map pane portion of the Map window.

2 Select **Fault** → **Synchronization** → **Operate...** from the main menu bar on the Map window.

Result:

This displays the **OperateSync** window.

3 Set the option menu **Sync Switch Modifier** to **System Clock Mode Switch**.

4 Select the switch request you want to perform in the option menu **Switch Type**. The following switch requests are possible:

- **Forced Switch**
  causes the system clock to be switched.

5 Apply the changes by clicking on **Operate**. If you wish to discard the changes, click on **Cancel**.

END OF STEPS

Switching of the external timing output

Overview

Use this procedure to switch the external timing outputs. The following switch requests are possible:

- Forced Switch
- Manual Switch
- Lockout Switch.

Related information

For related information see Chapter 10, "Timing provisioning concepts".

Instructions

Complete the following steps to switch an external timing output:

1 Select the NE in the Map pane portion of the Map window.

2 Select **Fault** → **Synchronization** → **Operate...** from the main menu bar on the Map window.

Result:

This displays the **OperateSync** window.

3 Set the option menu **Sync Switch Modifier** to **External Timing Output Switch**.

4 Select the switch request you want to perform in the option menu **Switch Type**. The following switch requests are possible:

- **Forced Switch**
  causes the system to be switched to the selected timing references regardless of the state of the timing reference. Only if a release a synchronization switch or a Lockout command is present the Forced Switch is denied. A Forced Switch remains active until it is removed by a release a synchronization switch or a Lockout command.
- **Manual Switch**

causes the system to be switched to the selected timing reference only if that timing reference is working fault free and no other external request is present.

- **Lockout Switch**
  allows manual selection of individual references, or manual disabling of individual references.

5 Select the timing reference source to which you want to perform a switch request in the option menu **Destination**. This can be:

- **LINE1** to **LINE6**

6 Apply the changes by clicking on **Operate**. If you wish to discard the changes, click on **Cancel**.

END OF STEPS

Releasing a synchronization switch

Overview

Use this procedure to release switch requests of the

- Timing Reference
- System Clock Mode
- External Timing Output

The release switch request clears any lockout or forced switch request.

Related information

For related information see Chapter 10, “Timing provisioning concepts”.

Instructions

Complete the following steps to release a switch:

1 Select the NE in the Map pane portion of the Map window.

2 Select **Fault** → **Synchronization** → **Release...** from the main menu bar on the Map window.

Result:

This displays the **ReleaseSync** window.

3

If you want to release the switch of the	set the Switch Modifier to	and the Destination to
Timing Reference	**System Assigned Timing Reference Switch**	**EXTREF1**, **EXTREF2**, **LINE1**,..., **LINE6**
System Clock Mode	**System Clock Mode Switch**	—
External Timing Output	**External Timing Output Switch**	**LINE1**,..., **LINE6**

4 Apply the changes by clicking on **Release**. If you wish to discard the changes, click on **Cancel**.

END OF STEPS

5 Traffic provisioning

Overview

Purpose This chapter contains procedures for traffic provisioning.

Contents

Port provisioning

When to use

Use this procedure to display the windows used to provision NE ports.

This procedure can be applied to provisioning ports or port tributaries in an NE.

Changes made to a port's/tributary's parameters can be applied to the individual selected port/tributary or multiple ports/tributaries of the same type, on the same shelf as the provisioned port/tributary, on the circuit pack as the provisioned port/tributary, or across the entire NE.

Port provisioning can also be accessed from the **Equipment View** window ("View NE equipment" (2-5)).

Related information

For related information, see Chapter 11, "Traffic provisioning concepts".

Instructions

Complete the following steps to display the windows used to provision port/tributary parameters.

1 Select the NE on the Map window for which the ports shall be provisioned.

2 Select **Configuration** → **Provision...** from the menu in the Map window.

Result:

The **Provisioning** window is displayed.

3 Expand the structure in the **Network Element Explorer** by pressing the "+"signs until the port to be provisioned is displayed.

4 Select the desired SDH or SONET port and press **Provision**.

Result:

This displays the port attributes (for your selection) in the Provisioning area of the **Provisioning** window.

Provisioning of the fixed **Tributary Input Signal Rate** or **Tributary Unequipped/Output Signal Rate**, while accessed through the **Provisioning** window, requires a special sub-procedure that is described in "Provision fixed incoming or outgoing signal rate" (5-5).

For provisioning the **Tributary Input Signal Rate List** and/or the **Tributary Unequipped/Output Signal Rate List** for OC-192/STM-64 ports on a NE, there is no **Details** button next to the fields for these port types that bring up a secondary provisioning window for selection of these values as described in step "Provision fixed incoming or outgoing signal rate" (5-5). You must manually type in the signal rate for OC-192/STM-64 ports for this NE type.

The following table shows, for each port type, the rate value entered in either **Tributary Input Signal Rate List** or **Tributary Unequipped/Output Signal Rate List** and what it represents.

For OC-192 ports:

- 192I = 192 STS-1 tributaries
- 643 = 64 STS-3 tributaries
- 1612 = 16 STS-12 tributaries
- 448 = 4 STS-48 tributaries

For STM-64 ports:

- 1923 = 192 VC-3 tributaries
- 644 = 64 VC-4 tributaries
- 416c = 4 VC-4-16c tributaries
- 1c64 = 1 VC-4-64c tributary.

5 Make the settings as desired and click the **Apply** button.

Result:

A question dialog box is displayed, informing you that the port parameter change(s) for the selected port(s) made may affect service and asks if you want to make the modification(s) anyway.

6 Choose **Yes**.

Result:

The requested port parameter change(s) is sent to the NE.

Reference:

"STM port parameter description" (11-69), "Provisioning (VC-3) parameters" (11-72), "Substructuring input and output signals" (5-10).

END OF STEPS

Provision fixed incoming or outgoing signal rate

Use the following procedure to provision the fixed rate for the tributary Incoming or outgoing signal rate for a port tributary.

1 Follow Steps 1-4 in the "Port provisioning" (5-3) task for selecting the port to be provisioned. Locate the **Tributary Input Signal Rate** or **Tributary Output Signal Rate** port fields on the right side of the **Provisioning** window.

Result:

The **Tributary Incoming Signal Rate** or **Tributary Outgoing Signal Rate** field shows the current signal rate values for the port tributary group and the chosen values for the port tributary group.

2 Click the **Details...** button to the right of the **Chosen Values** field of the **Tributary Input Signal Rate** or **Tributary Output Signal Rate** parameter.

Result:

A secondary provisioning window is displayed, showing the port group and a series of numbers, separated by commas, which represent the current number of tributaries and the signal rate that each can carry.

3 Position the mouse cursor on the row of numbers to be reprovisioned in the **Group** and **Values** field portion of the window and click the left mouse button to select them.

Once the numbers at the top of the provisioning window are selected (either automatically or manually), the color of the buttons that correspond to the current signal rate of each tributary turns to dark grey.

To configure a different fixed signal rate for one or more tributaries, click on one or more of the buttons of a different signal rate that are located at the bottom of the secondary provisioning window to change the value and combination of signal rates for the tributaries.

---

4 Once you have selected and configured the tributary rates, click the **Apply** button at the bottom of the secondary provisioning window to apply your selections.

Result:

The numbers shown in the **Values** field will change to reflect the selection(s) you have made.

---

5 After all of your changes are made, click the **OK** button.

Result:

The system returns to the **Provisioning** window. The value now shown in the **Tributary Input Signal Rate** or **Tributary Unequipped/Output Signal Rate** (depending on the field you configured), reflects the new tributary signal configuration.

If, for example, you changed all of the STS-1 tributaries to STS-3 tributaries, the value now shown in the **Tributary Input Signal Rate** or **Tributary Unequipped/Output Signal Rate** field on the **Provisioning** window would be “43”, representing the configuration change to four STS-3 tributaries.

If, for example, you changed six of the STS-1 tributaries to STS-3 tributaries, the value now shown in the **Tributary Input Signal Rate** or **Tributary Unequipped/Output Signal Rate** (depending on the field you chose to reconfigure) would be “23-61”, representing two STS-3 tributaries and six STS-1 tributaries.

---

6 Click the **Apply** button on the primary provisioning window to ensure that all provisioning changes are applied.

Result:

A status window is displayed, showing that the provisioning changes are in progress. When they are completed, the status of the provisioning job changes to "Completed". Click the **Close** button to close the status window.

The primary **Provisioning** window remains displayed.

7 Click the **Retrieve** button on the primary **Provisioning** window to verify that the provisioning changes have been made.

END OF STEPS

Modify ports/tributaries of the same type

When to use Use this procedure to modify ports/tributaries of the same type.

Related information For related information, see Chapter 11, "Traffic provisioning concepts".

Instructions Complete the following steps to modify ports/tributaries of the same type.

1 Select the NE on the Map window for which the ports shall be provisioned.

2 Select **Configuration** → **Provision...** from the menu in the Map window.

Result:

The **Provisioning** window is displayed.

3 Expand the structure in the **Network Element Explorer** by pressing the "+"signs until the port/tributary to be provisioned is displayed.

4 Press **Provision** button.

Result:

All parameters of that port/tributary are displayed.

5 Change the parameter(s) as desired and select **Apply parameters to Multiple Ports**.

Result:

The **Select Ports...** button becomes enable.

6 Press **Select Ports...** button.

Result:

The **Select Ports** window is displayed.

7 Use the radio buttons to choose one of the following options:

- **On This pack**
- **On This shelf**
- **On This NE**(only possible for ports).

Move the ports to be provisioned to the right portion (**Ports to Update In Addition To...**) and click on **OK**.

Result:

The **Select Ports** window is closed.

8 Click on **Apply** in the **Provisioning** window.

Result:

A question dialog box is displayed, informing you that the parameter change(s) for the selected port(s) made may affect service and asks if you want to make the modification(s) anyway.

9 Choose **Yes**.

Result:

The requested port parameter change(s) is sent to the NE.

END OF STEPS

Substructuring input and output signals

When to use Use this procedure to substructure input and output signals.

Related information For related information, see Chapter 11, “Traffic provisioning concepts”, “Port provisioning” (5-3).

Instructions Complete the following steps to substructure input and output signals.

1 Select the NE on the Map window for which the ports shall be provisioned.

2 Select **Configuration** → **Provision...** from the menu in the Map window.

Result:

The **Provisioning** window is displayed.

3 Expand the structure in the **Network Element Explorer** by pressing the “+”signs until the port to be provisioned is displayed.

4 Select the desired SDH or SONET port and press **Provision**.

Result:

The port parameters are displayed on the provisioning side of the **Provisioning** window.

5 Press **Details** to provision the **Tributary Input Signal Rate** or the **Tributary Unequipped Output Signal Rate**.

Result:

The **Provisioning Inputsig** or **Provisioning Unequiposig** window opens.

6 Select the signal to be substructured in the list in the upper part of the window. The current signal structure is shown in the **Values** column.

The values **416c**, **44c**, **4** and **3** stand for VC4–16C, VC4–4C, VC4 and VC3 respectively.

Result:

The buttons for setting the signal structure (**3**, **4**, **4–4c**, **VC4–16C**) become active. Dark buttons correspond to the currently set structure.

7 Structure the signal by means of the buttons **3**, **4**, **4–4c** and **VC4–16C**. Press **Apply** to confirm your settings.

Result:

The **Value** column displays the new structure.

8 Repeat step 6 and 7 to structure the whole signal as desired. Press **Ok** when you are done. (When you press **Cancel** the settings are lost.)

Result:

The window is closed and the new settings are displayed in the **Provisioning** window.

9 Repeat the procedure beginning at step 5 so that Tributary Input Signal Rate and Tributary Unequipped Output Signal Rate are structured identically. Then press **Apply** in the **Provisioning** window.

Result:

The port is configured with the new settings.

Reference:

"STM port parameter description" (11-69), "Provisioning (VC-3) parameters" (11-72).

END OF STEPS

Enter/exit maintenance condition

When to use

Use this procedure to enter or exit the maintenance condition for an NE.

Related information

For related information, see Chapter 11, "Traffic provisioning concepts".

Instructions

Complete the following steps to enter or exit the maintenance condition for an NE.

1 Select the NE on the Map window.

2 Select **Configuration** → **Provision...** from the menu in the Map window.

Result:

The **Provisioning** window is displayed.

3 Select the NE name on top of the **Network Element Explorer** and press **Provision**.

Result:

The NE parameters are displayed on the provisioning side of the **Provisioning** window.

4 Switch **Maintenance Condition** to **Y** (yes) to enter or to **N** (no) to exit the maintenance condition by means of the drop down list and press **Apply**.

Result:

The system displays the confirmation window.

5 Select **Yes** to confirm the action.

Result:

The maintenance condition for the NE is configured with the new settings.

END OF STEPS

View NE cross-connections - textual

When to use Use this procedure to view a textual version list of existing cross-connections.

Related information For related information, see Chapter 11, "Traffic provisioning concepts", "Cross-connections" (11-3).

Instructions Complete the following steps to display a textual version list of existing cross-connections.

1 Select **Configuration** → **Connection Management** → **Cross-Connection...** from the main menu bar on the Map window.

Result:

This displays the **Choose an NE** window.

2 Choose the NE you want to work with by double clicking on it in the **Choose an NE** window and then clicking the **OK** button.

Result:

This displays the **Cross-Connection** window.

3 In the explorer area of the **Cross-Connection** window, use your mouse to select the system, a shelf, a circuit pack, or a port group for which you want to see the cross-connections.

4 Select **View** → **List Cross-Connections** from the main menu of the **Cross-Connection** window.

Result:

This displays the **Cross-Connection List** window.

5 If desired, select another element from the explorer area of the **Cross-Connections** window to change the information in the **Cross-Connection List** window for the new selection. Also if desired, select a row in the list and then click the **Delete** or **Modify**

button to display the windows used to delete and modify cross-connections, respectively.

END OF STEPS

Add a single NE cross-connection

When to use

Use this procedure to add new NE cross-connections.

Related information

For related information, see Chapter 11, "Traffic provisioning concepts", "Cross-connections" (11-3).

Several ways to access the cross-connection window

There are several ways to access the **Cross-Connection** window besides the method described in this procedure. Other ways to access the **Cross-Connection** window:

- From the Map main menu
  Choose the NE to work with in the Map and then **Configuration** → **Connection Management** → **Cross Connection...** from the main menu.
- Equipment View Window Menu
  Choose **Configuration** → **Cross Connection...** from the main menu.
- Equipment View Pop-Up Menu
  Right click over the equipment whose cross connection window is to be displayed and choose **Cross Connection** from the popup menu.

Instructions

Complete the following steps to add a single new cross-connection.

1 Position the mouse cursor on the NE in the Map pane portion of the Map window and click the menu (right) menu mouse button and choose **Connection Management** → **Cross Connection...** from the pop-up menu.

Result:

The **Cross-Connect** window is displayed.

2 Position the mouse cursor on the NE's TID displayed in the left portion of the window below the **Network Element Explorer** heading. Press the left mouse button twice to highlight the TID.

Result:

The explorer tree is expanded to show the shelf below the TID. (You can also expand any item in the **Network Element Explorer** by clicking the plus (+) sign next to the item. To collapse the item, click the minus (-) sign next to it.)

3 Position the mouse cursor on the shelf displayed in the explorer tree. Press the select (left) mouse button twice to highlight the shelf and expand the explorer tree to show the circuit packs beneath the shelf.

4 Position the mouse cursor on the circuit pack displayed in the explorer tree. Press the select (left) mouse button twice to highlight the circuit pack and expand the explorer tree to show the port groups beneath the circuit pack.

5 Repeat steps 3–4 for all shelves and ports that need to be displayed.

6 Expand and display the associated port tributary in the main view of the **Cross-Connect** window.

There are two ways to do this:

- Position the mouse cursor on the port group in the explorer to be expanded and click the menu (right) mouse button to display a drop-down menu of positions. Select the position for the tributary block from the drop-down menu list. (It is recommended to position the source tributary block on the left).
- Position the mouse cursor on the port group in the explorer, click and hold the select (left) mouse button and drag the selected port into the left portion of the main view of the **Cross-Connect** window. The tributary block for the selected port is displayed in the main view.

To remove a tributary block from the main view, position the mouse cursor on the tributary block, click the right mouse button and select **Clear**. The tributary block is cleared from the main view.

If necessary, click the up/down and left/right arrow keys located next to the tributary blocks displayed to scroll and locate the tributary you want to use. When you position the cursor on a tributary block, the status bar indicates the tributary address and whether the tributary is available to be used as a source or destination.

---

7 Select the destination port tributary and place it on the right side of the Main View of the window.

---

8 Move the mouse cursor to the source tributary block on the left side of the window and click the select (left) mouse button to select the source tributary for the cross-connection.

Result:

The available cross-connection type buttons are enabled at the top toolbar portion of the window above the Main View and **Network Element Explorer**. If a specific type of cross-connection is not possible for the source tributary selected, these cross-connection type buttons are greyed out.

---

9 Select the cross-connection type by clicking on the appropriate cross-connection type button at the top portion of the window.

Result:

The color of the selected source tributary block changes to green.

---

10 Select the destination port tributary block.

Result:

The **Create Cross-Connection Attributes** window is displayed.

---

11 Set the attributes of the cross-connection depending on the cross-connection type and press **OK**.

Result:

The line of the newly created cross-connection momentarily changes to orange. When the cross-connection has been established, the lines and arrows of the created cross-connection change color from orange to black and then to blue, indicating that the cross-connection has been made

Reference:

"1-Way cross-connection parameters" (11-14), "2-Way cross-connection parameters" (11-14), "1-Way PP cross-connection parameters" (11-15).

END OF STEPS

Roll a cross-connection

When to use

Use this procedure to roll a one-way cross-connection. A roll operation consists of moving the input (source) of an existing leg of a one-way or two-way point-to-point cross-connection from the current input (source) tributary to a new input (source) tributary, while leaving the output tributary unchanged.

Typically, a roll is used as a tail-end switch in a “facility or tributary” rolling operation, whereby traffic is moved from one facility to another or from one tributary to another on a facility. The head-end side of a facility or tributary roll usually has a bridge established (in one NE) so that the traffic flows on both the old and new facilities, minimizing the signal interruption time when the roll is carried out to that introduced by the roll itself (in the other NE). A roll is inherently a one-way operation, but because facilities are generally two-way, a head-end bridge/tail-end roll sequence is typically done in both directions.

Related information

For related information, see Chapter 11, “Traffic provisioning concepts”, “Cross-connections” (11-3).

Before you begin

Before you begin this task, determine the existing cross-connection for which you want to create a roll cross-connection.

Instructions

Complete the following steps to roll a cross-connection.

1 Position the mouse cursor on the NE in the Map pane portion of the Map window and click the menu (right) menu mouse button and choose **Cross Connection** from the pop-up menu.

Result:

The **Cross-Connection** window is displayed.

2 Expand the elements in the **Network Element Explorer** until you see the end points of the cross-connection you want to roll and drag the port groups to the main view of the **Cross-Connection** window.

3 Click with the right mouse button on the existing cross-connection for the roll and select the desired connection from the popup menu.

Result:

The selected cross-connection line is highlighted. The source changes its color to green and the sink to magenta.

4 Click the **Roll** button in the toolbar.

Result:

A pop-up window is displayed, prompting you to select a new input (source) tributary for the roll.

5 Click the **OK** button to close the pop-up window.

6 Select the new input tributary (source) for the roll by clicking on the tributary block.

Result:

A **Roll Cross Connect Attributes** window is displayed.

7 On the **Roll Cross Connect Attributes** window, choose the new LOCA NE by clicking the down arrow next to the **NEWLOCA** field to display a drop-down list of choices. This list may contain just the current NE or more choices, depending on the rate of the selected source tributary.

8 After choosing the new LOCA NE, click the **OK** button on the **Roll Cross Connect Attributes** window.

Result:

A pop-up window is displayed, asking if you really want to perform the roll operation for the selected cross-connection.

9 Choose **Yes**.

Result:

The cross-connection is rolled to the new source tributary.

END OF STEPS

Add a path-protected cross-connection

When to use

Use this procedure to create a path-protected cross-connection. This type of cross-connection can be used in Bidirectional Line-Switched Ring (BLSR)/Dual Node Interconnection (DNI) and Unidirectional Path-Switched Ring (UPSR)/ Sub-Network Connection Protection (SNCP) topologies.

For Dual Ring Interworking(DRI)/DNI applications, the path-protected cross-connection comprises one add and one through cross-connection with a working and protection leg.

For UPSR/SNCP applications, a 1-way path-protected cross-connection is created at the drop node, consisting of two drop cross-connections with a working and protection leg.

This type of cross-connection can be assigned to a path protection group name, which allows all cross-connections with the same path protection group name to be retrieved in a single request to the NE. This is a 1-26 character name that can consist of, for example, a combination of both input port AIDs.

The path protection behavior between the working and protection legs of the cross-connection can be defined as non-revertive with no hold-off time (the initial setting for UPSR/SNCP applications) or revertive with a hold-off time enabled (the initial setting for DRI/DNI applications).

Related information

For related information, see Chapter 11, “Traffic provisioning concepts”, “Protection mechanisms” (11-37), “Line protection” (11-44), “Ring protection” (11-46), “Protection configurations” (11-68).

Instructions

Complete the following steps to add a path-protected cross-connection.

1 Position the mouse cursor on the NE in the Map pane portion of the Map window and click the menu (right) menu mouse button. Choose **Connection Management** → **Cross Connection...** from the pop-up menu. (If you choose **Configuration** →**Connection Management** → **Cross Connection...** from the main menu bar on the Map window, the **Choose an NE** window is displayed. Double-click on the NE in the window list and click the **OK** button.)

Result:

The **Cross-Connection** window for the selected NE is displayed.

The equipment hierarchy in the **Network Element Explorer** portion of the window is automatically expanded to the slot (circuit pack) level for the NE.

You can expand any item in the **Network Element Explorer** by clicking the plus (+) sign next to the item. To collapse the item, click the minus (-) sign next to it. If items in the explorer are partially obscured, place the mouse cursor on the pane edge between the right side of the explorer and Main View, click and hold the left mouse button, and drag the edge to the right until the explorer items can be seen clearly.

---

2 Position the mouse cursor on the plus (+) sign next to each slot in the explorer portion of the window, then click and expand the equipment hierarchy until all ports for the cross-connection are shown.

Result:

All ports for the cross-connection are shown.

---

3 Expand and display the desired source port tributary in the Main View of the **Cross-Connect** window.

There are two ways to do this:

- Position the mouse cursor on the port in the explorer to be expanded and click the menu (right) mouse button to display a drop-down menu of positions. Select the position for the tributary block from the drop-down menu list (left, right, top, or bottom) or
- Position the mouse cursor on the port in the explorer, click and hold the select (left) mouse button and drag the selected port into the left, right, top, or bottom portion of the Main View of the **Cross-Connect** window.

Result:

The tributary block for the selected port is displayed in the Main View.

To remove a tributary block from the Main View, position the mouse cursor on the tributary block and click the left mouse button. Then click the right mouse button. A single option, **Clear**, is displayed in a pop-up window. Move the mouse cursor over the word **Clear** in the pop-up window to select it. The tributary block is cleared from the Main View.

4 Select and display the destination port tributary in the Main View, using one of the methods described in Step 3.

When you position the cursor on a tributary block, the status bar indicates the tributary address and whether the tributary is available to be used as a source or destination, or both.

Result:

The destination port tributary is displayed in the Main View.

5 Select and display the secondary destination port tributary (to be used initially for the protection leg of the cross-connection) in the Main View, using one of the methods described in Step 3.

Result:

The second destination port tributary is displayed in the Main View.

6 Select the tributary to be used for the working source leg of the cross-connection.

Result:

The color of the selected tributary changes to magenta.

7 Click on the cross-connection type toolbar button, **One Way PP** (for One Way Path-Protected).

If you are not sure which button is the **One way PP** cross-connection type toolbar button, move the mouse cursor across each cross-connection type toolbar button until the label **One Way PP** is displayed in the status bar in the bottom portion of the window. A tooltip help bubble with the label **One Way PP** will also be displayed.

Result:

The color of the selected source/input tributary changes to green.

8 Position the cursor on the tributary to be used as the destination tributary and click the left mouse button to select it.

Result:

The color of the selected tributary changes to purple.

9 Select the tributary to be used for the protection/secondary source leg of the cross-connection.

Result:

The color of the selected protection/secondary tributary block changes from yellow to magenta (yellow/brown).

A pop-up **Create Cross Connect Attributes** window is displayed. This window is used to specify the attributes of the path-protected cross-connection.

10 Select values for the following fields as needed:

- **Alias** – this field is used to enter an alias name.
- **LOCA**: click the down arrow next to this field to display a drop-down list of NEs and select the NE to be used as the source node for this cross-connection. The field defaults to the current NE.
- **LOCZ**: click the down arrow next to this field to display a drop-down list of NEs and select the NE to be used as the destination node for this cross-connection. The field defaults to the current NE.
- **LOCA2**: click the down arrow next to this field to display a drop-down list of NEs and select the NE to be used as the secondary destination node (for DRI/DNI application of the path-protected cross-connection). The field defaults to the current NE.
- **OMODE**: click the down arrow next to this field to display a drop-down list of options for the Output Mode for this cross-connection.

- **XCAPPL** (Application): click the down arrow next to this field to display a drop-down list of choices for the application (type) of cross-connection. Select 1-Way Path-Protected as the application.
- **XCNUM** (Cross-Connection Number): this field is pre-populated with a Cross-Connection number (it functions as a drop-down list; you can click the down arrow to display and select the number). The Cross-Connection Number is used to associate all atomic cross-connections that are created from the same associated legs and leg-pairs so information can be retrieved from the NE together. This Cross-Connection number can be used to modify and delete associated legs of one or more cross-connections with the same number on the **List Cross-Connections** window at one time. The **List Cross-Connections** window can be accessed by clicking the **List Cross-Connections** toolbar button on the **Cross-Connection**window toolbar.
- **PPGNAME** (Path Protection Group Name): this is an optional field for entering a 1-26 character Path Protection Group Name that identifies a path protection group for the path-protected cross-connection. All cross-connections associated with a Path Protection Group Name can be retrieved in a single request to the NE.
- **SNC TYPE**
  - **NA** for SONET
  - **SNCI**, **SNCN** for SDH
- **REVERTIVE MODE**
- **HOLD OFF TIME**
- **WAIT TO RESTORE TIME**

---

11 Click the **OK** button to activate your attribute choices in the **Attributes** window.

Result:

A pop-up confirmation window is displayed.

---

12 Choose **Yes**.

Result:

The lines and arrows of the newly created cross-connection are momentarily displayed in orange. When the cross-connection has been established, the lines and arrows of the cross-connection change to black and the tributary blocks change to blue, indicating that they are cross-connected.

The protection leg of the cross-connection is represented by a dashed line.

The path-protected cross-connection is represented on the Main View as a cross-connection with multiple legs.

END OF STEPS

Add an NE multi-cast cross-connection

When to use

Use this procedure to add a new multi-cast cross-connection. This is accomplished via the **Add a Multi-Cast Cross-Connection** window, which allows you to choose the number of destination AIDs for a multi-cast cross-connection.

Before you begin

Be aware that the maximum number of destination AIDs allowed for a multi-cast cross-connection for any NE type is two.

Related information

For related information, see Chapter 11, “Traffic provisioning concepts”, “Cross-connections” (11-3).

Instructions

Complete the following steps to add a new multi-cast cross-connection.

1 Select **Configuration** → **Connection Management** → **Cross-Connection...** from the main menu bar on the Map window.

Result:

This displays the **Choose an NE** window.

2 Choose the NE you want to work with by double clicking on it in the **Choose an NE** window and then clicking the **OK** button.

Result:

This displays the **Cross-Connection** window.

3 Expand an item in the explorer tree (using the mouse) and locate the port group that contains the tributaries/ports to display in the main view area.

4 Right click to see the pop-up menu and select a port area from the menu.

Result:

The port group is expanded to display the tributaries/ports.

5 Single click on a high speed line or low speed address at the appropriate signal rate for the new multi-cast cross-connection.

6 Choose the multi-cast button from the group of cross-connection buttons at the top of the **Cross-Connections** window (if tooltips help is enabled, positioning the mouse pointer over the button will indicate the correct button).

Result:

This displays the **Multi-Cast XC** window.

7 In the **Total Number of Destinations in this NE** field on the **Add a Multi-Cast Cross-Connection** window, enter the number of drops to be included in the cross-connection.

8 In the main view area of the **Cross-Connections** window, click on each port/tributary that is to be a drop for the new multi-cast cross-connection. Notice that as each drop is specified, it is added to the **Chosen Destinations** area of the **Multi-Cast XC** window.

If necessary, you can remove a previously selected AID from the **Chosen Destinations** area by selecting it with the mouse and then clicking the nearby **Remove AID** button.

9 After you have specified the last drop, click the **Done** button.

Result:

The system asks you to specify additional information for the cross connection, if any is needed. Specifically, for the purposes of a multi-cast cross-connection, a destination TID must be present for each and every destination that you specified. To get this information the system displays the **Additional Cross-Connection Information** window.

10 Type the additional requested information into this window and click **OK**.

Result:

The system displays the **Cross-Connection Confirmation** window.

Reference:

"Multicast cross-connection parameters" (11-16).

11 Click the **OK** button to send the new cross-connection command to the NE.

END OF STEPS

Add a compound cross-connection (via cross-connect template)

When to use

Use this procedure to enter a compound cross-connection. This is accomplished via the **Create Compound Cross Connect** window, which allows you to define the three tributaries and all related parameters of a cross-connection.

When a compound cross-connection is created for an NE , *Navis*™ Optical EMS sends separate TL1 requests to the NE to create each of the individual cross-connections that comprise the compound cross-connection.

Related information

For related information, see Chapter 11, “Traffic provisioning concepts”, “Cross-connections” (11-3).

Instructions

Complete the following steps to add a compound cross-connection in an NE via the cross connect template available through the **Cross-Connection** window.

1 Select **Configuration** → **Connection Management** → **Cross-Connection...** from the main menu bar on the Map window.

Result:

This displays the **Choose an NE** window.

2 Choose the NE you want to work with by double clicking on it in the **Choose an NE** window and then clicking the **OK** button.

Result:

This displays the **Cross-Connection** window.

3 Click on the **Cross Connection Template** button in the tool bar.

Result:

The **Create Compound Cross Connect** window is displayed.

4 Expand the structure in the **Network Element Explorer** by pressing the “+”signs until the tributary level is displayed.

5 Use the right mouse button in the **Network Element Explorer** to select the desired tributaries:

- **Tributary A** for protection source (LOCA2)
- **Tributary B** for destination (LOCZ)
- **Tributary C** for working source (LOCA)

Result:

The **Cross Connect Parameter** window becomes enable.

6 Enter all the required information and click on **Create**.

Result:

A question dialog window is displayed, asking if you are sure that you want to create the compound cross connection using the set of selected tributaries.

7 Click on **Yes** to confirm the creation of the compound cross-connection.

Result:

The TL1 commands to create the individual cross-connections for the application are sent to the NE.

A Status window is displayed, showing the results of the compound cross-connection request.

If the compound cross-connection is created successfully, a "Complete" message is displayed in the Status column for the request on the Status window.

If any of the cross-connection commands fail, an "Incomplete" message is displayed next to the failed command.

You can view the details of each request sent to the NE on the Status window by double-clicking on the individual request or by selecting the request and clicking the **Details** button on the Status window.

Reference:

"1-Way cross-connection parameters" (11-14) , "1-Way PP cross-connection parameters" (11-15).

END OF STEPS

Delete NE cross-connections - graphical

When to use

Use this procedure to delete a selected cross-connection using the graphical representation.

Related information

For related information, see Chapter 11, "Traffic provisioning concepts", "Cross-connections" (11-3).

Instructions

Complete the following steps to delete a cross-connection.

1 Position the mouse cursor on the NE in the Map pane portion of the Map window and click the menu (right) menu mouse button. Choose **Cross Connection** from the pop-up menu.

Result:

The **Cross-Connection** window is displayed.

2 Double-click on the TID of the NE in the **Network Element Explorer** portion of the window (or click the plus sign next to the NE TID) to expand and show the shelf, slot, circuit pack, and port that contains the cross-connection to be deleted. If the equipment hierarchy is not expanded to show all components down to port level, double-click on the shelf, slot, and circuit pack in successive order until the explorer tree expands to show the desired port.

3 Position the mouse cursor on the port in the explorer tree and click the left mouse button to select it.

Result:

The port is highlighted in the explorer.

4 Click the right mouse button to display a drop-down list and select the position to place the associated tributaries in the Main View of the **Cross-Connection** window. The other way to do this is to click and hold the left mouse button and drag the port into the left, right, or bottom position to display the associated tributaries in the Main View.

Result:

The window shows any existing cross-connections for the port. (If the cross-connection is not displayed, click the Show/Hide toolbar button to show the cross-connection. If there are multiple cross-connections, position the mouse cursor over one of the cross-connections and click the right mouse button to display a listing of the existing cross-connections. Then select the desired cross-connection.)

5 On the **Cross-Connection** window, position the mouse cursor on the line that represents the cross-connection and click the right mouse button.

Result:

The line of the selected cross-connection becomes thicker and the color is black. If you want to delete a two-way cross-connection, each leg of the two-way cross-connection must be deleted, one at a time.

6 Click the **Delete** button on the **Cross-Connection** window toolbar.

Result:

If a two-way cross-connection has been selected for deletion, a **Multiple Leg Cross Connection Deletion** window is displayed. Choose the two-way cross-connection or either one-way cross-connection comprising the two-way cross-connection and click the **OK** button. If a one-way cross-connection or another type has been selected for deletion, this window is not displayed. The system displays a confirmation window.

7 Select **Yes** in the confirmation window to delete the cross-connection.

END OF STEPS

Delete an NE cross-connection - textual

When to use

Use this procedure to delete a selected cross-connection using the **Cross-Connections List** window, which lists the cross-connections textually rather than graphically.

Denied deletion request

The following three scenarios will cause a cross-connection deletion request to be denied:

- a request to remove a cross-connection from a tributary used in a loop-back cross-connection

Related information

For related information, see Chapter 11, “Traffic provisioning concepts”, “Cross-connections” (11-3).

Instructions

Complete the following steps to delete an NE cross-connection.

1 Select **Configuration** → **Connection Management** → **Cross-Connection...** from the main menu bar on the Map window.

Result:

This displays the **Choose an NE** window.

2 Choose the NE you want to work with by double clicking on it in the **Choose an NE** window and then clicking the **OK** button.

Result:

This displays the **Cross-Connection** window.

3 In the explorer area of the Cross-Connection window, select the system, a shelf, a circuit pack, or a port group where the cross-connection resides.

4 Select **View** → **List Cross-Connections** from the main menu of the **Cross-Connection** window.

Result:

This displays the **Cross-Connection List** window, which displays all cross-connections on the selected item.

5 Select the cross-connection to be deleted and click the **Delete** button.

Result:

The system displays a confirmation window.

6 If you are certain you want to delete the cross-connection indicated for deletion in the cross-connection window, click the **Yes** button.

Result:

The system deletes the indicated cross-connection. Upon successful deletion of a cross-connection, all reference to that cross-connection, in any window in the GUI, is removed.

END OF STEPS

Delete multiple cross-connection

When to use Use this procedure to delete multiple cross-connections using the **Cross-Connections List** window.

Denied deletion request The following three scenarios will cause a cross-connection deletion request to be denied:

- a request to remove a cross-connection from a tributary used in a loop-back cross-connection

Related information For related information, see Chapter 11, “Traffic provisioning concepts”, “Cross-connections” (11-3).

Instructions Complete the following steps to delete multiple cross-connections.

1. Select **Configuration** → **Connection Management** → **Cross-Connection...** from the main menu bar on the Map window.

   Result:

   This displays the **Choose an NE** window.

2. Choose the NE you want to work with by double clicking on it in the **Choose an NE** window and then clicking the **OK** button.

   Result:

   This displays the **Cross-Connection** window.

3. In the explorer area of the Cross-Connection window, select the system, a shelf, a circuit pack, or a port group where the cross-connections reside.

4. Select **View** → **List Cross-Connections** → **All...** from he main menu of the **Cross-Connection** window.

   Result:

   This displays the **Cross-Connection List** window, which displays all cross-connections on the selected item.

5 Use the shift key to select all the cross-connections to be deleted and click the **Delete** button.

Result:

The system displays a confirmation window.

6 If you are certain you want to delete the cross-connections indicated for deletion in the cross-connection window, click the **Yes** button.

Result:

The system deletes the indicated cross-connections. Upon successful deletion of the cross-connections, all reference to that cross-connections, in any window in the GUI, are removed.

END OF STEPS

Print the cross-connection list

When to use Use this procedure to print the list of cross-connections using the Cross-Connections List window.

Instructions Complete the following steps to print the cross-connections list.

1 Select **Configuration** → **Connection Management** → **Cross-Connection...** from the main menu bar on the Map window.

Result:

This displays the **Choose an NE** window.

2 Choose the NE you want to work with by double clicking on it in the **Choose an NE** window and then clicking the **OK** button.

Result:

This displays the **Cross-Connection** window.

3 In the explorer area of the Cross-Connection window, select the system, a shelf, a circuit pack, or a port group where the cross-connections reside.

4 Select **View** → **List Cross-Connections** → **All...** from he main menu of the **Cross-Connection** window.

Result:

This displays the **Cross-Connection List** window, which displays all cross-connections on the selected item.

5 Select **File** → **Print...** from the main menu bar on the **Cross-Connection List** window.

Result:

The cross-connection list is printed.

END OF STEPS

Modify NE cross-connections – graphical

When to use Use this procedure to modify cross-connections graphically via the Cross-Connections window.

Related information For related information, see Chapter 11, "Traffic provisioning concepts", "Cross-connections" (11-3).

Instructions Complete the following steps to modify cross-connections graphically via the Cross-Connections window.

1 Select **Configuration** → **Connection Management** → **Cross-Connection...** from the main menu bar on the Map window.

Result:

This displays the **Choose an NE** window.

2 Choose the NE you want to work with by double clicking on it in the **Choose an NE** window and then clicking the **OK** button.

Result:

This displays the **Cross-Connection** window.

3 Expand the elements in the **Network Element Explorer** until you see the end points of the cross-connection you want to modify and drag the port groups to the main view of the **Cross-Connection** window.

4 Click with the right mouse button on the existing cross-connection to be modified and select the desired connection from the popup menu.

Result:

The selected cross-connection line is highlighted. The source changes its color to green and the sink to magenta.

5 Click the **Modify** button on the toolbar or select **Configuration** → **Cross-Connections** → **Modify** from the menu bar.

Result:

This displays the **Additional Cross-Connection Information** window, with the current information for the selected cross-connection.

6 Type the required changes into the displayed window and click the **Done** button.

Result:

This displays the **Cross-Connection Confirmation** window.

Reference:

"1-Way cross-connection parameters" (11-14), "2-Way cross-connection parameters" (11-14), "1-Way PP cross-connection parameters" (11-15), "Multicast cross-connection parameters" (11-16).

7 Make sure you have entered the desired changes and then click the **Yes** button.

Result:

The system modifies the selected cross-connection per the entered changes.

END OF STEPS

Modify NE cross-connections - textual

When to use

Use this procedure to modify cross-connections textually via the **Cross-Connections List** window.

Related information

For related information, see Chapter 11, "Traffic provisioning concepts", "Cross-connections" (11-3).

Instructions

Complete the following steps to modify cross-connections.

1 Select **Configuration** → **Connection Management** → **Cross-Connection...** from the main menu bar on the Map window.

Result:

This displays the **Choose an NE** window.

2 Choose the NE you want to work with by double clicking on it in the **Choose an NE** window and then clicking the **OK** button.

Result:

This displays the **Cross-Connection** window.

3 In the explorer area of the **Cross-Connection** window, use your mouse to select the system, a shelf, a circuit pack, or a port group where the cross-connection to be modified resides.

4 Select **View** → **List Cross-Connections** from the main menu of the **Cross-Connection** window.

Result:

This displays the **Cross-Connection List** window.

5 Choose a cross-connection to modify and select **Modify**.

Result:

This displays the **Additional Cross-Connection Information** window, with the current information for the selected cross-connection.

6 Type the required changes into the displayed window and click the **Done** button.

Result:

This displays the **Cross-Connection Confirmation** window.

Reference:

“1-Way cross-connection parameters” (11-14), “2-Way cross-connection parameters” (11-14), “1-Way PP cross-connection parameters” (11-15), “Multicast cross-connection parameters” (11-16).

7 Make sure you have entered the desired changes and then click the **Yes** button.

Result:

The system modifies the selected cross-connection per the entered changes.

END OF STEPS

Add NE protection groups

When to use

Use this procedure to add a port protection group to an NE.

An SNCP cannot be created with this procedure.

Related information

For related information, see Chapter 11, "Traffic provisioning concepts", "Protection mechanisms" (11-37), "Line protection" (11-44), "Ring protection" (11-46), "Protection configurations" (11-68).

Instruction

> **Important!** Please notice that for a BLSR/MSPRing the same Ring ID should be assigned to all affected NEs. This will simplify the ring maintenance especially in multiple ring scenarios.

Complete the following steps to create protection groups on the **Protection Provisioning** window.

1 Select **Configuration** → **Protection Management** → **Protection Groups...** from the main menu bar on the Map window.

Result:

The **Choose an NE** window is displayed.

2 Double-click on the NE to select it and click the **OK** button.

Result:

The **Protection Provisioning Manager** window is displayed for the selected NE.

3 Single-click on the protection group type to select it and click the **Add** button.

Result:

The **Add Protection Group Wizard** window to select a transmission interface (rate) is displayed.

Reference:

"1+1 protection group parameters" (11-19), "2F BLSR/MS-SPRing protection group parameters" (11-20), "4F BLSR/MS - SPRing Protection Group Parameters" (11-22).

4 Select the rate by clicking on the appropriate radio button and click the **Next** button.

Result:

The **Add Protection Group Wizard** window to identify the protection group and select the member ports is displayed.

5 If this is 2-Fiber BLSR/MSPRing or 4-Fiber BLSR/MSSPRing protection group, a **Ring ID** (Protection Group Name) field is displayed. Enter the **Ring ID** (this field is optional).

Important! There are no blanks allowed in the Ring ID name. The NE does not accept a Ring ID name with a blank in it.

6 Click the down arrow next to the **Bay-Shelf** field to display a drop-down list of bays and shelves.

7 Select the bay/shelf for the port protection group.

Result:

The bay and shelf selected becomes part of the **Protection Group ID** displayed on the window and is later used to identify the protection group. T - 2 Fiber, O - 1+1 Optical

The **Protection Group (PG) ID** (identifier) is derived from the information you provide. The format for the PG AID is {BayAID}{ShelfAID}{Entity Type Qualifier}{Protection Group AID}, where the {Entity Type Qualifier} is:

- T – 2 Fiber
- F – 4 Fiber
- O – 1+1 Optical
- N – 1xN Optical

8 Enter the **Protection Group (PG) AID** number (00-99) in the field next to the **PG AID** label. This number is used to uniquely identify a protection group of the same type provisioned on the same shelf. This field is required.

9 In the portion of the window labelled **Current Value** and **New Value**, select the member ports for the protection group.

Depending on the protection group type chosen, the member ports may be labelled **East/West** (2-Fiber BLSR/MSSPRing), **Working/Protection** (1+1 Optical) or **East Working/East Protection**, **West Working/West Protection** (4-Fiber BLSR/MSSPRing).

The system enforces that the ports selected are on the same shelf and the same transmission rate you selected. Mixing of SONET and SDH rates is not allowed by the system.

At any point on this window, you can click the **Back** button to go back to the previous wizard window to change the rate for the protection group. However, if you do this, the current selections you have made on this wizard window to identify the protection group and select the member ports will be removed.

10 To select the working port, click the down arrow under the **New Value** column to display a list of available ports for the selected bay/shelf.

11 Click on a port in the displayed drop-down list.

12 To select the protection port, click the down arrow under the **New Value** column to display a list of available ports for the selected bay/shelf.

Result:

The system only displays a list of ports that are on the same bay/shelf as the first (reference) port chosen and the rate chosen on the previous wizard window. The system enforces that the working and protection ports are the same rate.

13 After selecting the member ports, click the **Next** button.

Result:

The **Add Protection Group Wizzard** window is displayed.

14 Use the down arrows next to the parameter fields to select the desired values and click the **Next** button

Result:

A window is displayed, informing you that the protection group is in the process of being created for the NE. When the process is finished, the text in the window informs you that the protection group has been successfully created in the NE.

15 To view or modify any additional attributes for the protection group, click the **Next** button. If you are finished at this point, click the **Finish** button and skip the next step.

16 If you clicked the **Next** button in the previous step, one or more of the following attributes may be displayed for modification on the **Enter Protection Group Attributes** window (in this case, for 1+1 port protection groups):

- **Protocol**: this field is used to set the direction in which a protection switch can be applied. The choices are: **1+1_BIDIR** (1+1 Bidirectional), **1+1_UNI** (1+1 Unidirectional), **1+1_OPTIM** (1+1 Optimize).
- **Revertive Mode Enable**: this drop-down field is used to select whether traffic will automatically revert back to the service entity after a problem has cleared. If the **Protocol** field value is set to **1+1_BIDIR**, the Revertive Mode Enable field can be set to Enabled. If the **Protocol** field value is set to **1+1_UNI** or **1+1_OPTIM**, the **Revertive Mode Enable** field is greyed out and its value cannot be modified.
- **Wait to Restore**: this field is used to select the amount of time (seconds) to wait before switching back to the working port when it becomes available again. Click the down arrow next to this field to display a list of choices. Click on the choice in the list to select it.

Please note that if the **Revertive Mode Enable** field has been set to Disabled, or the NE type/transmission interface only allows non-revertive protection switching, the value of the **Wait To Restore** field cannot be modified.

17 If you are finished changing the protection group attribute(s), click the **Next** button.

Result:

A window is displayed, asking if you really want to create this protection group.

18 Click **Yes**.

Result:

A status window is displayed, showing whether the protection group was successfully created. If it was not successfully created, this is indicated on the status window. If the protection group was not successfully created, it may be that the protection group already exists or another problem with the NE or selections made.

Click the **Refresh** button to clear the status window or click the **Close** button to close it.

After the protection group is created, you can click the **Next** button and modify the characteristics of the protection group. If you are finished, click the **Finish** button.

END OF STEPS

View NE protection groups

When to use

Use this procedure to select an NE's port protection group and view all member ports and current attribute settings.

Related information

For related information, see Chapter 11, "Traffic provisioning concepts", "Protection mechanisms" (11-37), "Line protection" (11-44), "Ring protection" (11-46), "Protection configurations" (11-68).

Instructions

Complete the following steps to display protection groups on the Protection Provisioning window.

1. Select **Configuration** → **Protection Management** → **Protection Groups...** from the main menu bar on the Map window.

   Result:

   The **Choose an NE** window is displayed.

2. Double-click on the NE to select it. Click the **OK** button.

   Result:

   The **Protection Provisioning Manager** for the selected NE is displayed.

3. In the explorer portion of the window, click on the plus (+) sign next to the protection group type under which is the protection group you want to view.

   Result:

   The explorer expands to show the existing protection groups under the type selected.

4. Select the protection group to be viewed by clicking on its protection group AID in the explorer tree. Click the **View** button.

   Result:

   The **View Protection Group** window for the selected protection group is displayed. This window shows the Protection Group Type, Ring ID (only for 2-fibre and 4-fibre protection groups), Protection Group (PG) AID, member ports and their value (assignment), and the current setting of some provisionable attributes.

5 Click the **Close** button to close the window. The **Protection Provisioning Manager** window remains on the screen. Click the **Close** button to close this window.

END OF STEPS

Modify NE protection groups

When to use

Use this procedure to modify NE protection groups. *Navis*™ Optical EMS allows you to change any attributes associated with the protection group.

Related information

For related information, see Chapter 11, “Traffic provisioning concepts”, “Protection mechanisms” (11-37), “Line protection” (11-44), “Ring protection” (11-46), “Protection configurations” (11-68).

Instructions

Perform the following steps to modify a protection group.

1 Select **Configuration** → **Protection Management** → **Protection Groups...** from the main menu bar on the Map window.

Result:

The **Choose an NE** window is displayed.

2 Double-click on the NE to select it. Click the **OK** button.

Result:

The **Protection Provisioning Manager** for the selected NE is displayed.

3 In the explorer portion of the window, click on the plus (+) sign next to the protection group type under which is the protection group you want to view.

Result:

The explorer expands to show the existing protection groups under the type selected.

4 Select the protection group to be modified by clicking on its protection group AID in the explorer tree. Click the **Modify** button.

Result:

The **Modify Protection Group Wizard** window for the selected NE and protection group is displayed. The top of this window shows the Protection Group Type, Rate, Ring Id (in case of a

2-fibre or 4-fibre protection group), Protection Group (PG) AID, and shelf of the protection group (all of which cannot be modified).

5 Change the parameters if desired.

Important! If Revertive Mode has been disabled for this protection group through the *Navis* Optical EMS GUI, or is not supported by the NE type/transmission rate, the value of the Wait To Restore parameter cannot be modified.

6 Click the **Next** button.

Result:

A confirmation window pops up where you have to confirm your changes.

7 Press **Yes** to confirm the changes.

Result:

The protection group parameters are changed.

END OF STEPS

Delete NE protection groups

When to use

Use this procedure to delete an existing port protection groups from an NE. Deleting a protection group removes all member ports from the group.

Related information

For related information, see Chapter 11, “Traffic provisioning concepts”, “Protection mechanisms” (11-37), “Line protection” (11-44), “Ring protection” (11-46), “Protection configurations” (11-68).

Before you begin

Be aware that removing protection groups with existing cross-connections or reservations is not permitted.

Instructions

Complete the following steps to delete protection groups on the **Protection Provisioning** window.

1 Select **Configuration** → **Protection Management** → **Protection Groups...** from the main menu bar on the Map window.

Result:

The **Choose an NE** window is displayed.

2 Double-click on the NE to select it. Click the **OK** button.

Result:

The **Protection Provisioning Manager** for the selected NE is displayed.

3 In the explorer portion of the window, click on the plus (+) sign next to the protection group type under which is the protection group you want to view.

Result:

The explorer expands to show the existing protection groups under the type selected.

4 Select the protection group ID of the port protection group to be deleted by single-clicking on it. Click the **Delete** button.

Result:

A pop-up window is displayed, asking if you really want to remove the port protection group.

5 Choose **Yes** to remove the protection group.

Result:

A status window is displayed, showing the progress of the deletion. If the deletion is successfully completed, the status is shown as “Completed” on the status window.

END OF STEPS

Manually initiate DNO

When to use

Use this procedure to manually initiate Dynamic Network Operations (DNO) for one or more NEs or an aggregate. You can specify that all information be included in the DNO update, or just port, cross-connection, port protection group, subnetwork, NE parameters, or equipment information.

Related information

For related information, see Chapter 11, “Traffic provisioning concepts”, “Dynamic network operations” (11-28).

Instructions

Complete the following steps to manually initiate DNO.

1

If you are performing DNO...	then select...
on a single NE, group of NEs, or aggregate	one or more NEs or an aggregate.
on a single shelf	the shelf on the **Network Element Explorer**

2 Access the DNO function (as appropriate) through:

- **Configuration** → **DNO...** on the main menu bar of the Map window. The **Choose an NE/Aggregate**window is displayed. Double-click on the NE(s)/aggregate(s) for which you want to perform DNO. Click the **OK** button.
- The NE’s or aggregate’s pop-up menu – position the mouse cursor over the NE/aggregate icon on the Map pane or Subnetwork Explorer, and click the menu (right) mouse button. A pop-up menu is displayed. Select **DNO** from the pop-up menu.
- The **Equipment View** window (for the chosen NE/ aggregate) – Select **Configuration**from the main menu. A sub-menu is displayed. Select **DNO** from the sub-menu.
- The **Cross-Connection** window (for the chosen NE/ aggregate) – select **Configuration**from the main menu. A sub-menu is displayed. Select **DNO** from the sub-menu.

Result:

The **Manual DNO** window is displayed. If the DNO channel is down, a message is displayed in the status bar of the window, indicating that you cannot perform a DNO at this time. Click the **Close** button to close the window.

3

If you are initiating DNO for...	then click on the radio button labeled...
all configuration data	**All Information**. If you choose **All Information** for a shelf, *Navis*™ Optical EMS performs DNO for ports, port protection groups, cross-connections, and equipment.
a selected data type	**Only the following...** and choose one of the following data types: • **Port Parameters** • **Cross Connections/ Reservations** • **Port Protection Group** • **NE Parameters** • **Equipment** • **Subnetwork**

4 Click the **Apply** button to initiate DNO and select the next data type for update, or click the **OK** button to initiate DNO and close the window.

Result:

The DNO process is started.

To obtain DNO status for an NE before or after initiating DNO, click on the **GetStatus** button.

When the DNO is completed, a message is displayed on the window's status bar, indicating whether the DNO is successful or if there are any errors.

For certain NE types, such as the BWM and OLS 400G, DNO command requests for some data may result in DENY messages but the DNO process will continue, resulting in a "COMPLETED" status even though all data has not been updated in the database. In this case, your system administrator may have to check the ERRORLOG file in the $oamlog directory to check the NE responses to the DNO process.

If DNO cannot be performed for the selected NE(s), the system issues a message.

If you choose to perform DNO on all NEs in your Target Group, or for an NCC with the DSA function enabled, a pop-up window is displayed, informing you that the DNO process may take a long time and affect system performance. You can choose to perform DNO or stop the process. Choose **Yes** to perform DNO anyway or **No** to stop the DNO process.

END OF STEPS

Schedule DNO

When to use

Use this procedure to schedule a Dynamic Network Operations (DNO) database update for an NE.

Before you begin

Before you begin this task, be aware that DNO cannot be scheduled for a bay or shelf in a WaveStar® BWM NE. Unless you are scheduling a DNO for all NE data, you can only specify a database update for one data type. The first time that a DNO is scheduled for an NE, the system does database synchronization for all data types, even if you select only one type for database synchronization.

Related information

For related information, see "Scheduling tasks" (13-18).

Instructions

Complete the following steps to schedule DNO for an NE.

1 Select **Administration** → **Schedule** → **DNO...** from the main menu bar on the Map window.

Result:

The **Schedule Manager for DNO** window is displayed, showing a list of currently scheduled DNOs.

2 Click the **Add** button.

Result:

The **Add a Scheduled DNO** window is displayed.

3 Choose an NE (by TID) from the **Choose an NE** scroll bar list by double-clicking on the item. Use the type ahead field and/or filter/sort functions to narrow the list, if necessary.

4

To schedule a DNO for ...	Then click...
all data types	the **All Information** radio button under the **DNO Type** portion of the window.

To schedule a DNO for ...	**Then click...**
a specific data type	Click the **Only the following (checkmark below):** button and then click one of the following radio buttons: • **Port Parameters** • **NE Parameters** • **Subnetwork** • **Cross Connections** • **Equipment** • **Protection Groups** One or more data type buttons may be disabled for a specific NE type. When you perform DNO the first time on an NE, the system does database synchronization on all data types, even if you choose only one data type.

5 Choose the following scheduling options, as needed:

- **Weekly on...**: click on this radio button if you want to task to be done on a weekly basis. If you schedule the task to be done weekly, choose the day of the week by using the spinner field list next to this option.
- **Once every...**: click on this radio button if you want the task to be done periodically. If you schedule the task to be done periodically, choose the frequency (every x month(s)) and the day of the month it will be done using the spinner field lists next to this option or click the **Last Day of the Month** checkbox.
- **Schedule Time**: click the up and down arrows on this spinner field to select the time of day for the scheduled task. The schedule time is in 24-hour format, in hours:minutes. You can also type the time into this field. The time must be input in 24-hour format as hh:mm in 15 minute increments (for example, 11:15 P.M. is entered as 23:15). If the time entry is invalid, the color of the field changes to yellow, and you must re-enter a valid time in the proper format.

- **Number of Retries**: click the up and down arrows on this spinner field to specify the number of retries for the scheduled task.
- **Retry Interval (in minutes)**: If the **Number of Retries** selected is greater than 1, specify the retry interval, in minutes. Click the up and down arrows on the spinner field to select the time interval.

6 Click the **Apply** button to activate your choices, or click the **OK** button to activate your choices and close the window.

END OF STEPS

6 Traffic maintenance

Overview

Purpose This chapter contains procedures for traffic maintenance.

Contents

Add a loopback cross-connection

When to use

Use this procedure to add a loopback cross-connection to an NE's port tributary. A loopback cross-connection is created from an input tributary to the output of the same tributary for testing purposes.

Related information

For related information, see Chapter 11, "Traffic provisioning concepts", "Cross connection loopbacks" (12-10)

Before you begin

Before you begin this task, you need to identify the port tributary in the NE for which the loopback cross-connection will be created for testing purposes. Information about the port tributary, including the rate and AID, can be found by displaying the **Cross-Connection** window for the NE, and expanding the equipment hierarchy in the **Network Element Explorer** portion of the Cross-Connection until the desired port tributary is shown in the **Network Element Explorer**.

Be aware that *Navis*™ Optical EMS denies requests to add a cross-connection to a tributary that is currently in loopback. To see if a particular tributary is currently in loopback, open the **Cross-Connection** window for the NE, click the NE's TID in the **Network Element Explorer** portion of the **Cross-Connection** window, and then click the **List Cross Connections** button on the **Cross-Connection** window toolbar. The **Cross-Connections List** window is displayed. A port tributary is displayed with a cross-connect type of "LPBK" on the **Cross-Connections List** window if it is in loopback.

When a loopback is removed from a tributary, any pre-existing cross-connections on the tributary are automatically re-established in the NE.

Instructions

Complete the following steps to add a loopback cross-connection to a port tributary in an NE for testing purposes.

1 Display the **Cross-Connection** window for the selected NE and obtain the AID of the port tributary to be put in loopback by expanding the **Network Element Explorer** on the **Cross-Connection** window and "drilling down" the equipment hierarchy until the port tributary is found.

The **Cross-Connection** window can remain open while you access the Manage Loopbacks window to actually add the loopback to the port tributary.

Result:

The required port tributary is displayed.

---

2 If the **Cross-Connection** window is open, the NE is already chosen. Otherwise, click on the NE icon in the Map pane portion of the Map window to select it or select no NE at this point.

---

3 Go to the Map window and choose **TestManagement** → **Loopbacks...** on the Map window menu bar. If the NE for setting up the loopback was not already chosen in step 1 or step 2, the **Choose an NE** window is displayed. To choose the NE from this window, double-click on the NE in the list and click the **OK** button.

Result:

The **Manage Loopback** window is displayed

---

4 Click the **Create** button.

Result:

A **Create Loopback** panel is displayed in the right portion of the **Manage Loopback** window.

---

5 Fill in the following fields:

- **AID –** using the Subnetwork Explorer right-click on the AID that you want. The AID is then entered in the AID field automatically.
- **Loopback Type –** click the down arrow next to this field to display a list of choices. The choices are: **Cross-Connect Loopback**, **Far-side Facility Loopback**, **Near-side Facility Loopback**.

- **Rate** – click the down arrow next to this field to display a drop-down list of choices and select the rate of the port tributary to be placed in loopback.
- **Action** – click the down arrow next to this field to display a list of choices. The choices are: **Operate Loopback** or **Forced Loopback**.

  Reference:

  "Loopback parameters" (12-13).

---

6 Click the **Create** button to activate your choices, or click the **OK** button to activate your choices and close the window.

Result:

A pop-up dialog window is displayed, informing you that the loopback being created may affect service and asking if you want to proceed.

---

7 Choose **Yes**.

Result:

The newly created loopback cross-connection for the selected port tributary is displayed on the **Manage Loopback** window.

If part of the AID is obscured in the display portion of the window, position the mouse cursor on the pane edge between the **Network Element Explorer** and the display portion of the window, which displays a double-arrow cursor. Click and hold the left mouse button and drag the cursor to the left or right until the complete display of the loopback details is visible. You can also use the left/right scrollbar buttons at the bottom of the display portion to maneuver the display to the left or right.

---

8 Repeat steps 5 to 7 to create more loopback cross-connections on additional port tributaries, or click the **Close** button to close the window.

END OF STEPS

View loopback cross-connections

When to use Use this procedure to view loopback cross-connections in an NE.

Related information For related information, see Chapter 11, "Traffic provisioning concepts", "Cross-connections" (11-3).

Before you begin Before you begin this task, determine the existing cross-connection for which you want to view a loopback cross-connection.

Instructions Complete the following steps to view loopback cross-connections.

1 Select an NE in the Map pane portion of the Map window or select no NE at this point.

2 Go to the Map window and choose **TestManagement** → **Loopbacks...** on the Map window menu bar. If the NE for setting up the loopback was not already chosen in step 1, the **Choose an NE** window is displayed. To choose the NE from this window, double-click on the NE in the list and click the **OK** button.

Result:

The **Manage Loopback** window is displayed

3 Click the plus (+) sign next to each level of the equipment hierarchy shown in the **Network Element Explorer** portion of the window until the display expands down the shelf level.

4 Select the desired shelf in the explorer.

Result:

The **List** button, located at the bottom of the **Network Element Explorer** portion of the window, is enabled.

5 Click the **List** button.

Result:

The loopback cross-connections created for the selected piece of equipment are displayed.

Use the left/right scroll buttons located at the bottom of the ***loopback cross-connections*** display to move the display left or right to view all data.

Reference:

"Loopback parameters" (12-13).

END OF STEPS

Delete a loopback cross-connection

When to use

Use this procedure to delete a loopback cross-connection. After a cross-connect loopback is deleted on a port tributary, any other cross-connections defined for that tributary are automatically re-established in the NE.

Related information

For related information, see Chapter 11, "Traffic provisioning concepts", "Cross-connections" (11-3).

Before you begin

Before you begin this task, you need to identify the port tributary in the NE from which the loopback cross-connection will be deleted. Information about the port tributary, including the rate and AID, can be found by displaying the **Cross-Connection** window for the NE, and expanding the equipment hierarchy in the **Network Element Explorer** portion of the Cross-Connection until the desired port tributary is shown in the **Network Element Explorer**.

To see if a particular tributary is currently in loopback, open the **Cross-Connection** window for the NE, click the NE's TID in the **Network Element Explorer** portion of the **Cross-Connection** window, and then click the **List Cross Connections** button on the **Cross-Connection** window toolbar. The **Cross-Connections List** window is displayed. A port tributary is displayed with a cross-connect type of "LPBK" on the **Cross-Connections List** window if it is in loopback.

Instructions

Complete the following steps to delete a loopback cross-connection.

1 Select an NE in the Map pane portion of the Map window or Select no NE at this point.

2 Go to the Map window and choose **TestManagement** → **Loopbacks...** on the Map window menu bar. If the NE for setting up the loopback was not already chosen in step 1 or step 2, the **Choose an NE** window is displayed. To choose the NE from this window, double-click on the NE in the list and click the **OK** button.

Result:

The **Manage Loopbacks** window is displayed

---

3 Click the plus (+) sign next to each level of the equipment hierarchy shown in the **Network Element Explorer** portion of the window until the display expands down the shelf level.

---

4 Select the desired shelf in the explorer.

Result:

The **List** button, located at the bottom of the **Network Element Explorer** portion of the window, is enabled.

---

5 Click the **List** button.

Result:

The loopback cross-connections created for the selected piece of equipment are displayed.

Use the left/right scroll buttons located at the bottom of the loopback cross-connections display to move the display left or right to view all data.

---

6 Double-click on the loopback cross-connection in the display portion of the window to select it for deletion.

Result:

The **Delete** button is enabled.

---

7 Click the **Delete** button.

Result:

A pop-up question dialog window is displayed, informing you that deletion of the selected loopback cross-connect may affect service and asking if you want to continue with the deletion.

---

8 Choose **Yes** to delete the loopback cross-connection.

Result:

The deleted loopback cross-connection is removed from the display.

9 Click the **Close** button to close the window.

END OF STEPS

Operate protection switch (from the Manage Protection Groups window)

When to use Use this procedure to provision a protection switch, for a specified protection group, from the **Manage Protection Groups** window.

Related information For related information, see Chapter 11, "Traffic provisioning concepts", "Protection switch management" (11-26), "Equipment protection switch (timing pack equ.) parameters" (12-8), "MS - SPRing switch parameters" (11-49), "Switch Fabric Pack Equipment Parameters" (12-8), "1+1 protection group parameters" (11-19).

