USER MANUAL

FOXMAN-UN

Networking Package

Configuration and Operation

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Contents

1 Introduction

1.1 Purpose

This document provides procedures and information for the operation of FOXMAN-UN NP (i.e., the legacy FOXMAN-UN Networking Package), the separately licensed option for TDM-based networks in conjunction with the FOXMAN-UN BP (FOXMAN-UN Basic Package).

You will find in the present FOXMAN-UN Networking Package user manual all relevant information leading to the understanding of objectives, the specifications, and the usage of the Networking Package.

In this document, the Networking Package will be referred to as NP; the Basic Package will be referred to as BP.

> **i**
> **Please note:**
> From FOXMAN-UN R18 onwards, the FOXMAN-UN Web UI also provides the "TDM" application with all Circuits, Trails /SNCs, Sections, and NEs of the NP together with a map view of the complete network. This map view currently only provides a view feature.
> → For creating circuits, trails, and SNCs, the legacy NP is still required.
> → For creating new NEs in the network, the legacy NEM Configurator is still required.
> → Maps can be created via the Map Manager (via command "Manage Maps") in the Web UI TDM application.
> → Adding NEs to a map is also done in the Map Manager.
> → Sections can be created from the TDM application (in "Section" tab).

1.2 About this Document

This document is aimed for users who are responsible for provisioning and managing TDM (PDH, SDH) network services in a FOX51x and FOX61x networks. It describes how the FOXMAN-UN NP management software is used to provision network wide services and how to manage configuration changes.

> **i**
> **Please note:**
> For the provisioning and management of Ethernet / MPLS-TP network services refer to section "Ethernet Networking Package" in the user manual "FOXMAN-UN NEM Help System" [1KHW002412].

The NP user manual is divided into the following chapters:

- Introduction,
- Overview,
- Terminology,
- Commissioning,
- Usage,
- Navigation,
- Provisioning,
- Network Documentation.

1.3 Audience

This User Manual is written for experienced FOX51x and FOX61x network users. It is assumed that the reader has a technical understanding of the FOX51x, the FOX61x, and the FOXMAN-UN BP.

1.4 The User Manual

1.4.1 How to use

In general the User Manual explains the operation of the FOXMAN-UN NP application. Further information regarding the system set up of the FOXMAN-UN including NP is defined in the user manual "FOXMAN-UN under Linux".

The present FOXMAN-UN Networking Package User Manual is divided into two parts. The first part provides a general overview of the FOXMAN-UN NP application. It will give the user the theoretical background knowledge required to understand the terminology and the TMN model used to build the FOXMAN-UN NP application on top of FOXMAN-UN BP. The second part explains the usage of the FOXMAN-UN NP application.

> ⓘ **Please note:**
> The operational part of FOXMAN-UN NP starts with section 4 Commissioning (on page 36)

1.4.2 The User Manual Structure

1.4.2.1 FOXMAN-UN NP Overview (see section Overview)

The FOXMAN-UN NP does not replace FOXMAN-UN BP but operates as an important add-on to the package, providing enhanced features and functionality. The FOXMAN-UN BP enables management of FOX51x and FOX61x networks from a physical point of view. The FOXMAN-UN NP operates on top of the FOXMAN-UN BP to focus on end-to-end TDM connections (circuits) that the physical network contains.

1.4.2.2 FOXMAN-UN NP Terminology (see section Terminology)

The FOXMAN-UN NP supports modeling of TDM Trails, Circuits and Sub Network Connection SNC bearers at Section, Path and Circuit layers as defined in ITU-T recommendation G.805.

ITU-T G.805 provides a terminology for the abstraction of a transport network from a functional point of view. The FOXMAN-UN NP utilizes the benefits provided by the ITU-T G.805 recommendation and simplifies them to some extent.

An understanding of this terminology is required since it is widely utilized by the user interface.

1.4.2.3 Preparing the FOXMAN-UN NP (see section Commissioning)

The FOXMAN-UN NP package can only be started if the corresponding license key has been successfully installed. All FOXMAN-UN NP functionality is provided with this key. No other additional components need to be installed.

The FOXMAN-UN NP application can be started from the FOXMAN-UN BP GUI.

This chapter will explain what is required in the commissioning phase before using the FOXMAN-UN NP as well as providing additional hints on how to use the product.

1.4.2.4 FOXMAN-UN NP Usage (see section Usage)

The FOXMAN-UN NP is mainly driven through the graphical user interface (GUI) that consists of an initial window displayed when the user starts the FOXMAN-UN NP GUI.

The role of the user interface is very important because it is the main entry point of the user in the network management solution.

In this chapter the FOXMAN-UN NP usage will be explained using an application displayed in the FOXMAN-UN NP environment.

1.4.2.5 Navigation in the FOXMAN-UN NP (see section Navigation)

This chapter explains within an example the behavior of the FOXMAN-UN NP.

1.4.2.6 Provisioning (see section Provisioning)

Telecom service providers require the integration of operation, engineering and customer-care. They also require an end-to-end configuration view and control of the telecoms domains such as transport, switching of Voice, Data and ISDN services.

The FOXMAN-UN NP allows you to configure Circuits using defined Trails between two End-points. FOXMAN-UN NP will then manually or automatically establish the Path, i.e. the list of physical Sections, also called the Topological Trails and logical Trails in the layered network.

This chapter will describe how to establish an end-to-end configuration utilizing the user interface of FOXMAN-UN NP.

1.4.2.7 Network Documentation (see section Network Documentation)

Reports and Printing functionalities allow to systematically document the Network. Detailed information such as system inventory, system network capacity and system configuration are provided.

There is an integrated reporting component called «NP Reporting Tool». It produces a set of report files containing information on NEs, units, ports, applications, sections and transport entities every time it is activated. These files can be analyzed offline using a third party tool, e.g. MS Excel.

1.5 Document History

Table 1: Document History

Document ID	FOXMAN-UN Release	Rev	Date	Changes since previous version
1KHW002416	R14A	A	2020-07-21	Updated for release R14A.
1KHW002416	R14B	A	2020-12-15	Updated for release R14B. Added TE Graph dialog (section 6.3.2.3) and NP Usage dialog (section 6.3.2.4).
1KHW002416	R15A	A	2021-06-30	Updated for release R15A.
1KHW002416	R15B	A	2021-12-30	Updated for release R15B. Error corrections; some minor editorial modifications.
1KHW002416	R16A	A	2022-08-30	Updated for release R16A. Added note on new NP parameter in section 7.3.5.2. Updated TE Graph views in section 6.3.2.3.
1KHW002416	R16B	A	2022-02-27	Updated for release R16B. Edited section 2.2.7.2 System Services (on page 17). Added section 2.2.7.2 System Services (on page 17).
1KHW002416	R17A	A	Sep 2024	Updated sections 11 "Appendix C - The NEs of type FO" and 6.3.2.3 "TE Graph".
1KHW002416	R18	A	Jul 2025	Updated for current system release. Some improvements and error corrections. Added a note in section 1.1 mentioning the newly introduced Web UI "TDM" application. Added notes related to routing algorithms in 3.4.1 "Manual Routing" and 3.4.2 "Automatic Routing".

2   Overview

The Networking Package (NP) is the FOXMAN-UN's Network Management System (NMS) layer for TDM (PDH and SDH) networks, whereas the Basic Package (BP) is the FOXMAN-UN's Element Management System (EMS) layer.

The BP manages functions and capabilities within each managed network element (NE):

- Network element (NE) configuration (via UCST/FOXCST):
    - adding a unit,
    - parameter settings of individual units and its sub-units (interfaces, ports),
    - cross-connections.
- Section Management:

    Sections represent the type of connectivity between NEs and NEs of type FO or a combination thereof.

The above information is provided to FOXMAN-UN NP by FOXMAN-UN BP. It is used by NP to manage TDM paths across the network for circuit provisioning.
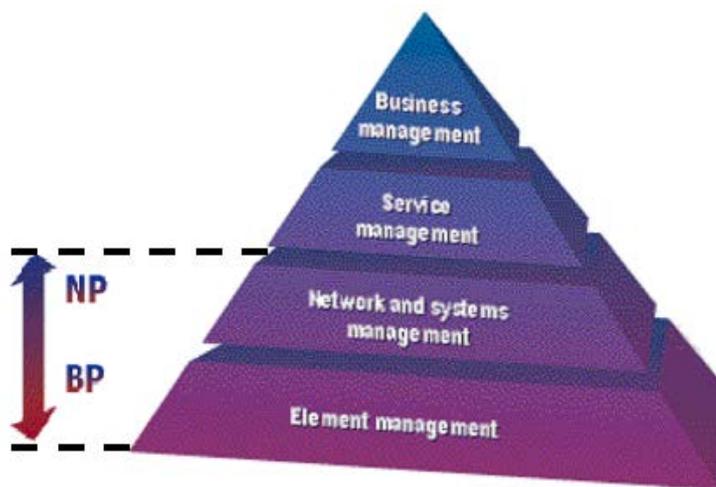
Figure 1:   FOXMAN-UN inside the TMN Pyramid

Automated Network and Service Provisioning

FOXMAN-UN NP is an integrated function of FOXMAN-UN that automates network and service provisioning for FOX51x and FOX61x based TDM networks. FOXMAN-UN NP includes many practical process enhancements, which allow for faster configuration and circuit provisioning compared to current solution implemented in the FOXMAN-UN BP.

It provides a system for fast and efficient:

- TDM end-to-end provisioning:
    - Existing end-to-end connections can be modified or deleted.
    - New end-to end connections can be created using the available network capacity.
- Network documentation:
    - Makes the discovery of all end-to-end connections (Transport Entities).
    - Keeps the information in its own database.
    - Keeps its database synchronised with network changes.
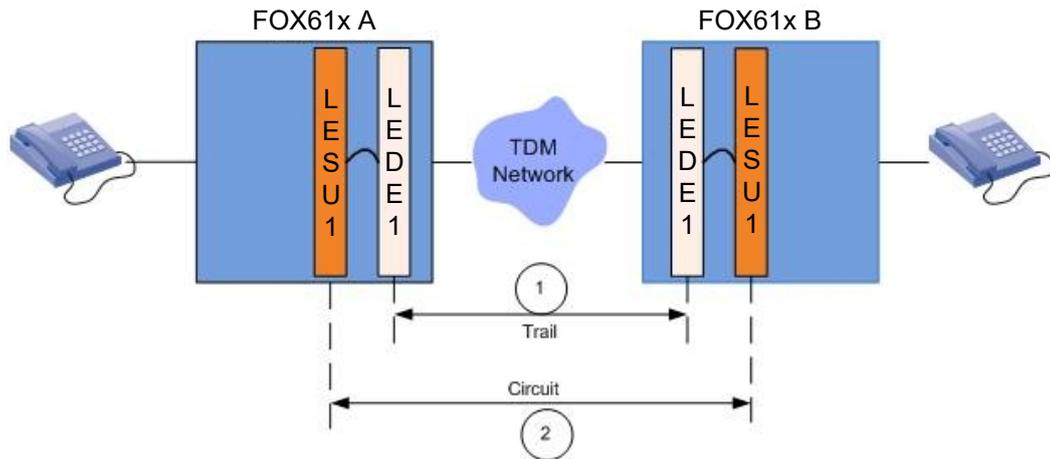
Figure 2:   TDM end-to-end connection (example)

2.1   The NP Components
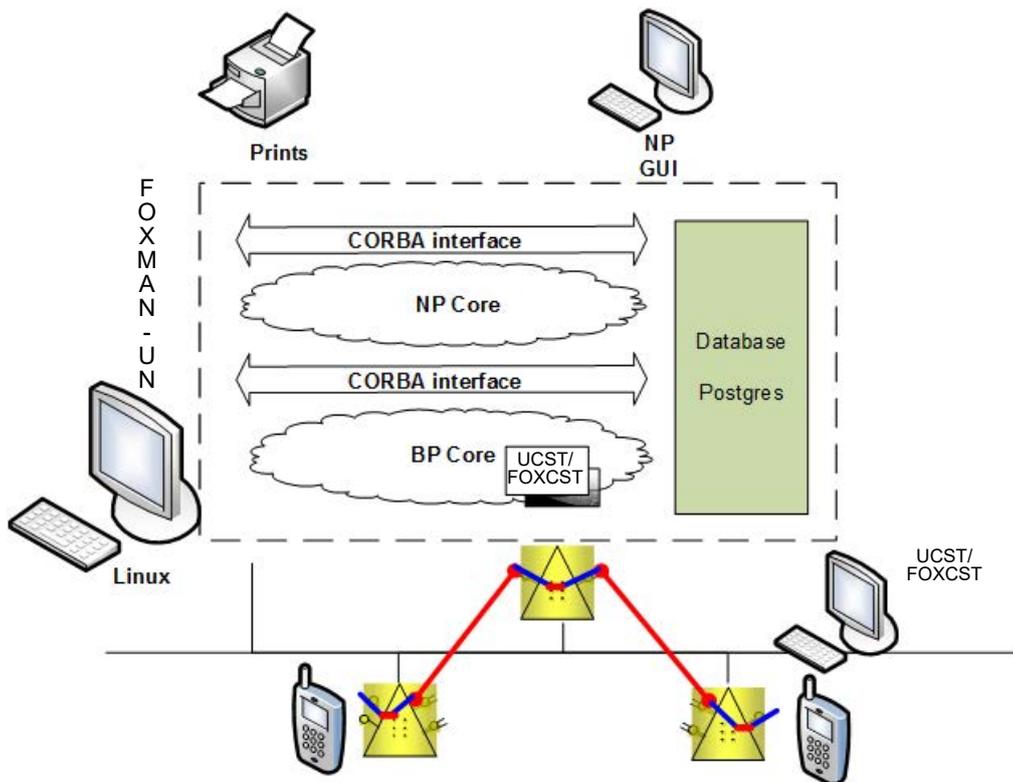
Figure 3:   The FOXMAN-UN NP Components

- The Graphical User Interface FOXMAN-UN NP (GUI) allows the user to access the FOX-MAN-UN NP functions.
- The Network Documentation functionality is used to generate the information required to document the existing network. FOXMAN-UN NP offers NP Report, which is part of the FOXMAN-UN NP standard installation.
- The back end server which communicates with the Graphical User Interface (GUI) and the FOXMAN-UN BP layer, manages the core processes.

The FOXMAN-UN NP also uses the existing facilities of FOXMAN-UN.

- The FOXMAN-UN NP logs its System Alarms in the FOXMAN-UN BP alarm management system.

− The FOXMAN-UN NP can be launched using the sub-command «Networking Package...» located in the «Application» menu in the FOXMAN-UN NEM Desktop.

2.2   Overview of NP Circuit Provisioning Process

The FOXMAN-UN BP provides information about:

• all the sections between the NEs;
• all NE configuration parameter settings of individual unit and its sub-units (interfaces), cross-connections.
• node members of the NP Domain

The FOXMAN-UN NP uses these information for bottom up provisioning:

• Circuit creation:
  − Creating new Application.

    The Application is a container of Transport Entities.
  − Creating new Transport Entities (TE).

    The TE is a connection that is created utilizing existing network cross-connections and Sections. Example of TE is an end-to-end circuit.
  − Defining the circuit extremities or terminating points. (a end TP and z end TP)
• Routing the Transport Entities.
  − The TE has a Path, which connects the a end TP with the z end TP.
  − The Routing can be Automatic or Manual Routing.
• Committing the configuration to the network.
  − Configuration changes are made (circuit is created and maintained in the database, cross-connections are created) and automatically downloaded or applied to the node.

i	**Please note:** The NP Pre-requisites and detailed NP User Workflow are discussed in section 4 Commissioning (on page 36). Detailed step-by-step Circuit Provisioning is discussed in section 7 Provisioning (on page 79). For a list of supported units, please refer to section 9 Appendix A - Supported FOX-61x Units (on page 104). For quantitative requirements, please refer to section 10 Appendix B - NP Quantitative Requirements (on page 105).

2.2.1   Basic Package (BP) Information

The figure below displays an existing BP Configurations.

  − the service has been defined as a data connection between two LEDE1 sub-units located in NE82 and NE80.
  − LEDE1 units and sub-units (ports) parameters are already configured. The ports are not enabled.
  − STM-4 Section created between NE82 and NE81.
  − STM-16 Section created between NE81 and NE80.
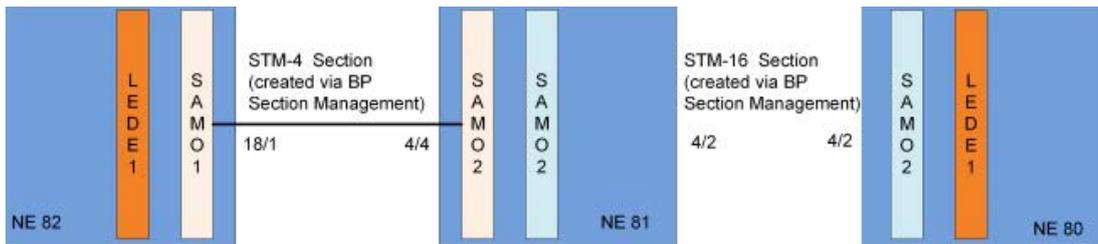
Figure 4:   end-to-end connection before NP

2.2.2   BP Sections - NP Topological Trails

The Sections are recognized by FOXMAN-UN NP as topological trails.
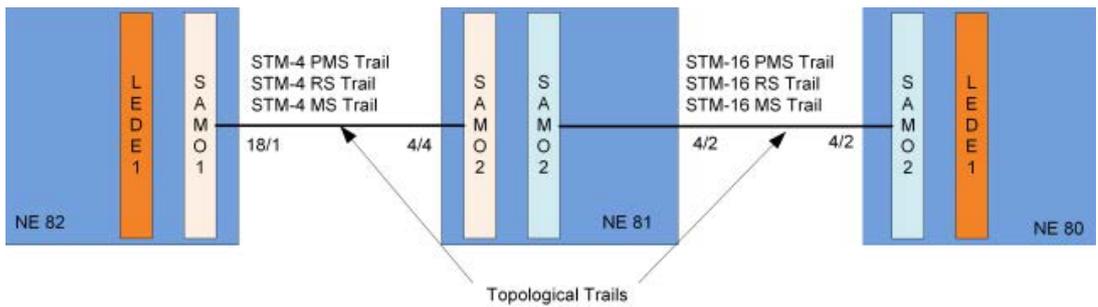
Figure 5:   Topological Trails

In our example, the FOXMAN-UN NP auto-generated topological trail for each SDH layer: PMS, RS and MS of STM-4 and STM-16 Sections.

Each Section's topological trails are maintained in one Application. The FOXMAN-UN BP Section name is used as the Application name.

Name ▲1	Layer	TE(s)	Type	Status
○ NE81 to NE80 STM16 Link1		3		
NE81 to NE80 STM16 Link1	**STM16 PMS**		**Trail**	**Valid**
NE81 to NE80 STM16 Link1	STM16 RS		Trail	Valid
NE81 to NE80 STM16 Link1	STM16 MS		Trail	Valid
○ NE81 to NE80 STM16 Link2	STM16 PMS	3	Trail	Valid
○ NE82 to NE 81 STM 1 Link	STM1 PMS	3	Trail	Valid
○ NE82 to NE81 STM4 Link		3		
NE82 to NE81 STM4 Link	STM4 RS		Trail	Valid
NE82 to NE81 STM4 Link	**STM4 PMS**		**Trail**	**Valid**
NE82 to NE81 STM4 Link	STM4 MS		Trail	Valid
○ NE82 to NE82 STM1 Link	STM1 PMS	3	Trail	Valid

Figure 6:   Applications Lists-Topological Trails

2.2.3 Circuit Creation

i

Please note:

The provisioning example described in this section assumes the following:

→ NP database is initialized.

→ NP/BP databases are synchronised.

→ No pending changes indications.

→ No application conflict detected.

In case of any of the above listed issues, the Conflict State icon on the tool bar of the application window is colored orange, and a click on the icon provides more information.

Please refer to section 4.2.2 Main GUI Status Indications (on page 40) and section 4.2.3 User Work Flow: Application Create/Edit (on page 41).

1　Create a new Application by calling the Application dialog via NP main Window menu: File > New Application
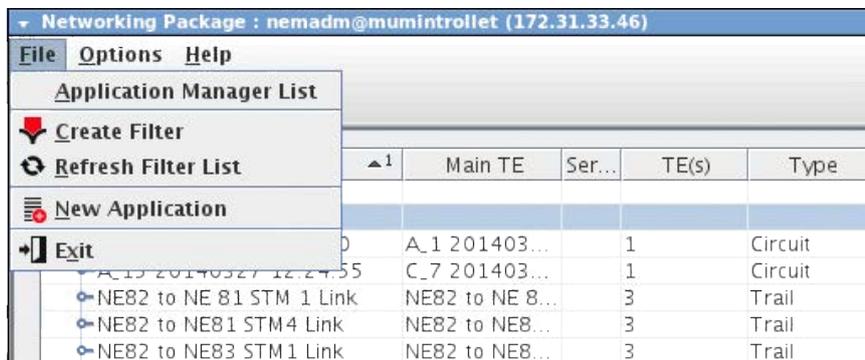
Figure 7:　　Calling Application dialog via Main Window

2　Create new Transport Entity:

−　from the Application dialog call the TE dialog:

Edit > New
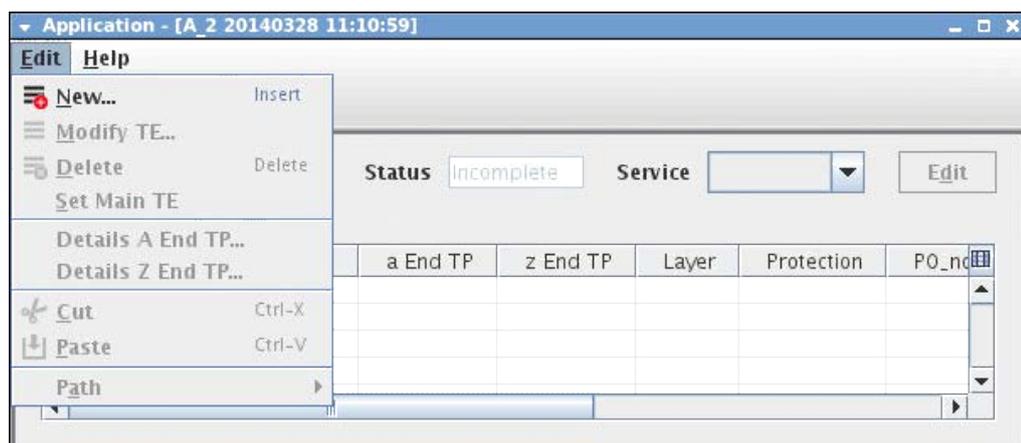
Figure 8:　　Creating new TE from Application dialog

−　Create new TEs by specifying the following between a End and z End NEs: VC4 Trail, V12 Trail and P0_nc Circuit.
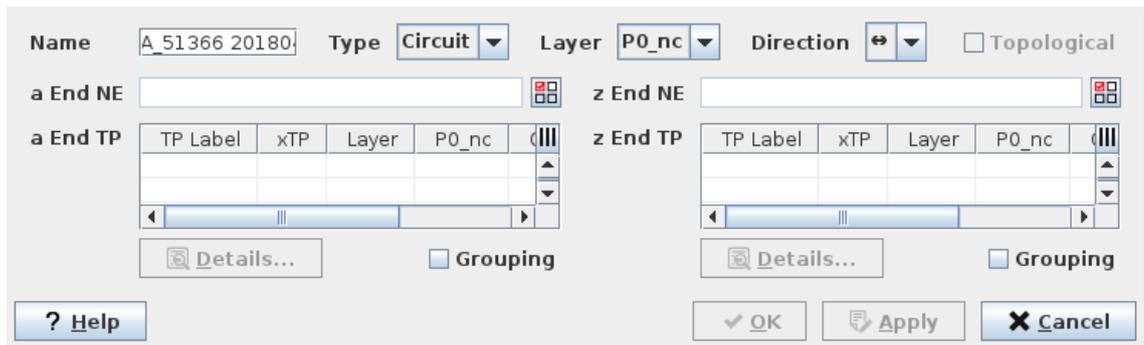
Figure 9:   Defining the new TE parameters

- click "OK" to go back to Application dialog.
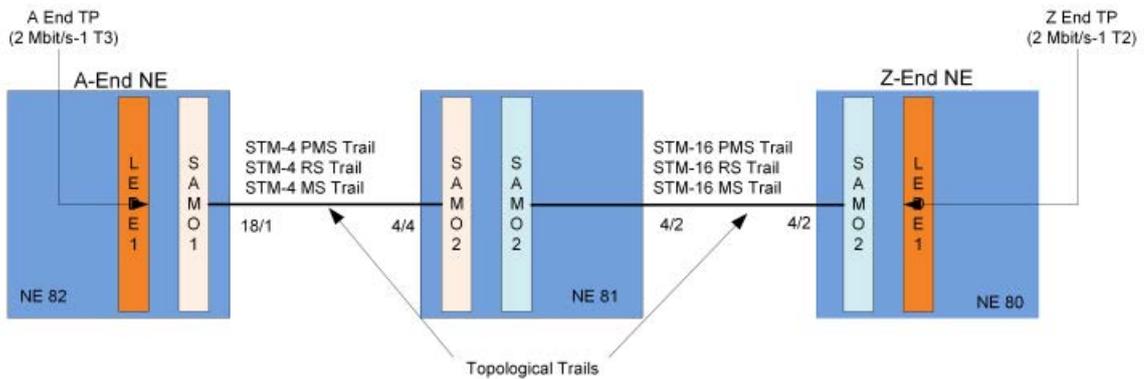
Figure 10:   Transport Entity (Circuit) created with extremities defined

2.2.4   Routing

1 From the Application dialog, select the new TEs.
   - Note that TE Status is still Incomplete.
   - The Working Path of the selected TE displays "Hole". This means the routing has not been completed by the user.

2 Select the Routing:
   - If Automatic Routing is selected, the NP completes the Route based on the user's previously configured Automatic Routing Parameters.

     (Main NP Window > Options > Set Auto Routing Parameters)
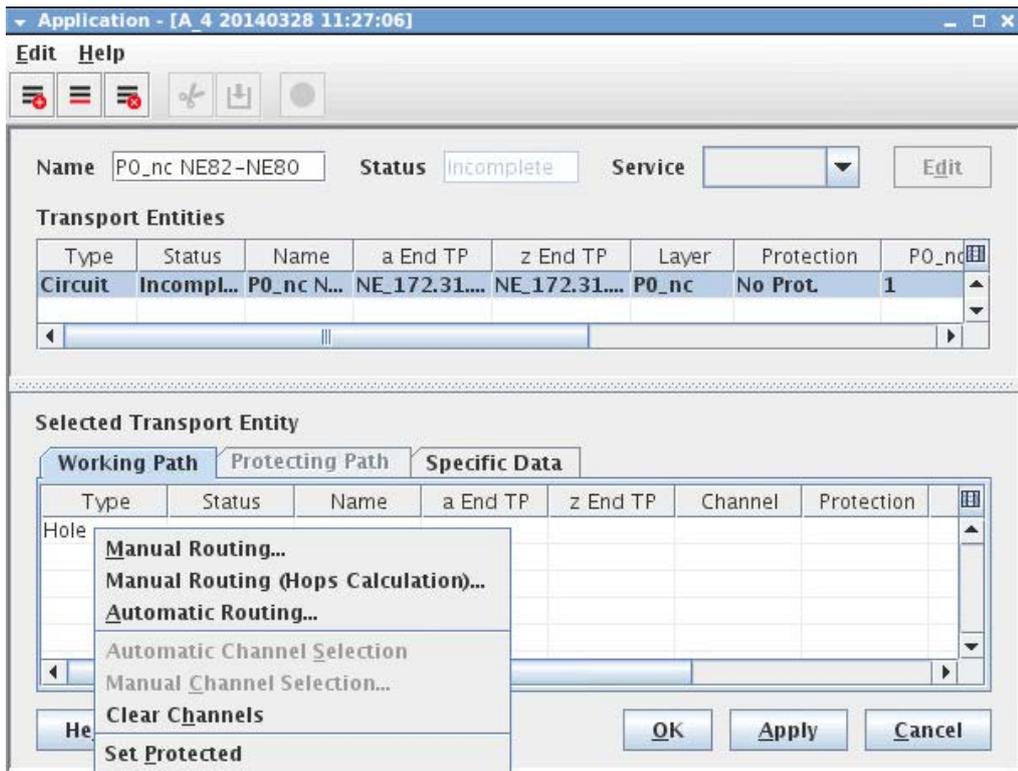
Figure 11:   Routing: Manual Routing or Automatic Routing

− If Manual Routing is selected, the "Next Hop" dialog is called. The user has to manually select each "Hop" until the path is complete.
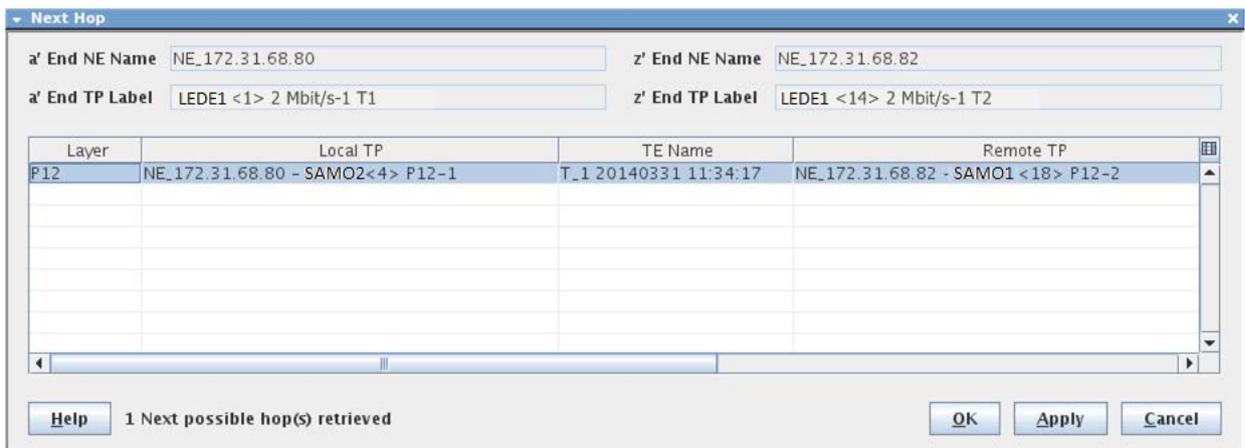
Figure 12:   Manual Routing: Selecting the "Next Hop"

3   NP generates Trails depending on the Layer (e.g. P12) and Local and Remote TP selected to complete the Path. When the Path is complete, the selected TE's Working Path changes from "Hole" to list of "LC(s)" or Link Connection(s) with "undefined" channels.
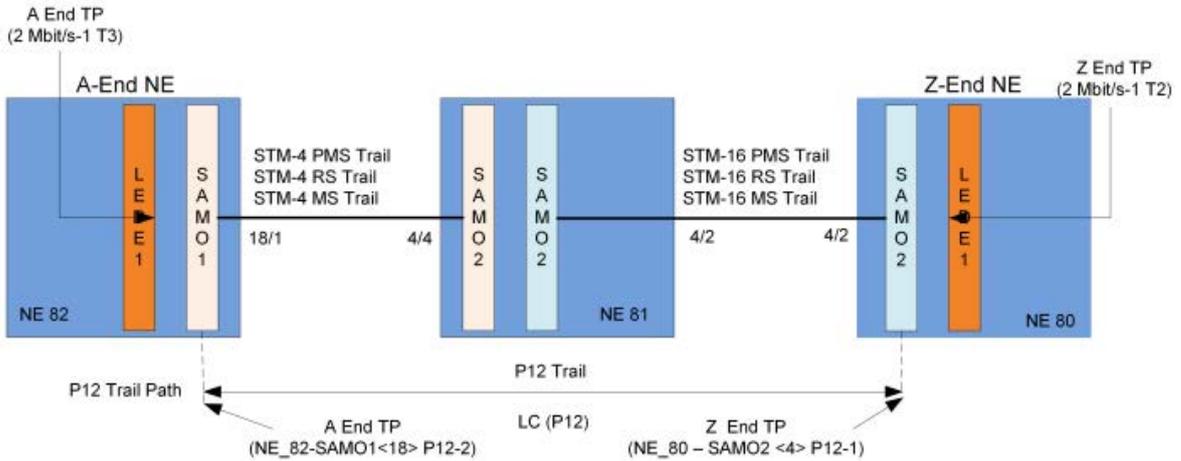
Figure 13:   P12 Trail and Termination Points

> **i**   **Please note:**
>
> The diagram illustrates only the P12 Trail and its TPs, which are displayed in the Working Path GUI as shown in Figure 14.
>
> Clicking the "Details" context menu will display all the generated Trails and their TPs, e.g:
>
> → Topological Trails (STM4/16 - PMS, RS and MS Trails),
>
> → VC4 Trail,
>
> → VC12 Trail,
>
> → P12 Trail.

2.2.5   Channel Selection

A dedicated timeslot or channel has to be selected on the Trail(s) of the Path.
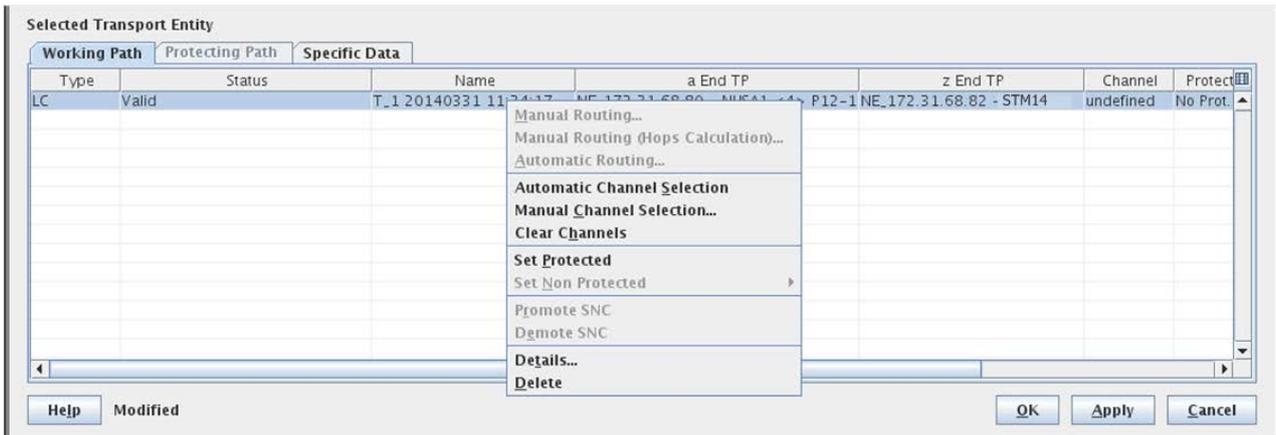
Figure 14:   Channel Selection

- If Manual Channel Selection is selected, the user has to manually select the available timeslot(s).
- If Automatic Channel Selection (recommended) is selected, the next available timeslot is automatically selected for the Path and required Matrix Connection(s) or MCs are displayed with Status "Waiting".
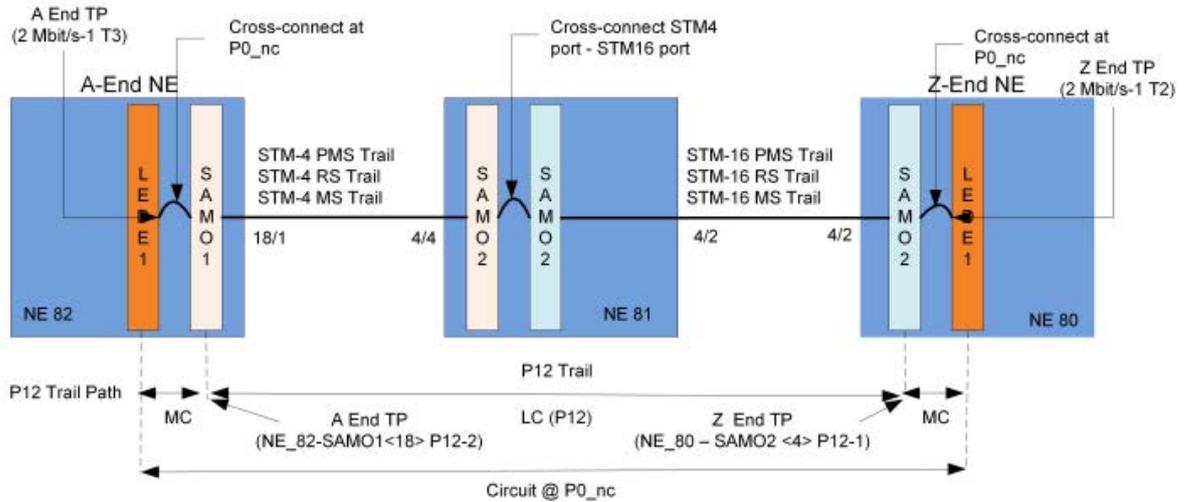
Figure 15:   Circuit Working Path

2.2.6   Deploying Configuration to the Network

1   Click "Apply" or "OK" button to deploy the configuration to the network. Configuration changes are made and automatically downloaded to the NEs.

> **Please note:**
> The main window may show the indication "Pending Changes". This represents the number of configuration confirmation changes the FOXMAN-UN is waiting for. The FOXMAN-UN NP will not allow any change until all changes have been confirmed.
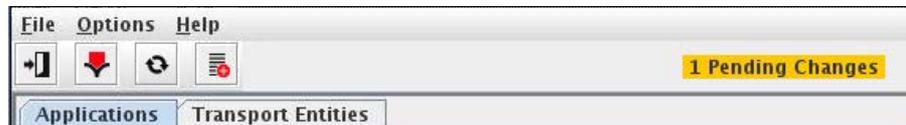
2   When the Status becomes "Valid" the Circuit with its Path as shown in Figure 15 is created. The network can now transport the signal end-to-end.
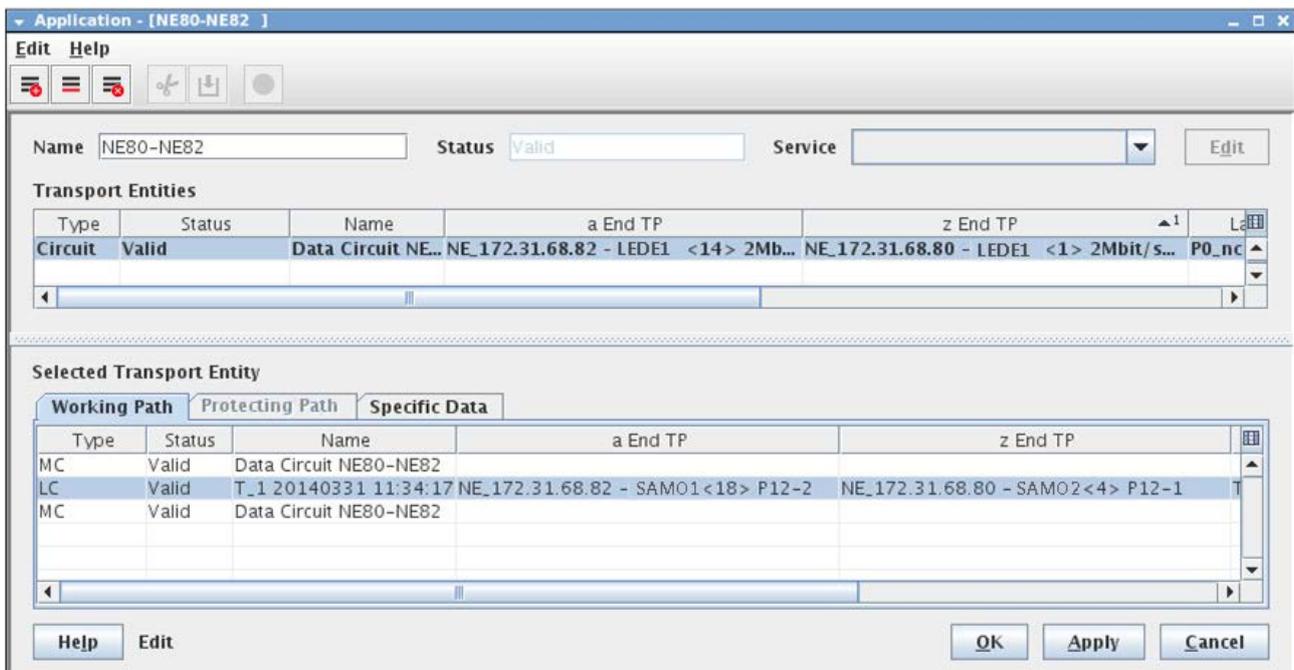
Figure 16:   Valid Circuit with Working Path

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2.2.7 Check NP Circuits against Supervised Services

2.2.7.1 Advanced Services

In order to find out which of the circuits are part of supervised services (i.e. added to Advanced Services in Service Supervision) the nemtasktool may help. The nemtasktool is a FOXMAN-UN built-in tool provided in /opt/nem/bin/private.

The nemtasktool is using the following syntax relevant to the check described here:

```
/opt/nem/bin/private/nemtasktool -h

   -X (alarm | service | print) (-I name=<TEName>,slot=<slot>) (--
circuitNames <circName1,circName2>) (--checkSections) (--checkPorts)

   alarm : create system alarm for missing services
   service : create service for missing services
   print : print circuit names which are missing services
   TEName : Ignore Circuits containing this string in the name
   slot : Ignore Circuits starting/ending on this slot
   circNameX : ONLY check circuits containing this string in the name
```

To check NP services against supervised services,

Proceed as follows: (note that circuit names given below are samples)

1. Print list of help:

   /opt/nem/bin/private/nemtasktool -h

2. Show list of circuits not being part of service supervision:

   /opt/nem/bin/private/nemtasktool -X print

3. Add service to Service supervision by name:

   /opt/nem/bin/private/nemtasktool -X service --circuitNames P0nc_83_82_Prot

4. Add service to Service supervision by name including sections and ports:

   /opt/nem/bin/private/nemtasktool -X service --circuitNames P0nc_83_82_Prot --checkSections --checkPorts

5. Update service to Service supervision, add sections and ports (for all service):

   /opt/nem/bin/private/nemtasktool -X service --checkSections --checkPorts

6. Update service to Service supervision, add sections and ports (for a named service):

   /opt/nem/bin/private/nemtasktool -X service --circuitNames P0nc_83_82_Prot --checkSections --checkPorts

End of instruction

Please note that the nemtasktool has other options that are not described herein since they are implemented and used for support activities only.

2.2.7.2 System Services

For TEs added to System Services in Service Supervision, the TE table provides the column "Supervison". If a TE is part of System Services in Service Supervision, the column shows "Running" or "Paused" for the respective TE. If a TE is not part of System Services in Service Supervision, the column shows "Disabled" for the respective TE.

3   Terminology

The FOXMAN-UN NP follows a provisioning oriented abstraction. The NP specific terminology are explained in this section to understand the NP implementation and operations.

The following topics are discussed:

- Topological Entities:
    - FOX51x,
    - FOX61x,
    - NEs of type FO,
    - Sections.
- NE Configuration Entities:
    - Termination Points (TP),
    - Matrix Connections (MC).
- Managed Structure:
    - Application,
    - Transport Entity,
    - Path.
- Circuit Provisioning:
    - Manual Routing,
    - Automatic Routing.

3.1   The Topological Entities

The network topology is made of the following topological elements:

- FOX51x,
- FOX61x,

    For the list of supported units, please refer to section 9 Appendix A - Supported FOX61x Units (on page 104).

- NEs of type FO,
- Section.

Table 2:   Mapping of topological elements

Network topological elements	NP
FOX51x	NE
FOX61x	NE
Foreign Objects	NEs of type FO
Section	Topological Trail
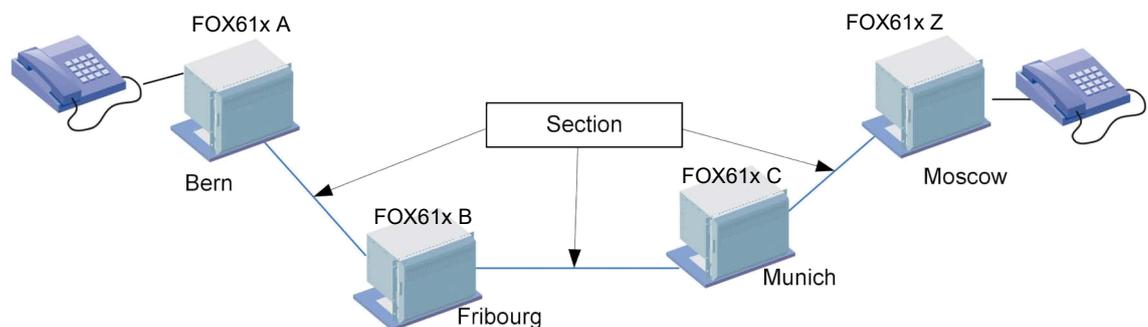
Figure 17:   FOXMAN-UN BP Network View
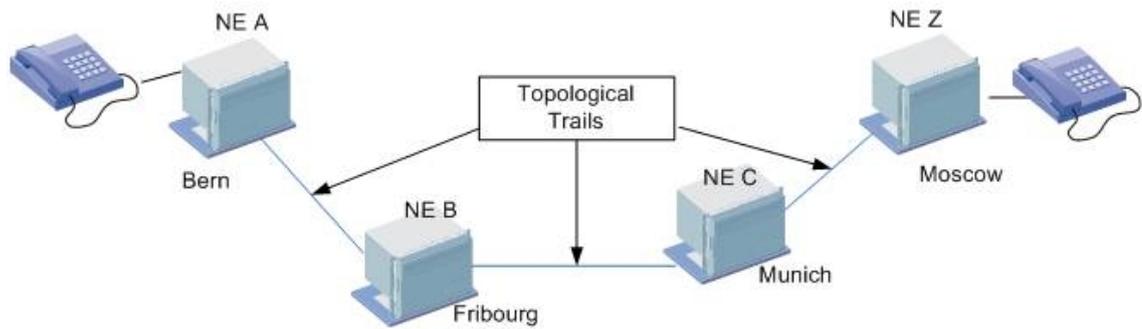
Figure 18:   FOXMAN-UN NP Network View

The Section represents the type of connectivity between NEs and NEs of type FO or a combination thereof. FOXMAN-UN NP recognizes the Sections as topological Trails Transport Entities (TEs).

3.2   NE Configuration Entities

3.2.1   The Termination Points (TP)

The TP identifies a source/sink point inside a NE or Foreign Object for creating cross-connections.

The sub-systems of a TP are:

- TTP (Trail Termination Point):
    - represents the TP that is used as termination point for Trails,
    - extremities of a Trail,
    - bears multiplexed information, thus at TTP the signal is multiplexed or demultiplexed into other points called CTP.
- CTP (Connection Termination Point):
    - represents the TP that is used as a termination for the multiplexed TTP, e.g. CTP Channel: T1 to T31, Layer: P0_nc.

The diagram below displays the Circuit and Trails Termination Points of an end-to-end connection.
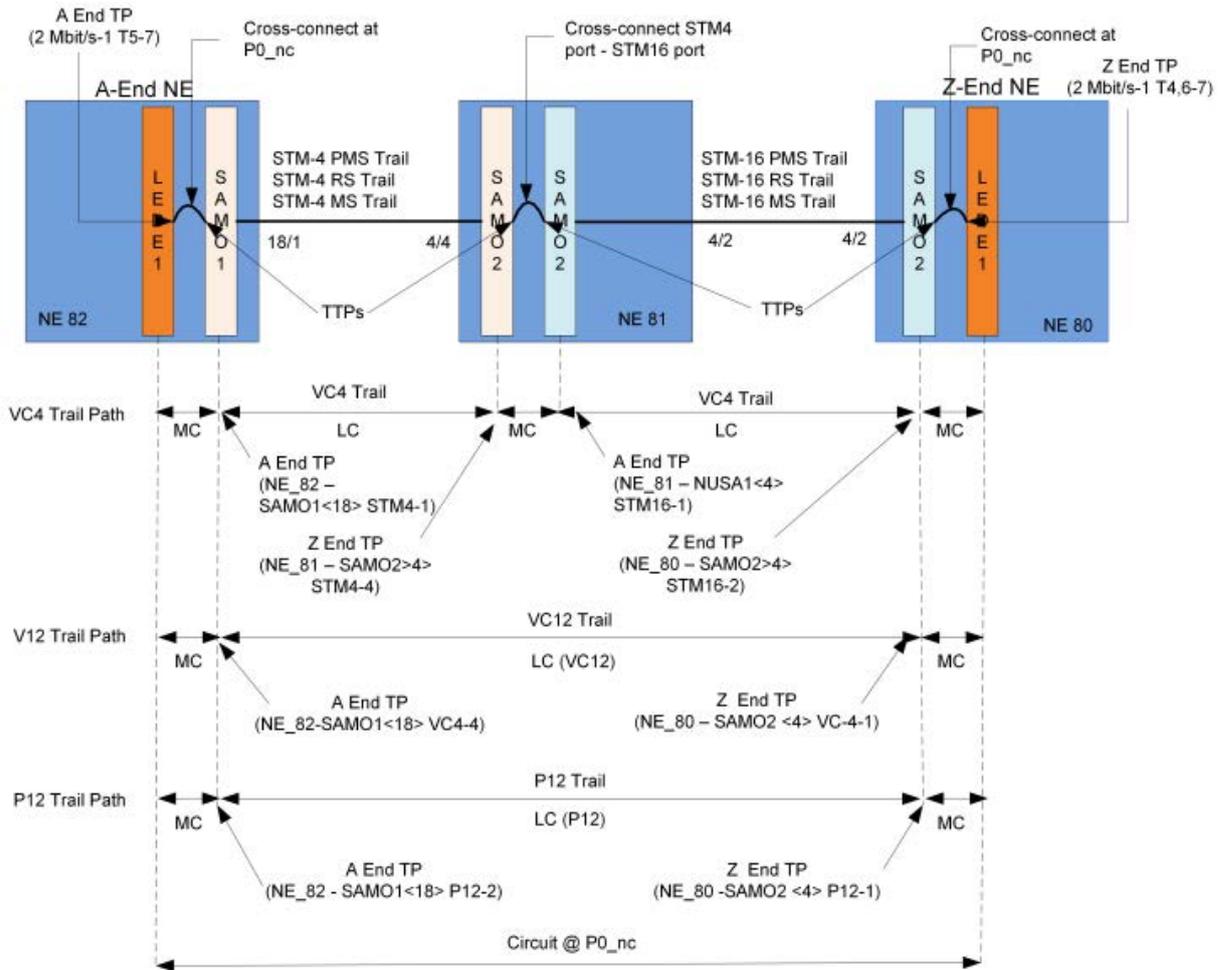
Figure 19:   A End and Z End Termination Points (TP)

3.2.2   Matrix Connections (MC)

A TDM cross-connection is created between two connection termination points (TP), where the starting point is the A-End TP and the ending is the Z-End TP.
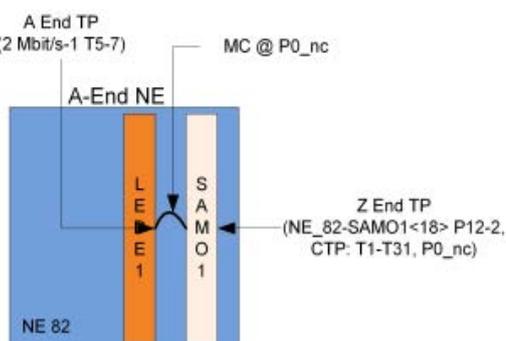
Figure 20:   Matrix Connection at P0_nc level

The TPs can be connected with each other inside a NE through Matrix Connections (MC). The MCs are named as cross-connections in the FOX51x and FOX61x documentations.

A pair of TPs can be connected if:

• neither is already part of a connection,

• both TPs are of the same bandwidth (layer, e.g. P0_nc).

The MC has three TPs: Working (AWork), AProtecting (AProt) and Output (Z) that are TPs of the same layer rate. The MC itself can be configured in protected mode.

If the MC is not protected only the A Work and Z TP are used.
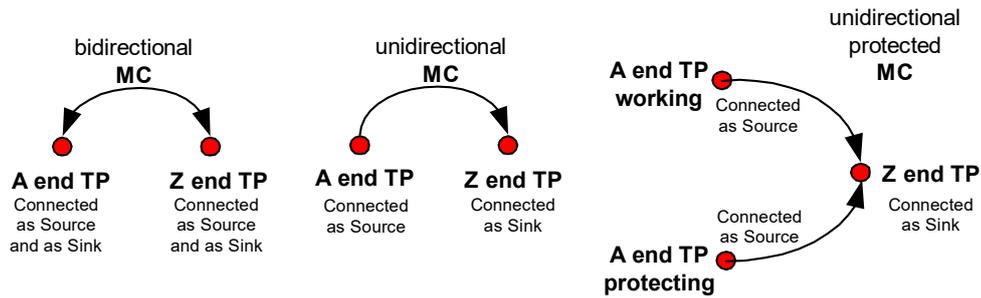
Figure 21:   The MC representation

3.3   The NP Managed Structure

The NP model is built of Application, Transport Entity (TE) and Path Elements.

The Application is a container of TEs. It contains at least one TE.

The TE can be:

- − circuit,
- − trail,
- − Sub Network Circuit (SNC),
- − unknown.

The TE has a Path, which connects the endpoints: a End TP (Terminating Point) with z End TP. The path elements can be a:

- − Sub Network Connection (SNC),
- − Link Connection (LC),
- − Matrix Connection (MC),
- − Hole.

The diagram below illustrates the relationship of TEs and Path elements.
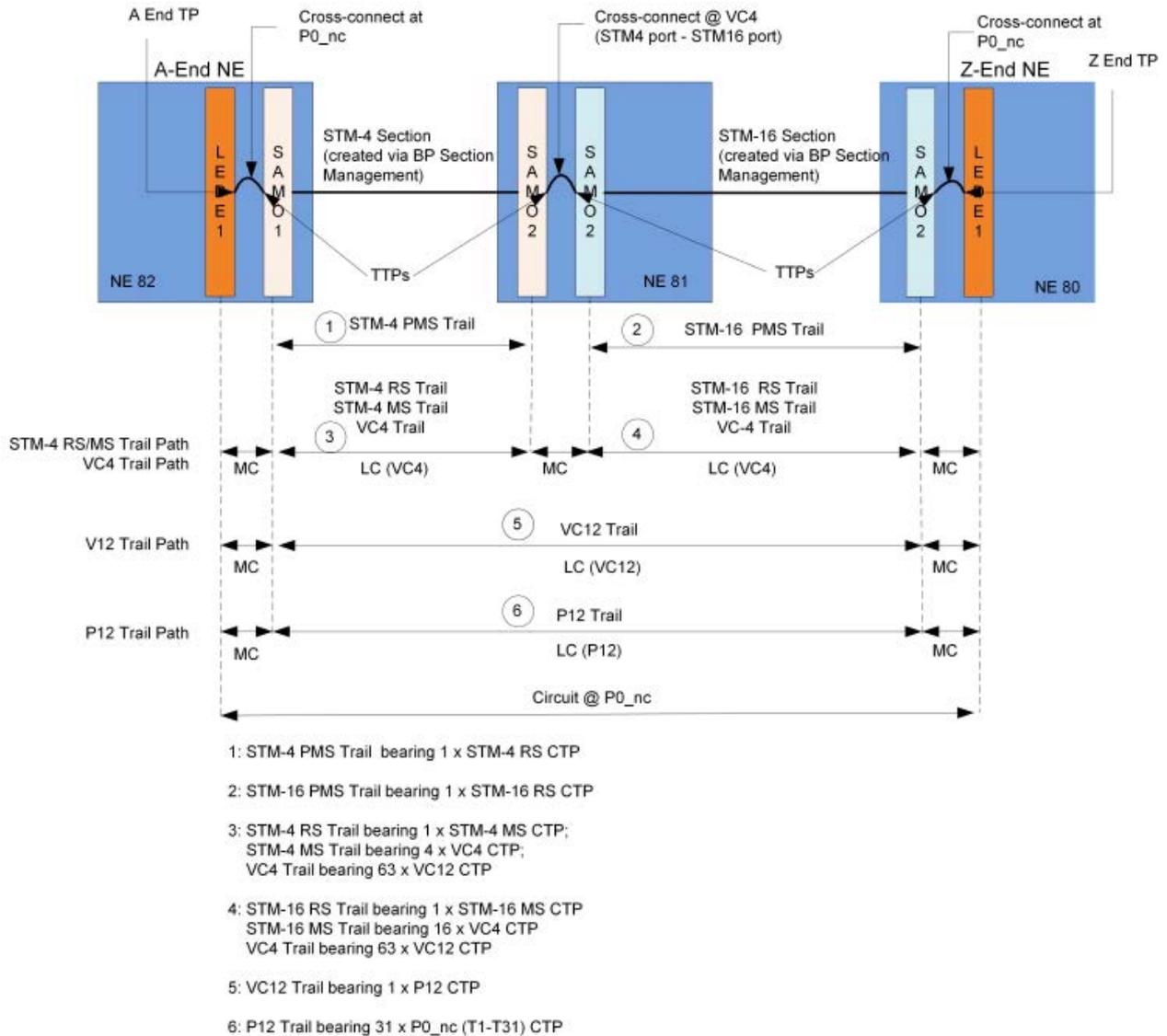
Figure 22:   TE (Circuit, Trails) and Working Path

3.3.1   Application

The Application is a FOXMAN-UN NP specific concept that contains Transport Entities (TE). Any TE has to be created inside an Application. All user actions are done through the Application. The Application itself is downloaded to the network (i.e. to the Network Elements) and saved in the database in its entirety.

Before creating a TE in the network, the user has to create a new Application or reuse an existing one. There is no limitation of the maximum number of TEs per Application. A TE can't be created outside an Application.

The screenshot below displays the network's Application lists. Each Application contains TE(s). For example, the Application NE80-NE82 contains one Circuit TE.

Name	Layer	TE(s)	Type	Status	a End TP	z End TP	Service	Protection	
NE80–NE82		1							
Data Circuit NE80–NE82	P0_nc		Circuit	Valid	NE_172.31.68...	NE_172.31.68...		No Prot.	3
NE81 to NE80 STM16 Link1		3							
NE81 to NE80 STM16 Link1	STM16 PMS		Trail	Valid	NE_172.31.68...	NE_172.31.68...		No Prot.	
NE81 to NE80 STM16 Link1	STM16 RS		Trail	Valid	NE_172.31.68...	NE_172.31.68...		No Prot.	
NE81 to NE80 STM16 Link1	STM16 MS		Trail	Valid	NE_172.31.68...	NE_172.31.68...		No Prot.	
NE81 to NE80 STM16 Link2		3							
NE81 to NE80 STM16 Link2	STM16 MS		Trail	Valid	NE_172.31.68...	NE_172.31.68...		No Prot.	
NE81 to NE80 STM16 Link2	STM16 PMS		Trail	Valid	NE_172.31.68....	NE_172.31.68....		No Prot.	
NE81 to NE80 STM16 Link2	STM16 RS		Trail	Valid	NE_172.31.68...	NE_172.31.68...		No Prot.	
NE82 to NE 81 STM 1 Link		3							
NE82 to NE 81 STM 1 Link	STM1 MS		Trail	Valid	NE_172.31.68...	NE_172.31.68...		No Prot.	
NE82 to NE 81 STM 1 Link	STM1 RS		Trail	Valid	NE_172.31.68...	NE_172.31.68...		No Prot.	
NE82 to NE 81 STM 1 Link	STM1 PMS		Trail	Valid	NE_172.31.68....	NE_172.31.68...		No Prot.	
NE82 to NE81 STM4 Link		3							
NE82 to NE81 STM4 Link	STM4 MS		Trail	Valid	NE_172.31.68...	NE_172.31.68...		No Prot.	
NE82 to NE81 STM4 Link	STM4 PMS		Trail	Valid	NE_172.31.68....	NE_172.31.68....		No Prot.	
NE82 to NE81 STM4 Link	STM4 RS		Trail	Valid	NE_172.31.68...	NE_172.31.68...		No Prot.	
NE82 to NE83 STM1 Link	STM1 PMS	3	Trail	Valid	NE_172.31.68...	NE_172.31.68...		No Prot.	

Figure 23:   Application: container of TE(s)

Applications are useful for:

- FOXMAN-UN BP Section recognition;

  each section and its respective hierarchy is stored in an Application.

- Broadcast constructs;

  all Circuits belonging to a broadcast and shared Sub Network Connections SNCs are gathered inside the same Application.

- Conference and Point-Multipoint constructs;

  each recognized construct is maintained in one Application.

- Management Communication Channels in DCN Network;

  each recognized Embedded Operational or Embedded Communication Channel (EOC/ECC) is maintained in one Application.

3.3.1.1   FOXMAN-UN BP Section recognition

The FOXMAN-UN NP recognizes the Sections as Trail TEs. The FOXMAN-UN NP scans all Sections for all fixed Trails bound to this Section and creates them in the same Application. This behavior leads to gathering SDH/PDH/DSL hierarchies, as shown in sample entries below:

Table 3:   Trails

Physical Rate	Trail (Layer)
STM-1	- STM-1 PMS: Physical Section layer, provides termination of the optical or electrical section. - STM-1 RS: Regenerator Section, provides termination of STM-1 regenerator section - STM-1 MS: Multiplex Section, provides the termination of STM-1 multiplex section
STM-4	STM-4 PMS, STM-4 RS, STM-4 MS
STM-16	STM-16 PMS, STM-16 RS, STM-16 MS
E12 (External 2 Mbit/s)	E12, P12 (when units are "Terminated")

For example as shown in Figure 23: "Application: container of TE(s)" (on page 23), an STM-16 Section will auto-generate PMS, RS and MS Trails maintained in the same Application which is named as the name of the Section in FOXMAN-UN BP.

3.3.1.2   Broadcast Constructs

A broadcast is a construct in the network that has data transported from a unique source to multiple destinations.

A broadcast involves unidirectional Circuits and SNCs.

- All unidirectional Circuits have the same source Point and a different destination. There are as many Circuits as destination End Points.
- SNCs are created to share common Paths between the Circuits.
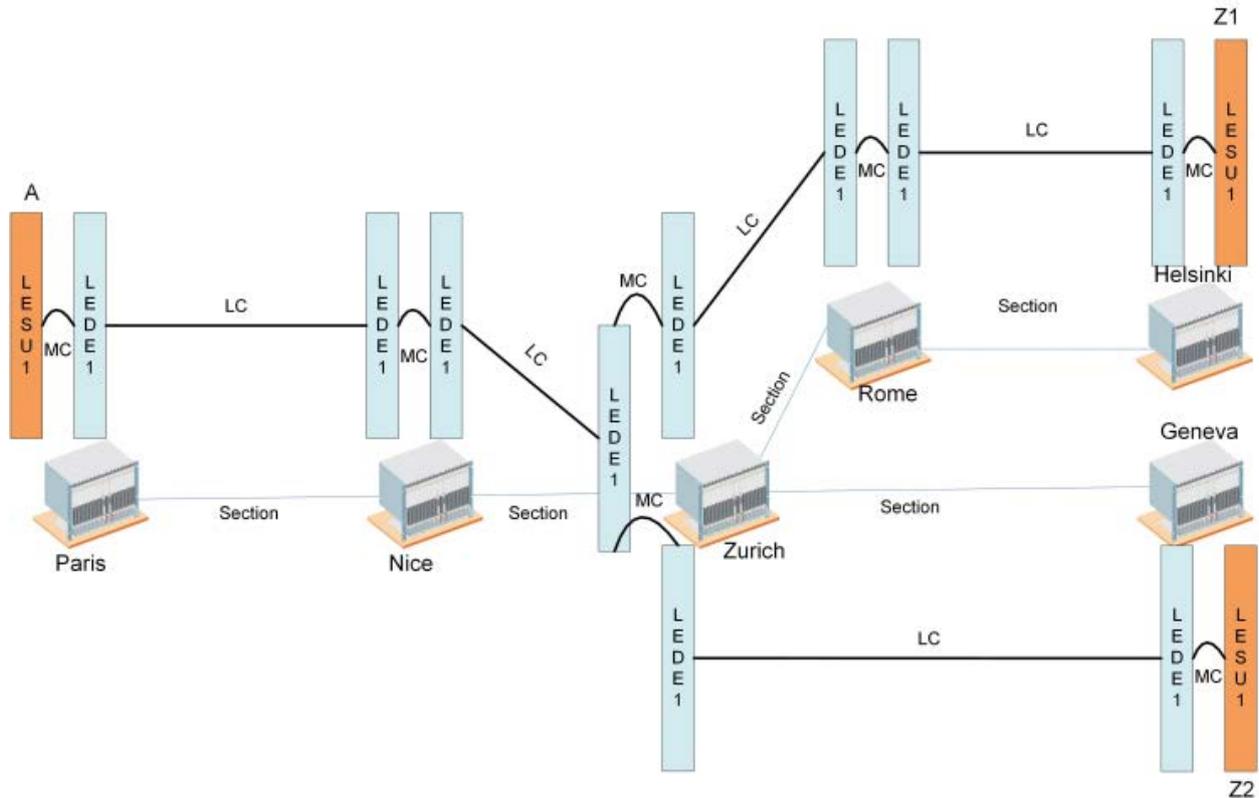
Figure 24:   The Broadcast

- SNC Paris to Nice,
- Circuit A to Z1,
  Path = {SNC, LC(Nice-Zurich), MC, LC(Zurich-Rome), MC, LC(Rome-Helsinki), MC}.
- Circuit A to Z2,
  Path = {SNC, LC(Nice-Zurich), MC, LC(Zurich-Geneva), MC}.

3.3.2   Transport Entity

The TE is a connection that is created utilizing existing network configuration information such as cross connections and Sections. FOXMAN-UN NP knows all TEs contained in the network at all rates, SDH (STM-[1|4|16], RS, MS, VC-X), PDH (P0, P0_nc), DSL, … and inter-layer usage (client/server relations).

The TE brings data from one source termination point to one or more sink termination points in the network at various physical (STM-1, STM-4, STM-16, E12, E-DSL…) and logical rates (P0_nc, P12, VC12, …). The recognition of the TE requires a global view of the network as opposed to an element view.
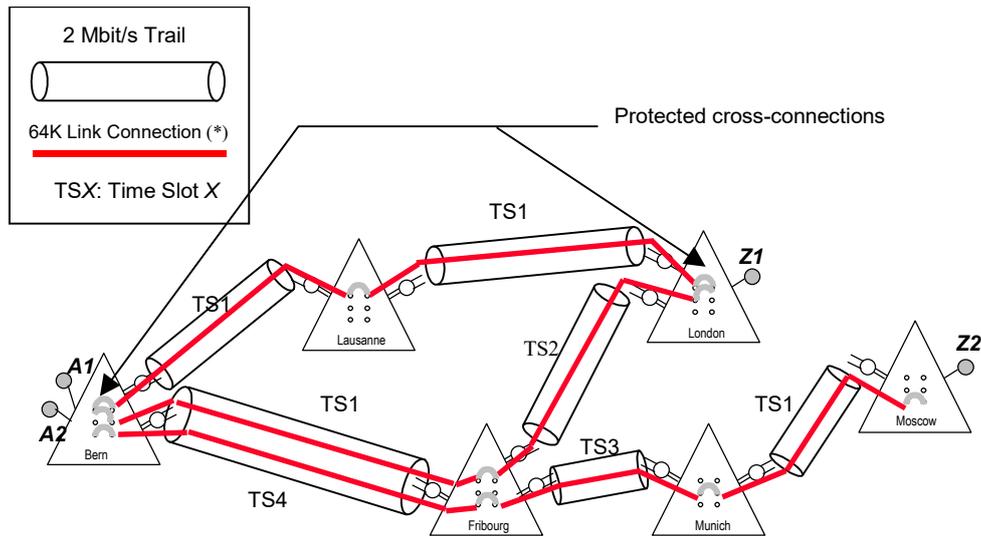
Figure 25:   TE representation

The FOXMAN-UN NP has defined four types of TE:

- Circuit,
- Trail,
- Sub-network Connection (SNC),
- Unknown.

3.3.2.1   Circuit

- Defines the end-to-end connections and the Path within the network.
- User oriented connections between the points at the border of the network. Possible rates are P0_nc, P12.
- Has end-points that are connected to external equipment.
- In the Figure 25: "TE representation" (on page 25) example, the FOXMAN-UN NP found two P0_nc Circuits:
    - From A1 to Z1, P0 protected Circuit, Bern-Lausanne-London.
    - From A2 to Z2, P0 non protected Circuit, Bern-Fribourg-Munich-Moscow.

3.3.2.2   Trail

- Bandwidth resource that carry multiplexed signal from one point to another in the network.
- The Trail's extremities are TTPs (Trail Termination Point), where the signal is demultiplexed into points that can be cross-connected with another points in the same NE.
- The purpose of a Trail is adaptation, so a Trail will generate one or more Link Connection(s) (LC).
- Trails can exist in all Layer Rates. Typical Trails seen in NP:
    - E12 Trail: created by FOXMAN-UN BP as an E12 section
    - VC12 Trail: created by FOXMAN-UN NP, which spans an SDH network
    - P12 Trail: automatically created inside an E12 Trail and VC12 Trail.

For more details, please refer to Figure 22: "TE (Circuit, Trails) and Working Path" (on page 22).

3.3.2.3   Sub-Network Connection (SNC)

a TE that represents a connection between two points inside the network. Additional configuration must be added in order to complete the path necessary for traffic to pass.

The FOXMAN-UN NP can generate SNC for the following reasons:

- Loss of connectivity inside the network.

  In this situation there is a missing cross connection within the network.

  Example: a LESU1 port at P0_nc is cross connected with a LEDE1 port in one FOX61x of the network. On the remote FOX61x there is no cross connection between the transmission card and LESU1 at P0_nc.

- Missing sections in the FOXMAN-UN BP can also lead to SNCs.

  The upper graphic of Figure 26: "The missing Section in FOXMAN-UN BP" (on page 26) shows the NP recognizes one TE (Circuit). If the second Section is missing, then the FOXMAN-UN NP will then recognize two TEs of type SNC.
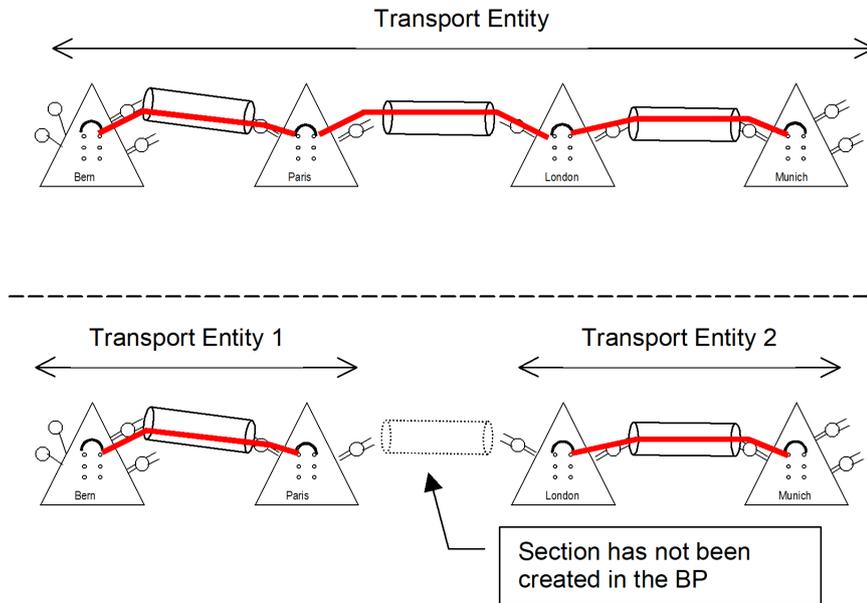
Figure 26:   The missing Section in FOXMAN-UN BP

- Broadcast configuration.

  Any broadcast configuration will generate one or more SNCs (depending on the broadcast configuration). For more details, please refer section 3.3.1.2 Broadcast Constructs (on page 23).

- P0_nc connection point shared into Nx64 kbit/s connection points.

  e.g. FOX61x allows to cross connect a P0_nc port (LEDS1 at 128 kbit/s) into two 64 kbit/s ports (LEDS1 port at 64 kbit/s or a 64 kbit/s G.703 port).

  This configuration starting at P0_nc and ending at P0 layer leads to an SNC.

- FO Tool configuration files not complete.

  There are NEs of type FO configurations files in the FOXMAN-UN NP:

  the npfotool_termination.csv file defines all the NEs of type FO names used for terminated circuit connectivity, the npfotool_trailhierarchy.csv specifies which FO/MUX section should be completed with missing multiplexing rates and the npfotool_crossconnect.csv file defines the cross-connections within all the NEs of type FO.

  If any information is missing in one of these files then a SNC will be generated.

- Incorrect SNCs in the FOXMAN-UN NP.

  SNC may exist in the network before FOXMAN-UN NP analyses the FOX51x or FOX61x network and the NEs of type FO. After the FOXMAN-UN NP network analysis, all the SNCs used in Trails and in terminated Circuits or in cross-connection through FO should be removed and replaced by Trails and Circuits. In other words, if a Circuit uses a SNC, then the SNC should be removed automatically.

- NE of type FO internal connections are SNCs.

3.3.2.4 Unknown

- Any TE that FOXMAN-UN NP does not recognize as a Circuit, Trail or SNC.
- Whenever an invalid construct is recognized, Unknown TEs are generated.
- Unknown are non-manageable TEs, i.e. the user cannot do anything with them.

The following provides an example of a valid end-to-end connection that is recognized as «Unknown» after a Matrix Connection (MC, cross connection) has been added to the network.
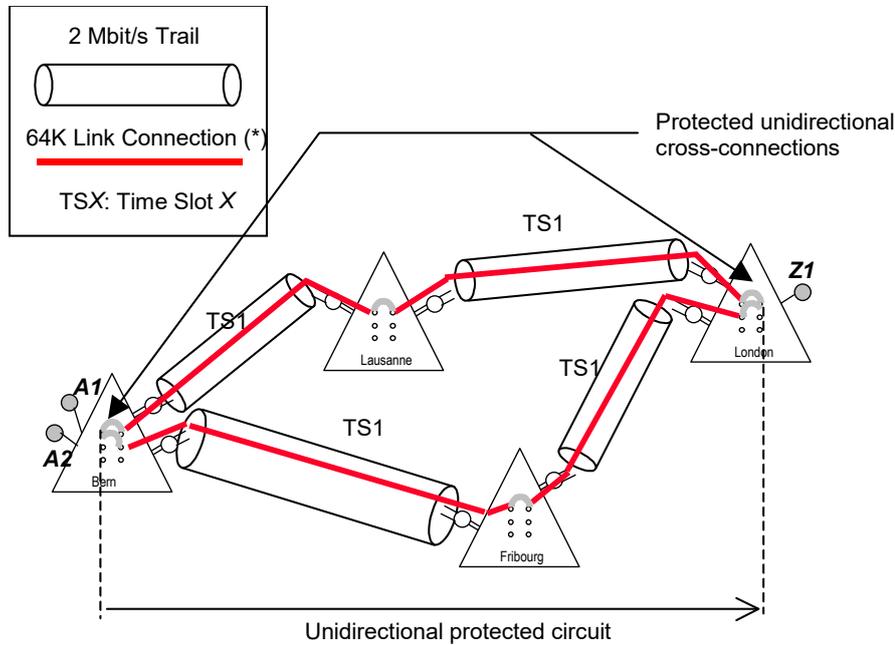
Figure 27: Valid end-to-end Path configuration

With the above network configuration the FOXMAN-UN NP recognizes a valid unidirectional TE which is protected.

The operator modifies Lausanne and creates a unidirectional cross connection which has a source connection point from the Circuit.
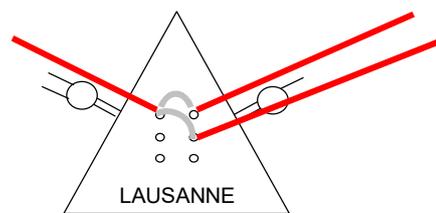
Figure 28: the network node in broadcast condition

Unknown TEs are generated so that FOXMAN-UN NP is aware of these non end-to-end connections.

> **Please note:**
> Unknown TEs are not manageable. Once an Unknown TE has been identified, the FOXMAN-UN NP operator is required to use the CST configuration tool in FOXMAN-UN BP to remove or to add cross-connections to get the end-to-end Paths. Due to the notification mechanism in FOXMAN-UN NP the change that is done in FOXMAN-UN BP will be reflected and will lead to the deletion of Unknown TEs.
>
> In an ideal situation, there should be zero Unknown TEs in the database.

3.3.2.5   Managing the Transport Entities (TE)

Circuit Provisioning: Existing TEs can be managed; new TEs can be created and managed.

Once recognized by the FOXMAN-UN NP, the operator can:

- − Define a protected route,
- − Free used capacity through deletion,
- − Modify an Endpoint (A or Z),
- − Reallocate used Timeslot (TS).

The FOXMAN-UN NP allows you to create and manage new TEs, which will use the available resources in the network.

The management of TEs leads to updating the real network at deployment time. Deploying means applying the modifications to the real network and saving the changes the user made since the last deployment:

- − Creation and deletion of cross connections.
- − Update and activation or deactivation of ports.

All these above actions on the FOXMAN-UN BP will create or update the user-requested TE in the network.

When the commit has ended, the FOXMAN-UN NP and FOXMAN-UN BP are synchronised in terms of physical data knowledge.

The FOXMAN-UN NP also adds customer data place-holders bound to those end-to-end TE for documentation purposes.

3.3.3   Path

A Path is collection of:

- Matrix Connection MC:
  - − represents the cross-connection inside one NE between sub-units or inside a unit and tier hierarchy.
  - − named as cross-connections in the FOX51x and FOX61x documentation.
  - − MCs are not created via the FOXMAN-UN BP cross-connection. The creation and deletion of cross-connections are the implicit results of actions on TEs such as routing or setting a protecting path.
- Link Connection LC:
  - − specifies the channel used inside a Trail in the Path of TE.
- Subnetwork Connection SNC:
  - − parts of the network at a single layer (e.g. at P0_nc layer).
- Hole:
  - − a Hole in the Path means that the routing has not been completed by the user. The FOXMAN-UN NP allows only one hole.
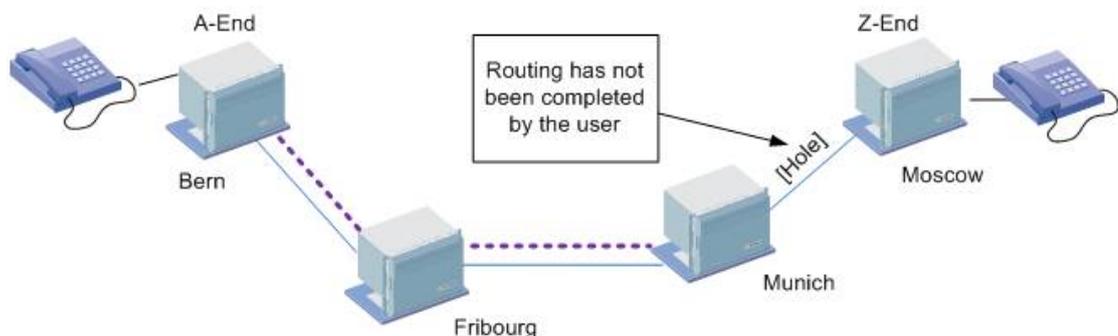
Figure 29:   Phase 1: The Hole exists

When a Transport Entity (TE) is created, the route has not been defined thus the Path contains a Hole.

The Path can be a mix of MC, SNC and LC. A hole maybe located anywhere in the Path.
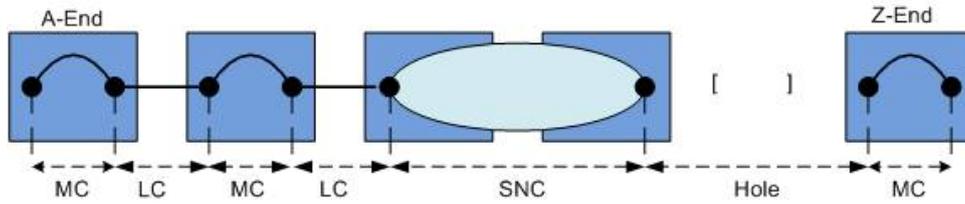
Figure 30:   Graphical representation of the Path
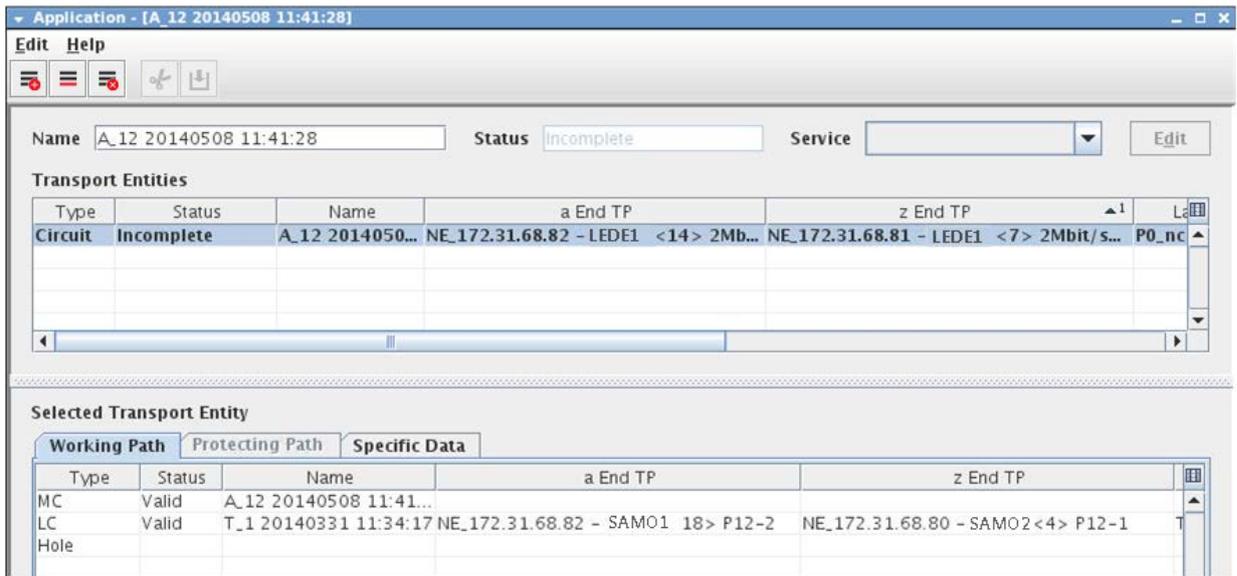
Figure 31:   GUI: Working Path

If enough capacity is available, provisioning leads to a complete Path.
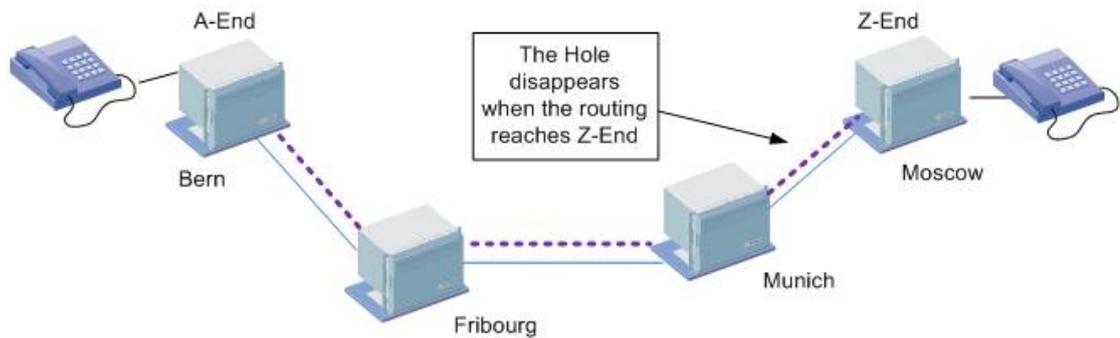
Figure 32:   Phase 2: Closed Hole

A Path can be protected when it has two separate routes, the Working and the Protecting. Both can be routed independently.
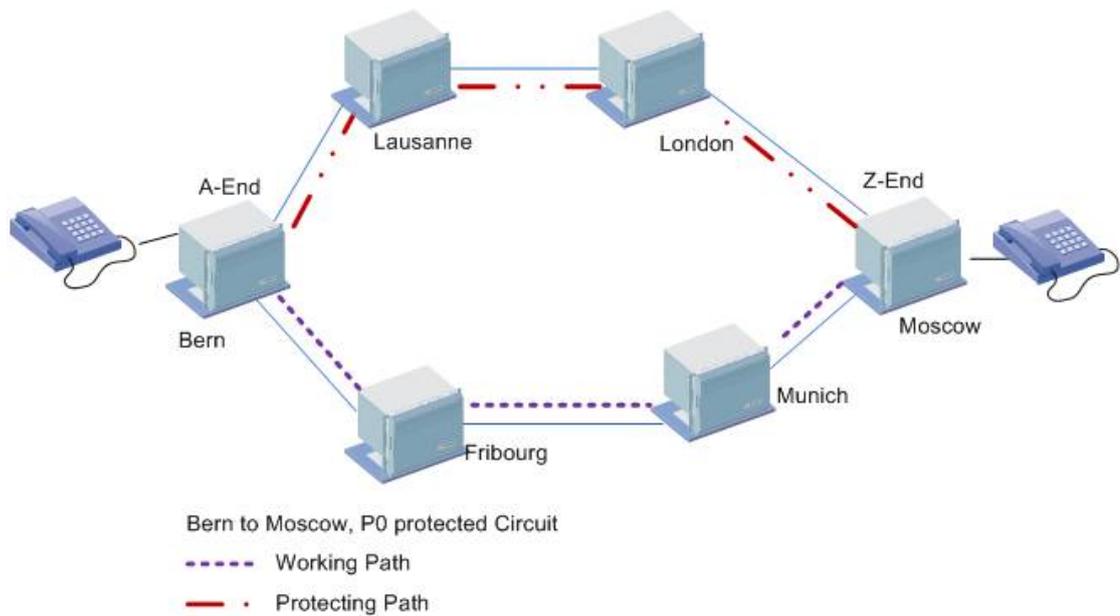
Figure 33:   Working and Protecting Path
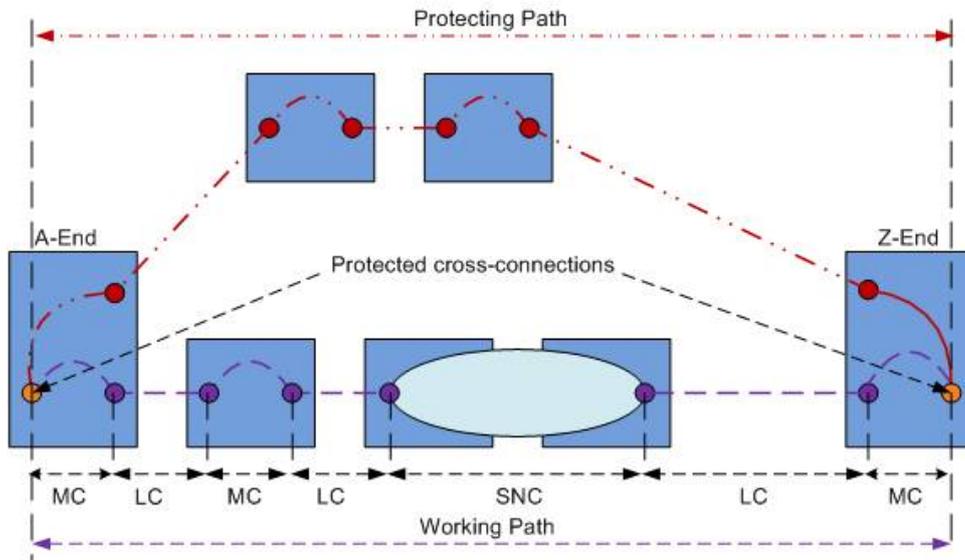
Figure 34:   Working and Protecting Path

3.4   Circuit Provisioning via Manual or Automatic Routing

The FOXMAN-UN NP assists the operator with the circuit provisioning. If more than one route through the network is possible, NP offers two approaches in selecting the preferred route to provision a circuit:

• Manual Routing (Step by step provisioning):

At each node where one or more routes are possible, each valid "next hop" is offered, and is selected manually by the operator.

• Automatic Routing:

NP makes a selection based upon the defined routing criteria.

The two routing approaches have their individual characteristics - please read the notes at the beginning of the two chapters.

3.4.1   Manual Routing

> ℹ️ **Please note:**
> Manual routing (hops) is calculating ALL routes and only then providing the first hops. It is therefore much slower in large networks than automatic routing. The time required to propose the first hops may be several minutes in large networks.