Before you begin Before you begin this task, identify the type of protection group and type of protection switch you want to provision. To perform this task, access the Map window.

Instructions Complete the following steps to create protection groups on the **Protection Provisioning** window.

1 Select **Configuration** → **Protection Management** → **Protection Groups...** from the main menu bar on the Map window.

Result:

The **Choose an NE** window is displayed.

2 Double-click on the NE to select it and click the **OK** button.

Result:

The **Manage Protection Groups** window is displayed for the selected NE. This window consists of an explorer that shows the available protection group types and port protection groups created for each type.

To display existing protection groups for a protection group type, click the plus (+) sign next to the protection group type. The explorer expands the list to show existing protection groups for a type, if any. If there are no existing protection groups for a given type, the explorer tree shows "No protection Groups". To collapse the listing, click the minus (-) sign next to the protection group type.

The window also has a series of buttons:

- **Add**: click this button to add a new protection group.
- **Modify**: click this button to modify an existing protection group.
- **Delete**: click this button to delete an existing protection group.
- **View**: click this button to view the member ports and attributes of an existing protection group.
- **Operate Switch**: click this button to bring up the Operate Protection Switch window to provision a protection switch for the selected protection group.
- **Close**: click this button to close the Protection Provisioning Manager window.
- **Help**: click this button to display online help for this window.

3 Click the plus (+) sign next to the protection group type to expand and see the protection groups set up for the selected protection group type.

4 Select the protection group to be provisioned for a protection switch by single-clicking on it in the explorer portion of the window, under the selected protection group type.

Result:

The buttons for actions that can be performed for the selected protection group are enabled. For example, if you cannot add or change the member entities of the selected protection group type or delete the protection group itself, the **Add**, **Modify**, or **Delete** buttons remain disabled.

5 Click the **Operate Switch...** button.

Result:

The **Operate Protection Switch** window for the selected protection group is displayed. The fields shown on the **Operate Protection Switch** window will vary, based on the protection group type selected.

The fields common to all protection group types are:

- **Protection Group Type** – this is a display-only field that shows the selected Protection Group Type.
- **PG AID** – this is a display-only field that shows the Protection Group AID of the selected protection group.
- **Switch Status** – this is a display-only field that shows the last message prompting a protection switch. If there is no current message, this field indicates that there has been No Request (“NR”).
- **Switch Command** – this field allows you to select the command for provisioning the type of protection switch to be performed. Click the down arrow next to the field to display a drop-down list of commands.
  The list of commands displayed depends on the selected protection group type. Possible choices from the command list are: **CLEAR**, **LOCKOUT**, **FRCED** (forced), **MAN** (manual).
  The list of available commands is also based on the current switch status and the priority of the switch request. For example, if the current switch status for the protection group is “Forced Switch”, then the system does not allow a manual switch.
  Switch priorities for WaveStar TDM NEs, in descending order, are: CLEAR, LOCKOUT, FRCD, MAN

6 Select the switch command from the drop-down list of commands.

7 Select the destination of the entity that should be active after operation of the protection switch.

For the protection group type shown in the example in the previous steps of this procedure (Switch Fabric Pack Equipment), the entity selected is a circuit pack, with a circuit pack ID. The **Active Unit** field in this example indicates the ID of the circuit pack currently active.

For the example shown (Switch Fabric Pack Equipment), click the down arrow next to the **Destination Entity** field to display a drop-down list of choices. In this case, the list contains the list of slots. Choose the slot to become active after the switch is operated if both circuit packs are being switched to protection.

To choose an individual circuit pack in the slot to be switched, click the down arrow next to the **Destination Entity** field to display a drop-down list of choices and choose the AID of the circuit pack being switched to protection.

This field should be chosen instead of the **Destination Entity** field if you are switching an individual circuit pack on the shelf to protection.

If the entities to be switched are ports, the version of the **Operate Protection Switch** window displayed is different:

Identifying fields for this protection group type (display-only) are:

- **Protection Group Type**
- **Protection Group Ring ID** (RID)
- **Protection Group AID**

The fields displayed to select the destination entity (port) for this type of protection group are:

- **Destination Entity**: click the down arrow next to this field to display a drop-down list and select the entity that is being switched to protection, if both working or protection ports are being switched to protection. The choices are WKG (Working) or PROTN (Protection).
- **Destination Side**: click the down arrow next to this field to display a drop-down list and select the port side that is being switched to protection. The choices are east, west, or both.
- **Destination Entity AID**: click the down arrow next to this field to display a drop-down list and select the individual port AID of a working or protection group to be switched to protection.
- **Switch Type**: click the down arrow next to this field to display a drop-down list and select the NE configuration involved in the protection switch. The choices are span or ring.

8 To review the details of the protection group affected by the switch, click the **Details** button.

Result:

A second window is displayed, showing the Protection Group Type, Protection Group Ring ID (if applicable), and Protection

Group AID. To close this details window, click the **Close** button.

9 After your choices are made, click the **Apply** button to initiate the switch request and leave the **Operate Protection Switch** window open, or click the **OK** button to initiate the switch request and close the window.

Result:

A status window is displayed, showing the results of the request. If it is completed successfully, the status is shown as “Completed”. If the request fails for some reason, the status of the request is shown as “Failed”.

END OF STEPS

Operate protection switch (from the Protection Status Management window)

When to use

Use this procedure to provision a protection switch for a selected protection group type and protection switch message related to that protection group type, from the **Protection Status Management** window.

Related information

For related information, see Chapter 11, "Traffic provisioning concepts", "Protection switch management" (11-26), "Equipment protection switch (timing pack equ.) parameters" (12-8), "MS - SPRing switch parameters" (11-49), "Switch Fabric Pack Equipment Parameters" (12-8), "1+1 protection group parameters" (11-19).

Instructions

Complete the following steps to provision a protection switch for a given protection group type and protection switch message.

1. Choose **Configuration** → **Protection Management** → **Protection Switching...** from the main menu bar of the Map window.

   Result:

   The **Choose an NE/Aggregate** window is displayed.

2. Click the **Network Elements** radio button to obtain a list of NEs. Click the **Aggregates** radio button to obtain a list of aggregates. For the purposes of this function, click the **Network Elements** radio button to obtain a list of NEs.

   Once the list criteria is selected (NEs or Aggregates), you can use the Filtering/Sorting option to filter and limit the list to only the named items that you want (for details on how to use the Filter/Sort option, see "Sorting tables" (14-57)).

3. Double-click on the NE in the list to select it and click the **OK** button.

   Result:

   The **Select Type/Rate** window is displayed showing the available protection types to select.

4 From the available valid protection types, choose the protection type(s) to be displayed in the **Protection Switching Status** window by positioning the mouse cursor in the box and clicking the select (left) mouse button to select the box.

Result:

A checkbox is placed in the box and the **Apply** button is enabled.

5 Click the **Apply** button.

Result:

The **Protection Switching Status** window is displayed, showing protection switch status messages (if any), for the selected protection group type(s).

Use the left/right scroll bar buttons located at the bottom of the display area of this window to scroll left or right, to see the complete status message.

6 Once you have located the protection group type and message for which you want to provision a protection switch, click on the message in the display portion of the window to select it.

7 Click the **Operate Switch...** button.

Result:

The **Operate Protection Switch** window for the selected protection group type and message is displayed. The fields shown on the **Operate Protection Switch** window will vary, based on the Protection Group Type selected.

Identifying fields for this Protection Group Type (display-only) shown on the window are:

- **Protection Group Type**
- **Protection Group Ring ID** (RID)
- **Protection Group AID**

The fields common to all Protection Group Types are:

- **Protection Group Type** – this is a display-only field that shows the selected Protection Group Type.
- **PG AID** – this is a display-only field that shows the Protection Group AID of the selected protection group.
- **Switch Request** – this is a display-only field that shows the last message prompting a protection switch. If there is no current message, this field indicates that there has been No Request ("NR").
- **Switch Command** – this field allows you to select the command for provisioning the type of protection switch to be performed. Click the down arrow next to the field to display a drop-down list of commands.
  The list of commands displayed depends on the selected Protection Group Type. Possible choices from the command list are: : **CLEAR**, **LOCKOUT**, **FRCED** (forced), **MAN** (manual), **CLEARFRCD** (clear forced).
  The list of available commands is also based on the current switch status and the priority of the switch request. For example, if the current switch status for the protection group is "Forced Switch", then the system does not allow a manual switch.
  Switch priorities for TDM NEs, in descending order, are: CLEAR, LOCKOUT, FRCD, MAN.

---

8 Select the switch command from the drop-down list of commands.

---

9 Select the destination of the entity that should be active after operation of the protection switch.

The fields displayed to select the destination entity (port) for this type of protection group are:

- **Destination Entity** – click the down arrow next to this field to display a drop-down list and select the entity that is being switched to protection, if both working or protection ports are being switched to protection. The choices are WKG (Working) or PROTN (Protection).
- **Destination Side** – click the down arrow next to this field to display a drop-down list and select the port side that is being switched to protection. The choices are east, west, or both.
- **Destination Entity AID** – click the down arrow next to this field to display a drop-down list and select the individual port AID of a working or protection group to be switched to protection.
- **Switch Type** – click the down arrow next to this field to display a drop-down list and select the NE configuration involved in the protection switch. The choices are span or ring.

---

10 To review the details of the protection group affected by the switch, click the **Details** button.

Result:

A second window is displayed, showing the Protection Group Type, Protection Group Ring ID (if applicable), and Protection Group AID. To close this details window, click the **Close** button.

---

11 After your choices are made, click the **Apply** button to initiate the switch request and leave the **Operate Switch** window open, or click the **OK** button to initiate the switch request and close the window.

Result:

A status window is displayed, showing the results of the request. If it is completed successfully, the status is shown as “Completed”. If the request fails for some reason, the status of the request is shown as “Failed”.

END OF STEPS

Display protection switching status

When to use

Use this procedure to display protection switching status.

Related information

For related information, see Chapter 11, “Traffic provisioning concepts”, “Protection switch management” (11-26).

Instructions

Complete the following steps to display protection switching status.

1 From the main menu bar of the Map window, select **Configuration** → **Protection Management** → **Protection Switch...**.

Result:

This displays the **Choose an NE/Aggregate** window.

2 Choose either NEs or Aggregates.

A Filtering/Sorting option is also available to the user by clicking on the **Filter/Sort** button. After setting the parameters for this option, click the **Apply** button to enter your data and then click the **OK** button to return to the **Choose an NE/Aggregate** window.

3 Double click on the desired selection from the list and click the **OK** button.

Result:

The **Select Type/Rate** window is displayed showing the available protection types to select.

4 From the available valid protection types, choose the protection type(s) to be displayed in the **Protection Switching Status** window and click the **Apply** button.

Result:

The **Protection Switching Status** window is displayed with the correct information as indicated by the user.

5 When you have finished viewing the data, click on the **Close** button.

END OF STEPS

Enable/disable the PM feature

When to use

Use this procedure to globally enable or disable the Performance Monitoring (PM) data collection feature for all supported NEs. When the PM data collection feature is turned on, *Navis*™ Optical EMS periodically collects PM data from each NE that has PM data collection activated. When the PM feature is globally disabled, PM data is not collected from any NE.

Related information

For related information, see Chapter 11, "Traffic provisioning concepts", "NE PM management parameters" (12-6).

Before you begin

Before you begin this task, access the Map window.

Instructions

Complete the following steps to globally enable or disable the PM feature.

1 Select **Performance** → **Global PM Management...** from the main menu bar on the Map window.

Result:

The **Global PM Data Administration** window is displayed.

2

If you want to...	click on the Collect PM Data box...
enable the PM feature	to place a check there and select the retention period for 15-minute and 1-day PM data reports. To select the retention period, move the slider bar for each report type. You can set the retention period from 1 to 30 days for each report type. The number displayed to the right of each slider bar shows the setting selected. Click the **Retrieve** button to display the current system default retention periods.
disable the PM feature	to remove the check or leave the box blank.

3 Click the **Apply** button to activate your choices.

END OF STEPS

Enable/disable PM data collection

When to use

Use this procedure to enable or disable PM data collection for the specified NE and, if PM data collection is enabled, select the PM reporting interval.

Related information

For related information, see Chapter 12, "Traffic maintenance concepts".

Before you begin

Before you begin this task, be aware that NE PM data collection will not be performed until the PM feature is globally enabled. Be aware that PM data collection is suspended during an alarm storm. *Navis*™ Optical EMS resumes PM data collection after the alarm storm has subsided.

Instructions

Complete the following steps to enable collection of the selected PM data types or disable PM data collection for the entire NE.

1 Select **Performance** → **NE PM Management** → **Manage Both...** from the main menu bar on the Map window.

Result:

The **Choose an NE** window is displayed.

2 Double-click on the NE in the list to select it and click the **OK** button or

Select an NE on the Map or Subnetwork Explorer, right-click on the NE to bring up a pop-up menu, select **Performance Management** → **Manage Both...**.

Result:

The **NE PM Data Administration** window shows the **EMS PM Data Settings** panel.

Reference:

"Global PM management parameters" (12-6).

3

If you want to...	**then...**
collect PM data for the selected PM data type in 15-minute intervals	check the **Enable 15 Minute PM data collection** for this NE box.
collect PM data for the selected PM data type in 1-day intervals	check the **Enable 1-Day PM data collection** for this NE box.
collect both 15- minute and daily PM data for the PM data type	check both boxes.
collect no PM data (disable PM data collection for the NE)	click both boxes to remove the checks, or leave both boxes blank.
collect PM data from all data types	click the **All Facility Types in This NE** radio button.
collect PM data from one or more types	click the **Only these facility types** radio button and then check the data types for PM data.
enable/ disable PM data collection for the NE	click the **Apply** button to activate your choices.

END OF STEPS

Administer PM data

When to use

Use this procedure to display analog and/or digital PM data parameters for the selected NE interface.

Related information

For related information, see Chapter 12, "Traffic maintenance concepts".

Before you begin

Be aware that the PM feature must be globally enabled and the selected NE must have PM data collection activated for one or more PM data types.

PM threshold values must be set by issuing TL1 commands via the Cut-Through window.

Instructions

Complete the following steps to display PM parameters for the selected NE interface.

1 Select **Performance** → **NE PM Management** → **Manage Both...** from the main menu bar on the Map window.

Result:

The **Choose an NE** window is displayed.

2 Double-click on the NE in the list to select it and click the **OK** button or

Select an NE on the Map or Subnetwork Explorer, right-click on the NE to bring up a pop-up menu, select **Performance Management**→ **Manage Both...**.

Result:

The **NE PM Data Administration** window shows the **EMS PM Data Settings** panel.

Reference:

"NE PM management parameters" (12-6).

3 Click the **Apply** button to activate your choices.

Result:

A pop-up question dialog window is displayed, informing you that changing the PM parameter values may affect service, and asks if you want to modify the values. Choose ***Yes*** to initiate the PM data parameter changes.

END OF STEPS

View PM data

When to use

Use this procedure to view the PM data collected by *Navis*™ Optical EMS. You can choose to view either current data from the NE(s) or historical data stored in the *Navis* Optical EMS database, as well as for what facility type, and whether to show 15-minute or 1-day PM data. The data selected for viewing is shown in table format, sorted and filtered according to your choices.

Related information

For related information, see Chapter 12, "Traffic maintenance concepts", "NE PM management parameters" (12-6).

Before you begin

Before you begin this task, the PM feature must be globally enabled and the selected NE must have PM data collection activated for one or more PM data types.

Instructions

Complete the following steps to view PM data for a specified NE.

1. Select **Performance** → **View PM Data** → **View Both...** from the menu bar on the Map window.

   Result:

   The **Choose an NE** window is displayed.

2. Select an NE and click the **OK** button or

   Select an NE on the Map or Subnetwork Explorer, right-click on the NE to bring up a pop-up menu, select **Performance Management** → **View Both...**.

   Result:

   The **Selecting PM Data** window is displayed.

3. Choose to show either current data or historical data by clicking on the appropriate radio button. If you chose historical data, choose the date and time of the data by using the date and time (if you choose 15-minute data, in hours) spinner fields.

If you configured the data retention period on the **Global PM Data Administration** window for less than 30 days, you can only view the data files that fall within the selected data retention period.

4 Choose one of the NE facility types for viewing by clicking on the appropriate radio button.

5 Choose to show 15-minute or 1-day PM data by clicking on the appropriate radio button.

6 Click the **OK** button.

Result:

The **PM Data** window is displayed, showing the selected PM data in table format. To save the contents of the table to a file on the local system, click the **Save** button.

END OF STEPS

7 Software upgrade

Overview

Purpose

This chapter provides information for carrying out tasks regarding the NE software.

Contents

Transfer NE software

When to use Use this procedure to transfer an NE software release from a Digital Access Tape (DAT) or CD-ROM onto the *Navis*™ Optical EMS host for eventual downloading to an NE.

Related information For related information, see Chapter 13, "Software upgrade concepts", "Software transfer via removable media" (13-9).

Before you begin Before you begin this task, the DAT must be physically mounted (if the file source is tape) or the CD-ROM must be physically loaded and the file system mounted on the *Navis* Optical EMS host (if the file source is CD-ROM). If you are transferring the NE software from CD-ROM, a special setup procedure must be performed for the *Navis* Optical EMS host prior to doing the transfer; this procedure is explained as part of the task. To perform this task, access the Map window.

Instructions Complete the following steps to transfer NE software to *Navis* Optical EMS.

1 If you are transferring NE software form CD-ROM, then a special setup procedure must be performed by the *Navis* Optical EMS administrator once prior to the NE software transfer. If you are transferring NE software form DAT, continue with the next step.

2 Before transferring a software release, you may want to see what software releases are already stored in *Navis* Optical EMS for the NE type, using the View Software Release Descriptive Information function.

3 Select **Configuration** → **Software Management** → **Import Software to the EMS...**.

Result:

The **Select NE Type and Drive for Software Transfer** window is displayed.

4 Choose **CD Drive** or **Tape Drive** for the media that you want to search for the software release.

5 Select the desired ***NE Type*** from the list or type the NE type in the text field and click the **OK** button.

Result:

The system begins a search for the software release on the tape or CD. The **NE Type Selection for NE Software Transfer** window is displayed. If the search is successful, a pop-up confirmation window is displayed, indicating that the software release was found on the tape or CD and asks if you want to continue with the transfer.

6 Click the **OK** button to start the software transfer.

END OF STEPS

Setting up the *Navis*™ Optical EMS host for transferring NE software from CD-ROM

When to use

Before NE software can be transferred from CD-ROM onto the *Navis* Optical EMS host machine, the *Navis* Optical EMS system administrator must do the following once while configuring the *Navis* Optical EMS host or installing the host software.

Instructions

Perform the following steps to set up the *Navis* Optical EMS host for transferring NE software from CD-ROM

1 Log into the *Navis* Optical EMS host machine as ***root***.

2 As root, use the following command to find the hardware path to the CD-ROM drive: `ioscan -fn -C disk`

3 In the output locate the line that contains the hardware path to the CD-ROM drive.

The hardware path could be, for example, */dev/dsk/c4t2d0*.

4 Do a symbolic link between the above hardware path and */dev/cdrom* using the following command as root (replace the ***c4t2d0*** by your hardware path): `ln -s /dev/dsk/c4t2d0 /dev/cdrom`

END OF STEPS

Success or failure

If the Software Transfer function performed through the GUI is successful, the file system for the CD-ROM drive will be mounted each time the CD-ROM is physically loaded into the drive.

The CD-ROM drive may fail to mount because

- The CD is not physically loaded into the drive.
- The file system for the CD-ROM drive failed to be mounted.

In the latter case, log in as root (if not already logged in) and issue a mount command (replace the ***c4t2d0*** by your hardware path):
`/etc/mount /dev/dsk/c4t2d0 /SD_CDROM`

To remove the CD-ROM, issue the following command (replace the ***c4t2d0*** by your hardware path): `/etc/unmount /dev/dsk/c4t2d0 /SD_CDROM`

□

View NE software

When to use

This procedure is used to see what software releases are already stored in *Navis*™ Optical EMS for an NE type.

Related information

For related information, see Chapter 13, “Software upgrade concepts”, “NE software generic information” (13-6).

Instructions

Perform the following steps.

1 Select **Configuration** → **Software Management** → **View Software Release Descriptive Information...**.

Result:

The **Select NE Type** window s displayed.

2 Select the desired NE from the **NE Type** list or type the NE type in the text field.

3 Click the **OK** button.

Result:

A description of all the software releases stored in *Navis* Optical EMS for the selected NE type is displayed.

END OF STEPS

Download NE software

When to use

Use this procedure to download a selected software release to a specific NE.

Related information

For related information, see Chapter 13, "Software upgrade concepts", "NE software download" (13-11).

Before you begin

Before you begin this task, you must first access the Map window. The software release to be downloaded to the NE must be transferred to *Navis*™ Optical EMS from CD-ROM or tape.

Instructions

Complete the following steps to download software to an NE.

1 Select **Configuration** → **Software Management** → **Download Software To NE...**. from the main menu bar on the Map window.

Result:

The **Choose an NE** window is displayed.

2 Select an NE by double-clicking on the NE's TID and click the **OK** button.

Result:

The **Software Download to NE** window is displayed.

3 Select a software release from the **Releases Available** list and click the **Apply** button. (You can abort the software download at this point, if necessary, by clicking the **Abort** button. A pop-up window is displayed, asking if you really want to abort the download. Choose **Yes** to abort the download or **No** to continue it.)

Result:

The system verifies that the software release is not the same or older than the version currently running on the NE and is supported by *Navis* Optical EMS. If there is a problem with the selected release, a pop-up information window is displayed, asking if you want to continue with the software download.

4 Choose **Yes** to perform the software download anyway or **No** to cancel the software download.

Result:

A pop-up message window is displayed, informing you that the download may take a certain amount of time and asks if you want to proceed with the software download.

5 Choose **Yes** to continue with the software download. (If you choose **No** the software download is cancelled.)

Result:

The software download is initiated. The status bar shows when the software download has been completed.

END OF STEPS

Activate NE software

When to use

Use this procedure to activate software that has previously been transferred via software download or software copy.

Related information

For related information, see Chapter 13, “Software upgrade concepts”, “NE software activate” (13-13).

Before you begin

Be aware that the NE Software Activate function provides the set of allowable NEs for activation and only allows the user to select from among those choices. Be aware that you may lose the NE visibility on the Map window for some time as the NE reboots during this process. To perform this task, access the Map window.

Instructions

Complete the following steps to activate software that has previously been transferred via software download or software copy.

1. Select the desired NE(s) in the *Navis*™ Optical EMS map window.

2. Select **Configuration** → **Software Management** → **Activate NE Software...**.

   Result:

   This displays the **Activate Software** window populated with the selected NE(s) and their currently active software release.

3. Select one or more NE(s) and click **Get Standby Release** to retrieve the standby release number of the selected NE(s). You can also click on **Remove From List** to remove the chosen NE from the list.

4. Click on **OK** to initiate the activation of the new release.

   Result:

   EMS verifies that the NE release version that has been requested for activation, is higher than the release version that is currently running on the NE, and also if the selected release is supported by the EMS. A warning box appears if there is a problem with the selected software release. Once verified, a dialog box confirms the software release number and NE.

5 Click on **Yes** to continue with the activation if the information is correct, or click on **No** to return to the Activate Software window.

END OF STEPS

Delete NE software

When to use

Use this procedure to delete a specific executable software release for an NE type from *Navis*™ Optical EMS.

Related information

For related information, see Chapter 13, "Software upgrade concepts", "NE software delete" (13-14).

Before you begin

Before you begin this task, access the Map window. The software to be deleted must be transferred to the *Navis* Optical EMS from CD-ROM or tape.

> **Important!** When software is deleted from the system, it is not recoverable. The only way to get the software back into the system is to reload it from a tape. Make sure that you want to delete the software release before executing the following procedure.

Instructions

Complete the following steps to delete a specific software release for the NE type.

1. Select **Configuration** → **Software Management** → **Delete Software from the EMS...** from the main menu.

   Result:

   The **Delete NE Software from EMS** window displayed.

2. Select **Lambda Unite** from the **Select NE Type** list.

   Result:

   The **Delete Software Release** list shows the available software releases for the selected NE type.

3. Select the software release to be deleted from the **Delete Software Release** list by double-clicking on it and click the **Delete** button.

   Result:

   A confirmation window is displayed, asking if you want to proceed with the deletion.

4 Choose **Yes** to perform the software deletion or **No** to cancel the software deletion

END OF STEPS

Back up NE data

When to use Use this procedure to back up an NE's provisioning data. The provisioning data includes port parameters and cross-connections.

Related information For related information, see Chapter 13, "Software upgrade concepts", "NE data backup" (13-15).

Before you begin Before you begin this task, determine the NE for which you want to perform a backup. Ensure that there are no alarms present on the NE. You must access the Map window to perform this function.

Instructions Complete the following steps to perform an NE backup.

1 Select **Configuration** → **Software Management** → **Backup...** from the main menu bar on the Map window.

Result:

The **Choose an NE** window is displayed.

2 Double click on the desired NE and click the **OK** button.

Result:

A pop-up window is displayed, indicating how long the backup process will take and asking if you want to proceed with the backup.

3 Choose **Yes** to perform the NE backup or **No** to cancel the NE backup

END OF STEPS

Restore NE data

When to use Use this procedure to restore NE provisioning data from a specified backup file. You can specify the type of provisioning data to be restored. You have the option of performing a Regular Restore or an Intelligent Restore. A Regular Restore restores all backup data from the selected NE file, including the default settings. For an Intelligent Restore, the system compares each parameter setting from the backup file against its default value. If the current setting matches the default value, that parameter is excluded from the restore. If all parameters on a given command issued during the restore request matches the defaults, that command is skipped during the restore process. Only parameters that do not currently have default settings are set, thus reducing the amount of time it takes to restore the NE's backup data.

Related information For related information, see Chapter 13, "Software upgrade concepts", "NE data restore" (13-17).

Before you begin Before you begin this task, determine the NE to which you want to restore data. You must access the Map window to perform this function.

Instructions Complete the following steps to restore an NE's backup data.

1. Select **Configuration** → **Software Management** → **Restore** → **Regular Restore...** or **Intelligent Restore** from the main menu bar on the Map window.

   Result:

   The **Choose an NE** window is displayed.

2. Double click on the desired NE and click the **OK** button.

   Result:

   The **Restore – Select Backup File** window is displayed.

3. Select a backup file for restoral. To look at a description of the backup data contained in the file before restoring it, click the **View Descriptive Files** button.

4 Click the **OK** button.

Result:

The restore process is started. As part of the restore process, the system performs several validation checks, comparing the software release, equipment, and switch settable parameters in the backup file with the current NE values. If there are discrepancies, a pop-up window is displayed with an error message asking if you want to continue with the restore.

5 Choose **Yes** to perform the NE restore anyway or **No** to cancel the NE restore.

6 If you respond **Yes** to perform the restore anyway the system continues with the restore.

Result:

A pop-up message window is displayed, informing you that the restore may take a long time and asking if you want to proceed with the restore.

7 Choose **Yes** to perform the NE restore or **No** to cancel the NE restore

Result:

If you respond **Yes** to perform the restore the restore is initiated. The system informs you of the restore’s progress with a status message. When the restore is completed, an information window appears that notifies you of the completion. If the restore fails, an error message is displayed in a pop-up window, indicating the source of the problem.

If the restore operation has been initiated, wait several minutes while the affected NE turns white on the Map window and then back to its original color (normally green, in the absence of alarms against the NE).

The *Navis*™ Optical EMS kicks off a post-restore DNO at the end of the Restore operation, and it can continue after the ***Restore Complete*** message is displayed. You must wait until the post-restore DNO is completed before proceeding to the next step of this procedure. When the NE icon changes back to green, this indicates that the post-restore DNO process has completed.

8 Perform a complete manual DNO on the NE (see "Manually initiate DNO" (5-55)).

END OF STEPS

Schedule NE data backup

When to use

Use this procedure to schedule backup of an NE's provisioning data.

Before you begin

Be aware that if you are scheduling a job to be performed monthly, regardless of the frequency (every x months) that a job is scheduled, the first time the job will be performed will be at the time and day you selected, which can occur in the current month or the following month. For example, if you have scheduled a job to be performed once every two months, at 1:00 AM, on the 21st day of the month, the first time that the job will be performed could be on the 21st day of this month, if that date has not yet passed.

Related information

For related information, see "Modify a scheduled task" (7-24) and "Delete a scheduled task" (7-25).

Instructions

Complete the following steps to schedule an NE software backup.

1 Select **Administration** → **Schedule** → **Software Mgmt** → **Backup...** from the main menu bar on the Map window.

Result:

The **Schedule Manager for Backup NE Software** window is displayed, showing a list of currently scheduled NE backups.

2 Click the **Add** button.

Result:

The **Add a Scheduled Backup** window is displayed.

3 Choose an NE (by TID) from the **Choose an NE** scroll bar list by double-clicking on the item. Use the type ahead field and/or filter/sort function to narrow the list, if necessary.

4 For backup type, click the **Regular Backup** or **Intelligent Backup** radio button.

Important! The **Intelligent Backup** option is disabled for any NE that uses file transferred based memory backup.

5 Choose the following scheduling options, as needed:

- **Daily**: click on this radio button if you want the task to be done on a daily basis. If you schedule the task to be done daily, use the **Schedule Time** spinner field to select the time of day for the scheduled task.
- **Weekly on...**: click on this radio button if you want to task to be done on a weekly basis. If you schedule the task to be done weekly, choose the day of the week by using the spinner field list next to this option.
- **Once every...**: click on this radio button if you want the task to be done periodically. If you schedule the task to be done periodically, choose the frequency (every x month(s)) and the day of the month it will be done using the spinner field lists next to this option or click the **Last Day of the Month** checkbox.
- **Schedule Time**: click the up and down arrows on this spinner field to select the time of day for the scheduled task. The schedule time is in 24-hour format, in hours:minutes. You can also type the time into this field. The time must be input in 24-hour format as hh:mm in 15 minute increments (for example, 11:15 P.M. is entered as 23:15). If the time entry is invalid, the color of the field changes to yellow, and you must re-enter a valid time in the proper format.
- **Number of Retries**: click the up and down arrows on this spinner field to specify the number of retries for the scheduled task.
- **Retry Interval (in Minutes)**: If the **Number of Retries** selected is greater than 1, specify the retry interval, in minutes. Click the up and down arrows on the spinner field to select the time interval.

6 Click the **Apply** button to activate your choices, or click the **OK** button to activate your choices and close the window.

END OF STEPS

Schedule NE software download

When to use

Use this procedure to schedule an NE software download.

Before you begin

Before you begin this task, make sure that the software release to be downloaded to the NE has been transferred to the *Navis*™ Optical EMS host. Be aware that after a software download is performed on an WaveStar® OLS 1.6T NE, you must perform DNO on the NE before the release software can be activated.

Be aware that if you are scheduling a job to be performed monthly, regardless of the frequency (every x months) that a job is scheduled, the first time the job will be performed will be at the time and day you selected, which can occur in the current month or the following month. For example, if you have scheduled a job to be performed once every two months, at 1:00 AM, on the 21st day of the month, the first time that the job will be performed could be on the 21st day of this month, if that date has not yet passed.

Related information

For related information, see "Modify a scheduled task" (7-24) and "Delete a scheduled task" (7-25).

Instructions

Complete the following steps to schedule an NE software download.

1 Select **Administration** → **Schedule** → **Software Mgmt** → **Download Software to NE...** from the main menu bar on the Map window.

Result:

The **Schedule Manager for Download NE Software** window is displayed, showing a list of currently scheduled NE software downloads.

2 Click the **Add** button.

Result:

The **Add a Scheduled Software Download to NE** window is displayed.

3 Choose an NE (by TID) from the **Choose an NE** scroll bar list by double-clicking on the item. Use the type ahead field and/or filter sort function to narrow the list, if necessary. The NE type is displayed in the **NE Type** field after you choose an NE.

4 Click the down arrow next to the **Release** field to display a drop-down list of available releases and select the release to download. This field is required.

5 Choose the following scheduling options, as needed:

- **Date**: click the up and down arrows on this spinner field to select the schedule date. Choose Today or the date. This field is required.
- **Schedule Time**: click the up and down arrows on this spinner field to select the time of day for the scheduled task. The schedule time is in 24-hour format, in hours:minutes. This field is required. You can also type the time into this field. The time must be input in 24-hour format as hh:mm in 15 minute increments (for example, 11:15 P.M. is entered as 23:15). If the time entry is invalid, the color of the field changes to yellow, and you must re-enter a valid time in the proper format.
- **Number of Retries**: click the up and down arrows on this spinner field to specify the number of retries for the scheduled task.
- **Retry Interval (in minutes)**: if the **Number of Retries** selected is greater than 1, specify the retry interval, in minutes. Click the up and down arrows on the spinner field to select the time interval.

6 Click the **Apply** button to activate your choices, or click the **OK** button to activate your choices and close the window.

END OF STEPS

Schedule NE software activation

When to use

Use this procedure to schedule activation of an NE's executable software. When new software is downloaded to an NE, it is placed in ***standby*** until it is activated; it then replaces the old software. Software activations can be scheduled for more than one NE at a time, up to the limit imposed by the *Navis*™ Optical EMS host type.

Before you begin

Before you begin this task, make sure that the software to be activated has already been downloaded to the NE. Be aware that after a software download is performed on a WaveStar® OLS 1.6T NE, you must perform DNO on the NE before the release software can be activated.

Related information

For related information, see the following:

- "Download NE software" (7-7)
- "Schedule NE software download" (7-19)
- "Modify a scheduled task" (7-24)
- "Delete a scheduled task" (7-25)

Instructions

Complete the following steps to schedule software activation for one or more NEs.

1 Select **Administration** → **Schedule** → **Software Mgmt** → **Activate NE Software...** from the main menu bar on the Map window.

Result:

The **Schedule Manager for Activate NE Software** window is displayed, showing a list of currently scheduled NE software activations.

2 Click the **Add** button. The **Add a Scheduled Software Activation** window is displayed. The window is designed to show the current active and standby software releases for each NE once this information is displayed.

If necessary, use the scroll bar to move the window left to right to see the entire contents of the window.

If the standby software release is not displayed, click the **Get Standby Release** button.

3 Choose an NE (by TID) from the **Choose an NE** scroll bar list by positioning the mouse cursor on the item and single-clicking on it with the select (left) mouse button.

4 Click the **Get Standby Release** button to display the standby (currently inactive) release for the NE.

5 After displaying the standby release, single-click on the NE (by TID) again in the scroll list.

6 Choose the following scheduling options, as needed:

- **Date**: click the up and down arrows on this spinner field to select the schedule date. Choose Today or the date. This field is required.
- **Schedule Time**: click the up and down arrows on this spinner field to select the time of day for the scheduled task. The schedule time is in 24-hour format, in hours:minutes. This field is required. You can also type the time into this field. The time must be input in 24-hour format as hh:mm in 15 minute increments (for example, 11:15 P.M. is entered as 23:15). If the time entry is invalid, the color of the field changes to yellow, and you must re-enter a valid time in the proper format.
- **Number of Retries**: click the up and down arrows on this spinner field to specify the number of retries for the scheduled task.
- **Retry Interval (in minutes)**: if the **Number of Retries** selected is greater than 1, specify the retry interval, in minutes. Click the up and down arrows on the spinner field to select the time interval.

7 Click the **Apply** button to activate your choices, or click the **OK** button to activate your choices and close the window.

Result:

The Status Dialog window is displayed, indicating that the task schedule request has been processed. Click the **Close** button to close the status window.

END OF STEPS

Modify a scheduled task

When to use

Use this procedure to change the parameters of a task for any function that can be scheduled.

Before you begin

Before you begin this task, be aware that you cannot modify a scheduled task that is already in progress. You cannot modify another user's scheduled tasks unless you are the system administrator or have a privileged login.

Instructions

Complete the following steps to modify a scheduled task.

1. Select **Administration** → **Schedule** → **Software Mgmt** (or **DNO...** or **Date/Time Sync...** from the main menu bar on the Map window.

   Result:

   The **Scheduler Manager** window for the selected function is displayed, showing a list of currently scheduled tasks.

2. Select a task from the list to be modified.

3. Click the **Modify** button.

   Result:

   The appropriate **Modify a Scheduled Item** window is displayed.

4. Make modifications to the information.

5. Click the **Apply** button to apply the changes or click the **OK** button to apply the changes and close the window.

END OF STEPS

Delete a scheduled task

When ti use

Use this procedure to delete a scheduled task for any function that can be scheduled.

Before you begin

Before you begin this task, be aware that you cannot delete another user's scheduled tasks unless you are the system administrator or have a privileged login.

Instructions

Complete the following steps to delete a scheduled task.

1 Select **Administration** → **Schedule** → **Software Mgmt** (or **DNO...** or **Date/Time Sync...** from the main menu bar on the Map window.

Result:

The **Scheduler Manager** window for the selected function is displayed, showing a list of currently scheduled tasks.

2 Choose the item to be deleted, which is identified by TID, from the list.

3 Click the **Delete** button.

Result:

A pop-up question dialog window is displayed, asking if you want to delete the selected scheduled task. Choose **Yes** to delete the selected scheduled task or **No** to cancel the deletion.

4 Choose **Yes** to delete the scheduled task.

END OF STEPS

8 Management communication setup concepts

Overview

Purpose

This chapter provides background information needed for adding or modifying NEs to the management of the *Navis*™ Optical EMS.

Contents

Data communication networks

Overview

Purpose

The present section deals with the basic theoretical background of Data Communication Networks (DCNs) and provides DCN configuration guidelines for *LambdaUnite*™ MSS systems.

Contents

Basic DCN principles

Overview

This subsection serves as an entry point, it describes the basic DCN principles. The following subsection describes common DCN configurations. DCN configuration guidelines for optical networking products, NSAP address formats and other related information are provided thereafter.

Purpose of a DCN

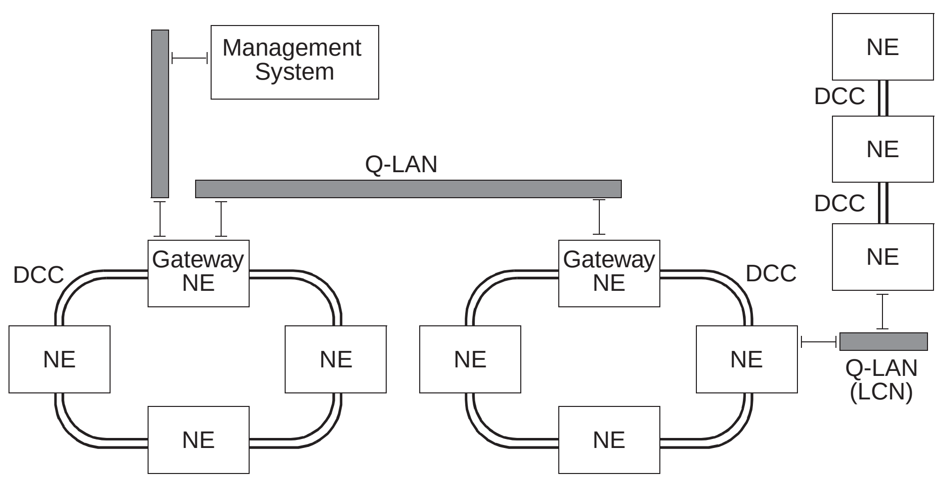
A DCN is used for the exchange of management data. This section provides an overview of the DCN and describes the type of communication between the nodes in the network and the used protocols.

SDH/SONET management network

The SDH/SONET management network is an overlay network of the transmission network. A management system and the NEs together are the nodes of this network. The Q-LAN and Data Communication Channels (DCCs; cf. "Data communication channels" (8-32)) provide the physical connection between the nodes.

DCN physical components

The following figure illustrates an OSI-DCN. The illustration only gives the physical components and connections in the DCN, it does not give the logical configuration.



The illustration of the OSI-DCN consists of 2 Q-LANs and a number of DCCs in an SDH transmission network (point-to-point configuration and two ring configurations shown), with a management system (Element Management System (EMS) or Craft Terminal) connected to it. The management system is connected to the transmission network via gateway network elements (GNEs) and the Q-LAN. The NEs are connected to each other by DCCs.

In the case where there is no DCC connectivity between nodes (see the right part of the illustration), a Local Communication Network (LCN) can be used to connect the nodes to each other.

NE versus node

NEs can be identified by their target identifier (TID), i.e. their NE name (***NE name*** and ***TID*** are used synonymously throughout this Provisioning Guide), whereas a node is identified by its Network Service Access Point (NSAP) address or its Network Entity Title (NET). Each NSAP address or NET within a network constitutes a node which can individually be addressed. A node represents an End System (ES) (represented by the NSAP address) and/or an Intermediate System (IS) (represented by the NET) in a DCN.

Multiple OSI nodes

An Network Element can consist of multiple OSI nodes (OSI node–1 til OSI node–8). An OSI node is a fully provisionable OSI routing node, which can be seen externally via the routing data base. The default node is OSI node–1, which is the only node to offer the 7 Layer OSI services to all application parts. Only node-1 is represented by the NSAP address. All other OSI nodes only provide the TARP and the Network Layer services and are represented by their NET.

DCN protocols

The Protocols used in the DCN between the nodes include:

- Media access protocols:
  - Ethernet on the Q-LAN
  - LAPD on the DCCs
- OSI network routing protocol (DCN wide)
  The OSI network routing protocol (OSI-DCN) is used for routing management data between nodes in the DCN.

ISO-OSI network protocols

The network protocols used between nodes are the ISO-OSI network protocols:

- Connectionless Network Service/Connectionless Network Protocol (CLNS/CLNP) acc. to ISO 8473,
- ES-IS routing protocol acc. to ISO 9542,
- IS-IS routing protocol acc. to ISO 10589.

According to these protocols a node in the network can behave as an end system (ES) or as an intermediate system (IS, sometimes also called a router).

End systems

Nodes behaving as end systems perform no forwarding of data packets. They communicate with each other on an end-to-end basis via intermediate systems.

End systems (ESs) periodically generate ES Hellos (ESHs) to announce their presence. These ESHs are received and recorded by neighboring intermediate systems. The interval between two ESHs is determined by the End System Configuration Timer (ESCT).

Intermediate systems

Intermediate systems (ISs) are used for routing data between nodes and networks or parts of a network. The end system to intermediate system protocol (ES-IS protocol) is responsible for the exchange of data between an end system and an intermediate system. A NE can act both as an end system as well as an intermediate system. However, a management system, for example, can only act as an end system.

Comparable to ESs, ISs periodically generate IS Hellos (ISHs). The interval between two ISHs is determined by the Intermediate System Configuration Timer (ISCT).

ES - IS protocol

The end system to intermediate system protocol (ES-IS protocol) provides information to ISs on the existence of ESs within an area. This information is sent periodically to the ISs via a broadcast mechanism. The ES-IS protocol permits ESs to discover the existence and reachability of ISs and vice versa. Furthermore, the ES-IS protocol provides information to ISs supporting the computation of the shortest path first (SPF) algorithm. Optical networking products make use of the ES-IS protocol acc. to ISO 9542.

IS - IS protocol

The intermediate system to intermediate system protocol (IS-IS protocol) is used between intermediate systems in the DCN. The IS-IS protocol maintains the IS Routing Information Base (RIB). The information in the RIB is used by the SPF algorithm for the routing of management data packets in the DCN by the intermediate systems. Optical networking products make use of the IS-IS protocol acc. to ISO 10589.

Routing information base and LSPs

Each RIB comprises a number of routing tables containing information on NSAP addresses of nodes in the network and ports of the IS through which these nodes can be reached.

Intermediate systems exchange routing information regularly with one another as part of the IS-IS protocol by the use of Link State PDUs (Link State Protocol Data Units, LSPs). A Link State PDU contains information about the node itself, about its neighboring ES nodes, and about its neighboring IS nodes.

LSPs exchanged within a level 1 area are called L1-LSPs, LSPs exchanged across level 2 areas are called L2-LSPs.

OSI routing map and OSI neighbor map

The ***OSI Routing Map*** and the ***OSI Neighbor Map*** information that can be retrieved by using the *WaveStar*® CIT is derived from a node's internal routing tables and the LSP databases. The LSP database contents are equal in all nodes within an area (distributed database concept).

Please note that when a DCN controller (DCF) is restarted then the LSP databases and the internal routing tables may temporarily contain inconsistent information. As a consequence, the information displayed in the ***OSI Routing Map*** and the ***OSI Neighbor Map*** may also be inconsistent. After the DCC controller restart has finished Link State PDUs are exchanged to resynchronize the databases.

Management protocol: TL1

The management of optical networking products is based on the use of the Transaction Language 1 (TL1, defined by Telcordia Technologies, formerly Bellcore, standards) on the OSI application layer.

Please also refer to the *LambdaUnite*™ MSS ***Operations System Engineering Guide***.

☐

DCN configurations

Hierarchical routing

Hierarchical routing is used for large networks when the number of NSAP entries in the RIB databases of the intermediate systems becomes too large. When this happens, it causes an exponential increase of exchanged LSPs between intermediate systems. This in turn causes the performance of the DCN to decrease due to the computation of the shortest path first (SPF) algorithm.

Definition of hierachical routing

In hierachical routing, the addressing domain of the DCN is divided into a number of areas. Each area is assigned a unique area identifier. The value of the area identifier of the NSAP address of each node is set according to which area a node belongs (cf. “NSAP address format” (8-25)).

Level 1 IS and level 2 IS

Each area contains a number of end systems as well as level 1 and level 2 intermediate systems. Level 1 intermediate systems (level 1 ISs) provide interconnectivity between nodes in an area. Level 2 intermediate systems (level 2 ISs) provide interconnectivity between areas.

Level 2 subdomain

The adjacent set of level 2 ISs is also referred to as the level 2 subdomain. All areas in a network are connected via the level 2 subdomain

Area-divisioning of a DCN

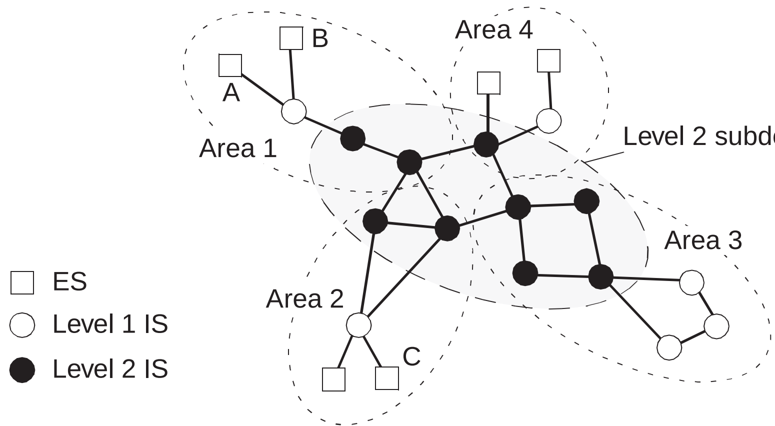
Divisioning is configuring the DCN in such a way that the exchange of LSPs between intermediate systems is limited.

When networks are divisioned into areas, the RIB databases in the systems are much smaller and hence the routing overhead is significantly reduced. Intermediate systems in an area only exchange information (L1-LSPs) on nodes with other systems in their own area. Information on other areas is exchanged by level 2 ISs only and maintained by the level 2 ISs of the area.

In this way, the load of management data in the network is strongly reduced, while keeping the dynamic re-routing capabilities of intermediate systems in case of failures intact. It is important to notice that although the DCN is divided into areas, ES-ES communication between all nodes in the DCN is still possible.

Area-divisioning of a DCN illustration

The following figure illustrates how a network can be divisioned into areas, connected by level 2 ISs. Each area has at least one level 2 IS assigned and can have a number of level 1 intermediate systems and end systems.



Divisioning at network protocol level

Divisioning of the DCN is usually done at the network protocol level. Communication between intermediate systems is disabled or enabled using different techniques, but this does not necessarily have to affect the physical DCN topology. The SDH transmission network should in general not be affected by DCN engineering.

Example: Routing of management data

Suppose a node ***A*** wants to send messages to another node. If this node is in the same area (determined by means of the area identifier of the node's NSAP address), the messages from ***A*** to this particular node (***B*** in "Area-divisioning of a DCN illustration" (8-8)) are routed directly using a level 1 intermediate system.

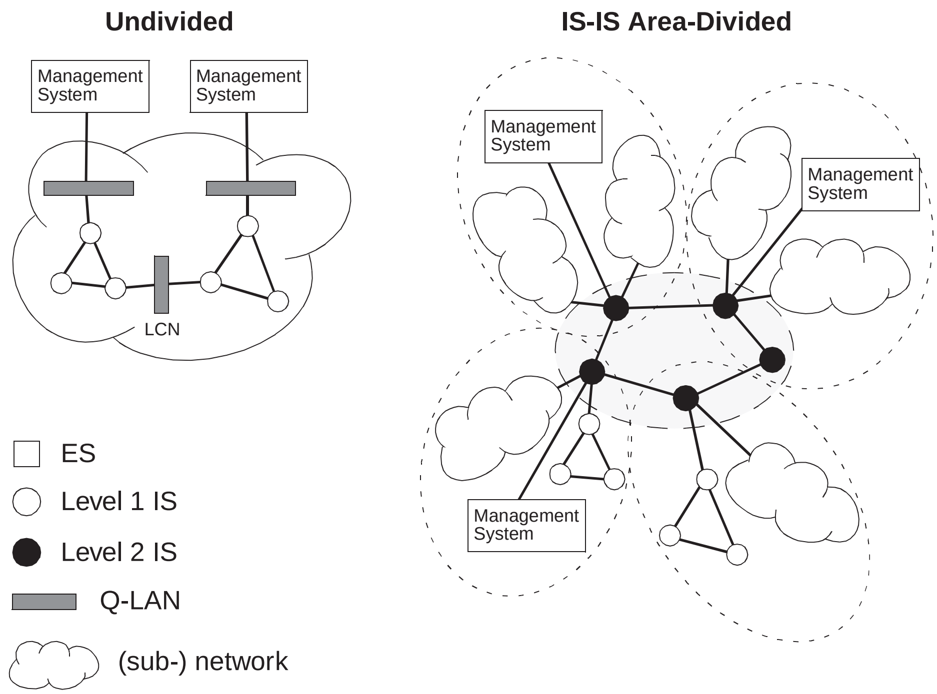
Alternatively, if the desired destination is in a different area (***C*** in "Area-divisioning of a DCN illustration" (8-8)), the messages are sent to a second, higher level (level 2) intermediate system. This level 2 IS routes the messages coming from node ***A*** to other level 2 ISs until they reach a level 2 intermediate system attached to the destination area of ***C***. From there the messages are routed to ***C*** within the area using one or more level 1 ISs.

Types of OSI-DCN networks

In general the OSI-DCN network can be classified in two types:

- Undivided DCN, or
- IS-IS area-divided DCN.

These two types of OSI-DCN network are illustrated in the following figure.



Undivided DCN

An undivided DCN consists of a single area. There is no division between the nodes on network protocol level. All nodes in the network and especially the intermediate systems can exchange routing information with each other. Although a NE can only be managed by one management system at a time, the IS-IS protocol is running between all nodes in the network. This leads to the exchange of LSPs between all intermediate systems in the network.

IS-IS area-divided DCN

The divisioning of the DCN into areas can be accomplished by introducing level 2 intermediate systems (cf. “Area-divisioning of a DCN” (8-7)).

Advantages of areas

Among others, areas have the following advantages:

- Management systems can be connected to any point in the DCN.

As a rule, management systems should be connected to the backbone of the DCN, i.e. to a level 2 intermediate system in the center of their management domain, to prevent them from being overloaded with too much data in the case of a failure resulting in re-routing data traffic.

- The exchange of data is still possible between ***all*** nodes in the DCN (cf. "Example: Routing of management data" (8-8)).

Domain border routing

In order to facilitate the construction of multiple-domain topologies, inter domain routing information can be provided via the reachable address prefix at the domain boundary. The prefix indicates that any node whose NSAP address matches the prefix, is reachable via the SNPA (of the reachable address destination node) with which the prefix is associated. The address prefixes are handled (flooded etc.) by the level-2 routing algorithm. NPDU's with a destination address matching any of the prefixes present in the level-2 subdomain can therefore be relayed (using level-2 routing) and delivered outside the domain.

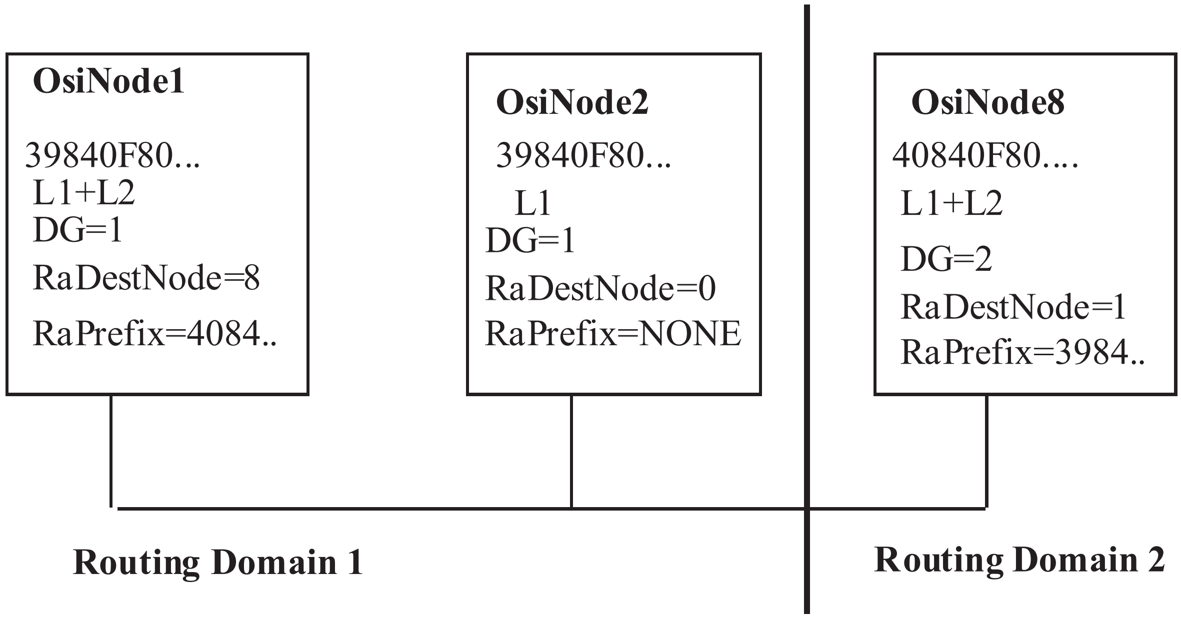
Routing information is not exchanged (IS-IS is disabled) across the routing domain boundary. The routing information related to a circuit connected to an other routing domain is specified via the reachable address prefix. This causes NPDU's destined for NSAPs which are included in the prefix to be relayed to the node where the prefix is provisioned.

Reachable address routes have lower precedence than the intra-domain routes. For two routes with equal precedence, the shortest path is preferred, using the COST values of the default metric.

A multiple-domain topology can be used for the following purposes:

- Share an external network to interconnect several (vendors) routing domains with the office where all management equipment is located. This would require to support this feature on external LAN's (possible future enhancement - with SPOF).
- Enlarge the Lucent Management domain and manage NE's in several Lucent routing domains by the same manager (supported via requirements below - no SPOF).

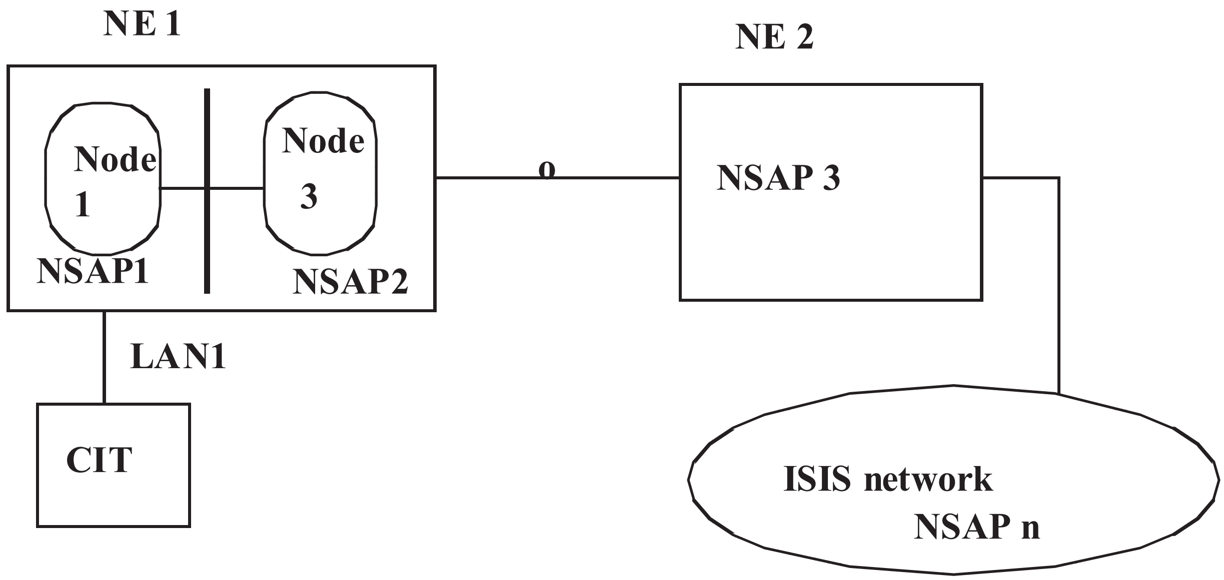
Example of a domain boarder routing configuration



The following recommendations have to be fulfilled for domain boarder routing:

- Between different routing domains there is NO ISIS traffic.
- Static routing is performed via Reachable Address Prefix!
- Domain boarder routers (osinode1 and osinode8) must be Level1+2 routers.
- Only one osinode is allowed to be in DomainGroup 2 (DG=2).
- The reachable address prefix of an osinode should not match with it’s own NSAP.
- Domain boarder routers must point to each other (using reachable address destination node)
- The router in routing domain 2 MUST specify Node1 as reachable address destination node.

Guidelines for configuring the "Reachable Address Prefix"



The following rules have to be observed for configuring reachable address prefixes:

- between osinode1 and osinode3, TARP manual adjacencies must be provisioned
- reachable address prefix in osinode1 must match all NSAPs behind the domain boarder (NSAP 2, NSAP 3, NSAP n).

Deleting domain boarder routing

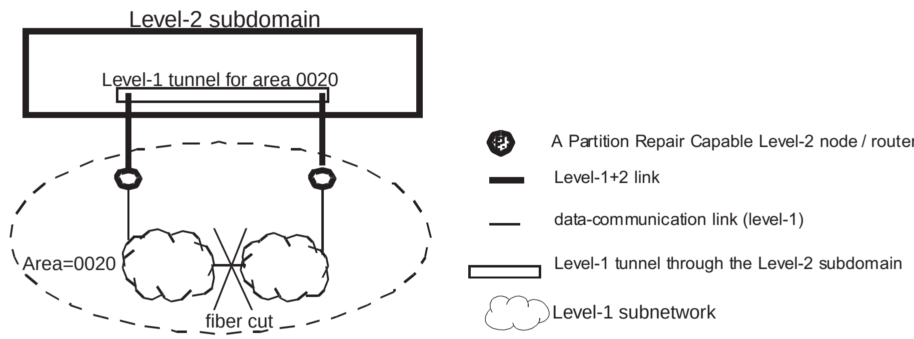
The following steps have to be performed to delete domain boarder routing:

1. Set **Reachable Address Prefix** to **none** with valid reachable address destination node in both osinodes.
2. Set **Reachable Address Destination** to **none** in both osinodes
3. Set domain group (**Domain Boundary**) back to no in the former domain boarder router.

Partition repair

(Area) partition repair provides a way to enhance the robustness of the DCN by providing the capability to repair intra-area routing using connections via nodes outside the area. This is done by creating a path outside the area, between two level-2 nodes (which are provisioned to be Partition Repair Capable level-2 nodes) that belong to distinct partitions of the same IS-IS area. Level-1 IS-IS PDUs and CLNP PDUs are encapsulated and transferred over the level-2 path.

Note that NE types that do not support the Partition Repair feature can exist in the ***repaired*** areas; however, they cannot be part of the level-2 repair path (they are not able to be part of the level-1 tunnel through the level-2 domain).



The terminology that is used in combination with the Partition Repair functionality requires some explanation. A node can be ***Partition Repair Capable***, ***Partition Repair Compatible***, and ***Partition Repair Designated***. These terms are described below.

- A node is ***Partition Repair Capable*** if it is provisioned as such. Only possible end points of ***Partition Repair*** tunnels need to be provisioned as ***Partition Repair Capable***. Such possible end points must be ***attached*** level-2 nodes. (A level-2 node is called ***attached*** if it is able to forward packets to a different area, even if the level-2 node itself is not on an area boundary.)
- A node is ***Partition Repair Compatible*** if a partition repair path can pass through the node. No provisioning is needed or required to make a node ***Partition Repair Compatible***; this is a property of the stack software.

- A node is ***Partition Repair Designated*** if all other nodes of its area that are still connected to it via a level-1 path elect it as such. The election is done by choosing one node from the set of still-connected ***Partition Repair Capable*** nodes. If a ***Partition Repair Designated*** node of a certain area learns (by listening to level-2 communication) that there is another ***Partition Repair Designated*** node in the same area, both of these nodes conclude that their area is partitioned. They will then establish a partition repair path between each other.
- The ***partition repair path*** is a virtual level-1 connection between the two ***Partition Repair Designated*** nodes that runs through the level-2 domain. Level-1 packets are tunnelled through this virtual connection; this removes the area partitioning.

□

DCN configuration guidelines

Background information

Please refer to "Basic DCN principles" (8-3) and to "DCN configurations" (8-7). These two sections provide theoretical background information on data communication networks.

Guidelines

Please observe the following engineering guidelines when configuring a DCN with *LambdaUnite*™ MSS systems involved:

- A maximum of 250 nodes (i.e. NSAP addresses) is supported in an area.
- A maximum of 50 areas is supported in a subnetwork.
- All nodes in an area must have the same area address (cf. "ISO-DCC NSAP address format" (8-26)).
- All nodes in an area must have DCC connectivity ***within the area*** to all other nodes in the same area.
- At least one level 2 IS is required per area in area-divided DCNs for communication across area boundaries. Two level 2 ISs are recommended in each area for DCC communications redundancy to/from each area.
- All level 2 ISs must have DCC connectivity, either directly or indirectly via other level 2 ISs, to all other level 2 ISs in the subnetwork to form a single level 2 subdomain that provides connectivity to all areas.
- To distribute the load of management data in a subnetwork, it is recommended, when feasible, but not required that:
  - all area sizes be approximately the same,
  - and the number of level 2 ISs be about the same as the average area size.

  For example, a perfectly balanced subnetwork of 200 nodes would include 20 nodes per area in each of 10 areas and 20 level 2 ISs in the level 2 subdomain (two level 2 ISs per area).

Related information

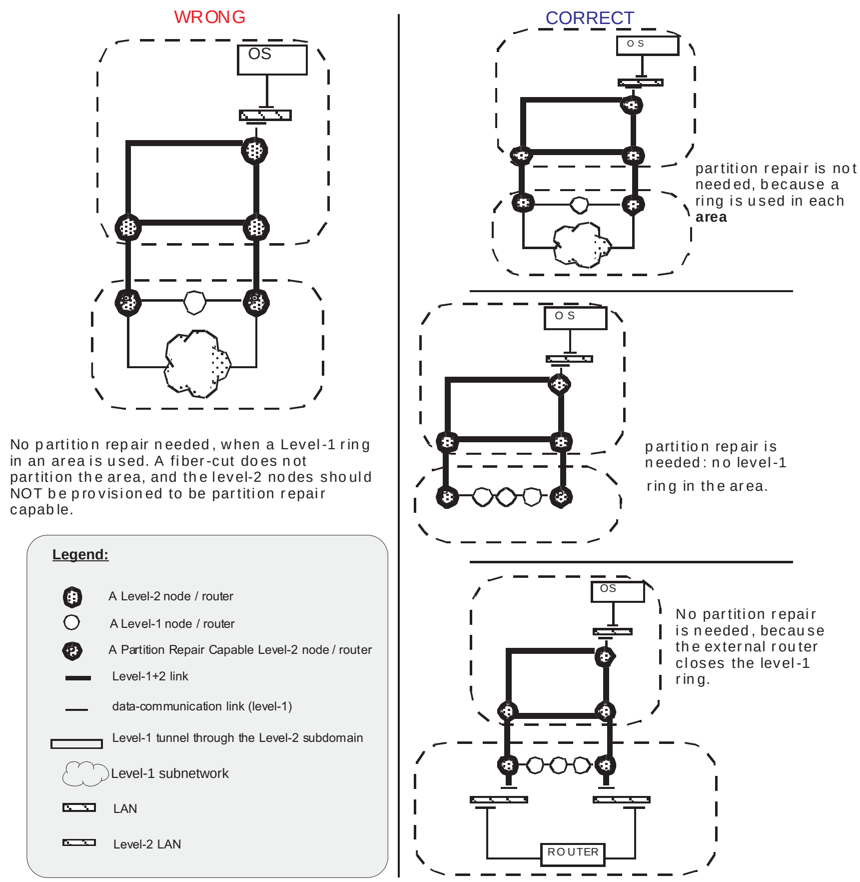
Please refer to "NSAP address format" (8-25) and to "Data communication channels" (8-32) for further information.

□

Partition repair guidelines

When to use partition repair

Only provision nodes to be ***Partition Repair Capable*** in an area, if a Single Point of Failure can otherwise not be avoided for that area. If more than one Level-2 entry into an area is used, partition repair is a valid mechanism.

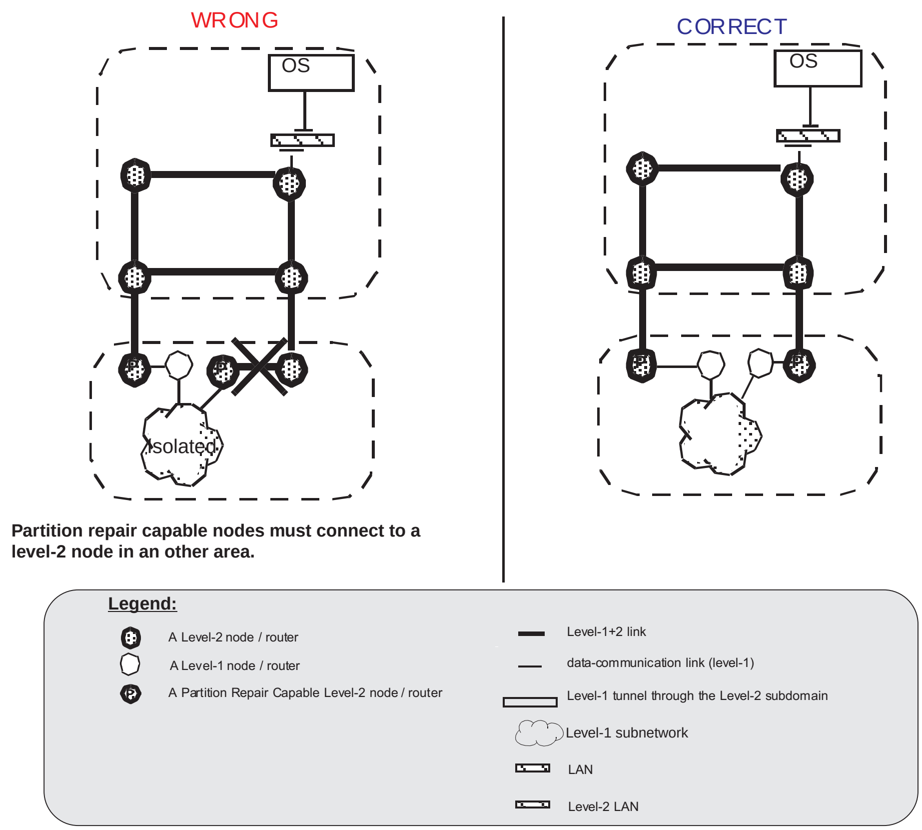


How to use partition repair

To allow the healing of a partitioned area, two nodes must be provisioned as ***Partition Repair Capable*** as follows:

- At the area boundary, connecting Level-2 node(s) in (an) other area(s)
- The potential virtual link (tunnel) should reduce the SPoF's in the area to a minimum.

In case an area is partitioned due to a single failure, the two partition repair capable level-2 nodes in each partition will establish a level-1 tunnel through the level-2 subdomain, in order to repair level-1 connectivity between all nodes in the two related partitions.



NE type restrictions

Observe the following NE type restrictions:

- All NE-types, managers and other OSI nodes (like external OSI-routers) are allowed as Level-1 IS nodes or as ES-only nodes, in an area with ***Partition Repair Capable*** NE's.
  When a repair tunnel is established, the partition repair designated NE's will advertise information such, that the tunnel is identified as a normal level-1 route within the area.
- All NE-types and other OSI nodes (like external OSI-routers) are allowed as Level-2 nodes in the Level-2 subdomain, as long as they are not part of the shortest inter-area path between two ***Partition Repair Capable*** NE's in an area.

The network is expected to be designed for full management connectivity in case of a single failure. In case of two failures, including a partitioned area and a failure in the shortest potential tunnel route, the network is allowed to drop management connections. Therefore not all OSI-nodes in the Level-2 subdomain need to be partition compatible.

Large network restrictions

Observe the following restrictions regarding large networks:

- The manager (OS/ *Navis*™ Optical EMS) connections that are tunnelled through a Level-2 node in case of a single failure, are counted as connections and must therefore be subtracted (like all other rerouted connections through this node) from the maximum number as specified in S-111 in order to identify the maximum number of acceptable connections in the case that the network is in its normal (failure-free) state.
  If 50 manager connections can be tunnelled in case of a failure, and 150 manager connections are forwarded in a failure-free network, through one of the nodes in the potential tunnel, the related node must be capable of forwarding 200 manager connections.
  The total number of managed NE's in an area can be tunnelled through the Level-2 subdomain with regard to the maximum number of manager connections that can be forwarded by a node. Only the shortest inter-area route between two ***Partition Repair Capable*** nodes in an area has to be taken into account.
- The manager (*WaveStar*® CIT/*Navis* Optical EMS) connections that are received, encapsulated and forwarded into a partition-repair tunnel, are counted as normal connections. If 100 manager connections can be tunnelled in case of a failure, the related partition designated node must be capable of forwarding 100 manager connections.
- All areas can be provisioned to have one or more ***Partition Repair Capable*** node(s).
  Each area with one or more ***Partition Repair Capable*** nodes requires an extra entry in the routing table (RIB), because of initial selection of a partition repair designated node per area.
- Avoid the use of partition repair capable NE's in large areas.

A DCN network design that selects small level-1 areas to use partition repair, while the large areas are rings that need no partition repair, will be easier to understand. Also it is easier to check that all rules are obeyed.

- The maximum number of ***Partition Repair Capable*** NE's in a network is 10.
  All partition designated nodes in the level-2 subdomain require an additional entry in the routing table of the other partition designated nodes. Up to 49 additional entries are available, which are all used after a single failure when all 10 areas have ***Partition Repair Capable*** nodes and one of those areas is partitioned.

Partitioning restrictions

A maximum of 10 ***Partition Repair Capable*** NEs per area is allowed. This implies that the ***Partition Repair Capable*** NEs can terminate a maximum of 9 partition repair tunnels. A single cable cut may imply many fiber cuts, of which more than 9 of those fiber cuts may imply partitioning of the same area. A fiber cut between two DWDM nodes may imply a cut of many DCC channels. The Network design shall not use partition repair to cover such topologies.

□

DCN protocols and services

Overview

LambdaUnite™ MSS NEs support the exchange of management information over DCC, OSI LAN or TCP/IP. The DCC and OSI LAN network operations capabilities use the section DCC bytes in the SDH/SONET overhead of the optical signals. *Navis*™ Optical EMS dialogs and OS messages are transmitted in these DCC bytes.

The *LambdaUnite* MSS OS interface is accessed through one of the 10 or 100 BaseTX Ethernet IAO LAN rear panel connectors. The *LambdaUnite* MSS interface supports Transaction Language 1 (TL1) for commands/messages, and File Transfer and Access Management (FTAM) for software downloads and provisionable data backup and restore.

The *LambdaUnite* MSS OS interfaces supported include the following:

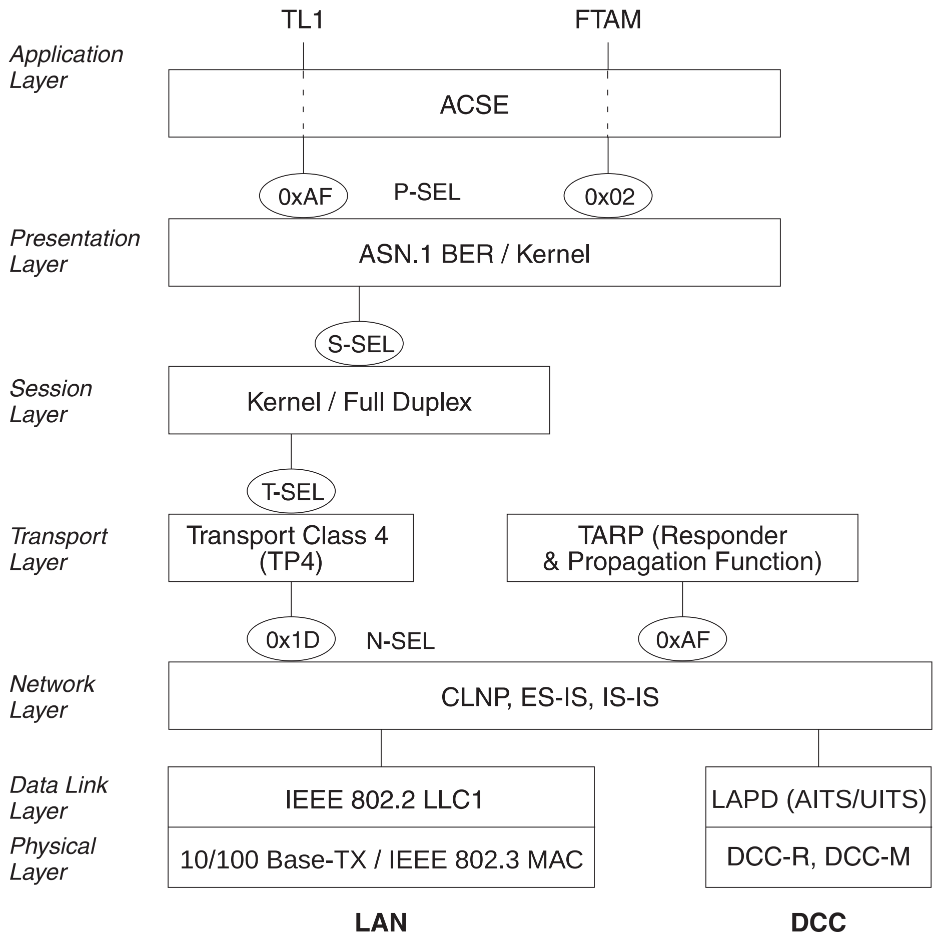
- OSI LAN/WAN
- TL1 TCP/IP (using the internal gateway function)
- File Transfer, Access and Management (FTAM) protocol (for software download, database backup and restore.)
- FTP (for software download, database backup and restore)

Standard 7-layer OSI stack

LambdaUnite MSS NEs support the exchange of management information over the standard 7-layer OSI protocol stack over Local Area Networks (LAN) and over Data Communication Channels (DCC) acc. to the Telcordia Technologies (formerly Bellcore) GR-253 standard.

Protocols and services

The following figure shows how *LambdaUnite* MSS NEs support the protocols and services.



FTAM

File Transfer, Access and Management (FTAM), defined by ISO 8571, is an Application Service Element (ASE). FTAM facilitates file transfer and allows file manipulation across a network. The FTAM protocol is used for *LambdaUnite* MSS software management purposes, such as software download, backup or restoration.

IAO LAN access

The IAO LAN serves two main purposes:

- It provides a standard means of connecting a NE into a central office (CO) data communications network (DCN) to provide OS access
- It provides an alternate path for data communications channel (DCC) communications to travel within a subnetwork.

The *LambdaUnite* MSS IAO LAN is internally connected to the DCC subnetwork so that operations messages on the IAO LAN can be seamlessly delivered to a remote NE by the DCC and vice-versa (DCC to IAO LAN).

TCP for support of IP access networks

TCP provides a connection-oriented, reliable, full duplex byte stream service. There are always exactly two peers (end points) communicating with each other on a TCP connection. Concepts like broadcasting and multi-casting are not applicable to TCP. A TCP connection is set up between an IP-address-and-port-number on one end, and an IP-address-and-port-number on the other end. A combination between an IP address and a port number is called a socket. Using this terminology, a TCP connection is uniquely identified by a pair of sockets. TCP uses IP as the basis for providing its services.

TL1 over TCP/IP

A TL1 TCP/IP gateway (refer to "T-TD Gateway" (8-22)) may be used to connect multiple collocated *LambdaUnite* MSS systems to a remote OS equipped to communicate through a TCP/IP WAN. Since the OS communicates through TCP/IP, a gateway is required to provide a mapping between TCP/IP and OSI. That gateway function is included as a feature of the *LambdaUnite* MSS system.

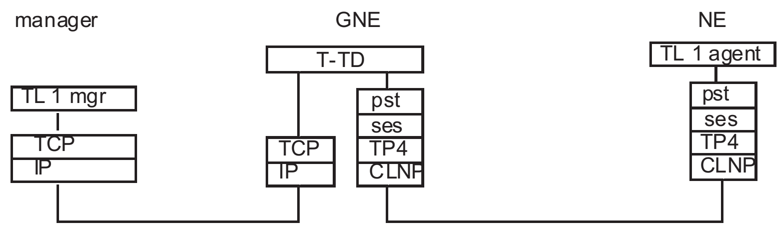
The gateway is provisioned to provide a TL1 TCP/IP gateway between TCP/IP and OSI. This process is bidirectional, mapping messages originating in the OS to the proper NE NSAP, as well as mapping messages originating in the NE to the proper OS IP address and returning then to the OS.

This interface supports TL1 messages only.

T-TD Gateway

The TL1 Translation Device (T-TD) is a device that translates TL1 over TCP to TL1 over OSI presentation. By doing so, it enables the OSs which are located in the IP-based network to manage the NEs that are located in the OSI-based network. Thus, T-TD is essentially a TL1 TCP-OSI gateway, and it requires the support of both the TCP/IP stack and the OSI stack. The T-TD may be an NE or it may be a separate device. It encompasses both the TL1 initiator and TL1 responder aspect.

The T-TD gateway resides in an NE and operates as shown in the figure below.



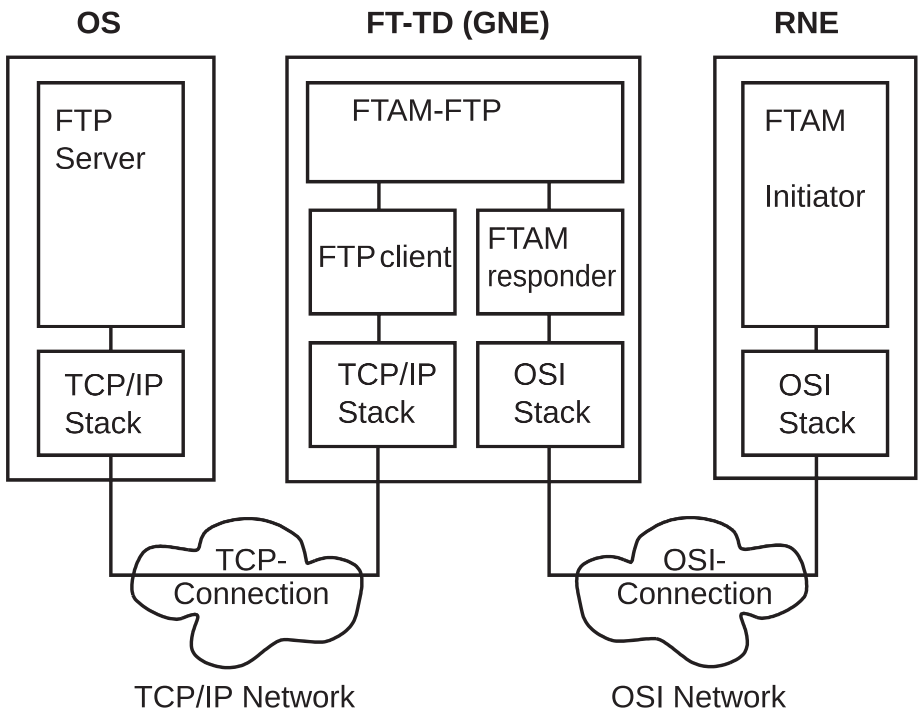
FT-TD Gateway

The FTAM-FTP Gateway is a gateway that translates FTAM over OSI presentation to FTP over TCP/IP. It requires the support of both the TCP/IP stack and the OSI stack. It is also referenced as FT-TD (File Transfer Translation Device).

The FT-TD is used in a mixed OSI and IP network, where the access DCN is IP, and the NEs being managed are in an OSI network. While different approaches exist to solve the file transfer problem in a mixed network, the system will be using an FTAM-FTP On-The-Fly Gateway. Other approaches are IP Tunneling or an FTAM-FTP Store and Forward Gateway.

The FT-TD acts as a gateway with connection set-up in a single direction - from FTAM to FTP, and not the other way. Even though an OS sends the initial TL1 message requesting a file transfer, it is the FTAM initiator residing on the remote NE (RNE) that creates an FTAM association with an FTAM responder on the Gateway NE (GNE). The FTAM-FTP Gateway translates the FTAM requests into FTP requests that are passed to the FTP Client on the GNE. The file transfers are supported in both directions (download, backup, restore). The FT-TD does not require FTP Server functionality on the NE.

The FT-TD gateway resides in an NE and operates as shown in the figure below.



□

NSAP address format

Related information

Please refer to "Basic DCN principles" (8-3) and to "DCN configurations" (8-7). These two sections provide theoretical background information on Data Communication Networks.

For related task oriented procedures, please refer to Chapter 1, "Management communication setup".

***LambdaUnite*™ MSS NE addressing**

A *LambdaUnite* MSS NE that runs OSI has at least one node, which is referred to as node-1. Additional nodes can be added, with a subset of the functionality of node-1.

When a node acts as an intermediate system (all nodes), SEL = 0, and this implies that we are concerned with the Network Entity Title alone. When a node acts as an end system (node-1), which is where the network services are provided, SEL NOT= 0, and this implies we are concerned with the NSAPs.

Summarizing, a node is known by its unique NET (see "Network entity title NET" (8-30)). If it provides multiple services, then each service has a unique access point, the NSAP (***NSAP = NET + SEL)***. One NSAP differs from the other only in the SEL value.

In TL-1 messages towards the user interfaces, the NSAP for TL-1 management via node-1 will be presented. For the other nodes the NET is used.

NSAP address

The Network Service Access Point (NSAP) address is used by the network protocol for location information.

The Network Service Access Point (NSAP) address is the access point where the Network Layer services are available to network service users.

NSAP addresses take on three properties:

1. they must identify a unique entity,
2. they must be globally unique across the network, and
3. routing information cannot be derived from the NSAP address.

Several formats for the NSAP, each with its own syntax and semantics, are possible. GR-253 requires the use of the ISO DCC syntax (20 octets long) for NSAP addresses for SONET nodes. Non-SONET nodes are not restricted to this NSAP format. The syntax selected has no bearing on the routing strategy of the routing protocols used.

ISO-DCC NSAP address format

Although different NSAP formats exist, preferably all nodes in a network should use the same address structure. The *LambdaUnite* MSS supports only the 20-byte ISO Data Country Code (DCC) NSAP address format in accordance with ISO 8348.

The figure below represents both the ″SONET ISO-DCC″ format and the ″default SDH ISO-DCC″ format. The value of the IDI field is the only difference between the two formats.

<table>
<tr><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td><td>6</td><td>7</td><td>8</td><td>9</td><td>10</td><td>11</td><td>12</td><td>13</td><td>14</td><td>15</td><td>16</td><td>17</td><td>18</td><td>19</td><td>20</td></tr>
<tr><td colspan="3">IDP</td><td colspan="17">DSP</td></tr>
<tr><td colspan="13">Area Address</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td></td><td></td><td></td><td colspan="10">High Order DSP</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td>AFI</td><td colspan="2">IDI + pad</td><td>DFI</td><td colspan="3">ORG</td><td colspan="2">RES</td><td colspan="2">RD</td><td colspan="2">AREA</td><td colspan="6">SYSTEM (MAC)</td><td>SEL</td></tr>
</table>

The NSAP address consists of the Initial Domain Part (IDP) and the Domain Specific Part (DSP).

The ISO_DCC IDP defines the DSP to be 17 octets long, all coded in direct binary, not preferred binary. The DSP values are allocated by the ISO member body to which the ISO DCC value has been assigned. For the US, ANSI picks the specific DSP format. The DSP is further broken down into the High Order DSP (HO-DSP), followed by the SYSTEM (SysID) and SEL fields.

The first 13 bytes (“AFI” to “AREA” fields) of the NSAP address make up the area address.

The meaning of the individual fields of the ISO-DCC NSAP address is explained in “NSAP address fields” (8-26).

Purpose

This window is used to provision the network service access point (NSAP) area address(es).

NSAP address fields

The following table lists the NSAP address fields and describes their meaning.

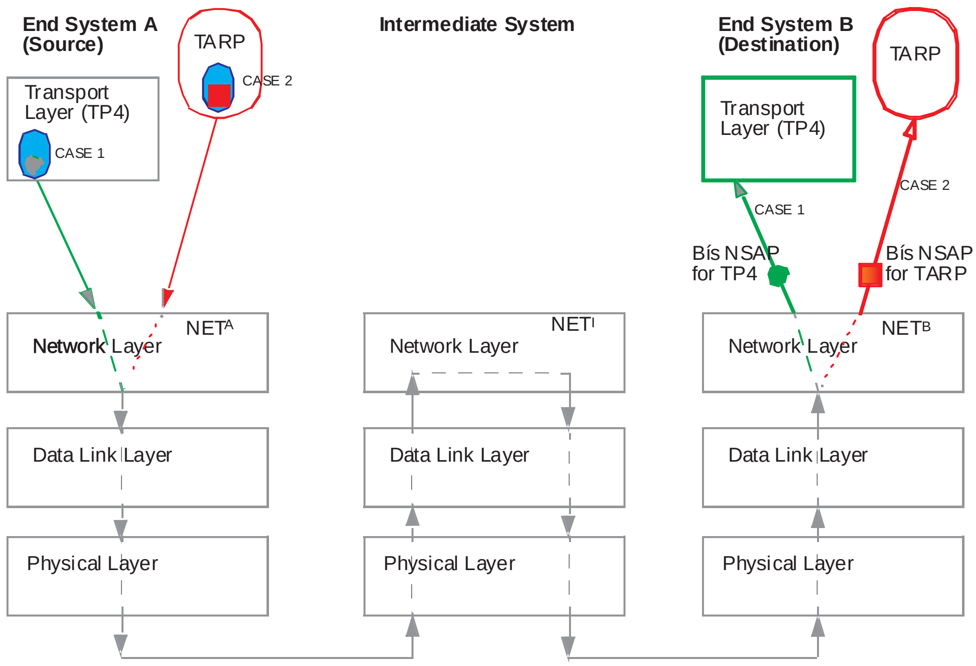
Field	Meaning	Description
Area address to be modified	the NSAP (network server access point) address.	
Initial Domain Part (IDP):		
AFI	Authority and Format Identifier specifying the NSAP address format.	The predefined value is 0x39 (hex.), indicating that the ISO Data Country Code (ISO-DCC) is the address format. This field is configurable.
IDI	Initial Domain Identifier specifying the country code.	The predefined value is 0x840F (hex.). This field is configurable.
Domain Specific Part (DSP):		
DFI	DSP Format Identifier specifying the DSP format.	The predefined value is 0x80 (hex.). This field is configurable.
ORG	Organization identifier (or Operator identifier) representing the Network Service Provider (NSP).	The predefined value is 0x000000 (hex.). This field is configurable.
Reserved	Reserved portion of the NSAP.	The predefined value is 0x0000 (hex.). This field is configurable.
RD	Routing Domain	The predefined value is 0x0000 (hex.). This field is configurable.
AREA	Area identifier indicating the routing area to which a node belongs (cf. "Hierarchical routing" (8-7)).	The predefined value is 0x0000 (hex.). This field is configurable.

Field	Meaning	Description
SYSTEM	System identifier representing the node. The IEEE 802.3 MAC address	A range of 9 subsequent IEEE-MAC numbers is reserved for every UNITE NE, and only one number is physically stored in the backplane SEEPROM of the NE. This field is ***not configurable***. The SYSTEM field in the NET of each node has the following value: • Node-2: the IEEE-MAC address of LAN1 +1 • Node-3: the IEEE-MAC address of LAN1 +2 • Node-4: the IEEE-MAC address of LAN1 +3 • Node-5: the IEEE-MAC address of LAN1 +4 • Node-6: the IEEE-MAC address of LAN1 +5 • Node-7: the IEEE-MAC address of LAN1 +6 • Node-8: the IEEE-MAC address of LAN1 +7

Field	Meaning	Description
SEL	The selector field is used to direct the Protocol Data Units (PDUs) to the correct destination making use of the CLNP network layer service.	The predefined value is: • 0x00 (hex.): For the "Network Entity Title", used for exchanging PDUs in the ES-IS and IS-IS routing exchange protocols. • 0x04 (hex.):For the NSAP of CLNP PDUs, containing encapsulated IP packets. • 0x1D (hex.) for PDUs to be processed via the OSI stack • 0xAF (hex.) for PDUs to be processed via the TID Address Resolution Protocol (TARP, cf. "Name-to-address translation" (8-47)). This field is ***not configurable***.

Relationship between NSAP and NET

The figure below describes the relationship between NSAPs and NETs and their roles in PDU transfer between peer Transport/TARP layers. The SONET network SEL for TP4 is used in the example.



NETs define the network entities uniquely from an addressing point of view. They are used for routing decisions by the network layer. NSAPs are only relevant for end systems, because that's where the services are that can be "accessed". The network SEL defines the specific access point, if more than one.

Case 1

The Transport Layer of End System A wishes to communicate with its peer Transport Layer of End System B. A should launch a TP4 PDU containing B's NSAP for TP4 which is: B' s NET + SEL=0x1D .

Case 2

TARP of End System A wishes to communicate with its peer TARP of End System B. A should launch a TARP PDU containing B's NSAP for TARP which is: B's NET + SEL=0xAF

Network entity title NET

The area address together with the system identifier (SYSTEM field) of the NSAP address is also called the Network Entity Title (NET; cf. "ISO-DCC NSAP address format" (8-26)).

DCC controller reset

All parameters related to DCC communication including all fields of the NSAP address are retained over a DCC controller reset. All parameters are kept in non-volatile memory.

Configuring the NSAP address

You can configure the NSAP address on node-1 in each NE. individually.

> **Important!** Changing the NSAP address causes the DCC controller to be restarted, thus causing momentary loss of communication with the system via that circuit pack.

Additional information

For information on how to change the configurable fields of the NE's NSAP address, please refer to "Modify an NE" (1-11).

Data communication channels

Exchange of network management information

Network management information can be exchanged between SONET/SDH NEs via Data Communication Channels (DCCs) using the D1-D12 Section Overhead (SOH) bytes of the first STM-1 frame within an STM transmission signal.

The DCC bytes in the overhead of the SONET/SDH signal provide an embedded operations channel at the physical layer. It carries operations traffic, a combination of application messages and protocol management messages, between optically connected NEs.

This makes it possible to set up a Data Communication Network (DCN; cf. “Basic DCN principles” (8-3)) which uses SDH/SONET connections for exchanging network management data.

The DCC uses OSI protocols. IP traffic is carried on the DCC by encapsulating it in CLNP PDUs.

Please note that all nodes in an area must have DCC connectivity ***within the area*** to all other nodes in the same area (cf. “DCN configuration guidelines” (8-15))

DCC-R (Section DCC)

The Regenerator Section Data Communication Channel (DCC-R or Section DCC) makes use of the RSOH bytes D1-D3 thus providing a transmission channel with a capacity of 192 kbit/s. The DCC-R is automatically set as the default DCC for provisioned (configured) or pre-provisioned optical interface ports.

DCC-M (Line DCC)

The Multiplex Section Data Communication Channel (DCC-M or Line DCC) uses the MSOH bytes D4-D12 thus providing a transmission channel with a capacity of 576 kbit/s.

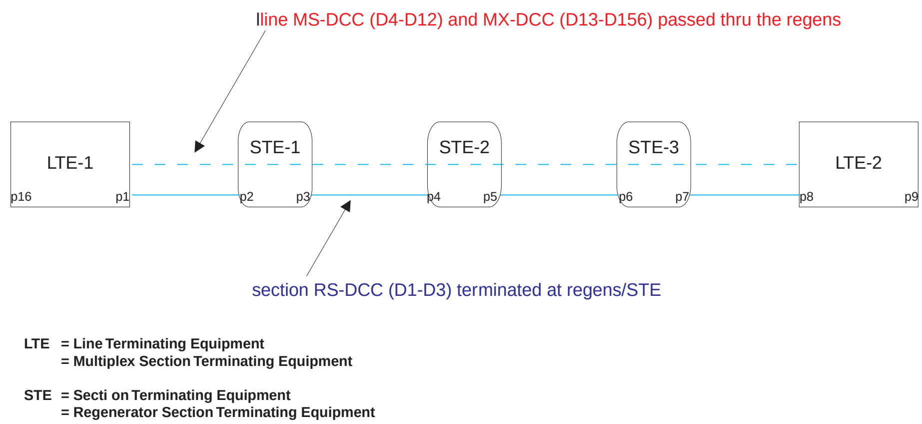
Termination of Data Communication Channels

The *LambdaUnite*™ MSS system supports the 7-layer OSI protocol stack over the DCC links which terminate on the DCC controller DCF. The controller circuit pack (DCF and SCF in one circuit pack) provides the source and sink of the DCC bytes to and from the active DCC links via LAPD devices. The LAPD protocol acc. to ITU-T Rec. Q.921 is used. You can define DCC links by assigning DCC terminations to optical interface ports.

The NE provides the capability to terminate and originate

- the Section/RS-DCC (D1-D3) overhead bytes for all SONET optical interfaces according to ANSI-T1.105.04 and for all SDH optical interfaces according ITU-T G.784. The SONET optical interfaces include OC-768, OC-192, OC-48. The SDH optical interfaces include STM-256, STM-64, STM-16. The transmit and receive rate for the Section/RS-DCC (SONET/SDH) access is a single bandwidth of 192 Kbit/s in each direction.
- the Line/MS-DCC (D4-D12) overhead bytes for all SONET optical interfaces according to ANSI-T1.105.04 and for all SDH optical interfaces according ITU-T G.784. The transmit and receive rate for the Line MS-DCC channel is a single message-based channel of 576 kbit/s in each direction.

The following figure illustrates the functional principle.



Max. number of active DCC links

The maximum number of simultaneously supported MS/RS-DCC channels per NE is 8. Each DCC controller thus can support up to 8 active DCC links.

When a circuit pack is inserted into a slot, the RS/MS/-DCC on a port are left in disabled state.

The user has to explicitly enable the RS/MS-DCC on a port.

DCC provisioned state

A Data Communication Channel (RS/MS-DCC) can be in one of the following provisioned states:

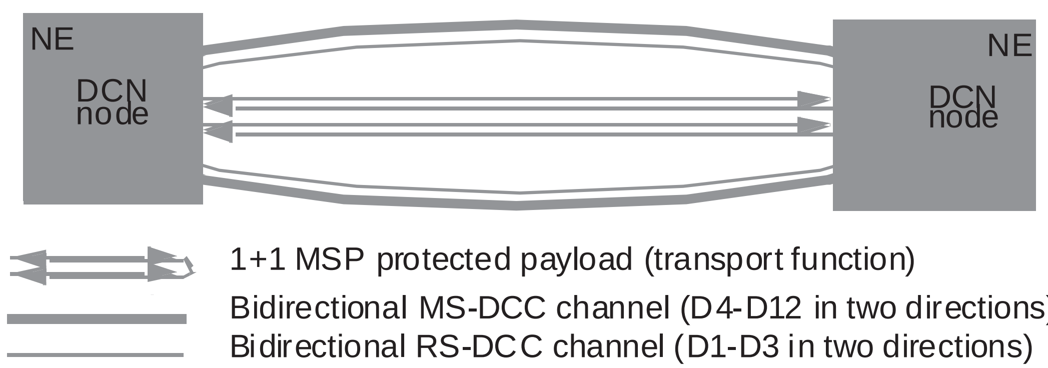
- ***Enabled***
  - The corresponding DCC bytes are allocated to an optical interface port.
  - The DCC is assigned a LAPD channel.
- ***Disabled***
  - The corresponding DCC bytes are no longer allocated to an optical interface port.
  - The DCC is no longer accessed by a LAPD channel.

The provisioned state of a DCC as well as the LAPD channel assignments are persistent over a DCC controller or NE reset.

DCC protection switching

The DCC channels in an APS/MSP protection group are independent of the MS-protection and there is no DCC protection facility in an APS/MSP-pair, other than the layer-3 re-routing facilities of the protocol stack.

The figure below shows the APS/MSP protection of the transport channels (payload), while the two bidirectional MS-DCC channels (subnets) and the two bidirectional RS-DCC channels (subnets) are independent from APS/MSP.



Mandatory DCC access for BLSR/MS-SPRing

The DCC channels are used by the BLSR/MS-SPRING protection facilities to exchange information between the nodes in the BLSR/MS-SPRING ring. The BLSR/MS-SPRING protection is only available after exchange of information via DCC (building a ring map and cross-connect representation).

Node addition/deletion in a 4-fiber ring

The node addition/deletion in a 4-fiber ring requires procedures whereby the DCC is disabled on the affected span to prevent a ring discovery of the new neighbor. In the 4-fiber ring, traffic is forced onto the protection line of a span before the node is added to (deleted from) the working line. DCC is disabled on the working line so that a new ring map is not discovered until the forced span switch is released and the active traffic is on the working line again, and the NE is added to (deleted from) the protection line.

The node addition/deletion scenario in a 4-fiber ring include the following steps:

- FS-R on both adjacent nodes to force the traffic to the protection lines
- all DCC off for the working line on both adjacent nodes
- node insertion into/ deletion from the working line
- clear to bring the traffic back to the working lines
- node insertion into/ deletion from the protecting line
- enable DCC for the working lines.

The RCS and therefore the ring map discovery only registers to the LinkID neighbor information from the working line. The DCC of the protection line is not used for ring map discovery. If a new neighbor is detected, the ring map is invalidated and protection switching is suspended. Protection switching is resumed after the new map is successfully discovered.

Important! The following has to be observed:

1. DCCs used for MS-SPRing management cannot be disabled as long as the MS-SPRing protection group exists and the MS-SPRing management mode is “automatic discovery”.
2. If the neighboring node in an SDH MS-SPRing is an ADM-16/1, then you must enable the DCC-M on the side connected to the ADM-16/1.

Creating a BLSR/MS-SPRING protection group

The BLSR/MS-SPRING protection group can only be created when a DCC channel is enabled on the ports in the protection group. For a BLSR/ MS-SPRING ring protection group at least one DCC channel (MS-DCC or RS-DCC or MX-DCC) must be enabled on each working line. See below for the related requirements on enabling/disabling. Only DCC-channels on the working-line of a 4-fiber ring are not used for ring map discovery.

Requirements on enabling/disabling DCC channels

The following requirement have to be observed for enabling/disabling DCC channels in BLSR/MS-SPRING protection groups:

- If there is no DCC (MS-DCC or RS-DCC or MX-DCC) enabled on each port of a 2-fiber BLSR/MS-SPRING protection group, the creation of the protection group is denied.
- If there is no DCC (MS-DCC or RS-DCC) enabled on each working-line port of a 4-fiber BLSR/MS-SPRING protection group, the creation of the protection group is denied.
- DCC-disabling on a port of a 2-fiber BLSR/MS-SPRING protection group is denied if no other DCC channel (MS-DCC or RS-DCC) is available on that port.
- DCC-disabling on the port of the working line of a 4-fiber BLSR/MS-SPRING protection group is denied if no other DCC channel (MS-DCC or RS-DCC) is available on that port.

Enabling of DCCs

When a circuit pack is inserted into a slot, the RS/MS-DCC on a port is in disabled state. Each RS/MS-DCC has to be enabled explicitly on each port.

The Section/RS-DCC and/or Line/MS-DCC channels of any optical interface port can be enabled, as long as

- the optical port is (pre-)provisioned
- DCC channels are available.

A DCC can be enabled manually by user provisioning.

A DCC will be successfully enabled if an LAPD channel exists that can be assigned to this DCC in the unprotected mode.

DCC pre-provisioning

A DCC can be pre-provisioned to be enabled for a provisioned or pre-provisioned optical interface port even if the port is not physically equipped.

Disabling of DCCs

A DCC (RS-DCC or MS-DCC) can be disabled in either of the following ways:

- Automatically when an optical interface port is de-provisioned.

When an optical interface port is provisioned to be removed (de-provisioned), then all enabled DCCs will be disabled, and the corresponding LAPD channels will be released.

- Manually by user provisioning.

  Important! Disabling a previously enabled DCC at a local NE needs to be coordinated with disabling the same DCC at the opposite end of the DCC link (remote NE) to avoid persistent communication alarms from the remote NE.

LAPD mode

The LAPD protocol, which controls communication between the NEs, operates in either of the following modes:

- ***Network Side***
  The LAPD is assigned as Network. This mode complies with the standards and interoperates successfully with other LAPDs operating in user_side mode.
- ***User Side***
  The LAPD is assigned as User. This mode complies with the standards and interoperates successfully with other LAPDs operating in network_side mode.

Please note that the DCCs work according to the master/slave principle, i.e. the LAPD modes of two interconnected SDH ports must be set differently. A corresponding “User-Network Side Failure” alarm will be generated if the LAPD mode is the same at both ends of a DCC.

AITS and UITS supported

LambdaUnite MSS NEs support the Acknowledged Information Transfer Service (AITS) and the Unacknowldeged Information Transfer Service (UITS) as the basis for the LAPD protocol with the UITS mode being the default mode of operation. AITS should only be used if required by other NE types. UITS is furthermore used for link protocol at the same time when AITS is chosen.

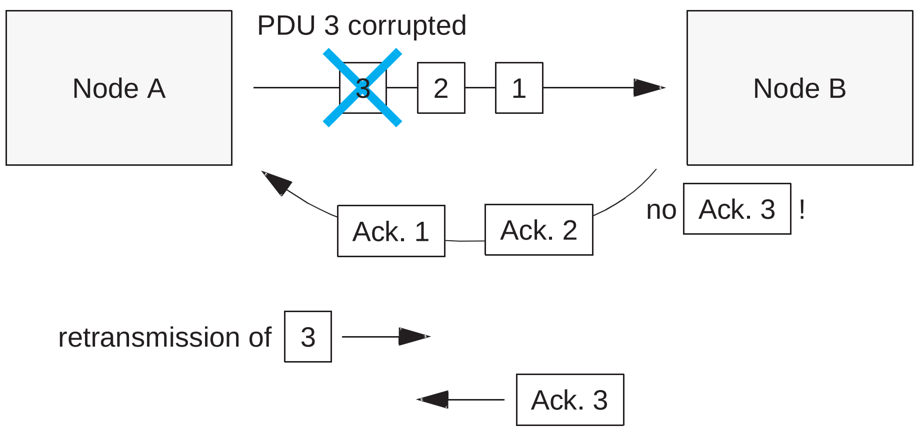
AITS and UITS functional principles

In the LAPD protocol, all PDUs are sent with a checksum to verify that the data has not been corrupted during the transmission over the

DCC link. If a PDU is received with a bad checksum, it is not acknowledged and will be resent:

- In the ***Unacknowldeged Information Transfer Service*** (UITS) (default), corrupted PDUs are ignored and no further actions taken. Upper layers of the OSI stack are responsible for recovery actions.
- In the ***Acknowledged Information Transfer Service*** (AITS), PDUs are numbered and transmitted sequentially, and acknowledgement PDUs are sent back from the receiver to the sender. If a PDU is lost, that is, if the sender gets no acknowledgement, the PDU is retransmitted.

Functional principle of the AITS



Routing metric

The shortest-path-first (SPF) algorithm calculates the preferred route between two nodes based on the cost of a route. The cost of a route is described by a single dimensionless routing metric.

The *LambdaUnite* MSS system makes use of the default routing metric as defined in ISO 10589.

□

LAN access

Overview

4 LAN ports with automatic 10/100BASE-T selection are supported. All LANs have an own MAC address. No hub is supported in HW on the CTL/DCF.

The 4 LAN ports are available as follows:

1. LAN1: Internally connected via the CIP [8] to the CTL/DCF. Accessible on User Panel (UPL), intended for CIT access.
2. LAN2: Internally connected via the CIP to the CTL/DCF. Accessible on LAN I/O-Panel at the rear, intended for EMS access.
3. LAN3: Internally connected via the CIP to the CTL/DCF. Accessible on LAN I/O-Panel at the rear, reserved for future applications (e.g. SNN, or as backup port for the EMS).
4. LAN4: Internally connected via the CIP to the CTL/SCF. Accessible on LAN I/O-Panel at the rear, intended for interworking with Xtreme. This LAN interface is HW-prepared only. There is no protocol definition available yet.

LAN connectors

The RJ-45 LAN connectors are located on the User Panel (connector labelled “CIT (LAN)”) and on the LAN I/O-Panel at the rear (connector labelled “LAN 2”).

□

Gigabit Ethernet Interface

Overview

LambdaUnite™ MSS supports a Gigabit Ethernet interface. The GE1/SX4 interface conforms to the standards outlined in IEEE 802.3/IEEE 802.1Q, and supports the 1000BASE-SX protocol.

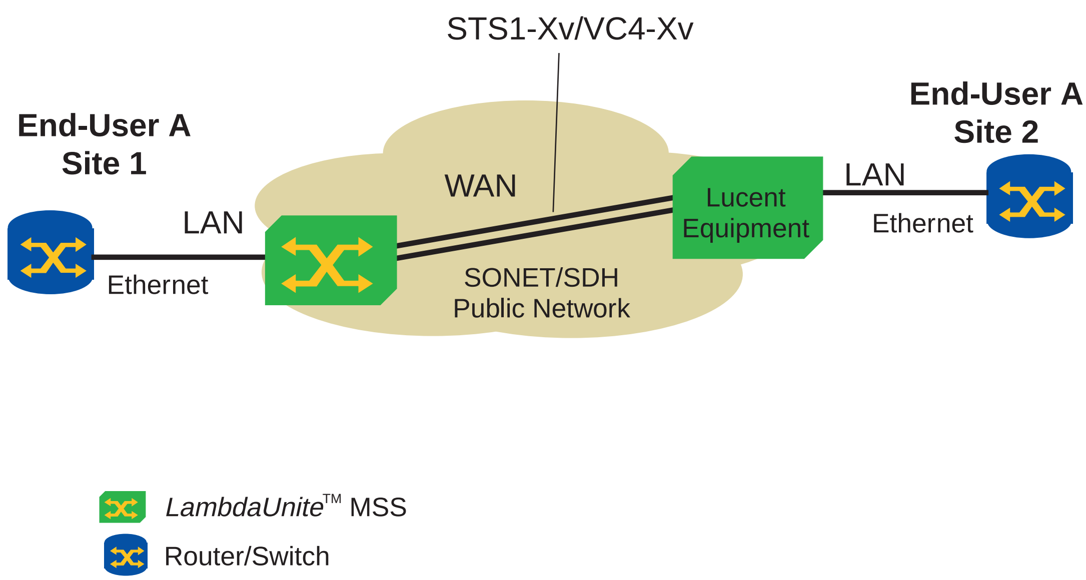
Gigabit Ethernet is mapped in up to 21 virtually concatenated STS-1 or in up to 7 virtually concatenated VC-4. 10GbE is mapped into one contiguous concatenated STS-192c or VC4-64c. Value proposition is mainly the more cost efficient solution than connecting the routers via OC48 (STM-16) or OC192 (STM-64) due to cheaper interface costs compared to OC/STM ports and due to higher metro/back bone fiber utilization in case of GbE with virtual concatenation compared to mapping GbE directly.

Capabilities

The GE1/SX4 interface supported by *LambdaUnite* MSS allows you to transport Gigabit Ethernet (GbE) signals over SONET/SDH networks by encapsulating Ethernet packets in virtually concatenated SPEs/VCs. Each GE1/SX4 port unit offers four 1000BASE-SX Ethernet LAN ports. The GbE interface supports point-to-point connectivity. The capacity per GbE line is 21 STS-1s/7 VC-4s.

Mode of operation

LambdaUnite MSS operates in point-to-point mode. The point-to-point application is used to interconnect two sites of a customer, each of which has a LAN interface. Another application is the interconnection of two service provider routers that have Ethernet interfaces. The service offered by a point-to-point LAN connection can be compared with a leased-line. Some dedicated SONET/ SDH bandwidth is allocated to the connection between both end-points. The virtual concatenation mapping allows the operator to assign the proper amount of SONET/SDH bandwidth: “Right-sized Pipes”. The Ethernet frames from the Gigabit Ethernet LAN ports are transported over the SONET/SDH network using virtual concatenation: STS1-Xv (X=1..21) or VC4-Yv (Y=1..7). The user can provision the capacity (X or Y) of the WAN ports to allow flexible allocation of SONET/SDH network capacity for Ethernet transport. Two basic modes of operation are distinguished for point-to-point applications: repeater mode and bridge mode.



Repeater Mode

The simplest form of Ethernet transport is to transparently forward all frames on the WAN that are transmitted by the end-user via the LAN; this mode is called repeater mode (also referred to as promiscuous mode or no-tag mode). In this mode minimal provisioning is necessary. Full transparency can only be obtained when sufficient bandwidth is allocated on the WAN (X=21 or Y=7). Packet loss may occur in scenarios where less bandwidth is allocated on the WAN. To prevent such packet loss one can enable flow-control over the LAN interface towards the end-user. The difference between a hub or repeater in the sense of IEEE802.3 and the repeater mode described here is two-fold: first the repeater mode will operate in store-and-forward mode; secondly, flow-control frames are not transparently forwarded, but interpreted.

VLAN tagging mode

In the VLAN (Virtual Local Area Network) tagging mode frames are processed according IEEE802.1D bridging and uses IEEE802.1Q VLANs. In a point-to-point application the main functions are MAC address learning, VLAN filtering and priority queuing. MAC address learning helps prevent that frames are forwarded over the WAN link while the destination is local. VLAN filtering helps in preventing forwarding unwanted or unnecessary VLANs of the WAN link. Priority queueing allows the operator to support service differentiation: high priority tagged frames are always forwarded before low priority tagged frames. In case of a low capacity WAN link low priority tagged frames are more likely to be dropped during congestion. Another important application for bridge mode is when the remote WAN to LAN bridge is a multi-point or LAN trunk node on the network.

Media Access Control (MAC)

Configuration and operation of the Learning Process and the Filtering Database such that, for a given set of VLANs, if an individual MAC Address is learned in one VLAN, that learned information is used in forwarding decisions taken for that address relative to all other VLANs in the given set.

The GE1/SX4 card maintains 9 MAC addresses for each LAN, WAN and the CPU. The MAC addresses need to be world wide unique and are programmed at the factory. Only the first of 9 sequential addresses is stored in the SEEPROM of each GE1 card. The 9 MAC addresses are assigned through a fixed binding to the 9 MACs under software control: MAC1-MAC4 for LAN port 1 till 4, MAC5-MAC8 for WAN port 1 till 4, MAC9 for the CPU.

Priority Queuing

When a GbE port is in IEEE VLAN tagging mode it offers some ″service differentiation″. Individual Ethernet frames are treated differently depending on the user priority field in the IEEE VLAN tag. The GbE card implements two transmit queues per port. Ethernet frames with a user priority of 4, 5, 6 or 7 are maintained in the high priority queue, the other frames in the low priority queue.

When an Ethernet frame is to be transmitted, the card will always serve the high priority queue first (strict priority scheduling).

For example, first assume a full rate SONET/SDH capacity (e.g.: 1000 Mbit/s over VC-4-7v). Because the GbE port and the SDH capacity are equal, the two queues can always be served in time and the end user should not observe any packet loss or special behavior depending on the user priority. In a second scenario the operator allocates lower SONET/SDH capacity for GbE transport, say 300 Mbit/s. Ethernet frames will be dropped depending on the offered mix of frames with high or low user priority. Assume 500 Mbit/s is offered on average of which 100 Mbit/s is high priority frames and 400 Mbit/s is low priority frames. Since only 300 Mbit/s is available the end user will observe that all of high priority frames are transported successfully and only 200 Mbit/s of low priority frames. If the amount of high priority frames is higher than the allocated SONET/SDH bandwidth then all low priority frames are dropped. This behavior can be compared to the general data networking engineering rule that in a priority aware network the percentage of high priority traffic must be low enough to not impede the behavior of priority queueing.

Flow Control

The priority queueing also interacts with flow control. The flow control effectively only operates on the high priority queue. This means that the GbE card will not signal **Pause on** if the internal queues are filled with low priority frames; otherwise it could potentially halt transmission of high priority frames.

The operator can use the parameter **Default user priority** on *WaveStar*® CIT to support various priority queuing schemes:

- If the operator wants to create the above described priority queueing service and the end user equipment supports IEEE VLAN tagged frames only, or a mix of IEEE VLAN tagged and untagged frames, then the default user priority must be set to **Low**.
- If the end user equipment only supports untagged Ethernet frames, all are queued in the same queue according to what was provisioned on EMS for the default user priority. Priority queueing is not available.
- If the operator does not want to support priority queueing then the default user priority must be set to **High**: all frames are queued in the same queue independent of tagged or untagged and independent of the user priority field of the VLAN tagged frames.

Link Aggregation Application

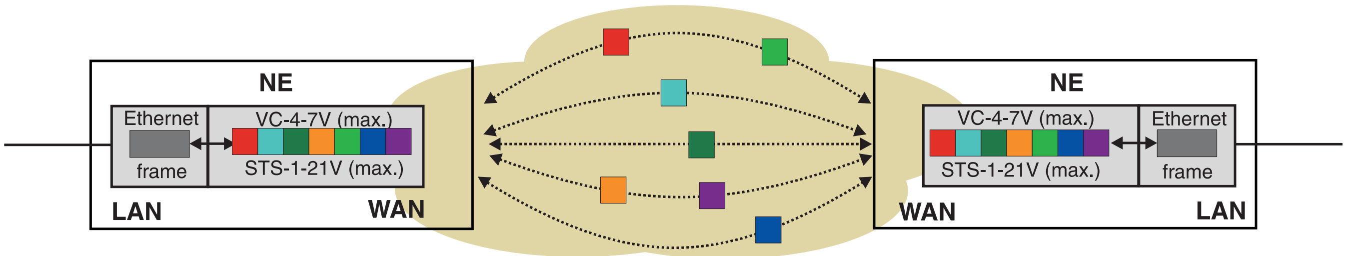
In point-to-point applications the end-user may want to use link aggregation (LAG) between the end-user equipment to create a transport capacity of more than 1 Gb/s. Two or more GbE links are bundled to create a larger capacity transport pipe. The external routers can use the LAG protocol to set up and maintain the bundled LAN ports. UNITE is not involved in the protocol itself but is fully transparent for the protocol, especially the LAG protocol PDUs.

Virtual concatenation

STS-1/VC-4 concatenation can be used for the transport of payloads that do not fit efficiently into the standard set of synchronous payload envelopes (SONET) or virtual containers (SDH). Virtual concatenation splits the contiguous bandwidth into individual SPEs/VCs, transports these SPEs/VCs and recombines them to a contiguous functionality only at the path termination equipment, i.e. the GE1/SX4 Gigabit Ethernet circuit pack.

The following figure shows the principle of virtual concatenation in a point-to-point Gigabit Ethernet (GbE) network application example. Protection of the STS-1-Kv/VC-4-kv traffic is possible via

UPSR/SNCP and in ring topologies via BLSR/MS-SPRing protection schemes.



The H4 POH byte is used for the sequence and multi-frame indication specific for virtual concatenation.

Due to different propagation delay of the STS-1s/VC-4s a differential delay will occur between the individual STS-1s/VC-4s. This differential delay has to be compensated and the individual STS-1s/VC-4s have to be re-aligned for access to the contiguous payload area. The *LambdaUnite* MSS re-alignment process covers at least a differential delay of 32 ms.

Link Capacity Adjustment Scheme

Link Capacity Adjustment Scheme (LCAS) is an extension to virtual concatenation that allows dynamic changes in the number of STS-1/VC-4 channels per connection. In case channels are added or removed by management actions this will happen without loosing any customer traffic. LCAS allows a bandwidth service with scalable throughput in normal operation mode. In case of failure the connection will not be dropped completely only the affected STS-1s/VC-4s. The remaining channels will continue carrying the customer traffic. The implemented link capacity adjustment system (LCAS) provides automatic decrease of bandwidth in case of link failure and reestablishment after link recovery.

Interworking

LambdaUnite MSS supports interworking on WAN port side with the following NEs in a point-to point application:

- *LambdaUnite* MSS
- DMX
- *WaveStar*TDM10G
- ADM 16/1
- ADM 16/1c

Interworking with non-Lucent equipment via the WAN interface is only possible in repeater mode, without VLAN tagging.

□

Name-to-address translation

Overview

The communication between *LambdaUnite*™ MSS NEs and their management systems, such as the *Navis*™ Optical EMS, is established by using TL1 command messages.

A TL1 message addresses a NE by its ***name***, also referred to as its target identifier (TID), whereas nodes within an OSI network are identified by their NSAP address. Hence a name-to-address translation becomes necessary.

Naming conventions

“NE name” and “TID” are used synonymously throughout this Provisioning Guide.

TID to NSAP-address translation

LambdaUnite MSS offers two possible ways to accomplish the TID to NSAP-address translation:

1. A static routing table; please refer to “Static routing” (8-47) (starting below).
2. The TID Address Resolution Protocol (TARP).

To establish a management association to a remote NE, the *WaveStar*® CIT first evaluates the static routing table. If the corresponding name/address pair cannot be found in the table, the TARP will automatically be used.

Static routing

The complete area address part of the NE’s NSAP address is configurable. Therefore, the *WaveStar* CIT allows static routing, i.e. the TID-to-NSAP-address translation is realized by using a static routing table (Name/Address List) stored in the *WaveStar* CIT.

The Address List is used to provision the TIDs and NSAPs and/or IP addresses for NEs that might be connected to the *WaveStar* CIT via OSI. Provisioning IP addresses into this local *WaveStar* CIT file does not set or change the NE’s IP address, which is done via the Data Communication, but provides a method for giving the CIT the IP addresses of an NE to which the CIT is to be connected in the absence of a DNS. This is necessary since there is no equivalent in TCP/IP to the OSI/TARP capability to broad-cast a TID on the network and receive back the NSAP from the NE that has that TID.

For systems that have no access to an SDS database and which do not support TARP for Name/Address resolution, it is necessary to provide a mechanism to manually enter a list of TID/NSAP pairs.

Static routing table

The static routing table

- must be constructed and maintained manually by a system administrator and
- must be synchronized in ***all*** *WaveStar* CITs managing the NEs.

TARP

The TID Address Resolution Protocol (TARP) acc. to Telcordia Technologies (formerly Bellcore) GR-253 standard provides a means to perform the TID to NSAP address translation dynamically by means of TARP Protocol Data Units (TARP PDUs), originating from an end system such as the *Navis* Optical EMS.

Three basic TARP functionalities can be distinguished:

- TARP originator functionality
- TARP propagation functionality
- TARP responder functionality

TARP originator functionality

The TARP originator functionality means the ability to spontaneously originate a TARP PDU type 1, 2 or 5 query and broadcast it over the OSI network.

TARP propagation functionality

The TARP propagation functionality means the ability to evaluate a received TARP PDU type 1, 2 or 5 query and to further broadcast it over the OSI network if the requested TID or NSAP address does not match the NE’s TID or NSAP address, and if the requested TID or NSAP address could not be found in the TARP Data Cache.

A TARP propagator decrements the lifetime of a received TARP PDU by one and broadcasts the modified PDU to all of its network neighbors (with the exception of the previous PDU sender). When the TARP PDU lifetime becomes zero, then no further propagation takes place.

TARP responder functionality

The TARP responder functionality means the ability to respond to a TARP PDU type 1, 2 or 5 query via a type 3 response (cf. “Types of TARP PDUs” (8-49)).

Types of TARP PDUs

The following table shows the five defined types of TARP PDUs.

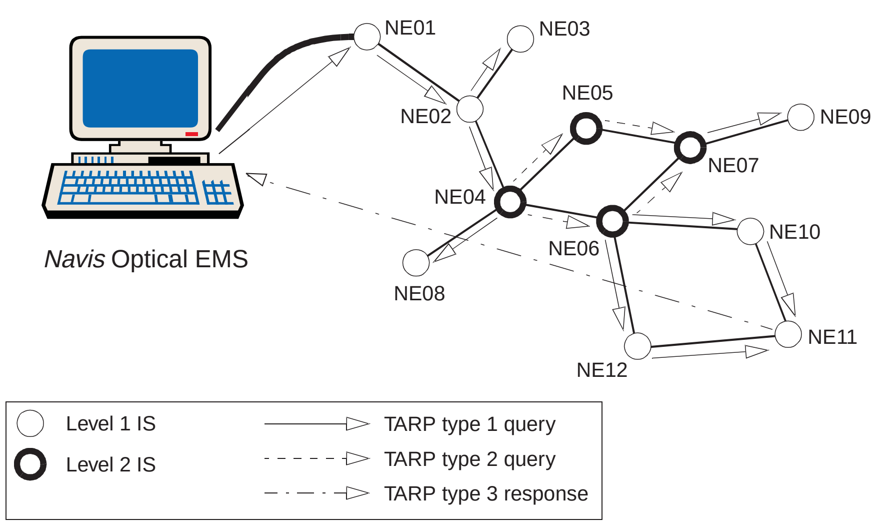
Type	Characteristic	Description
1	Query	Given an NE name (TID), the corresponding NSAP address is requested (restricted to IS-IS level-1 area).
2	Query	Given an NE name (TID), the corresponding NSAP address is requested (IS-IS level-1 and 2 areas).
3	Response	Response to a TARP Query.
4	Autonomous notification	Autonomous notification of a TID or NSAP address change, or a reset indication.
5	Query	Given an NSAP address, the corresponding NE name (TID) is requested.

Supported TARP functionality

LambdaUnite MSS NEs support the TARP originator, propagation and responder functionalities. These functionalities can be either enabled or disabled. If T-TD is used in a GNE the TARP originator functionality must be enabled for this NE.

TARP example

The following figure shows an example to illustrate the TARP functional principle.



When a user requests to establish a management association to NE11 and the corresponding NSAP address cannot be found in the static routing table, then the *Navis* Optical EMS originates a TARP type 1 query. This query will be propagated over the network until it reaches NE11. NE11 then sends a TARP-type-3 response directly back to the *Navis* Optical EMS.

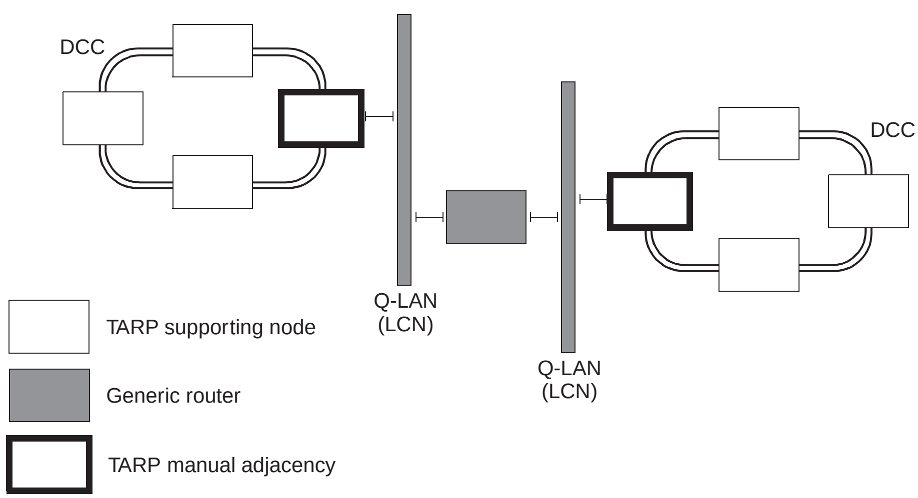
Please note that the TARP Data Cache was not taken into consideration for this example.

Network services/protocols

TARP depends on the network layer services and protocols provided by the Connectionless Network Service/Connectionless Network Protocol (CLNS/CLNP) and the ES-IS and IS-IS routing protocols (cf. “ISO-OSI network protocols” (8-4)) to obtain information about the network neighbors of an NE.

TARP manual adjacencies

By using TARP manual adjacencies it is possible to route TARP PDUs over subnetworks which do not support the TARP functionality. However, a precondition is that the nodes within the non-TARP subnetwork are “generic routers”. A TARP manual adjacency is simply the Network Entity Title (NET; cf. “Network entity title NET” (8-30)) of a node that supports TARP.



Configuration of TARP parameters

For information on the configuration of TARP parameters, please refer to the following procedures:

- “Configuring the TARP parameters for an NE” (1-38),
- “Assigning TARP manual adjacencies” (1-40).

NE name administration

Overview

Purpose

This section provides information about the NE name administration.

Contents

NE name administration

Definition

NE Name (TID) The NE name, also referred to as the NE's target identifier (TID), is an alphanumeric string of up to 20 characters, used to uniquely identify a NE within the network.

NE name and ***TID*** are used synonymously throughout this Provisioning Guide.

Configuration rules

The following NE name configuration rules must be observed:

- The following characters are allowed in an NE name:
  - Upper case letters ('A' .. 'Z'),
  - Lower case letters ('a' .. 'z'),
  - Digits ('0' .. '9'),
  - Special characters ("-", "+", "_", ".", "/"),
- Each NE name must be unique within the network.
- Each NE name must be maximally 20 characters in length.

  Important! NE names are case insensitive.

Examples:

The following are examples for valid NE names.

- "NE-A1", "CHICAGO7", "NY-B3-C5","NE-01", "CHICAGO-7" or "NY-3/5" are valid NE names.

Changing the NE name

For information on how to change the NE name, please refer to "Modify an NE" (1-11).

☐

9 Equipment provisioning concepts

Overview

Purpose

This chapter gives you an overview of the hardware components of the *LambdaUnite*™ MSS NEs which have to be configured.

Contents

Equipment provisioning and autoprovisioning

What does equipment provisioning mean?

Equipment provisioning is the pre-configuration of NE components before protection groups and cross-connections can be defined.

Provisioning can take place for the first time after the installation of the equipment (initial provisioning) or when re-configuration of the *LambdaUnite*™ MSS in an existing SDH or SONET network is necessary.

The following components have to be provisioned initially:

- System
- Slots/circuit packs
- Optical ports
- Tributaries.

Equipment provisioning can be carried out with the *Navis*™ Optical EMS. The configuration data is placed in the NE and stored in a non-volatile memory (NVM) on the ***CompactFlash***™ card.

Autoprovisioning

Some of the components are autoprovisioned. This means some system parameters are assigned automatically after installation and system start. These are:

- System control and DCC control circuit pack
- Plugged-in Switch circuit packs with timing generator functions
- Synchronization default mode (free running)
- Equipment protection (if two XC320 are available)
- DCC default modes: LAPD role is set automatically via auto-negotiation, DCC-R (Section DCC) and DCC-M (Line DCC) are disabled, AITS mode
- All mandatory circuit packs in the shelf and all circuit packs which are already plugged-in during system start.

A modification of the autoprovisioned parameters is possible.

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Navis™ Optical EMS methods to perform provisioning

Overview

The *Navis* Optical EMS supports two different methods, graphical and windows-style explorer, to perform provisioning tasks. You may choose to use only one of the methods or a combination of the two. Generally, you can switch from one method to the other at any time.

Graphical

The following steps demonstrate the graphical method.