When the extremities are specified a Circuit is created with an empty route. The route is said to be incomplete.
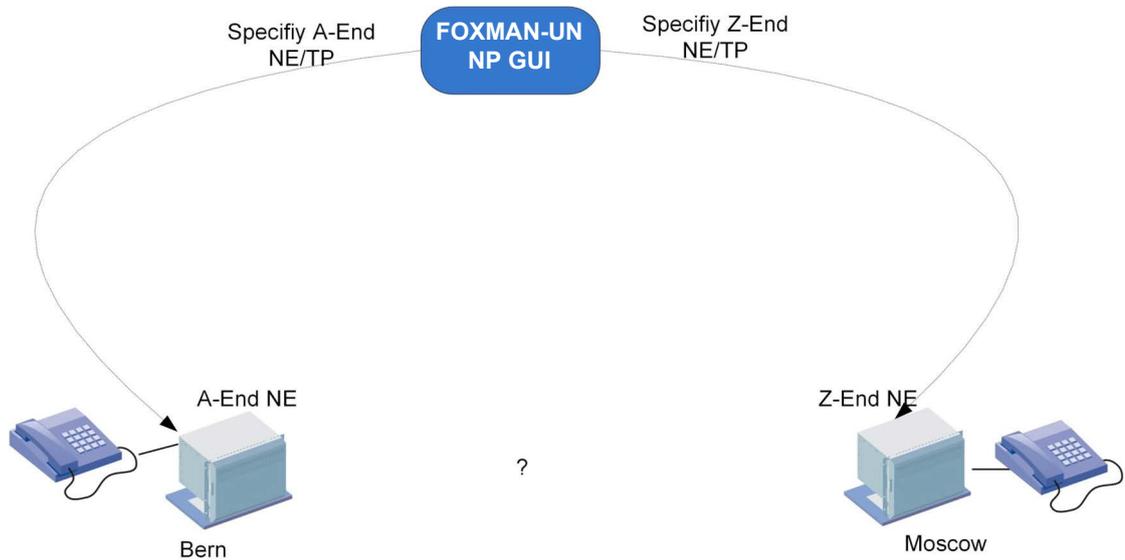
Figure 35:   Manual Routing: Circuit is created with an empty route

The user can then ask for all possible end-to-end connections that are either Trails or SNCs that can be used to transport the data from point A to the next NE thereby reducing the distance of incomplete Path. This process is repeated until the Path A-End and Z-Endpoint is complete.
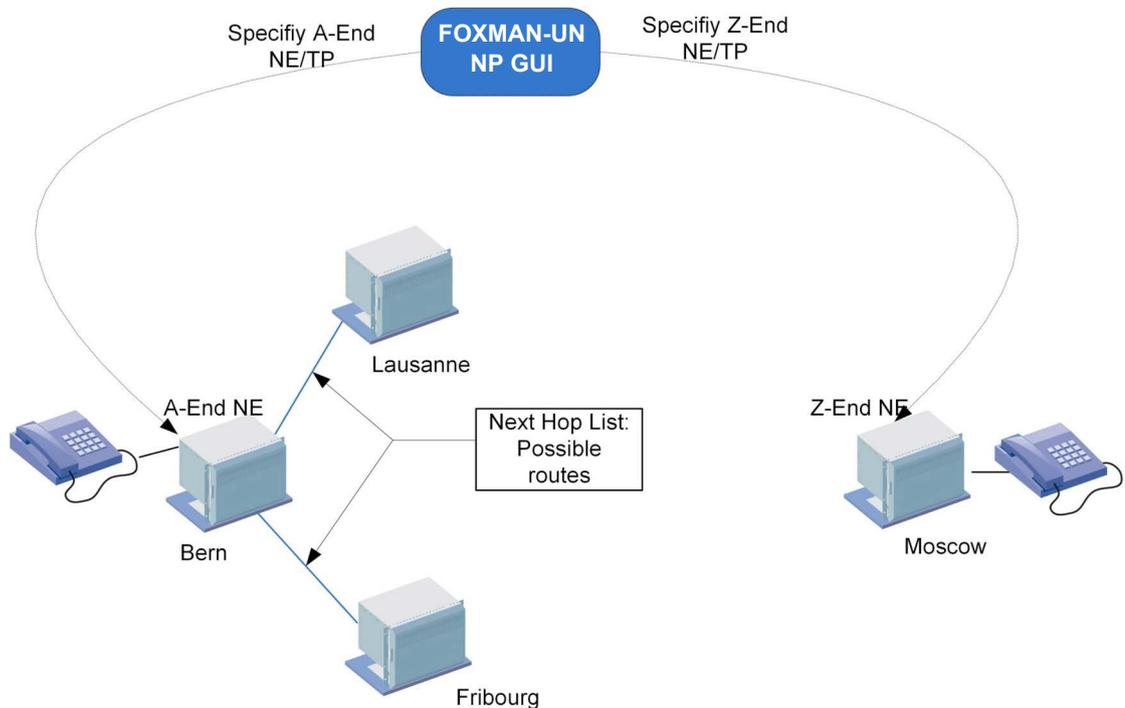
Figure 36:   Manual Routing: the FOXMAN-UN NP shows possible hops

3.4.1.1   Channel Selection

Once routed, the Circuit knows on which hops the end-to-end signal is multiplexed. One more step is required to ensure the correct routing is used between End Point A and Z. A dedicated timeslot has to be selected on all Trails of the Path. The user can either:

− call on automatic channel selection action based on residual capacity of each Trail or

− manually select each Timeslot (TS)

3.4.2   Automatic Routing

> **i**
>
> **Please note:**
> Automatic routing stops at the first route found and is therefore much faster in large networks than manual routing.

The Automatic Routing process enables the operator with End-to-End routing based on a set of criteria. The operator can select:

- the cheapest route:

  The calculation is based on aggregation of individual costs per section/hop previously applied in BP;

  or

- the shortest route;

  and

- avoid specific nodes or link types:

  − one or more nodes can be excluded as part of any route;

  − one or more link bandwidth/types can be excluded as part of any route.
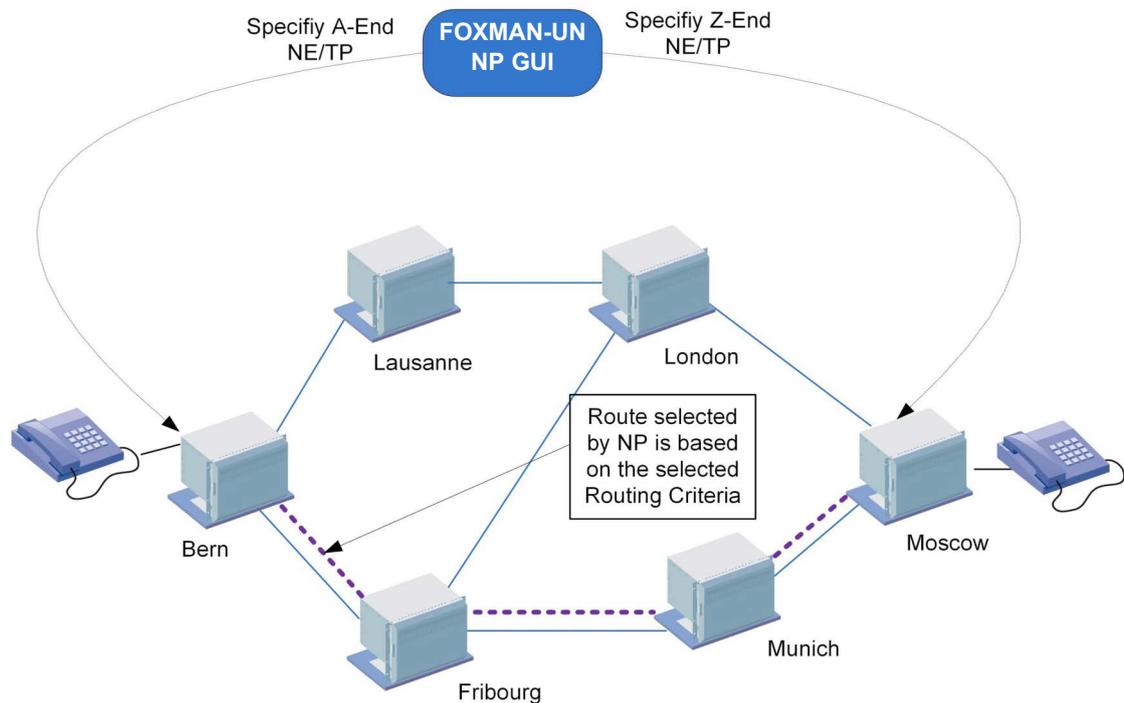
Figure 37:   Automatic Routing

3.5   Management of an NE of type Foreign Object (FO)

The FOXMAN-UN NP provisions a network made of FOX51x, FOX61x and NE of type FO.

The NEs of type FO in FOXMAN-UN are defined as those which are not managed by FOXMAN-UN BP but they are represented in FOXMAN-UN BP as being part of the network, e.g. router, PBX, switch.

The FOXMAN-UN NP management with NE of type FO means:

-   The user can create Circuits or Trails starting or ending in an NE of type FO.
-   The user can create any TE crossing one or more NE of type FO.
-   The user can create SNC between NEs of type FO.

Possible network configurations with NEs of type FO are as follows.
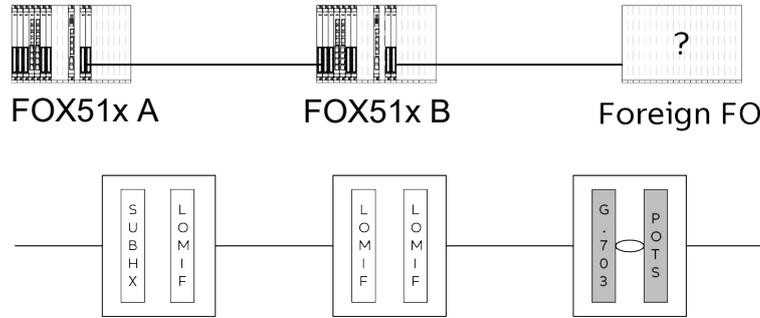
Figure 38:   Shows a TE ending in an NE of type FO
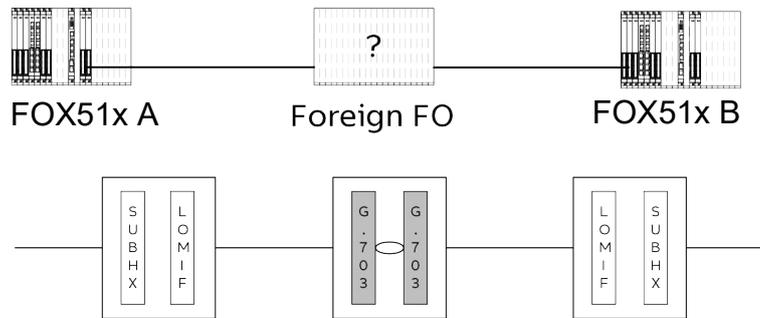
Figure 39:   Shows a TE crossing an NE of type FO
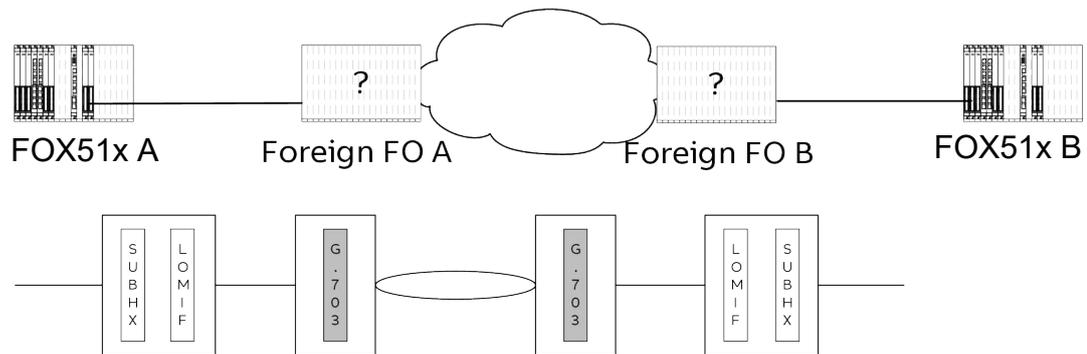
Figure 40:   Shows a TE crossing a third party network
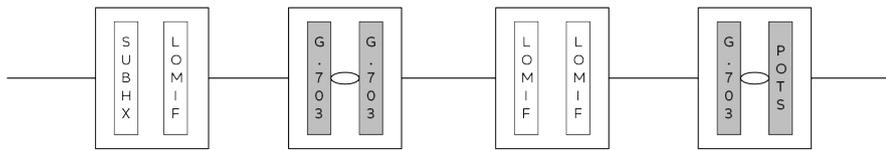
Figure 41:   Shows a TE crossing and ending in FO

> ⓘ **Please note:**
> Further information to the FO handling is available in section 11 Appendix C - The NEs of type FO (on page 106)

3.5.1   The Sections between FOX51x or FOX61x and an NE of type FO

A Section at any speed between an FOX51x or FOX61x and an NE of type FO does not lead to the creation of the associated Trail hierarchy as shown in the previous Section for connecting Sections between two FOX51x. This can't be done since the FOXMAN-UN BP does not provide any information about the cross connections inside the NE of type FO.

The FOXMAN-UN NP uses the extremity on a NE and copies it into the NE of type FO. It then uses those two points to create a Topological Trail.

Thus, an Application that has been created to handle a Section between an FOX51x or FOX61x and an NE of type FO contains only one Trail.

3.5.2   The Topological SNC in an NE of type FO

3.5.2.1   The situation to be solved

The FOXMAN-UN NP does not know anything about cross connections in NEs of type FO. If a Circuit that exists in the real network starts with, ends or crosses an NE of type FO, the FOX-MAN-UN NP is not able to identify it because of the connectivity gap into the NE of type FO.

The user has to define a Topological Sub Network Connection (SNC)

Example:

A network is made of three FOX51x and one NE of type FO. Six 2 Mbit/s sections are connecting the four pieces of equipment as shown in next figure.
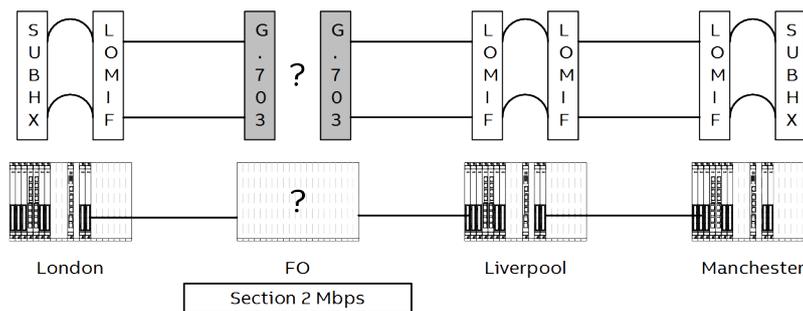
Figure 42:   The SUBHX Circuit crossing an NE of type FO

This network contains two 64 kbit/s Circuits on SUBHs utilizing channels T1 and T17.

The FOXMAN-UN NP sees four SNCs as follows:

- 2 SNCs in London between SUBH and LOMIF;
- 2 SNCs from Liverpool (LOMIF) to Manchester (SUBHX).

Each SNC is put in a different Application with a random name.

3.5.2.2   The Solution

In order to generate the missing Circuits, the user has to create a Topological SNC in the FO.

Following questions have to be asked before starting the solution process:

- How is the third party equipment is connected to the network?
- What kind of end-to-end connectivity is done inside the FO?

We will study the two possible answers in our network with four nodes.

- The Equipment Cross Connects at P12.

  Once created, the FOXMAN-UN NP will scan for the new connectivity, it will detect:

  − P12 Trail between the two LOMIF around the FO;
  Its Path is {MC LC SNC(topological) LC MC}.

  − There are two Circuits at P0_nc that uses P12 Trail;
  Both have the Path {SNC LC SNC}.

- The Equipment Cross Connects at P0_nc

  In the FO the P0_nc point does not exist. The FOXMAN-UN NP user has to create

  − two Trails at P12 routed through the two existing Sections;

  − the two missing P0_nc topological Circuits.

  For each P0_nc Topological SNC, the connectivity search creates in the same application the two Circuits.

4   Commissioning

4.1   Pre-requisites

1   Check with the FOXMAN-UN Release Note if all parameters regarding network size and server type have been set as recommended.

2   Ensure that the units and ports (sub-units) parameters are already configured via FOXCST or UCST.

3   Ensure that the network has all «Sections» defined according to the network plan. Further information can be found in the FOXMAN-UN – NEM Help System User Manual.

4   If the user is not an administrator, verify that the current user has access rights to the Networking Package user Privileges and Domain Access to NP-Nodes Domain.

> **NEM Desktop > NEM Configurator > Security > Users > "User" > User Properties**

   –   "NP Open Access": the operator can launch the FOXMAN-UN NP user interface and browse the content of the network.

   –   "NP Update Access": the operator can make modifications.

   –   "Domain Access": NP-Nodes.

5   Verify that the Networking Package is enabled in the License. The number of supported NEs of each type should likewise be defined:

> **$ lslicense**

6   Ensure that all FOXMAN-UN core (BP and NP core) processes are up and running.

```
$ lsnem

Host: Running system services            Status
-------------------------------------------------
RabbitMQ Service                         active
Postgresql Server                        active

Database: Instances                      Status
-------------------------------------------------
'NEM_DATABASE'                           present
'PM_DATABASE'                            present

NEM Base: Running services               Status
-------------------------------------------------
NEM Procwatch                            active
NEM OMNI names                           active
NEM OMNI event                           active
NEM BP Eventchannel                      active
NEM BP RabbitMQ VirtualHost              active
NEM BP Securitymanager                   active
NEM BP Credentials                       active
NEM Voyager NEMCORE                       active
NEM Voyager API Gateway                  active
NEM Voyager MainStandby                  active

NEM Core: Running services               Status
-------------------------------------------------
BP Network Manager                       active
BP Alarm Manager                         active
BP Network Query Manager                 active
BP Eventlog Manager                      active
BP Business Logic Manager                active
```

```
BP Task Manager                             active
BP PM Async Manager                         active
BP PM Collector                             active
BP Service Manager                          active


NEM NP: Running services              Status
-------------------------------------------------
NP Network Manager                          active


NEM CLI: Running services             Status
-------------------------------------------------
BP Report Manager                           active
BP Linetest Manager                         active
BP ECLI Proxy                               active
```

| i | **Please note:**
    If you don't need detailed descriptions of the NP User Workflow, please proceed
    directly to section 4.2.3 User Work Flow: Application Create/Edit (on page 41)

| i | **Please note:**
    The user manual "FOXMAN-UN under Linux" provides a detailed description of the
    installation and the file structure in FOXMAN-UN BP. The description includes top-
    ics and functions which also belong to FOXMAN-UN NP as follows:
    → FOXMAN-UN Components,
    → Element Agent Component,
    → Element Manager Component,
    → CORE Component,
    → Installing FOXMAN-UN,
    → Starting and Stopping FOXMAN-UN,
    → Files and Directory Structure,
    → NEM Tool (Nemtool),
    → NEM Administration,
    → Upgrading FOXMAN-UN,
    → Linux System Administration.

| i | **Please note:**
    The User Manual "FOXMAN-UN – NEM Help System" gives further information
    about the handling of the FOXMAN-UN BP. The manual includes topics like:
    → FOX51x/FOX61x Networks,
    → Basic Tools,
    → Populating the FOXMAN-UN Database,
    → Defining Map View,
    → Security and Multi-user Management,
    → Fault management,
    → Performance Monitoring and Diagnostics,
    → Configuration Management of FOX51x, FOX61x and FO,
    → Interfaces and Function Units.

4.2   NP User Work Flow

The NP User Work flow should help the NP User or Operator to understand the way FOXMAN-UN NP is working, giving him the ability to react correctly at certain system event.

> | i | **Please note:**
> If multiple users are concurrently working with the NP, the following procedure should be adhered to:
>
> → Create a work-only application; create "np-edit-bob";
>
> → Create the TE1 within this work-only application "np-edit-bob";
>
> → Deploy the TE1;
>
> → Open for editing "np-edit-bob";
>
> → Create the TE2 within this work-only application "np-edit-bob";
>
> → Deploy the TE2;
>
> → Continue with next TEs;
>
> → Once all TEs are created and deployed, move the TEs (cut/past operation) to the destination application.

4.2.1   Networking Package Data Consistency Checks

Check points are implemented to keep data consistency between the Basic Package (BP), the Networking Package (NP) and the Edit sessions in the NP.

An overview of the operation is provided below:

Check 1: The NP **Database and BP Database synchronization.**

In order for the FOXMAN-UN NP to work properly, the NP database must be synchronized with the BP database, in which the provisioned state of the network is stored.

- The following network element changes (trail information changes) are discovered by the BP and updates the BP database accordingly:
  - a network element is added to the network;
  - a service unit is removed or reconfigured;
  - section is created;
  - cross-connection is created or deleted.
- BP Event Notifications

  The NP database is kept synchronised with the real network through the notification mechanism. The BP notifies the NP process when BP trail information changes.
- The NP/BP sync is triggered every trail information change (e.g. matrix connection). It does not wait until the network element configuration is "saved" via FOXCST/UCST.
- NP processes each Event notification to:
  - Recognize new/existing TEs;
  - Delete existing TEs based on removed physical elements;
  - Complete the existing TEs with the new connectivity.
- Resynchronization Process, npresynch:

  The NP-BP database synchronization is normally achieved automatically. In the rare occurrence that there is a synchronization problem, the command **npresynch** needs to be executed.

> | STOP | **Risk of operating trouble!**
> During the resynchronization phase, it is mandatory not to work with FOXMAN-UN NP.

Check 2: Log Objects.

For every change required in the network element, the NP-core is creating a log object. This log object is deleted, when the corresponding BP object create/update/delete notification is received.
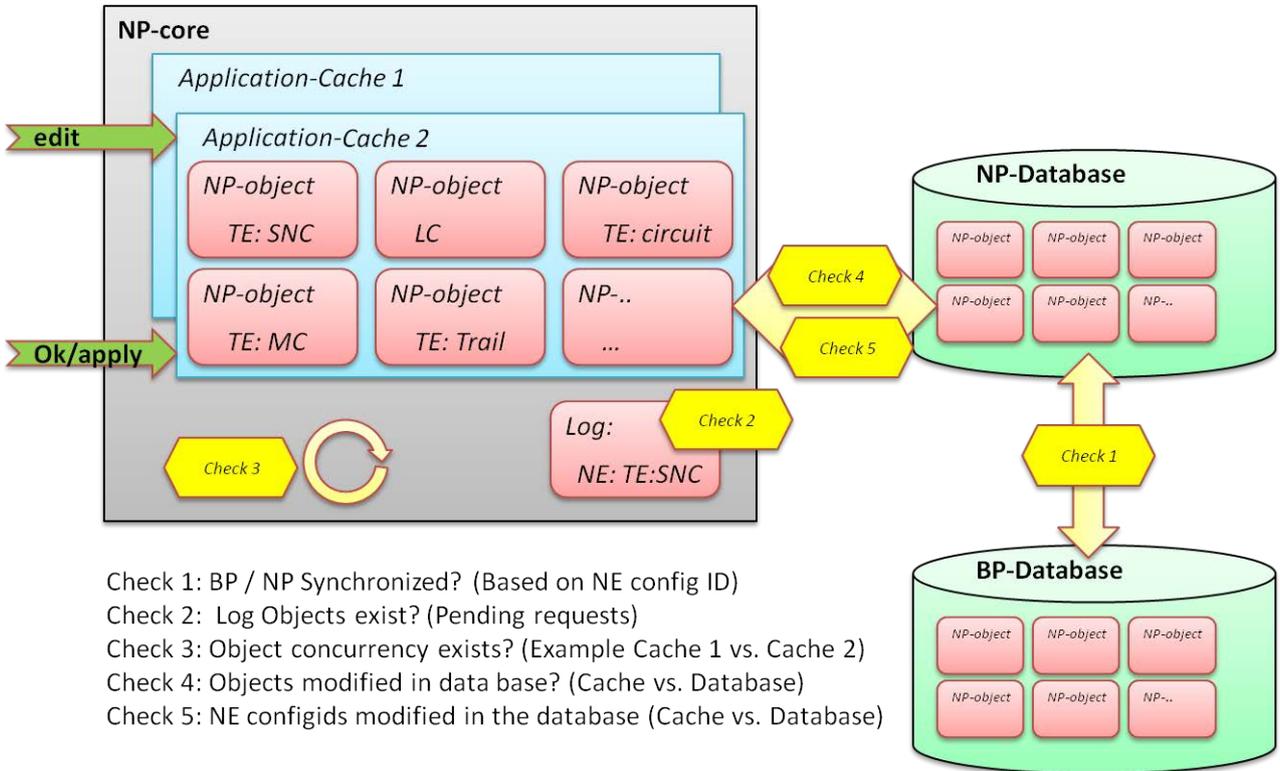
Check 1: BP / NP Synchronized? (Based on NE config ID)
Check 2: Log Objects exist? (Pending requests)
Check 3: Object concurrency exists? (Example Cache 1 vs. Cache 2)
Check 4: Objects modified in data base? (Cache vs. Database)
Check 5: NE configids modified in the database (Cache vs. Database)

Figure 43:   NP Data Consistency Checks

Check 3: Concurrency Check (Cache 1 vs. Cache 2).

An NP Application Edit session will always create a cache of the objects pertaining to the Application. All user modifications on an Application are done in this cache and committed to the database when the user leaves the Application Edit session with "OK/Apply".

Simultaneous Application Edits are allowed as long as the concurrent users are not editing the same network element (the same NE loaded in both users' Caches).

Check 4: (Cache vs. Database, unsaved changes).

The user's (e.g. User 1) Application cache loaded objects are no longer up-to-date compared with the NP Database objects. This situation could be the result of:

- A FOXMAN-UN user (e.g. User 2) edits the same NE already loaded in the User 1 Application Cache via UCST or FOXCST.

  The unsaved object changes (e.g. cross-connection creation) in the network element is discovered by BP and updates the BP database. The BP notifies the NP process and updates the NP database. The loaded objects in User 1 Application Cache, however, are not updated.

Check 5: (Cache vs. Database, saved changes).

The user's (e.g. User 1) Application cache loaded NE configid is no longer up-to-date compared with the NP Database. This situation could be the result of:

- Another user (e.g. User 2) has successfully committed his changes to an NE, which is already loaded in the User 1 Application Cache.

The NE configid in NP and BP databases is updated, but not the loaded NE configid in User 1 Application Cache.

> **Please note:**
> NP users commit their changes to the NE via NP Application Edit "OK/Apply",
> whereas FOXMAN-UN users commit via FOXCST or UCST "Save to NE".

4.2.2   Main GUI Status Indications

The most demanding task of FOXMAN-UN NP is to keep the network configuration up-to-date with the network elements configurations. This is in particular the case when concurrent users are doing changes with multiple networking instances or changes to the network element directly via FOXCST or UCST.

Due to the nature of concurrent changes (race condition when changes common objects) in the NE and NP, the desynchronization of NP Data with BP /NE Data cannot be avoided.

To easily detect these situations, the following visual indications on the Main NP User interface are implemented:

Out of Synch indication:

- − NP/BP Databases are desynchronized or the NP is waiting for network element configuration change confirmations.
- − The NP User has to run "npresynch".

Pending Changes indication:

- − Indicates the number of pending changes or downloads of changes to the NE(s).
- − The NP User has to wait until all the pending changes indications are cleared before he can continue with Application Edit.
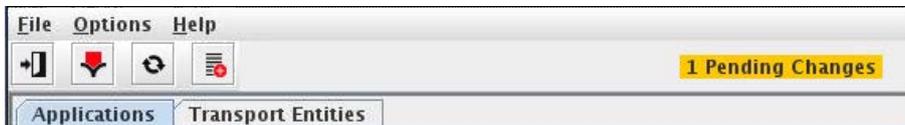
Refresh of the Filter List indication:

The "Refresh Filter List" button becomes active when

- − the object download is terminated, the "Pending Changes" indication cleared. This indicates that the changes caused updates in the database;
- − BP trail information changes e.g. creation/deletion of TDM cross connection via FOXCST/ UCST.
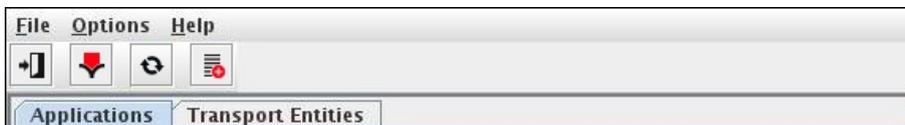
Conflict State indication (Application window)

- − An orange-colored bullet icon indicates that there is a conflict during creation or editing of an application. The last conflict state is indicated when clicking on the colored icon.
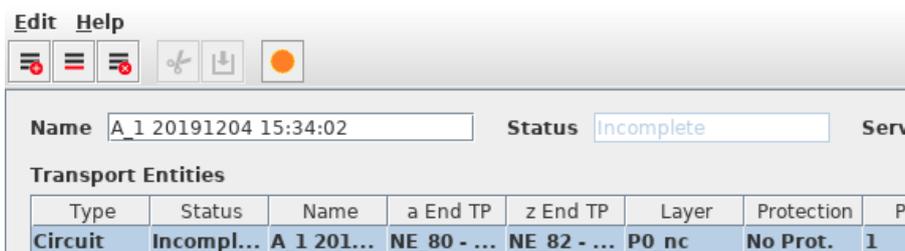
4.2.3   User Work Flow: Application Create/Edit

> | i |
>
> **Please note:**
> For pre-configurations, please refer to section 4.1 Pre-requisites (on page 36). For
> background information, please refer to section 4.2.1 Networking Package Data
> Consistency Checks (on page 38) and section 4.2.2 Main GUI Status Indications
> (on page 40).
>
> For multiple users working with NP observe the procedure given in 4.2 "NP User
> Work Flow".

For creating an application,

Proceed as follows: (Note that the steps are as indicated in figure NP user work flow for creating
an application)

1   Open a terminal and ensure correct interworking of BP and NP databases, by running the
    "npresynch" script:

```
$ npresynch

Stopping NP Network Manager Service...

Starting resynchronization of all NEs, foreigns and sections in the
database.
====================================================================
===========
GenApp started: 20210112 08:02:27
Network generation running...
Analysing 5 equipment(s).
NE-80
COMMIT: database version, new id 14
...
Total Time : seconds
COMMIT: database version, new id 15
Received 0 Foreign network elements from BP network Mgr.

Total Time : seconds
Generating TEs from free MCs ...
Generating TEs from free MCs, done!
COMMIT: database version, new id 16
Generating TEs from free MCs ...
...
Generating TEs from free MCs, done!
COMMIT: database version, new id 17
Network synchronisation finished!
Starting synchronization of Foreign Object definitions.
=======================================================
GenApp started: 20210112 08:02:28
Network completion running...
Network completion finished!

Done.
Starting NP Network Manager Service...
```

2   Add NEs to NP-Nodes Domain:

```
NEMDesktop > Application > NEM Configurator > Domains > right-click
on "NP-Nodes" > Domain Properties > Change Selection > Choose
Members
```

> ⓘ **Please note:**
>
> NP license specifies a specific number of NEs, ensure that all the NEs to be reported to NP are members of the automatically generated "NP-Nodes" Domain.
>
> → To automatically add the subsequently discovered or created NEs to NP-Nodes Domain, add the parameter below to /opt/nem/etc/np.conf (Note: execute "nem-start" or "corestart" to activate the configuration changes).
>
> ```
> np_add_ne_to_domain true
> ```
>
> This parameter must be configured in the core and in the distributed EA hosts.

3   Start NP User Interface:

```
NEMDesktop > Application > Networking Package
```

- Are NP/BP Databases synchronized?

   – If "Yes", click the "Refresh Filter List" button to retrieve the existing Application(s)/Transport Entities.
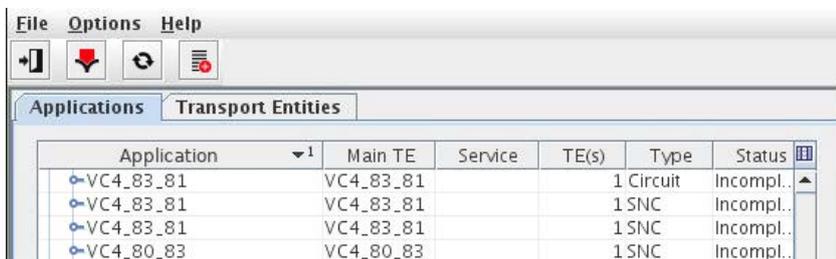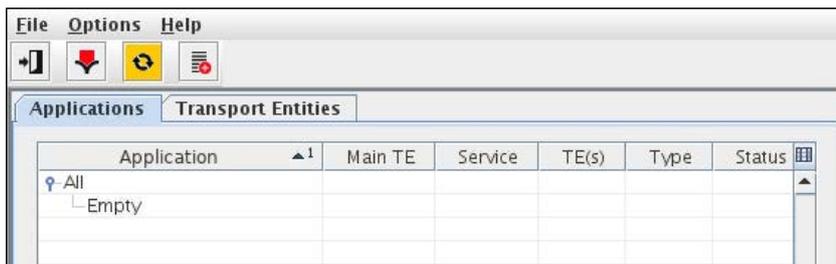
   – If "No", there will be an "OUT of SYNC" indication as shown below.
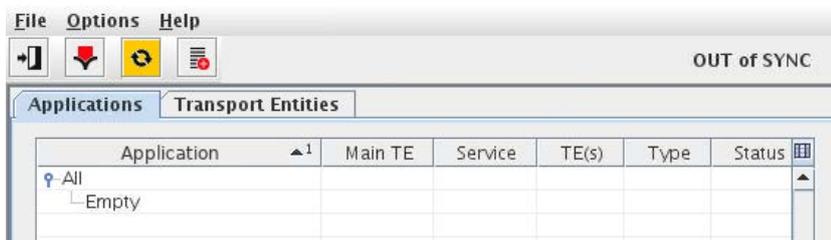
   → Log out of NEM Desktop.

   → Go to Step 1 and run "npresynch".

   → Go to Step 3.
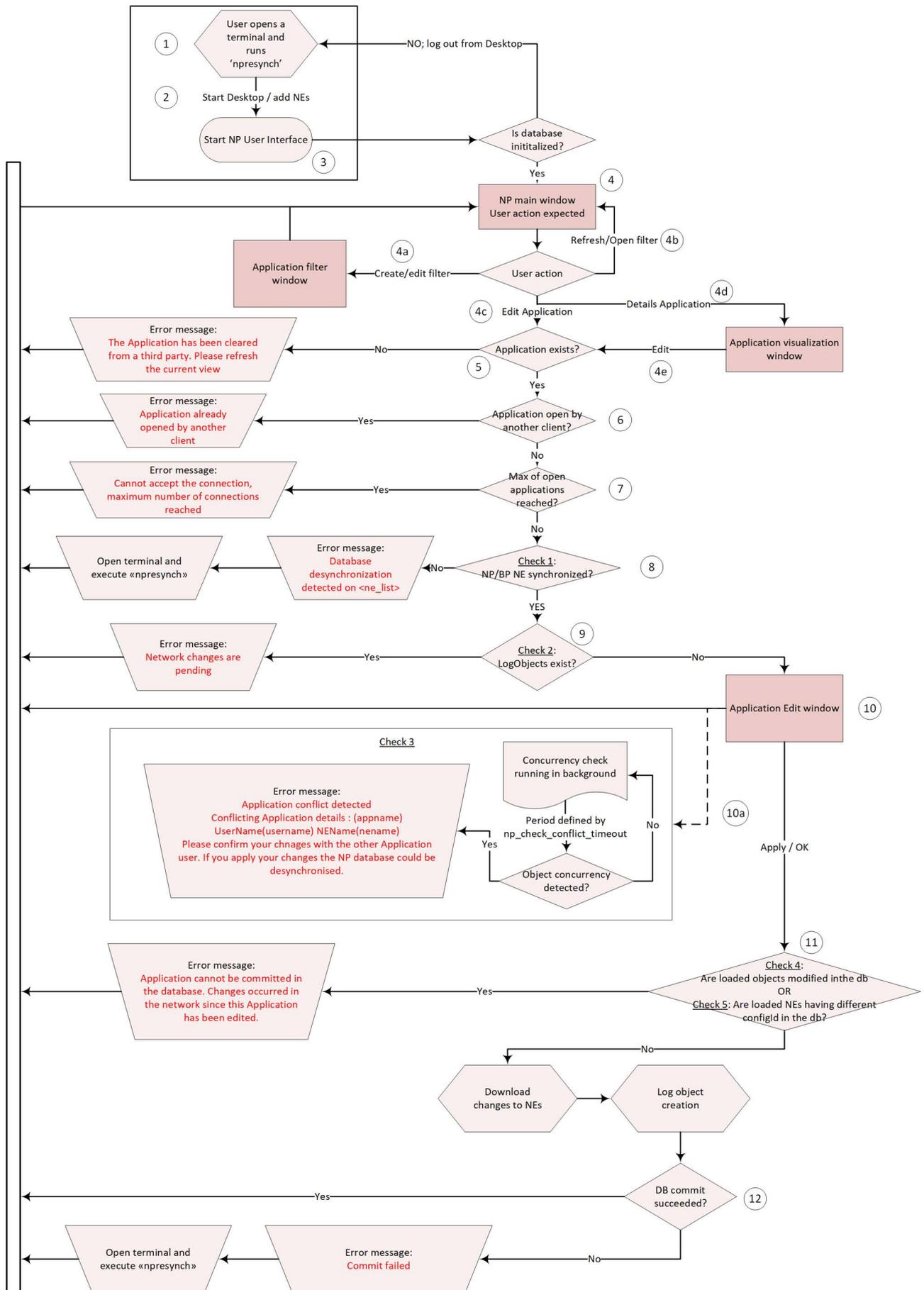
Figure 44:   NP user work flow for creating an application

4   From the NP Main user interface window, the following NP user actions are possible:

4a. Create Filter:

The filter provides the possibility to search for particular information regarding the network in order to retrieve and display only Applications/TEs that meet the selected filter criteria.

```
NP Main Window > File > Create Application Filter
```

4b. Refresh Filter List:

The NP GUI has a background thread, which periodically polls the NP database status and updates the "Refresh Filter List" button.

The NP database status is updated when:

−   Object download via NP GUI is terminated (Pending Changes indication is cleared).

−   NP-BP synchronization:

   The BP has notifications to the Event Channel informing the NP when BP trail information changes (e.g. creation/deletion of TDM cross connection via FOXCST/UCST) are ready for NP.

   For example, the "Refresh Filter List" changes color as soon as the cross-connections are created. It does not have to wait until the changes are "saved" to NE via FOXCST/UCST.
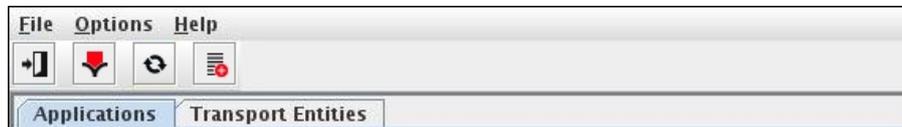
   → Click "Refresh Filter List" button

After the Refresh is executed by the system, the "Refresh Filter List" button return to its default state (gray background) and the main user interface is updated.

4c. Call the Application Window in "Edit" Mode:

−   Create new Application:

```
NP Main Window > File > Create New Application
```

−   Edit an existing Application:

```
NP Main Window > Application/Transport Entities Tab > Right click
on Application/TE to be edited > Edit
```

4d. Call the Application in "View" mode:

```
NP Main Window > Application/Transport Entities Tab > Right click
on Application/TE to be Viewed > Details
```

4e. Change from Application "View" Mode to "Edit" Mode:

   → Click "Edit" button on currently opened Application "View" Window.

5   Application exits?

•   If "Yes":

The system proceeds to next step.

- If "No"

  The Application currently being edited could have been deleted by another NP user.

  The user receives the error message:

  > **Error** ✕
  >
  > ✖ Unable to edit application: southwest (ID=application_1565)
  > Causing exception:
  > Invalid user request.
  > PREFIX_APP_ERROR
  > Get Application Manager failed.
  > PREFIX_NETMGR_GETAPPMGR
  > The application has been cleared from a third party. Please refresh the current view
  >
  > OK
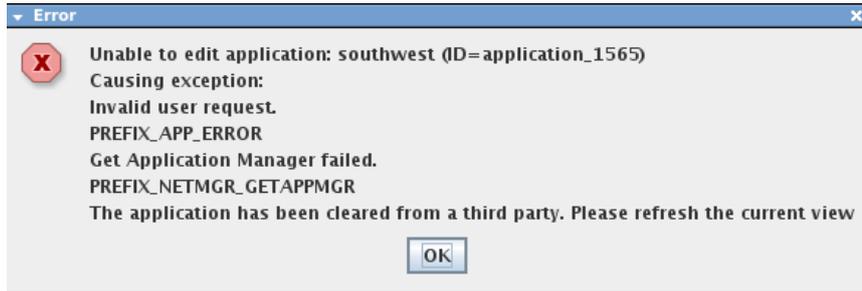
  → Click "OK".

  → Click "Cancel" button on Application Window to go back to Step 4.

6   Application already opened in "Edit" mode by another Client?

- If "Yes":

  Application Conflict icon is colored orange.

  > **Edit Help**
  >
  > [icons] 🔴
  >
  > **Name** A_1 20191204 15:34:02   **Status** Incomplete   Serv
  >
  > **Transport Entities**
  >
  > | Type | Status | Name | a End TP | z End TP | Layer | Protection | P(|
  > |------|--------|------|----------|----------|-------|------------|-----|
  > | Circuit | Incompl... | A_1 201... | NE_80 - ... | NE_82 - ... | P0_nc | No Prot. | 1 |
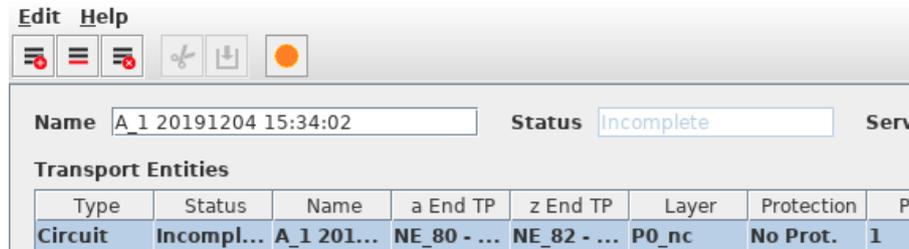
  Details about the conflict state is given when clicking on the conflict status icon.

  The User receives the error message as shown below:

  > **Error** ✕
  >
  > ✖ Unable to edit application: A_154 20151012 09:33:51 (ID=application_2152)
  > Causing exception:
  > Invalid user request.
  > PREFIX_APP_ERROR
  > Get Application Manager failed.
  > PREFIX_NETMGR_GETAPPMGR
  > Application already opened by another client.
  > APP_ERROR_1190
  >
  > OK
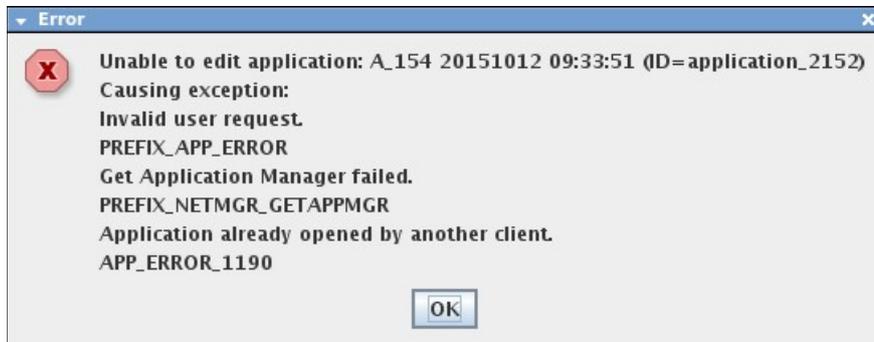
  → Click "OK" button.

  → Click "Cancel" on Application Window to go back to Step 4.

- If "No":

  The system proceeds to next step.

7   Max. no. of open Application Edit reached?

  → By default there is no limit to the number of open Applications Edit.

  To set a limit, uncomment the "np_max_applicationmanager" parameter of np.conf and edit the default value as required.

```
[nemadmin@nemsrv ~]$ vi /opt/nem/etc/np.conf

np_max_applicationmanager        5
```

  → restart the Core

```
[nemadmin@nemsrv ~]$ corestart
```

- If "Yes":

  The number of Application Edits opened by other NP users already reached the set limit.

  When the NP user tries to open another Application Edit he receives an error message as shown below:
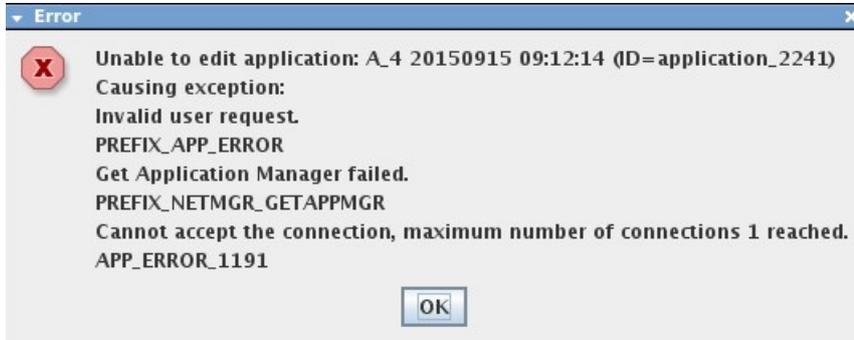
> → Click "OK".
> → Click "Cancel" on Application Window to go back to Step 4.

- If "No":

  The system proceeds to next step.

8   Check 1: NP/BP NE synchronized?

The NP core regularly queries the current NP database synchronization with the BP database. This is done by comparing the NE config ID recorded in the NP Database with the NE config ID in the BP Database.

- If "Yes":

  The NP/BP NEs are synchronized if the NEs have the same NE config IDs in the NP and BP databases.

  The system proceeds to next step.

- If "No", the user receives an error message as shown below:
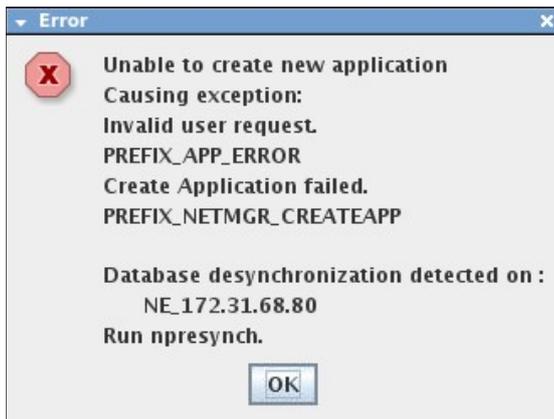
> → Click "OK".
> → Log out all the users of NEM Desktop.
> → Open terminal and execute "npresynch".

```
[nemadmin@nemsrv ~]$ npresynch
```

| i | **Please note:**
The user receives the error message below, if not all users are logged out:

```
[nemadm@mumintrollet ~]$ npresynch

Error : NP resync stopped!

Follow user(s) are connected ...
--------------------------------
NEM Desktop        mumintrollet        nemadm        2170
NEM Desktop        mumintrollet        southwest      2369
```

→ Log in all users to NEM Desktop

→ Go to Step 4

9 Check 2: Log Objects exist?

When the NP user commits a change (NP User click the Application Window "OK" or "Apply"), the Networking Package downloads the change configuration to the involved network elements. For each modified object, e.g. TE: Circuit, the NP-core creates a log object.