1 A graphic drawing of the shelf 1-1 is displayed. Note that each port unit has a light-emitting diode (LED) associated with each port. Each LED displays the alarm status (for example, green = no alarm, red = critical alarm, yellow = major alarm, cyan= minor alarm) for the associated port.

2 Place the cursor anywhere on a circuit pack and right-click to select the circuit pack.

3 Place the cursor on a port-unit LED and right-click to select a port on the circuit pack.

4 Select **Provision Circuit Pack** or **Provision Port #** in the pop-up menu to provision the selected circuit pack or port.

All provisionable parameters for the selected circuit pack or port are displayed in the pop-up dialog box. You can select each parameter and display or change the parameter for a specific application.

END OF STEPS

Windows-style explorer The following steps demonstrate the windows-style method:

1 Select **Configuration** → **Provision...** in the *LambdaUnite*™ MSS Shelf 1-1 window.

Result:

A Windows-style explorer window opens.

2 Do one of the following:

- Enter the AID (for example, 1-1-#-#-1-1) of the desired component in the **Enter AID:** field, or
- In the left side of the window, click the "+" symbol left to shelf to expand shelf information.
  1. Select the desired circuit pack or slot location.
  2. Select the desired port.

3 Select the **Provision** button at the bottom of the window.

The provisionable parameters of the selected port are displayed in the right portion of the window. You can select each parameter and display or change the parameter for a specific application.

END OF STEPS

Provisioning of new components

Overview

You can add new components to an existing system. This can be necessary during reconfiguration or after installation. The following components can be added:

- Circuit packs
- Protection groups

Invocation

Select in the main menu **Configuration** → **Create New**. In the pop-up menu you can select the desired component.

Parameters

Already while creating a component you can define some parameters of the respective component:

- Circuit Pack
  New circuit packs can be established. The circuit pack types can be selected. In the selection window for new circuit packs only the circuit packs, which are suitable for the respective slot can be selected.
- Protection Group
  LambdaUnite™ MSS supports both, SDH and SONET ring protection features. All entities which are necessary for the creation of a new protection group can be selected. They can be part of the following protection types:
  - 1+1 MSP/1+1 APS
  - MS-SPRing/BLSR

  For further information on the protections please refer to “Protection mechanisms” (11-37).

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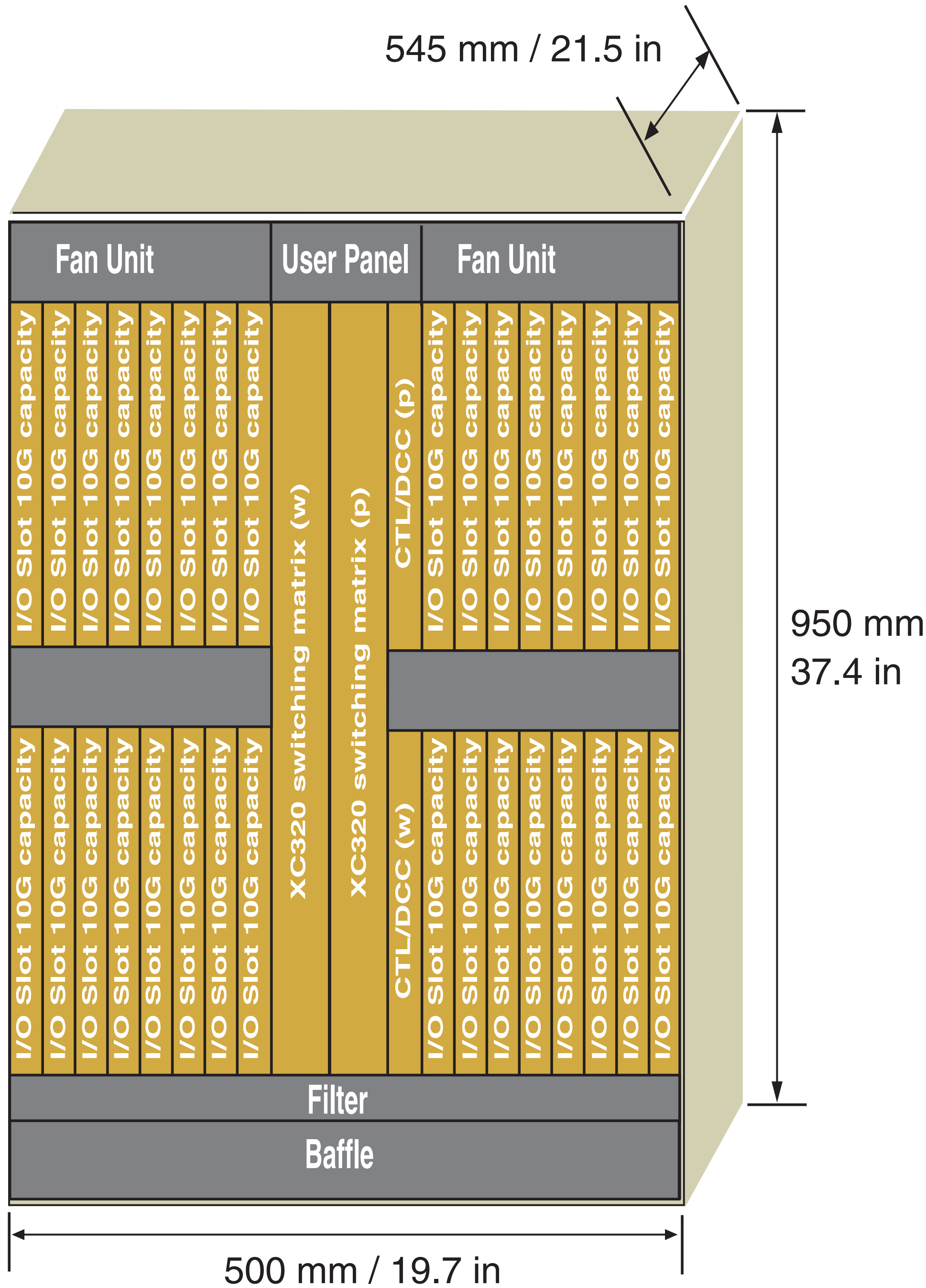
Shelf configuration

Overview This chapter describes the configuration of the shelf of the *LambdaUnite*™ MSS.

Layout (front view)

The following figure depicts the *LambdaUnite* MSS shelf circuit pack slots.



Minimum complement of circuit packs

The minimum complement of circuit packs required for an operational *LambdaUnite* MSS shelf is

- Working XC320 circuit pack (switch and timing functions)
- CTL circuit pack (controller functions)
- Any interface circuit packs in the universal slots

A shelf equipped with these circuit packs would be fully functional. Other essential parts of the system which always have to be installed in the shelf are the Power Interfaces (PI), the fan unit, the User Panel and a CI-CTL.

Circuit pack slots

The following table identifies the circuit packs used in the *LambdaUnite* MSS shelf.

Slot Designation	Slot Equipage
universal slots (32)	Any mix of transmission interface circuit packs: • 155 Mbit/s port units (future release) • 622 Mbit/s port units (future release) • 2.5 Gbit/s port units • 10 Gbit/s port units • 40 Gbit/s port units (future release) • 1 Gigabit Ethernet interface • 10 Gigabit Ethernet interface (future release)
Controller slot (working)	CTL circuit pack. System controller including non-volatile memory and DCC controller for the whole NE.
Controller slot (protection)	Reserved for future use.
320G switch slot (working)	The switching circuit pack in this slot can make cross-connections for 6144 STS-1 / 2048 VC-4 equivalent circuits. This switch is paired with 320G switch (protection) in a 1+1 non-revertive protection mode configuration. Furthermore, this circuit pack contains the timing generator function for the NE.

Slot Designation	Slot Equipage
320G switch slot (protection)	The switching circuit pack in this slot can make cross-connections for 6144 STS-1 / 2048 VC-4 equivalent circuits. This switch is paired with 320G switch (working) in a 1+1 non-revertive protection mode configuration. Furthermore, this circuit pack contains the timing generator function for the NE. After initial power up of the system this circuit pack is in standby mode.

Overview of access identifiers

Overview

Access identifiers (AIDs) are used for addressing particular components within a *LambdaUnite*™ MSS system, like a shelf, circuit pack, slot or port, for example. An AID is case-insensitive, but AID values are usually given in lower case.

Hierarchical structure

AIDs are hierarchically structured. The following table provides an overview of the general AID structure by presenting some examples.

Entity	Format	Example
Network element	bay	1
Shelf	bay-shelf	1-1
Protection group	bay-shelf- protection group	1-1-t001
Slot	bay-shelf-#-#-slot	1-1-#-#-1
Circuit pack	bay-shelf-#-#-slot-cp	1-1-#-#-1-cp
Port	bay-shelf-#-#-slot-port	1-1-#-#-1-1
Tributary	bay-shelf-#-#-slot-port-trib	1-1-#-#-1-1-1

The entity network element refers to a logical unit which can be composed of up to the shelf.

The “#” character serves as a wildcard if a particular AID field cannot be specified, instead of leaving the field empty.

General AID structure

The general AID structure is based on the assumption that there is a hierarchy associated with the system entities in the order of bay, shelf, protection group, line/side, slot, port/circuit pack and tributary. Therefore, the general structure consists of these entities separated by “-”:

- ***bay-shelf-protection group-line/side-slot-port/circuit pack-tributary***

Some entities such as the system itself fall out of this hierarchy and are handled separately.

An AID may not exceed 20 characters in length (including “-”).

Simple and compound AIDs

Access identifiers can be distinguished into simple and compound AIDs. For example, “system” or “estgrp” are simple AIDs. Compound AIDs follow the general AID structure given in the previous paragraph.

Please refer to “Overview of AIDs” (9-11) for an overview of *LambdaUnite* MSS AIDs.

The “all” AID entry

Access identifiers allow for the specification of a range of entities by using the term **all**. The **all** AID entry may be used in the bay, shelf, slot, port, and tributary fields. It can neither be used in the protection group field nor in the side/line field.

If **all** is used in the bay and/or shelf AID fields, it cannot be used in any other AID fields.

Overview of AIDs

The following table gives an overview of the access identifiers defined for *LambdaUnite* MSS. If there are several values possible for an entry, they are given in curly braces ({ }).

Entity	Access Identifier
System	
system	system
Nodes	
OSI Nodes	osinode{1-9} osinodeall
Bay	
Bay	1 all
Shelf	
Shelf	1-1 1-all
Protection Group	

Entity	Access Identifier
1+1 Facility Protection Group	1-1-o{001-999} 1-1-oall
1:N Facility Protection Group	1-1-n{001-999} 1-1-nall
2-F BLSR Facilility Protection Group	1-1-t{001-999} 1-1-tall
4-F BLSR Facilility Protection Group	1-1-f{001-999} 1-1-fall
1+1 Switch and Timing Equipment Protection Group	1-1-estgrp
1+1 System Controller Equipment Protection Group	1-1-ectlgrp
Slot	
All slots	1-1-#-#-all
Universal Slots	1-1-#-#-{1-8, 12-19, 21-28, 32-39} 1-1-#-#-all 1-1-#-#-usall
Cross-Connect Slots	1-1-#-#-xcp 1-1-#-#-xcw 1-1-#-#-xcall
Controller Slots	1-1-#-#-ctlp 1-1-#-#-ctlw 1-1-#-#-ctlall
Circuit Packs	
Universal Slots Circuit Packs	1-1-#-#-{1-8, 12-19, 21-28, 32-39}-cp 1-1-#-#-usall-cp
Cross-Connect Circuit Packs	1-1-#-#-xcp-cp 1-1-#-#-xcw-cp 1-1-#-#-xcall-cp
Controller Circuit Packs	1-1-#-#-ctlp-cp 1-1-#-#-ctlw-cp 1-1-#-#-ctlall-cp

Entity	Access Identifier
NVM	
NVM	1-1-#-#-ctlp-nvm 1-1-#-#-ctlw-nvm 1-1-#-#-ctlall-nvm
Port	
I/O Port (Generic type)	1-1-#-#-{1-8, 12-19, 21-28, 32-39}-{1-4} 1-1-#-#-{1-8, 12-19, 21-28, 32-39}-all
Port Access to User bytes	1-1-ubio{1-6} 1-1-ubioall
LAN Ports	1-1-lan{1-3} 1-1-lanall
Virtual Concatenation Group (VCG)	1-1-#-#-{1-8, 12-19, 21-28, 32-39}-v{1-4} 1-1-#-#-{1-8, 12-19, 21-28, 32-39}-vall
Tributary	
AU-3/STS-1 Tributary	1-1-#-#-{1-8, 12-19, 21-28, 32-39}-{1-4}-{1-768} (SONET format) 1-1-#-#-{1-8, 12-19, 21-28, 32-39}-{1-4}-all
VCG Tributary	1-1-#-#-{1-8, 12-19, 21-28, 32-39}-v{1-4}-{1-21} 1-1-#-#-{1-8, 12-19, 21-28, 32-39}-v{1-4}-all
Interfaces	
Power Interfaces	1-1-pia 1-1-pib 1-1-piall
Timing Interfaces	1-1-tia 1-1-tib 1-1-tiall
Backplane	1-1-backpl
User panel	1-1-usrpnl
CI-CTL	1-1-cictl
Fans	
Fan unit	1-1-fan 1-1-fanall

Entity	Access Identifier
External Timing References	
External Timing reference	extref1 extref2 extrefall
Line Timing references	line1 line2 line3 line4 line5 line6 lineall
Timing Ports	
External Timing Input Port	exttmg0 exttmg1 exttmgall
External Timing Output Port	exttmg0_out exttmg1_out exttmgall_out
Timing Output	outtmg
Miscellaneous Discrete Inputs and Outputs	
Miscellaneous Discrete Alarm Points: Inputs	misc_in{1-8} misc_inall
Miscellaneous Discrete Alarm Points: Outputs	misc_out{1-8} misc_outall

□

Shelf provisioning

Overview

Shelf provisioning allows the user to configure parameters associated with the shelf.

Parameters

The following parameter can be viewed:

- ***Shelf AID***

The following parameter can be set:

- ***Alarm Severity Assignment Profile***
  An Alarm Severity Assignment Profile (ASAP) is a list of alarms that can occur in an NE and which have each an alarm severity assigned. Several ASAPs for different functional categories are predefined for the *LambdaUnite*™ MSS system.

Slot/circuit pack provisioning

Slot provisioning

Slot provisioning allows the user to configure parameters associated with a specific slot.

Parameter

The ***Alarm Severity Assignment Profile*** can be selected.

Circuit pack provisioning

Circuit pack provisioning allows the user to configure parameters associated with a specific circuit pack.

Parameters

The ***Alarm Severity Assignment Profile*** can be selected.

ASAPs

An Alarm Severity Assignment Profile (ASAP) is a list of alarms that can occur in an NE and which have each an alarm severity assigned. Several ASAPs for different functional categories are predefined for the *LambdaUnite*™ MSS system.

□

Port and tributary provisioning

Optical ports

Optical port provisioning allows the user to configure parameters associated with a specific optical port.

Tributary provisioning

Tributary provisioning allows the user to configure parameters associated with a specific tributary belonging to a port .

□

Cut-Through commands

Introduction

In order for the user to execute NE native commands that may not be explicitly supported by a particular release of *Navis*™ Optical EMS, a cut-through capability has been developed. In addition, with the command builder and broadcaster, TL1 cut-through gives the user powerful capabilities. See "Perform cut-through commands" (2-11), "Build TL1 commands" (2-13), "Broadcast TL1 commands" (2-15).

Two additional points to remember

- *Navis* Optical EMS allows the user access to only the NEs and associated commands defined by the Target and Command groups for which the user is validated.
- Not all TL1 commands displayed in the Cut-Through window can be executed. The capability to execute commands depends on the subnetwork equipment.

TL1 commands

Instructions about actual TL1 commands can be found in the TL1 Reference Manual.

Initiating an NE cut-through session

The NE Cut-Through window allows you to access and communicate with an NE, using the TL1 command set. You can submit TL1 cut-through commands to the NE directly. (For specific NE command information, see the appropriate NE documentation.)

Building TL1 commands

The TL1 macro builder allows you to create a TL1 command file to assist in performing maintenance and provisioning activities on one or more NEs (such as download of standard configuration), without having to manually enter a set of TL1 command strings. This feature both reduces the amount of manual entry needed to create TL1 command strings and allows for the reuse, at a later time, of the commands built on the same NE or other NEs of the same type.

Broadcasting TL1 commands to NEs

The broadcasting TL1 commands feature allows you to perform maintenance and provisioning activities (such as download of standard configuration) on one or more NEs, utilizing the TL1 command files created by the TL1 macro builder feature, and broadcasting those files to multiple NEs of the same type. This feature saves you time by performing similar tasks on multiple NEs in one step, and by reducing the manual entry required in the creation of TL1 command strings.

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Equipment protection

Principle

An equipment protection always involves one or more plug-in units which carry traffic (***working*** plug-in unit) and one plug-in unit which will assume the function of a plug-in unit that has failed (***protection*** plug-in unit). Together they form a ***protection group***.

Types

For the following objects, equipment protection is supported:

- Cross-connect and timing generator circuit pack XC320: 1+1
- Redundant Power supply

Cross-connect and timing generator unit protection

A XC320 can be protected 1+1 by another XC320. Both the cross-connect function as well as the timing function are protected on this way and build a single protection object. The equipment protection process of the XC320 will be fully performed by a central process in the CTL.

The standby XC320 works in the so called hot-standby modus, which means both XC320 work in parallel. The whole configuration of the XC320 is broadcasted by the CTL to both the active as well as the standby unit.

Creation

The equipment protection group is created automatically if

- the second XC320 unit is plugged in the shelf
- the two slots for the working and the protection XC320 are preprovisioned
- one of the two slots is autoprovisioned and the other one is preprovisioned

Operation

The XC320 equipment protections operate in non-revertive mode.

□

Date/time synchronization

Introduction

Periods of time when an NE is out of service, as during a software upgrade, can cause the NE's date/time setting to be out of sync with the *Navis*™ Optical EMS host and the other NEs in the network. Lack of date/time synchronization can create problems in determining the order in which alarms occurred on the network.

Navis Optical EMS uses the Network Time Protocol (NTP) to ensure the accuracy of its internal clock. *Navis* Optical EMS, in turn, provides centralized remote date/time synchronization between its internal clock and those of its managed NEs. Synchronization can be performed on a single NE, on an aggregate of NEs, or on all of the NEs in a user's Target Group. Synchronization can be performed on demand or set up on a periodic schedule using the *Navis* Optical EMS Scheduler. The transition from standard time to daylight savings time is also supported as a user selected option.

NE time zone

As part of the date/time synchronization feature, *Navis* Optical EMS can take into account whether the NE is located in a different time zone from the system host.

The time zone parameter is one of the fields that can be defined or changed for an NE through the **Add an NE** window or **Modify an NE** window (cf. "Add an NE - OSI communication" (1-3)., "Add an NE - TCP/IP communication" (1-6) and "Modify an NE" (1-11)).

Standard time and daylight savings time

You can use the Spring Forward/Fall Back option to have *Navis* Optical EMS automatically make time adjustments for Daylight Savings Time (Spring Forward) and standard time (Fall Back) when doing date/time synchronization for an NE, a group of NEs, an aggregate, or all NEs under system control, 20 NEs at a time or more, depending on system load. The Spring Forward/Fall Back option can be enabled or disabled, as needed. This option is enabled, by default. If the option is disabled for an NE, the NE's time is always set to standard time.

The Spring Forward/Fall Back option should be set by the system administrator.

Ways to perform date/time synchronization

NE Date/time synchronization can be performed in three ways:

- ***Scheduled***: NE date/time synchronization can be scheduled to be performed on a daily, weekly, or monthly basis. A scheduled date/time synchronization will only be done if the time difference between the NE and the system host is more than 15 seconds.
- ***Automatically***: You can have the system automatically perform date/time synchronization on an NE when it is manually added or autodiscovered by the system, or when communications between the NE and the system host are lost and then regained. Automatic date/time synchronization will be performed on an NE only if the time difference between the NE and system host is more than 15 seconds, or the drift threshold set via the Set Date/Time Synchronization Drift window. The drift threshold is the maximum time difference allowed (in seconds) between the NE and the EMS host before date/time synchronization is performed automatically. Automatic date/time synchronization can be enabled or disabled; the default is enabled.
  Automatic date/time synchronization should be enabled/disabled by the *Navis* Optical EMS system administrator or a user with a privileged login.
- ***Manually***: Date/time synchronization can be performed on demand for an NE, a group of NEs, an aggregate, or all NEs under system control, up to 20 NEs at a time or more, depending on system load.

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10 Timing provisioning concepts

Overview

Purpose

This chapter describes the timing features *LambdaUnite*™ MSS provides.

LambdaUnite MSS synchronizes all incoming and outgoing signals to one timing source which is normally locked to an external reference signal. This reference signal is configurable. Various signals can be used as a timing reference signal. Furthermore *LambdaUnite* MSS provides different clock modes (see "Clock modes" (10-3)). Clock protection can also be established by using two timing generator circuit packs within one shelf.

More detailed information on the timing concept is given in the section ***"Synchronization"*** in the *LambdaUnite* MSS ***Applications, Planning, and Ordering Guide, chapter 4, "Product Description"***.

Contents

Timing generator

Function of the timing generator

LambdaUnite™ MSS synchronizes all add, drop and through signals by using one timing source. The timing is ensured by the XC320 circuit pack which generates one common internal clock. If two XC320 circuit packs are present in the NE, an 1+1 non-revertive protection of the timing sources is provided.

The timing generator and the clock distribution within the NEs is described in more detail in the section ***"Synchronization"*** in the *LambdaUnite* MSS ***Applications and Planning Guide, chapter 4, "Product Description"***.

Clock modes

The *LambdaUnite* MSS timing generator circuit packs can run in the following clock modes:

- Free-running mode
  The active timing generator circuit pack is not locked to an external timing reference, but the standby timing generator is locked to the active one.
  This mode may especially be needed for the initial startup of an NE to allow the system being installed without a valid external timing reference.
- Holdover mode
  The active timing generator circuit pack enters the holdover mode if all timing reference signals fail. The active timing generator keeps its internal oscillator at the point at which it was synchronized to the last known good reference signal. The standby timing generator remains locked to the active one.
- Locked mode, the system is locked to:
  - One of the two external netclock inputs (each of them configurable for 2048 kHz or 2 Mbit/s or DS1 signals)
  - One of all STM-64/OC-192 line input (choice of input is provisionable)
  - One optical STM-16/OC-48 tributary input (choice of input is provisionable)

  If the incoming signal of the external timing references is from lower quality than the internal stratum3 clock, the system will lock to the stratum 3 quality clock.

□

Timing configuration

Querying timing configuration

The *Navis*™ Optical EMS allows you to query the timing configuration of the *LambdaUnite*™ MSS. Please refer to “Viewing the timing configuration” (4-2).

Timing configuration

In the menu **Configuration** → **Synchronization** → **Configure...** it is possible to change the timing configuration.

This includes:

- the configuration of the external timing input ports (cf. “Configuring the external timing input ports” (4-4))
- the configuration of the external output port (cf. “Configuring the external timing output ports” (4-6))
- the selection and configuration of the timing references (cf. “Configuring the timing references” (4-11))
- the configuration of the system timing, this means the configuration of the master timing generator (cf. “Configuring the system timing” (4-15))

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Timing quality

Optical line timing

In the locked mode, the timing functions on the XC320 circuit packs can be provisioned to accept a timing reference signal from an incoming optical signal (10 Gbit/s, 2.5 Gbit/s), the timing functions accept a timing reference signal from one port unit (40 Gbit/s, 10 Gbit/s, or 2.5 Gbit/s) and derive the timing signals used to synchronize the transmission port units.

The timing reference signal is continuously monitored for error-free operation. If the reference signal becomes degraded or unavailable, the timing function selects the timing reference signal that is next in the priority list. If all configured timing reference signals are degraded or unavailable, the timing function enters the holdover mode.

External netclock timing mode

In the external netclock timing mode, the timing function on the active XC320 circuit pack receives a 2.048-MHz, 2.048-Mbit/s ITU-T or a DS1 Telcordia (B8ZS, SF and ESF format) reference signal from the external netclock inputs. The reference signals should be based on a Stratum 1 clock. The timing function on the active circuit pack synchronizes its internal Stratum 3 clock to the reference signal. The timing function on the standby XC320 circuit pack synchronizes its internal Stratum 3 clock to the active circuit pack. Then the timing functions distribute the clock signals to all circuit packs in the shelf.

Timing protection

LambdaUnite™ MSS uses non-revertive 1+1 protection switching to protect its timing function. If the active XC320 circuit pack fails and causes a switch to the standby circuit pack, the standby circuit pack becomes the active circuit pack. It remains the active circuit pack, even when the failed circuit pack is replaced. The replaced circuit pack becomes the standby circuit pack. Thus bit errors can be avoided.

If the active timing generator fails while the system is in holdover mode, the standby timing generator would become the active timing generator and would switch to holdover mode (before switching, it was fed by the active timing generator) until the reference signal is restored to an acceptable quality.

Timing provisioning

The *LambdaUnite* MSS synchronization mode can be set to locked or free running by using *Navis*™ Optical EMS . Additionally, either timing generator circuit pack can be switched to be the active timing generator. However, when *LambdaUnite* MSS is provisioned for the locked mode, the holdover mode is entered automatically upon loss of all reference signals. The holdover mode can be entered intentionally by the operator command “Forced Holdover, when *LambdaUnite* MSS is in locked mode. Holdover mode is not available in free running mode.”.

Control and status

The behavior of the timing generators is controlled by switching them among several defined states. As commands are issued or as failures occur and are cleared, the timing system switches from one state to another. The status of the timing is retrievable for user observation. You can issue commands to obtain status reports or to manually change the synchronization state from one to another.

There are three categories of commands

- Modify – to provision operating parameters
- Retrieve – to obtain parameter values, states and statuses
- Operate – to lockout a switch, force a switch or holdover mode or clear a state

Timing marker

The timing quality of the 10 Gbit/s and 2.5 Gbit/s data signals is coded in the timing marker (Synchronization Status Marker, SSM) as per ITU-T Rec. G.783 and G.707. The timing marker is located in the lower four bits of the S1 byte of the STM-N signal SOH (SDH) or of the first STS-1 of a STS-N (SONET).

The bit combinations are listed in the following table. The remaining combinations are reserved for future use.

S1 Bits	Quality level (SDH)	Quality level (SONET)
0000	—	Synchronized - Traceability Unknown (STU)
0001	—	Primary Reference Source (PRS), acc. to Bellcore TR-1244

S1 Bits	Quality level (SDH)	Quality level (SONET)
0010	Primary Reference Clock (PRC), acc. to ITU-T Rec. G.811	—
0100	Transit Node Clock (SSU-T), acc. to ITU-T Rec. G.812	—
0111	—	Stratum-2 clock (ST2), acc. to Bellcore TR-1244
1000	Local Node Clock (SSU-L), acc. to ITU-T Rec. G.812	—
1010	—	Stratum-3 clock (ST3), acc. to Bellcore TR-1244
1011	SDH Equipment Clock (SEC), acc. to ITU-T G.81s	—
1100	—	—
1110	—	—
1111	Do not use for Synchronization (DNU)	Do not use for Synchronization (DUS)

The quality level “DUS/DNU” is inserted if AIS, LOS or LOF is detected in the incoming signal. Insertion of “DUS/DNU” in an outgoing timing signal can also be configured by the operator in order to avoid timing loops in the network.

SSM of lower quality than the internal system clock

If the SSM of a reference clock source indicates a lower quality than the internal clock (SEC), this reference is considered to be failed and the system switches to the reference with the next lower priority. When all assigned references are considered to be failed, the system enters the holdover mode.

No SSM available

As long as no SSM value has been accepted and evaluated at STM-N/OC-M interfaces, “DUS/DNU ”is assumed. This also applies at the initial system start-up.

SSM for 2048 kbit/s synchronization signals

LambdaUnite MSS supports the interpretation and generation of SSM values for framed 2048 kbit/s timing input and output ports ("G.703.9 ports"). The coding conforms to ITU-T Rec. G.704. One set of the S_{a4} to S_{a8} bits can be allocated for the Synchronization Status Marker (SSM). The message set is similar to the SSM messages defined for bits 5 to 8 of the byte S1 belonging to an SDH signal.

User operation

You can define whether the SSM is evaluated for the selection of the timing reference from which the system timing is derived. Furthermore, you can define the quality level of the outgoing timing signal.

□

Timing protection

Timing reference protection switching

During configuration of the timing references, a priority list is created for the configured timing reference signals. The signal with the highest priority is initially used as the timing reference signal. If it fails, the system switches to the signal with the next lower priority. If all possible timing reference signals fail, the timing generator enters the holdover mode.

The following signals can be used as a timing reference:

- 2 external netclock input signals (2048 kHz or 2048 kbit/s acc. to G.703)
- 6 reference signal derived from the incoming STM-16/OC-48, STM-4/OC-12 or STM-1/OC-3 tributary signals or the incoming STM-64/OC-192 line signals.

The following alarms cause a protection switch from a G.703 2048 kbit/s signal to another timing reference signal (acc. to the priority list):

- LOS (Loss of Signal)
- AIS (Alarm Indication Signal)
- LOF (Loss of Frame)
- LOM (Loss of Multiframe)

The following alarm causes a protection switch from a G.703 2048 kHz signal to another timing reference signal (acc. to the priority list):

- Loss of Signal

The following alarms and fault criteria cause a protections switch from an SDH/SONET signal to another timing reference signal (acc. to the priority list):

- LOS
- AIS
- LOF
- LOM
- EXC (Excessive Bit Error Ratio)

Timing equipment protection switching

A NE can contain two timing circuit packs (XC320) on which the timing function (TF) is located. If there are two TFs, Timing equipment protection switching is possible.

When two timing circuit packs are present the timing is derived from one circuit pack, called the ***active*** timing circuit pack. The other timing circuit pack is standby. It produces the same timing signal as the active one but is not used, unless the active timing circuit pack fails.

For the initial start-up of the system and initial provisioning of the 1+1 protection group the free running mode is used. For the system reset after the 1+1 protection was in operation, the system restores the timing circuit pack as the active one which was active before the system reset operation.

If only one cross-connection is present (worker) and the protection cross-connection is inserted, LambdaUnite ™ MSS is in a warm-up status for about 6 minutes. During this time the system quality is set to DNU in SDH mode or DUS in SONET mode. During this state is not allowed to perform a manual switch command to the standby cross-connection.

Wait-to-restore time

The timing reference protection is working in a revertive mode. If a timing reference is restored the system has to make a wait for a defined time (wait-to-restore time, WTR) to see whether the signal is stable, before the system switches back to it.

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Parameters of the View Timing/Sync window

General

The window **View Timing/Sync** contains five tabs:

- **External Timing Input Ports**
- **External Timing Output Ports**
- **Timing Reference**
- **System Timing**

The corresponding parameters are described as follows.

Push-button

The displayed data can be refreshed via the **Refresh** button. the selected data can be applied via the **Apply** button, via **Help** the online help can be displayed.

Via **Close** the window is closed.

□

The External Timing Input Ports tab

Overview

The first tab displays the parameters of external timing input ports.

LambdaUnite™ MSS provides two external timing input ports, including the following information fields for each.

External Timing Input Port AID

The information field **External Timing Input Port AID** displays the Access Identifier (AID) of the external timing input ports. Possible values are:

- **exttmg0**
- **exttmg1**

Timing Input Format

The information field **Timing Input Format** displays the format of the incoming timing signal. The displayed values can be:

SDH mode	**SONET** mode
2 MHz	**SF** (Super Frame)
2 Mbit - framed	**ESF** (Extended Super Frame)
2 Mbit - unframed	**64 kHz**
64 kHz	

Input sa Bit Location

This parameter is only supported for framed 2 Mbit/s **SDH** signals.

Possible values are:

- **SA4**
- **SA5**
- **SA6**
- **SA7**
- **SA8**

Input SSM Support

The SSM is supported for 2 Mbit/s - framed (**SDH** mode) and **ESF** (**SONET** mode) external timing input signals.

Possible values are:

- **SUPPORTED** (default)
- **NOT-SUPPORTED**

□

The External Timing Output Ports tab

Overview

LambdaUnite™ MSS provides two external timing output ports. A 2 MHz or 2 Mbit/s timing signal can be derived from the internal system clock and forwarded to the output ports. A timing signal can be derived from the system clock and is forwarded to both external timing outputs in parallel. It can be used as synchronization signal for an external network.

External Timing Output Port AID

The tab **External Timing Output Ports** of the window **View Timing/Sync** displays data on the timing output port.

The possible values are **exttmg0_out**, **exttmg1_out** or **exttmgall_out**.

Timing Output Selection

This parameter shows from which source the external timing signal is derived.

Possible for **SDH** mode values are:

- **TLS** (Timing Link Switch)
  The external timing signal is derived from one of the six timing references. The selection criteria are the same as for system timing apply except the following:
  - signals with derived output priority enabled
  - signals with derived output lockout status set to **No Lockout**.
- **SETG** (default)
  The timing output is derived from the system clock

The possible values for **SONET** mode are:

- **LINE1** (for output 1)
- **LINE2** (for output 2)

Timing Output Format

This parameter shows the signal format of the outgoing timing signal. **2 MHz** (default), **2 Mbit/s-framed**, **2 Mbit/s-unframed** and **6.321 MHz** are possible for **SDH** mode.

For **SONET** mode the possible values are **SF** (Super Frame), **ESF** (Extended Super Frame, default value) and **6.321 MHz**.

Output sa Bit Location

This parameter is only supported for framed 2 Mbit/s **SDH** signals.

Possible values are:

- **SA4** (default)
- **SA5**
- **SA6**
- **SA7**
- **SA8**

Output Signal Status

This parameter describes the Status of the outgoing timing signal.

It can take the values

- **NORMAL**
- **DISABLED** (default)
- **UNACCEPTABLE**

Timing Output Enable Disable

This parameter shows whether a timing signal is derived from the system clock and forwarded to the output port.

The values are

- **ENABLE**
- **DISABLE (default)**

Timing Output AIS Mode

This parameter is only supported for framed 2 Mbit/s output format signals (**SDH** mode) and **ESF** output format signals (**SONET** mode). It specifies what value will be sent when the signal is below quality acceptance or when forced **DNU/DUS** (Quality Level Mode) is set enabled.

The possible values are

- **AISMODE**
- **QLMODE** (default)

Forced DNU/DUS

This parameter defines whether Sync Message Force DNU (**SDH** mode) respectively Sync Message Force DUS (**SONET** mode) is inserted in the outgoing timing signal.

The following values are possible

- **ENABLE**
- **DISABLE (default)**

Timing Regenerator Loop Delay

Delay during which **DNU/DUS** is maintained after the Regenerator Loop conditions are no longer present.

This parameter can take the values:

- **0 ... 60 s**in 1 sec steps
  Default value is **10s**.

Timing Output Port QL

This information field shows the quality (the value of the Synchronization Status Marker, SSM) of the outgoing timing signal. It is greyed out, when the **Timing Output Format** is 2 MHz, as the SSM can only be provided for framed 2 Mbit/s (**SDH**) respectively ESF (**SONET**) signals.

The following values are possible (in order from highest to lowest quality):

- For **SDH** NEs
  1. **PRC** (Primary Reference Clock)
  2. **SSUT** (Synchronization Supply Clock (Transit node)
  3. **SSUL** (Synchronization Supply Clock (Local node)
  4. **SEC** (**SDH** Equipment Clock)
  5. **DNU** (Do not use for synchronization)
- For **SONET** NEs
  1. **PRS** (Primary Reference Source)
  2. **STU** (Synchronized Traceability Unknown)
  3. **ST2** (Stratum 2)
  4. **ST3** (Stratum 3)
  5. **DUS** (Do not use for synchronization)

Acceptance QL for Output Threshold AIS

This parameter defines the provisioned quality acceptance level for external timing output signals. When the incoming signal is below this level the AIS or **DNU/DUS** will be inserted.

The possible values are:

SDH mode	**SONET** mode
PRC	**PRS**
SSUT	**STU**
SSUL	**ST2**
SEC (default)	**ST3** (default)

Timing Regenerator Loop (SDH mode)

This parameter indicates that a timing loop may be present from the timing output to one or both of the timing inputs through a Stand-Alone Synchronization Equipment (SASE) Office Clock. This might happen, if the NE forwards timing to the SASE and the same time receives a timing signal via one or both of the external timing input ports. If additionally the system clock is in the Locked Mode and derived from an external timing signal, **DNU** is forwarded to the timing outputs.

This parameter can take the values:

- **DISABLE (default)**
  The Regenerator Loop functionality is disabled. Timing loops are not considered.
- **EXTREF1**
  If the quality level of the incoming framed 2 Mbit/s timing signal at the exttmg0 input is equal to the quality level of the timing signal that is transmitted to the external timing output ports, **DNU** is inserted for the outgoing timing signal as the NE assumes that a timing loop is present.
- **EXTREF2**
  If the quality level of the incoming framed 2 Mbit/s timing signal at the exttmg1 input is equal to the quality level of the timing signal that is transmitted to the external timing output ports, **DNU** is inserted for the outgoing timing signal as the NE assumes that a timing loop is present.
- **BOTH**
  The **Regenerator Loop** functionality is applied to both external timing inputs.

***Timing Regenerator Loop* (SONET mode)**

This parameter indicates that a timing loop may be present from the timing output to one or both of the timing inputs through a Building Integrated Timing Supply (BITS) Office Clock. This might happen, if the NE forwards timing to the BITS and the same time receives a timing signal via one or both of the external timing input ports. If additionally the system clock is in the Locked Mode and derived from an external timing signal, **DUS** is forwarded to the timing outputs.

This parameter can take the values:

- **ENABLE (default)**
  The **Regenerator Loop** functionality is enabled. Timing loops are considered.
- **DISABLE**
  The **Regenerator Loop** functionality is disabled. Timing loops are not considered.

Timing Output Equalization

This information field is available for **SONET** DS1 signals only.

The possible values are:

- **20%** (initial value)
- **40%**
- **60%**
- **80%**
- **100%**

ASAP Name

The ASAP (Alarm Severity Assignment Profiles) name can be an alphanumeric string up to 24 characters. As default name **PFNAME** is placed.

For further information please refer to the ***Alarm Messages and Trouble Clearing Guide***.

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The Timing Reference tab

Overview The **Timing Reference** tab of the **View Timing/Sync** window displays data on the configured timing reference source

Timing Reference AID In the group box **System Timing Reference**, the information field **Active Timing Reference** displays the reference timing signal which is currently selected. The timing reference is an external signal to which the internal **SDH/SONET** Equipment Clock is locked.

The following signals can be used as timing reference:

- 2 external net clock input signals (2048 kHz or 2048 kbit/s acc. to G.703)
- 6 reference signals derived from the incoming STM-64, STM-16 or OC48 line signals.

Thus the following values can be displayed:

- **EXTREF1**, **EXTREF2** or **EXTREFALL** for the external net clock input signals
- **LINE1** to **LINE6** or **LINEALL** for the **SDH/SONET** signals

Settings The table on the tab gives an overview of the possible settings of the timing references.

Column	Possible values	Meaning
Port AID	**EXTTMG0**, **EXTTMG1**, **EXTTMGALL**	An external net clock input signal is used as timing reference
	NOT-CONNECTED	The respective timing reference source is not used
	SPortAID	The respective **SDH/SONET** timing reference signal is used as timing reference
System Timing Reference Priority	**0** (initial value), **1**, **2**,**3**, **...**, **8**	Configured priority of the timing reference signals. **0** means disabled.

Column	Possible values	Meaning
Timing Reference SignalStatus	**NORMAL**	The timing reference signal is fault-free.
	FAILED	The timing reference signal failed.
	WAIT-TO- RESTORE	The timing reference signal has been failed and is now restored. A wait is made for a defined time (wait-to-restore time) to see whether the signal is stable, before the system switches back to it.
	NOT-CONNECTED	The timing reference is not used.
Station Clock Output Timing Reference LockoutState	**LOCKOUT**	The clock protection is deactivated
	NO-LOCKOUT	The clock protection is activated
Timing Reference QL (**SDH** mode)	**DNU**, **PRC**, **SSUT**, **SSUL**, **SEC**	This parameter shows the synchronization messaging quality level value for timing references. This is the value which is forwarded to the timing output ports.
Timing Reference QL (**SONET** mode)	**DUS**, **PRS**, **STU**, **ST2**, **ST3**	This parameter shows the synchronization messaging quality level value for timing references. This is the value which is forwarded to the timing output ports.
Input QL Status	**VALID**, **INVALID**, **NOT-SUPPORTED**, **NOT-APPLICABLE**	This parameter shows if a valid timing input signal is available for the respective timing reference.
QL Provisioned (**SDH** mode)	**PRC**, **SSUT**, **SSUL**, **SEC**, **AUTO**	This parameter is the quality level SSM value which will be received on the timing references.
QL Provisioned (**SONET** mode)	**PRS**, **STU**, **ST2**, **ST3**, **AUTO**	This parameter is the quality level SSM value which will be received on the timing references.
Timing Output Reference Priority (**SDH** mode only)	**0 ... 6**	This parameter defines the priority according to which the reference for the timing output signal is selected. **0** indicates that the reference is not used (disabled).
Timing Reference Lockout Status	**LOCKOUT**, **NO-LOCKOUT**	This parameter shows whether a certain timing reference is locked out as reference from which the timing output signal can be derived.
ASAP Name	**PFNAME** (default)	The ASAP (Alarm Severity Assignment Profiles) name can be an alphanumeric string up to 24 characters
Timing Port Mode Monitoring	**MONITORED**, **NOT-MONITORED**	

Column	Possible values	Meaning
Timing Port Incoming SSM (SDH mode)	**PRC** , **SSUT**, **SSUL**, **SEC**, **DNU**, **SSM0**, **SSM1**, **SSM2**, **SSM3** **SSM4**, **SSM5**, **SSM6**, **SSM7** **SSM8**, **SSM9**, **SSM10**, **SSM11**, **SSM12**, **SSM13**, **SSM14**, **UNSTABLE**, **NONE**	The reference selection process to use or not to use the incoming QL messages and the transmission of sync messaging on optical interfaces.
Timing Port Incoming SSM (SONET mode)	**PRS**, **STU**, **ST2**, **ST3**, **DUS**, **NONE**	The reference selection process to use or not to use the incoming QL messages and the transmission of sync messaging on optical interfaces.
Wait-To-Restore	**0SEC** (default), **20SEC**, **1–60MIN**, **99**	The wait-to-restore time is the wait which is made before every single switching from one timing reference to another.

Only one of the timing references at a time can be selected as the active one.

□

The System Timing tab

Overview The **System Timing** tab on the **View Timing/Sync** window displays data on the system timing state.

The following table lists the information fields, the possible values and their meaning.

Information field	Possible value	Meaning
Active Timing Reference Status	**LINE1** … **LINE6** **EXTREF1** **EXTREF2**	The currently active Timing Reference.
Clock Mode	**FREE-RUNNING** (initial value)	For the internal timing generator the Free Running Mode is selected. It is not locked to an external timing reference signal. The system clock is generated by an internal oscillator.
	LOCKED	The Locked Mode is selected. The internal timing generator is locked to an external timing reference signal.
Clock Mode Status	**AUTONOMOUS HOLDOVER**	The current operating system clock mode is the holdover mode. The active timing generator enters the holdover mode if all timing reference signals fail. In the holdover mode, the active timing generator keeps its internal Stratum 3 clock at the point at which it was synchronized to the last known good reference signal.
	NORMAL	The internal timing generator is not locked to an external timing reference signal. The system clock is generated by an internal oscillator.
	FORCED HOLD-OVER	A forced switch to the holdover mode has been carried out.
	FAST START (**SONET**)	Fixed value.
Reference Switch Status	**FORCED**	A forced switch to the holdover mode has been carried out.
	MANUAL	A manual switch has been carried out.
	NO REQUEST	No switch request is currently active.

Information field	Possible value	Meaning
Stratum Level Status	**SEC** (**SDH**); **3** (**SONET**)	Timing quality of the internal equipment clock acc. to ITU-T Rec. G.813.
System QL Status (**SDH** mode)	**PRC**, **SSUT**, **SSUL**, **SEC**, **DNU**	The current quality level of the system clock.
System QL Status (**SONET** mode)	**PRS**, **STU**, **ST2**, **ST3**, **DUS**	The current quality level of the system clock.
System Timing ASAP	**PFNAME** (default)	The ASAP (Alarm Severity Assignment Profiles) name can be an alphanumeric string up to 24 characters.
Warm Up Status	**NORMAL**, **WARMING-UP**	
Active Output Timing Reference Status (**SDH** mode only)	**LINE1**, **Line_timing_ref_AID**	Selected value of the currently active Timing Output Reference if it is set to TLS (lines).
Output Timing Reference Switch Request Status (**SDH** mode only)	**NO-REQUEST**, **MANUAL**, **FORCED**,	Value of the Switch Request activated by the user or initiated by the system.

□

Timing with facility loopbacks

Overview

LambdaUnite™ MSS supports two type of facility loopbacks: near side facility-loopback and far side facility-loopback.

When a near side facility-loopback is set, the signal received is transparently looped to the corresponding output. However the SSM received in the S1 byte of the overhead will be overwritten with the value "Do not use for sychronization (DNU/DUS)" in the outgoing S1 byte. This is done because a signal which is looped should not be used as a timing reference to avoid timing loops.

Configuration rules

Consider the following configuration rules to set a facility loopback:

- When a facility loopback is set, no line timing references can be assigned.
- When a line timing reference is assigned, no facility loopbacks can be set
- Before a facility loopback can be set the port must be set out-of-service.

□

Timing slaved to MSP/APS groups

Overview

When a line timing reference is assigned to a protection a MSP/APS group, the system will internally reserve 2 timing references (one for the worker port and one for the protection port). For the user there is only one timing reference which is mapped to the worker port. But dependent of the protection switch status of the MSP/APS group, internal either the worker or the protection line is selected. This means that the timing follows the MSP/APS switching protocol.

If for instance the worker fibre is cut, the MSP/APS protection switch status shows an SF condition and the protection port is active. In this case timing will select the protection line as timing reference and the reference is not failed. When the timing reference is the active reference, in the outgoing S1 byte the quality DNU/DUS will be forwarded (in order to prevent timing loops when this signal is used as timing reference).

In the case that the timing reference is the active reference on a worker port of a MSP/APS group, in both worker and protection lines the quality DNU/DUS will be forwarded the outgoing S1 byte.

Configuration rules

Consider the following configuration rules to set a facility loopback:

- An MSP/APS group can only be provisioned successfully when no line timing reference is assigned to the protection port of the 1+1 MSP/APS group.
- A line timing reference can only be assigned to the protection port of the 1+1 MSP/APS group.

□

4-fibre MS-SPRing/BLSR protection switching

Overview

LambdaUnite™ MSS supports two types protection switching in 4-fiber MS-SPRing/BLSR groups:

- Timing slaved to the span switching protocol
- Timing independent of the ring switching protocol

Timing slaved to the span switching protocol

The same as for MSP/APS groups also applies to 4-fiber MS-SPRing/BLSR groups. There are 2 MSP/APS groups (spans), an east span and a west span. So in this case timing is slaved to the span switching protocol.

Configuration rules

Consider the following configuration rules to set a facility loopback:

- A 4-fiber MS-SPRing/BLSR group can only be provisioned successfully when no line timing reference is assigned to the protection port of the spans of the 4-fiber MS-SPRing/BLSR group (East/West protection port).
- A line timing reference can only be assigned to the protection port of the East and West span.

Timing independent of ring switching protocol

When line timing is used in a 4-fiber MS-SPRing/BLSR protection group, on both spans (East and West), line timing is assigned. If one of the spans is failed (say east, both the worker line and the protection line of the MSP/APS spans are failed), a transmission ring switch will occur. However timing will not follow the transmission ring switch. It will be detected that the east line timing reference is declared failed. Timing will then switch automatically to the assigned line timing reference on the west span and the ring timing will be derived via the west side of the ring. When the span failure has recovered, timing switches back to the east line timing reference of the recovered span and timing will be derived again from the east side.

Please note, a span is only recovered when the worker line has no signal failure. When timing is switched back from the west side to the east side, always the worker line of the east side is selected.

□

11 Traffic provisioning concepts

Overview

Purpose This chapter provides you with information about traffic provisioning.

Contents

Cross-connections

Introduction

Navis™ Optical EMS provides a graphical means of viewing and provisioning NE cross-connections via the **Cross-Connection** window. This window is designed to display connection termination points and cross-connections for a selected NE. This section provides information about cross-connection functionality and the **Cross-Connection** window.

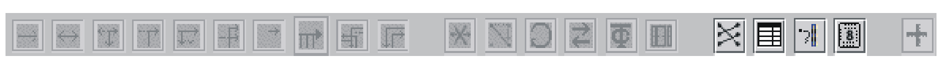
The Cross-Connection window

The **Cross-Connection** window provides the user with access to all cross-connection features. It contains an interface tailored to the large, modern cross-connection fabrics now supported by the system. The window for instructions on displaying the **Cross-Connection** window) consists of a menu bar, a toolbar, a status bar, a net work element explorer, and a main view. The main view area is further broken down into four (or eight) port areas. This window is used for all cross-connection operations, including viewing, adding, modifying, and deleting cross-connections.

Toolbar

The **Cross-Connection** window contains a toolbar (at the upper left) that contains a series of buttons used for specifying different types of cross-connections or tributary reservations. If you are unsure of the operation that a certain toolbar button will perform, point at it with the cursor and after 2 seconds a tooltip is displayed, showing the operation of that button. This information is also displayed in the status bar.

The following graphic shows the toolbar.



The toolbar contains the following buttons (from left to right):

- Buttons for different types of cross-connections used to initiate the creation of a cross-connection. Initially all buttons are disabled, when the user chooses a port only buttons which are available for the NE will get enabled.
  - One way
  - Two way
  - One way path protected

  - Two Way Dual Ring Interworking
  - Multicast
  - Locked
  - Video source
  - Video sink
  - Dual Ring Interworking Primary Node (DRI PRI)
  - Dual Ring Interworking Secondary Node (DRI SEC)
  - Multipoint
  - Cross connect template (for creating compound cross connections).
- Delete cross-connection
  used to delete an existing cross-connection. (It is disabled until the user chooses a cross-connection that can be deleted.)
- Modify cross-connection
  used to modify a cross-connection. (It is disabled until the user chooses a cross-connection that can be modified.)
- Convert cross connection
  used to convert an existing cross-connection. (It is disabled until the user chooses a cross-connection that can be converted.)
- Roll cross connection
  used to roll an existing cross-connection. (It is disabled until the user chooses a cross-connection that can be rolled.)
- Switch cross connection
  used to switch the working leg of a path protected cross connection. (It is disabled until the user chooses a cross-connection on which a switch operation can be done.)
- Reservation
  Click this button after you have chosen a tributary to reserve. The system displays a pop-up window for selection of tributary parameters for the reservation. (The Reservation feature is only available for BWM NEs.)
- Show/Hide
  Click this button to show cross-connection lines - click it again to hide the cross-connection lines.
- List existing cross-connection

If you click on the NE's TID in the explorer portion of the window, and click this button, a complete listing of all cross-connections for the NE is displayed. The listing shows the source and destination tributary AIDs, the cross-connect type, the rate, the TID of the source NE and the TID of the destination NE. Clicking on any equipment level in the explorer (such as a specific shelf or port), and then clicking this button, displays a list of cross-connections for the selected equipment in the NE.

- Cancel
  Click this button when you have started a cross-connection and want to terminate the operation. (This button is disabled until you select a cross-connection type.)
- Toggle view
  Click this button to change the number of port areas displayed in the view panel. Initially the view is set to Toggle to Four, which shows four port areas (and the contents of the pop-up menus in the explorer accommodate all eight ports). When you click the Toggle View button, the view changes to Toggle to Eight, which shows eight port areas (and the contents of the pop-up menus in the explorer accommodate four ports).

Status bar

The status bar, at the bottom of the Cross-Connections window, provides the following information to the user:

- The source and destination AID and the cross-connection type of a selected cross-connection in the cross-connection view area.
  If more than one cross connection is displayed the status bar will display `Multiple`.
- Indicating a reservation by displaying `Reservation`.
- The cumulative information about a cross-connection being added, as it is selected by the user.
- Information about the status of add/delete/modify/roll/convert/switch working leg operations that have been requested.
- The presence of a cross connect loopback or a facility/terminal loopback.

When a port tributary is displayed in the Main View of the Cross-Connection window, and you position the mouse cursor on the tributary block, a message is displayed next to the tributary address in the status bar identifying it as a "Source" or "Destination" tributary.

The “Source” and “Destination” literal displayed in the status bar is used to indicate whether the tributary could act as a “Source” or “Destination” , or both, for additional cross-connections.

Displaying ports

Ports are displayed on the Cross-Connection window between the arrow buttons surrounding the main view area. Top and Bottom port areas appear between the left and right arrow buttons, while Left and Right port areas appear between the up and down arrow buttons.

Cross-connection prerequisites for some NE types may prevent the user from provisioning a cross-connection to or from a tributary only if the port unit slot containing the tributary has already been provisioned (or pre-provisioned) with information that determines the number of ports and the rate of the ports in the port unit slot.

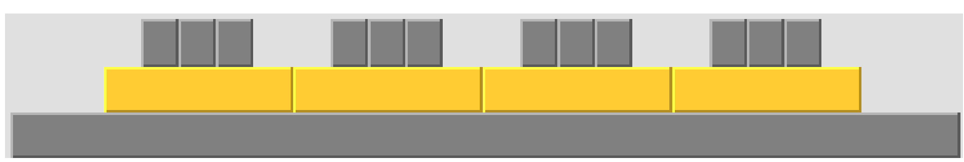
Display of STM-4 and STM-1

The cross-connection window displays three STM-1 ontop of one STM-4 in the following way.

When the cursor is positioned over one of the signal components the status line displays the respective AID.

Display of STM-4, STM-1 and VC-3

The cross-connection window displays three VC-3 ontop of four STM-1 ontop of one STM-4 in the following way.



When the cursor is positioned over one of the signal components the status line displays the respective AID.

Color conventions

Listed in the following table are the default color conventions used to represent cross connection and tributary properties. These colors may be changed through the Preferences window (see "Map preferences" (14-42)).

See the next table for color conventions for cross connection and tributary properties.

Color	Representation
Green	Tributary is selected as a source for cross-connection
Magenta	Cross connection destination(s) (shows when selected)
Red	Cross connection line whose redline property is enabled
Black dashed line	Standby cross connection
Orange	Cross connection on tributary is in the process of a pending operation (such as creation, deletion, modification).
Light yellow	Tributary which is not being used for any cross connection or reservation
Blue	Tributary which is being used for a cross connection
Dark blue	Tributary changes to this color when a cross-connection is created. Also indicates a reserved tributary.
Purple	Tributary which is a destination tributary for a cross-connection
Dark green	Tributary which is uni-directional
Grey	Tributary not available for cross-connection

A grey box is also displayed when:

- A multiple level graphic is displayed and there are cross connections at a lower rate than the highest rate in the graphic. For example, the graphic showing both STM-1 and VC-3 tributaries may have a grey STM-1 box if any of the VC-3 boxes are blue (already cross-connected in both directions).
- A multiple level graphic is displayed and for some reason the NE will not allow cross connection at a particular rate in the graphic. This will sometime occur when a specific setting in the NE is made to disable a certain rate.

For NE which allow cross-connections at multiple rates within a single tributary, for which no graphic exists (such as STM-1 and VC-3), the explorer will allow the user to drag and drop either the STM-1 tributary, or the VC-3 tributary to the View Area. In all other cases, only the bottom most level of tributaries shown in the explorer can be dragged to the View Area.

Entering cross-connections

The general steps for entering cross-connections on the Cross-Connection window in the GUI are as follows:

1. Find the tributaries that are to be cross connected together and display them in the view area.
2. Choose the box that represents the source tributary for the cross connection by clicking on the box. The box will turn green. The cross connection type buttons on the toolbar will become enabled, but only those that can use the tributary chosen as a source.
3. Choose a cross connection type by clicking on the button in the toolbar for that cross connection type.
4. Choose the box that represents the destination tributary for the cross connection by clicking on it. Both the source and destination boxes will now turn orange (an operation is pending on these tributaries).
5. If it is necessary to provide further information before the cross connection can be completed, an additional information (**Cross-Connect Attributes**) window is opened. It contains parameter names and lists of values for each parameter. Choose the parameter values for this cross connection and choose **OK**.
6. Confirm entry of the cross connection when the confirmation window is displayed.

The cross-connection command is now sent to the NE. When the command has completed (either correctly or with errors), the orange color is removed from the chosen tributaries. If the cross connection was created in the NE, the tributaries will turn blue. If the command failed, they will revert to their original colors.

Cross-connection topologies

Cross-connection topologies supported by the system include the following:

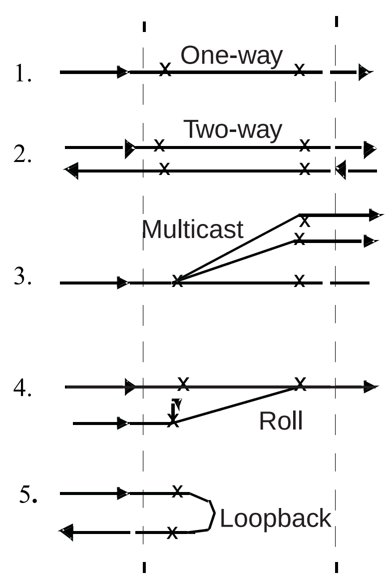
- One-way point-to-point cross-connection
  Note: A one-way cross-connection can be created using the same tributary as source and destination (often referred to as a "loopback").
- Two-way point-to-point cross-connection
- One way path-protected cross-connections.
- Multicast cross-connection. Also encompasses bridge cross-connections. A bridge cross-connection allows the addition of a second leg to an existing one-way point-to-point cross-connection, resulting in a 1:2 one-way cross-connection from one input tributary to two output tributaries.
- Roll cross-connection
  This refers to the operation of moving the input of an existing leg of a one-way or two-way point-to-point cross-connection from the current input tributary to a new input tributary, while leaving the output unchanged.
- Path-switching and dual ring interworking cross-connections
- Path-protected cross-connections to support Dual Ring Interworking (DRI) or Dual Node Interworking (DNI - SDH equivalent of DRI); or Unidirectional Path-Switched Ring (UPSR)/Sub-Network Connection Protection (SNCP) topologies.
- Redlining: this refers to the ability to mark a cross-connection and prevent it from being deleted.
- Loopbacks

There are three types of loopbacks that can be set up through the *Navis* Optical EMS GUI:

- ***Cross-connect loopback*** - this type of loopback is done at the tributary level, by setting up a temporary cross-connection from the input of the tributary to the output of the same tributary for purposes of sending a test signal.
- ***Near-side facility loopback*** - this type of loopback is done at the port level, where the entire line is looped back from the input to the output of the same port.
- ***Far-side facility loopback*** - this type of loopback is done at the port level, where the entire line is looped back from the transmit (input) side of the port to the receive (output) side, and the test signal path may extend through the circuit pack equipment to a distant NE and back again.

Note that although Facility Loopback is supported for *LambdaUnite*™ MSS, there is no interaction between Cross Connects and Facility Loopbacks. Meaning that even if a port has a facility loopback, cross connects can still be established and deleted from tributaries of this port.

The following figure shows the cross connection topologies



Interworking

The system provides the ability to provision cross-connections at different ports by enabling to select a mix of SONET and SDH tributaries.

For *LambdaUnite* MSS supports both SONET and SDH tributaries, the *Navis* Optical EMS allows e. g. STS-1/VC-3 cross-connections between tributaries on SONET and SDH ports. In other words, the input tributary can be on a SONET port or a SDH port while the output tributary can also be on a SONET or a SDH port

The NE permits cross-connects made at one rate to be accessed at the other rate. This means, if the cross-connect is made at VC-3, it can be retrieved, modified, and deleted using STS-1 rate. The same is valid for cross-connects made at STS-1 rate, they can be accessed using VC-3 rate.

The following table shows the corresponding cross connection rates for SDH/SONET interworking

SDH rate	SONET rate
STS-1	VC-3
STS-3	VC-4
STS-12	VC-4-4c
STS-48	VC-4-12c
STS-192	VC-4-64c
STS-768	VC-4-256c

Compound cross-connections

Navis Optical EMS supports the establishment of compound cross-connections between input and output tributaries in a NE, which may be needed in a NE for some network application.

To make it easier to identify an individual cross-connection's function in a compound arrangement, and to facilitate retrieval of information about cross-connections with associated legs and leg pairs, *Navis* Optical EMS allows you to assign a cross-connection application and cross-connection number to each cross-connection when it is being added.

There are two ways to create compound cross-connections:

- Create individual cross-connections graphically on the main view of the **Cross-Connection** window
- Create all cross-connections for a specific network topology/application via the **Cross Connect Template** window.

Cross Connect Template

To facilitate the creation of compound cross-connections for a specific network application as a one-step process, rather than having to create individual cross-connections on the main view of the **Cross-Connection** window, a special **Cross Connect Template** window can be invoked by clicking the **Cross Connect Template** button on the **Cross-Connection** window toolbar for this purpose.

The **Cross Connect Template** window, when it is invoked, replaces the main view of the **Cross-Connection** window. The template window guides you through the process of creating a compound cross-connection through a series of drop-down list fields, textual fields, and other fields that allow you to select tributaries from the **Network Element Explorer** for the cross-connections. You can also enter identifying information (Path Protected Group Name, Cross-Connect alias) for all related multiple cross-connections at once.

In the current *Navis* Optical EMS product release, the Cross Connect Template only supports creation of compound cross-connections for the UPSR/SNCP Add/Drop network topology, which provides protection for two-way traffic between separate NEs in a ring configuration.

Cross connection application

The Cross-Connection Application is a parameter that can be assigned to a cross-connection to identify the cross-connection type. This parameter can be modified for the cross-connection.

The following application (cross-connection types) can be optionally assigned when creating or modifying a cross-connection:

- 1-Way Point-to-Point
- 2-Way Point-to-Point
- 1-Way Path-Protected
- Ring Interworking, Drop and Continue, BLSR/MS-SPRing Primary Node
- Ring Interworking, Drop and Continue, BLSR/MS-SPRing Primary Nodes in Same NE
- UPSR/SNCP Ring Add, Drop
- UPSR/SNCP Ring-to-Ring, Single Node Interconnection, Same NE

Cross connection number

The Cross-Connection Number is a parameter that can be assigned to a cross-connection to associate all atomic cross-connections being established in one step, so the associated legs and leg-pairs with the same Cross-Connection can be retrieved and displayed together on the List Cross-Connections window. When you add a cross-connection or compound cross-connections from the same output tributary, *Navis* Optical EMS populates the Cross-Connection Number drop-down list for this field with a Cross-Connection Number for each of the atomic cross-connections with the same value. The number is a 9-digit number based on the AID of one of the logical output tributaries.

On the List Cross-Connection window (which is accessed by clicking the List Cross Connections toolbar button on the Cross-Connection window), if you select a leg of a cross-connection with the same Cross-Connection Number that has been assigned to associated legs in compound cross-connections, you can modify or delete all legs of compound cross-connections with the same Cross-Connection number.

Deleting cross-connections

Navis Optical EMS denies the request to delete (remove) a cross-connection in the following scenarios, unless some modification is made to the cross-connection to be deleted:

1. A request to remove redlined cross-connections. The modification necessary to delete a redlined cross-connection is to change the redline status of the cross-connections.
2. A request to remove a cross-connection from a tributary also being used in a loopback cross-connection. The modification necessary to remove this type of cross-connection is to remove the loopback cross-connection.
3. A request to remove a cross-connection from a tributary used in a test access connection. The modification necessary to remove this type of cross-connection is to take the tributary out of test access mode using the proper TL1 command (see the vendor NE's documentation for the appropriate TL1 command/syntax to perform this action).
4. A request to remove a path-protected cross-connection that has an adjunct cross-connection associated with the same input tributary. In this case, the adjunct cross-connection associated with the same input tributary as the path-protected cross-connection must be deleted before the path-protected cross-connection can be deleted.

Modifying cross-connections

The system allows you to modify various cross-connection information, including the source TID, destination TID, cross-connection application, cross-connection number, and source NE.

The working and protection legs of a path-protected cross-connection can be modified by being switched.

For compound cross-connections from the same set of input and output tributaries, *Navis* Optical EMS allows you to change the cross-connection application of the cross-connection.