- If "Yes":

There is an on-going download of Application changes (log objects) to the NE(s). The download of changes has not yet terminated or the NP-core has not yet received the BP notification for the object creation, update or deletion in the network element.

The number of current log objects is shown in "Pending Changes" indication on the right side of the tool button bar.
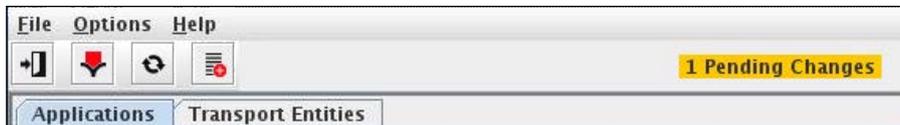
The user receives an Error message "Network Changes are pending"
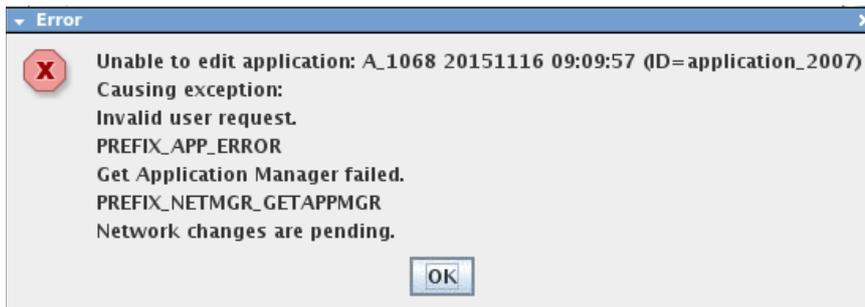
→ Click "OK".

→ Wait until the "Pending Changes" indication is cleared.

i	**Please note:** The NP User has to wait until all log objects are cleared before he can perform Application Edit. → To monitor the details of the pending changes.

```
$ cd /opt/nem/var/log
$ tail -f npnetworkmgrd.log
```

- If "No":

There is no on-going download of changes to the NEs. The system proceeds to next step.

10 Call the TE Window:

As soon as the a/z NEs are selected, the system proceeds to 10a.

10a. Check 3: Concurrency Check (Fast conflict detection):

When an NP user selects a NE, which is already selected for Edit by another NP user, both of users will receive error messages as shown below:

```
┌─ Error ──────────────────────────────────────── ✕ ┐
│                                                     │
│  ⬡  Application Conflict detected.                  │
│  ✕  Conflicting Application Details:                │
│        Name(nrosar121015)                           │
│        UserName(nemadm)                             │
│        NEName(NE_172.31.68.80)                      │
│     Please confirm your changes with the other Application user. │
│     If you apply your changes the NP database could be desynchronised. │
│                                                     │
│                      ┌──────┐                       │
│                      │  OK  │                       │
│                      └──────┘                       │
└─────────────────────────────────────────────────────┘
```

```
┌─ Error ──────────────────────────────────────── ✕ ┐
│                                                     │
│  ⬡  Application Conflict detected.                  │
│  ✕  Conflicting Application Details:                │
│        Name(nrosar1210152)                          │
│        UserName(southwest)                          │
│        NEName(NE_172.31.68.80)                      │
│     Please confirm your changes with the other Application user. │
│     If you apply your changes the NP database could be desynchronised. │
│                                                     │
│                      ┌──────┐                       │
│                      │  OK  │                       │
│                      └──────┘                       │
└─────────────────────────────────────────────────────┘
```

→ Click "OK" on the Error window.

- If the other NP user (e.g User 2) has the priority to commit changes to the NP Database:

  → Close the TE and Application Windows.

  → Go back to Step 4 (NP Main Window).

- If the NP user (e.g. User 1) has the priority or if there is no agreement between the simultaneous users:

  → Continue with TE creation or edit.

  → Click "OK/Apply" on the "New/Modify" TE Window.

  → Click "OK/Apply" on the Application Window.

11 Check 4: Are loaded objects modified in the NP Database? or
   Check 5: Are loaded NEs having different config ID in the NP Database?

   The system compares the User's Application Cache data with the NP database information.

- If "Yes":

  The user's (e.g. User 1) Application cache is no longer up-to-date compared with the NP Database. This situation could be the result of either:

  – Another NP user (e.g. User 2) has committed his changes to an NE, which is already loaded in User 1 Application Cache.

  – A FOXMAN-UN user (e.g. User 3) edits via UCST or FOXCST the same NE already loaded in the User 1 Application Cache.

  When the FOXMAN-UN user saves his changes, the NE configid in the BP Database is updated. The NP Database is then updated by synchronizing with the BP Database. The User 1 Application Cache, however, is not updated.

  User 1 receives an error message as shown below:

→ Click "OK".

→ Close the "New/Modify TE" and "Application" Windows.

→ Go back to Step 4 (NP Main Window).

• If "No":

The User 1 changes are downloaded to NE(s).

The number of pending log objects are shown in the "Pending Changes" indication. After completion of download, the system proceeds to next step.

12 Database commit succeeded?

• If "Yes":

The changes are committed to the NP Database. Application with TE(s) is created/edited.

• If No:

The changes are not committed to the NP Database. The user receives an Error message: "Commit failed".

A possible cause could be the NP database is out of sync with the BP database.

→ Log out of NEM Desktop.

→ Open terminal and execute "npresynch".

```
[nemadmin@nemsrv ~]$ npresynch
```

→ Log in all users to NEM Desktop.

→ Go to Step 4 (NP Main Window).

4.3   The FOXMAN-UN System Alarms

The alarm massages will give to the user the possibility to investigate problems in the FOXMAN-UN NP environment.

4.3.1   The Configuration of the System Alarm NE

The System Alarms are available through a System symbol on any topological map of the NEM Browser.

4.3.2   Show FOXMAN-UN NP System Alarm

For some circumstances a System Alarm will be given.

The icon representing the System Alarm will change color to reflect the alarm severity class.

The alarm list can be opened to read the System Alarm message.
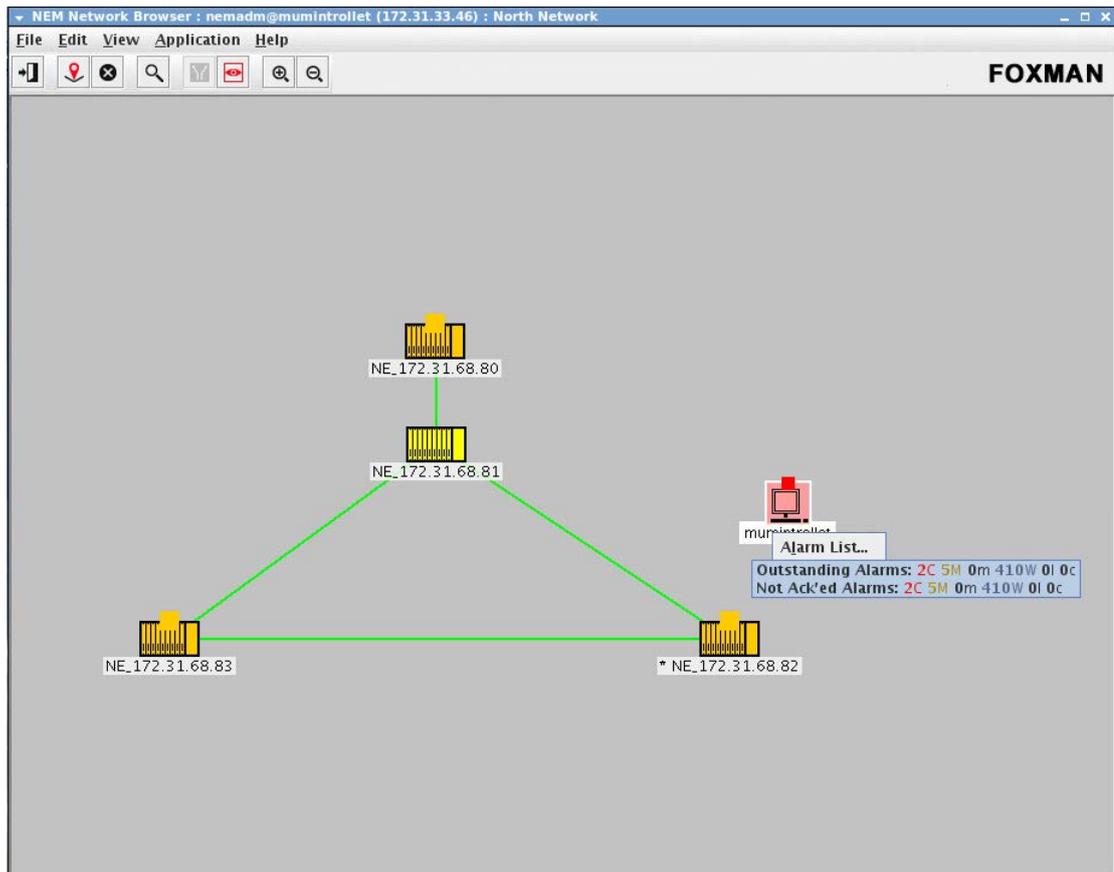
Figure 45:   FOXMAN-UN System Alarms

From the Main View
  − press with the right mouse button the System Alarm Symbol
  − select «Alarm List». The Alarm List will pop up.
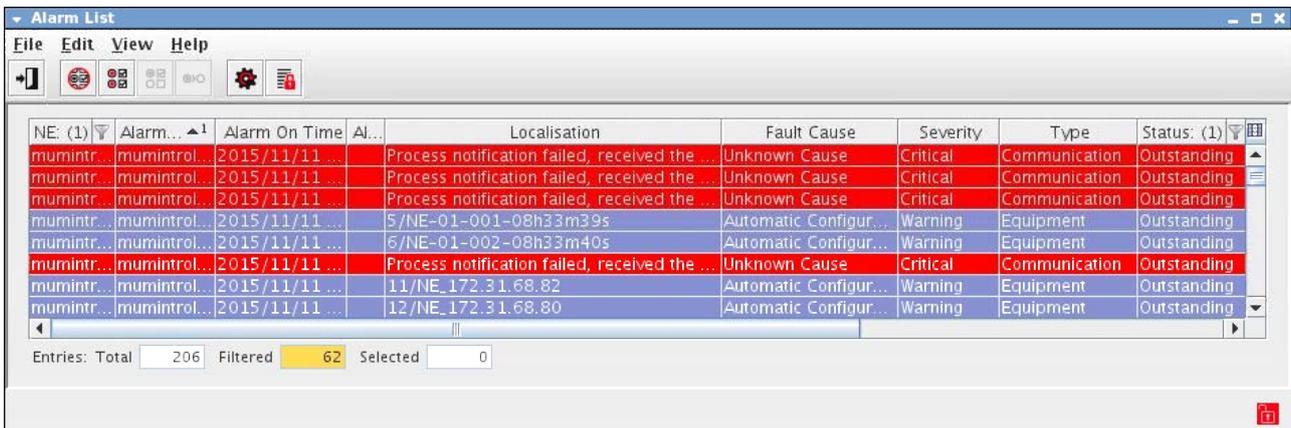
Figure 46:   System Alarm List

4.3.3   Clear FOXMAN-UN NP System Alarm

There is no polling mechanism of FOXMAN-UN NP which automatically clears the system alarm even if the problem has been successfully solved. This is the reason why these alarms will remain until they have been manually cleared and acknowledged.

To clear the System Alarm the following procedure has to be followed:

From the Alarm List:
  − select the alarms with the left mouse button. The selected alarms are highlighted.

    – click the right mouse button (with the mouse pointer over the highlighted alarms) and select «Clear Alarms».

4.4 The FOXMAN-UN NP Error Messages

The FOXMAN-UN NP Error Messages are used to inform the user about manipulation done, which does not give sense for FOXMAN-UN NP.

> **i**
>
> **Please note:**
> The Error messages are shown to the user through the NP GUI only.

4.4.1 The Format of Error Messages in NP

An Error Message is composed of four parts:
- Error Type message,
- Action failed message,
- Details of error message,
- Identifier.

4.4.1.1 The Error Type Message

Table 4:

Type	Message	Action to be done by the user
Applicative	Invalid user request	The Message is clear enough to the user to deduce the corrective action. Consult the User Manual for more explanations on the action done if necessary (createTE, deleteTE...).
System	A System Error occurred	A resynchronization may be needed, information should be provided by support.
Internal	An Internal Error occurred	HIGHLY CRITICAL, please contact support.

4.4.1.2 The Action Messages

Shows the action asked by the user that has failed.

Table 5:   Action Messages

Action	Message
Group TPs	Group TPs failed.
Get Application Manager	Get Application Manager failed.
Release Application Manager	Release Application Manager failed.
Create Application	Create Application failed.
Delete applications	Delete applications failed.
Promote Application	Promote Applications failed.
Get Proprietary NE list	Get Proprietary NE list failed.
Get Proprietary NE	Get Proprietary NE failed.
Get UnitInfo list	Get UnitInfo list failed.
Get Foreign list	Get Foreign list failed.
Get Foreign NE	Get Foreign NE failed.
Get TTP list	Get TTP list failed.
Get TTP	Get TTP failed.
Get TE list	Get TE list failed.

Table 5:   Action Messages

Action	Message
Get Application list	Get Application list failed.
Get Application	Get Application failed.
Get Application from TE	Get Application from TE failed.
Get TE path	Get TE path failed.
Get Application	Unable to get the application.
Set Application Label	Unable to set the application label.
Set Application Note	Unable to set application note.
Set Circuit Data	Unable to set Circuit Data.
Get TE Path	Unable to get TE path
Set Main TE	Unable to set main TE.
Set TE Name	Unable to set TE name.
Add TE from another Application	Unable to add TE from another application
Delete TE	Unable to perform delete TE.
Create TE	Unable to create TE.
Get Possible End TPs	Unable to get possible end TPs.
Create TE	Unable to create TE.
Get Possible Hops	Unable to get possible hops.
Add TEs in path	Add TEs in path failed.
Remove TEs from Path	Remove TEs from path failed.
Set TE Endpoint	Set TE Endpoint failed.
Demote SNC	Demote SNC failed.
Promote SNC	Promote SNC failed.
Select channels	Select channels failed.
Clear channels	Clear channels failed.
Get possible Channel List	Get possible channel list failed.
Set Channel	Set Channel failed.
Protect TE	Protect TE failed.
Unprotect TE	Unprotect TE failed.
Rollback	Rollback failed.
Commit	

4.4.1.3   Details of Error Message

The cause of an error will be explained. Some error messages contain also the action to be done by the user.

This part is independent from the action asked by the user; the same error message can be raised after different user commands.

4.4.1.4   The Identifier

The last line in an error message identifies uniquely an error. The identifier is build from its type and a number.

The Error Type can be:

- APP for Applicative errors.
- APPSYS for errors that can be Applicative or System. Its type depends on who asked for the command, the user or an internal process.
- SYS for System errors.
- INT for Internal errors.

| i | **Please note:**
The Error Number is specific to each message and facilitates the communication between the support and the user. |
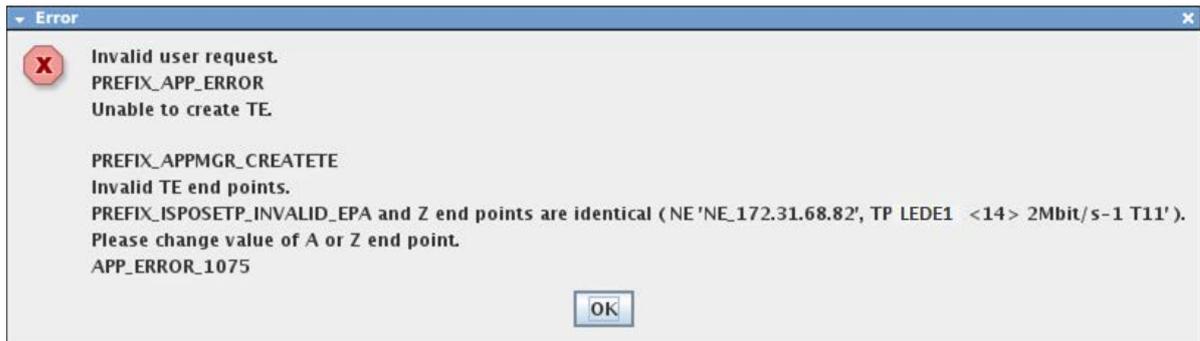
Figure 47:   The Error View

5 Usage

The FOXMAN-UN NP GUI will start as follows:

- − From the FOXMAN-UN BP NEM Desktop menu select

  Application -> Networking Package...

This action will start the Main FOXMAN-UN NP application window.

5.1 Main Window

The NP Main Window displays the list of all existing Application Filters, Applications and Transport Entities (TEs). Each Application displays details of all its TEs.

There is likewise an event logger at the bottom, which can be cleared as required.

The Main Window allows to:

- − Create/Edit/Delete Filter.

  The Filter is used to retrieve and display only a specific list of Applications or TEs.

- − Refresh Filter List.
- − Create/Edit/View Application.
- − Create/Edit/View TEs.
- − View the Application Mgr. list, which displays all currently on-going Application Edits.
- − Displays the "Out of Synch" and "Pending Changes" indications.

  For details, please refer to section 4.2.2 Main GUI Status Indications (on page 40).
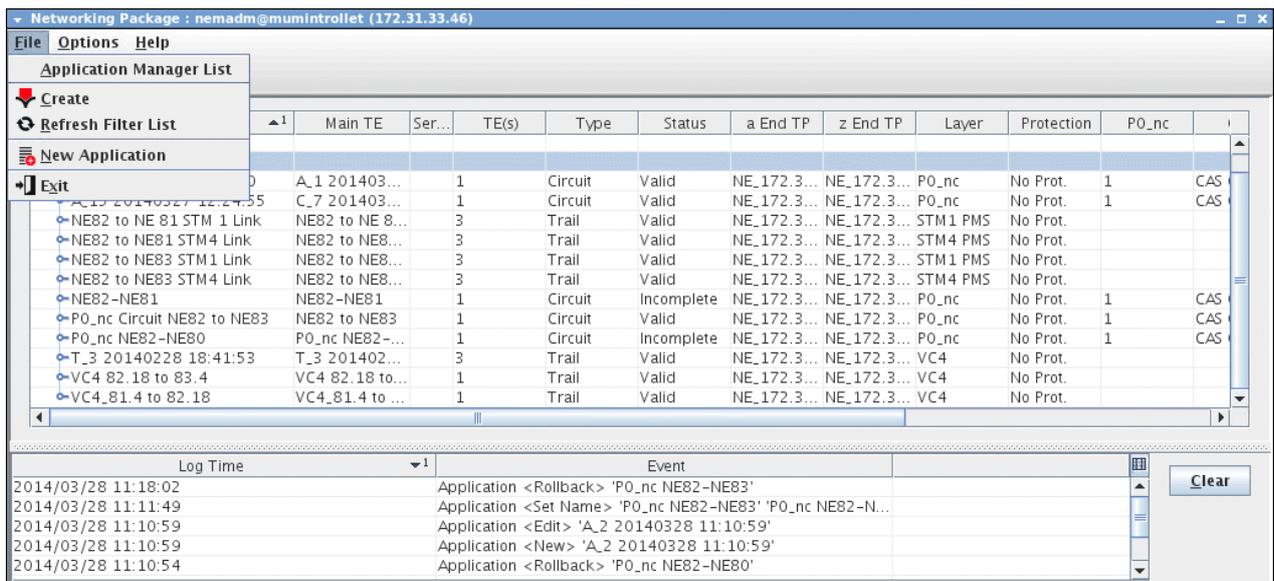
Figure 48: NP Main Window

The following generic menu items in the file system are accessible:

Table 6: File

Application Manager List	Calls the Application Manager List dialog, which displays all currently on-going Application Edits.
Create	Calls the Create Application Filter dialog.
Refresh Filter	Refresh the Filter List.

Table 6:   File

New Application		Calls the Application dialog to create a new Application.
Exit		Quit Networking Package.

Table 7:   Options

Set Auto Routing Parameters	Calls the Set Automatic Routing Parameters dialog to specify parameters used by the Automatic Routing facility of the NP.
Multi Layer Routing	Select if client rates and higher rates should be included in the Manual Routing: Next Hop List dialog when creating a path/trail.
	If higher rate is selected, NP will automatically create the missing trails when a higher rate is selected.
	Note: The higher rate should per default not be suggested. They are confusing and in most cases the higher rates are already provisioned.

> **i**
>
> **Please note:**
> For cost based routing you may set required options as follows:
> → In the settings file "/opt/nem/etc/np.conf" a Path Cost Calculation Model can be chosen. The three options available are:
> - Model 1: (CostWorking + CostProtecting)
> - Model 2: (CostWorking + CostProtecting) / 2
> - Model 3: (CostWorking * CostProtecting) / (CostWorking + CostProtecting)
> → The parameter "path_cost_calc_model" can be set to 1, 2, or 3. Default is 1, but by default the parameter is disabled. To enable the parameter, remove the # in front of the entry.

Table 8:   Help

Help Viewer	Calls the help viewer and opens this page.

Table 9:   Application Filter Context Menu

Retrieve Application		Generates a list of NP Applications (data extracted from the NP database) that matches the defined filter attributes.
Modify Filter		Edit the selected Filter.
Delete Filter		Delete the selected Filter.
Expand		Retrieves and shows all the Applications under the selected Filter.
Collapse		Hides the Applications under the selected Filter.

Table 10:   Application/Transport Entity Context Menu

Details…	Calls the Application dialog to view details of the selected Application.
Edit	Calls the Application dialog to edit details of the selected Application.
Show NP Usage…	Opens a dialog to show information on the usage of the selected NP transport entity; see NP Usage.
Supervision ► Enable…	Enable supervision of this TE. To do that, the service information attributes Customer, Service Level Agreement, and Network need to be selected.

Table 10: Application/Transport Entity Context Menu

Supervision ► Disable…	Enable supervision of this TE. Must be confirmed by the user. If service supervision cannot be disabled, an error message is shown with the respective reason(s).
Supervision ► Resume	Resume service supervision that has been paused before.
Supervision ► Pause	Pause service supervision.
Supervision ► Reload Configuration	Reloads the configuration from the NEs to make sure it is up to date in case of recent changes to the TE.
Supervision ► Show Details…	Show service supervision details for this TE. Opens the TE in a view-only window of the Service Editor. The windows also provides an alarm tab showing active alarms of the TE.
Supervision ► Show in Service Supervision…	Opens the service supervision dialog with a filtered view for the TE.

Table 11: TE Graph

Open in separate window		Open the TE Graph in a separate window for maximum space.
Reload		Reloads and rebuilds the graph

Table 12: TE Graph, context sensitive

Options		Legend:
		Shows a legend of the graphical symbols and colors used in the graph.
		
		View Options: choose from the following options:
		- PATHS:
		  - Working Path;
		  - Protecting Path;
		  - Sub Protecting Path.
		- VIEW SETTINGS: enable or disable the following options:
		  - Show fixed TEs;
		  - Show SNCs as Cloud;
		  - Show Indistinct Sections.
		- LABELS:
		  - Show TE labels;
		  - Show NE IDs;
		  - Show Shared Resource Counts;
		    For protected TEs, indicates with a digit the number of TEs routed over shared resources.

Issues		Shows possible issues that apply to the selected TE such as - Shared resources that represent a potential single point of failure, - resources that have a status issue, - Holes present in a TE due to incomplete routing.
Edit		Toggle between Edit and View mode. In Edit mode you can edit the layout of the elements in the graph. You can move NEs to get a customized arrangement of NEs and sections. This is applicable to the physical graph only.
Refresh	⟳ Refresh	Refreshes the graph.
Separator		In the split view, move the graph separator upwards or downwards: - upwards: give more space to the logical graph; - downwards: give more space to the physical graph.
Zoom in		Zoom in to the graph. Applicable separately to each graph.

Table 12: TE Graph, context sensitive

Zoom out	🔍	Zoom out of the graph. Applicable separately to each graph.
Fit	↘	Fit the graph sub-window with the following options: - Fit to screen, - Fit to height, - Fit to width.
Download	↓	Save a graphics file to your machine. The file is stored in the default download folder. Applicable separately to each graph. You can choose among two formats: - PNG, - SVC.

Table 13: TE Graph, selected Circuit or Trail

Details	🔍	Opens the Application dialog for the selected element to show details on the selected application and TE.
Show NP Usage	⟳	Opens the NP Usage dialog for the selected element.

Table 14: TE Graph, selected NE

Configuration	⚙	Opens the Local Craft Terminal for the selected NE, using the chosen user class.
Alarm List	❶	Opens the list of active alarms for the selected NE.

5.2   Application Manager List

This dialog displays all currently on-going Application Edits. It allows determining if another user's Edit will overlap.

NP supports multi-user Edit.
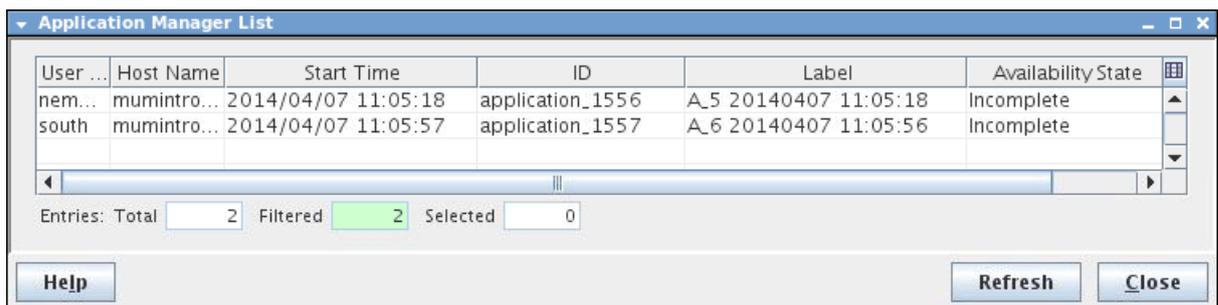
Figure 49:   Application Manager List

You shall receive an error message as soon as you select a NE, which is already selected for update by another user.
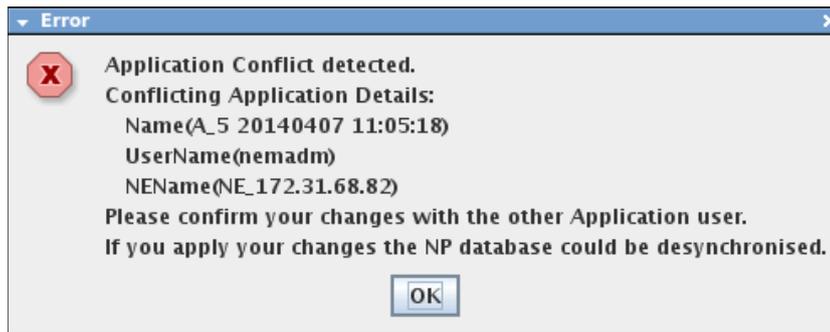
Figure 50:   Fast Conflict Detection

> **i**
>
> **Please note:**
> When the simultaneous users receive this error, the following actions are possible:
> → They may agree among themselves who has the priority. The changes of the first user (e.g. User 1) to click "Apply/OK" in its currently opened "New TE" window will be committed in the FOXMAN-UN database. This operation does not generate a BP/NP database synchronization problem, but:
> → the other users Application cache are no longer up-to-date, therefore they will need to close their "NE TE" windows. Their changes are lost and are not saved in the FOXMAN-UN database.They may open "New TE" windows to start new Edit sessions.

5.3   Filter

The concept of FOXMAN-UN NP contains five different filters as listed below:
- Transport Entity Information,
- Application Information,
- Route Information,
- Customer Information,
- Path Protection Information.

The filter entries provide the possibility to search for particular information regarding the network in order to retrieve and display only Applications or Transport Entities that meet the selected filter search criteria. This limits the amount of data that must be displayed and therefore improves the updating performance of the GUI.

> **i**
>
> **Please note:**
> The maximum number of Applications to be retrieved can be configured in the file /opt/nem/etc/np.conf. The default value is set to "np_querylistmaxsize 10000". A filter set to * (wild card operator) does not filter.

> **i**
>
> **Please note:**
> A filter set to * (wild card operator) does not filter.

Transport Entity

The NP Transport Entity contains filters to retrieve Transport Entities based on end-to-end filter types:
- Name,
- CPE Trails,
- Type,
- Layer,

- P0_nc,
- Topological,
- Fixed,
- Status.

Application

It allows the search of a particular Application in the network. This end-to-end detail of the Applications can be of a TE type: Trail, SNC Circuit, Unknown. The Application filter provides 3 sub-filters:

- Name,
- Manager,
- Service.

Route

It used to filter the Application based on the TEs' Routing Information.

The NP Route Information lists the TE's Routing information in the application. It is used to display the end-to-end routing details that have been added in FOXMAN-UN application of types: With Direct, Through Direct, With All, Through All, Term At, Don't Care.

It bridges the gap between the FOXMAN-UN BP and the FOXMAN-UN NP manual alarm correlation. In some cases it is necessary to find the relation between a unit or a sub unit alarm to their used transport layer.

Customer

The NP Customer Information lists the Customer specific information for the particular application. It is used to display the end-to-end circuit details. Any circuit used by customer can be listed/filtered by the specific data information criteria, as specified in the Customer and/or Note sub-filters.

Path

The NP Path Protection Information lists the TE's Path Protection information in the application. It is used to display the Protected and the Not Protected paths. There is also a Protection Mode criterion available for filter.

Table 15:   Filter

Name	Specifies Name of the Filter. Note: The Name must be unique and shall not contain characters like []/|*?{}=
Transport Entity	
Name	Specifies the name of the Transport Entity. Generic forms are accepted (e.g. '*Line' '*ISDN*').
CPE Trails	- Ignore, - Include.
Type	Specifies the type of Transport Entity: - * (no filter), - Unknown, - Trail, - SNC, - Circuit.
Layer	Specifies the layer of the Transport Entity: - * (no filter), - STM1 MSP, P0_nc, VC12, etc.
P0_nc	Specifies the capacity of the Transport Entity. This filter is applicable on TEs where layer is P12 or P0_nc: - * (no filter), - 1 .. 32.

Table 15:   Filter

Status	Specifies the Status of the TE: - * (no filter), - Valid: the NP managed object is fully supported by resources in the network. - Waiting: the NP managed object is fully defined and scheduled to be downloaded later in the network. - Invalid: the NP managed object is not supported by some resources in the network. - Based Invalid: the NP managed object is based on other application with invalid state. - Incomplete: the NP managed object is not fully defined and cannot be scheduled for download. - Based Incomplete: the NP managed object is based on other application with incomplete state.
Topological	Specifies if the TE is: - * (no filter), - Topological: represents the physical connection between two TTP that are external ports. - Not Topological.
Fixed	Specifies if the TE is: - * (no filter), - Fixed; the user can not delete the Matrix Connection (MC). - Not Fixed.
Application	
Name	Specifies the name of the Application.
Service	Specifies the type of service: - * (no filter), - Service 1, - Service 2, - Service 3, Note: By default, Service 1 to 3 are defined. The number of the Services can be enhanced by adapting the np.conf file (/opt/nem/etc/np.conf). For each Application a service level can be allocated (e.g. Voice, Data, Leased Line).
Manager	Specifies the manager who is responsible for the provisioned Application. If FOXMAN-UN NP has provisioned such an Application, the Manager is of type 'NP'. If it is FOXMAN-UN BP or CST in the field, the manager of the provisioned Application is of type 'Other'.
Route	
Routing	Specifies the routing criteria as described below: - * (no filter), - With Direct: retrieves any Transport Entity which path goes through specified Termination point or NE. - Since only the TE path is considered, the retrieve TEs are those with the same layer rate specified in the Termination Point. - Through Direct: same as "With Direct" but the TE extremities are not considered in the search. - With All: retrieves any TE which path goes through or is multiplexed in a specified TP or NE. - Retrieved TEs may have different layer rate than the specified TP. - Ex. if an E1 port is specified, all P0/P0_nc TEs, which are multiplexed through the port are retrieved. - Through All: same as "With All" but the TE extremities are not considered in the search. - Term At: retrieves any TE (Circuit/Trail/SNC) which A or Z extremity in the specified Termination Point or NE name.
NE Name	Specifies the name of the FOX51x or FOX61x NE. Likewise, the NP Select NEs dialog can be launched by clicking on the icon next to the NE Name field.

Table 15:   Filter

Port Label	Specifies the Port Label. Note: The Port Label can be modified via the CST, otherwise the default port label can be used.
TP Label	Specifies the Termination Point Label (Sub-unit of a Unit). The TP label is selected from the TP Browser dialog, This can be launched by clicking on the icon next to the TP label field.
Unit Type	Specifies a unit for the specified or selected NE.
Slot	Specifies the slot position of the unit type selected in the NE subrack.
Port Number	Specifies the port number of the unit type selected.
Customer	
Customer	Specifies the customer name who owns the Application as defined in the Specific Data menu.
Note	Specifies the End Point Data (EP Data) or Circuit Information Value as defined in the Specific Data menu.
Path Protection	
Path Prot	Specifies the protection mode of the Application: - * (no filter), - Protected, - Not Protected.
Prot. Mode	In a protected Application, the following values can be associated: - * (no filter), - SNC/I, - SNC/N, - LTP.
OK	Creates the Filter and closes the dialog.
Apply	Creates the Filter without closing the dialog.
Reset	Returns the attributes of the dialog back to their default values.
Cancel	Closes the dialog without creating the Filter.
Help	Calls the help viewer and opens this page.

6 Navigation

6.1 Introduction

This chapter will explain how to navigate through FOXMAN-UN NP and interpret information created by it. With network examples the usage of the FOXMAN-UN NP will be explained. It will also explain how an add-on can be created to adapt the NP functionality to customers need.

The provisioning part of FOXMAN-UN NP will be explained in another chapter.

6.2 The Network Example

To explain the functionality of NP, the following network topology will be used.

6.2.1 The Network Plan

The sample network itself is mainly based on a SDH ring structure using four FOX61x systems (NE80 to NE82).
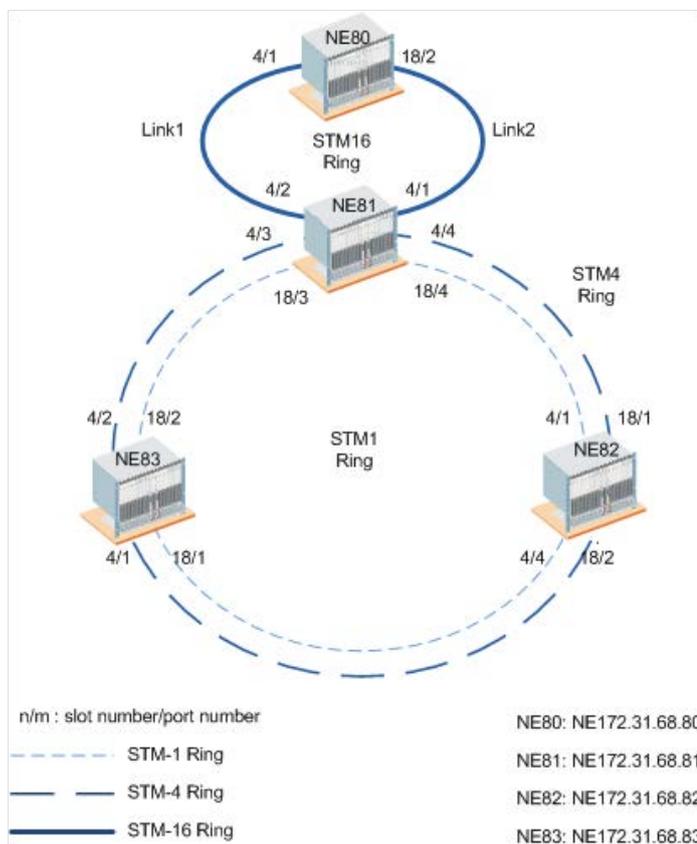
Figure 51:   The Network Plan

Each port of a traffic unit is specified by the Slot position (n) and Port number (m). The following aggregate interfaces per FOX61x system have been defined.

Table 16:   SDH Aggregate Interfaces

System	STM-1	STM-4	STM-16
NE80			x
NE81	x	x	x
NE82	x	x	

Table 16:   SDH Aggregate Interfaces (continued)

System	STM-1	STM-4	STM-16
NE83	x	x	

6.2.2   The FOXMAN-UN NP Point of View

As an example the following application has been configured using the configuration management interface of FOXMAN-UN BP.

The service that has been defined can be seen as a data connection between two LEDE1 sub units.

The two Endpoints, also called A and Z points, are located in NE82 and NE80.
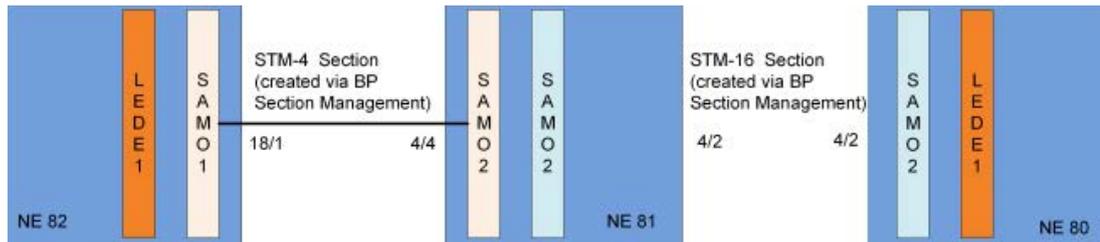
Figure 52:   end-to-end connection before NP

The NE81 is used only as a pure cross-connect to pass the traffic from NE80 to NE82.

The whole model will be represented after FOXMAN-UN NP configuration as follows:
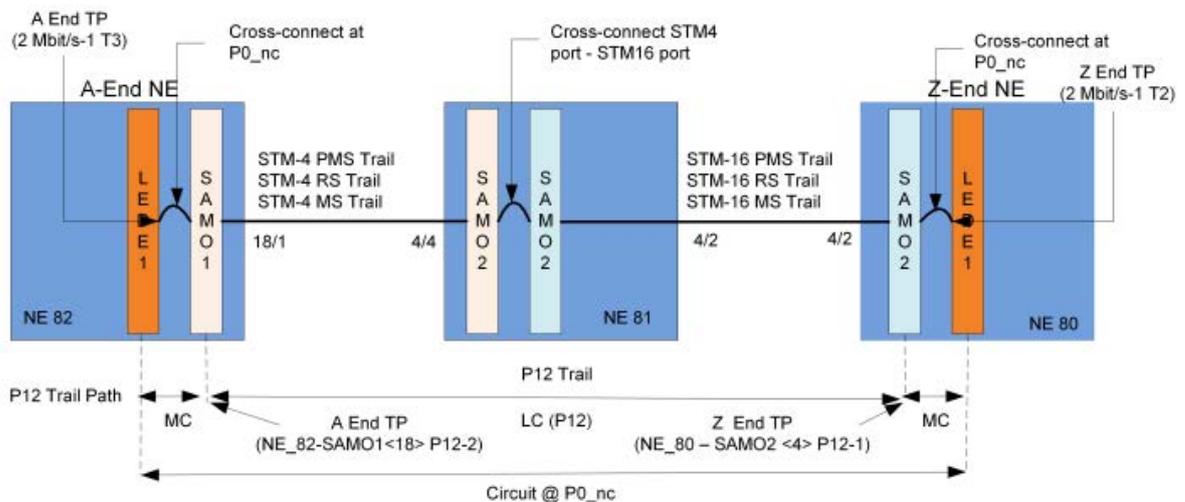
Figure 53:   The Application using Trails and Circuits

The LEDE1 P0_nc circuit starts in the NE82 using a Matrix Connection (MC) to the STM-4 port unit of SAMO1. From there a STM-4 physical connection is established to NE81 which will work as a pure Digital Cross Connect (DXC). This connectivity is known in FOXMAN-UN BP as STM-4 Section or VC4 Topological Trail in FOXMAN-UN NP.

The SAMO2 in the NE81 will allow you to bypass the P0_nc channel via the MC between STM-4 Port 4 and STM-16 Port 2. Again a Topological Trail between NE81 an NE80 will allow the termination of that P0_nc in NE80 using the LEDE1 tributary interface.

The whole construct is called a P0_nc Circuit.

The scheme above visualizes all the different layers to build up the described construct of the P0-nc Circuit. This construct is also applicable in FOXMAN-UN NP and it will be explained in the following paragraphs.

6.3 The Representation in FOXMAN-UN NP

The FOXMAN-UN NP has the same topological and network configuration as FOXMAN-UN BP and adds the network end-to-end oriented information.

The Main Window's Application List Table will give the first information about the Endpoint connections as well as the used Transport Entities.
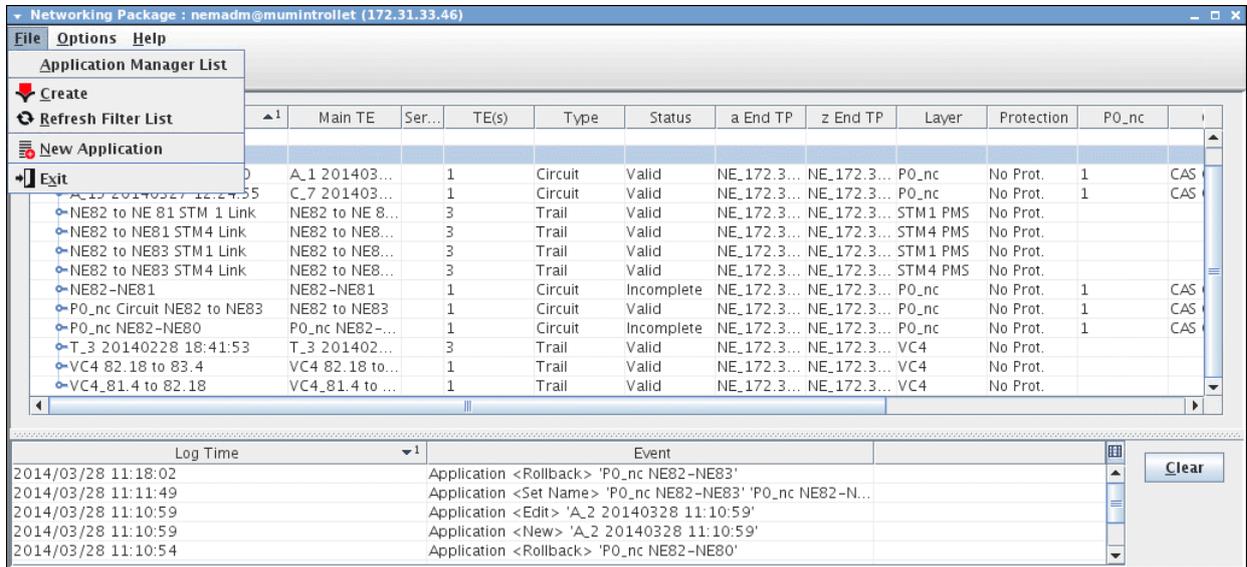
Figure 54:   Application Lists

More information about an Application can be looked on using the «Details» context menu.

6.3.1 The List of Applications

The List of Applications are names that are given to identify them. For all Topological Trails, which means the physical connection between the NE's, the Section name created in FOXMAN-UN BP will be taken. For all Circuits and SNCs seen by FOXMAN-UN NP, the name of the cross connections belonging to Transport Entities will be seen.

For each Application which has been once created with an auto-generated name «A_n yyyym-mdd hh:mm:ss» will be visualized with the particular auto-generated name.

A change to a more readable one should be done now. They can be changed by calling the Application dialog «Edit» mode.

> **Please note:**
> It is recommended not to change an Application Name inherent from Section name.

6.3.1.1 The Application Name

Whenever a Transport Entity is recognized, the FOXMAN-UN NP sets a label for the Transport Entity to the cross-connections belonging to the Transport Entity.

If FOXMAN-UN NP recognizes an existing Circuit in the network, therefore a Circuit is created with the label «Circuit P-Z» inside an Application called «Circuit P-Z».
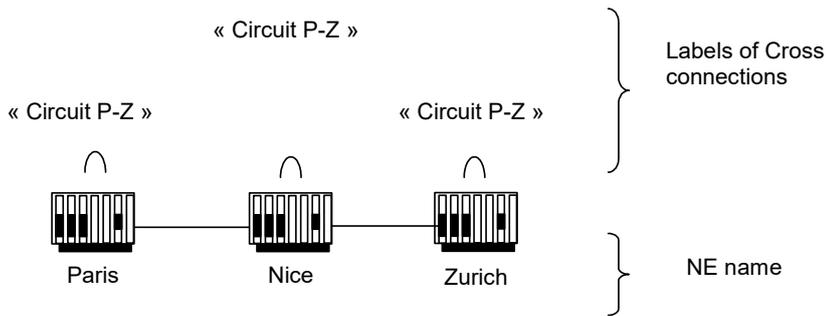
Existing networks have thousands of cross connections entered manually by the operators and some labels have been mistyped.
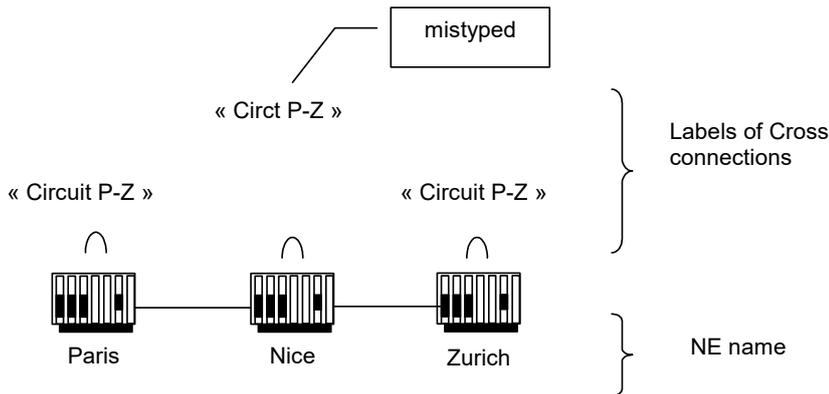
The FOXMAN-UN NP takes the label of the first Cross Connection in the path. The Application called «Circuit P-Z».

> **i**　**Please note:**
> If through the user interface a Transport Entity name is modified, the label of each cross connection in the equipment for the particular path is modified.

6.3.2　The Application Dialog

An Application dialog can be in two modes:

- − View mode,
- − Edit mode.

The View mode allows viewing the details of the Application such as:

- − the TE(s) contained in the Application,
- − the Path(s), Specific Data and TP properties of the selected TE,
- − likewise, it allows to cut TE(s) to be pasted to another Application.

The Edit mode must be activated explicitly in the dialog. This mode allows management of the Application such as:

- − creating/modifying/deleting TE(s),
- − adding TE(s) from other Application(s),
- − Routing (Path selection) of the selected TE,
- − modifying the resources in the database if the user commit his changes with an «Apply».

An Application dialog to create new Application is called from the Main Window menu: File > New Application. The dialog is automatically in Edit mode.

The Application dialog to View or Edit an existing application is called from the Main Window's Application Context menu > "Details" as shown in Figure 54: .

The Application is identified by its:

- − Name,

‒   Service,

‒   Status.
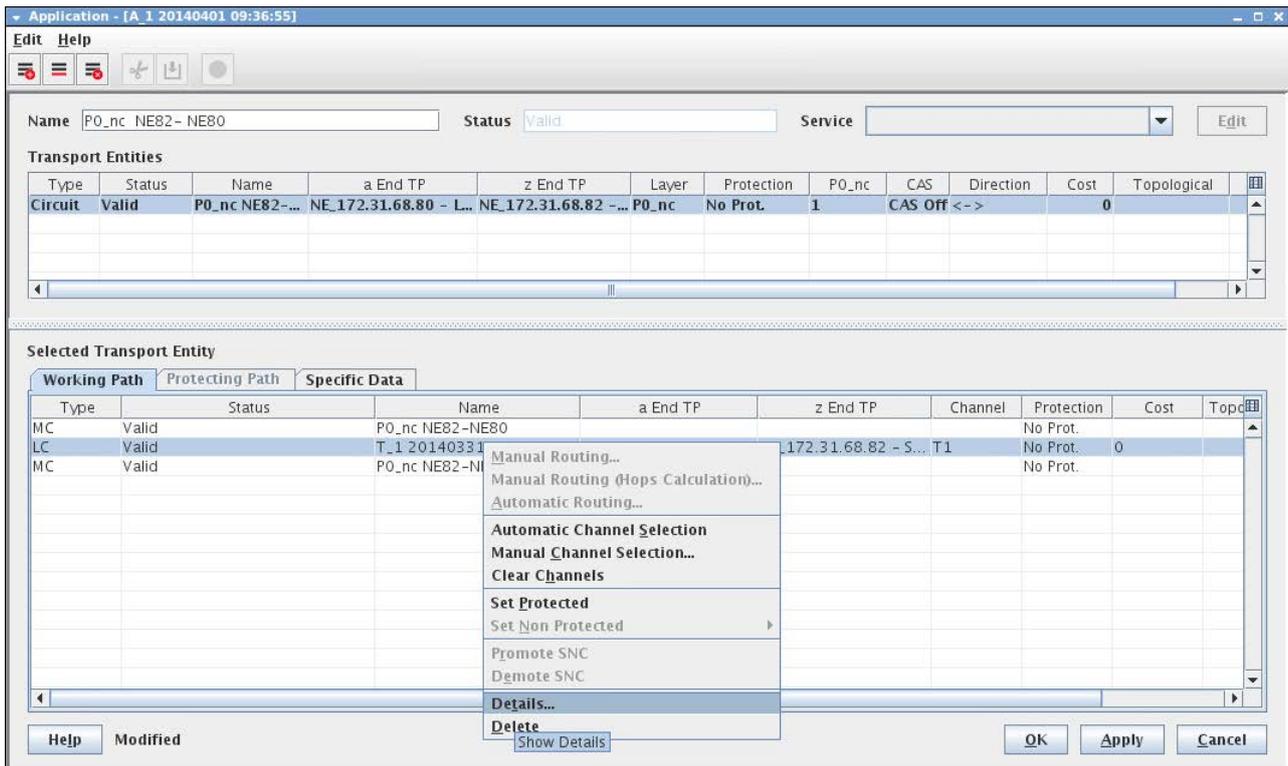
Figure 55:   Main Application View/Edit

Table 17:   General Information menu

Name	This is the name of the Application. It is possible to add a new self-explanatory name.
Status	Indicates if the Application is established and running. Can not be edited.
Service	Each TE can be labeled to identify certain services. Example: Service 1 -> Voice, Service 2 -> Data and Service 3 -> ISDN.
Edit	Changes the dialog from "View" mode to "Edit" mode, which allows: - any adaptation or modification of the Application Name and Status, - creation of new TE(s), - modification of TE(s), - deletion of TE(s).

> **i**   **Please note:**
> The fields in the main Application view are 'grayed out' as long the «Edit» button has not been activated. With «Cancel» you leave the dialog without generating any change in the network. With «OK» or «Apply» the changes will be established.

The Main Application dialog displays information regarding the

‒   Transport Entities, and

‒   Selected Transport Entities.

6.3.2.1   The Transport Entities View

The Application can have several TEs. The TE is defined by:

‒   Type.

A TE itself can be of a Trail, SNC or, as it is in our example, a Circuit.

67

- – A End TP,
- – Z End TP,
- – Layer.

The main TE is shown in bold type in the Application view.

The TE view shows the Endpoints of the TE built by a Circuit starting in NE 80 an ending in NE 82. The Endpoints are defined as: **a End TP** and **z End TP**.

The following menus are applicable to Transport Entities:

Table 18:   Menu Edit (Application View Mode)

Details A End TP/Details Z End TP		Calls the TTP Trail Termination Point dialog of the selected TE, which displays the details of the A End TP/Z End TP.
Cut		Allows to cut TE(s) into another Application. Activated only in View mode.
Paste		Allows to paste one or more TEs from another Application. Activated only in Edit mode.

Table 19:   Menu Edit (Application Edit Mode)

New		Calls the New TE dialog to create new Transport Entity (TE).
Modify TE		Calls the Modify TE dialog to edit the selected Transport Entity. Note: The TE Name must not be same as the Application Name.
Delete TE		Calls the Confirm delete dialog to confirm the deletion of the selected TE(s)
Set Main TE		Set the selected TE as the main TE. The main TE is marked bold in the TE list. The main TE is shown in the NP Main Window allowing the user to give information about the application.
Details A End TP/Details Z End TP		Calls the TTP dialog of the selected TE, which displays the details of the A End TP/Z End TP.

6.3.2.2   Selected Transport Entity view

This part of the Application focuses on the construct of the TE.

Working Path

In the example, the Application is using a P0_nc Circuit as TE is reflected as a construction built on a

- – MC   Matrix Connection on NE 82 between LEDE1 and SAMO1.
- – LC   Link Connection between NE 82 and NE 80 on a P12 layer.
- – MC   Matrix Connection on NE80 between LEDE1 and SAMO2.
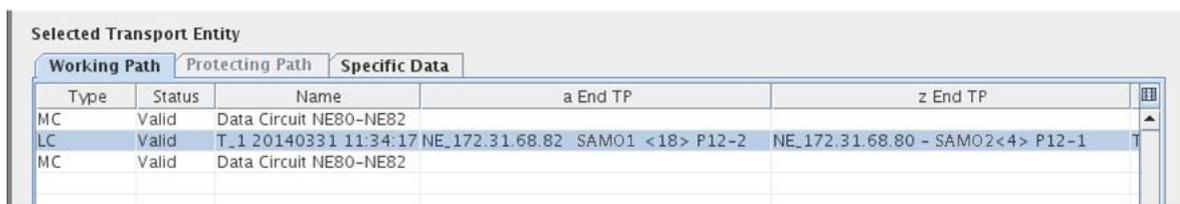
Figure 56:   Selected Transport Entity: Working Path

Table 20:   Working Path Context Menu

Manual Routing	Calls the Manual Routing: Next Hop List dialog to search for all possible hops having enough capacity for the service to be routed. The user can select one of these hops. NP search then for all possible hops from the selected hop.
Manual Routing (Hops Calculation)	Calls the Manual Routing: Next Hop List dialog to search for all possible hops having enough capacity for the service to be routed with the additional indication of minimum number of hops to reach the final. The user can select one of these hops. The NP search then for all possible hops from the selected hop.
Automatic Routing	Enables the route completion in one operation based on the values specified in the Set Automatic Routing Parameters dialog.
Advanced Routing	Select parameters before executing the routing process. The parameters are the same as in the Automatic Routing Parameters dialog but are applied directly when clicking on "Route". You can either "Route" with the parameters set in the dialog, or "Abort".
Automatic Channel Selection	Selects a channel automatically. Note: Once routed, the Circuit knows on which hops the End-to-End signals are multiplexed. The next step is to select a dedicated TS in all Trails of the Path.
Manual Channel Selection	Calls the Select Possible Channels dialog, which displays a list of all possible channels to choose from.
Clear Channels	Clear the channels from the path elements.
Set Protected	Add protection to the TE. The path has to be build before TE gets valid or waiting.
Set Non Protected	Choose between Keep Working or Keep Protecting Path. The chosen path is used as working path.
Promote SNC	The SNC is removed from the TE list and replaces the SNC with the original MC to MC (e.g. MC-LC-MC..MC) path sequence.
Demote SNC	Paths from MC to MC can be defined as SNC. This adds the SNC in the TE list.
Details	Calls the Application Trail View.
Delete	Delete the path elements. Holes cannot be deleted.

Specific Data:

This dialog is used for adding Customer Specific Information.

To allocate specific information to the Endpoint of a TE, this field can be used. In this case the TE is based on a Circuit.

As an example for a TE based on a Circuit:

To change the default attributes of the Endpoint Info and Circuit Info: /opt/nem/etc/np.conf

```
#np_circuit_data_fields        Data1;Data2;Data3
#np_circuit_ep_data_fields     EPData1;EPData2
```

It is recommended to do the definition during the commissioning process of NP.
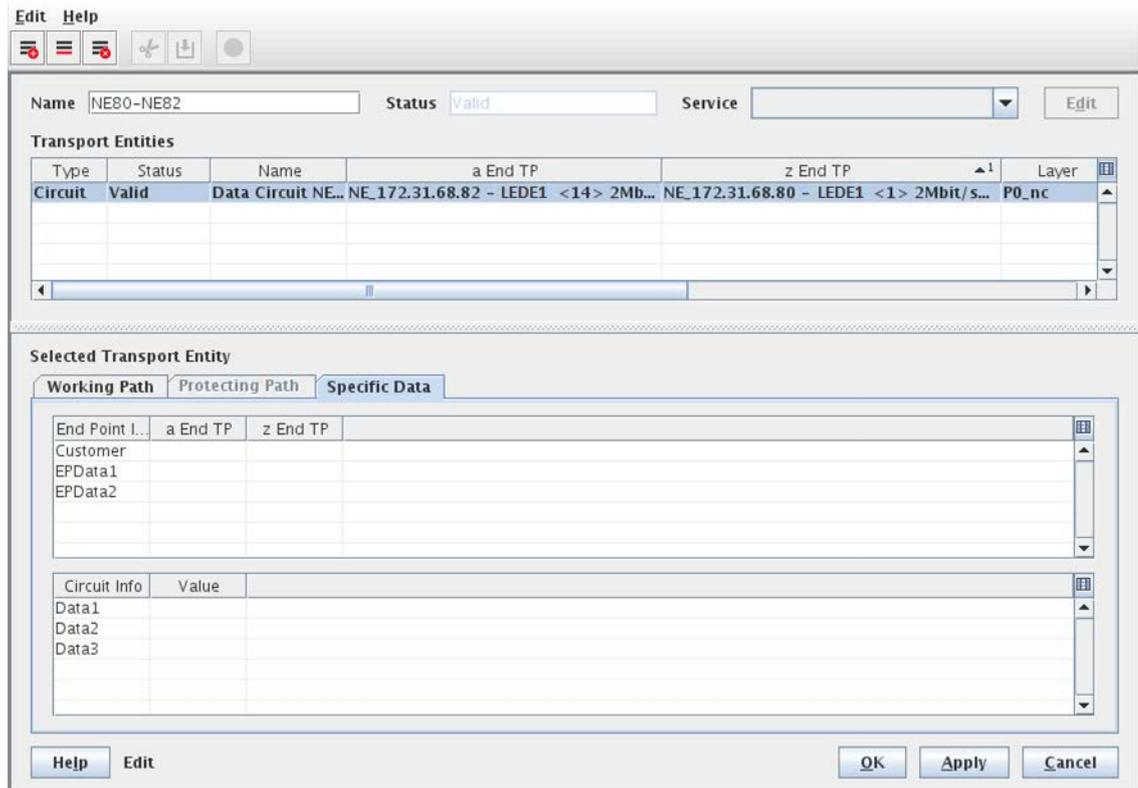
Figure 57:   Selected Transport Entity: Specific Data

> ⓘ **Please note:**
> By default three fields for Endpoint and Circuit Info can be used. The attributes can be renamed or enlarged as required. The adaptation must be done in the /opt/nem/ etc/np.conf file. It is recommended to do the definition during the commissioning process of FOXMAN-UN NP.

6.3.2.3   TE Graph

Any selected TE provides a graphical view of the logical and the physical TE diagram. You can zoom in and out with the mouse wheel, via zoom icons or via double-click, switch the view (logical, physical), enable/disable several view options, and edit the NE placement in the physical view.

Via an information icon (i) additional information on possible issues for the TE is provided, such as shared resources, status issues, holes, and alarms.

The logical view shows all logical layers that are relevant for the TE, see Figure 58: "TE Graph, Logical View, without banner (sample)" (on page 71).

Any transport element of the graph can be highlighted by clicking on it.
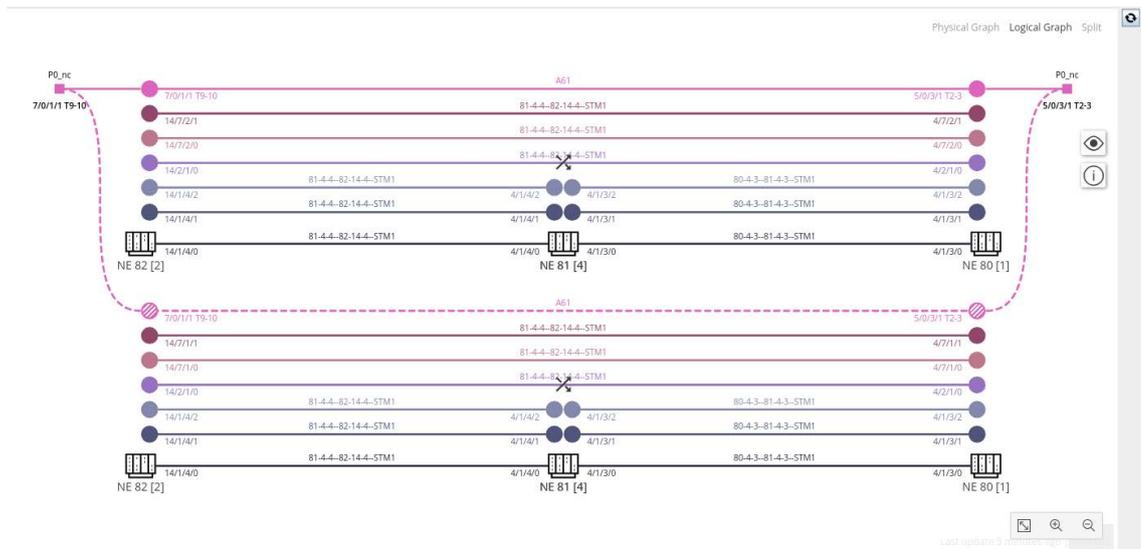
Figure 58:   TE Graph, Logical View, without banner (sample)
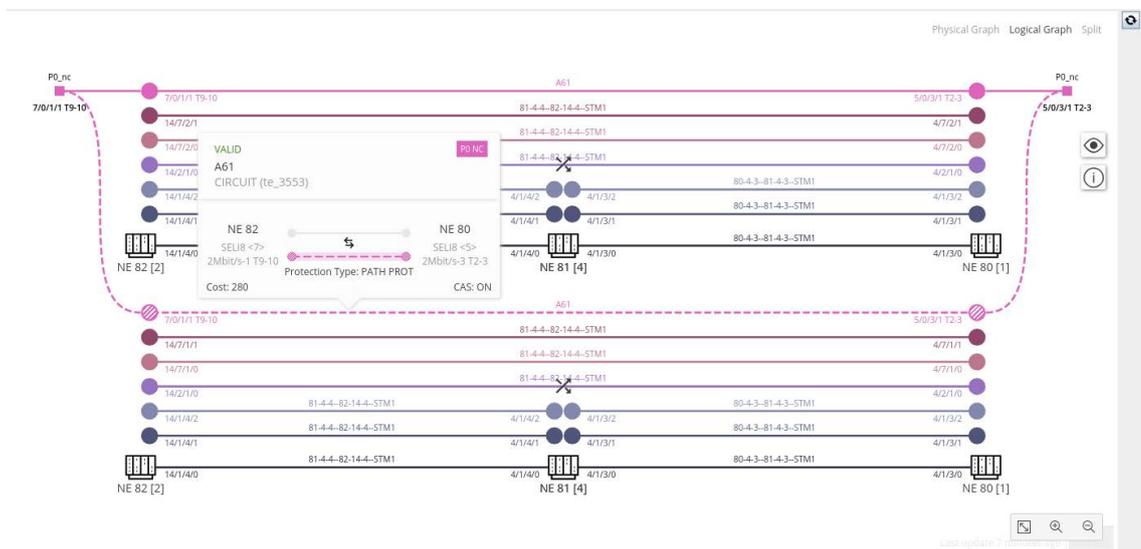
Figure 59:   TE Graph, Logical View, with banner for the protected path (sample)

The physical view shows all physical elements that are relevant for the TE, including A-End and Z-End NEs, and Intermediate NEs.

The layer colors shown on the sections correspond to the colors used for the elements in the logical view. The legend of colors used for the different layer rates and sections is listed in the view options.

You can rearrange the NEs in the physical view using the editing mode. The NE arrangement will be stored in the NEM database.
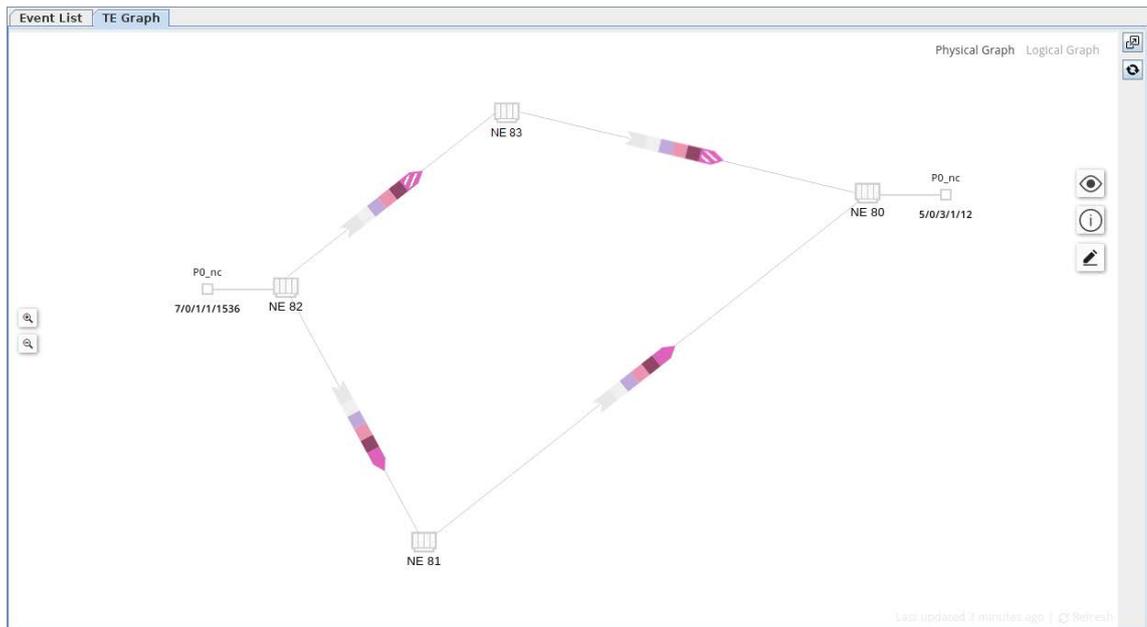
Figure 60:   TE Graph, Physical View

6.3.2.4   NP Usage

For any Transport Entity (TE), the usage of channels or containers can be shown as a property of the TE. "NP Usage" is opened from the context menu on a selected TE. It provides detailed information of the TE, including a colored bar showing the usage of the TE. A usage below 90% is colored green, above 90% but below 100% is colored orange, and 100% is colored red.

Figure 61:   NP Usage Example

6.3.2.5   The Application View on the Trail Level

Back on the Working Path layer, a specific view of the Trail used for a TE can be achieved. This dialog can be called via the Working Path context menu > "Details". See Figure 55: .

Transport Entities:

In our example, the Application Trail View displays 3 Trails:

- P12 Trail,
- VC12 Trail,
- VC4 Trail.

Selected Transport Entity: Working Path

The screenshot below displays Working Path of the VC4 Trail using the construct as follows:

- For the Trail between NE 82 and NE 81:
  - − MC Matrix Connection between SAMO1 and LEDE1 of NE 82,
  - − LC Link Connection between NE 82 and NE 81 on VC4 layer,
  - − MC Matrix Connection between STM16 port and STM4 port of SAMO2 inside NE 81.
- For the Trail between NE 81 and NE 80:
  - − MC Matrix Connection between STM16 port and STM4 port of SAMO2 inside NE 81,
  - − LC Link Connection between NE 81 and NE 80 on VC4 layer,
  - − MC Matrix Connection between SAMO2 and LEDE1 of NE 80.
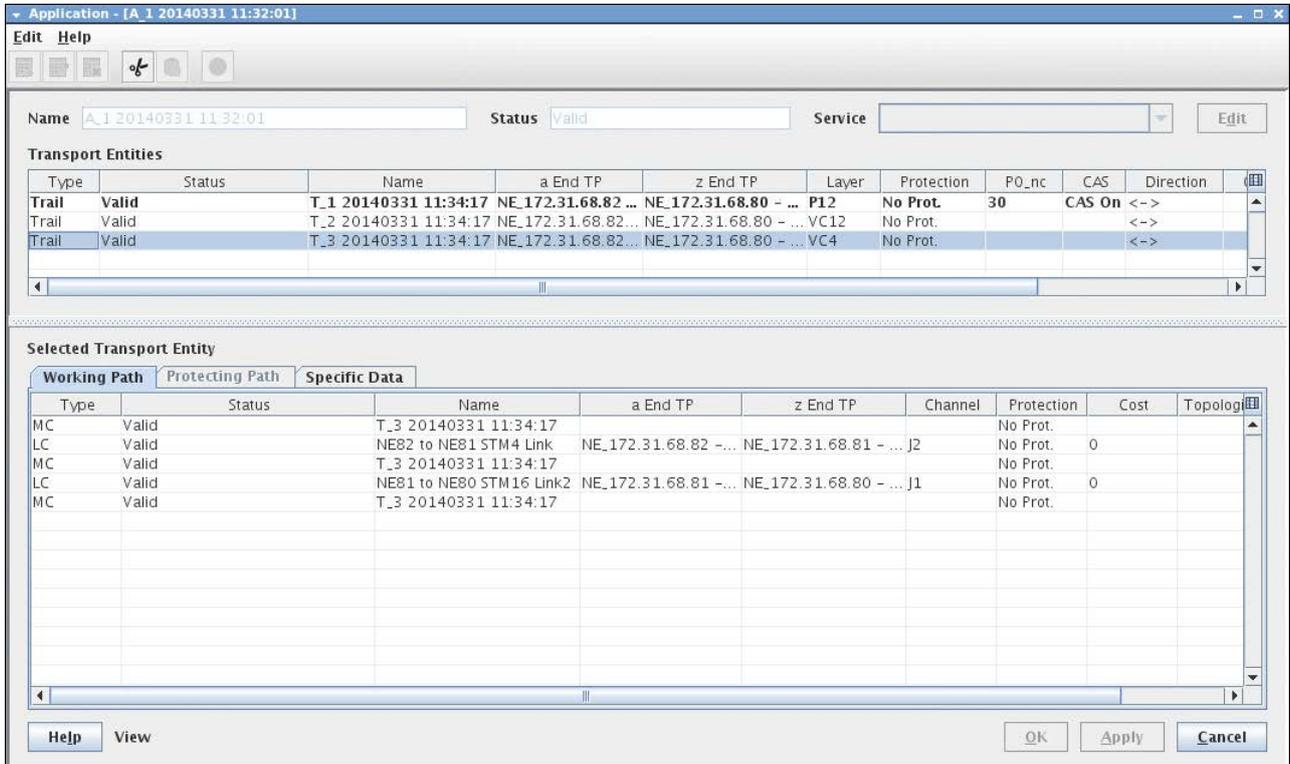
Figure 62:   Application View on Trail Level

The provisioned circuit and details of Figure 62: "Application View on Trail Level" (on page 73) is shown in this diagram:
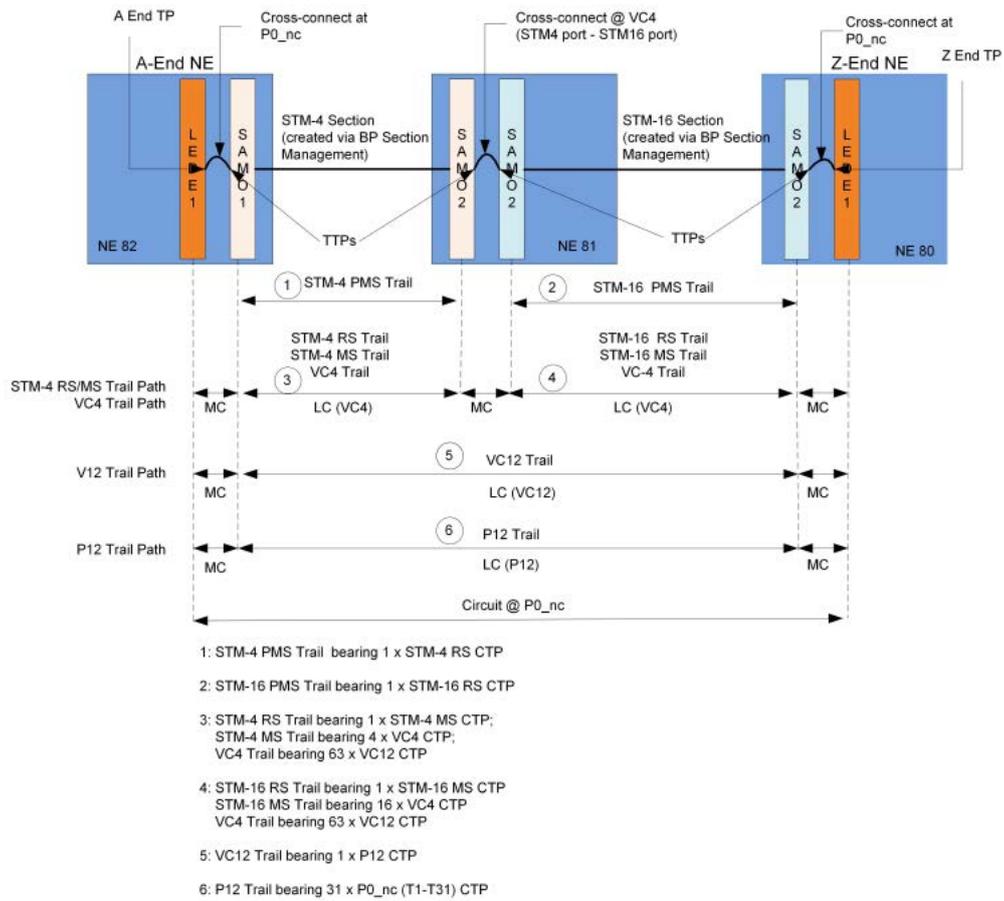
Figure 63:   Details of Application View on Trail Level

Selected Transport Entity: Specific Data.

If the capacity of a used Trail (protected or unprotected) is of interest, this mask will help to focus on that information.
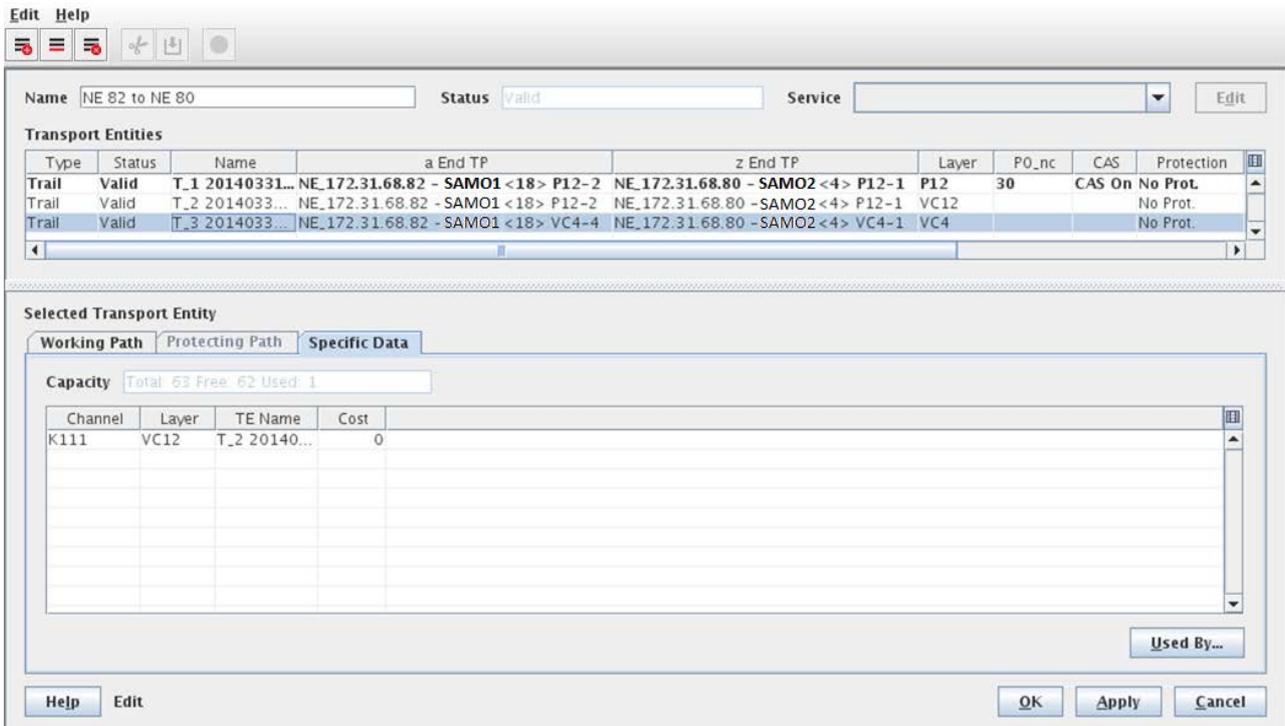
Figure 64:   Capacity View: VC4 Trail Capacity

Based on our sample network:
- − VC4 Trail Capacity of 63 x VC12 channel (1 x VC12 channel used, and 62 x VC12 Channels free).
- − The VC12 Trail has 1 x P12 channel capacity (0 used and 1 free).
- − The P12 Trail has 30 x T1 channel (1 used and 29 free).

Further details of Application Trail View is possible, e.g. on a specific section or link within the end-to-end connection. For example, to know about the remaining capacity of the STM4 Link between NE 82 and NE 81, right-click on the required LC and select the "Details" context menu as shown in Figure 62: . This calls another Trail View of that particular section or link as shown in the screenshot below.
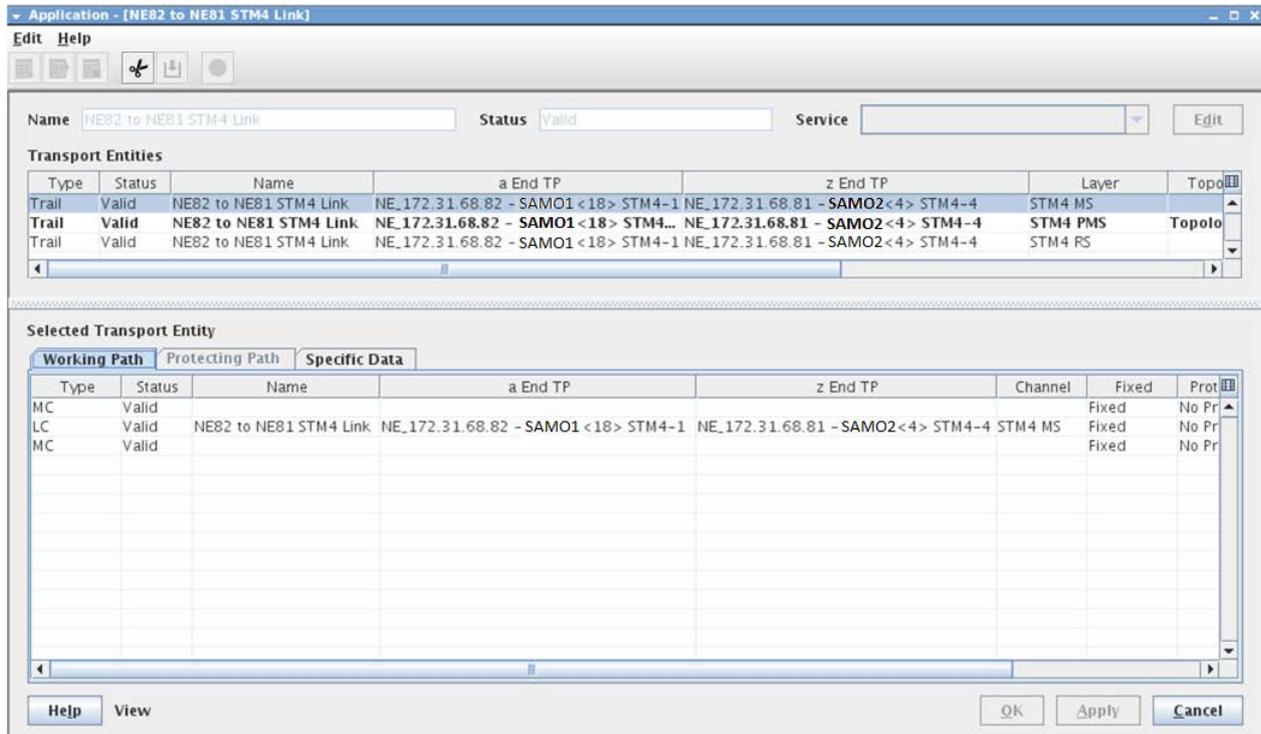
Figure 65:   Application View Trail Level (STM4 Link)
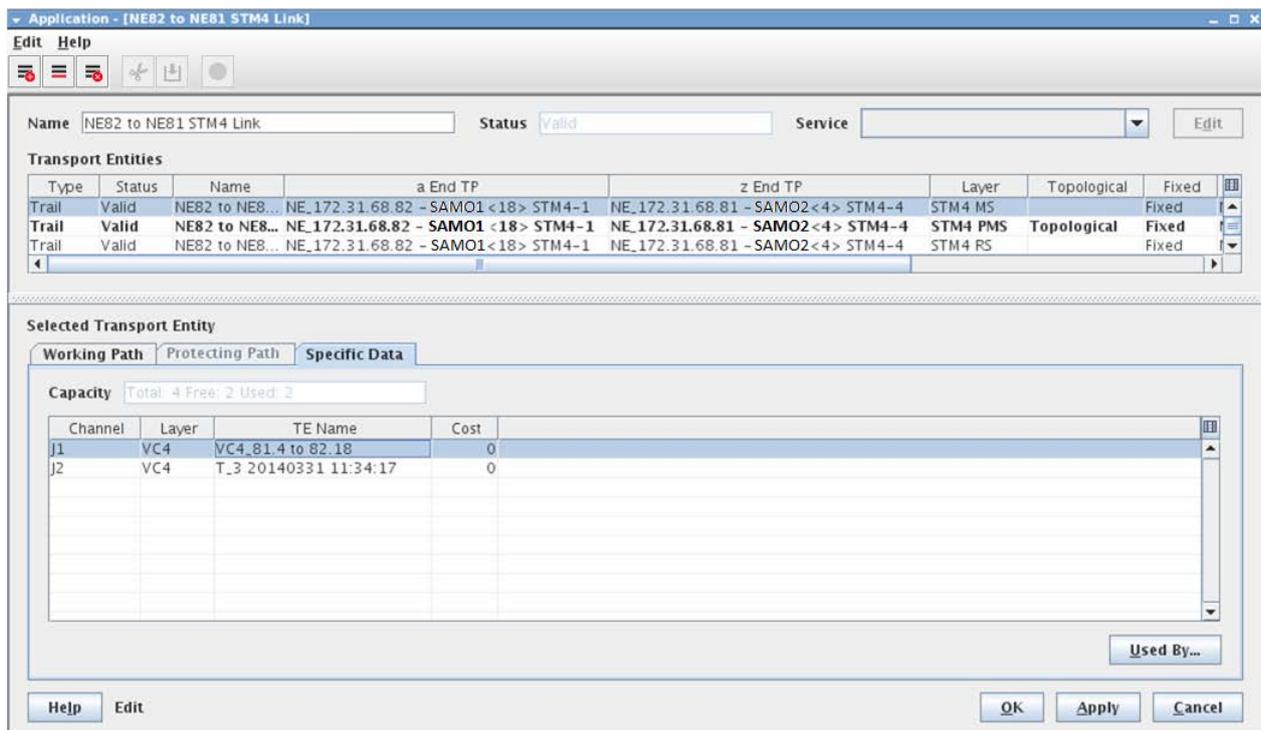
Figure 66:   Capacity View: STM4 MS Trail Capacity

The following capacity information is available:

 − STM4 MS Trail of 4 x J1 (VC4) channel (2 used, 2 are free).
 − STM4 PMS Trail capacity of 1 x STM4 RS channel (1 used, 0 free).
 − STM4 RS Trail capacity of 1 x STM4 MS (1 used, 0 free).

6.3.2.6   Endpoint Information

The Trail Termination Point (TTP) dialog in Figure 68: "The visualization of an Endpoint" (on page 77) allows the visualization of the functionality of the Termination Endpoints.

This dialog is called from the main Application dialog's context menu: "Details A End TP" or "Details Z End TP" s shown in Figure 67: "Getting information on the Endpoints" (on page 77) below:
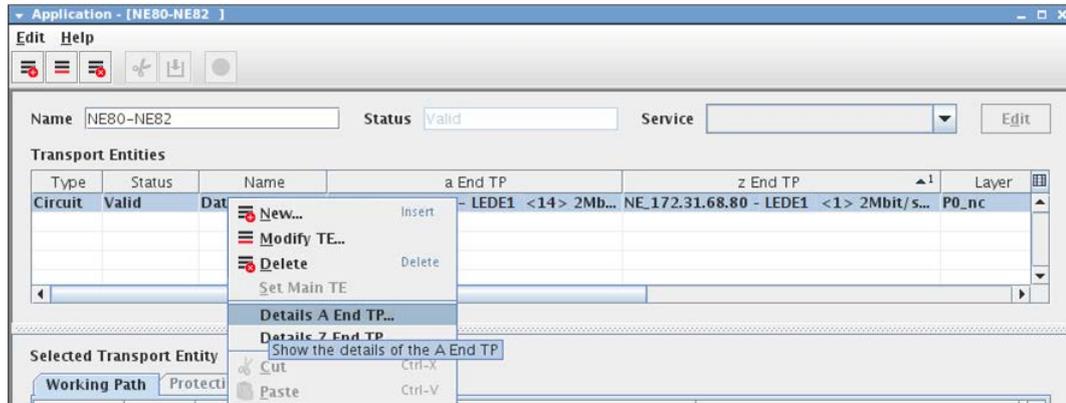
Figure 67:   Getting information on the Endpoints

The TTP dialog is used to provide physical characteristics of a TTP. This is a read-only dialog, no modification can be made to the displayed information. Those configuration parameters can be modified in the NE configuration using the CST.
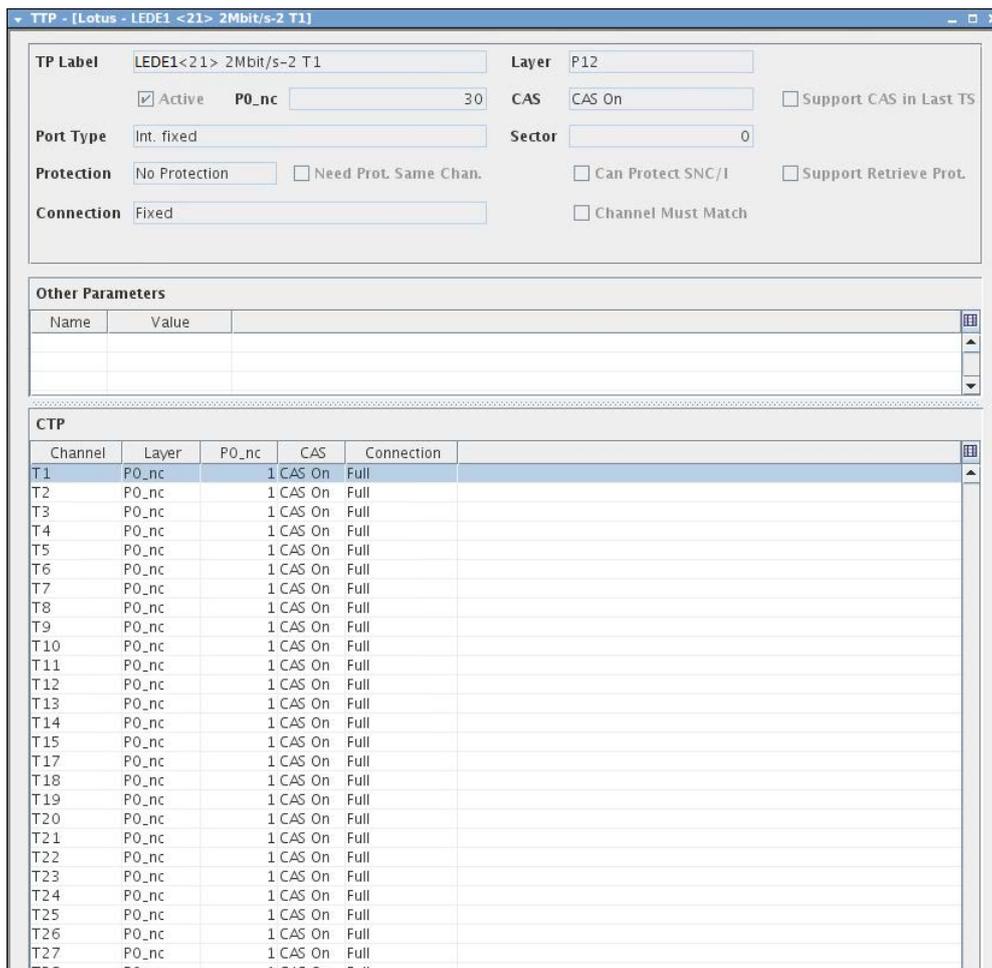
Figure 68:   The visualization of an Endpoint

Table 21:   Endpoint Information

TP Label	Identifies the TTP.
Layer	Defines the Layer rate of a TTP.
Active	Operational status of the TTP.
P0_nc	Shows the amount of usable nx64 kbit/s
CAS	Shows whether Channel Associated Signaling is supported or not.
Support CAS in Last TS	Mainly used in xDSL applications.
Port Type	The Port Type can be: - Ext. Optical, - Ext. electrical, - Int. section, - Int. logical, - Int. fixed, - Int. floating, - Ext. SFP, - Ext. radio.
Sector	Shows the FOX51x bus sector.
Protection	Indicates the mode of protection this TP supports.
Need Prot Same Chan	This parameter specifies that a termination point connection as AWork must have a similar channel on the AProt of the connection. Note: Only used for MEGIF unit.
Can Protect SNC/I	The Termination Point supports SNC/I protection.
Support Revertive Prot	The Termination Point supports Revertive protection.
Connection	Indicates the connection of this Termination Point.
Channel Must Match	When cross-connected to another Termination Point, this later must have the same channel. This is used to model the KLM constraint for SDH units (SYNIO/SYNUF/SYNIF).