1-Way cross-connection parameters

The following table gives an overview over the parameters in the 1-way cross-connection parameters window.

Field	Possible values	Meaning
LOCA	(name)	NE name of the source location. In an MS-SPRING this should be the location were the path enters the ring.
LOCZ	(name)	NE name of the sink location. In an MS-SPRING this should be the location were the path exits the ring.
OMODE	NORM, IDLE/UNEQ, AIS	If the cross-connection is not in a normal (NORM) operation mode, either IDLE/UNEQ or AIS can be inserted into the signal. The OMODE refers to the “To” port.

2-Way cross-connection parameters

The following table gives an overview over the parameters in the 2-way cross-connection parameters window.

Field	Possible values	Meaning
LOCA	(name)	NE name of the source location. In an MS-SPRING this should be the location were the path enters the ring.
LOCZ	(name)	NE name of the sink location. In an MS-SPRING this should be the location were the path exits the ring.
OMODE	NORM, IDLE/UNEQ, AIS	If the cross-connection is not in a normal (NORM) operation mode, either IDLE/UNEQ or AIS can be inserted into the signal. The OMODE refers to the “To” port.
RTNOMODE	NORM, IDLE/UNEQ, AIS	If the cross-connection is not in a normal (NORM) operation mode, either IDLE/UNEQ or AIS can be inserted into the signal. The RTNOMODE refers to the “From” port.

1-Way PP cross-connection parameters

The following table gives an overview over the parameters in the 1-way path protected parameters window.

Field	Possible values	Meaning
LOCA	(name)	NE name of the source location. In an MS-SPRING this should be the location were the path enters the ring.

Field	Possible values	Meaning
LOCZ	(name)	NE name of the sink location. In an MS-SPRING this should be the location were the path exits the ring.
LOCA2	(name)	NE name of the second source location.
OMODE	NORM, IDLE/UNEQ, AIS	If the cross-connection is not in a normal (NORM) operation mode, either IDLE/UNEQ or AIS can be inserted into the signal. The OMODE refers to the “To” port.

Multicast cross-connection parameters

The following table gives an overview over the parameters in the multicast cross-connection parameters window.

Field	Possible values	Meaning
LOCA	(name)	NE name of the source location. In an MS-SPRING this should be the location were the path enters the ring.
LOCZ	(name)	NE name of the sink location. In an MS-SPRING this should be the location were the path exits the ring.
OMODE	NORM, IDLE/UNEQ, AIS	If the cross-connection is not in a normal (NORM) operation mode, either IDLE/UNEQ or AIS can be inserted into the signal. The OMODE refers to the “To” port.

Protection groups

Introduction

Protection group management can include both equipment and port protection groups. There are several types of protection strategies, including:

- 1+1 protection (where a service entity and a protection entity serve as a pair, with only one of them active at any given time)
- 1xN equipment protection (where a single protection entity is shared by multiple service entities)
- 4-fiber BLSR protection (for SONET)
- 4-fiber MS-SPRing protection (for SDH)
- 2-fiber BLSR protection (for SONET)
- 2-fiber MS-SPRing protection (for SDH)
- Path protected
- Unprotected entities (0x1 protection)

Navis™ Optical EMS allows you to retrieve an NE’s current protection configuration for its transmission interfaces and to configure, at NE level, the rate, member ports, and attributes of its protection groups. Protection group modifications are done per NE for its associated protection groups. *Navis* Optical EMSalso provides the capability to select a protection group and then to provision a protection switch between the working and protection entities in that group.

Protection group discovery

Navis Optical EMS retrieves an NE’s current protection group data for transmission interfaces and stores this information in its database when DNO is performed upon discovery of the NE or update of this information is requested while performing a manual DNO on the NE. For NEs with multiple bays/shelves, such as the WaveStar® BWM, DNO can be performed to update protection group data for a selected single bay or shelf.

Provisioning protection groups

Protection groups can be added, modified, rolled, bridged or deleted from an NE. You can also view the member ports and attributes for a protection group in an NE.

To add a new protection group for an NE, you select a protection group type from a list of available protection group types for the NE type, pick the rate of the protection group, assign a user-specified protection group ID which is associated with the selected bay and shelf, choose the members (ports) of the protection group, and provision the attributes for the group. In creating or modifying protection groups, *Navis* Optical EMS enforces that all members (ports) of the group are within the same shelf and bay and of the same transmission rate. When you select the first member port on the shelf, the first port becomes the reference port for the other members of the protection group and the remaining allowable choices are other ports on the same shelf.

For the optical interfaces, protection switching provides protection against both equipment and facility (line) failures. For the optical network NEs, one universal constraint is that all the entities, service and protection, must be within the same shelf.

Deleting protection groups

Deleting a protection group removes it from an NE.

Bidirectional line-switched ring (BLSR) ring maps

The *Navis* Optical EMS allows you to view existing ring map of NEs that provide 2–fiber or 4–fiber BLSR protection. You can view a discovered ring of DCC-connected NEs or a manually created ring map. Manual ring provisioning allows multi-vendor NEs to provide BLSR protection.

Viewing a ring map

The *Navis* Optical EMS allows you to view a ring map autodiscovered via the DCC interconnectivity of NEs in the ring or manually provisioned. The ring map displayed depends on the selection of the local NE and protection group AID and its interconnected NEs. When requested through the GUI, the resulting display shows, in tabular format, the local NE TID and node ID, and the list of NEs in the ring, identified by their TID and node ID. The TIDs and node IDs must be unique in the list. The NEs are presented as pairs in the ring, showing the TID of the From NE and the To NE and the direction of the connection. The ring map is requested by *Navis* Optical EMS issuing a RTRV-MAP-RING command to the local NE. The ring map display may show varying degrees of detail, depending on whether the ring map was manually provisioned or previously autodiscovered. For example, the display may only show the TID of the From NE in the node pairings or may not contain any connectivity information.

Provisioning a protection switch

A protection switch in a protection group occurs automatically when a signal failure, signal degradation, equipment failure, or similar cause prompts a switch from the working entity in a protection group to the protection entity. *Navis* Optical EMS also allows you to provision a protection switch on demand through a GUI-based function on the Protection Group Management window. To provision a protection switch, you specify the protection group type, protection group AID, protection switch type (command), and the destination of the entity that should be active after the protection switch is activated. In some types of protection groups (for example, 2-Fiber BLSR), the protection switch is made between the working and protection ports, while in equipment protection groups (for example, 1xN Electrical), the protection switch is made between working and protection circuit packs.

1+1 protection group parameters

The following table gives an overview over the parameters in the 1+1 protection group parameters window.

Field	Possible values	Meaning
Protection Group Type	1+1	Type of the Protection Group
Protection Group AID	1–239, 1-1-oall, 1-1-o[001-239], 1-1-o[01-239], 1-1-o[1-239] output values: 1-1-o[001-239	Protection Group Identifier
Rate	OC48, OC192, OC768, STM16, STM64, STM256	Protection Group Rate
Working Group Member/Role	(AID)	Valid Port AID. Both ports on an NE must be at the same rate.
Protection Group Member/Role	(AID)	Valid Port AID. Both ports on an NE must be at the same rate.
Fault Status of Working Member	SF, SD, NONE	Fault status of the working Member
Fault Status of Protecting Member	SF, SD, NONE	Fault status of the protecting Member
Wait to Restore	0–60	Wait to Restore Time

Field	Possible values	Meaning
Revertive Mode	Enable Disable	If the revertive mode is enabled, the signal is switched back to the defined working line after the interruption is over. Enable revertive mode is allowed only if protocol is set to 1+1_BIDIR
Protocol	1+1_UNI, 1+1_BIDIR, 1+1_OPT	The type of the protection either it is unidirectional (1+1_UNI) or a bidirectional or a optimized (1+1_OPT) protection. In an optimized protection the working port becomes the protecting and vice versa if a switch occurs.
Switch Status	LO, FS, SF, SD, MS, NR, WTR, DNR, FOP	The Status of the Switch Request
Active Member	wrk, protn	Active Unit State
Far-end incoming request selection	WKG, PROTN, NA, INV	
Near-end outgoing request selection	wrk, protn	
Far End Incoming APS	DNR, EXER, INV, NA (Not Available, when SF condition pending for protection line), FS, LO, MS, NR, RR, SF-H, SF-L, SD-H, SD-L, WTR	Far End Incoming APS messages
Near End Outgoing APS	DNR, EXER, FS, LO, MS, NR, RR, SF-H, SF-L, SD-H, SD-L, WTR	Near End Outgoing APS messages
APS Protection Switch Profile Name		alphanumeric character string with a maximum of 24 characters

2F BLSR/MS-SPRing protection group parameters

The following table gives an overview over the parameters in the MS - SPRing protection group parameters window.

Field	Possible values	Meaning
Protection Group Type	2F BLSR/MS-SPRing	Type of the Protection Group

Field	Possible values	Meaning
Ring ID	20 characters A .. Z a .. z 0 .. 9 ‘ (Apostrophe) - ( ) . / + ! * [ ] ^ ‘ (Grave accent) { | } < > ~ % # _ @, ? = ; , & $ ″ space ″ : \	Protection Group Ring Identification Name
New Ring ID	20 characters A .. Z a .. z 0 .. 9 ‘ (Apostrophe) - ( ) . / + ! * [ ] ^ ‘ (Grave accent) { | } < > ~ % # _ @, ? = ; , & $ ″ space ″ : \	This replaces the protection groups previous ring ID
Protection Group AID	input values: 1-1-fall, 1-1-f[001-239], 1-1-t[01-239], 1-1-t[1-239] output values: 1-1-t[001-239]	Protection Group Identifier
Rate	OC48, OC192, OC768, STM16, STM64, STM256	Protection Group Rate
Group Member/Role East	(AID)	Valid Port AID. Both ports on an NE must be at the same rate.
Group Member/Role West	(AID)	Valid Port AID. Both ports on an NE must be at the same rate.
2-Fiber BLSR WTR	0-12 ,99	The time in minutes after which a signal is switched back to the working line after the interruption is over
BLSR protection switch profile name	(ASAP)	alphanumeric character string and ‘-’ (dash) with a maximum of 24 characters
Switch Request State	LPS -- Lockout of Protection Span; FSR -- Forced Switch of Service to Protection - Ring; SFR -- Signal Fail - Ring; SDR -- Signal Degrade - Ring; MSR -- Manual Switch of Service to Protection - Ring; WTR -- Wait to Restore; RRS -- Reverse Request - Span; RRR -- Reverse Request -Ring; NR -- No Request	East and West Switch Request State

Field	Possible values	Meaning
East/ West Incoming APS message	IDLE, BRIDGED, BANDS, XTRFC, RDIL, AISL	Channel status of the East/ West Incoming APS message
East/ West Incoming APS message Destination NID	0-15, NA	NA is reported when pending SF condition exists
East/ West Incoming APS message Protection	0, 1, NA	0 is for Short path code, 1 is for Long path code NA is reported when pending SF condition exists
East/ West Incoming APS message Source NID	0-15, NA	NA is reported when pending SF condition exists
East/ West Incoming APS message Switch priority	LPS, FSR, SFR, SDR, MSR, WTR, EXERR, RRS, RRR, NR	Switching Priority of the incoming messages
East/West Last Protection Switch Attempt	SUCCESS, DENY, FAILURE	
Ring Node APS State	IDLE, SWITCHING, PASSTHROUGH, SUSPENDED-IDLE SUSPENDED-SWITCHING, SUSPENDED-PASSTHROUGH	
East New Value	(AID)	AID of the east side of the protection group.
West New Value	(AID)	AID of the west side of the protection group.

4F BLSR/MS - SPRing Protection Group Parameters

The following table gives an overview over the parameters in the MS - SPRing protection group parameters window.

Field	Possible values	Meaning
Protection Group Type	4F BLSR/MS-SPRing	Type of the Protection Group
Ring ID	20 characters A .. Z a .. z 0 .. 9 ‘ (Apostrophe) - ( ) . / + ! * [ ] ^ ‘ (Grave accent) { | } < > ~ % # _ @, ? = ; , & $ ″ space ″ : \	Protection Group Ring Identification Name

<table>
<tr><th>Field</th><th>Possible values</th><th>Meaning</th></tr>
<tr><td>New Ring ID</td><td>20 characters A .. Z a .. z 0 .. 9 ‘ (Apostrophe) - ( ) . / + ! * [ ] ^ ‘ (Grave accent) { | } < > ~ % # _ @, ? = ; , & $ ″ space ″ : \</td><td>This replaces the protection groups previous ring ID</td></tr>
<tr><td>Protection Group AID</td><td>input values: 1-1-fall, 1-1-f[001-239], 1-1-t[01-239], 1-1-t[1-239] output values: 1-1-t[001-239]</td><td>Protection Group Identifier</td></tr>
<tr><td>Rate</td><td>OC48, OC192, OC768, STM16, STM64, STM256</td><td>Protection Group Rate</td></tr>
<tr><td>Group Member/Role East</td><td>(AID)</td><td>Valid Port AID. Both ports on an NE must be at the same rate.</td></tr>
<tr><td>Group Member/Role West</td><td>(AID)</td><td>Valid Port AID. Both ports on an NE must be at the same rate.</td></tr>
<tr><td>4-Fiber BLSR WTR</td><td>0-12 ,99</td><td>The time in minutes after which a signal is switched back to the working line after the interruption is over</td></tr>
<tr><td>BLSR protection switch profile name</td><td>(ASAP)</td><td>alphanumeric character string and ‘-’ (dash) with a maximum of 24 characters</td></tr>
<tr><td>Switch Request State</td><td>LPS -- Lockout of Protection Span; FSR -- Forced Switch of Service to Protection - Ring; SFR -- Signal Fail - Ring; SDR -- Signal Degrade - Ring; MSR -- Manual Switch of Service to Protection - Ring; WTR -- Wait to Restore; RRS -- Reverse Request - Span; RRR -- Reverse Request -Ring; NR -- No Request</td><td>East and West Switch Request State</td></tr>
<tr><td>East/ West Incoming APS message</td><td>IDLE, BRIDGED, BANDS, XTRFC, RDIL, AISL</td><td>Channel status of the East/ West Incoming APS message</td></tr>
<tr><td>East/ West Incoming APS message Destination NID</td><td>0-15, NA</td><td>NA is reported when pending SF condition exists</td></tr>
</table>

Field	Possible values	Meaning
East/ West Incoming APS message Protection	0, 1, NA	0 is for Short path code, 1 is for Long path code NA is reported when pending SF condition exists
East/ West Incoming APS message Source NID	0-15, NA	NA is reported when pending SF condition exists
East/ West Incoming APS message Switch priority	LPS, FSR, SFR, SDR, MSR, WTR, EXERR, RRS, RRR, NR	Switching Priority of the incoming messages
East/West Last Protection Switch Attempt	SUCCESS, DENY, FAILURE	
Ring Node APS State	IDLE, SWITCHING, PASSTHROUGH, SUSPENDED-IDLE SUSPENDED-SWITCHING, SUSPENDED-PASSTHROUGH	
East New Value	(AID)	AID of the east side of the protection group.
West New Value	(AID)	AID of the west side of the protection group.

Protection group wizard

Overview

The protection group wizard consists of three windows and can be invoked from the **Protection Provisioning Manager** window. The wizard will prompt you through each step when you add or modify a protection group.

Adding protection groups

For adding a protection there are four steps to do

- select a protection group type from the explorer in the **Protection Provisioning Manager** window
- select a rate for the protection group
- choose the members (ports) of the protection group
- provision the attributes for the protection group

Modifying protection groups

Once a protection group has been added for member ports in an NE, you can modify the given attributes of a protection group.

Please note that type, rate and members of the protection group can not be modified.

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Protection switch management

Overview

Navis™ Optical EMS has the capability to monitor and control protection switches that can occur as a result of a fiber cut, signal degradation, equipment failure, or loss of signal, thereby provoking a switch from the working to the protection facility. Protection switches can occur automatically or be manually provisioned by the user.

Protection switch status information is generated by NEs for:

- ports involved in 1+1 optical line protection
- circuit packs involved in 1xN equipment protection
- ports involved in 2-fiber BLSR/2-fiber MSSPRing protection
- ports involved in 4-fiber BLSR/4-fiber MSSPRing protection
- signal rates that are path protected
- optical ports involved in optical channel path protection

Protection switch management functions

The protection switch management functions provided by *Navis* Optical EMS are:

- monitoring the messages generated by the NE in response to protection switch requests that occur automatically due to incoming signal failure, incoming signal degrade, circuit pack failure, or similar cause
- maintaining the status of protection switches in the *Navis* Optical EMS database based on the protection switch messages received by the system
- provisioning protection switches for a given protection group type, while viewing autonomous messages received about protection switch activity for that protection group type, from the **Protection Status Management** window.
- logging all autonomous and user-generated (CIT/*Navis* Optical EMS) protection switch requests and NE messages generated in response to switch requests. Protection switch requests and resulting messages can be viewed through the Network Notification Log.
- notifying the user of a protection switch status change (see “Display protection switching status” (6-19)).

- displaying the current protection switch status for a protection type for one or more NEs on demand (see "Display protection switching status" (6-19)).
- displaying the history of protection switch status changes for a protection type for one or more NEs on demand (see "Display protection switching status" (6-19)).
- operating a protection switch

Dynamic network operations

Introduction

The Dynamic Network Operations (DNO) feature performs two major functions in *Navis*™ Optical EMS:

- Subnetwork discovery
- Database synchronization.

DNO methods

The database synchronization of the DNO operation can be accomplished with one of the following methods

- Database Retrieval Method
  The DNO feature synchronizes the system database with current configuration data from the NEs. The information that DNO gathers from NEs includes:
  - NE parameters
  - NE equipment inventory
  - NE port parameters
  - NE port protection groups
  - Subnetwork discovery (see below)
  - Software version
  - NE cross-connections.

  As part of subnetwork discovery, the system retrieves an NE's current equipment configuration and stores this information in the system database.
- Dynamic Synchronization
  Once the target NE database is retrieved, the system continuously synchronizes its database with the NE by updating the system database based on the received database change notifications from the NE. However, in case the generation of the NE autonomous messages was turned off, the EMS will not be able to synchronize its database dynamically using the NE database change notifications.
- Log-based Synchronization

The Log-Based Synchronization method retrieves the NE log data that contains the history of the database change notifications so that the system database can be re-synchronized, when the *Navis* Optical EMS lost communication to the NE. In case the period of lost communication is too long, which exceeds the limit of the log size of the NE, the DNO Database Retrieval method has to be deployed.

Ways to initiate DNO

There are four ways that the DNO feature is initiated in the system:

- ***Initial discovery***: The Database Retrieval method of DNO starts automatically when the user adds an NE to the system, or the *Navis* Optical EMS discovers new NEs through the subnetwork discovery process. When an NE is discovered, the *Navis* Optical EMS automatically runs a complete NE database retrieval on all categories on the new NE. Once you confirm the request, a complete Database Retrieval DNO on all data categories will be executed.
- ***Automatically***: You have the option of activating the Automatic DNO for each NE so that when the communication with the NE went down and up, either the Log-Based synchronization method or the Database Retrieval of DNO can be automatically triggered. This automatically triggered DNO operation can be enabled or disabled by setting a parameter in a configuration flat file. The setting of the control parameter is primarily intended for the *Navis* Optical EMS customer engineer, and is not recommended for the user.
- ***Manually***: The DNO subnetwork discovery/database synchronization process is executed for the NE, when you request it. When you request a manual DNO for an aggregate, DNO is executed for all NEs in the aggregate.
- ***Scheduled***: You can schedule DNO to be performed for each NEs on a weekly or monthly basis.

Subnetwork discovery

The DNO feature retrieves the internal configurations of NEs and external connectivity relationships. This allows the system to discover all NEs in a subnetwork as well as the trails between NEs where available. As a result, the subnetwork topology (NEs and trails) is automatically displayed on the Map window as soon as it is discovered.

When the subnetwork discovery aspect of DNO is executed on a per-NE basis, the neighbors of the target NE are also discovered. *LambdaUnite*™ MSS NEs support the `RTRV-MAP-NEIGHBOR` TL1 command but do not support SONET Directory Services (SDS). Thus, *Navis* Optical EMS automatically discovers *LambdaUnite* MSS NEs via subnetwork DNO.

Parameters of the RTRV-MAP-NEIGHBOR command

The following table shows the parameters of the TL1 command `RTRV-MAP-NEIGHBOR` and the possible values for the *LambdaUnite* MSS NE.

Param-eter	TL1 Parameter	Possible Values	Description
Optical Port Rate	rate	STM16, STM64, STM256, OC48, OC192, OC768	Provides the optical port rate between the NE returning the RTRV-MAP-NEIGHBOR TL1 command and its neighbor NE.
Con-nected through	thru	DCC, LAN	Indicates the type of connectivity between the NE returning the RTRV-MAP-NEIGHBOR TL1 command and its neighbor NE.
Local Port AID	lpaid	Local Port AID.	Provides the port AID of the NE returning the RTRV-MAP-NEIGHBOR TL1 command.
Neighbor NSAP	nsap	Neighbor NE NSAP address	The network-wide address of the neighbor NE of the NE returning the RTRV-MAP-NEIGHBOR TL1 command.

Neighbor Port AID	npaid	Neighbor Port AID	Provides the port AID of the neighbor NE of the NE returning the RTRV-MAP-NEIGHBOR TL1 command.
Neighbor TID	tid	Neighbor NE TID (up to 20 printable charac- ters)	The Target Identifier of the neighbor NE of the NE returning the RTRV-MAP-NEIGHBOR TL1 command.
DCC Type	dcctype	SECTION, LINE	Specifies whether the values displayed in the spec_block refer to the MS/Line or RS/Section DCC. .

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Cross-connection management

Overview

The *LambdaUnite*™ MSS add/drop multiplexer is in its basic configuration a single shelf that interfaces optical STM-16/OC-48, STM-64/OC-192 and STM-256/OC-768 lines to an SDH/SONET-standard MS-SPRing/BLSR protected ring. It has 32 universal slots that support flexible optical port unit mixing.

Definitions

Port A physical transmission interface, consisting of both an input and an output, which may be used to carry traffic between NEs. Operational differences between ports determined by port provisioning include pointer processing, fault and performance monitoring, path maintenance (e.g. Unequipped, AIS, RDI), cross-connections (supported rates), and protection switching.

Port protection group A user-provisioned association of optical interface ports which is used for protection in a particular type of network configuration. The following types of port protection groups are defined:

- 4-fiber MS-SPRing port protection group used for STM-64 1+1 MS-SPRing
- 4-fiber MS-SPRing port protection group used for STM-64 1+1 MS-SPRing Transoceanic Protocol
- 2-fiber MS-SPRing port protection group used for STM-256, STM-64 and STM-16 1+1 MS-SPRing
- 1+1 MSP port protection group used for STM-256, STM-64, STM-16, STM4 and STM-1 1+1 Multiplex Section Protection (MSP)
- 2-fiber BLSR port protection group used for OC-768, OC-192 and OC-48 1+1 BLSR
- 4-fiber BLSR port protection group used for OC-192 1+1 BLSR
- 1+1 APS port protection group used for OC-768, OC-48, OC-48, OC-12 and OC-3 1+1 Automatic Protection Switching (APS)

The operations on a port protection group include the provisioning, control, and status of the protection switching.

Tributary A path-level unit of bandwidth within a port, or the signal(s) being carried in this unit of bandwidth, e.g. a VC-3/STS-1 or VC-4/STS-3 within an STM-N/OC-M port.

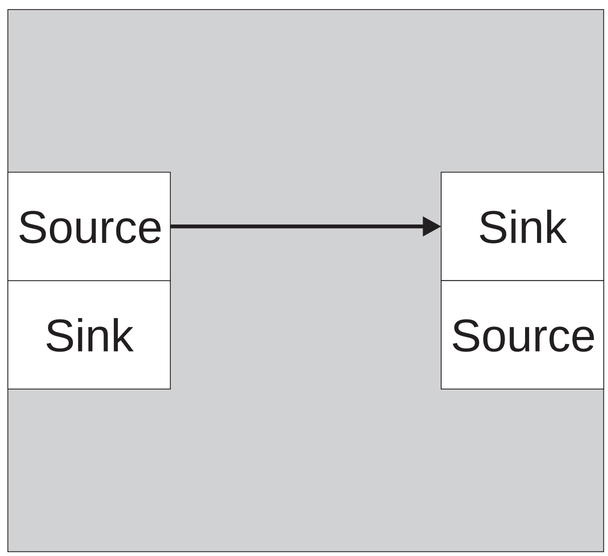
Cross-connection A reconfigurable path-level interconnection within a NE between input and output tributaries of specific ports.

Cross-connection leg A one-way connection provisioned from one input tributary to one output tributary. Each leg is identified as an entity by its input and output tributaries, its cross-connection rate, and the type of cross-connection it is part of. A leg pair is a pair of cross-connection legs which are reported as a two-way connection between two tributaries.

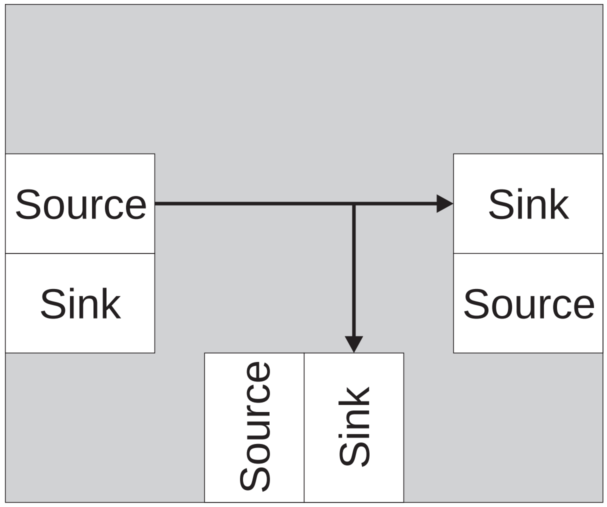
Cross-connection types

All meaningful cross-connection types can be reduced to three basic types:

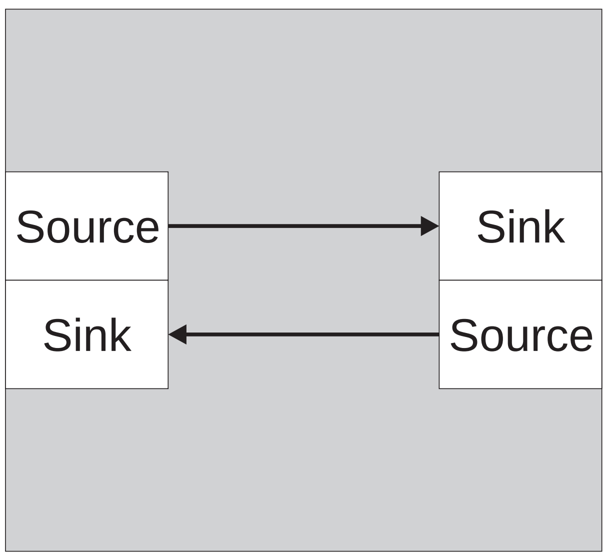
- Unidirectional point-to-point connection



- Unidirectional path protected connection



- Bidirectional connection



You can provision and reconfigure cross-connections. *LambdaUnite* MSS provides an STM-1 rate time-slot-assignment capability that supports the following types of cross-connections, which are derived from the three basic types introduced above:

- 1-way point-to-point
- 2-way point-to-point
- 1-way path protected (DRI/DNI applications only)

- DRI/DNI (bidirectional) with four nodes
- DRI/DNI (bidirectional) with collapsed nodes
- Bidirectional Sub-Network Connection Protection (SNCP)
- Unidirectional Path Switched Ring UPSR
- Ring-to-ring SNCP/UPSR

Transmission interfaces

LambdaUnite MSS includes the following optical port units:

Interface type	Transmission rate	Wavelength
Optical	STM-256/OC-768	1.5 long reach
		1.5 µm (intermediate reach)
		1.3 µm (intra office)
		OLS 800 G compatibel
		passive WDM compatible
		passive WDM compatible
	STM-64/OC-192	1.5 µm (long reach)
		1.5 µm (intermediate reach)
		1.3 µm (intra office)
		OLS 800 G compatibel
		passive WDM compatible
	STM-16/OC-48	1.3 µm (short reach / intra office)
	GE1/SX4, 1Gigabit Ethernet	—

Switch capacity

The total full non-blocking switch capacity is 320 Gbit/s (6144 STS-1/2048 VC-4s).

Additionally also overhead information from SDH/SONET I/O ports may be transparently switched. The switch is based on a bit sliced architecture providing this very high capacity on a single pack.

Cross-connection levels

The following cross-connection levels are supported in *LambdaUnite* MSS:

- VC-3
- VC-4
- VC-4-4c (Concatenated VC-4)
- VC-4-16c (Concatenated VC-4)

- VC-4-64c (Concatenated VC-4)
- STS-1
- STS-3
- STS-12
- STS-48
- STS-192

Output mode The cross-connection output mode is a provisionable parameter

- for the destination-to-source direction, and/or
- for the source-to-destination direction.

If some of the facilities are not in place whenever the cross-connection is being established, then you can provision this field as Terminated-AIS or Terminated-IDLE (DS3) / Unequipped (SDH/SONET) and a Terminated-AIS or Terminated-IDLE (DS3) / Unequipped (SONET) signal will be inserted to function as a keep-alive signal.

If all of the involved facilities are in place when the cross-connection is established, the field should be provisioned as NORMAL. The end-to-end signal path is then established and the signal can be passed.

□

Protection mechanisms

Overview

The reliability of a transmission system can be considerably increased by means of redundant transmission routes. In the event of a transmission error, e.g. if LOS (Loss of Signal) is signalled due to a cable break, or in the event of an excessive bit error ratio, the signals can be switched to a protection line.

Types

The following types of network protection switching can be realized:

- STM-256, STM-64, STM-16 2-fiber Multiplex Section-Shared Protection Ring (MS-SPRing) or OC-768, OC-192, OC-48 2-fiber Bidirectional Line Switched Rings (BLSR)
- STM-256 4-fiber Multiplex Section-Shared Protection Ring (MS-SPRing), STM-256 4-fiber MS-SPRing transoceanic protocol or OC-768 4-fiber Bidirectional Line Switched Rings (BLSR)
- Multiple MS-SPRing/BLSR protection
- Sub-Network Connection Protection (SNCP) or Unidirectional Path Switched Rings (UPSR)
- STM-256, STM-64, STM-16, STM-4, STM-1 1+1 Multiplex Section Protection (MSP) or OC-768, OC-192, OC-48, OC-12, OC-3 1+1 Automatic Protected Switch (APS)
- Multiple MSP/APS 1+1 protection.

Principle

Equipment Protection

An equipment protection always involves one or more plug-in units which carry traffic (***working*** plug-in unit) and one or more ***protection*** plug-in unit(s) which will assume the function of a plug-in unit that has failed. Together they form a ***protection group***.

Types

For the following circuit packs equipment protection is supported:

- Timing Generator circuit pack (TMG): 1+1
- Cross-connect circuit pack (SWITCH/STS576 and PPROC/STS192): 1+1
- Power feed is maintained duplicated throughout the system

Creation The equipment protection groups are created automatically if the required circuit packs are plugged in the shelves (cf. "Protection configurations" (11-68)).

Operation The equipment protections operate non-revertive.

Path Protection

Overview

The principle of a path protection is based on the duplication of the signals to be transmitted and the selection of the best signal available at the path connection termination. The two (identical) signals are routed over two different path segments, one of which is defined as the main path and the other as standby path. The same applies to the opposite direction. The system only switches to the standby path if the main path is faulty.

LambdaUnite™ MSS supports both, SONET and SDH path protection features.

- SDH: SNCP
- SONET: UPSR

SNCP

SNCP providing path-level protection for individual VC-N circuits that are routed independently across any network (meshed, rings or mixed). It may be applied at any path layer in a layered network. It can be used to protect a portion of a path between two Connection Points (CPs) or between a CP and a Termination Connection Point (TCP), or the full end-to-end path between two TCPs.

SCNP is a dedicated 1+1 protection architecture in which the traffic is permanently bridged onto two SNCs at the transmit end, carried through any number of facilities of any type, and selected from one of the two SNCs at the receive end. One SNC is called the working SNC and the other, the protection SNC.

LambdaUnite MSS supports two types of SNCP:

- Inherently monitored subnetwork connection protection (SNC/I) SNC/I protection, generally, protect against failures in the server layer. The protection process and the defect detection process are performed by two adjacent layers. The server layer performs the defect the defect detection process, and forwards the status to the client layer by means of the Server Signal fail (SSF) signal. This means AU-4 or STS-1 defects are defects and the switch is triggered by the SSF signal.
- Non-intrusively monitored subnetwork connection protection (SNC/N)

SNC/N protection, generally, protects against failures in the server layer ***and*** against failures and degradation in the client layer. This means the non-intrusive monitor function on the received side detects Signal Fail (SD) and Signal Degrade (SD) events on the incoming signal and triggers the switch.

UPSR

The UPSR is typically a SONET ring architecture. It provides path-level protection for STS-N circuits within in physical ring network. The ring is usually comprised of unprotected lines at the same OC-N rate which are connected in a ring topology. Typically all (or most) of the circuits within the ring are path-protected. The UPSR provides redundant bandwidth to protect services against node failures or other failures conditions. UPSR operate by bridging an identical STS-N path signal in both directions around the ring, and then selecting the better of the two signals to drop from the ring, based on a signal quality hierarchy. As for SNCP, the path selection is based on purely local information, i.e. on path layer indications including path layer defects and maintenance signals.

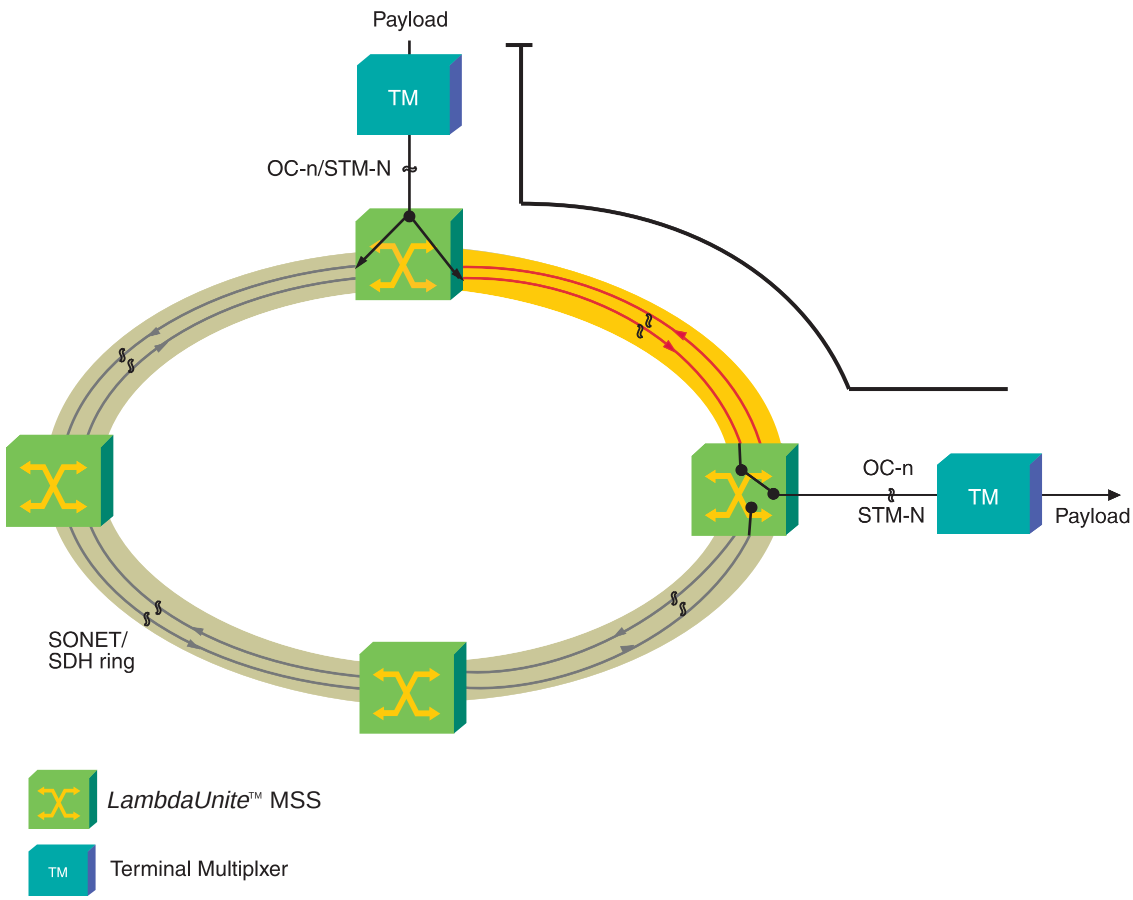
LambdaUnite MSS supports UPSR protection, also within logical ring applications.

A logical ring is formed by bridging the incoming signal at a source node, diversely routing the two paths through a SONET network, and selecting the ***better*** of the two diversely routed paths at the destination node. The paths may traverse over any type of physical linear, mesh or ring network.

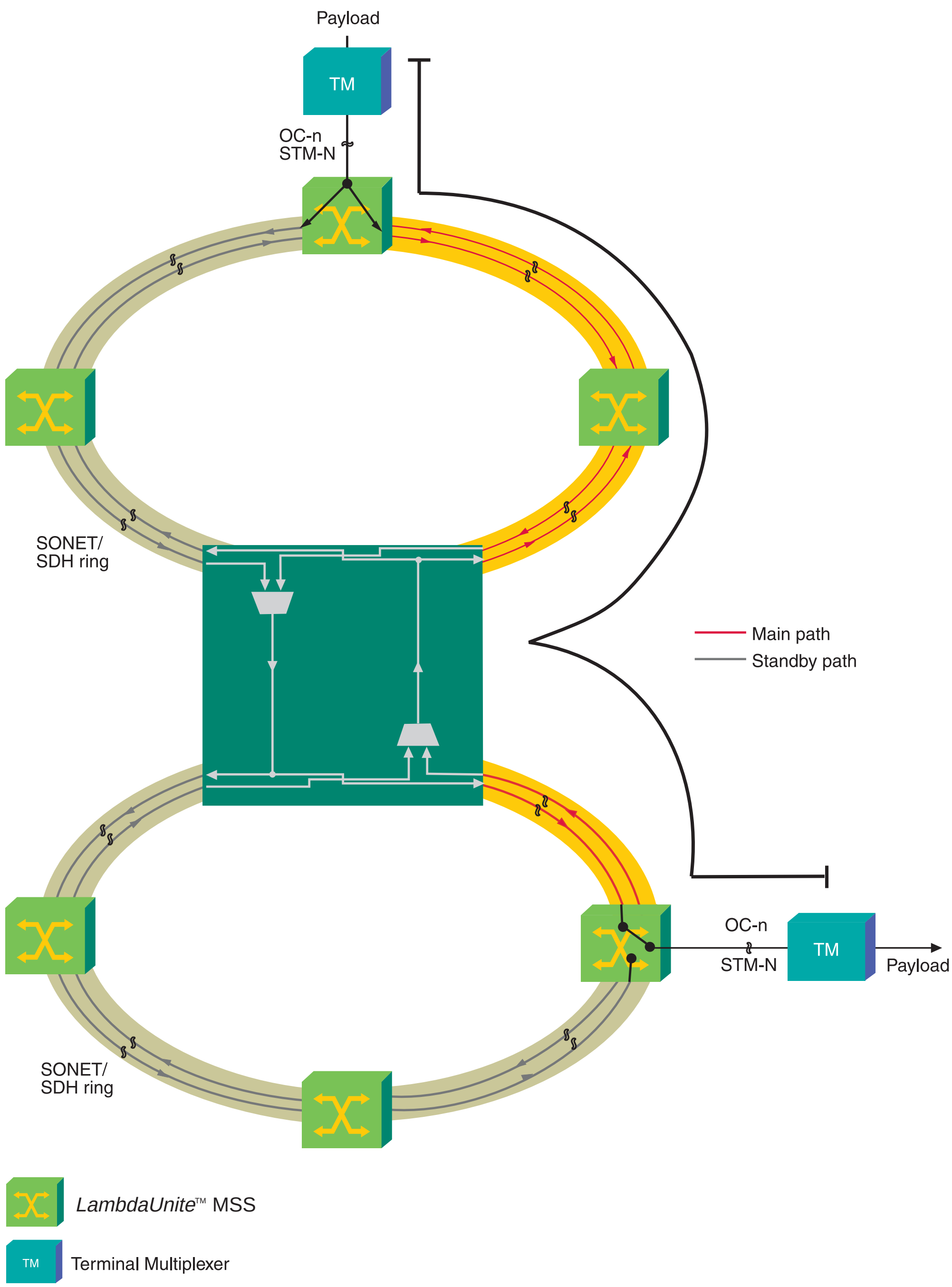
Topologies

The *Navis*™ Optical EMS supports the creation of SNCP/UPSR protected paths in single rings and in connected rings (ring-to-ring configuration, i.e., one NE connects to two rings). Please note that in the ring-to-ring configuration the full SNCP/UPSR is available within each ring. The connection between the rings, this means the connection within the NE, is unprotected, because there is no dual node ring interworking.

The following figure shows an example of a single ring UPSR/SNCP application. Path 1 is the working (main) path, path 2 is the protection (standby) path in this example. The path termination is always outside the *LambdaUnite* MSS. For simplification, the UPSR/SNCP switch is only shown for an unidirectional connection.



The following figure shows an example of a ring-to-ring UPSR/SNCP configuration. Here, the UPSR/SNCP also consists of a broadcast in transmit direction. The signal then moves through the first ring via path 1 (working) and path 2 (protection). The ring is connected to another ring via one single NE. For simplification, the UPSR/SNCP switch is only shown for an unidirectional connection.



Switching criteria

Two types of events can trigger a switch action.

- failure detection
- external request

Controller failures in the NE do not affect the capability of automatic SNCP/UPSR protection switching.

SNCP/UPSR protection switching can be configured revertive or non-revertive with *Navis* Optical EMS. When revertive switching is configured, a wait-to-restore time can be defined. The default configuration is non-revertive.

Switching time

For automatic SNCP/UPSR protection switching, the total time to complete the protection switch does not exceed 50 ms. It is possible to provision a hold-off time, i.e. a time period before initiating a switch.

Manual switch

The following manual switching actions are possible with *Navis* Optical EMS:

- manual to working: switches the traffic to the main path if it is not faulty
- manual to protection: switches the traffic to the standby path if it is not faulty
- forced to working: causes switchover to the main (working) path (even if this path is faulty)
- forced to protection: causes forced switchover to the standby (protection) path (even if this path is faulty)
- clear: clears any active manual switch request, clear will also release the wait-to-restore timer when provided for revertive switching

□

Line protection

Overview

In line protection switching, the complete (physical) transmission path between two multiplexers is duplicated. This means that a separate Optical Interface Unit is connected in each multiplexer for the main (working) and standby (protection) section.

LambdaUnite™ MSS supports both, SONET and SDH line protection features.

- SDH: 1+1 Multiplex Section Protection (MSP) on STM-256, STM-64, STM-16, STM-4 and STM-1 interfaces
- SONET: 1+1 Linear Automatic Protection Switch (APS) on OC-768, OC-192, OC-48, OC-12 and OC-3 interfaces

MSP

The SDH multiplex section protection scheme complies with the ITU-T G.841.

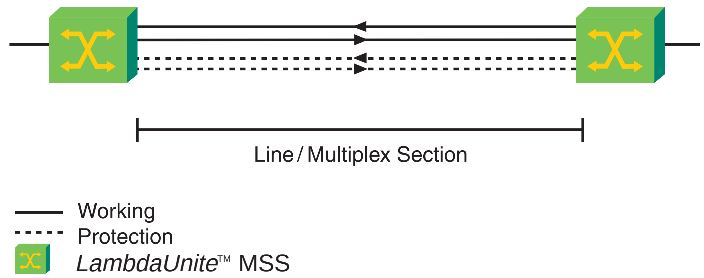
APS

The SONET Linear Automatic Protection Switch scheme complies with the ANSI T 1.105.01 APS.

1+1 MSP/APS

In case of a 1+1 MSP/APS each main line is assigned to one standby line. As for other types of protection switching the signals are duplicated in the transmit direction. In the receive direction, this type of switching either selects, depending on the signal quality, the input signals of the main section or that of the standby section for transmission. The NEs are equipped with an MSP function which carries out the selection and changeover processes. The switching activities are monitored by the K1-K2 byte protocol according to ITU-T Rec. G.783. This takes place in the receive direction on the circuit pack, which is connected to the standby section.

The following figure illustrates the schematic diagram of a 1+1 Multiplex Section Protection.



Switching criteria

The switchover is triggered by the following switching criteria, which are generated by the MST functional block after evaluation of the SOH:

- ***Signal Degrade (SD)***
  Bit error ratio (BER) in the range 10^{-3} ... 10^{-9}
- ***Loss of Signal (LOS)***
- ***Loss of Frame (LOF)***
- ***Multiplex Section Excessive Bit Error Ratio (MS-EXC)***
  Bit error ratio $\geq 10^{-3}$
- ***Multiplex Section Alarm Indication Signal (MS-AIS)***

Mode of operation

In the *LambdaUnite* MSS systems the 1+1 MSP/APS operate unidirectional in non-revertive mode.

□

Ring protection

Overview

A Ring Protection is a self-healing ring configuration in which traffic is bidirectional between each pair of adjacent nodes and is protected by redundant bandwidth on the bidirectional lines that interconnect the nodes in the ring. Because traffic flow is bidirectional between nodes, traffic can be added at one node and dropped at the next without traveling around the entire ring. This leaves the spans between other nodes available for additional traffic. Therefore, with many traffic patterns a bidirectional ring can carry much more traffic than the same facilities could carry if configured for a unidirectional ring.

LambdaUnite™ MSS supports both, SONET and SDH ring protection features.

- SDH: Multiplex Section Shared Protection Ring (MS-SPRing)
- SONET: Bidirectional Line Switched Ring (BLSR)

MS-SPRing

The following MS-SPRing protection schemes can be configured:

- 2-fiber MS-SPRing on STM-256, STM-64 and on STM-16 interfaces
- 4-fiber MS-SPRing on STM-64 interfaces
- 4-fiber MS-SPRing with transoceanic protocol on STM-64 interfaces

The protection scheme complies with ITU-T Rec. G.841 and provides in a future release also “extra traffic” on STM-64 and STM-16 interfaces in the MS-SPRing configuration. 4-fiber MS-SPRing for the STM-256 and on the STM-16 interfaces will be supported in future.

BLSR

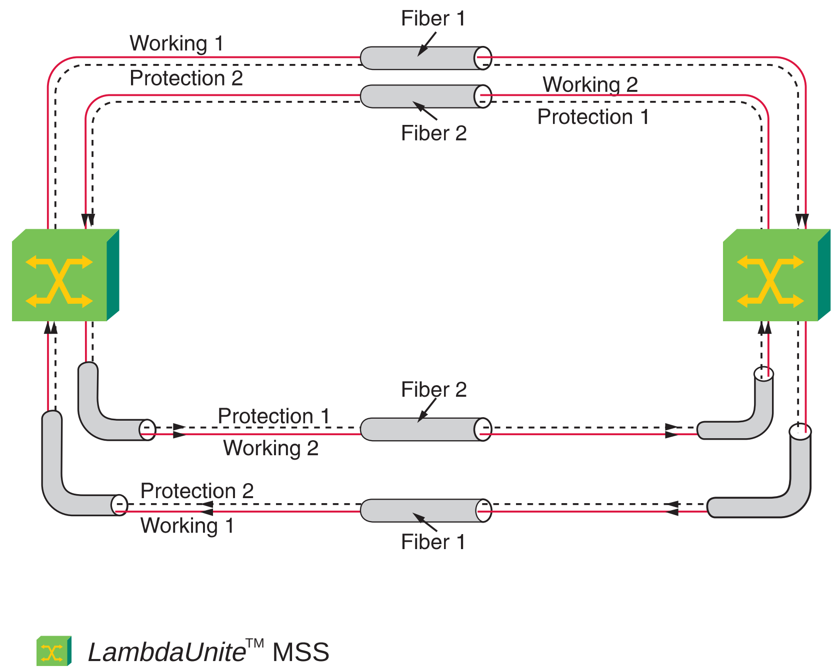
The following protection schemes can be configured:

- 2-fiber BLSR on OC-768, OC-192 and on OC-48 interfaces
- 4-fiber BLSR on OC-192 interfaces

The OC-48 and OC-192-fiber BLSR complies with the ANSI T1.105.01 APS.

Traffic capacity

The following figure shows working and protection traffic capacities in a *LambdaUnite* MSS 2-fiber MS-SPRing/BLSR.



Self-healing rings

LambdaUnite MSS MS-SPRings/BLSRs are self healing, that means transport is automatically restored after node or fiber failures.

In case of a 2-fiber 10Gbit/s MS-SPRing/BLSR, each line carries 32 VC-4/STS-3c equivalent timeslots of working capacity plus 32 VC-4/STS-3c equivalent timeslots of protection capacity. For 2-fiber 2.5 Gbit/s MS-SPRing/BLSR, the working and protection capacity is 8 VC-4/STS-3c equivalents timeslots.

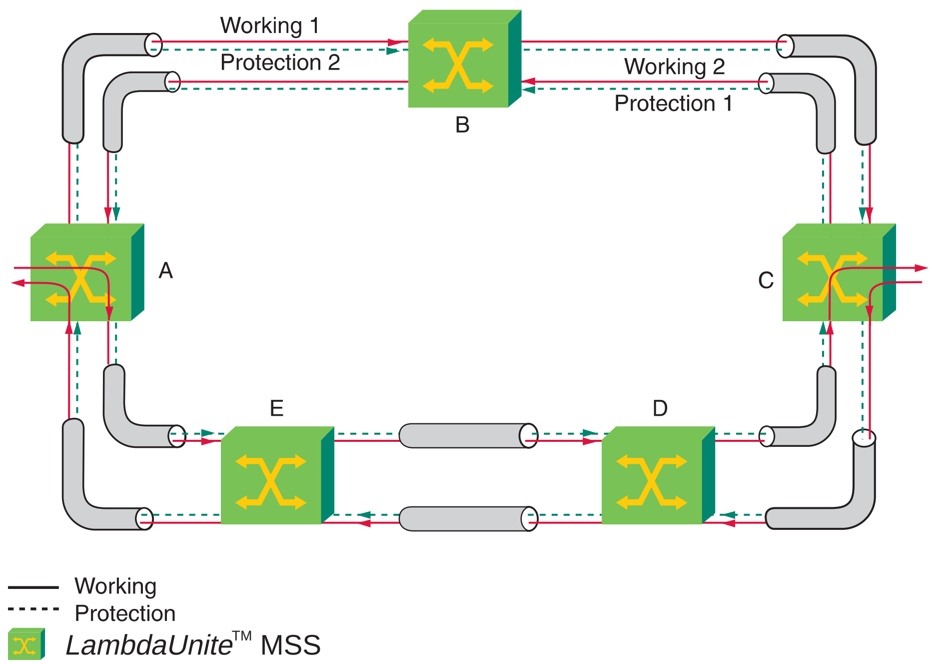
In the event of a fiber or node failure, service is restored by switching traffic from the working capacity of the failed line to the protection capacity in the opposite direction around the ring. (See “Fiber cut example” (11-49).)

Low-priority traffic

Unprotected traffic can be established on the protection channels (low-priority traffic). This traffic is preempted in case of a protection switch.

Traffic flow example

The following figure shows normal (non-protection-switched) traffic flow in a *LambdaUnite* MSS 2-fiber MS-SPRing/BLSR.

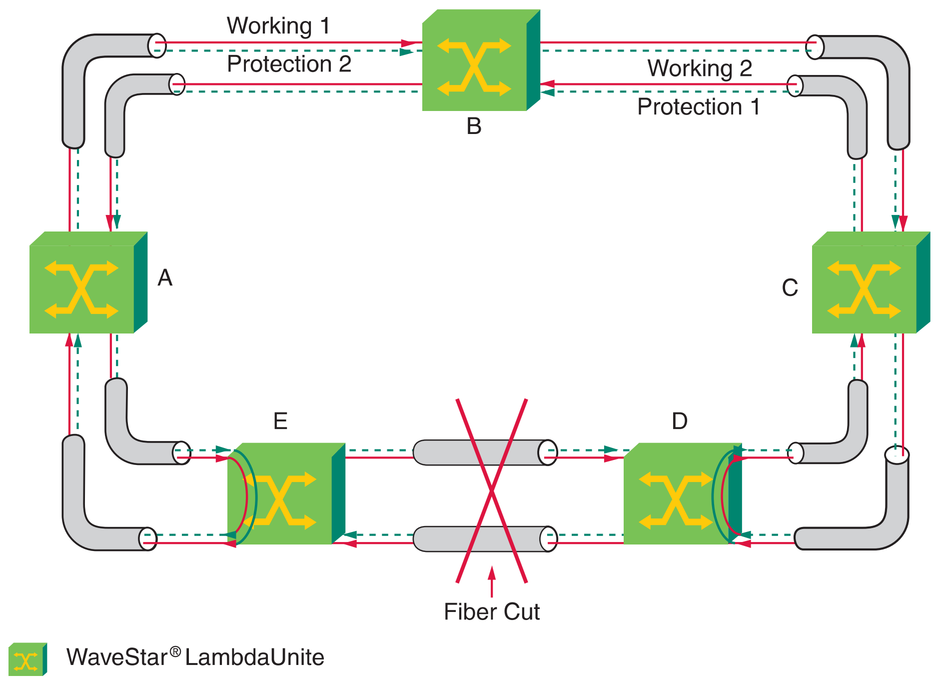


Protection switching

When a line-level event triggers a protection switch, the affected nodes switch traffic on to protection capacity and transport it to its destination by looping it back the long way around the ring. (See "Fiber cut example" (11-49).) Service is reestablished on the protection capacity in less than 50 milliseconds after detection of the failure (for catastrophic failures in rings without existing protection switches or extra traffic).

Fiber cut example

The following figure illustrates a 2-fiber MS-SPRing/BLSR protection switch that results from a fiber cut.



Protection traffic flow

In the example (see "Fiber cut example" (11-49)), traffic going from node A to node C that normally passed through node E and node D on ***working 2*** capacity, is switched onto the ***protection 2*** capacity of the line leaving node E in the opposite direction. The traffic loops back around the ring via node B, C, and D (where the loopback switch is active) to node C. Similarly, traffic going from node C to node A that normally passed through node D and node E on ***working 1*** capacity is switched on to the ***protection 1*** capacity of the line leaving node D in the opposite direction.

The same approach is used for a node failure. For example, if node D were to fail, nodes C and E would perform loopback protection switches to provide an alternate route for ring traffic.

MS - SPRing switch parameters

The following table gives an overview over the parameters in the MS - SPring switch parameters window.

Field	Possible values	Meaning
Switch Command	CLEAR, LOCKOUT, FRCD, MAN	The switch commands have the following meaning • CLEAR - Clears a previous LOCKOUT or FRCD request. Allows the protection to switch automatically • LOCKOUT - The protection switch is disabled. • FRCD - A forced switch is issued even if the other line would be faulty. • MAN - A manual switch is issued only if the other line is error free.
Destination Entity	WKG, PROTN	Entity for which the switch is issued. This is either the working (WKG) or the protecting (PROTN).
Destination Side	east, west	The transmission direction (east or west) to which the traffic shall be switched.
Destination Entity AID	AID	AID of the entity for which the switch is issued.
Switch Type	ring, span	The switch type should be set to ***span***.

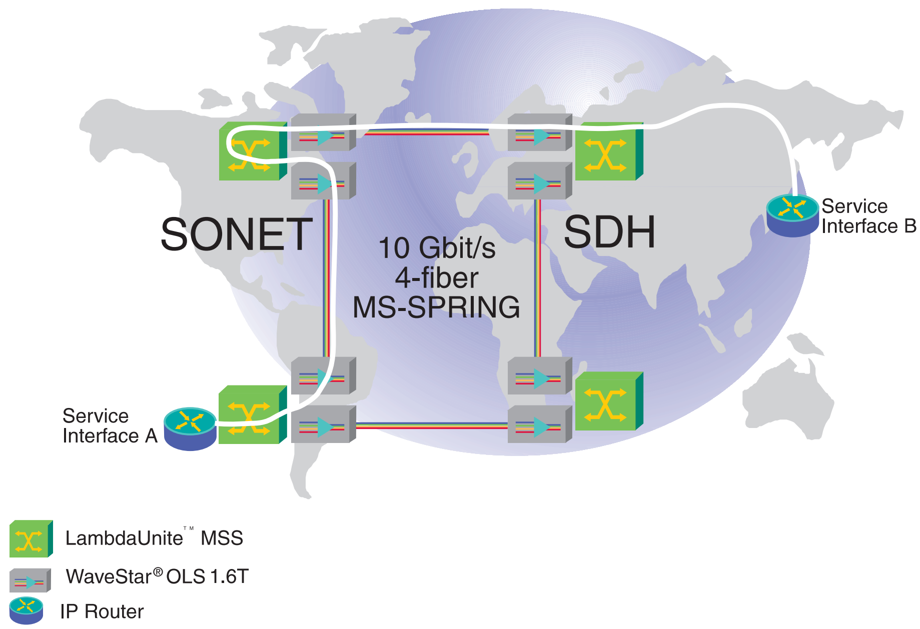
Transoceanic protocol

A special feature of a future release of *LambdaUnite* MSS for very long-haul 4-fiber MS-SPRing applications is the transoceanic protocol. It shortens the protection path in rings, avoiding loops over very long distance spans. Thus it greatly reduces the impact of propagation delay on the signal quality, and it saves fiber resources.

LambdaUnite MSS supports 4-fiber MS-SPRing transoceanic protocol protection schemes on the 10-Gbit/s interfaces. The protection scheme complies with ITU-T Rec. G.841.

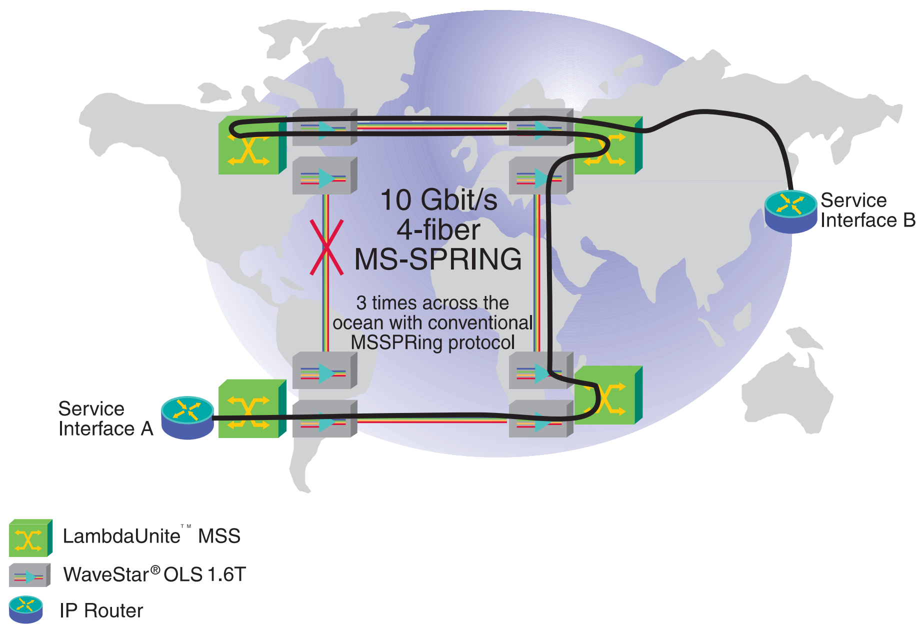
Transoceanic principle

The following figure provides a schematic view of *LambdaUnite* MultiService Switch (MSS) in a 4 fiber MS-SPRing very long distance configuration. The MS-SPRing is composed of four *LambdaUnite* MultiService Switch (MSS) elements. Under normal conditions (MS-SPRing idle) the traffic is routed from service interface A over two very long distance spans to service interface B.



Plain MS-SPRing switching case

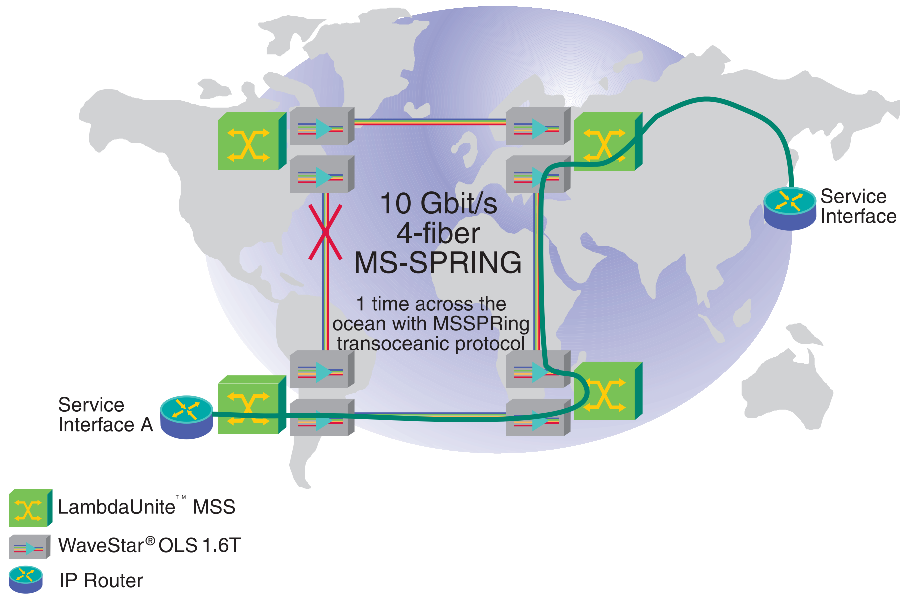
The figure below shows the traffic flow in the MS-SPRing protection condition (switching case) ***without*** transoceanic protocol. In case of a complete fiber cut as indicated by the red cross, the traffic is carried ***three times across the ocean***.



MS-SPRing with transoceanic protocol, switching case

In the protection condition (switching case) ***with*** transoceanic protocol, the traffic ***passes the ocean only once***, running through ***two very long distance spans*** only, as shown in the following figure.

LambdaUnite MultiService Switch (MSS) routes the traffic directly to the service interface B, avoiding the loop over the ocean.



In this way *LambdaUnite* MultiService Switch (MSS) in the MS-SPRing with transoceanic protocol shortens the protection path strikingly, improving significantly the signal quality and increasing the performance of fiber resources.

□

Dual Node Ring Interworking (DNI)/Dual Ring Interworking (DRI) for MS-SPRing or BLSR

Overview

Dual node ring interworking (DNI) is a configuration that provides path-level protection for selected STM-N circuits that are being carried through two rings. Protection for the route between the two rings is provided by interconnecting the rings at two places.

Each circuit that is provisioned with DNI protection is dual-homed, meaning it is duplicated and subsequently terminated at two different nodes on a ring. The two interconnecting nodes in each ring do not need to be adjacent.

DNI protection

The self-healing mechanisms of the two rings remain independent and together protect against simultaneous single failures on both rings (not affecting the interconnections). The DNI configuration additionally protects against failures in either of the interconnections between the rings, whether the failure is in a facility or an interconnection node.

Transoceanic protocol

DNI is not yet supported in a 4-fiber MS-SPRing transoceanic protocol.

Interworking

All *LambdaUnite*™ MSS tributary interfaces (STM-256, STM-64, STM-16, STM-4 and STM-1, OC-3, OC-12, OC-48, OC-192, OC-768) can support dual node ring interworking.

A *LambdaUnite* MSS ring can interwork with MS-SPRing/BLSR, including rings using

- *WaveStar*® TDM 10G
- *LambdaManager*™ Terabit MultiService Switch (TMSS)
- *Metropolis*™ DMX Access Multiplexer
- *WaveStar* BandWidth Manager
- *LambdaUnite* MultiService Switch (MSS)
- *WaveStar* ADM16/1 STM-16 interfaces

Additionally, there can be intermediate NEs in the interconnection routes between the two rings.

Primary and secondary nodes

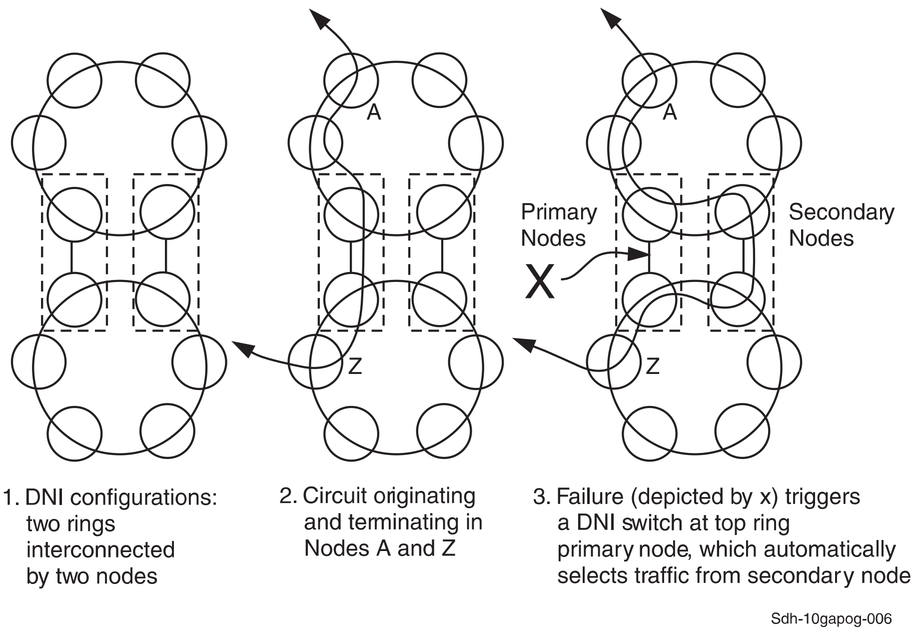
In the MS-SPRing, a bidirectional DNI-protected circuit to and from the terminating node is added and dropped at both a primary node and a secondary node, both of which interconnect with the other network. The primary and secondary nodes are defined and provisioned on a per-circuit basis.

Drop and continue

LambdaUnite MSS supports the drop and continue method of DNI, in which the primary node is located between the terminating node and the secondary node and performs the drop-and-continue and path-selection functions. The primary node drops the circuit in the direction of the other network and also continues (bridges) the circuit to the secondary node. The secondary node drops the circuit in the direction of the other network and adds the circuit from the other network in the direction of the terminating node. The primary node either adds the circuit received on its tributary interface from the other network, or else passes through the duplicate signal received on the line from the secondary node, depending on standards-compliant path selection criteria.

Protection switching example

The following graphic illustrates a failure of the interconnection to a primary node at the point labeled “X” in the figure. The failure results in a DNI switch at the primary node in the top ring. A DNI protection switch in a *LambdaUnite* MSS occurs in ≤ 50 milliseconds (not counting the detection time) plus a provisionable hold-off time nominally of 100 milliseconds. The graphic shows a DNI configuration transporting traffic between nodes A and Z.



Types of connection

The two types of connections shown in Example: DRI/DNI via OC-3/STM-1 tributaries are

- a direct intraoffice connection between the primary nodes, Node 1 and Node 2, at the first central office (CO 1).
- an optically extended, direct secondary connection between the secondary nodes (Node 3 at the second central office (CO 2) and Node 4 of the WaveStar® ADM16/1 STM-16 ring). This type of connection is achieved through the STM-1 low-speed interfaces at the interconnected nodes and can go through other equipment.

Both types of connection can be used in either primary or secondary nodes.

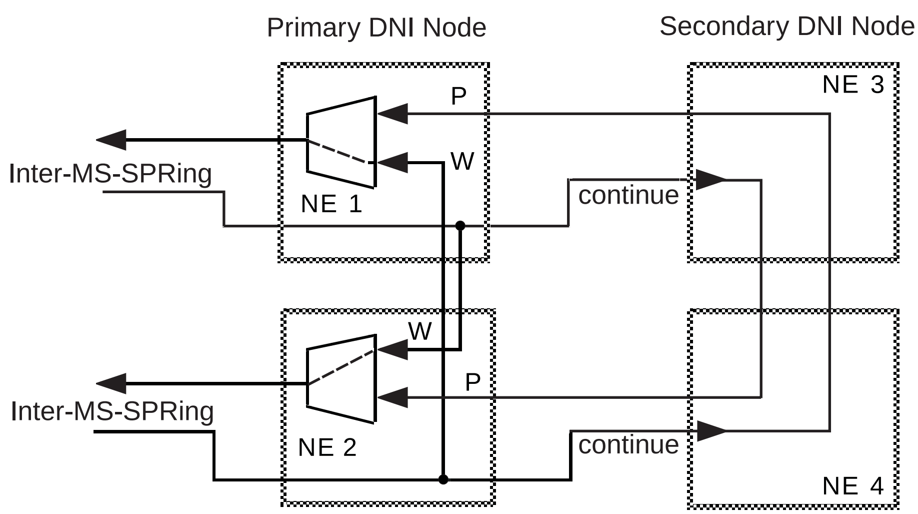
Failure conditions

In the illustrated configuration *LambdaUnite* MultiService Switch (MSS) protection switching results from the following failure conditions (grouped by priority, from highest to lowest):

- LOP, P-AIS, or Unequipped
- Excessive Bit Error Ratio (EXC)
- Signal Degrade (DEG)

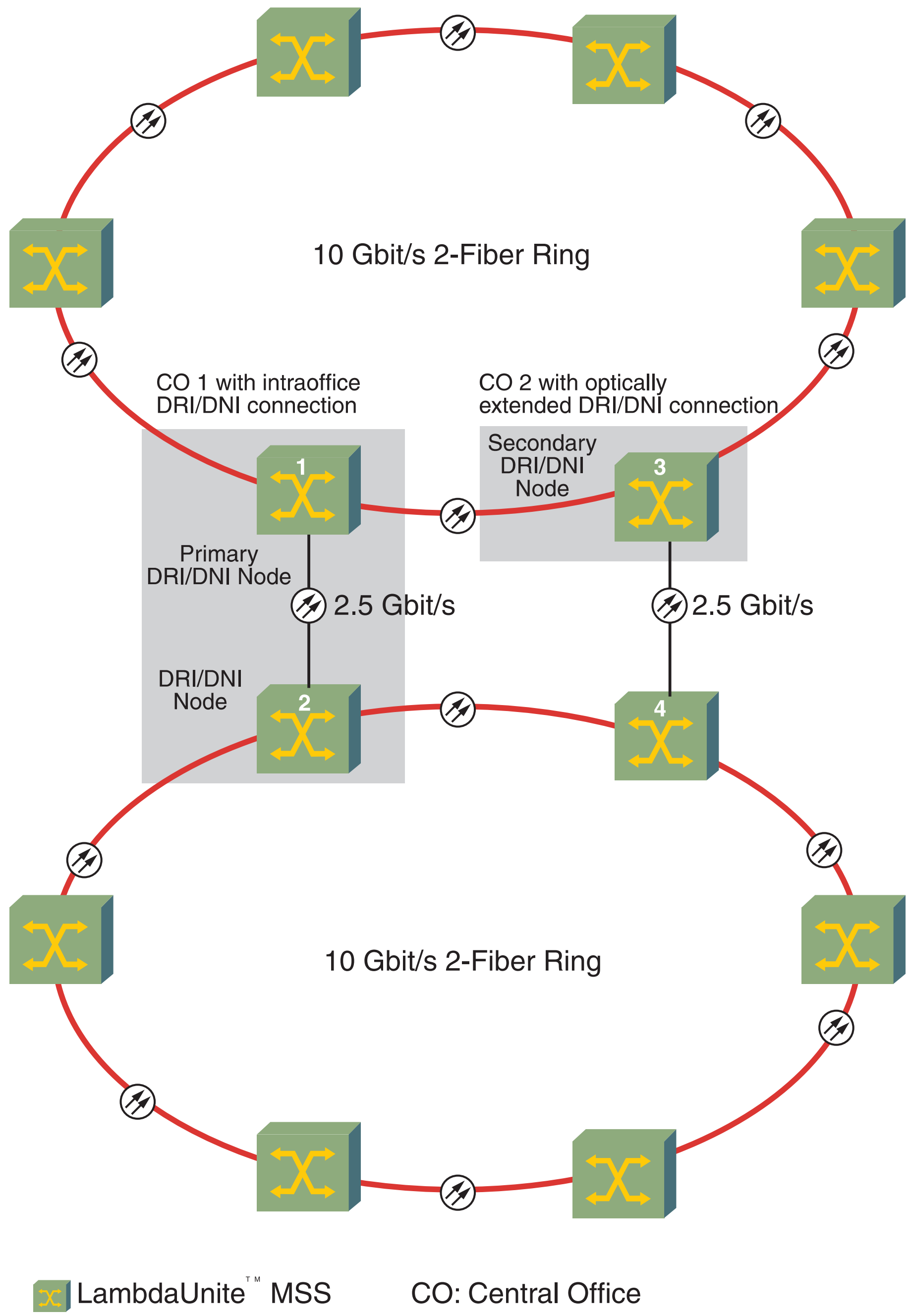
Implementation of the switch

The following figure shows in more detail the implementation of the protection switch in the previous example in NE 1 and NE 2.



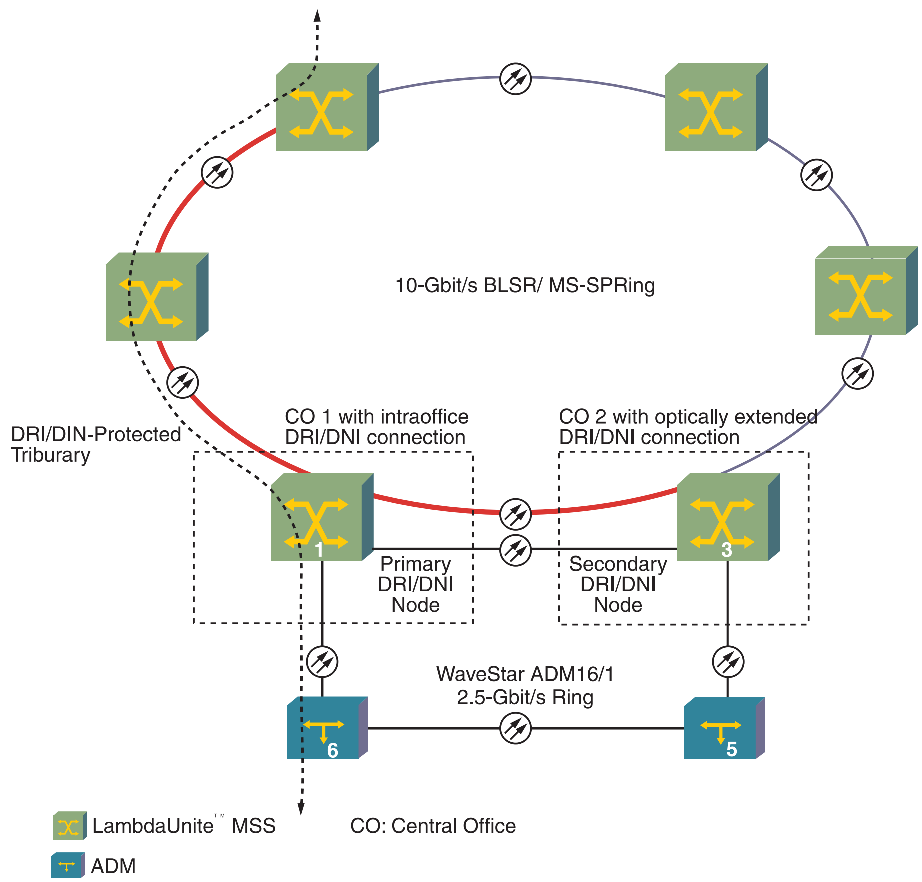
Example: DRI/DNI via OC-3/STM-1 tributaries

The following figure illustrates a DRI/DNI configuration that uses 2.5-Gbit/s interfaces between two *LambdaUnite* MSS 10-Gbit/s rings.



Collapsed nodes

A further, more sophisticated, possibility is to use the *LambdaUnite* MultiService Switch (MSS) itself as the DNI node. By means of the STM-16 interfaces, the STM-16 ring can be directly connected to the *WaveStar* TDM 10G (STM-64), as depicted in the following graphic. So, the complete DNI node is included in one network element.



□

DNI/DRI SNCP or UPSR

Overview

LambdaUnite™ MSS supports DNI/DRI between two SNCP or UPSR protected rings.

Related Information

For related information please refer to "SNCP" (11-39) and "UPSR" (11-40).

SDH Dual node ring interworking (DNI) for SNCP

LambdaUnite MSS supports SDH dual node interworking (DNI) for the purpose to protect between two SNC/I/N protected rings. The DNI feature is compliant with ITU-T Rec. G.842 standard. It provides a service selector for each VC-N tributary provisioned for DNI.

The service selector selects the better of two received path-level signals in accordance with a given hierarchy of conditions. These conditions include VC Path Signal Fail. Multiple DNIs (up to the maximum system capacity) are supported.

SONET Dual ring interworking (DRI) for UPSR

LambdaUnite MSS supports SONET dual ring interworking (DRI) for the purpose to protect between two UPSR protected rings. The DRI feature is compliant with Telcordia GR-1400-CORE chapter 4.6 standard. It provides a service selector for each STS-M tributary provisioned for DRI.

The service selector selects the better of two received path-level signals in accordance with a given hierarchy of conditions. These conditions include STS Signal Fail and PDI-P (Payload defect indicator path level), for drop and continue. Multiple DRIs (up to the maximum system capacity) are supported.

□

DNI/DRI between MS-SPRing and SNCP or BLSR and UPSR

Overview

LambdaUnite™ MSS supports Dual Node Ring Interworking (DNI) with the Drop-and-Continue method between a MS-SPRing and a SNCP ring.

Benefits

This feature allows for

- highly survivable services where circuits are carried through interconnected rings with different protection schemes
- advanced networking capabilities with a single network element that supports OC-48/STM-16, OC-192/STM-64 and OC-768/STM-256 rings and interconnects traffic directly from one ring to another.

Transoceanic protocol

DNI is not yet supported in a 4-fiber MS-SPRing transoceanic protocol.

Concept

The ring interworking between a MS-SPRing/BLSR and a SNCP/UPSR ring provides a high degree of protection of the traffic crossing from one ring to the other.

It is capable of protecting against the failure of

- one interconnecting node
- two interconnecting nodes (each on different rings, but on the same interconnect)
- the connection between two interconnecting nodes.

Note that, within the MS-SPRing/BLSR, any line or node failure (including interconnecting node) will be protected at Multiplex Section level by the standard MS-SPRing/BLSR scheme, as described in ITU-T Recommendation G.842 . The BLSR DRI feature is compliant with Telcordia GR-1230-CORE, GR-1400-CORE and ANSI T1.105.01

There are two variants of interconnection between rings. The two interconnected rings being in

- the same network element or
- in different network elements.

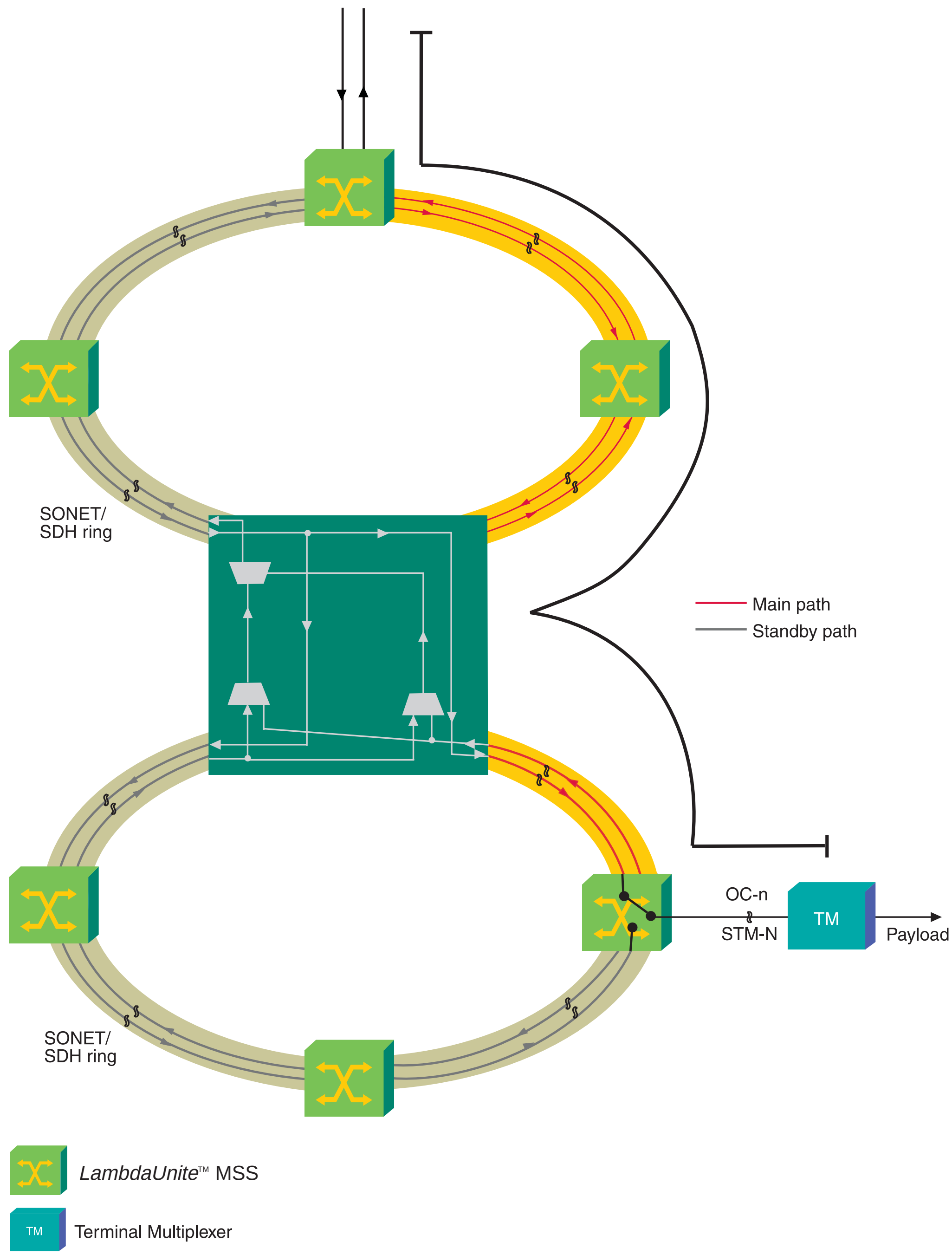
The SNCP and MS-SPRing behave as described in ITU-T Recommendation G.841. The MS-SPRing is either a STM-256, STM-64 or a STM-16 2-Fiber MS-SPRing The SNCP ring is either a STM-256, STM-64, a STM-16, a STM-4 or an optical STM-1 SNCP ring.

The following combinations of ring interworking between a MS-SPRing and a SNCP ring are supported:

- STM-256 MS-SPRing with either STM-64 or STM-16 or STM-4 or optical STM-1 SNCP ring.
- STM-64 MS-SPRing with either STM-64 or STM-16 or STM-4 or optical STM-1 SNCP ring.
- STM-16 MS-SPRing with either STM-64 or STM-16 or STM-4 or optical STM-1 SNCP ring.
- STM-64 MS-SPRing with STM-64 SNCP ring, with both rings in separate nodes.

Both MS-SPRing/BLSR and SNCP/UPSR ring support VC-3, VC-4, VC-4-4c and VC-4-16c, VC-4-64c, STS-1, STS-3, STS-12, STS-48, STS-192 signal rates. The interconnection between rings can be done at any of these rates. The ring interworking does not require inter-ring signalling. Ring interconnection may occur among multiple rings.

Functional details The following figure shows in more detail the interworking between the two rings (one MS-SPRing and one SNCP ring) in different NEs.



MS-SPRing Nodes

The MS-SPRing nodes support the Drop-and-Continue method, i.e.

- in one direction, the traffic is extracted from a working channel on the ring (Drop), and transmitted towards the opposite side on the ring (Continue);
- in the other direction, the signal is selected from either a traffic entering the ring (Add), or a channel from one side on the ring (Continue), and it is transmitted towards the opposite side on the ring.

The selector is called ring interworking service selector. The interconnecting node providing the Drop-and-Continue function for a tributary is called the primary node for this tributary.

The Continue traffic is only carried over the working bandwidth between the primary and secondary nodes, i.e. the channel assignment (timeslot) on the multiplex section used between the primary and secondary nodes is the same as that used between the primary and terminating nodes. The Drop-and-Continue on the protection bandwidth is not supported in this release.

The ring interworking service selector in the primary node is used to protect against ring interconnection failures. It protects at path level, based on path defects detection. It supports the SNC/N protection type only, and operates in either the revertive or the non-revertive mode. By default, it operates in the revertive mode, with a Wait-to-Restore time of 5 minutes. In other words, the ring interworking service selector shall behaves just like any other path selector.

The service selector in the primary node can be operated by the user.

The ring interworking service selector in the primary node behaves independently of the MS-SPRing scheme. Though these two protection mechanisms (i.e. path protection and MS-SPRing) are cascaded back-to-front in a primary node, they do not interfere since they do not protect at the same level. Therefore it is required to support a hold-off time for the service selector in order to avoid a double protection (hence a double transmission hit) in some failure scenarios (like a line failure between the primary and secondary nodes). The default hold-off time is 100 ms.

The hold-off time to the ring interworking service selector is also required to avoid propagation of switching from one ring to the other (e.g. a path protection switch in the SNCP ring leading to a service selector switch at the primary node in the other ring).

An interconnecting node failure is protected at Multiplex Section level by the standard MS-SPRing scheme.

The two interconnecting nodes (i.e. the primary and secondary nodes) within the MS-SPRing do not need to be adjacent.

SNCP ring nodes

The SNCP Ring nodes support the Drop-and-Continue method. Note that the connections for this Drop-and-Continue method differ from that used in a MS-SPRing interconnecting node (primary node). For each direction of transmission in the SNCP ring, the signal is dual-fed from the terminating (source) node around both sides of the ring. When each of the dual-fed signals hits an interconnection node, it is dropped at that node and continued onto the other interconnection node using drop-and-continue. Thus, each interconnection node can select from two signals sent on a different way around the ring. The output of the selector in each interconnection node is then transmitted to the other ring (MS-SPRing). In the other direction, the signal coming from the other ring (MS-SPRing) is transmitted towards the terminating (sink) node, away from the other interconnection node. Finally, the terminating (sink) node makes the selection between the two signals from the two directions around the ring. Due to the symmetry of this scheme, the two interconnecting nodes are completely equivalent.

The path selector in the interconnecting node supports the SNC/N protection type only, and operates in either the revertive or the non-revertive mode. By default, it operates in the revertive mode, with a Wait-to-Restore time of 5 minutes. In other words, the ring interworking service selector behaves just like any other path selector.

The path selector in the interconnecting node can be operated by the user.

A hold-off time to the path selector avoids propagation of switching (i.e. one protection switch leading to another). The default hold-off time is 100 ms.

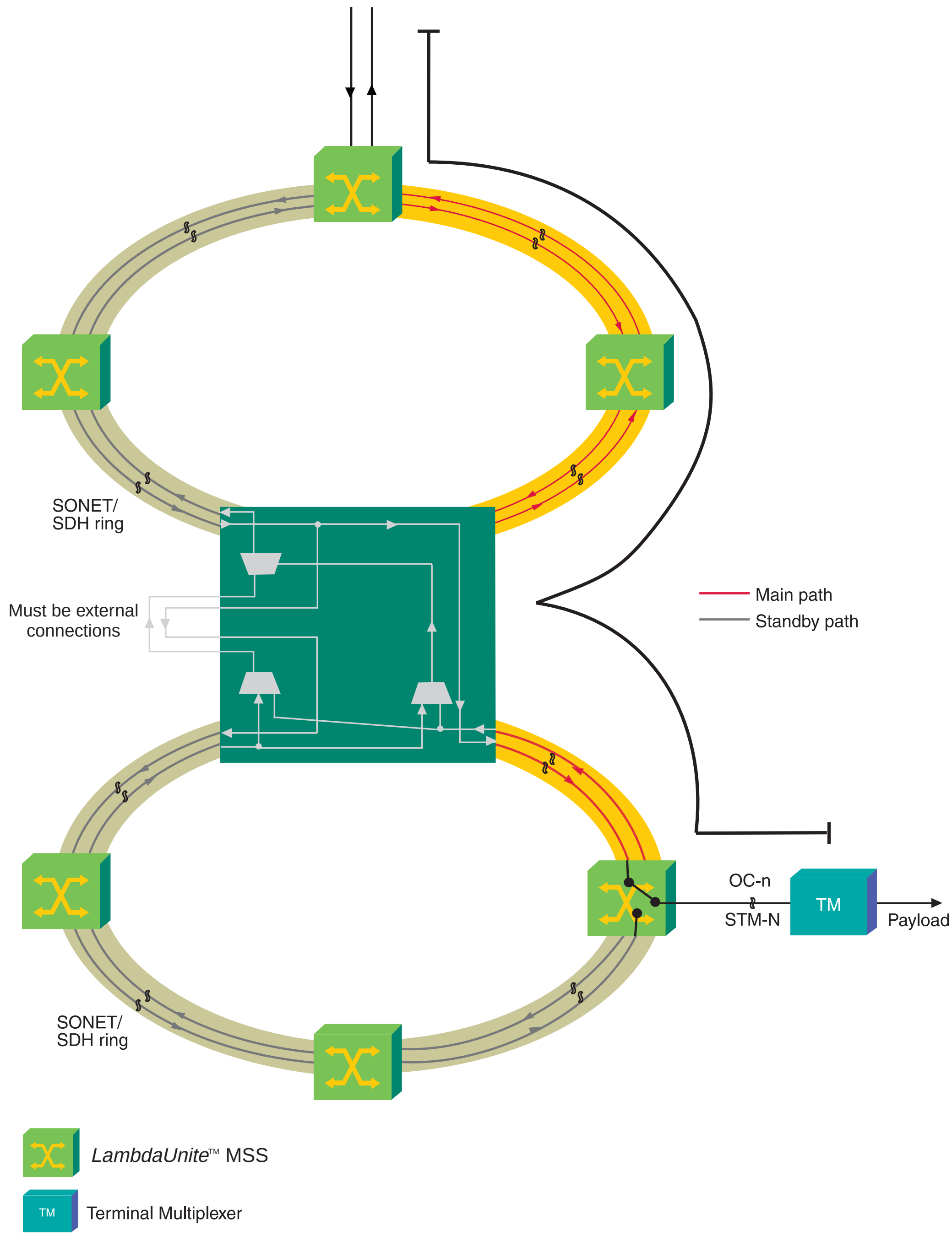
The two interconnecting nodes within the SNCP ring do not need to be adjacent.

Both rings in the same NE

The ring interworking between a MS-SPRing and a SNCP ring is supported with both rings in different NEs or with both rings in the same NE.

For this latter case, the recommended method is to connect the circuits in this limited category through an additional pair of optical ports and fibers, as if between separate NEs. One pair of unprotected optical ports could be used for all such circuits in the NE unless the number of these circuits requires additional capacity.

A bidirectional VC-3/VC-4/VC-4-Nc circuit, which is interconnected between a MS-SPRing and a SNCP Ring, is depicted in the following figure, according to this feature restriction.



□

Protection configurations

Overview

This section describes the shelf configuration guidelines that have to be observed for the following protection mechanisms:

- 4-fiber MS-SPRing/BLSR
- 4-fiber MS-SPRing Transoceanic Protocol
- 2-fiber MS-SPRing/BLSR
- 1+1 MSP/ 1+1 APS.

MS-SPRing/BLSR

The MS-SPRing/BLSR related STM-16/OC-48, STM-64/OC-192 and STM-256/OC768 circuit packs have to be plugged into any universal slot.

MSP/APS

MSP/APS can only be established between two separate circuit packs (which are of the same type), i.e. it is not allowed to establish MSP/APS between 2 ports on the same circuit pack. MSP/APS between different ports on different circuit packs can be configured independently, e.g. one port of circuit pack 1 can be protected with one port of circuit pack 2 while the second port on circuit pack 1 is protected by circuit pack 3.

For STM-16/OC-48 port units, any pair combination of universal slot positions can be applied.

Cross-connect unit protection

The SWITCH/STS576 circuit pack in slot (1-1) switch0 in the Main Shelf is paired with the circuit pack in slot (1-1) switch1 in a 1+1 non-revertive protection mode configuration.

The SWITCH/STS576 circuit pack in slot (1-2) switch0 in the Main Shelf is paired with the circuit pack in slot (1-2) switch1 in a 1+1 non-revertive protection mode configuration.

The PPROC/STS192 circuit pack in slot (1-2) ppls0 provides frame delay management between the switch functions of the low speed part of the shelf and the high speed part ((1-1) sw. 0).

The PPROC/STS192 circuit pack in slot (1-2) ppls1provides frame delay management between the switch functions of the low speed part of the shelf and the high speed part ((1-2) sw. 1).

The SWITCH/STS576 circuit pack in slot switch0 in the Extension Shelf is paired with the circuit pack in slot switch1 in a 1+1 non-revertive protection mode configuration.

□

Port parameters

STM port parameter description

The following table gives an overview over the parameters in the STM port parameters window.

Field	Possible values	Meaning
Excessive Maintenance Inhibit	TRUE, FALSE	When this parameter is set to ***false*** an AIS (Alarm Indication Signal) will be inserted as consequent action of the alarm EBER (Excessive Bit Error Ratio).
Optical Wavelength	1310, 1550	The wavelength of the optical signal in nm.
Optical Distance	INTRA-OFFICE, SHORT-HAUL, LONG-HAUL	The length of the optical line.
Forward Error Correction	ENABLE, DISABLE	The forward error correction can be enabled or disabled for the output. An enabled FEC allows for greater spans.
FEC Correction Enable	ENABLE, DISABLE	The forward error correction can be enabled or disabled for the input. An enabled FEC allows for greater spans.

Field	Possible values	Meaning
Tributary Input Signal Rate List	signal structure is shown. e.g. 644 (= 64xVC-4), 444C(= 4xVC-4–4C)	This parameter defines the VC-n signal substructure across the port's bandwidth for the input signal. For each STM-1 the substructure can be selected. The substructure for the Tributary Input Signal Rate List and the Tributary Unequipped Output Signal Rate List need not be the same. For example, 64 VC-4s on the input signal and 4 VC-4-4cs on the output signal is allowed.
Tributary Unequipped Output Signal Rate List	signal structure is shown. e.g. 644 (= 64xVC-4), 444C(= 4xVC-4–4C)	This parameter defines the VC-n signal substructure across the port's bandwidth for an output signal which does not contain real traffic. For each STM-1 the substructure can be selected. The substructure for the Tributary Input Signal Rate List and the Tributary Unequipped Output Signal Rate List need not be the same. For example, 64 VC-4s on the input signal and 4 VC-4-4cs on the output signal is allowed.

Field	Possible values	Meaning
FEC Type	INBAND, OUTBAND	In-band FEC yields an OSNR improvement of approx. 3 dB at a BER of 10 -12 . It is primarily used to compensate insufficiencies of optical components. Out-of-band FEC yields an OSNR improvement of approx. 5 dB at a BER of 10 -12 . It enables high-speed transmission more reliably and for longer distances.
Multiplex Section Degrade Threshold	-5, ..., -9	This parameter defines the threshold for the tolerable signal degradation. If the threshold is exceeded MS-DEG is signalled.
Multiplex Section DEXC Threshold	-3, ..., -5	This parameter defines the threshold for the Excessive Bit Error Ratio (EXC) related to the Multiplex Section. If the threshold is exceeded MS-EXC is signalled.
Port Mode		The Port Mode defines whether a port causes alarms or not.
	AUTO	If a valid signal is present at the port, the Port Mode is set to MON automatically.
	MON	The port causes alarms, if necessary.
	NMON	The port does not cause alarms.

Field	Possible values	Meaning
Far-end Multiplex Section PM Enable	ENABLE, DISABLE	The performance monitoring for the far-end of the multiplex section can be enabled or disabled.
PM Multiplex Section Far-end SES threshold	0, 5, ..., 50	The threshold of severely errored seconds (in %) can be set for the far-end of the multiplex section. If the threshold is exceeded an alarm is raised. (Should be set to 30.)
PM Multiplex Section Near-end SES threshold	0, 5, ..., 50	The threshold of severely errored seconds (in %) can be set for the near-end of the multiplex section. If the threshold is exceeded an alarm is raised. (Should be set to 30.)
PM Regenerator Section Near-end SES threshold	0, 5, ..., 50	The threshold of severely errored seconds (in %) can be set for the near-end of the regenerator section. . If the threshold is exceeded an alarm is raised. (Should be set to 30.)
RSMS TCA Profile Name	Default0, Default	The threshold crossing alert profile for the regenerator and multiplex section.
RS/Near End Multiplex Section PM	ENABLE, DISABLE	The performance monitoring for the near-end of the regenerator section can be enabled or disabled.

Provisioning (VC-3) parameters

The following table gives an overview over the parameters in the VC-3 parameters window.

Field	Possible values	Meaning
DEXC Threshold	-3, -4, -5	This parameter defines the threshold for the Excessive Bit Error Ratio (EBER). If the threshold is exceeded Signal Fail (SF) is signalled.
Path degrade threshold	-5, ..., -9	This parameter defines the threshold for the signal degrade condition.
Path Trace J1 Read Format	1, 15, 16, 64	(Setting not supported by the current NE release.)
Path Trace (J1)	(number)	(Setting not supported by the current NE release.)
Tributary Monitoring Mode	NMON, MON	If set to MON an alarm is caused, if necessary. If NMON is set, no alarms are caused by the tributary.

12 Traffic maintenance concepts

Overview

Purpose

This chapter provides you with information about traffic maintenance regarding performance monitoring and measurements.

Contents

Performance monitoring background

Definitions

The following definitions explain expressions which are important for the performance monitoring.

Anomaly An anomaly is a discrepancy between the actual and the desired characteristic of a system component.

Defect A defect is the limited interruption of the ability of a system component to perform a required function.

Block A block is a set of consecutive bits associated with the path/section. Each bit belongs to one and only one block. Consecutive bits may not be contiguous in time.

Errored block An errored block is a block in which one or more bits are in error.

Errored second An errored second (for in-service measurements) is a one-second interval with one or more errored blocks or at least one anomaly.

Severely errored second A severely errored second (for in-service measurements) is a one-second interval which contains a configurable amount of errored blocks (default: 30 %) or at least one defect

Background block error An errored block not occurring as part of a severely errored second is a background block error.

Unavailable seconds Unavailable seconds determine the period of time during which a path is in the unavailable state. A period of unavailable time begins at the onset of ten consecutive severely errored second events. These ten seconds are considered to be part of unavailable time. A new period of available time begins at the onset of ten consecutive non severely errored second events. These ten seconds are considered to be part of available time.

□

Performance measurement

Basic measurement parameters

The following performance parameters are available to estimate the error performance of a section (SONET):

- SES (number of Severely Errored Seconds in the received signal)
- ES (number of Errored Seconds in the received signal)
- CV (number of Code Violations in the received signal)
- SEFS (number of seconds during which the Severely Errored Framing defect was detected)
- LOSS (number of seconds during which the Loss of Signal defect was detected)

The following performance parameters are available to estimate the error performance of a line (SONET):

- SES (number of Severely Errored Seconds in the received signal)
- ES (number of Errored Seconds in the received signal)
- CV (number of Code Violations in the received signal)
- UAS (number of Unavailable Seconds in the received signal)
- FC (number of times the incoming signal failed (AIS detected or inserted))
- AISS (number of seconds during which the AIS defect was detected)

The following performance parameters are available to estimate the error performance of an RS, MS (SDH):

- SES (number of Severely Errored Seconds in the received signal)
- ES (number of Errored Seconds in the received signal)
- BBE (number of Background Block Errors in the received signal)
- UAS (number of Unavailable Seconds in the received signal)

The following performance parameters are available to estimate the error performance of a VC sub-network connection (SDH):

- SES (number of Severely Errored Seconds in the received signal)
- ES (number of Errored Seconds in the received signal)
- BBE (number of Background Block Errors in the received signal)
- UAS (number of Unavailable Seconds in the received signal)

Enabling performance measurement points

Performance measurement points can be enabled via the *Navis*™ Optical EMS and via the *WaveStar*® CIT.

Data storage

All data is stored in the current bin. The managed NE has a current data register (current bin) for 15 minutes and 24 hours. Once a termination point for measurements has been configured, you are able to get a snapshot view of the data gathered at any time (default).

Historic bins

The NE keeps a store of the historic 15 minute and 24 hour bins.

Interval	Number of historic bins	Total storage time
15 minute	16	4 hours
24 hours	1	1 day

Data retrieval

Performance Data can be polled via the *Navis* Optical EMS and via the *WaveStar* CIT.

Reports

Via the *WaveStar* CIT the user is able to create reports from history data stored in the database of the network management system.

Zero suppression

Performance data sets with counter value zero, i.e. no errors occurred, will not be stored in the performance data log.

Performance alarms

If the counter value of a performance parameter exceeds the threshold, an alarm can be generated and displayed on the *Navis* Optical EMS and *WaveStar* CIT.

Threshold profiles

Threshold profiles store the threshold values of PM parameters that require thresholding. One threshold profile of each parameter group type may be associated with each port. PM values stored in threshold profiles determine the threshold crossing alerts of a monitored value for a port. The **Performance** menu in the **System View** window of the *WaveStar* CIT allows you to create, modify, or delete profiles, view profile information, and assign profiles to ports.

Maximum number of threshold profiles

The maximum number of threshold profiles is limited to the NVM space. The system supports the following maximum number of default and user created profiles:

- 30 regenerator multiplex-section port-level profiles

Fault localization

Performance alarms only give a hint that the signal quality at a certain measurement point is degraded. They can be used as a help for fault localization. The severity of such an alarm is strongly dependent on the application of your network. Often it can be helpful to define a very low threshold value in order to realize a signal degradation at a very early stage.

Clearing

The clearing of the alarms is done automatically at the end of the first complete interval during which no threshold crossing occurred.

□

Performance management parameters

Global PM management parameters

The following table gives an overview over the parameters in the global performance management parameters window.

Field	Possible values	Meaning
Collect PM Data	(checked, not checked)	Switch on or off the collection of PM data by *Navis*™ Optical EMS
For 15 minute Reports: (1 to 30 days)	1, ..., 30 (slider)	Number of days for which 15 minute reports are collected.
For 1 day Reports: (1 to 30 days)	1, ..., 30 (slider)	Number of days for which 1 day reports are collected.

NE PM management parameters

The following table gives an overview over the parameters in the NE performance management parameters window.

Field	Possible values	Meaning
Enable 15 minute PM data collection for this NE	(checked, not checked)	The 15 minute PM data collection for this NE is enabled or disabled.
Enable 1 day PM data collection for this NE	(checked, not checked)	The 1 day PM data collection for this NE is enabled or disabled.
All facility types in this NE	on, off (radio button)	The performance date from all facility types in this NE are collected.
Only these facility types	on, off (radio button)	The performance data from the below checked facility types in this NE are collected.

Field	Possible values	Meaning
STM-256, STM-64, STM-16, STM-1, STM-1E, VC3, VC4, VC4-4C, VC4-16C, VC4-64C, VC4-256C	(checked, not checked)	Only data from the here checked facility types are collected, if **Only these facility types** is selected.

Equipment protection switch parameters

Equipment protection switch (timing pack equ.) parameters

The following table gives an overview over the parameters in the global performance management equipment protection switch parameters for timing pack equipment window.

Field	Possible values	Meaning
Switch Command	CLEARFRCD, FRCD, MAN	A previous forced protection switch can be cleared (CLEARFRCD) or a manual (MAN) or forced (FRCD) switch can be issued.
Destination Entity	0, 1	Entity for which the switch is issued.
Destination Entity AID	(AID)	AID of the entity for which the switch is issued.

Switch Fabric Pack Equipment Parameters

The following table gives an overview over the parameters in the switch fabric pack equipment parameters window.

Field	Possible values	Meaning
Switch Command	CLEARFRCD, FRCD, MAN	The switch commands have the following meaning • CLEARFRCD - Clears a previous FRCD request. Allows the protection to switch automatically • FRCD - A forced switch is issued even if the other line would be faulty. • MAN - A manual switch is issued only if the other line is error free.

Field	Possible values	Meaning
Destination Entity	0, 1	Entity for which the switch is issued.
Destination Entity AID	AID	AID of the entity for which the switch is issued.

Cross connection loopbacks

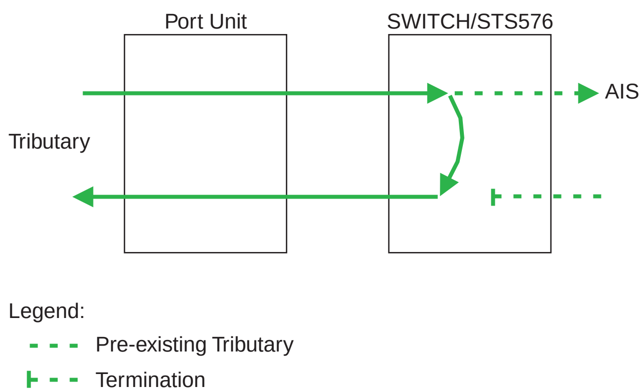
Purpose of cross connection loopbacks

Cross connection loopbacks (also referred to as "XC loopbacks") make it possible to loop an input tributary back to the output of the same tributary. The selected input tributary is looped back in the switch unit (SWITCH/STS576 circuit pack).

Cross connection loopbacks can be used for testing purposes.

Functional principle

The following schematically diagram depicts the functional principle of cross connection loopbacks.



A cross connection loopback can be regarded as a temporary cross connection of indeterminate duration. If a cross connection already exists on the selected tributary, an alarm indication signal (AIS) is inserted downstream during the loopback. If a cross connection exists in the opposite direction, the signal is terminated during the loopback. When the cross connection loopback is released, any cross connections that were affected by the loopback are automatically re-established and the insertion of AIS is brought to a termination.

Active cross connection loopbacks are indicated via the ABN LED on the user panel.

Permitted signal levels

Cross connection loopbacks can be performed on any tributary regardless of whether there exists a cross connection for the selected tributary or not.

All supported signal rates are permitted.

Facility loopbacks

Overview

Facility loopbacks are loopbacks switched on whole ports. They make it possible to verify the correct system operation and may facilitate troubleshooting of problems.

There are two types of facility loopbacks:

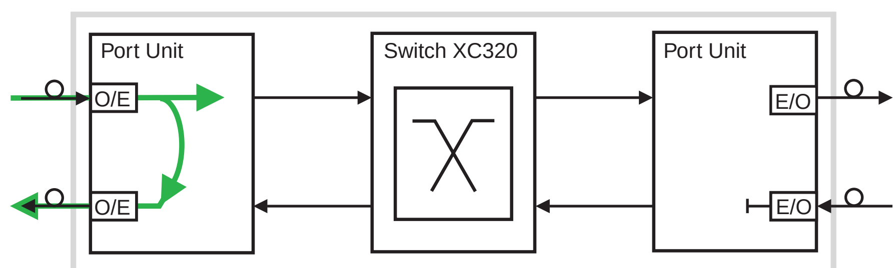
- Near-side facility loopbacks
  The signal on the input port is looped to the corresponding output port with transpassing as few NE components as possible.
  Near-side facility loopbacks can be switched on all out-of-service optical interface ports.
- Far-side facility loopbacks
  The transmission signal to the output port in the NE is looped back to the corresponding input port with passing through as many equipment components as possible.
  Far-side facility loopbacks can be switched on all out-of-service optical interface ports as well as on 1-Gbit/s Ethernet ports.

Near-side facility loopbacks

Near-side facility loopbacks can be used to test the correct cabling between two network elements including the involved interface ports.

Functional principle

The following diagram depicts the functional principle of near-side facility loopbacks.



The incoming signal at the input port is, after optical-to-electrical conversion, entirely looped back to the output port.

Near-side facility loopbacks are characterized as follows:

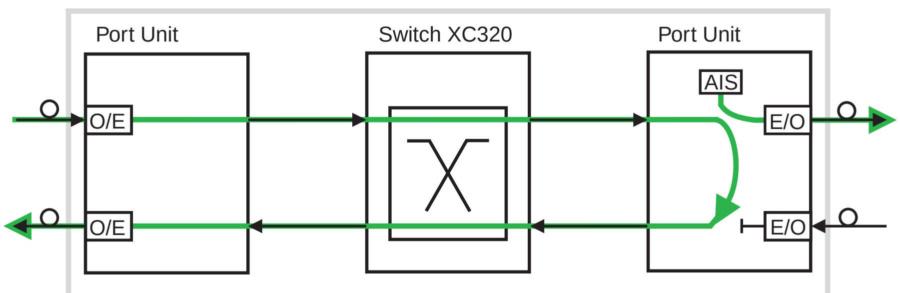
- Near-side facility loopbacks are transparent, the signal transmitted in the downstream direction is not changed.
- The signal transmitted in the original (downstream) direction is different from the signal looped back. Particular Section/RS and Line/MS Overhead bytes, such as those used for frame alignment (A1, A2) or bit error monitoring (B1, B2) for example, are not looped back but processed. The Path Overhead (POH) and the payload signal, however, are looped back unchanged.
- The incoming signal in the upstream direction is terminated during the loopback.

Far-side facility loopbacks

Far-side facility loopbacks can be used to test signal paths through a network element.

Functional principle

The following diagram depicts the functional principle of far-side facility loopbacks.



Far-side facility loopbacks are characterized as follows:

- Far-side facility loopbacks are non-transparent, the signal transmitted in the original (downstream) direction is different from the signal looped back. Line AIS (SONET) or MS-AIS (SDH) respectively is inserted into the outgoing signal in the downstream direction during the loopback.
- The signal is not changed before it is looped back.
- The incoming signal in the upstream direction is terminated during the loopback.

□

Loopback parameters

Loopback parameters

The following table gives an overview over the parameters in the loopback parameters window.

Field	Possible values	Meaning
Access Identifier	(AID)	AID for which the loopback shall be operated.
Loopback Type	Cross-Connect Loopback, Near-side Facility Loopback, Far-side Facility Loopback	Type of the loopback
Rate	VC3, VC4, VC4 – 4C, VC4 – 16C, VC4 - 64C, VC4 - 256C, STS - 1c, STS - 12c, STS - 48c, STS - 192c, STS - 768c	Signal rate at which the loopback operates.
Action	Operate Loopback, Force Loopback	A loopback can be operated in a normal way or being forced.

Lucent Technologies
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13 Software upgrade concepts

Overview

Purpose This section provides background information on features relating to the NE Software Management.

Contents

NE memory concept

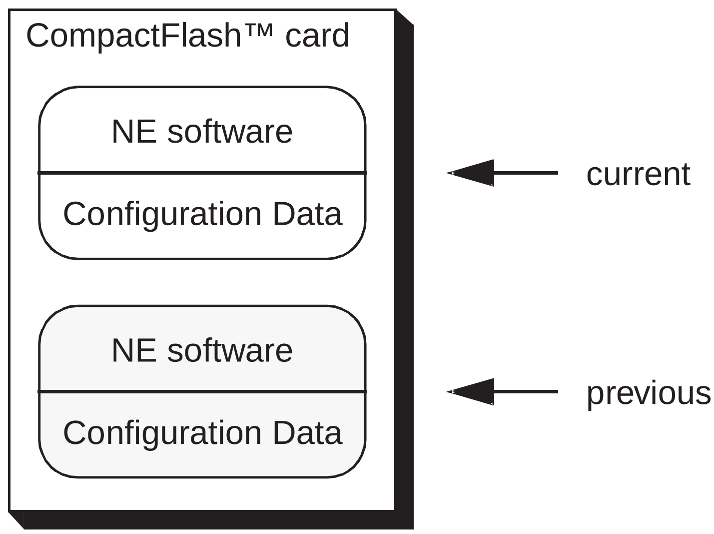
Overview

The *LambdaUnite*™ MSS system is equipped with volatile working memory and non-volatile memory (NVM). *LambdaUnite* MSS systems make use of a *CompactFlash*™ card as a nonvolatile memory.

***CompactFlash* card**

The *CompactFlash* card is used to store the currently active and a previous version of the executable NE software and configuration data. The *CompactFlash* card is inserted into the CTL system controller. The “previous” store area is the one into which data can be downloaded using the *Navis*™ Optical EMS system or the *WaveStar*® CIT. Activating (“installing”) a newly downloaded software version changes the current/previous assignment automatically.

The following figure illustrates the partitioning of the *CompactFlash* card.



Preparing a *CompactFlash* card

When initially delivered, the compact card is empty. *WaveStar* CIT can be used to copy the initial software generic from the CD-ROM to the *CompactFlash* card .

□

Software download

Definition

Software download is the process of transferring a software generic from a remote entity to a target NE's memory. The remote entity may be a network management system or a CIT. The download process is responsible for establishing the association between the source of the software generic and the target NE and ensuring the integrity of the data during the transfer. The download procedure uses bulk transfer to move an uninterpreted binary file into an NE.

Types of software download

Depending on the state of the NE, there are two possible types of software download:

- Initial software download
- Software download for upgrade purposes.

Initial software download

Typically, when a software generic is installed for the first time, it is necessary for a craft person to be present on site to monitor the installation. The on-site installation is supported via removable storage media (*CompactFlash*™ card) associated with *WaveStar*® CIT.

The software is initially delivered to the customer via CD-ROM. The *CompactFlash* card is initially empty. The software generic has to be copied from the CD-ROM to the empty *CompactFlash* card via *WaveStar* CIT. Afterwards, the *CompactFlash* card is inserted into the NE.

Software download for upgrade purposes

After a software generic is initially installed on-site, its future releases may be downloaded remotely from a centralized location supported by a configuration management application. Remote downloading of software generics not only minimizes dispatching of technicians, but also provides tighter coordination and synchronization among the activation of these software generics across multiple NEs.

Upgrading a software generic in the NE

- causes no disruption to customer services
- causes no disruption to operations support, such as performance monitoring and protection switching

- does not alter any of its existing option settings, e.g., performance monitoring parameters
- requires no re-entry of site-dependent data (e.g., provisioned parameters) into the service database of the NE.

Before accepting the loading of a software generic, the NE verifies a match between its type and the type specified in the software generic control information.

The download time for a software generic to the non-volatile memory (NVM) of the NE from *Navis*™ Optical EMS connected indirectly via a LAN is approx. 1 hour, via DCC approx. 2 hours.

After completion of the software download, there are now two versions of the software on the NE, the currently active version and the newly downloaded version which has replaced the former backup version.

After a software generic has successfully been loaded onto the NE, the NE waits for an activation (**Apply**) command.

□

Configuration backup and restoration

Background

To recover from loss of NE data because of human error, power failure, NE design flaws, software bugs etc, the system provides a backup and restoration capability.

Restore

In the restoration process the backup data is copied back into the previous NVM. Then the NE reboots. The NE verifies the serial number of the database with the serial number in the NE's EEPROM. If they are identical the restoration database becomes the working database. All command processing is suspended during restoration.

Impact on service

Backup and restoration impact the service as follows:

- The backup operation does not interfere with or interrupt the service.
- The restore operation in general impacts the service.

Restore

In the restoration process the backup data is copied back into the working memory. After the binary image is loaded the OS sends the incremental changes to the NE. The NE verifies a match between the destination of the binary image against its TID before accepting a restoration file. All command processing is suspended during restoration.

No impact on service

The backup and restore operation does not interfere with or interrupt the service.

□

NE software generic information

General

Via *Navis*™ Optical EMS you can retrieve the current software version ID. Software updates, or patches, are identified and included in the current version, if appropriate.

Software version numbering

The version number of a software generic (e.g., new, point, or patch) is identified by a numeric scheme by which a new release and its subsequent point and patch releases can unambiguously be identified and related. Each field in the version numbering has two digits.

As an example of version numbering, x.y.z, which signifies the z patch release to the y point release associated with the x release, corresponds to the successive edits for the first release.

Software management

Introduction

The *Navis*™ Optical EMS Software Management feature provides a set of functions that automates the process of transferring NE software from Digital Access Tape (DAT) or CD-ROM to the *Navis* Optical EMS host machine, and downloading, activating, and copying software to NEs. The Software Management functions assist you in doing a generic software upgrade of a given NE type in the network by providing the ability to download NE software to NEs. The Software Management features also provides backup and restore functions to protect against NE data loss. Software management functions can be performed on demand or scheduled to be performed at a later time.

Software management functions

The following functions are provided for executables:

- NE Software Transfer
- NE Software Download
- NE Software Copy
- NE Software Activate
- NE Software Delete

The following functions are provided for data:

- NE Software Backup
- NE Software Restore

The following function is provided for Software Release Information:

- View software release descriptive information

Ways to perform software management functions

Some of the Software Management functions can be performed either on-demand or scheduled. Scheduled tasks are set up to be performed once or periodically at a certain time. As with other scheduled tasks, you can specify the number of times to retry a failed or incomplete Software Management activity, as well as the time interval between attempts.

The following table indicates how the various Software Management functions can be performed.

Software Management Function	On-Demand	Scheduled
NE Software Transfer	x	
NE Software Download	x	x
NE Software Copy	x	x
NE Software Activate	x	x
NE Software Delete	x	
NE Software Backup	x	x
NE Software Restore	x	

Software transfer via removable media

DAT and CD-ROM

For file transfer from Digital Access Tape (DAT), the *Navis*™ Optical EMS hosts are configured so that all the user has to do is physically mount the tape and then use the *Navis* Optical EMS application to transfer the files to the *Navis* Optical EMS file system. For file transfer from CD-ROM, the user must both physically load the CD-ROM and use UNIX utilities to mount the file system for the CD-ROM. Once the CD-ROM has been inserted and mounted, a user can use the EMS GUI application to transfer the files from the CD-ROM to the EMS file system.

Other tools

It is also possible to use other commonly available tools and applications to get software files into the EMS file system (for example, use file transfer software, such as File Transfer Protocol (FTP), to transfer software to *Navis* Optical EMS over a network).

Viewing descriptive information for an NE software release

Prior to transferring a new software release or after the software transfer, *Navis* Optical EMS provides a function for viewing descriptive information for all software releases that are currently maintained on the *Navis* Optical EMS host machine for a given NE type.

Maximum number of software releases on *Navis* Optical EMS host

The maximum number of software releases for a given NE type that can reside on the *Navis* Optical EMS host machine varies with the host type.

The following table shows the maximum number of NE software release copies by host type.

Host Type	Number of NE Software Release Copies Per NE Type
K580	3
K460	3
K360	2
K380	3

If the host limit is exceeded, and you attempt to transfer a new software release, *Navis* Optical EMS informs you of this and instructs you to delete at least one of the existing software releases. You can use the NE Software Delete function to do this (see “Delete NE software” (7-11)).

□

NE software download

Software download function

The Software Download function allows you to download a specific software release from the *Navis*™ Optical EMS host to a specified NE. Software downloads are done by specifying the NE type and the software release to download. Software downloads are performed by *Navis* Optical EMS via an IAO-LAN interface using File Transfer Access Method (FTAM) protocol.

Verifying software downloads

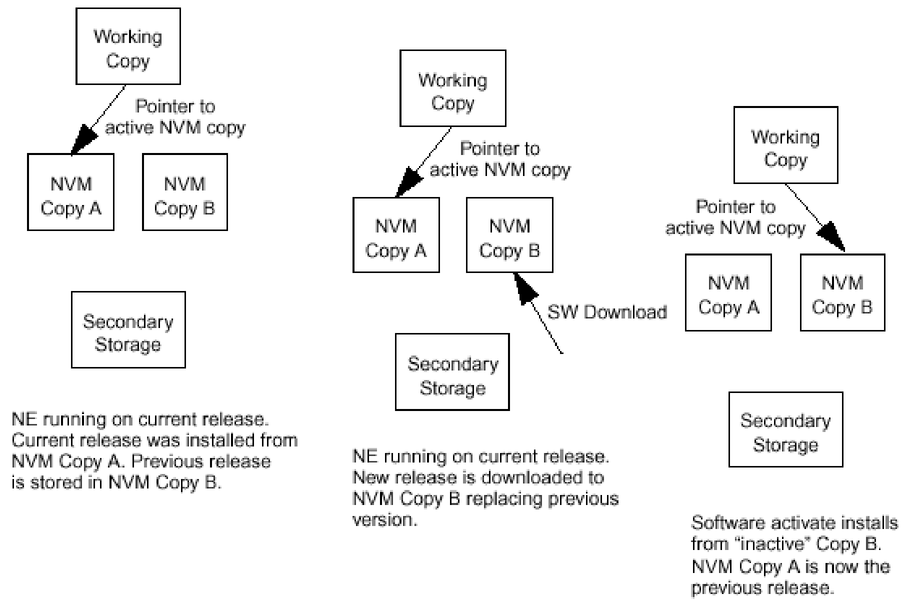
When a software download is performed *Navis* Optical EMS checks if the release identified for the download is older than or the same version currently running on the NE, or if it is a release that is not supported by *Navis* Optical EMS. If any of these conditions occur, *Navis* Optical EMS informs you of this, and asks if you want to proceed with the software download anyway. You have the option of continuing with the software download or cancelling it. *Navis* Optical EMS informs you of the status of the download. If the software download fails for some reason, *Navis* Optical EMS issues an error message.

Maximum number of software downloads

The number of simultaneous software downloads allowed by *Navis* Optical EMS is 4.

The NE software download process

The following figure illustrates the software download/activation process for optical networking NEs



When software is downloaded from *Navis* Optical EMS to a optical networking NE, it replaces the non-working copy in the NE's Non-Volatile Memory (NVM). When you perform a software download and click the Apply button on the Software Download to NE window, the currently non-working release is activated and becomes the active version. The software release that it replaces in working memory remains in the NVM and becomes the previous software version.

□

NE software activate

Software activate function

The software activate function allows you to activate a specific software release on an NE. When new software is downloaded to an NE, it is placed in ***standby*** until it is activated; it then replaces the old software.

Software activation for the NEs

NEs maintain two copies of software in Non-Volatile Memory (NVM), one of which corresponds to the installed and working software and the other is typically the previous version that was replaced by the current working version. When a new version is downloaded using the Software Download function, it replaces the old version in the NE's NVM. When a software activation is performed, the new software release is installed from the NVM and current running version becomes the standby version in NVM.

Verifying software activations

When a software activation is performed, *Navis*™ Optical EMS checks if the software being activated is the same as the current version, older than the current version, or is currently not supported by ITM SNC. If either of these conditions exist, *Navis* Optical EMS informs you of this, and asks if you want to continue with the software activation anyway. You have the option of continuing with the software activation or cancelling it.

Software activation failures

When *Navis* Optical EMS is unable to complete an on-demand request to activate NE software on one or more NEs because some of the NEs rejected the software activation request, *Navis* Optical EMS displays an error message for each failed NE request.

Loss of communications

When *Navis* Optical EMS loses its connection to the NE as a result of a software activation request, and determines that the activation request was unsuccessful upon re-establishment of the connection with the NE, a failure message is logged in the Activity Log and *Navis* Optical EMS issues a failure message in the status bar for failed on-demand requests.

□

NE software delete

Software delete function

The Software Delete function allows you to delete a specific software release from *Navis*™ Optical EMS for an NE type.

Deleted SW not recoverable

When software is deleted from *Navis* Optical EMS, it is not recoverable. The only way to get the software back into *Navis* Optical EMS is to reload it from a tape on CD-ROM. *Navis* Optical EMS informs you of this prior to actually deleting the software. You have the option of continuing with the software deletion anyway or cancelling the deletion.

□

NE data backup

NE software backup

The NE software backup feature lets you perform an on-demand backup of an NE's provisioning data. The provisioning data includes port parameters and cross-connections.

Check for necessary backup

To avoid unnecessary redundant backups of NE data that has not changed since the last backup, *Navis*™ Optical EMS checks the selected NE to make sure a backup is necessary. If there is no change in the NE's configuration status since the last backup, a backup is not necessary and you are informed of this and given a choice of performing the backup anyway or cancelling it. If you choose to do a backup anyway, all data is backed up.

Storage of backup data

NE backup data is stored in flat ASCII files with header information, including the NE type, software release, NE's TID, equipment/slot information, the ID of the user performing the backup, date/time of the backup, and the system release that created the backup.

Simultaneous backups

The number of simultaneous NE backups (either on-demand or scheduled) that can be performed depends on the *Navis* Optical EMS host type.

The following table indicates the number of simultaneous backups that can be performed by host type.

Host	NE Simultaneous Backups
K580 (6 CPU)	6
K580 (4 CPU)	6
K580 (2 CPU)	6
K460 (4 CPU)	6
K460 (2 CPU)	6
K380	4
K360	4
L2000 (1, 2, 4 CPU)	6
N4000 (8 CPU)	6

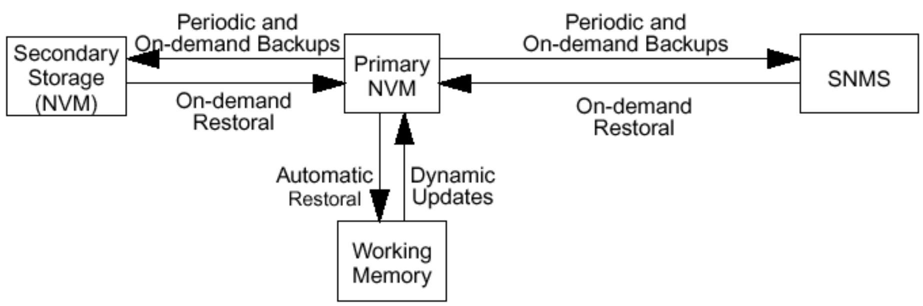
If you attempt to perform more than the maximum number of simultaneous backups than can be performed for the *Navis* Optical EMS host type, the new backup is not accepted and *Navis* Optical EMS informs you that no more backups can be performed at the current time.

Backups/restorals for the NEs

Some of the NEs and NCCs have both a primary NVM that mirrors the current working memory configuration and a local secondary storage device that provides a local memory backup and restore capability. *Navis* Optical EMS supplements the local memory backup and restore, by both managing the local backup and restore capability and providing additional capabilities to back up and restore NE configuration data to/from *Navis* Optical EMS as is done for other NE types.

The NEs memory backup and restore process

The following figure illustrates the basic memory backup and restoral scheme for the NEs.



Data transfers between the NE's primary NVM and secondary storage use local file system copy functions. *Navis* Optical EMS allows you to choose whether to back up the NE data to *Navis* Optical EMS memory or the NE's local secondary storage.

Alarms present during backups

If an on-demand NE backup is performed on an NE with alarms present, you are informed of this and given a choice of proceeding with the backup anyway or cancelling it.

☐

NE data restore

NE restore function

The NE Restore function allows you to restore NE data that was backed up using the NE Backup function.

Backup/restore in progress

When a backup or restore is in progress, *Navis*™ Optical EMS prevents the execution of any command that may change the settings of NE parameters until the backup or restore is completed.

Backup/restore requested

When a restore is requested, *Navis* Optical EMS compares the NE type, software release, and equipment of the NE with the data in the selected backup file. If the NE type or software release does not match, a message is issued and you are given the option of continuing with the restore anyway.

Types of NE restorals

There are two types of NE restorals that can be performed:

- Regular Restore
- Intelligent Restore

Regular restore

A Regular Restore restores all backup data from the selected NE file, including parameters set to the default settings.

Intelligent restore

If you select the Intelligent Restore option, *Navis* Optical EMS compares each parameter setting from the backup file against its default value. If the current setting matches the default value, that parameter is excluded from the restore. If all parameters on a given command issued during the restore request match the defaults, that command is skipped during the restore process. Only parameters that do not currently match the default settings are set, thus reducing the amount of time it takes to restore the NE to the backup data.

Restoring NE backup data

The files that are created by the NE Backup function are accessible through the NE Restore function. *Navis* Optical EMS stores up to seven files for each NE. When seven backup files exist and another backup file is created, the oldest backup file is removed.

Verifying NE restorals

Navis Optical EMS keeps you informed about the status of the NE restoral in progress. If the restoral fails for some reason, *Navis* Optical EMS informs you of the problem via a pop-up message window.

Scheduling tasks

Overview

Many of the administrative functions that are performed on demand can also be scheduled to be done periodically, and/or a specific time through the GUI.