7 Provisioning

7.1 Introduction

The provisioning process has been introduced in the section 2.2 Overview of NP Circuit Provisioning Process (on page 10).

The FOX61x and FOX51x systems allow you to establish a wide range of applications. It is not foreseen that all the various configuration possibilities will be covered in this chapter. This chapter will mainly focus on a practical step by step example how to use the GUI to establish a Circuit between two Endpoints using the network topology known by FOXMAN-UN NP.

> **i**
>
> **Please note:**
> For list of supported units, please refer to section 9 Appendix A - Supported FOX-61x Units (on page 104).
>
> For quantitative requirements, please refer to section 10 Appendix B - NP Quantitative Requirements (on page 105).

7.2 The Network Example

Throughout the provisioning process of FOXMAN-UN NP you will be asked which Trail you want to use to reach the Endpoint destination. For this reason we recommend that at least a study of the network topology be done before starting the provisioning process of FOXMAN-UN NP.

7.2.1 The Network Plan

The network plan shows how systems are interconnected and which media have been used for this interconnection. The network plan is an important feature that can be used to assist with the provisioning process and to show the inter-connectivity between NEs and FOs. The example explained in the following chapters is based on a data application using the LEDE1 units in FOX61x systems, namely NE80 and NE82. NE81 bypasses the data service and will work as a kind of Digital Cross Connect (DXC).
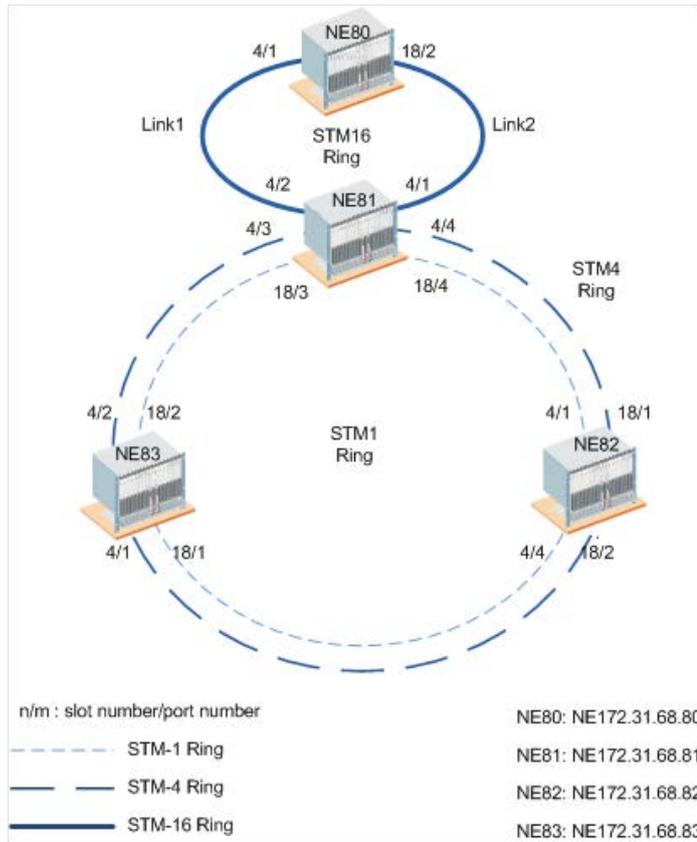
Figure 69:   The Network Plan

7.2.2   The Basic Package (BP) Configuration and View

Figure 70:   Basic Package NEM Browser View

Figure 71:   Basic Package Section Management View

Because of the network topology, several possibilities are given to route the data service between NE82 to NE80.

For the example we will chose the established STM4 link between NE82 and NE81 and STM16 Link1 between NE81 and NE80.

Regarding the network plan, it would also be possible to route a protected Path for this data service via the STM4 or STM1 link between NE82 and NE81 via NE83 and STM16 Link 1 between NE81 and NE82. The procedure for routing a protected Path besides the working Path will be explained briefly during the following provisioning example.

7.2.3   The FOXMAN-UN NP point of view

FOXMAN-UN NP will use the physical data of the network and nodes configuration provided by the FOXMAN-UN BP and modeled on the ITU-T G.805 standard to abstract the network from a provisioning point of view.

7.3   Provisioning Process

7.3.1   Setting of Unit parameters

Through the FOXMAN-UN BP interface, all relevant Unit and Sub-unit parameters must first be defined as required.

In the example the LEDE1 SubUnit has to be set for a bit rate up to 192 kbit/s, other additional data parameters can be adapted if required.

> **i**   **Please note:**
> The individual SubUnit per unit does not have to be enabled first. This will be done automatically by the FOXMAN-UN NP.

7.3.2   The new Application

On the existing base, the FOXMAN-UN NP will allow you to create a new Application containing one TE of the Circuit type. The Circuit itself is layered as a P0_nc, bi-directional link between the two end Termination Endpoint point located in NE82 (a End TP) to NE80 (z End TP) with a capacity of 192 kbit/s.

The Application dialog below to create new Application is called from Figure 48: "NP Main Window" (on page 54) NP Main Window menu via File > New Application.

> ⓘ **Please note:**
>
> The provisioning example described in this section assumes the following:
>
> → NP database is initialized.
>
> → NP/BP databases are synchronised.
>
> → No pending changes indications.
>
> → No application conflict detected.

In case of any of the above listed issues, please refer to section 4.2.2 Main GUI Status Indications (on page 40)
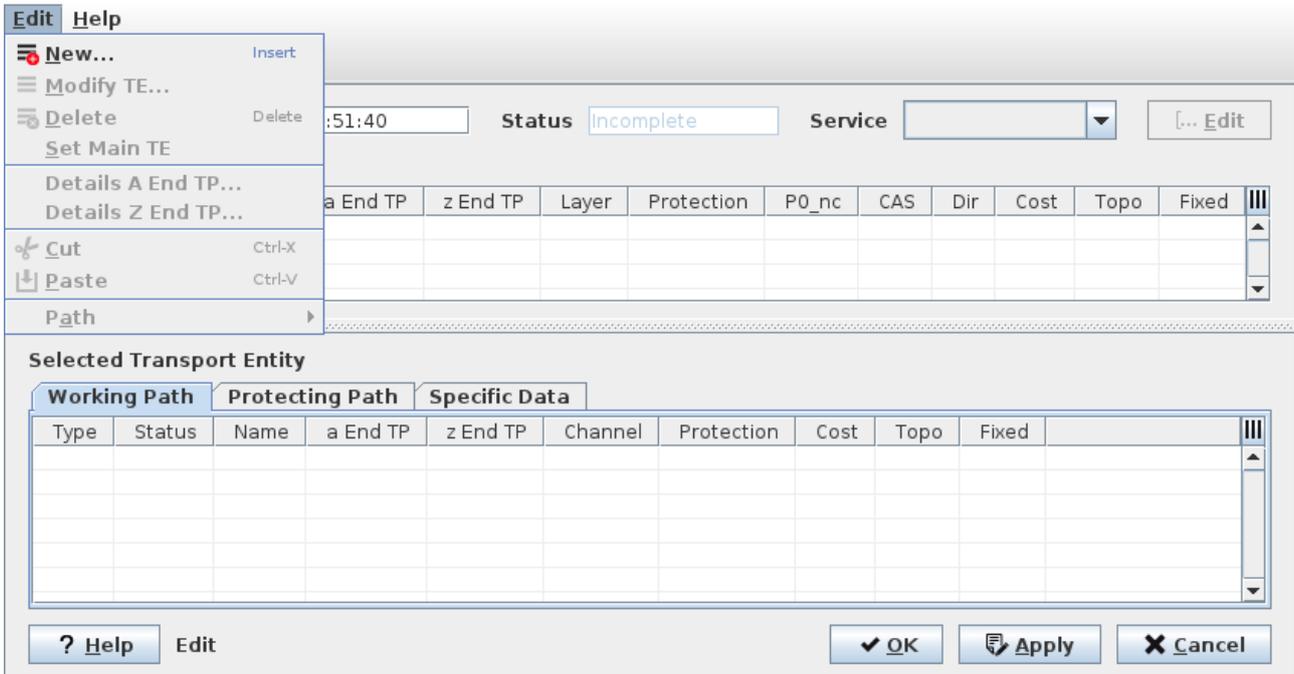
Figure 72:   The empty Application Window

To start the provisioning process, click on Edit and select:

Table 22:   Create new TE

New		Calls the New TE dialog to create new Transport Entity (TE). Mainly used to provision the network with new services.

7.3.3   The definition of the Endpoints

Before FOXMAN-UN NP can start to search for all possible hops having enough capacity to carry the P0_nc service, the Endpoint of a unit location on a particular NE has to be defined first.

7.3.3.1   New Transport Entity

The Endpoint of the location A End and Z End has to be specified first.
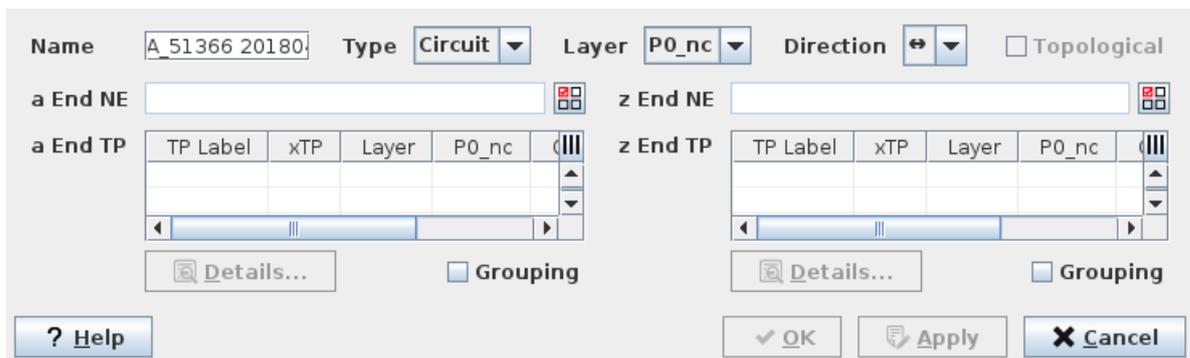
Figure 73:   The TE Endpoints

The following menu points are available:

Table 23:   New TE

Type	Defines the type of TE. Possible entries are Circuit, Trail or SNC.
Name	Any string to help identify the new Transport Entity.
Layer	Specifies the bit rate used for this TE. Only a possible layer rate for each TE type can be selected.
Directionality	Possible entries are Unidirectional (->) or Bidirectional (<->).
a End NE/z End NE	Calls the Select NE dialog to select the A End NE/Z End NE.
a End TP z End TP	a End/Z End Termination Point (TP) Browser table. Note: The TPs of the selected NE will automatically appear on the TP Browser table.
Details	Calls the TTP Trail Termination Point dialog for the selected TP label.
Grouping	When more than one Endpoints are selected, each Endpoint will be used as extremity for Circuit. When the checkbox is selected, the NP will group selected endpoints to create one TE.
Help	Calls the FOXMAN-UN help viewer and opens this page.
OK	Applies the modifications and closes the dialog. With «OK» the Circuit will be established in the FOXMAN-UN NP database The Circuit itself remains as a 'hole'. The Route is said to be incomplete.
Apply	Applies the modifications without closing the dialog. With «Apply» the Circuit will be established in the FOXMAN-UN NP database The Circuit itself remains as a 'hole'. The Route is said to be incomplete.
Cancel	Closes the dialog without applying the modifications.

In our example the data service we are going to provision is based on the Type of Circuit and uses a bandwidth of a P0_nc layered structure.

7.3.3.2   The Select NE Dialog

The Select NE dialog is called via the A/Z End NE icon of New Transport Entity dialog shown on Figure 73: "The TE Endpoints" (on page 83).

The Network Element (NE) that contains the unit required to establish the data service, now has to be defined.

> ℹ️ **Please note:**
>
> If the NP license specifies a specific number of NEs to be reported to NP, the listed NEs are members of the NP_nodes Domain.
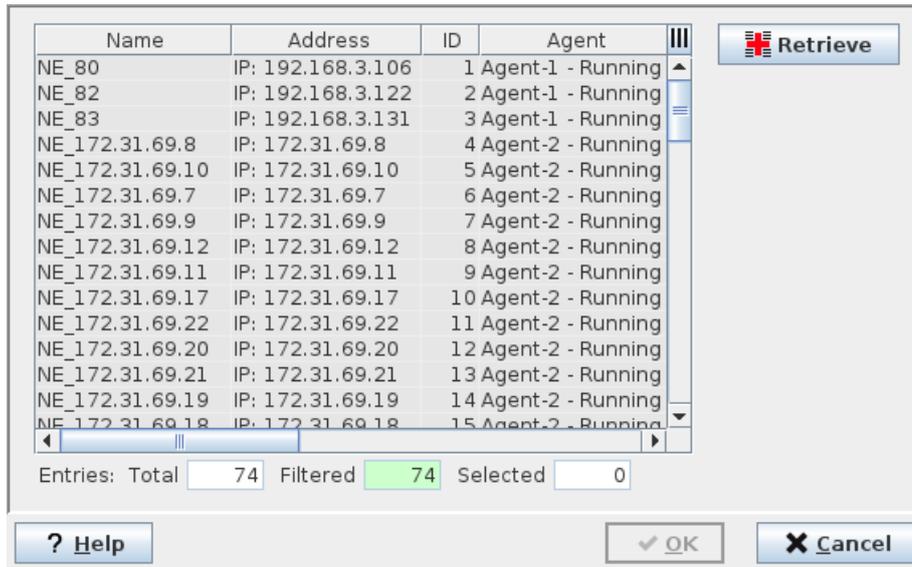
Figure 74:   The NE Browser (a End TP)

The following menu points are available:

Table 24:   Select NE

Retrieve	Refreshes the NE list by starting the scanning process of all available NEs (members of the NP_nodes Domains) in the network.
Help	Calls the FOXMAN-UN help viewer and opens this page.
OK	Selects the NE and closes the dialog.
Apply	Selects the NE without closing the dialog.
Cancel	Closes the dialog without making any changes.

The described procedure has to be repeated for the other missing Endpoint.

After the endpoint NEs have been defined, the Unit and the SubUnit that belong to these NEs now have to be chosen.

7.3.4   The Routing

The Circuit needs to be routed from one Endpoint to another NE, thereby having the distance between the incomplete Path extremities reduced, until the Path is completed. FOXMAN-UN NP allows routing manually as well as automatically. The automated routing process will be described later in this chapter.

7.3.4.1   The Routing process

The FOXMAN-UN NP will search for all possible hops having enough connectable capacity at the 'a End TP'. It is possible to select any proposed hop and continue routing towards end point Z until the Circuit routing has been completed (i.e. a complete Path between 'a End TP' and 'z End TP' has been configured).
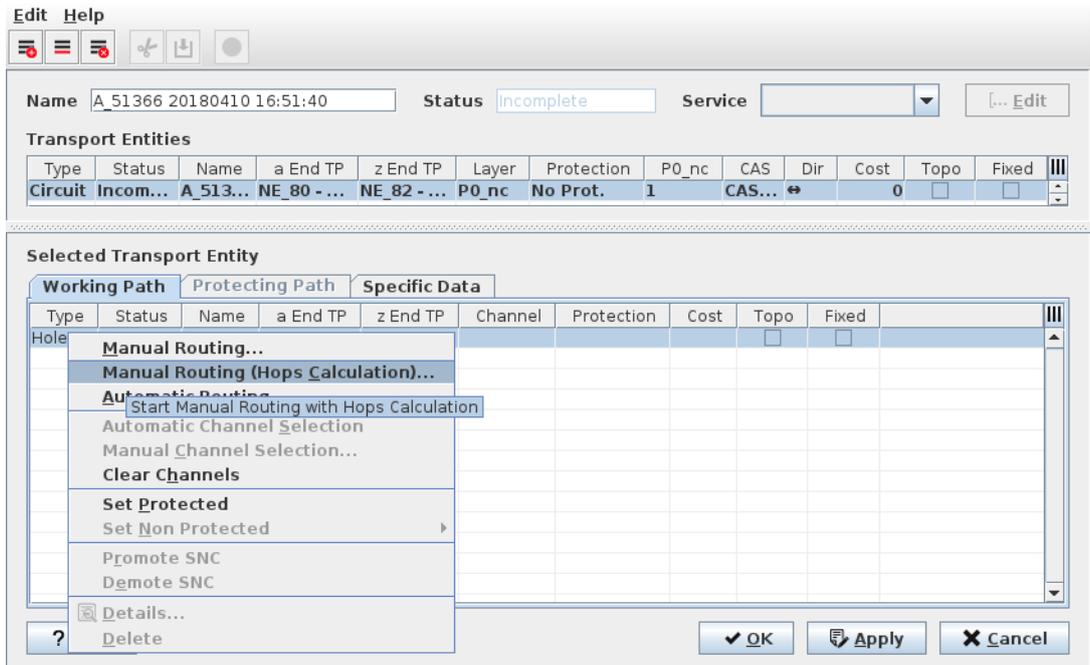
Figure 75:   The Incomplete Path

To start the manual Routing process, select the Working Path entry «Hole» and open the context menu with the right mouse button.

Table 25:   Working/Protecting Path Context Menu

Manual Routing	Calls the Manual Routing: Next Hop List dialog shown to search for all possible hops having enough capacity for the service to be routed. The user can select one of these hops. NP search then for all possible hops from the selected hop.
Manual Routing (Hops Calculation)	Calls the Manual Routing: Next Hop List dialog shown on Figure 76: "The possible hops with indications to reach the Endpoints" (on page 86) to search for all possible hops having enough capacity for the service to be routed with the additional indication of minimum number of hops to reach the final. The user can select one of these hops. The NP search then for all possible hops from the selected hop.
Automatic Routing	Enables the route completion in one operation based on the values specified in the Set Automatic Routing Parameters dialog. Note: When an NP user initiates an Auto Route request, a Cancel dialog shall appear to allow the user to terminate the request.
Automatic Channel Selection	Selects a channel automatically. Note: Once routed, the Circuit knows on which hops the End-to-End signals are multiplexed. The next step is to select a dedicated TS in all Trails of the Path.

If the Manual Routing (Hop Calculation) is selected, the FOXMAN-UN NP shows in the Final field the remaining hops till Z point is reached.

The list below allows you to select any proposed hop to reach the Endpoints.
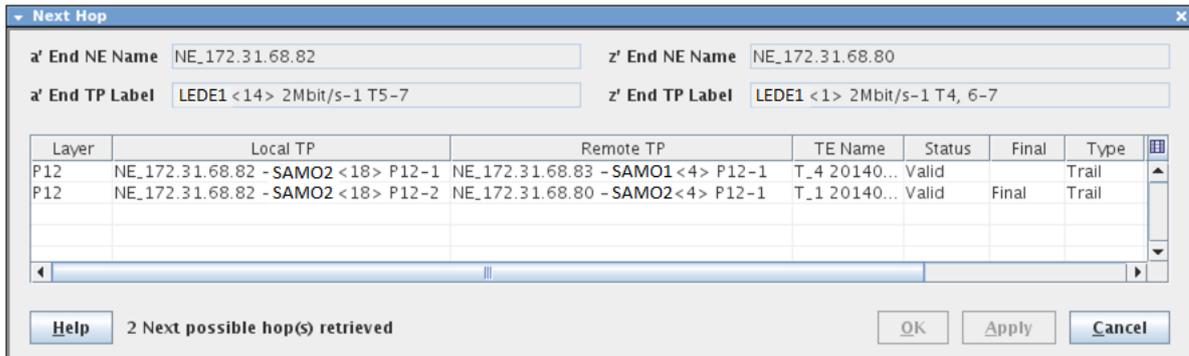
Figure 76:   The possible hops with indications to reach the Endpoints

Table 26:

OK	Applies the modifications and closes the dialog.
Apply	Allows the selection of next possible hop till the selected Trail reaches the Endpoint.
Cancel	Closes the dialog without making any changes.

7.3.4.2   Channel (TS) selection

Once routed, the Circuit knows on which hops the end-to-end signals are multiplexed. One more step is required to definitely have the signal going from A to Z which means from NE82 to NE80.

A dedicated Time Slot TS has to be selected in all Trails of the Path.

There are two possibilities

- – Automatic channel selection based on residual capacity of each Trail, or
- – Manual Section.

i	**Please note:** It is recommended to use the automatic channel selection process.
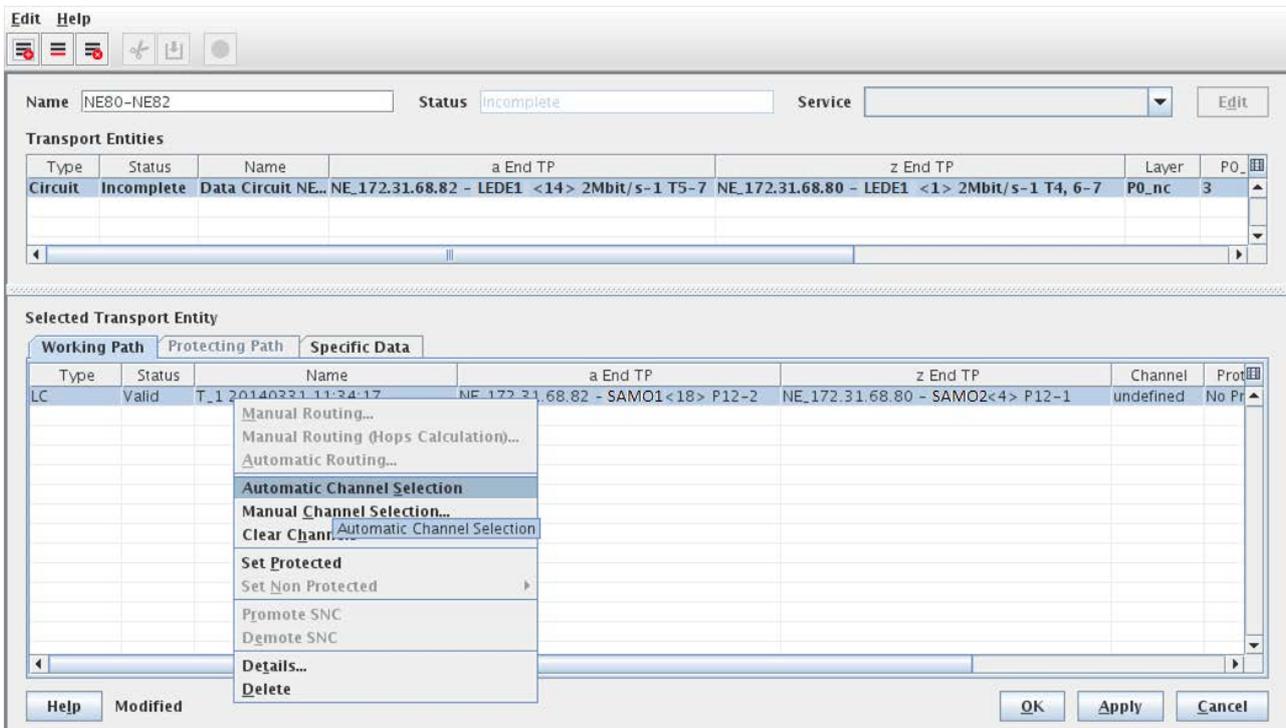
Figure 77:   The routed Circuit

To allow the automatic or manual channel allocation, right-click on the Working Path's "LC" entry as shown in the screenshot above. This calls the context menus:

Table 27:   Working Path "LC" Context Menu

Automatic Channel Selection	Selects a channel automatically. Allows the FOXMAN-UN NP to search for all possible hops having enough capacity for the service to be routed.
Manual Channel Selection	Calls the Select Possible Channels dialog, which displays a list of all possible channels to manually choose from.
Clear Channels	Clear the channels from the path elements.

7.3.4.3   Apply the Work
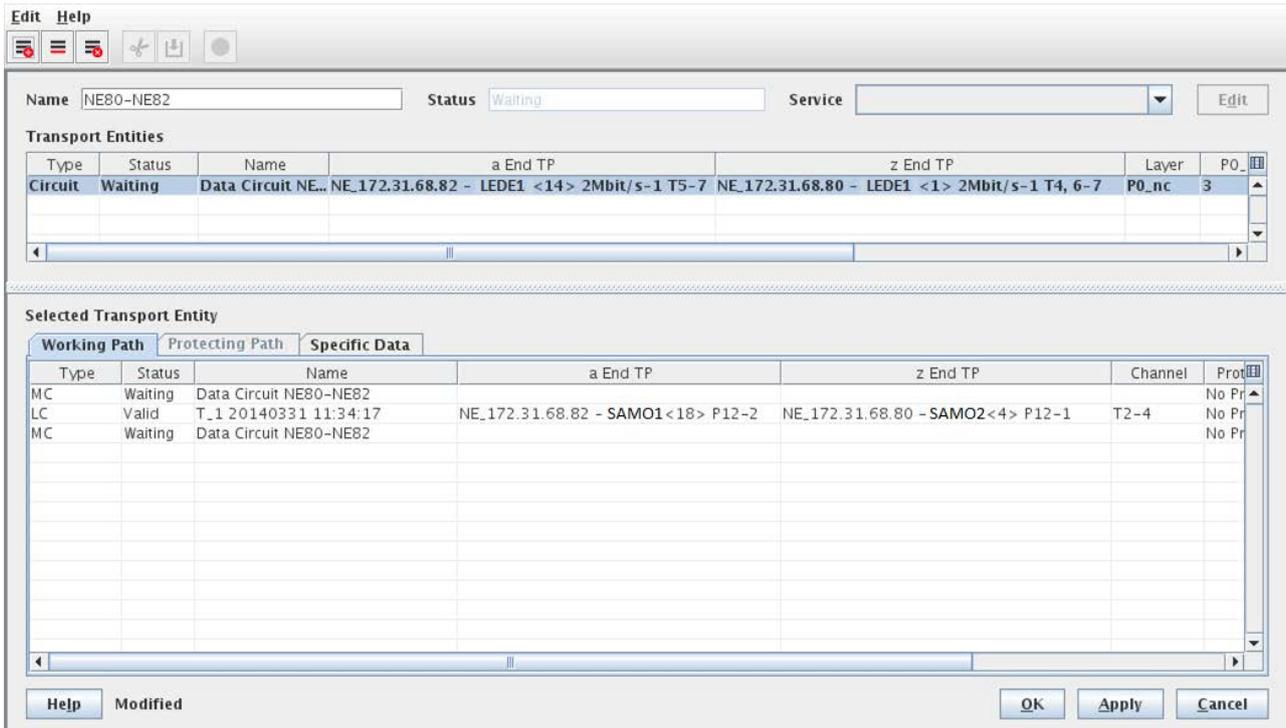
Figure 78:   The created cross connections

The Application is now ready to be applied to the network.
- «Apply» to start the down load process to all relevant NEs.
- «OK» to close the window.
- «Cancel» to exit without making any changes.
- The Circuit has now been completed.
- The Circuit is maintained in the database.
- The cross connections are created which means the MCs are now in a valid state.

If all downloads are successfully applied the network will transport a bi-directional P0_nc signal from A to Z. The Application will state this situation for all selected cross connection with the identification Valid.

7.3.4.4   Manually Protection Routing

With the Set Protection option, it is possible to route the same service over another Path. The procedure is the same as has been described for the standard Working Path.
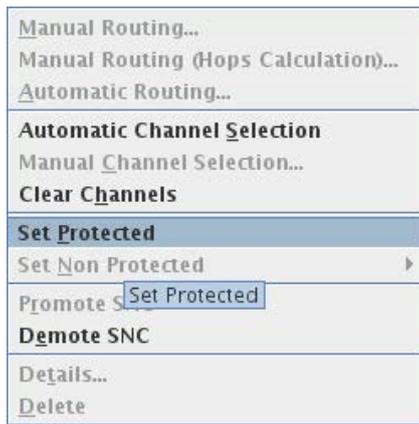
Figure 79:   Menu structure

Table 28:   Set Protected

Set Protected	Add protection to the TE.
	Allows the FOXMAN-UN NP to search for the protected Path having enough capacity for the service to be routed.

Selecting "Set Protected" activates the Protecting Path menu:
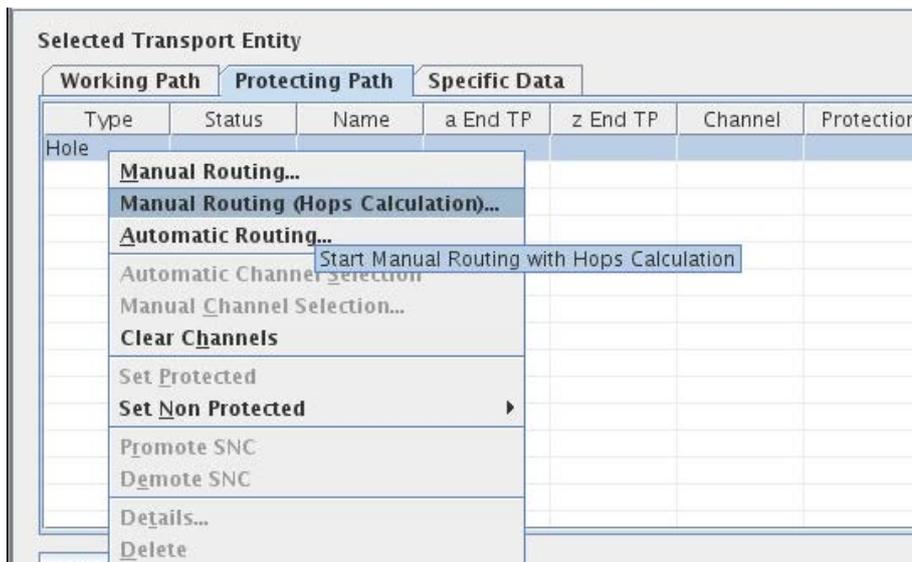
7.3.5   Automatic Routing

The Automatic Routing process of FOXMAN-UN NP enables the route completion in one operation with common user criteria that can be selected in the sub-menu «Set Auto Routing Parameters».

Any transport Entity having a Hole in its path can be automatically routed if there is a possible route in the network. If a route is found, a channel for each found Trail is selected.
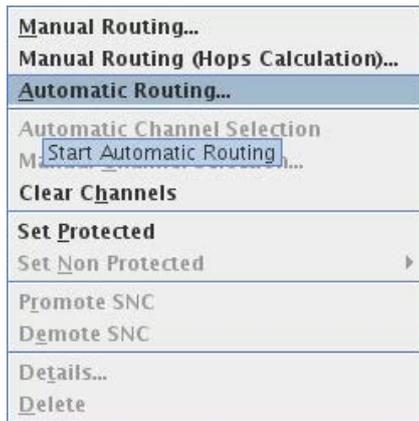
Figure 80:   Menu structure

7.3.5.1   Automatically Protected Routing

The Automatic Routing process can also be used in protected environment. FOXMAN-UN NP will recognize if the protected path of a Transport Entity is routed through the network element already used in the working path (e.g. in our sample, NE81 is already used by the working path)

The operator will be informed with the following message box:

Figure 81:   Message Box

If the operator accepts, the automatic routing for the Protecting Path is launched.

7.3.5.2   Automatic Routing Parameters

The Set Routing Parameter dialog is called via NP Main Window > Options > «Set Auto Routing Parameters…»
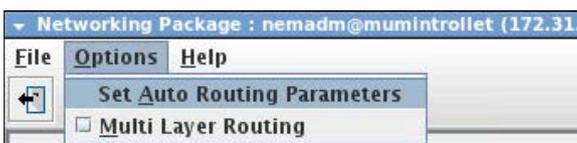
Figure 82:   Call Set Auto Routing Parameters dialog
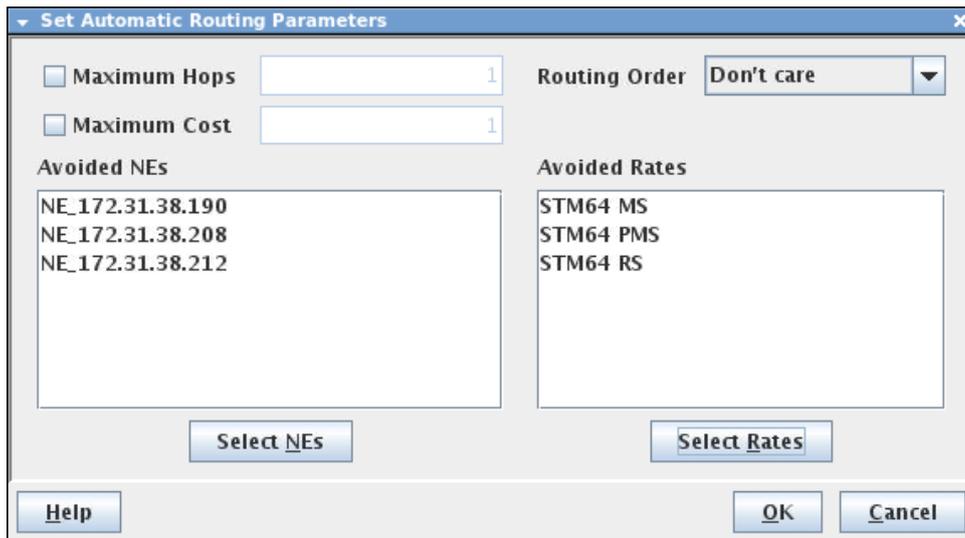
Figure 83:   Setting the Routing Parameters

Table 29:   Automatic Routing Parameters

Maximum Hops	Allows the selection of the number of hops within a path. The route should not exceed specified value.
Maximum Cost	Allows to define the maximum cost as routing criteria for the TE. The cost of the route should not exceed specified value.
Routing Order	The path should follow an optimization as follows: - Shortest, - Cheapest.
Avoided NEs	Allows to specify Network Element(s) through which the routing is not allowed. Note: To make sure that "Avoided NEs" is also considering intermediate NEs of found trails to be avoided when routing topological TEs, and not only A-End and Z-End NEs of found trails, add the parameter "np_use_topote_in_avoidne_check" with option "true" to the file /opt/nem/etc/np.conf. The NP service (nem-np-networkmgr.service) needs to be restarted for this option to take effect.
Avoided Rates	Allows to specify Layer Rates of Trail through which the routing is not allowed.

7.3.6   Change of Sections

This chapter describes recommended procedures. Its contents are applicable to one sample use case out of many possible scenarios. In case of doubt, please contact technical support.

Changing a layer rate on a section between two nodes requires that the section carrying the trails/circuits is removed in FOXMAN-UN between the two nodes, and a new section is added. With a FOX51x node (SYN4E units for optical sections) the recommended procedure e.g. for changing the physical layer rate from STM-1 to STM-4 is as shown in the first example. The second example describes the recommended procedure for FOX61x nodes with SAMO1 units.

The examples assume nodes 81 and 83, and section A (STM-1) between the two nodes. Refer to Figure 84 where the two situations **A** (section with STM-1 layer rate) and **B** (same section, now with STM-4 layer rate) are shown.
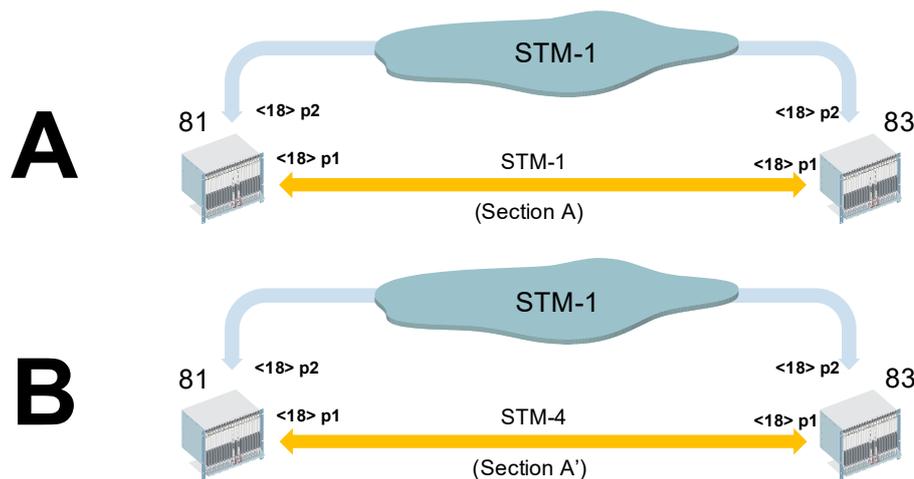
Figure 84:   Change of section layer rate (sample)

Recommended sample procedure for FOX51x nodes equipped with SYN4E units

Sample procedure for FOX51x nodes equipped with SYN4E units. Note that this requires on-site intervention if single-rate SFP modules are used. Also note that disabling the subunits, and re-enabling them after changing the layer rate may not be required, depending on the preferred on-site procedure.

Proceed as follows:

1. FOXMAN-UN / UCST: Get (and print) an inventory of VC4 layer cross connections on node 81. Take appropriate measures not to lose management access to nodes 81 and 83 when re-configuring section A.

2. FOXMAN-UN / UCST: Disable the STM1 subunit providing the physical port to section A of node 81. This will disable the physical port and remove the cross connections of that subunit on node 81.

3. FOXMAN-UN / UCST: On the same subunit change the physical section "Type" from "STM1" to "STM4". Enable the subunit.

4. FOXMAN-UN / UCST: Re-create the VC4 layer cross connection(s) for this STM4 subunit in node 81. Do not yet download the configuration to the node.

5. FOXMAN-UN / UCST: Get (and print if required) an inventory of VC4 layer cross connections on node 83.

6. FOXMAN-UN / UCST: Disable the STM1 subunit providing the physical port to section A of node 83. This will disable the physical port and remove the cross connections of that subunit on node 83.

7. FOXMAN-UN / UCST: On the same subunit change the physical section "Type" from "STM1" to "STM4". Enable the subunit.

8. FOXMAN-UN / UCST: Re-create the VC4 layer cross connection(s) for this STM4 subunit in node 83. Do not yet download the configuration to the node.

The following action is to be taken immediately before on-site intervention.

9. FOXMAN-UN / UCST: Download the configurations to node 81 and to node 83. If you do not have remote management access with interrupted section A take the configuration files on-site for local configuration download.

The following actions are to be taken on-site (with single-rate SFPs).

10. On both node 81 and node 83 unplug the fibers on the front port that is to be changed from STM-1 to STM-4.

11. Replace the STM-1 SFP modules by STM-4 SFP modules.

12. Re-connect the fibers on the front port of node 81 and on the front port of node 83.

The following actions are taken off-site, but may require on-site intervention.

13. FOXMAN-UN: Delete section A with old layer rate between node 81 and node 83.

14. FOXMAN-UN: Create section A' with new layer rate between node 81 and node 83.

15. FOXMAN-UN NP: Verify that all Transport Entities of the new section are listed correctly, and their status is valid.

End of instruction

Recommended sample procedure for FOX61x nodes equipped with SAMO1 units

The following is a recommended sample procedure for FOX61x nodes equipped with SAMO1 units; note that this requires on-site intervention if single-rate SFP modules are used. Also note that setting the admin state of the ports to down, and to up again after changing the layer rate may not be required, depending on the preferred on-site procedure.

If single-rate SFPs are used the following action is to be taken immediately before on-site replacement of the STM-1 SFP modules by STM-4 SFP modules; with multi-rate SFPs on-site intervention may not be required.

Proceed as follows:

1. FOXMAN-UN/FOXCST: Get (and print) an inventory of VC4 layer cross connections on nodes 81 and 83. Create backup files for nodes 81 and 83. Take appropriate measures not to lose management access to nodes 81 and 83 when re-configuring section A.

2. FOXMAN-UN/FOXCST: Optional: Set the admin state to "down" for the STM1 port to section A of node 81.

3. FOXMAN-UN/FOXCST: On the same port change the PS "Port Mode" from "STM1" to "STM4". The VC4 cross connection on that port on node 81 will remain.

4. FOXMAN-UN/FOXCST: Optional: Set the admin state to "down" for the STM1 port to section A of node 83.

5. FOXMAN-UN/FOXCST: On the same port change the PS "Port Mode" from "STM1" to "STM4". The VC4 cross connection on that port on node 83 will remain.

The following actions are to be taken on-site (with single-rate SFPs).

6. On both node 81 and node 83 unplug the fibers on the front port that is to be changed from STM-1 to STM-4.

7. Replace the STM-1 SFP modules by STM-4 SFP modules.

8. Re-connect the fibers on the front port of node 81 and on the front port of node 83.

The following actions are taken off-site, but may require on-site intervention.

9. FOXMAN-UN/FOXCST: Optional (to be done if admin state has been set to "down" before): Set the admin state to "up" for the STM4 ports on node 81 and on node 83.

10. FOXMAN-UN: Delete section A with old layer rate (STM1 PMS) between node 81 and node 83.

11. FOXMAN-UN: Create section A' with new layer rate (STM4 PMS) between node 81 and node 83.

12. FOXMAN-UN NP: Verify that all Transport Entities of the new section are listed correctly, and their status is valid.

End of instruction

7.3.7   Integration of a New Node

This chapter describes recommended procedures. Its contents are applicable to one sample use case out of many possible scenarios. In case of doubt, please contact technical support.

Assuming you have a circuit from port 4 on node 81 to port 4 on node 83, using an STM1 optical section between node 81 and node 83 (situation **A** in Figure 85). Now you want to insert a new node 82 into that optical section so that the circuit will be running from port 4 on node 81 via node 82 to port 4 on node 83 (situation **B** in Figure 85).
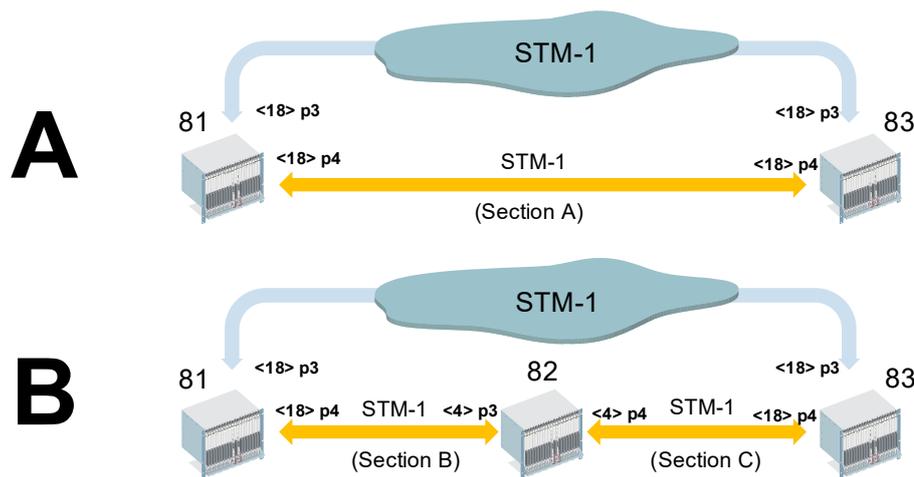
Figure 85:   Insertion of a new node (sample)

Inserting a new node (82) into an existing Trail (or section A between node 81 and node 83, respectively) requires a procedure as follows. Note that this includes on-site intervention.

Recommended sample procedure for a FOX51x based network with SYN4E units.

Proceed as follows:

The following steps are taken off-site or on-site.

1. FOXMAN-UN/UCST: If you have protecting Trails or SNCs for the working section in which you need to insert the new node, switch the traffic over to the protecting Trails or SNCs. Also make sure you do not lose management access to nodes 81 and 83 when breaking section A in a later step.

2. UCST: Save the configuration of the nodes 81 and 83.

3. FOXMAN-UN NP: Get inventory of Transport Entities over the section A (use Section Editor, select section A, click "Open Circuit..." from the context menu, select the "Transport Entities" tab, and expand the "Section A" name). Make sure you are aware of all circuits and trails running over this section.

4. UCST: Create the configuration for the new node 82 with all required units, parameters and settings like synchronization, management communication channels (DCN), subunits/port configurations, cross connections, cabling, etc. Take into account the inventory of Transport Entities over the section A taken in previous step. Make the configuration file ready to be accessible when on-site.

5. UCST (optional): Enable Automatic Laser Shutdown and Automatic Laser Restart on the STM1 ports of nodes 81 and 83 if required for safety reasons.

The following actions are to be taken on-site (at node 82).

6. Physically open the section A (if configured, this will shut down the lasers, and operations can be executed without danger). Insert node 82, i.e. connect fibers to create section B and section C.

7. UCST: Locally connect to node 82 and download the configuration created in step 4 of the current procedure.

8. UCST: If required perform an ALS (Automatic Laser Shutdown) Manual Restart on the physical section for the subunits on nodes 81 and 83.

9. Make sure the ports' operational state is up.

The following actions are taken off-site, but may require on-site intervention.

10. FOXMAN-UN: Add node 82 to FOXMAN-UN (basic procedure).

11. FOXMAN-UN: Check management connectivity; if not working, on-site action may be required to correct this.

12. FOXMAN-UN Section Manager: Delete section A.

13. FOXMAN-UN Section Manager: Create section B between node 81 and node 82; create section C between node 82 and node 83 (see situation **B** in Figure 85).

14. FOXMAN-UN NP: Add node 82 to the NP Domain.

15. FOXMAN-UN NP: The new circuit is created automatically.

16. FOXMAN-UN NP: Check that all Transport Entities are set up as expected, and their individual status is valid.

17. After verification of all changes, switch the traffic back from protecting Trails or SNCs to the working ones if required.

If manual creation of cross connections in UCST as in step 4 above is not wanted, the original circuits can be re-routed automatically or manually in FOXMAN-UN NP. This procedure may be preferred if manual creation of cross connections with UCST is unwanted.