Tasks that can be scheduled

The following tasks can be scheduled:

- DNO
- NE Date/Time Synchronization
- NE Software Download
- NE Software Activate
- NE Backup.

Scheduling methods

Tasks can be scheduled to be performed periodically (daily, weekly, monthly, once every x months) or as a one time event.

NE software downloads, NE software copies, and NE software activations are scheduled as one time events. DNOs, NE date/time synchronizations, and NE backups are scheduled to be performed periodically.

Retrying scheduled tasks

The Scheduler software allows you to specify the number of times to automatically retry a scheduled task that did not complete or failed due to loss of communications with the NE or some other reason.

You can also specify the timer interval between retries. The retry interval timer starts on receipt of the failure response by the scheduled task server for the task type. The system attempts to complete the failed scheduled task the number of specified times.

Each failed scheduled task is logged in a task-specific error log in the $ROAMLOG/SCHED.out directory.

Scheduling simultaneous tasks

tasks The number of tasks that can be scheduled simultaneously depends on the task type and the *Navis*™ Optical EMS host server size.

If the number of tasks that you schedule to be performed in the same timeframe exceeds the maximum number allowed, *Navis* Optical EMS informs you of the next available timeslot for scheduling the task. The system calculates the next available timeslot based on the number of tasks already scheduled and the process duration of each task type.

The process duration can vary with the NE type for which the task is being performed. For example, a DNO for most NE types takes approximately 30 minutes. Depending on the size and equipage of an NE, however, a DNO can take up to 180 minutes.

Modifying and deleting scheduled tasks

You can also modify and delete scheduled tasks. However, if a scheduled task is already in progress, you cannot modify it.

For scheduled software downloads and DNOs, if you attempt to delete a task that is already in progress, a warning message is issued, asking if you want to continue with the deletion. If you indicate that you want to delete the in-progress job, the job is terminated and is removed from the scheduled list.

> **Important!** Deleting scheduled DNO requests can result in database discrepancies between the *Navis* Optical EMS database and the network configuration.

Load management and scheduled tasks

The *Navis* Optical EM has a Load Manager process that determines how the system behaves during high load conditions. The Load Manager coordinates the processing of transactions initiated by *Navis* Optical EM users that involve multiple data transfers and performs acts as a “gatekeeper” that intercepts command notifications to the appropriate back-end process that actually performs the data transfer.

The Load Manager checks whether the average CPU utilization (at that instant) exceeds a set value or whether there is an overload condition in effect. If either of these condition is true, new commands are delayed until the CPU utilization is below the set value or the system is no longer in overload.

The Load Manager checks the following activities:

- NE backups
- NE software downloads
- DNOs
- Data transfers to other OSs
- Periodic maintenance activities (such as database and file purges).

If the average CPU utilization exceeds a Delay Threshold of 70% of the total CPU capacity (the pre-set default), any/all of the above activities are suspended until this is no longer true and the system is not in overload.

The system resumes processing of transactions, on a first-in, first-out basis, in the following order:

1. all transactions requested by users in “ad hoc” (on demand) mode
2. all scheduled NE data backups
3. all other scheduled tasks.

□

14 *Navis*™ Optical EMS tutorial

Overview

Purpose

This chapter provides information on the *LambdaUnite*™ MSS,*Navis* Optical EMS and its graphical user interface. It also includes descriptions of simple basic procedures which are useful when provisioning a NE, like fault management.

Contents

Introduction to *LambdaUnite*™ MSS

Overview

Purpose This section introduces the *LambdaUnite* MSS.

Contents

LambdaUnite™ MSS network solutions

Overview

LambdaUnite MultiService Switch (MSS) is a global platform design supporting both the Synchronous Optical Network (SONET) standards as well as the Synchronous Digital Hierarchy (SDH) standards.

Using the experience Lucent Technologies gained with 40-Gbit/s TDM products in more than one year of successful field trials, *LambdaUnite* MSSis the next generation of Lucent's high speed TDM equipment for various 40-Gbit/s applications as well as 10-Gbit/s applications built upon a cost optimized, high density and future proof platform. The feature set in this first release has common points with existing SDH and SONET transport products as well as an advanced set of market-proven features. The feature set will grow continuously in future releases. For planning reasons, major future features will also be mentioned within this Applications and Planning Guide.

Key features

Key features of *LambdaUnite* MSS include:

- 40-Gbit/s, 10-Gbit/s, 2.5-Gbit/s, 622-Mbit/s and 155-Mbit/s optical synchronous interfaces
- Direct Gigabit Ethernet (IEEE 802.3) optical interface
- DWDM and passive WDM compatible optics
- 2-fiber BLSR/MS-SPRing on 40-Gbit/s, 10-Gbit/s and 2.5-Gbit/s interfaces
- 4-fiber BLSR/MS-SPRing on 10-Gbit/s interfaces
- 4-fiber MS-SPRing with Transoceanic Protocol on 10-Gbit/s interfaces
- Unidirectional Path Switched Ring (UPSR) / Subnetwork Connection Protection (SNC/I and SNC/N) for all types of cross connections and any mix of supported interfaces, also for the 1-Gigabit Ethernet interface
- 1+1 linear APS / MSP for 40-Gbit/s, 10-Gbit/s and for 2.5-Gbit/s interfaces
- Dual Ring Interworking (DRI, SONET) / Dual Node Interworking (DNI, SDH) between two BLSR / MS-SPRing / SNCP protected rings; collapsed nodes functionality supported in future release

- Flexible, non-blocking STS-1/HO VC-3, STS-3c/VC-4, STS-12c/VC-4-4c, STS-48c/VC-4-16c and STS-192c/VC-4-64c granularity cross connect
- Cross Connection capability: 320 Gbit/s in total: 6144 x 6144 STS-1 / 2048 x 2048 VC-4, extension to 640 Gbit/s planned for future releases
- Multiple Ring Closure
- Flexible any card in any slot architecture
- Telcordia Management Support in future release
- TL1 operations interface
- Manageable by *Navis*™ Optical EMS element and subnetwork manager and WaveStar® CIT Craft Interface Terminal.

Applications

LambdaUnite MSS is designed to cover a variety of 10-Gbit/s and 40-Gbit/s applications in the metro and backbone domain, based on the same common hardware and software. *LambdaUnite* MSS can comprise one or more Terminal Multiplexer (TM) or Add/Drop Multiplexer (ADM) functions in a single node, but as well can also act as a fully non-blocking cross connect (XC). As a combination of the ADM function with the XC function, also multi ring applications are supported to directly interconnect added/dropped tributaries between 40-Gbit/s, 10-Gbit/s and 2.5-Gbit/s rings. The ability to support and efficiently interconnect multiple rings using a single network element provides the basis for advanced networking capabilities and potential cost savings to a large amount.

The complete *LambdaUnite* MSS NE requires only one single sub-rack. The design is in compliance with ETSI / NEBS specifications.

Differentiators

The main differentiators of the product are:

- Minimized Number of Equipment Types
  - Innovative high flexible architectural design
  - Full configuration & application coverage with single shelf
  - Easy, restriction-less configuration via simple I/O pack plugging
- All configurations based on common HW/SW components
  - Same shelf, same units, same SW
  - Upgrade just means plugging of additional cards and new configuration
  - Drastically reduced spare part, maintenance and training costs for operators
- Minimized Floor Space and Equipment Cost
  - Lowest foot print by ultra compact single shelf
  - Outstanding architectural support for pay as you grow
  - High interface density merging today's multiplexer farms into a single shelf
  - Multi Ring closure architecture prevents from back-to-back ADM arrays
- Multi Service Support
  - Global product design covering SDH, SONET and transoceanic application
  - Bandwidth optimized data transport with Link Capacity Adjustment System (LCAS) and direct low cost 1 Gigabit Ethernet interfacing. Low cost VSR OC/STM optics towards routers at full concatenation support
- Future proof investment
  - 640 Gbit/s switch capacity upgrade improves return on investment
  - Self aware services including fast provisioning and restoration

- Transparent Services
- Enables highest bandwidth for lowest cost/bit with 40-Gbit/s interfaces: Upgrade to 40 Gbit/s from initial deployment with 10 Gbit/s

- Full integration into Lucent Technologies' management solution

These features make the *LambdaUnite* MSS one of the most cost-effective, future-proof and flexible NEs available on the market today.

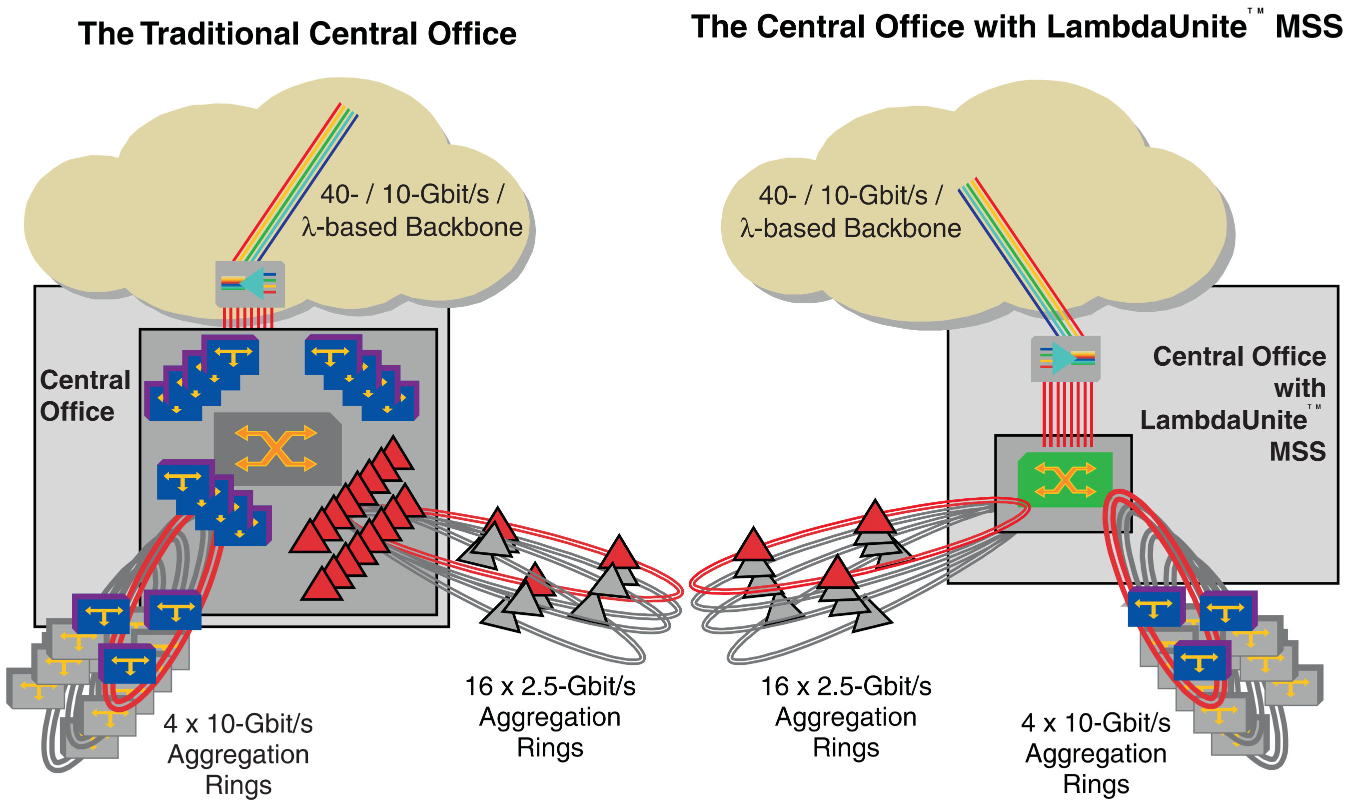
Comparison: central office

A comparison of a traditional central office and the future central office with *LambdaUnite* MSS impressively shows its advantages:

- significantly reduced floor space requirements
- lowering equipment cost
- reducing power requirements
- reducing cabling effort.

The following figure shows as an example a traditional central office consisting of 8 backbone feeder 10-Gbit/s ADMs, 4 metro 10-Gbit/s ADMs, 16 metro 2.5-Gbit/s ADMs and one 4/4 Digital Cross Connect

(DXC) with 160 Gigabit cross connection capacity on the left. On the right, all these NEs are replaced by one *LambdaUnite* MSS NE.



Configurations

Because of the modular design of *LambdaUnite* MSS, the system can be configured as:

- One or multiple Add/Drop Multiplexer (ADM) system working at 40 Gbit/s or 10 Gbit/s line rate in rings or linear chains
- One or multiple Terminal Multiplexer (TM) system working at 40 Gbit/s or 10 Gbit/s line rate
- A Cross Connect (XC) system with 40-Gbit/s, 10-Gbit/s, 2.5-Gbit/s, 622-Mbit/s, 155-Mbit/s SDH/SONET interfaces, and 10-Gbit/s Ethernet WANPHY or 1-Gbit/s Ethernet interfaces.

Management

Like most of the NEs of the Lucent Technologies Optical Networking Group (ONG) product portfolio, *LambdaUnite* MSS is managed by Lucent Technologies *Navis* Optical EMS, a user-friendly subnetwork and element level management system. On a network level, the network management system *Navis* Optical NMS can be used to manage, among others, the *LambdaUnite* MSS NEs. A local craft terminal, the *WaveStar*® CIT, is available for on-site, but also for remote operations and maintenance activities.

Interworking

LambdaUnite MSS is a member of the suite of next generation transport products which have the prefix “Lambda” in their name. The system can be deployed together with other Lucent Technologies transport products, for example WaveStar® TDM 10G, WaveStar® ADM-16/1, WaveStar® BandWidth Manager, *Metropolis*™ DMX, WaveStar® OLS 1.6T, *LambdaXtreme*™ Transport and *LambdaRouter*™ All Optical Switch systems today and in the future. This makes *LambdaUnite* MSS one of the main building blocks of today’s and future transport networks.

If necessary, you can coordinate with Lucent Technologies what products are able to interwork with *LambdaUnite* MSS.

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The optical networking products family

Overview

Lucent Technologies offers the industry's widest range of high-quality transport systems and related services designed to provide total network solutions. Included in this offering is the optical networking product family. The optical networking product family offers telecommunications service providers advanced services and revenue-generating capabilities.

Family members

The optical networking products family includes products designed to bring your networks forward into the next century.

The following table lists optical networking products that are currently available or under development.

Optical networking product	SONET	SDH
LambdaRouter™ All Optical Switch (AOS)	Yes	Yes
LambdaUnite™ MultiService Switch (MSS)	Yes	Yes
LambdaXtreme™ Transport	Yes	Yes
Metropolis™ DMX Access Multiplexer	Yes	No
Metropolis DMXpress Access Multiplexer	Yes	No
Metropolis Enhanced Optical Networking (EON OLS40G/80G)	Yes	Yes
Navis™ Optical Element Management System (EMS)	Yes	Yes
Navis Optical Network Management System (NMS)	Yes	Yes
WaveStar® ADM 16/1	No	Yes
WaveStar® ADM 16/1 Compact	No	Yes
WaveStar® ADM 4/1	No	Yes
WaveStar® AM1	No	Yes
WaveStar® AM1 Plus	No	Yes
WaveStar® BandWidth Manager	Yes	Yes
WaveStar® DACS 4/4/1	No	Yes
WaveStar® Digital Video System (DVS)	Yes	No
WaveStar® External Orderwire (EOW)	Yes	Yes

Optical networking product	SONET	SDH
WaveStar® Optical Line System (OLS) 1.6T	Yes	Yes
WaveStar® OpticGate™ Subsystems	Yes	No
WaveStar® R 16	No	Yes
WaveStar® TDM 10G (OC-192)	Yes	No
WaveStar® TDM 10G (STM-64)	No	Yes
WaveStar® TDM 2.5G (OC-48)	Yes	No
WaveStar® TM1	No	Yes
WaveStar® *TransLAN*™ Card	No	Yes

Family features

The optical networking products family offers customers

- SDH and/or SONET-based services
- Scalable cross-connect, multiplex and transport services
- Network consolidation and reliability
- Interoperability with other vendors' products
- Coordination of NE and element management services.

□

LambdaUnite™ MSS description

Overview

The *LambdaUnite* MSS system architecture is based on a 320 Gbit/s full non-blocking switch matrix with AU-3 granularity. This equals 6144 x 6144 STS-1s or 2048 x 2048 VC-4s. The switch can be upgraded to 640 Gbit/s capacity in a later release.

The system provides 32 universal slots, which can be flexibly configured with 40-Gbit/s, 10-Gbit/s, 2.5-Gbit/s, 622-Mbit/s, 155-Mbit/s, 10-Gbit/s Ethernet WANPHY and 1-Gbit/s Ethernet optical interface circuit packs. Any one-slot wide interface circuit pack can be operated in any slot position with no connectivity restrictions in all configurations.

The mix and the number of 40-Gbit/s, 10-Gbit/s, 2.5-Gbit/s 2-fiber/4-fiber rings and linear links is only limited by the maximum number of slots. This makes *LambdaUnite* MSS a highly flexible system and allows for a variety of different configurations.

One whole NE fits in a double row sub-rack. The dimensions of the sub-rack are: 950 x 500 x 545 mm (37.4 x 19.7 x 21.5 in) (H x W x D). Therefore, two complete NEs fit in one rack. The sub-racks are in accordance with Rec. ETS 300 119-4 and Telcordia and can be mounted in ETSI racks (2200 mm (86.6 in) and 2600 mm (102.4 in) height) and Telcordia racks (2125 mm (83.7 in) height).

LambdaUnite MSS sub-rack

The following figure illustrates the *LambdaUnite* MSS sub-rack in top-position in an ETSI rack.

Building requirements for *LambdaUnite* MSS operation

LambdaUnite MSS is designed for areas with restricted access, in particular:

- for central office (CO) applications according to Telcordia GR-1089-CORE, section 1.1 and GR-63-CORE, section 1.1,
- for telecommunication centres according to ETS 300 019-1-3, section 4.1.

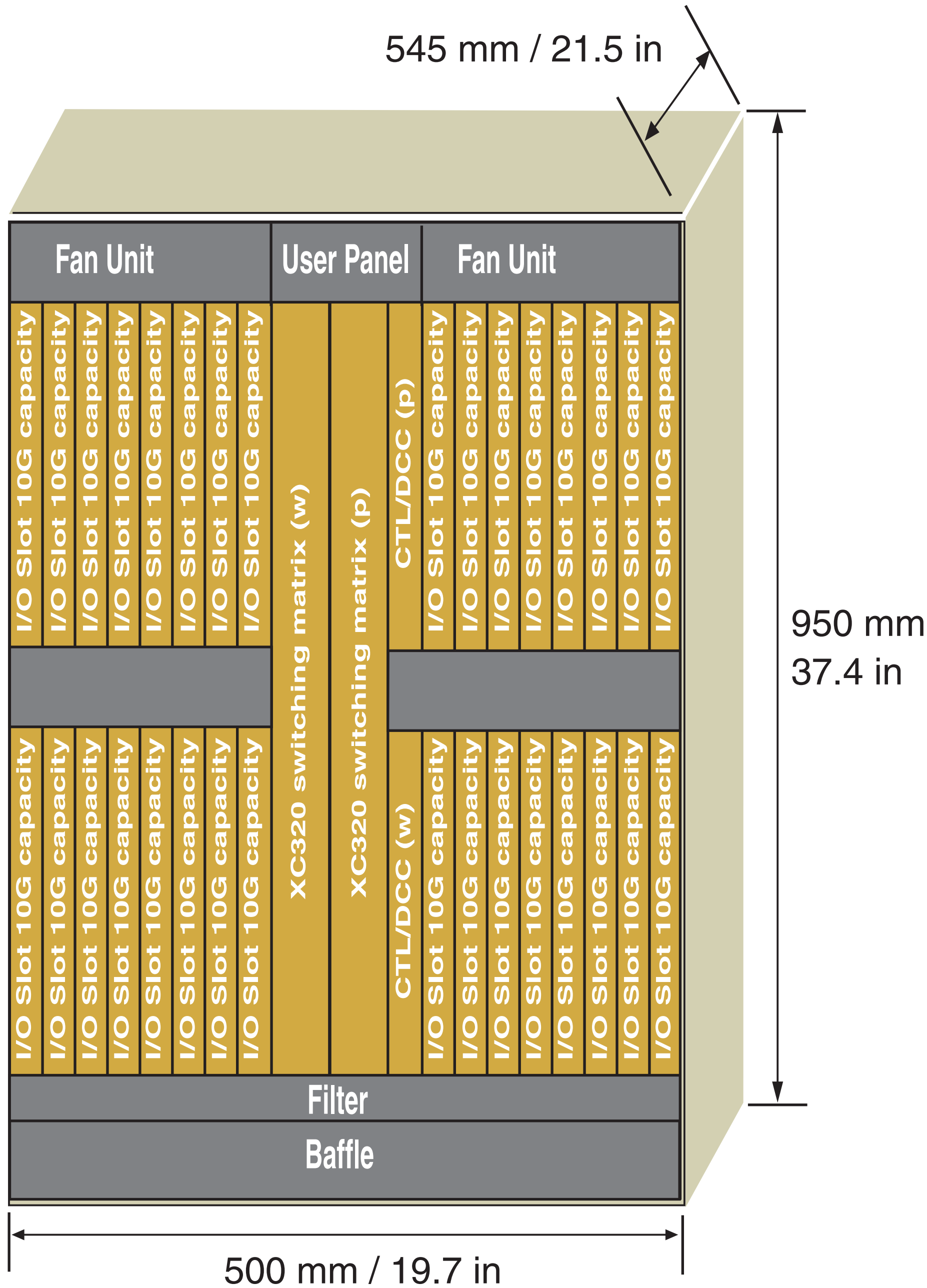
Control and synchronization

The functions in the *LambdaUnite* MSS NE are controlled by a system controller circuit pack (CTL) and by function controllers on the other circuit packs in the shelf. Overall shelf operation is controlled by signals received over the SDH Data Communication Channel (DCC) or the intra-office LAN (IAO LAN).

LambdaUnite MSS provides two physical timing inputs and two timing outputs. For SONET applications, DS1 (B8ZS) Telcordia timing signals (SF or ESF) are supported. In SDH networks, ITU-T compliant 2.048 kHz and 2 Mbit/s (framed or unframed) timing signals can be used as inputs and outputs.

Shelf layout

The following figure depicts the *LambdaUnite* MSS shelf circuit pack slots.



Circuit pack slots

The following table identifies the circuit packs used in the *LambdaUnite* MSS shelf. Refer to the optical parameters descriptions in chapter 10 of the ***Application and Planning Guide*** for additional information about the transmission interface circuit packs.

Slot Designation	**Slot Equipage**
Universal slots (32)	Any mix of transmission interface circuit packs: • 155-Mbit/s port units (future release) • 622-Mbit/s port units (future release) • 2.5-Gbit/s port units • 10-Gbit/s port units • 40-Gbit/s port units (future release) • 1-Gigabit Ethernet interface • 10-Gigabit Ethernet WANPHY interface.
Controller slot (working)	CTL circuit pack. System controller including non-volatile memory and DCC controller for the whole NE.
Controller slot (protection)	Reserved for future use.
XC320G switch slot (working)	The switching circuit pack in this slot can make cross-connections for 6144 STS-1 / 2048 VC-4 equivalent circuits. This switch is paired with XC320G switch (protection) in a 1+1 non-revertive protection mode configuration. Furthermore, this circuit pack contains the timing generator function for the NE.
XC320G switch slot (protection)	The switching circuit pack in this slot can make cross-connections for 6144 STS-1 / 2048 VC-4 equivalent circuits. This switch is paired with XC320G switch (working) in a 1+1 non-revertive protection mode configuration. Furthermore, this circuit pack contains the timing generator function for the NE. After initial power up of the system this circuit pack is in standby mode.

□

The *Navis*™ Optical EMS graphical user interface

Overview

Purpose

This section provides background and introductory information about the *Navis* Optical EMS GUI. It includes available features and references to specific task-related instructions.

After learning the information in this chapter, the user should be able to do the following:

- Identify the mouse buttons and know how to use them to perform various GUI functions.
- Obtain their user ID and password and be able to log into the *Navis* Optical EMS GUI.
- Identify and use the different parts of the *Navis* Optical EMS Map window, including the main menu bar, the toolbar, the alarm directional button, the subnetwork explorer, and the Map pane.
- Recognize on the Map window the difference between NEs, aggregates, the Host, trails, and managed/non-managed devices.
- Display and use the *Navis* Optical EMS system help documentation.
- Use GUI lists and tables.

Contents

Background

Introduction

The *Navis*™ Optical EMS Graphical User Interface (GUI) is a Java-based, multilevel windowing environment that provides fault, provisioning, configuration, and security management functions and allows you to graphically monitor the status of the network. The *Navis* Optical EMS GUI is designed to be an intuitive, consistent, easy-to-use interface. Status bar messages and windows keep you informed of the outcome of an operation. The GUI offers point-and-click, menu-driven operation, as well as a cut-through interface to issue TL1 commands to connected NEs. Several types of online help are available to assist you in performing any task. The GUI runs on PCs. Once a GUI session is started, the GUI server can support multiple platform-independent GUI client connections simultaneously.

□

Using the mouse

Mouse The mouse is used to move a pointer around the screen. A mouse usually has three buttons, two of which are used to select items on the display.

Mouse buttons The select mouse button, which is the leftmost button on the mouse, is used to select an item in *Navis*™ Optical EMS. The terms “click” and “select” are used interchangeably throughout the *Navis* Optical EMS documentation. Both terms represent the following operations:

Mouse button	Description
Select mouse button	The select mouse button, which is the leftmost button on the mouse, is used to select an item in *Navis* Optical EMS. The terms “click” and “select” are used interchangeably throughout the *Navis* Optical EMS documentation. Both terms represent the following operations: • Activating a button, such as OK, Cancel, or Help • Activating a menu, such as a pull-down menu on the menu bar • Selecting an item from a menu • Selecting an NE/aggregate symbol on the Map window • Selecting an item from a scroll list • Moving window focus to a text field to type an entry in the field To do a click or select operation, position the mouse pointer over the desired list item, NE/aggregate icon, button, field, or menu, and double click the select mouse button.

Mouse button	Description
Menu mouse button	The menu mouse button, which is the rightmost button on the mouse, is used to bring up (activate) a pop-up menu. To activate a pop-up menu, position the mouse pointer over the object (like an NE or aggregate icon on the Map pane or Subnetwork Explorer), and single-click the menu mouse button.

□

Manipulating fields and text

Entering text

The following guidelines explain how to enter text in windows that contain text fields:

- Press the **Tab** key to enter text that you have typed in a field. Pressing the **Tab** key in a text field accepts the data in the text field and moves the cursor focus to the next field that accepts input. If the cursor is positioned in the last enterable field on the window, pressing the **Tab** key moves the cursor to the first text field on the window.
- Use the **Tab** key for field-to-field navigation within a window.
- Use the **Backspace** key to delete text field input.
- You can cut and paste text between text fields and/or text areas using the standard cut and paste hot keys for Microsoft Windows and HP Vue.

□

Logging into *Navis*™ Optical EMS

Start GUI

To start up an instance of the GUI on your PC or workstation, click on the desktop or menu bar icon representing the *Navis* Optical EMS application. When you click on this icon, a command is sent to the *Navis* Optical EMS host machine to start up the application. The *Navis* Optical EMS Login window is then displayed for logging into *Navis* Optical EMS. Click on the same icon/menu item to start up another instance and log into the same host. Click on a separate icon/menu item to start up a GUI instance and log into a different host.

Log in

To log into *Navis* Optical EMS, you must enter a valid user ID (login) and password that you been supplied to you by your *Navis* Optical EMS system administrator.

First Log-in

When you log into *Navis* Optical EMS for the first time with a new user login, you must change your password from the default password given for the login. A pop-up window is displayed, indicating that you must change your password before being allowed to log into *Navis* Optical EMS. You are given the option of continuing the session or exiting the system at this point. If you choose to continue the login session, the Change Password window is displayed, prompting you to change your password from the default password. The system validates your new password. If it is valid, the system re-displays the Login window to re-enter your user ID and your new password.

Successful login

If the user ID and password that you entered are valid, *Navis* Optical EMS displays an advisory message, the Alarm Notification window and Map window are displayed.

Unsuccessful login attempts

If you cannot log into *Navis* Optical EMS the first time, because you entered an invalid user login or password, the system allows you to retry a certain number of times (as defined by the system administrator) before you are denied access. You must enter a valid user ID (login) and valid password. See the Valid user ID and Valid password sections below for definitions of a valid user ID and password.

Password expiration

Passwords must be changed after a period of time, as defined by the system administrator. If you attempt to log into *Navis* Optical EMS with a password that is about to expire, the system informs you of this via a pop-up window and asks if you want to change your password to log into the system immediately. If you choose to change your password at this time, the Change Password window is displayed. If you choose not to change your password at this time, but the password expiration period has not yet been reached, you can continue to log into the system. If the password has expired, and you do not change it, the login session will be terminated.

Valid user ID

A valid User ID (login) is 1-10 alphanumeric characters in any combination. Special characters (such as ;*&@) are not allowed.

Valid password

A valid password is 6-10 characters. A password must include at least two uppercase and/or two lowercase letters, at least one numeric, and at least one special character (!#$%^&*()-+_=?). The following special characters are not permitted (:,;).

Alarm notification window

Once you have logged in and the GUI is running, the Alarm Notification window is displayed. The Alarm Notification window displays a running tally of the number of Critical, Major, Minor alarms, Not Alarmed (which represents Standing Condition events that require clearing), and Communication alarms for SONET, or Prompt, Deferred alarms, No Alarms (which represents Standing Condition events that require clearing), and Communication alarms for SDH. The number displayed below the box for each alarm severity increases by one whenever a new alarm of that severity occurs. You can click on any of the severity type boxes to display the Alarm List window, filtered for that severity type. If you click on the Communications alarms box, a list of NEs that are currently not communicating with the system is displayed. The Alarm List window is only displayed if there is one or more active alarms or standing condition events in the selected alarm severity category. Once displayed, the Alarm Notification window remains open during the GUI session. When a new alarm is received by *Navis* Optical EMS, the Alarm Notification window is brought to the forefront of the GUI display to signal the arrival of the new alarm.

GUI application not running

If the *Navis* Optical EMS host is successfully contacted, but the application and/or GUI server is not functioning on the host, a pop-up message window is displayed, indicating that the *Navis* Optical EMS application is not currently running on the host machine.

Multiple GUI instances

If the *Navis* Optical EMS host machine is successfully contacted, and the application is running, but no more GUI instances can be started by the GUI server, a pop-up warning message window is displayed, informing you that no more GUIs can be connected to the host machine, and to retry later.

Session time out

When you do not use a GUI session for 15 minutes (or another time interval specified by the system administrator), a pop-up window is displayed, stating that the GUI session will time out in 60 seconds and asking if you want to exit *Navis* Optical EMS at this time. If you choose Yes or make no choice, you are automatically logged out of *Navis* Optical EMS. If you choose No, the GUI session keeps running and the session timeout clock is reset.

□

Logging Out of *Navis*™ Optical EMS

Introduction

When you log out of *Navis* Optical EMS, all open windows associated with the current session are closed and the GUI client/server sessions are terminated.

Changes made during GUI session

If you have made changes during the GUI session to certain settings, such as user-specified preferences for the GUI or NE positions, a pop-up window is displayed, asking if you want to save the settings. Choose Yes if you want to save the settings or No if you do not want to save them.

□

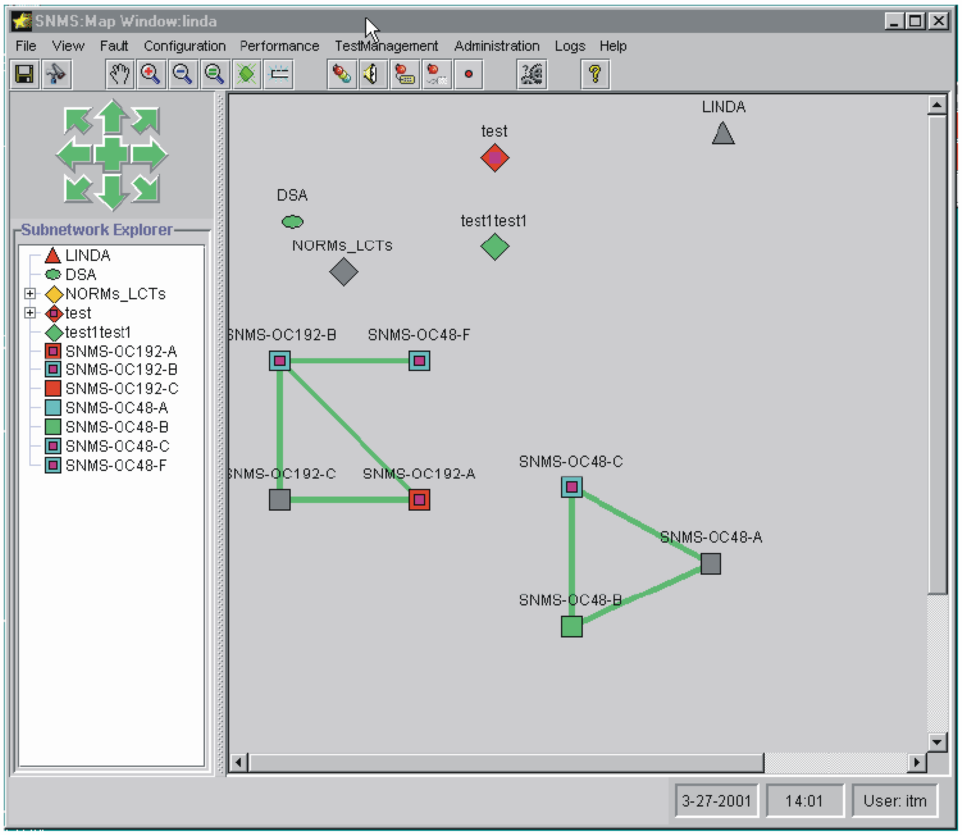
The Map window

Introduction

After you have logged into *Navis*™ Optical EMS, the Map window is displayed. This window provides access to all of the *Navis* Optical EMS functions and features.

The Map window

The following figure shows the *Navis* Optical EMS Map window.



Parts of the Map window

The Map window is divided into several different but interrelated areas.

Window area	Description
Main menu bar	It is located just below the Map window label, it provides access to all the main *Navis* Optical EMS functions.

Window area	**Description**
Tool bar	A series of buttons just below the main menu bar that control the Map view and provide a shortcut way of accessing some of the *Navis* Optical EMS functions.
Status bar	A status bar - a text bar at the bottom of the window that displays messages related to system activity, the current date/time, and the User ID of the user currently logged in.
Alarm Directional button	An icon used to indicate that an alarm exists in some portion of the map that is currently not visible.
Subnetwork Explorer	An explorer tree that is used to show a textual list of the aggregates and NEs in a subnetwork, along with the subnetwork's hierarchy.
Map pane	The portion of the Map window that provides a graphical representation of the network, displaying the NEs, aggregates, and trails between them.

The Map window menu

All of the main *Navis* Optical EMS functions are accessed through the main menu bar on the Map window. When you select a main functional menu (for example, Configuration), this displays an associated drop-down menu, which lists a series of related options for you to select. The following summarizes each of the main functional menu categories.

Menu	**Description**
File	This menu provides access to a set of options for saving, restoring, and copying user preferences, constructing a TL1 Macro Builder File, and logging out of *Navis* Optical EMS.

Menu	Description
View	This menu provides access to a set of options for setting Alarm Severity and Alarm Indications, for viewing the Trail Alarm List, for clearing the Map window status line, for viewing the Alarm Tally window, for zooming in/out of the Map view, and for setting user preferences.
Fault	This menu provides access to the set of Fault Management options for monitoring alarms and conditions in the network.
Configuration	This menu provides access to the set of Configuration Management options for viewing and/or modifying NE, port, and line parameters.
Performance	This menu provides access to the set of options for collecting and viewing Performance Monitoring (PM) data.
TestManagement	This menu provides access to the set of functions for creating, viewing and deleting cross-connection loopbacks and testing purposes.
Administration	This menu provides access to the set of options for Security Management and NE administration.
Logs	This menu provides access to the set of options for viewing logs generated by *Navis* Optical EMS that track network and EMS performance and activity.
Help	This menu provides access to the set of online Help options.

Map Window toolbar

These series of buttons allow you to control the Map view and provide a quick way to access many of the frequently used GUI functions. The toolbar, from left to right, provides the following buttons.

Button	Description
Save User Preferences	Details about this function are provided in "Save preferences / map positions" (14-44).
View User Preferences Window	Details about this function are provided in "Modify User Preferences" (14-42).
Turn On/Off Map Pan	Enables or disables use of the Map Pan feature to reposition the Map view.
Zoom in on the map	Zoom into a portion of the Map pane display.
Zoom out on the map	Displays an enlarged view of the portion of the Map pane display.
Reset the Zoom on the map	Resets the Map pane view.
Add an Aggregate	Details about this function are provided in "Add an aggregate" (3-2).
Clear the Status Line	Details about this function are provided in "Clearing status messages" (14-41).
Alarm Severity	Changes the severity level of active alarms displayed on the Map window. The number and the color of the balls shown on the toolbar button indicate the type and severity of alarms currently being displayed on the Map window. You can also change the alarm severity level of displayed alarms using the Preferences function. For details, see "Modify User Preferences" (14-42).
Audible Enable/Disable	Details about this function are provided in "Audible alarms" (14-36).
Global Acknowledge	Acknowledges all active alarms for an NE or aggregate. Displays a Choose an NE/Aggregate window. Double-click on the NE or aggregate in the list to select it and click the OK button. All active alarms for the selected NE or aggregate are acknowledged. For more details about this function, refer to "Alarm indication and acknowledgement" (14-62) and "Fault management" (14-58).

Button	**Description**
Global Unacknowledge	Unacknowledges all active alarms for an NE. Displays a Choose an NE/Aggregate window. Double-click on the NE or aggregate in the list to select it and click the OK button. All active alarms for the selected NE or aggregate are unacknowledged. For more details about this function, refer to "Alarm indication and acknowledgement" (14-62) and "Fault management" (14-58).
Transient Condition Event Browser	Displays a list of transient condition (TC) events that occur in the host's NE network. Transient events do not require a clear message by the NE because they do not change the NE's condition over an extended period of time. The **Transient Condition Event Browser** can be displayed via **Fault** → **Transient Condition Event Browser**.
Status Dialog	Details about this function are provided in "Status window" (14-46).
Help	Brings up an online help window which explains the Map window.

Alarm directional button

A monitored network can be larger than can be viewed on the Map pane at any one time and alarms can occur on network objects that are not currently being displayed. The **Alarm Directional** button, which is located in the left-hand portion of the Map window, above the Subnetwork Explorer, shows the relative location and highest severity alarm of the area not visible. When an alarm exists, an arrow point is lit with the color of the alarm level, showing the direction to go on the Map pane to view the map item in an alarm state.

□

The subnetwork explorer

Subnetwork explorer

The Subnetwork Explorer, located in the left-hand portion of the Map window, is a tree diagram that shows the content and hierarchical relationship of aggregates and NEs in the portion of the network currently being viewed on the Map pane.

Improving the display of the subnetwork explorer

If the TID/alias of one or more NEs/aggregates in the Explorer is obscured, use the scroll bars below and to the right of the Explorer to view the complete TID/alias of the item. If the display of the Explorer list is still obscured by Map pane, position the mouse pointer on the window bar just to the right of the Explorer. A two-sided arrow is displayed in place of the mouse's arrow pointer. Click and hold the left (select) mouse button, and drag the two-sided arrow symbol to the right until the desired view of the Explorer is obtained. Then, release the mouse button. If the NE TID/alias listing is in complete view, the scroll bars disappear. You can adjust the display by clicking and dragging the bar between the Map pane and the Explorer to the left or right, as desired.

Element labels

NEs and aggregates are labeled by their Target Identifier (TID), by default. The label format can be changed through the Preferences option from the View menu on the Map window menu bar.

Selecting an item

To select an item on the Subnetwork Explorer, position the mouse pointer on the item and click the mouse select button. The selected item is highlighted.

Expanding/collapsing an item

To expand an item (such as an aggregate) in the Subnetwork Explorer, single-click on the plus ("+") sign next to the item. To collapse the item, single-click on the minus ("-") sign next to the expanded item.

Pop-Up menu

A pop-up menu of *Navis*™ Optical EMS functions for the NE or aggregate can be accessed by positioning the mouse pointer and clicking the menu mouse button.

Map pane display

Any change on the Subnetwork Explorer, such as expansion or contraction of an aggregate, causes a corresponding change in the network display on the Map pane.

□

The Map pane

Map pane

The Map pane displays a graphical representation of the network automatically when you log into *Navis*™ Optical EMS and the Map window is brought up.

Map pane preferences

The system defaults for different characteristics of the Map pane display, such as NE symbol sizes, shapes, alarm colors, and NE/aggregate labels, can be changed through the Preferences option on the View menu. See "Map preferences" (14-42) for more information on changing characteristics of the Map pane display.

NEs

Each square on the Map pane represents an NE in your Target Group. A square is the default shape for NEs. The shape used to represent NEs can be changed through the Shapes panel on the Preferences window. By positioning the mouse pointer over a specific NE symbol on the Map pane, you can display the NE type and alias of the NE. If tooltips help is enabled via the Preferences option, the NE type and alias is displayed as a callout and in the status bar at the bottom of the Map window. If tooltips help is disabled, the NE type and alias are just displayed in the status bar on the Map window.

Aggregates

The diamond-shaped symbols on the Map pane represent aggregates. The diamond shape is the default for aggregates; this can be changed through the Shapes panel of the Preferences window. Aggregates are collections of NEs that do not necessarily correspond to any physical connectivity or other NE attributes. An aggregate can consist of a group of related NEs, such as a subnetwork, or a group of collocated NEs that are not necessarily in the same subnetwork. An aggregate can be moved under another parent aggregate on the Map pane or Subnetwork Explorer by selecting it and then dragging it to the parent aggregate symbol.

Non-managed devices

A non-managed device is an NE or other telecommunications entity that is part of the network of NEs that communicate with *Navis* Optical EMS but is not managed by the system. These NE types are treated as "non-managed devices" and appear on the Map pane display as circles (the default shape) about the same size as the squares that represent managed NEs.

Non-managed devices that are discovered are added to the *Navis* Optical EMS database to complete the network map and to avoid retries by *Navis* Optical EMS to log into a non-managed device.

Certain non-managed devices can only be manually added using the Add an NE window on the GUI, specifying it as a non-managed device, when *Navis* Optical EMS is not communicating with the NE. You can also change the NE type to a non-managed device through the Modify an NE window. Once a non-managed device has been added, *Navis* Optical EMS does not attempt to log into it.

EMS alarm icon

The Map window pane contains an additional square-shaped icon, labeled with the *Navis* Optical EMS host name, that displays the highest severity alarm present on the host. Although this icon looks similar to the NE symbols, it cannot be included in an aggregate or have trails connected to it.

The EMS Alarm icon receives alarms from various application processes and monitors the communication links between the *Navis* Optical EMS host and the NEs. It indicates, for example, whether a file system has exceeded capacity, whether there are remote printer problems, or whether the UNIX message queues are getting full. The icon is shown with the machine name of the host that is running the EMS application.

Like NEs and aggregates, colors are used on the EMS Alarm icon to show the current state of the application or its communications links. The default colors are the same as for NEs (see “Alarms” (14-35)). The icon shows the current highest severity alarm for the application. Alarm clearing methods used for NEs and aggregates also apply to the EMS application alarms.

DSA icon

If the EMS-based DSA feature has been enabled, the upper right portion of the Map window pane contains an oval-shaped icon, below the EMS Alarm icon, that represents the Directory Services Agent (DSA) providing NE directory information to *Navis* Optical EMS. An oval shape is the default; it can be changed through the Shapes panel of the Preferences window. This icon is labeled “DSA”. This icon cannot be included in an aggregate or have trails connected to it.

The only pop-up menu function that is available for the DSA icon is the manual DNO feature for Subnetwork Discovery on the DSA.

Like NEs and aggregates, colors are used on the DSA icon to show the current alarm state. The default colors are the same as for NEs (see "Alarms" (14-35)). The icon shows the current highest severity alarm for the application. Alarm clearing methods used for NEs and aggregates also apply to the DSA alarms.

Trails

The lines that run between NEs and/or aggregates represent trails. Trails are physical links between NEs or aggregates. If there is more than one trail between two NEs, the phrase "Multiple Trails" is displayed when you position the mouse cursor on the trail line in the Map pane.

Alarms

The color of a map item symbol or trail indicates the level of the most severe active alarm.

The default alarm colors for the Map pane display are as follows.

Alarm Color (default)	Alarm Severity Level (SONET)	Alarm Severity Level (SDH)
Red	Critical	Prompt
Yellow	Major	Deferred
Cyan	Minor	
Gray	Throttled	
Green	No Active Alarms	
Magenta	Loss of Communications	
White	Not Alarmed state	Not Alarmed state

Color of an NE

The center of an NE symbol may show a different color than the border of an NE/aggregate symbol. When more than one alarm type has occurred, the center of an NE symbol shows the highest severity alarm that has occurred and the border shows the next highest severity alarm. Communication alarms are always top priority and always color the center of the NE symbol. If alarms are being throttled for an NE, the throttled alarm color (gray) is always shown in the center of the symbol, with the color indicating the severity of the last occurring alarm shown in the border. If automatic alarm throttling is enabled, the alarm throttling color is not displayed until the alarm throttling threshold has been passed.

White color When the color of an NE is white on the Map window (the default color), this indicates that the NE is in a ***Not Alarmed*** state, or has received one or more Standing Condition (SC) events which require clearing by the NE. This can occur, for example, during an NE data restore operation (for more details, see "Restore NE data" (7-14)). SC events which occur against the NE are counted in the alarm tallies on the Alarm Notification window. When the SC event has been cleared by the NE, the color of the NE returns to green, indicating that there are not active alarms present and the NE is communicating.

Modify colors The default Alarm display colors shown in the above table can be modified through the Preferences option of the View menu on the Map window main menu bar. For more details, see "Modify User Preferences" (14-42).

Blinking NE A flashing (blinking) NE symbol indicates that there are one or more unacknowledged alarms against that NE or aggregate. For more details see "Alarm indication and acknowledgement" (14-62).

Audible alarms A speaker-shaped symbol in the middle of the toolbar on the Map window indicates whether the Audible Alarm feature is enabled or disabled. This symbol has a slash through it if the audible alarm feature is disabled. To enable the audible alarms feature, click on the symbol. The slash is removed from the symbol. To disable the audible alarm feature, click on the symbol again. A slash appears on the speaker-shaped symbol.

The audible alarm feature can also be enabled or disabled by selecting Fault from the main menu bar on the Map window and then selecting audible from the displayed sub-menu. If the audible alarm feature is currently enabled, selecting audible disables the feature. If the audible alarm feature is currently disabled, selecting audible enables the feature.

When the audible alarm feature is enabled, an audible sound is triggered each time a new alarm occurs on the network. Once triggered, the audible alarm will sound for a short time and then repeat until the alarm is cleared or it is silenced through the GUI. The sound characteristics of the audible alarm correspond to the most severe prevailing alarm condition (Critical, Major, Minor). The alarm sound interval can be changed by the *Navis* Optical EMS system administrator. See “Audible alarms/events” (14-68) for more details about the audible alarms feature.

Actions in the Map pane

Selecting one NE

To select a single NE or aggregate on the Map pane, position the mouse pointer over the NE or aggregate icon and click the select mouse button.

Selecting NEs and aggregates

To select one or more NEs or aggregates on the Map pane:

1 Position the mouse pointer over a portion of the background adjacent to the items to be selected.

2 Click the mouse select button and drag the mouse pointer. As you drag the mouse pointer, an outlined box appears over the selected area As items in the Map pane are selected, they change color. Release the mouse select button.

Result:

The items are selected.

END OF STEPS

Deselect NEs and aggregates

To deselect a selected item in the Map pane, position the mouse pointer over the item and single-click the mouse select button. To deselect a group of items, position the mouse pointer within the boxed region and single-click the mouse select button. Any item in the box that is already selected becomes deselected.

Moving NEs and aggregates

To move a single NE or aggregate on the Map pane:

1 Position the mouse pointer over the icon to move and press and hold the select mouse button.

2 Drag the icon to the new position and release the mouse button.

END OF STEPS

Moving a group of NEs or aggregates

To move a group of NEs or aggregates on the Map pane:

1. Select a group of NEs or aggregates by positioning the mouse pointer in an area of the background adjacent to the items, clicking the select mouse button and dragging the mouse pointer (a faint dashed box appears) to surround the items, and release the mouse select button.

2. Position the mouse pointer over one of the chosen icons and press and hold the select mouse button.

3. Drag the icons to the new position and release the mouse button.

END OF STEPS

Expanding and collapsing aggregates

To expand an aggregate and show its member NEs on the Map pane perform the following steps.

1. Select the aggregate and click the right (menu) mouse button.

   Result:

   A pop-up menu is displayed.

2. Select **Expand** from the displayed pop-up menu.

   Result:

   The aggregate is expanded to show the member NEs on the Map pane.

END OF STEPS

Collapse an aggregate

To collapse the expanded aggregate, select one of the member NEs and double-click on it. The aggregate is collapsed and the aggregate symbol replaces the member NEs on the Map pane display.

Moving an NE to the TOP aggregate level

To move an NE out of an aggregate to the TOP level (which includes all NEs):

1 Make sure the aggregate is expanded and then select the NE.

2 Once the NE is selected, click the right (menu) mouse button to display a pop-up menu. Choose **Return to TOP**.

Result:

The NE is brought to the TOP aggregate level and is taken out of the aggregate.

END OF STEPS

Zooming the Map view

1 Select **View** from the main menu bar on the **Map window**.

Result:

A pull-down menu is displayed

2

If you want to...	then...
make the Map pane show fewer map items in the same size space	select **View** → **Zoom In** on the main menu.
make the Map pane show more in the same size space	select **View** → **Zoom Out** on the main menu.
reset the Zoom level to zero (which is the default)	select **View** → **Zoom Reset** on the main menu.

END OF STEPS

Finding a NE

Navis™ Optical EMS assists you in locating an NE on the Map window if you cannot find it on the Map pane display or Subnetwork Explorer. To find an NE:

1. Select **View** → **Find an NE** from the main menu bar on the Map window.

2. Enter the TID and/or alias of the NE and click the **OK** or **Apply** button.

   Result:

   The Map pane display is repositioned to show the NE and the NE is selected in the Map pane and Subnetwork Explorer. If more than one match is found, the item which is found first is indicated in the Subnetwork Explorer portion of the Map pane. If the NE is contained in an unexpanded aggregate, the aggregate is expanded and the NE is highlighted in the Map pane.

END OF STEPS

Clearing status messages

Status messages that are displayed in the status bar on the Map window can be cleared at any time. To clear the status bar message display:

1. Select **View** → **Clear Status Line** from the main menu bar on the Map window or click the **Clear Message Line** button on the Map window toolbar.

   Result:

   The message area in the status bar is cleared.

END OF STEPS

Map preferences

Overview

There are system defaults for how map items are displayed. *Navis*™ Optical EMS allows you to change certain characteristics of the Map pane display, such as NE size, NE labels, NE/aggregate shapes, and alarm colors, to suit your own needs. The appearance of Map items on the Map pane can be changed through the Preferences option on the View menu. Preferences are stored on a per-user basis.

Modify User Preferences

Complete the following steps to modify user preferences.

1 Select **View** → **Preferences** from the main menu bar on the Map window.

Result:

The **View Preferences** window is displayed.

2

If you want to change...	select the tab...
NE size or thickness of trail lines between NEs	**Nodes & Lines**
Size, content, or alignment of map item labels	**Labels**
Colors associated with alarms and/or cross-connections	**Colors**
Shapes used to represent NEs, aggregates, EMS host, DSA, and non-managed devices on the Map window	**Shapes**
Alarm severity level displayed in the Map and Alarm Notification windows (Critical/Major/Minor for SONET, Prompt/Deferred for SDH)	**Fault**

If you want to change...	select the tab...
tooltips help on/off setting	**Other**
date format for items on the Map window, alarm lists, and tallies	**Other**
display of Bidirectional Line Switched Ring (BLSR) Protected Port Groups on the **Cross-Connect View** window	**Other**

3 When the selected panel of options is displayed on the **View Preferences** window, change the display characteristics as needed.

To change the shape for an item in the **Shapes** panel, double-click on the current shape in the scroll list. A pop-up window is displayed, showing the shapes available for selection. Click on the desired shape. The changed shape is displayed next to the Map item in the scroll list.

To change the color indications for alarms and cross-connections on the Map window through the **Colors** panel, double-click on the item in the Colors scroll-bar list to display a palette of colors. Click on the desired color box in the palette to select it. The color selected is applied to the item.

4

If you want to...	then click on...
save the changes made to user preferences on each panel, to be applied each time the Map window is brought up	**Save**
restore the saved values for the user	**Restore**

If you want to...	then click on...
retrieve and displays the system defaults for the preferences category, overriding the displayed settings	**Get Defaults**

5 Click the **Apply** button to apply the changes to the Map window display or click the **OK** button to apply the changes to the Map window display and close the **View Preferences** window.

END OF STEPS

Save preferences / map positions

If you want to save...	then select...
User preferences	**File** → **Save** → **Preferences**
Map item positions	**File** → **Save** → **Positions**
User preferences and Map item positions	**File** → **Save** → **Both**

Restore preferences / map positions

If you want to restore...	then select...
User preferences	**File** → **Restore** → **Preferences**
Map item positions	**File** → **Restore** → **Positions**
User preferences and Map item positions	**File** → **Restore** → **Both**

Copy preferences / map positions

Complete the following steps to copy another user's preferences and/or Map item positions.

1

If you want to copy a user's...	choose...
Preferences	**File** → **Copy** → **Preferences**
Map item positions	**File** → **Copy** → **Positions**
Preferences and Map item positions	**File** → **Copy** → **Both**

Result:

The **Choose a User** window is displayed.

2 Choose a user and click the **OK** button.

Result:

If you are copying map item positions, the new positions are applied to your Map pane display once a user is chosen. If you are copying another user's preferences, the **View Preferences** window is displayed. Make any changes as necessary to the other user's preferences before applying them. When you are finished making necessary changes, click the **OK** button.

END OF STEPS

Status window

Overview

Navis™ Optical EMS provides a Status window, which allows you to check on the status of on-demand functions you requested to be performed by the system, such as a manual DNO on an NE or manual addition of an NE. The status dialog window is also displayed after the completion of certain GUI functions.

The Status window can be accessed at any time, by clicking the **Status Dialog** toolbar button on the Map window toolbar, or by selecting **View** → **Status Window** from the main menu bar on the Map window.

Status window elements

The Status window is a single table with three columns.

Column	**Description**
Processing	contains a text string which describes the function that is being performed.
Time	indicates the host time, in hours/minutes, that the function was requested.
Status	indicates the status of the requested function (see below).

Possible status of a function

The status of a function is labeled as shown in the following table.

Status	**Meaning**
Working	A simple operation is still in progress. When the request has finished processing, the status of the operation changes to show the result, as Completed, Incomplete, or Failed.
Completed	The function has completed successfully. If it is a multi-step function, such as a backup or restore, the percentage of the function completed successfully is shown. Example: 25%
Incomplete	The function is still in the process of being completed, or the function did not complete due to non-communicating NE or another problem.

Status	Meaning
Failed	The function did not complete successfully due to some problem or error.
Aborted	The function was aborted by the user.

Order of items

Items on the Status window are shown in the order requested, with the most recent function requested shown at the top of the list. Successfully completed items are removed from the list when you click the **Close** or **Refresh** button on the window. Click the **Close** button to close the Status window.

Display status of a group

Many of the functions in *Navis* Optical EMS can be performed on a single NE or a group of NEs, including aggregates. To view the status of a function being performed on a group of NEs, double-click on the row in the Status Dialog window table that refers to the aggregate or group of NEs.

Help options

Overview

Navis™ Optical EMS provides various types of online information to assist you in using the system's functions and features.

Help types

The types of help available are:

Help type	Description
Tooltips help	Tooltips help assists you in identifying a toolbar button on the Map window toolbar, the function of a window button, or the alias and NE type of a NE on the Map window pane. To identify a toolbar button, window button, or NE, position the mouse button on the item. The item is identified either by a message in the status bar or a message callout to the right of the item. Tooltip help can be enabled or disabled through the Preferences option accessible through either the Map window toolbar or through the View option on the main menu. See "Modify User Preferences" (14-42) for instructions on how to enable/disable tooltip help.
Window help	Window help provides specific information about the window's purpose or function. Window help is accessed by clicking the Help button on any functional window in *Navis* Optical EMS.
Online documentation	A complete version of the User Guide is available to view online through Adobe Acrobat Reader. An online version of the *Navis* Optical EMS documentation is accessed by selecting **Help** → **User Guide** from the main menu bar on the Map window.

Help type	Description
Product information	General information about *Navis* Optical EMS, including the full product name, copyright information, the product release number, and other related information is available at any time from a pop-up window that is accessed by selecting **Help** → **About the EMS** from the main menu bar on the Map window.

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Network Element Explorer

Introduction

The **Network Element Explorer** is a tool displayed on the **Port Provisioning**, **Cross-Connections**, and **Equipment Configuration** windows that provides a graphical, step-down, hierarchical view of the equipment to be provisioned. The **Network Element Explorer** consists of a tree diagram that shows the configurable hardware that comprises the NE, and the relationship between each hardware component.

Using the Network Element Explorer

The purpose of the **Network Element Explorer** is to graphically display the desired hardware component and then select it for provisioning purposes.

Equipment hierarchy

The possible equipment levels that can be displayed and configured on the **Network Element Explorer** are as follows: TID ⇒ Lineup ⇒ Bay ⇒ Shelf ⇒ Slot ⇒ Circuit Pack ⇒ Port ⇒ Tributary

The content and relationship of equipment shown on the explorer varies by NE type. Not every NE contains every level of the hierarchy. Generally, access to a shelf provides access to circuit packs that exist on the shelf. Ports exist on circuit packs, which are placed in slots. Slots are in shelves, shelves are in bays, and bays are in NEs.

Selecting an item

To select an equipment component on the **Network Element Explorer**, position the mouse pointer on the equipment component and click the mouse select button. The selected item is highlighted.

Expanding/collapsing an equipment component level

There are the following ways of expanding or collapsing an equipment component level on the **Network Element Explorer**:

- A select mouse button click on the plus (“+”) or minus (“-”) sign causes the branch associated with the component level to expand (“+”) or collapse (“-”).
- A double-click on any equipment level selects it and expands to show the component parts. For example, if you double-click on a shelf in the explorer, the diagram expands to show the associated slots, by number.
- A double-click on the expanded component collapses it back to the next higher component level.

Equipment view display

Any change on the **Network Element Explorer**, such as expansion or collapse of the equipment level, causes a corresponding change on the Equipment View window.

Window Buttons

Types of window buttons

All of the windows in *Navis*™ Optical EMS from which you perform a function have standard buttons that work the same way regardless of the function. The following table lists the standard window buttons and their function on windows.

Button	Function
OK	Accepts input on the window, validates the input, initiates the requested operation, and closes the window.
Apply	Accepts input on the window, validates the input, initiates the requested operation, but leaves the window open.
Cancel	Cancels the operation and dismisses the window. Any insertions or changes made during the use of the window are not saved.
Help	Accesses online help for information about a particular window, function, feature, or task.
Close	Closes the window without performing an operation.

Greyed-out buttons

If a button is greyed out (dimmed) on a window, it means that a function is not available. In some cases, an item has to be selected or specified on the window before the dimmed button is activated.

Exclusive choice buttons

Exclusive choice buttons in *Navis* Optical EMS let you choose one item or setting from a list of two or more settings. When you change an exclusive choice setting, the previous setting is automatically deactivated.

Exclusive choice buttons are also called “radio buttons” because they work like car radio preset buttons that let you change stations with the press of a button.

To change an exclusive choice setting, click the mouse select button with the pointer positioned on the button. Your choice is activated when the button is darkened.

Push buttons

Some of the function windows in *Navis* Optical EMS have push buttons that are used to transfer one or more items (such as NEs) between lists on the window.

The following table shows each push button label, its name, and its purpose.

Push Button Label	Push Button Name	Purpose
>	Push Right	When this button is clicked, the selected item is transferred to the list on the right and removed from the list on the left
>>	Push All Right	When this button is clicked, all items on the corresponding list on the left are transferred to the corresponding list on the right
<	Push Left	When this button is clicked, the selected item is transferred to the list on the left and removed from the list on the right
<<	Push All Left	When this button is clicked, all the items on the corresponding list on the right are transferred to the corresponding list on the left

□

Lists

Introduction

A majority of the *Navis*™ Optical EMS functions are performed by picking a function to perform (for example, Cut-Through) and then selecting the item (such as a specific NE) on which to perform the function, from a list of similar items.

To select an item from a list, position the mouse pointer over the item(s) and click the select mouse button. The selected item(s) is highlighted. On the type-ahead lists, it may be necessary to double-click the select mouse button to select the item and perform the operation.

Navis Optical EMS provides different methods of locating items on lists to narrow the search to only the item(s) you want. These methods are:

- Scrollable lists
- A filtering/sorting function
- A type ahead field

Scrollable lists

When a window in *Navis* Optical EMS cannot display all of the information available to you, the information is presented in a scrollable list. The information that you cannot see is available by paging through the scrollable list.

Using a scrollable list

The vertical bar on the right side of the window is the scroll bar. The scroll bar consists of an up-arrow, a down-arrow, and an elevator box between the two arrows.

The scroll bar on the window works as follows:

If you want to...	then...
Display the next page	click under the elevator box.
Display the next line	click on the down-arrow.
Display the previous page	click above the elevator box.
Display the previous line	click on the up-arrow.
Display the bottom of the list	drag the elevator box to the bottom of the scroll bar and release the mouse select button.

If you want to...	**then...**
Display the top of the list	drag the elevator box to the top of the scroll bar and release the mouse select button.

You can select a single item from a scrollable list by positioning the mouse pointer over the item and clicking the mouse select button. This causes the item to become highlighted and indicates your selection.

Filtering and sorting items

Navis Optical EMS has a filter/sort function to further narrow a list to only the item(s) you want. This function allows you to:

- Narrow a list by filtering out all items on the list that do not match all or part of the filename, NE/aggregate name, TID, or alias you supply.
- Sort a list by placing the items in ascending or descending order.

Navis Optical EMS allows you to filter and/or sort the list. Many of the scrollable list windows in *Navis* Optical EMS provide this function.

Sorting items

When you click the **Filter/Sort** button on a list window, a **Filter and Sort Options** window is displayed to allow you to filter and/or sort the list according to the criteria you specify.

Filter and Sort Options window

The **Filter and Sort Options** window allows for the following settings:

- **Alphanumeric/Wildcard Filter** – This is a text field for entering all or part of the name/label to narrow the list to only those items that match these criteria. An asterisk (*) can be used as a wildcard character to match one or more characters in the name or label. Use the **Backspace** key to erase what you have entered in this field.
- **Sorting Option**buttons – These exclusive choice buttons are used to determine the sort order of the list. Click on the **Ascending** button to display the list in ascending order. Click on the **Descending** button to display the list in descending order. Click on the **Not Sorted** button to leave the list as it is.

- **OK** – After making your filtering/sorting choices, click on the **OK** button to apply your criteria to the list and close the **Filter/Sort** window.
- **Close** – Click on this button to close the window without applying any filtering/sort criteria to the list.
- **Apply** – After making your filtering/sorting choices, click the **Apply** button to apply your criteria to the list and leave the **Filter and Sort Options** window open.
- **Help** – Click on the **Help** button to obtain online help for the **Filter and Sort Options** window.

Type ahead field

Many of the list windows have a ***type ahead*** field. This is a text field which is usually located above the first item in the list. As you start to type the item name or label in this field, the system automatically selects an item from the list that matches what you have typed. An asterisk (*) can be used in the type ahead field as a wildcard character to match one or more characters of the item name or label. You can also enter the entire name of the item in the type ahead field to expedite the search and selection of an item on the list.

If you select an item from the list, the name of the item appears in the type ahead field. The status bar on the list window indicates whether the list has also been filtered.

□

Sorting tables

Introduction

Some of the data that *Navis*™ Optical EMS retrieves from its managed NEs, such as alarm data, is displayed in multi-column tables. Data is displayed in table format on may windows.