In the above procedure, after having added the node 82 to the NP domain (step 14), depending on the trails listed in step 3 above, you will have to add VC4 and VC12 trails between nodes 81 and 82, and between nodes 82 and 83 to enable routing of circuits.

End of instruction

Recommended sample procedure for an FOX61x based network with SAMO1 units.

Proceed as follows:

1. FOXMAN-UN/FOXCST: If you have protecting Trails or SNCs for the working section in which you need to insert the new node, switch the traffic over to the protecting Trails or SNCs. Also make sure you do not lose management access to nodes 81 and 83 when breaking section A in a later step.

2. FOXMAN-UN/FOXCST: Make backup of nodes 81 and 83 (save configuration to disk).

3. FOXMAN-UN NP: Get inventory of Transport Entities over the section A (use Section Editor, select section A, click "Open Circuit..." from the context menu, select the "Transport Entities" tab, and expand the "Section A" name). Make sure you are aware of all circuits and trails running over this section.

4. FOXCST (standalone version): Create offline configuration for the new node 82 with all required units, parameters and settings like synchronization, management communication channels (DCN), port configurations, cross connections, cabling, etc. Take into account the inventory of Transport Entities over the section A taken in previous step.

5. FOXCST (standalone version): Save offline configuration for node 82 to disk. Make the configuration file ready to be accessible when on-site.

The following action is to be taken immediately before on-site intervention.

6. FOXMAN-UN: Disable section A by putting the section A ports on nodes 81 and 83 to admin state "down" (this will shut down the lasers, and operations can be executed without danger).

The following actions are to be taken on-site (at node 82).

7. Physically open the section A and insert node 82 (i.e. connect fibers to create section B and section C).

8. FOXCST: Locally connect to node 82 and download the configuration created in step 4 of the current procedure.

9. FOXCST: Enable sections B and C by settings the admin state of ports on nodes 81 and 83 to "up". Make sure the ports' operational state is up.

The following actions are taken off-site, but may require on-site intervention.

10. FOXMAN-UN: Add node 82 to FOXMAN-UN (basic procedure).

11. FOXMAN-UN: Check management connectivity; if not working, on-site action may be required to correct this.

12. FOXMAN-UN Section Manager: Delete section A.

13. FOXMAN-UN Section Manager: Create section B between node 81 and node 82; create section C between node 82 and node 83 (see situation **B** in Figure 85).

14. FOXMAN-UN NP: Add node 82 to the NP Domain.

15. FOXMAN-UN NP: The new circuit is created automatically.

16. FOXMAN-UN NP: Check that all Transport Entities are set up as expected, and their individual status is valid.

17. After verification of all changes, switch the traffic back from protecting Trails or SNCs to the working ones if required.

End of instruction

8 Network Documentation

8.1 Introduction

The Network Documentation is basically used to generate information needed to document the existing network. FOXMAN-UN NP offers the Report Network Documentation interface.

The FOXMAN-UN "Print and Export" can be use to generate information from the various Tables of FOXMAN-UN NP dialogs. It represents what the user sees on the screen whereas the NP Reports are extracting information from the whole FOXMAN-UN database.

8.2 FOXMAN-UN Print and Export

The FOXMAN-UN Print and Export represent the current situation with up to date information and are dedicated to contain a limited amount of information.

8.2.1 Print/Export Table Lists

The Print and Export functions allow you to print or export reports as they are shown in the Tables of the following Windows/Dialogs:

- Main Window:
  - Event logs.
- Application Manager List.
- Application:
  - Transport Entities,
  - Selected Transport Entity,
  - Next Hop (Manual Routing/Manual Routing (Hop Calculation)),
  - Select Possible Channels (Manual Channel Selection).
- New TE:
  - Select NE,
  - TP Browser,
  - a End TP/z End TP.
- TTP:
  - Other Parameters,
  - CTP.
- Set Auto Routing Parameters:
  - Choose Avoided NEs,
  - Choose Avoided Rates.

8.2.2 Print/Export Menu/Options

The Print/Export menu is called by right-clicking on the icon ▦ located at the edge of a Table list as shown in the sample below:
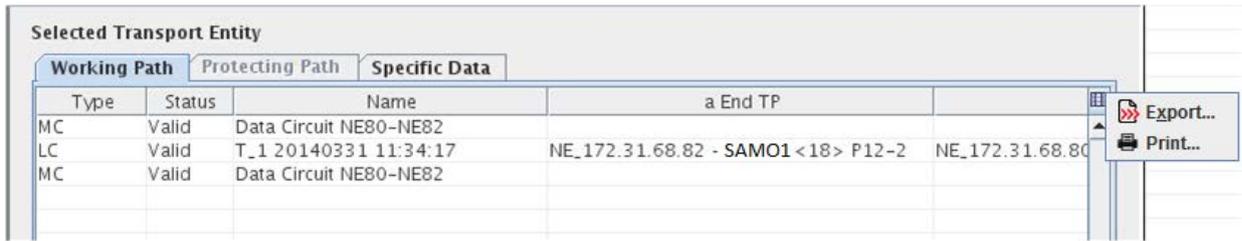
Figure 86:   The Print/Export menu

The Print Options pop-up window allows to adjust the print output, to preview and to print the selected Table list.
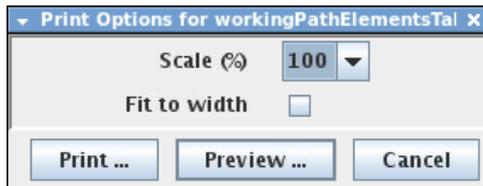
Figure 87:   Print Options
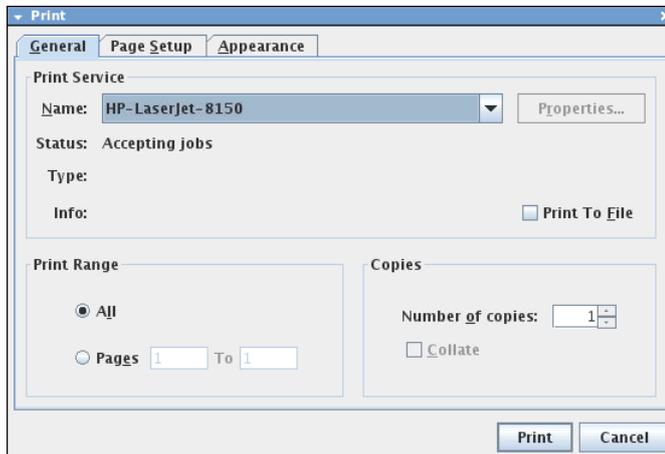
Figure 88:   Print Service Set Up

The General Tab's "Print Service" menu allows you to select the Printer from the list of configured printers in your Linux system (System > Administration > Printing).

The Export menu allows to save the selected Table list in csv or xml format in the server directory. It is possible to open the csv file with Windows excel.
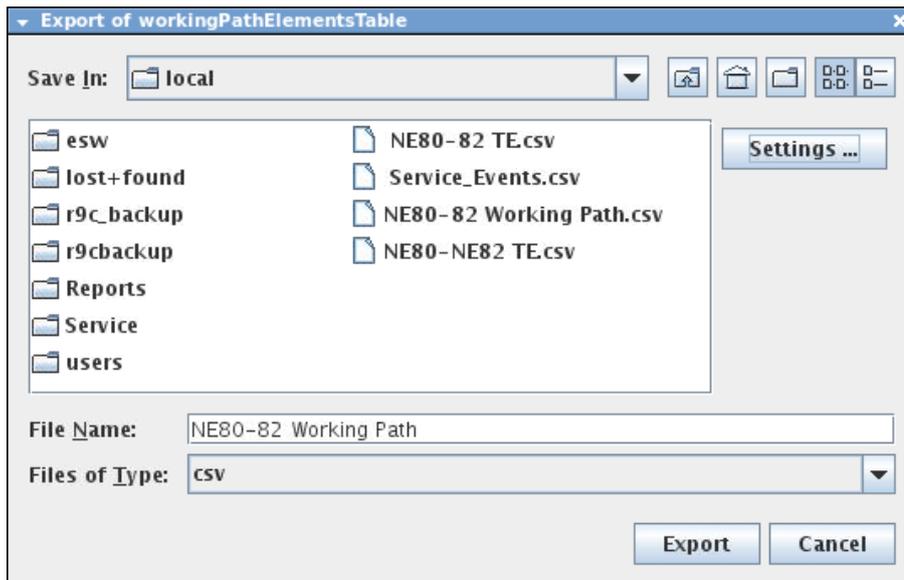
Figure 89:   Export sub-menu

Figure 90:   CSV Export Settings

The resulting Print and Export outputs are shown in the screenshots below:

Figure 91:   Print Selected Transport Entity: Working Path

Figure 92:   Export Selected Transport Entity: Working Path

8.3   NP Reporting Tool

8.3.1   Installation

The NP Reporting Tool is installed automatically together with the FOXMAN-UN system. It adds the required script to the /opt/nem/bin directory.

If required, the script can be run on a regular basis by creating a cronjob.

8.3.2   Generating Reports

Reports are generated on executing the Reporting Tool script as follows:

- Login on the FOXMAN-UN workstation as an administrator.
- Open a terminal and enter the command:
  `npgenreports`
  This command has no options.
- A report directory will be automatically created under the directory `/opt/nem/var/reports/np` using the naming convention:
  <Year>_<Month>_<Day>__<Hour>_<Minute>

```
[nemadmin@nemsrv ~]$ npgenreports

Starting NP Report generation

Creating report directory: /opt/nem/var/reports/np/2017_02_27__10_23

EndToEnd reports:
=====================
Done.

Port reports:
=====================
Done.

NP reports:
==========
generation ...
Done.
```

- The generated report files will be placed in the report directory.

For example these reports have been generated in /opt/nem/var/reports/np:

```
[nemadmin@nemsrv np]$ ls -l
total 8
drwxr-sr-x 2 nemadm nem 4096 Feb 27 10:17 2017_02_27__10_16
drwxr-sr-x 2 nemadm nem 4096 Feb 27 10:24 2017_02_27__10_23
```

Each folder contains a set of CSV files that can be used in any third party tool like Microsoft Excel.
The following files have been generated:

```
[nemadmin@nemsrv 2017_02_27__10_23]$ ls -l
total 960
-rw-r--r-- 1 nemadm nem 349449 Feb 27 10:23 endtoend.csv
-rw-r--r-- 1 nemadm nem    404 Feb 27 10:24 inv_allnes.csv
-rw-r--r-- 1 nemadm nem   3992 Feb 27 10:24 inv_allunits.csv
-rw-r--r-- 1 nemadm nem   2476 Feb 27 10:24 inv_externalports_e12.csv
-rw-r--r-- 1 nemadm nem 255374 Feb 27 10:23 np_applications.csv
-rw-r--r-- 1 nemadm nem     10 Feb 27 10:24 np_customers.csv
-rw-r--r-- 1 nemadm nem   1193 Feb 27 10:24 np_sections.csv
-rw-r--r-- 1 nemadm nem   1193 Feb 27 10:24 np_sections_e12.csv
-rw-r--r-- 1 nemadm nem   1193 Feb 27 10:24 np_sections_o22.csv
-rw-r--r-- 1 nemadm nem   1193 Feb 27 10:24 np_sections_pms.csv
-rw-r--r-- 1 nemadm nem 303852 Feb 27 10:24 np_tes.csv
-rw-r--r-- 1 nemadm nem  32183 Feb 27 10:23 port.csv
```

> **i** **Please note:**
> Depending on the network size, the reports may take several Mb of disk space. It is recommended to remove old report folders.

> **i** **Please note:**
> For performance reasons, it is recommended to start the NP reports at night or at a time when the load of the workstation is reduced (e.g. to avoid starting the NP reports when several users are working simultaneously.

8.3.3   NP Reporting Tool Files

The NP Reporting Tool generates the following files with the following information:

Table 30:   NP Reporting Tool Files

- inv_allnes.csv:	All configured network elements (FOX51x, FOX61x and NEs of type FO)
- inv_ allunits.csv:	All configured units.
- inv_externalports_E12.csv:	All E12 (2 Mbit/s) ports
- np_applications.csv:	All Applications
- np_customers.csv:	All Circuits customer data
- np_sections.csv:	All Sections
- np_sections_e12.csv:	All E12 (2 Mbit/s) Sections
- np_sections_o22.csv:	All O22 (8 Mbit/s) Sections
- np_sections_pms.csv:	All PMS (STM1) Sections
- np_tes.csv:	All Transport Entities (Circuits/Trails/SNCs)
- endtoend.csv:	All Transport Entities (circuits, trails, SNC) with path details
- port.csv:	All ports and detailed time slot occupation

Table 31:   inv_allnes.csv

- Network Element Type	- Network Element Location
- Network Element Name	- Network Element System Type
- Network Element Tag	- Network Element Config Id

Table 32:   inv_allunits.csv

- Network Element Type	- Network Element Name
- Network Element Tag	- Network Element Location
- Network Element System Type	- Network Element Config Id
- Unit type	- Unit slot
- Unit identity	- Unit description
- Unit SW version	

Table 33:   inv_externalports_E12.csv

- Network Element Type	- Network Element Name
- Network Element Tag	- Network Element Location
- Network Element System Type	- Network Element Config Id
- External port name	- Layer rate
- External port type	- Is active?
- Operational state	- Is Free?

Table 34:   np_applications.csv

- Application name	- Application service
- Application status	- Application manager
- Number of TEs	- Main TE type
- Main TE name	- Main TE A End NE name
- Main TE A End NE type	- Main TE A End NE system
- Main TE A End NE tag	- Main TE A End NE location
- Main TE A End TP label	- Main TE A End TP chan
- Main TE A End TP chan label	- is Main TE A End TP active
- Main TE A End TP unit type	- Main TE A End TP unit slot
- Main TE A End TP sub slot	- Main TE A End TP port number
- Main TE A End TP unit id	- Main TE A End TP unit descr
- Main TE A End TP unit vers	- Main TE Z End NE name
- Main TE Z End NE type	- Main TE Z End NE system
- Main TE Z End NE tag	- Main TE Z End NE location
- Main TE Z End TP label	- Main TE Z End TP chan
- Main TE Z End TP chan label	- Main TE Z End TP active
- Main TE Z End TP unit type	- Main TE Z End TP unit slot
- Main TE Z End TP sub slot	- Main TE Z End TP port number
- Main TE Z End TP unit id	- Main TE Z End TP unit descr
- Main TE Z End TP unit vers	- Main TE layerRate
- Main TE status	- Main TE direction
- Main TE protection mode	- Main TE protection type
- Main TE is Topo	- Main TE is Fixed
- Main TE cost	- Main TE CAS for P0nc
- Main TE nb channels (Trails)	- Main TE nb used channels (Trails)
- Main TE is used (SNCs)	- Main TE A customer (Circuits)
- Main TE Z customer (Circuits)	-

The following files contain the information listed on the table below:

- np_sections.csv,
- np_sections_e12.csv,
- np_sectoins_pms.csv,
- np_test.cst.

Table 35:   np_sections and np_test

- Application name	- Application service
- Application status	- Application manager
- TE type	- TE name
- TE A End NE name	- TE A End NE type
- TE A End NE system	- TE A End NE tag
- TE A End NE location	- TE A End TP label
- TE A End TP chan	- TE A End TP chan label
- is TE A End TP active	- TE A End TP unit type
- TE A End TP unit slot	- TE A End TP sub slot
- TE A End TP port number	- TE A End TP unit id
- TE A End TP unit descr	- TE A End TP unit vers

Table 35: np_sections and np_test

- TE Z End NE name	- TE Z End NE type
- TE Z End NE system	- TE Z End NE tag
- TE Z End NE location	- TE Z End TP label
- TE Z End TP chan	- TE Z End TP chan label
- is TE Z End TP active	- TE Z End TP unit type
- TE Z End TP unit slot	- TE Z End TP sub slot
- TE Z End TP port number	- TE Z End TP unit id
- TE Z End TP unit descr	- TE Z End TP unit vers
- TE layerRate	- TE status
- TE direction	- TE protection mode
- TE protection type	- TE isTopo
- TE isFixed	- TE cost
- TE CAS for P0nc	- TE nb channels (Trails)
- TE nb used channels (Trails)	- TE nb free channels (Trails)
- TE nb channels used by Unknown TE (Trails)	- TE is used (SNCs)
- TE A customer (Circuits) <End Point 1 A Data Field>(Circuits) <End Point 2 A Data Field>(Circuits) <Data1> (Circuits) <Data3> (Circuits)	- TE Z customer (Circuits <End Point 1 Z Data Field>(Circuits) <End Point 2 Z Data Field>(Circuits) <Data2> (Circuits)

Table 36: endtoend.cst

- Application name	- Trail Label
- TE type	- Operational State (MC)
- TE name	- Channel (LC)
- TE A End NE name	- Label
- TE A End TP label	- TE A customer
- TE Z End NE name	- TE Z customer
- TE Z End TP label	- <End Point 1 A Data Field>
- Working path	- <End Point 1 Z Data Field>
- Path Elt Type	- <End Point 2 A Data Field>
- NE name (MC)	- <End Point 2 Z Data Field>
- A End Work	- <...>
- Z End	- <Data 1>
- A End Prot	- <Data 2> - <Data 3>
- Directionality	- <...>
- Status (LC/SNC)	

Table 37: port.csv

- Network Element Name	- Z End TP
- External Port Name	- TE A customer
- Slot	- TE Z customer
- Port	- <End Point 1 A Data Field>
- Channel	- <End Point 1 Z Data Field>
- n*64 kbit/s	- <End Point 2 A Data Field>
- Cross-Connect inside NE	- <End Point 2 Z Data Field>

Table 37:   port.csv

- Local Termination	- <...>
- TE Type	- <Data 1>
- A End NE	- <Data 2> - <Data 3>
- A End TP	- <...>
- Z End NE	

9 Appendix A - Supported FOX61x Units

Table 38: **Supported FOX61x Units**

FOX61x Units	Description
CESM1 / CESM2 CESM1-F / CESM2-F (fanless)	Control, 1/10 GbE uplink (5 Ethernet ports).
CESM3	Control, 10 Gb Ethernet switch, uplinks, sync (5 Ethernet ports).
EPSI1	Ethernet Aggregation Unit (4 Ethernet ports).
LEDE1	E1 Trunk (8 ports).
SAMO2 / SAMO2-F (fanless)	STM-16/STM-4/STM-1 Trunk (4 SDH ports, 4 Ethernet ports).
SAMO3	STM-16/STM-4/STM-1 Trunk (4 SDH ports, 4 Ethernet ports, 48 E12 ports).
SAMO5 / SAMO5-F (fanless)	STM-4 /STM-1 Trunk (4 SDH ports, 4 Ethernet ports).
DATI1	TDM SHDSL Interface (8 ports).
LESU1	POTS Subscriber Interface (16 ports).
SAMO1	STM-4/STM-1 Trunk (4 SDH ports, 4 Ethernet ports).
CEPI1	Circuit Emulation Service over Packets Gateway and Service units with 8 E1 ports.
LEDS1	- Serial Data Interfaces: V.24/V28,V.35 (Appendix II),X.24/V11, RS485; - 10Base-T/100 Base-T interface.
LEDA1	2w/4w Analogue Telephony- E&M (8 ports).
LECO1	64 kbps G.703 Interface (8 ports).
LEXI1	POTS Exchange Interface -FXO (12 ports).
COSI1	SIP VoIP Subscriber Media Gateway, 1216 Bearer Channels.
ODIS1	Optical Teleprotection, distance protection.
OPIC1	Optical Teleprotection, TDM Services, 4 Ports.
OPIC2	Optical Teleprotection, Packet Services, TDM Services, 4 Ports.

10   Appendix B - NP Quantitative Requirements

This section specifies the quantitative requirements for FOXMAN-UN NP.

Slowness in the NP execution should be expected in case any of the specified limit is exceeded.

> **i**   **Please note:**
> Contact the responsible Hitachi Energy for questions and any installation exceeding the recommended configuration.

Table 39:   Network

Parameter	Recommended	Limit
Number of NE in NP domain	800[1]	1,000
Number of units (NP domain only)	5,000	10,000
Number of ports (NP domain only)	20,000	40,000
Number of sections (only between NEs in the NP domain)	2,000	2,500

1. Due to FOX51x constraints, the network capacity cannot be used at 100%.

Table 40:   HW Platform

Parameter	Recommended	Limit
Number of Threads	12	--
RAM	32 GByte	--
Connection speed between the client and server	LAN speed	--

11   Appendix C - The NEs of type FO

11.1   Introduction

The FOXMAN-UN BP topological representation allows the user to use equipment and network of a third party equipment provider. A generic topological network element is created by the user and referred to as a Network Element (NE) of type «Foreign Object» (FO). An NE of type FO may have a Termination or Transport function for Circuits.

An example of the usage for an NE of type FO in a Transport configuration is a SDH transport network as shown below.

Figure 93:   Passing the third party network

The user has two possible ways to model this network topology:

- A single NE of type FO is used to represent the whole third party network as shown in Figure 94:
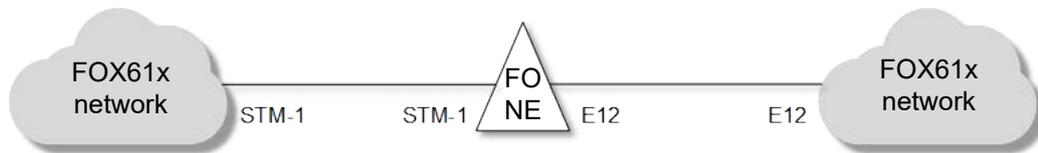
Figure 94:   Passing one NE of type FO

- The NE of type FO is used to represent each edge third party equipment of the SDH network; in this example two such NEs as shown in Figure 95:
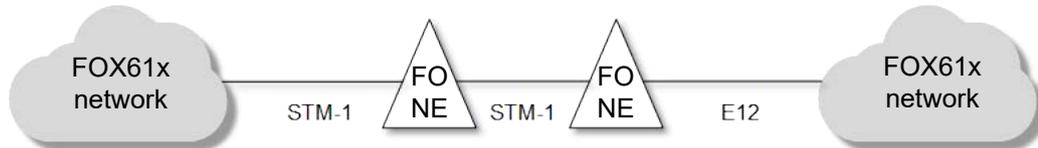
Figure 95:   Defining the edges by two NEs of type FO

11.1.1   The NEs of type FO in the FOXMAN-UN NP

All NEs of type FO the user adds to the system are also available to the Networking Package. Since the FOXMAN-UN BP doesn't know anything about their internal function initially, they are set up as simple network elements to which sections (via external ports) are bound. They need to be provided with termination points (TTPs) for external ports, defining also their internal structure. This is done while creating the NE of type FO.

In the example in figure Passing one NE of type FO above, the user needs to define the external ports of the NE of type FO via TTP configuration for at least one external STM-1 port and at least one external E12 port.

In the example in figure Defining the edges by two NEs of type FO above, the user needs to define the external ports of both NEs of type FO via TTP configuration for at least two external STM-1 ports for the first of the two NEs of type FO, and one STM-1 and one E12 ports for the second one.

The internal structure of the first NE of type FO is assumed to provide a signal structure STM1 PMS / RS / MS / VC-4 / VC-12 / P12. The internal structure of the second NE of type FO is

assumed to multiplex/demultiplex the signal structure from E12 to STM-1 and vice versa. It is also assumed that the multiplex/demultiplex structure is the same as used by the FOX61x NEs.

The E12 port can be defined with the termination modes

- Terminated (i.e. P0_nc timeslot structured signal),
- Transparent (i.e., no P0_nc structure),
- Clock (i.e., no data signal but providing clock information).

11.2   Automated Completion System

Once the FOXMAN-UN NP database is populated with existing NEs, the user has to create the missing connectivity with NEs of type FO in terms of missing logical Trails, Topological SNCs, and Circuits.

The manual completion operation is supported through the auto-creation of layer hierarchies and SNCs based on layer rates and port types defined by TTP creation for the NE of type FO.

In the example above, the NE of type FO may have two STM-1 ports and an E12 port. Each of the ports needs to be defined via a TTP:

- TTP on port 1 with:
    - Port = 1
    - Layer rate = STM1 PMS
    - Label = leave empty; will be set automatically
    - Active = true
    - Port type = Ext. optical
    - P12 mode = not relevant, leave as is
    - Number of 64k = not relevant, leave as is
    - Has CAS = not relevant, leave as is
    - Support CAS in last TS = not relevant, leave as is
- TTP on port 2 with:
    - Port = 2
    - Layer rate = STM1 PMS
    - Label = leave empty; will be set automatically
    - Active = true
    - Port type = Ext. optical
    - P12 mode = not relevant, leave as is
    - Number of 64k = not relevant, leave as is
    - Has CAS = not relevant, leave as is
    - Support CAS in last TS = not relevant, leave as is
- TTP on port 3 with:
    - Port = 3
    - Layer rate = E12
    - Label = leave empty; will be set automatically
    - Active = true
    - Port type = Ext. electrical
    - P12 mode = Terminated
    - Number of 64k = 32
    - Has CAS = true
    - Support CAS in last TS = disabled

Once the two TTPs are applied, the NE of type FO is available for routing as its internal multiplex structure has been defined automatically based on the two ports and their TTPs.

The settings for the TTPs can be exported into an xml file or, when saved before, imported from an xml file.

11.3   Sample Procedure to Route a Circuit

To successfully route, e.g., using a FOX61x network (assuming NE_80 and NE_82) with a P12 trail going via two NEs of type FO, the following procedure may be used as guideline:

Proceed as follows: (sample setup)

1. Make sure to configure the NE_80 and NE_82 so as to having a setup that provides connectivity for multiplexing a P12 trail from within the NE over, e.g., a configured STM1 port of a SAMO2 unit.

2. In the NEM Configurator, under Agents, create an agent of type FO.

3. From the context menu of the newly created agent, select "Create NE" to create FO-STM1-1:

4. Set the Name (tab "Configuration").

5. Set the FO key (tab "Configuration"; must be unique).

6. Go the "TTP" tab.
   • click on "Add" to add the first optical STM1 TTPs (use the settings for port 1 and port 2 given in section section 11.2). Click "Apply" to save port 1.
   • increase "Port" to "2".
   • Delete the "Label".
   • Click "OK" to save the TTP for port 2.

7. Now that both STM1 ports are configured, click "Apply" to save FO-STM1-1.

8. In the "Configuration" tab change the name to "FO-STM1-2" and increase the FO Key by 1.

9. Go again the "TTP" tab.
   • Check that the two TTPs from step 5 above are still there and click on "OK" to apply the same two TTPs to FO-STM1-2 and to close the creation dialog.

10. In the NEM Configurator, when selecting the an agent of type FO, the two new NEs of type FO are now listed:

Name ▲1	Addressing	Alarm State	Operational State	Save State	Supervision	NE Type	ID	Agent Na..
FO-STM1-1		Cleared	Manageable		on	Foreign Object	132	FO1
FO-STM1-2		Cleared	Manageable		on	Foreign Object	133	FO1

11. Add the new elements (NEs of type FO) to the NP Domain.

12. Create three STM-1 optical sections:
   • NE_80 to FO-STM1-1,
   • FO-STM1-1 to FO-STM1-2,
   • FO-STM1-2 to NE_82.
   • To do so, open the "Section Management" dialog, click on "New Section", select the appropriate "A End NE" and "Z End NE", enter a "Name" for the section, set the cost if required, Select the "A End TP" and "Z End TP" from the list of available TPs, then click "Apply". Repeat this for each of the three sections from the list above.
   • This will result in the following three new entries in the section list:

Name	Layer Rate	Type	Supervision	Superv. O...	Fault State	A End NE	A End TP Label	Z End NE	Z End TP Label	Capa... ▲1
NE_80 to FO-STM1-1	STM1 PMS	Optical	Disabled			NE_80	SAMO2 <4> stm-4 (STM1-4)	FO-STM1-1	FO-UNIT <1> 1/0/1/0	155,520
FO-STM1-2 to NE_82	STM1 PMS	Optical	Disabled			FO-STM1-2	FO-UNIT <2> 2/0/2/0	NE_82	SAMO2 <14> stm-3 (STM1-3)	155,520
FO-STM1-1 to FO-STM1-2	STM1 PMS	Optical	Disabled			FO-STM1-1	FO-UNIT <2> 2/0/2/0	FO-STM1-2	FO-UNIT <1> 1/0/1/0	155,520

   • Note: alternatively you can also initiate this from the NEM Network Browser if you have already added the NEs to the map.

13. Open the Networking Package main window. Click the "Create a new Application" icon or select "File - New Application" from the menu.
   • In the Application dialog, click the "Create a new transport entity" icon or select "Edit - New..." from the menu.

14. In the "New TE" dialog, select
    - a End NE = NE_80, z End NE = N_82,
    - Type=Trail,
    - Layer=P12,
    - a End TP: any available P12,
    - z End TP: any available P12, then click "OK".
15. Select the working path entry "Hole" of the new TE and click "Manual Routing..."
    - Select the first P12 between local TP and Remote TP including the NE of type FO, then click "OK".
    - This will create the TEs for P12 and VC12 layers in the application.

12   Appendix D - Errors and Alarms

12.1   Introduction

12.1.1   Overview

This chapter contains a description of all errors and alarms raised by FOXMAN-UN NP. Each error has a unique code made of 4 digits that fits into one of the following categories:

- − Application,
- − Application/System,
- − Internal,
- − System,
- − Alarm.

12.1.2   Support

For an efficient support to troubles met with the FOXMAN-UN NP, Hitachi Energy is asking to provide the following information:

- • A description of the trouble:
  - − What are the circumstances of the trouble? Please provide maximum information specific to the trouble (Network Element name, Section Name, …).
  - − Is it reproducible?
- • A backup of the FOXMAN-UN database.
- • From the FOXMAN-UN installation directory, give the following files if they exist:
  - − /opt/nem/var/log/npnetworkmgrd.log,
  - − /opt/nem/etc/np.conf.

12.1.3   Application

Code	Error	Description/Possible Action
1000	«A loop is detected while analyzing connectivity»	This error may happen in two contexts: the user has created a Transport Entity that leads to the creation of a loop in the network =>The FOXMAN-UN NP forbids the creation of loops in the network through the GUI. If a loop is required, then the user has to create individually each MC in the FOXMAN-UN BP. It will be immediately identified as an Unknown. during the initialization of the network npresynch while processing **npfotool_crossconnect.csv** and **npfotool_termination.csv**, an existing loop is detected, the loop should be detected and removed. The FOXMAN-UN NP will not allow the user to create Transport Entities that are not End-To-End through the FOXMAN-UN NP using : the user interface. **npfotool_crossconnect.csv** and **npfotool_termination.csv**
1010	«A loop is detected while analyzing connectivity»	See 1000
1011	«Connectivity linked to Trail '%s' without Z End Point»	The requested action is not possible because the FOXMAN-UN NP has detected that a Transport Entity being created is bound to an existing trail that doesn't have a Z extremity. Locate and delete this trail first before creating any Transport Entity.

Code	Error	Description/Possible Action
1012	«Connectivity linked to SNC '%s' without Z End Point»	The requested action is not possible because the existing connectivity of the TE being created is bound to an existing SNC that doesn't have a Z extremity. Locate and delete this SNC to remove this error.
1013	«Found '%s' with incompatible direction while analyzing connectivity»	Happens during the processing of **npfotool_crossconnect.csv** and **npfotool_termination.csv** generation or through the user interface. The processing has raised an error because of a directionality mismatch with MC or SNC in the network. Please check that the directionality of the specified MC or SNC is correct.

Found	%s
MC	'MC(« MC Label »)'
SNC	'SNC(« SNC Label »)'

Code	Error	Description/Possible Action
1020 → 1025, Integrity problem.		
1020	«Affects integrity of more than one TE»	The FOXMAN-UN NP is designed such that it will prevent the user from creating non End-to-End connectivity. Invalid End-to-End connectivity may be: Loops : the signal doesn't have an origin and a destination SNCs : between two extremities used for Circuits (Subla/Exlic/..) … « Integrity » troubles are related to those Transport Entities created or modified that are not valid.
1021	«Affects integrity of the Unknown TE '%s'»	
1022	«Affects integrity of TE '%s' in Application '%s'. Current Application '%s'»	
1023	«Affects integrity of Circuit '%s' in Application '%s'. Current Application '%s'»	
1024	«Affects integrity of a TE in a different Application. Current Application '%s'»	
1025	«Found SNC with incompatible direction while analyzing connectivity»	
1026	«Connectivity linked to SNC '%s' without Z End Point»	The user has created a Transport Entity which is impacting a SNC without Z. The operator should first clean up the network : Identify the SNC : why is it there ? is it used ? can it be deleted ? Delete it or set its Z extremity.
1040	«Detected incompatible directionality while autogenerating '%s' '%s'»	This error happens during the processing of **npfotool_crossconnect.csv** and **npfotool_generation.csv** files or using the User Interface. First %s = « bidirectional » or « unidirectional » Second %s = « Circuit », « Trail », « SNC » During a « connectivity analysis » a directionality mismatch has been detected that should generate an Unknown if the user request would be accepted. Existing Unidirectional cross-connections are bearing the signal in opposite directions.
1041	«Detected incompatible directionality while autogenerating '%s' '%s'. Found Unidirectional MC '%s'»	See 1040
1042	«Detected incompatible directionality while autogenerating '%s' '%s'. Found Unidirectional SNC '%s'»	See 1040
1043	«Detected incompatible directionality while autogenerating a Trail. Cannot generate a Unidirectional Trail»	The Trail is bidirectional bearer, the FOXMAN-UN NP does not allow a user to create a unidirectional Trail.
1050	«Invalid point for SNC demotion, demoted SNC cannot start with a protected MC»	This is a limitation of the FOXMAN-UN NP. The operator has requested a special demotion not managed by the FOXMAN-UN NP. The set of path elements to be demoted should not start or end with a protected Cross Connection. The demotion always leads to gathering Path Elements into a new non protected SNC.

Code	Error	Description/Possible Action
1051	«Invalid Z end point for SNC demotion, demoted SNC cannot end with a protected MC»	See 1050.
1052	«Invalid call to SNC demotion, cannot demote whole content of '%s' path of TE '%s' (A end NE , A end TP '%s', Z end NE '%s', Z end TP '%s')»	This is a limitation of the FOXMAN-UN NP that considers meaningless to demote all Path Elements of a Transport Entity.
1060	«Cannot get channel list, number of remaining timeslots (%d) in trail '%s' is lower than TE '%s' number of timeslots (%d)»	The operator has requested the list of available channels for a LC but the Trail providing the LC doesn't have enough capacity for setting the specified LC. Ex : a P12 Trail has 4 timeslots available whereas the current Transport Entity will use more than 4 timeslots.
1061	«A loop is detected while analyzing connectivity»	This error occurs during the processing of **npfotool_crossconnect.csv** and **npfotool_termination.csv** files or through the FOXMAN-UN NP user interface. The FOXMAN-UN NP doesn't allow the creation of loops, they are not end-to-end constructs.
1071	«Nb of 64 kbits incompatible between A('%s') and Z('%s') end points»	The operator has specified A and Z extremities of a Transport Entity which have different number of P0 channels. Different number of P0 channels is allowed only for circuit between an ISDN unit and a G.703 data termination unit (GECOD).
1072	«CAS incompatibility between A end TP ('%s') CAS '%s' and Z end TP ('%s') CAS '%s'»	The FOXMAN-UN NP takes care of the CAS flag to ensure its compatibility when needed : Circuit : when a circuit is created, the CAS should be either ON or OFF on both extremities. If the CAS is ON, the FOXMAN-UN NP provides only SNC and Trails which CAS is ON at both extremities, whereas a CAS OFF Circuit doesn't care about CAS parameter for routing. Trail : when the user creates a PDH trail, the CAS should be either ON or OFF on both extremities of the Trail SNC : when a SNC is created, CAS should be either ON or OFF on both extremities except if « np_incompatible_cas_allowed_for_snc » is set to « true » in the configuration file (np.conf). Note: FOXMAN-UN NP does not check whether both extremities of a Circuit have the same CAS setting. NP only checks whether the SNC/Trail can transport CAS.

Transport Entity	Extremity CAS	Routing
Circuit	ON/OFF	
	OFF/ON	
	ON/ON	Only ON/ON Trail and SNCs
	OFF/OFF	
Trail	ON/ON	
	OFF/OFF	
SNC	ON/OFF	
	OFF/ON	
	ON/ON	Only ON/ON Trail and SNCs
	OFF/OFF	

Code	Error	Description/Possible Action
1073	«Invalid TE end points for an SNC, A and Z end points are two TTPs. Please change A ('%s') or Z ('%s') end points (at least one must be a CTP), or change the type of the TE»	The operator has requested the creation of an invalid Transport Entity. The specified extremities are matching Trail criteria. The FOXMAN-UN NP prevents from creating a SNC which extremities are matching for a Trail Transport Entity type. See 1074, the same rule is applied for Circuits, a SNC can't be created instead of a Circuit.
1074	«Invalid endpoints for an SNC, A and Z end TP are Circuit end points. Please create a Circuit instead of an SNC»	The operator has requested the creation of an invalid Transport Entity. The specified extremities are matching Circuits criteria. The FOXMAN-UN NP prevents from creating a SNC instead of a Circuit. See 1073, the same rule applies for Trails.
1075	«A and Z end points are identical (NE '%s', TP '%s'). Please change value of A or Z end point»	The operator has requested the creation of an invalid Transport Entity. The operator has specified two TPs which refer to the same point in the network. The FOXMAN-UN NP doesn't allow the user to create a loop through the User Interface. Loops are not valid End-to-End Transport Entities.
1076	«Invalid end point (NE '%s', TP '%s') that uses timeslots partially used by the TE named: '%s'»	The operator has requested the creation of an invalid Transport Entity. The operator has specified a TP extremity or rate P0nc which is already partially used by another existing Transport Entity. Example: an existing P0nc Transport Entity starts on a LEDE1 using timeslots T1-6 and the operator has requested the creation of a Transport Entity starting on the same LEDE1 sbu with timeslots T4-7. An overlapping is detected for T4-6. This is forbidden by the system.
1090	«Cannot promote a protected SNC ('%s')»	The promotion requested by the operator is not valid. The promotion of a SNC is allowed only if the SNC is completely routed and not protected. Promotion of protected a SNC is not allowed.
1100	«Cannot remove fixed sub path from bidirectional TE '%s'»	The user requested that elements of a path (SNC or LC) are removed from a selected Path. One or more elements can't be removed because they are part of the configuration that can't be modified. Ex : The user has created a circuit from a SULIC on a Network Element A to another SULIC in another network element. Once created the Path of the circuit is : [MC LC Hole LC MC]. LCs in the Path are associated to the link between the NT and the Mux and can't be removed from the Circuit at FOXMAN-UN NP level.
1101	«Invalid call, cannot remove fixed sub path from TE '%s'»	See error 1100
1120	«Channel selection failed on protecting path of TE "%s"»	Automatic channel selection action failed because the FOXMAN-UN NP did not find a set of possible channels for the protecting path. Check that the network capacity allows the Transport Entity to be completed.
1121	«Failed to select channels in TE '%s'»	Automatic channel selection failed for the working path, existing network capacity does not allow completing the Transport Entity.
1122	«Cannot set channel, more than one channel furnished and TTP '%s' cannot be grouped»	The user has tried to set multiple channels to a LC, the trail forbids the usage of multiple channels once. Ex using multiple KLMs for one LC. VC12/VC3 Transport Entities are bearing only one VC12 or VC3. N*VC12 or n*VC3 Trails are allowed, only n*P0 Transport Entities may be allowed.
1123	«Cannot set channel, number of timeslots in channel list (%d) different of TE number of timeslots (%d)»	In the case of P0nc, the channel of a LC has to be set to the same number of timeslots than the Transport Entity using the LC.
1124	«Cannot set channel, number of timeslots in TTP channel list (%d) different of TE number of timeslots (%d) and TTP '%s' can not be grouped»	The user interface did an invalid call to the server. Please report this error to the Customer support. Refer to «Support» at the beginning of this appendix for the information to be provided for an efficient analysis of the problem.

Code	Error	Description/Possible Action
1140	«Invalid channel %d for LC in trail '%s', connectivity problem»	The user interface has allowed performing an invalid request. The FOXMAN-UN NP has failed to set the specified channel to a Trail (the name is provided). The operator has asked to set a LC with a channel from the channel list window where all possible channels have been computed by the FOXMAN-UN NP. This channel should not have been provided by the server. Please report this error to the Customer support. Refer to «Support» at the beginning of this appendix for the information to be provided for an efficient analysis of the problem.
1150	«Cannot change the A end point of a TE without Z end point»	This is a limitation of the FOXMAN-UN NP. The operator can create a Transport Entity without setting the Z extremity at creation time. For such Transport Entities it's not possible to modify the A extremity unless Z is set.
1151	«Cannot change TE end point of a topological TE»	A topological Transport Entity is the physical cable (electrical or optical), the FOXMAN-UN NP is not intended to configure the topology of the network. Please, remove the cable in the BP and the FOXMAN-UN NP will be notified of the deletion.
1152	«Cannot change TE A End Point of a unidirectional TE»	This is a limitation of the FOXMAN-UN NP.
1153	«A Foreign to Foreign Transport Entity must be a SNC ('%s')»	Rules applied to Transport Entity extremities.

Source to destination	SNC	Circuit	Trail
Foreign to Foreign	OK		
Foreign to Mux		OK	OK
Mux to Foreign		OK	OK
Mux to Mux	OK	OK	OK

Code	Error	Description/Possible Action
1154	«Cannot set the A end point of a simple TE»	This is a limitation of the FOXMAN-UN NP. A simple Transport Entity has a Path made of one MC only, the A extremity for such Transport Entity can't be modified.
1155	«Setting A and Z points in the same NE is not allowed when the TE is protected (TE is ' %s ')»	The FOXMAN-UN NP does not allow creating a protected Transport Entity which extremities are inside the same Network Element. Such a Transport Entity is useless.
1156	«Cannot set TE end point to NE '%s' already used in its path. Please remove elements in path using this NE before»	The FOXMAN-UN NP prevents the user creation of loops. This happens typically in next configuration : A Transport Entity has a Path starting into a Network Element NEA, ending in NEZ and crossing { NE1 NE2 NE3 }. { NEA ➜ NE1➜ NE2 ➜ NE3 ➜ NEZ } It's not possible to modify Z Extremity to NEA, NE1, NE2 and NE3. To modify Z to be into NE2, the user has to remove elements into the path such that the path reaches NE2 and doesn't leave it.
1157	«Cannot change the A or Z end points of a TE in use. SNC '%s' is used at least by TE '%s'»	See 1158
1158	«Invalid call, cannot change the A or Z end points of a TE in use. Trail '%s' is used at least by TE '%s'»	SNC/Trails are Transport Entities which are intended to be used by other Transport Entities. Their A and Z extremity can be set to any other valid extremity only if the TE is not used.
1159	«Invalid call, cannot set A or Z end points into a foreign element because the SNC is not topological»	A SNC is either FOX51x to FOX51x, FOX61x to FOX61x or Foreign to Foreign. It's not possible to move modify the A or Z of a SNC from one NE Type (FOX51x/FOX61x/Foreign) to another. see 1153 for rule extremities.

Code	Error	Description/Possible Action
1170	«Cannot delete fixed or autogenerated TE '%s'»	The FOXMAN-UN NP gives ALL existing Transport Entities in the network. Transport Entities are either : Created by the user: using FOXMAN-UN NP or BP. Those Transport Entities can be managed: deleted, modified, rerouted Fixed : they can't be managed by the user because they are physical cables (Optical, Electrical). Autogenerated : logical connectivity defined by the SDH/PDH/DSL hierarchies that can't be modified. Example : SDH provides Regeneration/Multiplexing/VC4 layers. The latter two can't be managed (deleted/modified) through the FOXMAN-UN NP.
1171	«Invalid parameters, A and Z end points are identical»	The user required to create a Transport Entity which extremities are referencing the same point, therefore creating a loop in the network. Creating loop is not allowed from the user interface.
1172	«Invalid call, promotion requires the TE and the SNC to be in the same application»	Check that the selected SNC is in the Application of the selected Transport Entity. Double click on the SNC : if the SNC is in the same Application a message window is opened if the SNC is in another Application, the associated Application window is opened or created. The operator should move the SNC into the current Application window to perform the promotion of the SNC.
1175	«Specified TP does not exist in Foreign NE '%s'. Please specify a correct TP Label in Foreign NE '%s'»	See 1176
1176	«Specified TP does not exist in NE '%s'. Please specify a correct TP Label in NE '%s'»	The FOXMAN-UN NP provided a TP that doesn't exist in the database any more, the network may have been modified between the query and the usage of the TP. Please query again the TP, it should not exist anymore. Please report this error to the Customer support. Refer to «Support» at the beginning of this appendix for the information to be provided for an efficient analysis of the problem.
1190	«Application already opened by another client»	Someone is already editing the Application. The FOXMAN-UN NP is a client/server application, the server may be contacted by multiple clients in parallel but the same Application can't be opened twice.
1191	«Cannot accept the connection, maximum number of connections %d reached»	The FOXMAN-UN NP has a maximum number of edited Applications at the same time. This maximum has been reached.
1200	«Application not found in database. Please retrieve new data»	The user has requested the visualization of an Application that's doesn't exist in the database anymore. The Application may have been : previously deleted by the user a network configuration has been detected which led to the deletion of the Application.

12.1.4   Application/System

Code	Error	Description/Possible Action
2000 to 2007, failure while adjusting path		Please report this error to the Customer support. Refer to "Support" at the beginning of this appendix for the information to be provided for an efficient analysis of the problem.
2000	«Affects another TE»	
2002	«Affects integrity of different path sides of a TE»	
2003	«Affects the integrity of TE '%s' without hole»	
2004	«Found MC used by TE '%s'. Call demotion first»	
2005	«One side connectivity research affects integrity of a TE, other side stopped because no more connectivity was found or a TTP was found»	
2006	«Affects directionality of TE '%s'»	
2007	«Connectivity problem, existing connectivity linked to a TTP ('%s') that is not the A or Z end point of TE '%s'»	
2020	«Connectivity problem while completing path, left extremity of the hole (NE '%s' TP '%s') is a TTP different from TE '%s' end points»	Please report this error to the Customer support. Refer to «Support» at the beginning of this appendix for the information to be provided for an efficient analysis of the problem.
2040	«Incomplete information for a TE starting or finishing in a Foreign NE. Please specify A and Z end points»	This error is raised because the operator has requested the creation of an invalid Transport Entity. The Transport Entity is invalid because the A extremity is set to a TP into a Foreign and the Z extremity is not specified. Such Transport Entity is not allowed.
2041	«Incomplete information for a topological SNC creation. Please specify A and Z end TP Labels»	This error is raised because the operator has requested the creation of an invalid Transport Entity. The operator has requested the creation of a Transport Entity where both A and Z network elements are Foreign. The Transport Entity is invalid because the A or Z TP is not specified. When creating a Transport Entity between two Foreigns, the TP extremities have to be set to existing TPs different from « Undefined Unit < 0> Null TP »
2042 to 2043, Autogeneration failure		An error occurred during network analysis. The operator has requested the creation of a Trail or SNC which is followed by an analysis of the network to detect if new Transport Entity should be created as a consequence of the newly created Transport Entity. This analysis raised an error which is appended to this error.
2042	«Problem detected while analyzing connectivity after Trail '%s' creation»	
2043	«Problem detected while analyzing connectivity after SNC '%s' creation»	
2060	«Invalid call, channels cannot be grouped for TP '%s'»	
2080 to 2085, initial connectivity failure		A user action can not be completed because the FOXMAN-UN NP has found an existing Transport Entity or MC that is preventing the action to be performed correctly. The Transport Entity or MC should be deleted to complete the user action.
2080	«Found already used bidirectional SNC connected to TP '%s' while analyzing initial connectivity»	
2081	«Connectivity linked to more than one SNC at TP '%s'»	
2082	«Connectivity linked to Unknown TE "%s"»	
2083	«Connectivity linked to Circuit '%s'»	
2084	«Connectivity linked to SNC '%s'»	
2085	«Connectivity linked to a used MC»	

Code	Error	Description/Possible Action
2086	«Found an unknown transport entity during auto-generation processus»	The FOXMAN-UN NP forbids connecting a valid Transport Entity to any Unknown. Those valid Transport Entity are : created by the operator created by the FOXMAN-UN NP as a consequence of a Transport Entity created by the operator (SNC or Trails)
2100	«Cannot build a SNC including only another SNC ('%s')»	This is a limitation of the FOXMAN-UN NP. The user as requested the creation of a SNC type Transport Entity which A and Z extremities are matching the A/Z of an existing SNC, this user action is not allowed.
2120 to 2140, Transport Entity integrity impact		The operator has requested the creation of a Transport Entity which conflicts with existing Transport Entities.
2120	«Connectivity problem, affects integrity of more than one TE»	
2140	«Connectivity problem, affects integrity of another TE with different number of 64k»	
2160	«Cannot delete a MC used by a TE. MC '%s' is used by TE '%s' and recursive mode is off»	Please report this error to the Customer support. Refer to «Support» at the beginning of this appendix for the information to be provided for an efficient analysis of the problem.
2180	«Invalid channel '%s', please perform a ClearChannel at point NE '%s' TTP '%s'»	Please report this error to the Customer support. Refer to «Support» at the beginning of this appendix for the information to be provided for an efficient analysis of the problem.
2200	«Cannot delete SNC '%s'. The SNC is used by TE '%s' and recursive mode is off»	Please report this error to the Customer support. Refer to «Support» at the beginning of this appendix for the information to be provided for an efficient analysis of the problem.
2210	«Cannot delete a trail ('%s') used by an unknown TE»	Please report this error to the Customer support. Refer to «Support» at the beginning of this appendix for the information to be provided for an efficient analysis of the problem.
6000 to 6009, errors during processing of npfotool_termination.csv and npfotool_crossconnect.csv		
6000	«Failed to find section '%s'»	This errors is raised during the processing of an entry in **npfotool_crossconnect.csv**. The Section label provided in the csv file does not exist. Please check the section name. Typos are a common error, the name matching is case sensitive. Check the label name and call **npresynch**.
6001	«Section called '%s' found multiple times»	This error is raised during the processing of an entry in **npfotool_crossconnect.csv**. This is a limitation of the FOXMAN-UN NP, multiple sections called '%s' connect the same Foreign. A unique name should be provided to sections connecting a Foreign. Please, provide a unit name in FOXMAN-UN BP or modify section name in the FOXMAN-UN NP user interface and call **npresynch**.
6002	«TTP '%s' has no channel»	This error is raised during the processing of an entry in **npfotool_crossconnect.csv**. The processing has found a TTP which does not have any channel and the cross-connect entry in the csv file specifies one. Check the entry, if the trouble still exists then report the trouble to the Customer support. Refer to «Support» at the beginning of this appendix for the information to be provided for an efficient analysis of the problem.
6003	«A channel should be provided to break ambiguity on TTP '%s'»	This error is raised during the processing of an entry in **npfotool_crossconnect.csv**. An entry in the csv is ambiguous, please check the User Manual to find which channel is missing. Please, report the trouble to the Customer support if it is not solved. Refer to «Support» at the beginning of this appendix for the information to be provided for an efficient analysis of the problem.

Code	Error	Description/Possible Action
6004	«Failed to match channel '%s' on TTP '%s'»	This error is raised during the processing of an entry in **npfotool_crossconnect.csv**. A channel name has been specified in the csv that does not exist on a TTP in the database. Check the channel name in the csv entry, typos are a common error Check the csv entry using the User Manual. Please, report the trouble to the Customer support if it is not solved. Refer to «Support» at the beginning of this appendix for the information to be provided for an efficient analysis of the problem.
6005	«Failed because Trail '%s' should support channel '%s'»	This error is raised during the processing of an entry in **npfotool_crossconnect.csv**. Specified trail in the network doesn't have then channel provided in last %s available on both extremities. In most cases it is due to CAS availability on a P12 Trail where the CAS setting is different on Trail extremities (ON/ OFF) thereby making available the T16 timeslot on one side but not on the other. Please set the CAS to the same configuration on both extremities. Please, report the trouble to the Customer support if it is not solved. Refer to «Support» at the beginning of this appendix for the information to be provided for an efficient analysis of the problem.
6006	«Reached invalid Termination Point, a SNC was expected here. '%s'/'%s'»	This error is raised during the processing of an entry in **npfotool_crossconnect.csv**. This is an internal error. Please report this error to the Customer support. Refer to «Support» at the beginning of this appendix for the information to be provided for an efficient analysis of the problem.
6007	«Reached invalid Termination Point, SNC prevents creation of Trail at '%s'/'%s'»	This error is raised during the processing of an entry in **npfotool_crossconnect.csv**. The network contains an SNC that prevents the handling of a csv entry. Please report this error to the Customer support. Refer to «Support» at the beginning of this appendix for the information to be provided for an efficient analysis of the problem.
6008	«Failed to find foreign called '%s'»	This error is raised during the processing of an entry in **npfotool_termination.csv**. Typos are a common error, please check that the Foreign name is matches the real Foreign name of FOXMAN-UN NP.
6009	«Found multiple Foreigns called '%s'»	This error is raised during the processing of an entry in **npfotool_termination.csv**. The Foreign names specified in the csv should be unit in the network. Please provide a different name.

12.1.5 Internal

Code	Error	Description/Possible Action
3000	«Invalid database schema, there is no instance of the object TEDataPointer»	Please report this error to the Customer support. Refer to «Support» at the beginning of this appendix for the information to be provided for an efficient analysis of the problem.
3020	«Cannot add a TE with undefined type %d in the path of TE '%s'»	
3040	«Incorrect internal parameter, TE Type '%s' undefined»	
3060	«Undefined TE type '%s'»	
3080	«Undefined TE type found while trying to convert a TE from the database»	
3081	«Undefined TE type found while trying to convert a TE to the database»	
3082	«Undefined Path element type found while trying to convert a Path element from the database»	
3100	«Null Link Path element in '%s' path of TE '%s'»	
3120	«Invalid Status value %d»	
3121	«Invalid Path element type (No MC, SNC, LC, section protection or hole)»	
3140	«Selector out of bounds»	
3141	«Invalid internal call, null persistent object found»	
3142	«Found object type not defined while reading from database»	
3143	«Unexpected Database Error '%s'»	
3160	«Concurrent access on the same resource, object '%s' has been already deleted»	
3180	«Invalid internal call, null transient object specified»	
3181	«Object type not defined»	
3182	«Unexpected Database Error '%s'»	
3200	«Undefined state %d in context»	
3220	«Path element type not defined»	
3240	«Availability Status %d not defined»	
3241	«Path element type %d not defined»	
3260	«Undefined Path element type %d while trying to convert a Path element from the gui»	

12.1.6 System

Code	Error	Description/Possible Action
4000	«Cannot add a Trail in the '%s' path of TE '%s', there is no hole»	The User Interface has allowed an invalid action : the operator has requested to add a Trail in the route of a Transport Entity which is already routed. Please report this error to the Customer support. Refer to «Support» at the beginning of this appendix for the information to be provided for an efficient analysis of the problem.

Code	Error	Description/Possible Action
4020	«SNC '%s' is not a possible hop for TE '%s'»	The FOXMAN-UN NP has provided a possible SNC for manual or automatic routing that is rejected when used. Please report this error to the Customer support. Refer to «Support» at the beginning of this appendix for the information to be provided for an efficient analysis of the problem.
4040	«Cannot add a TE in protecting path of the non protected TE '%s'»	The User Interface has allowed an invalid action. Please report this error to the Customer support. Refer to «Support» at the beginning of this appendix for the information to be provided for an efficient analysis of the problem.
4041	«Cannot add a TE in '%s' path of TE '%s', there is no hole»	The User Interface has allowed an invalid action. Please report this error to the Customer support. Refer to «Support» at the beginning of this appendix for the information to be provided for an efficient analysis of the problem.
4060 ➔ 4071, internal error		Please report this error to the Customer support. Refer to «Support» at the beginning of this appendix for the information to be provided for an efficient analysis of the problem.
4060	«Cannot find Internal Section '%s', A End TTP not found in NE '%s'»	
4061	«Cannot find Internal Section '%s', A End TTP not found in NE '%s'. '%s'»	
4062	«Cannot create MC '%s' in NE '%s', received incorrect specification from BP. '%s'»	
4063	«Cannot create Internal Section in Trail '%s' NE '%s', invalid A or Z End TTP. '%s'»	
4064	«Cannot create Internal Section, A End TP '%s' in NE '%s' already used by trail '%s'»	
4065	«Cannot create Internal Section, Z End TP '%s' in NE '%s' already used by trail '%s'»	
4066	«Cannot modify Unit '%s' in NE '%s', Unit not found in database»	
4067	«Cannot modify TTP '%s' in NE '%s', TTP not found in database»	
4068	«Cannot modify MC '%s' in NE '%s', MC not found in database»	
4069	«Cannot modify InternalSection '%s' in NE '%s', InternalSectionInfo not found in database»	
4070	«Cannot destroy Unit '%s' in NE '%s', Unit not found in database»	
4071	«Cannot destroy TTP '%s' in NE '%s', TTP not found in database»	
4080	«Detected incompatible directionality while auto-generating '%s' '%s'»	This error occurs during the processing of **npfotool_termination.csv** and **npfotool_crossconnect.csv** or through the user interface during the autogeneration of new Transport Entities. Directionality mismatch between unidirectional MCs has been detected. The FOXMAN-UN NP prevents the operator from creating an invalid Transport Entity.
4100	«Cannot auto-generate a TE with both null A and Z End NE»	Please report this error to the Customer support. Refer to «Support» at the beginning of this appendix for the information to be provided for an efficient analysis of the problem.
4101	«Cannot auto-generate a Unidirectional TE with null A End NE»	Please report this error to the Customer support. Refer to «Support» at the beginning of this appendix for the information to be provided for an efficient analysis of the problem.
4102	«Cannot auto-generate a P0nc TE with A and Z End TP with incompatible nb of 64k»	Please report this error to the Customer support. Refer to «Support» at the beginning of this appendix for the information to be provided for an efficient analysis of the problem.
4120	«Invalid call to clear channels in protecting path, TE '%s' not protected»	The User Interface has allowed an invalid action.

Code	Error	Description/Possible Action
4130	«Creation of topological Circuits not supported»	This error is due to an invalid call to the server. A topological Transport Entity does not have a path. Only SNCs between two Foreigns can be topological.
4131	«Creation of topological Trails not supported»	See 4130
4132	«Null Z end NE, in a topological SNC both A and Z end points must be specified»	Invalid call to the server. The FOXMAN-UN NP supports the creation of Transport Entities which Z is not specified for Transport Entities that are not topological.
4133	«Invalid end points for a topological TE creation, end points must be located into Foreigns NEs»	Please report this error to the Customer support. Refer to «Support» at the beginning of this appendix for the information to be provided for an efficient analysis of the problem.
4134	«Invalid parameters for TE creation, a TE between two Foreign NEs ('%s' and '%s') must be topological»	Please report this error to the Customer support. Refer to «Support» at the beginning of this appendix for the information to be provided for an efficient analysis of the problem.
4135	«Cannot create a fixed TE»	Please report this error to the Customer support. Refer to «Support» at the beginning of this appendix for the information to be provided for an efficient analysis of the problem.
4150 ➔ 4155, demotion failed		Please report this error to the Customer support. Refer to «Support» at the beginning of this appendix for the information to be provided for an efficient analysis of the problem.
4150	«Invalid A end point for SNC demotion, A end channel '%s' of TE '%s' different of A end channel '%s' of SNC '%s' and the SNC is at the beginning of the TE»	
4151	«Invalid A end point for SNC demotion, channel '%s' of previous LC in TE '%s' different of A end channel '%s' (NE '%s' TP '%s') of the SNC to demote»	
4152	«Invalid A end point for SNC demotion, channel '%s' in TE '%s' different of A end channel '%s' (NE '%s' TP '%s') of the SNC to demote»	
4153	«Invalid A end point for SNC demotion, failed to find matching A end point (NE '%s' TP '%s') of the SNC to demote in TE '%s'»	
4155	«Invalid Z end point for SNC demotion, failed to find matching Z end point (NE '%s' TP '%s') of SNC in TE '%s'»	
4156	«Invalid call to SNC demotion, cannot demote only a SNC»	This is a limitation of the FOXMAN-UN NP. The user requested that a SNC is demoted which will lead to the creation of a SNC having one SNC in the path. No use case has been defined for this action.
4170	«Unexpected Database Error: '%s'»	A database error occurred. The error message as provided by the database is in the %s. Please report this error to the Customer support. Refer to «Support» at the beginning of this appendix for the information to be provided for an efficient analysis of the problem.

Code	Error	Description/Possible Action
4180 ➔ 4322, Invalid calls		Please report this error to the Customer support. Refer to «Support» at the beginning of this appendix for the information to be provided for an efficient analysis of the problem.
4180	«Invalid call, path must have a hole to obtain next trails to route. TE '%s' has no hole»	
4190	«Invalid call, path must have a hole to obtain next sncs to route. TE '%s' has no hole»	
4200	«Cannot get channel list, LC using Trail '%s' in path '%s' of TE '%s' not found»	
4220	«Invalid call, path must have a hole to get possible end TTP for server layer Trail. TE '%s' has no hole»	
4240	«Invalid call, path must have a hole to be routed. TE '%s' has no hole»	
4260	«Invalid call, path must have a hole to get possible ServerLayer Hops. TE '%s' has no hole»	
4280	«Invalid in channels for SNC '%s', timeslots of channel %d are not included in A end TP timeslots channel '%s'»	
4300	«TPs to be grouped do not belong to the same TTP (reference TTP '%s')»	
4320	«Null Z NE specified with a Z TP not null ('%s'). Please specify the NE»	
4321	«Incompatible layer rate between A end point ('%s' rate '%s') and Z end point ('%s' rate '%s')»	
4322	«Invalid rate for a Trail. Please use a rate different of '%s'»	
4323	«Invalid directionality, unidirectional Trails are not supported»	The FOXMAN-UN NP does not allow unidirectional Trails. All Trails are bidirectional.

Code	Error	Description/Possible Action
4324 ➜	4341, Transport Entity creation failed	The operator has specified TPs that can't be used for the creation of the user Transport Entity.
4324	«TP '%s' is not a TTP»	
4325	«TTP of TP '%s' already bound to Trail '%s'»	
4326	«Invalid Z end point, Z end TP '%s' is not a TTP»	
4327	«Invalid Z end point, Z end TTP of TP '%s' already bound to Trail '%s'»	
4328	«Invalid rate for a Circuit. Please use a rate different of '%s'»	
4329	«Invalid TE end point (TP '%s'), a TTP cannot be a Circuit end point»	
4330	«Invalid TE end point (NE '%s' TP '%s'), end points of a Circuit need to be CTPs that are not end point of an LC»	
4331	«Invalid Z end point (TP '%s'), a TTP cannot be a Circuit end point»	
4332	«Invalid TE end point (TP '%s'), end points of a Circuit need to be CTPs that are not end point of an LC»	
4333	«Invalid Z end point, Z end TP '%s' is already a end point of a Circuit»	
4334	«Invalid A end point, A end TP '%s' is already a end point of a Circuit»	
4335	«Invalid A end point, A end TP '%s' has common slots with an existing TE»	
4336	«Invalid rate for a SNC. Please use a rate different of '%s'»	
4337	«Invalid A end point, A end TP '%s' is already a Circuit end point or in the middle of an existing TE»	
4338	«Invalid Z end point, Z end TP '%s' is already a Circuit end point or in the middle of an existing TE»	
4339	«Invalid Z end point, Z end TP '%s' has common slots with an existing TE»	
4340	«Invalid Z end point, SNCs finishing in a Foreign NE must have a defined TP. Please specify Z end TP»	
4341	«Invalid Z end point, not enough unused capacity Z end TP '%s'»	

Code	Error	Description/Possible Action
4360 ➔	4376, Invalid call for routing	Please report this error to the Customer support. Refer to «Support» at the beginning of this appendix for the information to be provided for an efficient analysis of the problem.
4360	«Deleted TE '%s' cannot be a possible hop»	
4361	«No TE can be hop of TE '%s' without hole»	
4362	'%s' '%s' is not a possible hop for TE '%s', only SNC/Trails can be candidates for a hop»	
4363	«TE '%s' is not a possible hop for TE '%s', only connectable TEs can be candidates for a hop»	
4364	«TE '%s' is not a possible hop for TE '%s', left NE of TE ('%s') is different from left NE of hole ('%s')»	
4365	«'%s' named ' '%s' ' is not a possible hop for TE '%s', CAS should be ON»	
4366	«Trail '%s' is not a possible hop for TE '%s', only connectable TEs can be candidates for a hop»	
4367	«Trail '%s' is not a possible hop for TE '%s', left NE/TP of Trail must be different of Z end point of TE»	
4368	«SNC '%s' is not a possible hop for TE '%s', bidirectional protected TE cannot begin with a SNC»	
4369	«SNC '%s' is not a possible hop for TE '%s', left TTP of possible hop ('%s') different of A end TTP of TE ('%s') and hop must be inserted at the beginning of the path»	
4370	«SNC '%s' is not a possible hop for TE '%s', timeslots of left TP channel of hop ('%s') don't include all slots of A end channel of TE ('%s') and hop must be inserted at the beginning of the path»	
4371	«SNC '%s' is not a possible hop for TE '%s', left TP of possible hop ('%s') different of A end TP of TE ('%s') and hop must be inserted at the beginning of the path»	
4372	«SNC '%s' is not a possible hop for TE '%s', inserting this SNC leads to a connectivity problem»	
4373	«SNC '%s' is not a possible hop for TE '%s'. Left TP channel of SNC ('%s') is incompatible with A end channel of hole ('%s'), rate is P0nc and TE EndPoint cannot be grouped»	
4374	«SNC '%s' is not a possible hop for TE '%s', timeslots of left TP channel of hop ('%s') don't include all slots of A end channel of hole ('%s')»	
4375	«SNC '%s' is not a possible hop for TE '%s', left TP channel of hop ('%s') different of A end channel of hole ('%s')»	
4376	«SNC '%s' is not a possible hop for TE '%s', left TTP of possible hop ('%s') different of A end TTP of hole in TE ('%s')»	

Code	Error	Description/Possible Action
4390 ➔ 4405, Protecting a Transport Entity		
4390	«Cannot protect simple TE '%s'»	This is a limitation of the FOXMAN-UN NP.
4391	« Cannot protect already protected TE '%s'. »	Simple Transport Entity are made of one MC. The FOXMAN-UN NP does not allow protecting such Transport Entities.
4392	« Cannot protect topological TE '%s'. »	
4393	« Cannot protect fixed TE '%s'. »	
4394	«Cannot protect TE '%s' with identical A and Z end NE '%s'»	
4395	«Cannot protect TE '%s' with SNC '%s' as last path element»	
4396	«Cannot protect a TE ('%s') with Z Endpoint at a SNC ('%s') Endpoint»	
4397	«Cannot protect a bidirectional TE ('%s') with a SNC ('%s') as first path element»	
4398	«Cannot protect a TE ('%s') with a fixed MC ('%s') as last path element»	
4399	«Cannot protect a bidirectional TE ('%s') with a fixed MC ('%s') as first path element»	
4400	«Cannot protect TE '%s', A end TP '%s' does not support protection»	
4401	«Cannot protect TE '%s', Z end TP '%s' does not support protection»	
4402	«Cannot protect TE '%s', protection mode incompatibility between A and Z end points»	
4403	«Cannot protect TE '%s', existing route from A Endpoint prevents path protection»	
4404	«Cannot protect TE '%s', existing route from Z Endpoint prevents path protection»	
4405	«Cannot protect TE '%s' which is an Unknown»	

Code	Error	Description/Possible Action
4440 ➔ 4453, internal errors during network synchroni-zation		Please report this error to the Customer support. Refer to «Support» at the beginning of this appendix for the information to be provided for an efficient analysis of the problem.
4440	«A NE with name '%s' that is not a Proprietary NE already use the key '%d'»	
4441	«A NE with name '%s' that is not a Foreign NE already use the key '%d'»	
4442	«Cannot find A end NE of Section '%s' with object key %d and name '%s'. BP error: '%s'»	
4443	«Cannot find Z end NE of Section '%s' with object key %d and name '%s'. BP error: '%s'»	
4444	«Cannot find A end TTP of Section '%s' with TTP Label '%s'. BP error: '%s'»	
4445	«Cannot find Z end TTP of Section '%s' with TTP Label '%s'. BP error: '%s'»	
4446	«Cannot create Section '%s' with A end TTP '%s', TTP already in use by Trail '%s'»	
4447	«Cannot create Section '%s' with Z end TTP '%s', TTP already in use by Trail '%s'»	
4448	«Proprietary NE with key %d and name '%s' not found in database»	
4449	«Foreign NE with key %d and name '%s' not found in database»	
4450	«Section named '%s' not found in database»	
4451	«Proprietary NE with key %d and name '%s' not found in database»	
4452	«Foreign NE with key %d and name '%s' not found in database»	
4453	«Section named '%s' not found in database»	
4470 ➔ 4476,Invalid call during SNC promotion		SNC promotion failed.
4470	«Cannot promote SNC '%s' not used by TE '%s'»	
4471	«Cannot promote a topological SNC ('%s')»	
4472	«Cannot promote a SNC ('%s') with a hole»	
4473	«Cannot promote an incomplete SNC ('%s')»	
4474	«Cannot promote SNC '%s' with capacity %d different of the TE using it capacity %d»	
4475	«Cannot promote SNC ('%s') used in multiples TEs»	
4476	«Cannot promote Bidirectional SNC ('%s') into Unidirectional TE ('%s')»	
4490 ➔ 4491, Removes TEs from Path		Please report this error to the Customer support. Refer to «Support» at the beginning of this appendix for the information to be provided for an efficient analysis of the problem.
4490	«Cannot remove elements into protecting path of TE '%s' not protected»	
4491	«Cannot remove the elements list from TE '%s', at least one element is not included in the path»	
4500 ➔ 4510, Connectivity analysis		

Code	Error	Description/Possible Action
4500	«Detected an unidirectional Trail, case not supported»	The FOXMAN-UN NP has detected that the last user action would lead to created Transport Entities that not valid end-to-end. Therefore, the user action is refused.
4501	«A TE without Z is linked to left or right connectivity»	
4502	«Incompatible direction found during auto-generation processus»	
4510	«Detected incompatible directionality while scanning b '%s'»	Please report this error to the Customer support. Refer to «Support» at the beginning of this appendix for the information to be provided for an efficient analysis of the problem.
4520 ➜ 4545, Automatic channel selection		Automatic channel selection failed.
4520	«Cannot select channels in working path of TE '%s' with a hole in working path»	
4521	«Cannot select channels in protecting path of TE '%s' with a hole in protecting path»	
4522	«Cannot set the channel, LC path element corresponding to Trail '%s' not found in path of TE '%s'»	
4523	«Invalid channel list furnished to set channel, at least channel '%s' does not exist in trail TTP '%s'»	
4524	«Invalid channel list furnished to set channel, there is at least one null channel. Null Channels not allowed»	
4540	«Invalid call to set path element channel, specified channel '%s' already used by LC in trail '%s'»	
4541	«Cannot set channel %d for LC in trail '%s', found fixed MC '%s' as previous and first path element with channel '%s'»	
4542	«Cannot modify the channel of LC in Trail '%s', found SNC '%s' with incompatible channels»	
4543	«Cannot modify the channel of LC in Trail '%s', found SNC '%s' with incompatible channels»	
4544	«Cannot modify the channel of LC in Trail '%s', found fixed MC '%s' with incompatible channel»	
4545	«Cannot set channel because protecting or working path start with a MC not followed by a LC»	
4550	«Cannot set TE end point to null»	This is a limitation of the FOXMAN-UN NP. The operator is allowed to create a Transport Entity without specifying the Z TP, but he is not allowed to set it to an unspecified value once set.
4560	«Cannot unprotect non protected TE '%s'»	Please report the trouble to the Customer support. Refer to «Support» at the beginning of this appendix for the information to be provided for an efficient analysis of the problem.
4570	«Invalid internal parameter Circuit identifier ('%s'), the specified TE is not a Circuit»	Invalid call, a setting of Circuit user data has been requested on a Transport Entity that is not a Circuit. Please report the trouble to the Customer support. Refer to «Support» at the beginning of this appendix for the information to be provided for an efficient analysis of the problem.
4571	«Invalid internal parameter, NE with null NEKey doesn't exist»	Invalid call. For the creation of a new Transport Entity, the A end Network Element has not been specified correctly. Please report the trouble to the Customer support. Refer to «Support» at the beginning of this appendix for the information to be provided for an efficient analysis of the problem.

Code	Error	Description/Possible Action
4572 ➔ 4573, Invalid call, TE creation		Invalid call to the creation of a Transport Entity, an invalid channel is specified. Please report the trouble to the Customer support. Refer to «Support» at the beginning of this appendix for the information to be provided for an efficient analysis of the problem.
4572	«Invalid internal parameter, the proposed channel ('%s') for the A end point doesn't exist for the TTP ('%s')»	
4573	«Invalid internal parameter, the proposed channel ('%s') doesn't exist for the Z TTP ('%s')»	
4574 ➔ 4578, Invalid call, Routing		The user interface has allowed to perform routing actions on a Transport Entity that is not manageable, i.e. can't be modified Please report the trouble to the Customer support. Refer to «Support» at the beginning of this appendix for the information to be provided for an efficient analysis of the problem.
4574	«Cannot route a non manageable TE»	
4575	«Cannot add a TE in the path of TE '%s', TE is a non manageable TE»	
4576	«Cannot remove TEs from TE '%s', the TE is non manageable»	
4577	«Cannot remove TEs from protecting path of the non protected TE '%s'»	
4578	«Cannot modify TE '%s', cannot modify a non manageable TE»	
4580 ➔ 4581, Invalid call, Automatic channel selection		The user interface has allowed to perform routing actions on a Transport Entity that is not manageable, i.e. can't be modified Please report the trouble to the Customer support. Refer to «Support» at the beginning of this appendix for the information to be provided for an efficient analysis of the problem.
4580	«Cannot select channels of TE '%s', cannot modify a non manageable TE»	
4581	«Cannot select channels of TE '%s', the path contains a hole element»	
4582	«Cannot clear channels of TE '%s', cannot modify a non manageable TE»	Invalid Call, a non manageable TE can't be modified by the operator. Please report the trouble to the Customer support. Refer to «Support» at the beginning of this appendix for the information to be provided for an efficient analysis of the problem.
4583 ➔ 4584, invalid call, get channel list		
4583	«Cannot get possible channels of TE '%s', TE is not manageable»	
4584	«Cannot get possible channels of TE '%s', TE is not a Trail»	
4585 ➔ 4587, invalid call, channel setting		Invalid Call, a non manageable TE can't be modified by the operator. Please report the trouble to the Customer support. Refer to «Support» at the beginning of this appendix for the information to be provided for an efficient analysis of the problem.
4585	«Invalid internal call to set channel, the channel list is empty»	
4586	«Cannot set channel of TE '%s', TE is not manageable»	
4587	«Cannot set channels of Hop '%s' in TE '%s', the Hop is not a Trail»	
4588 ➔ 4589, invalid call, protection/unprotection		Invalid Call, a non manageable TE can't be modified by the operator. Please report the trouble to the Customer support. Refer to «Support» at the beginning of this appendix for the information to be provided for an efficient analysis of the problem.
4588	«Cannot protect TE '%s', TE is not manageable»	
4589	«Cannot unprotect TE '%s', TE is not manageable»	

Code	Error	Description/Possible Action
4590 ➜	4598, invalid call, invalid elements provided	Invalid Call, the user interface has provided invalid data to the FOXMAN-UN NP server.
4590	«Invalid internal parameter, application with Id '%s' not found in database»	Please report the trouble to the Customer support. Refer to «Support» at the beginning of this appendix for the information to be provided for an efficient analysis of the problem.
4591	«The requested element with Id '%s' is not a TE but a MC»	
4592	«The requested element with Id '%s' is an internal non-manageable SNC included in a Foreign NE»	
4593	«Requested TE with teId '%s' not found in database»	
4594	«Requested Path with pathId '%s' not found in database»	
4595	«Requested NE with NEKey '%s' not found in database»	
4596	«Specified a transport entity Id '%s' that does not belong to current application»	
4597	«The path of TE '%s' is invalid, it contains many times the same trail»	
4598	«Requested TE with teId '%s' is already deleted»	
4599	«Routing an Unknown TE is not possible»	Invalid Call, a non manageable Transport Entity can't be modified by the operator. Please report this error to the Customer support. Refer to «Support» at the beginning of this appendix for the information to be provided for an efficient analysis of the problem.

Code	Error	Description/Possible Action
4610 ➜ 4637, unexpected internal error during synchronization		Please report this error to the Customer support. Refer to «Support» at the beginning of this appendix for the information to be provided for an efficient analysis of the problem.
4610	«WARNING !! An error occurred during NE '%s' units generation. Look at the traces and launch again the resynchronization»	
4611	«WARNING !! An error occurred during NE '%s' TTPs generation. Look at the traces and launch again the resynchronization»	
4612	«WARNING !! An error occurred during NE '%s' MCs generation. Look at the traces and launch again the resynchronization»	
4613	«WARNING !! An error occurred during NE '%s' Internal Sections generation. Look at the traces and launch again the resynchronization»	
4614	«WARNING !! Database error occurred during NE '%s' units generation: '%s'»	
4615	«WARNING !! Database error occurred during NE '%s' TTPs generation: '%s'»	
4616	«WARNING !! Database error occurred during NE '%s' MCs generation: '%s'»	
4617	«WARNING !! An error occurred during NE '%s' Internal Sections generation: '%s'»	
4630	«WARNING !! An error occurred during NE '%s' Units synchronization. Look at the traces and launch again the resynchronisation»	
4631	«WARNING !! An error occurred during NE '%s' TTPs synchronization. Look at the traces and launch again the resynchronisation»	
4632	«WARNING !! An error occurred during NE '%s' MCs synchronization. Look at the traces and launch again the resynchronisation»	
4633	«WARNING !! An error occurred during NE '%s' Internal Sections synchronization. Look at the traces and launch again the resynchronisation»	
4634	«WARNING !! Database error occurred during NE '%s' Units synchronization: '%s'»	
4635	«WARNING !! Database error occurred during NE '%s' TTPs synchronization: '%s'»	
4636	«WARNING !! Database error occurred during NE '%s' MCs synchronization: '%s'»	
4637	«WARNING !! Database error occurred during NE '%s' Internal Sections synchronization: '%s'»	
4650 ➜ 4660, unexpected communication error		Please report this error to the Customer support. Refer to «Support» at the beginning of this appendix for the information to be provided for an efficient analysis of the problem.
4650	«Cannot get a reference on the BPQueryNetworkMgr»	
4660	«Corba exception prevents the Event Handler to attach the Observer. Please verify all process are running»	

Code	Error	Description/Possible Action
4670 ➔ 4672, unexpected database error		The system error message as provided by the database is in the %s.
4670	«Unexpected Database Error while generating Proprietaries NEs: '%s'»	
4671	«Unexpected Database Error while generating Foreigns: '%s'»	Please report this error to the Customer support. Refer to «Support» at the beginning of this appendix for the information to be provided for an efficient analysis of the problem.
4672	«Unexpected Database Error while generating Sections: '%s'»	
4673	«Invalid call to group TPs with an empty TPs list, please select the list of TPs to group»	The user interface has allowed an invalid call. Please report this error to the Customer support. Refer to «Support» at the beginning of this appendix for the information to be provided for an efficient analysis of the problem.
4674 ➔ 4687, invalid calls to Network Query Manager		
4674	«Invalid internal parameter, Application with Id '%s' not found in database»	Please report this error to the Customer support. Refer to «Support» at the beginning of this appendix for the information to be provided for an efficient analysis of the problem.
4675	«Invalid internal parameter, Application with Id '%s' not found in database»	
4676	«Invalid internal parameter neKey (%d), Network Element not found in database»	
4677	«Invalid internal parameter neKey (%d), Network Element not found in database»	
4678	«Invalid internal parameter neKey (%d), it doesn't correspond to a Network Element»	
4679	«Invalid internal parameter neKey (%d), Foreign Network Element not found in database»	
4680	«Invalid internal parameter neKey (%d), Network Element not found in database»	
4681	«Invalid internal parameter TTPAddress (%d|%d|%d|%d), TTP not found inside the NE '%s'»	
4682	«Invalid internal parameter TE identifier (%d), the TE is a topological SNC (MC '%s') inside the foreign NE '%s'»	
4683	«Invalid internal parameter TE identifier (%d), the identifier corresponds to MC '%s' not a TE»	
4684	«Invalid internal parameter TE identifier (%d), TE not found in database»	
4685	«Invalid internal parameter TE identifier (%d), the TE is a topological SNC (MC '%s') inside the foreign NE '%s'»	
4686	«Invalid internal parameter TE identifier (%d), the identifier corresponds to MC '%s' not to a TE»	
4687	«Invalid internal parameter TE identifier (%d), TE not found in database»	
4700	«The BP provided 0 network elements»	This error is issued by **npresynch**/**npinitdb** scripts. The BP provided an empty list of network element. Instead of clearing all existing data, the NP raised this error to prevent loosing the database in case of an error in the BP. If the operation is correct, i.e. no equipment has already been configured, the user can bypass this error using the genapp command with –f option. Please contact support to confirm.

Code	Error	Description/Possible Action
4701➔ 4702, Synchronization trouble		possible causes :
4701	«WARNING !! An error occurred during NEs synchronization. Look at the traces and launch again the resynchronisation»	one of the specified NE name (-l flag used) does not exist in the database retrieving Network Elements from the BP has failed
4702	«WARNING !! An error occurred during Proprietary NE '%s' synchronization. Look at the traces and launch again the resynchronisation»	Please report this error to the Customer support. Refer to «Support» at the beginning of this appendix for the information to be provided for an efficient analysis of the problem.
4703➔ 4704, Unexpected database error		Please report this error to the Customer support. Refer to «Support» at the beginning of this appendix for the information to be provided for an efficient analysis of the problem.
4703	«Database error '%s' occurred during Proprietary NEs synchronization»	
4704	«Database error '%s' occurred during Foreign NEs synchronization»	
4706	«Database error '%s' occurred during Sections synchronization»	Please report this error to the Customer support. Refer to «Support» at the beginning of this appendix for the information to be provided for an efficient analysis of the problem.
4707	«Generic resynchronisation is required, NE name mismatch is detected»	This error may happen when the operator has requested a synchronization of a specific set of Network Elements. The error means that one of the specified Network Element has the same name as an existing Network Element in the NP database but those Network Elements are not the same. A global resynchronisation (npresynch command called without option) will give clean up mismatches in Network Element lists.
4720	«Received system database error: '%s'»	Database engine raised a system error which is put in %s. Please report this error to the Customer support. Refer to «Support» at the beginning of this appendix for the information to be provided for an efficient analysis of the problem.

4730 ➔ 4803, Internal error in database layer

Code	Error	Description/Possible Action
4730	«Unsatisfying criteria, cannot specify a TP without its NE»	Please report this error to the Customer support. Refer to «Support» at the beginning of this appendix for the information to be provided for an efficient analysis of the problem.
4731	«Unsatisfying criteria, cannot specify a Slot without its NE»	
4732	«The specified NE '%s' is a foreign and foreign NEs have no slots»	
4733	«Specified Slot %d in NE '%s' is empty, there is no unit inside it»	
4734	«Invalid internal call, the specified NE '%s' is a foreign and Foreigns have no slots»	
4735	«Unit type '%s' does not exist in specified NE '%s'»	
4736	«Unit type '%s' does not exist in specified slot %d of the NE '%s'»	
4737	«Incompatible slot criteria, specified slot %d and TP slot (%d) are incompatible»	
4738	«Specified NE '%s' is a foreign and foreign NEs have no slots»	
4750	«Specified Slot '%s' in NE '%s' is empty, there is no unit inside it»	
4751	«ALERT!!! More than one Unit matches the criteria NE '%s' Slot %d, the database needs to be re-synchronized»	
4752	«More than one Section Protection matches the criteria (MC '%s'), the database needs to be re-synchronized»	
4753	«Unit type not found in NE '%s'»	
4760	«Failed to find TTP with address (%d/%d/%d/%d) in NE '%s'»	
4761	«ALERT!!! More than one TTP matches the criteria TTP address (%d/%d/%d/%d) in NE '%s', the database needs to be re-synchronized»	
4762	«MC '%s' in NE '%s' not found in database»	
4763	«MC with TP '%s' in NE '%s' not found in database»	
4764	«ALERT!!! More than one MC matches the criteria TP '%s' in NE '%s', the database needs to be re-synchronized»	
4765	«NE with NE key %d not found in database»	
4780	«Cannot determine if protecting path of TE '%s' is complete, the TE is not protected»	
4790	«Trail '%s' is not a topological one, only topological Trails have a Section Address»	
4800	«Invalid internal parameter, to find a CTP in a TTP you must specify a valid channel (not null)»	
4801	«CTP with channel %d in TTP '%s' not found in database»	
4802	«More than one CTP with channel %d in TTP '%s' matches the criteria, the database needs to be re-synchronized»	
4803	«Invalid criteria to find TTPs. Specified Null NE key for Unit '%s'»	

Code	Error	Description/Possible Action
4810 ➔ 4917, internal error		Please report this error to the Customer support. Refer to «Support» at the beginning of this appendix for the information to be provided for an efficient analysis of the problem.
4810	«Cannot delete LC with channel '%s' in Trail '%s', it is used by TE '%s' and recursive mode is off»	
4820	«Cannot delete TTP, only TTPs in Foreigns can be deleted. TTP '%s' is in the proprietary NE '%s'»	
4840	«Cannot get the TE using MC '%s', the MC is not used by a TE»	
4841	«Cannot delete fixed MC '%s'»	
4850	«Received Database Error: '%s'»	
4860	«Cannot get protecting path of TE '%s', the TE has not a protecting path»	
4861	«Cannot get hole in protecting path of TE '%s', the TE has not a protecting path»	
4862	«Cannot get hole of TE '%s', the TE has no hole in '%s' path»	
4863	«Path element in '%s' path of TE '%s' not found»	
4870	«Path element is not a hole in path»	
4871	«Path element is not a MC in path»	
4872	«Path element is not a SNC in path»	
4873	«Path element is not a LC in path»	
4874	«Path element is not a Section Protection in path»	
4880	«Path element info is not a MC in path»	
4881	«Path element info is not a SNC in path»	
4882	«Path element info is not a LC in path»	
4883	«Path element info is not a Section Protection in path»	
4890	«Invalid call, unidirectional Section Protection cannot be inverted»	
4900	«Cannot detach SNC '%s'. Only simple and fixed SNCs can be detached»	
4910	«TE '%s' has no application»	
4911	«TE '%s' has no path»	
4912	«Cannot get MC of TE '%s'. Only simple TEs have a MC as path»	
4913	«Cannot set path of TE '%s', topological TEs have no path»	
4915	«There is no a LC with channel %d in Trail '%s'»	
4916	«Cannot delete TTP '%s'. TTPs used by TEs cannot be deleted if recursive mode is off»	
4917	«Cannot delete the Unknown '%s' containing a fixed protected MC»	
4920	«Cannot modify the name of an internal section»	This is a limitation in the FOXMAN-UN. The name of an internal section (NT to LT cable) can't be modified. A check is performed by the FOXMAN-UN NP.

12.1.7   Alarm

Code	Error	Description/Possible Action
5000 ➔ 5061, Invalid specification between NP/BP		An unexpected internal error has occurred in NP handling of a network change. The BP provided data that the NP fails to handle.
5000	«Received invalid Section specification from BP, named '%s'. (ExceptionMsg: A end TP already in use, Z end TP already in use, NE '%s' not found in database, connectivity problems after scanning the Trail)»	The specified network element is desynchronized, please launch the configuration script called **npresynch** and check that there's no new alarm and the **npresynch** succeeds. Please report this error to the Customer support. Refer to «Support» at the beginning of this appendix for the information to be provided for an efficient analysis of the problem.
5020	«Received invalid TTP specification from BP, in NE named '%s'»	
5021	«Received invalid MC specification from BP, in NE named '%s'»	
5022	«Received invalid Internal Section specification from BP, in NE named '%s'»	
5040	«Received invalid TTP specification from BP, in NE named '%s'»	
5041	«Received invalid MC specification from BP, in NE named '%s'»	
5042	«Received invalid Internal Section specification from BP, in NE named '%s'»	
5060	«Received invalid TTP specification from BP, in NE named '%s'»	
5061	«Received invalid MC specification from BP, in NE named '%s'»	
5063	«Process notification failed, received the internal error '%s'»	An unexpected internal error occurred during the processing of a network change : Please report this error to the Customer support. Refer to «Support» at the beginning of this appendix for the information to be provided for an efficient analysis of the problem. Launch the configuration script called **npresynch**.
5064	«Process notification failed, received the Database error '%s'»	An database error occurred while managing a network change. Please report this error to the Customer support. Refer to «Support» at the beginning of this appendix for the information to be provided for an efficient analysis of the problem.
5065	«Process notification failed, received the CORBA error : '%s'»	An unexpected communication error occurred between FOXMAN-UN NP and FOXMAN-UN BP. Launch **npresynch**, if the trouble still exists then contact the Customer support. Refer to «Support» at the beginning of this appendix for the information to be provided for an efficient analysis of the problem.
5066	«Process notification failed, unknown error»	This is a critical Alarm, unidentified error occurred. Please report this error to the Customer support. Refer to «Support» at the beginning of this appendix for the information to be provided for an efficient analysis of the problem.
5081 ➔ 5083, unexpected communication failure with BP		The FOXMAN-UN NP failed to get a Network Element from BP. One of this error has desynchronized the specified network element.
5081	«Create Element Manager failed on NE '%s'. BP exception: '%s'»	Please synchronize using **npresynch**.
5082	«Create Element Manager failed on NE '%s'. CORBA exception: '%s'»	
5083	«Create Element Manager failed on NE '%s'. Unhandled exception»	

Code	Error	Description/Possible Action
5087 → BP	5089, unexpected communication failure with	Please report this error to the Customer support. Refer to «Support» at the beginning of this appendix for the information to be provided for an efficient analysis of the problem.
5087	«Release Element Manager failed on NE '%s'. BP exception: '%s'»	
5088	«Release Element Manager failed on NE '%s'. CORBA exception: '%s'»	
5089	«Release Element Manager failed on NE '%s'. Unhandled exception»	
5090	«Failed to retrieve Network Query Manager, BP exception, '%s'»	
5091	«Failed to retrieve Network Query Manager, unhandled error»	

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