Navis Optical EMS allows you to sort and display data displayed in tables in the exact order that you need it.

Moving and dragging table columns

To change the display order of columns in a table, position the mouse pointer on column heading, click and hold the select (left) mouse button, and drag the column to a different position in the table.

Example: sorting a table

The following figure shows a sample **Alarm Summary** window where you may want to change the order of the alarm summary data.

The default order for data on the **Alarm Summary** window to be displayed is by critical, major, and minor alarms. To change the sort order in which alarm data is displayed on this type of window, you would click on one of the column headers or select the **View** → **Sort** option for the **Alarm Summary** window. Either action brings up a **Sort** window.

Sort window

The **Sort** window allows you to select three categories from the table list on which to sort. Each category consists of a drop-down list that contains all of the column names (in column order) from the table list on which to sort, and two exclusive choice radio buttons, labeled **Ascending** and **Descending**.

To sort a table, choose a column name from the **First sort by** drop-down list. The item you select becomes the primary sort key for the table list. Then, click the **Ascending** radio button next to the first drop-down list to sort the table by this item in ascending order or click the **Descending** radio button to sort by this item in descending order. Ascending order is the default.

To further sort the table data, choose an item from the first **Then Sort By** drop down list and then the second **Then Sort By** drop down list. Choose **none** from the drop down list to indicate no sort at this level. For each level, choose whether to sort the item in **Ascending** or **Descending** order. Ascending order is the default.

□

Fault management

Overview

Purpose

Fault management monitors alarms and conditions in the subnetwork. Users can access fault management functions from the Main menu, or by accessing the pop-up menu on an NE or Aggregate icon in the Map window, or on the items listed in tables or other screens. Some important fault management features include the alarm summary and alarm list, viewing autonomous alarms as they are received, alarm throttling, and visible alarm indicators.

Contents

Alarm notification

General

Another way *Navis*™ Optical EMS keeps you informed about current alarms is via the **Alarm Notification** window. This window contains information on the type and number of current alarms in the subnetwork. It remains open (unless iconified) on your screen, and comes to the front each time another alarm is tallied.

Alarm Notification window

The **Alarm Notification** window contains for SDH, four buttons labeled **Prompt**, **Deferred**, **No Alarm** and **EMS Communications**, corresponding to the types of alarms that may appear. The **No Alarm** (for SDH) represents the number of Standing Condition (SC) events that have been received which require clearing. Below each of these buttons is a number that indicates the current number of alarms/events for each category.

Colors

When the color of an NE is white on the Map window (the default color), this indicates that the NE is in a ***Not Alarmed*** state, or has received one or more Standing Condition (SC) events which require clearing by the NE. When the SC event has been cleared by the NE, the color of the NE returns to green, indicating that there are no active alarms present and the NE is communicating.

Getting more information about an alarm

To see more information about a specific alarm severity level or the event, just point to the desired severity button on the **Alarm Notification** window and click. The system then displays the **Alarm List** window, filtered by the severity type of the clicked button.

□

Alarm summary

General

The Alarm Summary feature provides a single-line overview of alarm information for each node and trail in an aggregate. This information is provided via the **Alarm Summary** window on the GUI. This window lists the NEs in your target group and displays the number of critical, major, and minor alarms for each NE. The alarms can be listed by severity or TID.

Accessing the alarm summary

The alarm summary for a single NE can be accessed by selecting this NE and choosing **Fault** → **Alarm Summary** form the menu in the Map window. When no NE was selected, the alarm summary is shown for all NEs.

The **Alarm Summary** window contains the following two sections:

- **NE/Aggregate Alarm Summary Table –** Each line in this table provides, for the listed TID, a color code indicating the highest severity alarm for the NE/aggregate, as well as a count of the critical, major, and minor alarms for SONET or prompt and deferred alarms for SDH, and count of Standing Condition (SC) events (shown under the ***NA*** category) for the NE/aggregate.
  For the NEs listed, you can initiate cut-throughs, access the alarm list, define the level of alarms to be monitored/displayed, provision the NE system parameters and port, and display equipment. To access these tasks, point to an NE’s summary line with the mouse, click the left mouse button to select it, and then click the menu mouse button. A pop-up menu appears, from which you can select the desired operation.
- **Trail Alarm Summary Table –** This table lists a count of critical, major, and minor alarms for the AIDs that terminate the trail between two NEs. A color code indicates the highest severity alarm for the trail.

□

Alarm list

General

The Alarm List contains a line of various information about each active alarm in an NE. You can sort the list using various criteria, such as alarm severity and age, age alone, condition, date/time logged, and acknowledged vs. unacknowledged. You can also acknowledge or unacknowledge the alarms listed here.

Accessing the alarm list

The **Alarm List** can be accessed by pointing on an NE, pressing the right mouse button and selecting **Alarm List** from the cursor menu. If the colored region (below **Critical**, **Major**, **Minor**, **Not Alarmed** or **EMS Comm**) in the **Alarm Notification** window is selected, the **Alarm List** opens and alarms of this severity are shown only.

The **Alarm List** window provides the following data for each alarm for the selected NE:

- **Color** – a color code associated with the alarm severity
- **Alarm ID** – an identifying code for the alarm
- **TID** – the TID of the NE that originated the message or target TID that receives a command.
- **AID** – the Access Identifier, or address, of the equipment component or facility. If this is part of an SLC NBS (Narrow Band Shelf), an asterisk (*) appears.
- **Ack** – the user ID of the user that acknowledged the alarm
- **Severity** – Critical, Major, or Minor
- **SA/NSA** – whether the problem is service affecting (SA) or non-service affecting (NSA)
- **Date/Time of OCC** – the date/time the alarm occurred
- **Date/Time of Log DateTime** – the date/time the alarm was logged by the EMS
- **Condition** – a code that indicates the type of failure or status condition
- **SLA** – the Signal Level Affected (category)

Alarm indication and acknowledgement

General

The Alarm Indicator feature graphically indicates the arrival of new alarms by flashing the impacted nodes and aggregates. If there are one or more alarms against an NE and alarm indication is enabled, that node will flash (in the color of the highest severity alarm). Likewise, if there are one of more alarms against one or more NEs in an aggregate and alarm indication is enabled, that aggregate will flash. (When all the alarms against an NE or aggregate are acknowledged it no longer flashes.) Users should acknowledge alarms for which they are responsible. (The system tags the acknowledgment so that other users will not attempt to troubleshoot the same problem.)

Acknowledging / unacknowledging alarms

One or more alarms can be acknowledged or unacknowledged by selecting the alarms in the alarm list and choosing **Fault** → **Acknowledge Selected** or **Fault** → **Unacknowledge Selected**. Multiple alarms can be selected by pressing the Ctrl-key while selecting the alarm. A range of alarms can be selected by selecting the first alarm of the range as usual and pressing the Shift-key while the last alarm in the range is selected.

All alarms in the Alarm List can be acknowledged or unacknowledged at the same time by choosing **Fault** → **Acknowledge All in List** or **Fault** → **Unacknowledge All in List**.

□

Alarm details

General

Alarm details are available to the user via the **Alarm List** window. This window contains a line of information about each active alarm in an NE or aggregate. Before acknowledging an alarm, it is a good practice to display it on the **Alarm List** window to check the details and make sure you want to acknowledge it. You can then perform the acknowledgement right from the **Alarm List** window.

Viewing alarm details

Alarm details can be displayed by double clicking on an alarm in the **Alarm List** window.

□

Trail alarms

General

Trails are physical links between NEs. The system monitors all existing trails for alarm conditions.

Discovery of trails

NEs can only automatically discover and report to *Navis*™ Optical EMS trails over which there is an active DCC. Users can, however, add trails between any pair of termination points on NEs.

Information about trail

The following information about trail alarms that have occurred can either be displayed on the **Alarm Summary** window or by selecting the trail:

- **Trail Alarm Summary**Window – this lists a count of critical, major, and minor alarms for the AIDs that terminate the trail between two NEs.
- **Trail Alarm List** – this contains a line of information about each active alarm for the trails between two NEs. This information includes alarm severity, occurrence date/time, condition, and date/time logged.

Displaying informations about trails

The **Trail Alarm Summary** window and the **Tail Alarm List** can be accessed by positioning the mouse over a trail, pressing the right mouse button and choosing **Trail Alarm Summary...** or **Tail Alarm List...**.

□

Alarm resynchronization

General

Alarm resynchronization provides the ability for the system to update its alarm list, autonomous message log, and command/response log fromNEs in the subnetwork whenever any outage of NE communications occurs. The system automatically resynchronizes alarms whenever the communications status with an NE changes from ***down*** to ***up***. In addition, users can initiate resynchronization of alarms on demand.

Resynchronizing alarms

Alarms for a single NE can be resynchronized by pointing on the NE, clicking the right mouse button and choosing **Resynchronize Alarms** from the cursor menu. Alarms for all NEs can be resynchronized by not choosing **Fault** → **Resynchronize Alarms** from the menu in the Map window while no NE is selected. This opens the **Choose an NE** window, where **ALL** must be selected and confirmed with **OK**.

Disable alarm throttling

Please note, before resynchronizing alarms for an NE, the user should disable the automatic/manual alarm throttling control for the NE. Alarm resynchronization does not work unless the NE is in an unthrottled state.

GUI and list display not cleared

The alarm resynchronization process does not clear the existing GUI display and alarm notification/list displays during the resynchronization process, but rather retains the existing alarms until the resynchronization is completed.

The system can distinguish between:

- standing alarms that already exist in the GUI and alarm/notification list displays
- new alarms
- alarms that are cleared by the NE between resynchronizations.

This allows the system to incrementally update the GUI display and alarm notification/list displays to accurately indicate the subnetwork status to the user.

□

Alarm throttling

General

The Alarm Throttling feature enables you to limit the amount of autonomous messages and critical autonomous messages that should be monitored for an NE.

Recommended values

Alarm throttling can be done on demand for an NE through the **Alarm Throttling** option on the NE's pop-up menu or be set up to occur automatically when the number of alarms exceed a specified threshold. An alarm throttle level between zero and 3,600 per hour can be specified in the **Automatic Alarm Throttling** window. The recommended initial level is 100 messages per hour (and this is the default). If an NE has been enabled for alarm throttling and the number of alarms in the NE exceeds the set level, the NE is automatically put on throttled, or partial, alarm monitoring.

Throttle alarms

The automatic throttling of alarms can be changed by choosing **Administration** → **Fault** → **Alarm Throttling...** from the menu in the Map window. Select the desired NE in the **Subnetwork Explorer** portion of the window and enable or disable the alarm throttling under **Set Alarm Throttling to**. Set the messages per hour either by using the slider or entering a number in the text field.

Maintenance activity

The Alarm Throttling feature is useful during events, such as an initial network turn-up (or maintenance activity), where large numbers of messages are generated by an NE. Throttling alarm only allows alarms of a critical priority to be displayed on the GUI, sent upstream to an OS, or retrieved via alarm queries. (Non-maintenance-related messages are not affected by alarm throttling and continue to be logged in the normal manner.)

View only throttled alarms / all alarms

If only thottled alarms shall be viewed for one or all NEs, choose **Fault** → **Alarm Monitoring** → **Throttled**, which opens the **Choose an NE** window. Choose the desired NE or choose **All** if the alarm messages from all NEs should be throttled. Confirm your selection with **OK**. (If all alarm messages should be viewed again, repeat the above procedure but choose **Fault** → **Alarm Monitoring** → **All Messages**.)

View alarm statistics

The alarm statistics for an NE can be viewed by selecting the NE and choosing **Fault** → **Alarm Monitoring** → **Statistics** from the menu in the Map window. Statistics for all NEs can be displayed when no NE is selected and **Fault** → **Alarm Monitoring** → **Statistics** and then **ALL** in the **Choose an NE** window is chosen.

□

Audible alarms/events

Audible alarm specifications

The audible alarm provides an alternative way to alert the user to existing alarms or standing condition (SC) events.

The following list provides an overview of audible alarm specifications:

- Audible alarms are generated at each system interface screen.
- To eliminate possible confusion, the characteristics of the audible alarm (that is, sound, duration, and interval between sounds) is common to all users of the host.
- Individual user interface users can enable or disable the audible alarm feature for their respective system user interface screens.
- The Map window contains the audible alarm symbol near the upper middle of the screen. The symbol is a speaker if the audible alarm is enabled, or a speaker with a slash through it if disabled.
- When the audible alarm is enabled, an audible alarm is initiated at the onset of each new alarm or SC event, with sound characteristics that correspond to the severity level of the most severe alarm/SC event. When there are multiple concurrent alarms or SC events of different severity levels, the sound emitted corresponds to the most severe unacknowledged prevailing alarm or SC event.
- Audible alarms last for a short duration and are repeated after a set time interval, until quieted by the user.

When you log off *Navis*™ Optical EMS and then log in again, the Audible Alarm feature is enabled. You can disable it The audible alarm sounds are initially loaded with system default settings. These settings can be adjusted by the system administrator.

Enable/disable audible alarms

The audible alarms sound can be switched on or off by choosing **Fault** → **Audible Alarms** → **Audible** or **Fault** → **Audible Alarms** → **Quiet Audible Alarms** in the Map window. Alternatively, you can click the speaker icon in the icon bar of the Map window.

□

Alarm browser

General

The Alarm Browser lets you view alarms and clear messages for the NEs in your target group as they occur. Specifically, it captures alarm, event, and clear messages that are received from NEs in your target group and displays them in the **Browsing Alarm Audit Log** window on your workstation screen.

Activate Alarm browser

The Alarm Browser is activated by choosing **Fault** → **Alarm Browser** in the Map window.

Alarm filtering

General

Alarm filtering is the selective removal of alarm messages from being forwarded to the GUI. Alarm filtering can be applied to reduce the number of alarms forwarded to the GUI caused by intermittent failure, or to filter symptomatic alarms associated with a reported signal failure, such as those that occur during a fiber cut. All alarms that are filtered out are logged in *Navis*™ Optical EMS and can be viewed through the Alarm Browser (**Fault** → **Alarm Browser**).

Types of alarm filtering

Navis Optical EMS uses three basic methods to reduce the number of alarms to be displayed:

- ***Aging***: waiting for a pre-set time period to eliminate alarms that are caused by temporary failures (and are cleared within a time period shorter than the aging interval)
- ***Event-per-Time (EPT) Filtering***: EPT, which is primarily an alarm reduction technique, filters transient condition (TC) events such as PM Threshold Crossing Alerts (TCAs). To forward all TC events, set the EPT count to zero. Both the time and number of TEs can be adjusted to only log TCs that exceed the expected normal level.
- ***Symptomatic Alarm Filtering***: Symptomatic Alarm Filtering (SAF) filters out a set of pre-defined symptomatic NE alarms and standing condition (SC) events. The filtering is based on the Probable Cause (Condition Type) of the alarms and SC events received from all NEs, including the EMS-based alarms. The list of Probable Causes for SAF filtering is specified in the SAF filter parameter file, which is a UNIX flat file that can be edited using standard UNIX editing tools such as vi. Any alarm (including NE and EMS alarms) that match a Probable Cause specified in the SAF filter parameter file is filtered out. Alarms and events that are filtered out are not shown in the Map window or alarm lists. The SAF filter does not differentiate between NE types for the source of the alarms/events.

□

Glossary

µ
Microens

NUMERICS

0x1 Line Operation
0x1 means unprotected operation. The connection between NEs has one bidirectional line (no protection line).

1+1 Line Protection
A protection architecture in which the transmitting equipment transmits a valid signal on both the working and protection lines. The receiving equipment monitors both lines. Based on performance criteria and OS control, the receiving equipment chooses one line as the active line and designates the other as the standby line.

1xN Equipment Protection
1xN protection pertains to N number of circuit pack/port units protected by one circuit pack or port unit. When a protection switch occurs, the working signals are routed from the failed pack to the protection pack. When the fault clears, the signals revert to the working port unit.

12NC (12-digit Numerical Code)
Used to uniquely identify an item or product. The first ten digits uniquely identify an item. The eleventh digit is used to specify the particular variant of an item. The twelfth digit is used for the revision issue. Items with the first eleven digits the same, are functionally equal and may be exchanged.

A

ABN
Abnormal (condition)

ABS (Absent)
Used to indicate that a given circuit pack is not installed.

AC
Alternating Current

ACO (Alarm Cut-Off)
A button on the user panel used to silence audible alarms.

ACT (Active)
Used to indicate that a circuit pack or module is in-service and currently providing service functions.

Adaptive-rate tributary operation of a port (Pipe mode)
Mode of operation of a port in which tributaries are ***not*** explicitly provisioned for the expected signal rates. The signal rates are automatically identified.

ADM (Add/Drop Multiplexer)
The term for a synchronous NE capable of combining signals of different rates and having those signals added to or dropped from the stream.

AEL
Accessible Emission Limits

Agent
Performs operations on managed objects and issues events on behalf of these managed objects. All SDH managed objects will support at least an agent. Control of distant agents is possible via local “Managers”.

AGNE
Alarm Gateway NE

AID (Access Identifier)
A technical specification for explicitly naming entities (both physical and logical) of an NE using a grammar comprised of ASCII text, keywords, and grammar rules.

AIS (Alarm Indication Signal)
A code transmitted downstream in a digital network that indicates that an upstream failure has been detected and alarmed if the upstream alarm has not been suppressed.

AITS
Acknowledged Information Transfer Service: Confirmed mode of operation of the LAPD protocol.

Alarm
Visible or audible signal indicating that an equipment failure or significant event/condition has occurred.

Alarm Correlation
The search for a directly-reported alarm that can account for a given symptomatic condition.

Alarm Severity
An attribute defining the priority of the alarm message. The way alarms are processed depends on the severity.

Alarm Suppression
Selective removal of alarm messages from being forwarded to the GUI or to network management layer OSs.

Alarm Throttling
A feature that automatically or manually suppresses autonomous messages that are not priority alarms.

Aligning
Indicating the head of a virtual container by means of a pointer, for example, creating an Administrative Unit (AU) or a Tributary Unit (TU).

AMI (Alternate Mark Inversion)
A line code that employs a ternary signal to convert binary digits, in which successive binary ones are represented by signal elements that are normally of alternative positive and negative polarity but equal in amplitude and in which binary zeros are represented by signal elements that have zero amplitude.

Anomaly
A difference between the actual and desired operation of a function.

ANSI
American National Standards Institute

APD
Avalanche Photo Diode

APS (Automatic Protection Switch)
A protection switch that occurs automatically in response to an automatically detected fault condition.

ASCII (American Standard Code for Information Interchange)
A standard 7-bit code that represents letters, numbers, punctuation marks, and special characters in the interchange of data among computing and communications equipment.

ASN.1
Abstract Syntax Notation 1

Assembly
Gathering together of payload data with overhead and pointer information (an indication of the direction of the signal).

Association
A logical connection between manager and agent through which management information can be exchanged.

Asynchronous
The essential characteristic of time-scales or signals such that their corresponding significant instants do not necessarily occur at the same average rate.

ATM (Asynchronous Transfer Mode)
A high-speed transmission technology characterized by high bandwidth and low delay. It utilizes a packet switching and multiplexing technique which allocates bandwidth on demand.

Attribute
Alarm indication level: critical, major, minor, or no alarm.

AU (Administrative Unit)
Carrier for TUs.

AU PTR (Administrative Unit Pointer)
Indicates the phase alignment of the VC-N with respect to the STM-N frame. The pointer position is fixed with respect to the STM-N frame.

AUG
Administrative Unit Group

AUTO (Automatic)
One possible state of a port or slot. When a port is in the AUTO state and a good signal is detected, the port automatically enters the IS (in-service) state. When a slot is in the AUTO state and a circuit pack is detected, the slot automatically enters the EQ (equipped) state.

Autolock
Action taken by the system in the event of circuit pack failure/trouble. System switches to protection and prevents a return to the working circuit pack even if the trouble clears. Multiple protection switches on a circuit pack during a short period of time cause the system to autolock the pack.

Autonomous Message
A message transmitted from the controlled NE to the *Navis*™ Optical EMS which was not a response to an *Navis* Optical EMS originated command.

AVAIL
Available

B **Bandwidth**
The difference in Hz between the highest and lowest frequencies in a transmission channel. The data rate that can be carried by a given communications circuit.

Baud Rate
Transmission rate of data (bits per second) on a network link.

BER (Bit Error Rate)
The ratio of error bits received to the total number of bits transmitted.

Bidirectional Line
A transmission path consisting of two fibers that handle traffic in both the transmit and receive directions.

Bidirectional Ring
A ring in which both directions of traffic between any two nodes travel through the same NEs (although in opposite directions).

Bidirectional Switch
Protection switching performed in both the transmit and receive directions.

BIP-N (Bit Interleaved Parity-N)
A method of error monitoring over a specified number of bits (BIP-3 or BIP-8).

Bit
The smallest unit of information in a computer, with a value of either 0 or 1.

Bit Error Rate Threshold
The point at which an alarm is issued for bit errors.

BLD OUT LG
Build-Out Lightguide

Bridge Cross-Connection
The setting up of a cross-connection leg with the same input tributary as that of an existing cross-connection leg. Thus, forming a 1:2 bridge from an input tributary to two output tributaries.

Broadband Communications
Voice, data, and/or video communications at greater than 2 Mbit/s rates.

Broadband Service Transport
STM-1 concatenation transport over the *LambdaUnite*™ MSS for ATM applications.

Byte
Refers to a group of eight consecutive binary digits.

C

C
Container

CC (Clear Channel)
A digital circuit where no framing or control bits are required, thus making the full bandwidth available for communications.

CC (Cross-Connection)
Path-level connections between input and output tributaries or specific ports within a single NE. Cross-connections are made in a consistent way even though there are various types of ports and various types of port protection. Cross-Connections are re-configurable interconnections between tributaries of transmission interfaces.

Cell Relay
Fixed-length cells. For example, ATM with 53 octets.

CEPT
Conférence Européenne des Administrations des Postes et des Télécommunications

Channel
A sub-unit of transmission capacity within a defined higher level of transmission capacity.

Circuit
A set of transmission channels through one or more NEs that provides transmission of signals between two points, to support a single communications path.

CIT or WaveStar® CIT (Craft Interface Terminal)
The user interface terminal used by craft personnel to communicate with a NE.

CL
Clear

CLEI
Common Language Equipment Identifier

Client
Computer in a computer network that generally offers a user interface to a server.

CLLI
Common Language Location Identifier

Closed Ring Network
A network formed of a ring-shaped configuration of NEs. Each NE connects to two others, one on each side.

CM (Configuration Management)
Subsystem that configures the network and processes messages from the network.

CMI
Coded Mark Inversion

CMIP
Common Management Information Protocol. OSI standard protocol for OAM&P information exchange.

CMISE
Common Management Information Service Element

CO (Central Office)
A building where common carriers terminate customer circuits.

Co-Resident
A hardware configuration where two applications can be active at the same time independently on the same hardware and software platform without interfering with each others functioning.

Collocated
System elements that are located in the same location.

Command Group
An administrator-defined group that defines commands to which a user has access.

Concatenation
A procedure whereby multiple virtual containers are associated one with each other resulting in a combined capacity that can be used as a single container across which bit sequence integrity is maintained.

Correlation
A process where related hard failure alarms are identified.

CP
Circuit Pack

CPE
Customer Premises Equipment

CPU
Central Processing Unit

CR (Critical (alarm))
Alarm that indicates a severe, service-affecting condition.

CRC
Cyclical Redundancy Check

Cross-Connect Map
Connection map for an SDH NE; contains information about how signals are connected between high speed time slots and low speed tributaries.

Crosstalk
An unwanted signal introduced into one transmission line from another.

CSMA/CD
Carrier Sense Multiple Access with Collision Detection

CTS
Customer Technical Support within Lucent Technologies

Current Value
The value currently assigned to a provisionable parameter.

D

DACS/DCS
Digital Access Cross-Connect System

Data
A collection of system parameters and their associated values.

Database Administrator
A user who administers the database of the application.

dB
Decibels

DC
Direct Current

DCC (Data Communications Channel)
The embedded overhead communications channel in the synchronous line, used for end-to-end communications and maintenance. The DCC carries alarm, control, and status information between NEs in a synchronous network.

DCE (Data Communications Equipment)
The equipment that provides signal conversion and coding between the data terminating equipment (DTE) and the line. The DCE may be separate equipment or an integral part of the DTE or of intermediate equipment. A DCE may perform other functions usually performed at the network end of the line.

DCF
Data Communications Function; Dispersion Compensation Fiber

DCM (Dispersion Compensation Module)
A device used to compensate the dispersion, the pulse spreading properties of an optical fiber. DCMs are necessary for very-long-haul applications and high bit rates.

DCN
Data Communications Network

Default
An operation or value that the system or application assumes, unless a user makes an explicit choice.

Default Provisioning
The parameter values that are pre-programmed as shipped from the factory.

Defect
A limited interruption of the ability of an item to perform a required function. It may or may not lead to maintenance action depending on the results of additional analysis.

Demultiplexing
A process applied to a multiplexed signal for recovering signals combined within it and for restoring the distinct individual channels of these signals.

DEMUX (Demultiplexer)
A device that splits a combined signal into individual signals at the receiver end of transmission.

Deprovisioning
The inverse order of provisioning. To manually remove/delete a parameter that has (or parameters that have) previously been provisioned.

Digital Link
A transmission span such as a point-to-point 2 Mbit/s, 34 Mbit/s, 140 Mbit/s, VC12, VC3 or VC4 link between controlled NEs.

Digital Multiplexer
Equipment that combines by time-division multiplexing several digital signals into a single composite digital signal.

Digital Section
A transmission span such as an STM-N signal. A digital section may contain multiple digital channels.

Disassembly
Splitting up a signal into its constituents as payload data and overhead (an indication of the direction of a signal).

Dispersion
Time-broadening of a transmitted light pulse.

Dispersion Shifted Optical Fiber
1330/1550 nm minimum dispersion wavelength.

Divergence
When there is unequal amplification of incoming wavelengths, the result is a power divergence between wavelengths.

DNI (Dual Node Ring Interworking)
A topology in which two rings are interconnected at two nodes on each ring and operate so that inter-ring traffic is not lost in the event of a node or link failure at an interconnecting point.

DNO
Dynamic Network Operation

Doping
The addition of impurities to a substance in order to attain desired properties.

Downstream
At or towards the destination of the considered transmission stream, for example, looking in the same direction of transmission.

DPLL
Digital Phase Locked Loop

DRAM
Dynamic Random Access Memory

Drop and Continue
A circuit configuration that provides redundant signal appearances at the outputs of two NEs in a ring. Can be used for Dual Node Ring Interworking (DNI) and for video distribution applications.

Drop-Down Menu
A menu that is displayed from a menu bar.

DSNE (Directory Service NE)
A designated NE that is responsible for administering a database that maps NEs names (node names) to addresses (node Id). There can be one DSNE per (sub)network.

DTE (Data Terminating Equipment)
The equipment that originates data for transmission and accepts transmitted data.

DTMF
Dual Tone Multifrequency

DUR
Dual Unit Row (subrack)

DUS
Do not Use for Synchronization

DWDM (Dense Wavelength Division Multiplexing)
Transmitting two or more signals of different wavelengths simultaneously over a single fiber.

E

EBER (Excessive Bit Error Rate)
The calculated average bit error rate over a data stream.

ECC
Embedded Control Channel

EEPROM
Electrically Erasable and Programmable Read-Only Memory

EIA (Electronic Industries Association)
A trade association of the electronic industry that establishes electrical and functional standards.

EM (Event Management)
Subsystem of *Navis* Optical EMS that processes and logs event reports of the network.

EMC (Electromagnetic Compatibility)
A measure of equipment tolerance to external electromagnetic fields.

EMI (Electromagnetic Interference)
High-energy, electrically induced magnetic fields that cause data corruption in cables passing through the fields.

EMS
Element Management System

Entity
A specific piece of hardware (usually a circuit pack, slot, or module) that has been assigned a name recognized by the system.

Entity Identifier
The name used by the system to refer to a circuit pack, memory device, or communications link.

EPORTS
Ethernet (LAN) ports

EPROM
Erasable Programmable Read-Only Memory

EQ (Equipped)
Status of a circuit pack or interface module that is in the system database and physically in the frame, but not yet provisioned.

ES (Errored Seconds)
A performance monitoring parameter. ES “type A” is a second with exactly one error; ES “type B” is a second with more than one and less than the number of errors in a severely errored second for the given signal. ES by itself means the sum of the type A and type B ESs.

ESD
Electrostatic Discharge

ESP
Electrostatic Protection

Establish
A user initiated command, at the WaveStar® CIT, to create an entity and its associated attributes in the absence of certain hardware.

ETSI
European Telecommunications Standards Institute

Event
A significant change. Events in controlled NEs include signal failures, equipment failures, signals exceeding thresholds, and protection switch activity. When an event occurs in a controlled NE, the controlled NE will generate an alarm or status message and send it to the management system.

Event Driven

A required characteristic of NE software system: NEs are reactive systems, primarily viewed as systems that wait for and then handle events. Events are provided by the external interface packages, the hardware resource packages, and also by the software itself.

Externally Timed

An operating condition of a clock in which it is locked to an external reference and is using time constants that are altered to quickly bring the local oscillator's frequency into approximate agreement with the synchronization reference frequency.

Extra traffic

Unprotected traffic that is carried over protection channels when their capacity is not used for the protection of working traffic.

F

Fault

Term used when a circuit pack has a hard (not temporary) fault and cannot perform its normal function.

Fault Management

Collecting, processing, and forwarding of autonomous messages from NEs.

FCC

Federal Communications Commission

FDA/CDRH

The Food and Drug Administration′s Center for Devices and Radiological Health.

FDDI (Fiber Distributed Data Interface)

Fiber interface that connects computers and distributes data among them.

FE (Far End)

Any other NE in a maintenance subnetwork other than the one the user is at or working on. Also called remote.

FEBE (Far-End Block Error)

An indication returned to the transmitting node that an errored block has been detected at the receiving node. A block is a specified grouping of bits.

FEC (Forward Error Correction)

An error correction technique in which redundant bits are added to the payload signal enabling the receiving station to detect and correct bit errors that unavoidably occur when an optical line signal is transmitted over longer distances over an optical fiber. FEC is used to increase the transmission span length.

FEPROM (Flash EPROM)

A technology that combines the non-volatility of EPROM with the in-circuit re-programmability of EEPROM.

FERF (Far-End Receive Failure)
An indication returned to a transmitting NE that the receiving NE has detected an incoming section failure. Also known as RDI.

FIT (Failures in Time)
Circuit pack failure rates per 10^9 hours as calculated using the method described in Reliability Prediction Procedure for Electronic Equipment, BellCore Method I, Issue 6, December 1997.

Fixed-rate tributary operation of a port
Mode of operation of a port in which tributaries are provisioned for the expected signal rates. This provisioning information is used for cross-connection rate validation and for alarm handling (for example “Loss of Pointer”).

Folded Rings
Folded (collapsed) rings are rings without fiber diversity. The terminology derives from the image of folding a ring into a linear segment.

Forced
Term used when a circuit pack (either working or protection) has been locked into a service-providing state by user command.

FR (Frame Relay)
A form of packet switching that relies on high-quality phone lines to minimize errors. It is very good at handling high-speed, bursty data over wide area networks. The frames are variable lengths and error checking is done at the end points.

Frame
The smallest block of digital data being transmitted.

Framework
An assembly of equipment units capable of housing shelves, such as a bay framework.

Free Running
An operating condition of a clock in which its local oscillator is not locked to an internal synchronization reference and is using no storage techniques to sustain its accuracy.

FT-TD
File Transfer Translation Device

G

GB
Gigabytes

Gbit/s
Gigabits per second

GHz
Gigahertz

Global Wait to Restore Time
Corresponds to the time to wait before switching back to the timing reference. It occurs after a timing link failure has cleared. This time applies for all timing sources in a system hence the name global. This can be between 0 and 60 minutes, in increments of one minute.

GNE (Gateway NE)
A NE that passes information between other NEs and management systems through a data communication network.

Grooming
In telecommunications, the process of separating and segregating channels, as by combing, such that the broadest channel possible can be assembled and sent across the longest practical link. The aim is to minimize de-multiplexing traffic and reshuffling it electrically.

H

Hard Failure
An unrecoverable non-symptomatic (primary) failure that causes signal impairment or interferes with critical network functions, such as DCC operation.

HDB3 (High Density Bipolar 3 Code)
Line code for 2 Mbit/s transmission systems.

HDLC (High Level Data Link Control)
OSI reference model datalink layer protocol.

HMI
Human Machine Interface

HML (Human Machine Language)
A standard language developed by the ITU for describing the interaction between humans and dumb terminals.

HO
High Order

Holdover
An operating condition of a clock in which its local oscillator is not locked to an external reference but is using storage techniques to maintain its accuracy with respect to the last known frequency comparison with a synchronization reference.

Hot Standby
A circuit pack ready for fast, automatic placement into operation to replace an active circuit pack. It has the same signal as the service going through it, so that choice is all that is required.

HPA (Higher Order Path Adaptation)
Function that adapts a lower order Virtual Container to a higher order Virtual Container by processing the Tributary Unit pointer which indicates the phase of the lower order Virtual Container Path Overhead relative to the higher order Virtual Container Path Overhead and assembling/disassembling the complete higher order Virtual Container.

HPC (Higher Order Path Connection)
Function that provides for flexible assignment of higher order Virtual Containers within an STM-N signal.

HPT (Higher Order Path Termination)
Function that terminates a higher order path by generating and adding the appropriate Virtual Container Path Overhead to the relevant container at the path source and removing the Virtual Container Path Overhead and reading it at the path sink.

HS
High Speed

HW
Hardware

Hz
Hertz

I

I/O
Input/Output

IAO LAN
Intraoffice Local Area Network

ID
Identifier

IEC
International Electro-Technical Commission

IEEE
Institute of Electrical and Electronics Engineers

IMF
Infant Mortality Factor

Insert
To physically insert a circuit pack into a slot, thus causing a system initiated restore of an entity into service and/or creation of an entity and associated attributes.

Interface Capacity
The total number of STM-1 equivalents (bidirectional) tributaries in all transmission interfaces with which a given transmission interface shelf can be equipped at one time. The interface capacity varies with equipage.

Intermediate System (IS)
A system which routes/relays management information. An SDH NE may be a combined intermediate and end system.

IS (In-Service)
A memory administrative state for ports. IS refers to a port that is fully monitored and alarmed.

IS-IS Routing
The NEs in a management network, route packets (data) between each other using an IS-IS level protocol. The size of a network running IS-IS Level 1 is limited, and therefore certain mechanisms are employed to facilitate the management of larger networks.
For STATIC ROUTING, the capability exists for disabling the protocol over the LAN connections, effectively causing the management network to be partitioned into separate IS-IS Level 1 areas. In order for the network management system to communicate with a specific NE in one of these areas, the network management system must identify through which so-called Gateway NE this specific NE is connected to the LAN. All packets to this specific NE are routed directly to the Gateway NE by the network management system, before being re-routed (if necessary) within the Level 1 area.
For DYNAMIC ROUTING an IS-IS Level 2 routing protocol is used allowing a number of Level 1 areas to interwork. The NEs which connect an IS-IS area to another area are set to run the IS-IS Level 2 protocol within the NE and on the connection between other NEs. Packets can now be routed between IS-IS areas and the network management system does not have to identify the Gateway NEs.

ISDN
Integrated Services Digital Network

ITM
Integrated Transport Management

ITM-NM
Integrated Transport Management Network Module

ITU
International Telecommunications Union

ITU-T
International Telecommunications Union — Telecommunication standardization sector. Formerly known as CCITT: Comité Consultatif International Télégraphique & Téléphonique; International Telegraph and Telephone Consultative Committee.

J

Jitter
Short term variations of amplitude and frequency components of a digital signal from their ideal position in time.

K

kbit/s
Kilobits per second

L

LAN (Local Area Network)
A communications network that covers a limited geographic area, is privately owned and user administered, is mostly used for internal transfer of information within a business, is normally contained within a single building or adjacent group of buildings, and transmits data at a very rapid speed.

LAPD (Link Access Procedure D-bytes)
Protocol used on Data Link Layer (OSI layer two) according to ITU-T Q.921.

LBC
Laser Bias Current

LBFC
Laser Backface Currents

LBO (Lightguide Build-Out)
An attenuating (signal-reducing) element used to keep an optical output signal strength within desired limits.

LCN
Local Communications Network

LCS
Local Customer Support

LED
Light-Emitting Diode

LH
Long Haul

Line
A transmission medium, together with the associated equipment, required to provide the means of transporting information between two consecutive NEs. One NE originates the line signal; the other terminates it.

Line Protection
The optical interfaces can be protected by line protection. Line protection switching protects against failures of line facilities, including the interfaces at both ends of a line, the optical fibers, and any equipment between the two ends. Line protection includes protection of equipment failures.

Line Timing
Refers to a NE that derives its timing from an incoming STM-N signal.

Link
The mapping between in-ports and out-ports. It specifies how components are connected to one another.

LL
Lucent Learning (former CTIP)

LO
Low Order

Location
An identifier for a specific circuit pack, interface module, interface port, or communications link.

Lockout of Protection
The WaveStar® CIT command that prevents the system from switching traffic to the protection line from a working line. If the protection line is active when a “Lockout of Protection” is entered – this command causes the working line to be selected. The protection line is then locked from any Automatic, Manual, or Forced protection switches.

Lockout State
The Lockout State shall be defined for each working or protection circuit pack. The two permitted states are: None – meaning no lockout is set for the circuit pack, set meaning the circuit pack has been locked out. The values (None & Set) shall be taken independently for each working or protection circuit pack.

LOF (Loss of Frame)
A failure to synchronize an incoming signal.

LOM
Loss Of Multiframe

Loop Timing
A special case of line timing. It applies to NEs that have only one OC-N/STM-N interface. For example, terminating nodes in a linear network are loop timed.

Loopback
Type of diagnostic test used to compare an original transmitted signal with the resulting received signal. A loopback is established when the received optical or electrical external transmission signal is sent from a port or tributary input directly back toward the output.

LOP (Loss of Pointer)
A failure to extract good data from a signal payload.

LOS (Loss of Signal)
The complete absence of an incoming signal.

Loss Budget
Loss (in dB) of optical power due to the span transmission medium (includes fiber loss and splice losses).

LPA (Lower order Path Adaptation)
Function that adapts a PDH signal to a synchronous network by mapping the signal into or de-mapping the signal out of a synchronous container.

LPC (Lower Order Path Connection)
Function that provides for flexible assignment of lower order VCs in a higher order VC.

LPT (Lower Order Path Termination)
Function that terminates a lower order path by generating and adding the appropriate VC POH to the relevant container at the path source and removing the VC POH and reading it at the path sink.

LS
Low Speed

LTE
Line Terminating Equipment

M

µm
Micrometer

MAF
Management Application Function

Maintenance Condition
An equipment state in which some normal service functions are suspended, either because of a problem or to perform special functions (copy memory) that can not be performed while normal service is being provided.

Management Connection
Identifies the type of routing used (STATIC or DYNAMIC), and if STATIC is selected allows the gateway NE to be identified.

Manager
Capable of issuing network management operations and receiving events. The manager communicates with the agent in the controlled NE.

Manual Switch State
A protection group shall enter the Manual Switch State upon the initiation and successful completion of the Manual Switch command. The protection group leaves the Manual Switch state by means of the Clear or Forced Switch commands. While in the Manual Switch state the system may switch the active unit automatically if required for protection switching.

Mapping
The logical association of one set of values, such as addresses on one network, with quantities or values of another set, such as devices or addresses on another network.

MB
Megabytes

Mbit/s
Megabits per second

MCF (Message Communications Function)
Function that provides facilities for the transport and routing of Telecommunications Management Network messages to and from the Network Manager.

MD (Mediation Device)
Allows for exchange of management information between Operations System and NEs.

MDI
Miscellaneous Discrete Input

MDO
Miscellaneous Discrete Output

MEC (Manufacturer Executable Code)
NE system software in binary format that after being downloaded to one of the stores can be executed by the system controller of the NE.

MEM
Memory

Mid-Span Meet
The capability to interface between two lightwave NEs of different vendors. This applies to high-speed optical interfaces.

MIPS
Millions of Instructions Per Second

Miscellaneous Discrete Interface
Allows an operations system to control and monitor equipment collocated within a set of input and output contact closures.

MJ (Major (alarm))
Indicates a service-affecting failure, main or unit controller failure, or power supply failure.

MMF
Multi-Mode Fiber

MMI
Man-Machine Interface

MML
Human-Machine Language

MN (Minor (alarm))
Indicates a non-service-affecting failure of equipment or facility.

MO
Managed Object

MS
Multiplexer Section

ms
Millisecond

MS-SPRING (Multiplexer Section Shared Protection Ring)
A protection method used in Add-Drop Multiplexer NEs.

MSOH (Multiplexer Section OverHead)
Part of the Section Overhead. Is accessible only at line terminals and multiplexers.

MSP (Multiplexer Section Protection)
Provides capability for switching a signal from a working to a protection section.

MST (Multiplexer Section Termination)
Function that generates the Multiplexer Section OverHead in the transmit direction and terminates the part of the Multiplexer Section overhead that is acceptable in the receive direction.

MTBF
Mean Time Between Failures

MTBMA
Mean Time Between Maintenance Activities

MTIE
Maximum Time Interval Error

MTPI
Multiplexer Timing Physical Interface

MTS (Multiplexer Timing Source)
Function that provides timing reference to the relevant component parts of the multiplex equipment and represents the SDH NE clock.

MTTR
Mean Time To Repair

Multiplexer
A device (circuit pack) that combines two or more transmission signals into a combined signal on a shared medium.

Multiplexing
A procedure by which multiple lower order path layer signals are adapted into a higher order path, or the multiple higher order path layer signals are adapted into a multiplex section.

N

NA
Not Applicable

***Navis* Optical NMS**
Optical Network Management System

NE (Network Element)
A node in a telecommunication network that supports network transport services and is directly manageable by a management system.

NEBS
Network Equipment-Building System

nm
Nanometer (10^{-9} meters)

NMON (Not Monitored)
A provisioning state for equipment that is not monitored or alarmed.

No Request State
This is the routine-operation quiet state in which no external command activities are occurring.

Node
A NE in a ring or, more generally, in any type of network. In a NE supporting interfaces to more than one ring, node refers to an interface that is in a particular ring. Node is also defined as all equipment that is controlled by one system controller. A node is not always directly manageable by a management system.

Non-Revertive Switching
In non-revertive switching, an active and stand-by line exist on the network. When a protection switch occurs, the standby line is selected to support traffic, thereby becoming the active line. The original active line then becomes the stand-by line. This status remains in effect even when the fault clears. That is, there is no automatic switch back to the original status.

Non-Synchronous
The essential characteristic of time-scales or signals such that their corresponding significant instants do not necessarily occur at the same average rate.

NORM
Normal

NPI
Null Pointer Indication

NPPA (Non-Preemptible Protection Access)
Non-preemptible protection access increases the available span capacity for traffic which does not require protection by a ring, but which cannot be preempted.

NRZ
Nonreturn to Zero

NSA
Non-Service Affecting

NSAP Address (Network Service Access Point Address)
Network Service Access Point Address (used in the OSI network layer 3). An automatically assigned number that uniquely identifies a NE for the purposes of routing DCC messages.

NVM (Non-Volatile Memory)

Memory that retains its stored data after power has been removed. An example of NVM would be a hard disk.

O

O&M
Operation and Maintenance

OA
Optical Amplifier

OAM&P
Operations, Administration, Maintenance, and Provisioning

OC, OC-n
Optical Carrier

OC-12
Optical Carrier, Level 12 Signal (622.08 Mbit/s)

OC-192
Optical Carrier, Level 192 (9953.28 Mbit/s) (10 Gbit/s)

OC-3
Optical Carrier, Level 3 Signal (155 Mbit/s)

OC-48
Optical Carrier, Level 48 (2488.32 Mbit/s) (2.5 Gbit/s)

OC-768
Optical Carrier, Level 768 (39813.12 Mbit/s) (40 Gbit/s)

OI (Operations Interworking)
The capability to access, operate, provision, and administer remote systems through craft interface access from any site in an SDH network or from a centralized operations system.

OLS
Optical Line System

OOF
Out-of-Frame

OOS (Out-of-Service)
The circuit pack is not providing its normal service function (removed from either the working or protection state) either because of a system problem or because the pack has been removed from service.

Open Ring Network
A network formed of a linear chain-shaped configuration of NEs. Each NE connects to two others, one on each side, except for two NEs at the ends which are connected on only one side. A closed ring can be formed by adding a connection between the two end nodes.

Operations Interface
Any interface providing you with information on the system behavior or control. These include the equipment LEDs, user panel,WaveStar® CIT, office alarms, and all telemetry interfaces.

Operator
A user of the system with operator-level user privileges.

Optical Channel
A STM-N wavelength within an optical line signal. Multiple channels, differing by 1.5 µm in wavelength, are multiplexed into one signal.

Optical Line Signal
A multiplexed optical signal containing multiple wavelengths or channels.

Original Value Provisioning
Preprogramming of a system’s original values at the factory. These values can be overridden using local or remote provisioning.

OS (Operations System)
A central computer-based system used to provide operations, administration, and maintenance functions.

OSF
Open Software Foundation; Operations System Function

OSI (Open Systems Interconnection)
Referring to the OSI reference model, a logical structure for network operations standardized by the International Standards Organization (ISO).

Outage
A disruption of service that lasts for more than 1 second.

OW (Orderwire)
A dedicated voice-grade line for communications between maintenance and repair personnel.

P

Parameter
A variable that is given a value for a specified application. A constant, variable, or expression that is used to pass values between components.

Parity Check
Tests whether the number of ones (or zeros) in an array of binary bits is odd or even; used to determine that the received signal is the same as the transmitted signal.

Pass-Through
Paths that are cross-connected directly across an intermediate node in a network.

Path
A logical connection between the point at which a standard frame format for the signal at the given rate is assembled, and the point at which the standard frame format for the signal is disassembled.

Path Terminating Equipment
NEs in which the path overhead is terminated.

PCB
Printed Circuit Board

PCM
Pulse Code Modulation

PDH
Plesiochronous Digital Hierarchy

PI
Physical Interface

Pipe mode (Adaptive-rate tributary operation of a port)
Mode of operation of a port in which tributaries are ***not*** explicitly provisioned for the expected signal rates. The signal rates are automatically identified.

Platform
A family of equipment and software configurations designed to support a particular application.

Plesiochronous Network
A network that contains multiple subnetworks, each internally synchronous and all operating at the same nominal frequency, but whose timing may be slightly different at any particular instant.

PM (Performance Monitoring)
Measures the quality of service and identifies degrading or marginally operating systems (before an alarm would be generated).

PMD (Polarization Mode Dispersion)
Output pulse broadening due to random coupling of the two polarization modes in an optical fiber.

POH (Path Overhead)
Informational bytes assigned to, and transported with the payload until the payload is de-multiplexed. It provides for integrity of communication between the point of assembly of a virtual container and its point of disassembly.

Pointer
An indicator whose value defines the frame offset of a virtual container with respect to the frame reference of the transport entity on which it is supported.

POP
Point of Presence

Port (also called Line)
The physical interface, consisting of both an input and output, where an electrical or optical transmission interface is connected to the system and may be used to carry traffic between NEs. The words “port” and “line” may often be used synonymously. “Port” emphasizes the physical interface, and “line” emphasizes the interconnection. Either may be used to identify the signal being carried.

Port State Provisioning
A feature that allows a user to suppress alarm reporting and performance monitoring during provisioning by supporting multiple states (automatic, in-service, and not monitored) for low-speed ports.

POTS
Plain Old Telephone Service

PP
Pointer Processing

PRC (Primary Reference Clock)
The main timing clock reference in SDH equipment.

Preprovisioning
The process by which the user specifies parameter values for an entity in advance of some of the equipment being present. These parameters are maintained only in NVM. These modifications are initiated locally or remotely by either WaveStar® CIT or *Navis* Optical EMS. Preprovisioning provides for the decoupling of manual intervention tasks (for example, install circuit packs) from those tasks associated with configuring the node to provide services (for example, specifying the entities to be cross-connected).

PRI
Primary

Proactive Maintenance

Refers to the process of detecting degrading conditions not severe enough to initiate protection switching or alarming, but indicative of an impending signal fail or signal degrade defect.

Protection Access

To provision traffic to be carried by protection tributaries when the port tributaries are not being used to carry the protected working traffic.

Protection Group Configuration

The members of a group and their roles, for example, working protection, line number, etc.

Protection Path

One of two signals entering a path selector used for path protection switching or dual ring interworking. The other is the working path. The designations working and protection are provisioned by the user, whereas the terms active path and standby path indicate the current protection state.

Protection State

When the working unit is currently considered active by the system and that it is carrying traffic. The “active unit state” specifically refers to the receive direction of operation — since protection switching is unidirectional.

PROTN (Protection)

Extra capacity (channels, circuit packs) in transmission equipment that is not intended to be used for service, but rather to serve as backup against equipment failures.

PROV (Provisioned)

Indicating that a circuit pack is ready to perform its intended function. A provisioned circuit pack can be active (ACT), in-service (IS), standby (STBY), provisioned out-of-service (POS), or out-of-service (OOS).

PSDN

Public Switched Data Network

PSTN

Public Switched Telephone Network

PTE

Path Terminating Equipment

PTR

Pointer

PWR

Power

PWR ON
Power On

Q

Q-LAN
Thin Ethernet LAN which connects the manager to Gateway NEs so that management information between NEs and management systems can be exchanged.

QL (Quality Level)
The quality of the timing signal(s) provided to synchronize a NE. In case of optical line timing the level can be provided by the Synchronization Status Message (S-1 byte). If the System and Output Timing Quality Level mode is “Enabled”, and if the signal selected for the Station Clock Output has a quality level below the Acceptance Quality Level, the NE “squelches” the Station Clock Output Signal, which means that no signal is forwarded at all.

QOS
Quality of Service

R

RAM
Random Access Memory

RDI (Remote Defect Indication)
An indication returned to a transmitting terminal that the receiving terminal has detected an incoming section failure. [Previously called far-end-receive failure (FERF).]

Reactive Maintenance
Refers to detecting defects/failures and clearing them.

Receive-Direction
The direction towards the NE.

Regeneration
The process of reconstructing a digital signal to eliminate the effects of noise and distortion.

Regenerator Loop
Loop in a NE between the Station Clock Output(s) and one or both Station Clock Inputs, which can be used to de-jitterize the selected timing reference in network applications.

Regenerator Section Termination (RST)
Function that generates the Regenerator Section Overhead (RSOH) in the transmit direction and terminates the RSOH in the receive direction.

Reliability

The ability of a software system performing its required functions under stated conditions for a stated period of time. The probability for an equipment to fulfill its function. Some of the ways in which reliability is measured are: MTBF (Mean Time Between Failures) expressed in hours; Availability = (MTBF)/(MTBF+MTTR)(%) [where MTTR = mean time to restore]; outage in minutes per year; failures per hour; percentage of failures per 1,000 hours.

Remote NE

Any NE that is connected to the referenced NE through either an electrical or optical link. It may be the adjacent node on a ring, or N nodes away from the reference. It also may be at the same physical location but is usually at another (remote) site.

Restore Timer

Counts down the time (in minutes) during which the switch waits to let the worker line recover before switching back to it. This option can be set to prevent the protection switch continually switching if a line has a continual transient fault.

Revertive

A protection switching mode in which, after a protection switch occurs, the equipment returns to the nominal configuration (that is, the working equipment is active, and the protection equipment is standby) after any failure conditions that caused a protection switch to occur, clear, or after any external switch commands are reset. (See “Non-Revertive”.)

Revertive Switching

In revertive switching, there is a working and protection high-speed line, circuit pack, etc. When a protection switch occurs, the protection line, circuit pack, etc. is selected. When the fault clears, service “reverts” to the working line.

Ring

A configuration of nodes comprised of NEs connected in a circular fashion. Under normal conditions, each node is interconnected with its neighbor and includes capacity for transmission in either direction between adjacent nodes. Path switched rings use a head-end bridge and tail-end switch. Line switched rings actively reroute traffic over the protection capacity.

RNE

Remote NE

Route

A series of contiguous digital sections.

Router

An interface between two networks. While routers are like bridges, they work differently. Routers provide more functionality than bridges. For example, they can find the best route between any two networks, even if there are several different networks in between. Routers also provide network management capabilities such as load balancing, partitioning of the network, and trouble-shooting.

RSOH
Regenerator Section OverHead; part of SOH

RST
Regenerator Section Termination

RT
Remote Terminal

RTRV
Retrieve

RZ (Return to Zero)
A code form having two information states (termed zero and one) and having a third state or an at-rest condition to which the signal returns during each period.

S

SA
Service Affecting

SA
Section Adaptation

SD
Signal Degrade

SDH (Synchronous Digital Hierarchy)
A hierarchical set of digital transport structures, standardized for the transport of suitable adapted payloads over transmission networks.

SDS
Standard Directory Service based on ANSI recommendation T1.245

SEC
Secondary

SEC
SDH Equipment Clock

Section
The portion of a transmission facility, including terminating points, between a terminal NE and a line-terminating NE, or two line-terminating NEs.

Section Adaptation

Function that processes the AU-pointer to indicate the phase of the VC-3/4 POH relative to the STM-N SOH and assembles/disassembles the complete STM-N frame.

Self-Healing

A network’s ability to automatically recover from the failure of one or more of its components.

SEMF (Synchronous Equipment Management Function)

Function that converts performance data and implementation specific hardware alarms into object-oriented messages for transmission over the DCC and/or Q-interface. It also converts object-oriented messages related to other management functions for passing across the S reference points.

Server

Computer in a computer network that performs dedicated main tasks which generally require sufficient performance.

Service

The operational mode of a physical entity that indicates that the entity is providing service. This designation will change with each switch action.

SES (Severely Errored Seconds)

This performance monitoring parameter is a second in which a signal failure occurs, or more than a preset amount of coding violations (dependent on the type of signal) occurs.

SH

Short Haul

Single-Ended Operations

Provides operations support from a single location to remote NEs in the same SDH subnetwork. With this capability you can perform operations, administration, maintenance, and provisioning on a centralized basis. The remote NEs can be those that are specified for the current release.

Site Address

The unique address for a NE.

Slot

A physical position in a shelf designed for holding a circuit pack and connecting it to the backplane. This term is also used loosely to refer to the collection of ports or tributaries connected to a physical circuit pack placed in a slot.

SM or SMF (Single-Mode Fiber)

A low-loss, long-span optical fiber typically operating at either 1310 nm, 1550 nm, or both.

SMN

SDH Management Network

SNC/I
SubNetwork Connection (protection) / Inherent monitoring

SNC/N
SubNetwork Connection (protection) / Non-Intrusive Monitoring

SNR (Signal-to-Noise Ratio)
The relative strength of signal compared to noise.

Software Backup
The process of saving an image of the current NE’s databases, which are contained in its NVM, to a remote location. The remote location could be theWaveStar® CIT or *Navis* Optical EMS.

Software Download
The process of transferring a generic (full or partial) or provisioned database from a remote entity to the target NE’s memory. The remote entity may be theWaveStar® CIT or *Navis* Optical EMS. The download procedure uses bulk transfer to move an un-interpreted binary file into the NE.

Software ID
Number that provides the software version information for the system.

SOH (Section Overhead)
Capacity added to either an AU-4 or assembly of AU-3s to create an STM-1. Contains always STM-1 framing and optionally maintenance and operational functions. SOH can be subdivided in MSOH (multiplex section overhead) and RSOH (regenerator section overhead).

SONET (Synchronous Optical Network)
The North American standard for the rates and formats that defines optical signals and their constituents.

Span
An uninterrupted bidirectional fiber section between two NEs.

Span Growth
A type of growth in which one wavelength is added to all lines before the next wavelength is added.

SPE
Synchronous Payload Envelope

SPF (Single point of failure)
A single failure in the OSI-network (DCC, LAN or node), that causes isolation of more than one node in the OSI-network. The use of IS-IS areas, without obeying all rules & guidelines, increases the risk of a single point of failure in the network.

SPI
SDH Physical Interface

Squelch Map
This map contains information for each cross-connection in a ring and indicates the source and destination nodes for the low-speed circuit that is part of the cross-connection. This information is used to prevent traffic misconnection in rings with isolated nodes or segments.

SSM
Synchronization Status Marker

SSU_L
Synchronization Supply Unit — Local

SSU_T
Synchronization Supply Unit — Transit

Standby Path
One of two signals entering a constituent path selector, the standby path is the path not currently being selected.

State
The state of a circuit pack indicates whether it is defective or normal (ready for normal use).

Station Clock Input
An external clock may be connected to a Station Clock Input.

Status
The indication of a short-term change in the system.

STBY (Standby)
The circuit pack is in service but is not providing service functions. It is ready to be used to replace a similar circuit pack either by protection or by duplex switching.

STM
Synchronous Transport Module (SDH)

STM-N (Synchronous Transport Module, Level N)
A building block information structure that supports SDH section layer connections, where N represents a multiple of 155.52 Mbit/s. Normally N = 1, 4, 16, 64 or 256.

Stream (Line; aggregate)
A synchronous high rate connection between multiplexers, typically 10 or 40 Gbit/s.

STS
Synchronous Transport Signal (SONET)

Subnetwork
A group of interconnected/interrelated NEs. The most common connotation is a synchronous network in which the NEs have data communications channel (DCC) connectivity.

Supervisor
A user of the application with supervisor user privileges.

Suppression
A process where service-affecting alarms that have been identified as an “effect” are not displayed to a user.

SYNC
Synchronizer

Synchronization Messaging
Synchronization messaging is used to communicate the quality of network timing, internal timing status, and timing states throughout a subnetwork.

Synchronous
The essential characteristic of time scales or signals such that their corresponding significant instances occur at precisely the same average rate, generally traceable to a single Stratum 1 source.

Synchronous Network
The synchronization of transmission systems with synchronous payloads to a master (network) clock that can be traced to a reference clock.

Synchronous Payload
Payloads that can be derived from a network transmission signal by removing integral numbers of bits from every frame. Therefore, no variable bit-stuffing rate adjustments are required to fit the payload in the transmission signal.

SYSCTL
System Controller circuit pack

System Administrator
A user of the computer system on which the system’s OS software application can be installed.

T

T-TD
TL1 Translation Devive

TARP
Target Identifiers Address Resolution Protocol

TBD
To Be Determined

TCA (Threshold-Crossing Alert)
A message type sent from a NE that indicates that a certain performance monitoring parameter has exceeded a specified threshold.

TDM (Time Division Multiplexing)
A technique for transmitting a number of separate data, voice, and/or video signals simultaneously over one communications medium by interleaving a portion of each signal one after another.

TEN
Telecommunications Management Network

Through (or Continue) Cross-Connection
A cross-connection within a ring, where the input and output tributaries have the same tributary number but are in lines opposite each other.

Through Timing
Refers to a NE that derives its transmit timing in the east direction from a received line signal in the east direction and its transmit timing in the west direction from a received line signal in the west direction.

THz
Terahertz (10^{12} Hz)

TID (Target Identifier)
A provisionable parameter that is used to identify a particular NE within a network. It is a character string of up 20 characters where the characters are letters, digits, or hyphens (-).

TL1 (Transaction Language One)
A subset of ITU's human-machine language.

TM (Terminal Multiplexer)
An Add/Drop Multiplexer with only one stream interface.

Transmit-Direction
The direction outwards from the NE.

Tributary
A signal of a specific rate (2 Mbit/s, 34 Mbit/s, 140 Mbit/s, VC12, VC3, VC4, STM-1 or STM-4) that may be added to or dropped from a line signal.

Tributary
A path-level unit of bandwidth within a port, or the constituent signal(s) being carried in this unit of bandwidth, for example, an STM-1 tributary within an STM-N port.

Tributary Unit Pointer
Indicates the phase alignment of the VC with respect to the TU in which it resides. The pointer position is fixed with respect to the TU frame.

True Wave™ Optical Fiber
Lucent Technologies' fiber generally called non-zero dispersion-shift fiber, with a controlled amount of chromatic dispersion designed for amplified systems in the 1550/1310 nm range.

TRY
Technical Requirement

TSA (Time Slot Assignment)
A capability that allows any tributary in a ring to be cross-connected to any tributary in any lower-rate, non-ring interface or to the same-numbered tributary in the opposite side of the ring.

TSI (Time Slot Interchange)
The ability of the user to assign cross-connections between any tributaries of any lines within a NE. Three types of TSI can be defined: Hairpin TSI, Interring TSI (between rings), and intra-ring TSI (within rings).

TSO
Technical Support Organization

TTP
Trail Termination Point

TU (Tributary Unit)
An information structure which provides adaptation between the lower order path layer and the higher path layer. Consists of a VC-n plus a tributary unit pointer (TU PTR).

TUG
Tributary Unit Group

Two-Way Point-to-Point Cross-Connection
A two-legged interconnection, that supports two-way transmission, between two and only two tributaries.

Two-Way Roll
The operation which moves a two-way cross-connection between tributary i and tributary j to a two-way cross-connection between the same tributary i and a new tributary k with a single user command.

U

UAS (Unavailable Seconds)
In performance monitoring, the count of seconds in which a signal is declared failed or in which 10 consecutively severely errored seconds (SES) occurred, until the time when 10 consecutive non-SES occur.

UITS (Unacknowledged Information Transfer Service)
Unconfirmed mode of LAPD operation.

UNEQ
Path Unequipped

Upstream
At or towards the source of the considered transmission stream, for example, looking in the opposite direction of transmission.

User Privilege
Permissions a user must perform on the computer system on which the system software runs.

UTC (Universal Time Coordinated)
A time-zone independent indication of an event. The local time can be calculated from the Universal Coordinated Time.

V

V
Volts

VAC
Volts Alternating Current

Value
A number, text string, or other menu selection associated with a parameter.

Variable
An item of data named by an identifier. Each variable has a type, such as int or Object, and a scope.

VC (Virtual Container)
Container with path overhead.

VCG
Virtual Concatenation Groups

VDC
Volts Direct Current

VF
Voice frequency

Virtual
Refers to artificial objects created by a computer to help the system control shared resources.

Virtual Circuit
A logical connection through a data communication (for example, X.25) network.

VLAN
Virtual LAN

Voice Frequency (VF) Circuit
A 64 kilobit per second digitized signal.

Volatile Memory
Type of memory that is lost if electrical power is interrupted.

W

WAD
Wavelength Add/Drop

WAN (Wide Area Network)
A communication network that uses common-carrier provided lines and covers an extended geographical area.

Wander
Long term variations of amplitude frequency components (below 10 Hz) of a digital signal from their ideal position in time possibly resulting in buffer problems at a receiver.

Wavelength Interchange
The ability to change the wavelength associated with an STM-N signal into another wavelength.

WaveStar® OLS 1.6T (400G/800G)
WaveStar® Optical Line System 1.6 Terabit/s (400Gbit/s/800Gbit/s)

WDCS
Wideband Digital Cross-Connect System

WDM (Wavelength Division Multiplexing)
A means of increasing the information-carrying capacity of an optical fiber by simultaneously transmitting signals at different wavelengths.

Wideband Communications
Voice, data, and/or video communication at digital rates from 64 kbit/s to 2 Mbit/s.

Working
Label attached to a physical entity. In case of revertive switching the working line or unit is the entity that is carrying service under normal operation. In case of nonrevertive switching the label has no particular meaning.

Working State
The working unit is currently considered active by the system and that it is carrying traffic.

WRT (Wait to Restore Time)
Corresponds to the time to wait before switching back after a failure has cleared, in a revertive protection scheme. This can be between 0 and 15 minutes, in increments of one minute.

WS
Work Station

WTR (Wait to Restore)
Applies to revertive switching operation. The protection group enters the WTR state when all Equipment Fail (EF) conditions are cleared, but the system has not yet reverted back to its working line. The protection group remains in the WTR state until the Wait-to-Restore timer completes the WTR time interval.

X

X.25
An ITU standard defining the connection between a terminal and a public packet-switched network

X.25 Interface/Protocol
The ITU packet-switched interface standard for terminal access that specifies three protocol layers: physical, link, and packet for connection to a packet-switched data network.

XC
Cross Connect

Z

Zero Code Suppression
A technique used to reduce the number of consecutive zeros in a line-coded signal (B3ZS, B8ZS).

Index